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Requirements for Entry Drafting Positions as Indicated by a Survey of Companies Employing Draftsmen

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REQUIREMENTS FOR ENTRY DRAFTING POSITIONS AS
INDICATED BY A SURVEY OF COMPANIES EMPLOYING DRAFTSMEN
(TITLE)

BY

James P. Kull

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Science in Education

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1971

YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
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DEPARTMENT HEAD

TABLE OF CONTENTS

	PAGE
LIST OF TABLES	iii
INTRODUCTION	1
Chapter	
I. The Problem	2
Statement of the Problem	
Purpose of the Study	
Definition of Terms	
Limitations of Study	
Need for Study	
Related Studies	
II. Design of the Study	8
Approach	
The Questionnaire	
Method of Collecting Data	
Reporting of Findings	
III. Findings	10
Number of Draftsmen and Employers	
Education Level of Beginning Draftsmen	
Subject Matter Preparation	
On-The-Job Training	
Apprenticeship Program	
Duties	
Exceeding Minimum Requirements	
Military Status	
Additional Requirements	
IV. Summary and Conclusions	22
APPENDIX A	24
APPENDIX B	26
APPENDIX C	29

LIST OF TABLES

Table	Page
1. Distribution of Draftsmen by Company	10
2. Education Level	11
3. Subject Matter Preparation	12, 13
4. On-The-Job Training	14
5. Apprenticeship Program	15
6. Experience	15
7. Tests Required	16
8. Age Requirement	17
9. Duties	18
10. Exceeding Minimum Requirements	19
11. Military Status	20

INTRODUCTION

Drafting, a precise, pictorial language, is the universally accepted communication in all phases of industrial and engineering work. In the drafting room ideas, rough sketches, specifications, and calculations of engineers, architects, and designers are translated into working plans for fabricating a product.

A competent draftsman must be able to visualize three dimensional objects and represent them in two dimensional drawings which must be unmistakably clear to all who read them. The draftsman should also have developed habits of accuracy, speed, legibility, and neatness.

It is the concern of many educators that prospective draftsmen be well prepared for the latest drafting standards. According to J. W. Giachino and Henry J. Beukema¹ there is a lag between the drafting procedures taught in educational institutions and the drafting practices used in the field. Because of this discrepancy in preparation, many intended draftsmen are not able to compete for jobs. It is the writer's belief that the educators have a responsibility to the students to assist in the development of essential qualities and technical knowledge required by potential employers.

¹J. W. Giachino and Henry J. Beukema, Engineering-Technical Drafting and Graphics (Illinois: American Technical Society, 1966), p. iii.

CHAPTER I

THE PROBLEM

Purpose of the study. The major purpose of this study was to ascertain preparations and qualifications necessary for entrance into drafting occupations. More specifically, the study sought answers to the following questions:

1. What is the nature of the employers needs in terms of drafting instruction?
2. What age and education level of beginning draftsmen would be acceptable to employers?
3. What duties should a beginning draftsman be prepared to perform?
4. What is the probability of a beginning draftsman being hired if he only meets, but does not exceed, that which is established by an employer as "minimum requirements?"

DEFINITION OF TERMS

For the purposes of this study, the following is a description of terms as used in this study:

Draftsman. In general the draftsman is one who prepares clear, complete, and accurate working plane and detail drawings from rough or detailed sketches or notes for engineering or manufacturing purposes, according to specified dimensions. He makes the final sketch of proposed drawings, checking dimensions of parts, materials to be used, relation of one part to another, and relation of various parts to the whole structure.

