JOURNAL

ROYAL ARCHITECTURAL INSTITUTE OF CANADA

Serial No. 268 TORONTO, DECEMBER, 1947 Vol. 24, No. 12

PRESIDENT . . . . . CHARLES DAVID (F)

CONTENTS

EDITORIAL, F. Bruce Brown, Chairman, Editorial Board - - - 420

POLYMER CORPORATION - - - - - - - - - - 421

POLYMER CORPORATION LIMITED, SARNIA, ONTARIO - - 424

THE SHIPSHAW No. 2 POWER DEVELOPMENT, 1941-1943, J. C. Meadowcroft - - - - - - - - - - - - - - 430

ALUMINUM COMPANY OF CANADA LIMITED, SHIPSHAW POWER DEVELOPMENT, No. 2 POWER HOUSE, SAGUENAY RIVER, QUEBEC, J. C. Meadowcroft, Consulting Architect - 432

THE DESIGN OF MASONRY MORTARS, Lane Knight - - - 436

ENGLAND'S POSTWAR SCHOOLS FEATURE MODERN ARCHITECTURE AND STANDARDIZED CONSTRUCTION, Howard Vicars Lobb - - - - - - - - - - - - - 438

THE INSTITUTE PAGE - - - - - - - - - - - - 444

ONTARIO ASSOCIATION OF ARCHITECTS 1948 CONVENTION AND ANNUAL MEETING - - - - - - - - - 446

INDEX TO VOLUME 24 - - - - - - - - - - - - 449

J. F. SULLIVAN, PUBLISHER

Editorial and Advertising Offices - - - - - - 57 Queen Street West, Toronto 1

SUBSCRIPTION RATES

Canada and Newfoundland—Three Dollars per year. Great Britain, British Possessions, United States and Mexico—Five Dollars per year. All Other Countries—Six Dollars per year. Single Copies—Canada 50 Cents; Other Countries 75 Cents.

R.A.I.C. JOURNAL

DECEMBER 1947

AT this season a year ago there was a restrained optimism at the prospect of resolving the major obstacles to international co-operation. In spite of setbacks, one sensed the presence of a will to succeed and a willingness to compromise for the common good. There appeared to be grounds for hope. Unfortunately repeated situations arose in which no compromise could be found. When agreement between the major conflicting groups became more and more remote a new phase of activity emerged. This became apparent with the enunciation of the Truman Doctrine with respect to Greece and Turkey, and as counter move the announcement of the Balkan Alliance.

PERHAPS 1947 will be remembered for all time as the year in which the Marshall Plan was announced. It has been described by one group as one of the great unsordid acts of recorded history, and by the other, a scheme for imperialist expansion conceived to infringe upon the sovereignty of weakened states. The latter move has been countered by the widely publicised re-incarnation of the Commintern. Though reluctant to do so, one cannot escape the conclusion that the major opposing groups are presently engaged in the process of forcing all intervening powers to take their place on the one side or the other. An all out struggle has been precipitated in France and Italy. This state of affairs can only lead to a clash too terrible to contemplate and it is to be hoped that the will to survive will prove to be strong enough to impose renewed efforts to seek the path of sanity and peaceful co-operation.

IN the midst of this turmoil, and welter, of charge and counter charge, we have to thank our Mother Country for reminding the world of the persistence and value of the simple virtues and the fact that all society is built, after all, on its smallest unit, a Family. The news concerning the wedding of Princess Elizabeth and Prince Philip, God bless them, has gone forth like a wholesome breath of fresh air to a universe surfeited with so much that is cynical and ugly.

TWO significant events will mark 1947 for Canada. Foremost is the fact that our nationality has been established by act of Parliament, and later Canada's stature as a nation was recognized by election to the Security Council of the United Nations.

ARCHITECTS continue to be hard pressed to keep up with the unprecedented demand for their services. We are still hampered by shortages of labour and materials. Rising building costs constitute a serious problem and, if not halted, may snuff out urgent post-war building before it has attained its full momentum. Your *Journal* has continued to grow and is consciously striving to become more stimulating, and more valuable to the profession as a source of reference. It has been said that an army travels on its stomach. It is equally true that a magazine travels on its advertising. The substantial increase in this section of our *Journal* is a positive indication that more and more manufacturers of building materials are coming to realize the unique position which the *Journal* holds as an advertising medium in the building industry. So, in closing, we include our advertisers when we wish you all a prosperous New Year.

F. BRUCE BROWN, *Chairman, Editorial Board*

POLYMER CORPORATION

IN the turbulent days of World War II, pressure on the Department of Munitions and Supply to obtain increasing quantities of raw materials and convert those into war weapons led to the development of a new mechanism of democratic government. This mechanism, known as the Crown Company, had all the freedom of action of a private company plus the prestige and authority of an agency operating as a unit of the Dominion Government.

Polymer Corporation Limited was established as one of these Crown Companies. Responsible to the owners, the people of Canada, it takes its policy direction from the Right Honorable C. D. Howe, now Minister of Reconstruction and Supply, formerly Minister of Munitions and Supply, and from its Board of Directors. At the instance and under the direction of the Department of Munitions and Supply, it was incorporated on February 13, 1942, a few brief weeks after Pearl Harbor. Almost immediately its Board of Directors began looking about for a site and arranging for the design and construction of the plant. On March 27 of the same year plans were far enough advanced for Government consideration of the project and an order-in-council (P.C. 2369) was passed which gave the infant company the green light to go ahead.

In the days of the construction of the plant, the difficulties faced by Polymer Corporation were not confined to scarcities of manpower and materials. On this continent few knew how to make rubber and the little knowledge available was that of men in United States processing and oil companies. However, these men, and men in U.S. chemical companies did know how to make butadiene, styrene and isobutylene. So, on behalf of the Canadian government, the Polymer Corporation turned to private industry for assistance in constructing and operating the plant.

Three operating companies were set up as subsidiaries of larger corporations. And thus Polymer was able to draw upon the know-how, the professional advice, and the administrative services of the greatest engineers, research workers, and managerial experts in North America. The three companies, all established in 1942, have operated on a management-fee basis. The plant and materials they employed at the Polymer site have all remained the property of the Canadian people, but their employees have been hired and paid by the individual companies rather than by Polymer Corporation.

The operating companies have been:

St. Clair Processing Corporation, Limited, Sarnia, Ontario, a subsidiary of Imperial Oil Limited.

Dow Chemical of Canada Limited, Sarnia, Ontario.

Canadian Synthetic Rubber Limited, Sarnia, Ontario.

Early in 1946, by joint agreement between Imperial Oil Limited and the government, it was decided that Polymer Corporation should take over all the functions of St. Clair Processing Corporation. The absorption became effective on May 1, and at that time more than 90% of the St. Clair men became employees of Polymer Corporation.

Although conceived, designed, and built at top speed to meet an urgent war need, the Polymer rubber plant has already become woven into the fabric of the Canadian peacetime economy. Its existence guarantees that Canada shall never again be dependent on faraway sources for rubber in time of emergency, and also guarantees a greater stability in the price of rubber.

From the Polymer property go forth each year about 100,000,000 pounds of man-made rubber plus millions of pounds of chemicals. Its output has an annual value of approximately $20,000,000.

From petroleum gases, with the aid of coal, salt, soap, water and a variety of chemicals, the 1,800 employees on the 130-acre property turn out a volume of man-made rubber roughly equivalent to the output of 28,000 tappers tending 16,000,000 natural rubber trees covering 125,000 acres in the South Pacific. One Polymer employee produces as much as 15 native tappers.

How Rubber Is Made

Although Polymer is unique in what it makes, the processes it uses are no different from those of similar North American plants. Certain of the processes are like those of an oil refinery. Others are essentially those of a chemical factory.

Basically, the making of rubber is a chemical reaction known as polymerization. By this is meant the linking of the molecules of a substance into "chains" ranging up to 10,000 times as long as a single molecule. These "chains", known as polymers, give the substance its rubber-like qualities. At the Polymer plant two basic types of rubber are produced. One is GR-S, a polymer of two different combinations of hydrogen and carbon known as butadiene and styrene. The other is Butyl, a polymer of two other hydrocarbons known as isobutylene and isoprene. The plant makes its own butadiene, styrene, and isobutylene, and purchases its isoprene from an oil refinery at Baton Rouge in Louisiana.

The two main types of Polymer rubber are made in separate units of the plant. Not only is the process for making GR-S different in detail from the process for making Butyl, but the products are also different. GR-S closely resembles natural rubber and can be mixed with it in any proportion desired. Butyl is so different that it is never mixed with either natural rubber or GR-S.

The making of GR-S begins at the oil refinery, where crude petroleum is broken down into gases, liquids and solids. Polymer purchases some of the lighter gases, bringing them into its plant by pipeline or in tank cars in which they are kept in liquid form under pressure.

At the first unit of the plant, the Polymer distills from the petroleum stream a gas known as ethylene. This is piped to a second unit where it is combined with benzine obtained from the coke ovens of the steel plants. The resulting compound, ethyl-benzine, is placed in a bath of superheated steam. In this way the molecules are spread far apart, making it easy for a catalyst to remove atoms of hydrogene. This process produces styrene, one of the two chief ingredients of GR-S, and in its own right a chemical for making a popular plastic.

The other chief ingredient of GR-S is butadiene. To make butadiene chemists employ another hydrocarbon, butylene which they extract from the petroleum stream. In massive $12,000,000 equipment comprising squat towers, large boilers, heavy pumps and pipes, they mix the butylene with superheated steam. They pipe the mixture to large open vessels containing a catalyst which removes hydrogen atoms and creates butadiene. In another section, butadiene is brought to 98% purity using a copper solvent which holds the butadiene until the unreacted hydrocarbons have been removed. The result is then styrene and butadiene, the two ingredients of GR-S. These are mixed under pressure in a solution of soap, water and chemicals. When stimulated by a catalyst, the two hydrocarbons become linked together as a co-polymer. Thus we have man-made rubber in latex form—looking much like the milk from a rubber tree. Substantial quantities of this latex are shipped to the rubber processors for use in such things as foam rubber and adhesives.

Products

Polymer does not make tires, footwear, hot water bottles, plastic toothbrush holders, anti-freeze, or any other consumer items. Instead, it produces only the man-made rubber and chemicals from which these and tens of thousands of other articles can be manufactured. The chief Polymer products are types of general-purpose rubber grouped under the family name of GR-S, and specialty types in the Butyl family. Some of the types are made both in solid and in liquid forms. The general-purpose types can be used for more than 30,000 different articles. The specialty types are tailor-made. Each is designed for a limited number of purposes and in its own field is intended to do a better job than other raw materials. In the GR-S family, Polymer is now turning out seven solid varieties and three types of latex. The solid types are used in tire casings, automotive and airplane parts, belting, certain types of hose, wire and cable covering, footwear, hard-rubber articles and thousands of other items. The latices are used in foam rubber, dipped articles and impregnated fabrics. In the Butyl family, the Polymer plant at present is making four types. Its most important use is for inner tubes and other gas and liquid containers.

No other plant in the world is quite like this plant at Sarnia, Ontario. It is the only plant turning out not only the two principal types of man-made rubber, but also the principal components, butadiene and styrene for making GR-S, and isobutylene for making Butyl. In short, it is the only plant able to convert petroleum gases and other raw materials into crude rubber ready for shipment to the tire factories and other rubber processors.

What Is Man-made Rubber Used For?

Almost every month of fresh research adds to the list. With the addition of new types of GR-S, and Butyl, and of man-made latex, still more uses will be found and eventually the manufacturer will be able to obtain, on a quantity basis, rubber to suit almost all purposes for which natural rubber has been employed, plus many new purposes now being developed.

To date the chief uses of the Polymer products are these:

GR-S

Tires of all types, including automobile, truck and tractor. Mechanical items such as transmission and conveyor belting, hose of all types, acid-resistant industrial tank linings, industrial roll covering for paper mills and other plants, washing machine wringer rolls, all types of molded goods, chemically blown sponges, and asbestos gaskets. Electrical items such as wire and cable, and insulators of many kinds. Drug sundries such as hot water bottles, baby pants and crib sheeting.

GR-S Latex

Foam rubber for automobile, bus, truck and theatre seats and for mattresses. Tire cord dipping. Fabric impregnation. Adhesives.

BUTYL

Inner tubes of all types including automobile, truck and bicycle. Curing bags for making automobile tires. Proofed goods such as hospital sheeting and ground sheets. Drug sundries such as hot water bottles, syringes and tubing. Adhesives such as paper tape.

Efficiency and Volume

It is unique, too, in its efficiency. It has succeeded in reducing its operating costs to at least as great a degree as any similar plant. Designed for an output of 83,600,000 pounds per annum, it produced in the first quarter of 1947 at a rate of more than 21 per cent. above its rated capacity. The only rubber producing plant north of the United States border, it supplies all Canadian requirements of GR-S and Butyl, and has made substantial exports to Europe and Latin America. In 1946, it sold to other nations about 50,600,000 pounds valued at approximately $10,000,000.

The 1,800 persons working at the plant do not begin to represent the total employment the plant provides. It creates employment in Canada by purchasing 2,500,000 imperial gallons of benzol, 5,000,000 pounds of soap, enough brine to contain 11,000,000 pounds of salt, 800,000 pounds of sulphuric acid, and hundreds of thousands of dollars worth of chemicals. It buys 25,000,000 imperial gallons of light petroleum and 5,000,000,000 cubic feet of petroleum gas, both of which raw materials are obtained from United States crude oil. From the United States, it also buys 300,000 tons of coal and large quantities of modifiers and other chemicals.

Why Make Rubber From Oil?

The chemist of today is able to make rubber from almost any vegetable matter, but like any other business man he must think of costs.

