SOUTH AFRICAN ARCHITECTURAL RECORD

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JOURNAL OF THE INSTITUTE OF SOUTH AFRICAN ARCHITECTS; THE CAPE, NATAL, ORANGE FREE STATE AND TRANSVAAL PROVINCIAL INSTITUTES AND THE CHAPTER OF SOUTH AFRICAN QUANTITY SURVEYORS

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VOLUME 37

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STANDARD BANK OF SOUTH AFRICA

ARCHITECTS: RALPH P. HAMLIN & PARK-ROSS

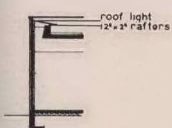
1

The Branch bank at Pinetown is the larger of the two banks illustrated in this issue of the Record. The Bank has accommodation for two tellers, withe provision allowed for a further two tellers. Allowance has also been made for extending the Banking hall area when so required. The Manager's office overlooks the street and is directly related to the public concourse. The strongroom occupies a prominent position, being adjacent to the manager's office, and is accessible from the Bank hall. A rest-room for the staff and the usual cloakrooms are provided to the rear of the building.

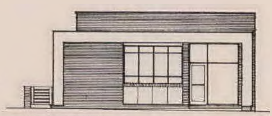
As the North wall of the Banking hall is on the boundary, cross ventilation and light on this side is provided by a continuous roof light which illuminates the face-brick internal wall on this side, creates interest, and provides a spatial effect which makes the interior of the hall an interesting volume. The facades which have been carefully thought out provide interest on each side, and not merely on the street front as is so often the case in buildings designed on an internal plot. Face-brickwork has been used extensively, internally and externally to good effect. The floor finish is asphalt tile and the roof is carried out in concrete with inverted beams, built up with hollow tiles and finished in Pabcoweld roofing and coolite spray.

Photography by Ballance Studio.

View of banking hall looking towards entrance porch and showing continuous roof lights.

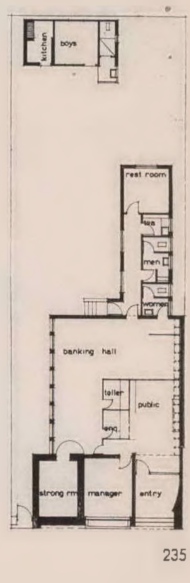


DETAIL SECTION



STREET ELEVATION

SECTION



STANDARD BANK OF SOUTH AFRICA

FLORIDA ROAD BRANCH : DURBAN

2

ARCHITECTS: RALPH P. HAMLIN & PARK-ROSS

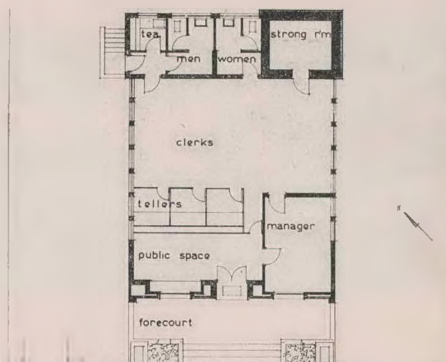
The second Bank illustrated in the following pages is the Florida Road Branch agency for two tellers only, and an Enquiry cubicle. No provision for future extensions is allowed for.

The site for this small building was unduly large and as a result the architects have set back the building 12 ft. from the street pavement. This arrangement provides an interesting forecourt for this rather monumental neatly arranged main facade. Provision is also made for a manager's office which has direct access to the public space and to the Banking hall. The strongroom and cloak facilities are zoned on the internal side of the site.

In this building, as in the previous bank in Pinetown, all the facades have been carefully designed to present a complete overall unity. The finish externally is mainly facebrick work with plaster surrounds, and internally the walls and ceilings are finished in plaster, floors in asphalt tile and the counters in natural wood. Hollow tile roof construction is used for the roof, which is waterproofed and finished with painted bituminous sheeting.

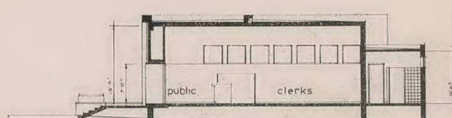
View of interior of banking hall showing tellers cubicles and clerestory lighting.

Photography by Ballance Studio.



PLAN

STREET ELEVATION



SECTION

CHAMBER OF MINES RESEARCH LABORATORIES

ARCHITECTS: K. E. F. GARDINER & McFADYEN

CHAMBER OF MINES RESEARCH LABORATORIES

These Laboratories have been built by the Transvaal Chamber of Mines to provide modern facilities for the development of scientific research into problems affecting the Mining Industry.

The new building houses two separate laboratory departments, namely, the Dust and Ventilation Laboratory and the Timber Research Laboratory.

Dust and Ventilation Laboratory

The Dust and Ventilation Laboratory of the Chamber deals with investigations concerning the quality of mine air, not only especially in relation to the problem of the prevention of silicosis in the mines but also in relation to questions of heat, humidity and other factors affecting the supply of air in mine workshops. In regard to the silicosis problem, extensive sampling of dust concentrations is carried out with the object of finding out the causes of the production of harmful dust and methods to prevent the production of such dust.

At the laboratories the dust samples are examined under miscroscopes with varying degrees of magnification, including the Electron Microscope. In order to determine the composition of the dust, samples are examined chemically and also with X-Ray apparatus. In the Physics Laboratory, dust is measured by electronic devices and other forms of measuring instruments. There are also in the laboratory many special instruments for research into the quantity and quality of air in the mines and its distribution.

Timber Research Laboratory

The activities of the Timber Research Laboratory are, as the name implies, mainly concerned with the investigation and preservation of timber used in the mines, but research is also carried out on other materials such as fabrics and metals. The Work of the laboratory has been further developed within recent years to cover a wider field than the preservation of materials. Special investigations are conducted into such matters as the prevention of Sporotrichosis, the occurrence of poisonous algae in dams and the fire-proofing of material used underground and the protection of timber and metal structures against decay caused. by weather or by contact with mine-water. Preservations developed under experimental conditions at the Laboratory are tested under service conditions on various mines.

The Site

The site is one of approximately eight acres at the corner of Main Road East and Landau Terrace in Melville. The ground falls steeply from the main road to the stormwater drain in the valley on the Eastern boundary. In the future a new main road will be built along the Eastern boundary, which will set the buildings off to better advantage on this side. There is a pleasant view to the North East over the Agricultural lands on the other side of the valley and towards Westcliff.

The main Laboratory building is situated at the southern end of the site with approaches from Landau Terrace. The main entrance is approached through a forecourt with garages on the West side, and the entrance is covered by a Porte Cochere. At the lower end of the site there is a service road with another block of garages and ample parking space.

