PROVINCE OF BRITISH COLUMBIA

Minister of Public Works

REPORT

FOR THE FISCAL YEAR

1966/67

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in right of the Province of British Columbia.
1968

To Major-General the Honourable GEORGE RANDOLPH PEARKES,
V.C., P.C., C.B., D.S.O., M.C., C.D.,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

Herewith I beg respectfully to submit the Annual Report of the Department of Public Works for the fiscal year ended March 31, 1967, in compliance with the provisions of the *Public Works Act.*

W. N. CHANT,
Minister of Public Works.

Office of the Minister of Public Works,
Parliament Buildings, December 30, 1967.

"When men are rightly occupied, their amusement grows out of their work."—*John Ruskin (1819–1900)*.

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" Be not the first by whom the new are tried,
Nor yet the last to lay the old aside."

—*Alexander Pope.*

REPORT OF THE DEPUTY MINISTER

The Honourable W. N. Chant,
Minister of Public Works,
Parliament Buildings, Victoria, B.C.

Sir,—I have the honour to submit for your consideration the Annual Report of the Department for the fiscal year ended March 31, 1967.

Elsewhere in this Report will be found those of the heads of divisions. These set out work accomplished and planned, tenders let and accepted, and Departmental accounts.

We have continued with efforts to combat rising construction costs. Full-scale estimating by two staff members has resulted in a much more thorough examination of components entering into construction. This method brings with it some re-design to implement advantageous changes brought to light. While some time is lost in so doing, the effect has been to hold costs down. The "package deal" is also under experimental study.

The modular concept of design is engaging our attention and gives promise of significant savings.

Production and reproduction of plans and specifications by automatic means has been entered into, and additional methods of reducing the time spent on this part of our work are being studied.

A great deal of our design time has been spent, in accordance with instructions, on mental health and vocational school facilities. However, the shortage of office space for Government purposes throughout the Province is bringing problems and will require attention.

I am pleased to be able to report that the continuing efforts of the Maintenance Division are resulting in Government buildings presenting a high standard of up-keep and appearance. Correspondence indicates that this has been noticed and is particularly appreciated in the smaller centres.

The Centennial celebrations of 1966–67 resulted in an unusual number of demands for service from our maintenance staff. They have responded well. The cheerful and loyal co-operation of all the staff has been of great value, and I would like to place on record my sincere thanks to them.

Yours respectfully,
A. E. WEBB,
Deputy Minister.

Victoria, B.C.

REPORT OF THE CHIEF ARCHITECT

The second Centennial Year rapidly draws to a close and reflection on the achievements of the past century inevitably breeds speculation about the next. It is tantalizing to imagine how a Public Works Report for the fiscal year 2066/67 would read.

The 19th Century fantasies of Verne and Wells appear almost pallid when measured against the predictions of today's nuclear and other scientists. In 50 years or less, fantasy has become reality: temperatures vastly greater than the sun, light that can pierce metal, the existence of anti-matter, and the rich commercial possibilities of nuclear fission. Who can gainsay any prediction about the next hundred years?

It occurred to the writer in 1921 that it would be a delightful time-saver if one could insert a drawing at eighth scale into a machine, press a button, and instantly receive the drawing enlarged to half-inch scale with added details. Fantasy in 1921 but fact in 1967, with a data plotter hooked up to a computer.

Two modest predictions related to the building industry are that materials and construction techniques will achieve a very high degree of sophistication. Materials will be infinitely more attractive and durable, thereby reducing maintenance costs to a fraction of what they are today. Construction and erection methods will be automated to a point where a costly building will be erected in a 10th of today's time.

There are, however, two sides to every coin.

Firstly, will the Department of Public Works be reduced to one, lone Civil Servant called, for example, " Director of Thinkplan "? Secondly, will his computer spew back tape with such a message as " $18,000 per square foot? Cut back to $15,575."

Ah! Plus ça change, plus que la même chose.

Work soberly undertaken by the Department of Public Works is set forth as follows:—

Category 1: Contracts let during the fiscal year 1966/67.
Category 2: Projects researched and planned during the same period.

CATEGORY 1

Thirty principal contracts were awarded, aggregating approximately $12,000,000; 46.6 per cent were designed for the Department of Health Services and Hospital Insurance, 30 per cent for the Department of Education, and 23.4 per cent classified as " general " projects.

Particulars of these contracts will be found at the end of the Public Works Report, but four projects of particular interest may be mentioned here.

1. *Victoria—Archives and Museum Complex.*—Two contracts were let for this Centennial project, totalling $3,844,615. These contracts were as follows:—

Phase 3B: Concrete retaining-walls and foundation work.
Phase 4: Completion of the Exhibit Building and related services.

2. *Burnaby—British Columbia Institute of Technology, New Wing.*—A contract for $3,329,000 was awarded for the construction of a new wing having a gross floor area of 164,000 square feet. This new wing will provide 20 new classrooms, 30 laboratories, and 4 lecture theatres, for a variety of technological disciplines.

3. *Burnaby—Vocational Teacher-training School.*—A contract in the amount of $1,207,837 was let for this new building. It will provide an administration wing, a classroom wing, and a shop wing, aggregating approximately 78,000 square feet.

4. *Burnaby—Residential Care Centre for Children.*—A contract was awarded for Phases 2 and 3 of this complex amounting to $759,500. This work comprised roads and outside services, and the construction of three residences, each of 6,500 square feet.

The Centre will provide, when completed, a seven-classroom school, an Activity Building housing administration offices, gymnasium, swimming-pool, and a food centre. This latter will cater for staff, out-patients (including the existing adjacent clinic), and for meals distributed to the residences.

CATEGORY 2

Approximately 63 projects were in various stages of planning during the fiscal year under review. Of these, 18 went out to tender during this period. Of the balance in the planning stage, 54 per cent were being designed for the Department of Education, 18 per cent for general purposes, 14 per cent for the Department of Health Services and Hospital Insurance, and 14 per cent for the Department of the Attorney-General.

Department of Education

Planning started on two new vocational-school projects.

1. *British Columbia Vocational School, Kamloops.*—This new establishment will comprise, basically, seven buildings:—

(*a*) A classroom, administration, and workshop building.
(*b*) A cafeteria.
(*c*) Central heating plant.
(*d*) Central stores and P.W.D. service building.
(*e*) A welding shed.
(*f*) A welding service building.
(*g*) An automotive service building.

2. *British Columbia Vocational School, Victoria.*—The first phase, as currently planned, comprised the following facilities:—

(*a*) A main L-shaped workshops building for welding, steel fabrication, auto body, automotive, diesel engines, small engines, plumbing, pipe-fitting, carpentry, and electrical.
(*b*) Central stores.
(*c*) Automotive service building.
(*d*) Welding service building.
(*e*) Welding shed.

Future planning will provide a cafeteria and a classroom-administration building.

3. *British Columbia Institute of Technology, Burnaby.*—(*a*) Classroom and Workshop Building (Electrical): Planning was completed for this building, and subsequently put into abeyance due to the urgency of obtaining rented space for immediate occupancy.

(*b*) Library: Facilities will comprise a library proper, lobby and exhibition area, and a curriculum wing. The total gross floor area will approximate 79,000 square feet.

(*c*) Mechanical Building: Planning was put in hand to enlarge this building to accommodate mechanical, forestry, and surveying technologies, as well as providing additional heating capacity.

(*d*) Food Training Centre and Cafeteria: With the enlarged student enrolment and the need for expanding the chef and food training programme, the building required additional space to be planned.

(*e*) Playing-fields: Hitherto no facilities existed for outdoor sports or recreation. It was considered highly desirable to plan a cinder running-track with a playing-field within, together with student activity building and changing-rooms.

4. *British Columbia Vocational School, Burnaby.*—Due to the transfer of the Administration Division, the area vacated in Buildings Nos. 13 and 14 were replanned for other purposes.

5. *British Columbia Vocational School, Terrace.*—(*a*) Planning was carried out on a building comprising automotive shops, heavy-duty mechanics, welding-shops, with adjacent classrooms.

(*b*) A cafeteria.

The latter project was planned due to the absence of similar facilities in reasonable proximity to the school.

6. *British Columbia Vocational School, Nanaimo.*—(*a*) An additional floor to the existing classroom block was planned.

(*b*) A workshop for heavy-duty mechanics, carpentry, and attendant classrooms was designed.

(*c*) A dormitory for women was planned.

7. *British Columbia Vocational School, Prince George.*—Planned as additions to the existing school were the following buildings:—

(*a*) A general-purpose workshop.

(*b*) Alterations and additions to the existing classroom block.

(*c*) Dormitories.

(*d*) A cafeteria.

(*e*) An addition to the mechanical plant.

8. *British Columbia Vocational School, Kelowna.*—A cafeteria has been designed for this school.

9. *British Columbia Vocational School, Nelson.*—To supplement existing facilities at this school, the following additional buildings were planned:—

(*a*) A general-purpose workshop.

(*b*) A cafeteria.

General

1. *Victoria—1019 Wharf Street.*—Remodelling of the lower floors of this building, formerly a Liquor Control Board warehouse, was commenced primarily to locate certain divisions of the Department of Recreation and Conservation.

2. *Vancouver—Centennial Terrace and Fountain.*—A description of this Centennial project may be found elsewhere in the Public Works Report.

3. *Victoria—Government House.*—Planning was put in hand for a conservatory on the west side of the House in order to be able to exhibit exotic plant material.

4. *Duncan—New Government Offices.*—Replanning of the office building took place in order to effect certain economies.

5. *Terrace Weigh-scale Station.*—Due to the additional volume of commercial traffic from the logging areas in the vicinity, it was necessary to plan a weigh-scale station at Terrace.

6. *Abbotsford—New Brooder-house.*—This large new brooder-house was designed to enable the Department of Agriculture to expand its facilities in the development of commercially promising poultry blood lines.

7. *Vancouver—Cassiar Street Laboratory.*—Additional facilities for the existing dairy laboratory were deemed necessary, and planning was started.

8. *Prince George—Public Works Depot.*—Due to the expansion in Zone 5, it was found necessary to plan a Public Works maintenance depot to serve the regional needs of the area Superintendent of Works.

9. *Victoria—B.C. Hydro Building.*—Plans were prepared for remodelling floors taken over for offices for the Department of Municipal Affairs.

10. *Kamloops—Mine Rescue Station.*—To replace existing obsolete facilities at Kamloops, planning was started for a new station.

11. *Cloverdale—Department of Highways Establishment.*—Preliminary planning was commenced for a new Highways facility at Cloverdale.

12. *Victoria—Archives and Museum Complex.*—Intensive planning continued on the redesign of various elements of the three buildings comprising the complex—the exhibit building, the archives building, and the curatorial block. Planning also proceeded on the design of the carillon tower to house the bells donated by the Dutch community.

13. *Williams Lake—Government Offices.*—All Government departments were canvassed by questionnaires relating to space requirements, and preliminary research and planning were instigated for this building, which will include courtroom facilities.

Department of Health Services and Hospital Insurance

1. *Victoria—Eric Martin Institute.*—Planning started on Phase 5 of this mental health facility located near the Royal Jubilee Hospital. This work comprised the concrete foundations for the future six-story building.

2. *Victoria—Glendale School.*—The first building to be erected on this site will be the laundry-heating plant building, and planning was started.

3. *Burnaby—Residential Care Centre for Children.*—Planning continued on this project, described earlier in this report.

4. *Riverview Hospital—Colony Farm Kitchen, Dining-rooms, Etc.*—In order to up-grade standards, extensive remodelling plans of the kitchens and patients' and staff dining-rooms were developed. This work will include recreational- and industrial-therapy areas.

5. *Tranquille School—Greaves Building.*—Due to conditions of poor ventilation, a new air-conditioning system was planned.

6. *Tranquille School—Laundry.*—Due to the extended facilities offered by the Sage Building, it was found necessary to plan an extension to the existing laundry to provide additional staff rooms, storage and work rooms, and new laundry equipment.

7. *Tranquille School—Covered Link.*—Plans were prepared for a covered way linking the new kitchen-dining block and the recreation hall. This was necessitated by the fact that there is considerable traffic between these two areas. The covered link will obviate continual dressing and undressing of patients during inclement weather.

8. *Tranquille School—Farm.*—Planning was started to replace the existing inadequate dairy-barn and equipment.

Similarly, drawings and specifications were put in hand with a view to complete remodelling and up-grading the large cow-barn.

Department of the Attorney-General

1. *Saltair, Vancouver Island—New Men's Gaol.*—Detailed planning continued on this project, which, when completed, will accommodate upwards of 224 prisoners and 75 staff.

2. *Hutda Lake—Men's Camp.*—Plans were completed for this camp located near Prince George. It was anticipated that prison labour would be available for a major portion of this work.

3. *Kamloops—Temporary Gaol.*—Some of the existing buildings left on the newly acquired D.N.D.A.D. site were remodelled into provisional gaol facilities pending the erection at a later date of a permanent gaol.

4. *Allco-Haney—Kitchen and Stores Building.*—To serve the needs of this expanding project, plans and specifications were prepared for adequate kitchen and storage facilities.

5. *Oakalla—Piggery-cooker.*—Plans and specifications were prepared for a new building to replace the existing operation at the prison farm.

6. *Lower Mainland Remand Centre.*—Exploratory meetings were held with officials of the Attorney-General's Department in order to draw up a programme for planning a remand centre for the Lower Mainland.

7. *Victoria—Motor-vehicle Testing-station.*—Plans were commenced for the first of what may be a chain of Government-operated testing-stations. The Victoria station will be located just off Quadra Street on McKenzie Avenue.

8. *Burnaby—Motor-vehicle Testing-station.*—A testing-station basically similar in design to the Victoria station, was planned for a site on Moscrop Avenue, Burnaby, south of the big British Columbia Institute of Technology complex.

GENERAL

During the fiscal year 1966/67, 30 projects for senior citizens' housing were reviewed on behalf of the Provincial Secretary's Department, with constructive criticisms offered on design and structural matters in order to ensure maximum efficiency from the standpoint of capital cost and maintenance.

Similarly, a review of plans was made for Lands Service for four projects—residences and fraternity houses to be erected on University Endowment Lands at the University of British Columbia.

In conclusion it is once again a pleasure to record the excellent co-operation received from the Capital Design staff, from the Division of Construction and Maintenance, and field personnel.

This same degree of co-operation from other Government departments has also been greatly appreciated.

