

Australian Databases & Engineering Heritage

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SUMMARY While preparing a bibliography of literature on Australian Engineering Heritage, the authors searched the ENGINE, HERA, WATR and ROAD on-line databases for appropriate literature. The search techniques are described, and the type of material located by these searches is discussed. Among the many types of users of this material, are persons interested in identification, assessment, recording, preservation and presentation of Engineering Heritage, and also persons interested in history and particularly in the history of ideas. The needs of these various groups with implications for those interested in the clever country and value added products are discussed. Some means of satisfying these needs are identified.

1. INTRODUCTION

A major characteristic of Homo Sapiens is the ability to collect and to process information. Over-loaded memories were supplemented by the making of notes and a progression to writing manuscripts, which were subsequently stored in libraries, and catalogued to provide access by author or title or content. With the explosion of information, a literature search can be very time-consuming. The development of computers with extensive memories and the ability quickly to recover and then display specified items of information has made it possible to search the literature more effectively.

It is now common practice to utilise computer techniques in research projects which involve the searching for, and review of, existing information. Thus it is appropriate to review the use of existing databases in the comparatively modern concept of engineering heritage.

Engineering heritage is envisioned as covering the identification, description, assessment and conservation of sites and objects, including papers which are normally considered the province of Archivists and also the researching and writing of the history of engineering and of biographies of engineers. The bibliography by Cumming, et al. (1) identifies early attempts at databases including; papers by St Clair Johnson (2) on a database of items of engineering heritage in South Australia; a monograph by O'Connor (3) on a register of Australian historic bridges; and a paper (4) on division activities of the Canberra Division. Papers on archives include one by Dwyer (5) on engineers' papers in the archives at Sydney University, and another by McCarthy (6) who notes that the only artefacts from the homopolar generator which can reasonably be preserved, are the papers generated during the project.

In 1990, the Chief Executive of the Institution of Engineers, Australia (7) expressed his hope that 'Our nation, our community, will come to appreciate more strongly the fundamental role that engineering must play in the generation of wealth, and creating a better environment' and that 'Our young people . . . will

perceive the enduring values of an engineering career to solve the problems of our future'. One significant means of achieving this hope, is by creating and articulating a better and wider understanding of what Engineers and Engineering have done for Australia and Australians. This is the essence of engineering heritage, a subset of heritage which is normally defined as that which one hands on to one's descendents, which identifies and interprets the ideas, often by conserving the resulting artefacts and sites.

2. CURRENT WORK

The authors began assembling in 1988 a bibliography on published works on Australian civil engineering in preparation for a conference on civil engineering heritage in the United States which was advertised but has still not been held. This work was extended into industrial and mechanical engineering and resulted in a preliminary survey of the monograph literature presented to the Fifth National Conference on Engineering Heritage (8) which excluded references to aeronautical, railway and tramway engineering, as this proved very extensive and had been partially summarised by Potter (9) and Quinlan (10) in 1985. Mining and mineral processing were also excluded, since these constituted such an extensive subject that they could not be reviewed satisfactorily in the time and space available. In addition considerable difficulty was encountered in separating the literature on mining and mineral processing, the activities which occur after mineral deposits have been located, from the far more extensive literature on geology, and particularly generalised mapping, which precedes discovery.

Although the current work towards a Bibliography on the History and Heritage of Engineering in Australia concentrates on monographs; individual books, reports and pamphlets; the literature searches supporting the work ranged wide and included indexes to journal articles and conference papers. The major printed and electronic indexes to Australian material were searched. References to papers relating to engineering heritage may be found in many of these sources, albeit in small numbers which makes searching tedious in the printed indexes.

3. ONLINE DATABASES

Indexes in electronic form offer speed and increased flexibility in searching, with the ability to search for individual words and/or phrases in an entry rather than being restricted to the subject headings of the particular source index. There are limits to this flexibility, some databases offer only the minimum information, such as the bibliographical details of a paper, whereas other databases include an abstract and/or provide additional indexing terms. Not all systems are equally easy to use and some information retrieval programs could be more user-friendly.