On the Northern portion of the site are three staff residences and in the valley on the Eastern boundary natives' quarters and a timber workshop has been built. The remainder of the Northern portion is being laid out as recreation grounds. Tennis courts and a bowling green has already been constructed and the future development includes a pavilion, squash courts and a swimming bath. An additional staff house is also contemplated.

Planning

The building has been designed to house the activities of the two research departments previously mentioned and, in addition to the working facilities, other requirements were a Library, a Museum, a Committee Room, a Lecture Hall and a Staff Dining Room and Kitchen.

The Timber Research Laboratory is on the East side of the building, and the Dust and Ventilation Department on the West. From the Entrance Hall on the South side, corridors lead off to each department and on the North side they are joined together by the Lecture Hall. Thus, while each department functions as a separate entity, such common facilities as the Lecture Hall and Library are easily accessible to both.

Every building where specialised research work is undertaken has its own particular planning requirements. In the Timber Research Department, besides the usual chemistry laboratories, there is a Mycology Laboratory with special ancillary rooms, known as Transfer Rooms. These are actually small laboratories where fungal cultures are handled, and the nature of the work demands specially hygenic conditions. Other special features of the Timber Department are the twelve compartments where experiments with fungi and materials used in the mines are carried out under accurately controlled temperature and humidity conditions. A Sterilising Room is also included, which houses a large steam autoclave and other smaller sterilizers. A model timber treatment plant is installed below the large Chemistry Laboratory and connected thereto by a staircase.

In the Dust and Ventilation Department there are chemistry and physics laboratories and a special Dust Laboratory where dust conditions prevailing underground are stimulated. A special feature in this department is the Electron Microscope which is capable of giving magnifications of 100,000 times or more, and this is housed in its own compartment where temperature and humidity are carefully controlled. There are also special microscope rooms where dust samples from underground are analysed.

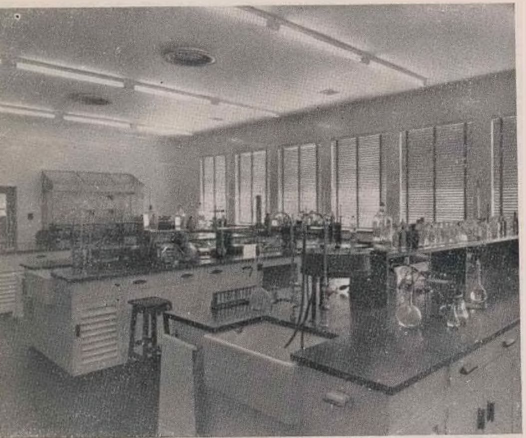
Each department has offices for the Directors and other senior members of the staff, and there are also workshops where precision instruments are made and repaired.

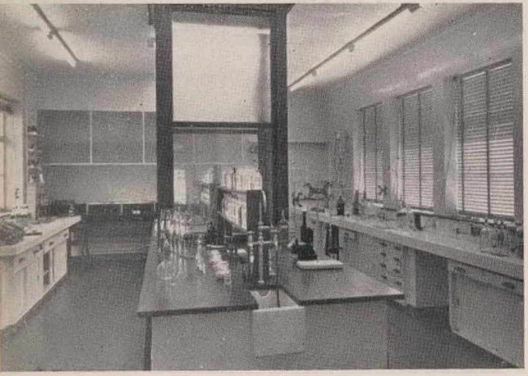
The planning requirements were most suitably met in a building of not more than two storeys in height. To achieve this, the building had to be stepped down, as will be seen on the photographs and drawings. The main ground floor extends over practically the whole area; on the West side there is a first floor level and on the East a lower ground floor level. The stepping of the building in this way has ensured good light, ventilation and orientation to all the main rooms. Another advantage is that each floor level has entrances at ground level, which provides for easy access to all departments.

An important condition contained in the Title Deeds was that the Laboratories should present a general appearance of a large private residence or residences. A further condition was that there should be no unsightly chimney stacks. These conditions have had an important bearing on the planning and elevational treatment.

The residences comprise a double storey house for one of the Directors and two cottages for the Caretaker and Labora-

1. View looking towards dining hall on ground floor chemistry lab over, and the lecture theatre on right.
2. View of chemistry laboratory (Timber Research).
3. View of chemistry laboratory (Dust Research).





tory Technician, respectively. These houses are approached by a roadway leading off from Main Road East. The elevational treatment of the houses and the natives' quarters has been designed to harmonize with the Main building.

Construction

The construction is generally of load bearing brick walls with reinforced concrete floor slabs and beams, or hollow tile construction where flush ceilings were required. The retaining walls, where the sections step down to lower levels are of reinforced concrete.

The roofs are of timber and are covered with blue slates. For the general insulation of rooms below slate roofs, a layer of exfoliated vermiculite has been laid on the ceilings, but in the case of the Physics Laboratory, where special thermal precautions were necessary, aluminium foil insulation has been used.

The external walls are rendered in cement plaster with a Tyrollean finish, and painted ivory white. The garages, plinths generally and certain other portions have been faced with 2 in. plum coloured rustic bricks. The internal walls are generally plastered and enamel painted. Glazed wall tiling has been used in the fume cupboards, on some of the laboratory benches and elsewhere where specifically required. The Lecture Hall is panelled in Kiaat to a height of 5 feet, and the back wall above the panelling is treated with acoustic plaster. The controlled condition rooms are insulated with cork.

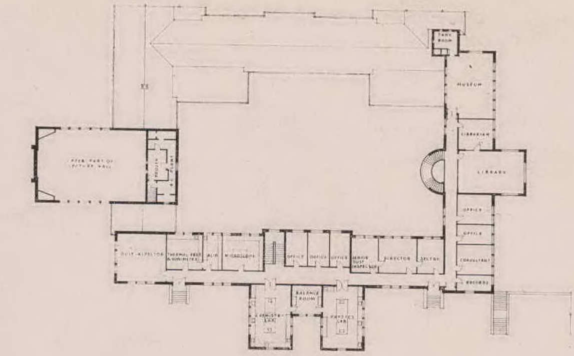
The ceilings under timber roofs are of flush fibrous plaster board, except in the Lecture Hall where acoustic tiles have been used. The false ceilings in the corridors, which enclose the air conditioning ducts, are of Masonite tempered hardboard screwed to brandering, and readily removable when repairs to the ducts or other services are required.

The floors in the corridors, Laboratories and workrooms are of brown battleship linoleum; in the offices, Museum, Library and staff rooms, of woodblock, and in the Lecture Hall Oregon strip flooring has been used. The entrance hall is paved with terrazzo and also the main circular staircase. Other staircases are finished in black non-slip granolithic.