W. R. H. Curtis, M.R.A.I.C., A.R.I.B.A., A.N.Z.I.A.,
Chief Architect.

" Practice is the best of all instructors."—*Publibius Syrius (Maxims).*

REPORT OF THE CONSTRUCTION AND MAINTENANCE ARCHITECT

MAINTENANCE AND BUILDING MANAGEMENT

During the 1966/67 fiscal year the volume of work reached a new peak, and we experienced considerable difficulty with our present labour force in performing essential maintenance. For the past five or six years, new buildings worth many millions of dollars have been accepted and have become an additional maintenance and operational responsibility of this Division.

It is with sincere regret that early in 1967 we learned of the death of Mr. W. J. Smith, Superintendent of Works, Zone No. 3, Kamloops. This event left a vacancy which has since been filled by the transfer of the Superintendent of Works from Prince George. The latter vacancy was then filled by competition.

Overcrowding in Government buildings has become an acute problem with the passage of time. This Division is continually working at solutions. In some instances, departments have been in unsuitable accommodation or have outgrown the space available. As alternative space is rarely available, it is often necessary to obtain rented premises. This Division has continued to participate in the inspection of proposed rentals, has prepared plans for the subdivision of space, and has ensured remodelling work is completed. We have also continued in our efforts to alleviate overcrowding by remodelling and renovating both old and new Government Buildings. However, we must now report that a point has been reached where, in the majority of instances, there is no extra space available. It appears a number of buildings will require additions.

Major projects designed and supervised by the headquarters component of the Division include the following:—

(1) *The Woodlands School, New Westminster.*—Phase I: Major renovation and remodelling of the centre building. Completion of this project will up-grade patient accommodation, and was undertaken in preference to the more costly alternative of replacement of this building by a new structure.

(2) *New Denver, Youth Centre.*—Renovation of the kitchen, recreation wing, and administrative offices was achieved by using a skilled works force under the direction of our Project Inspector.

(3) *Oakalla Prison Farm, Burnaby.*—Final phase of the alterations to the main kitchen included dish-washing and storage areas. As normal operations within the area could not be disturbed, a large portion of the work was carried out at night-time.

(4) *Port Hardy, Residences.*—Two prefabricated three-bedroom residences were constructed to provide residential accommodation for Public Health personnel.

(5) *Motor-vehicle Building and Data Process Centre, Victoria.*—Plans for extensive remodelling of the public areas were prepared and work implemented by the Superintendent of Works trades personnel.

(6) *British Columbia Vocational School, Nanaimo.*—Alterations to the automotive shop entrances and improvements to the welding area were made.

(7) The reconstruction of a portion of the hospital wing to provide a self-contained juvenile detention unit entailed the preparation of drawings and

specifications by the headquarters component. Construction work was carried out by the Superintendent of Works, Zone No. 2A, in collaboration with the Corrections Branch maintenance personnel.

(8) *Courthouse, New Westminster.*—Replacement of basic services, redecoration, and cleaning of deteriorated areas. Work was supervised by the Superintendent of the area and one of our Project Inspectors.

(9) *Forestry Offices, Superior Street, Victoria.*—Accommodation vacated by other departments was remodelled.

(10) *Courthouses and Offices.*—Terrace: New resilient floor covering was installed.

Fernie: New roof coverings and flashings were installed.

Kelowna: New roof coverings and flashings were installed.

Grand Forks: New roof coverings and flashings were installed.

Creston: Interior alterations to social welfare offices were carried out.

Kaslo: General renovations and redecoration of interior were done.

Nakusp: Renovations and redecoration of interior were done.

Cranbrook: General alterations and remodelling of storage areas were carried out.

Nelson: General alterations were made to permit better usage of available space.

In addition, the Division has supplied consultant services to the Liquor Control Board in respect of reroofing premises at Victoria and Quesnel, and also, at the request of the British Columbia Ferry Authority, help and advice were given in the matter of redecoration of its Victoria offices.

Accommodation layouts and interior designs were made in respect to 11 social welfare offices located throughout the Province.

The Mechanical Maintenance and Operations Section of this Division designed and prepared specifications for 20 projects in connection with alterations, renovations, and additions to mechanical services in buildings throughout the Province. In addition, the Operations and Maintenance Engineer was actively engaged throughout the year in modifying and up-grading older mechanical installations.

A sample of projects undertaken during the period include:—

(1) Additional air supply and exhaust ventilation systems, Highways Material Testing Laboratory, Burnaby.

(2) Phase I, Renovation to Steam Boiler Plant, The Woodlands School, New Westminster.

(3) Ventilation system to additional welding booths, Vocational School, Burnaby.

(4) Evaporative cooling system installation, Wards 2, 4, and 5, Home for the Aged, Kamloops.

(5) New heating plant and renewal of heating distribution system, Youth Centre, New Denver.

(6) Air-conditioning system for Computer Centre, B.C. Medical Services, Government Street, Victoria.

In conclusion, I would like to express my appreciation of the help and co-operation received from other departments of Government and from all design divisions of our own department.

CONSTRUCTION

The number of new buildings under construction during the fiscal period was in excess of previous years, and the Division was called upon to supply Project Inspectors. This applied to buildings designed by the Department, and also those where a consultant was retained.

Although senior members of the Division's headquarters staff have endeavoured to make periodic visits to building-sites, the volume of other work in connection with our maintenance and operations programme seriously curtailed the amount of time available for this task. I would respectfully suggest serious consideration should be given to establishing personnel on headquarters staff who would devote their whole time to co-ordinating this important phase of the Department's work.

Project Inspectors were engaged in supervising the following work under construction during this period:—

(1) Victoria: Museum and Archives Building.
(2) Terrace: Vocational School—classroom and administration building.
(3) Dawson Creek: Vocational School.
(4) Burnaby: Vocational School—conversion of old Trowel-trades buildings.
(5) Vancouver: Centennial Terrace, Courthouse.
(6) Victoria: Government House—conservatory.
(7) Victoria: Mental Health Centre, Lee Avenue.
(8) Vancouver: Bottling-line, Liquor Control Board.
(9) Tranquille: Hospital kitchen and dining facilities.
(10) Essondale: Riverside Hospital, Centre Lawn Building—kitchen and garbage-handling facilities.
(11) Burnaby: British Columbia Institute of Technology—addition.
(12) Burnaby: British Columbia Institute of Technology—teacher-training building.
(13) Burnaby: Child Care Centre.
(14) Vancouver: Willow Chest Centre—operating-room facilities.
(15) Victoria: Glendale School—Phase I.
(16) Victoria: B.C. Hydro Building—remodelling offices.

Major projects completed and accepted from the general contractors include the following:—

(1) Terrace: Vocational School—Phase I.
(2) Dawson Creek: Vocational School.
(3) Burnaby: Vocational School—new trowel-trades building.
(4) Vancouver: Centennial Terrace, Courthouse.
(5) Victoria: Government House—conservatory.
(6) Tranquille: Hospital—kitchen and dining-room.
(7) Essondale: Riverside Hospital, Centre Lawn Building—kitchen and dining-room.
(8) Vancouver: Willow Chest Clinic.
(9) Ruskin: Camp for women.
(10) Burnaby: Public Works Building—additions.
(11) Sundry minor works throughout the Province.

STANLEY LLOYD, M.R.A.I.C., A.R.I.B.A., DIP. PUB. ADMIN.,
Senior Construction and Maintenance Architect.

"A man builds a fine house, and now he has a master and a task for life. He is to furnish, watch, show it and keep it in repair the rest of his days."—*Ralph Waldo Emerson (1803–82).*

THE CARILLON OF BELLS, A CENTENNIAL GIFT FROM THE NETHERLANDS COMMUNITY

"I have loved the principle of beauty in all things, and if I had had time I would have made myself remembered."—*John Keats.*

One of the most interesting projects to be assigned to the Structural Division last year was to design the tower for the carillon of bells, a Centennial gift to the Province from the Netherlands community. Standing at the corner of Belleville and Government Streets, this imposing structure is a significant feature of the new archives and museum complex. It arouses the interest of both visitors and residents alike. Everyone in British Columbia should appreciate that they have one of the few "singing towers" in Canada. The carillon is composed of 49 bronze bells varying from the smallest of 6½ inches in diameter and weighing 20 pounds to the 44½-inch-diameter "bourdon" weighing 1,910 pounds. The mechanics of the carillon are designed so that normal playing is by means of an automatic roll-player. However, for special occasions the carillon is played using a manual keyboard called a clavier. It is only by manual playing that the full tonal quality of the bells can be realized, since the carillonneur can control the dynamic variation of the sound by varying the length of time the clapper is in contact with the bell.

The æsthetics of this tower were conceived by Mr. J. Wilkinson, the Department's staff artist, and Mr. J. Cochrane, the project architect for the archives and museum complex. The duty of the project structural engineer was to design a structure that would represent the artist's theme and be capable of withstanding such natural forces as wind, earthquake, and gravity. Basically, the tower is 12 long columns of similar geometric shape to those in the exhibit and archives buildings. These columns support the belfry at the top and, directly below, a room to house the clavier.

Geographically, Victoria is situated in an area of occasional high winds and potential earthquake activity. Therefore, structures in Victoria must be designed to withstand earthquake shocks. The mathematical analysis of any structure for earthquake loading is a difficult and time-consuming job. After the project engineer had completed the analysis and chosen the actual sizes for the members, the data were processed in an electronic computer for an independent check on the results. Since no serious errors manifested themselves, the design was approved and working drawings prepared.

Because of its durability to the elements and its ability to be cast into the intricate architectural shapes required, pre-cast concrete was the material chosen for the construction of the columns. Usually columns of this length would have been built in two pieces and joined during erection. However, for this project one-piece columns were specified, thus avoiding the technical difficulties of making and hiding a splice joint. To withstand the lateral loads and to prevent cracking of the units during erection, each column was put under a permanent compressive stress when being built. In order to put this stress into the columns, high-strength steel wires were stretched between two supports while the concrete was being poured. After the concrete had set, the ends of the wires were cut, and, as they returned to their original length, they squeezed the concrete into compression.

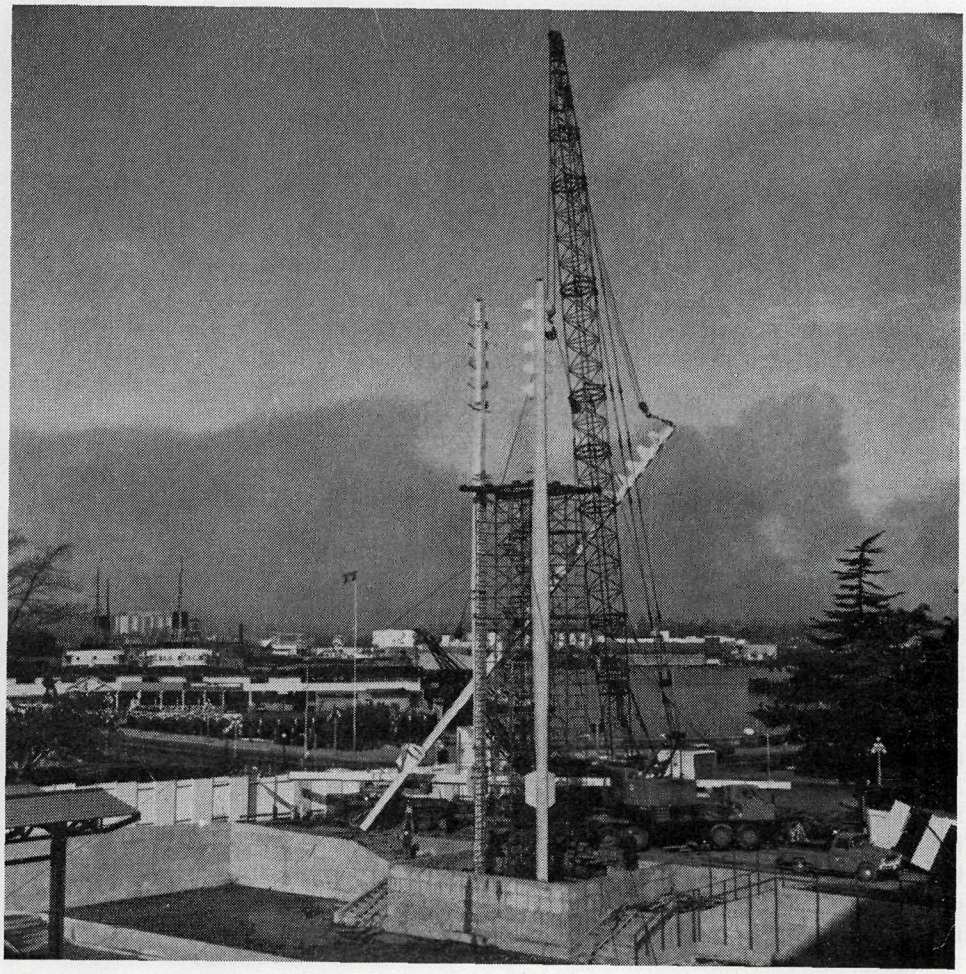
To enable the carillonneur to get to the control-room, a set of stairs was required. A spiral staircase was designed, using pre-cast concrete treads. These

treads were threaded onto a steel pipe column fixed to the centre of the tower. Pre-cast concrete treads were used for æsthetic reasons and ease of maintenance.

The foundations for the tower bear on bedrock by means of pressure-creosoted timber piles. This was necessary because the soil is unsuitable as a foundation material.

Some interesting statistics for the tower are as follows: Height, 88 feet 3 inches; length of columns, 90 feet 9 inches; weight of each column, 40,500 pounds; compressive force in each column, 336,000 pounds; total weight of tower, 1,200,000 pounds; stairs, 75 treads turning through six complete circles; weight of bells, 10,613 pounds.

J. R. SIMPSON, B.Sc., M.I.C.E., DIP. PUB. ADMIN.,
Senior Civil and Structural Engineer.



Raising the pre-cast columns of the Carillon Tower into place was an exacting task requiring great care.

EXTRAORDINARY WORK CARRIED OUT BY DEPARTMENT OF PUBLIC WORKS MAINTENANCE STAFF

The Department of Public Works, being a maintenance and service department, has many and varied duties to perform. Some of these are minute but very important. Others are large but must be completed on time. The timing of certain duties performed by the staff is crucial. On many occasions, duties must be completed, or started, at an exact time.

During the two Centennial Years the demand for efficiently timed service from the maintenance teams of the Public Works Department has been very high. This was due to many important occasions involving Royal visitors and statesmen from different countries, State functions at Government House, and Centennial activities held in various locations. It might be interesting to outline some of the tasks that are performed by the staff on special occasions.

