S. 80-6

SIMON FRASER UNIVERSITY

MEMORANDUM

Mr. H. Evans	From J. M. Munro
Secretary of Senate	Vice-President, Academic
Subject Engineering Program Proposal	Date 1979-12-27

Action taken by the Senate Committee on Academic Planning at its meeting of December 12, 1979 gives rise to the following motion:

> "That approval in principle be given to the establishment of undergraduate and graduate degree programs in Engineering at Simon Fraser University."

Note:

If approval is given by Senate to this motion, the intent is that a Director be appointed as soon as possible to take charge of detailed curriculum development with a view to submitting a full program to Senate in December, 1980.

A number of issues relating to this proposal were addressed at SCAP. These included the potential demand for the graduates of an engineering program, the impact of introducing an engineering program on the University, the possible program structure, and budgetary considerations.

Actions proposed by both the Federal and Provincial Governments involve an increasing emphasis on research and development and an increasing need for individuals with professional engineering skills. Moreover, information presented to SCAP indicated that the number of engineering graduates presently produced by the University of British Columbia was disproportionately low compared with the rest of Canada. B. C. also has a net migration of engineers into the Province. These factors all suggest graduates of a Simon Fraser University engineering program should have ample employment opportunities.

It was also noted that the Univeristy of Victoria is also giving consideration to an engineering program and that their Senate has authorized a planning study. However, even if all three B.C. universities were to offer programs in various engineering disciplines, demand should be large enough to absorb the graduates.

The Engineering Program proposed for Simon Fraser University would build on the strengths already present in the Departments of Mathematics, Physics, Kinesiology and Computing Science. These strengths involve both faculty research interests and teaching programs. Indeed, first year transfer programs to the University of British Columbia Engineering Program are presently being offered by the Departments of Mathematics and Physics at Simon Fraser University. Also, the growth of the manufacturing industry in the eastern Lower Mainland should enhance the growth of the program.

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An Engineering Program established at Simon Fraser University would have to meet the accreditation requirements of the Canadian Accreditation Board. Currently, these require that students complete at least one semester of basic sciences; one semester of Mathematics and one semester of humanities, social sciences and administrative studies taken together. Because of this, it is clear that an Engineering Program at S.F.U. would have the effect of enhancing enrolments within existing S.F.U. departments. The program proposed would offer a four year undergraduate degree. Such a program is standard at many other Canadian and United States universities. Furthermore, it is intended that graduate programs would also be established simultaneously.

One important concern is the organizational structure and designation of the proposed Engineering Program. In formulating its recommendations, the Ad Hoc Engineering Committee drew upon the advice of consultants. They indicated that their experience with the development of univeristy engineering programs had led them to two conclusions. First, because of the strong inter-relationships between university Schools or Faculties of Engineering and the various Engineering professional societies, there existed a strong university-community relationship. This relationship was enhanced if an engineering program was given a separate identity and structured along conventional lines. Thus, it is proposed that the departments within the proposed Engineering Program be administered under a School or Faculty of Engineering separate from the existing Faculties at Simon Fraser University. It is also proposed that Engineering departments be structured along conventional lines, i.e. departments of Mechanical, Electrical, and Chemical Engineering. Within these conventional departments, specializations would be developedwhich would be unique to British Columbia, e.g. communications, energy and materials, industrial systems, and engineering in extreme environments.

Finally, it should be noted that the motion as approved by the Senate Committee on Academic Planning is intended to enable more intensive program planning activity. If the motion is approved by Senate, it is the intent of the University to proceed with the appointment of a Director and to charge that individual with responsibility for preparing detailed program proposals with a view to submitting a full program for Senate approval in December, 1980. The Director would be someone who was familiar with university engineering education and would be expected to consult widely with other universities, the engineering profession, potential employees and governments in the course of the planning period.

The information contained in the proposal before you outlines the directions that an Engineering Program might take if developed at Simon Fraser University; while it represents the considered views of the Ad Hoc Engineering Committee, the proposal is not intended to act as a detailed model for a fully developed program proposal.

