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EDITORIAL

IT HAS BEEN SUGGESTED that it would be appropriate this year for the President's editorial to take the form of a short report upon the more important activities of the Royal Institute since the last Annual Meeting.

In periods of prosperity, time-consuming demands upon all of us tend to reduce, or at least to prolong activities in committees. Nevertheless, a great deal of important work is being done, not altogether without personal sacrifice, by the members of our many committees for the advancement of the profession.

Further examination and study of the RAIC Contract and other forms always lead to their revision. The 'Cost Plus' Contract Form No. 13 has now been fully revised and checked with the Canadian Construction Association's Committee on documents. It will be printed in English and French. French translation of other documents is also in hand. Through careful negotiations with the printers, and by joining with the CCA in placing orders, the cost of all documents to the membership has been appreciably reduced.

A booklet entitled *A Suggested Guide to Bidding Procedure* has been compiled and is now under review by the CCA Documents Committee. It is anticipated that this Guide will be of great assistance to both architects and contractors in creating a more uniform method of obtaining tenders.

Preparations are being made to approach the various departments of the Federal Government employing architects with a view to obtaining an increase in the rates of fees paid for services rendered, which will bring the fees up to a fair and equitable level. In approaching the governmental departments we have the backing and co-operation of the Consulting Engineers' Association of Canada whose members work in collaboration with architects on departmental projects.

At the request of the Federal Department of Labour, we have had representation at committee meetings held for the purpose of finding ways and means to extend the work of many of the building trades over the winter months and so relieve seasonable unemployment.We feel sure that the Department of Labour will have the full co-operation of our membership along with that of the construction industry in general, in this movement. Although the matter of winter construction affects the client principally, it is realized that careful planning by client, architect and builder would certainly aid in spreading employment more evenly over the winter months.

Concerning architectural education, substantial donations from the Royal Institute to the Schools of Architecture in Canadian universities, earmarked for specific purposes, have been enthusiastically and gratefully accepted. Arrangements for the preparation of a uniform curriculum for a course of training for students not attending universities, who are preparing for membership examinations into the Provincial Associations, have not proceeded as rapidly as some have hoped for. However, the Provincial Associations can be assured that the matter is receiving the most careful attention of the Architectural Education Committee and of the Executive.

The Massey Medals for Architecture Exhibition of 1955 was opened by His Excellency The Right Honourable Vincent Massey, C.H., Governor-General of Canada, at the National Gallery in Ottawa on November 18th. Judging from the quality of the entries and from their number the exhibition is highly successful, and a credit to the architects of Canada.

His Excellency's favourable comments upon the continued growth of the Exhibition and upon the widespread interest it creates in good architecture throughout the country should be carefully considered by all of us. As a medium for making ourselves and our works known these exhibitions can hardly be surpassed.

It is unfortunate that the exhibitors were not more evenly spread across Canada however. Whereas the far west exhibited well beyond their membership, proportionately, no entries were received from the far east, and some of the provinces in between were but sparsely represented. This variation in the interest displayed is not readily understood. The following comment from a member of the Jury of Awards sums up the opinion of the Executive Committee, on this phase of the Exhibitions: "I have been looking at a considerable number of buildings and feel that it is a pity that more of our really fine efforts were not included in the entries. The impression seems to be prevalent that only designs representing a certain design philosophy would be considered worthy of awards. I hope that the showing throughout the country of the medal-winning entries will help dispel that idea . . . I agree that an effort should be made at the time of the next exhibition to increase greatly the number of individuals exhibiting."

In wishing all of our members a very happy, prosperous, and satisfying New Year, I would like in particular to extend to each and every member of that hard-working group, the Editorial Board of the *Journal*, the sincere and hearty thanks of all of us for the good work that they are doing. The results of their efforts are being made manifest monthly in a most praiseworthy and ever-improving form.

A. J. C. Paine, President

The Royal Canadian Academy — Some Reflections

Paul Duval

A ROYAL CHILD of Canadian art, the Canadian Academy has experienced a chequered career. Step-sister of the British Royal Academy, her title was conferred upon her by Queen Victoria in 1880. Through the ensuing years, the Academy has won the allegiance of most luminaries of Canadian art; she has also received as many brickbats as bouquets and known a poverty ill-suited to her intended position in the community. The Academy's faults were publicly aired, her appearance variously censored as too demure or too brash, until she developed a split-personality, unsure whether to purse her lips or flounce her crinoline.

From the very beginning, the Academy was faced by the uncertainties of jealousy and hostility. At birth, her godfather, the Duke of Argyle, cautioned: "Some gentlemen have been good enough to propose that we should postpone the initiation of this institution for the present and wait for the moderate space of exactly 100 years". Despite the opposition of such "gentlemen", the Academy was born and stubbornly persisted in her appointed role, albeit at times with the awkward airs of an uncertain debutante.

At times, the Academy appeared to be her own worst enemy. For periods, she turned her back on all but dead conventions, blindly refusing to acknowledge changing manners. For decades on end, she sulked with her head in a pot of muddy varnish. The courting of the young was discouraged and the Academy deservedly won her name as a reactionary prude. During the past ten years, she has gained a new set of advisers who have pointed out some of the errors of her ways and set about restoring her place in public esteem. Now the Academy is revealing a new poise and a brighter day seems to be dawning for her in the circles of Canadian art.

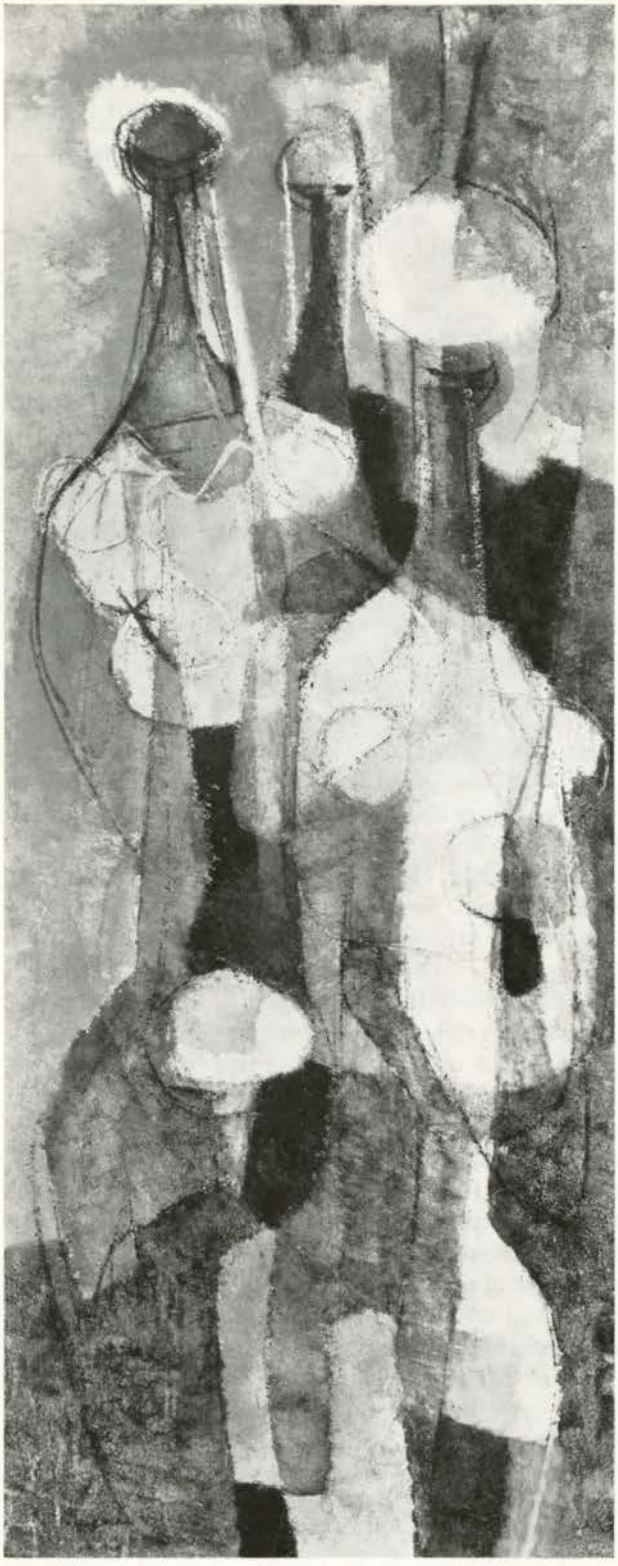
Some artists still feel about the Academy what the American painter, John Sloan, expressed toward a projected ministry of fine arts: "Sure, a ministry of fine arts would be a good thing – then we would know where the enemy is". However, better public relations, increased responsibility for Associate or junior members, and the disappearance – by accident or by-law – of considerable dead wood, have done much to reinstate the Academy in the eyes of most Canadian painters, sculptors and architects. Artists realize that the annual Academy exhibitions function as an invaluable index of the state of the country's visual arts, generally, and as a showcase for their best creations. It remains for officialdom to recognize these facts.

For an official art body, the Academy has been treated with shocking niggardliness. The Department of Public Works, under whose ministry the Academy functions, treats it as an embarrassing poor relation, instead of a senior member of the Canadian cultural community. The Government's first annual grant to the Academy, in 1884, amounted to $2,500.00. Today, seventy years, and several inflations, later, the annual grant is $4,025.00. In return for this, the Academy carries on its business as an official representative of Canadian art at home and abroad and underwrites a large annual exhibition in either Montreal or Toronto. When called upon, it acts freely as adviser for public or private art projects. Over the years, it has lent its exhibition space and encouragement to almost every Canadian artist of prominence. They have included such painters as J. W. Morrice, Horatio Walker, Clarence Gagnon, Maurice Cullen, Tom Thomson and J. E. H. MacDonald; the sculptors Alfred Laliberte, Walter Allward, Tait McKenzie, Henri Hebert and Emanuel Hahn; and such architects as William Storm, Henry Langley, Thomas Fuller, Frank Darling, Henry Sproatt, Hugh Jones and John Lyle. If the truth were acknowledged, the Academy – except for a few barren decades – has served as fully a ground for the encouragement of new styles as many of the more avowedly liberal groups.

From time to time, the Academy has shown respect for the larger place of the visual arts within the framework of society. Its founder had a broadly based group in mind when he stressed the importance of "designs for manufacture, these being drawings and designs for all sorts of useful things". In 1923, the RCA sponsored the first major competition for mural painting and, over the years, has offered a number of scholarships and prizes for young artists of promise. In the past year, it has organized an important mural project for the Department of Veterans' Affairs and awarded three scholarships to advanced students of painting. This area of art in society is one which the Academy might well cultivate to the enrichment of its own position and of Canadian life as a whole.

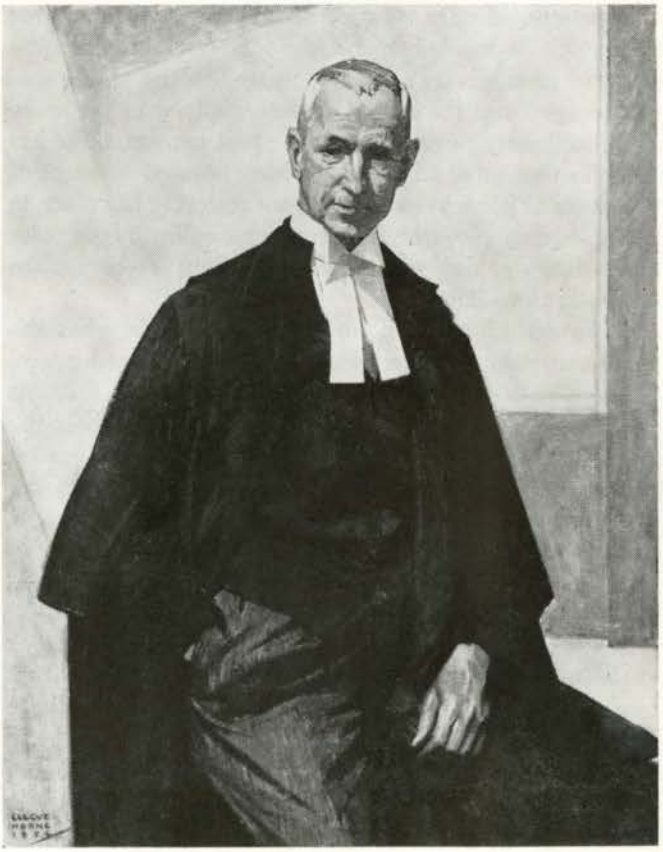
With the above in mind, it is gratifying to see that the 1955 Academy exhibition touches upon this larger social function of fine art. In the architectural section, painting and architecture mingle in a series of mural designs by leading artists. This is a feature which should be continued and enlarged whenever possible in future exhibitions. Through it, the Academy can help lead toward a closer integration of all the visual arts for the benefit of all citizens. It is in a unique position to indicate what the architect, sculptor and painter can do for the community.

If it can avoid a past tendency to backslide, the Royal Canadian Academy can now secure for itself the position in Canadian art for which it was originally intended. Such a development would strengthen the culture of the nation as a whole.