ROYAL VISITS

Close liaison must be established between the Department of the Provincial Secretary, Royal Canadian Mounted Police, the city police, and the Canadian forces. Red carpets are laid. Correct flags must be flown. Decorations must be in good taste, with correct floral arrangements. Microphones, speakers, etc., are provided when needed. Power is supplied to same. The security of party, buildings, and control of crowds must be anticipated and taken care of. Parking of cars, roping off certain specific areas, driveways, etc., must be attended to. Locating and constructing covered platforms, dais, paths, etc., must be arranged. Decorations, chairs, and lighting arranged, if necessary. Flowers, fresh drinking-water, special chairs, floor coverings, carpets, etc., provided. All services and fixtures at Government House must be checked. Maintenance-men must stand by for large functions. Supplying telephone operators, special security, special cleaning, dusting, etc., where Royal party is involved.

CEREMONIES

Ceremonies such as opening a new building, laying a cornerstone, activation of water displays, presentation of colours or flags, turning the sod for a new building, crowning the May Queen, concerts, bands playing on Government property, all take careful planning. The correct positioning of flags, correct seating of honoured guests, and the safety of all concerned at these functions must be given thorough attention.

This type of organization is a task which has been met with success by maintenance teams. The greatest challenge, perhaps, was the opening of Parliament at New Westminster on January 24, 1967. All furnishings were moved from the Legislature to Queens Park Arena at New Westminster and set up in perfect order for opening of the House. After the opening, everything was immediately shipped back to Victoria, reassembled, and was ready for the Legislature to start work the next day, January 25, 1967. This type of work takes precedence over some of the less exciting work, but general maintenance is always kept up to the necessary high standard.

We are proud to report that on all occasions prompted by the celebrations, there was not a single hitch. All times were met, and details attended to.

On pages 17, 26, and 27 are colour photographs taken of some of the ceremonies.

Opening of Legislature in New Westminster, B.C., 1967.

REPORT OF THE MECHANICAL ENGINEER

The concepts for environmental control in buildings, and indeed sometimes the areas surrounding buildings, are undergoing transitions at a faster pace than ever before. This is the result of innovations and advances of technology when coupled with a better understanding of what constitutes optimum comfort conditions.

Considering the principal environmental factors—thermal, visual, sonic, and æsthetic—few building systems approach the optimum. Yet no one can deny that substantial progress has been made in recent years. Today's environments differ in many ways from those of a decade ago, both in objectives and the means by which they are achieved. This fact poses a challenge to the designer, who should keep himself informed at the highest level of technical knowledge.

There are great variations in environmental objectives, depending on the type of space, office, school, laboratory, hospital, industrial area, exhibition hall, clean room, and all have individual criteria for thermal, visual, sonic, and æsthetic factors.

Temperature, humidity, and ventilation requirements, zoning flexibility, illumination quality and quantity, degree of visual comfort, and colour scheme are a few of the obvious variables.

More and more of the solutions to these environmental control problems involve the use of electric power to provide the heating and heat reclamation.

This Division has been busy this year and participated in most of the capital projects listed elsewhere in this Report. Although, all of these projects are worthy of note, several outstanding ones should be mentioned.

First is the extension to the mechanical building at the British Columbia Institute of Technology in Burnaby. This project is essentially adding additional capacity to the boiler plant.

The growth of both the Vocational School and the Institute of Technology and the use of the large tract of Crown land on which they stand required a study to determine the most economic approach for servicing the area. This led to the conclusion that high-temperature hot-water (330° F.) primary system would give the necessary service required now, and the flexibility of extending it when required to service additional buildings when they are built. The high-temperature hot-water system would allow us to integrate a number of small heating plants into one system with reduced operating and maintenance costs. Although the pressure required to keep the water in the liquid form rather than steam is not excessive (that is, 150 p.s.i.g.), careful considerations had to be made of the corrosion problems set up by the hot water. Hot water can be very corrosive to unprotected carbon steel.

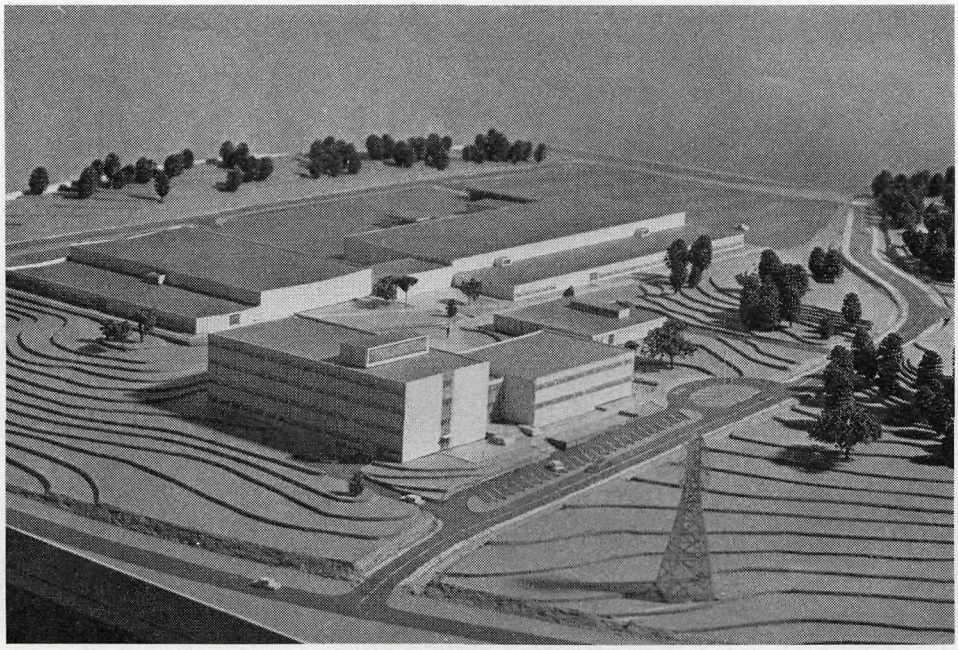
Due to the " flywheel " effect of a large volume of hot water, smaller boilers, pumps, and piping could be used.

We are pleased and proud to announce that this Division, in conjunction with the heart specialists of the Vancouver General Hospital, planned and executed the conversion of the old tuberculosis operating suite at the Willow Chest Centre, Vancouver, to a successful ultra-modern open-heart operation suite.

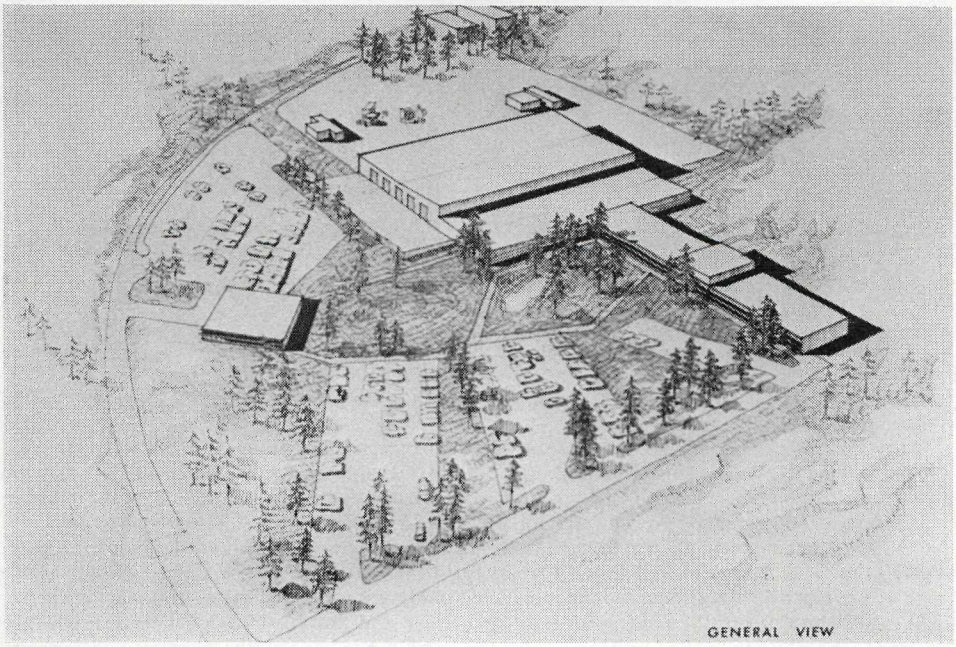
Next is one project not listed elsewhere in this Report. This Division, working with the Liquor Control Board, designed and supervised the installation of a modern bottling-line in the new central warehouse on East Broadway, Vancouver.

May we once more express our thanks to those sections of this Department who have co-operated so well and given us such able assistance throughout the year.

W. E. MILLS, B.A.SC., P.ENG., DIP. PUB. ADMIN.,
Senior Mechanical Engineer.



Plan of proposed vocational school at Victoria.



Plan of proposed vocational school at Kamloops.

Night scene, Centennial Fountain, Vancouver, B.C.

SYMBOLISM OF THE FOUNTAIN THEME

The fountain portrays the rugged rocks of the coastal fringe. The western sea is represented by a water pattern appearing in an abstract mosaic ornamental design in the basin.

Moving water has many moods, sometimes vibrant with rotation, sometimes flowing swiftly, at others smoothly.

The flow of the pattern leads to the central motif, which is symbolic of sea-washed rocks.

Carved into this rock formation are symbols of the ancient bardic sea-going people, who were the forebears of so many Canadians. The Celtic Confederacy, composed of the Gaulish Celts, Basques, Brythonic or Welsh Celts, the Picts, Scots, and Irish Celts, is represented.

All these people were alleged to have descended from the race known as the People of Dana (Tuatha de Danaan), who dwelt in the City of the Twin Rocks called the Falais. This was the home of the Earth Goddess, Dana, who is depicted holding the cup of healing and friendship.

Dagda, the Lord of the Gods, sent the Fiery Spear and Sword of Light of the Sun God to the Gaels. Nuada, the God of Light, was also the Lord of Science and the Mysteries. The Gaels received from him the Orb of Light, which enabled them to foretell the future.

Thus is portrayed the mystery symbolism of a sea people whose origins, though lost in the mists of time, are traceable by way of bardic myths for over 6,000 years.

Day scene, Centennial Fountain, Vanco

ELECTRIC HEATING OPERATING COSTS

(A digest of an article by Leo Nova, P.Eng., Consulting Engineer, Spring Valley, New York.)

The opinion often expressed that the operating cost of an electrically heated structure will be two to three times that of a combustible (fossil) fuel-fired central heating system has no basis in fact. On the contrary, it may be demonstrated that for many situations the cost for electric heating will be less. Final results cannot be predicted arbitrarily. Accurate relative cost estimates must be obtained through a systematic appraisal of the variables involved in each particular application. This is done by collecting all of the variables affecting operating cost, from which a simple workable equation may be developed.

FUEL HEATING VALUES

The heat equivalent of electricity is fixed at 3,413 B.t.u. per kilowatt-hour; it never varies. A kilowatt-hour purchased implies the availability of 3,413 B.t.u. for heating. The heat content of gas and oil varies, however, and must be established through standardized tests.

The values ascribed to natural gas vary from 900 to 1,400 B.t.u. per cubic foot, but the usual range for use is from 1,000 to 1,050 B.t.u. (gross) per cubic foot. The more liberal value of 1,050 will be used here.

Fuel-oils are classified by grades according to their characteristics and viscosities. Grades 1 and 2 are predominantly used for residential heating. Grade 6 always requires pre-heating; Grade 5 generally requires pre-heating. Such pre-heating is generally accomplished using electricity as a heating source, adding to the cost of the oil.

This leaves Grade 4 as a good representative fuel-oil for general-purpose commercial use. Its heating value ranges from 140,600 to 153,300; the average value of 146,950 can be used.

HEATING EFFICIENCY

By over-all seasonal heating efficiency, we mean the ratio of the heat energy actually delivered into the heated space to the total energy input into the boiler. A growing accumulation of data resulting from field tests and experience indicates that the over-all seasonal heating efficiency of combustible fuel systems is in the neighbourhood of 40 per cent.

The 60 per cent of wasted energy may be located by first examining the boiler itself. Efficiencies of new oil- and gas-fired boilers are commonly listed as being between 70 and 80 per cent. These efficiencies will be reached when the boilers are tested under laboratory conditions (rarely obtained in use), where ideal combustion conditions are controllable to a fine degree to provide continuous perfect mixtures of fuel-to-air ratios. Also, these laboratory tests are conducted at full load with new boilers and for relatively short periods of time, so that the effect of age deterioration of the components and deposits on the interior heating surfaces does not become a factor.

A boiler will actually be operating at its full rated load (needed to attain its highest efficiency) only a small percentage of the time. During most hours of its use it will be operating under partial loading only, including stand-by for nights, week-ends, holidays, etc. Some boilers will never operate at full load because their

rating exceeds the capacity required under design conditions. This happens when the needed capacity falls between two standard manufactured sizes, necessitating the selection of the next higher standard size. Many are deliberately oversized to allow for future building additions or to ensure fast pick-up. (EDITOR'S NOTE.—This provision, bringing with it higher capital cost, is only necessary to a minor degree when electricity is used.)

Also, heat-loss calculations normally are not credited with expected gains from people, solar radiation, lighting, and equipment, leading to oversized boilers. It is easy to see, therefore, that if 20 to 30 per cent of the energy available from the fuel is lost up the chimney and through the boiler casing under ideal conditions, the above-mentioned deviations from the ideal can be expected to increase these losses to about 40 per cent. The remaining 20-per-cent waste is found in the distribution losses (called piping tax) and pick-up allowance (which represents the load needed to heat the boiler, radiators, and piping after setback for night-time and week-ends). Although only 20 per cent has been used here, an allowance of 25 per cent is generally considered to be a safe maximum for the sum of piping tax and pick-up allowance if they cannot be specifically determined, so that this amount is not unreasonable. This 20 per cent when added to the 40-per-cent boiler losses gives 60 per cent total wasted energy, or an over-all seasonal heating efficiency of 40 per cent as compared with 100 per cent for a decentralized electric system.

INSULATION

The over-all building insulation efficiency included in the equation is needed to account for probable differences in insulating a central fossil-fuel-heated building as compared with an electrically heated building.

If the insulation efficiency of the electrically heated structure is arbitrarily given the value of 1.0, then the insulation efficiency for any given fossil-fuel-heated structure will usually be considerably less than 1.0. Use of urethane insulation (together with double-glass windows) can reduce the total transmission building heat loss by approximately one-half. The insulation efficiency of the electrically heated structure thus defined by the sections would be 1.0, while the insulation efficiency of the fuel-fired building relative to electric would have the value of 0.5. For any given comparison, therefore, "I" may always be taken as 1.0 for the electrically heated building, and some calculated value equal to or less than 1.0 for the central fossil-fuel-heated building.

