DOCUMENT RESUME

ED 055 302 SE 012 023

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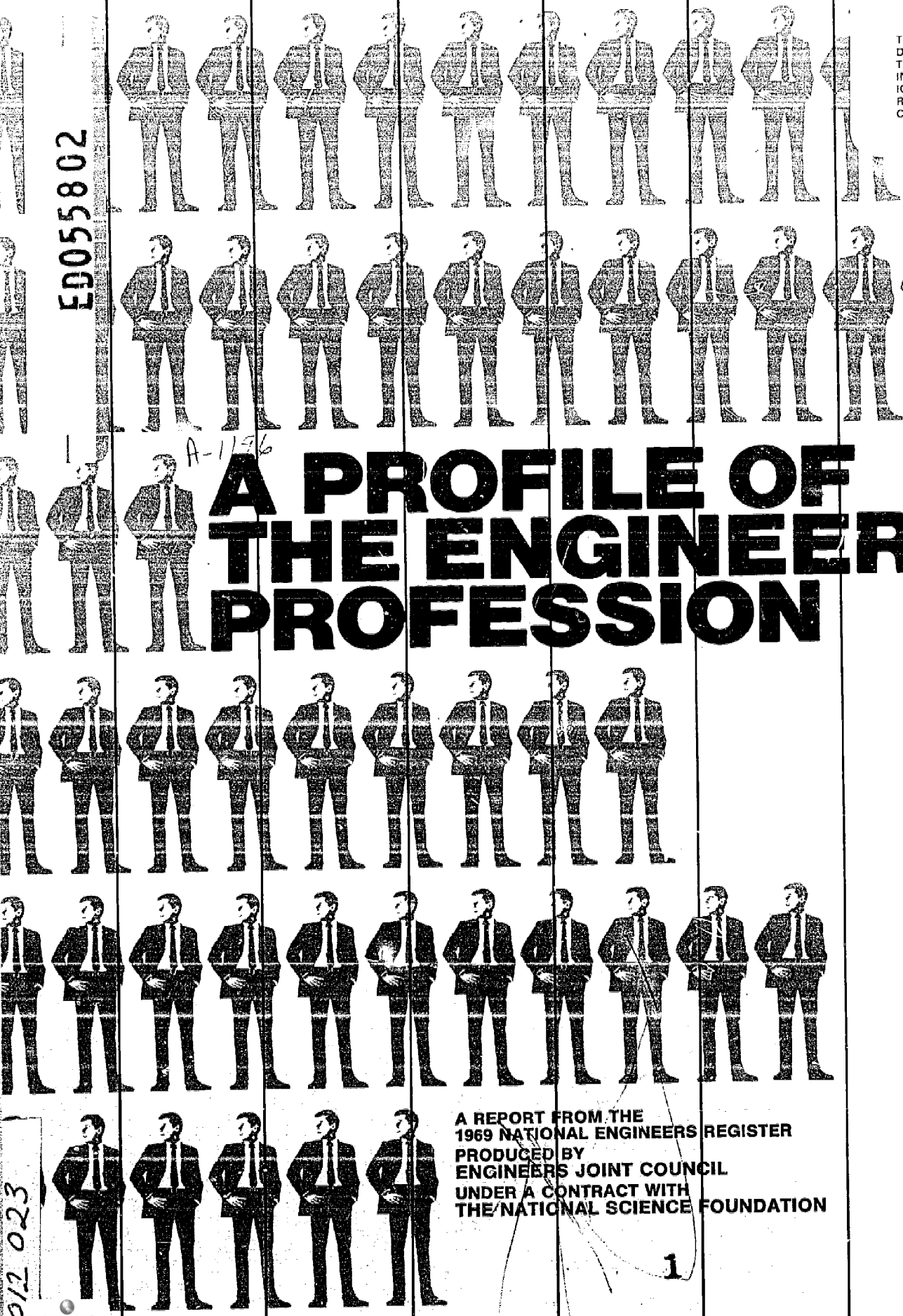
TITLE A Profile of the Engineering Profession.
INSTITUTION Engineers Joint Council, New York, N.Y. Engineering Manpower Commission.
SPONS AGENCY National Science Foundation, Washington, D.C.
PUB DATE Mar 71
NOTE 36p.
AVAILABLE FROM Engineers Joint Council, 345 East 47th Street, New York, New York 10017 ($1.00)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Employment, Employment Trends; *Engineering Education; *Engineers; Geographic Distribution; *National Surveys; *Specialization

ABSTRACT

This report is based on data obtained during the summer of 1969 from 45,000 fully qualified engineers, representing an estimated 308,00 members of the organized engineering profession. The following statements summarize the findings of this study. The largest number of degrees were reported in the fields of electrical and electronic, mechanical, and civil engineering respectively. Among 199 areas of technology, 34 percent of the engineers selected the following eight as the areas in which they were most competent: engineering generally, mechanical engineering, electrical engineering, structures, systems engineering, industrial engineering, electronic applications, and plant and facilities engineering. Of the qualified respondents who were employed, most were in three major sectors of the economy: 72 percent in industry, 14 percent in government, and 7 percent in educational institutions. Fifteen percent of the qualified respondents regarded themselves as other than engineers, even though they met the criteria to be counted as engineers for purposes of the survey. Forty-three percent of the qualified respondents were licensed in one or more states. Less than one half of one percent of the group were women. The two states with the largest number of engineers were California with 13 percent and New York with 9 percent. (Author/PR)



A PROFILE OF THE ENGINEERING PROFESSION

A REPORT FROM THE
1969 NATIONAL ENGINEERS REGISTER
PRODUCED BY
ENGINEERS JOINT COUNCIL
UNDER A CONTRACT WITH
THE NATIONAL SCIENCE FOUNDATION

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Washington, D. C.

March 1971

Price: $1.00

ENGINEERS JOINT COUNCIL

Engineers Joint Council (founded in 1941 and incorporated in 1958) is an organization of engineering societies whose general objective is to advance the art and science of engineering in the public interest.

ENGINEERS JOINT COUNCIL MEMBERSHIP

MEMBER SOCIETIES

American Society of Civil Engineers
American Institute of Mining, Metallurgical and Petroleum Engineers
American Society of Mechanical Engineers
American Society for Engineering Education
Society of Naval Architects and Marine Engineers
American Society for Testing and Materials
American Society of Agricultural Engineers
American Institute of Consulting Engineers
American Society for Metals
Society of American Military Engineers
Society of Manufacturing Engineers
Society for Experimental Stress Analysis
Instrument Society of America
American Society for Quality Control
American Institute of Industrial Engineers
Society of Fire Protection Engineers
American Institute of Plant Engineers
American Association of Cost Engineers

ASSOCIATE SOCIETIES

Air Pollution Control Association
National Institute of Ceramic Engineers
American Society for Non-Destructive Testing
Society of Packaging and Handling Engineers
International Material Management Society
Society of Women Engineers
Society for the History of Technology
Western Society of Engineers
Michigan Engineering Society
Louisiana Engineering Society
North Carolina Society of Engineers
Washington Society of Engineers
Engineering Societies of New England
South Carolina Society of Engineers
Los Angeles Council of Engineers and Scientists
Hartford Engineers Club
International Materials Management Society (New Jersey Chapter)
Chinese Institute of Engineers (New York)
Cleveland Engineering Society
Worcester Engineering Society

FOREWORD

This report is based upon responses to a detailed questionnaire sent to a cross section of engineers in the United States. It is one phase of Engineers Joint Council's program to develop a broad range of information on the characteristics of engineers in the United States.

We are pleased to be associated with the National Science Foundation, which made this survey and report possible through a contract with Engineers Joint Council. The National Science Foundation staff, under the direction of Dr. Milton Levine, Study Director for the National Register of Scientific and Technical Personnel, carried out the statistical processing and prepared the data on which this report is based. The report itself was developed and written by John D. Alden, Director of Manpower Activities, of the EJC staff.

Carl Frey, Executive Director
Engineers Joint Council

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INTRODUCTION

This report is based on data obtained by surveying a large sample of engineers in the Summer of 1969. Questionnaires were sent to every fourth name from lists of about 345,500 engineering society members prepared by Engineers Joint Council. Replies from nearly 45,000 fully qualified engineers, representing an estimated 308,000 members of the organized engineering profession, were analyzed statistically for this report.

The responses were screened to separate the returns from individuals who did not meet the predetermined criteria established by EJC for inclusion as engineers. The need for applying such criteria stemmed from the fact that most engineering societies include among their members many non-engineers, such as scientists and business executives who are involved in related technical fields. For purposes of the 1969 survey, anyone with an engineering degree or holding state registration as a professional engineer was included, even if he indicated that he did not consider himself an engineer. In addition, anyone holding professional-level membership in a society which provides for the acceptance of demonstrated professional competence in lieu of a formal engineering degree, and who regarded himself as an engineer, was also included. This group consisted mainly of individuals having degrees in physics, chemistry, or other fields of science plus a few exceptional individuals with less than a bachelor's degree in terms of formal education. Non-U.S. citizens were counted if they were working in the United States but excluded if they were residing abroad.

In all of the charts where statistics are given as percentages, small groups of non-respondents have been eliminated for clarity. The percentages in each case should therefore be interpreted as applying only to those respondents who provided information on the characteristic being presented. Percentages may not add up exactly to 100% in all cases because of rounding.

The basic questionnaire provided much detail that cannot be presented in a report of this type. For example, many specialties were reported by too few engineers to be statistically meaningful. Most of the charts and tables have been simplified to some extent by grouping or combining specialties into categories. The specialties included in such groupings are listed in various sections of the report. Facsimiles of the complete questionnaire and specialties lists are also included. There is obviously no "one best way" for splitting the field of engineering into manageable categories for statistical analysis. Experience gained from this and earlier surveys will be used to refine and improve the classification systems used by the National Engineers Register.

SUMMARY

Education

Eight percent of the engineers held a doctorate. There were about 23% with master's degrees, 4% with professional engineering degrees, 61% with bachelor's degrees, and 3% with less than a bachelor's.

The largest number of degrees were reported in the fields of electrical and electronic, mechanical, and civil engineering respectively.

Areas of Technology

Among 199 areas of technology, 34% of the engineers selected the following eight as the areas in which they were most competent: engineering generally, mechanical engineering, electrical engineering, structures, systems engineering, industrial engineering, electronic applications, and plant & facilities engineering.

Employment

Of the qualified respondents who were employed, most were in three major sectors of the economy: 72% in industry, 14% in government, and 7% in educational institutions.

The two functions relating to work activity most often cited were planning or directing (20%) and design (18%). The product or service areas most often selected were construction and civil engineering (16%), followed by electrical and electronics combined (14%) and aircraft and space (11%).

Professional Identification

Fifteen percent of the qualified respondents regarded themselves as other than engineers, even though they met the criteria to be counted as engineers for purposes of the survey.

Registration

Forty-three percent of the qualified respondents were licensed in one or more states.

Age, Sex, and Experience

Less than one half of one percent of the group were women. The median age was 42, and the median number of years of professional experience was approximately 16.

Geographic Distribution

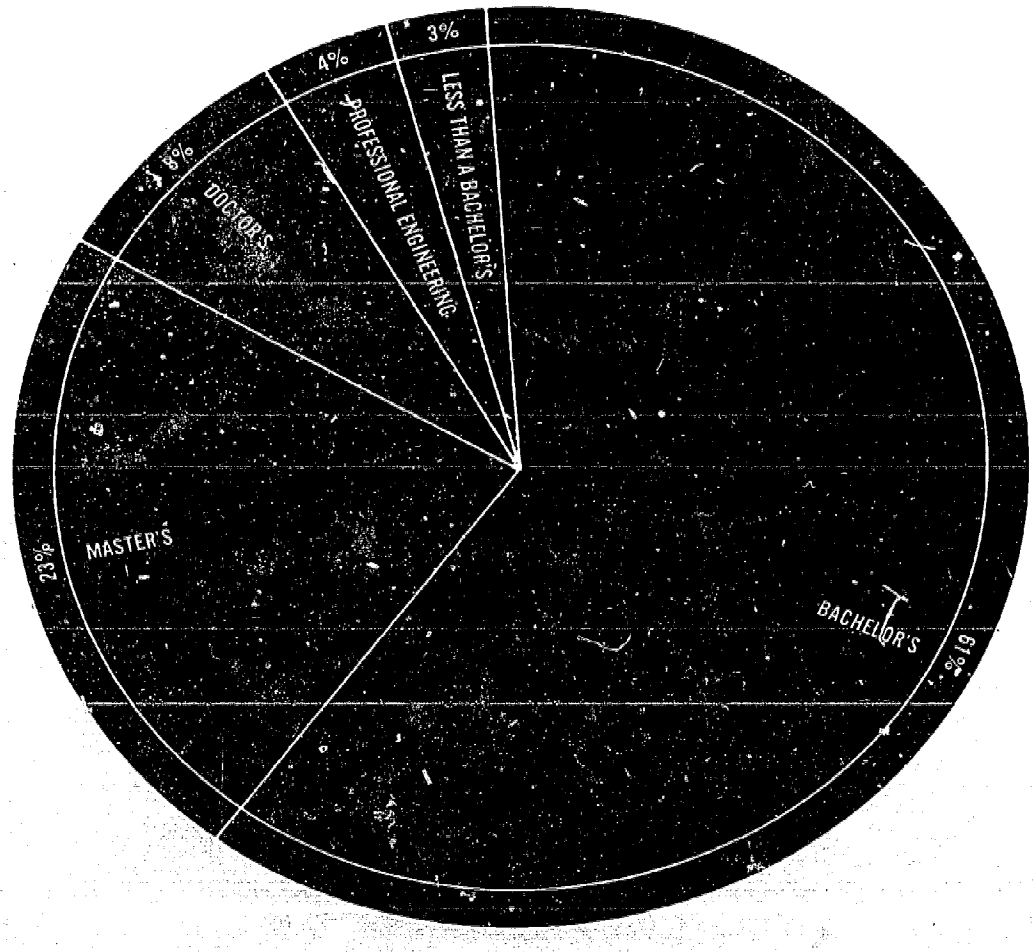
The two states with the largest number of engineers were California with 13% and New York with 9%; 22% of the engineers were from the Middle Atlantic region.

EDUCATIONAL LEVEL AND CURRICULUM

Level of Highest Degree

Although the bachelor's degree is still by far the most prevalent educational level for professional engineers, the percentage of advanced degrees is steadily rising. In 1969 the proportion of bachelor's degrees was 61%, compared to 70% in 1967; the percentage of higher degrees was 36% in 1969, compared to 27% in 1967. The professional engineering degree (usually titled Engineer and considered roughly equivalent to a master's degree) was separately reported for the first time in this survey and made up 4% of the total. Engineers with less than a bachelor's degree, who constituted about 3% of the group, typically have some college education plus long experience, or hold state registration as an engineer.

