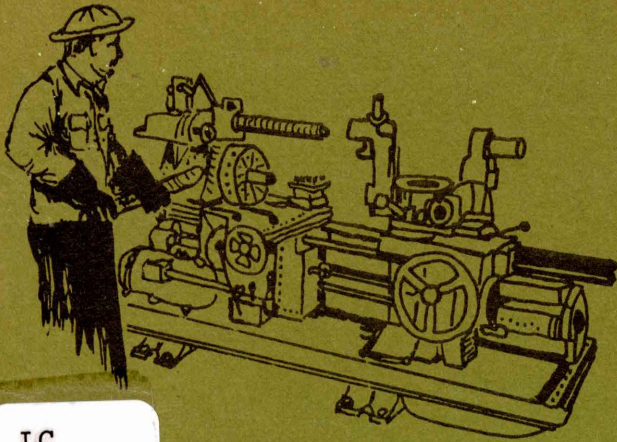
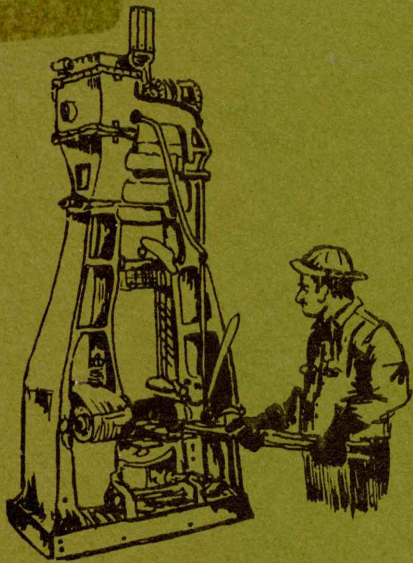


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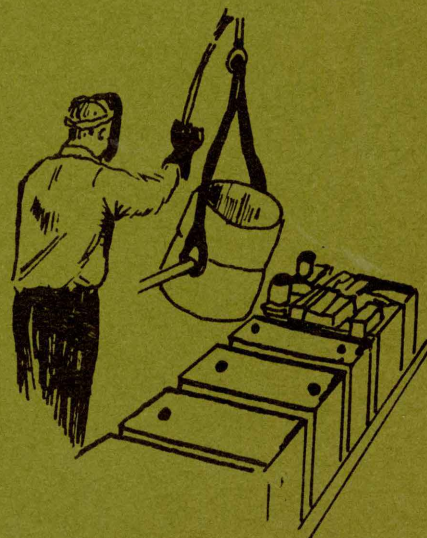
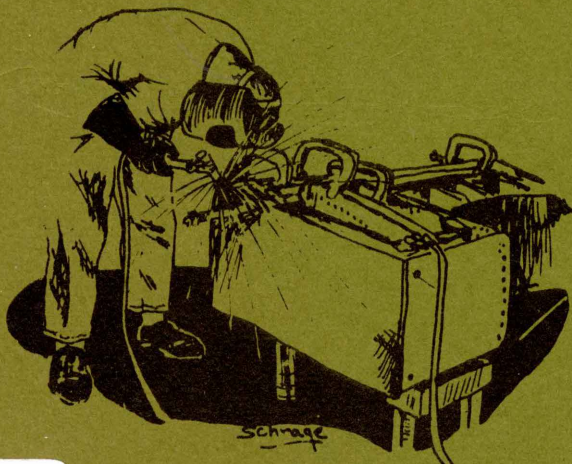


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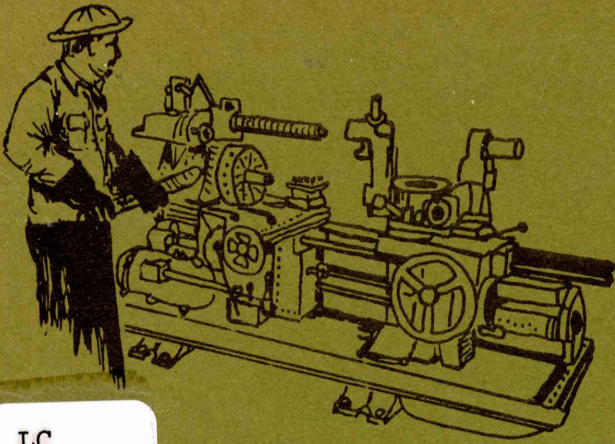
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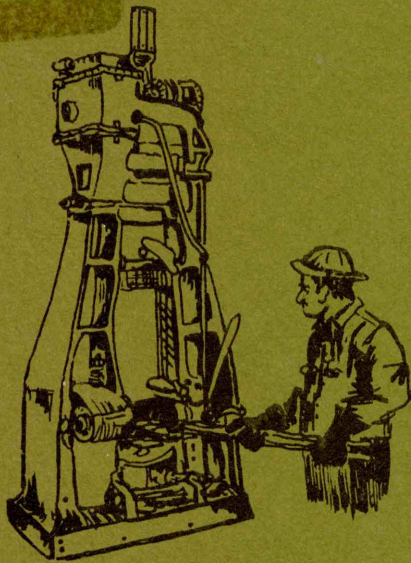
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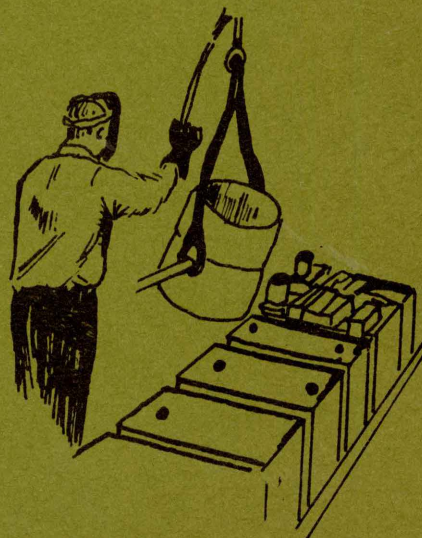
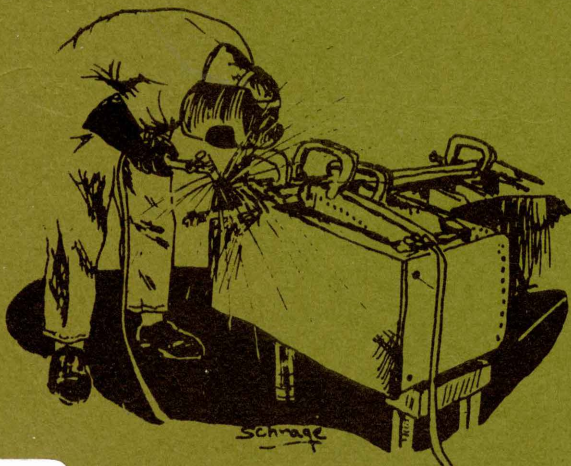