Online searches usually are done by an Information Professional with training in the techniques for efficient searching. Access to these services is charged usually either by the connect time to the vendor's computer or by an annual fee which includes a quota of connect time. Compact disc databases are expensive, in some cases more expensive than their online equivalents, but their ease-of-use; menu driven, with back-up available if the user does succeed in ruining the system; means that trained staff do not have to do searches for the end-user. Libraries have treated the compact disc as equivalent to the paper version of the index, and in general, these remain free to the end user.

4. AUSTRALIAN DATABASES

The major online networks in Australia are Australis from the CSIRO (Commonwealth Scientific and Industrial Research Organisation), Ausinet from Ferntree Computer Corporation and Ozline from the National Library of Australia. Of these services, Australis specialises in scientific and technical databases; Ausinet in business related databases; and Ozline includes the *Australian National Bibliography*, *Australian Government Publications* and three indexes, APAIS, MAIS and CINCH which cover public affairs, multicultural affairs and criminology. In addition the Royal Melbourne Institute of Technology has produced a compact disk system known as Austrom which covers primarily the social sciences and humanities and includes some of the same databases as the on-line services.

Online networks in Australia use the STAIRS retrieval program to locate the required information within a database. Although the original files for the databases come from a number of sources the network service provides a common basic structure for its databases, and offers access to the databases using the same command language. Different characteristics of the original files may mean that some search techniques are not applicable to every database on a network.

Australis carries the majority of the online databases of use for engineering heritage. In databases on Australis, each record is divided into two parts, 'Formatted fields' contain numeric data such as date of publication, map scale, and postcode, and assigned codes indicating the type of material, its intended audience and language. 'Paragraphs' include aspects of the textual data such as title, author's name and institution, abstract, funding, geographic region, project name and objectives, sponsors and staff, assigned codes for subject content, and assigned subject descriptors. These classification codes and subject descriptors enhance the effectiveness of a

search on an individual database. The extensiveness of the codes, the suitability of the descriptors for particular topics, and the consistency with which both codes and descriptors are applied can have a considerable effect on the results of a search. Examples of records from Australis databases are given in Appendix A.

4.1. ENGINE: Australian Engineering Database

ENGINE covers all engineering disciplines and provides references to the publications of the IEAust. and to some publications from both the Australian Institute of Refrigeration, Air Conditioning and Heating and the Concrete Institute of Australia. The authors set out to find all relevant papers from ENGINE on engineering heritage. Those papers known to have been presented at the National Conferences on Engineering Heritage were used as a benchmark for the effectiveness of the searches.

The initial search aimed to locate any references on ENGINE which included either of the words "history" or "heritage", together with any word beginning with the stem "engineer", such as engineer, engineers, engineering, engineerium, engineered, etc. This produced nearly 400 titles many of which did not seem relevant. A search for a phrase is far more specific than searching for the occurrence of individual words anywhere in a record and search for the phrase "engineering heritage" located some papers from the Engineering Heritage Conferences. Investigation of the full records from this search revealed that the phrase was retrieved from the titles of the papers or from the name of the conference. Some of the papers had been assigned the subject descriptor "ENGINEERING -- History". Checking *SHE: Subject Headings in Engineering*, the subject thesaurus used for ENGINE, showed that this was the approved heading. A search for papers with that descriptor located some but not all of the papers from the National Conferences on Engineering Heritage. A more thorough search would have required selecting words for every concept, site or artefact likely to have engineering heritage significance. Such a search was not undertaken at this time (1990). Since then Cumming et al. (1) have compiled a 'Bibliography of Australian Engineering Heritage and History' from the ENGINE database.

Following the initial search for engineering heritage material on ENGINE it was decided to see what coverage of this topic was given by other databases on the Australis system. The opportunity arose from the nature of the charges for Australis, an annual fee with an allowance of 50 hours searching time. Time which remained unused towards the end of the financial year could be used without charge. There being no financial pressure it was possible to refine searches on a number of databases before 30th June 1991.

Of the databases searched, HERA: *Heritage Australia* (from the Australian Heritage Commission), ROAD: *Inroads* (from the Australian Road Research Board) and WATR: *Streamline* (from the Department of Primary Industries and Energy, on behalf of the major Australian water agencies) produced the most substantial results, although some material relevant to engineering heritage was found on CSIX: *CSIRO index*, LEIS: *Australian Leisure Index* (from the Footscray Institute of Technology) and CONC: *Australian Conferences* (from CSIRO).

