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THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

/

REPORT

relating to the proposed erection of

LABORATORY AND ANCILLARY BUILDINGS

for

DIVISION OF CHEMICAL ENGINEERING

of

C.S.I.R.O., CLAYTON, VICTORIA

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PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

LABORATORY AND ANCILLARY BUILDINGS FOR DIVISION OF CHEMICAL ENGINEERING OF C.S.I.R.O., CLAYTON, VICTORIA

R E P O R T

By resolution on 31st August, 1966 the House of Representatives referred to the Parliamentary Standing Committee on Public Works for investigation and report, proposals for the erection of a new main laboratory and ancillary buildings for the Division of Chemical Engineering of the Commonwealth Scientific and Industrial Research Organisation at Clayton, Victoria.

The Committee have the honour to report as follows -

THE COMMITTEE'S INVESTIGATION

1. The Committee received written submissions from the C.S.I.R.O. and the Department of Works and took evidence in Melbourne from representatives of these organisations. We inspected the site of the proposed new buildings as well as the existing facilities used by the Division of Chemical Engineering at Fishermens Bend, Victoria.

THE PROPOSAL

2. The proposal submitted to the Committee is for the construction of new accommodation facilities and services for research purposes in the field of chemical engineering for the C.S.I.R.O. at Clayton. The aim is to rehouse the Division of Chemical Engineering, which is at present working in unsatisfactory and badly overcrowded accommodation at Fishermens Bend, in new buildings on a site set aside for the re-establishment of the C.S.I.R.O. Chemical Research Laboratories at Clayton.

3. The proposed facilities include a main laboratory with an administrative wing, a light technical laboratory, a heavy technical laboratory, a process bay building, a workshop and stores building, and a flammables store. The estimated cost of the proposed work is $1,400,000.

CHEMICAL RESEARCH BY C.S.I.R.O.

4. Chemical Research Laboratories The greater part of C.S.I.R.O's chemical research for secondary industry is carried out in the Chemical Research Laboratories. The laboratories comprise five closely integrated Divisions - Applied Chemistry, Applied Mineralogy, Chemical Engineering, Chemical Physics and Mineral Chemistry - each of which is responsible for research of national importance in a different area of chemistry. The broad aims of the Laboratories are -

- to promote technical efficiency in established industries;
- to stimulate the establishment of new industries;
- to encourage the use of raw materials of Australian origin;
- to seek substitutes for imported materials;
- to find uses for by-products not utilised;
- to study national problems to which, by virtue of their knowledge and experience, the research staff can contribute.

5. Facilities Until recently all five Divisions were located at Fishermens Bend on a site shared with the Aeronautical Research Laboratories of the Department of Supply. The Division of Mineral Chemistry has now been relocated in buildings about a mile from the Fishermens Bend site, whilst the Division of Chemical Physics has moved to Clayton.

6. When the establishment of Monash University at Clayton was being planned, the Commonwealth purchased 38 acres of land immediately to the north of the University. It was planned that this area would accommodate the Chemical Research Laboratories, with the Division of Chemical Physics being the first to move. The aim was for the remaining Divisions to be relocated as soon as practicable. The proposal to construct buildings for the Division of Chemical Physics was reported on by the Public Works Committee in 1961 when it was recommended that construction should proceed. These buildings have now been completed and occupied.

7. The works in the present reference will be the second stage of development on the Clayton site.

DIVISION OF CHEMICAL ENGINEERING

8. Chemical Engineering Chemical engineering may be described as the part of engineering concerned with processes which change the composition or properties of matter in bulk. These changes may be either physical or chemical in nature and chemical engineering is often concerned with processes in which only physical changes are involved. It involves the development, design and improvement of processes, the design, construction, operation and management of plant for these processes, and construction and research in these fields. It also involves the application of chemistry, physics and mathematics and its interests sometimes overlap other branches of engineering and technology.

9. Chemical engineers serve a wide range of industries, chief of which are the chemical industry, petroleum refining and many of the process industries. The chemical industry produces a wide range of essential commodities, for direct consumption, as intermediates for other branches of the chemical industry and for use in process industries. The increasing importance and output of the industry is dependent in large measure on modern chemical engineering practice.