It is his responsibility to make any adjustments or changes necessary or desired. The draftsman inks in all lines and letters on pencil drawings as required. He must exercise manual skill in manipulation of triangle, T-square, and other drafting tools. He draws charts for representation of statistical data. A knowledge of various machines, engineering practices, mathematics, building materials, and other physical sciences is utilized by the draftsman to complete drawings.²

Mechanical Draftsman. The mechanical draftsman is one who performs the duties of the draftsman specializing in drafting detailed working drawings of machinery and mechanical devices, indicating dimensions and tolerances, fasteners and joining requirements, and other engineering data. He drafts multi-view assembly and subassembly drawings as required for manufacture and repair of mechanisms.³

Architectural Draftsman. The architectural draftsman is one who performs the duties of a draftsman by planning artistic architectural and structural features of any class of buildings and like structures. He sketches designs and details, using drawing instruments. He also makes engineering computations involved in the strength of material, beams, and trusses. It is his responsibility to estimate quantities needed for projects and compute costs. The architectural draftsman makes freehand drawings of proposed structures when necessary to clarify plans.⁴

²U. S., Department of Labor, Dictionary of Occupational Titles, Vol. I: Definitions of Titles (Washington, D. C.: U. S. Printing Office, 1965), p. 217.

³Ibid., p. 218.

⁴Ibid., p. 217.

Structural Draftsman. The structural draftsman is one who performs duties of the draftsman by drawing plans for structures employing structural steel, such as bridge trusses, plate girders, roof trusses, trestle bridges and columns, and other integral parts. He also makes drawings for masonry or timber members.⁵

Electrical Draftsman. The electrical draftsman is one who performs duties of the draftsman in preparing electrical equipment, working drawings and wiring diagrams used by construction crews and repairmen who erect, install, and repair electrical equipment and wiring in power-plants, industrial establishments, commercial or domestic buildings, or electrical distribution systems.⁶

Civil Draftsman. The civil draftsman is one who drafts detailed construction drawings, topographical profiles, and related maps and specification sheets used in planning and construction of highways, river and harbor improvements, flood control, drainage, and other civil engineering projects. He plots maps and charts showing profiles and cross sections, indicating relation of topographical contours and elevations to buildings, retaining walls, tunnels, overhead powerlines, and other structures. He also drafts detailed drawings of structures and installations, such as roads, culverts, fresh water supply and sewage disposal systems, dikes, wharfs, and breakwaters. He computes volume of tonnage of excavations and fills, and prepares graphs and hauling diagrams used in earthmoving operations. The civil draftsman may accompany survey crews in the field to locate grading markers or to collect data required for revision of construction drawings.⁷

⁵Ibid., p. 219.

⁶Ibid., p. 218.

⁷Ibid., p. 218.

Combination of Types. In a specific company none of the preceding terms express exactly the type of draftsman desired. In these several cases we have chosen to refer to this type as a combination of types or simply combinations. This term may refer to companies which hire more than one type of draftsman or hire draftsmen who perform duties of two or more of the types listed above.

LIMITATIONS OF STUDY

The study of this problem has been limited in geographical area to a one hundred mile radius around Hillsboro, Illinois. For a list of the companies and cities within this area, refer to Appendix C.

This geographical area was chosen because the writer was able to secure the names of establishments hiring draftsmen in sufficient quantity for a study of the problem and this appears to be the labor market most likely to be selected by students of Hillsboro. Approximately seventy-five different companies were requested to contribute information concerning the hiring of draftsmen.

NEED FOR STUDY

There is an apparent need for more information concerning requirements for beginning draftsmen. This information can be made available to high school counselors and drafting students. Learning more about the requirements of employers will help students to be better prepared for employment.

RELATED STUDIES

In a search for related information two studies were examined. The first one by Richard Halliburton in 1968 was entitled "A Survey of Labor Unions, Industry, and Public School Representatives to Determine What Summer Employment Opportunities are Available for Teachers to Compare Opportunities Existing for the Purpose of Updating Knowledge and Skills, to Determine the Need, Benefit, and Feasibility of an Industrial Training Program." In his study he pointed out the gap that exists between what youth are prepared to do as a result of their academic training and what is expected of them by industry. He surveyed fifty-nine industries from which 49 per cent said a gap existed; 37 per cent stated gap was narrow, and 14 per cent thought students were qualified. Another survey question related to the writer's own study was: "What qualities are needed to improve the employability of future workers?" The response by industries showed 52 per cent marking "dependability and work habits," 33 per cent marking "basic skills," and the remaining 15 per cent marking "information."