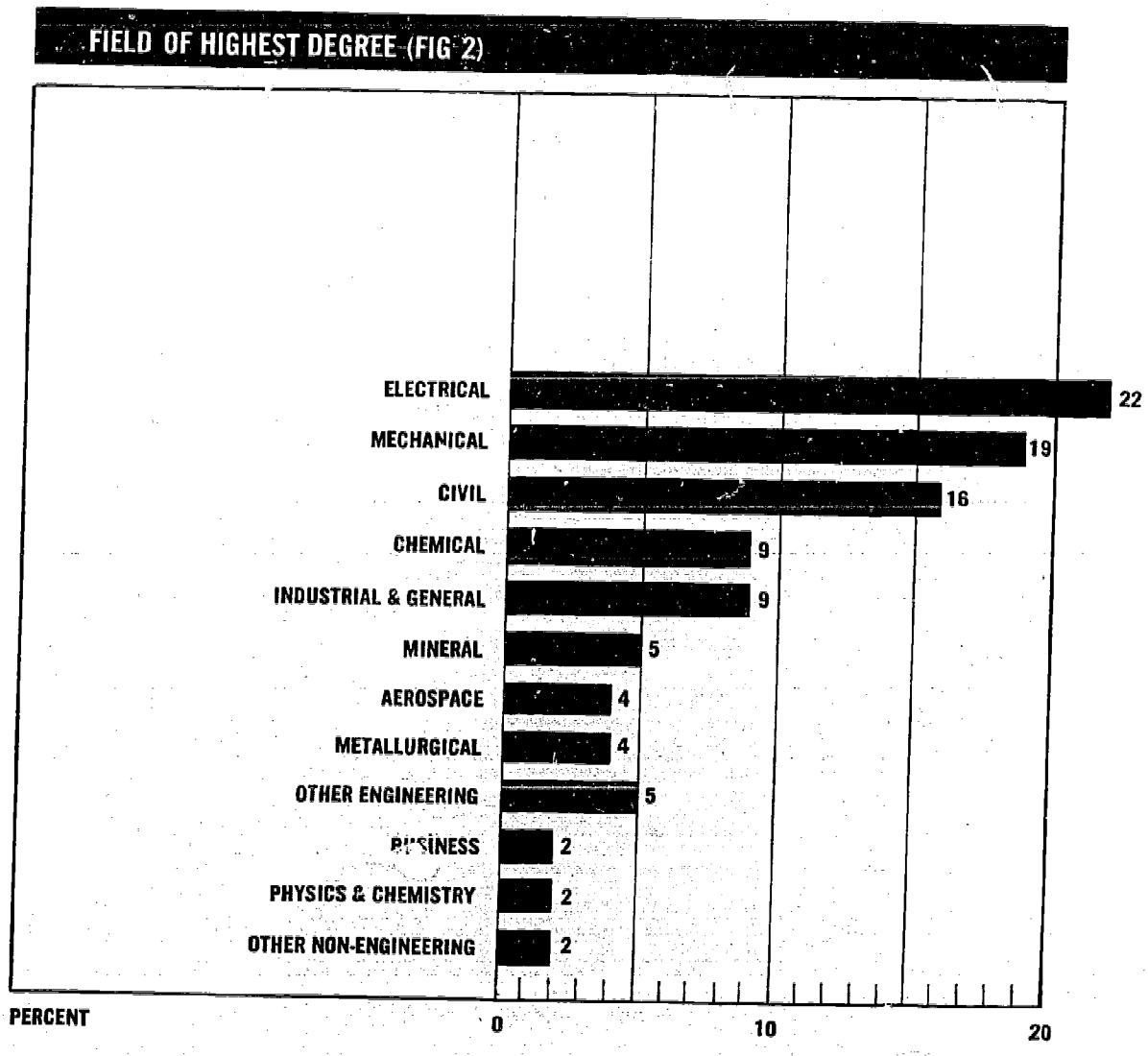
LEVEL OF HIGHEST DEGREE (FIG 1)



Source—National Engineers Register, 1969

Field of Highest Degree

Electrical, mechanical, and civil engineering continued to be the three largest fields, together making up 57% of all degrees. Note that Figure 2 shows the field of highest degree, not bachelor's degree—many engineering graduates take advanced work in scientific or other studies. Among the master's degrees reported in this survey, for example, 9% were in business administration, while 10% of the doctorates were in non-engineering fields. Table 1 gives the complete distribution of degrees by level and curriculum.



Source—National Engineers Register, 1969

TABLE 1

NUMBER OF ENGINEERS BY CURRICULUM AND HIGHEST DEGREE, 1969

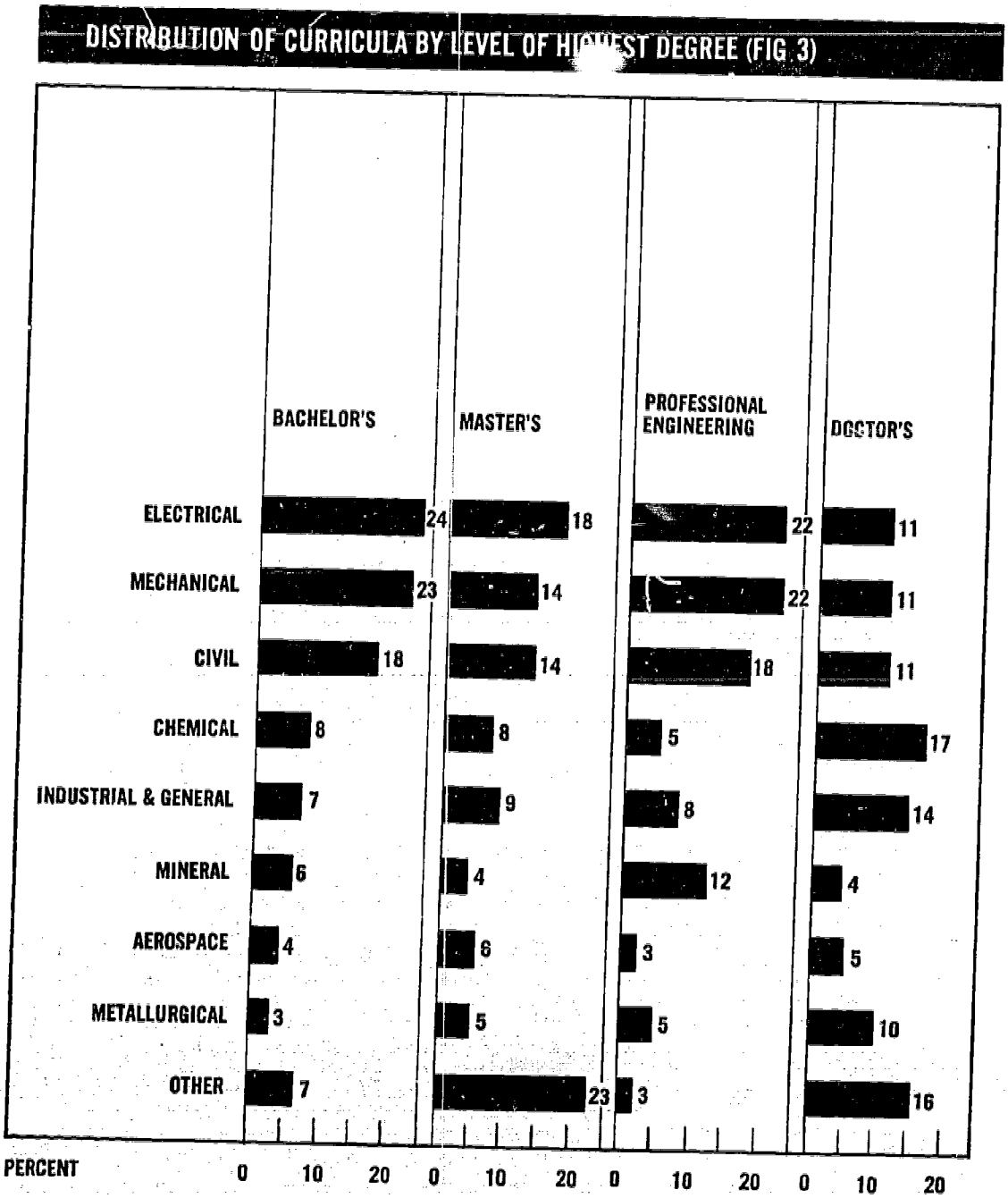
Curriculum of Highest Degree	Total	Doctorate	Professional Engineering	Master's	Bachelor's	Associate	Less Than Associate	Foreign Degree, Level Unknown
All Curricula	308,000	24,500	13,200	71,100	185,300	300	9,100	400
Aeronautical and Astronautical	13,100	1,300	400	4,000	7,100	—	200	—
Agricultural	4,700	400	—	1,300	2,900	—	—	—
Architectural	1,300	—	—	200	1,000	—	100	—
Bioengineering	400	100	—	100	200	—	—	—
Ceramic	500	100	—	100	300	—	—	—
Chemical	26,600	4,200	700	5,700	15,700	—	200	—
Civil	43,600	2,100	2,100	7,900	31,000	—	300	100
Communications	1,600	100	100	500	800	—	100	—
Construction	600	—	100	200	300	—	—	—
Electrical	47,200	2,000	2,400	6,800	34,600	100	1,200	100
Electronic	16,800	700	400	5,300	9,400	—	900	—
Engineering Mechanics	4,700	1,500	100	1,600	1,300	—	200	—
Engineering General	4,900	200	500	600	2,900	—	700	—
Engineering Physics	1,700	300	—	300	900	—	100	—
Engineering Science	2,100	400	—	800	700	—	—	—
Engineering Technology	800	—	100	100	400	—	100	—
Environmental	600	100	—	200	200	—	—	—
Geological	4,200	600	200	900	2,400	—	—	—
Geophysical	300	100	—	100	100	—	—	—
Industrial	11,300	500	300	2,600	7,400	—	500	—
Marine	1,300	—	—	100	1,100	—	100	—
Materials	900	400	—	300	100	—	—	—
Mechanical	57,200	2,700	2,800	9,500	40,900	—	1,100	100
Metallurgical	12,800	2,500	700	3,200	6,100	—	200	—
Mineral	400	—	—	200	200	—	—	—
Mining	4,200	100	900	400	2,700	—	100	—
Naval Architecture	1,300	—	100	500	600	—	100	—
Nuclear	700	200	—	500	100	—	—	—
Petroleum	6,400	200	400	900	4,800	—	100	—
Sanitary	1,900	300	100	1,400	200	—	—	—
Textile	200	—	—	—	200	—	—	—
Transportation	600	100	100	300	100	—	—	—
Welding	100	—	—	—	—	—	—	—
Other Engineering	6,400	600	300	2,800	2,400	—	300	—
Business Administration	7,300	100	—	6,300	600	—	200	—
Chemistry	1,700	500	—	300	800	—	—	—
Physics	4,100	600	—	1,200	2,200	—	100	—
Other Nonengineering	7,000	1,200	—	3,400	2,200	—	100	—
No Report	6,800	—	200	200	400	—	1,900	—

Note—Groups may not add to total because of rounding. In addition to the columns shown, there were 100 Professional Medical degrees and 4,000 that did not report degree level.
Source—National Engineers Register, 1969.

In order to relate the individual curricula listed in Table 1 to the groups used in Figure 2, the following definitions apply: Aerospace (Aeronautical and Astronautical), Civil (Architectural, Civil, Construction, Environmental, Sanitary, Transportation), Electrical (Communications, Electrical, Electronic), General (Engineering Mechanics, Engineering General, Engineering Physics, Engineering Science, Engineering Technology, Industrial, Materials), Mechanical (Marine, Mechanical), Metallurgical (Metallurgical, Welding), Mineral (Geological, Geophysical, Mineral, Mining, Petroleum), Other (Agricultural, Bioengineering, Ceramic, Naval Architecture, Nuclear, Textile, Other Engineering).

Distribution of Engineering Curricula by Level of Highest Degree

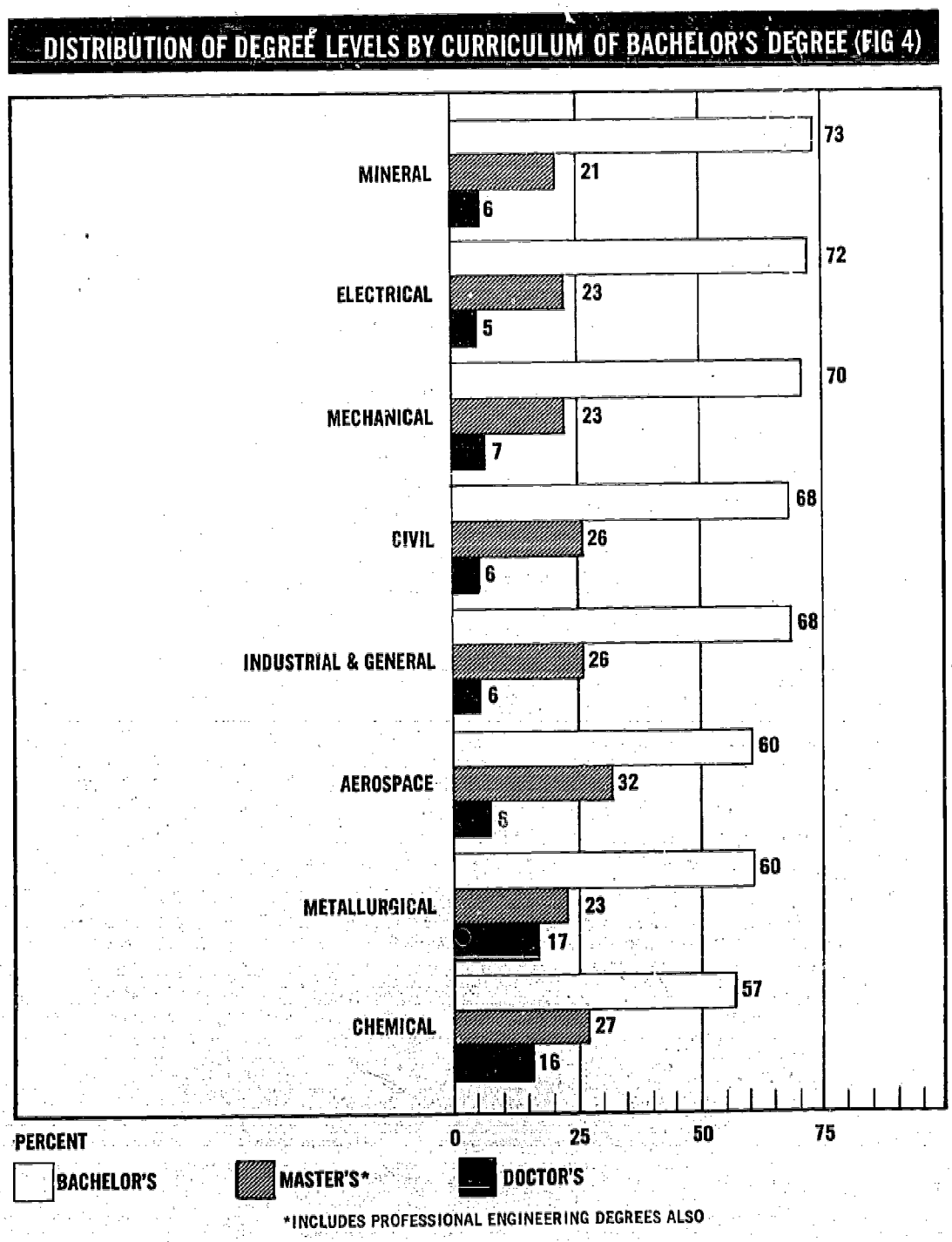
Figures 3 and 4 throw additional light on the way degree levels and curricula vary in the different branches of engineering. In Figure 3 we look at the four major levels in turn to see how the percentages represented by the different curricula changed. Note the high percentage of "other" curricula in the master's degree group, and the shift in the relative rank of many curricula in the doctorate group, with chemical engineering becoming the largest single curriculum group at that level.