10. Features of the chemical industry are its use of a wide diversity of equipment and the complexity of the chemical reactions involved in its operations. The magnitude of these operations varies in scale from the manufacture of large quantities of fertilisers and heavy chemicals, to producing only a few pounds per week of pharmaceuticals or other expensive fine chemicals. Between these extremes it is concerned in the manufacture of such materials as plastics, synthetic fibres and solvents. The refining of petroleum is a related industry wholly dependent upon chemical engineering. Process industries dependent on chemical engineering include food processing, mineral processing, pulp and paper manufacture and the plastics and rubber industries.

11. Role and History The increasing application of chemical engineering in industry has created a need for more chemical engineers as well as a need to develop new techniques and to investigate chemical engineering problems of special significance to Australian industry. Some research is undertaken within industry and in the universities. There is, however, research of major importance that is not being undertaken by individual firms and which requires a sustained attack and resources of a kind not appropriate to universities. The Division of Chemical Engineering fills this need.

12. The Division developed from a small Chemical Engineering Section set up within the Division of Industrial Chemistry in 1940. A process equipment laboratory established with the Section proved of immediate value to local industry. This contained small to medium scale equipment which enabled industrial firms to evaluate new processes before commitment to heavy capital investment. The laboratory has since been expanded and it now contains a wide range of pilot-scale equipment which is extensively used by industry.

13. The Chemical Engineering Section remained a small unit until about 1958 when the research programme began to expand and the staff was built up to its present level of 33 professional scientists and engineers and 27 supporting staff.

14. The Division at present has active research programmes in mineral processing, extractive metallurgy, automatic control of processes, water desalination, fuel and power as well as in basic chemical engineering research and general process development. This programme is creating pressure for more space, better appointed facilities and for some additional staff.

15. Present Facilities The Division's laboratories at Fishermens Bend are based on three brick buildings each measuring 80 ft. by 40 ft. Two of these are used for pilot-scale work and are very congested. The third provides space on two levels. This is sub-divided into laboratories and offices which are also very

crowded and are most unsatisfactory due to vibration and noise, the risk of fire and the leakiness of the upper wooden floor when spillages occur. This accommodation is supplemented by an adjacent small 2-storey building containing offices, a small library, toilets, etc.

16. Other accommodation includes a timber framed building containing the control room for the gasification plant, a small heat transfer laboratory and a sheet metal and welding shop. An area between two of the brick buildings has been roofed over for a small machine shop and store. A corrugated iron building is used for offices and specialised photographic work.

17. Due to the congestion at Fishermens Bend, the work of the C.S.I.R.O. Ore-dressing Laboratory, which is closely allied to that of the Division of Chemical Engineering on concentration and treatment of mineral ores, must continue to be carried out in the Mining Department at the University of Melbourne. When the new facilities are completed most of the staff and the facilities of the Laboratory will be integrated with the Division of Chemical Engineering.

18. The Division possesses a considerable amount of equipment, much of which is relatively new and of considerable value. Some of this is of a heavy nature including machine tools, pilot-plant and service equipment, and will be transferred to the new buildings at the appropriate time.

19. The most valuable item of scientific equipment is an analogue simulator which was purchased in 1965. This item cost $240,000 and it is being added to continuously as funds are available. Unfortunately, it has been necessary to install it on the first floor of the third of the brick buildings referred to above. The risk of fire in this building is high, although all reasonable fire detection and prevention precautions have been taken.

20. Need for Proposed Accommodation We found that the Division is at present housed in unsuitable and overcrowded accommodation at Fishermens Bend on a site which is shared with other groups of the

Chemical Research Laboratories and the Department of Supply. The site is restricted and no expansion by any of the groups can take place under the present circumstances. Furthermore, the location at Fishermens Bend is unsatisfactory for research purposes due to air pollution and vibration from nearby industry.

21. The inadequacies of the existing facilities are -

(a) inhibiting the Division's research programmes;

(b) preventing the appointment of the additional staff required to satisfactorily handle the programme; and

(c) preventing the integration of the Ore-dressing Laboratory with the Division of Chemical Engineering.

22. There is thus a pressing need to provide new laboratory and other accommodation for the Division of Chemical Engineering as quickly as possible. The adverse effect the existing facilities are having on the present programme of work is quite apparent.