In making the butadiene necessary for GR-S, he can, if he wishes, use alcohol, coal or oil. Which he chooses will depend on the economics of his geographical location. In Russia, he would use alcohol. In Germany, he would use coal, and in North America he would use petroleum. During World War II, some of the butadiene plants in the United States used alcohol even though the costs of the resulting butadiene were higher. In those days, when the United Nations faced a rubber famine, the first consideration was speed rather than cost. To secure the necessary butadiene from alcohol called for factories less elaborate, less expensive, and quicker to build than those needed to make a like quantity of butadiene from oil. The capital costs for the alcohol process were lower, but not enough lower to make up the difference in costs between the two available raw materials, grain and oil. On this continent alcohol is made from molasses, corn, wheat and organic waste products; at higher capital costs it could also be made from petroleum. The most expensive of these raw materials is wheat.

The wartime cost of butadiene was approximately 31 cents per pound higher when made from grain alcohol. This means that the rubber made from wartime alcohol cost 21.6 cents (U.S.) more per pound than the rubber from petroleum. Despite the higher costs of using alcohol, the United States Government planned about 40% of the butadiene output on the basis of using this raw material, and the remainder on the basis of using oil. When the war was ended, the first U.S. rubber units to be closed down were the uneconomic butadiene-from-alcohol plants.

Fortunately for the economic success of Polymer Corporation, the Canadian government decided from the beginning to use oil instead of alcohol. Thus the Sarnia plant was able to continue in operation after the war.

Why Was the Sarnia Site Chosen?

Because its plant was built during World War II, the Polymer Corporation had to consider the danger of submarine warfare interfering with its supply of crude oil. Sarnia is the point of intake for the most secure and reliable source of oil coming into Canada, the pipeline from the U.S. midcontinent fields. The only Canadian petroleum source free from danger of submarine sinking was the Turner Valley field in Alberta, but petroleum from this field is high in butane content, which makes it unsuitable for the butadiene process Polymer intended to use. Also it was far away from other necessary raw materials and from the factories which process rubber.

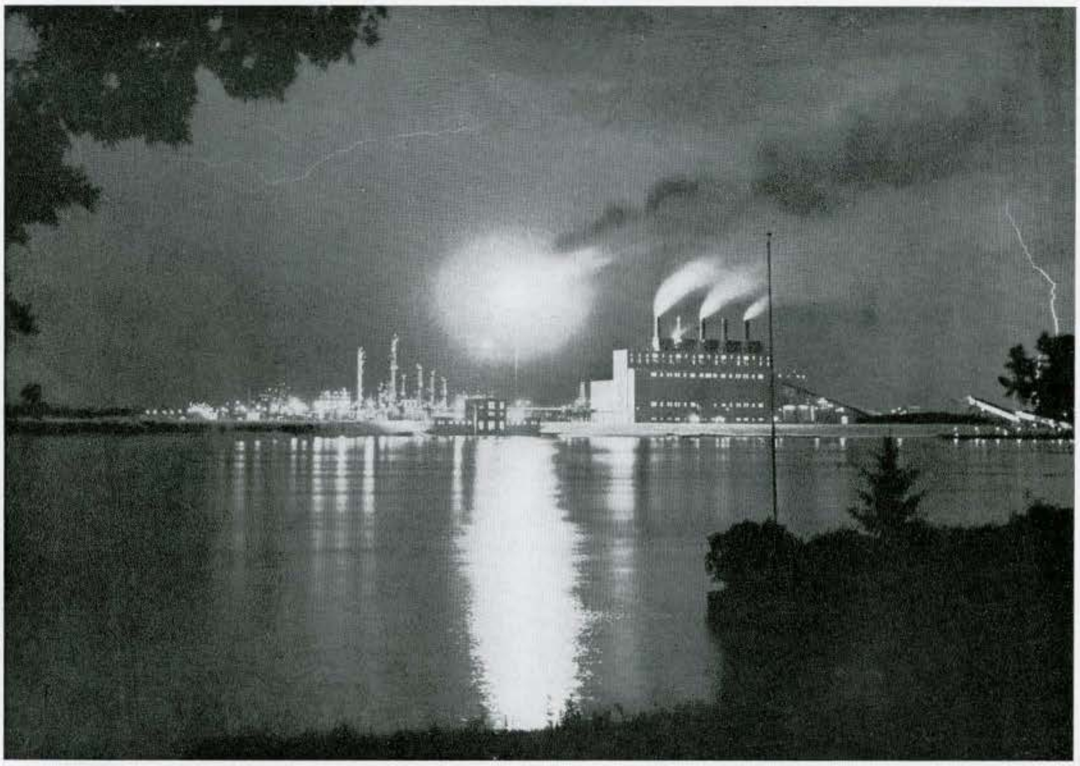
To make rubber calls for immense quantities of comparatively low temperature water, of which Polymer uses more than 45 billion imperial gallons per year. The Polymer site is a plateau 16 to 26 feet (depending on height of water) above the St. Clair River. The water from that river is steady flowing and cool. It ranges from 34 degrees F. in the winter to 70 degrees F. in the summer, and thus is ideal for cooling. In some of the American plants it was necessary to spend substantial amounts on large cooling towers. At Sarnia such towers were unnecessary.

Sarnia is located strategically between Sault Ste. Marie, Ontario, and Hamilton, Ontario, in both of which places coke ovens produce benzol as a by-product. Thus Polymer can easily obtain its benzol, an essential ingredient of ethyl-benzine from which comes styrene. Polymer uses 2,250,000 imperial gallons per year of benzol. Great quantities of brine are needed to make rubber. This brine can be obtained cheaply and readily from the Dominion Salt Company at Sarnia. Some rubber plants have to use dry salt. Two unnecessary steps, the original drying and re-wetting, are avoided at Sarnia. Polymer trucks bring in brine containing 11,000,000 pounds of salt, dry basis, per year. The Sarnia site is convenient to water, rail and road transport. Thus Polymer's annual consumption of 300,000 tons of coal can be brought in by water, and the rubber can be shipped by water, rail or road. It is on the Père Marquette rail line, on No. 40 King's Highway to Windsor, and has its own dock. The plant is not far from Kitchener, Hamilton, and Toronto, where most of the Canadian rubber processing factories are located. The site is level with a clay soil which made for quick and comparatively easy construction.

How Was the Plant Built?

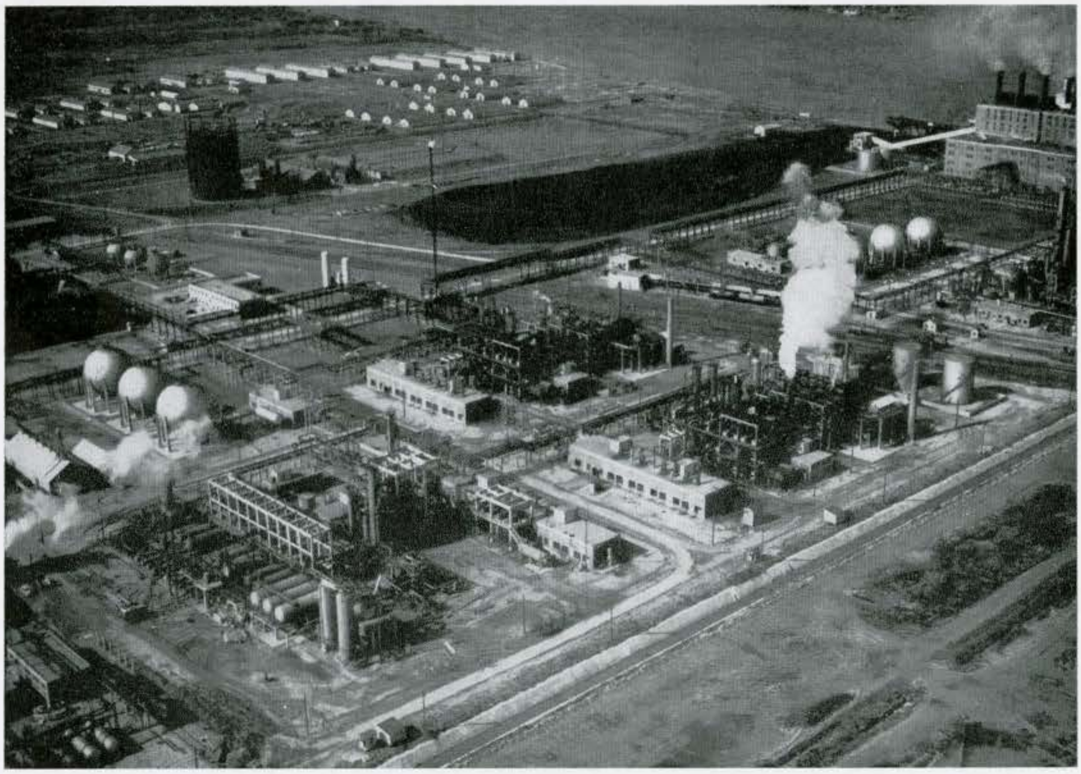
The construction of the Polymer Corporation plant was remarkable, not only for its speed but also for its extent and complexity.

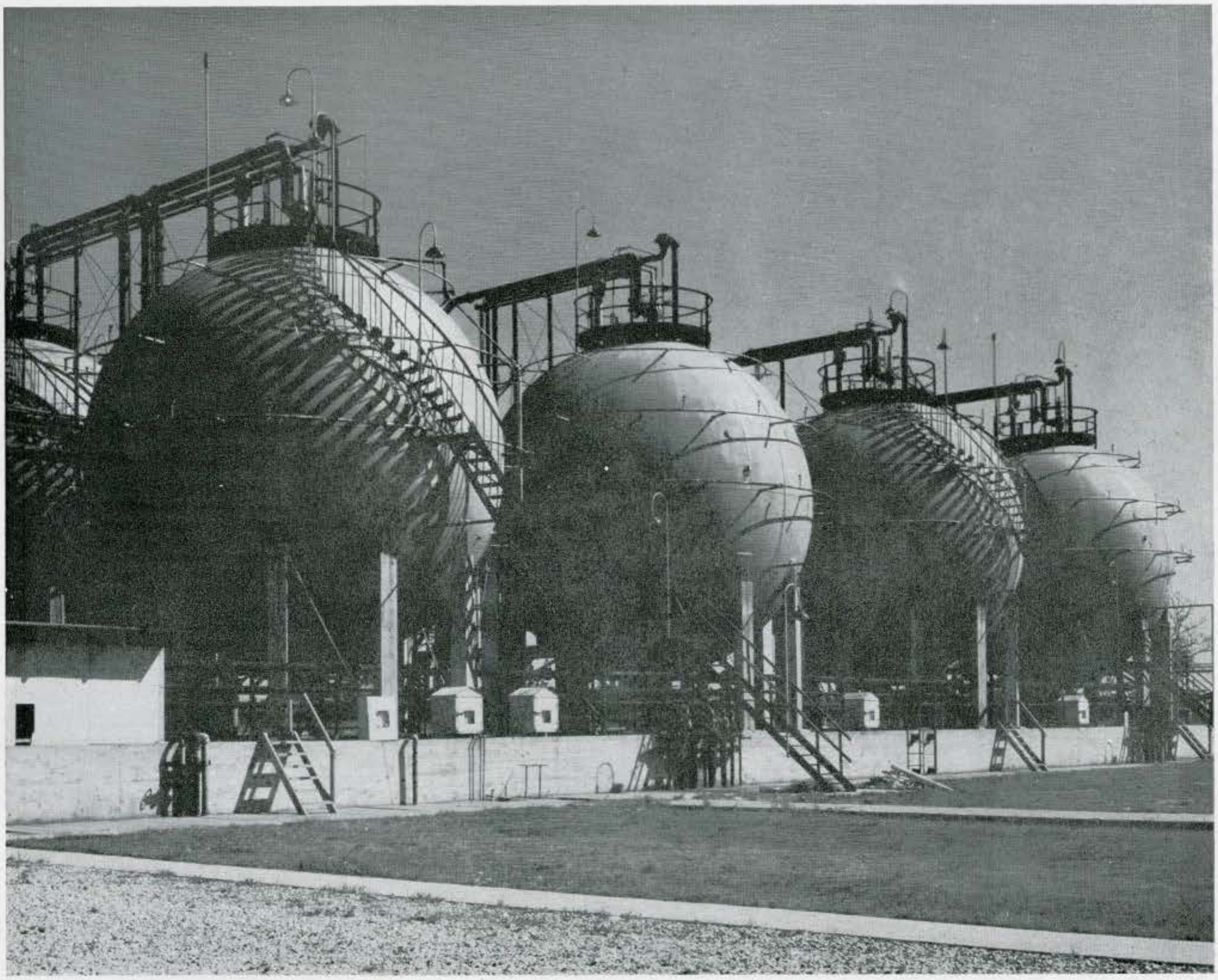
(Continued on page 448)



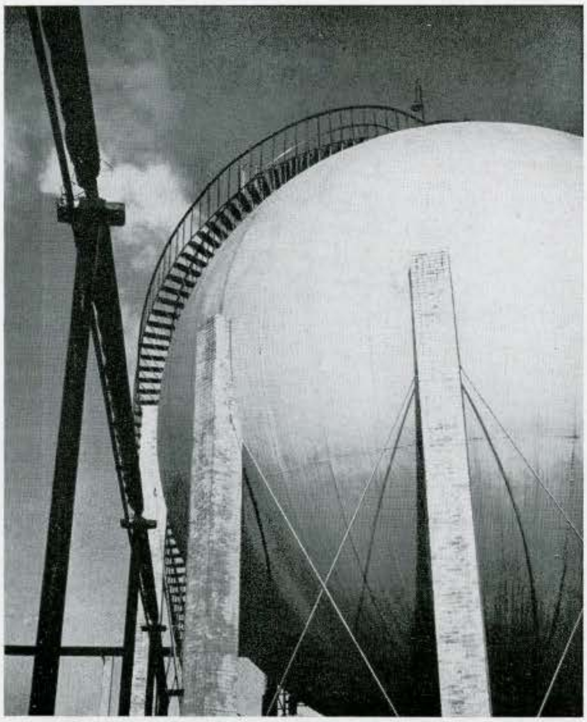
POLYMER CORPORATION LIMITED, SARNIA, ONTARIO

