Official opening of

TELECOM AUSTRALIA RESEARCH LABORATORIES COMPLEX

by Hon. A. A. Staley, M.P.

MINISTER FOR POST & TELECOMMUNICATIONS

on Monday, 19th June, 1978, at 2.30 p.m.

Welcome

On behalf of the Commissioners and management of Telecom Australia, may I welcome you to the opening of these new buildings which have been specifically designed to meet the complex needs of the Commission's Research Department. These buildings, which cost some $9.8 million, provide accommodation for about 200 of the Research Department's 500 staff and represent stage one of a continuing programme to centralise the whole of the Research Department's activities on one site.

I trust that you will take the opportunity to inspect some of the technical displays which are on view throughout the buildings. These displays comprise a selection of some of the work being undertaken in the Research Laboratories and are representative of the activities being undertaken in our buildings here, in the City of Melbourne and at Winterton Road, Clayton.

Please feel free to visit any of the displays which attract your interest; you will find them listed at the end of this brochure.

If however you would prefer a guided tour of some of the displays, please join a guided party at either of the Building 1 or Building 2 foyers.

The official opening will be performed at 2.30 p.m. in the area between Buildings 1 and 3. At the conclusion of the opening ceremony, the Cafeteria on the ground floor of Building 2 will be open for afternoon tea.

If you would like to follow up any of the Laboratories' work in greater detail, please contact our Information Section (Telecom Australia Research Laboratories, 770 Blackburn Road, Clayton, Vic., 3168, telephone (03) 541 6452) and they will ensure that you are directed to the appropriate person.

Thank you for your attendance. I trust that your visit has been instructive. We are proud of this new complex and will use it as effectively as possible in our continued role of research and development for Telecom Australia.

E. Sandbach
Director, Research

THE TELECOM AUSTRALIA RESEARCH LABORATORIES

From its beginnings in 1923 as a one-man research unit, the Research Laboratories has grown until it is now a Department of the Headquarters organisation of Telecom Australia with a staff of some 500.

The original charter of the Laboratories emphasised the need to study "the latest discoveries, inventions and developments in electrical communications" and to advise on those "which are promising and likely to benefit the (Postmaster General's) Department's telephone and telegraph services" and this charter remains equally relevant today. The passage of 50 years has seen rapid advances in the science of telecommunications and these are reflected in the growth of the Laboratories and their span of activities.

In the 1920s, the Research Laboratories pioneered the introduction of vacuum tube voice frequency amplifiers in the Sydney-Melbourne telephone route and this was quickly followed by the installation of three-channel carrier systems.

By the late 1930s, twelve-channel systems had been introduced. This work required the development of telephone and transmission performance standards and the performance of complex measurements and analyses of various systems and media. The growth of these specialties has continued and a significant number of present-day activities can be traced back to these modest beginnings.

Radio transmission studies have also been an important part of the Research Laboratories' work. In the late 1920s, the Laboratories pioneered the transmission of radio programmes over the trunk network and this led to the Laboratories' contribution to the development of the National Broadcasting System which, today, provides ABC programmes to most parts of Australia. Later work saw the commencement of high frequency broadcasting and then the first very high frequency radio telephone system between Victoria and Tasmania.

During World War 2, the Laboratories contributed to the development of radar and this work, combined with its expertise in radio propagation, led to the Laboratories' studies of TV propagation and system parameters. Recommendations arising from this work paved the way for the introduction of TV to Australia. Present-day emphasis in this field includes the study of transmission techniques, including specialised digital methods, and the use of TV for business conferences.

The extension of earlier radio telephony work at very and ultra high frequencies has involved the Laboratories in studies of satellite systems and their propagation problems. A recent development, which has attracted overseas interest, is a technique to eliminate echo from the long transmission paths inherent in satellite circuits. Other media which have been studied include coaxial cable, waveguides and, at present, optical fibre systems.

The invention of the transistor in 1948 was quickly followed by investigations by Laboratories staff with a view to the device's introduction into telecommunications equipment. Early work included the use of the transistor in telephone traffic switching devices and this, with the introduction of the modern integrated circuit, has led to current work in digital switching and transmission systems and in stored program controlled telephone exchanges.

Over the years, the Laboratories has built up certain specialist activities. One such group commenced investigations of the properties of materials in the early 1930s. This expertise has grown to encompass physical, chemical and metallurgical analysis work which has contributed to developments in cable manufacture and jointing techniques and to the introduction of various plastics and metals into telecommunication equipment. Other specialist groups maintain and apply precise standards of electrical quantities and time interval.