THE SITE

23. The site of the proposed development at Clayton is roughly rectangular in shape and 38 acres in extent. It is located about 11 miles from the city. To the south and east the frontage is to Monash University and to the north the boundary of 2587 feet faces Normanby Road. The western frontage of 675 feet is to Gardiner Road. The contours vary from flat to gentle grades in the west to steeper grades in the south-east.

24. The Division of Chemical Physics has been established towards the eastern end of the site in accordance with the master plan drawn up at the time. The plan has since been up-dated and on the basis of current requirements the buildings for the Division of Chemical Engineering are to be built towards the western end of the area. Space is allowed for the other Divisions of the Chemical Research Laboratories and for two additional future Divisions if necessary.

25. The Division of Chemical Physics development comprises a laboratory buildings complex, electricity sub-station and road development. The site is landscaped.

26. We believe that the proposed site at Clayton is eminently suited to the needs of the Division and to the other Divisions of Chemical Research Laboratories.

BUILDING PROPOSALS

27. Overall Planning The site will permit the laboratories to have a north/south orientation. Restricted landscaping of the surrounding areas is proposed and the road layout will form part of the future development designed to allow free traffic flow between all areas. On-site car parking for 78 vehicles is planned.

28. We noted that in planning the Chemical Engineering complex of buildings, allowance has been made for future extensions to the light technical laboratory, the workshop and store, the process bay, and there is a site on which an additional laboratory could be erected.

29. The Main Laboratory Building This is to be a 2-storey structure oriented so that the main laboratories located on the south side of the building will have a maximum amount of consistent natural light. Offices, ancillary rooms and toilets will be located on the north side. The ground floor provides office accommodation, a conference room, P.A.B.X., lunch room, analogue computer room, laboratories with offices attached, toilets, plant room and study offices. The first floor will accommodate 12 research laboratories and associated offices, library and stack room, drawing office, photographic studio and dark room, instrument room, balance room, fume cupboards and toilets.

30. Strip footings under masonry walls and spread footings under the columns are the foundations proposed. The laboratory section will be of reinforced concrete construction supporting, at first floor level, a reinforced concrete ribbed floor which will span transversely between supporting beams. The ribbed floor will facilitate the provision of service ducts to the laboratories. The first floor of the office section will be of reinforced concrete beam and slab

construction to permit the installation of heavy mobile storage units in the library area. Steel roof trusses will support steel purlins and a galvanised steel roof deck.

31. The external finishes will continue the theme established by the Chemical Physics buildings. The external end walls will be of clay face bricks. The longitudinal walls will be framed in aluminium between columns with fixed sashes above sill height and removable enamelled metal panels below to provide access to service piping.

32. Internal corridor walls and partitions will be of concrete masonry block. Prefabricated timber partitions will separate offices from adjoining laboratory areas. Internal masonry walls will be painted except in the toilets where vinyl tiles will be used from floor to ceiling. Ceramic tile surrounds will be provided to sinks and basins as required. The floors will be finished in vinyl except in toilets and the plant room where terrazzo and granolithic respectively will be used. Ceilings will be sheeted with fibrous plaster but in offices, library, lunch room, conference room and analogue computer room, acoustic ceilings will be provided. Removable metal acoustic ceiling panels in the corridors will facilitate access to the mechanical services in the ceiling space.

33. Laboratories will be fitted with standard benches. They will be provided as required with sinks, vacuum points and service outlets for hot and cold water, compressed air, gas and power.

34. Light Technical Laboratory This building is to be located north of the main laboratory block and will be connected to it by an open covered way. It will provide 9800 sq.ft. of space in a building with a 14 ft. ceiling to facilitate experiments with larger assemblies of equipment. Accommodation is proposed for 11 laboratories, 10 offices for research scientists, a balance room, an analysis room and a grinding area.

35. Construction will be of load bearing masonry, lateral stability being provided by transverse internal masonry walls and the reinforced concrete sill beams. Roof framing will be prefabricated timber trusses supporting timber battens and carrying galvanised steel roof decking and ceiling joists.

36. The external walls will be of clay face bricks and the windows will be aluminium. Internal masonry walls will be of concrete brick. Partition walls separating offices will be prefabricated timber sections. The walls of toilets will be finished with vinyl tiles.