AERIAL VIEW OF PART OF THE ONE HUNDRED AND EIGHTY-FIVE ACRE PLANT



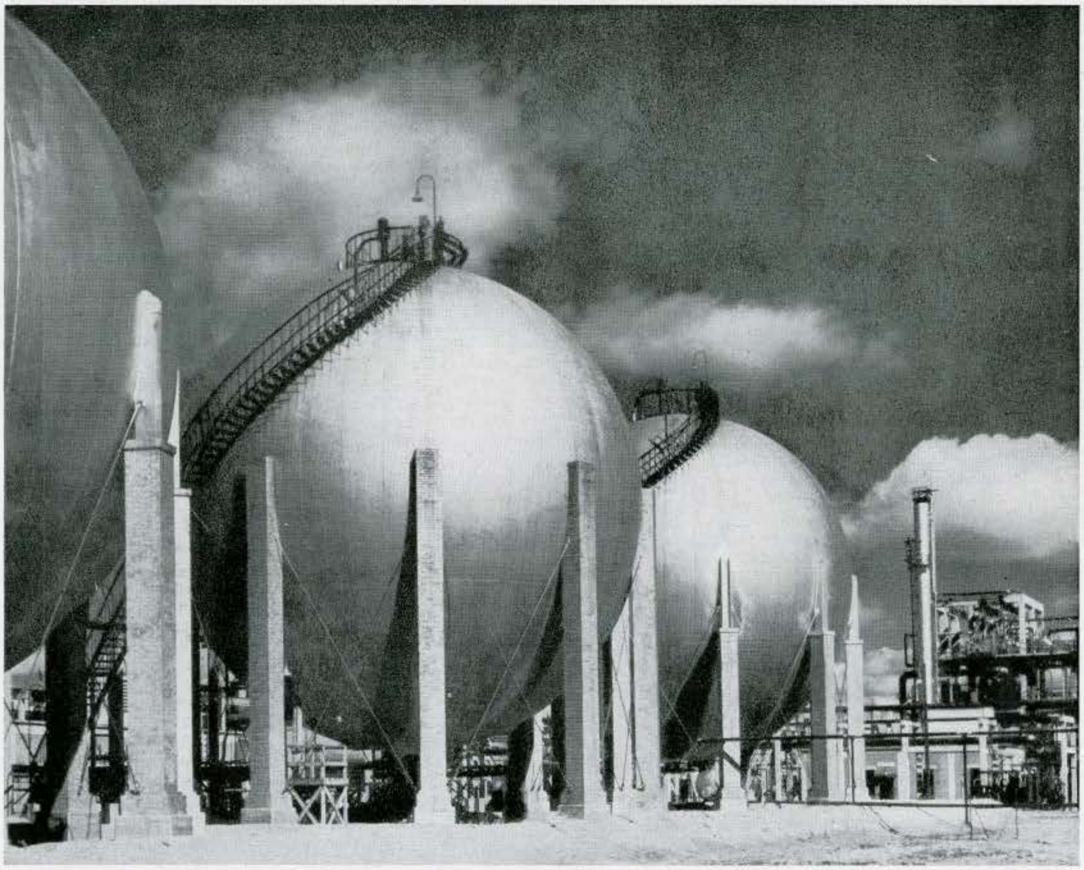


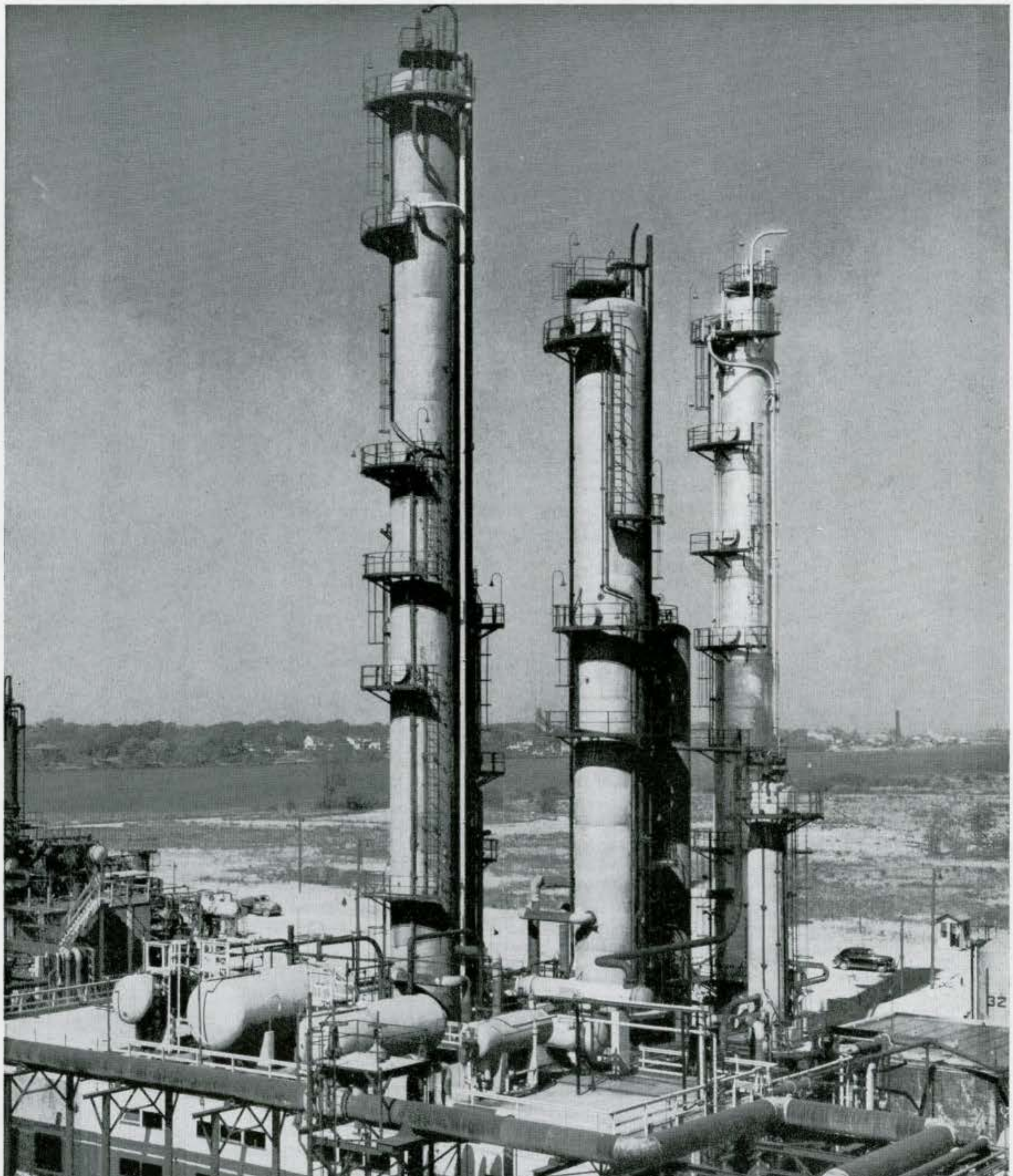
Thirteen Horton spheres are storage tanks for butadiene and styrene, the two chief ingredients of buna-S rubber. The spheres are encircled by water pipes which turn on automatically to spray the spheres with cooling water when the sun brings the pressure within the tanks to over fifty pounds per square inch. The thirteen spheres range from thirty-eight to fifty-one feet in diameter, made of steel shapes welded together. Each contains from five thousand to twelve thousand barrels of the previous hydrocarbons which become synthetic rubber.