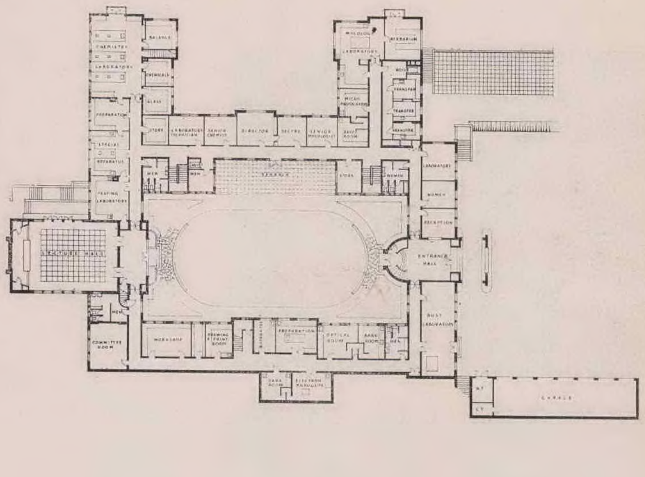
The benches and other fittings in the laboratories are generally constructed of timber and painted ivory white, with bench tops of Teak or Kiaat. Stainless steel fittings have been installed in the Dark Rooms, Transfer Rooms and Sterilizing Room, and the fume hoods in two of the Chemistry Laboratories are also in stainless steel.

As in all laboratory buildings, major problems arose in the planning of all the various services required. The building has gas, compressed air, hot, cold and chilled water services, the main pipe runs which are generally located in the ceiling voids above the corridors.

Drainage was particularly complicated by the slope of the site. Pipework in the laboratories has, as far as possible, been



FIRST FLOOR PLAN



GROUND FLOOR PLAN

BASEMENT PLAN

concealed under benches, and removable panels make it readily accessible for repairs. Full electrical services have been provided, including a constant voltage supply to the Electron microscope room, and the Physics Laboratory. Electric clocks are installed throughout the building.

There are two electric hoists which connect the controlled condition rooms on the lower ground floor with the laboratories above. The Sterilizing Room is fitted with a 45 cu. ft. capacity steam autoclave which is recessed into its own compartment and is fitted with "mastrocam" control. Compressed air is supplied to the building by a 107 c.f.m. compressor driven by a 25 h.p. motor. The timber treatment plant on the lower ground floor is a model of the pressure plants used in the commercial treatment of timber.

The building is air-conditioned throughout, with a positive air supply and exhaust. Cooling in Summer is by the evaporative cooling system and in Winter the air is heated by a hot water boiler. Chemical and Mycological laboratories are provided with separate exhaust systems. The Lecture Hall has its own air-conditioning plant. The main air-conditioning ducts are located in the voids above the false ceilings in the corridors and air is supplied to the rooms through distributors in the ceilings.

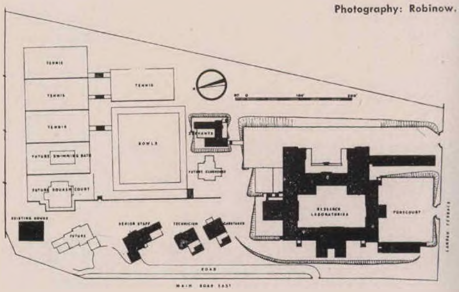
The controlled condition rooms and dark-rooms are connected to separate air-conditioning and refrigeration plants. Each room has its own conditioning unit fitted with heating and cooling coils and the conditions are thermostatically controlled within wide ranges of temperature and humidity.

A novel feature of the fume exhaust system is that the stainless steel extract fans are located in the tops of certain dummy chimneys. These fans are connected to the various fume cupboards with lead-lined sheet iron ducts.

1

2

Photography: Robinow.



SITE PLAN

1. View from foyer to lecture theatre looking towards main entrance hall staircase.

2. View of interior of lecture theatre.

SECTION

DEMOLITION OF THE DENTAL HOSPITAL

PRELIMINARY REPORT

by DR. A. J. OCKLESTON

In the February issue of this year the South African Architectural Record listed the series of tests to be conducted on the Dental Hospital. The Record now presents the second article giving an interim report of the work done in connection with this unique opportunity of testing the strength of various parts of a modern structure.

A committee for demolition tests was set up under the chairmanship of Dr. Ockleston of the University of the Witwatersrand devised to study the stiffness and ultimate strengths of one-way and two-way slabs, beams, panel walls and stairs. As the building was designed to carry several extra floors, no tests were carried out on the columns.

It is hoped that the results of the tests will in time give a lead to Architects and Engineers to find ways and means of designing lighter and more flexible structural systems.

Shortly after the War, plans were drawn up by the South African Railways and Harbours Administration for the extensions and reconstruction of the Johannesburg Railway Station, which had become too small for the greatly increased traffic it was called upon to handle. The extension of the station involved the expropriation and demolition of a number of buildings, among them that housing the Dental and Oral Hospital of the University of the Witwatersrand. This building was a three-storey reinforced-concrete framed structure occupying a site approximately 100 feet square, which had been completed in the second half of 1942.

The demolition of this modern building provided an unusual opportunity of conducting tests to destruction on a full-sized reinforced-concrete structure designed and constructed in accordance with present practice. After some negotiation the co-operation of the Railways Administration was secured, and towards the end of 1950 (about a year before the demolition of the building was scheduled to begin) a Committee representative of the Railways, the University, and a number of professional and public bodies was formed to organize the tests. At first the resources at the disposal of the Committee were very limited, but eventually sufficient support, in the form

The Hospital on its islanded site immediately before its demolition.

of donations, provisions of services, and loans of instruments, was received from organizations interested in the design and construction of reinforced-concrete structures to enable the scheme to be proceeded with. By the middle of December 1951, a complete programme of tests had been worked out, the necessary equipment had been secured, and checked and calibrated in the laboratory, and a test team had been assembled.

Work at the Dental Hospital building began on December 11th, shortly after the top floor had been vacated by the Faculty of Dentistry as the first stage in the closing down of the Hospital. With the co-operation of the staff of the Dental Hospital a considerable amount of work such as setting out, the preparation of instrument positions, and the erection of scaffolding, was completed during the next month, although parts of the building were still occupied by the Faculty of Dentistry, and patients were still receiving treatment. The completion of this preparatory work made it possible for the first test to begin on January 15th, only four days after the Hospital had finally closed down. Testing proceeded continuously with all available staff until the end of March, by which time all the major tests had been carried out. A small team continued work on the building during April in order to complete the few remaining tests. The removal of all the fittings from the building and the demolition of the brickwork had proceeded concurrently with the tests, and by the time the tests were finished the building had been reduced to little more than a bare reinforced-concrete framework. When the demolition of the reinforced concrete began in May a number of samples were cut from various parts of the structure and removed for subsequent testing in the laboratory.