Source—National Engineers Register, 1969

Distribution of Degree Levels by Curriculum of Bachelor's Degree

Figure 4 on the other hand shows how the different degree levels were distributed in the major curriculum groups, only this time the curriculum is that of the graduate's bachelor's degree, not his highest degree. These charts are therefore useful in showing the tendency of bachelor's degree graduates in the several curricula to pursue advanced study. The highest percentage of bachelor's degrees was found in the mineral group and the lowest in chemical engineering. Aerospace had the highest percentage of master's, and metallurgical engineering the largest proportion of doctor's.



Source—National Engineers Register, 1969

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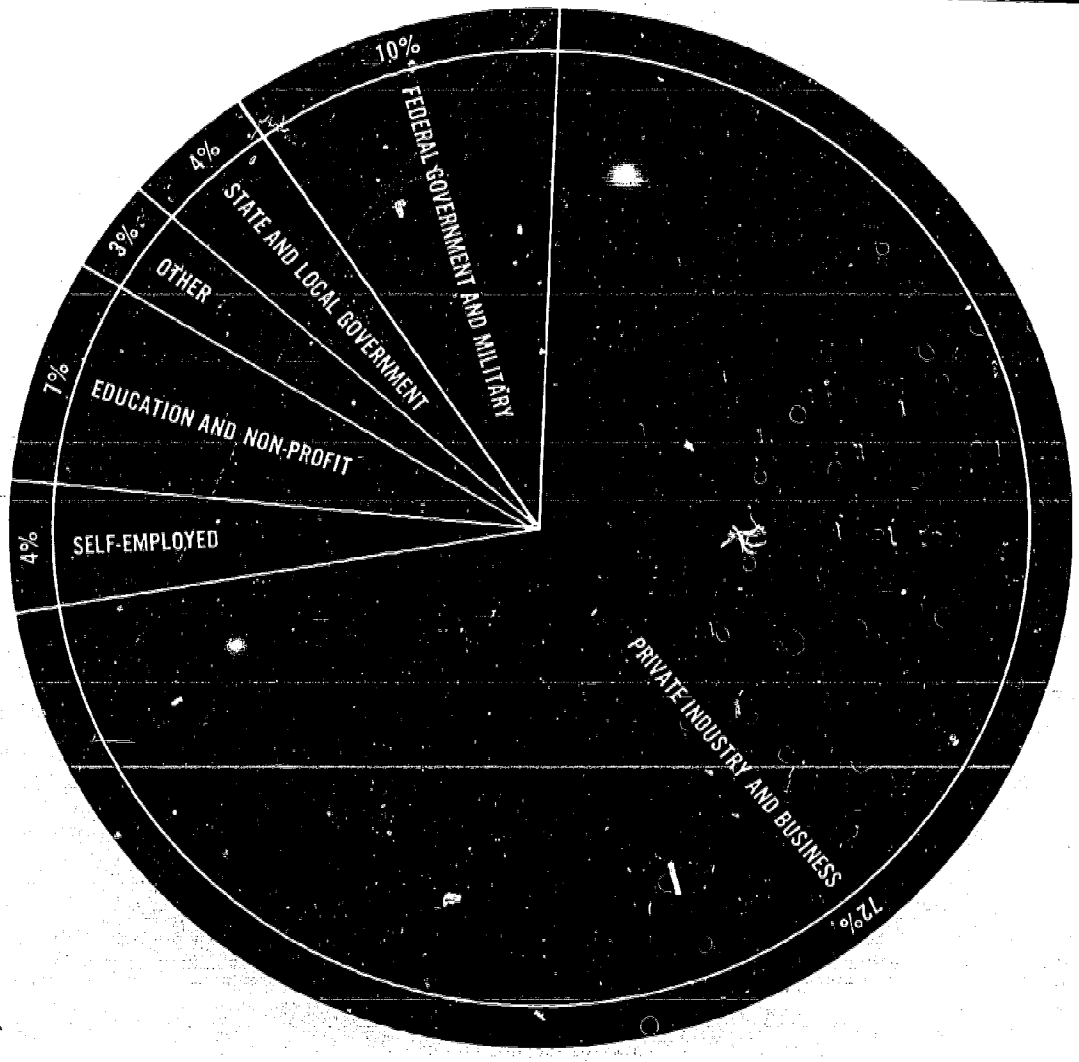
EMPLOYMENT

Type of Employer

The great majority of respondents were employed by private industrial or business organizations, as shown in Figure 5, while the rest were distributed among a variety of types of employer as indicated in Table 2. Of those not employed, only 2,000 were seeking employment. Another 4,500 were employed part-time. Ninety-four percent of the respondents were professionally employed on a full-time basis.

TYPE OF EMPLOYER (FIG 5)



Source—National Engineers Register, 1969

TABLE 2

TYPE OF EMPLOYER

Private Industry or Business	211,100
Federal Government, Civilian Employee	24,600
College or University	20,200
Not Employed	12,800
Self-Employed	11,400
State Government	5,900
Nonprofit Organization Other Than a School	5,400
Military Service or USPHS—Active Duty	4,900
Local Government	4,800
Junior College or Technical Institute	900
Secondary, Elementary or Other School	300
Other	4,600
No Report	1,200
Total	308,000

Note: Numbers do not add up to total because of rounding.
Source—National Engineers Register, 1969.

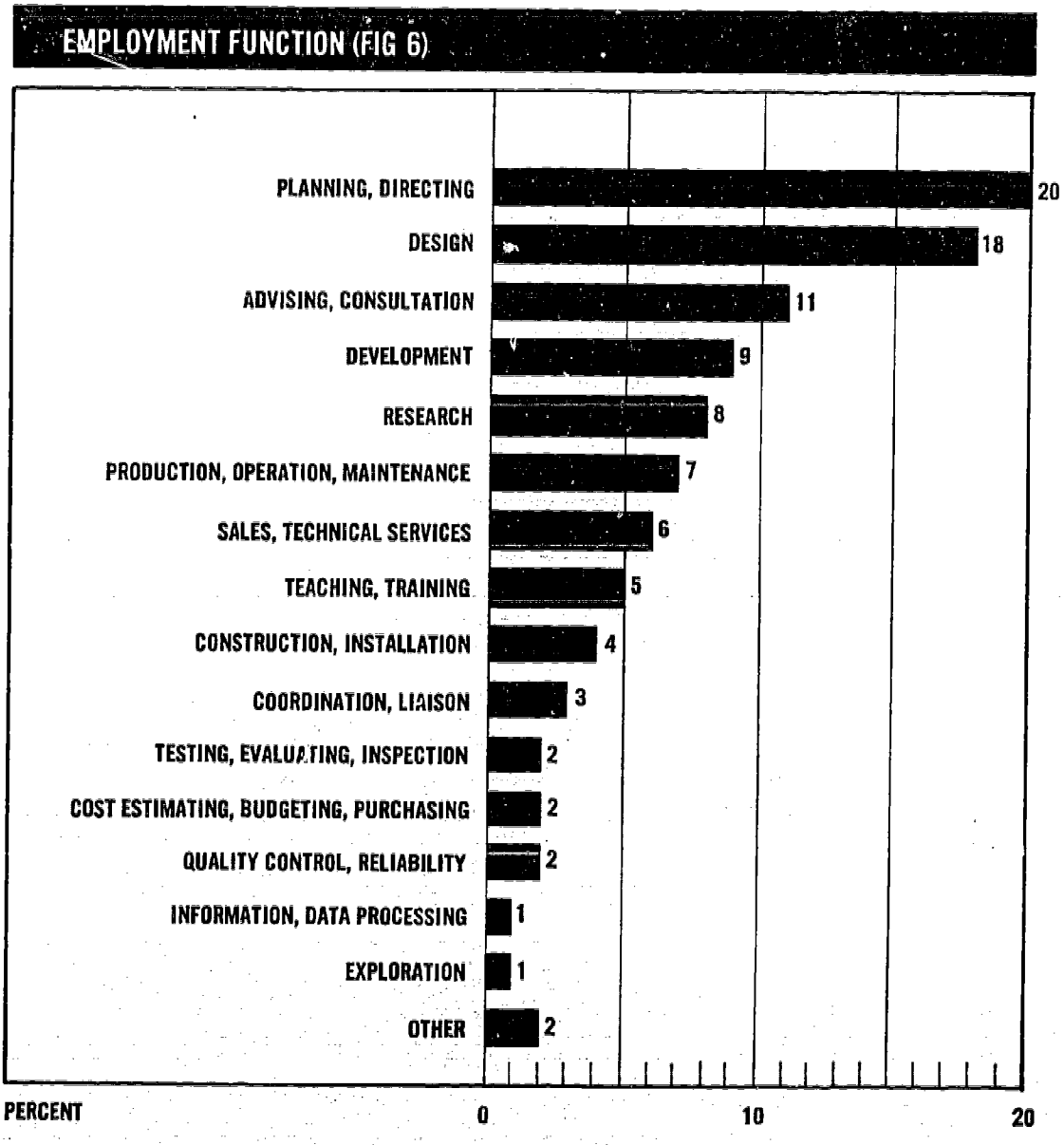
Federal Support

Less than half (45%) of the engineers whose support status was known reported receiving some degree of federal support, which could vary from some part-time work to full-time employment, while 55% received none. The programs most commonly mentioned as the source of government support were defense, space, transportation, public works, and atomic energy.

Employment Function

Respondents were given a list of 17 job functions from which to select the one most descriptive of their current employment. Management was deliberately omitted from the list of functions since it was already known that a large number of engineers considered themselves to be a part of management, and functions were defined as those "you perform or supervise".

The function most widely selected was that of planning or directing, in which one-fifth of the engineers reported themselves. Design, with 18%, was the next most common function, followed by the others shown in Figure 6.

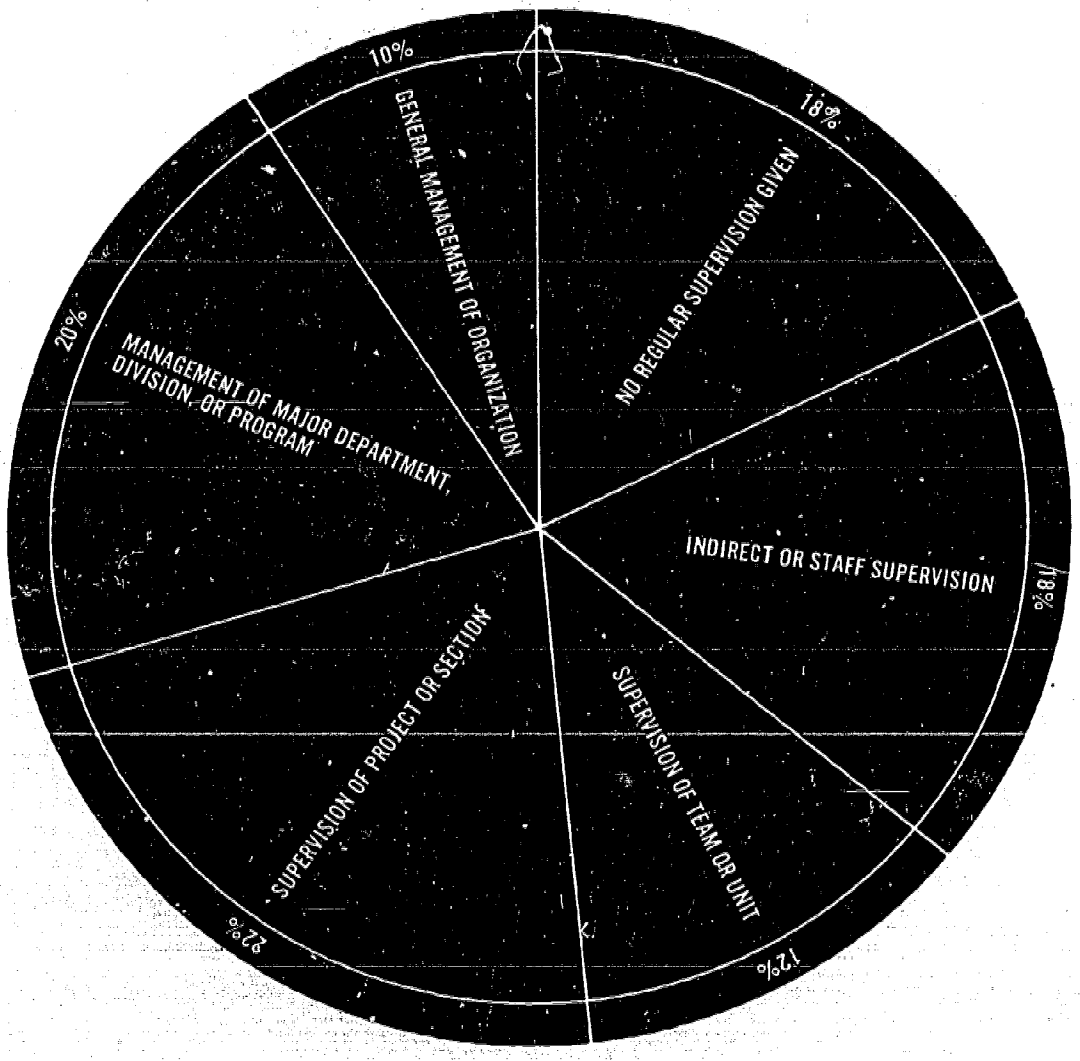


Source—National Engineers Register, 1969

Supervisory Responsibility

To throw more light on the elusive concept of management, respondents were asked to select their level of supervisory responsibility from the six shown in Figure 7. The result, which was a unique finding of this survey, showed that engineers were indeed largely managers or supervisors, with 64% providing supervision ove components ranging from teams or small units up to major organizations. Only 18% had no supervisory responsibilities at all, while another 18% had indirect or staff responsibility. Although all levels of supervisory responsibility were well represented, there was a definite relationship between age and responsibility. From detail not presented here it was ascertained that the group with no supervisory responsibility centered around the 25-29 year age bracket, both the staff and team or unit groups centered at 30-34 years, the project or section supervisor group had a modal age of 40-44 years, while the two top management groups clustered around the 45-49 year age bracket.