Use of an insulating efficiency factor provides a convenient method of evaluating the effects on cost of various insulating levels as well as the effects of increased heat loss due to ventilating air.

FUEL-SYSTEM VARIABLES

Every combustible-fuel-fired central heating system consumes electrical energy to power its fans, pumps, burner motors, ignition devices, and controls. The use of electricity, therefore, is vital to the functioning of the system, and, as such, is chargeable to the system's operating cost. The extent of this usage is difficult to generalize and should be calculated for each specific application. Investigations by the author indicate that electrical costs equal to 15 per cent of the cost of the combustible fuel used are reasonable and justifiable for this purpose.

ENERGY COSTS

The cost of natural gas, oil, and electricity varies from region to region. Gas and electricity rates are established by the local utility companies; oil delivery prices

Her Majesty Juliana, Queen of The Netherlands.

His Imperial Majesty Haile Selassie I, Emperor of Ethiopia.

Their Royal Highnesses Princess Margarethe and Prince Henrik of Denmark.

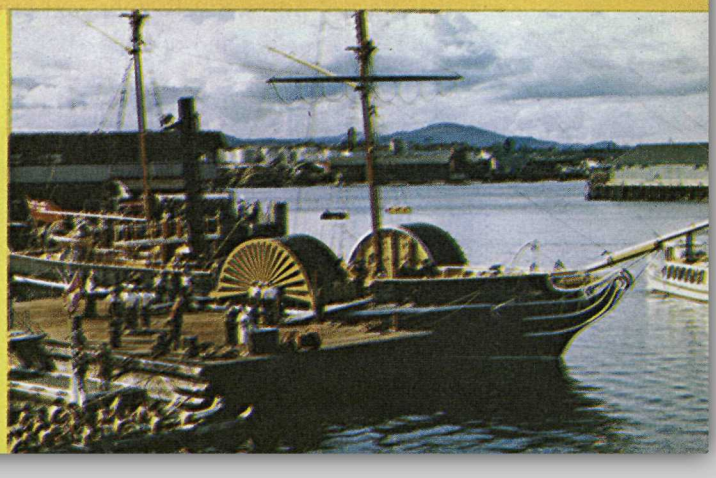
Her Majesty Queen Elizabeth, the Queen Mother.

I.O.D.E. salute to Queen Victoria,
Parliament Buildings.

Her Royal Highness Princess Alexandra.

R.C.A.F. march past, Dominion Day,
Parliament Buildings.

Visit of S.S. " Beaver " to Victoria.



are obtained from the local distributor. Because of the many pricing variations which exist, it would be impractical to attempt to set a single price for each of the energy sources as being representative nation-wide. Accordingly, the following ranges have been selected for use after careful investigation of many utility company rates, reports, and other information:—

Natural gas: 8 to 12 cents per 100 cubic feet.
No. 4 oil: 9 to 13 cents per gallon.
Electricity: 1.0 to 1.7 cents per kilowatt-hour.

(EDITOR'S NOTE.—The author is using United States prices.)

Gas and electricity prices are normally based on a " block " system or " sliding scale," whereby the cost per unit decreases as consumption increases. It can be assumed that the higher scale rates will be charged off to the other energy-consuming equipment in the building (hot water, cooking, lighting, appliances, etc.), and comparison is made at the lowest available rate for each energy source. Where the utility company provides a separate energy rate for electric heating, that figure should, of course, be used. It is to be noted that many utilities have such special rates.

EVALUATING THE DATA

An equation may now be evaluated for the three energy sources, substituting the values discussed above.

Direct comparisons can then be made to suit the specific conditions of any geographical area, or for any design philosophy as to degree of insulation versus cost of energy.

It would serve little purpose to make such comparisons for the extremes, since the actual conditions of any given building will almost certainly lie somewhere between. However, from the use of average energy rates we can calculate the comparative B.t.u. purchasing power per cent for each of the three energy sources and obtain some insight as to the need for insulating properly for electric heating.

1. Assume equal insulation is used for all three systems (I=1.0):—

	B.T.U./Cent	Ratio
Gas	3652	1.44
Oil	4647	1.84
Electricity	2532	1.00

Electricity costs 84 per cent more than oil and 44 per cent more than gas, a far cry from the 200 to 300 per cent claimed.

2. More commonly, increased insulation is used for the electrically heated building, while conventional insulating methods are used for gas and oil. Accompanying sketches demonstrate the extent of improvements possible in typical wall and roof structures using modern insulating methods as used for gas and oil. Accompanying sketches demonstrate the extent of improvements possible in typical wall and roof structures using modern insulating techniques. The following ratios show the effect of progressively improved insulation:—

	B.T.U./Cent	Ratio
(*a*) I=0.7 for gas and oil:		
Gas	2556	1.01
Oil	3253	1.28
Electricity	2532	1.00
(*b*) I=0.6 for gas and oil:		
Gas	2191	0.87
Oil	2788	1.10
Electricity	2532	1.00

(*c*) I=0.5 for gas and oil:

	B.T.U./Cent	Ratio
Gas	1826	0.72
Oil	2323	0.92
Electricity	2532	1.00

The cost of electricity is about equal to that of gas at I=0.7; electricity becomes less expensive than gas at I=0.6; and electricity becomes less expensive than both gas and oil at I=0.5.

3. The improvement in insulation necessary to equalize the energy costs for all three energy sources may be determined directly from the equations:—

	B.T.U./Cent	Ratio	I
Gas	2532	1.0	0.69
Oil	2532	1.0	0.54
Electricity	2532	1.0	1.00

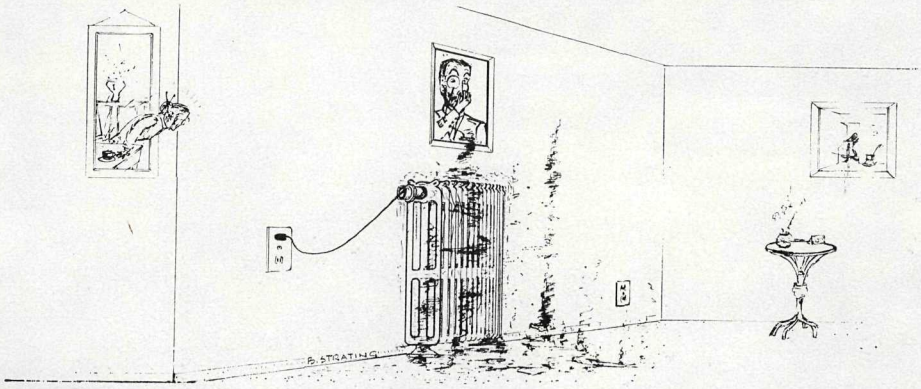
Curves can be plotted using the three equations given and may be used for rapid determination of the interrelationships among the energy sources and the insulating efficiency.

For example, the insulating efficiencies given in 3 above may be found directly from the curves. Locate the cost of electricity (1.35 cents per kilowatt-hour) on the centre scale. Move right to the curve for 10-cent gas and down to the insulating efficiency scale and read I=0.69. Again, move left from 1.35-cent electricity to the 11-cent oil curve and down to I=0.54.

CONCLUSIONS

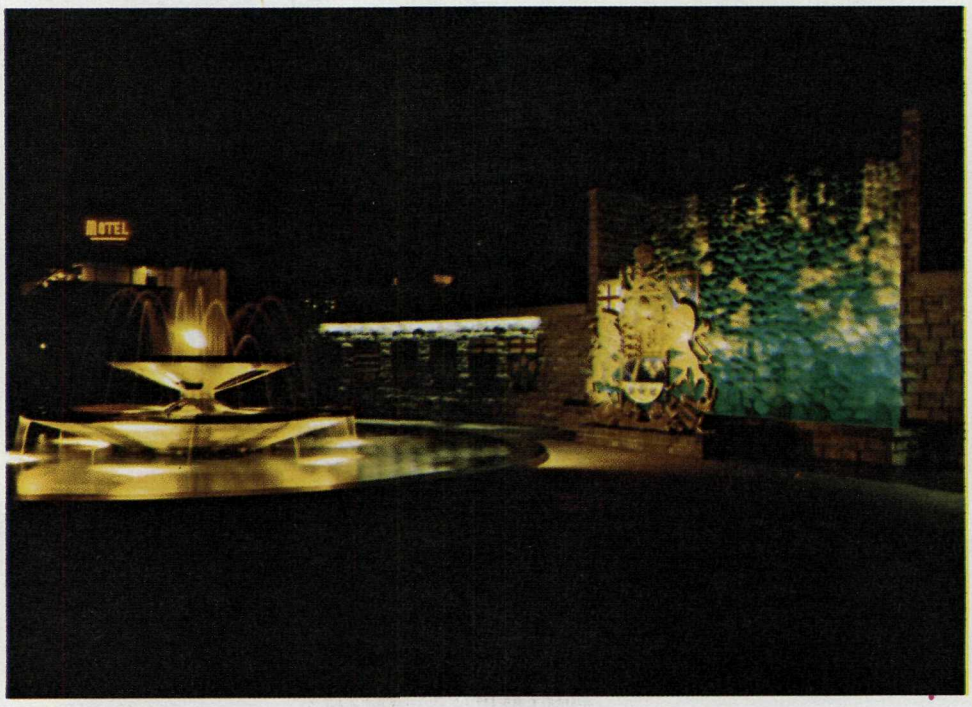
It is evident that only under the most deliberate of conditions will operating cost ratios be as unfavourable to electric heating as is so often pictured. Quite the contrary, as shown by condition 2, over-all economics dictate that electric heating is the best possible choice so long as proper insulation values are maintained through the use of modern insulating materials. Also of much significance is the fact that such insulating techniques reduce summer air-conditioning operating costs due to the reduction in required refrigeration tonnage.

—Acknowledgment, " Electric Heating Forum."



Converting steam to electrical heat is possible, however, . . .

Day scene, Confederation Garden, Victoria, B.C.



Night scene, Confederation Garden, Victoria, B.C.

CONFEDERATION GARDEN COURT

The Capital Improvement District Commission was formed to sponsor and build projects which would beautify the city and district of Victoria. With this objective in mind, the Department of Public Works, in collaboration with the Commission, participated in constructing a pleasing and permanent reminder of our entry into the second century of Confederation.

Confederation Garden Court is located on property previously owned by the Canadian Pacific Railway and for a number of years used as tennis courts. The site chosen for this Centennial Project is on Menzies Street and extends the full block between Belleville and Quebec Streets.

A concave masonry-clad wall, with a centre recessed panel, provides a background to the design. The centre panel has been increased in height as opposed to the remainder of the wall and constructed with random-pattern boulders, to provide an irregular surface over which water tumbles into a catch basin below. On both sides of the centre panel and waterfall, the wall surfaces are finished in Nelson Island grey granite, on which are mounted 12 shields. The shields are of bronze and provide the surface upon which are mounted the coat of arms of each of the Provinces and Territories of Canada. The heraldic colours on the coat of arms are a baked enamel finish to ensure their permanence and durability.

The shields are the work of a local sculptor and artist. At night the centre wall panel is illuminated in a soft emerald green and provides a satisfying contrast to the floodlights of the Federal coat of arms located several feet in front of the catch basin.

The Federal coat of arms is located on the central axis of the court and cast in bronze, with heraldic colours in a similar finish to the Provincial shields. The fine details and excellent workmanship in finishing this 5-ton bronze casting have in no small measure demonstrated the competence and skills of the craftsmen available in this Western Province of Canada.

Immediately in front of the Federal coat of arms and on the axis of the elliptical paved area, a three-bowl circular fountain, with water spray jets ascending in radial lines to the top basin and encompassing the eternal flame, draws both the resident's and visitor's attention to the court. The constant movement of water upwards and spillage downwards from each basin provides a feature of high interest at all times.

Paved areas have been separated from the landscaping by a metal railing in which the maple leaf emblem is dominant. The remainder of the site not occupied by paving is landscaped with evergreens and annual-plant material, and will form a fitting extension to the grounds of the Parliament Buildings. It is also of interest to note the preparation of this site disclosed a rock outcrop scored by glacial action at the north-east end which has, with the exception of a small planting area, been retained in its natural state.

On Dominion Day, July 1, 1967, Confederation Garden Court was dedicated. His Honour the Lieutenant-Governor of British Columbia unveiled the name plaque on the stone pillar at the north terminal of the concave stone wall, and the Honourable W. A. C. Bennett, Prime Minister of British Columbia, at that time lit the eternal flame. Mr. Robert Savery, Landscape Architect, conceived and designed the scheme, and credit was accorded at the official opening to the many who contributed to its construction and completion.

"He builded better than he knew. The conscious stone to beauty grew."—*Ralph Waldo Emerson.*

REPORT OF THE ARCHITECT-PLANNER

"To be a man is to feel that through one's own stone he contributes to building the edifice of the World."—*Antoine de Saint-Exupery (from "Terre des Hommes," Man and his World).*

This is the time of Centennials, and we are nearing the end of two consecutive years which for the majority have been stirring in many ways. To many of us the North American Continent has appeared so vast that its resources appeared limitless and inexhaustible.

This, of course, is not so. While the total land area of British Columbia is great in many places, there is a shortage of land suitable for given purposes. This is especially true in the urban areas. We have realized we must husband our land resources carefully.

Within very recent times, land values have risen sharply. Rising construction costs have been accompanied by a rise in the value of improvements. The value of land, however, has risen even more sharply. This is reflected in the day-to-day business of the Department, and every effort is made to effect exchanges or otherwise contain the cost of land acquisition.

Land for motor-vehicle testing-stations has been balanced and kept to a minimum by the choice of some Crown Provincial sites and some exchanges with other commissions; others have been purchased. Victoria station will be completed first, while Burnaby is planned for early construction. Sites for smaller stations have already been agreed upon for other areas.

Master plans have been drawn up for Abbotsford, Jericho Hill, Kamloops at Columbia Street, and the former Department of National Defence site. Colquitz is also in the process of a design programme. The majority of the foregoing have been substantiated by the construction of contour models.

Master plans for Vocational School sites in existence at Nanaimo, Terrace, Nelson, and Victoria are being completed. The last named necessitated a great amount of care, diplomacy, and attention to detail, culminating in a municipal public hearing, all of which had the effect of returning the location of the school to the same site as originally offered by this Division. Such exercises, including legal arbitration, form a challenging and interesting part of the duties carried out.