The second thesis was entitled "A Survey of Businessmen in Effingham, Illinois, to Determine How Effectively the Business Curriculum at Effingham High School is Meeting Employment Needs." Joseph F. Green conducted this research in 1960. His study is related to this study in that he attempted to ascertain the qualifications for beginning employment. From his survey of twenty businessmen, Mr. Green was able to make recommendations for improvement of the business curriculum and equipment. Since the businessmen indicated that the most frequently used machines were typewriters, adding machines, and calculators, Mr. Green recommended more of these machines should be purchased. He was also able to recommend from his

interview with Effingham businessmen that more emphasis should be placed on fundamental education objectives--primary spelling, mathematics, and penmanship. Also units should be formed on business ethics, business English, and business economics. Another suggestion was that students should be indoctrinated as to what makes a good employee.

CHAPTER II

DESIGN OF THE STUDY

Approach. Obtaining the names of companies that employ draftsmen was accomplished by contacting the Litchfield office of the Illinois State Employment Service. This office was able to supply the names of Illinois State Employment Service offices throughout Illinois. Letters were sent to the offices within an approximate 150 mile radius of Hillsboro. A total of twenty-nine offices were contacted. Most of these offices responded with the names of companies hiring draftsmen in their area.

Introductory letters and questionnaires were then sent to the personnel managers of companies hiring draftsmen. (See Appendixes A and B.)

The Questionnaire. Research was conducted in the formulating of the questions comprising the questionnaire. Research began by consulting members of the Hillsboro vocational drafting class. They related information which would be most helpful to them, concerning the requirements of firms hiring draftsmen prior to their seeking employment. A jury was selected to test the effectiveness of the questionnaire. Corrections and additions were made to the questionnaire on the basis of this test.

Specific items on the questionnaire will be discussed in greater detail in Chapter III.

Method of Collecting Data. After final revisions, the questionnaire and letter of introduction were sent to eighty-seven companies within the geographical area chosen. Within three weeks sixty-five questionnaires had been returned. This is over 74 per cent of those mailed and was considered adequate for the study.

Reporting of Findings. The data was summarized according to the type of draftsmen the company employed. These draftsmen were divided into six groups; all mechanical, all electrical, all architectural, all structural, all civil, and combinations. The group "combinations" contains data from companies making more than one response to item two on the questionnaire. This would indicate that the company employs several different types of draftsmen or that their draftsmen do different types of drafting. The former is usually the case with larger companies and the latter with smaller companies.

CHAPTER III

FINDINGS

In this chapter the writer has attempted to summarize the data concerning employer requirements according to the type of draftsmen the company employs.

DISTRIBUTION OF DRAFTSMEN BY COMPANY

When examining data from the questionnaire, the first item concerns the number of draftsmen a firm employs. This gives an indication as to the size of the company. In Table One the number of draftsmen is shown according to the type of drafting done.

TABLE 1

DISTRIBUTION OF DRAFTSMEN BY COMPANY

	Mechan- ical	Elec- trical	Archi- tectural	Struc- tural	Civil	Combina- tions	Total
Number of Draftsmen	105	4	28	23	309	227	696
Number of Companies	12	1	5	3	12	32	65

Relatively few companies employ all electrical draftsmen, all architectural draftsmen, or all structural draftsmen. Of those companies hiring all one type of draftsmen, most are small companies with a total of ten draftsmen or less. Nearly half of the employers responding hire combinations. The most common combination is mechanical and electrical drafting, occurring in sixteen of the thirty-two combinations.

EDUCATION LEVEL OF BEGINNING DRAFTSMEN

Although the number of responses in some areas is rather low, it would appear that the education level for architectural draftsmen should generally be higher than for other areas. As shown by Table Two, over half of the employers of architectural draftsmen require more than a high school education. The numbers in the table refer to the number of employers responding to each item.

