

MATCHING DISCIPLINES FOR
A BILATERAL FRAMEWORK TO FACILITATE MOBILITY
FOR MUTUAL RECOGNITION OF
REGISTERED / LICENSED ENGINEERS

1 October 2003

MEXT

Ministry of Education, Culture,
Sports, Science and Technology
Japan



The Institution of Professional Engineers, Japan

IPEJ



**ENGINEERS
AUSTRALIA**



National
Engineering
Registration
Board

INDEX TO MATCHING DISCIPLINES PAPER

Introduction	1
Definition of Engineering Disciplines.....	1
Matching the Scope of Engineering Disciplines	1
Conclusion	2
APPENDIX 1.....	3
APPENDIX 2.....	5

MATCHING DISCIPLINES FOR A BILATERAL FRAMEWORK TO FACILITATE MOBILITY FOR MUTUAL RECOGNITION OF REGISTERED / LICENSED ENGINEERS

INTRODUCTION

The bilateral framework will apply to disciplines or areas of practice that have a similar scope in both countries. The scope of the framework states specifically:

5. SCOPE OF FRAMEWORK

- 5.1 This Framework applies to registered / licensed engineers whose names appear on the APEC Engineer Register of the home country. It is intended that there be no discrimination based on place of origin or place of education.
- 5.2 This Framework is intended for permanent or temporary registration / licensing, depending on the needs of the individual applicant and any legislative limitations in each country.
- 5.3 This Framework applies to the disciplines for which both countries have a similar scope, such as Mechanical, Electrical, Chemical, as listed in the APEC Engineer Manual.
- 5.4 This Framework does not apply where disciplines have a different scope.

This paper addresses the difference in approach in the two countries to defining the scope of engineering disciplines and deals with the exclusion from mechanical and electrical engineering of work relating to civil and building infrastructure.

DEFINITION OF ENGINEERING DISCIPLINES

The Japanese side has adopted definitions of engineering disciplines that express the industrial involvement of its engineers. The Japanese approach is detailed in Part C, *Scope of Engineering Disciplines*, of the Japanese APEC Engineer Assessment Statement, Rev. 3, dated October 2001. Section 2 states that the Japanese Monitoring Committee was planning seven disciplines to add to the Japanese APEC Engineer Register, including chemical, electrical and mechanical engineering. Relevant material from Part C is reproduced for reference in Appendix 1 of this paper.

At the initial implementation of the bilateral framework, civil and building engineering work is excluded. Along with this, the scope of mechanical and electrical engineering is also narrowed to exclude work relating to civil and building infrastructure. Specifically, the scope of electrical engineering covered by the bilateral framework will be the Technical Discipline 16 in Appendix 1.

The Australian side has adopted definitions of engineering disciplines that describe the specific expertise needed by its engineers. The Australian approach relies on definitions of disciplines based on *Indicative Range Statements for Engineering Disciplines* in the National Competency Standards for Stage 2 Professional Engineers (http://www.nerb.org.au/aop/nper_areas_index.cfm), from which relevant sections of Appendix C are reproduced for reference at Appendix 2 of this paper. Complementary definitions of the disciplines have been reproduced from definitions of registration areas on the National Professional Engineers Register (http://www.nerb.org.au/aop/nper_areas_index.cfm.)

MATCHING THE SCOPE OF ENGINEERING DISCIPLINES

It would be possible to develop a matrix in which each specific expertise proposed in the Australian definitions (Appendix 2) would match with one or more optional subjects proposed in the Japanese definitions (Appendix 1) and vice versa. Such a matrix would demonstrate a high level of correspondence between the two approaches to defining disciplines as applied to chemical, mechanical and electrical (information) engineering. Nevertheless, the overall match within the matrix may not of itself be conclusive, especially as acceptance criteria have not been discussed or agreed.

It is therefore proposed to rely on the professional judgement of experienced engineers that make use of mutual recognition under the bilateral framework. They would know that they would be held accountable for practising only within their area of competence. In Japan and in Australia the Codes of Ethics specifically state:

- “Professional engineers shall not undertake any services beyond an area of their competence or any services in which the professional engineers lacks confidence.” – IPEJ.
- “Members shall act only in areas of their competence and in a careful and diligent manner” – Engineers Australia

The APEC Engineer Manual states that each authorised Monitoring Committee must further undertake to ensure that all practitioners registered by them as APEC Engineers comply fully with the requirements specified in the APEC Engineer Framework.