SUPERVISORY RESPONSIBILITY (FIG 7)

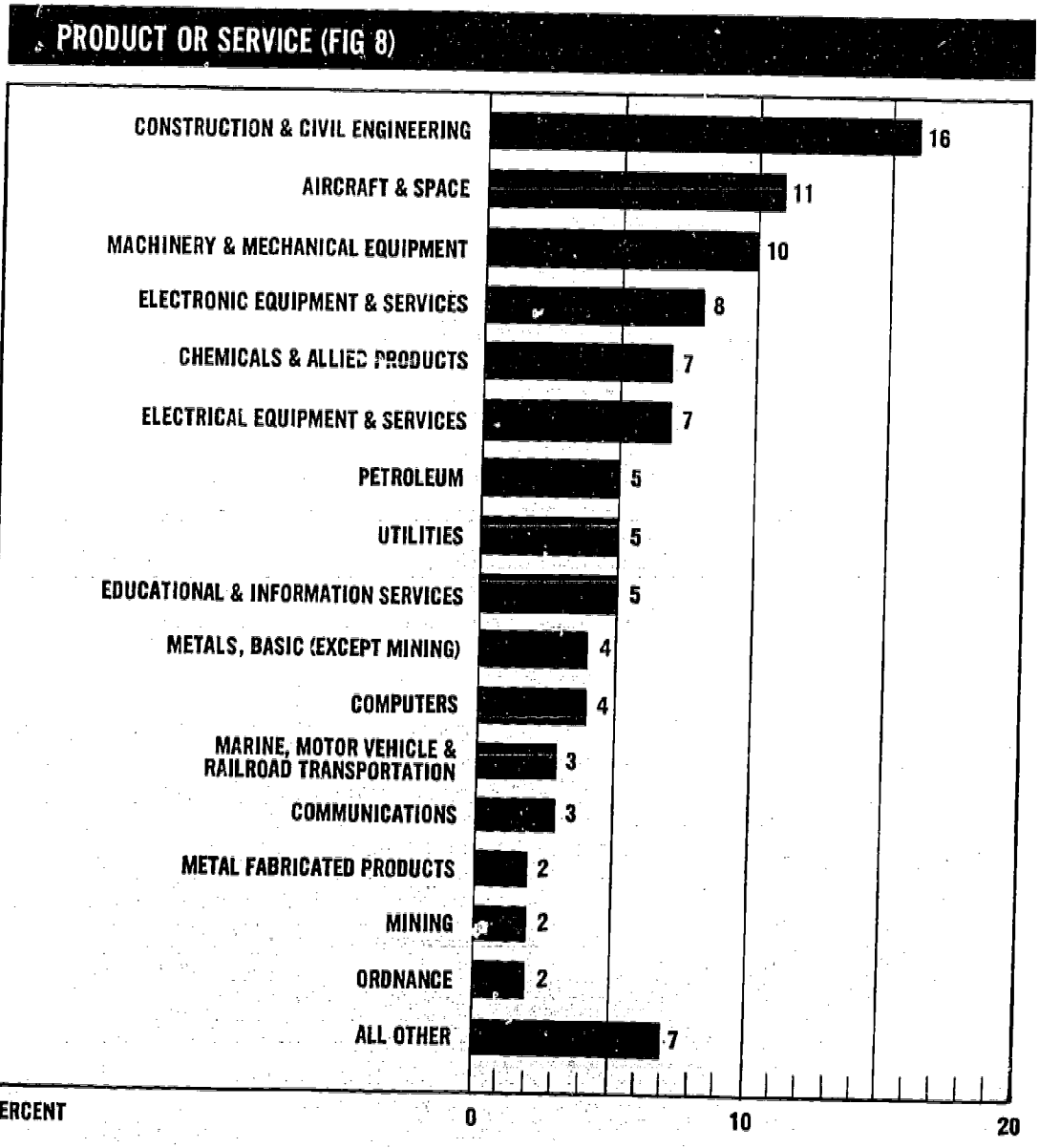


Source—National Engineers Register, 1969

Product or Service

Products and services related to engineering work were grouped into 23 categories for this study, but only 16 are identified specifically in Figure 8. The others each constituted only one percent or less of total engineering employment. A detailed list of products and services appears as List B in the facsimile of the questionnaire reproduced later in this report.

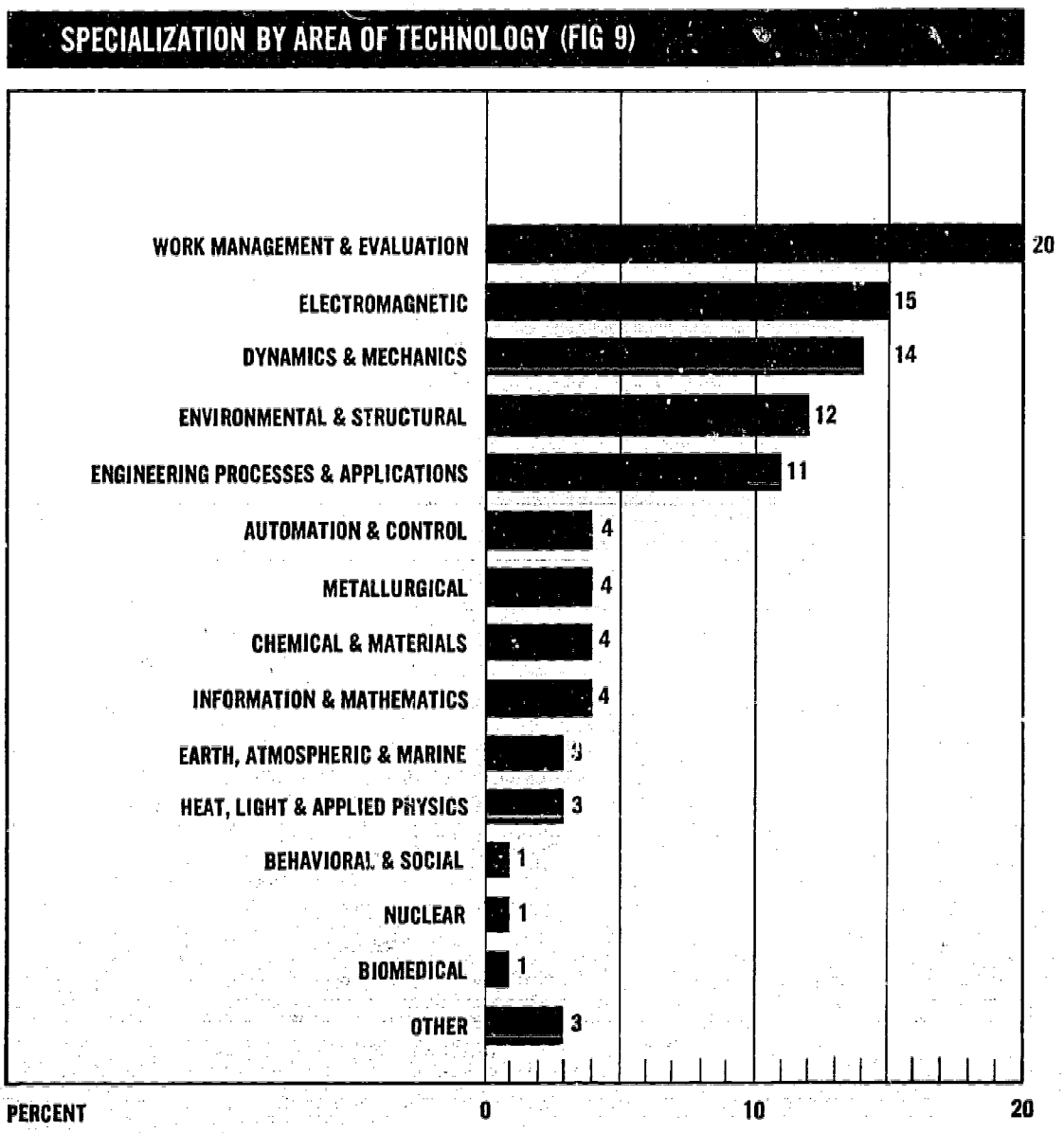
Construction and civil engineering, with 16% of the total, appeared as the largest area, but electrical and electronics would have been larger if all subgroups were combined. Aircraft and space, although the second largest category shown, occupied only 11% of the engineers covered by this survey. The great variety of products and services with which these engineers were involved is readily apparent from the chart, and clearly no industry can be singled out as having a dominant position in the employment of engineers.



Source—National Engineers Register, 1969

Specialization by Area of Technology

Respondents were asked to identify the area of technology in which they were employed and the one in which they had the greatest competence. These areas were listed alphabetically in the specialties list used with the Register questionnaire (see the facsimile included later in ths report) but for statistical analysis were grouped into the 14 major employment categories presented graphically in Figure 9. Table 3 on page 14 gives the estimated number of engineers, out of the 308,000 represented by this survey, employed in each area and shows the areas were combined into groups.



Source—National Engineers Register, 1969

It will be noted that some areas of specialization are broad while others are quite specific. This system of categorization was adopted because earlier surveys showed that many engineers considered themselves generalists and were unable to identify themselves with a narrow specialty, while others readily identified themselves as specialists. All respondents in the 1969 survey were therefore given the opportunity to select from a comprehensive list. In attempting to identify the entire number of engineers in a broad field (such as industrial engineering, for example) the reader should scan the list for more specialized fields that might be considered a part of the broader one and add these numbers to the total.

Many specialties, although important, were reported by too few respondents to be statistically significant in the expanded totals. These are included in Table 3 for completeness but with a dash instead of a number. Minor discrepancies between some group totals and the sum of the separate specialties are caused by rounding of the numbers.

SPECIALIZATION BY DETAILED EMPLOYMENT AREA OF TECHNOLOGY
TABLE 3

WORK MANAGEMENT AND EVALUATION GROUP 56,500

Systems Engineering	8,300
Industrial Engineering	8,100
Plant & Facilities Engineering	6,800
Product Engineering	4,900
Manufacturing Technology	4,400
Production Planning & Control	3,300
Operations Research; Systems Analysis	2,600
Cost Engineering	2,400
Maintainability; Maintenance	2,200
Testing, Environmental & Operational	1,900
Production Methods	1,700
Testing, Laboratory	1,500
Quality Assurance	1,200
Quality Control	1,000
Operating Procedures	1,000
Reliability	900
Specifications; Standards	900
Fire Prevention & Protection	800
Safety Engineering	600
Equipment; Facilities	500
Value Engineering	400
Configuration Control	300
Work Methods & Simplification	300
Nondestructive Testing	200
Tooling; Tools	200
Arrangement	100
Motion & Time Study	—
Radiography; X-rays	—

ELECTROMAGNETIC GROUP 42,800

Electrical Engineering	15,400
Electronic Applications	6,800
Power, Electrical	5,000
Communication	4,100
Electrical Applications	3,900
Telecommunications	2,000
Electromechanical Technology	1,400
Circuits; Networks	1,200
Electromagnetic Radiation	900
Navigation	800
Magnetics; Magnetism	400
Infra-Red; Radiometry	200
Insulation, Electrical	200
Dielectrics	100
Photoelectricity	100
Radio Frequency Compatibility	100
Recording	100
Superconductivity	—

DYNAMICS & MECHANICS GROUP 40,100

Mechanical Engineering	18,300
Aerodynamics	4,100
Mechanical Applications;	
Applied Mechanics	3,400
Propulsion	2,600
Fluid Dynamics; Fluid Mechanics	2,400
Hydraulics	2,100
Energy Generation & Conversion	1,400
Mechanics	1,300
Power, Mechanical	1,300
Astrodynamics	700
Gas Dynamics	500
Mass Transfer	400
Kinetics	300
Lubrication	300
Explosive Effects	200
Fluidics	200
Hydrodynamics	200
Vacuum Technology	200
Friction	100
High Pressure	100
Magnetohydrodynamics	100

ENVIRONMENTAL & STRUCTURAL GROUP 33,700

Structures	12,000
Transportation	3,700
Environmental Control	3,300
Sanitary Engineering	2,800
Water Resources & Supply	2,500
Soils	1,500
Concrete Technology	1,300
Air Pollution	900
Drainage; Irrigation	900
Surveying; Mapping	900
Water Pollution	800
Conservation; Reclamation	700
Traffic	500
Waste Disposal	400
Environmental Factors	300
Pollution	300
Noise Reduction	200
Public Safety	200
Rock Mechanics	200
Photogrammetry	100
Solid Waste	100

ENGINEERING PROCESSES & APPLICATIONS GROUP 32,100

Engineering	21,700
Processes	3,400
Military Applications	2,000
Drilling	1,400
Refining	1,300
Material Handling	1,100
Assembly Methods	300
Forming; Shaping	300
Containerizing; Packaging	200
Drying	200
Fastening; Joining	200
Size Reduction	100
Miniaturization	—
Preserving	—

SPECIALIZATION BY DETAILED EMPLOYMENT AREA OF TECHNOLOGY
TABLE 3 (Continued)

AUTOMATION & CONTROL GROUP 12,400	
Instrumentation	5,500
Control, General	4,200
Guidance; Stability	1,000
Automation; Cybernetics	500
Measurement; Metrology	500
Telemetry	300
Servo-Mechanisms	200
Adaptive Systems	100