TABLE 2

EDUCATION LEVEL OF BEGINNING DRAFTSMEN

	Mechan- ical	Elec- trical	Architectural	Struc- tural	Civil	Combina- tions	Total
High School	8	1	2	3	8	20	42
Trade School	3	0	1	0	2	8	14
Junior College	1	0	1	0	2	3	7
College	0	0	1	0	0	1	2

The data listed in Table Two indicates the minimum education level required for a beginning drafting position. The table shows that forty-two of the sixty-five employers require only high school education, however many of these employers stated that they would hire a high school graduate only if someone with a higher education was not available.

SUBJECT MATTER PREPARATION

Table Three shows the minimum subject matter preparation required by employers of draftsmen as indicated on the questionnaire. The numbers refer to the number of firms responding to each item.

TABLE 3
SUBJECT MATTER PREPARATION

	Mechan- ical	Elec trical	Architectural	Struc- tural	Civil	Combina- tions	Total
General Math.	5	1	3	3	5	20	37
Algebra	5	0	3	1	8	16	33
Geometry	6	0	3	2	7	22	40
Trigonometry	9	1	2	2	7	17	38
Physics	6	0	2	1	3	8	20
Chemistry	0	0	0	0	0	3	3
Geography	0	0	0	0	2	1	3

TABLE 3 CONTINUED
SUBJECT MATTER PREPARATION

	Mechan- ical	Elec- trical	Arch- tectural	Struc- tural	Civil	Combina- tions	Total
Metalworking	6	0	0	1	0	3	10
Woodworking	0	0	2	1	0	1	4
Basic Mechan- ical Drawing	6	1	0	0	3	22	32
Basic Archi- tectural dwg.	1	0	5	0	4	8	18
Vocational Drafting	7	0	2	0	0	16	25
Electricity/ Electronics	0	0	0	1	0	5	6
Basic Surveying	0	0	0	0	1	0	1

Most employers stressed the importance of preparation in the area of mathematics. Over half of those responding to the questionnaire indicated the necessity of preparation in each area of mathematics listed on the questionnaire. Some of the employers marked only the area of geometry or trigonometry while others marked all four areas. It could be assumed that the totals for general mathematics and algebra should be higher since these courses are usually required by schools as a prerequisite to geometry and trigonometry. Of the thirty-eight employers indicating trigonometry, five did not indicate any other course in mathematics.

Science was not considered as important in the preparation of draftsmen as was mathematics. Physics was desired more by employers than other areas of science.

In the area of industrial skills the courses in drafting are considered the most important. However, most employers did not indicate that the higher level of vocational drafting was necessary.

ON-THE-JOB TRAINING

One-third of the employers indicated that they have an on-the-job training program. This is probably why many of them did not require the higher education level or the vocational drafting at the high school level. Table Four shows the distribution of employers offering on-the-job training.

TABLE 4
ON-THE-JOB TRAINING

	Mechan- ical	Elec- trical	Architectural	Struc- tural	Civil	Combina- tions	Total
Yes	2	0	2	2	5	11	22
No	10	1	3	1	7	21	43

While many employers indicated no formal training program, many of them wrote that senior draftsmen or engineers often worked closely with beginning draftsmen for several weeks.

APPRENTICESHIP PROGRAM

The apprenticeship program does not appear to play a large part in the career of drafting. Table Five shows the relatively small number of companies offering an apprenticeship program.

TABLE 5
APPRENTICESHIP PROGRAM

	Mechan- ical	Elec- trical	Architectural	Struc- tural	Civil	Combina- tions	Total
Yes	0	1	1	0	2	2	6
No	12	0	4	3	10	30	59

Most companies do not require a beginning draftsman to have had previous experience. Most of the firms indicate that experience is necessary in small companies which hire fewer than five draftsmen. Table Six indicates how employers responded to the questionnaire concerning experience.

TABLE 6
EXPERIENCE

	Mechan- ical	Elec- trical	Architectural	Struc- tural	Civil	Combina- tions	Total
No experience	8	1	3	1	10	23	46
One Year	0	0	1	1	0	1	3
Two Years	2	0	1	1	1	4	9
Three Years	2	0	0	0	1	3	6
Four Years	0	0	0	0	0	0	0
Five Years	0	0	0	0	0	1	1

Forty-six of the sixty-five companies surveyed indicated that a beginning draftsman must take some type of test before employment. The figures in Table Seven refer to the number of employers requiring the test as indicated. The responses total more than forty-six because some companies require more than one type of test.