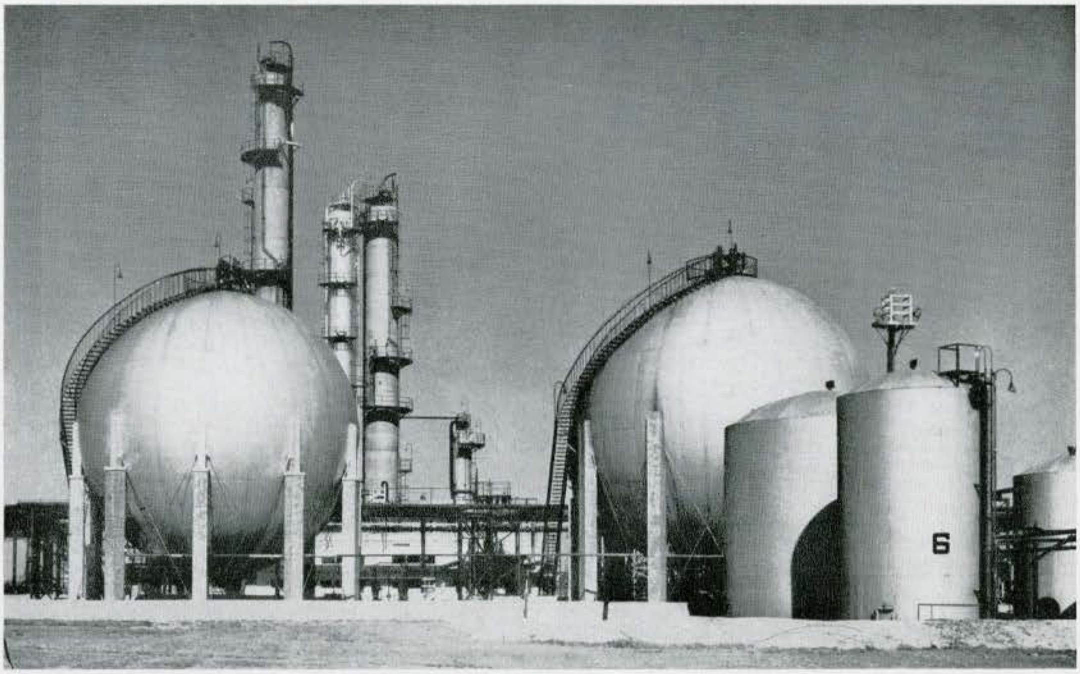
DETAIL OF HORTON SPHERES

BUTANES AND BUTYLENE STORAGE SPHERES



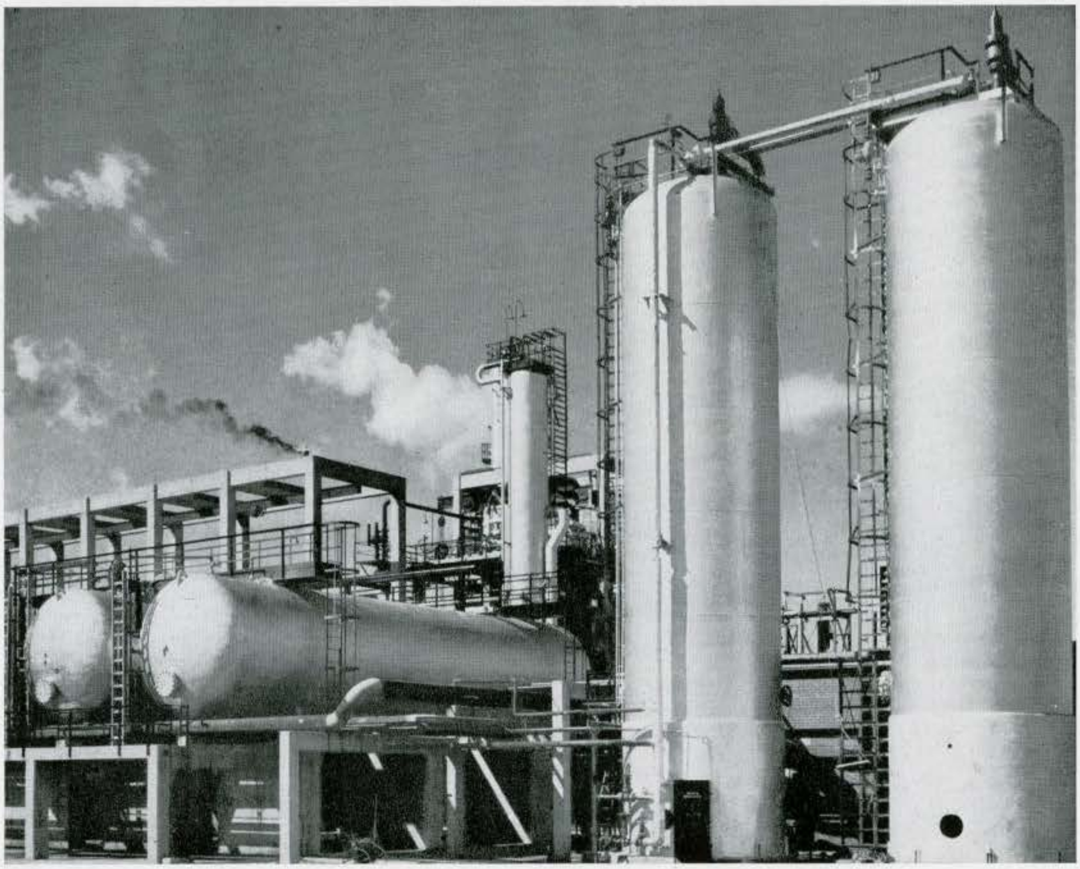


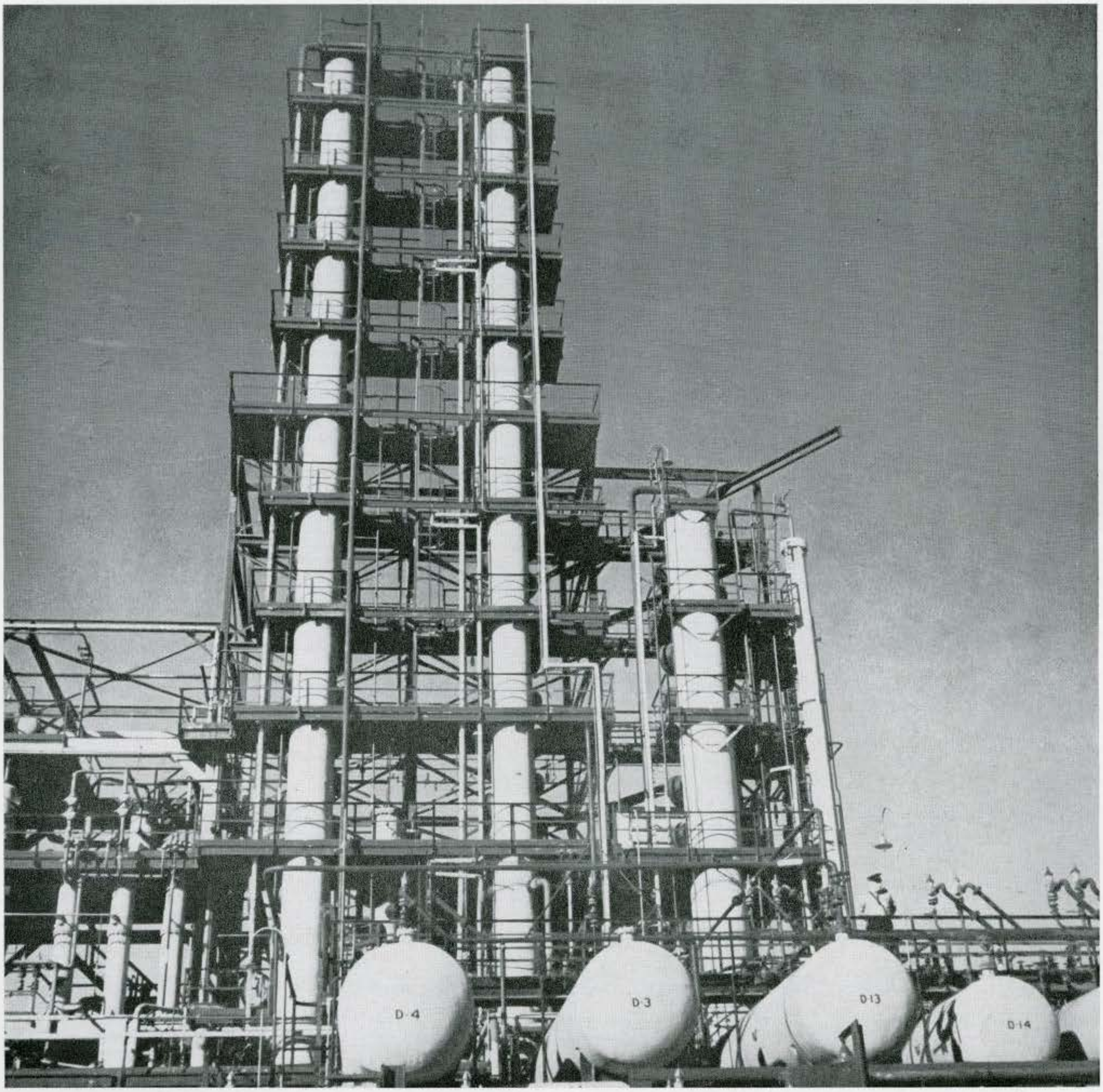
BUTYLENE CONCENTRATION UNIT



STORAGE TANKS IN FOREGROUND. BUTYLENE CONCENTRATION TOWERS IN BACKGROUND

BUTADIENE EXTRACTION UNIT





THE FRACTIONATING STRUCTURE OF THE BUTYLENE UNIT CONSISTS OF PURIFYING TOWERS WHICH EXTRACT FROM PETROLEUM THE MOST IMPORTANT INGREDIENT FOR MAKING BUTYL.

THE SHIPSHAW No. 2 POWER DEVELOPMENT 1941-1943

By J. C. MEADOWCROFT

SITUATED at tidewater on the Saguenay River in the Province of Quebec, the Shipshaw Power Development of the Aluminum Company of Canada exists primarily for the purpose of supplying electric power to the world's largest aluminum smelter a few miles downstream. Both the power development and the smelter lie within the limits of the city of Arvida.

The project is justifiably considered as one of the major contributions to Canada's war effort, but it was actually conceived in the early years of the present century. It was not until 1926, however, that the construction of the first stage of the development was commenced. By 1931 the Shipshaw No. 1 Powerhouse and No. 1 Dam had been completed. The depression years and the consequent reduction in the demand for aluminum enforced the cessation of all further work on the undertaking. With the advent of World War II came an active revival of interest in the Shipshaw development. Late in 1940 it was apparent that the aluminum required to meet the demands of the war would be greatly in excess of any previous anticipations. In order to make possible the necessary increased production, it became absolutely essential to develop more power.

The first confirmed instructions for the continuation of the Shipshaw Power Development were issued to the engineers in May, 1941. These instructions required the preparation of plans, specifications, and working drawings for the immediate construction of the complete project from the control works to the headblock inclusive, but with only the east half of the powerhouse, including six generator units, and the central erection bay and control section. The schedule called for power to be delivered from the first unit on January 1, 1943, with succeeding units turning over thereafter at intervals of from one month to six weeks, depending upon the subsequent subsurface exploratory work showing results as favourable as those previously realized; and that earth excavation on the sites of the various major structures could be commenced not later than the beginning of July, 1941.

Early in 1941 preliminary architectural sketches of the powerhouse superstructure were begun. From the first these studies emphasized a horizontal treatment rather than the conventional insistence on verticality so persistently used in powerhouse design. The sketches of the downstream elevation were based on the final twelve unit development; but since the program had called for only a six unit powerhouse, the incomplete superstructure would have terminated just beyond the large central window. This factor prompted a great deal of discussion and opposition. Realizing that the entire substructure was to be erected at once, the architect was of the opinion that the scheme would be quite satisfactory, as anyone could readily see that it represented only a portion of the projected building. The opposition strongly advocated a symmetrical design incorporating large windows at the center and at either end of the downstream elevation. Finally, in an effort to end the deadlock, a model consisting of eight interchangeable sections was fabricated: five of the sections represented the building as it is today, and three additional ones were used to replace the end panels and the center portion with large windows. When the three windows were substituted in the model the results were disastrous to the design, and all opposition ended abruptly. Subsequently, in November, 1942, it was decided to proceed with the construction of the west half of the powerhouse; so the problem of a design for half of the building disappeared.

Naturally enough, in all large projects of this highly specialized type the architectural design is not usually considered to be of primary importance; so the architect's duty lies more in the nature of housing the engineering works. In this particular instance the column centers were set at 27 feet, with the generators placed at 54 foot centers. The superstructure was to be of steel frame construction with steel roof trusses and a poured-in-place concrete roof slab. The need to reduce freight to a minimum on the overtaxed single track railroad to the Lake St. John district necessitated the employment of poured-in-place reinforced concrete for the exterior walls as well.

One of the next problems involved the question of texture treatment of the exposed face of the exterior walls. It was well known that the T.V.A. had utilized band saws, with occasional offset teeth, to cut the face of the form lumber used in several of its projects. With this information as a starting point, it was decided to direct a local mill to prepare form lumber by this technique. An experimental pour was made, but the results were unexciting due to the uniformity in the spacing of the scoring. As an alternative, one of the resident engineers suggested offsetting the teeth of a circular saw. The outcome of the pour using these forms was astounding, and the sample rapidly gravitated to a fill area. Finally, a satisfactory appearance was achieved with sand-blasted jack pine forms.

The desirability of concealing the exterior display of the vertical expansion joint at each steel column (27 foot centers) lead to the development of a V joint of sufficient depth to meet the requirements. The design had called for blocks about 7 feet high by 13 feet 6 inches long; so these were indicated by the dummy joints, and the depth of each concrete pour was fixed at 7 feet. By placing the sand-blasted jack pine form lumber in a vertical position in alternate panels, the interesting textural pattern apparent in the photographs was obtained. Hollow pre-cast concrete spreaders, with removable terminal wood cones, and ⅝ inch diameter tie rods were used. After the stripping of the forms, the only necessary work on the concrete was the filling in of the cones at the ends of the spreaders. No particular forming was utilized for the interior face of the walls, and no finish was added; consequently, the interior face remains as it was when the forms were stripped. The exterior faces of the superstructures of all buildings received a textural treatment similar to that previously noted; and the dummy V joint proved an effective camouflage of the pour joints in the dam walls.

The powerhouse itself is 837 feet long and 78 feet wide: the substructure being 75 feet high, and the superstructure reaching upwards an additional 72 feet. An extension on the northwest corner houses the reception room, while the central administration wing is located at the rear, on the short axis of the building. Also behind the powerhouse are the concrete transformer cubicles, which occupy the area between the administration wing and the ends of the building.

The reception room lies just inside the main entrance of the Shipshaw No. 2 Powerhouse. This room, approximately 30 feet square, is illuminated by a large glass block window in the north wall and glazed aluminum entrance doors on the west. The reception room floor is Cedar Tennessee marble with a border composed of York fossil marble and red Levanto marble, all having a honed finish. Aluminum strips have been utilized to outline the subdivisions of both floor and border. Polished red Levanto marble also forms the base, but the walls from floor to ceiling are filled and honed Travertine. The plaster ceiling is coved and recessed to conceal the indirect lighting units. Soon to be set into the south wall of the reception room is an aluminum plaque commemorating the organizations responsible for the design and execution of the final stage of the Shipshaw Power Development. Also in the process of preparation is a large mural which will eventually hang on the east wall.

Glazed aluminum doors lead from the reception room into the powerhouse proper. The interior finish, held in abeyance throughout the war years, is now nearing completion. Extruded aluminum railings and stair treads have replaced the rough wooden substitutes in use pending the alleviation of wartime shortages. It was originally intended to dispense with the painting of the interior walls of the powerhouse; but this decision has been revised due to the uncontrollable variation in the colour of the concrete pours. Fortunately, this condition is not perceptible in the texture concrete of the exterior walls. At present, the interior painting is proceeding rapidly and should be completed in the near future. A warm grey-green colour has been chosen for the generator casings, with a slightly darker tone for the excitor casings, trimmings, and accessories. The structural steel will be painted pale green; the ceiling, cream; and the walls, a light shell colour. Extruded railings and stair treads are to retain the natural colour of alumilited aluminum. Red quarry tile floors have already been laid at both levels of the generator room in an effort to control the dust.

The control room is located on the second floor of the administration wing. Approximately 60 feet long by 30 feet wide, the room is screened from the foyer of the powerhouse by a 60 foot plate glass window extending from floor to ceiling. This screen makes it possible to observe the workings of the control room without disturbing the operators. Asphalt tile has been used for the control room floor; the walls are painted plaster; and the arched plaster ceiling is covered with acoustic tile. Flood lighting units, for the indirect lighting of the controls, are installed on a canopy above the observation window.

The load-dispatching facilities occupy the system offices on the third floor of the administration wing. Here lies the focal point of the communication system of the development, and short-wave connections with any of the storage dams are possible at a moment's notice.

A service tunnel from the lower level of the powerhouse provides a means of access to the headblock. This tunnel is 430 feet long and is finished with a red quarry tile floor, buff brick walls, and a painted concrete ceiling. An elevator at the north end of the passage lifts the ambitious visitor 205 feet to the central foyer of the headblock. Observation windows in the north wall of the room command a splendid panoramic view of the surrounding country. For the convenience of visitors a semi-circular lounge, with large plate glass windows overlooking the head channel, has been provided. Construction methods similar to those employed in the erection of the powerhouse have been utilized in the building of the headblock superstructure. The familiar textural treatment of the poured-in-place concrete exterior walls is again in evidence. Alumilited extruded aluminum railings line the edge of the headblock deck. At strategic intervals along the top of the dam walls, aluminum barriers have been installed.

As has previously been stated, the contractors were reasonably assured that the first generator unit could be turned over on January 1, 1943. In actuality, the head channel and tailrace were flooded on November 21, 1942; and three days later unit No. 7 went on the line, followed by unit No. 8 on November 27th, just eighteen months after the award of the contract. Units Nos. 9 to 12 in the east half of the powerhouse and Nos. 1 to 6 in the west half were turned over at regular intervals, the last being unit No. 1 on December 24, 1943. It was a source of great satisfaction to all concerned to have met the schedule almost to a matter of days for all twelve generator units.

ALUMINUM COMPANY OF CANADA LIMITED, SHIPSHAW POWER DEVELOPMENT

NO. 2 POWER HOUSE, SAGUENAY RIVER, QUEBEC

J. C. MEADOWCROFT, CONSULTING ARCHITECT

H. G. ACRES AND COMPANY, CONSULTING ENGINEERS

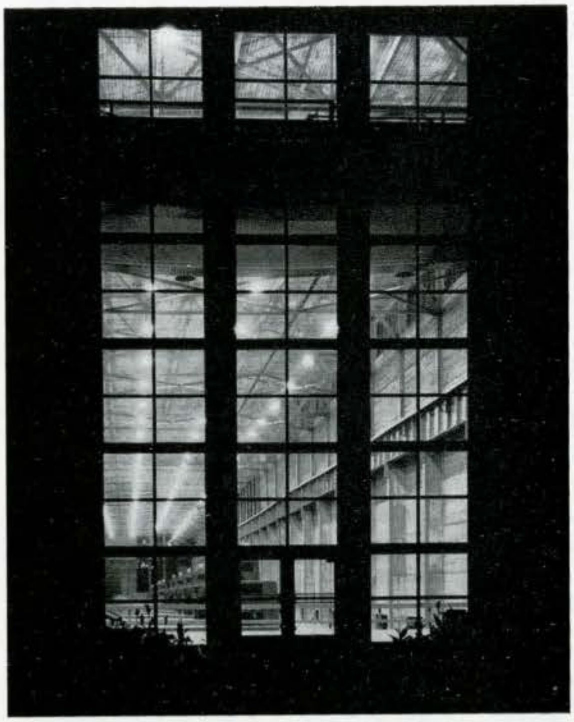
THE FOUNDATION COMPANY OF CANADA LIMITED, GENERAL CONTRACTORS

SHIPSHAW NO. 1 POWERHOUSE

AERIAL VIEW OF SHIPSHAW NO. 1 POWERHOUSE AND DAM
SHOWING CONTROL GATES AND CANAL IN CENTER RIGHT

AERIAL VIEW OF SHIPSHAW POWER DEVELOPMENT SHOWING SHIPSHAW NO. 2 POWERHOUSE IN FRONT RIGHT FOREGROUND AND SHIPSHAW NO. 1 POWERHOUSE AND DAM IN LEFT CENTER BACKGROUND

AERIAL VIEW OF SHIPSHAW NO. 2 TAKEN FROM THE REAR



SHIPSHAW NO. 2 POWERHOUSE AT NIGHT

INTERIOR OF SHIPSHAW NO. 2 POWERHOUSE

THE DESIGN OF MASONRY MORTARS

By **LANE KNIGHT**

BRICK mortars present a peculiar problem in that the properties required in them are rather different from those necessary for other types of cement mixes and in that consideration must be given to the other part of the structure, the brick, in designing a suitable mortar.