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UNIVERSITY OF
NORTHERN IOWA
Cedar Falls, Iowa
Nov. 1967

by
Harlan Giese

TRAINING NEEDS FOR METAL TRADESMEN IN IOWA

A Summary of

A Study

Presented to

the Faculty of the Graduate School

University of Northern Iowa

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Harlan E. Giese

October 1967

FOREWORD

This is a summary of a study undertaken to fulfill a two-fold purpose. It was initially designed to identify training needs for skilled and semi-skilled metal tradesmen. The results would provide information on which occupational training programs could be organized in local and area schools based on needs identified by industries in the state. This study was partially funded by the Research Coordinating Unit, Division of Vocational Education, Iowa Department of Public Instruction, Des Moines. The funding of this project is made possible under the provisions of Title 4A Public Law 88-210, The Vocational Education Act of 1963.

The second purpose of the study was to fulfill the thesis requirement for an M. A. Degree at the University of Northern Iowa, Cedar Falls.

ACKNOWLEDGEMENTS

The writer desires to express his gratitude to the numerous persons and organizations that provided a variety of services that made this study possible.

Mr. Donald Hauser, Administrative Assistant, Iowa Manufacturers Association, assisted by recommending names of key persons in Iowa industries who would be willing to review the questionnaire for this study prior to the general mailing.

Mr. J. Sid Craiger, Executive Vice-President, Iowa Manufacturers Association, assisted by writing the introductory letter that accompanied all of the initial mailings for this research.

Mr. Robert P. Schmidt, Editor, Business and Industry magazine assisted by printing a news article introducing this study to his readers. He also assisted by offering constructive criticism of the questionnaires used in this study.

Drs. Kenneth Wold and Donald Green of the Research Coordinating Unit, Division of Vocational Education, Iowa Department of Public Instruction, assisted by offering constructive criticism of the phrasing of questions used in the questionnaires.

Drs. Howard O. Reed, Lawrence S. Wright, Gordon Rhum, Cecil Phillips, Robert Johnson, and Mr. Willis Wagner of the University of Northern Iowa, Cedar Falls assisted with editorial comments on the questionnaires, this summary and the thesis.

The following industrial representatives reviewed the questionnaires and made valuable comments and suggestions for corrections:

Mr. Fred M. Chase, Director, Area Industry Development, Northern Natural Gas Company, Omaha, Nebraska

Mr. George Hall, Vice-President, Pittsburgh-Des Moines Steel Company, Des Moines, Iowa

Mr. Walter Brown, Executive Vice-President, Kiowa Corporation, Marshalltown, Iowa

Mr. Vernon Peters, Vice-President-Engineering, Viking Pump Company, Cedar Falls, Iowa

Mr. G. W. Yeager, Treasurer, Iowa Malleable Iron Company, Fairfield, Iowa

Mr. E. F. Scoutten, Vice-President-Personnel, Maytag Company, Newton, Iowa

Mr. J. R. Sickert, Vice-President, Murray Iron Works Company, Burlington, Iowa

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

In 1965 the Iowa Legislature passed a law providing for the establishment of area vocational-technical schools and area community colleges. Both types of institutions are to offer in whole or in part vocational and technical curricula for the training of persons to enter employment. By March of 1967, fifteen groups of county and local school districts merged to form area community college and area vocational-technical school districts. Seven of the ninety-nine counties in Iowa did not support area schools at this time.

I. THE PROBLEM

Statement of the problem. The purpose of this study was to identify, by state-wide survey, the training needs for skilled and semi-skilled metal tradesmen in eleven job classifications. After the information was compiled and organized, it would be made available to area school administrators for their use in initiating occupational training programs.

Limitations of the study. This study was concerned with identification of training needs for skilled and semi-skilled metal tradesmen in the following eleven job classifications: assemblers, forge-press operators, hydraulic equipment mechanics, industrial equipment salesmen, machine repairmen (maintenance), machinist (custom) and (job shop), machinist (production), molder-foundry worker, patternmaker, tool and diemaker, and welder-combination. Blank forms were provided for the manufacturers to report anticipated needs in other job classifications.

The population of this study was limited to 823 metalworking manufacturing firms that are listed in the Iowa Development Commission Directory of

Manufacturers between the standard industrial classifications of thirty-three and thirty-seven inclusive. In addition 189 Iowa firms, outside the standard industrial classification above, but employing more than one hundred persons were sent questionnaires. It was assumed that many firms of this size employ personnel to maintain their production equipment and therefore may employ semi-skilled or skilled metal tradesmen.

The survey forms were sent to manufacturing concerns within the state of Iowa.

The findings of this study are summaries of information returned by responding firms. The questionnaires were answered by personnel directors, owners, business managers, or shop foremen.

The study was limited to the identification of training needs for certain occupations. The job descriptions presented on the questionnaires identified skills and abilities used by the worker in execution of his job. Additional study should be made to identify in greater detail the training content for each occupational category.

II. DEFINITIONS OF TERMS USED

The following terms are used in this study. They are included here to clarify their usage. Other terms will be defined when necessary within the body of the report.

Area Community College. "Area Community College" means a school offering the first two years of college work, vocational and technical training, and in-service training and retraining of workers.¹

Area Vocational School. "Area vocational school" means a school offering vocational and technical training, and programs for in-service training and retraining of workers.²

¹Iowa Legislature, 1965, Senate File 550.

²Ibid.

Merged area. "Merged area" means an area where two (2) or more county school systems or parts thereof merge resources to establish and operate a vocational school or community college.³

Metal tradesman. Any person who earns his livelihood by machining, forming, welding, molding, casting, forging, assembling, or selling metal parts or products.

Preparatory training. Occupational training programs usually pursued by the student who possesses little or no skill or technical knowledge of the subject at the time of enrollment. The student usually attends class and laboratory work a minimum of six hours per day, five days per week to receive training leading to his vocational goal.