Master plans have been drawn up in previous years for the Legislative Precinct, and a comprehensive report was prepared three years ago. Apartments are being erected within the confirmed Precinct area, which has had the effect of raising prices. The net result is that some radical thinking and reassessment of the whole concept must now be undertaken.

The net increases of Departmental space requirements indicate 25 to 30 per cent increases during the next five to six years. The existing office accommodation amounts to 525,000 square feet, of which more than half is in temporary buildings. To this figure must be added 125,000 square feet of rentals in the city, together with 125,000 square feet of storage rentals.

The Department is faced with a problem which requires a new approach. Thought is presently being given to the proposition that the area provided in the Precinct plan for semi-industrial purposes, such as the Queen's Printer, Data Processing, Motor-vehicle Branch, Civil Defence, Public Works Maintenance, Textbook, Vital Statistics, Health Stockroom, Laboratories, and Testing areas, be planned and set up in a secondary precinct area either adjacent to, and west of, the

Legislative Precinct, or divorced completely from the Buildings and set up elsewhere on existing Crown land or on land bought and assembled for the purpose.

This problem is not confined to our own capital city, but is apparent in all built-up areas, not only in this Province, but throughout North America—even the Pentagon is said to be too small by half! Building is lagging behind the boom.

The price of property, both land and improvements, was again brought to notice during a busy 36 hours when options were taken up on half a dozen properties in Vernon for a Centennial project. This is planned as an open space and frontispiece to the Courthouse, which will enable this fine piece of Government property to be seen from downtown. It is interesting to note that upwards of 5,000 persons will gather here each year to witness the crowning of the Ice Queen.

As a member of a special committee set up to advise on gaol and reform centre sites, extensive surveys were carried out on the Lower Mainland area, and recommendations have now gone forward to receive policy consideration and direction. Without the assistance of staff in other departments and in particular the Lands Branch, this would not have been possible. The good relations enjoyed interdepartmentally makes the end result more satisfying.

The Civil Service Parking Committee, following on the successful implementation of the Victoria scheme, has received, during the past year, encouragement to enlarge the scope by setting up regulations for other areas. With this in mind, permission has been granted to set up a committee of four, together with a chairman who has power to co-opt others for specific areas. This committee will be responsible for the Vancouver and New Westminster areas.

The inventory of Crown ownership and survey of properties proceeds as expeditiously as time will allow, but now takes second place to more time-consuming, if importunate, matters such as easements, rights-of-way, and other legal matters for which this Division is responsible.

What of the future as we go forward into the second hundred years? The future will be influenced by our ability to use diminishing resources wisely.

Public and private interests must accept the responsibility of developing a greater sense of stewardship toward land and mineral resources, with much greater emphasis on compatible relationship of land uses.

We are all shareholders in a community within which each passing day leaves us with fewer resources.

W. D. LOUGHER-GOODEY, M.T.P.I., M.T.P.I.C., M.I.F.L.A.,
F.I.L.A., M.A.S.P.O., A.L.I.STRUCT.E.,
Architect-Planner.

"Land is the platform of all human activity."

WASTE-WATER REUSE

In the Annual Report of the Department for the fiscal year of 1960/61, the subject of sewage disposal and water pollution was dealt with. By then it had become realized that the disposal of sewage waste water from Government institutions was a growing problem.

The passage of time brings a heightened realization of the situation, and this Department is alert to it.

The problem has been further aggravated by the acquisition of new institutional properties with less favourable location to rivers, lakes, or tidewater basins. There is also a growing demand from the general public, fishermen, shellfish-growers, and other water-users to keep our streams, lakes, and other water bodies free from pollution and free from any kind of sewage effluent. Rightly so. It is felt this demand should be satisfied where possible and practical.

The Provincial Government has, of necessity, some institutions passing effluent into streams and other water bodies after prescribed treatment as approved by the Provincial Pollution Control Board and the Health Branch. Due to location it is quite often necessary to discharge treated effluent into streams or water bodies being used by the general public for other purposes. The cumulative effect of this discharge into the streams or rivers is to increase the algæ growth in the water due to chemicals and organics, and to increase the psychological objection to using a stream, lake, or tidewater body into which treated effluent is discharged. Also, as experienced in other countries, as the population grows so does the discharge of effluent into the streams. In turn, more water is drawn off the stream or water body for domestic, industrial, or irrigation use. The net result is possibly eventual stream pollution.

In British Columbia we have not had to worry very much about discharging raw sewage or effluent into streams, lakes, and tidewater bodies because of our relatively small population and the large size and great flows of the receiving water bodies. The same discharge pattern has been experienced in other countries not too long in the past. These countries now have to watch very carefully what waste water is discharged into their lakes, streams, and tidewater bodies, as quite often the water from them is used several times over for domestic, industrial, and irrigation purposes. At some time in the future we could experience the same problems.

Some of the older and more densely populated countries have had considerable and varied experience with the reuse of sewage waste water. In some cases it has been necessary because there have been inadequate or no receiving water bodies for the waste water or the streams or lakes are used for domestic water supply, fishing or recreational purposes. These waste waters or effluents have been successfully used for irrigation of certain vegetable crops, orchards, citrus groves, watering of golf courses and parks, growing of field forage crops, and the like. Also, some waste water has been used successfully for cooling-water in electric generation plants, in oil refineries, steelworks, and for other industrial purposes. In most cases the cost per unit for the waste water at the sewage plant is much cheaper than the unit cost of new domestic or irrigation water. In a number of cases the cost has been less than half the cost of new water. The cost of pumping and distribution from the plant to the waste-water user would be an additional cost. In some cases the sale of waste water has defrayed a good portion of the sewage-plant operation. Also, in most instances the waste water from a sewage plant, when sold, has been worth more than the value of the solids collected from the sewage.

When considering sewage waste water for irrigation purposes, it is well to know the nutrient value of the waste water as a fertilizing media. It is claimed that 1 acre-foot of sewage waste water contains 103 pounds of P_2O_4. It is also known that extremely lush vegetation is obtained when irrigating with sewage waste water.

It might be well to list some of the actual waste-water uses and experience from countries other than Canada.

In California in 1954, 74 communities and 32 public and private institutions were reported to be using sewage waste-water effluents for irrigation of crops and pastures. At the Golden Gate Park in San Francisco, California, the waste water from a specially designed plant is used for lawn and shrub irrigation and feeding water into an artificial lake. The cost of new domestic water at the park at that time was $66 per acre-foot; the reclaimed waste water was delivered from the sewage plant for $21 per acre-foot!

One of the latest proposed large uses of sewage waste water for irrigation purposes is in Israel, where the waste water from a sewage-works in the City of Tel Aviv is to be transported 60 miles for irrigation in the Negev Desert.

Another very large use of sewage waste water in the United States is the Bethlehem Steel Company in Baltimore County, Maryland, where 590,000,000 gallons per day are transported from a sewage plant through one 60- and one 90-inch-diameter pipe to a steel-mill, where the waste water is used for cooling and other steel-mill uses.

South Africa also uses sewage waste water for various purposes. Recently it was claimed that of 100,000,000 gallons per day, approximately 25.3 per cent of the total went to industry, 45.7 per cent to irrigation and crops, and only 28.8 per cent into streams or rivers.

Any use of waste water from our institutional sewage-treatment plants is subject to approval by the Provincial Pollution Control Board and the public health department. After final treatment it would be conducted to a large storage reservoir or lagoon for future irrigation use. It would probably be necessary to store some, or all, of the waste water during periods of no irrigation. The water from the storage reservoir could then be conducted to irrigation projects, industrial users, or used for recharging underground water supplies. The ground-water can be recharged by direct ponding over the underground storage area, or by injecting the water directly into the ground with pumps and underground piping.

Waste water from Government institutional sewage plants could be used for either agricultural or, possibly, forest nursery irrigation. It may be possible to sell the waste water to nearby industries, to golf courses, or other establishments needing irrigation or industrial water.

It is understood that considerable research has been undertaken on the use of fertilizers in forest culture. Sewage waste water, with its many beneficial fertilizing elements, might prove useful in forest nursery operation and tree propagation. In this regard it has been found that some pulp-mill waste water can be used for irrigating purposes.

Further research should be entered into to determine the best possible use of waste, both solid and liquid. To begin with, it need not be " waste." There are economic gains to be made. Less tangible, but very definite, advantages would accrue to ourselves and future generations in the lessening of pollution to our streams, rivers, and lakes.

J. R. SIMPSON,
Senior Civil and Structural Engineer.

REPORT OF THE SUPERVISOR, ELECTRICAL DESIGN AND COMMUNICATIONS

The Electrical Design Division functioned at full capacity during this fiscal year and carried out the complete electrical designs on all capital and maintenance projects produced by our Architectural and Maintenance Divisions. We continued to supply technical information and guidance to all electrical maintenance staffs when required.

Lighting and power design was completed on the Victoria Museum and Exhibit Hall in close co-operation with the project architect and the sculpture designer. For the first time in this area, many new and flexible lighting systems for display purposes will be used on this project.

Other large units on which the electrical designs were completed this year include the following: Library, British Columbia Institute of Technology, Burnaby; Vocational School, Terrace; and Eric Martin Institute, Victoria. Among the many electrical designs carried out for various other Government departments was the extension of the electrical system on the Seymour Park recreation facilities.

Electrical plans were also completed for the new electrical distribution system for the Parliament Buildings Precinct, which includes the ultimate rewiring of the main Parliament Building.

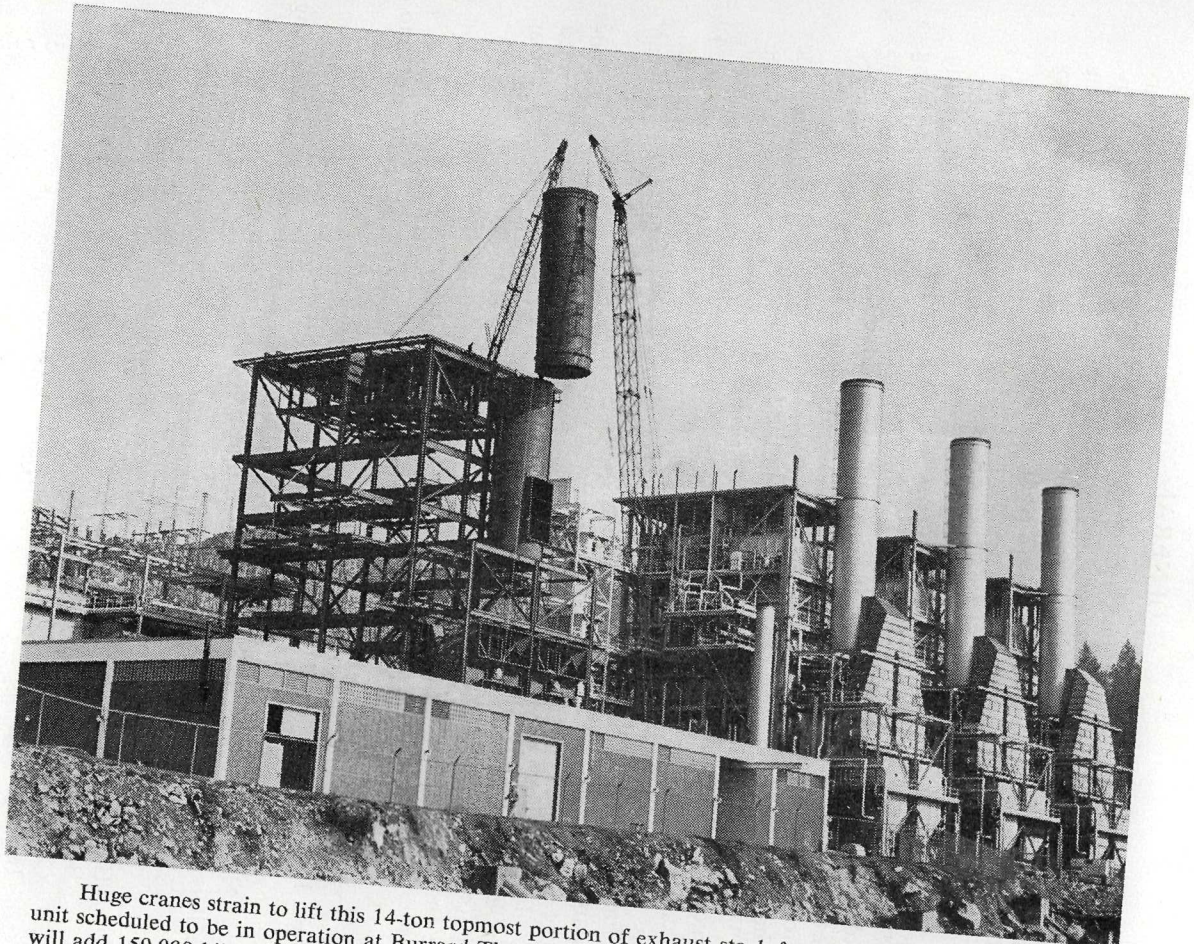
The first phase of this electrical work includes a new high-voltage vault, low-tension switchboard, and distribution panels. These will replace the existing units, which have been in service since the Parliament Building was constructed. As a result of the advancement of electrical equipment, the load has outgrown the capacity of the existing units. When the system is completed, the entire Parliament Buildings Precinct will be recorded through one primary metering account in place of the many individual secondary billing accounts in existence today and will substantially reduce the electrical operating costs within the precinct.

Another interesting project carried out was the electrical design of the Centennial of Confederation Fountain, Victoria. The waterfall, or water curtain, is floodlit by twelve 300-watt underwater coloured floodlights, the screen with three 150-watt mixed colour floods, and the 11 wall plaques are indirectly illuminated by 20-watt fluorescent units mounted one each in a recessed wall cove immediately above and behind each plaque, giving a silhouette effect on the plaques at night. Six 300-watt flood units are used to illuminate the lower fountain bowl, and six 150-watt units on the intermediate bowl. All water is recycled, using a 7½-horsepower pump on the waterfall and a 5-horsepower pump on the fountain. All water levels are automatically controlled by electronic sensors. The plaza lighting is carried out using 14 low-mounted 150-watt totally indirect units, which supplies a pleasing night-time coverage without distracting the effect from the fountain and waterfall display. The entire operation is controlled by time clocks and requires no attention other than periodic maintenance.

In telephone communications the traffic continues to increase with the expansion of many departments, and a large increase in the amount of calls handled per day has been noted during the past year.