The first property requisite in a brick mortar is that of workability. Unless the mortar is workable a satisfactory structure will not be produced regardless of the excellence of the mortar with respect to other properties. While this might also be said of any concrete or mortar mix, the problem of workability is more acute in brick mortars because of rather exacting requirements. The mortar must have high mobility or fluidity in order that it may flow into and fill the joints and come in complete contact with the brick. At the same time it must be highly cohesive or sticky to permit it to be handled by the mason and to stick to the brick. This combination of properties is difficult to attain, since means which increase mobility usually decrease cohesiveness and vice versa.

Much has been said regarding the relation of workmanship to masonry construction. It is undoubtedly true that with sufficient care and a very high quality of workmanship it will be possible to erect a tight brick wall with a mortar which would ordinarily be considered unsatisfactory with respect to workability. This observation seems to have little practical value because the construction industry must deal with average workmanship. The high quality of workmanship to which reference is made is not available and even if it were the added cost in both materials and labour would make it prohibitive. The conclusion appears inevitable that, assuming average workmanship, the more workable the mortar the better will be the result.

Another important property of brick mortars is that of water retaining capacity, that is, the ability of the mortar to hold water against forces tending to draw it out such as evaporation and suction of the brick. If the water is drawn out too rapidly the mortar will stiffen before the second course of brick is in place and good contact will not be secured. Rapid loss of water also causes volume change which opens up cracks. Retention of the water aids curing.

Volume change, especially in the early periods is of utmost importance. If the mortar in the plastic state tends to shrink or settle the contact between the upper surface of the mortar and the under surface of the brick is impaired. Large volume changes in the early stages also account for the cracking at the junction of the vertical and horizontal joints. Since leakage of brick walls occurs almost always between the brick and the mortar rather than through either of them it will be seen that the importance of properties which tend to prevent loss of this contact can hardly be exaggerated.

Prehydration, that is, soaking the mortar for a period of some hours before use, has been suggested as a method of combatting shrinkage. It is doubted whether it would be practical to soak the mortar being used on a construction job of any size for a period of hours before use. Even if it could be done, it is not apparent what benefit is derived. If the mortar is mixed to the desired consistency and allowed to stand the cement begins to hydrate. As this takes up water the mortar becomes stiffer and in order to bring it back to the desired consistency it must be retempered with more water breaking down any structure which has been formed. The last state of the mortar is no better than the first and some of the cementitious value of the cement has been lost. This seems to be borne out by work carried out a few years ago at the Building Experiment Station, London.

Volume changes subsequent to hardening are less important. Mortar will expand on heating or on saturation with water. If such volume changes occurred simultaneously in the same direction some difficulty might be encountered. It is frequently overlooked, however, that when the mortar becomes hotter it usually dries out and when it cools it takes up moisture. The effect of one volume change more or less cancels the other.

Good bond between mortar and brick is vital for obvious reasons. The strength of the wall is dependent on the strength of the bond and water tightness can only be assured by the close contact between brick and mortar which characterizes a good bond. Bond strength is largely dependent on the mortar properties previously enumerated. Complete contact of the plastic mortar with the surface of the brick is a prerequisite and this is dependent on good workability, retention of water, and minimum volume change during the plastic stages. If complete contact is secured bond strength is then primarily dependent on the strength of the mortar. Lowering of the surface tension of the water by the use of stearates in the mortar mix will improve the contact between mortar and brick.

Other desirable properties of a brick mortar are low permeability or absorption, high strength, and low solubility. Inability of water to penetrate the mortar helps to make the wall more water tight and to prevent efflorescence. Low solubility of the mortar minimizes the danger of efflorescence. High strength contributes to structural value and is also a criterion of durability.

It hardly seems necessary to point out the desirability of durability. A mortar which lacks durability leads to the necessity for repointing in a short time. As repointing is a great deal more expensive than the original construction it will be evident that every effort should be made to secure a durable mortar in the first instance. To do this requires the design of a mortar with the properties already mentioned such as workability, low volume change, low permeability and high strength. It also implies a high cement content and low water-cement ratio. It should be noted that all the desirable properties of the mortar are related to the water content; a high water ratio impairs all the properties of the mortar except workability, a low water content with adequate workability improves them all.

It may well be asked how the desired properties can be secured in a brick mortar. This may be done by a proper design of the mortar. First a suitable sand should be selected from those available. This means a sand reasonably free from impurities and well graded to give maximum density. The sand is then combined with the proper proportion of cement and lime to slightly more than fill the voids. In general this is about one part cement plus lime to three parts sand but this will vary with the grading of the sand. It may be that no good sand is locally available. It then becomes a question of economics: whether the use of a higher proportion of cement and lime is less expensive than importation of a better graded sand from a distance.

The next step is to select the proportions of portland cement and lime and this is primarily dependent on the properties of the brick with which the mortar is to be used. There is considerable misunderstanding of the role which lime plays in brick mortars. It is not a cementitious material at all but is an admixture added for workability. Lime contributes to the improvement of two properties of the mortar; cohesiveness or stickiness and water retaining capacity. In all other respects lime impairs the properties of the mortar. It decreases strength and durability, increases water requirement, volume change, permeability and solubility. It is necessary to use a certain proportion of lime to secure cohesiveness and the water retaining capacity to resist the suction of the brick. The extent to which this is required will depend on the type of brick. For a brick of low absorption, of which the typical example is a glass block, low water retaining capacity will be satisfactory and the lime content may be low. Conversely, for highly absorptive brick high water retaining capacity and a high lime content will be necessary.

It would appear that brick manufacturers are becoming more conscious of the necessity for mutual compatibility between brick and mortar as is seen in publications by associations such as those of the Common Brick Manufacturers' Association, the Structural Clay Products Institute, and by some individual manufacturers. A rough guide, based on the principle of using as little lime as is consistent with proper water retaining capacity is as follows:—

Absorption of Brick	*Mortar Mix Proportions*		
	Cement	*Lime*	*Sand*
0% - 5%	1	½	4½
5% - 12%	1	1	6
Over 12%	1	2	9

Other materials than lime may be used for a similar purpose. Lime is the most readily available and the most commonly used ordinarily but is not necessarily the best. The requisites of this component of brick mortar are that it shall be finely divided, inert, as insoluble as possible and that it will form with water a very plastic paste which holds the water fairly firmly. On the other hand it should not swell unduly with water as this will lead to subsequent volume changes. A number of materials of this nature are known of which one example which has been found satisfactory in practical use, is ground shale.

It is possible further to improve masonry mortars by the addition of certain reagents in small quantities. Stearates have already been mentioned in connection with improved bond through reduction of surface tension. Since all mortars are more or less porous the addition of the water repellent stearate which imparts this quality to the pores is helpful in reducing the penetration of water into the mortar.

Since most of the desirable properties of a mortar are dependent on a low water content anything which will reduce the amount of water required for a given consistency is a desirable addition to the mortar, provided the substance used for this purpose does not adversely affect the hydration of the cement. A few such materials, usually called plasticizers, are known. Among these the most effective are cement dispersing agents. These have the effect of dispersing the cement particles which naturally exist in the flocculated condition in the water of the paste. Just as in the deflocculation of clay slips, this dispersion has the effect of increasing the mobility of the paste for a given water content, or, what is the same thing, decreasing the water required for a given consistency. Dispersion also increases the available surface area of the cement, thereby increasing water retentiveness and the efficiency of the hydration reaction.

To produce water-tight, durable structures of brick and tile serious consideration must be given to the quality of the mortar which is to be used. First, this

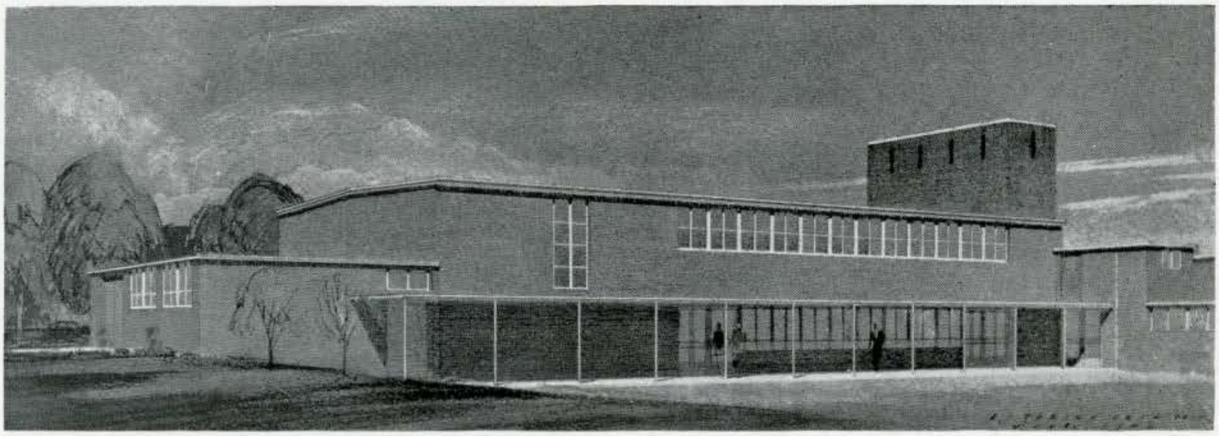
(Continued on page 443)

ENGLAND'S POSTWAR SCHOOLS

FEATURE MODERN ARCHITECTURE AND STANDARDIZED CONSTRUCTION

By **HOWARD VICARS LOBB, ARCHITECT, LONDON, ENGLAND**

First published in "The Nation's Schools"



A view in perspective of the south side of the Assembly Hall at Southbourne Garden School, South Ruislip, England.

THE British Education Act of 1944, together with the Amending Act of 1946, constitutes a major change in the British law relating to education.

The previous acts made from 1870 to 1921 provided a system of state sponsored elementary schools for children between the ages of 5 and 14. Parents had no legal obligation except to see that their children received instruction in reading, writing and arithmetic.

The duty of a local education authority was to provide schools in which such instruction was given. The authority was also empowered to provide secondary education for a limited number of pupils and further education in technical fields, art and commerce. The exercise of these powers differed greatly in extent among districts and there was no uniformity of practice.

As a result, the chances of children having the advantage of a secondary education or further education were very unequal and varied from district to district. It is true, of course, that secondary or further education could be obtained by the payment of a fee but this made a child's opportunity for education dependent upon the capacity of the parents' purse.

The war, possibly more than anything else, emphasized the fact that in order to make the best possible use of everyone within the limits of his or her capacity, a national system of education was needed whereby every child, whatever the parents' resources and wherever the child might live, could have the education which his natural abilities warranted. Instructing the general body of the population in the three R's and then relying upon a relatively few people who had higher education were no longer deemed sufficient.

The 1944 act aims at ensuring a national system of education for everyone at all stages and in all places. The legal school-leaving age has been raised from 14 to 15 years as of April 1, 1947, and will be further raised to 16 years at a date to be decided later by the Minister of Education.

Instead of the two broad divisions of elementary education for the majority and secondary education for the few, the whole educational system is now divided into three main stages dependent upon age as follows:

1. The primary stage, for children up to the age of 12.
2. The secondary stage, for boys and girls from 12 to about 16.
3. Further education, a post full time school education.

Included in the primary stage are nursery education (up to 5 years, which is optional), infant education (5 to 7 years) and junior education (7 to 12 years).

The primary stage is intended to equip the child with the means of learning so that he will be fitted to enter the secondary stage, at which time his particular bent, whether it be academic or technical or more generally inclined, will be given a chance to develop and he will have a proper balance of other activities. This will mean the provision of different courses within the secondary school as circumstances decide.

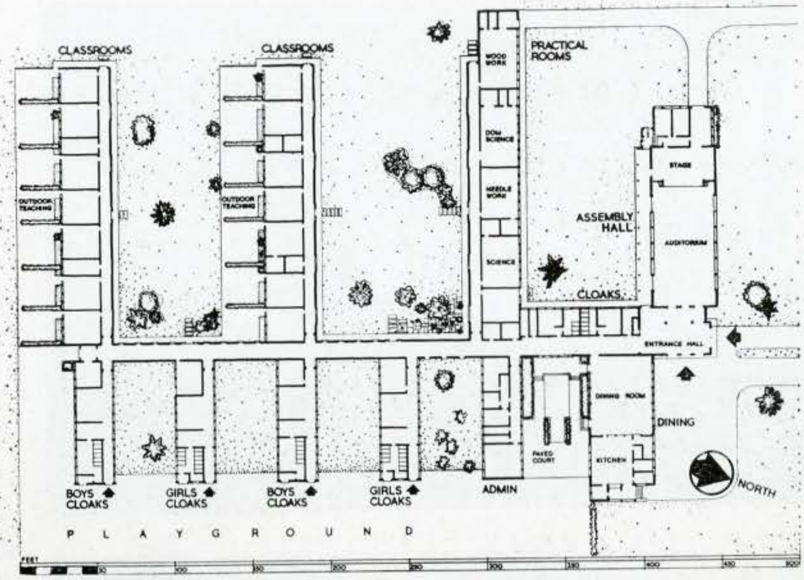
Further education provides that under post full time school study it will be compulsory for all boys and girls upon completing the secondary stage to attend a county college at least one day a week, or its equivalent, up to the age of 18. Provision is made for financial aid for advanced education in suitable cases and for the further voluntary education of those who require it. The education act covers, in effect, education from the nursery to the university.