Semi-skilled worker. One who requires less training than the skilled worker. His work is specialized and often limited to one machine or a small area of the trade. His use of independent judgement is limited and he is under closer supervision than the skilled worker. High manipulative ability is a necessity.⁴

Skilled worker. One who attains maximum productivity through a period of training usually more than two years in duration. He must have high manipulative ability. He must be able to exercise independent judgement and assume responsibility for the proper care and use of complex machines and the products produced.⁵

Standard Industrial Classification. A nationally-recognized numerical identification system classifying industries according to the products or services produced by the company.

Supplemental training. Occupationally oriented classes attended by an employed worker on a part-time basis. The worker receives training primarily in manipulative skills on-the-job. It is usually stated that he is

³Ibid.

⁴Robert A. Crowley, "Guidance Information for the Vocational Metalworking Program of Waterloo, Iowa" (an unpublished independent paper, The University of Minnesota, St. Paul 1958) p. 5.

⁵Ibid., p. 6.

learning "how" to complete the job. The worker learns the "why" of his job through supplemental classes. Supplemental classes include apprenticeship-related instruction, journeymen-upgrading classes, and other occupationally related classes.

CHAPTER II

RELATED LITERATURE

Various materials were reviewed to secure information relating to this study. One group of studies pertained to procedures to be used when making labor market surveys. Outstanding in this group was the Handbook on Employment Security Job Market Research Methods.⁶ Included in this publication were step by step procedures to be followed in making a labor market survey as well as helpful hints on receiving endorsement of the study by community groups. Pointers on the review of questionnaires prior to mailing and the follow-up procedures for those who do not return questionnaires were especially valuable. The Bureau of Employment Security also recommends procedures to be used in projecting future replacement needs where the employer did not feel able to estimate these needs.

The National Education Association also prepared a research memo entitled Studies of High School Graduates.⁷ This publication was valuable for its contribution in terms of developing a schedule of mailing the questionnaires as well as recommending the tone of letters used to accompany the questionnaire.

In 1960 Robert Jacoby prepared a manual for the state of Pennsylvania pertaining to Trade and Technical Education Surveys.⁸ This study enumerated sources for mailing lists and covered both student interest and industrial surveys. Jacoby also recommends elements to be included in the report following the survey.

⁶ Bureau of Employment Security, U. S. Department of Labor, Handbook on Employment Security Job Market Research Methods (Washington: Government Printing Office, 1965).

⁷ National Education Association, Studies of High School Graduates (Research Memo No. 1963-16. Washington: National Education Association, 1963).

⁸ Robert Jacoby, Trade and Technical Education Surveys Department of Public Instruction, Commonwealth of Pennsylvania (Harrisburg: Trade and Industrial Education, 1960).

CHAPTER III

THE METHOD OF PROCEDURE

INTRODUCTION

In reviewing the methods and techniques used in conducting this survey, reference will be made to sources of information on survey procedures. The topic headings are listed in the chronological order of the steps followed.

I. SELECTION OF THE POPULATION

This study was developed to identify the training needs for metal tradesmen on a state-wide as well as merged area school basis.

A map of the state of Iowa showing the geographical boundaries of each merged area district may be found on page 7. Since at the time of this study there were approximately seven counties not supporting a merged area school, four of these counties were attached to existing merged area schools for purposes of this study. Three counties were grouped as a merged area district. Crawford and Cherokee Counties were listed as part of Merged Area District XII. Carroll County was listed as part of Merged Area District V. Audubon and part of Guthrie County were listed as part of Merged Area District XIII. Jackson, Dubuque and Delaware Counties were listed as Merged Area District VIII.

Because of the variation in concentration and size of manufacturing firms across the State and the diversity of products produced, it was decided to survey all of the metalworking manufacturing firms in the State listed in the Directory of Iowa Manufacturers, published by the Iowa Development Commission. This Directory lists approximately ninety-six percent of all manufacturers in the State.⁹

⁹Iowa Development Commission, Directory of Iowa Manufacturers (Des Moines: Research Division, Sixth Edition, 1965), Procedures.

It was anticipated that, for some of the occupations surveyed, there would not be sufficient need for trained workers in any one of the merged area districts. However, on a state-wide basis there may be sufficient need for a single or a small number of training programs. It seemed justifiable that this need be satisfied by the establishment of training in a merged area school district to meet the needs of the manufacturers elsewhere in the State.

The initial proposal for this research specified that all manufacturers listed in the Directory of Iowa Manufacturers in Standard Industrial Classifications 33 through 37 inclusive would be surveyed. Table II shows the type of product produced by firms found in each of the Standard Industrial Classifications 33 through 37 inclusive.

In addition firms employing one hundred or more persons outside of the Standard Industrial Classification 33 through 37 were surveyed since these firms may employ metal tradesmen to maintain their production equipment.

Because the number of firms listed in the classifications of 33 through 37 inclusive was 823, and the firms employing 100 or more persons numbered 189 it was decided to mail the survey form to the population.

TABLE II¹⁰

STANDARD INDUSTRIAL CLASSIFICATIONS

33	PRIMARY METAL INDUSTRIES
34	FABRICATED METAL PRODUCTS
35	MACHINERY EXCEPT ELECTRICAL
36	ELECTRICAL MACHINERY, EQUIPMENT AND SUPPLIES
37	TRANSPORTATION EQUIPMENT

II. DESIGN OF SURVEY PROCEDURE

The firms that were surveyed in this study were placed in two groups. One group was composed of the manufacturers who produced non-metallic products and who employed one hundred or more persons. The other group of manufacturers contained those who produced metal products.

¹⁰Iowa Development Commission, op. cit., p. 204.

III. SURVEY ELEMENTS COMMON TO BOTH GROUPS

Some efforts expended in organizing the survey were common to both groups of manufacturers.

One common element in surveying both groups of manufacturers was that of making the future respondents of questionnaires aware of the scope, methodology, and purpose of the study. The Bureau of Employment Security states that ". . . sufficient . . . publicity should be obtained to insure community awareness of the survey's importance."¹¹ The writer requested Mr. Robert B. Schmidt, Editor of Iowa Business and Industry to publish an article containing the type of information outlined above, about this study, in the October 1966 issue of that magazine.¹² A copy is located in the appendix, Exhibit 1. This periodical was selected because of its wide circulation (3,168) in Iowa to the management level of manufacturing firms.¹³

The mailing list. The next step was to obtain the names and addresses of the manufacturing firms to be covered by this study. This was accomplished by obtaining the magnetic tapes from which the Directory of Iowa Manufacturers was printed. The names and addresses were extracted from the magnetic tapes by computer. The computer was programmed to print-out the names within a space two and three-quarters of an inch wide and one inch high. When printed three columns wide and eleven rows high, this consumed a space on each print-out sheet of eight and one-half inches by eleven inches. It was then possible to reproduce gummed labels by using a heat type copying machine and the proper heat sensitive perforated, gummed label sheets. The cost of this process was much less than printing all needed gummed labels directly on the computer.