The Manual further states that Registered APEC Engineers must agree to the following:

- **Codes of professional conduct.** All practitioners seeking registration as APEC Engineers must also agree to be bound by the codes of professional conduct established and enforced by their home jurisdiction and by any other jurisdiction within which they are practising. Such codes normally include requirements that practitioners place the health, safety and welfare of the community above their responsibilities to clients and colleagues, practice only within their area of competence, and advise their clients when additional professional assistance becomes necessary in order to implement a program or project. Monitoring Committees are required to certify that at registration the candidate has signed a statement of compliance with such applicable professional codes.
- **Accountability.** APEC Engineers must also agree be held individually accountable for their actions, both through requirements imposed by the licensing or registering body in the jurisdictions in which they work and through legal processes.

The Bilateral Framework to Facilitate Mobility for Mutual Recognition of Registered / Licensed Engineers also states in paragraph 6.2.2, that:

- 6.2.2 Applicants must fulfil the following in order to qualify for registration / licensing pursuant to this Framework:
- a) Agree to:
 - i) abide by the laws, rules and regulations of the host country;
 - ii) meet the continuing competency assurance requirements of the host country; and
 - iii) conform to ethical standards of truth, honesty and integrity as the basis for ethical practice including, at a minimum, abiding by the ethical standards in the host country.

In paragraph 8 of the Bilateral Framework, both sides make definite undertakings to pursue all necessary disciplinary action and to respect sanctions applied elsewhere for violation of standards.

Accordingly, the Bilateral Framework provides a high degree of confidence that an APEC Engineer registered in Japan would practise competently in Australia and vice versa.

CONCLUSION

A reliable basis has been established for the mutual recognition of Registered APEC Engineers from Australia receiving registration in Japan and vice versa. This basis applies to the disciplines included in the Scope of the Framework as defined in Appendices 1 and 2 to this paper. The explicit requirement that APEC Engineers must practise ethically provides the greatest safeguard against individuals practising outside their area of competence as they will be subject to the disciplinary framework.

JAPAN APEC ENGINEER ASSESSMENT STATEMENT (Rev 3) October 2001 PART C

Based on Table 2 - Technical Disciplines and Optional Subjects for Registration of Registered Engineer and the table with tentative information on Seven Technical Disciplines, which are under planning.

APEC Engineer Discipline	Technical Discipline	Optional Subject
Mechanical (Infrastructure)	1 Mechanical Engineering	1-1 Mechanical Processing & Processing Machinery
		1-2 Prime Mover
		1-3 Precision Machinery
		1-4 Railroad vehicle & Automobile
		1-5 Chemical Machinery
		1-6 Hydraulic Machinery
		1-7 Construction, Mining, Loading & Carrier Machinery
		1-8 Industrial Machinery
		1-9 Air-Conditioning & Refrigerating Equipment
		1-10 Machine Equipment
Mechanical	2 Ship & Marine Engineering	2-1 Hull, Shipbuilding Work & Shipbuilding Equipment
		2-2 Ship Machinery
Mechanical	3 Aerospace Engineering	3-1 Aircraft Body
		3-2 Navigation Support Facilities
		3-3 Space Environment Utilisation
Electrical (Infrastructure)	4 Electrical & Electronics	4-1 Generation, Transmission, Distribution & Transformation
		4-2 Electric Application
		4-3 Electronics Application
		4-4 Info-communication
		4-5 Electric facilities
Chemical	5 Chemistry	5-1 Ceramics & Inorganic Chemical Products
		5-2 Organic Chemical Products
		5-3 Fuel & Lubricant Oil
		5-4 Polymer Products
		5-5 Chemical Equipment & Facilities
Chemical and Mechanical	6 Textile	6-1 Chemical Spinning, Thread Making, Mechanical Spinning & Fabric Manufacturing
		6-2 Dyeing & Finishing
		6-3 Sewing
Chemical and Mechanical	7 Metals	7-1 Iron & Steel Manufacturing System
		7-2 Nonferrous Metals Manufacturing System
		7-3 Metallic Materials
		7-4 Surface Technologies
		7-5 Metal Working
	8 Mining	8-1 Metals & Nonferrous Mining
		8-2 Coal, Petroleum & Natural Gas Mining
	9 Civil Engineering	9-1 Soil Quality & Foundation
		9-2 Steel Structure & Concrete
		9-3 Urban & Rural Planning
		9-4 River, Erosion Control & Seashore
		9-5 Harbour & Airport
		9-6 Construction for Electricity
		9-7 Road
		9-8 Railroad
		9-9 Tunnel
		9-10 Construction Planning, Construction Equipment & Estimation
		9-11 Construction Environment
	10 Water Supply & Sewerage	10-1 City Water & Industrial Water Supply
		10-2 Sewerage
		10-3 Water Service Environment
	11 Environmental Engineering	11-1 Water Quality Control
		11-2 Waste Disposal
		11-3 Air-Conditioning Facilities
		11-4 Architecture Environmental Facilities
		11-5 Waste Management