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For this reason, the budgetary and space information included on pages 11 and 12 of the Committee report cannot be regarded as in any way definitive. Budget and space requirements would depend on the size of the Program, the number of specialized fields offered, and the scope of research programs.

Once approved by the Universities Council, an Engineering Program would be eligible for new and emergent program funding for a five-year period. After that, the full cost of the Program would become part of the University's regular operating budget, funded according to the enrollment-driven formula.

J. M. Munro

/mgl

REPORT OF THE ENGINEERING COMMITTEE

Recommendations:

1. That graduate and undergraduate degree programs in Engineering be established at Simon Fraser University.

2. That a Director be appointed as soon as possible to take charge of detailed curriculum development with a view to submitting the full program to Senate in December 1980.

T.W. Calvert - Chairman

M. Plischke

E. Shoemaker

J. D'Auria

1. THE NEED TO EXPAND UNIVERSITY ENGINEERING PROGRAMS

New programs in Engineering are required to meet provincial and national needs and to provide equitable educational opportunities to the citizens of the province. National statistics (Appendix B) show that there is an existing need for additional graduates in engineering. Information from the Technical Service Council shows that there is a high demand for engineers and demand will almost certainly increase dramatically in the immediate future (Appendix C). Further, the number of engineers graduating in British Columbia is disproportionately low compared to the rest of Canada (Table 3 in Appendix B). The current UBC engineering enrollment is about 1500 but would need to rise to about 4000 to bring B.C. to the national average. It is also known that revenue generated by manufacturing companies in B.C. is very low compared to the Canadian average. There is evidence that new high technology industry might be more easily encouraged to establish in British Columbia if the universities have educational programs geared to their needs and if there is a university research resource for them to draw upon. One outstanding example of an engineering based company that has achieved remarkable local success is MacDonald, Dettwiler and Associates. The Industrial development centred around the Stanford University area as well as in the Boston area can in large measure be attributed to the influence of their engineering schools.

2. THE CASE FOR THE DEVELOPMENT OF ENGINEERING AT SIMON FRASER

If it is accepted that additional opportunities for education and research in engineering are needed in B.C. then they could be provided in several ways. These include expansion of the existing program at UBC, development of new programs at SFU and/or University of Victoria and upgrading BCIT to university status. We believe that the needs of students and the province can be best met with a variety of high quality programs because:

1) There is good empirical evidence that universities are more responsive to the needs of industry and government when there are at least two programs in a province.
2) Students benefit from the choice between the strengths and styles of different universities.

Thus we feel that UBC should expand and reorientate itself where appropriate and that SFU should set up a high quality program that would complement the UBC program (and a University of Victoria Engineering program if it is implemented). After careful consideration, the Engineering Committee and consultants believe that an accredited program can not be based on a two year BCIT diploma. However this does not preclude the possibility of the development of a Bachelor of Technology Program in co-operation with BCIT at some point in the future.

SFU is particularly well suited to develop programs in Engineering.

Not only is a first year program (for transfer to UBC) already offered by the Mathematics and Physics Departments but these and other departments have faculty strengths which would complement a new program. Specifically, the applied group in Mathematics has five faculty who work in mechanics and one who works in thermodynamics. There are faculty with engineering qualifications in Physics, Computing Science and Kinesiology and a number of these are conducting research and advising graduate students in areas which are normally considered engineering. SFU also has the advantages of being located in the heart of a major area of population growth and is close to much of the manufacturing industry in the province (MacMillan Bloedel Research, Lenkurt, etc.).

The development of Engineering would have a number of advantages for SFU. These include:

a) Students enrolled in the new program would provide additional enrollments in introductory Science and Arts courses and make these courses more cost effective. Specifically, if the yearly graduating class was 200 there would be about 200 semester FTE enrollments per year in each of the following: Arts, Mathematics and Science.

b) An Engineering Program would lead to new research and graduate student opportunities. The program would complement and build on existing strengths such as the work in solid state phenomena in Physics, in environmental effects in Biosciences, Chemistry and

Kinesiology, the work on digital systems in Computing Science, the work in mechanics in Mathematics, and the work on communication policy in the Department of Communication.

c) An Engineering Program would lead to closer mutually beneficial ties and involvement of the university with B.C. business and industry. The Engineering faculty through providing specialized technical consultation would involve themselves with the current problems of business and industry. Students in the "co-op" program would also make the Faculty and the University more aware of the on going problems of industry. Ties with local industries make specialized facilities available to the University. All of this would achieve additional focus if a Research Park is established at SFU.