Moroccans by R. York Wilson

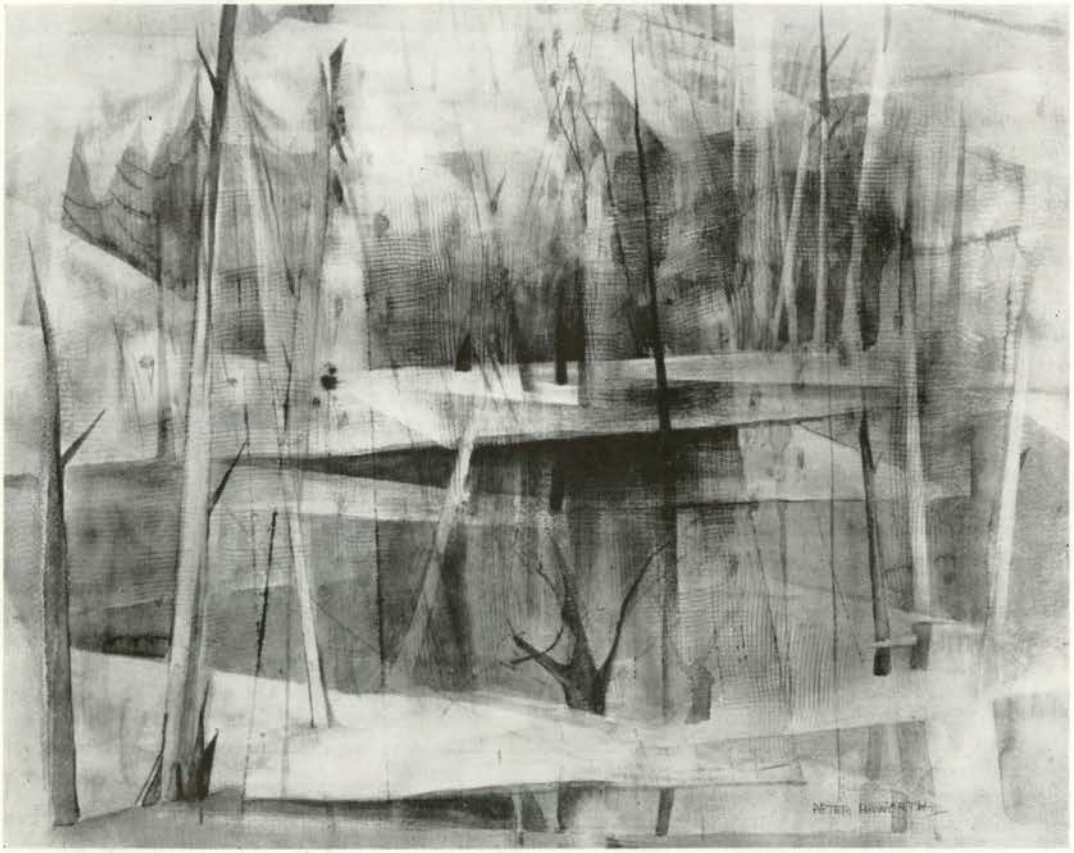
Mending Nets, Grand Banks
by George Pepper



The Hon. J. W. Pickup
Chief Justice of Ontario
by Cleeve Horne

Rue des Jardins, Quebec
by Robert W. Pilot

Summer Sky by A. J. Casson



Mist on the Lake by Peter Haworth

Comparisons in Modern Structural Steelwork

W. Fisher Cassie and D. W. Cooper

PART 1: Read by Professor Fisher Cassie

As THE DEVELOPMENT of civilisation accelerates, the productions of human ingenuity increase in complexity and in the power of their influence on life. We are surrounded by miracles, but we treat them too often as commonplace. We become too accustomed to wonders. The miracle of television – for it is no less – fills us with no awe. We use it for parlour games, or as the target of critical letters to the press! The marvellous transformation of matter into energy by nuclear fission does not strike us dumb at the wonders of the universe. We merely add this miracle to our armoury of destruction and talk its wonder away at interminable conferences.

It is unnecessary in this company to stress the argument that all creative achievements are more influenced by mental conceptions than by material circumstances. Architecture provides, in fact, the most striking examples of the physical manifestation of the creative idea. The work of an architect who thinks out his problems afresh is as unmistakably stamped with the signs of his personality as are his physical features.

The theme of this first part of the paper, then, is that ideas are more important than physical details even in such an apparently ordinary material as structural steel. We cannot claim for this method of building a place in the hierarchy of miracles beside television, atomic energy and the jet engine, but perhaps we get too accustomed even to our building materials. To the architects of even a century ago modern structural steel would have appeared as something of a godsend in the original use of the word. Let us look at the steel frame again, and decide whether the human brain, so fertile in mechanical, electrical and aeronautical engineering, is diverting enough of its creative power to building.

If one examines most of the structural steelwork of the present day, one finds that it has not progressed far beyond the pillar and beam construction by which the ancient Egyptians produced such enduring results. Only in a relatively few structures does one find the capacity of steel to withstand stress utilised in all its parts. Much of what is fabricated is useless dead weight, very lightly stressed and requiring for its support still more steel. This was recognised long ago for it was in 1929, twenty-six years ago, that the British Steelwork Association pointed out how little advantage was being taken of the excellent qualities of structural steel. Codes of practice were restrictive, and wasteful of one of our most valuable building materials. The story of the next decade shows, unfortunately, that designers of buildings are often not as receptive of mental revolutions as the designers of aircraft, for the results of seven years of intensive study in the search for a logical method of design were tacitly rejected by the building profession.

The story begins in 1930 when the new Steel Structures Research Committee had got to work. They made it their first task to review existing methods of steelwork design and to embody them in a 'Code of Practice for the use of Structural Steel in Building'. The result of this step seems to indicate that designers of structural steelwork heaved a sigh of relief and said 'Here at last are rules we can follow. We won't have to think any more'. The fact that the Code was based on existing methods rather than on any logical development made no difference – for the next seventeen years the methods of the 1920s frozen in B.S.S. 449 became the standard procedure. The Steel Structures Research Committee pointed out in vain that the methods described in the Code were almost entirely irrational and incapable of refinement. There was no response, and, until 1948, B.S.S. 449 was gospel.

Through the '30s until the issue of their Final Report in 1936, the Steel Structures Research Committee laboured to find a rational method of design. Laboratory experiments were matched, for the first time, with successful tests on full-scale buildings in the course of erection. The Cumberland Hotel and the Geological Museum, then under construction, were loaded and tested in many ways and the stresses in the frames measured on the bare steel and on the cladded beams and columns. It was found, as had been expected, that the usual beam-to-column connection was not the simple free joint that it was supposed to be by current design methods. Brackets and cleats were capable of taking some moment and of transferring that moment 'round the corner' into the stanchion. This diffusion of the bending was not as complete as it would have been with truly rigid joints, but the amount of moment transferred increased as the stiffness of the joint increased until with complete concrete encasement a fully rigid joint could be assumed.

The Steel Structures Research Committee then classified six beam-to-stanchion connections of various orders of stiffness and, with these grades of stiffness as a guide, built up design methods for both beams and stanchions. One of the difficulties of dealing with continuous or nearly continuous structures is that a direct design cannot be made. It is not possible to work logically from loads through to the final beam and stanchion sections. The properties of the proposed sections must first be assumed and from these properties the adequacy of the proposed beams and stanchions to carry the applied moments can be determined. If the sections are found to be inadequate, a fresh start must be made.

The method, following these lines, which was developed by the Steel Structures Research Committee was logical and rational. Its procedure was based on how steel frames actually behave under load, and it eliminated the prejudiced estimates which too often served in the past as design methods. It was, however, much too complex to receive ready acceptance, and when designers found that, although the steel was more efficiently distributed in beams and stanchions, the total weight of the structure was not much decreased, they merely disregarded, and so rejected, the results of seven years of research. The older, more comfortable and simpler methods held sway until 1948, unchanged except for the wartime raising of the allowable stress to 10 tons/in^2. Even then, the new B.S. 449 (1948) owed little or nothing to the tests on existing buildings and to the researches alluded to above.

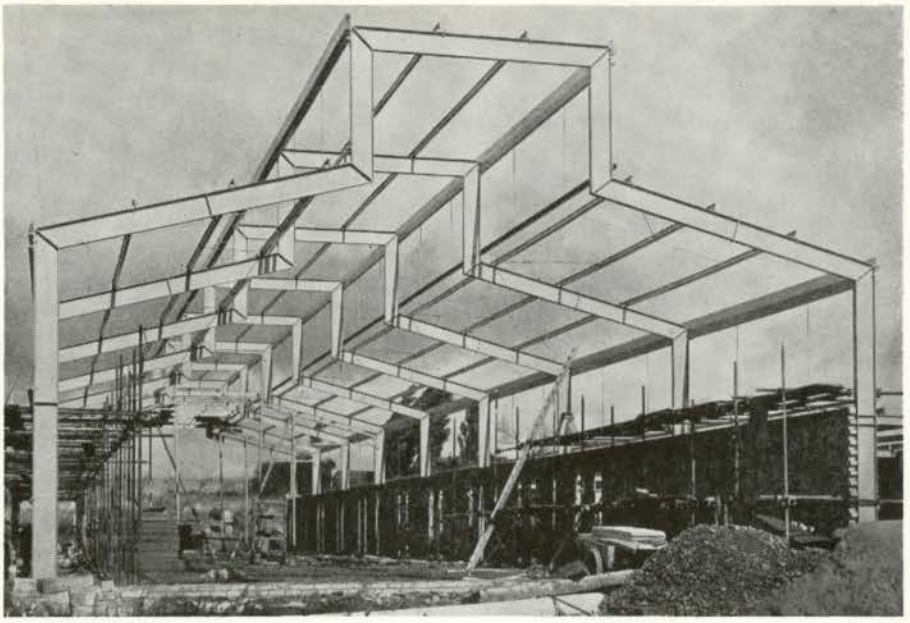


Fig. 1 Laboratory for Guest, Keen and Nettlefold. Architects: Lavender, Twentyman and Percy. Consulting engineer: Professor J. F. Baker. Designed by the plastic design method. Total covered area 12,100 sq. ft.

There is no doubt that the only sound method of structural steel design *in the elastic range* is that given by the Steel Structures Research Committee's investigations. The fact that this method shows neither economy nor simplicity does not discredit it, but merely indicates that the criterion used as a guiding principle cannot lead to much more economic design than do the rule of thumb methods of an earlier generation. That criterion was that at no point in a structure must the stress rise above a defined 'safe' value. We must search for another.

What then is the answer? It was clear, in these seven pre-war years, that the moments acting in beams and stanchions depend closely on the properties of the sections which comprise the different parts of the frame. If the beam-to-column connections were rigid or semi-rigid no one beam or one stanchion length could be designed independently of the others; the structural frame had to be considered as a whole. Loads on one beam, for example, or wind forces on one column were not supported by that member alone, but affected stresses in distant parts of the frame.

With this already well understood idea as a clue and with the failure of their elastic design proposals as a spur, the designers went on to study not safe stresses at isolated points of a frame, but rather the safety of the whole frame against collapse. Like many revolutionary ideas this one seems in retrospect to be obvious and simple. The effect it has had, however, on the appearance and weight of structural steelwork in the few buildings yet erected – the first physical manifestations of this new idea – is much more striking than that produced by the complex rules of the Steel Structures Research Committee's Reports.

The simple idea, that the new criterion in design should be not a 'safe' stress but the collapse load of the whole structure, would not have produced the striking results it has if it had not been for the brilliant work done at the University of Cambridge. Professor J. F. Baker and his teams have for years been working on the theoretical and experimental development of the new conception. This is not an easy task, for although the idea may be simple, the creative thought required to produce a design method is formidable. Professor Baker was the Secretary of the Steel Structures Research Committee and one of its most industrious experimenters, and the reports on his more recent work on the plastic collapse loads of structures are well known internationally.[1, 2, 4] The second volume of his book on *The Steel Skeleton*, which will deal with plastic design, is eagerly awaited, and structural engineers must all be pleased at your Council's action in awarding Professor Baker an Honorary Associateship of this Institute – an honour he certainly deserves. Professor Baker, by the way, gives me permission to mention a letter he received recently from the United States in which La Motte Grover of the American Welding Institute, referring to a paper he read to the American Society of Civil Engineers, praised the method of plastic design. He said he was

Fig. 2 Store building, Rosyth, designed by the plastic design method. *Royal Naval official photograph, published by permission of the Admiralty.*

glad to be able to tell his audience

'. . . of the reception that the method is receiving in England and the several projects that have been executed or are under way at this time; because I had to say that to the best of my knowledge, none of the structural engineers on this side has wittingly taken advantage of this method of design'.

It is often and sometimes justly said that we are slow to apply the results of research in practical construction, and it is pleasant to find this sphere where we have been alive to new ideas.

Under the older conception, using the criterion of a 'safe' stress, the 'unsafe' range of loading was that which produced a yield stress at some point in a beam or column. If loading is continued beyond this point more and more of the metal in the member reaches the plastic state and deforms without increase in stress. The outer fibres of the section where stress is highest are naturally affected first, but finally the whole thickness of the member from top to bottom reaches a plastic state. In this condition the section of high stress at which plasticity has been reached can be considered as a hinge, free to rotate through a small angle and offering no resistance to movement.[5]

Several interesting points have been established in these investigations.

It has been found, for example, that contrary to all expectations, a plastic zone develops, not only in the material *near* a joint, in column or beam, but actually *in* the material of the joint itself, even if the joint is much stiffer than the members composing it. Also, because of the extra stiffness afforded by short vertical members of a shallow vierendeel frame, deflection under a given load increases with increasing depth over a range of truss proportions. This, again, is contrary to expectation, for we are accustomed to finding that a greater construction depth results in decreased rather than in an increased deflection. If, within defined limits of proportion, shallow beams of the vierendeel type deflect less than the deeper beams, a much wider field of structural and architectural design is opened up. We have called this phenomenon the 'Cooper effect'!

Models, of course, cannot be expected to yield comprehensive answers, but through the valuable co-operation of Mr A. Dean, Chief Civil Engineer to the North Eastern Division of British Railways, we hope soon to have specially fabricated full-scale vierendeel frames of the type used in signal gantries.

Fig. 3 Transit shed for passengers and cargo, Southampton. Designed by the plastic design method. Consulting engineers: Scott and Wilson, Kirkpatrick and Partners.

'Hinges' also develop at other points where the stress rises as the load increases and in the end when sufficient plastic zones appear the structure collapses. It is then, technically, a mechanism with one degree of freedom. From the bending moment diagram of, say, a portal frame, it is clear that at the joints between stanchions and rafters and at points of loading there are high stresses caused by large bending moments and at any of these points, as the load is gradually increased, plastic hinges may develop. Four or more of these hinges[3,6] may be required to cause complete collapse depending on the type of portal, and these hinges may occur in different combinations according to the relative stiffness of the beams and columns. It is the task of the designer to estimate in advance which mode of collapse will actually take place and so decide on the true collapse load of the structure. This load, divided by an agreed load factor, gives the working load which can be safely carried by the structure.

During the past few years a particular study of plastic failure has been made on model vierendeel frames in my department. The work, which consists of an investigation of vierendeel frames loaded up to plastic failure, has been conducted by S. Henderson and supervised by Mr Cooper, my fellow author. Tests of these to destruction should give very valuable information.