Again, it has been our pleasure to work with the various departments and divisions within the Government, and the co-operation extended to us by all, including the Superintendents of Works, throughout the Province has been greatly appreciated.

J. R. WALKER, M.I.E.S.,
Supervisor.



Huge cranes strain to lift this 14-ton topmost portion of exhaust stack for the fourth turbo-generating unit scheduled to be in operation at Burrard Thermal Plant near Port Moody by September, 1967. Unit will add 150,000 kilowatts of electricity to the plant's output, increasing it to 600,000 kilowatts.

REPORT OF THE CHIEF INSPECTOR OF BOILERS AND PRESSURE VESSELS

GENERAL

The vigorous industrial expansion throughout the Province has continued during the year and placed heavy demands on all sections of the Branch. Many pulp-mills, refineries, thermal power stations, and chemical plants are adding or building new plant facilities. Concerted efforts are being put forth to improve the efficiency of all our operations.

OPERATIONS

The demands for certification of welders, welding procedures, and the quality control of welding have been particularly high during the year. Vocational training centres (welding) have been extremely busy all year, and the steady influx of welders from other Provinces and European countries continues. This year the welders' tests have increased 55 per cent.

The black-liquor recovery boiler plants in the Province have all instituted the emergency shutdown procedures recommended by the Black-liquor Advisory Committee, and have provided, or are in the process of constructing, protected control-rooms and evacuation routes. In addition, all the foregoing plants have installed auxiliary fuel safety interlocks. A chemical recovery boiler guide booklet has been prepared. Ratification by the Committee is scheduled to take place in the near future.

The standards of engineers' examinations, particularly at the first- and second-class level, are being maintained at a high standard, since the modern trend is toward highly sophisticated equipment and accompanying complex operation. This year the engineers' examinations have increased 10.6 per cent.

THE ACT AND REGULATIONS

The safety code for mechanical refrigeration was completed, and went into effect in December, 1966.

ACCIDENTS

No person was killed or seriously injured arising from accidents involving boilers, pressure vessels, or refrigeration units.

Boilers

Emergency shutdowns on chemical recovery boilers	11
Boilers burned out	2
Control malfunctions	3
Inadequate purge	1
Low-water conditions	3
Defective safety or relief valves	2

Refrigeration

Explosion of a valve due to operator error.

Complete investigations were made of all the foregoing accidents and full reports are on file. Recommendations to prevent recurrence of accidents involving equipment covered by the Act were made as deemed necessary.

SUMMARY OF WORK

	1966/67	1965/66	1964/65
Designs registered	908	945	843
Boilers built under inspection	47	66	91
Pressure vessels built under inspection	1,750	2,156	1,503
Total boilers inspected	4,923	4,162	4,120
Total pressure vessels inspected	2,507	3,068	2,182
New boiler installations	411	478	399
Engineers examined	800	732	798
Welders examined	2,564	1,647	1,301

ENGINEERS' EXAMINATIONS

Class	Number Examined	Passed	Failed
First, A	35	26	9
First, B	30	25	5
Second, A	126	74	52
Second, B	73	55	18
Third	155	132	23
Fourth	295	221	74
Boiler Operator, A	47	34	13
Boiler Operator, L.P.B.	34	22	12
Boiler Operator, H.P.B.	5	4	1
Totals	800	593	207

WELDERS' TESTS

Grade	Number Examined	Passed	Failed
D.P.W. 1, 2, 3, 5	2,195	1,759	436
D.P.W. 4	158	146	12
A.P.I. (pipe-line)	55	53	2
Provisional	156	152	4
Totals	2,564	2,110	454

Renewals, 900 (without tests); instructors, 6; procedures, 74.

S. SMITH, P.ENG.,
Chief Inspector.

REPORT OF THE INSPECTOR OF ELECTRICAL ENERGY

BOARD OF EXAMINERS FOR ELECTRICAL CONTRACTORS

On October 1, 1966, the chairmanship of the Board was handed over by Mr. L. Robson to Mr. G. A. Harrower, Mr. Robson having assumed the duties and responsibilities of the Chief Engineer, Safety Engineering Services Division. Mr. J. Smith, Assistant Inspector of Electrical Energy, was chosen to represent the Electrical Energy Inspection Branch on the Board for the remainder of the year. Apart from these two changes, the membership of the Board remained unaltered. Six meetings were held throughout the year.

The total number of certificates of competency in effect, as of December, 1966, were as follows:—

Class A	206	Class PA	50
Class B	421	Class PB	117
Class C	469	Class PC	167
	1,096		334

Total, 1,430

This represents a decrease of approximately 12½ per cent below the number of certificates in effect for the previous year.

Candidates for examination for certificates of competency numbered 313. Results of the examinations were as follows:—

Class	Number of Candidates Examined	Passed	Failed
A	82	45	37
B	88	55	33
C	143	74	69
Totals	313	174	139

This represents a decrease of approximately 13 per cent below the number of examinations for the previous year.

PERMITS

The issuing of permits for single-family and duplex residences through the Government agencies is proceeding satisfactorily. No extension of this programme was made during the year, but studies undertaken the previous year, and interrupted because of staff changes at head office, are continuing with this object in view.

The total number of permits issued during the year was as follows:—

April, 1966	3,668	November, 1966	4,913
May, 1966	4,345	December, 1966	3,584
June, 1966	5,221	January, 1967	3,522
July, 1966	4,171	February, 1967	3,314
August, 1966	5,016	March, 1967	4,253
September, 1966	4,557		
October, 1966	4,801	Total	51,365

This represents a decrease of 3.7 per cent below the previous year.

DISTRICT OFFICES AND INSPECTIONS

Two major changes in head office staff occurred during the year. On October 1, 1966, as a result of the elevation of Mr. L. Robson previously mentioned, the Chief Inspector's duties devolved upon Mr. G. A. Harrower. With the appointment of Mr. A. R. Luck, P.Eng., to the post of Assistant Chief Inspector, effective April 1, 1967, it is hoped that the functions of the Branch will proceed more smoothly.

The number of inspections carried out during the year in each district is listed below:—

Office	Inspections	Installations Approved without Inspection
Abbotsford	2,657	288
Alberni	2,312	236
Chilliwack	2,221	81
Clinton	1,695	420
Courtenay	3,207	648
Cranbrook	1,502	54
Dawson Creek	1,568	61
Duncan	2,694	429
Fort St. John	1,495	50
Kamloops	1,787	1,463
Kelowna	2,418	293
Delta-Langley	3,090	356
Nanaimo	2,271	883
Nelson	2,079	10
New Westminster	2,538[1]	286
Penticton	2,181	298
Powell River	1,665	207
Prince George	6,691[2]	707
Prince Rupert	2,748	233
Quesnel	2,041	-----
Richmond	3,641[1]	309
Salmon Arm	1,973	221
Smithers	2,035	151
Trail	1,629	167
Victoria	6,373[2]	322
Totals	64,511	8,173

Grand total, 72,684

[1] Two Inspectors. [2] Three Inspectors.

This represents an increase of 3.4 per cent over the previous year and 36.5 per cent over the same period 10 years ago.

PLANS INSPECTION

The plans inspection service carried on by the Branch continues to provide a means for detecting possibly hazardous or otherwise unacceptable installations before they are actually built, thus resulting in incalculable savings to contractors and to the public. A total of 743 sets of plans, comprising 4,350 drawings, was examined

during the year, an increase over the previous year of 9 per cent. This is particularly noteworthy, in view of the staff changes which occurred during this period.

CANADIAN STANDARDS ASSOCIATION

Meetings of the Approvals Council (Electrical) and the Committee on Canadian Electrical Code, Part I, were attended by Mr. Robson. These were held in June at Fredericton and in November in Toronto.

The ninth edition of the Canadian Electrical Code, Part I, published in February, 1966, was under study for most of the year, prior to its adoption by Order in Council in March, 1967, as regulations under the *Electrical Energy Inspection Act*. The number of amendments to the version published by the Canadian Standards Association was held to a minimum in the interest of uniformity of electrical standards across Canada.

EXAMINATION OF MOTION-PICTURE PROJECTIONISTS

The Branch assisted the Fire Marshal in conducting nine examinations for projectionists. The regulations covering such examinations provide that the Inspector of Electrical Energy be a member of this Examining Board in company with the Fire Marshal. In this connection, all fees arising from these examinations accrue to the credit of the Fire Marshal's department.

OVERHEAD-LINE CONSTRUCTION

During the year the Branch checked 1,228 applications for permits to erect or add to pole-lines on Crown lands or Provincial highways. Applications for the installation of television cable on power pole-lines were also processed to the number of 91. The total number of such applications processed is 2 per cent greater than last year.

ACCIDENTS

There was a total of seven accidents from electrical causes recorded during the year, of which three were fatal, as follows:—

(1) Two boys had thrown a light cabtire cable with a weight attached over a 12,000-volt line. In attempting to retrieve the cable with the assistance of an adult bystander, the two boys sustained burns and the man was killed.

(2) A young man in a state of intoxication climbed part way over the rail of a fire-escape platform outside his hotel room window and deliberately grasped a high-voltage line passing the building in the alley, resulting in his death.

(3) A workman, standing in a shallow pool of water, attempted to stop an electrically driven cord-connected concrete mixer by pulling its plug from the extension cord connector by which it was fed. The cord was in poor repair and the victim contacted an exposed live wire, resulting in his death.

On the occasion of the submission of this, my first annual report to you, Sir, may I express my appreciation for your interest in the problems of the Branch and of its personnel, and extend my thanks to your staff for their co-operation and assistance.

G. A. HARROWER, P.ENG.,
Inspector of Electrical Energy.

REPORT OF THE CHIEF GAS INSPECTOR

THE ACT

There were no amendments made to the *Gas Act* or pursuant regulations.

THE DIVISION

Gas inspection service was instituted in the City of Dawson Creek, the Municipality of Mackenzie, the Village of Hudson's Hope, the Peace River dam-site, and in the area known as Muskwa on the Alaska Highway.

The Corporation of the Township of Richmond instituted its own inspection service as of July 1, 1966.

There was a total of 832,324 feet of gas distribution mains installed by the gas utilities.

Night schools for Grade I gas-fitters were held in Vancouver, Burnaby, Abbotsford, Cranbrook, and Prince George.

Night-school courses for Grade II gas-fitters were held in Burnaby, Prince George, and Kelowna.

The first liquefied natural-gas installation in Canada began operations in The Corporation of the Township of Richmond, and the liquefied natural gas is transported by a special tanker truck to the new gas distribution system in Squamish.

The Chief Inspector continues to represent the Province on the following Canadian Standards Association committees:—

(1) The B 149 Installation Code for Gas Burning Appliances and Equipment.

(2) The B 200 Canadian Standards Association Sectional Committee on Specifications for Certification of Gas Burning Appliances.

(3) The Sub-committee for the Design, Installation, and Testing Section of the Z 134 Installation Code for Gas Transmission and Distribution Piping Systems.

(4) The Task Force Committee of the B 137.4 Plastic Piping for Gas Services, and the B 137.14 Recommended Practice for the Installation of Plastic Pipe for Gas Service.

SUMMARY OF WORK

	1966/67	1965/66	1964/65
Appliance certification	1,289	1,319	1,003
New designs checked	1,057	970	901
Gas Codes distributed	898	881	580
Gas-fitters' licences issued	1,496	1,570	1,608
Gas contractors' licences issued	521	533	528
Provisional licences issued	536	486	521
Gas-fitters' examinations	183	155	159
Gas-fitters' re-examinations	61	43	54
Number of gas-fitters passed examinations	167	150	116
Number of gas permits issued, municipalities	9,479	10,048	10,499
Number of gas permits issued by this Branch	13,943	13,898	14,303

In June the B 149 Committee, the B 200 Sectional Committee, and the Interprovincial Gas Advisory Council met in Vancouver. The work of the committees was to up-date standards and keep abreast of the many technological advances in the gas industry.

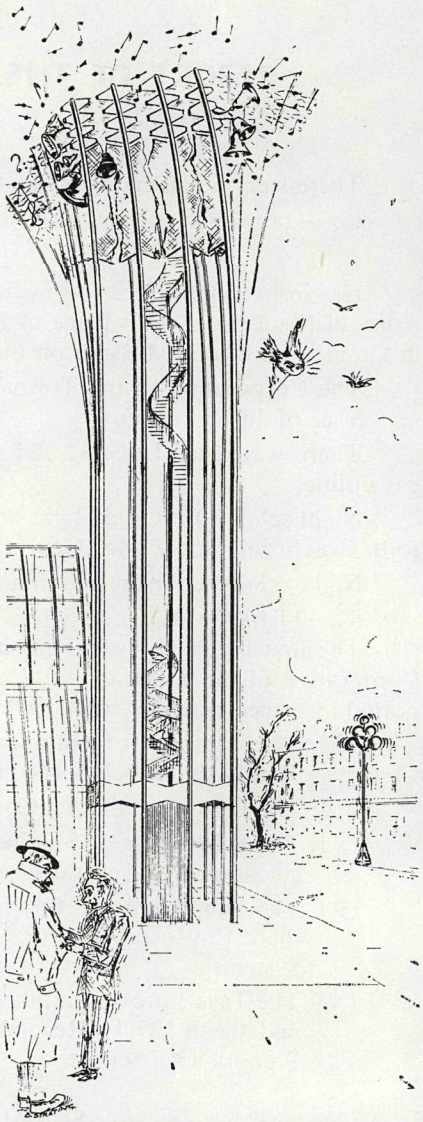
The industrial growth of the Province continues to increase, and more specialized gas-fired equipment is being designed for industry. The first solid-state electronic flame safeguard equipment appeared on the British Columbia market this year.

Proposals were made to extend natural-gas service in the coming year to Prince Rupert, Kitimat, Terrace, Smithers, Houston, Burns Lake, Vanderhoof, Fraser Lake, Fort Fraser, Telkwa, Endako, Topley, Decker Lake, Ashcroft, Clinton, Naramata, Princeton, Peachland, Westbank, Falkland, and Midway.

ACCIDENTS

There were 14 accidents investigated by this Branch. Eight of these were either attributed to natural gas or flammable-liquid vapours ignited by natural-gas pilots. The remainder were attributed to other causes. There were no serious accidents caused by natural gas in the Province.

A. G. KANEEN, P.ENG.,
Chief Inspector.



Sure, designed for earthquake, wind, and gravity, but not Wagner.

REPORT OF THE COMPTROLLER OF EXPENDITURE

The following presents in detail the expenditures relating to the construction, alterations, and repairs on the various Government buildings and institutions, etc., coming under the management, charge, and direction of the Minister of Public Works.