¹¹Bureau of Employment Security, Handbook on Employment Security Job Market Research Methods, Area Skill Survey (Washington, U. S. Department of Labor, 1965), p. 10.

¹²"Metalworking Survey on Jobs, Skills, Begins", Iowa Business and Industry, (October, 1966), p. 22.

¹³Personal Conversation with Robert Schmidt, Editor, Iowa Business and Industry (Des Moines) March 27, 1967.

The computer was programmed so that if a given firm employed less than 100 persons the name of the owner of the firm preceded the name of the company. If the firm employed 100 or more persons, "Personnel Director" preceded the name of the firm.

The United States Department of Labor recommends this procedure.

It is very important that the proper official(s) be contacted with respect to obtaining the necessary information for the survey. In many cases, this person will be a member of the firm's management since it is only at this level that future plans of the firm are known. If possible, contacts should be made with management, the personnel office, foremen, and other suitable sources.¹⁴

It was this writer's assumption that the smaller firms probably would not have a personnel officer. For this reason the survey instrument was mailed to the owner of the firm. Since most larger firms do have a personnel office, the survey instrument was mailed to their personnel director.

The covering letter. A second common element in conducting the survey for this study was that of obtaining an introductory letter from the Iowa Manufacturers Association endorsing the survey. The purpose of this letter was to notify and arouse interest. A copy of the letter may be found in the appendix, Exhibit 2.

Direction sheet. Space for directions on completing the questionnaires was not available on the forms. For this reason a separate direction sheet was developed which was included with each mailing of questionnaires. At the suggestion of Dr. Donald Green, cartoons were placed in the left margin of the direction sheet. The purpose of the cartoons was to attract the attention of the respondent and to motivate him to read the directions. A copy of the direction sheet may be found in the appendix, Exhibit 3.

¹⁴Bureau of Employment Security, loc. cit., p. 14.

IV. THE SURVEY TOOLS

It was decided that a higher percentage of returned questionnaires would be achieved if the metalworking manufacturers (SIC 33 to 77) were requested to complete inquiries about their training needs in job classifications presently found in their plant operations. While the Directory of Iowa Manufacturers lists the products produced by each manufacturer there is no listing of the manufacturing processes used to produce these products.

The post card. The initial questionnaire sent to the metalworking manufacturers was a post card asking them to check the manufacturing process(es) used in their plant. The responses on the post card included casting, machining, forming and forging, and welding. Based on the items checked on the return post cards, the manufacturers were then sent questionnaires which would apply only to their manufacturing operations. A copy of the post card appears in the appendix, Exhibit 4.

The covering letters. Included in the mailing of the post card was the letter from the Iowa Manufacturers Association which was described earlier. In addition this writer prepared a covering letter explaining the purpose of the study as well as its anticipated outcome. The article which appeared in Iowa Business and Industry was reprinted in the left margin of this letter. This was done to refresh the memory of the recipient, of this endorsement of the study. A copy of the letter may be found in the appendix, Exhibit 5.

The reminder. A reminder letter and second post card, identical to the first post card mailed, were mailed to those firms that did not respond within one week of the initial mailing. It was decided that a one week lapse of time was sufficient since the information requested could be placed on the card from memory and knowledge of the business. A copy of the reminder letter may be found in the appendix, Exhibit 6.

Sending the questionnaires. After the post cards were received by this writer, questionnaires were mailed to the manufacturers according to the manufacturing processes used in each firm.

A covering letter was prepared in which the manufacturer was reminded that he had recently returned a post card which was the first step in identifying state-wide training needs for skilled and semi-skilled metal tradesmen. He was also reminded of the scope and purpose of the survey. A copy of the letter may be found in the appendix, Exhibit 7.

Questionnaires were mailed for job classifications which could apply to the manufacturing process used. The manufacturers that stated that they made castings received questionnaires for Molder-Foundry Worker, Patternmaker, and Machinist (Production).

The reason for including the questionnaire on Machinist (Production) is that the job description included skills in the set-up and operation of die casting machines. This skill was included in the Machinist (Production) job description because this writer considered this more of a machine operation skill than a molder foundry-worker skill.

The manufacturers that used the process of forging and forming received questionnaires on Forge Press Operator and Machinist (Production). The reason for including the questionnaire bearing the job description of Machinist (Production) is that this description includes the skills of setting-up and operating brakes and punch presses. Some manufacturers may have correctly checked the forming and forging entry on the post card because they have punch presses in their plant operations. Punch press and brake work are considered to be forming processes.

The manufacturers that responded on the post card by indicating that they machined metals in their plant received questionnaires bearing the job descriptions for Machine Repairman - Maintenance (any industry), Machinist (Custom) (Job Shop), and Machinist (Production), and Tool and Die-Maker.

Those manufacturers who stated that they used welding processes in the production of their products or services received the questionnaire with the job description Welder, Combination.

The questionnaires not included in the above are ASSEMBLERS, HYDRAULIC-EQUIPMENT MECHANIC, and INDUSTRIAL EQUIPMENT SALESMAN.

It was not possible to identify specific industries that might employ persons possessing the skills outlined in these job classifications, therefore these questionnaires were included in the mailing to all manufacturers in the Standard Industrial Classification code 33 through 37.

The questionnaire for the HYDRAULIC EQUIPMENT MECHANIC was used because the greater use of hydraulics on machinery every year there may be a need for repairmen knowledgeable in this field. The growth in sales of hydraulic equipment can be used as an indicator of its importance in industry. In 1945, manufacturers of fluid power systems and components produced about one-third of a billion dollars worth of equipment. In 1957 these manufacturers produced five-hundred and twenty-four million dollars worth of equipment. With the increase in demand for fluid power equipment the per unit cost of components has been reduced.¹⁵

The questionnaire to determine the needs for ASSEMBLERS was developed because of clues provided by two manufacturers of construction equipment in Iowa. In 1965 this writer visited both manufacturing facilities. One firm employed less than 250 persons and the other firm employed less than 20 persons. This writer considered both firms low volume production operations. The products produced were assembled on an assembly floor as a complete unit. Assembly line methods typical of the automotive industry were not used. The operations performed by the assemblers appeared to fit the semi-skilled category. For this reason it appeared advisable to determine the training needs for this type of worker.