3. THE PROPOSED PROGRAM

It is recommended that a four year Bachelor's degree program be established. The first two years should provide a broad, non-specialized foundation which will enable students either to continue for the second two years in the degree specializations selected for development at SFU or to transfer to other universities to work in areas not available at SFU. A graduate program should be developed simultaneously with the undergraduate program.

Although it is recommended that degree programs be developed with conventional undergraduate majors, not all areas often included within these majors will be developed. Areas of specialization are proposed which will correspond to the identified priorities for research and the needs of B.C. industry and government. The interrelationship of these areas of specialization with the degree majors is best understood with the aid of the matrix in the figure below.

		Research Specialization			
		Communication	Energy and Materials	Industrial Systems	Engineering in Extreme Environments
Majors	Electrical	X	X	X	
	Mechanical		X	X	X
	Chemical		X	X	X

Areas of Specialization. The specializations of the Engineering faculty will be determined by the areas of research the University wishes to pursue and by the areas of concentration for students in the program. The proposed areas of specialization are:

a) Telecommunications. As a result of the microcircuit revolution almost all communication systems will soon be digital. While the processing technology is very

similar to that in digital computers the transmission links involve fibre-optics, microwaves and satellites. Telecommunication is a major industry in Canada and the emphasis in B.C. has been heightened with B.C. Telephone's acquisition of Lenkurt and the move of Pacific Microtel Research from Ontario. This emphasis in Engineering would complement the existing strengths in a number of departments, i.e. Computing Science (hardware-software architecture), Physics (solid state devices) and Communication (telecommunications policy and regulation).

b) Energy and Materials. The general area of energy is being given very high priority by the provincial and federal governments. UBC is concentrating its research effort on coal and we propose to complement this by concentrating on alternate energy sources and conservation. Many aspects of energy technology depend critically on the discovery or synthesis of new materials (e.g. solar collectors, nuclear waste storage, new batteries, alternate fuels) and it seems appropriate to set up a group whose research emphasis will be jointly on energy and materials. This group will complement existing strengths in Chemistry (nuclear, solar cells), Physics (batteries, solar cells, alternate energy sources), and Natural Resources Management. In addition, the proposed strength in chemical engineering will provide the capability to examine petrochemical processes.

c) Industrial Systems. This broad area represents the application of engineering design tools to productivity, man-machine systems and manufacturing processes particularly as applied to the forest product and mining industries. This will complement existing strengths in the "Management and Systems Science" program proposed by Mathematics, Computing Science and Business Administration and the work on ergonomics and occupational health underway in Kinesiology and Computing Science.

d) Engineering in Extreme Environments. This concentration represents the application of engineering design tools to offshore development and the north. Offshore engineering centres have been established at six British universities, in Norway and in the U.S. at Berkeley and Rice. This is an appropriate emphasis in the Lower Mainland where a number of small diving and submersible firms are concentrated. A number of these already have contacts with SFU through the work on diving in Kinesiology. Northern engineering concentrates on the special problems created by cold in developing the North. A similar concentration on Arctic Engineering exists at the University of Alaska. Both of these areas might make use of specialized environmental chambers in the Kinesiology Environmental Physiology Unit.

Departments and Degree Programs. It is proposed that Engineering be set up as a School or a Faculty with three departments. The departments and their proposed sizes are:

	Faculty	Undergraduate Students	Graduate Students
Electrical Engineering	15	350	35
Mechanical Engineering	20	450	45
Chemical Engineering	10	200	20
Total	45	1,000	100

These departments will offer majors in Electrical, Mechanical and Chemical Engineering. It should be noted that Mechanical Engineering includes components which are often found in Civil Engineering departments. While it is premature to spell out the curriculum in detail the proposed concentrations within each major are identified:

Electrical: Digital circuits, digital signal processing, communication systems, control systems, solid state and magnetic devices, computer aided design, power systems.