The load factor against complete collapse of a beam of I section simply supported and designed in accordance with B.S. 449 (1948) is 1.75 and it is thus consistent and logical to use a load factor of similar value in the design of more complex structures. Assuming then that the collapse load of a structure is somewhat less than twice the working load, and that the value of the collapse load can be determined in advance of construction, we find that plastic design methods result in lighter and more economical steel frames. The more highly redundant the type of construction, the greater is the advantage of plastic design. The plastic design of single bay portals is now well understood and has been expanded to multi-bay portals. Advance has also been made in developing design methods for multi-storey, multi-bay frames.[3]

In the illustrations (Figs. 1 to 4) it is noticeable that the sections used in buildings designed by the plastic method are not only lighter but also more uniform in size than is usual with conventional design. This uniformity tends to maintain working stresses low and normally within the elastic limit. If there is at any joint an abrupt change in section there is more likelihood

of plastic stresses being developed at working loads. Permanent strains at points of high stress, and larger deflections are, of course, more likely to develop than with conventional design, and the deflection rather than the strength of a frame may sometimes be the governing factor. The saving in weight of steelwork is given by various reports as about 34 per cent on portal-type frames, but this figure can be considered only as tentative and should not be applied widely. In cost, plastic design competes easily with conventional design, and savings in cost have been reported up to about 20 per cent.

So far we have traced development in thought about structural steelwork from the pillar-and-beam construction (which is still most commonly employed for multi-storey buildings) through the rational and logical proposals of the Steel Structures Research Committee. Both the older method and the Committee's method employed the criterion that the stress at any point must not rise above a given value. Adherence to this criterion resulted in the development of a design method which, though logical, was unacceptable because of its complexity. The abandonment of this criterion – a big step in creative thinking on the problem – brought in its train the method of plastic design and results of great importance. To some it seems likely that the day of elastic design of structural steelwork, as we now know it, will soon be over, except for construction where deflections and sway are important.

But is even plastic design the final stage? After all we are not designing steel frames as an end in themselves. They are part of the whole building which, with its floor and wall panels, exists in three dimensions – a very different structure from the two-dimensional frame, even when designed by the plastic theory. Just as we made a bold step in creative thought from the simple calculation of stresses in beams and columns to the consideration of the collapse of the complete two-dimensional frame, so we can step still further. Each such step, it is true, takes us away from simplicity. A multiplicity of unknown factors and variable conditions may be introduced to make the final solution difficult to reach, but complexity and efficiency often go together.

The first step in further development of creative thought in structural steelwork is probably to imagine even the simplest multi-bay, multi-storey steel frame as a three-dimensional entity rather than a series of two-dimensional frames linked together. Evidence of the savings in steel to be effected by work along these lines is given by the lightness of the frame used in the system devised by Dr Klöttel. Before the war the Quarry Hill flats of Leeds were designed with this system and, more recently, the Hindhaugh Street flats built by the Corporation of Newcastle upon Tyne (Fig. 5) again show the lightness which is obtained when the steelwork of each floor is considered as a horizontal stiffening girder and the designer takes the step of thinking in three dimensions.

What, then, is the relationship between the collapse load of a bare frame and that of the building it supports? No one can give the complete answer, but Dr R. H. Wood, of the Building Research Station, and his colleagues have been working steadily on a study of the strength of composite structures. Like the Steel Structures Research Committee, they have measured stresses in buildings under construction – notably the new Government buildings in Whitehall – and have confirmed what had long been suspected, that even light cladding of buildings stiffens them tremendously and that the true value of the strength of steel-framed structures will not be determined until we think both in three dimensions and in terms of the whole building rather than of its frame only. Beams built into completed buildings have ben found, because of the stiffness of the cladding, to be stressed due to live load to only one-quarter-ton per square inch.[8] Not only are moments and stresses modified by the cladding and by the relative stiffnesses of the different units of the frame, but the very distribution of the loading depends upon these factors.[9]

We are at the stage now of being closer than ever before to a true understanding of the behaviour of steel frames.[7, 9] The approaching publication of both the second volume of Professor Baker's book *The Steel Skeleton*, and of a National Building Studies Research Paper 'Studies in Composite Construction, Part 2',[10] point the way in which creative thinking is tending.

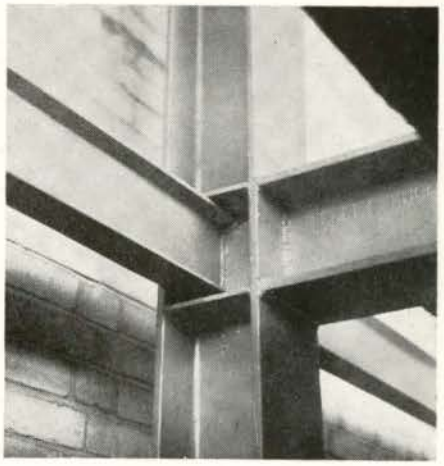


Fig. 4 Example of the type of welded detail achieved by the plastic design method. The main frame in a film-storage building of five storeys, one of the few multi-storey buildings yet designed by this method. Consulting engineers: R. T. James and Partners.

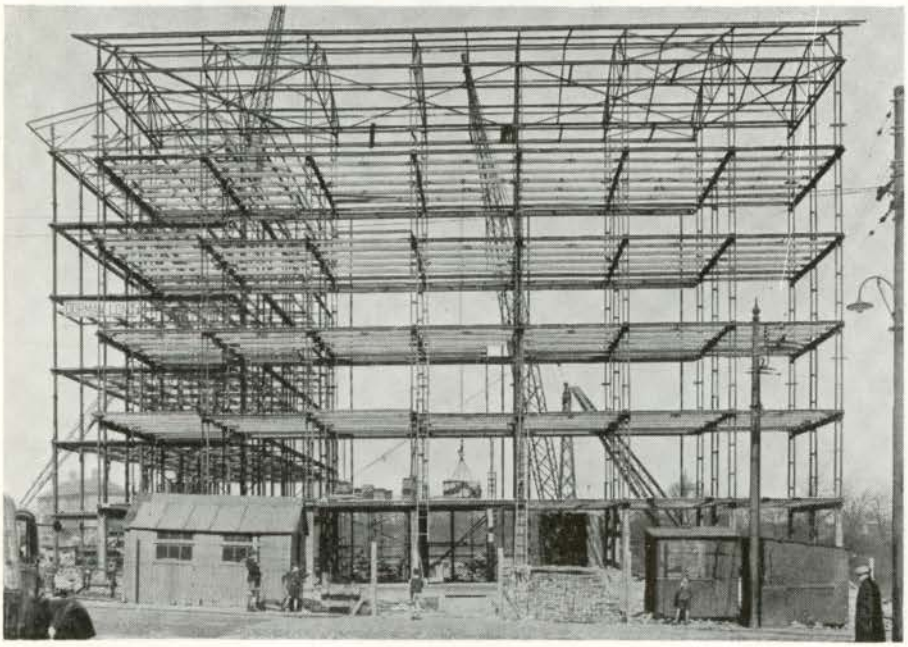


Fig. 5 Hindhaugh Street Flats, Newcastle upon Tyne. Designed by E. Czeiler as a three-dimensional frame, the floors acting as horizontal girders for lateral stiffness.

Figs. 9 and 10 Factory for Alexandre Ltd., Peterlee. Architect: J. H. Napper. Consulting engineer: D. W. Cooper, B.Sc., A.M.I. Struct.E. A factory frame erected in unconnected strips, each spanning 120 ft. clear, and fully articulated to follow ground movements caused by mining. Fig. 9 shows complete units assembled at ground level and lifted into position. The area covered by each unit is 3,000 sq. ft. and the time of lift is 90 minutes.

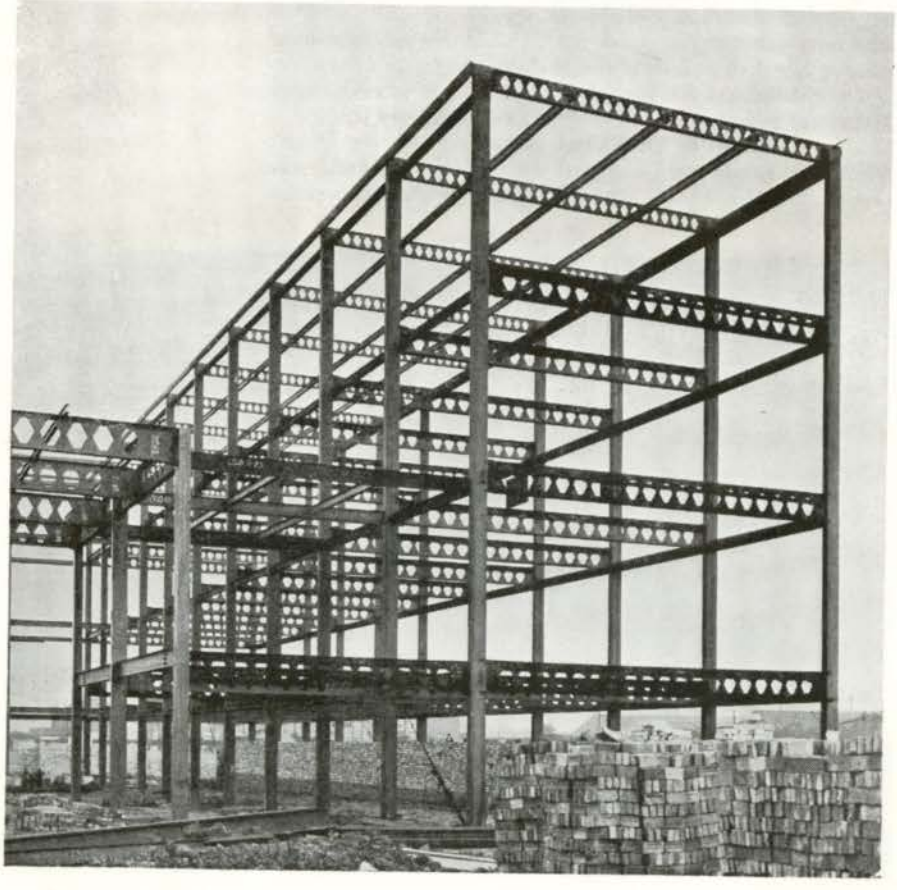


Fig. 8 Longlands County College, Middlesbrough. Architect: P. R. Middleton. Structural Consultant: D. W. Cooper, B.Sc., A.M.I.Struct.E. Steelwork by United Steel Co. Clear spans using 'Castella' beams carried on box stanchions of welded channels.

PART 2: Read by Mr D. W. Cooper

DR CASSIE HAS DESCRIBED the changing outlook of the structural engineer and something of the new concepts introduced by Professor Baker and by work at the Building Research Station. Coincident with this change in the technique of design there has been in progress a search for better ways of using known materials, and for improvements in those materials. Some of these developments have been borrowed from kindred engineering professions such as the automobile and aircraft industries. One might say we have gone so far as to borrow for this work the miracles of television – in the form of the oscillograph – and of cosmetics – in the form of 'brittle lacquers': both help to show us visually the workings within a material which are normally hidden.

Since the late war there has taken place increasing use and development of cold-formed sections. As the name implies these structural sections are fabricated from strip steel without the application of heat. The strip is supplied (from Margam) in rolls, usually in widths of 36 in., and perhaps weighing some 4 tons each. Machines at present in use handle strip up to 10 in. wide, and the first process of manufacture is to shear the material to required width, after which it is fed through successive rolls, each one impressing a little more of the required shape until, after the last, the required section emerges. The labour involved in setting up the mill varies from a few hours to several days depending upon the complexity of the shape required, and is therefore a decisive factor in determining the minimum economic run of section.

With processes such as these the designer has at his disposal an unlimited variety of shapes to apply to his requirements, and he may of course devise his own sections. As a result the weight of metal required to do a certain job is reduced very much below what can be achieved with hot rolled sections, particularly for small and medium spans. For spans of 25 to 50 ft. a saving in weight of 50 to 60 per cent is claimed over that of conventional forms as delivered to site. In site handling of course the light-weight structure scores by saving up to 25 per cent of the cost in fixing trusses.

Some criticism has been directed at cold-formed sections because of their apparent vulnerability to corrosion and so it is of interest to note that trusses built from these sections and erected circa 1941, without any protection save a single coat of oxide paint, are still as good as ever. Independent tests in the U.S.A., in the atmosphere of Pittsburgh, have shown no worthwhile corrosive effect after 15 years. The normal treatment in this country is phosphatising by dipping followed by stoved painting. New material now becoming available is known as Cor-Ten, a rust-inhibiting steel having a strength some 25 per cent greater than that of the standard quality, and a fatigue resistance some 80 per cent greater.

For the architect the cold-formed section offers a clean external appearance ready for painting, and when used in schools and the like, it does not require casing. Fenestration can be secured directly to stanchions (Fig. 6). It is of particular interest that research on cold-formed sections has been carried out at the Royal Technical College, Glasgow, and at the University of Bristol.

Parallel with the development of cold-formed sections has grown the use of tubes, a form of construction already well known to the aircraft industry and latterly to the motor industry also. In contrast to the cold-formed sections the tube offers the designer only a choice of diameter and wall thickness, although a large number of both are produced, diameters ranging from 27/32 in. to 12¾ in., each one being available with six or seven wall thicknesses. The tube is well known for its high stiffness/-weight ratio. As in the case of cold-formed sections most connections are made by welding, so that the frames so made gain not only by reason of their low self weight but also because of the tremendous stiffness resulting from the welding technique.

The assembly hall of an infants' school for the Essex County Council is supported on columns of welded tubes which are left exposed as a feature, and it is of interest to see the top of the column formed to a curve which accommodates a gutter bounding the roof. Dr Cassie has mentioned the three-dimensional outlook, which after all is the natural medium of architects. Such three-dimensional or space frame conceptions are apparent in the design of a factory extension for J. H. Ballinger, which incorporates a roof constructed in bays 28 ft. by 60 ft. Both the roof and the glazing are carried on lattice girders, which are triangulated as seen on plan, and an interesting detail is the way in which brackets are slung from the main girders to carry runway beams.

Yet another example of the three-dimensional approach is a shell roof built for Messrs May & Baker at Dagenham. Probably the greatest drawback to shell construction is the high cost of shuttering but in this design developed by Ove Arup & Partners lattice girder units of tubular construction are employed as a 'membrane', over which a mesh reinforcement is placed, and covered by concrete. The tubular frame remains cast in the concrete.