The questionnaire for Industrial Equipment Salesman was developed on the basis that some of Iowa's manufacturers employ their own sales force.

¹⁵National Fluid Power Association, "National Survey of the Availability of Manpower Trained in Fluid Power" (Thiensville, Wis: National Fluid Power Association, 1963), pp. 2,3. (Mimeographed).

This group of workers maintain contact with wholesale and retail sales organizations as well as directly with the consumer of the product. It would seem reasonable to assume that replacements and additional employees may be needed in this occupation. It also was apparent that in order to be an effective machinery salesman that they should receive instruction in mechanics as well as sales. For the above reasons this questionnaire was included in all mailings to Standard Industrial Classification firms 33 through 37. Samples of questionnaires can be found in the appendix, Exhibits 9 through 19.

V. SURVEYING FIRMS EMPLOYING MORE THAN ONE-HUNDRED PERSONS
THAT ARE LISTED IN STANDARD INDUSTRIAL CATEGORIES OTHER
THAN 33 THROUGH 37

This writer assumed that many large manufacturers or processors that do not fabricate metal products employ skilled or semi-skilled metal tradesmen to maintain their production machinery. All firms employing one-hundred or more persons listed in the Directory of Iowa Manufacturers in categories other than Standard Industrial Classification 33 through 37 were surveyed. Since the type of work performed by metal tradesmen in these firms would be of a maintenance nature the following questionnaires were sent to these manufacturers:

Hydraulic Equipment Mechanic
Machine Repairman, Maintenance (any industry)
Machinist (Custom) (Job Shop)
Welder, Combination

A covering letter was prepared and included with the questionnaires mailed to the above type of firm. A copy of this letter may be found in the appendix, Exhibit 8. The letter of endorsement by the Iowa Manufacturers Association, cited earlier, was included with this questionnaire mailing.

The inclusion of blank forms. All firms in this study also received two questionnaires which did not list a job description. The respondent was asked to complete the blank questionnaire for any job classification not

included in the packet in which he was experiencing a shortage of workers. A copy of the blank questionnaire may be found in the Appendix, Exhibit 20.

The reminder. All firms that did not respond to the initial mailing of the questionnaires within two weeks were sent reminder letters and a second set of questionnaires. Those manufacturers within Standard Industrial Classifications 33 through 37 were mailed a complete set of eleven prepared questionnaires and two blank questionnaires with their reminder letter. No effort was made to send questionnaires according to the manufacturing process used when mailing the reminder. The reason for this course of action was that all of the post cards that had been returned were categorized according to manufacturing process used and it would have been a time-consuming process to sort through the fourteen combinations of responses to locate the returned post card from the manufacturers that had not responded to the initial mailing of questionnaires.

Those manufacturers that employed more than 100 persons in Standard Industrial Classifications other than 33 through 37 were sent a reminder letter and a set of questionnaires identical to those included in the first mailing.

The reminder letter used for both groups of manufacturers was identical. The letter stressed the need for a response from each firm. A copy of this letter may be found in the Appendix, Exhibit 11.

THE QUESTIONNAIRES

The job description. Questionnaires were developed for eleven job classifications for which it appeared to this writer there would be demands for trained workers. The job descriptions do not match those found in publications, such as the Dictionary of Occupational Titles. The job classifications

are based on two factors. One factor is the observation of industrial work being done in selected manufacturing plants in the state. The other factor is an estimate by the writer of an adequate amount of identifiable content on which a preparatory vocational training program could be developed.

The questionnaires were sent to an advisory committee made up of key personnel in nine manufacturing firms located in Iowa. These persons were recommended by Mr. Don Hauser of the Iowa Manufacturers Association. Seven of the nine persons responded and reacted to the questionnaires. The questionnaires were then revised to reflect the constructive criticisms of these persons. The manufacturers who assisted with this are recognized in the ACKNOWLEDGEMENTS. Most of the reactions provided by this group pertained to the job descriptions on the questionnaires.

The questions. It was decided that since certain information would be required for each of the eleven occupations being surveyed that all questions on the forms would be identical. The only deviation from this in each of the eleven job classifications can be found in question 8. This question pertained to needs for supplemental classes. Since the duties in each job classification are different, it is reasonable that titles for supplemental classes vary according to the job description.

Since all questions, except number eight, were identical the reader may wish to consult Exhibit 9 to review the items of interrogation. The job descriptions used are listed in Exhibit 10. Question eight and possible responses are listed in Exhibit 11.

Since all questions, with the exception of 8, are identical there appeared to be the possibility that the respondent might discard a number of questionnaires after answering one or two, assuming that duplicate questionnaires had been mailed. For this reason the questionnaires were printed on six different colors of paper. This would call to the attention of the respondent a difference in the questionnaire.

CHAPTER IV

I. FINDINGS OF THE STUDY

The initial survey instruments were mailed during the first week in January of 1967. Procedures followed in the mailing are outlined in the preceding chapter. The last responses were received on February 10, 1967.

Responses to the questionnaires. The total population of this study included 1,012 firms located in the state of Iowa. A total of 440, or 43.6 percent, responded to the questionnaires. The responses by Merged Area District ranged from a low of 25.9 percent in Merged Area District XIV to a high of 61.5 percent in Merged Area District III. Table III provides number and percent responses from all Merged Area Districts as well as the State.

Of the firms classed as metalworking manufacturers (SIC 33 through 37) in the State, 80 percent returned the post card questionnaire. The Merged Area District with the highest response was XV with a percentage of 93 while the lowest was Merged Area I with a percentage of 66.7.

Forty-one and nine tenths percent of all of the metalworking manufacturers returned questionnaires or slightly more than one-half of those that returned post cards. Sixty percent of the manufacturers in Merged Area District IV returned questionnaires. This was the largest percentage of return. The lowest percentage of return of questionnaires by firms occurred in Merged Area District XIV. The return equaled 28 percent. The largest number of metalworking manufacturers are located in Merged Area XI while the smallest number of this type of firm is located in Area IV. Table IV provides details about responses of firms within other Merged Area Districts.