The Research Laboratories primary contribution to telecommunication stems, of course, from the expertise of its staff. However, it is imperative that such expertise be adequately provided with specialised laboratory buildings and, to this end, the new Research Laboratories complex in Blackburn Road, Clayton, provides the most advanced and comprehensive facilities in the Laboratories' 55 year history. These new buildings, and those which will follow in the future, provide the facilities needed to support the Research Laboratories continuing task of harnessing new ideas in telecommunications science and technology.

NEW ACCOMMODATION FOR RESEARCH LABORATORIES

Laboratories Accommodation in the Clayton Area

Since the establishment of the Research Laboratories in 1923, the provision of building accommodation has followed an ad hoc pattern of leasing buildings in the Melbourne city area. At one stage, seven buildings at the eastern end of Melbourne plus one building in North Carlton were in use by the Laboratories. These buildings were old, having been erected as factories or warehouses, and required considerable refurbishing and continual maintenance to keep them at a suitable standard for specialist laboratory work. A major problem was the provision of building services to meet the changing needs of a developing technology.

In the late 1960s the then Australian Post Office undertook a comprehensive review of its Research Laboratories' accommodation needs. It was agreed that the leased accommodation was unsatisfactory and it was recommended that the Laboratories should be consolidated in new specially designed buildings located well away from the Central Business District. This culminated with the purchase, in 1972, of a 7 hectare site in Blackburn Road, Clayton, near Monash University. Subsequently, a further 12 hectares adjoining the first site was purchased for long term development. Parliamentary approval to proceed with construction of the first stage of development was received in November 1973. This project has become known as the Monash Laboratories project.

The decision to develop a new Laboratories complex in the Clayton area was based on the economics of providing specialised laboratory buildings in a long term multi-staged expansion programme. Feasibility studies conducted by the then Department of Works concluded that the most cost effective design would result from the establishment of a number of low rise buildings in a campus-style setting on a large block of land. This arrangement made it possible to spread the development of the project over a number of years and required relatively small but regular funds commitments compared to a large investment for one high rise building. Land suited to this style of building was only available in the suburban area and this, combined with the popularity of the eastern suburbs as a residential area, and its proximity to the Monash University, led to the choice of the present site.

General Arrangements

The Monash Laboratories project currently comprises two 3 storey and one single storey laboratory buildings designed to accommodate some 200 staff, a single storey plant building and a gatehouse. Building 1 houses the Physical Sciences Branch and the Microelectronics Section; Building 2 houses parts of the Advanced Techniques and the Standards & Laboratories Engineering Branches, the Laboratories Executive and Administrative staff, Cafeteria and Library; Building 3 houses the Environmental Physics activity and Building 4 accommodates centralised mechanical and electrical plant for the building services systems. Buildings 1 and 3 are connected by a single storey laboratory and office link to form an integrated structure.

Architectural Features

The Laboratories Buildings conform to an overall master plan as a group of several low rise (up to 3 storey) buildings arranged in a campus-style configuration linked by garden courts. This approach allows the necessary flexibility for further stages to accommodate those Sections which are still in the City and at Winterton Road, Clayton. A feature of the modular design of the buildings is the ease with which laboratory needs may be altered in both size and function, and the practicality of converting offices into laboratory space.

Structures

The three storey laboratory buildings are constructed of reinforced concrete columns and floors with concrete block panel walls. Reinforced concrete has been used around stairs, lifts and service ducts to ensure lateral stability. Mechanical plant is located within the roof space. The single storey buildings are steel framed with concrete block external walls. The roofs of all buildings are sheeted with corrugated aluminium while facias and ducts are clad with pre-finished steel sheeting. Windows are of anodised aluminium glazed with reflective double glass to reduce solar heat load. The internal partition walls, which subdivide laboratories and offices, are constructed of steel studs faced with plaster sheeting. Ceilings comprise a flame resistant acoustic tile suspended from the underside of the concrete floor above.

A major feature of the laboratory buildings is the provision of horizontal and vertical service ducts to facilitate easy installation and modification of services. A central duct provides access for services to the inner rooms of the buildings whilst vertical and horizontal ducts on the outer walls serve the external rooms and provide the basis of the building's appearance.