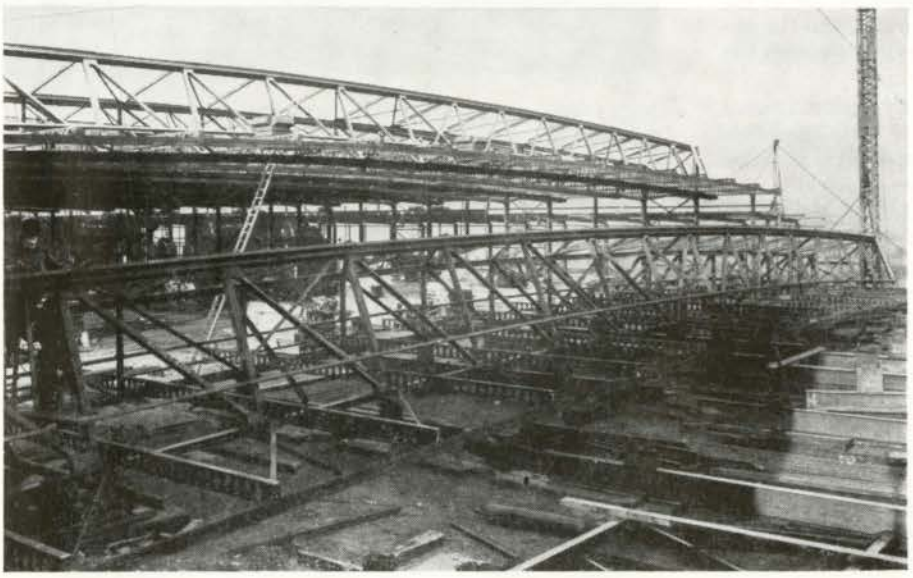
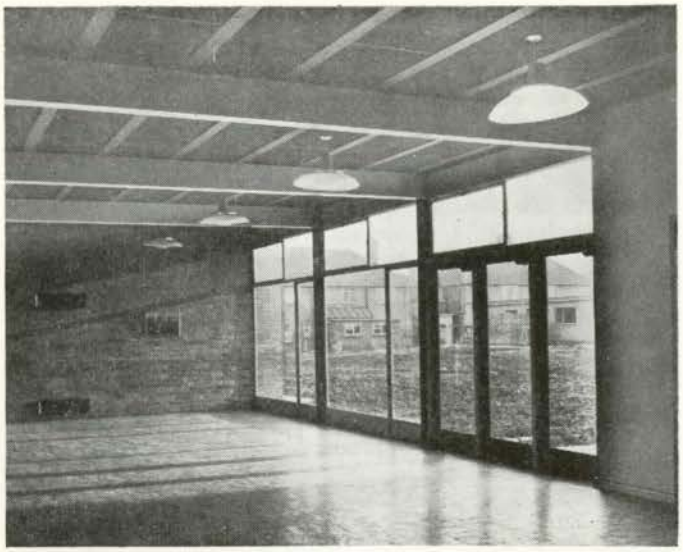


Fig. 9 *see Fig. 10*

The foregoing notes have probably given the impression that the hot-rolled sections we have come to know so well are now only museum specimens. Such is far from the truth, for the cold-



formed sections and tubes possess an inherent economic disadvantage because of the extra work that must be employed to produce them and the more costly techniques of fabrication used upon them. It is therefore interesting to look last at our old friend the R.S.J. So far, ideas have been mentioned borrowed from the motor and aircraft industries, so it will hardly come as a surprise to know that from the shipbuilding world comes the idea of the castellated beam, originally the invention of Mr G. M. Boyd. The successful application of flame cutting enables an ordinary R.S.J. to be cut along its web to a regular pattern. The upper and lower halves of the beam are then separated and rewelded so that a series of perforations is formed in the web. The result is a unit no heavier than the parent section but one and a half times as strong in bending and nearly twice as stiff. The latter characteristic may in practice be of greater import than the strength, for we are all well acquainted with the cost of these extra tons required only to limit deflections on long spans. To the architect is offered the possible use of exposed perforated webs as a feature of his building, and the undoubted advantages of being able to run services through the apertures provided (Fig. 8).

To demonstrate the earlier remarks on the three-dimensional approach in practice, together with the use of castellated sections, a factory frame is shown. This is being erected at Peterlee for North East Trading Estates Ltd., on a site which it is predicted will undergo considerable movement during the next few years. A minimum vertical movement of ± 18 in. accompanied by a horizontal movement of ± 12 in. is thought to be a likelihood, and the frame was designed to accommodate such movement without any change in stress and without fracture of glazing and the like. The main workshop area is 39,000 ft.^{2} and is covered by frames constructed and erected in independent strips, each having a clear span of 120 ft. (Figs. 9 and 10). From the outset architect and engineer worked in collaboration, so that the monitor roof required by the former was used to span a distance of 120 ft. as a simple space frame. The lower members of the frame are castellated sections which also carry the flat roof on each side. There are no purlins as such, for the roof sheets (Q-deck) span directly from one beam to the next, a distance of approximately 8 ft. From the interior the roof space is quite unobstructed and enables a high uniform level of natural lighting to be obtained.

In constructing the frame we decided at the outset that each strip should be assembled at ground level and then lifted as a unit, each one representing 3000 ft.^{2} of roof area, and involving a lift of 14 tons (10·4 lb./ft.^{2}). At one end the unit rests on a stanchion group rigidly attached to it whilst at the other the stanchion group is freely hinged. The stanchion groups carry the wall panelling and windows, which move with them. The only brick wall in the building is set on a concrete kerb having a rounded base so that it too may follow movements of the frame without restraint.

We find, then, a change in two directions – first in the newer conceptions employed in determining the safe condition of loading for a building, and secondly in the use of new sections and new methods. Development is by no means complete, and the buildings already designed by the plastic design method and erected in cold-formed sections, in tubes, in castellated beams in three-dimensional construction, and in prestressed steelwork are indications of the amount of ingenuity and imagination which is being applied to that commonplace of modern architecture – the steel frame. Perhaps we may still be able to place it alongside the more flamboyant examples of the modern miracle, and claim for it a place as at least one of the minor wonders of the world?

Fig. 6 Berwick Hills School, Middlesbrough. Architect: P. R. Middleton. Cold rolled stanchions, beams and purlins, giving a clean appearance without casing. The fenestration is attached directly to the stanchions.

Fig. 7 The Gilbert Colvin School for Ilford Borough Council. Tubular steel space frame by Ove N. Arup and Partners, consulting engineers in conjunction with Scaffolding (Great Britain) Ltd.

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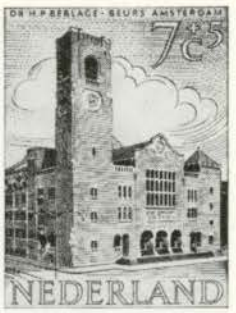


Jan H. Albarda

Stamps and Architects

IN THE NETHERLANDS several series of new postage stamps were issued lately. It is architecture rather than philately that draws our attention to some of these stamps; they just lead to a few remarks. Several months ago there was a series of Dutch stamps carrying the portraits of the five most important men of the first half of Holland's twentieth century. One of them was the architect Dr Berlage, whose name is well known in every circle in Holland, in spite of the fact that he died in 1934. Just recently a series of five stamps was issued, with the pictures of five important Dutch buildings. (Issued for charity purposes; this is why you see 5 + 3 cents, 10 + 5 cents, etc. People pay 3 and 5 cents extra.)

At least 85% of the people in Holland know the name Berlage, and I am sure that more than 60% of the people know the five buildings and the names of at least three, or perhaps four, out of five of their respective architects. The public in the Netherlands is proud of good buildings and considers architecture its common cultural asset, which it is of course. This is quite natural in older countries, where people have a strong architectural consciousness. Thus the publication of these stamps does not force the interest of the public in the Netherlands at all.

The 2 cent stamp is yellowish brown and shows the factory Van Nelle (coffee, tea and tobacco) near Rotterdam. The architects were Brinkman and van der Vlugt. We deplored their untimely death, van der Vlugt's while the building was under construction (1928), Brinkman's shortly afterwards. The architecture of this concrete and glass building is sparkling with liveliness and later additions did not spoil anything of its vital character. The green 5 cent stamp shows the least known of the five buildings: a central delivery building in the Hague for the P.T.T., which, literally translated, means Postage, Telephone, Telegraph. The architect is Bremer, architect in government service, and the concrete and glass block building has been constructed during the last war.

The building which was most important for the development of Netherland's architecture is on the red 7 cent stamp. It is the stock exchange building of Amsterdam, designed in 1903 by the late Dr Berlage, Netherland's most famous architect, forerunner of contemporary architecture. Dr Berlage was the first Dutch architect who completely broke with any false traditional form. He renewed architecture, with his strong conviction based upon the ideas of Ruskin and William Morris. In this building Berlage shows every supporting element clearly and thus every construction is evident.

The building on the bluish grey 10 cent stamp is Dudok's town hall of Hilversum. This is Dudok's best known building, constructed around 1928. Last year Dudok's seventieth birthday anniversary was celebrated and a book with beautiful photographs of most of his work has been published on that occasion (text in Dutch or in English, at will.) In one of his letters Dudok just wrote me: "I will never retire. You know that I am the type to die in harness!" It did not surprise me. The most prominent architects love their work too much.

A couple of years ago Dudok was presented with the medal of the Royal Institute of British Architects and the American Institute of Architects gave him their gold medal last summer.

The 25 cent brown stamp carries the illustration of J. J. P. Oud's well known office building of the Shell Oil Company in the Hague. Many people on the North American continent were quite surprised to see this building so different from Oud's previous work. They wondered whether Oud made this design more or less to satisfy the public. The answer can not be expressed strongly enough: 'No, not at all!' This is Oud's most honest conviction. He surprised many people by his early work; he now surprised many people by this work, which he sincerely sees as being the next step after fuctionalism. These stamps were sold at the post offices in Holland, but they were also available at the fourth congress of the Union Internationale des Architectes, held in July, 1955 in the Hague and Scheveningen (the sea-side resort of the Hague), where architects from a great many countries met. Some readers of the RAIC *Journal* may have seen them there.

The stamps illustrated are enlarged from the original which measured 1⅛ x ⅞ inches.

Benvenuto Place Apartments
Toronto, Ontario

Architects, Page & Steele

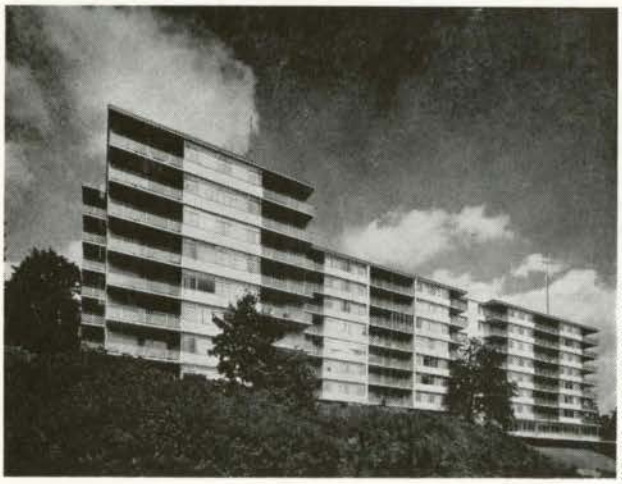
Structural Engineers, Hooper & Yolles
Mechanical Engineers, J. A. Norton & Co. Ltd.
Owner and Builder, Benvenuto Holding Corp. Ltd.

HUGH ROBERTSON–PANDA

Courtyard to hotel and apartments.
Hoop sculpture is in colour
and is by Peter Dickinson.