The firms outside of Standard Industrial Classifications 33 through 37 employing 100 or more persons demonstrated greater interest in the study by returning 49.7 percent of the questionnaire. All firms in this category

TABLE III

TOTAL FIRMS IN MERGED AREA DISTRICTS
RESPONDING TO QUESTIONNAIRES

Merged Area	Population N.	SIC 33-37 Questionnaire Returned N_1	Firms Employ 100 or more Questionnaire Returned N_2	$\leq N_1 + N_2$	$\frac{\leq N_1 + N_2}{N}$
I	27	10	1	11	40.7
II	41	10	5	15	36.6
III	26	12	4	16	61.5
IV	10	6	0	6	60
V	89	26	9	35	39.4
VI	44	12	4	16	36.2
VII	87	36	5	41	47.1
VIII	45	15	3	18	40
IX	114	40	16	56	49
X	111	46	10	56	50.9
XI	176	50	16	66	37.5
XII	71	18	10	28	39.5
XIII	32	12	0	12	37.5
XIV	27	7	0	7	25.9
XV	52	23	3	26	50
XVI	60	22	9	31	51.7
State Totals	1012	345	95	440	43.6

TABLE IV

METALWORKING MANUFACTURERS RESPONDING TO
POST CARD AND QUESTIONNAIRE (SIC 33 THROUGH 37)

Merged Area District	N	Returned Post Card N ₁	% Returned Post Card $\frac{N_1}{N}$	Questionnaire Returned N ₂	$\frac{N_2}{N}$	$\frac{N_2}{N_1}$
I	24	16	66.7	10	41.6	62.5
II	33	27	81.7	10	30.3	37.1
III	22	15	68.2	12	54.5	80
IV	10	12	80	6	60	50
V	72	62	86.1	26	36.1	42
VI	37	29	78.5	12	32.4	41.4
VII	76	58	76.2	36	47.3	62
VIII	38	27	71	15	39.4	55.5
IX	87	75	86.1	40	46	53.3
X	89	77	86.5	46	51.7	59.8
XI	142	106	74.7	50	35.2	47.1
XII	54	42	84.6	18	33.3	42.9
XIII	29	21	72.5	12	41.4	57.1
XIV	25	15	76	7	28	36.8
XV	44	41	93	23	52.3	56
XVI	41	35	85.4	22	53.6	62.8
State Total	823	658		345		
State Median			79.2		41.5	55.7
State Mean			80		41.9	53.4

located in Merged Area District III responded. None of the firms in Merged Area Districts XIII and XIV responded. The median response from all firms in this category was 47.2 percent. Table V provides detailed information on number and percent of responses by firms within each Merged Area District.

Processes used in manufacturing. As mentioned earlier, post cards were mailed to the metalworking manufacturers requesting them to report the manufacturing process(es) used in their firm. The four processes listed on the post card were casting, forging and forming, machining, and welding. There were 16 possible combinations of responses to the questionnaire. Of the 658 firms that responded, the combined processes of machining and welding were used most predominantly. One hundred and sixty-seven manufacturing firms used these processes. The one single process used least in the State was forming and forging. Sixteen firms used that process alone. Table VI shows the tabulation of the 658 firms by Merged Area District and state-wide totals with respect to the process(es) used.

TABLE V

QUESTIONNAIRES RETURNED BY FIRMS OUTSIDE
OF SIC 33 TO 37 EMPLOYING MORE THAN 100 PERSONS

Merged Area District	N	Questionnaires Returned N_1	$\frac{N_1}{N}$
I	3	1	33
II	8	5	62.5
III	4	4	100
IV	0	0	100
V	17	9	52.8
VI	7	4	57.1
VII	11	5	45.5
VIII	7	3	42.8
IX	27	16	59.3
X	22	10	45.5
XI	34	16	47
XII	17	10	58.8
XIII	3	0	0
XIV	2	0	0
XV	8	3	37.5
XVI	19	9	47.4
State Totals	189	95	
State Mean			49.7

TABLE VI

MANUFACTURING PROCESSES USED BY 80% OF IOWA METALWORKING MANUFACTURERS
VARIOUS COMBINATIONS IN ANSWERING POST CARD

Process Combinations	MERGED AREAS																State Totals
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Casting	1	0	0	0	3	3	6	1	6	1	3	0	2	0	4	1	31
Casting Machining	0	1	1	0	2	2	0	3	5	1	1	1	0	0	1	1	17
Casting Welding	0	0	0	0	0	0	1	1	1	1	0	0	1	1	0	0	6
Casting Form and Forg Machining Welding	1	2	1	0	3	0	2	1	2	6	7	6	3	0	1	1	36
Casting Machining Welding	0	1	0	0	3	3	8	1	2	1	4	2	0	0	4	3	32
Form and Forg	0	0	0	1	0	2	1	1	2	2	4	0	0	0	2	1	16
Form and Forg Machining	0	1	0	1	0	0	1	1	3	4	2	0	0	1	1	1	16
Form and Forg Machining Welding	3	2	3	4	5	0	11	4	10	7	14	6	3	0	5	3	80

TABLE VI (Continued)

MERGED AREAS

Process Combinations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	State Totals
Form and Forg Welding	2	3	1	0	2	2	4	2	9	6	11	3	2	2	1	2	52
Machining	1	0	0	1	4	2	2	1	11	13	12	1	0	2	2	7	59
Machining Welding	2	10	6	4	23	5	15	4	14	20	25	10	4	5	11	9	167
Welding	4	2	2	1	8	3	5	4	5	7	14	8	2	2	4	5	76
Casting Form and Forg	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	4
No Process Marked	2	5	1	0	9	7	2	3	7	7	8	4	3	2	5	1	66
Area District Totals	16	27	15	12	62	29	58	27	75	77	106	42	21	15	41	35	658

II STATE - WIDE NEEDS

State-wide patterns by occupation. The respondents were asked to indicate whether they would employ graduates of vocational technical programs to fill the anticipated vacancies they would have in each job classification in 1968, 1970, and 1972. If the response was "yes" the need for workers was tabulated in a column in Table VII entitled New Employees Needed by Institutional Training. Replacement needs are tabulated in the following columns of the same table.

Institutional training. Table VII shows the state-wide needs for new and replacement skilled and semi-skilled workers in the eleven occupations surveyed. In addition employment patterns in the occupations surveyed are shown.

Employment patterns. The 440 firms responding employed a total of 23,763 metal tradesmen. The largest employment occurred in the job classification Machinist (Production), with a total employment of 8,947. The second highest employment occurred in the occupation Welder-Combination with the level at 2900.