A. E. RHODES,
Comptroller of Expenditure.

STATEMENT OF EXPENDITURE, FISCAL YEAR 1966/67

ADMINISTRATION AND MAINTENANCE VOTES

(For details *see* Public Accounts.)

Vote 286—Minister's Office		$28,099.74
Vote 287—General Administration		238,098.29
Vote 288—Government Buildings (Maintenance)	(Gross)	9,157,878.31
Vote 290—Rentals	(Gross)	1,318,059.51
Vote 291—Safety Inspection Division, Vancouver		820,145.34
		$11,562,281.19
Less credits—		
Items recovered from the Department of Education *re* technical and vocational schools (Government Building Vote)		*1,015,770.41*
Items recovered *re* vocational training, energy board, etc. (Rental Vote)		*135,867.27*
		$10,410,643.51

CAPITAL

Vote 289—Construction of Provincial buildings (*see* expenditure by building, listed below)	(Gross)	$12,796,441.68
Less items recovered from the Department of Education *re* technical and vocational schools		*4,786,698.28*
		$8,009,743.40

SUMMARY

Gross expenditure, Department of Public Works—	
Administration and maintenance	$11,562,281.19
Capital	12,796,441.68
	$24,358,722.87
Less credits—	
Maintenance	*1,151,637.68*
Capital	*4,786,698.28*
Net expenditure	$18,420,386.91

VOTE 289—CONSTRUCTION OF PROVINCIAL BUILDINGS

Project No.	Description	Expenditure
453-B	Allco Infirmary, Haney	$4,246.50
599-B	Sewage-disposal system, Alouette River Unit	25.95
458-B	Animal Pathology Building, Abbotsford	19,000.57
421-B	Bull River Fish Hatchery	225,953.49
539-B	Burnaby Residential Care Centre for Children	141,058.27
484-B	Burnaby Mental Health Centre—repairs to roof and paved courts	1,843.24
299-B-2	Public Works Building, Burnaby Vocational Training School	84,138.96
497-B	Chetwynd Weigh-scale Station, Department of Commercial Transport	1,509.61
598-B	Purchase of property, City of Chilliwack	23,783.53
	Colony Farm—	
6-B-34	Repairs to piggery	12,376.35
6-B-35	Silo and barn	6,262.88
6-B-36	Scullery and can-washing	33,918.54
25-B-13	Dellview Hospital—Roads, paths, and drainage	5,000.00
	Essondale—	
5-B-102	Alterations and renovations to kitchen and staff rooms, dining-room areas	38,793.69
5-B-108	Hillside Building	35,656.40
5-B-116	Landscaping, roads, parking, etc.	31,873.26
5-B-119	Garbage-handling and incinerator	22,860.89
5-B-121	Structural alterations	52,831.36
5-B-133	Admitting Suite, Centre Lawn Building	35,130.41
482-B	Government office building and residence, Fort Nelson	17,609.47
289-B	General expenses (planning, survey supplies, etc.)	479,487.92
554-B	Glendale School (Colquitz), Victoria	92,112.04
290-B-2	Conservatory, Government House, Victoria	27,009.70
384-B	Grounds improvement, various Government buildings (Provincial)	66,601.08
	Haney—	
123-B-5	Development of grounds and irrigation	4,513.84
123-B-12	Alterations to workshop area	19,995.21
499-B	Prefabricated building for use as correctional institution, Hutda Lake (men's camp)	51,321.11
	Jericho Hill School—	
79-B-10	Dormitory unit and development	24,701.86
79-B-11	Classroom and Industrial Arts Building (clearing, grubbing, sloping land, seeding, etc.)	14,516.11
508-B	Remodel certain buildings on the Department of National Defence site, Kamloops (for the Attorney-General's Department)	96,879.92
528-B	Air Division, Lands Service (water services to process laboratory)	1,346.11
464-B	Mental Hospital, Lee Avenue, Victoria (preliminary design)	487,046.01
494-B	Government Agent's residence, Lillooet	5,000.00
501-B	Department of Highways house, Lillooet	5,000.00
518-B	Remodelling liquor warehouse, Fort and Langley Streets, Victoria	48,478.81
492-B	Motor-vehicle Building, Data Processing Centre, Victoria	54,678.59
550-B	Motor-vehicle testing-station, Victoria	26,250.31
519-B	Alterations to New Denver Dormitory	137,777.27
534-B	External renovations, New Westminster Courthouse	28,883.18
	Oakalla—	
39-B-18	Security fence	4,718.84
39-B-65	Renovations to kitchen	46,094.91
487-B	Acquisition of property for Parliament Buildings Precinct	1,052.79
385-B	Parking facilities, Parliament Buildings	35,645.37
	Pearson Tuberculosis Hospital—	
31-B-9	Modifications	15,956.20
31-B-10	Activity room	23,336.12
31-B-11	Fencing	12,944.56
31-B-12	Boiler plant	26,221.88
600-B	Purchase of property, Penticton	41,000.00
544-B	Prefabricated houses for Department of Health staff, Port Hardy	16,749.37
479-B	Structural alterations, Zone 5, Prince George Area	50,497.00
470-B	Addition to men's gaol, Prince George	617,446.08
547-B	Living-trailers, Prince George	90,676.97
505-B	Department of Highways residences, office manager's residence, Prince George	20,063.69
540-B	Department of Highways residence, engineer's residence, Prince George	21,500.00
437-B	Exterior restoration, Prince Rupert	13,616.43
602-B	Purchase of property (duplex), 403–405 Quebec Street, Victoria	17,500.00

VOTE 289—CONSTRUCTION OF PROVINCIAL BUILDINGS—*Continued*

Project No.	Description	Expenditure
455-B	Quesnel Courthouse	$17,601.35
545-B	Sewage disposal, Rayleigh Camp, Kamloops	10,000.00
452-B	Exterior restoration, Revelstoke Courthouse	8,000.00
504-B	Ruskin Women's Prison (Twin Maples Farm)	124,044.66
	Skeenaview Hospital—	
24-B-7	Stand-by power	10,208.99
24-B-8	Water supply	8,778.84
24-B-9	Sanitary sewage	15,000.00
24-B-10	Alterations and renovations	22,498.42
427-B	Government Agent's residence, Smithers	6,500.71
506-B	Department of Highways residence, Stewart	18,060.40
	The Tranquille School—	
10-B-12	Water supply and sewage disposal	5,526.03
10-B-41	Alterations, Main Building	49,998.55
10-B-47	Fire-pumper	15,000.00
10-B-49	Playground	9,974.31
10-B-51	104-bed unit	272,961.15
10-B-52	Extension of kitchen facilities	583,820.62
10-B-53	Air-conditioning, Greaves Building	82,338.97
10-B-55	Walkway	171.93
476-B	Vancouver Island Gaol	3,894.35
549-B	Renovations, 501 West 12th Avenue, Vancouver	4,963.29
408-B	Structural alterations, Vancouver area	51,823.97
537-B	Centennial Terrace, Vancouver Courthouse	351,778.14
538-B	Vancouver downtown parking, Block 61	21,724.37
292-B	Structural alterations, Victoria area	66,232.98
486-B	Museum and Archives Building, Victoria	1,400,824.80
546-B	Alterations, Willow Chest Centre	236,320.01
552-B	Windermere Building (purchase)	20,000.00
	The Woodlands School—	
7-B-40	Landscaping, fencing, paving, etc.	10,543.58
7-B-46	Structural alterations	30,475.16
7-B-47	Sound system	7,941.29
7-B-48	Renovations, Centre Building	153,662.09
7-B-49	Industrial Therapy Unit	67,192.65
7-B-50	Renovations to boiler plant, Phase I	2,399.16
369-B	Education—College of Education, University of British Columbia	11,134.01
	Vocational—	
401-B	Institute of Technology, Burnaby	158,729.38
401-B-1	Addition to Institute of Technology, Burnaby	1,929,004.59
299-B	Burnaby Vocational School	43,822.10
299-B-3	Burnaby Vocational School—trowel-trades and painting shop	433,071.21
507-B	Burnaby Vocational Teacher-training College	222,600.26
481-B	Dawson Creek Vocational School	1,340,088.16
407-B	Terrace Vocational School	1,065,160.78
511-B	Terrace Vocational School—sewer and water	160,000.00
	Highways, garages, etc.—	
415-B	Albert Canyon—equipment and fuel sheds (Revelstoke)	25.06
558-B	Alberni—shop	500.00
530-B	Aleza—two-bay shed (Fort George)	8,000.00
587-B	Athalmere garage and sheds (Columbia)	1,050.00
571-B	Atlin garage (painting) (Atlin (North))	800.00
526-B	Bowen Island—one-bay storage shed (Mackenzie)	1,007.00
555-B	Burnside—equipment sheds (painting) (Saanich)	500.00
569-B	Burns Lake, Houston, and Southbank garages (painting) (Omineca (West))	1,400.00
428-B	Cedarvale—three-bay shed and oil-house (Skeena (East))	8,000.00
565-B	Chilliwack yard (fencing) (Chilliwack)	9,000.00
405-B	Cloverdale—centre-lining storage building (Delta)	10,000.00
562-B	Cloverdale yard (painting) (Delta)	2,500.00
559-B	Courtenay shop (painting) (Comox)	3,000.00
588-B	Cranbrook shop, Yahk equipment-shed (painting) (Cranbrook)	1,255.21
420-B	Dease Lake maintenance depot (Atlin (North))	39,859.50
523-B	Denman Island—one-bay storage shed (Comox)	1,000.00
557-B	Duncan shop (painting) (Cowichan-Newcastle)	500.00
589-B	Fernie shop, Jaffray equipment-shed (painting) (Fernie)	977.11
570-B	Fort St. John garage (painting) (North Peace River)	1,200.00
393-B	Galiano Island—one-bay storage shed (Nanaimo-Islands)	1,000.00

VOTE 289—CONSTRUCTION OF PROVINCIAL BUILDINGS—*Continued*

Project No.	Description	Expenditure
	Highways, garages, etc.—*Continued*	
561-B	Gibsons shop (painting) (Mackenzie)	$1,000.00
533-B	Good Hope Lake—three-bay shed (Atlin (North))	27,866.23
590-B	Grand Forks oil-house and garage (painting) (Grand Forks-Greenwood)	1,603.21
402-B	Greenwood oil-house (Grand Forks-Greenwood)	878.98
493-B	Hazelton—foreman mechanic's residence (Skeena (East))	1,500.00
516-B	Hixon—two-bay equipment-shed (Cariboo (North))	7,000.00
531-B	Honeymoon Camp—oil-shed (Fort George)	1,000.00
522-B	Hornby Island—one-bay storage shed (Comox)	1,000.00
521-B	Jordan River—two-bay storage shed, oil-shed, and fuel pumps (Esquimalt)	12,000.00
579-B	Kamloops sheds, etc.	2,500.00
514-B	Langford Yard shop (painting) (Esquimalt)	2,000.00
525-B	Lasqueti Island—one-bay storage shed (Mackenzie)	1,000.00
586-B	Lillooet (North) District—garages, etc. (painting) (Lillooet (North))	2,300.00
527-B	Madeira Park—three-bay storage shed (Mackenzie)	2,000.00
567-B	McBride and Tête Jaune garages (painting) (Fort George)	1,000.00
563-B	Mission shop (painting) (Dewdney (East))	2,000.00
556-B	Nanaimo shop (painting) (Nanaimo-Islands)	1,000.00
592-B	Nelson garage and stockroom, Salmo shed (Nelson-Creston)	1,350.00
591-B	New Denver garage, etc. (painting) (Kaslo-Slocan)	1,000.00
582-B	North Okanagan—garages, etc. (painting) (North Okanagan)	2,000.00
560-B	North Vancouver shop (painting) (North Vancouver	1,500.00
578-B	Port Clements garage (painting) (Prince Rupert)	700.00
572-B	Pouce Coupe and Chetwynd garages (painting) (South Peace River)	1,600.00
566-B	Prince George and Honeymoon Creek garages (painting) (Fort George)	1,800.00
576-B	Prince Rupert garage (painting) (Prince Rupert)	900.00
524-B	Quadra Island—one-bay storage shed (Comox)	1,000.00
575-B	Quesnel garage (painting) (Cariboo (North))	1,200.00
581-B	Revelstoke sheds and garages (painting) (Revelstoke)	2,000.00
532-B	Rolla oil-shed (South Peace River)	2,000.00
597-B	Rolla equipment-shed (South Peace River)	25,291.35
564-B	Rosedale shed (painting) (Chilliwack)	500.00
593-B	Rossland, etc., garages and sheds (painting) (Rossland-Trail)	1,374.29
349-B	Salmo—three-bay shed and oil-house (Nelson-Creston)	4,469.83
580-B	Salmon Arm area—sheds and garages (painting) (Salmon Arm)	2,200.00
378-B	Saturna Island—one-bay storage shed (Nanaimo-Islands)	1,000.00
584-B	Similkameen District—garages and sheds (painting) (Similkameen)	2,370.00
573-B	Smithers and New Hazelton garages (painting) (Skeena (East))	1,400.00
583-B	South Okanagan—garages and sheds (painting) (South Okanagan)	1,800.00
577-B	Stewart garages (painting) (Atlin (South))	700.00
574-B	Terrace garage (painting) (Skeena (West))	1,200.00
568-B	Vanderhoof garage (painting) (Omineca (East))	1,100.00
585-B	Yale District—garages, etc. (painting) (Yale)	2,400.00
		$12,796,441.68