HUGH ROBERTSON–PANDA

The south front



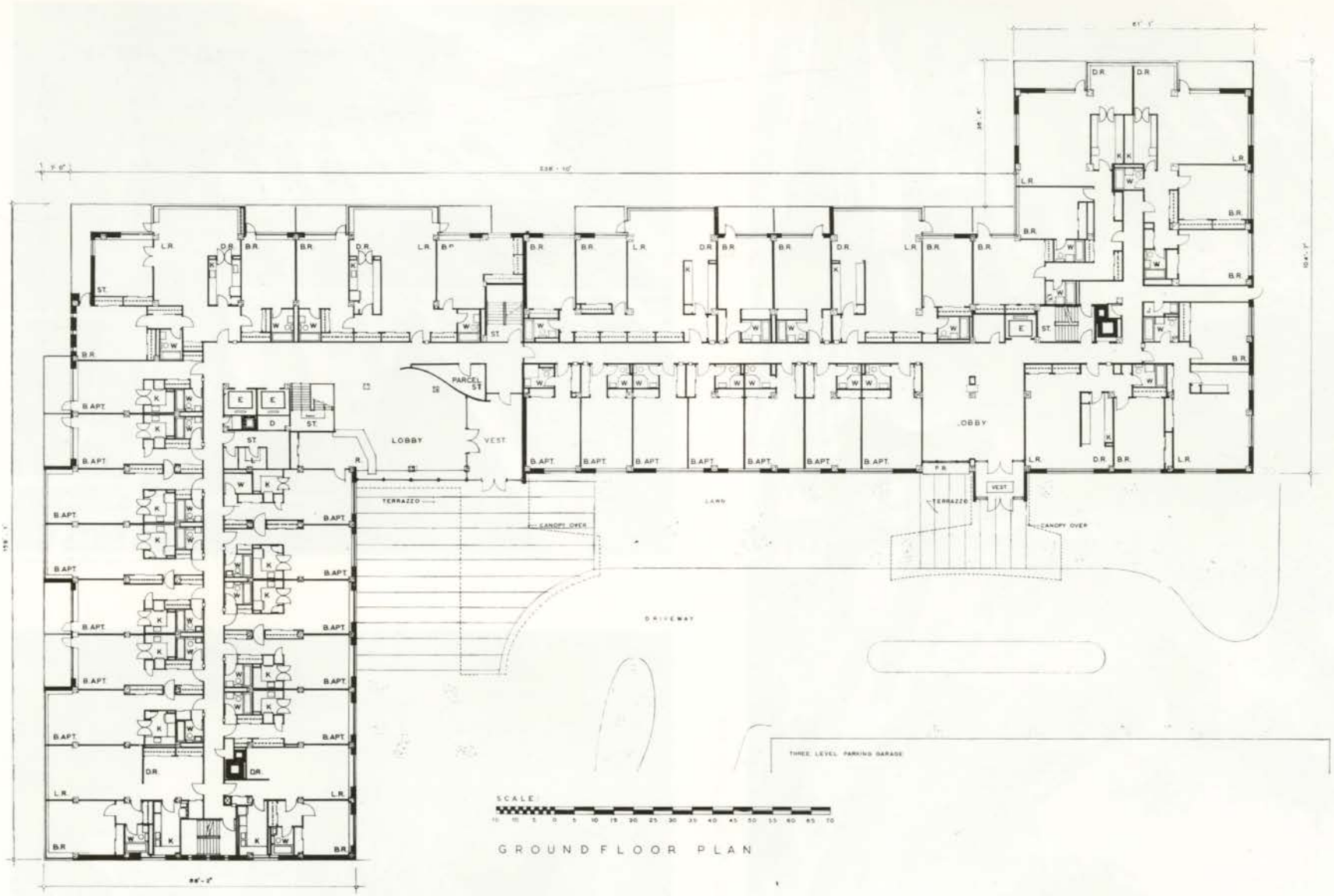
HUGH ROBERTSON–PANDA


HUGH ROBERTSON—PANDA

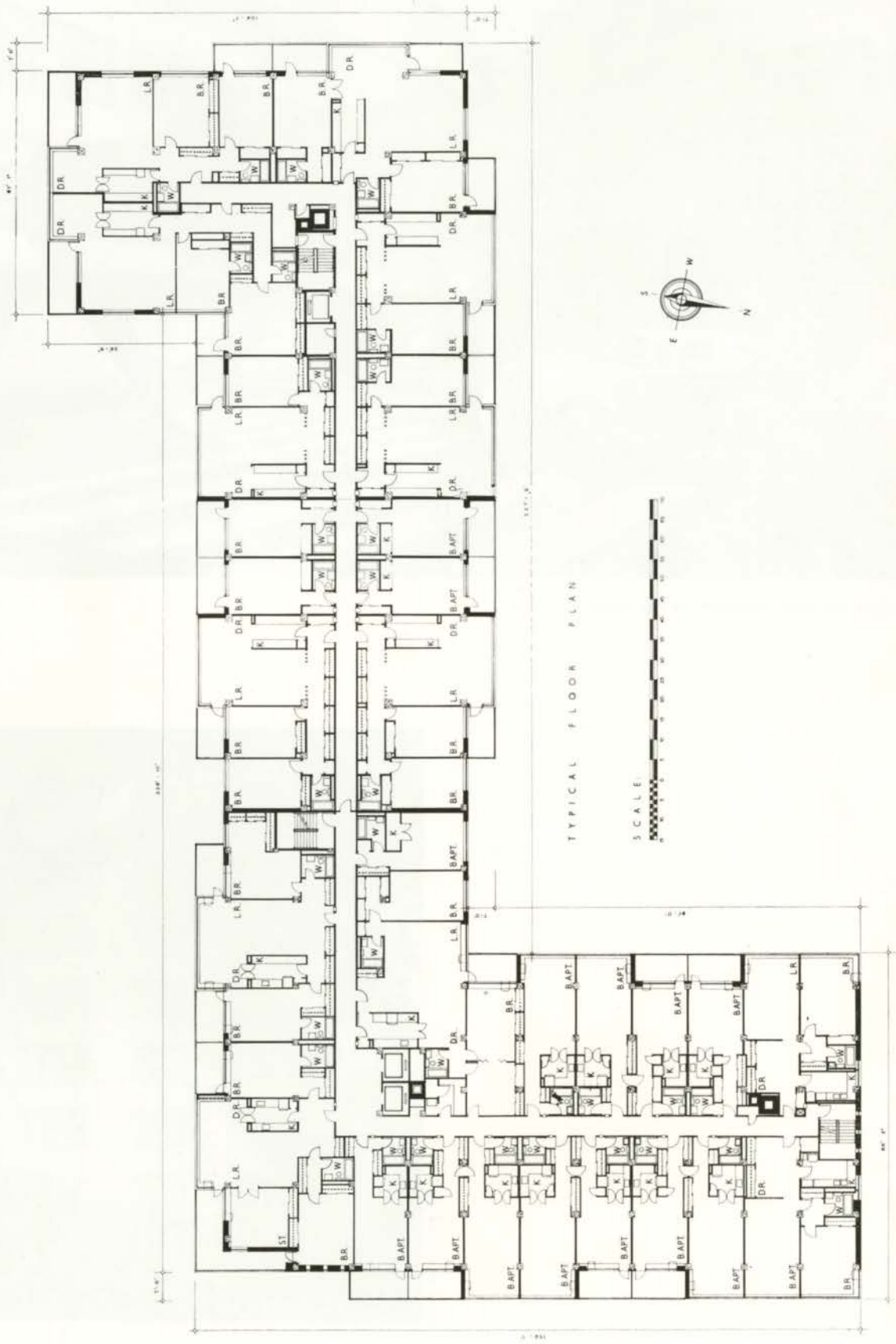
View from Avenue Road hill


HUGH ROBERTSON—PANDA


HUGH ROBERTSON—PANDA



GROUNDFLOOR PLAN


TYPICAL FLOOR PLAN
SCALE
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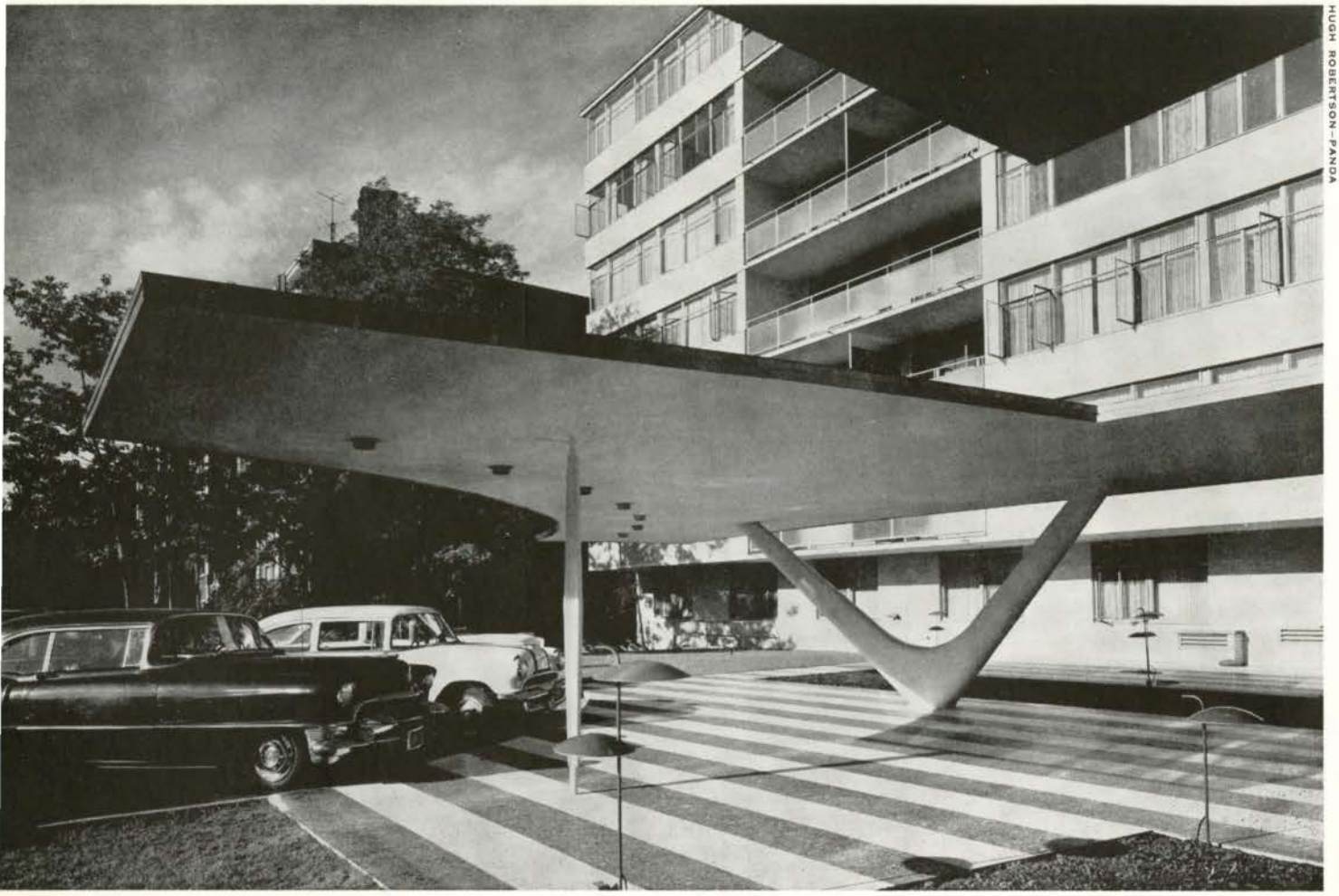


HUGH ROBERTSON–PANDA

Canopy covering entrance to the hotel

HUGH ROBERTSON–PANDA

HUGH ROBERTSON–PANDA

Canopy covering entrance to the apartments

The entrance foyer

HUGH ROBERTSON–PANDA

Office of John B. Parkin Associates, Don Mills, Ontario

Architects and Engineers, John B. Parkin Associates

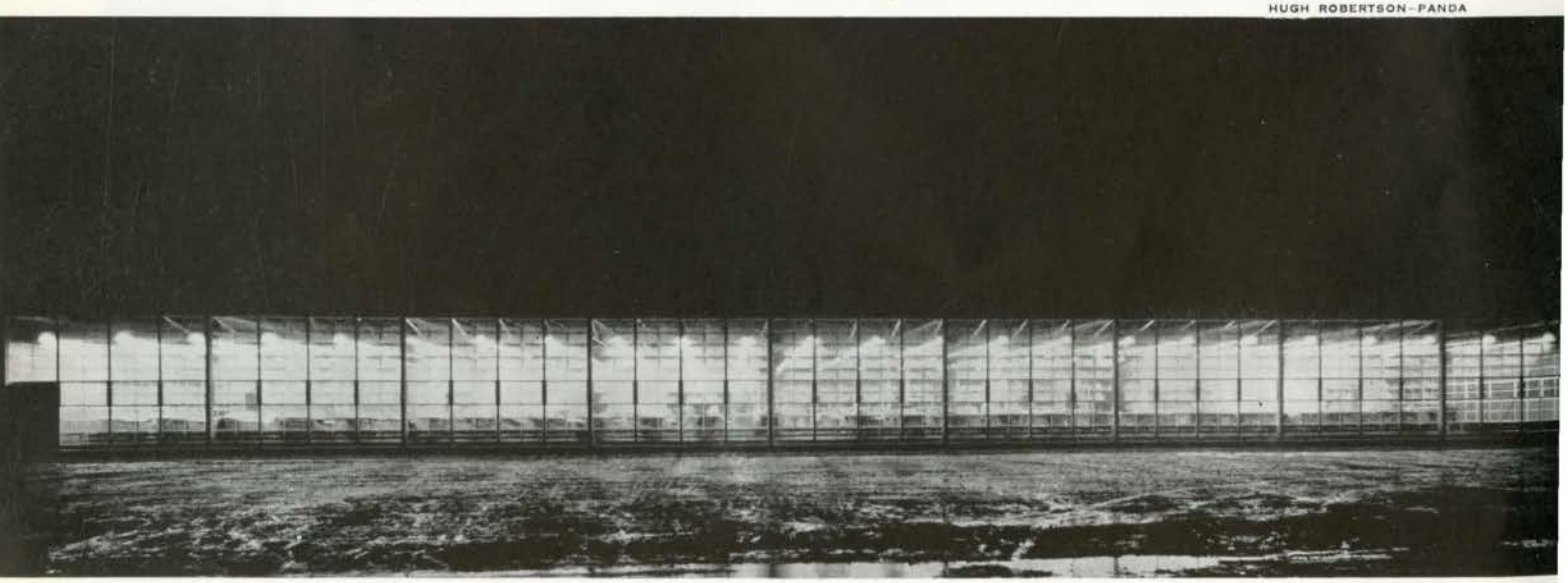
General Contractors, Redfern Construction Co. Ltd.

HUGH ROBERTSON-PANDA

Model showing office and parking

Night view of the draughting office

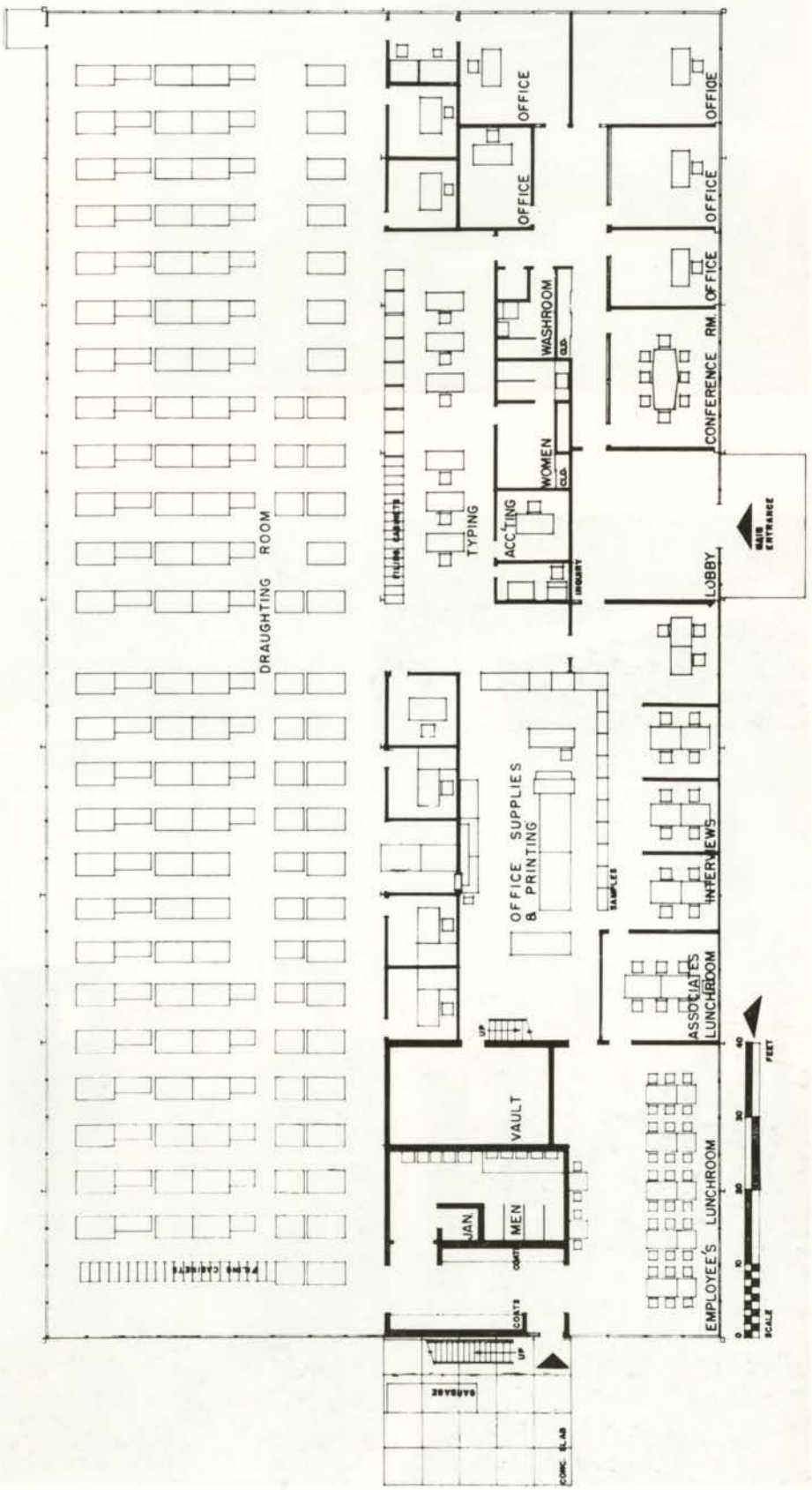
HUGH ROBERTSON-PANDA



The requirements of the new building were based entirely on the desirability of giving all draughting space north light. For easy interchange of information, separate draughting rooms for the various departments were avoided. The mechanical engineering department occupies the extreme west end. The structural engineering follows, with architectural working drawings taking the mid-section, while industrial engineering and design occupy the easterly end of the draughting room. Basic, also, was a close relationship between the general office, secretarial, and printing departments. The south side of the building is occupied by what might be termed short-term occupancy areas. Full provision is made for future air-conditioning.