TABLE 7
TESTS REQUIRED

	Mechan- ical	Elec- trical	Archi- tectural	Struc- tural	Civil	Combina- tions	Total
Physical Exam	7	1	0	2	4	13	27
Drawing Ability	2	0	3	2	5	15	26
Aptitude	0	0	0	1	1	2	4
Math	0	0	0	1	0	1	2

Although most companies consider a comprehensive mathematics background important, only two of the companies surveyed indicated that a test is required for mathematics.

AGE REQUIREMENTS

Many of the companies returning questionnaires did not indicate a minimum or maximum age. Table Eight specifies how employers responded to the item concerning age.

TABLE 8
AGE REQUIREMENTS

	Mechan- ical	Elec- trical	Archi- tectural	Struc- tural	Civil	Combina- tions	Total
Minimum age 18	5	0	0	1	3	17	26
19	1	0	1	0	0	0	2
20	3	0	0	0	0	1	4
21	1	0	0	1	1	2	5
25	0	0	0	0	1	0	1
Maximum age 35	0	0	0	0	0	1	1
40	0	0	0	0	0	0	0
45	0	0	0	0	0	1	1
50	0	0	0	0	1	1	2
55	0	0	0	0	0	1	1
60	1	0	0	0	0	0	1
65	2	0	0	0	0	4	6

SEX

Fifty-four of the sixty-five companies surveyed indicated that either male or female draftsmen would be considered for employment. The remaining eleven said that male draftsmen were required. The field of drafting appears to be open to women with one employer stating that he considered his female draftsmen more competent than the male. One of the employers

hiring only male draftsmen stated the reason being that women were not able to do much of the field work required of some draftsmen in his firm.

DUTIES

The duties of a beginning draftsman may be quite varied. Most employers indicated that the draftsman would begin as a tracer. Table Nine summarizes the responses of employers concerning the duties of a beginning draftsman. The numbers refer to the number of employers responding to each item. Several employers marked more than one item.

TABLE 9

DUTIES

	Mechan- ical	Elec- trical	Archí tectural	Struc- tural	Civil	Combina- tions	Total
Tracer	3	1	3	1	8	17	33
Checker	1	0	0	0	2	1	4
Detailer	8	0	3	2	1	17	31
Filing	1	0	1	0	0	1	3
Simple Drawings	1	0	0	0	2	3	6
Blueprinting	0	0	0	0	0	1	1
Documents	1	0	0	0	0	0	1

EXCEEDING MINIMUM REQUIREMENTS

Although employers list requirements for employment as being minimum requirements, it would be helpful to know the number of draftsmen who are actually hired with minimum requirements. The writer felt this could be determined by comparing the number employed during the past three years who met only minimum requirements with those who exceeded minimum requirements. Table Ten shows that 160 of the 303 draftsmen employed in the past three years exceeded minimum requirements. The numbers in the table refer to the number of draftsmen employed during the past three years.

TABLE 10

EXCEEDING MINIMUM REQUIREMENTS

	Mechan- ical	Elec- trical	Architectural	Struc- tural	Civil	Combina- tions	Total
Met Only minimum requirements	19	6	4	1	59	46	135
Exceeded minimum requirements	4	0	8	4	45	87	168

MILITARY STATUS

Most employers are willing to employ a beginning draftsman even though he may be draft vulnerable. Most of the companies hiring only those who are not draft vulnerable are small companies hiring fewer than five draftsmen. Table Eleven shows the number of employers responding

to the questionnaire item concerning military status. The employers total fewer than sixty-five because not all of them responded to this item.