METALLURGICAL GROUP 12,100	
Metallurgy, General	3,900
Metallurgy, Physical	2,900
Metallurgy, Process	2,200
Metallurgy, Extractive	1,100
Benefication; Ore Processing	600
Welding	600
Casting	400
Metallurgy, Powder	400

CHEMICALS & MATERIALS GROUP 11,700	
Chemical Applications	4,500
Material Application	3,500
Material Properties	1,300
Combustion; Fuels	1,000
Coating; Plating; Cladding	400
Corrosion	400
Electrochemistry	300
Crystals; Crystallography	100
Filament Technology	100
Fuel Cells	100
Thermochemistry	100

INFORMATION & MATHEMATICS GROUP 11,500	
Computer Applications	5,800
Stress Analysis	1,900
Data Processing	1,100
Drafting; Drawing; Graphic Technology	800
Display	400
Mathematics	400
Logic	300
Information Retrieval	200
Statistics	200
Information Theory	100
Neural Nets	—
Reprography	—

EARTH, ATMOSPHERIC, & MARINE GROUP 9,900	
Geology	2,400
Mining, Underground	1,600
Mining, Surface	1,200
Hydrology	1,000
Earth Sciences	900
Marine Sciences	800
Offshore Operations	600
Geophysics	300
Oceanography	200
Underwater Technology	200
Atmospheric Sciences; Meteorology	100
Desalting	100
Geochemistry	100
Geodesy	100
Hydrography	—
Mining, Underwater	—

HEAT, LIGHT, & APPLIED PHYSICS GROUP 8,500	
Heat Transfer	2,800
Thermodynamics	1,200
Acoustics; Sonics	600
Applied Physics	600
Cryogenics	500
Physics	500
Solid State	500
Illumination; Lighting	300
Optics	300
Photography	300
Plasmas	200
Underwater Acoustics	200
Astronomy & Astrophysics	100
High Temperature	100
Insulation, Thermal	100
Thermophysics	100
Ultrasonics	100
Holography	—
Radio Astronomy	—

BEHAVIORAL & SOCIAL GROUP 4,100	
Educational Technology	1,900
Economics	1,800
Human Factors	300
History, Technological	100
Psychology	—

NUCLEAR GROUP 2,600	
Nuclear Engineering	1,500
Power, Nuclear	800
Nucleonics	200
Radiation Safety	100
Radioactivity	—

BIOMEDICAL GROUP 1,600	
Bioengineering	600
Medical Applications	200
Public Health	200
Biochemistry	100
Biological Applications	100
Biomechanics	100
Bionics; Medical Electronics	100
Industrial Health	100
Life Support	100
Aquaculture	—
Health Physics	—
Physiology	—

OTHER (NOT SPECIFIED) 9,700

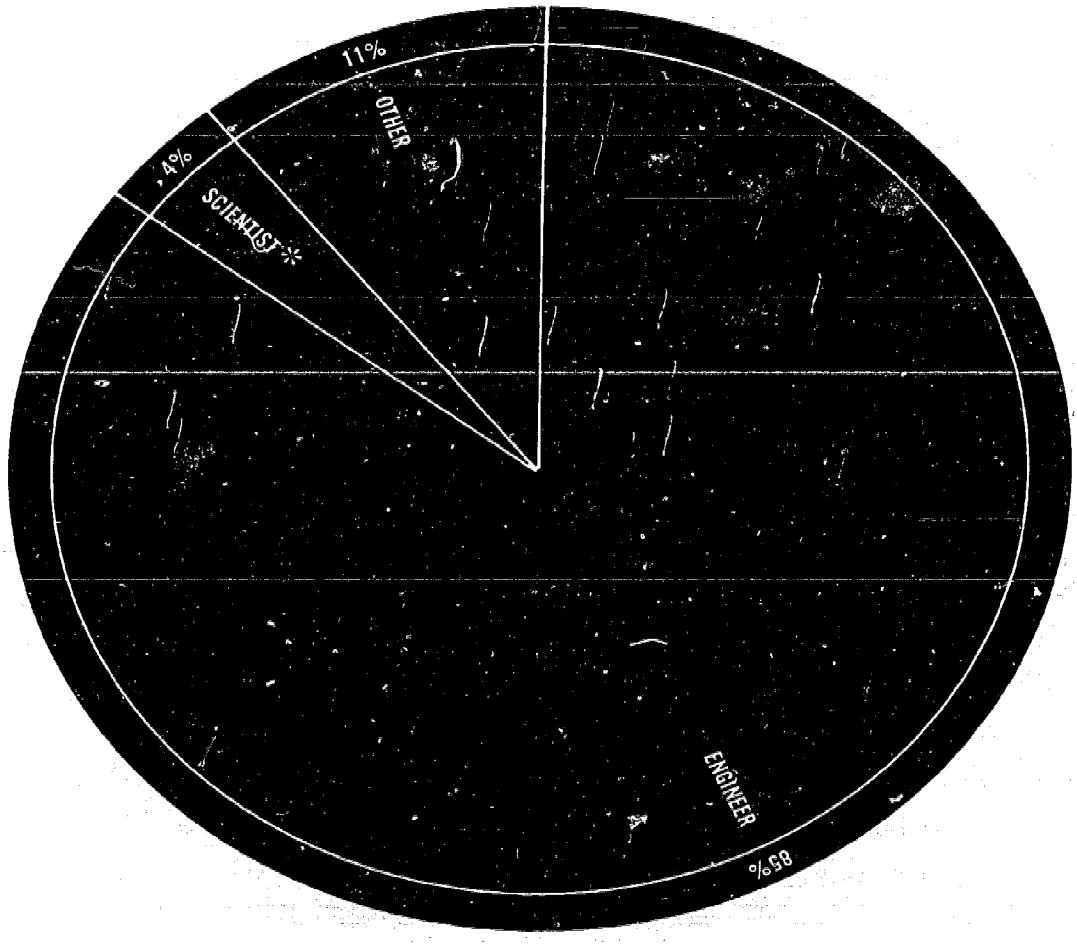
Source—National Engineers Register, 1969

GENERAL CHARACTERISTICS

Professional Identification

Although all respondents whose replies were analyzed for this report met the criteria established by Engineers Joint Council for inclusion in the National Engineers Register, Figure 10 shows that 4% considered themselves to be scientists (physicist, chemist, geologist, or metallurgist) and 11% checked or wrote in other categories, the most common of which were manager, business executive, administrator, and educator.

PROFESSIONAL IDENTIFICATION (FIG 10)



*PHYSICIST, CHEMIST, GEOLOGIST, METALLURGIST

Source—National Engineers Register, 1969

Registration

Of the engineers who provided information on this question, 43% held a state license or registration to practice engineering while 57% did not. Of those who were registered, 77% were licensed in only one state, 13% in two, and the rest in three or more states.

Student Status

Five percent of the respondents reported that they were either part-time or full-time students. Four out of five of these were part-time students only.

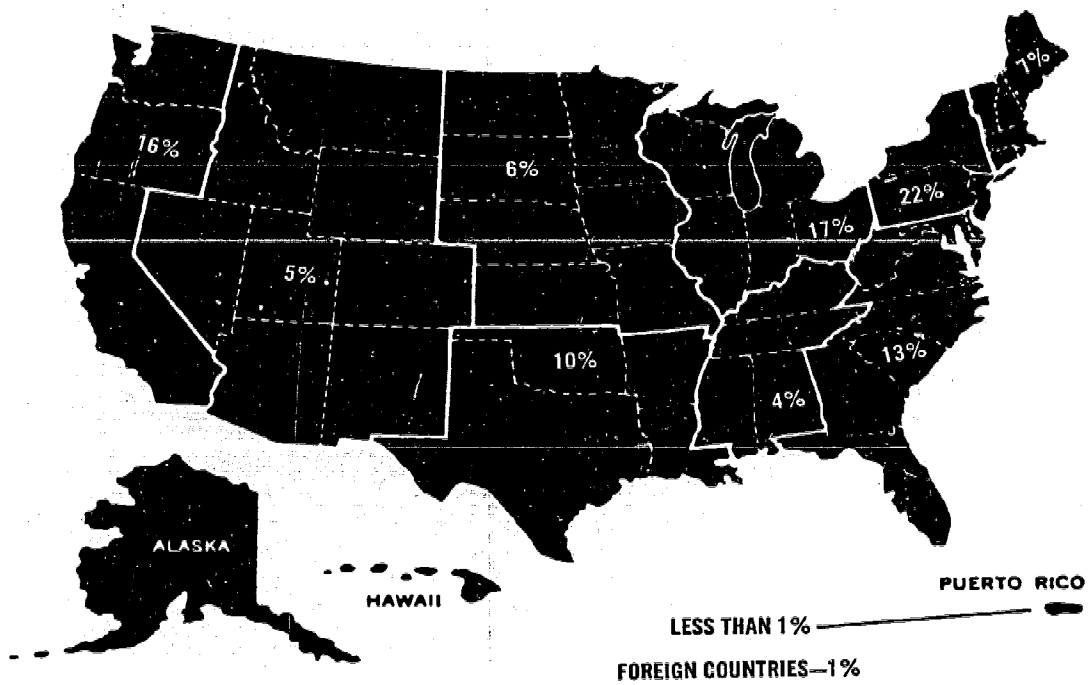
Representation of Women

As in previous surveys, women made up less than one half of one percent of all engineers.

Geographic Distribution

The regional distribution, as shown in Figure 11, was little changed since the 1964 and 1967 surveys. The West South Central region (principally Texas and Louisiana) grew by two percentage points, while the East North Central States were down by a similar amount. California continued to lead all other states in the employment of engineers, with 13% of the total, while New York with 9% was second. A detailed list showing location by state appears in Table 4. (See page 18.)

DISTRIBUTION OF ENGINEERS BY GEOGRAPHIC REGION (FIG 11)



THE FOLLOWING INDIVIDUAL STATES HAVE 3% OR MORE OF THE TOTAL NUMBER OF U.S. ENGINEERS

MASS.—4%	PENNA.—7%	OHIO—6%
N.J.—5%	ILL.—5%	TEX.—6%
N.Y.—9%	MICH.—3%	CALIF.—13%

Source—National Engineers Register, 1969

TABLE 4

GEOGRAPHIC LOCATIONS OF ENGINEERS IN 1969

Geographic Location	Number	Percent
ALL LOCATIONS	308,000	100
NEW ENGLAND	21,800	7
Connecticut	6,600	2
Maine	700	—
Massachusetts	12,300	4
New Hampshire	900	—
Rhode Island	1,000	—
Vermont	500	—
MIDDLE ATLANTIC	66,400	22
New Jersey	14,500	5
New York	29,200	9
Pennsylvania	22,700	7
EAST NORTH CENTRAL	52,200	17
Illinois	14,800	5
Indiana	5,800	2
Michigan	9,200	3
Ohio	17,500	6
Wisconsin	5,000	2
WEST NORTH CENTRAL	18,500	6
Iowa	2,800	1
Kansas	2,000	1
Minnesota	4,600	1
Missouri	7,000	2
Nebraska	1,500	—
North Dakota	300	—
South Dakota	400	—
SOUTH ATLANTIC	39,300	13
Delaware	2,100	1
District of Columbia	5,900	2
Florida	6,700	2
Georgia	3,100	1
Maryland	7,600	2
North Carolina	3,700	1
South Carolina	2,000	1
Virginia	6,300	2
West Virginia	2,000	1
EAST SOUTH CENTRAL	11,900	4
Alabama	4,000	1
Kentucky	1,900	1
Mississippi	1,200	—
Tennessee	4,800	2
WEST SOUTH CENTRAL	29,500	10
Arkansas	900	—
Louisiana	5,100	2
Oklahoma	4,300	1
Texas	19,200	6
MOUNTAIN	14,800	5
Arizona	3,100	1
Colorado	4,800	2
Idaho	900	—
Montana	800	—
Nevada	900	—
New Mexico	2,000	1
Utah	1,600	—
Wyoming	500	—
PACIFIC	50,700	16
Alaska	600	—
California	41,400	13
Hawaii	1,000	—
Oregon	1,700	—
Washington	6,000	2
U.S. TERRITORIES AND POSSESSIONS	500	—
Canal Zone	—	—
Guam	—	—
Puerto Rico	500	—
Virgin Islands	—	—
FOREIGN	2,200	1

NOTE—Groups or percents may not add to total because of rounding.

Source—National Engineers Register, 1969.

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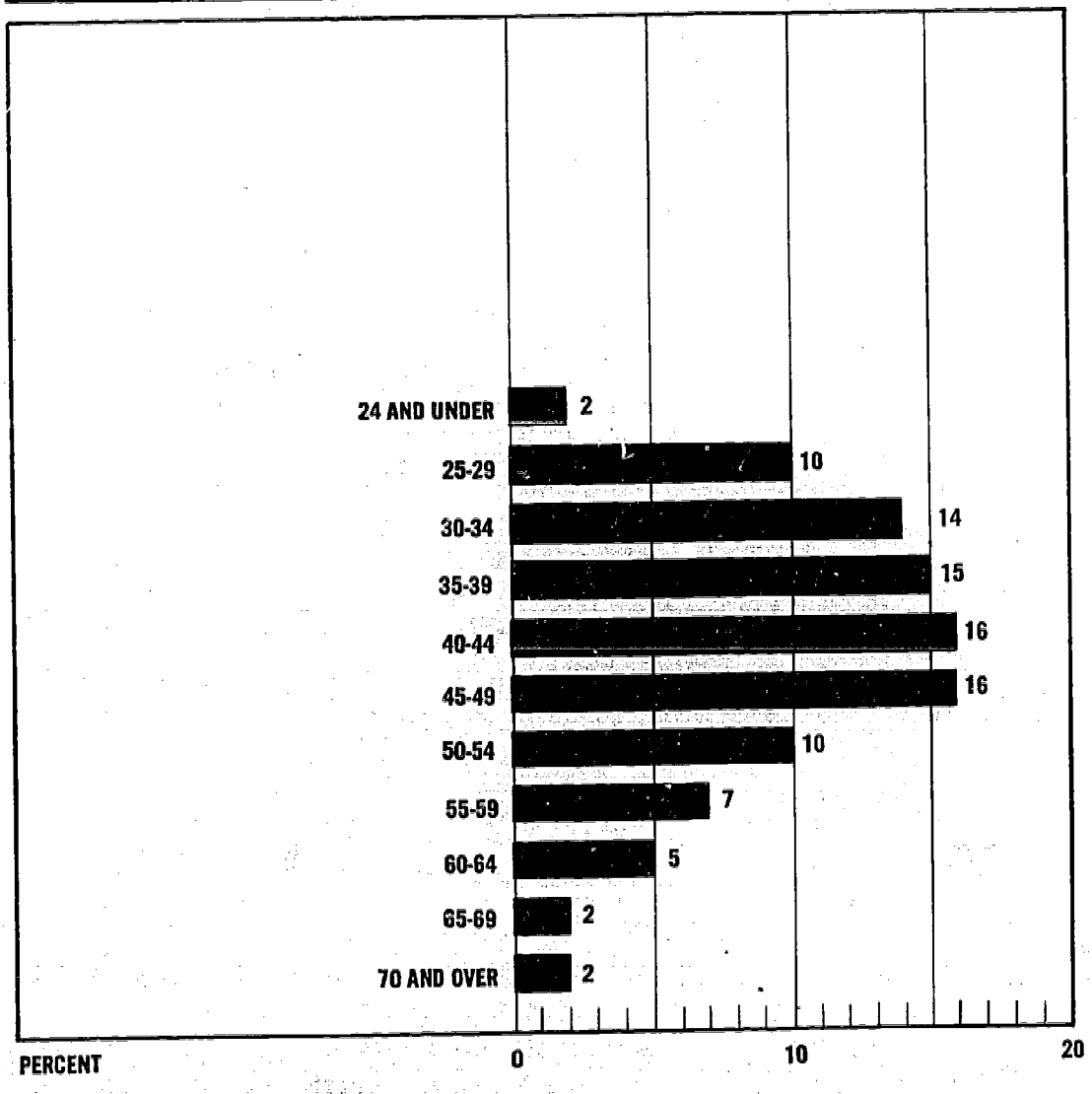
Age and Experience

The median age of the engineers covered by the 1969 National Engineers Register survey was 42. This corresponds to about 16 years of professional experience. The age distribution is shown in Figure 12 and experience in Figure 13 on page 20.