The entire building is designed on a 5-foot module, horizontally and vertically. 45-foot clear spans achieved through the use of long span bar joists give large areas entirely free of columns. Private offices for department heads are of metal demountable partitions. All fixed services are consolidated into a central utility core, with the boiler room on the mezzanine to free further ground floor space.

The exterior is of blue tinted, heat absorbing, glare reducing glass. 14-foot ceilings, a flooded roof, and continuous venting sash are used as effective controls against solar heat gain. The building adjoins two wide ravines designated as Green Belt Area, and is part of a development of three additional office buildings designed by the same firm to harmonize one with another.



HUGH ROBERTSON–FANDA

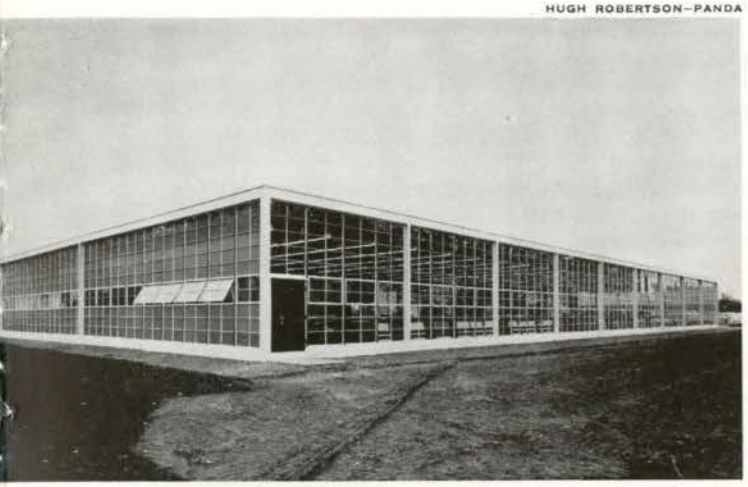
The draughting office

Corridor looking into Board room

HUGH ROBERTSON–FANDA

Main entrance

HUGH ROBERTSON–PANDA



HUGH ROBERTSON–PANDA

Private office

VIEWPOINT

Is it the architect's fault that the speculative builders have such a bad influence on the urban scene?

The architect is certainly not responsible for the actual frantic speculation and greed, amounting sometimes to "highway robbery", in connection with the vast part of house building business in this region.

The extravagant bulk of housing developments of the last decade is undoubtedly responsible for the debasement of man power and for the creation of so many shanty-towns, demurely called cities. This has been indirectly inspired by well meaning, but distrustful, CMHC towards the architects who have been, right from the start, clumsily prevented from participating actively with economists in shaping the oncoming cities in favor of national *human capital,* looked at from a regional standpoint.

I think that the most serious factor actually preventing architects from adequately answering the real needs in housing is the obligation for them to prostitute and view the problems through an always increasing arbitrary bureaucratic optic, eloquently expressed by many cities' by-laws, or some design and building standards imposed on them, contrary to the elementary spirit of living architecture.

Jean Damphousse, Laval des Rapides

The ugliness of our cities is appalling, depressing, stultifying and there is not a glimmer of hope that any improvement can be expected in newer sections and suburban sections because the whole growth is in the hands of speculative builders. In short, it is the speculative builders who are responsible for the ugliness of our cities and the debasing influence of this ugliness on public taste.

Materialism, greed and lack of good taste, added to faulty civic land patterns are reducing our cities to slums.

Is it the architect's fault that the speculative builders have such a bad influence on the urban scene? The architect is only partly responsible because little of this speculative work passes through architects' offices.

There can be no improvement until the entrepreneurs become more community conscious, employ better architectural skills with full service, and promote construction on a big scale, say, a city block for each operation.

Harold Lawson, Montreal

There appears to be two reasons for the preponderance of speculative dwellings without the benefit of the architect.

Firstly, our "architecture" has not reached the point where a speculative builder can afford to pay for our services and still price his building in competition with the 'non-architected' structures. This may be because we are oblivious to the hard economic facts of competitive house construction and we are not willing to concern ourselves sufficiently with this aspect of construction.

Secondly, when we do turn out a 'good' design, the builder for the most part is oblivious to its advantages and would rather build a popular model he knows would sell, or he will take our design and distort it out of all recognition in his effort to build it for a 'price'.

In both cases I would say the fault lies with our profession. We must learn economics and at the same time educate the public to the advantage to themselves in owning an 'architect designed' dwelling.

Francis J. Nobbs, Montreal

On doit reconnaître que, d'une façon générale, les récents développements de vastes quartiers domiciliaires et les groupements d'immeubles à appartements n'ont pas contribué à améliorer le paysage urbain, mais au contraire à l'enlaidir davantage. Les constructeurs-spéculateurs ont ignoré les avantages d'une utilisation plus rationnelle des terrains et d'une étude mieux faite de la disposition et de l'aspect des constructions. On n'a pas cru essentiel d'avoir recours aux services des architectes et des urbanistes pour préparer les plans des ensembles comme des détails, et cela sans doute par esprit d'économie.

On ne peut qu'être attristé par le gaspillage de capitaux qui est résulté de cette incompréhension. Les architectes, d'une façon générale, ne peuvent être blâmés de cet état de chose, puisqu'une grande partie des travaux qui déparent nos villes ont été exécutés sans leur concours. Mais, d'un autre côté, il serait trop sévère de blâmer uniquement les réalisateurs de ces constructions et de ces ensembles, d'où se dégage une impression de banalité et de tristesse, puisque le plus souvent les municipalités n'exercent pas le contrôle nécessaire et ne mettent pas à la disposition des intéressés les services indispensables pour orienter et diriger les initiatives mal éclairées. C'est surtout à ce palier que réside la cause du désordre et de la laideur dont souffrent nos villes et nos villages.

Denis Tremblay, Sherbrooke

NEWS FROM THE INSTITUTE

CALENDAR OF EVENTS

Annual Meeting of the Ontario Association of Architects, Royal York Hotel, Toronto, February 17th to 18th, 1956.

88th Convention of the American Institute of Architects, Hotel Biltmore, Los Angeles, California, May 15th to 18th, 1956.

Annual Assembly of the RAIC, Banff Springs Hotel, Banff, Alberta, June 6th to 10th, 1956.

OAA CONVENTION AND ANNUAL MEETING

George Abram, Chairman of the Committee of Arrangements has announced the following details of the Convention and Annual Meeting to be held at the Royal York Hotel on Friday and Saturday, February 17th and 18th, 1956.

The theme of the Convention, "Architecture and the Allied Arts", will be introduced by Philip Johnson at the Toronto Chapter luncheon on Friday. Mr Johnson is a

practising architect and director of the Department of Architecture and Design of the Museum of Modern Art in New York.

The Annual Meeting and reading of the committee reports will take place Friday morning. Friday afternoon there will be a panel on the question, "How can the allied arts play a greater part in architecture?" The panel chaired by Gordon S. Adamson will consist of John A. Hall and Eric Aldwinkle, artists; Angus Macdonald, stained glass designer; Austin Floyd, landscape architect; Elford Cox, sculptor; Joanne Brook, fabric design and interiors; John Layng, architect.

The Saturday luncheon topic will be "Industrial Design and Architecture". Saturday afternoon Victor Gruen will lead a seminar on "Architect-Artist-Client Relations". Mr Gruen is probably best known here for his work at Northland shopping centre in Detroit.

This year the exhibition of building materials and techniques has been greatly enlarged. In the same hall there will be exhibitions of industrial design, sculpture, mural design and landscape architecture. On Saturday morning, members will be able to view the Massey Medal Winners at the OAA building.

The Annual Dinner and Dance will take place Saturday evening when presentation of certificates and awards will be made.

Your Committee has arranged a Convention which will be both informative and enjoyable. Members of other Provincial Associations in Toronto at the time are cordially invited to attend.

QUEBEC

The November *Journal* on Ottawa and the publication in the same month of the "Rideau Waterway" made 1955 truly significant in the growing appreciation of the works of the 19th century in Canada. The authors of all these works deserve our thanks. Robert Legget's fine book on the Rideau is a challenge to others to gather and check stories, photograph and piece together accounts of other great works in this country. Though the scale of By's undertaking and the extent of his and his raconteurs zeal may be altogether uncommon and remain unequalled, there are all kinds of stories in the stones of Canada that need unfolding — Louisbourg, the Citadel of Quebec and the parliamentary group in Ottawa in their times engaged vast human and technical resources and in which many of our forefathers learned to work together, to build and to design. Perhaps a sensitive account of the West Block by someone with an appreciation of its historic and architectural significance would be enough to prevent the impending calamity of its removal.

John Bland, Montreal

HONORARY FELLOWSHIP

During the year 1955, the President described to Council the outstanding contributions to the profession of Mr Percy E. Nobbs, and proposed that he be made an Honorary Fellow. This proposal was supported by five Past Presidents of the Institute, and accepted unanimously by Council.

When it was found that Mr Nobbs would be unable to attend the 1955 Annual Assembly at Halifax to receive his award, it was decided that it should be presented in Montreal during the fall. This presentation was carried out at a dinner party at the University Club of Montreal on Wednesday, 12 October, attended by Mr Nobbs and members of the Executive Committee.

Council is obliged to Mr Roy Wilson for the following notes on Mr Nobbs' career and attainments.

To write an article of only a few thousand words, and do justice to a genius of Percy Erskine Nobbs' stature is an impossible task. His ability is so extensive in so many fields, both professional and 'extra-mural', that the 'universal man' inevitably comes to mind. How many architects, in these strictly materialistic days, have half his artistic ability, half his variety in outside activities or can look back on a life that has been half so full of virile achievement?

His architectural ability seems to be a mixture of Sir Robert Lorimer, his one-time employer, Bertram Grosvenor Goodhue and Frank Darling, and like them, he realizes that full size details are as important to the success of the building as anything else, and should be designed by the 'principal' in the office, not left, as they usually are, to a junior. But do not think that Mr Nobbs is intolerant of juniors. On the contrary, he has always taken the greatest interest in architectural education, witness his thirty years as head of design at McGill, and has always been ready and willing to explain everything in the most minute detail.

While on the staff at McGill, Mr Nobbs taught design, in the belief that an architect, worthy of the name, should be able to design anything to do with buildings, from the town plan to the furniture, and should be able to show the craftsmen what he means with his own hands. Design, to him, has always been the perfect combination of Head, Heart and Hand. His book on design, which he said was written as a means of crystallizing his ideas, is probably the most profound work on this subject yet published in Canada. He has designed everything with distinction, whether churches, houses, office buildings, schools, universities, clubs, libraries, housing schemes, stained glass, decorated interiors, heraldry, furniture, sculpture, ironwork, or even fish-ladders.

The mention of fish-ladders is not facetious. At the age of fourteen, young Percy wrote a letter to the *Scotsman*, and thereby obtained action from the Fisheries Board in providing a fishway at a new dam on the Tyne, his boyhood fishing river. He has been a great fisherman ever since, an international authority on the habits and welfare of sporting fish, and has revived many 'dead' salmon rivers, such as the Matane. Fellow-enthusiasts come from the British Isles and the U.S. to ask his advice.

Sport has always been of vital concern and for years he was fencing champion of Canada. He was one of the first Montrealers to take up skiing, now the sport of multitudes. He is an enthusiastic sailor, and has extensive knowledge of the design and handling of sailing craft of many types and of many nations.

Percy Nobbs has faced Life as a game. He spent countless days in non-profit occupations for the good of his fellow-citizens and fellow-architects. For thirty years he has advised the City of Montreal on city-planning and slum-clearance, and most of it without the satisfaction of seeing the schemes go past the blue-print stage. For several years was a City councillor. While acting president of the Royal Canadian Academy he re-wrote its by-laws. He was president of the PQAA and of the RAIC. Those of us who serve on committees, know the hours of apparently useless talk that takes place, even when the opinion of the committee is unanimous. He himself, though talkative, never wastes words. Whether lecturing or conversing, his talk is full of interesting facts, unusual knowledge and humorous anecdotes. He has the habit of driving home his point with a well-chosen funny story, and though I have known him for thirty-five years, I have never heard him tell the same tale twice. He is always good company. Once he told me how, while walking with his son Frank, then nine years old, they met a clergyman whom Frank greeted with his usual gaiety. After he had passed, Mr Nobbs asked Frank who his clerical friend was; to which Frank replied, 'Oh, that was Father S—, he's very high church, in fact, he's *almost* a celibate.'

His draughtsmanship has always been peerless. Look at some of his student drawings done in Italy, Russia or England, — every line is drawn with a sureness and a vigour that has always been the envy (and the despair) of his students. Especially noticeable in his pen or pencil drawings is this amazing accuracy. Apparently he never searched, as the rest of us do, for the right place for a line;

every curve is clean and sure and every delineation exudes authority and vitality.

This vigour is especially apparent in his heraldic designs. During the royal visits of 1939 and 1951, McGill University showed the best of taste, not so apparent in other parts of Montreal or most of Canada, in having Mr Nobbs produce numerous heraldic devices, complete with shields, crests and supporters. Each was drawn as only a master in the art of heraldry could draw them; his lions were savage, but with dignity, – his 'wild men' were Hun-like in their ferocity, and every last detail fulfilled the letter of the blazon.