Often a labor market analyst will study replacement rates and other factors about occupations and draw conclusions about the labor force, working conditions, and organized labor. This study was limited to identifying needs as expressed by employees. No effort will be made to analyze data based on replacement records of the populations. Table VII shows the replacement rates in the eleven occupations surveyed with percentages computed in the last column.

State-wide needs. The number of new workers employed in 1966 and the number of new workers which will be employed in 1968, as anticipated by the

manufacturers, is nearly equal. From this information one can conclude that manufacturers anticipate continued national economic growth and increasing demand for their products.

The need for replacement workers in 1968, 1970, and 1972 will be at a rate of approximately two-thirds of the number required in 1966.

The largest number of trained new and replacement workers will be needed in the Production Machinist category in 1968, 1970, and 1972. Second to this is the need for Moulder-Foundry Workers and ranking third is the need for Assemblers. The occupations Patternmaker and Forge Press Operator will require the least number of workers trained.

Geographic representation of state-wide needs. Tables number X through XX show needs for trained workers by Merged Area District. Some individual Merged Area Districts will not be able to justify the establishment of certain occupational training programs covered in this study. Tables X through XX show needs geographically by Merged Area Districts as well as state-wide needs. These tables illustrate that in certain occupations, manufacturers in adjacent Merged Area Districts report sufficient need to justify an occupational training program. Where this occurs the administration and boards of the adjacent Merged Area Districts should meet to decide which Merged Area District should offer the program. The Merged Area District in which there is greatest need should initiate the multi-merged area district meeting.

State-wide needs in other occupations. The employers responding to this survey had the opportunity to indicate occupations in which they were experiencing shortages in skilled workers outside of the eleven they were specifically requested to answer. Many firms did this to the degree that 19 occupations were represented which were different from those initially surveyed. Table IX lists these occupations and the number of workers required on a state-wide basis for the next six years.

TABLE VII

STATE-WIDE EMPLOYMENT PATTERN AND INSTITUTIONAL
TRAINING NEEDS IN 440 FIRMS

Occupation	Employment Patterns					New Employees Needed by Institutional Training								
	Number of positions closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
												1968	1970	1972
26 Assemblers	6	2783	561	772	3344	461	460	500	452	462	448	913	922	948
Forge Press Operators	0	205	39	30	144	22	26	34	17	15	19	39	41	53
Hydraulic Mechanic	2	209	25	31	234	50	52	53	31	42	50	81	94	103
Industrial Salesman	4	262	45	64	307	78	71	78	51	56	68	129	127	146
Machine Repairman	4	2359	228	341	2587	233	265	237	212	223	240	445	488	477
Machinist (Job Shop)	4	1076	110	183	1186	224	194	202	140	113	159	364	307	361
Machinist (Production)	17	7743	1204	1740	8947	1184	1106	1220	1143	1034	1084	2327	2140	2304
Moulder-Foundry Worker	3	2271	608	1174	2879	524	461	409	1101	1018	986	1625	1479	1395
Patternmaker	1	169	16	14	185	28	17	29	17	6	15	45	23	44
Tool and Die Maker	2	907	143	125	1050	254	238	254	141	133	140	395	371	394
Welder-Combination	5	2359	541	753	2900	405	430	477	353	334	353	758	764	830

TABLE VIII

REPLACEMENTS EMPLOYED DURING
JANUARY-DECEMBER 1966

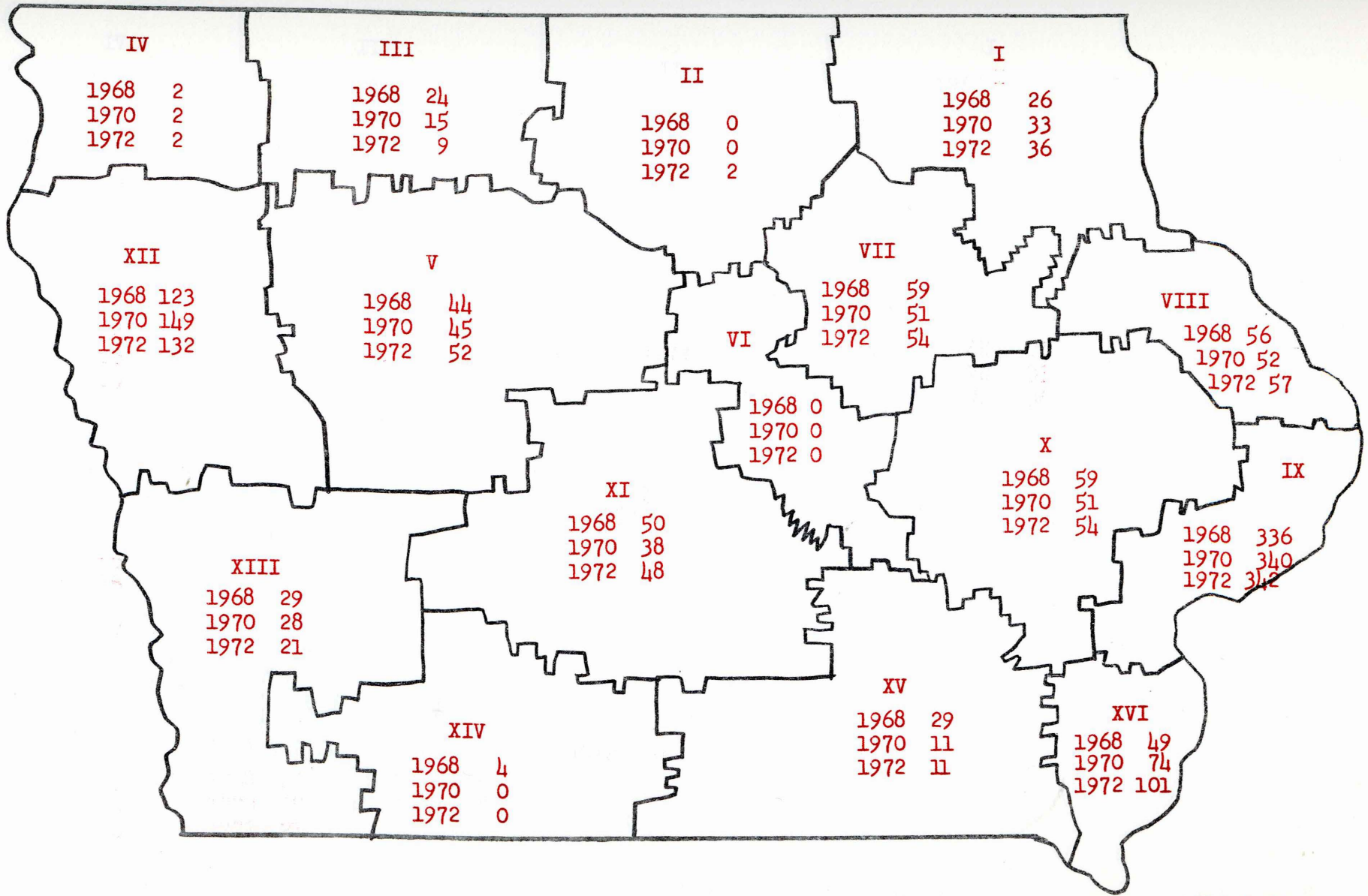
	Replace- ments	Total Employees	Replacement Percentage
Hydraulic Equipment Mechanic	31	234	13.5
Industrial Equipment Salesman	64	307	22.6
Machinery Repair	341	2587	13.5
Machinist (Job Shop)	183	1186	15.3
Machinist (Production)	1740	8947	19.5
Moulder-Foundry Worker	1174	2879	40.7
Patternmaker	14	185	7.5
Tool and Die Maker	125	1050	11.9
Welder Combination	753	2900	29.4