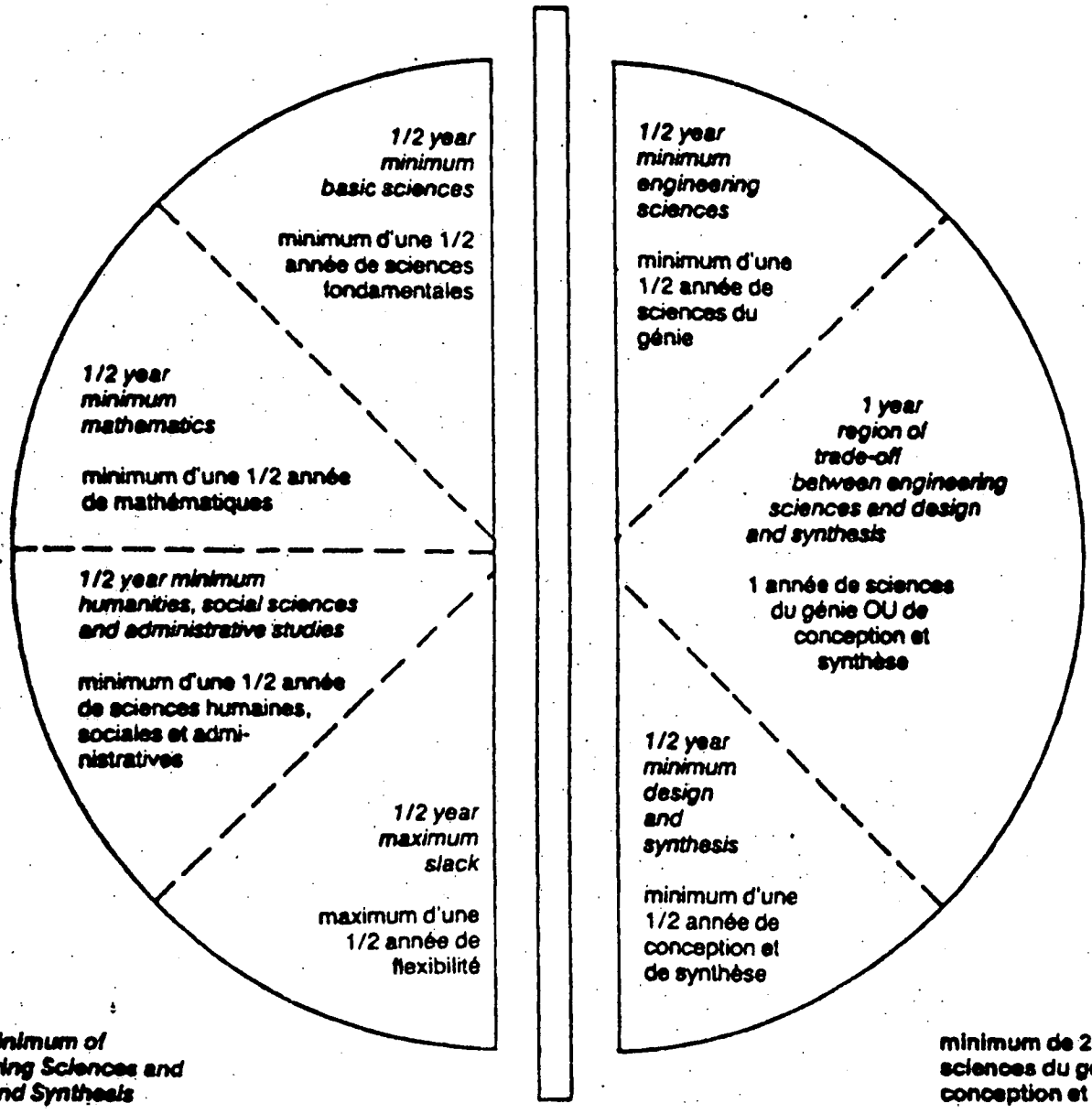
Mechanical: Structures, solid mechanics, materials, fracture mechanics, heat transfer, thermodynamics, conversion of energy, manufacturing processes, computer aided design, design in hostile environments.