Wrought iron has long been one of his favourite materials for decorative expression. His style follows the English school, where structure combines with flower and other natural forms, translated into iron. One would think, judging from his unerring choice of iron sections, that he had been an eighteenth century blacksmith in some former life.

And he is a good modeller as he is a designer. Look at his stylized lions, angels, maple-sprigs, bas relief panels and countless other decorative motives on his buildings. They have a feeling for the material that is reminiscent of the Florentine Renaissance, and the same vigour that Sir Robert Lorimer displayed in his Scottish National Memorial at Edinburgh Castle. Mr Nobbs has done a number of war memorials himself and acted as architectural adviser for the Battlefields Memorials Commission, after the first Great War, in which he was an enthusiastic and accomplished expert in camouflage, for both land and naval forces. Some of us suspect that he actually enjoyed the world conflict.

APPOINTMENT

Mr A. J. Hazelgrove, LLD, FRAIC, FRIBA, has been appointed a member of the Architectural Committee of the Federal District Commission, Ottawa.

SCHOLARSHIPS

Origin

In 1935, Mr Edward Langley, distinguished architect of Scranton, Pennsylvania, died, leaving a legacy to be known as the **Edward Langley Scholarship.** The income was to be used for scholarship purposes and particularly in aid of students who are residents of the United States and Canada, in the study of architecture. The fund was to be administered by the American Institute of Architects. Starting with 1936, a total of over fifty awards have been made, including five awards to Canadian students.

Award Provisions

The amount of the scholarship varies widely and is determined by the need of the applicant. Each recipient is committed to make a detailed report to the Institute at the end of his training, setting forth the values he feels accrued as a result of his scholarship.

Application Procedure

Application shall be made on AIA Form S70 and shall be from the student recommended by the head of the architectural department of any accredited school or member of the Association of Collegiate Schools of Architecture. *On or before March 15, 1956* nominations shall be mailed to the Regional Director of that region, who in turn will submit them to his Regional Committee for their selection of a regional candidate. This Committee will select the applicant that they believe most deserving and forward to the Institute their recommendations. The Institute Committee will recommend to the Board of Directors the number of candidates selected from the regional candidates as they feel most deserving and within the funds available. The awards are made by the Board of Directors. For Canadian students, the Royal Architectural Institute of Canada will designate candidates studying in Canada.

Policy in Selection

Weight in selection for this award is given to character, ability, need, purpose of the grant, and potential contribution to professional knowledge or welfare.

Procedure in Canada

In Canada the procedure is to obtain the AIA Form S70 from the Director of an accredited Canadian School of Architecture, to complete it, including the recommendation of that Director and send it to the Secretary of the Royal Architectural Institute of Canada, 88 Metcalfe Street, Ottawa, Ontario *on or before 15 March, 1956.* If and when nominations are received the RAIC may recommend one of these to the American Institute of Architects.

Cornell University
Graduate Division of Architecture and Fine Arts

The following financial aids are available in 1956-1957 to qualified students for graduate studies in Architecture, Landscape Architecture, City and Regional Planning, Painting and Sculpture.

Junior Graduate Fellowship–Stipend $1400, plus free tuition and fees. More than one may be awarded.

University Scholarship – Stipend $250, plus free tuition and fees.

Francke Huntington Bosworth Memorial Fellowship – Stipend $1000. For study of Landscape Architecture. Graduates of accredited Schools of Architecture or Landscape Architecture may apply.

E. Gorton Davis Memorial Fellowship – Stipend $1000. For study of Landscape Architecture. Graduates of accredited Schools of Architecture or Landscape Architecture may apply.

Tuition Scholarships – Value, free tuition. A number of awards may be made.

Assistantships – Stipend $1025, plus free tuition and fees. Several awards may be made.

Applications will be received *until February 17, 1956.* Requests for additional information and application forms should be addressed to Dean Thomas W. Mackesey, College of Architecture, Cornell University, Ithaca, N.Y.

COMPETITION

The Government of the State of New South Wales proposes erecting a new National Opera House in Sydney on the shores of the harbour. It has been decided to hold an International Competition, open to all architects, for the purpose of selecting a design and an architect for the work.

The Assessors for the Competition will be: Professor Henry Ingham Ashworth, MA (Arch.), FRIBA, FRAIA, MAPI – Sydney; Cobden Parkes, Esq., FRIBA, FRAIA – Sydney; Dr John Leslie Martin, MA, PhD, FRIBA – London; Eero Saarinen, Esq., AIA – Michigan, USA.

The premiums for the winning designs are as follows:

To the author of the design placed First by the Assessors
£5,000 (Australian)

To the author of the design placed Second by the Assessors
£2,000 (Australian)

To the author of the design placed Third by the Assessors
£1,000 (Australian)

Detailed conditions are at present being prepared and it is hoped that these conditions will be available for distribution in Sydney in mid-February, 1956, and will be posted (by airmail) to all registered competitors.

These conditions will embody a registration clause, in which all intending competitors shall register their names with the Secretary and Executive Officer, Opera House Committee, c/o Department of Local Government, Bridge and Phillip Streets, Sydney, Australia, and enclose a remittance for the sum of £10.0.0 Australian, or its equivalent, which sum will be returned to each competitor on the receipt of a bona fide design. This registration may be effected now and any time *up to 15th March, 1956,* which is the last day for registration.

Only designs from registered competitors will be accepted. Applications for registration should be in English and the register will be confidential and under the sole personal control of the Secretary and Executive Officer of the Opera House Committee.

A further condition of the competition will be that the winning architect will be required to register as an architect with the Board of Architects of New South Wales before proceeding with the work.

The present intention is that the final designs will have to be lodged in Sydney in December, 1956, but the exact date will be included in the formal conditions referred to above.

PROFESSIONAL PROBLEMS

The Standing Committee on Professional Usage is composed, in accordance with the by-laws of the Royal Institute, of all of the Presidents of the component societies of the Institute with the President of the Institute as the Chairman.

Amongst the objects of this Committee, is that of endeavouring to establish and maintain high standards of ethics and of professional practice throughout Canada. So far as possible the aims of the Committee are directed towards making these standards uniform throughout the country, but the fact has to be kept in mind that each Provincial Association, by its Charter, is responsible for its own Code of Ethics and must regulate within its own province the practice of the profession.

Through contacts made across the country, and through the medium of exchange of ideas and information, the Committee hopes for the realization of its aims within a reasonable time.

Coupled with the anticipation of uniform standards of ethics and professional practice is the desire to unify educational standards for entrance to the profession as well as to provide ways and means for training the young architect to become a highly efficient and effective member of his profession.

The Committee also has a deep interest in the relationship of the profession to the public, not only in respect to the intimate details of the business of being an architect, but also in the social and political sense. It is therefore concerned with the part played by the profession in community life, and with its relationship to other professions, institutions, and governmental bodies.

The reports of the Honorary Secretary on the general business of the Institute during the past year, as well as the reports from the chairmen of the Architectural Training Committee, the Public Relations Committee, etc., deal with some points referred to above. It is expedient, however, that this report in addition to commenting upon such matters, calls attention to several items of interest to the profession which have been reported to the Chairman by the Presidents of the component societies, particularly since some of these items are of a more confidential nature than would justify their inclusion in the Standing Committee Reports in their printed form.

From reports received from the Presidents of the component societies upon the deliberations of their Councils during 1954 the following digest has been made to record some of the matters relating to Professional Practice as they have been noted in the reports received.

Architectural Institute of British Columbia

It is reported that activities by engineering firms in the field of architecture still persist and are being extended, and that some construction firms are engaging in the "package deal" business to the detriment of the profession as a whole. One such firm employs "on commission" one architect in its extensive business.

An engineering firm actively engaged in architectural work which has one architect associate in its organization styles itself "Architects and Engineers". It is noted that there is no clear ruling so far as the AIBC is concerned on the rationality of this procedure.

It is also reported that negotiations have been concluded whereby consulting engineers in the structural field may under certain conditions become members of the AIBC.

The Alberta Association of Architects

This Association reports that the "package deal" method of struction is always present and that there are many companies engaged in designing and constructing buildings "to order".

The Joint Rules of Practice which have been established between the architectural and engineering professions seem to be giving a fair basis of understanding and provoke few problems.

The Saskatchewan Association of Architects

It is noted that in Saskatchewan, members of the Association of Professional Engineers are permitted by the law, as it now stands, to design buildings of many types. The Engineering Profession Act as amended in 1948 gives the right to members of that profession to lay out, design, and direct construction upon, amongst other works, factories, warehouses, swimming pools, rinks, garages, cold storage plants, hospitals, schools and public buildings. Consequently, their rights are being maintained, and one engineer is concentrating upon the design of schools, mainly in the northern part of the province.

The SAA submitted in 1954 a brief to the Minister in charge of adminstering the Architects' and Engineers' Acts, which requested a modification of the latter. The answer received was to the effect that the Government of Saskatchewan does not consider it expedient at present to deal with the proposed changes to the Engineering Profession Act.

The Manitoba Association of Architects

1954 was a busy year for all members. In consequence an increase in the problem concerning Professional Practice and Ethics was dealt with by the Association. Complaints were received upon fee cutting and questionable methods of practice.

A Committee on Fees and Ethics was set up during the year, through which an educational campaign for practising members is being instituted. It is felt that in most instances lack of knowledge of fee scheduling and of methods of practice is the real cause of the complaints received.

The Registration Committee has endeavoured to clarify the interpretation of the term "Architect's Office" as laid down by the Registration Act in respect to the term of apprenticeship required therein before a prospective candidate is admitted to membership. The Committee has felt that the broad and varied field of experience offered in some cases has not been adequate under the terms of the Act. A suitable formula for interpreting the requirements under the Act has been devised and approved by the Association.

The Ontario Association of Architects

The Ontario Association of Architects and the Association of Consulting Engineers of Canada held a joint meeting during the year to discuss the matter of "package deal" business being done throughout the province of Ontario. A list of arguments was drawn up favouring competitive bidding on building projects. A well-organized publicity campaign was suggested as a means of bringing the salient points to the attention of directorates of corporations etc. in particular, with the intent of creating favourable management opinion towards the competitive bidding system. Further consideration is being given to this matter, meantime an excellent booklet entitled *When You Build in Ontario*, sponsored by a group of architects with permission of the OAA and devoted entirely to industrial work in Ontario, has been published and is being distributed. It is highly commended as an effective means of publicising the skill, knowledge and experience of the architects in this field in which package dealers have their strongest hold.

The Association reports cases of schools in the province having been planned and built as package deals.

A special Committee was appointed during the year to study a draft of a revision to "Apartment House Standards" of the Central Mortgage and Housing Corporation. A report in comment upon many of the proposed regulations was submitted to the CMHC authorities for clarification and further revision. It was found that the proposed regulations would give to engineers a position in constructing apartment houses which by academic training and experience they were unqualified to assume. The solicitors of the Ontario Association of Architects and of the Province of Quebec Association of Architects went to Ottawa and interviewed officials of the CMHC in regard to this matter, with the result that the proposed "Apartment House Standards" were modified in a manner which now appears satisfactory from the viewpoint of the architectural profession.

The Ontario Association was called upon during the year to deal with a serious matter which arose when the National Association of Master Plumbing and Heating Contractors gave notice that members of these bodies would, in future, submit their tenders for sub-trades to architects and owners only, and not to general contractors.

This action, notice of which was in the first instance sent to the Royal Institute and to the Canadian Construction Association, and dealt with by the latter body in the preliminary stages, was found to be confined to certain parts of Ontario, rather than to being nation-wide. It was felt therefore that whatever action should be taken immediately should be taken by the OAA as they were for the time being the only association affected. Since the proposal of the sub-trade associations represented a drastic change in the established procedure for tendering, the OAA obtained from the Associations concerned a delay in their proposed action to allow the matter to be discussed.

At a joint meeting of the OAA, the Ontario General Contractors' Association, the Ontario Branch of the NAMPHC and the OECA it was agreed that the general contractors' and sub-contractors' associations should work out a mutually acceptable arrangement for tendering procedure, which should be submitted to the OAA for comment and approval. Such recommendations have now been received and are under consideration.

It is to be pointed out that the OAA Committee acted with great skill and patience as an intermediary in a somewhat tense situation. It should also be noted that the publicity given to this matter, both

in the official journal of one of the disputing associations and in a business and financial publication, was more highly coloured than the circumstances warranted. This matter was brought to the attention of the Executive Committee of one of the Associations by the Royal Institute and a promise obtained to desist from active publicity while the matter was under discussion.

As a result of an excellent annual report made by the Chairman of the Committee on Education, the Committee has been enlarged with a view to investigating in greater detail matters relating to architectural education within the province, and having particular regard to counselling and guidance in secondary schools, changes to the brochure "Architecture as a Vocation", admission policy of the University, the course in architecture in the School of Architecture in the University of Toronto, the course in Architectural Technology in the Ryerson Institute, the course conducted by the Registration Board of the OAA and OAA scholarships and prizes.

Province of Quebec Association of Architects

In the Province of Quebec the practice of architecture is so regulated by the Architects' Act that only members of the PQAA have a legal right to make plans and specifications for buildings, a right which is carefully guarded by the Association, and is apparently upheld by the powers that be, as a safeguard for the building up of cities and towns under the most favoured conditions for the cultural welfare and for right living.

Attempts have been made from time to time by the Corporation of the Professional Engineers of Quebec to change their Act of Incorporation so that the so-called borderline field of building, which includes structures intimately connected with engineering projects as well as industrial buildings, would be included within the group of activities in which the engineer may practise his profession.

The last attempt to so revise their Act of Incorporation was made by the Professional Engineers of Quebec in January 1954 when a bill was presented to the Provincial Legislature, which would permit the professional engineers to add, amongst other things, industrial buildings to their group of activities, and incidentally to open wide the door for the entry of package deal operations. The bill was categorically rejected.

Notwithstanding some aggression on the part of the Corporation of Professional Engineers, which is made up for the greater part of engineers in industry and in construction, it is felt in some quarters that it would be advantageous both to the architects in the province and to the consulting engineers who share with them the work of preparing plans for certain portions of building operations, if the consulting engineers were to be granted the exclusive privilege of preparing the plans for such portions in all cases where they are not being done by the architects themselves. Negotiations continue with this aim in sight.

In matters of ethics, it has been found necessary for the purpose of protecting the membership at large to make it a breach of the code of ethics for any member to sign plans which have not been prepared by him, or in his office, for his own client. Abuses in this respect have brought disciplinary action, even to the extent of suspension from the Association for a specified period.