More Services Provided

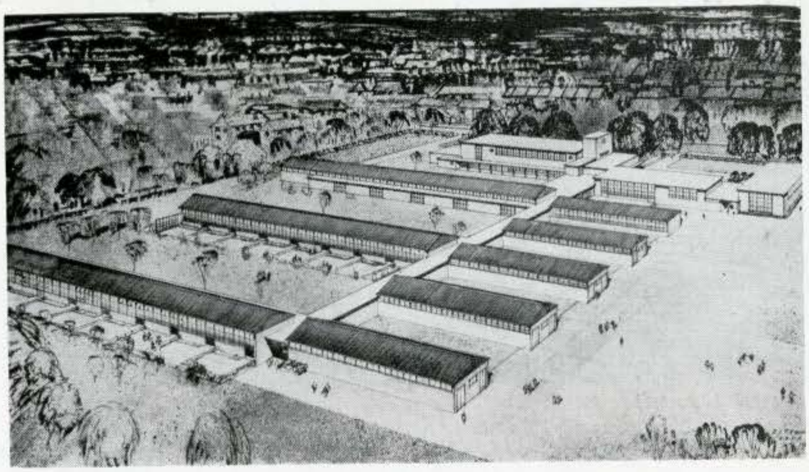
Other provisions are made for boarding schools, for full medical service which covers the special requirements for the handicapped, school meal service and free or assisted transport under certain circumstances.

I have not attempted to enumerate all the measures of the act but have tried only to give some idea of the changes which are taking place in British education.

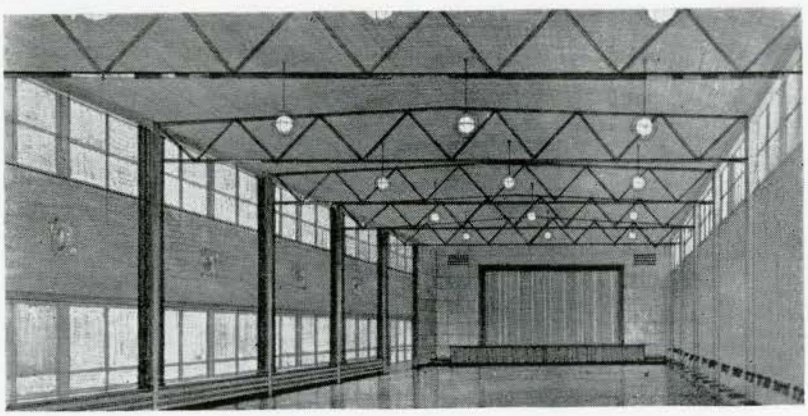
The ultimate aim of education must be the cultivation of the art of living. Teaching, improved standards for school buildings, hygiene and physical welfare are not in themselves sufficient for the attainment of this goal. Education for living must provide for the social, cultural and esthetic needs of the individual and it is here that environment plays a vital part.



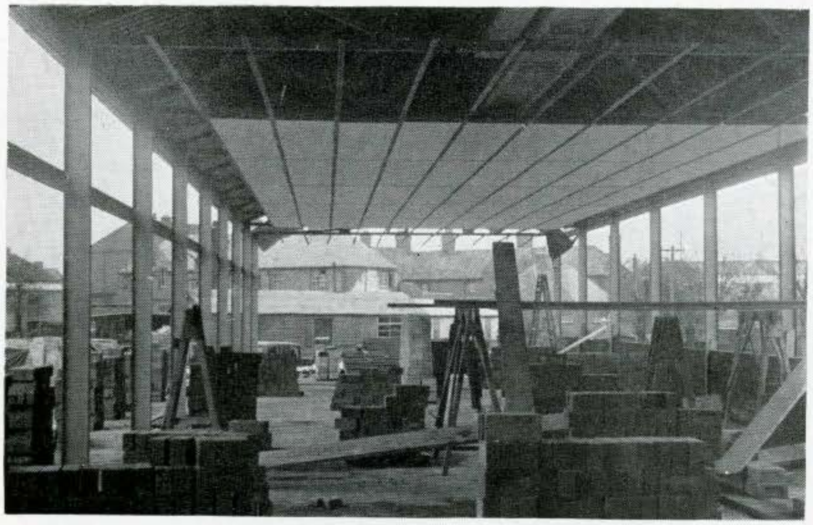
Floor plan of the senior school at Southbourne Gardens, South Ruislip, England.



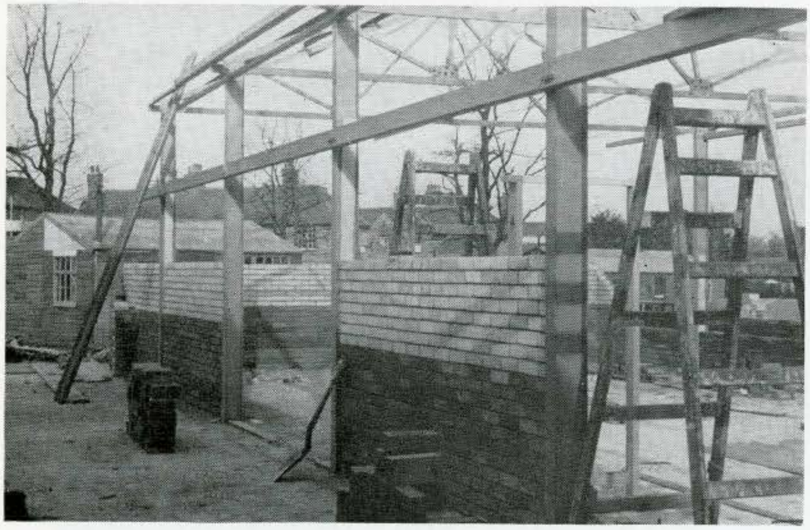
Architect's perspective of the senior school at Southbourne Gardens, South Ruislip, England.



Interior of the assembly hall showing how the roof is supported on lightweight steel trusses. The stage is fully equipped for dramatics.



As soon as the steel work is erected the roof is completed so that work may be continued under cover. The corridors are roofed with inverted steel tees into which are dropped 2 inch thick wood-wool slabs. These are covered with 1½ inches of reinforced concrete.



Both exterior and interior walls are finished with special facing bricks which make any further work of finishing or decoration unnecessary. The outer walls are 11 inch cavity and inner walls 4½ inch. Floors are mastic asphalt. Ceilings are of fibre board.

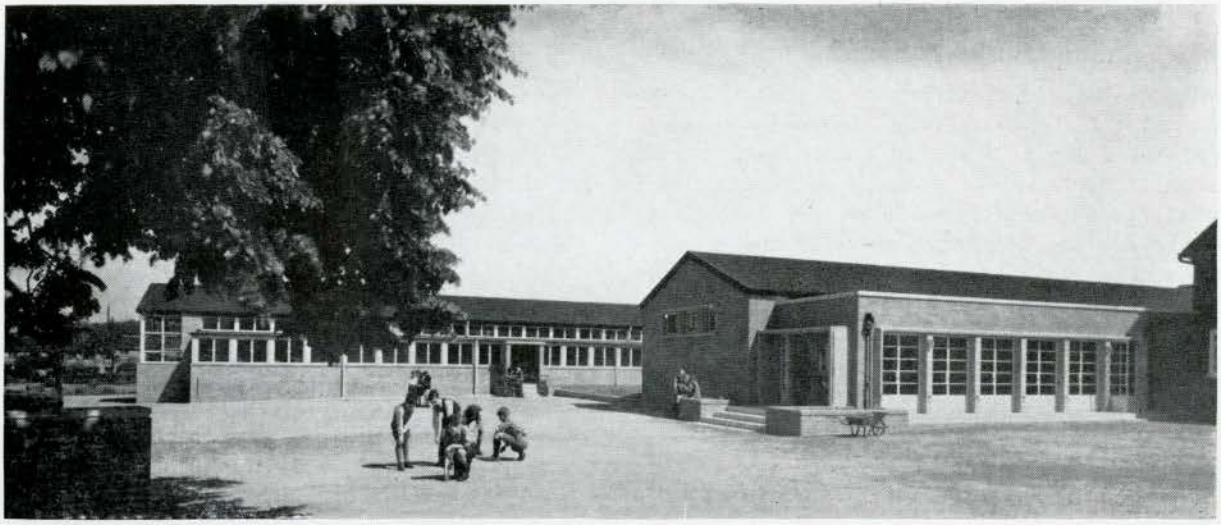
Better Architecture

Certain universities, public schools and older schools in England, by virtue of their early establishment, are fortunate in their architecture.

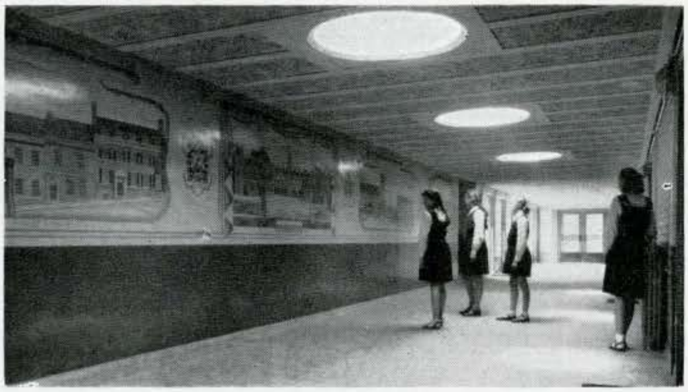
The pseudo-Gothic schools of the 19th century and after them those soulless institutions which followed the Education Act of 1870, inhuman in their disregard of everything except standards of accommodation and sanitation, are hardly centres of culture. Between the wars some not unsuccessful attempts were made to improve the architectural standards of school building and it is to be hoped that the chance for further improvement provided by the enormous number of schools necessary under the present act will not be thrown away. Although standards of accommodation, sanitation and heating had existed under the regulations of previous acts, their implementation, except in the case of new buildings, had been slow and haphazard. Even to-day some 633 buildings which were included in the black list of 1925 are still in use as schools. There is, therefore, much progress to be made if the regulations prescribing standards for school premises of 1945 are to be properly carried out.

Some idea of the magnitude of the task ahead can be gained from the fact that, in order to raise the school-leaving age from 14 to 15 years, 13,000 additional teachers and accommodations for an additional 390,000 children were required by April 1, 1947, and the buildings needed were estimated to cost 150,000,000 sterling.

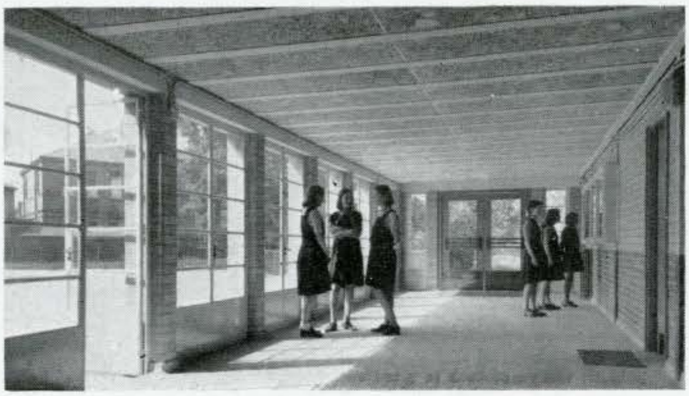
Provision of the necessary accommodations is a problem of great complexity. School building ceased during the war and with it the normal replacement of obsolete facilities. This fact and the losses caused by bombing have resulted in gross overcrowding of existing accommodations. With the present acute shortage of manpower and materials, school building has been obliged to give way to the more urgent needs of housing.



The new classroom wing at St. Audrey's School at Hatfield in Hertfordshire. Note the neat, trim appearance produced by the ultra modern architectural design worked out within the bounds of economical standardization of construction.



The main corridor which serves as the foyer to the assembly hall. It is decorated with murals depicting historic Hatfield.



Wood-wool slabs between steel "tees" acts as permanent formwork to concrete roofs. They are also sound absorbent, controlling noise.

The Problem of Postwar Construction

That this was likely to be so was, to some extent, foreseen in 1942 when officials of the board of education and H. M. Office of Works assisted by representatives of the Royal Institute of British Architects set to work to examine the problem of planning and erecting postwar school buildings. As a result of their findings and recommendations, a special committee was appointed in 1943 by the president of the Board of Education whose terms of reference were: "with a view to facilitating the planning and erection of school buildings after the war, to consider the possibilities of applying some measure of standardized construction to schools and to make recommendations as to their planning and layout."

The problem was resolved into two main categories as follows:

1. To conceive of a school as a connected structural whole to which any dimensional factors adopted can be applied throughout.

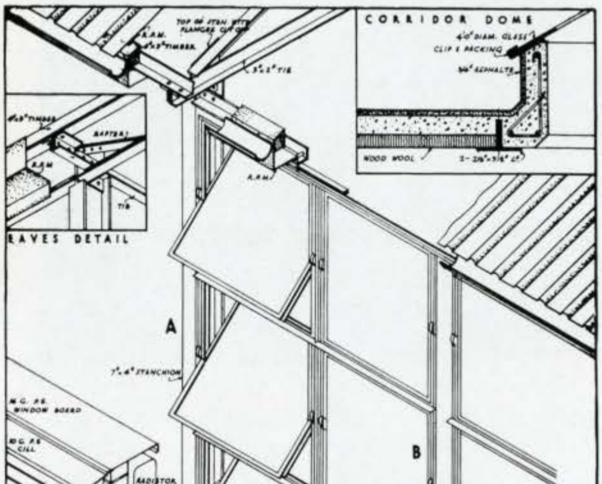
2. To conceive of a school as a group of separate plan units which may be left unconnected or connected by in situ work as desired.

The findings of the committee, which were published under a Ministry of Works Postwar Building Study No. 2, 1944, were briefly, that standardization of either category was possible and would be advantageous. The committee pointed out that procedure in obtaining sites and placing building contracts would need to be speeded up as the average time taken from the start of planning to school opening was 3¼ years.