Chemical: Mass transfer, thermodynamics, process

dynamics and control, chemical engineering kinetics, fuels, computer aided design.

Structure of the Bachelor Degrees. All accredited engineering degrees in Canada have to meet the requirements summarized in the diagram below.

INTERPRETATION OF CAB CRITERIA
INTERPRETATION DES NORMES D'ACCREDITATION DU BCA



Most Canadian universities offer four year bachelor degrees in engineering although for historical reasons UBC has a five year program. We strongly recommend that SFU implement a four year program with the admission requirements being grade 12 Physics, Mathematics and Chemistry. Students who enter the University without these requirements would require an additional one or two semesters. If a high quality program is based on these entrance requirements we anticipate that it would be possible for students to transfer to UBC (or other universities) after the first or second years. Indeed, there would be real advantages if our program were implemented such that it was compatible with that at UBC; it has been suggested that UBC might then accredit out program one year at a time as it was developed (they have already accredited our first year).

An important feature of any engineering curriculum is the way in which theory is integrated with practice in synthesis and design classes. We recommend that priority be given to integrating synthesis and design in all third and fourth year courses. Further, the degree programs should be offered on a co-op basis to ensure that students are exposed to real problems (but co-op should not be mandatory). The SFU semester system is ideally suited to a co-op program.

Graduate Program. It is considered essential that at least a small, but high quality graduate program be developed simultaneously with the bachelor's degree. High quality faculty cannot be expected to work in an environment where they cannot work with graduate students. The

initial priority will be to develop research M.Sc. and Ph.D. programs. There is probably a strong demand for a "professional" masters program but this is given lower priority since it will require additional faculty and will not contribute to research programs.

4. RESOURCES

Assumptions:

1. The Engineering Program is either an independent Faculty or a School within an existing Faculty.
2. Assume 3 Departments with the following size:

	Faculty	FTE UG Students	Grad Students
Electrical	15	350	35
Mechanical	20	450	45
Chemical	10	200	20
	45	1,000	100

3. The University can provide general purpose classrooms.
4. Existing Science Workshops can provide support for teaching and research.
5. It may be possible to obtain access to specialized lab facilities at BCIT.

Based on figures for existing SFU departments and on the Engineering Program at the University of Calgary the following estimates have been made:

(1,000's of 1979 dollars)

Faculty Salaries (45 at $30,000)	$1,350
Teaching Assistants (100 semester appointments)	240
Support Staff Salaries (.44 of Faculty)	594
Other Operating Expenses (Prorated from Calgary)	227
	2,331

Space. Based on 45 faculty, 1,000 FTE UG students and 100 GS.

Engineering program only:	N.A.S.F.
1) Classroom space for engineering lectures and tutorials	17,000
2) Office space - faculty, departmental, Dean's office, G.S., T.A.'s	15,000
3) Research lab. space - faculty, G.S.	33,000
4) Lab. space for UG.	54,000
	119,000 N.A.S.F.

(See Appendix D)

5. SCHEDULE FOR IMPLEMENTATION

1. December 1979 Approval in principle by SCAP.
2. January 1980 Approval in principle by Senate.
3. January-February 1980 Appoint a Director to develop a detailed proposal.
4. December 1980 Detailed curriculum approved by Senate.
5. January 1981 Submit Proposal to Universities Council.
6. December 1981 Approval by UCBC for funding May 1, 1982.
7. January-September 1982 Search for 15 faculty to implement Years 1 and 2.
8. By September 1983 Appoint additional 15 faculty to implement Year 3.
9. By September 1984 Appoint additional 15 faculty to implement Year 4.
10. May 1985 First graduates.

Appendix A.

Engineering Committee and Consultants

The Engineering Committee as set out below was established on 31 August 1979.

Chairman: T.W. Calvert, Dean, Faculty of Interdisciplinary Studies

M. Plischke, Physics Department

E. Shoemaker, Mathematics Department

J. D'Auria, Chemistry Department

Two external consultants visited SFU and met with the Committee, senior administrators and chairmen or their representatives from interested departments on November 29, 1979. Their reports will be appended.