Although all the tests on the building have now been completed, a great deal of work still remains to be done. Specimens must be prepared from the samples of materials taken from the structure and tested, and the mass of observations obtained must be studied in detail before final conclusions can be drawn. The following notes on the tests are intended to give only a brief description of the work so far carried out, and a general indication of the nature of the results obtained.

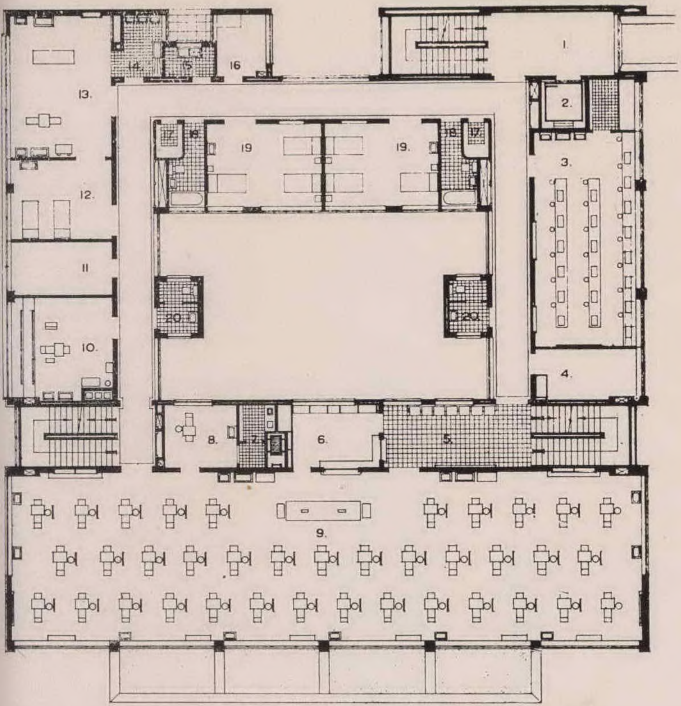
Tests on Wings

In plan the Dental Hospital building was in the form of a hollow square, and the first tests were made on two small wings which projected into the central courtyard. The two wings were almost identical; each was three storeys high and about ten feet wide, and projected about seven feet from the main building. Although the wings had been designed for vertical loading it was considered that tests in which horizontal loading was used would probably give the most useful results. These tests were planned with the object of determining the strength and stiffness of the wings, and the effect of the walls and floors on the behaviour of the reinforced-concrete framework. The loading adopted was a single horizontal load, acting at roof level in the plane of the end of the wing, which was applied by means of a jack reacting against the main building. In all the tests the horizontal deflections at the floors and midway between floors, and the changes in the lengths of the diagonals of the panels of the end frames were determined.

Altogether five series of tests were carried out on the two wings. First, both the north and south wings were tested complete, with floors and wall panels in place, the loads applied being kept within the working range. The end frame of each wing was then separated from the main building, the connecting slabs, beams and wall panels being completely severed; care was taken to avoid damage to the 11-inch brick walls filling the panels of the end frames. Both end frames, with wall panels in place, were subjected to loads within the working range, and the north frame then tested to failure. Lastly, the brick panels were removed from the south frame, and this frame tested first under working loads, and finally to destruction.

The test results gave an indication of the extent to which the stiffness of a reinforced-concrete framework may be increased by walls and floors. For working loads the end frame with brick panel walls in place was nearly eight times as stiff as the bare reinforced-concrete frame; the stiffness of the complete wing was approximately 1,200 times that of the bare frame. When the complete wing was tested the floor slabs acted as horizontal cantilevers and appeared to be almost perfectly rigid. A load of over 56,000 lb. caused a deflection at the roof of little more than .01 inch; the deflection of the floors below was negligible.

The strength of the structure was also affected to a marked extent by the walls and floors. The bare frame failed at a load of less than 5,000 lb., failure occurring at the beam-and-column junctions, and at the feet of the columns. The failing load for the north frame, which was tested with the brick panel walls in place, was just over 20,000 lb. This frame failed as a result of bond failure at a splice in the reinforcement at the foot of the column which was subject to tension. There were no signs of failure elsewhere other than a few cracks in the lowest panel wall and in the tension column. It is probable that the ultimate load would have been appreciably higher if the splice in the column had been designed to develop the full tensile strength of the steel. The complete wing was



FIRST FLOOR

LEGEND

1. Stair Hall.
2. Lift.
3. Phantom Head Room.
4. Staff Room.
5. Waiting Space.
6. Almoner.
7. Dark Room.
8. X-ray Surgery.
9. Conservation Surgery.
10. Demonstration Surgery.
11. Waiting Room.
12. Recovery Room.
13. Operating Theatre.
14. Scrub Up Room.
15. Sink Room.
16. Duty Room.
17. Clothes and Linen Cupboards.
18. Bathrooms.
19. Wards.
20. Staff Lavatories.

not tested to destruction, but a load of over 56,000 lb. was applied without causing more than hair cracking between the reinforced-concrete members of the end frame and the brick panel walls.

Tests on Slab Spanning in One Direction

The greater part of the floor area on the south side of the building consisted of a single large panel of slab, which had a clear span of 16 ft. 5 in. and was more than sixty feet long. The slab was continuous over the beam along one of its longer sides; it was monolithic with the beams supporting the other three edges but did not extend beyond them. The nominal thickness of the slab was 6 inches, and there was a mortar screed from ½ to ¾ inch thick on top of the concrete. The main reinforcement of the slab amounted to just under 1 per cent., and the distribution steel to about one-fifth of the main reinforcement.

Several series of tests, in which the loads were kept within the working range, were carried out in order to determine the effect of concentrated loads on the slab. In the first of these tests a single concentrated load of about 4,000 lb. was applied to the slab at a number of points along the quarter-span, the half-span and the three-quarter-span lines. For each loading the deflections of the slab were measured at a number of points. The deflections were in all cases small, the maximum deflection for a load of 4,000 lb. being about .02 inch. For certain of the loadings the strains in both the steel and the concrete were determined in addition to the deflections.

To investigate the effect of conditions at the end of the panel, the slab was cut away from the beam supporting one of its short sides, and the tests repeated. Two more cuts were then made through the slab parallel to the short sides so as to leave a strip of slab 10 ft. 6 in. wide and free at both edges. The deflections of this strip were determined for a series of loads equally spaced along the quarter-span line, and for similar loadings along the half-span and the three-quarter-span lines.