TABLE 11
MILITARY STATUS

	Mechan- ical	Elec- trical	Architectural	Struc- tural	Civil	Combina- tions	Total
Draft Vulnerable	10	0	3	1	7	24	45
Not Draft Vulnerable	1	1	1	1	4	5	13
Must be a Veteran	0	0	0	1	0	0	1

ADDITIONAL REQUIREMENTS

Several employers listed requirements in addition to those previously discussed. The following are the additional requirements as they were listed by the employers for the final item on the questionnaire:

1. "Must demonstrate his ability, either through willingness to learn and gaining of experience or having had similar experience with other firms."
2. "Keep mouth shut so he and others are able to work."
3. "Will work eight hours for eight hours pay."
4. "Accept additional duties as might be designated from time to time."

5. "We try to find people who can think--think before beginning a task. People who ask themselves what it is they are trying to do and why, and if they don't understand, then ask questions. An ability to express one's self is important, as it indicates an ability to think clearly and organize. We feel there is a need for draftsmen who have not had college training. Many college trained people today find some drafting tasks beneath their dignity; as they were trained to be architects or engineers."
6. "Must look like member of establishment."

CHAPTER IV

SUMMARY AND CONCLUSIONS

Questionnaires were sent to eighty-seven companies which employ draftsmen. Sixty-five of these, or approximately seventy-four per cent, responded to the questionnaires. From the data compiled it is possible to ascertain the needs of the employer in terms of drafting instruction, education level, and previous training.

In sixty-five per cent of the cases the employers indicated they required no more than a high school education for a beginning draftsman.

The draftsman should be well prepared in the area of mathematics. Fifty-eight per cent of the employers indicated that they required a draftsman to have some knowledge of trigonometry. In the field of science physics is required by thirty-one per cent of the employers surveyed. The industrial skills of metalworking and drafting are considered more important than others.

Most employers expect beginning draftsmen to be sufficiently trained to do assigned duties. Only thirty-four per cent of the companies offer an on-the-job training program. However, seventy-one per cent of the employers surveyed indicated they would hire a draftsman having no previous drafting experience. Seventy-one per cent of the employers gave a test of some type as part of their screening of applicants for drafting.

While companies list certain requirements as being minimum requirements for employment, it does not mean that a person meeting

only minimum requirements is likely to be employed. This is indicated by the fact that among the companies surveyed over fifty-five per cent of the draftsmen hired during the past three years exceeded requirements established as "minimum" by the employer.

As indicated by the data, it might be concluded that:

1. It is not imperative that the draftsman have extensive training in drafting, but rather that he have a thorough knowledge of mathematics to begin employment.
2. The draftsman should be over the age of eighteen and have at least a high school education.
3. The draftsman could expect to begin work on simple detail drawings and tracings, usually under the close supervision of the engineer.
4. The draftsman greatly increases the probability of getting a job if he exceeds what the employer considers minimum requirements.

APPENDIX A

HILLSBORO COMMUNITY UNIT SCHOOL DISTRICT NO. 3

522 East Tremont Street
HILLSBORO, ILLINOIS 62049

F. Ernest Tuthill
Unit Superintendent

Wayne Ford
Assistant Superintendent

Dear Sir:

The purpose of this letter is to request your assistance in obtaining information relative to preparation and qualifications necessary for entrance into drafting occupations. The findings of this study will be utilized to provide information for high school students and counselors regarding occupational and educational information and job opportunities in drafting.

It is hoped that the results of the study will encourage students to pursue a career in drafting and better prepare them to enter employment.

While the questionnaire is at hand and has your attention please pick up a pencil or pen and complete the enclosed questionnaire and return it in the stamped self-addressed envelope. Thank you in advance for your promptness and cooperation.

Sincerely,

James P. Kull

APPENDIX B

DRAFTING OCCUPATIONS - QUESTIONNAIRE

1. How many draftsmen do you employ? _____

2. Type of drafting - (indicate how many of each type)

<input type="checkbox"/> mechanical	<input type="checkbox"/> architectural	<input type="checkbox"/> structural	<input type="checkbox"/> pneumatic
<input type="checkbox"/> electrical	<input type="checkbox"/> marine	<input type="checkbox"/> topographical	<input type="checkbox"/> other (indicate) _____

3. Education level required -

<input type="checkbox"/> high school	<input type="checkbox"/> trade school	<input type="checkbox"/> junior college	<input type="checkbox"/> college
--------------------------------------	---------------------------------------	---	----------------------------------