1. Dr. Ernest Masur, Professor and Head, Department of Materials Engineering, University of Illinois at Chicago Circle (currently on leave with NSF).
2. Dr. Angel G. Jordan, Dean of Engineering, Carnegie-Mellon University.

The Committee, the consultants, and the group who met with the consultants on November 29 also met and had extensive discussions with Dr. Martin Wedepohl, Dean of Applied Science at the University of British Columbia. Because of his role in planning potentially conflicting developments at his own institution Dr. Wedepohl made it clear that he could not take a position on the development of Engineering at SFU. Nevertheless, he provided invaluable advice on the context in which developments should take place in this province.

Appendix B.

Summary of Information from Statistics Canada, M.O.S.S.T., etc.

1. 1979 data from Canadian Council of Professional Engineers

Starting Salary $15,000-19,000.
Average Salary $30,000.
Unemployment rate: less than 3%.
Good employment prospects for civil, electrical and mechanical engineers. Less certain for chemical engineers.

2. Enrolment and Degrees Awarded by field in 1978-79

Table A.

	Enrollment	Degrees Awarded
Full Time		
Engineering	6089	123
Aerospace Engineering		
Agricultural Engineering	405	71
Chemical Engineering	2218	507
Civil Engineering	4952	1298
Design, Systems Engineering	284	43
Electrical Engineering	4757	1111
Forestry Engineering	678	114
Geological Engineering	526	142
Geophysical Engineering	9	2
Industrial Engineering	465	154
Mechanical Engineering	4192	1068
Metallurgical Eng., Mat. Sc.	385	72
Mining Engineering	341	56
Petroleum Engineering	42	7
Surveying Eng., Geodesy	554	101
Other Engineering	174	59
Engineering Science	346	67
Engineering Physics	485	99
Engineering Chemistry	25	11
Total for Full Time	27647	5105

Note that civil, electrical and mechanical are roughly equal. They are twice as large as chemical and 8 to 15 times most other specializations.

Detailed figures for UBC are shown in Tables D and E which are attached.

3. Degrees Awarded by Province in 1978.

Table B.	Total	Total per 100,000 in population
Newfoundland	57	10
PEI	0	0
Nova Scotia	230	28
New Brunswick	157	23
(Total Atlantic Prov.)	(444)	
Quebec	1425	23
Ontario	2209	27
Manitoba	220	22
Saskatchewan	171	19
Alberta	420	23
B.C.	216	9
(Total Western Prov.)	(1027)	
Total for Canada	5105	22

Note that B.C. graduated 216 which represents:

4.2% of the Canadian total
21% of the Western Canadian total
51% of the Alberta total

On a per capita basis B.C. graduated a smaller number of Engineers than any other Province except PEI. The B.C. number per capita is less than half all other Provinces except Newfoundland. The per capita graduation rate in the U.S. is 1.3 times that in Canada.

Directly comparable figures for 1978 are not available but in 1975 B.C. had 240 hirings which represented:

11.3% of the Canadian total
33% of the Western Canadian total
77% of the Alberta total

Based on information from our consultants and the Technical Service Council we can state that there is a considerably higher demand for engineers in B.C. in 1979 than existed in 1975.

Migration data is not available by field. For all fields, university graduates who received their degrees in 1976 showed the following migration pattern by 1978.

Table C.

Province of Origin	Percentage of Graduates Migrated to B.C.
Newfoundland	0.5
PEI	3.1
Nova Scotia	1.5
New Brunswick	0.5
Ontario	0.9
Manitoba	2.5
Saskatchewan	3.5
Alberta	5.2
B.C. (retention)	91.5

TECHNICAL SERVICE COUNCIL

SUITE 1050, 475 WEST GEORGIA ST., VANCOUVER, B.C., CANADA V6B 4M9. TEL. 682-8888

Contact: A.G. Tinker, Pacific Area Manager

JOBS FOR PROFESSIONALS STILL AT RECORD LEVELS

Job vacancies for accountants, engineers, scientists and other professionals reached record levels at the end of September. The Technical Service Council's quarterly survey of openings with 1,600 firms showed demand increased 3% since June 1979, and 34% in the last 12 months.