Some material from the searches on ENGINE appeared also on HERA, ROAD or WATR, with some papers located on two or more of these databases. There was some material from the IEAust publications that came up on HERA, ROAD or WATR which had not been found on ENGINE. This material was retrieved for the more substantial search on ENGINE done by the Information Resource Centre of the IEAust., for the bibliography compiled by Cumming et al. (1)

4.2. HERA: Heritage Australia

HERA aims to record references to all papers relevant to the National Estate, within the Charter of the Australian Heritage Commission, from 1987. This includes popular, professional and technical literature, from books, conferences, journals, and the reports of government and non-government agencies. Overseas material is included where it is considered relevant. In addition to subject descriptors and identifiers, up to four classification codes are assigned to each record for subject content, and up to five treatment codes are given for the type of publication and the audience at which it is directed.

The classification codes proved to be very useful in restricting the searches to aspects of the historic environment likely to be of interest from an engineering heritage perspective. A number of specific searches were done for conservation methodology (classification 0802) or survey and assessment techniques (classification 0804) applied to a selection of classifications for the historic environment (Appendix B). As expected, those areas of more obvious engineering relevance produced the highest percentage of useful records, such as 0909: historic sites; 0913: mining; 0914: other resource industries; 0915: industrial; 0916: transport; 0917: shipwrecks; and 0920: military. Although many of the items from the building related sections were considered primarily architectural, there was some interesting material, such as salt damp problems (0924: religious) and Mawson's huts (0926: scientific).

The full records for these searches showed that the phrases "significance assessment", "assessment technique" and "recording techniques" existed as descriptors on HERA. Three more searches were done using these descriptors with the treatment code P (methodology). More than half of the records retrieved for "significance assessment" or "recording techniques" as descriptors, with treatment code P (methodology) were relevant, but only a quarter of the records retrieved for "assessment technique" as a descriptor, with treatment code P (methodology) was relevant.

Two broad searches were done on HERA. The first used free terms and sought to locate papers which included any words beginning with the stem "engineer", such as engineer, engineers, engineering, engineered etc., together with any word beginning with the stem "assess" or "identif" or "conserv" or "preserv". Of the resulting 98 records some 70 were considered relevant to people working on engineering heritage. 15 papers appeared on ENGINE and papers of the 3rd and 4th National Conferences on Engineering Heritage were retrieved. Perusal of the records from these searches showed that words such as "engineer", "engineering", "engineers", "industrial", "industries", "industry" and "archaeology" existed as descriptors. The second broad search looked for all records containing "archaeology" as a descriptor,

together with any words beginning with the stem "engineer" or the stem "industr" as descriptors. This resulted in 71 records of which 67 were considered useful, 4 were in ENGINE. There was little overlap with the material retrieved in the first general search. There was considerable overlap between the results of these broad searches and the specific searches done by classification codes. HERA offers the choice of a specific search tailored to the user's requirements or a broad survey of the literature. The very wide coverage of the literature provided by HERA makes it a useful source of information for engineering heritage related to sites, that is within the Charter of the Australian Heritage Commission.

4.3. ROAD: Inroads

ROAD, the database of the Australian Road Research Board provides a comprehensive coverage of material on roads and road structures, materials, soil and rock mechanics, construction and maintenance, vehicles, traffic and transportation, in and relating to, Australia. ROAD has an extensive coverage of historical material, including the reports from colonial engineers which appeared in the Proceedings of the Institution of Civil Engineers and classic Australian papers and reports. A preliminary search on ROAD revealed that the phrase "Engineering history" existed as a descriptor. A search on that descriptor revealed a wealth of information. Of some 165 records, two-thirds were about Australian subjects, the remaining third covering overseas material. ROAD covers the publications of the IEAust. as well as a range of other journal articles and conference papers as they relate to roads. A broad search conducted for "history" as an identifier (a category of subject heading) but excluding any record which contained the descriptor "Engineering history" resulted in nearly 700 references. Almost all of these references were irrelevant and it seemed that the useful material was all retrieved under the descriptor "Engineering history". Such a short cut search would have been very useful on ENGINE.