4. Minimum subject matter preparation -

Mathematics: ☐ general math ☐ algebra ☐ geometry
☐ trigonometry ☐ other (indicate) _____

Science: ☐ physics ☐ chemistry
☐ geography ☐ other (indicate) _____

Industrial skills: ☐ metalworking ☐ woodworking ☐ electricity/electronics
☐ basic mechanical drawing ☐ basic architectural drawing
☐ vocational drafting ☐ other (indicate) _____

5. Do you have an on-the-job training program? ☐ yes ☐ no Describe briefly-

6. Do you have an apprenticeship program? ☐ yes ☐ no Describe briefly-

7. Minimum years of experience required for initial employment with your firm-

☐ none ☐ one ☐ two ☐ three ☐ four ☐ five

8. Must beginning draftsmen pass a test? ☐ yes ☐ no

☐ physical exam ☐ drafting ability test ☐ other (indicate) _____

9. Minimum age _____ Maximum age _____

10. Sex -

☐ male ☐ female ☐ either

11. Duties of a beginning draftsman having minimum requirements -

☐ tracer ☐ checker ☐ detailer

☐ other (indicate) _____

12. Approximately how many draftsmen have been employed during the past three

years who: met only minimum requirements _____

exceeded minimum requirements _____

13. Military status -

☐ may be draft vulnerable

☐ must not be draft vulnerable

☐ must be a veteran

14. Please state briefly any other requirements not listed above.

APPENDIX C

LIST OF PARTICIPANTS

The following is a list of participants who responded to the questionnaire concerning the requirements of employers for beginning draftsmen.

- | | |
|---|---|
| 1. Airflex Corp.
3402 N. Mattis
Champaign, Ill. 61820 | 12. Cerro Corp.
Sauget, Ill. 62207 |
| 2. Allis Chalmers Mfg. Co.
3006 S. 6th St.
Springfield, Ill. 62705 | 13. Charles Pfiser & Co., Inc.
2001 Lynch
East St. Louis, Ill. 62205 |
| 3. American Steel Foundries
1700 Walnut St.
Granite City, Ill. 62040 | 14. C. L. Sagaser & Associates
104 N. Boone St.
Olney, Ill. 62450 |
| 4. Architectural Engineers Inc.
331 N. 8th St.
East St. Louis, Ill. 62201 | 15. Columbia Machines
E. Route 316
Mattoon, Ill. 61938 |
| 5. Basler Electric Co.
Highland, Ill. 62249 | 16. C. S. Johnson Co.
P. O. Box 3067
Champaign, Ill. 61820 |
| 6. Berger, Kelley, Unteed &
Skaggs
501 W. University
Champaign, Ill. 61820 | 17. David J. Johnston
403 Murphy Building
East St. Louis, Ill. 62201 |
| 7. Caldwell and Rhoads Co.
625 W. Beecher
Jacksonville, Ill. 62651 | 18. Diagraph Bradley Industries Inc.
Box 520
Herrin, Ill. 62948 |
| 8. Cash Acme Valve Co.
666 E. Wabash
Decatur, Ill. 62523 | 19. Dodson Engineering
1213 Charleston
Mattoon, Ill. 61938 |
| 9. Casler & Associates
202 S. Church
Jacksonville, Ill. 62651 | 20. East St. Louis Interurban Water Co.
4700 State St.
East St. Louis, Ill. 62205 |
| 10. Caterpillar Tractor Co.
North 27th St.
Decatur, Ill. 62526 | 21. Fields, Goldman and McGee
Fairfield Rd.
Mt. Vernon, Ill. 62864 |
| 11. Central Ill. Public Service
Company
701 S. 9th St.
Mattoon, Ill. 61938 | 22. Firestone Tire and Rubber Co.
North 22nd St.
Decatur, Ill. 62526 |