Preliminary examination of the results of these tests indicates that the deflections and stresses due to a concentrated load are not appreciably affected by the conditions at the end of the panel if the distance of the load from the end exceeds the width of the panel. For this case the effective width of the slab over which the concentrated load may be considered to be uniformly distributed appears to be about 10 or 12 feet. As the load approaches the end of the panel the deflections and stresses increase if the end is free; the reverse is the case if the end is supported.

In the next test, which was carried to failure, four equal loads extending across the slab from about the quarter span to the three-quarter span, acted at the centre of a thirty-feet length of slab. The loading was applied through a system of equalizing beams by a hydraulic jack reacting against the ceiling, which was stiffened by a heavy steel joist and strutted to the roof above. Cribs constructed of wooden railway sleepers were built under the slab to support it in the event of collapse. Throughout the test the deflections of the slab and the strains in both steel and concrete were measured at a number of points. The slab failed at a total load of 98,000 lb. The first sign of failure was the formation of a crack due to yield in the distribution steel immediately below the line of loads. Subsequently, cracks inclined at about 45 degrees on each side of the loading line extended from below the end loads towards the supports. On the top of the slab cracking first occurred over the supporting beams, and later cracks running parallel to the line of loads and about 8 feet on each side of it extending across the slab from one support to the other. There was considerable torsion cracking of one of the beams supporting the slab.

The last test was carried out on the strip of slab 10 ft. 6 in. wide and free at both edges, on which certain of the working load tests had been made. Cribs of sleepers were built beneath the test slab, and cast-iron rail chairs, each weighing about 45 lb. were then stacked upon it so as to give uniform loading over the whole of the test strip. Throughout the test the deflections and strains were measured at a number of points. As the load was increased cracking occurred first on the top of the slab over the supports, and then on the underside at mid-span. The slab failed at a superimposed load of 470 lb. per sq. ft. By the time failure occurred the negative reinforcement at the supports and the positive reinforcement at mid-span had yielded, and the concrete on the underside of the slab at the supports and on the top at mid-span had crushed.

Tests on Slabs Spanning in Two Directions

Two tests to destruction were carried out on slabs forming part of a beam-and-slab floor system covering an area of about 27 feet by 100 feet. The transverse main beams of the floor system were spaced at 17 feet centres, and supported secondary beams 7 ft. 6 in. on each side of the longitudinal centre line of the floor. The nominal thickness of the slab was 4½ inches throughout; screeding on top of the structural concrete increased the overall thickness to nearly 5½ inches. The 16 ft. by 13 ft. 6 in. panels bounded by the main and secondary beams had been designed as slabs spanning in two directions, and were reinforced with between .2 and .3 per cent. of steel in each direction. The main object of the tests was to determine the ultimate strength and the mode of failure for these two-way slabs.

In the first test a uniform load was applied to one of the interior two-way slabs by stacking cast-iron rail chairs over its whole area. Strain gauges were attached to the steel and concrete at a number of points below the slab and along the sides of the panel on the top. Deflectometers were fitted so as to measure the deflections of the slab and of the beams supporting it. Cribs of timber sleepers were provided to support the slab if it should collapse.

The failing load for this slab was 680 lb. per sq. ft. The first cracks were observed on the plastered underside of the slab at a load of about 150 lb. per sq. ft. As the loading increased these cracks developed into a pattern covering most of the area of the slab. The main cracks were near the centre of the panel, and roughly along the diagonals. As the maximum load was approached crushing occurred at the junction of the slab and the beams supporting it. On the top of the slab hair cracks were observed near the centre of one of the shorter sides, that is over one of the mainbeams, when a load of about 260 lb. per sq. ft. had been applied. Similar cracks subsequently developed over the other main beam, and then over the secondary beams. These cracks extended until eventually there was cracking around the whole of the periphery of the panel. There was little cracking in the adjacent unloaded panels. By the time failure occurred the secondary beams had cracked near the middle as a result of bending, and near the ends as a result of torsion. There were a few cracks due to bending and diagonal tension in the main beams.

In the second test equal uniform loads were applied to a pair of adjacent interior panels. Cracking was first observed when the load amounted to about 160 lb. per sq. ft., but failure did not take place until a value of 770 lb. per sq. ft. had been reached. The cracking of the loaded slabs was similar to that observed in the previous test, but there was rather more cracking in the unloaded side panels; the cracking of the secondary beams was also more extensive. When the Maximum load was reached the main beam between the two loaded panels was on the point of failure. Yield had occurred in the main steel at mid-span, and at the junction of the beam with the column at one end a large crack had opened up on the top, and the concrete had crushed below. There was considerable cracking due to torsion in the beam which supported the other end of the main beam. The main beams at the ends of the loading area showed numerous small cracks due to bending and diagonal tension.

Tests on Main Beams of Floor System

Immediately below the floor on which the last tests were made there was another of the same area. The general arrangement was the same as for the floor above except for the spacing of the secondary beams; in the lower floor the secondary beams were 6 ft. 6 in. on each side of the longitudinal centre line. A number of tests was made on this floor in order to investigate the behaviour of the main beams. These beams had an overall depth of 24 inches and a breadth of 12 inches; the main reinforcement at mid-span amounted to 5.3 sq. in. In all the tests the same type of loading was used, a pair of equal concentrated loads acting on the main beam at its intersections with the secondary beams. These loads were applied by means of jacks strutted against the main beams of the floor above, which were heavily reinforced.

In the first series of tests the loads 'applied to the main beams were kept within the working range. The strains due to these loads were determined at a number of points in the loaded beam, and in the slabs and the main beams on both sides of it. These 'ests showed that loads applied to a main beam caused transverse bending in the slab, in addition to bending in the direction in which the beam was spanning. As a result of this transverse bending a considerable proportion of the load was transferred from the loaded main beam to the adjacent unloaded beams. The maximum stresses in the steel of these unloaded beams were about one-fifth of those in the loaded beam. This indicates that nearly 30 per cent. of the applied load was transferred to the adjacent beams.

When the working load tests were completed tests to failure were carried out on three of the main beams. Two were tested as rectangular beams, the slab and secondary beams on each side of the rib being cut through before the test was commenced. In the first of these beams, which framed into columns at each end, a crack extending down from the top of the beam near one end was observed when a total load of about 40,000 lb. had been applied. Shortly afterwards a similar crack began to open up at the other end. Later diagonal tension cracks formed between each of the loads and the adjacent supports. The beam failed suddenly at a total load of 148,000 lb. as a result of yield in one of the stirrups at one of these diagonal cracks. The second beam, which framed into a column at one end and a beam at the other, failed at a total load of 137,000 lb A crack running downward from the top of the beam near its junction with the column formed at a load of about 45,000 lb. This was followed by the development of cracks due to bending and diagonal tension extending upward from the bottom of the beam. Failure was due to yield in the main steel near one of the loads; a large crack extended upwards and the concrete above crushed. There was torsion cracking in the beam supporting one end of the test beam.