APEC Engineer Discipline	Technical Discipline	Optional Subject
Chemical and other	12 Agriculture	12-1 Animal Husbandry
		12-2 Agricultural Chemistry
		12-3 Irrigation, Drainage & Reclamation
		12-4 Agriculture & Sericulture
		12-5 Regional Agricultural Planning
		12-6 Rural Environment
	13 Forestry	13-1 Forestry
		13-2 Forestry Civil Engineering
		13-3 Forestry Products
	14 Fisheries	14-1 Fisheries & Nurseries
		14-2 Fish Processing
		14-3 Fisheries Civil Construction
		14-4 Fishery Area Environment
	15 Industrial Management	15-1 Plant Planning
		15-2 Production Management
		15-3 Quality control
		15-4 Packaging & Logistics
		15-5 Project Engineering
Electrical	16 Information Technologies	16-1 Information System
		16-2 Information Mathematics & Knowledge Processing
		16-3 Information application
		16-4 Computer System
	17 Applied Science	17-1 Physics & Chemistry
		17-2 Geophysics & Geochemistry
		17-3 Geology
	18 Biotechnology	18-1 Biological Utilisation Technology
		18-2 Bio-Components Utilisation Technology
	19 Environment	19-1 Environment Preservation Planning
		19-2 Environmental Measurement
		19-3 Natural Environment Preservation
	20 GTP Management	20-1 Optional subjects covering the above 19 discipline subjects

INDICATIVE RANGE STATEMENTS FOR ENGINEERING DISCIPLINES IN THE NATIONAL COMPETENCY STANDARDS FOR STAGE 2 PROFESSIONAL ENGINEERS AND COMPLEMENTARY DISCIPLINE DEFINITIONS FROM THE AUSTRALIAN NATIONAL PROFESSIONAL ENGINEERS REGISTER (NPER)

1. CHEMICAL ENGINEERING

H. Chemical Engineering

Chemical Engineering is concerned with research, design, development, manufacture, installation, operation, maintenance and management of, commercial scale chemical plants and process systems, industrial processing and fabrication of products undergoing chemical and/or physical changes. Specific expertise areas include:

Ha	Chemical Process Engineering	Hg	Petroleum Process Engineering
Hb	Mineral Process Engineering	Hh	Process Plant Design
Hc	Environmental Engineering	Hi	Biochemical Process Engineering
Hd	Process Design and Development	Hj	Project Engineering & Management
He	Process Control and Optimisation	Hk	Emission Control and Treatment
Hf	Process Operation & Management	Hl	Safety Engineering

Complementary definition

Chemical Engineering is concerned with research, teaching, design, development, economics, manufacture, installation, operation, sales, maintenance and management of commercial scale chemical plants and process systems, industrial processing and fabrication of products undergoing chemical and/or physical changes being applied to materials for construction, process systems and equipment for instrumentation and control, and protection of the environment.

Registered Chemical Engineers have experience in the safety aspects of design and/or operations. In addition they have experience in two of the following functions involving process systems and equipment: design, evaluation, operation, materials selection and fabrication.