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| 23. General Electric Co.
North 22nd St.
Decatur, Ill. 62526 | 36. M. B. Corlew & Associates
116A St. Louis St.
Edwardsville, Ill. 62025 |
| 24. General Steel Industries
1417 State St.
Granite City, Ill. 62040 | 37. Millner Steel Supply Co.
1522 Walnut
East St. Louis, Ill. 62207 |
| 25. General Telephone Co.
1380 W. Walnut
Jacksonville, Ill. 62651 | 38. Mississippi Valley Structural
Steel Co.
2060 E. Eldorado St.
Decatur, Ill. 62521 |
| 26. Glenn Frazier and Associates
104 W. University
Urbana, Ill. 61801 | 39. Mobil Chemical
500 E. Superior
Jacksonville, Ill. 62651 |
| 27. Grizaly Corp.
205 S. Kosciusko
Jacksonville, Ill. 62651 | 40. Moore Farm Buildings
W. Route 316
Charleston, Ill. 61920 |
| 28. Illinois Power Co.
500 S. 27th St.
Decatur, Ill. 62521 | 41. Norge-Fedder Corp.
410 E. Maple St.
Herrin, Ill. 62948 |
| 29. Illinois Power Co.
4001 State St.
East St. Louis, Ill. 62205 | 42. Olin Mathieson Corp.
P. O. Drawer G
Marion, Ill. 62959 |
| 30. Illinois Power Co.
310 N. Main
Jacksonville, Ill. 62651 | 43. Phelps Dodge Aluminum
Weaver & College
Madison, Ill. 62060 |
| 31. Jenkins, Merchant & Nankivil
805 E. Miller
Springfield, Ill. 62705 | 44. Propellax Corp.
Edwardsville, Ill. 62025 |
| 32. John W. Hobbs Corp.
Yale and Ash Streets
Springfield, Ill. 62705 | 45. Reasor Corp.
500 W. Lincoln
Charleston, Ill. 61920 |
| 33. Lear Siegler Inc.
900 Wilson St.
Centralia, Ill. 62801 | 46. Richardson, Severns, Scheeler &
Associates
821 S. Neil
Champaign, Ill. 61820 |
| 34. Lee Gatewood
921 S. 19th St.
Mattoon, Ill. 61938 | 47. Rochester, Goodell, Moldovan &
Spain
Route 37
Salem, Ill. 62881 |
| 35. Magnavox Co.
1505 E. Main
Urbana, Ill. 61801 | 48. Ronald L. Bilerling
107 W. Washington
Belleville, Ill. 62220 |

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| 49. Rouk Electric
Nokomis, Ill. 62075 | 62. U. S. Forest Service
East Poplar St.
Harrisburg, Ill. 62946 |
| 50. R. R. Brown & Associates
Seaton Building
Harrisburg, Ill. 62946 | 63. Walrus Manufacturing Co.
650 N. Broadway
Decatur, Ill. 62521 |
| 51. Sahara Coal Co.
North Vine St.
Harrisburg, Ill. 62946 | 64. Watwood & Pyle Inc.
1400 W. Broadway
Centralia, Ill. 62801 |
| 52. Sheppard, Morgan & Schwaab
2100 State
Granite City, Ill. 62040 | 65. Wilson, Hodge & Groh
1115 Harrison St.
Mt. Vernon, Ill. 62864 |
| 53. Snap-On Tools Corp.
1200 W. 7th St.
Mt. Carmel, Ill. 62863 | |
| 54. Southwestern Bell Telephone Co.
721 Missouri Avenue
East St. Louis, Ill. 62201 | |
| 55. Stanfor Engineering Co.
Route 50
Salem, Ill. 62881 | |
| 56. State of Illinois Division of Highways
9300 St. Clair Avenue
East St. Louis, Ill. 62203 | |
| 57. State of Illinois Division of Highways
400 W. Wabash
Effingham, Ill. 62401 | |
| 58. Superior Equipment
1321 S. 19th St.
Mattoon, Ill. 61938 | |
| 59. Texaco Oil Refinery
Lawrenceville, Ill. 62439 | |
| 60. Union Oil Company of California
801 S. West St.
Olney, Ill. 62450 | |
| 61. University of Illinois
Employment Office
52 E. Gregory Drive
Champaign, Ill. 61820 | |