4.4. WATR: Streamline

WATR indexes material on all aspects of water and includes published and unpublished material and reports on research projects. The initial searches on WATR looked for "history" or "heritage" together with any word beginning with the stem "assess" or "identif" or "conserv" or "preserv". Only about a quarter of the resulting papers were considered relevant, most dealt with biology or the environment. However these records revealed that "history" existed as a descriptor and subsequent searches were conducted for "history" as a descriptor combined with a selection of classification codes (Appendix B) for water resource development; for urban water utilities; for machinery, equipment and materials; and for wastes and wastewater. Most of the material retrieved was considered to be relevant for engineering heritage, and papers from the National Conferences on Engineering Heritage and the Institution's journals were included.

4.5. APAIS: Australian Public Affairs Information Service

APAIS is one of the most widely-available indexes for Australian material and as its name implies, is concerned with politics, economics, government and other general issues of public interest. The subject

coverage of APAIS has expanded over the years and now includes papers from some of the conferences of the Institution of Engineers, Australia. APAIS is available online through Ausinet and Ozline and is available also on compact disc (CD-ROM) on the Austrom service from the Royal Melbourne Institute of Technology.

A recent search was conducted on the CD-ROM version of APAIS and involved a free term search for either "history" or "heritage" combined with any words beginning with the stem "engineer". 126 references were retrieved, published from 1977-1991, including some papers from the National Conferences on Engineering Heritage. Most of the references seemed to be relevant for engineering heritage.

With the demise of the printed form of the indexes, *Australian Road Index* (1985), *ENGINE* (1982), *CSIRO index* (1986) and *Streamline* (1990), APAIS remains, in printed and compact disc form, a readily available index covering aspects of engineering heritage. Given the increasing public availability of the Austrom compact disc service it may be desirable for *ENGINE* to be mounted on that service in addition to Australis. Two other Australis databases, *LEISURE: Australian Leisure Index* and *FAMILY: Australian Family and Society Abstracts* are on Austrom.

5. THE USERS

The history and heritage of Engineering is a very wide subject. It may and should be of interest to engineers as part of their own culture, to historians who study past culture of which, in Australia, engineering is a feature, and to sociologists and economists who are interested in the past as a guide to the potentials of the future. In essence, the concepts of a clever country, sunrise industries, and value added products have been the essential dynamic of engineering, the resultant skills were part of the cultural baggage of the early European settlers on this continent.

Those who identify and care for the built or manufactured heritage, include persons who care for buildings and sites where the work of the elements is highly significant, and others whose work is primarily within museums where presentation at an acceptable standard of display is the most difficult task, although salvage or recovery, and conservation can be significant tasks. The first conferences on engineering heritage in Australia were mainly concentrated on the task of identifying and conserving sites and artefacts.

With increasing emphasis on 'Australian Studies' and 'the world at work', it appears that the emphasis is likely to move in the future, on to publishing histories and biographies. The Institution of Engineers Australia has submitted lists of eminent engineers which it considers are worthy candidates for inclusion in future volumes of the Australian Dictionary of Biography, and it should probably be preparing lists of those who have been omitted from earlier volumes. This, and the potential for a volume on Presidents, Medal Holders and Honorary Fellows of the Institution, justify more effort in locating, recording, indexing and making available on a database, information on engineering heritage in Australia.

6. FUTURE WORK

It is a waste of time for many researchers to be reading the same papers while searching for slightly different material. With the advent of personal computers, on-line and compact disc databases it is easy to select and distribute material stored on discs, which can be interrogated by computers using word processing or listing packages as required.