Services

Air conditioning is provided to all laboratories, offices, cafeteria and amenities rooms for comfort conditions. Air conditioning plant for these areas is located in the roof space plant rooms of the two main laboratory buildings and chilled water for these systems is provided from the central plant building (Building 4). Special laboratories are provided with close tolerance air conditioning where necessary. Toxic exhaust systems are provided to 43 fume cabinets and 19 exhaust hoods. Hot, cold and chilled water, compressed air, gas, etc., is reticulated through the duct system for use where appropriate.
Electricity is reticulated by a high voltage underground ring main to sub-stations in each of the laboratory buildings. Installations within the buildings such as cabling, switchboards, power outlets, etc., are generally surface mounted to facilitate flexibility. Other wiring for various communication purposes such as telephones, inter-laboratory circuits, etc., is readily accessible via the duct system.

Security

The complex is provided with a 24 hour security service centred at the Blackburn Road Gatehouse. A computer-based alarm and surveillance unit is provided in the Gatehouse to monitor the various fire protection and security warning devices throughout the complex. Fire protection systems within the buildings comprise early warning detectors, internal and external hydrants and hose reels and portable extinguishers.

Grounds

Landscaping of the area has been designed to enhance the campus-style nature of the property and to harmonise with the overall appearance of the nearby Monash University. Carparking areas for approximately 170 vehicles are provided on the site.

Amenities

The buildings incorporate amenities in accordance with the Commonwealth Amenities Code which applied at the time of their design. These include a temporary Cafeteria (Ground Floor, Building 2) to seat approximately 120 people, active and passive recreation rooms, showers and tea-making facilities.

Future Development

The second stage of development of the Monash Laboratories will provide three buildings to accommodate those Sections which are currently in the city, namely Electrical Standards, Time & Frequency Standards, Laboratory Instrumentation and Customer Apparatus. Further facilities will be provided for an enlarged Cafeteria, the main library and various storage, service areas and workshops. Preparation of the contract documentation for this stage is now well advanced and completion of the new buildings is expected by 1982. A further stage of development will then be considered to provide accommodation for those Sections which are currently at Winterton Road, Clayton.

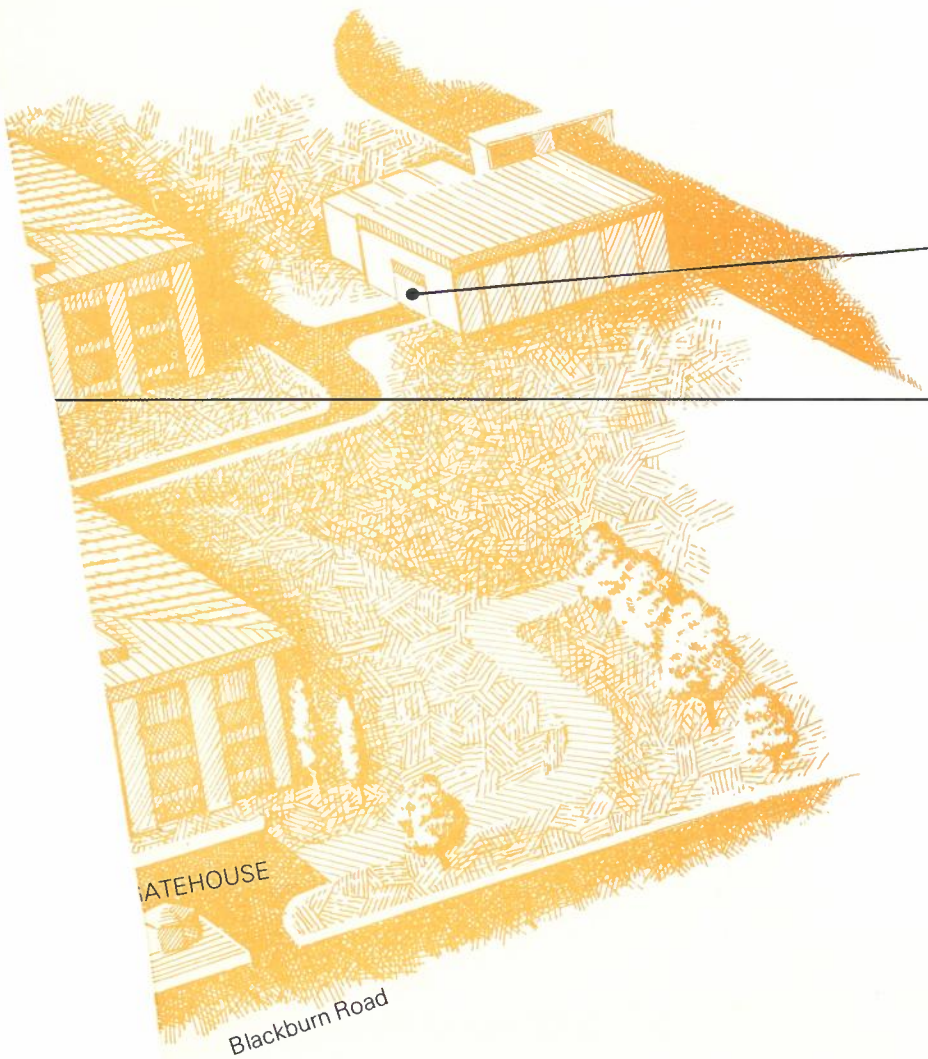
TELECOM AUSTRALIA
RESEARCH LABORATORIES,
770 Blackburn Road,
Clayton, Vic., 3168.