37. Generally floors will be finished in granolithic except in the toilets and offices where terrazzo and vinyl tiles respectively will be used. Ceilings throughout will be timber framed and sheeted with flat asbestos cement.

38. A sink and cupboard unit will be provided in each laboratory. The balance room will be fitted with standard balance benches.

39. Heavy Technical Laboratory This building, measuring 100 ft. by 50 ft. will be a large industrial type structure housing full scale chemical engineering equipment. Items weighing several tons and extending to the full 30 ft. height of the building will be rearranged periodically to suit the experimental programme. Steel columns with projecting flanges will support or brace equipment and permit attachment of framed experimental rigs on externally located concrete pads. Removable wall panels will allow an extension of internally located services to experimental test rigs outside the building.

40. Portal frames at 25 ft. centres will be used to enclose the laboratory. Intermediate columns will give a column spacing of 12 ft. 6 ins. Steel saw tooth roof trusses will span between the main roof frames and steel purlins will support the galvanised steel roof deck. Spread footings which will be provided under the steel columns will be tied to the reinforced concrete floor slab bearing on the natural ground.

41. External walls will be of face brick to 10 ft. with asbestos cement cladding fixed to steel girts above. Windows will be steel. The doors will be hand operated roller shutters and a single entry door. The floor will be finished in granolithic and graded to drains located on either side of the building. Ceilings will be close battened and sheeted to roof pitch with exposed aluminium foil.

42. Process Bay Building This building is similar in function to the heavy technical laboratory except that most equipment used in it will be permanently fixed standard units located on the mezzanine floor. The proposed structure measures 75 ft. by 50 ft. with a clearance of 20 ft. below the hook of the travelling crane. Construction and materials will be similar to those in the heavy technical laboratory.

43. The two laboratories and office located at the eastern end will have face brick walls, off form concrete ceilings and vinyl floors. A mezzanine floor and the two-tiered column and platform structure in the south east corner will be built of removable open steel grid floor sections supported on steel bearers.

44. Services will be similar to those in the heavy technical laboratory. Test rigs will be assembled on the externally located concrete pads on the northern side of the building. Removable wall panels above the mezzanine floor will permit extension of services to externally located rigs. Serviced laboratory benches will be provided in the laboratory rooms.

45. Workshop and Stores Building This building, measuring about 100 ft. by 90 ft., will be a single storey structure. It is to accommodate the electrical sub-station, plant room, workshop and assembly areas, materials store, surplus store, mess room, change room, first aid, lock-up and chemical stores, offices and toilets. It will be located so that the electrical sub-station and mechanical plant room it contains are convenient to the laboratory areas and can be expanded.

46. Strip footings are proposed under the brick walls and spread footings under the steel columns. The roof will be supported by a structural steel saw tooth roof system.

47. The external walls will be clay face bricks and the windows will be steel. The insulated roof will be covered with galvanised steel deck. External sliding doors will be of timber. Internal walls will be of fair face concrete block. Demountable timber partition walls will separate the first aid room and offices from the assembly and materials store. The walls of the toilets and showers will be covered in vinyl tiles to 7 ft. Other internal masonry walls will be painted. Ceramic tile surround will be provided to sinks and wash basins.

48. Floors throughout will be reinforced concrete with a monolithic hard wearing non-slip finish except in the offices, first aid, mess and change rooms and toilets where vinyl tiles will be used. Generally ceilings will be reflective aluminium foil fixed to the underside of the roof purlins. In rooms located under the mezzanine floor and in the electrical sub-station the ceilings will be off form concrete.

49. Flammables Store A standard flammables store measuring 20 ft. by 15 ft. with a reinforced concrete floor and light roof, masonry walls and a fireproof door will be constructed east of the heavy technical laboratory.

50. Committee Conclusion The Committee recommend the construction of the works in this reference as soon as possible.

ENGINEERING SERVICES

51. Mechanical Air conditioning will be provided in the main laboratory building only. Two conventional chiller units will be located in the plant room between the main laboratory and the light technical laboratory and air cooled condensers will be located on the roof of the plant room. Chilled and hot water as required will be reticulated to fan-coil units on the perimeter walls under windows.

Fresh air requirements of the laboratories will be met from air handling plants, one of which will be located in the main laboratory and the other in the plant room. Heating requirements of the fan-coil units and of the air handling plants will be met from a heat exchanger in the plant room. The analogue computor will have its own self-contained air conditioning system.