For the future well-being of an Association which enjoys the privileges extended to it through favourable legislation it is most important that the future membership be drawn from well-trained and capable candidates. With this end in view most careful consideration is being given by the Membership Committee to the qualifications of those who present themselves for admission.

The New Brunswick and Nova Scotia Associations of Architects

No detailed report has been received from the New Brunswick and Nova Scotia Associations of Architects.

The Newfoundland Association of Architects

This Association reports that it is still trying to have an Act of Incorporation of the Association passed by the provincial government, and that until such an act is passed, anyone can hold himself out as an architect and do architectural work without any particular qualifications for it.

It is learned that the "package deal" business is not uncommon in Newfoundland at the present time and that in industrial work in particular, planning and designing services are being included in the proposals made to would-be builders.

At the risk of making this report unduly long, this summary of country-wide reports has been presented here for the purpose of endeavouring to show once again the main points which present difficulties in attaining favourable conditions of practice across the continent. By considering these in more detail we may be able to help to solve some of the difficulties which are being met with, or at least to ameliorate them to some extent.

In the matter of adverse legislation it has been realized for some time that in certain provinces legislation has not been at all favourable to the architect. In some instances some improvements have been made possible, in others it would appear that as the good work of the architectural profession grows and advertises itself to the public, that in government circles the effects of it will not remain unnoticed. It can be hoped that within a relatively short time the benefit which a community derives from the existence of a well-trained and well-organized profession, and the need of a community of the advice and services of such a profession will tend to strengthen the claim of such a profession to fair and reasonable legislation which will be of a more protective nature than that presently in existence.

To this end, the profession has to undertake in a most serious way the preparation and education of future members for their life work. In the case of the component societies with reasonably large memberships the task is less exacting than in that of the smaller societies. At the special meeting of Council held in Toronto in February of this year, a lengthy discussion of the problem of uniformity in requirements for admission to the Provincial Associations led to an undertaking of the Executive Committee of the Institute to have a Basic Syllabus of Educational Requirements and a course of studies drafted, which might be made acceptable to all component societies.

The education of members cannot stop with their admission to the profession however. The erection of a building has become a highly complex undertaking over the past half century, so much so that the young architect needs training over many years before he can be considered as having even a normal proficiency in the business of building. It is the duty of the Institute to endeavour to augment, wherever possible, the experience being gained by the young architect in the office, with knowledge to be obtained by extending his studies in the arts, sciences, and practices of his profession. It is hoped, as a result of the talks at the special council meeting, that some assistance may be given in this respect through extension courses at centres where such can be made available.

In the annual report of the Legal Adviser of one of the component societies comment is made as follows on the need of a thorough training —

> "We find an increasingly critical attitude on the part of the client in respect of services rendered by architects. Their responsibilities under their retainers require the exercise of a reasonable degree of professional skill and an accurate recognition of, and adherence to the obligations of their retainers.
>
> "Any case in which a court criticises the work done by an architect does serious harm to the standing of the whole profession and may become a matter for consideration by the Registration Board under its power to reprimand, suspend or cancel the membership of an architect who is found incompetent. It should be . . . the policy of the Registration Board to maintain high standards for its members in professional practice".

Concurrent practice with members of Corporation of Professional Engineers is a matter which is regulated in each province by law. This practice will continue as long as it remains legal, it being the right, of course, of either profession to guard against intrusion into its field. With a high degree of training and fitness on the part of architects working alongside of engineers in a field for which the engineers are obviously not trained when they become engineers, the architects should have the advantage, and more and more there should develop a leaning towards the employment of an architect for general building projects.

There is, however, a field in which the architect and the consulting engineer should normally co-operate and enjoy a pleasant relationship. Consultants in structural, mechanical and electrical work play, and are willing to play an important part with the architect in the development of a building. From recent talks with the directors of the Association of Consulting Engineers of Canada one gathers that they are quite happy with the liaison now existing and would not wish for it to change. To them credit and recognition is due for the experience and advice given with their services. It was with pleasure that one saw recently on a tablet commemorating the erection of one of our newest hospitals the names of the architects, consulting engineers and contractors.

It may not be too much to look forward to the time when there will be a common code of ethics for architects and consulting engineers working together across Canada. The existence of many firms of Architects and Engineers, particularly in the eastern and western provinces, is a hopeful trend in this direction.

Our relations with the Federal Government continue to be most cordial. The acceptance of our revised Act of Incorporation by both Houses and its approval without change of any sort was most satisfactory. For this great credit is due to our legal advisers.

Complaints are still being received from our members in regard to the scale of fees paid by the various governmental departments on the work being done for them. Acting upon a request of the Association of Consulting Engineers, whose members are affected by the low rates paid to architects, a joint committee has been appointed to study the situation and to compare the rates of fees paid in Canada with the rates paid by the Governments of the United Kingdom and the United States of America. If found feasible, a joint brief will be sent to the heads of the governmental departments asking for fees on a more equitable basis. It must be borne in mind in this connection, that higher rates of fees, if obtained, must be accompanied by the highest standard of service, and that any department would be entirely justified in distributing its work amongst those who they know will render the highest grade of service.

According to the usual procedure a report such as this must dwell to some extent upon phases of professional life which are not the happiest. The report, however, is being made to ourselves, and it is only by bringing to our own attention faults and deficiencies can we be persuaded to deal with them. It is hoped that some of the matters herein, which are brought to your attention, will be commented upon and that suggestions and advice will be given, – not necessarily all at once, but during the coming year – as to how we may best deal with them.

In many of the component societies the matter of publicity and public relations is receiving a good deal of attention, and new ways of bringing the architect and his services to public attention are being devised and tried out. It has been considered advisable that direct publicity be left to the Provincial Associations at the present time, but more and more attention is being paid in both Canada and the United States to the desirability of increasing the value of our relationship to the public by individual service. Architects by virtue of the many years spent in preparation for their profession are as a class well informed and proficient people who are as well fitted for taking active part in community life as those from any other walk of life.

In service clubs, school and church groups, in civic bodies concerned with planning, traffic control, housing, building codes, zoning and playgrounds, the architect can furnish experience and provide leadership. He can also make his presence in the community known by speaking in panel discussions on radio and television. Such service on the part of many of the architects in a community, instead of the few, would tend to disseminate far more knowledge of the capability of the members of the profession than is now being spread by the occasional press notice or the distribution of a small brochure. It would make the architectural profession more widely known than can ever be the case by adopting a reticent attitude towards public affairs.

Finally, the services and talents of our members are needed within the profession, as teachers, for service on committees within the Royal Institute, and the component societies, and as well as on such bodies as the Canadian Standards Association, and the Division of Building Research of the National Research Council. All such activities redound to the credit of the profession and add to its service-value within the community.

A great debt is due by the members of the Royal Institute to the relatively few amongst them who are giving such wholehearted service in the active committees and functions of the Institute and the Provincial Associations.

A. J. C. Paine, President

CONTRIBUTORS TO THIS ISSUE

Jan H. Albarda was born in The Hague in 1910. He graduated from the University of Delft with the degree of both architect and professional engineer. He will never forget the wonderful years he spent working for J. J. P. Oud afterwards. During the nine years that followed Mr Albarda produced building of various kinds, taught architecture, town planning, etc., and wrote many articles in Dutch and other periodicals. In 1951 he crossed the ocean with his family and had to start all over again in Canada. After a few years he opened his office in Weston, Ont., together with his friend Eric W. Hounsom.

William Fisher Cassie, PhD, MS, FRSE, MICE, MI Struct.E, is Professor of Civil Engineering, University of Durham. He graduated BSc, PhD, from the University of St. Andrews, Scotland. Served under City Engineer and Harbour Engineer, Dundee. Graduated MS, University of Illinois. Member of faculty in several universities in Britain. Member of Council, Institution of Civil Engineers. Fellow of the Royal Society of Edinburgh. Professor Fisher Cassie is the author of several text books and various technical papers.

D. W. Cooper was born in Derby, England, in 1920. In 1936 he joined the Ferro-Concrete Construction Co. Ltd. as a pupil. Mr Cooper attended night school for five years and in 1943 sat the University of London examinations. He was awarded the degree with honours in mechanical and civil engineering.

In 1943 Mr Cooper joined Dr H. P. Buggen in research work for the War Office. In 1945 he joined the staff of the Technical College, Derby, as lecturer, and in 1947 the staff of King's College, Newcastle. At present he is in charge of the structural engineering section and is private consultant. Work in the latter field has been chiefly schools and factories, in steel, concrete including prestressed concrete, and aluminium alloy.

Paul Duval is the author of "A. J. Casson", a biography (1952), "Canadian Drawings and Prints" (1953) and "Canadian Water Colour Painting" (1954). For several years he has been art director of Odeon Theatres. Mr Duval is well known as lecturer and broadcaster on art subjects. He has been art critic for *Saturday Night* for more than a decade and in January, 1956, he assumes the duties of art critic of the Toronto *Telegram*.

ERRATUM

We regret a typographical slip in which the word 'bequest' read 'request'. The error does little to change the real meaning of the notice which we take pleasure in repeating. "Already one donation has been made by will and it is expected that more will follow from within and without the profession either by bequest or by immediate gift".
Journal, December 1955, page 477, paragraph 1.

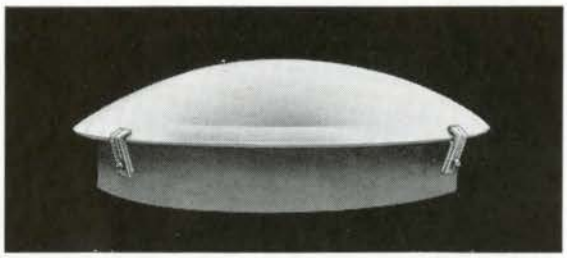
⊖ CANADA

Man marks the earth with ruin – his control
Stops with the shore

FACTS ABOUT GLASS

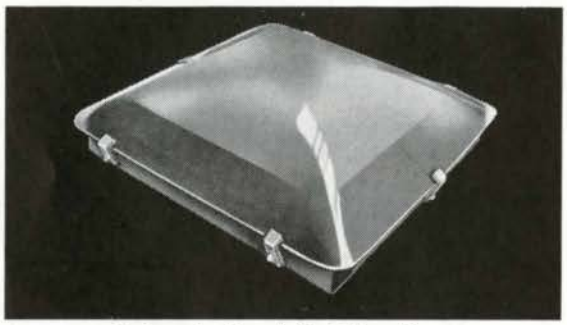
Vol. 6 No. 1

GLASS DOMES



Spherical Rough Cast Glass Dome

Spherical Wired Cast Glass Domes



Rectangular Rough Cast Glass Domes

APPLICATION

Glass Domes provide a simple and efficient means of admitting light through roofs. They have a pleasing appearance, are easy to clean and, being made in one piece, there is no possibility of leakage due to faulty joints. They give a pleasant diffused light which eliminates glare and strong shadows. They can be fitted to either concrete or wood curbs.

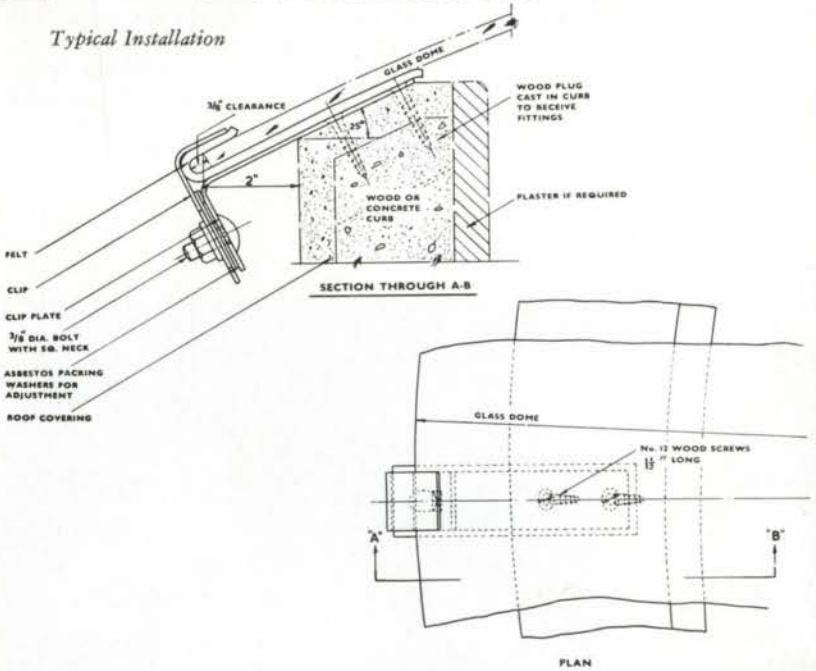
The lighting of corridors remote from windows is one example of their use, and where the safety factor in schools and other buildings is a prime consideration, Wired Cast Glass Domes are particularly suitable.

TYPES AND SIZES

Glass Domes are made in two shapes — Spherical and Rectangular. Spherical Domes are supplied in Rough Cast Glass in 2″ rises up to 72″ diameter, and in Wired Cast Glass in 2″ rises up to 48″ diameter. Rectangular Domes are supplied in Rough Cast Glass only, in a range of sizes up to 72″ x 48″. Larger sizes can be supplied to order for both types of Dome.

Glass Domes referred to are made by Pilkington. A brochure "Pilkington Glass Domes" illustrating full installation details is available from the Technical Service Department.

Typical Installation



DIMENSIONS OF GLASS DOMES

SPHERICAL

(Rough Cast and Wired Cast Glass)

Diam.	Depth	Diam.	Depth	Diam.	Depth
18″	2″	36″	4¾″	54″	7″
20″	2¼″	38″	5¼″	56″	7½″
22″	2½″	40″	5″	58″	7¼″
24″	2⅞″	42″	5⅝″	60″	7¾″
26″	3½″	44″	6 3/16″	62″	8¼″
28″	3½″	46″	6″	64″	8″
30″	4″	48″	6 9/16″	66″	8½″
32″	4½″	50″	7⅛″	68″	9″
34″	4¼″	52″	6 7/16″	70″	9½″
				72″	10″

Wired Cast Glass Domes are available up to 48″ diameter only

RECTANGULAR

(Rough Cast Glass Only)

36″ x 36″ x 5½″ deep	48″ x 48″ x 7″ deep
42″ x 42″ x 6½″ deep	60″ x 42″ x 6½″ deep
48″ x 36″ x 5½″ deep	72″ x 48″ x 7″ deep

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