2. MECHANICAL ENGINEERING

M. Mechanical Engineering

Mechanical Engineering is concerned with research, design, development, manufacture, installation, operation, maintenance and management of, machines, machine and thermodynamic processes, and manufacturing and materials handling plants and systems. Mechanical engineering is applied in manufacturing, transport, electricity generation, and in works and services using machine systems, including the environment of building interiors. Specific expertise areas include:

Ma	Automotive Engineering	Mp	Engineering Tribology
Mb	Fuel Engineering	Mq	Marine Engineering
Mc	Quality Control and Assurance	Mr	Robotics Engineering
Md	Environmental Engineering	Ms	Applied Mechanics
Me	Fluids Engineering	Mt	Production Engineering
Mf	Design Engineering	Mu	Systems Engineering
Mg	Hydraulic Engineering	Mv	Engineering Ergonomics
Mh	Fatigue and Fracture Mechanics	Mw	Metal Forming Engineering
Mi	Mass Transfer	Mx	Refrigeration Engineering
Mj	Vibration Analysis and Noise Control	My	Materials Engineering
Mk	Manufacturing Engineering Practices	Mz	Heat Transfer
Ml	Internal Combustion Engineering	Maa	Maintenance Engineering
Mm	Pressure Vessels	Mbb	Bio-mechanical Engineering
Mn	Computer-aided Design & Manufacturing	Mcc	Mechanical Machines Engineering
Mo	Machine Tool & Manufacturing Processes	Mdd	Aeronautical & Aerospace Engineering

Complimentary definition

Mechanical Engineering is concerned with design, development, research, evaluation, manufacture, installation, testing, operation, maintenance and management of machines, mechanical and mechatronic systems, automated systems and robotic devices, thermodynamic and combustion systems, fluid and thermal energy systems, materials and manufacturing equipment and process plant, and materials handling systems. This is applied to manufacturing, land sea and air transportation, electricity generation, mining, minerals and metals processing, food, agricultural and forest products processing, thermal and environmental control systems in buildings and industry, refrigeration and air conditioning systems.

A. Aerospace Engineering

For the purpose of NPER, Aerospace Engineering is defined as “the practice of the art and science of engineering for the purpose of achieving optimal integrated aerospace systems including military and civil air and space vehicle systems”. It is a separate registration area from mechanical.

Broadly speaking, the areas of practice embraced by Aerospace Engineering, in the context of the aerospace environment, involves expertise in the following areas:

Aa	Aerodynamics & Performance	Al	Aircraft Stores	Aw	Airports & Ground Systems
Ab	Airways Systems	Am	Cabin Environment	Ax	Cockpit Ergonomics
Ac	Communications Systems	An	Computer Systems	Ay	Crashworthiness
Ad	Electrical Systems	Ao	Electronic Warfare	Az	Environmental Effects
Ae	Fire Safety & Control	Ap	Flight Management Systems	Aaa	Flight Simulators
Af	Flight Test Recording	Aq	Fuels & Lubricants	Abb	Hydraulic Systems
Ag	Maintenance	Ar	Materials & Manufacturing	Acc	Navigation Systems
Ah	Noise & Acoustic Effects	As	Propulsion Systems	Add	Radar Systems
Ai	Risk Management	At	Satellite Systems	Aee	Software
Aj	Structural Integrity	Au	Test Flight Control	Aff	Tracking Systems
Ak	Vehicle Dynamics	Av	Vehicle Launch & Recovery		

The scope of activities by individuals or organisations practising in Aerospace Engineering includes, but is not necessarily limited to:

Air safety Investigation	Installation	Research and development
Certification	Manufacture and supply	Risk management
Design and documentation	Operation and maintenance	Test and evaluation
Education and training	Quality assurance	User and regulatory requirements

R. Maritime Engineering

Maritime Engineering is concerned with the operation of ships and other maritime facilities. Specific expertise areas include:

Ra	Manufacturing Process Engineering	Rf	Marine Acoustics Engineering
Rb	Maritime Engineering Administration	Rg	Ocean Science and Engineering
Rc	Ship Structural Engineering	Rh	Ship Propulsion Engineering
Rd	Operations Research	Ri	Ship Systems Engineering
Re	Ship Hydrostatic & Hydrodynamic Engineering		

N. Naval Architecture

The engineering discipline concerned with research, design, development, manufacture, installation, operation, maintenance and management of, marine vessels and floating structures, applied, for example, in design and construction of ships, and their economic evaluation, performance evaluation and seagoing trials. Specific expertise areas include:

Na	Manufacturing Process Engineering	Ne	Mechanical Engineering Practices
Nb	Ship Propulsion Engineering	Nf	Ship Management Economics
Nc	Ship Systems Engineering	Ng	Ship Structural Engineering
Nd	Ship Hydrodynamic & Hydrostatic Engineering	Nh	Vibration Analysis Engineering