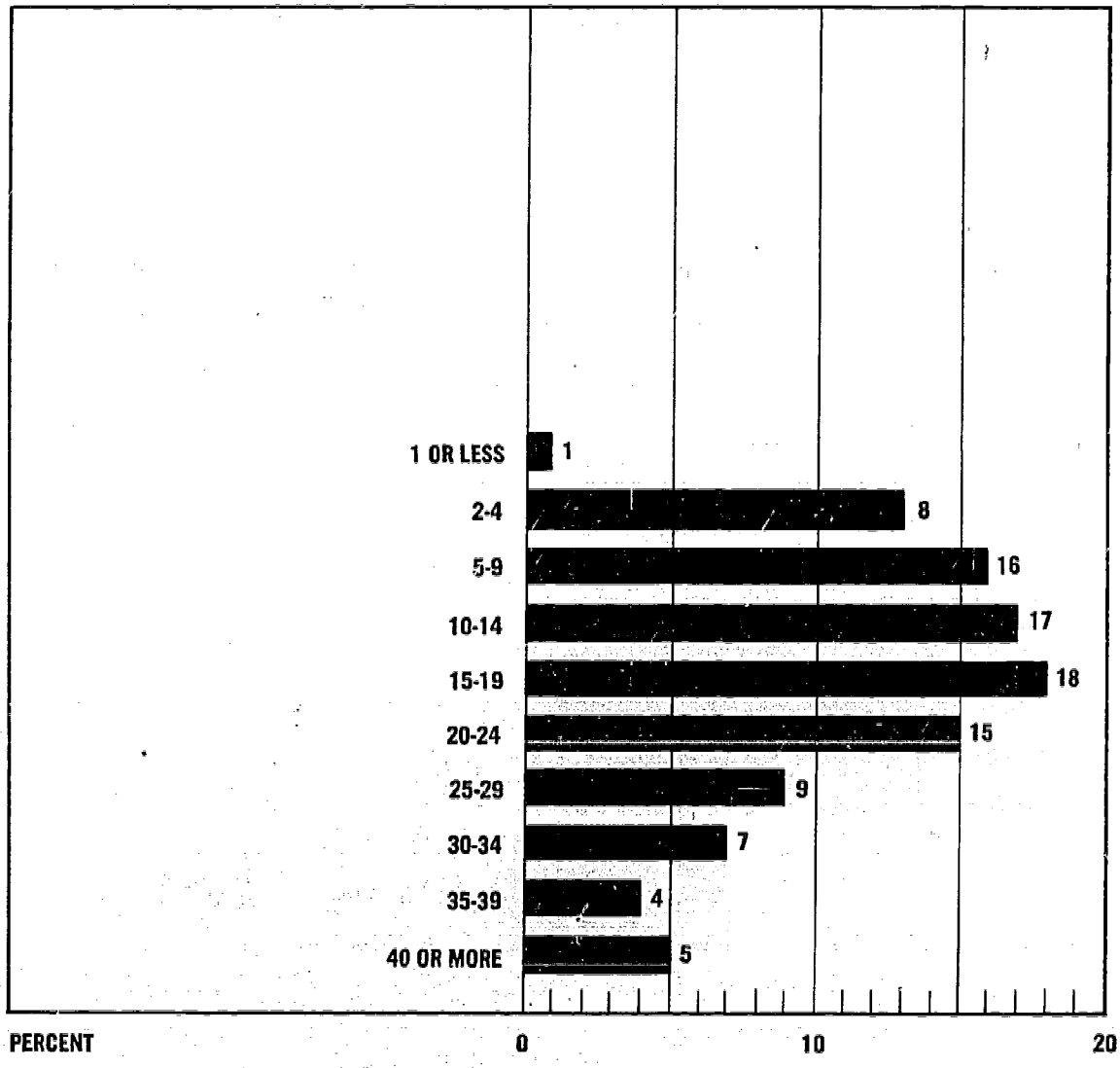
AGE DISTRIBUTION OF ENGINEERS (FIG 12)



Source—National Engineers Register, 1969

25

YEARS OF PROFESSIONAL EXPERIENCE (FIG 13)



26

Source—National Engineers Register, 1969

HISTORY OF THE NATIONAL ENGINEERS REGISTER

In the period 1954 to 1964 EJC maintained, under an NSF contract, a "finders list" for the National Engineers Register, but its current major objective is to serve as a source of statistical data useful for estimating supply, level of education, job function, and similar characteristics of the engineering community, and this function has been given increased emphasis in recent years.

The National Engineers Register is not intended to be a complete roster; rather it achieves its basic purposes through a sampling approach. Participation by individuals is purely voluntary.

In 1964 EJC, again under an NSF contract, conducted a major survey to determine certain key characteristics of the engineering community, as represented by the members of the major U.S. engineering societies. Results of this survey were published in a report entitled *Engineering Manpower in Profile*. Under the same contract EJC in 1967 conducted a second, more sophisticated survey, which was published as *The Engineering Profession: A New Profile*. This was followed by a third survey in 1969. Details of the methodology and statistical processing used in the 1969 survey are described elsewhere in this report, while highlights of the survey findings appear in the graphs and tables making up the body of this report.

HOW THE SAMPLE WAS SELECTED AND PROCESSED

Statistical data developed from the 1967 National Engineers Register survey were used in 1969 as the basis for a new method of sampling the organized engineering profession. The unified mailing list developed by Engineers Joint Council was the primary source of names and addresses. By using this list, which is essentially a combination of engineering society membership lists from which duplicate names have been largely eliminated, NER avoided the tedious procedure of merging samples of names drawn separately from the individual societies in order to identify duplications and establish statistical and mailing controls. Weighting factors computed from earlier studies of multiple membership patterns and variations in the response rate among different societies were applied to give a statistical picture of the entire population being sampled.

The basic sample was drawn by programming the computer to select every fourth name of the 315,205 names on the EJC unified mailing list. This was augmented by a separate sample from the 30,271 names on the American Institute of Aeronautics and Astronautics (AIAA) mailing list not included in the unified list. Questionnaires were mailed to the resulting sample of 86,438 names. Although a sample was selected from the 20,000 on the Society of Automotive Engineers (SAE) list to further supplement the sample, it was necessary to exclude these data from this study. This exclusion was caused by difficulties encountered in reconciling the SAE sample with the returned questionnaires and in developing weighting factors.

Questionnaires and lists of selected engineering specialties, which had been updated on the basis of experience with the 1964 and 1967 surveys, were mailed in June 1969 to the survey sample. A second mailing was made in August to all those who had not responded by that time. 54,556 responses, not all of which were usable, were received from these two mailings. The basic response rate was therefore about 63%.

The responses were screened to separate the returns from individuals who did not meet the predetermined criteria established by EJC for inclusion as engineers, as shown in the Introduction. The group excluded from the data, 9,719 in number, consisted of people who had not been educated as engineers and did not consider themselves engineers, foreign nationals living outside the U.S., deceased persons, duplicates, and those who had omitted key information required for statistical analysis. The remaining questionnaires were carefully screened for completeness and returned to the respondent for clarification where necessary. Information on the forms was coded and keypunched onto cards for computer data processing.

The usable responses were statistically adjusted to represent an unduplicated number of individual engineers in the participating societies. The statistical procedures took into consideration such factors as effective response rates for each society and the multiple memberships held in these societies. Based upon these procedures, weighting factors were developed for 18 societies separately. The resulting statistical adjustments enabled the 44,837 qualified respondents to represent a total of 308,000 individual engineers meeting EJC criteria and to represent each of the characteristics reported.

APPENDIX 1

PROFESSIONAL SOCIETY MEMBERSHIP OF RESPONDENTS

The following list shows the distribution of society memberships reported by survey respondents. Societies identified by asterisks (*) were those specifically included in the EJC unified mailing list from which the basic survey sample was drawn. A separate sample drawn from the membership list of the American Institute of Aeronautics and Astronautics was also included in the statistical analysis for this report.

Professional Society	Number	Percent
Aeronautics and Astronautics (AIAA)	4,825	11
*Agricultural (ASAE)	987	2
Air Pollution Control (APCA)	272	1
Audio (AES)	153	—
Automotive (SAE)	757	2
Ceramic (NICE)	106	—
*Chemical (AICHE)	3,669	8
*Civil (ASCE)	8,170	18
Concrete (ACI)	793	2
Consulting (AICE)	174	—
Corrosion (NACE)	275	1
*Cost (AACE)	221	—
County (NACE)	35	—
*Education (ASEE)	2,082	5
*Electrical and Electronics (IEEE)	8,068	18
*Fire Protection (SFPE)	189	—
Fluid Power (FPS)	93	—
*Heating, Refrigerating, and Air-Conditioning (ASHRAE)	1,825	4
History (SHOT)	63	—
*Industrial (AIIE)	2,074	5
*Instrument (ISA)	1,520	3
Illuminating (IES)	181	—
Iron and Steel (AISE)	371	1
Lubrication (ASLE)	72	—
Marine Technology (MTS)	169	—
Material Management (IMMS)	44	—
*Mechanical (ASME)	8,022	18
*Metals (ASM)	2,380	5
Military (SAME)	1,043	2
*Mining, Metallurgical, Petroleum (AIME)	4,660	10
Motion Picture (SMPTE)	54	—
*Naval Architects and Marine (SNAME)	665	1
Naval Engineers (ASNE)	264	—
Naval Ship Systems Command (ASE)	60	—
Nondestructive Testing (ASNT)	119	—
Nuclear (ANS)	402	1

(List continued on page 24)

Professional Society (continued)	Number	Percent
Packaging & Handling (SPHE)	12	—
Packaging Handling and Logistics (NIPHLE)	3	—
Photogrammetry (ASP)	93	—
Photographic (SPSE)	59	—
Photo-Optical Instrumentation (SPIE)	63	—
*Plant (AIPE)	340	1
Plastics (SPE)	152	—
Power (NAPE)	65	—
Professional (NSPE)	4,805	11
Pulp and Paper (TAPPI)	205	—
Quality Control (ASQC)	285	1
Railway (AREA)	107	—
Reproduction (SRE)	13	—
Safety (ASSE)	60	—
Sanitary (ASSE)	64	—
Standards (SES)	19	—
*Stress Analysis (SESA)	524	1
Traffic (ITE)	169	—
Testing and Materials (ASTM)	893	2
Tool and Manufacturing (ASTME)	351	1
Value (SAVE)	76	—
Water Pollution Control (WPCF)	676	2
Water Works (AWWA)	726	2
Welding (AWS)	399	1
Well Log Analysts (SPWLA)	51	—
*Women (SWE)	115	—
Other	7,189	16
None	736	2
No Report	1,148	2
Total Reporting	42,953	96
Reporting More Than One Society	19,325	43

*Included in EJC unified mailing list.

BUDGET BUREAU NO. 99-R58002
APPROVAL EXPIRES FEBRUARY 1971

NATIONAL ENGINEERS REGISTER

CONDUCTED BY THE

ENGINEERS JOINT COUNCIL

345 EAST 47TH STREET, NEW YORK, N. Y., 10017

AND THE NATIONAL SCIENCE FOUNDATION

PLEASE PRINT ANSWERS IN DARK INK OR TYPE

PLEASE DO NOT WRITE IN THIS COLUMN

IF YOUR NAME OR ADDRESS IS INCORRECT, PLEASE ENTER CORRECT INFORMATION BELOW:
PLEASE GIVE FULL NAME

.....

.....

.....

.....

SAMPLE

THE PERSONAL INFORMATION YOU PROVIDE IS CONSIDERED PRIVILEGED AND IS NOT AVAILABLE FOR PRIVATE OR COMMERCIAL PURPOSES.

VITA:

1. DATE OF BIRTH — Month | Day | Year

2. STATE OR FOREIGN COUNTRY OF BIRTH

3. STATE OR FOREIGN COUNTRY OF SECONDARY SCHOOL GRADUATION

4. SEX
- ☐ 1 - MALE
- ☐ 2 - FEMALE

5. CITIZENSHIP (check one)
- ☐ 1 - USA
- ☐ 2 - NON-USA (specify country) .....

6. How many years of professional work experience requiring a bachelor's degree or its equivalent, including teaching, have you had? ☐

EDUCATION:

7. COLLEGE, UNIVERSITY, OR OTHER INSTITUTION (Include city and state)	DEGREE, IF ANY	YEAR OF DEGREE	CURRICULUM (Select Name and Number from List A) NUMBER	CURRICULUM NAME

8. If you are a student, check your status.
- ☐ 1 - STUDENT, FULL-TIME
- ☐ 2 - STUDENT, PART-TIME

PROFESSIONAL IDENTIFICATION:

9. If you regard yourself primarily as an engineer check here: ☐ If you regard yourself as other than an engineer, please identify yourself as:
- ☐ 1 - ARCHITECT
- ☐ 2 - PHYSICIST
- ☐ 3 - CHEMIST
- ☐ 4 - GEOLOGIST
- ☐ 5 - MATHEMATICIAN
- ☐ 6 - METALLURGIST
- ☐ 7 - TECHNICIAN
- ☐ 8 - OTHER (SPECIFY) .....