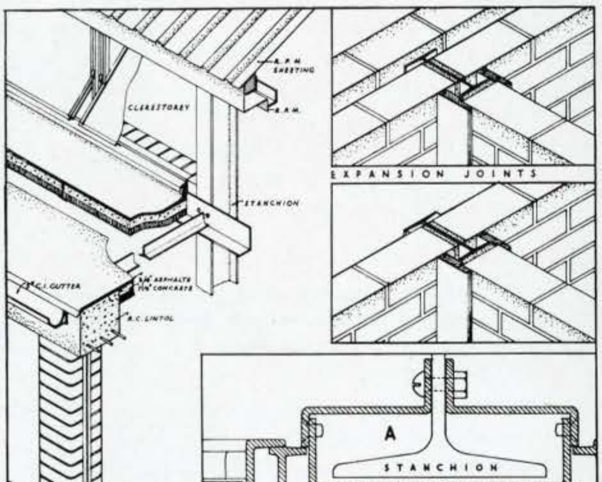
No Substandard Schools to be Tolerated

At the end of the war, conditions for building were even worse than had been anticipated and the suggestion was made that army hutments and similar temporary structures be used to provide the accommodations needed. This was strongly opposed by the Royal Institute of British Architects on the grounds that the accommodations would be seriously substandard and that in using them the object of the education act would be interminably delayed, if not defeated.

The school design and construction committee of the institute made counter proposals and recommended a system of construction which, it argued, required



Sectional isometic drawing showing general construction of steel frame, eaves and foundations. Steel window boards act as radiator shelves. Top inset: section of curb to glass dome corridor lights.



Construction details, showing at left a section of main frame and wall. Top inset: Expansion joints made of strips of fibreboard. Centre: "A" mullion trim at stanchions; "B" without stanchions. Bottom inset: detail of the clerestory sill.

only a few more man hours than did the provision of equivalent accommodation in the hutments. The facts given by the committee were based upon St. Audrey's School at Hatfield in Hertfordshire, then under construction.

This school was designed to replace a building wrecked by a flying bomb, of which only the assembly hall survived. Two other schools, designed by myself, which are being erected in Middlesex, are of interest in that they are examples of properly applied standardization of plan and construction and have overcome present difficulties that would have prevented their erection by traditional methods. The basis of the system of construction used is a steel framework of stanchions and trusses, standardized as to height and span to conform with the officially recommended classroom plus corridor sizes. After the frame is erected, the roof is covered with metal sheeting. Work then proceeds under cover; it is notable that at St. Audrey's not a single day was lost because of wet weather. The walls and partitions can be of any suitable material, either temporary or permanent, so that a temporarily finished building can be easily and cheaply changed to a permanent one later. The schools shown, being designed for permanency, have brick exteriors.

This system allows for rapid building. The work at St. Audrey's took approximately twenty weeks. Much of the labor, e.g. steelwork erectors, and materials used are not needed for housing. For instance, St. Audrey's School used slightly more than two standards of timber, which is approximately the amount allowed to-day in Great Britain for a single house.

In construction by this method, when the steelwork is erected and the roof is covered, a central permanent catwalk is fixed at truss level; this saves a considerable amount of scaffolding. The corridors are roofed with inverted steel trees into which are dropped 2-inch thick wood-wool slabs. These are covered with 1½ inches of concrete, reinforced with a fine steel mesh and surfaced with asphalt and a white spar trowelled in to reflect solar heat. The outer walls are 11-inch cavity and the inner, 4½ inch. The classroom floors are mastic asphalt and the corridors and steps of granolith. The ceilings are of fibreboard fixed to the steelwork.

The assembly hall at St. Audrey's was repaired but at the two Middlesex schools the buildings are entirely new. The halls have steel stanchions and light welded trusses, infilled with brickwork. The flat roofs are of concrete. Fluorescent lighting is used in the classrooms with a special mirror-backed unit above the blackboard. Blackboards are of three horizontally sliding leaves behind which, on the wall face, are an epidiascope screen in the centre, a cork facing for charts and maps on the right and another blackboard on the left. Each classroom has a matwell outside the door which reduces the amount of dirt carried in on shoes. The wood-wool ceilings of the corridors absorb corridor noise.

Site labor in construction is saved as much as possible, as for example by the use of prefabricated lavatory partitions of stove-enamelled sheet steel and of sheet steel window boards extended to form radiator shelves. The latter also keep children from knocking against open hopper lights.

All three schools are heated by low temperature, hot water radiators with gas fired boilers, the gas supply being controlled by a clock and by inside and outside thermostats. The clock switches on the gas at 7:30 a.m. and turns it off at 3:00 p.m., except on Saturdays and Sundays. The system used was selected after a careful comparison of different fuels and costs of installation.

It will be generally agreed, no doubt, that this form of construction, while solving the immediate problem of building schools quickly and in a permanent form, has some draw-backs. As materials and labour become more generally available and the housing programme, with its heavy call upon craftsmen, is reduced, more permanent buildings will be forthcoming.

The experimental schools described have been studied with great interest by a number of educators, architects and engineers both in England and in the United States.

☆ ☆

THE DESIGN OF MASONRY MORTARS

(Continued from page 437)

mortar must have a high degree of workability, combining both mobility and cohesiveness. Second, it must have a water retaining capacity which is suited to the characteristics of the brick with which it is to be used. Third, the properties of the mortar itself such as shrinkage, bond strength, absorption and permeability, strength, solubility and durability should be controlled by the design of the mortar mix with a well graded sand and the proper proportions of cement and lime or similar material. Fourth, the water content of the mortar should be reduced to a minimum and the full effectiveness of the cement realized by the addition of a cement dispersing agent with which it is usually desirable to include a stearate to impart a certain degree of water repellency.

The practical aspects of modern construction including speed required, availability of materials and the quality of workmanship available make it essential in order to secure satisfactory structures to provide a mortar which is inherently of the highest quality and which is suitable for the type of brick used.

ROYAL ARCHITECTURAL INSTITUTE OF CANADA

OFFICERS

COUNCIL

EDITORIAL BOARD REPRESENTATIVES

INCORPORATED BY THE DOMINION PARLIAMENT 16th JUNE, 1908, 1st APRIL, 1912, AND 14th JUNE, 1929

NEWS FROM THE INSTITUTE

THE FORTY-FIRST ANNUAL ASSEMBLY

Date: Monday, Tuesday and Wednesday, February 23rd, 24th and 25th, 1948.

Place: Chateau Laurier, Ottawa, Canada.

Meetings: On Monday, February 23rd, there will be Pre-Assembly meetings of the Editorial Board, the Architectural Training Committee, the 1947 Council, and a business meeting of the College of Fellows. The Business Sessions of the Assembly will be held on the mornings of Tuesday and Wednesday, February 24th and 25th, and the afternoons of these days will be devoted to seminars on topics of general interest, with free discussion from the floor. The Convocation of the College of Fellows and Installation Ceremonies will be held on Tuesday, February 24th, after the seminar.

Functions: The Ottawa Chapter, acting as host for their parent body The Ontario Association of Architects, extends a most cordial invitation to brother architects to the informal dinner and entertainment on Tuesday evening, February 24th. The Chapter has resurrected Thespian talent long dormant, and promises an evening memorable, if not educational.

The President's Reception and the Annual Dinner of the Institute will be held in the Quebec Suite of the Chateau Laurier on Wednesday evening, February 25th. On this occasion, the certificates will be presented to the newly elected Fellows, and the announcement of the new Officers of the Institute will be made.

Reservations: A block of rooms is being held at the Chateau for delegates attending the Assembly. **The Institute has been advised by the hotel that these rooms can only be held until the morning of Monday, February 23rd. All delegates and members are therefore urged to plan to arrive in Ottawa on the Sunday prior to the Assembly, or, at the latest, on the morning of Monday, February 23rd.**

Train and hotel reservations can be made through the Secretary of the R.A.I.C. prior to January 24th, 1948. Applications for reservations should be forwarded as soon as possible, in order that the necessary arrangements can be made for transportation and for the allotment of rooms at the Chateau. In making application, members will please indicate the date they wish to travel, the type of rail accommodation required, and whether their wives will accompany them.

ALBERTA

A letter written by Mr. A. J. C. Paine about a small house programme proposed by the Central Mortgage and Housing Corporation, and circulated to the provincial associations, contains some very sensible reflections which should clear away some of the fog that beshrouds the question of small house building. The small house is simply a space enclosed by walls and a roof, within which the necessary partitions and floors may be arranged in a variety of ways which barely affect the cost. The smaller the house, the higher will be its cost per cubic foot because the cost of the required engineering services cannot be reduced in proportion to the cubic content. Architects can arrange the partitions, doors and windows and lay out the kitchen more skilfully than others can. They are accustomed to exercise their thought daily on such matters. It is part of their routine work to show these things by means of specially drawn explanatory plans. Such plans prepared previous to the start of building greatly facilitate the operation of building and save money not only in the ordering of the necessary materials but also in avoiding adjustments in the course of building. Beyond this there is little that may be termed architecture in the exterior of the small house. In twenty similar houses twenty different occupants may live their lives and express their personalities in twenty different ways.

In the construction of walls and roofs a number of variations are practicable without appreciable variation of cost. The varieties provide some trouble to designers. We have no accepted method of building and finishing, and we have experimental methods thrust at us from various directions. Some people are for siding, some for stucco, some for shingles, or what not. Some wish high pitched roofs, some low pitched, gabled or ungabled. Others will have nothing but flat, invisible roofs. Some are for large window panes, others for small ones. Some must have glass brick porches. To others these are the abomination to be avoided. Some want to look smart and modern. Others will have nothing of that sort, preferring traditional forms without pertness but with the simple beauty that tradition has developed. If each is to get what he asks for we must reconcile ourselves to the picturesqueness of the irregular, which is rather apt to become an unholy mess.

Articles often appear reviling architects because they have not devised a method of producing houses on an assembly line as mechanical engineers have done with motor cars. In spite of Corbusier, houses are not "machines to live in." They are environments for the mind and body to develop in. Reduction in cost of production of the essential elements of a house is not within the architect's control. It belongs to the sphere of manufacture and commerce. Some of Mr. Paine's conclusions are well worth noting:

"It seems most logical to expect that building will be carried on in the way in which we are all accustomed during the next few years. In small house building in particular the standard outside wall construction with all of its different materials applied separately is cheaper in clapboard, sheeting, studding, insulation and inside finish than any other method of producing a structural wall, insulated and finished on both sides, now known to us.

"Savings are usually the result of producing a group of houses rather than a single house, and of cutting to dimensions and doing unit fabrication off the site."

The best hope both for improving the artistic quality of housing and of effecting economy is the designing of houses in considerable groups properly related to community needs. Each of such groups should be designed and superintended by one architect and built by one contractor as one operation. In this way one may hope for some general harmony of appearance and some reduction in expense, with at the same time some improvement in the conditions of life. Such a method admits of a sufficient variety of appearance and of accommodation. It would probably include a certain amount of repetition of plan. One specification would cover nearly the whole. The architect's remuneration may be reduced only on that account, and he should be paid for the general lay-out as a separate item. An architect would no doubt wish to expend some small amount on obtaining some charm of appearance, that "little more which is so much." This ought not to be considered needless expense. It is as much a necessity as bodily shelter. It is much more essential than many of the luxuries that are looked on as necessities.

Cecil S. Burgess

ONTARIO

Following the path of duty which leads into many towns and cities of this province, we are provided with some opportunities for observations in matters of construction. Being foremost in our interest, this trade affords us much in the way of speculation and dismay. The backlog is heavy and the prospect should be tinted with a glow of optimism. The performance, however, is a chain of bitter disappointments. Rising prices and labour unrest—more rising prices and still more labour unrest. When and where will it end? The industrial and home builders alike find it difficult to obtain tenders for straight contracts, and who can blame the contractors while this season of instability exists. There is still a great shortage of materials. Bricks, cement, nails, plumbing fixtures, cast iron fittings, etc., are found by extreme favour or priority alone.

Of the smaller, but rising cities, a recent visit to the expanding town of Sarnia was intriguing. In the news during war years from its Polymer Plant construction, Sarnia seems determined to remain in the news. Next door to the extensive acreage of the Polymer Rubber Plant and the Imperial Oil Refinery Plants, the public interest is now being engaged in the construction activities centred around a new enterprise. This is an enormous branch of an American chemical manufacturing company. The Austin Construction Company, with its parent company in Cleveland, Ohio, is spending some millions, it is said, for this company. At the present stage the work being done is roadwork, grading and subgrade work such as sewers and drainage. Special bus services are engaged, extending as far as thirty miles into the surrounding country to pick up labour which, judging by the length of the queue at the time office, must run into several hundreds.

The writer was unable to gather much information as to the exact extent and nature of the proposed plant, as some contractors have forgotten that the war is over, and are fencing their project against the public and planting uniformed guards at the main exits, and will issue few passes. However, the distant clouds of dust stirred up by bulldozers and laternedus were sufficiently expressive.

Sarnia owes much of its charm to the fact that it is the southern terminus of the celebrated blue water highway, which hugs the coastline of Lake Huron from Southampton to the mouth of the St. Clair River, through which pass the endless succession of lake boats on their way to and from Fort William and the Soo, not to mention the tunnel and the beautiful blue water highway bridge. Enthusiasm for Sarnia has run me off the main topic, which should be construction activities in the provinces. Well, they are pretty much the same as in Toronto—mostly provincial and county or government aided projects such as schools, hospitals, and housing developments. In the northern sections at Lake Superior, large power pulp mill property, and company township developments, the most recent being Terrace Bay and Marathon. Housing of medium and small type is proceeding steadily at a somewhat low average in most locations, the quality of design, in planning and appearance, is uniformly good.

In the lesser towns there is increasing activity in theatre construction, some church, mostly additions to existing churches, and one might add that along every highway there is much expansion in gasoline distribution stations. Highways, for the most part, are fair, and in some cases very good.

R. H. Collinge

ONTARIO ASSOCIATION OF ARCHITECTS 1948 CONVENTION AND ANNUAL MEETING

It is anticipated that there will be a large attendance at the 1948 Convention and Annual Meeting of the Ontario Association of Architects, which is being held at the Royal York Hotel on Friday and Saturday, January 23rd and 24th.

Stress is being laid this year on the participation of *all* the Ontario Chapters of the Association. With this in mind it was decided to run the Convention for two full days, thereby giving out-of-town members an opportunity to visit new projects in the Toronto area in which they may be interested.

The Exhibition of New Building Materials and Equipment was found to be extremely interesting last year but most members felt that there was insufficient time available to derive full benefit from it. The Exhibition this year will be twice as large and, of course, brought up to date. It will be on view for the full two days.