Designing & Construction Authority:
Australian Department of Construction,
General Contractors:
Dillingham Constructions Pty. Ltd.

BUILDING 3
- Environmental Testing
- Medium & High Voltage Laboratories

BUILDING 2
- Administration
- Advanced techniques
- Standards & Laboratories Engineering
- Cafeteria

plus displays by Transmission Systems



BUILDING 4
● Centralised Building Services

BUILDING 1
● Physical Sciences
● Microelectronics
plus displays by Switching & Signalling

SELECTED HIGHLIGHTS OF THE WORK OF THE TELECOM AUSTRALIA RESEARCH LABORATORIES

The following exhibits have been selected to demonstrate some of the work of the Research Laboratories. It is representative of the work undertaken in these new premises and at the other location in Melbourne (59 Little Collins Street and 117 Lonsdale Street) at 22 Winterton Road, Clayton.

A. TRANSMISSION

DISPLAY A1 — DIGITAL DATA NETWORK
(Building 2, Ground Floor)
The feasibility of the public digital data network (DDN) for data customers is being examined. The Line and Data Systems Section is investigating the quality of 64 kb/s transmission on groupband circuits set up to Sydney, Perth and Launceston, with specially developed monitoring equipment using a microprocessor.

DISPLAY A2 — PUBLIC AUTOMATIC MOBILE TELEPHONE SYSTEM
(Building 2, Ground Floor)
The Radio Systems Section is assisting with investigations of modern mobile radio telephone services. The work includes the determination of the area serviced by base station transmitters. Measurement techniques and computer prediction methods are displayed.

DISPLAY A3 — AUTOMATED MEASUREMENT OF CROSSTALK IN MULTIPAIR CABLES
(Building 2, Ground Floor)
The Network Theory Section is using an automatic network analyser which has been programmed to measure crosstalk in multipair cables and to calculate the statistics of these measurements. Recorded measurements are being used to demonstrate graphs of the covariance function.

DISPLAY A4 — EXCHANGE TONE SIGNALS
(Building 2, Ground Floor)
New customer equipment, international subscriber dialling, and new stored programme electronic local exchanges are forcing the introduction of new exchange tone signals. The Customer Apparatus Section's work in the study of technical, psychological and marketing factors is displayed.

DISPLAY A5 — TELEPHONE QUALITY ASSURANCE
(Building 2, Ground Floor)
The maintenance of a reliable telephone service requires efficient quality control of customer equipment. A new model telephone apparatus measuring system (TAMS-4), designed by the Customer Apparatus Section for electro-acoustic testing in factories, test rooms and repair workshops, is exhibited.

B. LABORATORIES ENGINEERING

DISPLAY B1 — INSTRUMENTATION THROUGH THE YEARS
(Building 2, Ground Floor)
The Laboratory Instrumentation Section is responsible for the provisioning, maintenance and calibration of the Laboratories' scientific and electronic instruments. The evolution of two categories of instrument, electronic voltmeters and cathode ray oscilloscopes, is displayed.

DISPLAY B2 — MICRO PLASMA WELDING
(Building 2, Ground Floor)
Specialised mechanical techniques are a necessary support for many research projects. The Project Engineering Section is displaying a micro plasma welding facility which enables the fabrication of items from extremely thin metals.

DISPLAY B3 — COMPUTER-AIDED PREPARATION OF TECHNICAL PUBLICATIONS
(Building 2, Ground Floor)
A major output of the Research Laboratories is the written word. The Information Section is demonstrating the preparation of technical publications using a computer technique which allows powerful editing and formating of material.