10. PROFESSIONAL SOCIETY MEMBERSHIP: Circle the number in front of all professional societies of which you are a member. For write-ins include only NATIONAL societies and use identifying words in full.

1A - AERONAUTICS AND ASTRONAUTICS (AIAA)
1B - AGRICULTURAL (ASAE)
1C - AIR POLLUTION CONTROL (APCA)
1D - AUDIO (AES)
1E - AUTOMOTIVE (SAE)
1F - CERAMIC (NICE)
1G - CHEMICAL (AIChE)
1H - CIVIL (ASCE)
1I - CONCRETE (ACI)
1J - CONSULTING (AICE)
1K - CORROSION (NACE)
1L - COST (AACE)
1M - COUNTY (NACE)
1N - EDUCATION (ASEE)
1O - ELECTRICAL AND ELECTRONICS (IEEE)
1P - FIRE PROTECTION (SFPE)
1Q - FLUID POWER (FPS)
1R - HEATING, REFRIGERATING, AND AIR-CONDITIONING (ASHRAE)
1S - HISTORY (SHOT)
1T - INDUSTRIAL (AIIE)
1U - INSTRUMENT (ISA)
1V - ILLUMINATING (IES)
1W - IRON AND STEEL (AISE)
1X - LUBRICATION (ASLE)
1Y - MARINE TECHNOLOGY (MTS)
1Z - MATERIAL MANAGEMENT (IMMS)
2A - MECHANICAL (ASME)
2B - METALS (ASM)
2C - MILITARY (SAME)
2D - MINING, METALLURGICAL, PETROLEUM (AIME)
2E - MOTION PICTURE (SMPTE)
2F - NAVAL ARCHITECTS AND MARINE (SNAME)
2G - NAVAL ENGINEERS (ASNE)
2H - NAVAL SHIP SYSTEMS COMMAND (ASE)
2I - NONDESTRUCTIVE TESTING (ASNT)
2J - NUCLEAR (ANS)
2K - PACKAGING & HANDLING (SPHE)
2L - PACKAGING, HANDLING AND LOGISTICS (NIPHLE)
2M - PHOTOGRAMMETRY (ASP)
2N - PHOTOGRAPHIC (SPSE)
2O - PHOTO-OPTICAL INSTRUMENTATION (SPIE)
2P - PLANT (AIPE)
2Q - PLASTICS (SPE)
2R - POWER (NAPE)
2S - PROFESSIONAL (NSPE)
2T - PULP AND PAPER (TAPPI)
2U - QUALITY CONTROL (ASQC)
2V - RAILWAY (AREA)
2W - REPRODUCTION (SRE)
2X - SAFETY (ASSE)
2Y - SANITARY (ASSE)
2Z - STANDARDS (SES)
3A - STRESS ANALYSIS (SESA)
3B - TRAFFIC (ITE)
3C - TESTING AND MATERIALS (ASTM)
3D - TOOL AND MANUFACTURING (ASTME)
3E - VALUE (SAVE)
3F - WATER POLLUTION CONTROL (WPCF)
3G - WATER WORKS (AWWA)
3H - WELDING (AWS)
3I - WELL LOG ANALYSTS (SPWLA)
3J - WOMEN (SWE)
9A - OTHER (SPECIFY) .....
.....
9X - NONE

11. Are you registered by a state board of engineering examiners? ☐ Yes ☐ No
If so: In which state(s) are you registered? .....

PROFESSIONAL EMPLOYMENT:

12. Check your employment status.
- ☐ 1 - EMPLOYED FULL-TIME
- ☐ 2 - EMPLOYED PART-TIME
- ☐ 3 - UNEMPLOYED AND SEEKING EMPLOYMENT
- ☐ 4 - NOT EMPLOYED AND NOT SEEKING EMPLOYMENT
- ☐ 5 - RETIRED

13. Please give name of present principal employer (if self-employed write in "self"), actual place of employment, and title of present position.

....
Name of present principal employer — Title of present position

.....
Actual place of employment (city and state)

14. Check the box of the category which is most appropriate for your present principal employer (check only one).
- ☐ 0 - PRIVATE INDUSTRY OR BUSINESS
- ☐ 1 - SELF-EMPLOYED
- ☐ 2 - COLLEGE OR UNIVERSITY
- ☐ 3 - JUNIOR COLLEGE OR TECHNICAL INSTITUTE
- ☐ 4 - SECONDARY, ELEMENTARY OR OTHER SCHOOL
- ☐ 5 - NONPROFIT ORGANIZATION, OTHER THAN A SCHOOL
- ☐ 6 - FEDERAL GOVERNMENT—CIVILIAN EMPLOYEE
- ☐ 7 - USPHS, MILITARY SERVICE—ACTIVE DUTY
- ☐ 8 - STATE GOVERNMENT
- ☐ 9 - LOCAL GOVERNMENT
- ☐ OTHER (specify) .....

NSF FORM 70
JUNE 1969

—PLEASE COMPLETE OTHER SIDE—

PROFESSIONAL EMPLOYMENT CONTINUED

PLEASE DO NOT WRITE IN THIS COLUMN

15. Is ANY of your work being supported or sponsored by U. S. Government funds? ☐ Yes ☐ No ☐ Don't know
If yes, is your work related to any of the following programs:

☐ A - AGRICULTURE
☐ B - ATOMIC ENERGY
☐ C - DEFENSE
☐ D - EDUCATION
☐ E - HEALTH
☐ F - HOUSING
☐ G - INTERNATIONAL
☐ H - NATURAL RESOURCES
☐ J - PUBLIC WORKS
☐ K - RURAL DEVELOPMENT
☐ L - SPACE
☐ M - TRANSPORTATION
☐ N - URBAN DEVELOPMENT
☐ OTHER PROGRAM (Specify) .....

Approximate the total percent of your time devoted to these Federally supported activities. .....%.

16. Based upon your PRESENT employment, describe your *Employment Profile:*

PRESENT EMPLOYMENT PROFILE				
PRIMARY DESCRIPTION		SIGNIFICANT ADDITIONAL DESCRIPTIONS		
Number	Product or Service from List B	Number List B	Number List B	Number List B
Number	Technology/Science from List C	Number List C	Number List C	Number List C
Number	Function from List D	Number List D	Number List D	Number List D
Number	Supervisory Responsibility from List E.	List "Additional Descriptions" for significant qualifications only; otherwise leave blank.		

See enclosed lists for individual entries and example.

17. Based on your academic training and total work experience, describe your greatest competence profile showing the interdependence of area of technology or science, product or service, and function. If your greatest competence is the same as your PRESENT EMPLOYMENT PROFILE, check here ☐, if not, complete this profile.

GREATEST COMPETENCE PROFILE				
	PRIMARY DESCRIPTION	SIGNIFICANT ADDITIONAL DESCRIPTIONS		
Number	Product or Service from List B	Number List B	Number List B	Number List B
Number	Technology/Science from List C	Number List C	Number List C	Number List C
Number	Function from List D	Number List D	Number List D	Number List D

LANGUAGE AND AREA KNOWLEDGES:

18. FOREIGN LANGUAGE: List the languages (other than English) in which you have competence and indicate with a check mark (V) your proficiencies. If you have no foreign language competence, check here. ☐

NAME OF LANGUAGE(S)	PROFICIENCY								
	CAN PREPARE AND DELIVER LECTURES		CAN CONVERSE		HAVE FACILITY TO TRANSLATE TECHNICAL JOURNALS		CAN READ TECHNICAL ARTICLES FOR OWN USE		SOME KNOWLEDGE BUT CAN'T USE AS A MEDIUM OF COMMUNICATION
	EASILY 1	WITH DIFFICULTY 2	FLUENTLY 3	PASSABLY 4	INTO ENGLISH 5	FROM ENGLISH 6	EASILY 7	WITH DIFFICULTY 8	9

19. AREA KNOWLEDGE: List the foreign countries or areas with which you are familiar by residence or professional specialization.

COUNTRY OR AREA	TOTAL YEARS RESIDENCE OR SPECIALIZATION	YEAR LAST VISITED OR SPECIALIZED	NATURE OF YOUR KNOWLEDGE OR SPECIALIZATION

DATE PREPARED:

SIGNATURE: (Please Sign Full Name)

EJC

ENGINEERS
JOINT
COUNCIL

345 EAST 47TH STREET, NEW YORK, N. Y. 10017
(212) 752-6800

NATIONAL ENGINEERS REGISTER

June, 1969

Dear Engineering Society Member:

Your name was picked at random from your engineering society's membership list as part of a sample of 100,000 engineers to be surveyed by Engineers Joint Council. The purpose of this survey, the third since 1964, is to provide current information on the nation's vital supply of engineering talent for the National Register of Scientific and Technical Personnel. EJC operates the National Engineers Register under contract with the National Science Foundation as one of its activities on behalf of the engineering profession.

In order to insure individual privacy, information you provide is considered privileged and is never released for commercial purposes. Only summary statistics are published. The Register also provides a means for locating qualified persons in event of urgent national needs. Engineers Joint Council's operation of this project assures that both national and professional interests are served in all uses of National Engineers Register data.

You may have participated in previous NER surveys. If so, you will note that this year's form has been improved and simplified. However, the changes have made it necessary that we ask you to fill out the entire form anew, even though some information may not have changed since the last survey. In any event, you will find that the form can be completed in about 15 minutes. Please answer the questions fully and accurately. Even if you do not consider yourself an engineer, or are no longer active, it is important that you return the form with all appropriate information filled in. This will also save us from mailing you follow-up questionnaires.

In the unlikely case that you receive duplicate forms, this is probably due to variations in your name or address in the records of the different societies to which you belong. We hope you will excuse any such duplication. Please complete one form, but return both to us so we can clear our records.

A postpaid envelope is enclosed for your convenience in replying. Engineers Joint Council and the societies cooperating in this project appreciate your assistance in providing information of importance to the engineering profession.

Sincerely,

John D. Alden

John D. Alden
Director
National Engineers Register

Enclosures

...TO ADVANCE THE ART AND SCIENCE OF ENGINEERING IN THE PUBLIC INTEREST

BUDGET BUREAU NO. 99-R68002
APPROVAL EXPIRES FEBRUARY 1971

LISTS OF ENGINEERING CURRICULA, PRODUCTS OR SERVICES, AREAS OF TECHNOLOGY AND SCIENCE, FUNCTIONS AND SUPERVISORY RESPONSIBILITIES

FOR USE WITH

NATIONAL ENGINEERS REGISTER

CONDUCTED BY THE

ENGINEERS JOINT COUNCIL

345 EAST 47TH STREET, NEW YORK, N. Y., 10017

AND THE NATIONAL SCIENCE FOUNDATION

List A. Curricula to Be Used with Question 7.

Select from this list the appropriate number and curriculum title to describe your educational background for reporting in question 7.

1. Aeronautical and Astronautical
2. Agricultural
3. Architectural
4. Bioengineering
5. Ceramic
6. Chemical
7. Civil
8. Communications
9. Construction
10. Electrical
11. Electronic
12. Engineering Mechanics
13. Engineering General
14. Engineering Physics
15. Engineering Science
16. Engineering Technology
17. Environmental
18. Geological
19. Geophysical
20. Industrial
21. Marine
22. Materials
23. Mechanical
24. Metallurgical
25. Mineral
26. Mining
27. Naval Architecture
28. Nuclear
29. Petroleum
30. Sanitary
31. Textile
32. Transportation
33. Welding
96. Other Engineering (specify)
34. Business Administration
35. Chemistry
36. Physics
99. Other Nonengineering (specify)

EXAMPLE FOR COMPLETING QUESTION 16.

The work of most engineers is related, directly or indirectly, to the combination of some Product or Service, Area of Technology and Science, Function, and Supervisory Responsibility.

We have grouped Products and Services in List B, using both general and specific terms within related fields. Look over the major headings and find the field that most specifically fits your situation. If your field cuts across several Products or Services look for the most appropriate single general term, or specify one. List C, Areas of Technology and Science, is made up of terms that can apply to numerous Products or Services. Again, both general and specific terms are listed. List D, Functions, consists of terms describing work activities in which engineers engage. List E, Supervisory Responsibility provides a means by which you can indicate the level of your Supervisory Responsibility.

When you have looked over the Lists, choose one term from each List so that the combination best provides a description of your employment profile. If the listed terms are inadequate in your particular situation, you may write in your own words in the space provided. The following is an example of an employment profile showing the relationship among Product or Service, Areas of Technology and Science, Function, and Supervisory Responsibility.

EXAMPLE: An engineer is designing pumps, with particular attention to the selection of materials for specialized applications. He would therefore report his employment profile as consisting of 1123 "Pumps and Liquid Handling Equipment" as his Product or Service from List B, and no other Product or Service would be needed in the significant additional description column; 102 "Material Applications" would be the primary description of Areas of Technology and Science from List C with additional descriptions 031 "Corrosion" and 061 "Fluid Dynamics"; his selection from List D, Functions, would be 05 "Design"; and his Supervisory Responsibility would be selected from List E, 1, "No regular supervision given."

PRESENT EMPLOYMENT PROFILE				
PRIMARY DESCRIPTION		SIGNIFICANT ADDITIONAL DESCRIPTIONS		
1123	Pumps and liquid handling equipment	Number List B	Number List B	Number List B
102	Material applications	Number List C 031	Number List C 061	Number List C
05	Design from List D	Number List D	Number List D	Number List D
1	No regular supervision given			

Complete in a similar manner question 17, Profile of Greatest Competence, using Lists B, C, and D to provide the required description.

List B. Products or Services for Use with Questions 16 and 17.

The following is a list of products or services for use with questions 16 and 17. Select from this list the appropriate number and product or service which applies to you.