The Prairies reported more openings than any other region, ousting Ontario from its traditional position of leadership. The survey showed 1,165 vacancies in the Prairies, 1,148 in Ontario, 342 in B.C. and the Yukon, 324 in Quebec and 39 in the Atlantic provinces.

This is the first time that openings in B.C. have exceeded those in Quebec, which for years had two-thirds as many openings as Ontario.

Demand in the Prairies increased 62% in the last year, compared to 50% in B.C. and the Yukon, 25% in the Atlantic provinces, 24% in Ontario. No substantial change was noted in Quebec.

"Canadian employers still have confidence in the economy, as evidenced by their active recruiting," according to N.A. Macdougall, general manager and director of the Technical Service Council/Le Conseil de Placement Professionnel. "Although there is concern about the effects of the downturn in the American economy, employers are equally concerned about their inability to hire experienced professionals."

Shortages of specialized engineers, data processing staff and accountants have intensified during the last year. Employers in every region of the country report problems filling openings for experienced professionals.

A survey of 17 major consulting and resource firms in Alberta showed shortages of senior engineers, planners, schedulers, systems specialists and auditors. These employers expected recruiting problems to worsen during the next six to twelve months. They reported a poor quantity and quality of replies to advertisements, an increasing number of rejected job offers, more counter-offers by present employers and rapidly increasing recruitment costs. Some firms were compromising with candidates who had qualifications well below their standards, while others anticipated recruiting outside of Canada.

Others plan to increase salaries and benefits, or to increase their number of trainees.

Employers in Ontario and Quebec report difficulty finding people with three to five years' experience. Personnel representatives in consulting engineering firms anticipate a crisis when engineering begins for the third tar sands plant, the Cold Lake heavy oil plants and/or the Foothills pipeline.

The TSC's national survey showed systems analysts and computer programmers were in greater demand than any other group. One employer reported a turnover of 40% per year. Demand is also intense for sales engineers and plant engineers. Most vacancies are for junior or intermediate people with specialized experience.

A strong demand was reported for electronics technicians and technologists, instrument engineers, petroleum engineers, chemical process engineers, personnel managers, plant superintendents, mechanical draftsmen and accountants.

A 10-year forecast of job prospects for accountants, financed by the Technical Service Council, shows that supply and demand will be more or less in balance during the period. Employers will place increased emphasis on academic qualifications, with C.A.'s, C.G.A.'s and R.I.A.'s being given preference to people with only practical experience.

The survey showed few jobs for biologists, biochemists, corporate lawyers, chemical laboratory technicians, food chemists, technical illustrators, welding engineers, ceramic engineers, junior civil engineers, market researchers, personnel trainees and architectural draftsmen.

Large university graduating classes provide a good supply of trainees. However, companies who failed to recruit in universities in the Spring report difficulty hiring 1979 graduates in commerce and most engineering courses. A few civil engineers are still unplaced. Arts, general science, physics and life science graduates have had difficulty finding responsible positions.

A separate survey of vacancies in the $30,000 to $150,000 salary range by Bryce, Haultain personnel consultants, a division of TSC, showed that the largest proportion (25%) were for financial and accounting executives. Sales and marketing openings accounted for 17%; traffic, credit and other business 16%; engineering and science 15%; presidents and general managers 11%; personnel 9%; manufacturing 4%; and data processing 3%.

An increasing number of executives are being laid off because of mergers, plant shutdown or ineffectual performance. Previously, such people would have been transferred, given make-work assignments, or retained as consultants. Employers now hire outside consultants to coach these executives on how to job hunt.

Executives and professionals now change jobs more frequently than was common a few years ago, but are much less willing to accept positions away from the city in which they live. Contributing to this immobility are the large number of spouses who work, increased interest in quality of life and decreased concern with careers, high real-estate prices in Toronto, Calgary, Edmonton and Vancouver and other active job centres, and high mortgage interest rates.