The third beam was tested as part of a complete floor system of main beams, secondary beams and slabs. The first sign of failure was a crack passing through a 3-inch diameter hole cored in the rib of the beam just above the main reinforcement, and extending diagonally up towards one of the loading points, which was observed at a load of 87,000 lb. At approximately the same load tension cracks formed between the ends of the secondary beams and the rib of the main beam. As the load increased the cracks at the ends of the secondary beams opened and extended up towards the slab, and cracks due to bending and diagonal tension formed in the rib. The beam failed at a total load of nearly 165,000 lb. as a result of diagonal tension at the cored hole in the rib.

Tests on Cantilever Canopy

Over the main entrance to the old Dental Hospital there was a cantilever canopy about 68 feet long which projected about 8 feet from the face of the building. The cantilever beams, which were spaced at 17 feet centres, were continuations beyond the line of columns of the main beams of the floor system on which the last tests were made. A 3-inch slab at the level of the soffits of the cantilevers spanned between beams connecting the free ends of the cantilevers and parallel beams between the columns.

Several tests in which the canopy was loaded by stacking rail chairs upon it were made to investigate the effect on the main structural framework of loads applied to the canopy. Strain gauges were fitted so as to indicate the stresses in the steel and the concrete at a number of selected points in the cantilever beam at the centre of the canopy, and in the column

and the main beam into which it framed. Deflectometers were arranged so that the deflections of the canopy and of the central main beam could be determined.

In the first test uniform loads of up to about 170 lb. per sq. ft. were applied over the half-panels on each side of the central cantilever. In the next test loading of the same intensity was applied over al the four panels of the canopy. For the same intensity of loading, the stresses in the central frame in the second test were about two and a half times those in the first test. It is evident that although in the first test the loading had been restricted to a small area on each side of the central cantilever, a considerable proportion of this load had been transferred to the adjacent frames, and the stresses in the central frame correspondingly reduced.

Finally, a third test was carried out in which, as in the first test, the loading was confined to the half-panels on each side of the central cantilever. The loading was increased to a value well beyond the working range, a maximum loading of about 570 lb. per sq. ft. being applied without causing failure.

The Effect of Partition Walls on Slabs

Two series of tests were made with the object of investigating the effect on floor slabs of brick partition walls built across them. In each of the cases considered the walls were of 4½-inch brickwork without doorways or other openings, built in the direction of the span across 6-inch reinforced-concrete slabs having a clear span of 16 feet.

In the tests a concentrated load was applied to the slab at mid-span as close as possible to the partition wall. Strain gauges were attached to the main reinforcement of the slab beneath the load, and deflectometers were fitted so as to indicate the deflections of the slab, and any movements of the slab relative to the wall. A test was first carried out with the wall in place. The wall was then carefully broken down and removed, and the test repeated. The strains and deflections were measured at regular intervals during both the loading tests, and also while the wall was being removed.

The readings obtained in the tests were rather erratic and it is difficult at this stage to draw any definite conclusions. There are, however, indications that the walls increased the stiffness of the slabs on which they were built, even for downward loads. The bond between a wall and the slab on which it is built seems to be somewhat unreliable; a number of partition walls were examined, and in all cases except one some cracking at the junction of the wall and the slab was observed before any loads were applied to the slab.

Tests on Stairways

Several tests were carried out to determine the strength and stiffness of one of the stairways in the building. The total width of the stairs was about 4 ft. 9 in. and each flight extended from a floor to an intermediate landing midway between floors and had a horizontal span of 11 feet. The intermediate landings were slabs approximately 4 ft. 9 in. wide, the ends of which were supported on 4½-inch brick walls 9 ft. 6 in. apart. The minimum thickness of the slabs forming the flights was 5 inches, and the thickness of the intermediate landings was 8¾ inches. On top of the structural concrete there was screeding between 1 inch and 2 inches thick.

Deflectometers were fitted at a number of points in the flights and the intermediate landings, and strain gauges were attached to the steel and the concrete in various positions. In the first tests the loads were kept within the working range. Both uniform loads, obtained by stacking rail chairs over the loaded area, and concentrated loads applied by means of a jack, were used, and loads were applied to one flight only, to both flights, and to the landing only.

A test to failure was then made on the lower flight, equal concentrated loads being applied at the third-points of the span. At a total load of 13,000 lb., equivalent to a uniformly distributed load of about 365 lb. per sq. ft., a crack developed on the upper surface of the slab at its junction with the intermediate landing. The load was then released. When it was reapplied, cracking occurred on the underside of the slab at mid-span at a load of approximately 11,000 lb., and at about 18,000 lb. the steel yielded. The flight, however, did not fail until the load had been increased to about 50,000 lb.

Next, the upper flight was cut through at mid-span, and loads applied to the ends projecting from the landings in order to determine the restraint provided by the continuity between the flights and landings. Finally, both flights were cut away from the landing, and the landing tested to destruction by means of concentrated loads at the third-points of the span. The landing failed at a total load of 67,000 lb. as a result of yield in the reinforcement. By the time the slab failed the 4½-inch brick walls supporting its ends had cracked, and the brickwork immediately below the slab showed signs of crushing.

Punching Tests on Slabs

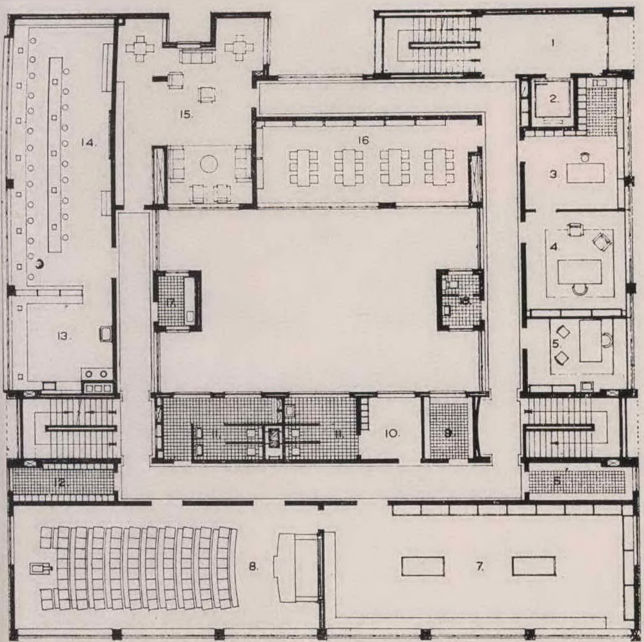
When the other tests had been completed, tests to determine the punching strength of reinforced-concrete slabs were carried out on most of the floor panels which had not already been damaged. A load was applied to the slab at about mid-span through a 3-inch or 6-inch diameter steel disc by means of a calibrated hydraulic jack. The nominal thicknesses of the slabs varied from 4 inches to 8¾ inches; in the majority of cases there was a mortar screed from ½ inch to 1¾ inches in thickness on top of the structural concrete. In about half of the forty-three tests performed the load was applied in an upward direction to the underside of the slab, so that the reinforcement was on the side of the slab adjacent to the load. In the remainder of the tests the load acted downward. In some cases the point of application of the load was directly over an intersection of the longitudinal and transverse reinforcement in the slab, while in others the load was applied over the centre of a space between bars.