52. The twelve fume cupboards will be provided and fitted with exhaust fans. Air to the fume cupboard areas will be replenished from small supply air plants containing air filters and electric heating elements. Such other areas as toilets, will be mechanically exhausted as required.

53. Heating in the light technical laboratory will come from hot water base board convectors and in the internal offices from tempered air. In the workshop, heating will be by hot water unit heaters. Domestic hot water supply will be reticulated to basins and sinks.

54. A travelling crane of two tons capacity will be provided in each of the heavy technical laboratory and the process bay.

55. Electrical The master plan for the area envisages a high voltage ring main electricity distribution system. A 22 kV underground cable is to be extended from the transformer sub-station in the Chemical Physics area to a 1000 kVA transformer sub-station in the workshop building. Space will be allowed for a future 1000 kVA transformer. The high voltage switchboard will be designed for incorporation into the future ring main system. Underground medium voltage cabling will be used to distribute power from the sub-station to other buildings.

56. Artificial lighting within the buildings will generally be from fluorescent fittings. Levels of illumination will conform to the appropriate Australian Standard Lighting Code. Fixed electrical equipment will be direct wired. General purpose outlets will be provided for portable equipment and a wiring duct above benches will facilitate the extension of power to meet the requirements of different investigations.

57. Thermal fire detectors are to be used generally, except in areas housing electronic equipment where smoke detectors will be used. The fire alarm control board will be connected to the master alarm and indicator panel for the area and to the Melbourne and Metropolitan Fire Brigade.

58. A goods/passenger lift designed to carry a load of 3,200 lbs. at 60 feet per minute is planned for the main laboratory building. The lift is required to move goods including scientific apparatus and when not in use for this purpose will be available for passenger traffic.

59. Hydraulic Water reticulation for domestic and fire services will be by extension of existing mains. Sewerage will be connected to the Melbourne and Metropolitan Board of Works main in the drainage easement which passes through the area. Stormwater will drain to a main also located in the easement.

60. Roads and Parking Roads and car parking areas will be bituminous surfaced. Kerbs and channels will be provided and stormwater from them delivered to the drainage system. On-site parking for 78 cars is proposed.

ESTIMATES OF COST

61. The estimated cost of the works as referred to the Committee is $1,400,000 as follows:

Building works	$590,000
Mechanical services	$446,000
Electrical services	$225,000
Roads and stormwater	$60,000
Sewerage and water supply	$55,000
Site services - Future development	$24,000
	$1,400,000

PROGRAMME

62. It is expected that after an approval to proceed is given, the preparation of contract drawings and documents, the invitation of tenders and letting of a contract will take 12 months. The building period is expected to occupy 18 months.

RECOMMENDATIONS AND CONCLUSIONS

63. The summary of recommendations and conclusions of the Committee is set out below. Alongside each is shown the paragraph in the report to which it refers.

		Paragraph
1.	THE RESEARCH PROGRAMME OF THE DIVISION OF CHEMICAL ENGINEERING IS CREATING PRESSURE FOR MORE SPACE, BETTER APPOINTED FACILITIES AND SOME ADDITIONAL STAFF.	14
2.	THE DIVISION IS HOUSED IN UNSUITABLE AND OVER-CROWDED ACCOMMODATION. THE LOCATION AT FISHERMENS BEND IS UNSATISFACTORY FOR RESEARCH PURPOSES.	20
3.	THERE IS A PRESSING NEED TO PROVIDE NEW LABORATORY AND OTHER ACCOMMODATION FOR THE DIVISION OF CHEMICAL ENGINEERING AS QUICKLY AS POSSIBLE.	22
4.	THE PROPOSED SITE AT CLAYTON IS EMINENTLY SUITED TO THE NEEDS OF THE DIVISION.	26
5.	THE CONSTRUCTION OF THE WORKS IN THIS REFERENCE AS SOON AS POSSIBLE IS RECOMMENDED.	50
6.	THE ESTIMATED COST OF THE WORKS AS REFERRED TO THE COMMITTEE IS $1,400,000.	61

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Chairman

Parliamentary Standing Committee
on Public Works,
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22nd September, 1966.