DISPLAY B4 — COMPUTER-AIDED PHOTOTOOL PRODUCTION
(Building 1, Ground Floor)
All microcircuits and printed wiring boards are produced from complex artwork known as phototools. The Microelectronics Section is demonstrating an interactive graphics system which incorporates computer-controlled techniques for the generation of the required lines and shapes.

DISPLAY B5 — THICK FILM HYBRID MICROCIRCUITS
(Building 1, 1st Floor)
Modern telecommunication often requires higher operating frequencies or smaller numbers of component interconnections. The thick film hybrid microcircuit technique of meeting such requirements is demonstrated by the Microelectronics Section.

C. NEW TECHNOLOGIES

DISPLAY C1 — ANTENNA AND PROPAGATION STUDIES
(Building 2, Ground Floor)
As telephone trunk traffic grows, it is important to examine the propagation mechanisms of higher capacity radio systems. The Unguided Media Section display depicts some of the antenna test facilities used in these studies including a new 11 GHz propagation experiment which has commenced in Gippsland.

DISPLAY C2 — WIRED TELETEXT
(Building 2, Ground Floor)
Wired Teletext is a system of displaying information from a central computer on a television set with two-way connection via the telephone system. A system designed to demonstrate and evaluate the technique is being displayed by the Computer Applications and Techniques Section.

DISPLAY C3 — OPTICAL FIBRE COMMUNICATIONS
(Building 2, Ground Floor)
Extremely thin glass fibres can carry light signals over long distances. The display by the Guided Media Section shows how the equivalent of 100 telephone conversations may be sent over several kilometres of fibre.

DISPLAY C4 — TELEVISION TRANSMISSION ON OPTIC FIBRE
(Building 2, First Floor)
Optical fibre has the potential to allow high capacity information dissemination to subscribers. The demonstration by Visual Communications Section of transmission of TV signals over a fibre is one example of the usefulness of this transmission medium.

DISPLAY C5 — AUDIO CONFERENCING
(Building 2, First Floor)
Group communications or teleconferencing, where people in different locations are linked together by the telephone network, is a research interest in many countries. The Visual Communications Section is demonstrating a novel processor-controlled audio conference system.

DISPLAY C6 — LABORATORIES COMPUTER FACILITIES
(Building 2, First Floor)
A wide range of computer facilities is currently employed in the Research Laboratories. The time-share video display terminals, which are demonstrated by the Computer Applications and Techniques Section, are connected to the Telecom Australia computer network.

DISPLAY C7 — SCANNING ELECTRON MICROSCOPE
(Building 2, Second Floor)
The scanning electron microscope (SEM) is a powerful tool for the examination of the topography and composition of materials. One example of its use by the Solid State and Quantum Electronics Section is the determination of the dopant concentration across the end face of an optical fibre.

DISPLAY C8 — OPTICAL FIBRE CHARACTERISATION
(Building 2, Second Floor)
A precise knowledge of the refractive index profile of an optic fibre is important in determining the fibres transmission bandwidth. The Solid State and Quantum Electronics Section is demonstrating the near-field scanning technique of profile measurement.

DISPLAY C9 — SATELLITE COMMUNICATION STUDIES
(Building 2, Second Floor)
The display shows two major emphases in satellite studies, namely the measurement of rain attenuation on earth-space paths (being undertaken by the Satellites Section) and investigations of microwave integrated circuits for satellite terminals (Solid State & Quantum Electronics Section).

D. SWITCHING AND SIGNALLING

DISPLAY D1 — REMOTE CONTROLLED SUBSCRIBER'S SWITCHING UNIT (RSU)
(Building 1, Ground Floor)
Considerable economies may result from the use of remotely controlled switching systems located in areas such as high rise buildings. The Systems Development Section is demonstrating such a facility.

DISPLAY D2 — CADDIE — COMPUTER AID FOR TELEPHONE SWITCHING SYSTEM DESCRIPTION AND DESIGN
(Building 1, Ground Floor)
The processes involved in complex switching systems may be readily examined using a computer-aided technique to specify various customer facilities. The Network Studies Section is demonstrating the use of this method.

DISPLAY D3 — MICROPROCESSORS AND MICROCOMPUTERS IN TELECOM AUSTRALIA
(Building 1, Ground Floor)
The microprocessor provides a powerful circuit element with many applications in switching-type environments. A standard microprocessor card system and memory hardware is displayed by the Devices and Techniques Section.