Agriculture and Food

0000 This field generally
0001 Agricultural services
0002 Animals
0003 Distilled products
0004 Fish products
0005 Forestry
0006 Food and beverage products
0007 Natural fibers
0008 Plants
0009 Tobacco
0010 Other (specify)

Aircraft and Space

0100 This field generally
0101 Aeronautics (general)
0102 Aircraft
0103 Aircraft V/STOL
0104 Aircraft engines
0105 Aircraft parts and accessories
0106 Aircraft services
0107 Airlines
0108 Astronautics (general)
0109 Launch vehicles
0110 Re-entry devices
0111 Spacecraft
0112 Spacecraft engines
0113 Spacecraft parts and accessories
0114 Spacecraft services
0115 Other (specify)

Ceramics

0200 This field generally
0201 Abrasives
0202 Cement, concrete, and gypsum products
0203 Clay products
0204 Glass products
0205 Insulation materials (thermal)
0206 Refractories
0207 Services related to ceramics
0208 Other (specify)

Chemicals and Allied Products

0300 This field generally
0301 Agricultural chemicals
0302 Carbon products
0303 Chemical services
0304 Cosmetics
0305 Drugs and pharmaceuticals
0306 Dyes and organic pigments
0307 Elastomers
0308 Explosives
0309 Fermentation products
0310 Fertilizer
0311 Gases
0312 Industrial chemicals (general)
0313 Inorganics
0314 Nuclear and radioactive materials
0315 Organics
0316 Paints and coatings
0317 Petrochemicals
0318 Photographic chemicals
0319 Plastics and synthetic polymers
0320 Propellants
0321 Soap and detergents
0322 Synthetic fibers
0323 Other (specify)

Communications

0400 This field generally
0401 Broadcasting
0402 Cable television
0403 Communication services
0404 Motion pictures
0405 Telegraph
0406 Telephone
0407 Other (specify)

(Also see Electrical and Electronics fields)

Computers

0500 This field generally
0501 Analog equipment
0502 Components and parts
0503 Computer services
0504 Digital equipment
0505 Hybrid equipment
0506 Memory units
0507 Optical equipment
0508 Peripheral equipment
0509 Software
0510 Other (specify)

Construction and Civil Engineering

0600 This field generally
0601 Airports and facilities
0602 Architecture
0603 Bridges
0604 Buildings and structures (general)
0605 Chemical plants and facilities
0606 City, regional, and urban planning
0607 Construction services
0608 Dams and water control structures
0609 Excavation and foundation
0610 Heavy construction (general)
0611 Highways
0612 Hydro-electric facilities
0613 Industrial plants and facilities
0614 Landscaping
0615 Military construction (not elsewhere classified)
0616 Prefabricated construction
0617 Public works (general)
0618 Recreational facilities
0619 Rivers and harbors
0620 Sanitary facilities
0621 Spacecraft and missile facilities
0622 Surveying and mapping
0623 Thin-shell construction
0624 Tunneling
0625 Water supply and treatment
0626 Other (specify)

Educational and Information Services

0700 This field generally
0701 Engineering instruction
0702 Information services
0703 Libraries
0704 Technical instruction
0705 Other (specify)

Electrical Equipment and Services

0800 This field generally
0801 Business and office equipment
0802 Components and accessories
0803 Controls
0804 Electrical services
0805 Household appliances
0806 Industrial electrical equipment (general)
0807 Instruments and test equipment
0808 Insulated conductors
0809 Lighting and wiring
0810 Magnetic devices
0811 Power generation
0812 Rural electrification
0813 Storage batteries
0814 Switchgear
0815 Telephone equipment
0816 Transformers
0817 Transmission and distribution
0818 Welding apparatus
0819 Other (specify)

(Also see Communications and Utilities fields)

Electronic Equipment and Services

0900 This field generally
0901 Antennas
0902 Audio
0903 Components and accessories
0904 Controls
0905 Electroacoustic transducers
0906 Electro-optical devices
0907 Electron tubes
0908 Electronic equipment generally
0909 Electronic services
0910 Instruments and test equipment
0911 Integrated circuits and components
0912 Lasers
0913 Microwave and radar
0914 Radio and TV receivers
0915 Radio and TV transmitters
0916 Recording
0917 Semiconductor devices
0918 Sonar
0919 Sonic and ultrasonic devices
0920 Thermo-electric and thermionic devices
0921 X-ray
0922 Other (specify)

(Also see Communications and Computers fields)

Laboratory, Scientific, Photographic, and Optical Equipment

1000 This field generally
1001 Laboratory and scientific apparatus
1002 Measuring and control instruments (except temperature)
1003 Optical instruments and lenses
1004 Photographic equipment
1005 Temperature measurement and thermostatic instruments
1006 Timing devices, clocks and watches
1007 Other (specify)

(Also see Electrical and Electronic fields)

Machinery and Mechanical Equipment

1100 This field generally
1101 Air compressors, blowers, gas handling equipment
1102 Air conditioning, heating, and ventilating
1103 Bearings
1104 Construction equipment
1105 Dies, jigs, and patterns
1106 Distilling equipment
1107 Farm machinery
1108 Food machinery
1109 Furnaces, heating equipment, ovens
1110 Gears
1112 Hydraulic machinery
1113 Industrial machinery and equipment (general)
1114 Internal combustion engines, (general)
1115 Machine tools and accessories
1116 Materials handling machinery
1117 Mining machinery
1118 Nuclear machinery
1119 Paper machinery
1120 Pneumatic equipment
1121 Power transmission equipment (mechanical)
1122 Printing and duplicating machinery
1123 Pumps and liquid handling equipment
1124 Refrigerating equipment
1125 Specialized industrial machinery
1126 Steam engines
1127 Textile machinery
1128 Turbines
1129 Vending and service machinery
1130 Other (specify)

Marine Transportation

1200 This field generally
1201 Boats and small craft
1202 Inland waterway craft and services
1203 Marine auxiliaries
1204 Marine engines
1205 Merchant ships
1206 Naval architectural services
1207 Naval vessels
1208 Ocean transportation
1209 Port facilities and services
1210 Propellers and shafting
1211 Shipbuilding and repair services
1213 Underwater craft
1214 Other (specify)

Medical and Health Services

1300 This field generally
1301 Artificial organs
1302 Medical and health care
1303 Medical and dental instruments
1304 Medical laboratory services
1305 Prosthetic devices
1306 Other (specify)

Metals, Basic (except Mining)

1400 This field generally
1401 Aluminum
1402 Copper
1403 Electrometallurgical products
1404 Foundries (general)
1405 Iron and steel mills, foundries, and forges
1406 Lead and zinc
1407 Metallurgical products (special)
1408 Metallurgical services
1409 Non-ferrous smelting, refining, and processing
1410 Non-ferrous castings
1411 Radioactive metals
1412 Rare metals
1413 Refractory metals
1414 Other (specify)

Metal Fabricated Products

1500 This field generally
1501 Boilers
1502 Cans and containers
1503 Electroplated and coated products
1504 Hardware
1505 Machined or turned products
1506 Metal fabrication services
1507 Pipe, fittings, and valves
1508 Pressure vessels
1509 Sheet metal products
1510 Stampings
1511 Structural steel products
1512 Weldments
1513 Wire products
1514 Other (specify)

Mining

1600 This field generally
1601 Coal
1602 Iron ores
1603 Mining services
1604 Non-ferrous metal ores
1605 Non-metallic minerals
1606 Quarry products
1607 Sulfur
1608 Uranium and radioactive ores
1609 Other (specify)

Motor Vehicle Transportation

1700 This field generally
1701 Automobiles
1702 Buses, trucks, and trailers
1703 Engines
1704 Motorcycles, etc.
1705 Motor transportation services
1706 Parts and accessories
1707 Other (specify)

Ordnance

1800 This field generally
1801 Ammunition
1802 Fire control equipment
1803 Guided missiles
1804 Guns
1805 Ordnance services
1806 Small arms
1807 Tanks
1808 Other (specify)

Petroleum

1900 This field generally
1901 Asphalt materials
1902 Crude petroleum
1903 Gas pipelines
1904 Liquified gas
1905 Lubricating oil and grease
1906 Natural gas
1907 Oilfield services
1908 Oil pipelines
1909 Refinery products
1910 Reservoirs (oil and gas)
1911 Other (specify)

Railway and Rapid Transit

2000 This field generally
2001 Railroad equipment
2002 Railroad transportation
2003 Railway services
2004 Rapid transit
2005 Other (Specify)

Utilities

2100 This field generally
2101 Electric utilities
2102 Electric and gas utilities (combination)
2103 Gas utilities
2104 Sanitary services
2105 Sewerage, waste disposal services
2106 Water supply and treatment
2107 Other (specify)

Other Products and Services

2201 Advertising and promotion
2202 Banking and finance
2203 Building maintenance
2204 Business forms
2205 Clothing
2206 Insurance
2207 Laboratory services
2208 Leather
2209 Lumber
2210 Paper
2211 Paper products
2212 Patents and legal services
2213 Personnel services
2214 Printing and related services
2215 Pulp
2216 Regulatory services
2217 Retail trade services
2218 Rubber and fabricated products
2219 Textiles and textile products
2220 Tires
2221 Toys and amusements
2222 Wholesale trade services
2223 Wood products
2224 Other product (specify)
2225 Other service (specify)

List C. Areas of Technology and Science for Use with Questions 16 and 17.

The following is a list of areas of technology and science for use with questions 16 and 17. Please scan the entire list and select the appropriate number and area of technology or science which describes your specific professional competence.

001 Acoustics, sonics
002 Adaptive systems
003 Aerodynamics
004 Air pollution
005 Applied physics
006 Aquaculture
007 Arrangement
008 Assembly methods
009 Astrodynamics
010 Astronomy and astrophysics
011 Atmospheric sciences, meteorology
012 Automation, cybernetics
013 Beneficiation, ore processing
014 Biochemistry
015 Bioengineering
016 Biological applications
017 Biomechanics
018 Bionics, medical electronics
019 Casting
020 Chemical applications
021 Circuits, networks
022 Combustion, fuels
023 Communication
024 Computer applications
025 Concrete technology
026 Configuration control
027 Conservation, reclamation
028 Containerizing, packaging
029 Control (general)
030 Coating, plating, cladding
031 Corrosion
032 Cost engineering
033 Cryogenics
034 Crystals, crystallography
035 Data processing
036 Desalting
037 Dielectrics
038 Display
039 Drafting, drawing, graphic technology
040 Drainage, irrigation
041 Drilling
042 Drying
043 Earth sciences
044 Economics
045 Educational technology
046 Electrical applications
047 Electrical engineering
048 Electrochemistry
049 Electromagnetic radiation
050 Electromechanical technology
051 Electronic applications
052 Energy generation and conversion
053 Engineering
054 Environmental control
055 Environmental factors
056 Equipment facilities
057 Explosive effects
058 Fastening, joining
059 Filament technology
060 Fire prevention and protection
061 Fluid dynamics, fluid mechanics
062 Fluidics
063 Forming, shaping
064 Friction
065 Fuel cells
066 Gas dynamics
067 Geochemistry
068 Geodesy
069 Geology
070 Geophysics
071 Guidance, stability
072 Health physics
073 Heat transfer
074 High pressure
075 High temperature
076 History (technological)
077 Holography
078 Human factors
079 Hydraulics
080 Hydrodynamics
081 Hydrography
082 Hydrology
083 Illumination, lighting
084 Industrial health
085 Industrial engineering
086 Information retrieval
087 Information theory
088 Infra-red, radiometry
089 Instrumentation
090 Insulation, electrical
091 Insulation, thermal
092 Kinetics
093 Life support
094 Logic
095 Lubrication
096 Magnetics, magnetism
097 Magnetohydrodynamics
098 Maintainability, maintenance
099 Manufacturing technology
100 Marine sciences
101 Mass transfer
102 Material applications
103 Material handling
104 Material properties
105 Mathematics
106 Measurement, metrology
108 Mechanical applications, applied mechanics
109 Mechanical engineering
110 Mechanics
111 Medical applications
112 Metallurgy (general)
113 Metallurgy, extractive
114 Metallurgy, physical
115 Metallurgy, powder
116 Metallurgy, process
117 Military applications
118 Miniaturization
119 Mining, surface
120 Mining, underground
121 Mining, underwater
122 Motion and time study
123 Navigation
124 Neural nets
125 Noise reduction
126 Nondestructive tests
127 Nuclear engineering
128 Nucleonics
129 Oceanography
130 Offshore operations
131 Operating procedures
132 Operations research, systems analysis
133 Optics
134 Photoelectricity
135 Photogrammetry
136 Photography
137 Physics
138 Physiology
139 Plant and facilities engineering
140 Plasmas
141 Pollution
142 Power, electrical
143 Power, mechanical
144 Power, nuclear
145 Preserving
146 Processes
147 Product engineering
148 Production methods
149 Production planning and control
150 Propulsion
151 Psychology
152 Public health
153 Public safety
154 Quality assurance
155 Quality control
156 Radiation safety
157 Radioactivity
158 Radio astronomy
159 Radio frequency compatibility
160 Radiography, x-rays
161 Recording
162 Refining
163 Reliability
164 Reprography
165 Rock mechanics
166 Safety engineering
167 Sanitary engineering
168 Servo-mechanisms
169 Size reduction
170 Soils
171 Solid state
172 Solid waste
173 Specifications, standards
174 Statistics
175 Stress analysis
176 Structures
177 Superconductivity
178 Surveying, mapping technology
179 Systems engineering
180 Telecommunications
181 Telemetry
182 Testing-environmental, operational
183 Testing-laboratory
184 Thermochemistry
185 Thermodynamics
186 Thermophysics
187 Tooling, tools
188 Traffic
189 Transportation
190 Ultrasonics
191 Underwater acoustics
192 Underwater technology
193 Vacuum technology
194 Value engineering
195 Waste disposal
196 Water pollution
197 Water resources and supply
198 Welding
199 Work methods and simplification
200 Other (specify)

List D. Functions for Use with Questions 16 and 17.

The following is a list of work functions for use with questions 16 and 17. Select from this list the appropriate number and function you perform or supervise.

01 Advising, consultation
02 Construction, installation
03 Coordination, liaison
04 Cost estimating, budgeting, procurement, purchasing
05 Design
06 Development
07 Drafting, drawing, graphics
08 Exploration
09 Information and data processing, or technical writing
10 Planning, directing
11 Production, operations, maintenance
12 Quality assurance and control, reliability
13 Research
14 Sales, technical services
15 Specifying
16 Teaching, instructing, training
17 Testing, evaluation, inspection
18 Other (specify)

List E. Supervisory Responsibility for Use with Question 16.

The following is a list of supervisory responsibilities for use in question 16. Select from this list the appropriate number and term for use with your employment profile.

1. No regular supervision given
2. Indirect or staff supervision
3. Supervision of team or unit
4. Supervision of project or section
5. Management of major department, division, or program
6. General management of organization