The authors would like to see indexes prepared of papers on engineering or by engineers, which were published in Australia by the various Royal Societies, ANZAAS, and by historical, geographical and other societies. Other important bibliographies or databases could provide lists of papers presented to the overseas institutions of civil, mechanical and electrical engineers either from Australian engineers or relevant to Australia, and list of articles relevant to Australia which were included in overseas technical magazines such as the *Engineer*, *Engineering*, and the *Mining Journal*. These would be especially valuable if abstracts of the papers were included and an index provided. Similarly an index to early technical journals published in Australia would very useful. A list of some of these journals, of which the authors have become aware in their work, is given in Appendix C.. Many of these early journals were short-lived and/or had frequent changes of name and the production of this incomplete list has not been a simple task. The listing and indexing of Parliamentary Papers and reports of Commissions and Select Committees which are relevant to engineering heritage is another task which needs to be done, to provide access by subject and by the name of those contributing, by authorship or by evidence. The authors are aware of one publication of this nature, for South Australia (11) and other unfinished papers for Victoria and Western Australia, but are unaware of any others.

7. REFERENCES

1. Cumming, D.A, Moulds, A. and Wrigley, L.J. "A bibliography of Australian Engineering history and heritage from the database ENGINE". Institution of Engineers, Australia, Canberra, October 1991
2. St Clair-Johnson, C. "The Australian heritage engineering record and the South Australian register". Engineering Conference 1980: Engineering in the 80's, Adelaide, April 1980, IEAust Publication No. 80/2 Supplement pp. 9-15.
3. O'Connor, C. "Register of Australian historic bridges", Australian Heritage Commission, Barton, ACT., February 1983
4. "The Institution of Engineers, Australia, Canberra Division: highlights of the Divisions activities 1927-1987" Institution of Engineers, Australia Canberra Division, Barton, ACT., 1987.
5. Dwyer, M.R. "Engineer's papers: an undervalued resource", Fifth National Conference on Engineering Heritage, IEAust., Perth, December 1990, IEAust Publication No. 90/16 pp. 29-34.

6. McCarthy, G.J. "Generating history; the heritage value of the archives of the Australian National University homopolar generator", Multi-disciplinary Engg Trans. IEAust. Vol. GE11, No. 2, November 1987, pp. 101-6.
7. "Chief Executive Review", Annual report 1990, The Institution of Engineers, Australia, Barton, ACT, March 1991, p. 5
8. Cumming, D.A and Leverett, K. "A preliminary survey of the literature on industrial and mechanical engineering in Australia", Fifth National Conference on Engineering Heritage, Perth, December 1990, IEAust Publication No. 90/16 pp. 123-131
9. Potter, G.R. "Australian aviation, an annotated bibliography for collectors", G.R.Potter, Dalkeith, WA, 1986
10. Quinlan, H. "A bibliography of Australian railway and tramway literature", Australian Railway Historical Society, Canberra, December 1984
11. Cumming, D.A. and Hamidon, B.A. "South Australian Parliamentary Papers as a source of engineering history" Department of Civil Engineering, University of Adelaide, 1986

APPENDIX A

SAMPLE RECORDS FROM DATABASES ON AUSTRALIS

1. ENGINE

000000911080

TI Misinterpreting engineering heritage
AU WHITMORE=RL
AULOC University of Queensland
SOURCE Fifth national conference on engineering heritage 1990: Perth 3-5 December 1990: preprints of papers. p25-28
IMPRINT Barton: IEAust, 1990
COLLATION 4p ill 6 refs
SERIES National Conference Publication (IEAust) no 90/16
AB The paper presents a number of cases where errors have occurred in interpreting the cultural significance of engineering places and artefacts. The sources of errors are examined, and some general conclusions drawn. These include a need for better technological training for the people carrying out the research and making the interpretations, improved data bases, and a requirement that major technological sites, works or artefacts scheduled for redevelopment or replacement, be subject to a cultural significance investigation when decommissioned.
DE ENGINEERING RESEARCH - standards
MINOR TECHNOLOGY - economic and sociological effects; ENGINEERING - professional aspects; ENGINEERING - social aspects; INFORMATION DISSEMINATION; MUSEUMS; ENGINEERING WRITING - analysis; PERSONNEL TRAINING; COAL MINES AND MINING - Queensland; WIND TURBINES - Brisbane; SAWMILLS - Brisbane; STEAM ENGINES
ID HISTORY; COAL DISCOVERY; STONE FRIEZE; FORGAN SMITH BUILDING; UNIVERSITY OF QUEENSLAND; WICKHAM TERRACE WINDMILL; BALMORAL COLLIERY; BLACKWATER; PATTERSON'S SAW MILL; TOOWONG; BLAIR ATHOL COALFIELD