DISPLAY D4 — ELECTROMAGNETIC COMPATIBILITY (EMC)
(Building 1, Ground Floor)
An understanding of the penetration of interfering signals into shielded transmission lines is important in devising effective protection methods. This work, and related line driving and receiving techniques, is demonstrated.

DISPLAY D5 — SUBSCRIBER'S LOOPS CONCEPTS
(Building 1, Ground Floor)
Special subscriber's facilities such as conference calls, automatic call diversion, message interception, etc., may be more readily provided by digital techniques on subscriber's loops. The display shows some of the possibilities which are currently being examined by the Switching and Signalling Branch.

E. PHYSICAL SCIENCES

DISPLAY E1 — HIGH VOLTAGE LABORATORY
(Building 3, Ground Floor)
The effects of lightning induced surges on telecommunication equipment provides an important input to the determination of effective protection methods. On display is a range of equipment used by the Applied Physics Section for these studies. Also in the area are a number of environmental test chambers.

DISPLAY E2 — FATIGUE TESTING OF GUY TERMINATIONS
(Building 1, Ground Floor)
Transmitter masts have traditionally been guyed with tailor-made guy terminations. The Metallurgy Sub-Section is investigating a new type of "general" termination which will feature greater economy and ease of provision. Other metallurgical studies and equipment on display include the effect of metal whiskers on telecommunication equipment.

DISPLAY E3 — RELIABILITY ASSESSMENT OF TELEPHONE DIALS AND SWITCHES
(Building 1, First Floor)
Equipment for determining the expected life of telephone dials, switches and push buttons is on display. One such machine, designed by the Reliability Studies Section, incorporates automatic print out of results.

DISPLAY E4 — DEVELOPMENT OF FILLED TELEPHONE CABLES
(Building 1, Second Floor)
Unfilled telecommunication cables allow water to "pipe" along their length. The Polymer Section is displaying the development of cable filling compounds which prevent the entry of water.

DISPLAY E5 — STUDY OF LEAD BATTERY PLATES
(Building 1, Second Floor)
Present sources of lead used in battery plate manufacture contain increasingly higher concentration of bismuth which consequently reduces battery effectiveness. The display shows the Electro-Chemistry Sub-Section's studies of this effect.

DISPLAY E6 — INSTRUMENTAL ANALYSIS LABORATORY
(Building 1, Second Floor)
This laboratory, operated by the Analytical Chemistry Section, provides sophisticated equipment for the analysis of a wide range of chemical substances. The display shows a mass spectrometer and various gas chromatographs and spectroscopes.

F. THE BUILDING

DISPLAY F1 — BUILDING ENGINEERING SERVICES
(Building 1, Second Floor)
Many building services are provided throughout the Laboratories to meet the special needs of individual Sections. The display features an overview of these facilities together with a pictorial representation of the development of the building project.

INDEX OF DISPLAYS BY BUILDINGS

Building 1, Ground Floor
B4 Computer-Aided Phototool Production.

D1 Remote Controlled Subscriber's Switching Unit (RSU).
D2 CADDIE — Computer Aid for Telephone Switching System Description and Design
D3 Microprocessors and microcomputers in Telecom Australia
D4 Electromagnetic Compatibility (EMC).
D5 Subscriber's Loops Concepts.

E2 Fatigue Testing of Guy Terminations.

Building, 1, First Floor
B5 Thick Film Hybrid Microcircuits.

E3 Reliability Assessment of Telephone Dials and Switches.

Building 1, Second Floor
E4 Development of Filled Telephone Cables.
E5 Study of Lead Battery Plates.
E6 Instrumental Analysis Laboratory.

F1 Building Engineering Services.

Building 2, Ground Floor
A1 Digital Data Network.
A2 Public Automatic Mobile Telephone System.
A3 Automated Measurement of Crosstalk in Multipair Cables.
A4 Exchange Tone Signals.
A5 Telephone Quality Assurance.

B1 Instrumentation Through the Years.
B2 Micro Plasma Welding.
B3 Computer-aided Preparation of Technical Publications.

C1 Antenna & Propagation Studies.
C2 Wired Teletext.
C3 Optical Fibre Communications.
Cafeteria

Building 2, First Floor
C4 Television Transmission on Optic Fibre.
C5 Audio Conferencing.
C6 Laboratories Computer Facilities.

Building 2, Second Floor
C7 Scanning Electron Microscope.
C8 Optical Fibre Characterisation.
C9 Satellite Communication Studies.

Building 3, Ground Floor
E1 High Voltage Laboratory (including environmental testing).

Telecom Australia