3. Electrical Engineering

E. Electrical Engineering

Electrical Engineering is concerned with research, design, development, manufacture, installation, operation, maintenance and management of, equipment, plant and systems applied in electrical power generation, transmission, and distribution and in industry and utilised in control of computer systems. Specific expertise areas include:

Ea	Electrical Engineering Principles	Ej	Plant & Switchgear Engineering
Eb	Industrial Machine Practice	Ek	Plant Protection Systems
Ec	Electrical Systems Engineering	El	Electromagnetic Compatibility (EMC)
Ed	Electrical Machines and Drives Engineering	Em	Electrical Safety
Ee	Industrial Electronics	En	Computer Network Engineering
Ef	Transformers Engineering	Eo	Computer-aided Design & Manufacturing
Eg	Electromagnetic Power Devices	Ep	Transducers & Actuator Engineering
Eh	Computer Principles	Eq	Signal Processing
Ei	Industrial Electrical Engineering		

Other areas of specific expertise relevant to the practice of Electrical Engineering are found within the disciplines of Electrical Power Engineering and Mechatronic Engineering.

Complementary definition

Electrical Engineering is concerned with research, design, development, manufacture, installation, operation, maintenance and management of equipment, plant and systems within the electrical, electronic, communication and computer systems areas, being applied to electrical power generation, transmission, distribution and utilisation, manufacture, instrumentation and control in industry, communications networks, electronic plant and equipment, integration and control of computer systems.

T. Electronics Engineering

Electronics Engineering is concerned with research, design, development, manufacture, installation, operation, maintenance and management of, electronic equipment, instrumentation and systems for industrial control, communication, navigation, data processing and entertainment. Specific expertise areas include:

Ta	Audio Engineering	Th	Communication Engineering Principles
Tb	Electromagnetic Power Devices	Ti	Electronic Digital Signal Systems
Tc	Electronic Image Processing	Tj	Radio Communication Engineering
Td	Wave Propagation Engineering	Tk	Biomedical Electronics Engineering
Te	Computer Principles	Tl	Opto-Electronics
Tf	Electronic Engineering Practices	Tm	Transducers & Actuator Engineering
Tg	Electronic Analogue and Digital Engineering		

C. Communications Engineering

Communications Engineering is concerned with research, design, development, manufacture, installation, operation, maintenance and management of, plant and equipment, transmission media and systems used for communication. Specific expertise areas include:

Ca	Communication Engineering Principles	Cg	Communication Switching
Cb	Communication Systems Engineering	Ch	Electromagnetic Power Devices
Cc	Electronic Coding	Ci	Electronic Digital Signal Systems
Cd	Navigation Aids and Radar	Cj	Optical Communications
Ce	Opto-Electronics	Ck	Radio Communication
Cf	Satellite Communication	Cl	Wave Propagation

S. Computer Systems Engineering

Computer Systems Engineering is concerned with research, design, development, manufacture, installation, operation, maintenance and management of, computing systems. Computer systems engineering requires specialized application of digital electronic engineering in the effective integration of the hardware and software components of computing systems. Specific expertise areas:

Sa	Communication Engineering Principles	Sh	Computer Engineering Practices
Sb	Computer Graphics	Si	Computer Network Engineering
Sc	Local Area Network Engineering	Sj	Computer Programming, Advanced
Sd	Software Engineering	Sk	Electronic Digital Signal Systems
Se	Microprocessor Engineering	Sl	Wave Propagation Engineering
Sf	Computer Principles & Operating Systems		
Sg	Electronic Analogue & Digital Engineering		

W. Software Engineering

Software Engineering is concerned with research, specification, design, development, deployment, testing, maintenance, and management of software systems. Specific expertise areas include:

Wa	Computer Programming Techniques	Wh	Requirements Analysis
Wb	Software Engineering Principles	Wi	Software Engineering Practices
Wc	Software Testing	Wj	Software Engineering Tools
Wd	Software Metrics	Wk	Human-Computer Interface Engineering
We	Algorithms and Data Structures	Wl	Computer Systems Security
Wf	Software Development Process Modelling	Wm	Software Reliability
Wg	Software Project Management & Planning Estimation		