A detailed programme will be issued to the members in due course. The following highlights are noted:

FRIDAY: Exhibition of New Building Materials and equipment; Tour of Building Trades School, Training and Re-establishment Institute; Tour of Sunnybrook Hospital; Movies relating to Construction Industry; Exhibition of Students' Work; Entertainment.

SATURDAY: Exhibition of New Building Materials; Business Session; Panel discussions led by prominent professional specialists; Cocktail party; Annual dinner; Entertainment.

BOOK REVIEW

HOMES

Selected by the editors of Progressive Architecture
By Thomes H. Creighton, Frank G. Lopez, Charles Magruder, George A. Sanderson. Drawings by Elmer A. Bennett.
Published by Reinhold Publishing Corporation, 330 West 42nd St., New York. Price $5.00.

To those four excellent books, which of recent years have defined contemporary American residential architecture (Modern House in America, Design of Modern Interiors, Tomorrow's House, If You Want to Build a House), must be added this selection of homes, small, medium and large, by the editors of Progressive Architecture. These editor-authors, enjoying unusual opportunity to preview the best works of the foremost designers, have assembled houses which, to my mind (and based on visits to several examples), indicate the capacity of recent contemporary residences to display a friendly, livable, warm, intimate and successfully casual approach to living today. A capacity noticeably absent in many examples of the first and earliest of the four companion books. The houses are well photographed and accompanied by plans and crisp analysis of family site and construction.

"You will not find," say the editors, "any houses whose designs stem from the requirements of families who lived in preceding centuries. At the same time, you will not find any tricky or modernistic attempts to anticipate some imagined way of life, which may (or may not) be congenial to future generations." For myself, the outstanding significance of this collection of work is the evidence of a rapidly evolving indigenous architecture of our day designed quite free of affectation, quite prepared to forego extravagant glazing or flat roofs, quite prepared to use natural materials, but also quite unprepared to impose a historical style, an outmoded grammar of ornament. No solemn statement of stylistic trends derives from the work illustrated, but the examples show friendly, livable, personal and charming architecture—a trend of major significance.

In a book concerned primarily with the layman, the editors make a sensible and timely plea that "these are not houses to copy—their very charm lies in the fact that they are individual solutions to individual problems."

The book is logically subdivided into one bedroom, two bedroom, and three or more bedroom dwellings. Within each division, examples shown embrace a wide divergence of costs. This organization of content appears more appropriate than the usual geographic or alphabetic arrangement.

The book is a must on the shelves of those interested in American residential architecture today. A companion volume of contemporary residential details is required to supplement, with technical information for the professional, the design information this and the other volumes indicate. For the layman, Homes, by the Editors of Progressive Architecture, conveys the imagination, warmth and familiarity of recent modern residential architecture.

James A. Murray

OBITUARY

VICTOR D. HORSBURGH

We regret to announce the death at the age of 81 of Mr. Victor D. Horsburgh, F.R.I.B.A., M.R.A.I.C., at Victoria, B.C., where he lived during the last few years with his niece, Miss Elsie Loudon.

The son of a well-known Edinburgh Artist, he received his professional training in that city and obtained experience in the office of Sir Rowand Anderson and other leading Edinburgh and London Architects.

In 1907 he won the Silver Medal of the Royal Institute of British Architects.

Later, while engaged in private practice in Edinburgh, he was appointed Supervisory Architect of the Dominion Realty Company Limited, which is a property holding subsidiary of the Canadian Bank of Commerce.

Mr. Horsburgh occupied that position from the time of his arrival in Toronto in 1910 till his retirement in 1933, and during that period was responsible for the design and construction of a large number of bank buildings from Coast to Coast.

Mr. Horsburgh served on the Committee engaged in revision of the Toronto Building By-laws prior to the outbreak of World War II.

Mr. Horsburgh's outside interests were largely in Art and Music and he will be remembered by his associates as a kindly, courteous and scholarly gentleman.

James Nicoll

POLYMER CORPORATION

(Continued from page 423)

The plant is in fact 10 big "factories":

1. The Supersuspensoid Cracking Coil
2. The Light Ends Recovery Unit
3. The Isobutylene Extraction Unit
4. The Butylene Concentration Unit
5. The Butadiene Unit
6. The Styrene Unit
7. The GR-S Unit
9. The Steam and Power Plant
10. The Pumping Station.

In addition to those ten "factories", the plant boasts one of the most modern and best-equipped laboratories in the world. Unlike any other laboratory, it is able to carry out testing and experimenting in connection with GR-S, Butyl, butadiene, styrene and all ingredients of these highly complex substances. The laboratory, with a graduate librarian, boasts a library in which are kept thousands of scientific journals, books and papers. Also on the 130-acre property are two modern pilot plants, large modern warehouses, fully equipped machine shops, and administration building, first aid quarters, a fire hall, a laundry, a safety department, and a cafeteria.

To build this giant new industry at Sarnia, famous engineering firms and contractors employed a peak of 5,579 men and women at the site. In addition, tens of thousands of man-hours went into preparing blue prints and making the components such as girders, pipes, towers, motors, valves, and fabricated steel. Among the engineering firms employed were H. G. Acres & Company, E. B. Badger & Sons Company, Blaw-Knox Company, M. W. Kellogg Company, Stone and Webster Engineering Corporation, J. Gordon Turnbull Company, and the contractors were Anglin-Norcross (Ontario) Limited, Canadian Kellogg Company Limited, Carter-Halls-Aldinger Company Limited, Pigott Construction Company Limited.

The clay soil of the Polymer property was at once the bane and the boon of the construction man. Following a 1942-3 winter of extraordinary snows, the spring thaw covered the plateau with scores of ponds and small streams, all of which had to be constantly drained to permit below-ground work. As the clay was removed from the diggings it was taken to the south end of the property and piled into a 25-foot hill measuring 500 feet by 200 feet and containing 125,000 tons. By the early fall of 1943, some of this clay was being used to landscape the grounds. By the early spring of 1944 all of it had disappeared.

From almost every quarter of the globe came the men and women working on the project. The engineers and technicians hailed from the four corners of this continent, from the British Isles, and as far away as Australia. The construction and operational men and women were mostly Canadians, including some 600 to 700 French Canadians, but many Americans, Poles, Czechoslovakians, Scandinavians, Englishmen, Irish, Scots, Russians and Italians lent a hand.

On June 10, 1942, the site was a tangled mass of second growth fir, pine, birch, poplar and underbrush. Before the day was over a score or more workmen had removed some of the tens of thousands of trees and stumps. By December, 1942, the work was speeding up and the payroll had jumped to 3,385. In July, 1943, the peak was reached with 5,579, of whom 150 were women employed in serving meals and cleaning the staff houses and other buildings. The whole project was in full-scale operation by April 20, 1944, and by July 22 of the same year the last of the original group of construction men had left the property.

Although the plant sprawls over the equivalent of 80 city blocks, only eight acres, or the equivalent of about three and a half city blocks are covered with permanent buildings. But connecting these buildings are six miles of sewers, five miles of roads, 125 miles of medium and large steam, petroleum and water pipes, and countless miles of smaller pipes, electric cables, telephone wires and robot control tubing. To carry the vast quantities of materials going into the project required approximately 9,000 freight cars, and to move these materials on the property and put them into position, approximately 40 tractors, 40 cranes and 120 trucks were in constant use. Into the whole job went an estimated 5,000,000 bricks, 102,700 cubic yards of concrete, 17,500,000 board feet of lumber, 4,000 tons of reinforcing steel, 156,000 cubic yards of crushed stone, 25,000 medium and large valves, and hundreds of thousands of nails, bolts, screws, nuts, and other items.

☆ ☆

CONTRIBUTOR TO THIS ISSUE

Lane Knight, Vice-President and General Manager of the Master Builders Company Limited, Toronto. Educated in Canada and the United States, Mr. Knight is an active member of the American Concrete Institute. For the past twelve years he has been engaged in the manufacture and field development of cement dispersing agents and application to concrete and masonry mortars.

JOURNAL

ROYAL ARCHITECTURAL INSTITUTE OF CANADA

INDEX

VOLUME 24, 1947

Month and Page

An Approach to Canadian Theatre Design, Eric W. Hounsom ... Apr. p. 113
Architect and Mass Produced Housing, The, D. C. Simpson Mar. p. 67
Architect and the Interior Decorator, The, H. L. Deacon ... Aug. p. 264
Architectural Education, Shelagh Rounthwaite ... May p. 151

Book Review, Good and Bad Manners in Architecture, Jack Ryrie ... Aug. p. 291
,, ,, Homes, James A. Murray ... Dec. p. 447
,, ,, Neighbourhood Unit Plan, The, Jas. A. Murray ... Nov. p. 419
,, ,, Old Architecture of Quebec, A. S. Mathers Sept. p. 335
,, ,, Specifications and Costs, Data Book for Civil Engineers, Geo. H. Piersol ... Aug. p. 290
,, ,, Trees for Town and Country, E. R. Arthur ... Nov. p. 419
,, ,, Your City Tomorrow, Anthony Adamson ... Aug. p. 290
Builders and Doers, Walter Dorwin Teague ... Jan. p. 3
Building Programme of the Public Library in Relation to its Functions, The, Anne Hume ... Feb. p. 42
Building Research Station, The, William Allen ... Jan. p. 24

Canadian Arts Council and Unesco, The, Herman Voaden ... Apr. p. 132
Canadian Designer's Picture, The, Part 1, T. E. Matthews ... July p. 240
Canadian Designer's Picture, The, Part 2, Clair Stewart ... July p. 248
Canadian Electrical Code, The, W. R. McCaffrey ... Aug. p. 291
Canadian Industrialist's Picture, Charles L. Moffat ... July p. 250
Canadian Picture, The, Donald W. Buchanan ... July p. 234
Central Library of Architectural Photographs at the National Film Board, Ottawa ... Aug. p. 293
Children's Library, The, Lillian H. Smith ... Feb. p. 56
Contemporary Domestic Architecture in British Columbia, C. E. Pratt ... June p. 179

Design and Transportation, Richard E. Bolton ... Nov. p. 385
Design in Industry Issue ... July
Design of Masonry Mortars, Lane Knight ... Dec. p. 436
Design of Residential Interiors, The, W. A. Salter ... Aug. p. 261
Domestic Architecture in British Columbia ... June

Editorial ... Feb. p. 34; Mar. p. 66; Apr. p. 106; June p. 178; July p. 222; Aug. p. 260; Sept. p. 296; Oct. p. 336; Nov. p. 384
Editorial, Charles David, President ... Jan. p. 2
Editorial, John Bland ... May p. 144
Editorial, F. Bruce Brown, Chairman, Editorial Board ... Dec. p. 420
England's Postwar Schools Feature Modern Architecture and Standardized Construction, Howard Vicars Lobb ... Dec. p. 438

Flexible Plan for Rural Schools, A, R. A. D. Berwick ... Oct. p. 354
Foreword, Freda F. Waldon ... Feb. p. 35
Fortieth Annual Assembly of the R.A.I.C. ... Mar. p. 71
Fourth Dimensional Planning, A Fantastic Phantasy, H. Williams ... May p. 150

How I Approach the Use of Colour, Freda G. James ... Aug. p. 280

In Defense of Ornament, G. Haydn Huntley ... Aug. p. 282
Index to Volume 24 ... Dec. p. 449

Month and Page

Institute Page, The ... Jan. p. 27; Feb. p. 61; Mar. p. 101; Apr. p. 137; May p. 171; June p. 214; July p. 254; Aug. p. 287; Sept. p. 330; Oct. p. 377; Nov. p. 414; Dec. p. 444

Letter to the Editor, J. W. Rengelink ... Apr. p. 118
Libraries for Today, E. S. Robinson ... Feb. p. 59
Library Issue ... February

Mathematical Basis in Greek Design, Bryant Fryer ... Oct. p. 368
Modern School Buildings, R. S. Wilshere ... Oct. p. 337

New Towns—An Approach to Urban Reconstruction, H. Peter Oberlander ... June p. 193
Notes from a Neighbour ... Aug. p. 265

Obituary, F. Merrill Cameron ... June p. 219
,, Charles Coxall ... Apr. p. 143
,, Jay Isadore English ... Sept. p. 334
,, Victor D. Horsburgh ... Dec. p. 447
,, Hugh G. Jones ... June p. 220
,, Edwin A. H. Menges ... Sept. p. 334
,, Wilfrid Truman Shaver ... Aug. p. 292
,, Stinson Kennedy Sinclair ... June p. 220
,, Wilfred F. Smith ... Aug. p. 292
,, Hugh Vallance ... Apr. p. 143
,, William Palmer Witton ... July p. 258
Ontario Association of Architects 1948 Convention and Annual Meeting ... Dec. p. 449

Partnerships, W. L. Somerville, Jr. ... May p. 175
"Pifflications" ... Mar. p. 82
Pilkington Glass Annual Travelling Scholarship ... Sept. p. 335
Polymer Corporation ... Dec. p. 421
Prize Winning Designs ... Jan. p. 7
Programme for the R.A.I.C. Annual Assembly ... Jan. p. 22

Railway Stations in Italy, E. G. Faludi ... Nov. p. 406
Rapid Transit in Toronto, A. G. Keith ... Nov. p. 391
Rapid Transit in Toronto, W. H. Paterson ... Nov. p. 389
Report of the First National Conference of the Community Planning Association of Canada, Anthony Adamson ... Nov. p. 417
Report of the Judges, Canadian Small House Competition ... Jan. p. 6
Residential Interiors Issue ... August

School Issue ... May
Schools Issue ... October
Shipshaw No. 2 Power Development 1941-1943, J. C. Meadowcroft ... Dec. p. 430
Smaller Public Library Building, The, Arthur H. Eadie ... Feb. p. 39
Social Aspects of Town Planning, H. Fliess ... May p. 165
Some Principles of Library Design, R. D. Hilton Smith ... Feb. p. 36
Student Centre on McGill Campus, A, Report on Final Design, Ala Mendelsohn ... May p. 160

Theatre Design, Raymond Card ... Apr. p. 107
Theatre Issue ... April