When the load was gradually applied the first sign of failure was, as a rule, the formation of tension cracks radiating outward from a point opposite the load. The cracks in some cases extended as much as seven feet from the load, and the deflection of the slab was easily visible. Failure usually occurred suddenly, a truncated cone of concrete being punched out of the slab. Although some of the fractures were very unsymmetrical, the cone was generally of a fairly regular shape. The average angle between the sides and the base of the cone varied in the different tests from 19 degrees to 36 degrees. The average value at failure of the tensile stress normal to the curved surface of the cone of fracture was about 80 lb. per sq. in. if the floor screed was considered to be fully effective, or about 110 lb. per sq. in. if only the structural slab was taken into account. The position of the reinforcement in the slab did not appear to have any great effect on the punching strength.

Radiographic Examination of Slabs

Radiographic examination of several of the slabs was undertaken to see whether this gave a satisfactory non-destructive method of determining the thickness of reinforced-concrete members and the size and position of the reinforcement in them.

The radio-active isotope of cadmium which was used as the source of radiation was supported about eighteen inches above the slab. Beneath the source a one-inch diameter steel ball was placed on the top of the slab, and a sensitive film in a suitable holder maintained in contact with the underside of the slab. The total exposure time was two hours. When half of this period had elapsed the source was moved about two inches, and kept in its new position for the remainder of the exposure. In this way stereoscopic images of the steel ball and of the reinforcing bars were cast on the film by the radiation transmitted by the slab. From the position of the images, their widths and the stereoscopic shifts it was possible to determine the thickness of the slab, and the size, spacing and depth of embedment of the reinforcing bars.



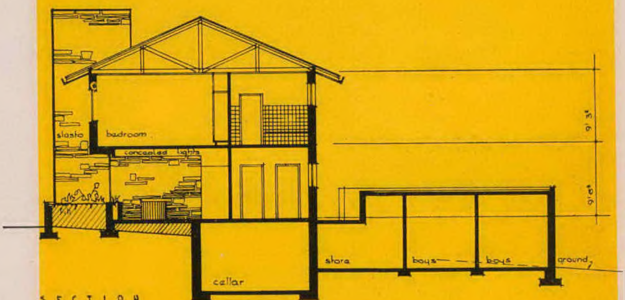
SECOND FLOOR

LEGEND

1. Stair Hall.
2. Lift.
3. Secretary.
4. Director.
5. Staff Room.
6. Store.
7. Museum.
8. Lecture Theatre.
9. Store.
10. Women Students' Retiring Room.
11. Students' Lavatories.
12. Locker Room.
13. Preparation Space.
14. Histology Laboratory.
15. Students' Common Room.
16. Library.
17. Tea Kitchen.
18. Staff Lavatory.

RESIDENCE READHEAD BIRDHAVEN

ARCHITECTS: H. H. LE ROITH & PARTNERS



SECTION

RESIDENCE READHEAD BIRDHAVEN

ARCHITECTS: H. H. LE ROITH & PARTNERS

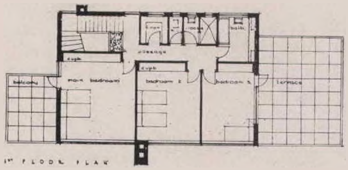
This three level house is built on a site in Birdhaven, Johannesburg, facing North which slopes steeply towards the South. This extensive fall has been made use of by placing a large Games Room and cocktail Bar under the ground floor.

The main entrance is on the East and is protected by a large canopy which forms an open terrace to the East Bedroom on the first floor. By arranging the entrance on the East privacy for the main porch was possible.

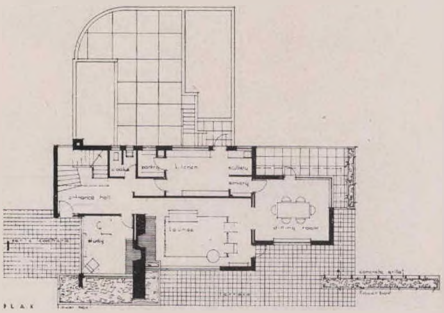
The lounge has large windows opening out onto a well designed garden, but unfortunately extensive lace curtains interrupt the view and mar the effect of integrating internal living space with outdoor living areas. The kitchen is extremely well finished and spacious enough to cater for a comfortable breakfast nook. The functional furniture used in the kitchen forms a marked contrast to the rather heavy period pieces which adorn the lounge. The bedrooms on the first floor are both spacious and airy and the sense of tranquility which the building offers is assisted by the choice of colour scheme which reads as follows:

Games Room—green walls with white ceiling.
Lounge—pale pink and beige.
Study—grey blue.
Dining Room—pale blue and pale green.
Entrance Hall—pale pink and green.
Main Bedroom—salmon pink ceiling and pale pink walls.
Second Bedroom—pale pink ceiling and light yellow walls.
Third bedroom—rose.

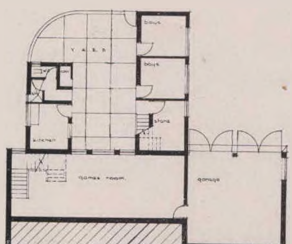
Externally the building is faced with Plum Rustic bricks, a large Slasto Fireplace Stack and Slasto Flowerboxes and contrast is given by an extensive white plaster band over the ground floor windows. The roof is covered with Brosley multicoloured tiles in Autumn Tints. All exterior finishes of the house blend and harmonise comfortably with its setting, and the scheme has been designed with simple double pitch roof terminated by two gables so as to allow for easy extension to the first floor on the West elevation.