The Technical Service Council/Le Conseil de Placement Professionnel is a non-profit placement service and personnel consulting firm run by industry. It was set up in 1927 to combat the brain drain to the U.S., when 20% to 30% of the graduating classes in engineering and science were emigrating. As a practical means of doing so, it operates a coast-to-coast placement service with offices in Montreal, Toronto, Winnipeg, Edmonton, Calgary and Vancouver.

The TSC is financed by 650 public-spirited companies. There is no charge to job hunters. The TSC has put on free "how to job hunt" courses and financed three major studies of the supply of and demand for university graduates and accountants.

Bryce, Haultain personnel consultants, a TSC division, undertakes relocation counselling, executive search, employment interviewing courses and personnel consulting.

SIMON FRASER UNIVERSITY

MEMORANDUM

To: Dean Calvert Interdisciplinary Studies	From: W. Wattamaniuk Analytical Studies
Subject: Engineering Program Space	Date: December 5, 1979

Your estimates of a steady state Engineering Program with:
- 45 faculty
- 1,000 F.T.E. undergraduate students
- 100 graduate students

will require the following space:

ENGINEERING PROGRAM ONLY

SPACE REQUIRED	NASF REQUIRED
1. Classroom space required for Engineering lectures and tutorials	17,000
2. Office space required for faculty, departmental offices, graduate students, T.A.'s, Dean's offices, etc.	15,000
3. Engineering Research lab space for faculty/ graduate research	33,250
4. Undergraduate Engineering lab space	53,700
TOTAL SPACE REQUIRED =	119,000 NASF

COMMENTS

1. Ideally, the above space should be provided for within an "Engineering Building" and if so, it would require about 119,000 ÷ .65 = 183,000 gross square feet (at a building efficiency of NASF/GROSS = 65%.

2. The above space should be viewed as "steady state" and would constitute comfortable facilities for the size of Engineering faculty you have in mind.

To keep the figure of 119,000 NASF in perspective, you can compare it to the size of Calgary's Engineering Complex (175,000 NASF with 68 faculty and 1,172 F.T.E. students) or to the size of S.F.U.'s Science Complex (150,000 NASF with 75 faculty and 1,125 F.T.E. students).

3. As well as space required specifically for the Engineering Program, other University "overhead" space will be required to support the input of 1,100 additional F.T.E. students and 45 additional faculty to the S.F.U. campus.

   I estimate this "overhead" space to be approximately 66,000 NASF.

W. Wattamaniuk

WW:dw
att.
c.c. J. Chase

Appendix E

THE UNIVERSITY OF BRITISH COLUMBIA
DECEMBER 1ST HEADCOUNT DEGREE REGISTRANTS
IN THE FACULTY OF ENGINEERING

	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79
FACULTY OF ENGINEERING	1,144	1,010	916	844	861	989	1,058	1,226	1,371
General	441	294	234	252	282	358	353	426	413
Chemical	85	74	70	54	47	44	52	51	81
Civil	89	140	158	156	148	166	207	238	274
Electrical	236	195	163	143	172	183	187	210	246
Geological	71	76	73	48	35	32	32	42	61
Mechanical	106	124	126	112	107	130	144	153	193
Mineral	38	38	41	28	24	20	23	23	20
Engineering Physics	37	27	16	13	18	28	29	39	39
Metallurgical	35	35	25	22	14	15	17	24	22
Other	6	7	10	16	14	13	14	20	22

JSC:dw
10/10/79

THE UNIVERSITY OF BRITISH COLUMBIA ENGINEERING ENROLMENTS

WINTER SESSION - 1978

	2ND YR. UNIV. 1ST YR. ENG.	3RD YR. UNIV. 2ND YR. ENG.	4TH YR. UNIV. 3RD YR. ENG.	5TH YR. UNIV. 4TH YR. ENG.	TOTAL
General	412	1			413
Mineral/Metallurgical	-	13	11	18	42
Mechnical	-	79	60	54	193
Geological	-	28	17	16	61
Physics	-	17	15	7	39
Electrical	-	106	81	59	246
Civil	-	98	83	93	274
Chemical	-	41	22	18	81
Bio-Science	-	10	10	2	22
TOTAL	412	393	299	267	1,371

JSC:dw

Appendix F