2. hera

00000B891162

TI The restoration of Thorpe Watermill, Bothwell, Tasmania
AU Bignell=J
SERIES Australian journal of historical archaeology
COLLATION 1988, 6:83-87
AB Thorpe Watermill is the only known Australian example of a traditional water-driven flour mill that can be operated in the original manner. This uniqueness results from restoration work carried out by John and Peter Bignell. This is an account of how the work was done. (Au, MS)
DE Thorpe Watermill Bothwell Tas ; Flour mills ; Restoration
CL 0915 0802
TC A P
LOCALITY Bothwell Tas
MAP SK5506 ; 8313
AREA T

00000B871780

TI Fighting rust
AU Weaver=M
SERIES APT bulletin
COLLATION 1987, 9(1):16-18
AB The author describes the use of Fertan, a British product, which is being used successfully in the treatment of rust. It has the ability to 'transform the rust into a material as strong as steel'. Being derived from a vegetable tannin base it is of low toxicity and has other advantages over synthetic resin. (Au, MS)
DE Decay ; Materials conservation ; Ships ; Conservation methods
CL 0802 0916
TC P

3. ROAD

008906AR074E
 TI The history of roller compacted concrete pavements in Australia
 AU Metcalf=JB (Australian Road Research Board (ARRB))
 Sharp=KG (Australian Road Research Board (ARRB))
 Mavin=KC(ed) (Royal Melbourne Institute of Technology)
 Sharp=KG(ed) (Australian Road Research Board (ARRB))
 CONF International Workshop on Roller Compacted Concrete Pavements, 1988, Melbourne, Australia
 PUBDATA DATE: 1989, PAGES: 1-7, PUBLISHER: Royal Melbourne Institute of Technology, Melbourne, Victoria, Australia
 AB This paper has attempted to briefly summarise the use of roller compacted concrete in Australia (especially Victoria) from the late 1920s (its earliest recorded use) to after World War II, when any major use appeared to be discontinued. It is clear that the major application of this material was as roadbase or in heavy duty pavements because of the perceived problems with surface rideability for high speed traffic. It is also apparent that the material discussed here ("roller consolidated concrete") is not the same as that being used today, especially with respect to cement content and water/ cement ratio and the construction technology. Today's RCC is an updated technology for today's conditions.
 DE Concrete pavement ; Compaction ; Engineering history ; Road construction ;
 ID Cement grouted macadam ; Construction method ; Pavement design ;
 NUMBER AUSTRALIAN IRRD: 814752
 AVAIL VARR (625.8 INT (2 copies))

4. WATR

000000019721
 TI Heritage treasures
 SOURCE Aquarian, 1989-05, 52, p12-14, 6 photos.
 AB The New South Wales Water Board has developed a heritage programme to conserve its significant historic buildings and sites. Discusses the value of SPS 271, the Marrickville NSW Sewage Pumping Station, built between 1880 and 1889 and still partially steam driven until 1954. Contemporary and historic photographs of the station and other heritage Water Board Structures illustrate the article.
 CL 805; 1000
 DE Conservation; History; Structures; Water Works; Sewerage
 MINOR Buildings; Pumping Stations; Storage Reservoirs; Conduits
 LOCALITY Marrickville NSW; Sydney Coast - Georges River (I113)
 AVAIL ANL; NML; NMWB; VMBW

5. APAIS

TITLE A heritage of waste. [Waste disposal works i.e. sewerage mains, drainage works and garbage disposal sites are significant engineering heritage sites in inner Sydney, centred on Blackwattle and Rozelle Bays]
 AUTHOR CLARKE, M. N. and COLTHEART, Lenore
 SOURCE In: National Conference on Engineering Heritage (5th: 1990: Perth, WA). Preprint of Papers (1990) : 1-7
 INPUT DATE 9107
 NOTES bibl., maps
 DESCRIPTORS Sydney: History ; Public health ; Bridges ; Utility service ; Historic sites
 IDENTIFIERS Public works ; Abattoirs ; Swamp reclamation ; Glebe Island Bridge ; Pyrmont incinerator
 NUMBER A91077662