TENDERS RECEIVED AND CONTRACTS AWARDED FOR BUILDINGS

Description of Work and Names of Tenderers	Amount	Remarks
Addition to British Columbia Institute of Technology, Burnaby:		
Laing Construction & Equipment Ltd.	$3,481,290.00	
Burns & Dutton Construction (1962) Ltd.	3,486,000.00	
Marwell Construction Ltd. and Dillingham Corporation of Canada	3,481,054.00	
Biely Construction Co. Ltd.	3,385,600.00	
A. R. Grimwood Ltd.	3,329,000.00	Awarded.
Smith Bros. & Wilson Ltd.	3,396,369.00	
Alterations to Willow Chest Centre, Vancouver:		
Allan & Viner Construction Ltd.	247,490.00	
E. H. Shockley & Son Ltd.	255,918.00	
A. W. Gillis Ltd.	263,730.00	
Cain Truscott Contractors Ltd.	250,768.00	
Western Building Ltd.	260,000.00	
Doyle Construction Co. Ltd.	234,000.00	Awarded.
Centennial Terrace Fountain, Vancouver Courthouse:		
Frank Stanzl Ltd.	253,977.00	
Biely Construction Co. Ltd.	233,202.00	
Burns & Dutton Construction (1962) Ltd.	249,000.00	
A. W. Gillis Ltd.	231,998.00	Awarded.
Conservatory, Government House, Victoria:		
Luney Bros. & Hamilton Ltd.	23,895.00	Awarded.
H. E. Fowler & Sons Ltd.	25,516.00	
Mental Health Facility, Victoria, Phase III:		
Dillabough & Luney Ltd.	20,464.00	Awarded.
Chew Excavating Ltd.	26,850.00	
Wakeman & Trimble Contractors Ltd.	24,333.00	
Oliver Equipment Service & Supply Ltd.	26,480.00	
C. J. Oliver Ltd.	29,500.00	
New Office Premises, 1019 Wharf Street, Victoria:		
M. P. Paine Co.	555,396.00	
C. J. Oliver Ltd.	521,000.00	
Burns & Dutton Construction (1962) Ltd.	515,000.00	
R. A. Hall Ltd.	495,946.00	Not awarded.
Farmer Construction Ltd.	544,208.00	
G. H. Wheaton Ltd.	522,622.00	
Supply and Erection of Prefabricated Residence at Stewart:		
Atco Industries Ltd.	21,705.00	
Greenall Bros. Ltd.	23,334.00	Awarded.
Janitorial Services, British Columbia Institute of Technology and the Cafeteria, Administration, Boiler-house, and Dry-kiln Buildings, Burnaby:		
Excelsior Building Maintenance Ltd.	109,400.00	
National Building Maintenance Ltd.	100,800.00	
Granville Building Maintenance Ltd.	78,240.00	Awarded.
Best Cleaners and Contractors Ltd.	106,482.00	
Banner Building Maintenance Ltd.	95,496.00	
Mercury Maintenance Services Ltd.	101,500.00	
Paving Provincial Government Parking-lots Q and U, Victoria:		
Victoria Paving Co. Ltd.	14,147.28	Awarded.
O.K. Trucking Ltd.	16,851.32	
Improvements to Filter System, Tranquille School, Tranquille:		
Narod Construction Ltd.	51,914.00	
McGregor Construction Ltd.	47,900.00	Awarded.
Pacific Pipe & Flume Ltd.	48,052.00	
Max Daburger Contracting Ltd.	53,750.00	
Studer Bros. Construction Ltd.	68,457.00	
Supply and Erection of Two Prefabricated Residences, Port Hardy:		
Coast Homes Ltd.	39,912.00	Awarded.
Campbell River Construction Ltd.	51,800.00	
Greenall Bros. Ltd.	54,172.00	
Fabco Manufacturing Ltd.	29,100.00	
Mental Health Facility, Victoria, Phase IV:		
Farmer Construction Ltd.	190,580.00	
H. E. Fowler & Sons Ltd.	208,108.00	
G. H. Wheaton Ltd.	187,435.00	
Burns & Dutton Construction (1962) Ltd.	179,900.00	Awarded.

TENDERS RECEIVED AND CONTRACTS AWARDED—*Continued*

Description of Work and Names of Tenderers	Amount	Remarks
Glendale School, Royal Oak, Phase I (Clearing):		
Henson Building Ltd.	$2,745.00	
Oldfield Bulldozing	4,200.00	
Copley Bros. Construction Ltd.	3,900.00	
Oliver Equipment Service & Supply Ltd.	1,750.00	Awarded.
Wakeman & Trimble Contractors Ltd.	2,730.00	
E. P. Carson (Pat Carson Bulldozing Ltd.)	2,960.00	
Smith Construction	2,130.00	
Chew Excavating Ltd.	6,903.50	
British Columbia Archives and Museum, Victoria, Phase 3B:		
Burns & Dutton Construction (1962) Ltd.	479,000.00	
C. J. Oliver Ltd.	459,615.00	Awarded.
Clearing and Grubbing Sloping Land, Cultivating and Seeding, Provincial School for Deaf and Blind, Fourth Avenue, Vancouver:		
Bert Murray Landscaping Ltd.	20,225.00	
Holland Landscapers Ltd.	14,800.00	Awarded.
Jensen & Johnsen Landscape Contractors	19,980.00	
Vocational Teacher-training School, Burnaby:		
Laing Construction & Equipment Ltd.	1,331,792.00	
Grimwood Construction Co. Ltd.	1,239,000.00	
Janin Western Contractors Ltd.	1,279,431.00	
Narod Construction Ltd.	1,286,749.00	
E. H. Shockley & Son Ltd.	1,207,837.00	Awarded.
Imperial Construction Co. Ltd.	1,352,267.00	
Entrance Road and Parking-lot, Glendale School, Royal Oak, Victoria:		
Chew Excavating Co. Ltd.	26,703.00	
Wakeman & Trimble Contractors Ltd.	24,276.00	Awarded.
Oliver Equipment Service & Supply Ltd.	27,955.00	
Residential Care Centre for Children, Burnaby, Phase II:		
Construction Cartage Co. Ltd.	138,955.00	Not awarded.
H.B. Contracting Co. Ltd.	165,960.00	
McPhail's Cartage & Contracting Co. Ltd.	188,500.00	
Progressive Cartage & Contracting Co. Ltd.	189,572.00	
Grimwood Construction Co. Ltd.	193,140.00	
Parking-lot, British Columbia Institute of Technology, Burnaby:		
Winvan Gravel & Supply Ltd.	57,488.00	
E. R. Taylor Construction Co. Ltd.	55,132.00	
Progressive Cartage & Contracting Co. Ltd.	53,134.00	
Jack Cewe Ltd.	63,689.00	
E. H. Shockley & Son Ltd.	72,912.00	
Sutherland Construction Ltd.	57,779.00	
R. F. Binnie Construction Ltd.	63,000.00	
Standard General Construction (International) Ltd.	63,106.00	
McPhail's Construction Co. Ltd.	49,803.00	Awarded.
Provincial Government Offices, Duncan, Phase II:		
Farmer Construction Ltd.	342,758.00	Not awarded.
D. Robinson Construction Ltd.	401,152.00	
G. H. Wheaton Ltd.	372,000.00	
Burns & Dutton Construction (1962) Ltd.	356,000.00	
Excavation and Grading (Phase III), Glendale School, Royal Oak, Victoria:		
Oliver Equipment Service & Supply Ltd.	58,850.00	
Wakeman & Trimble Contractors Ltd.	32,685.00	Awarded.
Paving Provincial Government Parking-lot S, Victoria:		
O.K. Trucking Co. Ltd.	16,003.43	
Victoria Paving Co. Ltd.	13,857.00	Awarded.
British Columbia Vocational School, Terrace, Phase II:		
Bennett & White Ltd.	499,127.00	
Blakeburn Engineering Ltd.	464,700.00	Awarded.
Marpole Construction Co. Ltd.	497,870.00	
Bjornson Construction Co. Ltd.	473,793.00	
Remodelling B.C. Hydro Building, Pandora Avenue, Victoria:		
Luney Bros. & Hamilton Ltd.	33,438.00	
M. P. Paine Co.	33,690.00	
T. Lambie & Son Ltd.	30,896.00	
Burns & Dutton Construction (1962) Ltd.	30,700.00	Awarded.
Air-conditioning, Greaves Building, Tranquille:		
J. Walsh & Sons	128,860.00	
Barr & Anderson (Interior) Ltd.	130,728.00	
Keith Plumbing & Heating Co. Ltd.	124,007.00	
McKinnon Plumbing & Heating Ltd.	123,661.00	Awarded.

TENDERS RECEIVED AND CONTRACTS AWARDED—*Continued*

Description of Work and Names of Tenderers	Amount	Remarks
Janitorial Services, British Columbia Institute of Technology and Cafeteria, Administration, Boiler-house, and Dry-kiln Buildings, Burnaby:		
Mercury Maintenance	$101,100.00	
Best Cleaners & Contractors Ltd.	107,699.00	
Banner Building Maintenance	103,000.00	
Excelsior Building Maintenance Ltd.	105,700.00	
National Building Maintenance Ltd.	98,750.00	Awarded.
British Columbia Archives and Museum, Victoria, Phase IV:		
Farmer Construction Ltd.	3,385,000.00	Awarded.
Burns & Dutton Construction (1962) Ltd.	3,497,000.00	
Bird Construction Co. Ltd.	3,584,102.00	
Foundations (Phase V), Mental Health Facility, Victoria:		
H.B. Contracting Ltd.	223,465.00	
Pacific Piledriving Co. Ltd.	157,170.00	Awarded.
Burns & Dutton Construction (1962) Ltd.	178,000.00	
Farmer Construction Ltd.	158,157.00	
C. J. Oliver Ltd.	206,900.00	
G. H. Wheaton Ltd.	161,813.00	
R. A. Hall Ltd.	188,564.00	
Addition to the Public Works Maintenance Building, Burnaby:		
Regent Construction Co. Ltd.	58,616.00	
K & F Construction Ltd.	51,947.00	
Pine Tree Construction Co. Ltd.	50,889.00	Awarded.
A. W. Gillis Ltd.	52,960.00	
B.W.B. Construction Ltd.	56,123.00	
Mainland Construction Co. Ltd.	57,389.00	
Grimwood Construction Co. Ltd.	60,600.00	
Lickley Johnson Palmer Construction Ltd.	55,385.00	
Cain Truscott Contractors Ltd.	57,082.00	
Span Structures & Supplies Ltd.	62,367.00	
Biely Construction Co. Ltd.	62,100.00	
Residential Care Centre for Children, Burnaby, Phases II and III:		
Doyle Construction Co. Ltd.	759,500.00	Awarded.
Ross-Crest Contractors, Rossi Construction Co. Ltd., and Crestwood Construction Ltd.	820,000.00	
Imperial Construction Ltd.	812,827.00	
Grimwood Construction Co. Ltd.	778,387.00	
Narod Construction Ltd.	807,260.00	
Pacific Coast Construction Co. Ltd.	790,000.00	
Western Building Ltd.	797,820.00	
Biely Construction Co. Ltd.	774,400.00	
Bennett & White Ltd.	866,088.00	
Covered Link, Tranquille School, Tranquille:		
Narod Construction Ltd.	23,929.00	
McGregor Construction Ltd.	21,900.00	Awarded.
Max Daburger Contracting Ltd.	23,250.00	
Turner Construction Co. Ltd.	26,047.00	
R. Marini & Sons Ltd.	24,000.00	
Cascade Builders Ltd.	27,500.00	
Renovations, Centre Building, Woodlands School, New Westminster:		
Ratcliffe & Sons Construction Co. Ltd.	498,000.00	Awarded.
E. H. Shockley & Son Ltd.	537,168.00	
Stevenson Construction Co. Ltd.	517,728.00	
Western Building Ltd.	523,000.00	
A. W. Gillis Ltd.	530,917.00	
Industrial Therapy Building, Woodlands School, New Westminster:		
A. W. Gillis Ltd.	57,670.00	
Ratcliffe & Son Construction Co. Ltd.	71,319.00	
Royal City Construction Co. Ltd.	60,880.00	
Regent Construction Co. Ltd.	52,141.00	Awarded.
Ross-Crest Contractors	54,500.00	
International Construction Co. Ltd.	66,555.00	
Knutson Construction Co. Ltd.	60,494.00	
H. J. Henningson & Sons Ltd.	69,600.00	
Gadicke Construction Co. Ltd.	60,919.00	
K & F Construction Ltd.	59,978.00	
Norwood Construction Co. Ltd.	57,527.00	

TENDERS RECEIVED AND CONTRACTS AWARDED—*Continued*

Description of Work and Names of Tenderers	Amount	Remarks
Warehouse Renovation, 1019 Wharf Street, Victoria:		
W. Campbell Ltd.	$88,548.00	
Herb Bate Ltd.	86,853.00	
Burns & Dutton Construction (1962) Ltd.	89,800.00	
E. J. Hunter & Sons Ltd.	105,086.00	
G. H. Wheaton Ltd.	93,547.00	
R. A. Hall Ltd.	92,490.00	
Farmer Construction Ltd.	90,880.00	
Luney Bros. & Hamilton Ltd.	85,975.00	Awarded.
Trowel Trades and Painting Shop, Building No. 13, British Columbia Vocational School, Burnaby:		
Pacific Coast Construction Co. Ltd.	64,000.00	Awarded.
A. W. Gillis Ltd.	66,788.00	
Hartley Leslie Hartley Ltd.	68,158.00	
Supply and Installation of Equipment, Building No. 14, British Columbia Vocational School, Burnaby:		
Paragon Electric Co. Ltd.	18,259.00	Awarded.
Maintenance of Grounds, British Columbia Vocational School, Nanaimo:		
Jensen & Johnsen Landscape Contractors Ltd.	15,600.00	Awarded.
Supply and Installation of Ventilating Equipment, Building No. 14, British Columbia Vocational School, Burnaby:		
Tacey Sheet Metal Ltd.	21,330.00	
Dukes & Bradshaw Ltd.	12,000.00	Awarded.
Glendale School, Royal Oak, Victoria, Phase IV:		
R. A. Hall Ltd.	388,815.00	
Farmer Construction Ltd.	343,596.00	Awarded.
Pacific Piledriving Co. Ltd.	398,837.00	
Burns & Dutton Construction (1962) Ltd.	375,000.00	
Bird Construction Ltd.	395,188.00	
Janitorial Services, Victoria Law Courts and Windermere Building:		
National Building Maintenance Ltd.	29,880.00	Not awarded.
Canadian Building Maintenance Ltd.	66,816.00	
Tennyson Building Maintenance Ltd.	90,970.00	
Excelsior Building Maintenance Ltd.	73,367.00	
Best Cleaners & Contractors Ltd.	84,388.00	
Cleaning, Painting, and Caulking of Centre Building, Woodlands School, New Westminster:		
A & A Service Co.	44,310.00	
M. Sleightolme & Co. Ltd.	34,421.00	
Alexander Building Maintenance Contractors Ltd.	32,302.00	
Blanchet Bros., Painters & Decorators, Ltd.	24,410.00	Awarded.
Park & Phillips Ltd.	29,688.45	
Burrard Painting & Decorating Ltd.	28,898.00	
Janitorial Services, British Columbia Vocational School, Burnaby, Work Zone No. 2:		
National Building Maintenance Ltd.	47,400.00	
Banner Building Maintenance Ltd.	39,984.00	Awarded.
Best Cleaners Ltd.	47,160.00	
Excelsior Building Maintenance Ltd.	68,472.00	

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