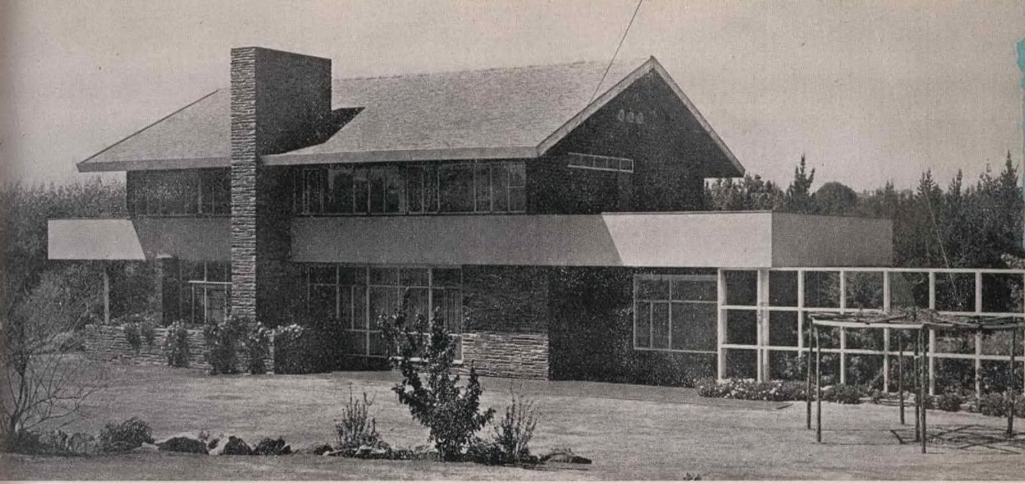


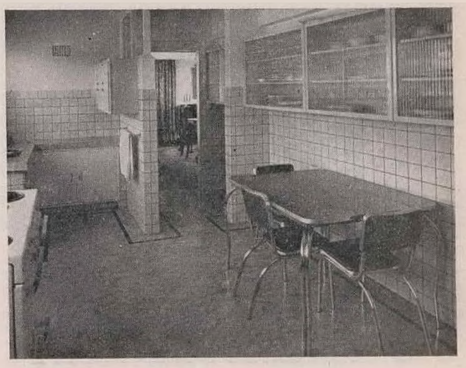
1st FLOOR PLAN



PLAN

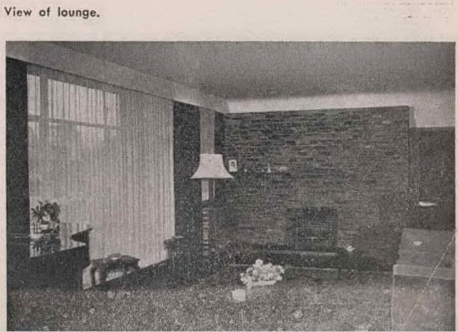






View of kitchen looking towards dining room.

View of lounge.



Photography B.R.S.

BOOK REVIEW

How To Draw Perspectives
by W. H. Fuller.

The Format and Presentation of this little volume is pleasing and the use to which the cover has been put is quite novel.

Concise and clearly written as it is, the text is liable to give students who have no knowledge of the subject a certain amount of difficulty, since the author has not presented the "first principles" of the method of construction used. Empirical formulae for drawing perspectives are difficult to accept without the logic which has necessitated their adoption. However, the results achieved by the author's principles and the use of space diagrams as demonstrated are very sound in practically all instances except "Parallel perspective" wherein no diminution is shown to take place on lines at right angles to the "normal" vision.

The method of plotting curves as shown is interesting and positive, but the statement — "The circle in perspective is always a perfect ellipse" is open to criticism. However, here it is assumed that the author is approximating with a view to the scale usually employed in perspective drawing.

— R.G.C.

A Decade of New Architecture.
Edited by S. Giedon (congers Internationaux d'Architecture Moderne), 224 pages, 500 Illustrations. Editions Girsberger, Zurich, 1951.

A Decade of New Architecture presents a selective review of modern architecture throughout the world between the years 1937 and 1947. This book, edited by S. Giedion, developed out of the 1947 Convention at Bridgewater, England. The International Congress of Modern Architecture (CIAM) was founded in 1928, and held its first meeting in Switzerland. Their aim has always been concerned with comparative study of the problems of contemporary architecture and town planning, and as rephrased at this first post war meeting is "to work for the creation of a physical environment that will satisfy man's emotional needs and stimulate his spiritual growth".

All previous CIAM publication from "Dwellings for the Lower Income Classes" (Stuttgart, 1930) to "Can Our Cities Survive?" (Harvard University Press, 1941) have been based upon material displayed at the congresses. This has not been the case in respect of this issue and in spite of the interrupted war years it is interesting and encouraging to note that the development of outlook in the various isolated groups has been proceeding on similar lines. The history, aims and methods of CIAM are presented in the first part of the book, and Walter Gropius offers recommendations regarding the important problem of architectural education as well as words of warning regarding trends.

The second part of this book illustrates the work of its members and includes such well-known figures as Richard Neutra, Alfred Roth, Mies van der Rohe, Walter Gropius, Maxwell Fry, Tecton, P. Nervi, le Corbusier, A. Aalto, G. Terragni, Oscar Niemeyer, Marcel Breuer, R. Soriano, and a host of others and is edited under the following sections: Sculpture, Living, Working, Cultivation of Mind and Body, Communications and Town Planning.

This book would form a valuable addition to any library in that it presents a clear and comprehensive pictorial review of good work carried out by the members of CIAM and has the effect of consolidating this varied work in one volume.

— U.T.

NOTES AND NEWS

CHAPTER OF SOUTH AFRICAN QUANTITY SURVEYORS

REGISTRATIONS

The following members have been enrolled as salaried members:— S. Nell, H. J. Kraayenbrink, P. C. H. Frylinck, M. H. Galgut, T. H. Hope.

The following member has been enrolled as a practising member:— C. R. Rogers.

TRANSFERS

The following members have been transferred from salaried members to practising members:— J. J. Pansegrouw, L. A. H. Down, R. H. G. Dunlop, F. G. Moore, C. W. Eglin, A. Coetzee, K. A. Morren, R. E. Schoombie.

The following member has transferred from practising membership to retired membership:— D. S. Mann.

INSTITUTE OF SOUTH AFRICAN ARCHITECTS

REGISTRATIONS

The following members have enrolled as salaried members:— M. K. Anderson, C. L. Stevens.

TRANSFERS

The following member has been transferred from a salaried member to a practising member:— D. O. Brown.

INTER PROVINCE TRANSFERS

The following salaried members has been transferred from the Transvaal Institute to the Cape Province Institute:— J. W. A. Meiring (S), S. Price (P).

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