APPENDIX B

SUBJECT CLASSIFICATION CODES USED FOR THE ONLINE SEARCHES ON HERA AND WATR

1. HERA

0800 NATURAL AND CULTURAL CONSERVATION MANAGEMENT

0802 Conservation methodology
 0804 Survey and assessment techniques

0900 HISTORIC ENVIRONMENT

0902 Urban areas
 0903 Towns and villages
 0909 Historic sites
 0910 Memorials, monuments
 0912 Pastoral, farming, agricultural
 0913 Mining
 0914 Other resource industries
 0915 Industrial
 0916 Transport
 0917 Shipwrecks
 0918 Buildings
 0919 Government
 0920 Military
 0921 Judicial, penal, constabulary
 0922 Health
 0923 Commercial
 0924 Religious
 0925 Educational
 0926 Scientific
 0927 Community services
 0928 Social, recreational
 0931 Artefacts

2. WATR

WASTES AND WASTEWATER

- 500 General
- 510 Household
- 520 Industrial
- 530 Mining
- 540 Agricultural
- 555 Wastewater Analysis and Monitoring
- 585 Ultimate Disposal of Wastes
- 590 Reuse of Water

WATER RESOURCE DEVELOPMENT

- 900 General
- 905 Dams and Related Structures
- 910 Power Generation
- 915 Hydro-Electric Development
- 925 Water Conveyance Systems
- 930 Surface Water Management
- [940 Floodplain Management]
- 970 Irrigation Development

URBAN WATER UTILITIES

- 1000 General
- 1010 Water Distribution Systems
- 1020 Water Treatment Processes
- 1030 Water Disinfection
- 1040 Water Treatment Facilities
- 1050 Wastewater Collection Systems
- 1055 Physical and Chemical Wastewater Treatment Processes
- 1060 Biological Wastewater Treatment Processes
- 1065 Wastewater Treatment Facilities
- 1070 Urban Stormwater Systems
- 1080 Rehabilitation of Underground Services
- 1090 Plumbing

MACHINERY, EQUIPMENT AND MATERIALS

- 1100 General
- 1110 Construction Plant and Equipment
- 1120 Drilling Equipment
- 1130 Water Meters
- 1140 Pumps and Turbines
- 1150 Other Hydraulic Equipment
- 1170 Construction Materials
- 1180 Pipes and Fittings

APPENDIX C

SOME AUSTRALIAN SERIALS ON ENGINEERING AND TECHNOLOGY

1. ENGINEERING

- Australasian builder and contractors' news
1887-1895
- Australasian engineer
1908-1972
- Australasian engineering and machinery
1911-1917
- Australasian hardware and machinery
see Australian hardware
- Australasian Institute of Mining and Metallurgy.
Proceedings
1897-1903; 1904-1911; n.s. 1911-
- Australasian Institute of Mining Engineers
see Australasian Institute of Mining and Metallurgy.

- Australasian ironmonger, engineer and metal worker
see Australian hardware
- Australasian manufacturer (Melbourne)
1889-1891
- Australasian manufacturer (Sydney)
see Australasian weekly manufacturer
- Australasian marine engineer
see Australasian engineer
- Australasian oil and gas journal
see Oil and gas
- Australasian oil and gas review
see Oil and gas
- Australasian record
1903-1917
- Australasian Vacuum review
1912-1915
- Australasian weekly manufacturer
1916-1974
- Australian automotive engineering and equipment
1936-
- Australian builder (title varies)
1855-1856; 1859-1860; n.s. 1861
- Australian builder and land advertiser
see Australian builder
- Australian builder and railway chronicle
see Australian builder
- Australian builder and practical mechanic
see Australian builder
- Australian electrical world
1936-
- Australian electrical and radio world
see Australian electrical world
- Australian engineering and building news
1879-?
- Australian engineering record
see Engineering and manufacture
- Australian gas bulletin
see Australian gas journal
- Australian gas journal
1936-
- Australian hardware
1886-
- Australian Institute of Refrigeration. Proceedings
see Australian Institute of Refrigeration, Air
Conditioning and Heating. Proceedings
- Australian Institute of Refrigeration, Air Conditioning
and Heating. Proceedings
1920-
- Australian machinery
see Australian machinery and production
engineering
- Australian machinery and production engineering
1949-
- Australian manufacturer
see Australasian weekly manufacturer
- Australian manufacturers' journal
1917-1925
- Australian mining
1908-
- Australian mining and engineering review
see Australian mining
- Australian mining news
1934-1938
- Australian mining standard (title varies)
1885-1962
- Australian refrigeration, air conditioning and heating.
1947-
- Australian standards quarterly
1938-1953
- Australian surveyor
1928-

- Building, engineering and mining contractors' record
see Australasian record
- Building, engineering and mining journal
1888-1905
- Building engineer
1896-
- Calvert's West Australian mining register
see West Australian review
- Chemical engineering and mining review
see Australian mining
- Commonwealth engineer
1913-1959
- Electrical Association of Australia. Proceedings
1916-1918?
- Electrical and radio world
see Australian electrical world
- Electrical Association of Australia. Proceedings
1914-1919
- Electrical engineer
1924-
- Electrical engineer and merchandiser
see Electrical engineer
- Electrical engineer of Australia and New Zealand
see Electrical engineer
- Engineering Association of New South Wales.
Memoirs
1885-1920
- Harbour
see Shipping, coal, metals, the harbour
- Hardware journal
see Australian hardware
- Institution of Automotive Engineers. Journal
see Society of Automotive Engineers - Australia
- Institution of Engineers, Australia. Journal
1928-
- Institution of Engineers, Australia. Transactions
1919-1928
- Main roads
1944-?
- Manufacturing and management
see Australian factory
- Mining and chemical engineering review
see Australian mining
- Mining and engineering review
see Australian mining
- Mining Institute of Victoria. Transactions
1857-1859
- Mining journal and investors review
1895-1897
- Mining record of Victoria. Australian and public
companies gazette (title varies)
1861-1870
- National gas bulletin
see Australian gas journal
- New South Wales government railway and tramway
magazine (title varies)
1892-1923
- Northern Engineering Institute of New South Wales.
Minutes of proceedings
1889-1919
- Power farming in Australia
1924-
- Radio review of Australia
1931-1938
- Refrigeration journal
see Australian refrigeration, air conditioning and
heating.
- Royal Melbourne Institute of Technology. College
quarterly
1899-1901, 1909-1912
- S.A.A. bulletin
see Australian standards quarterly
- Shipbuilding, ship repair and services
1947-
- Shipping, coal, metals, the harbour
1920-1970
- Society of Automotive Engineers - Australasia. S.A.E.
journal
1941-
- South Australian Electrical Society. Journal
1887-1890
- South Australian Institute of Engineers. Biennial
proceedings.
1913/15-1916/17
- South Australian Institute of Engineers. Journal
1914-1919
- Surveyor
1888-1927
- Telegraph Electrical Society. Journal
1874-1880
- Vehicle and aviation industry (title varies)
1890-1952
- Victorian electrical and telegraph journal
1886-1891
- Victorian engineer
1886-1889
- Victorian Institute of Engineers. Proceedings
1883-1917, 1923-1943
- Victorian mining journal
1872
- Victorian Railways gazette
1891-1893
- Victorian Railways journal
1894-1896
- Western Australian Institution of Engineers. Journal
1910-1919

2. COMPANIES AND ORGANISATIONS

- The house journals of major companies such as
BHP Review
1923-1969
- The journals of industry associations such as
Chamber of Mines of New South Wales. Journal
1899-1900
- Chamber of Mines of Western Australia. Journal
1902-1920
- The journals of port and harbour authorities such as-
Port of Melbourne quarterly
1948-
- Port of Sydney quarterly
1946-
- The journals of government and semi-government
bodies such as-
Australian municipal journal
1922-
- Sydney Water Board journal
1951-
- Other relevant papers may be found in the
publications of the various learned societies which
existed in most states from an early date such as
- Australian and New Zealand Association for the
Advancement of Science. Abstracts
1888-
- and the Royal Societies in each state.
- Directories of businesses, manufacturers and trade
are a further source of information.