TABLE IX

STATE-WIDE NEEDS FOR WORKERS TRAINED IN VOCATIONAL
CURRICULA IN OCCUPATIONS OTHER THAN THOSE
SPECIFICALLY COVERED IN THIS SURVEY

	<u>Total 1968, 1970, 1972</u>
Auto Mechanics	40
Carpenter-Cabinetmaker	283
Chemical Technicians	31
Draftsman, Mechanical, Electrical, Structural, Artist	85
Electrical Maintenance Mechanic	69
Electro Platers	22
Foreman and Supervisors	80
Instrument Repairman	40
Inventory Control	58
Maintenance Engineer Including Refrigeration	15
Mechanical Technician	65
Pipefitter, Maintenance	5
Printers	86
Sewing Machine Operator and Upholsterers	130
Sheetmetal Worker	57
Spray Painter	30
Structural Steel Fabricator	27
Tool Design Technician	41
Miscellaneous	51

TABLE X

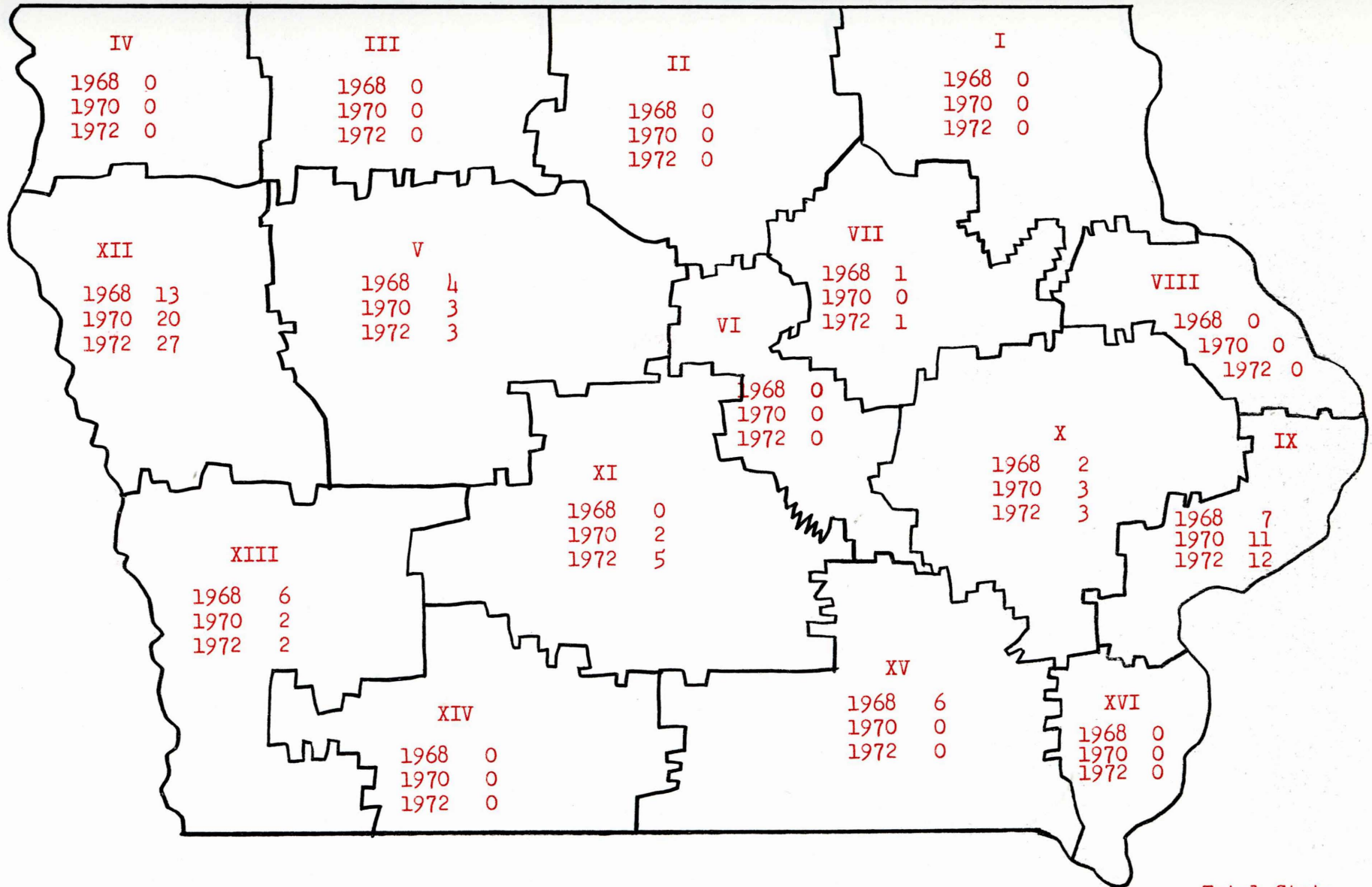


29

NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
BY MERGED AREAS FOR ASSEMBLERS

Total State	
1968	913
1970	922
1972	948

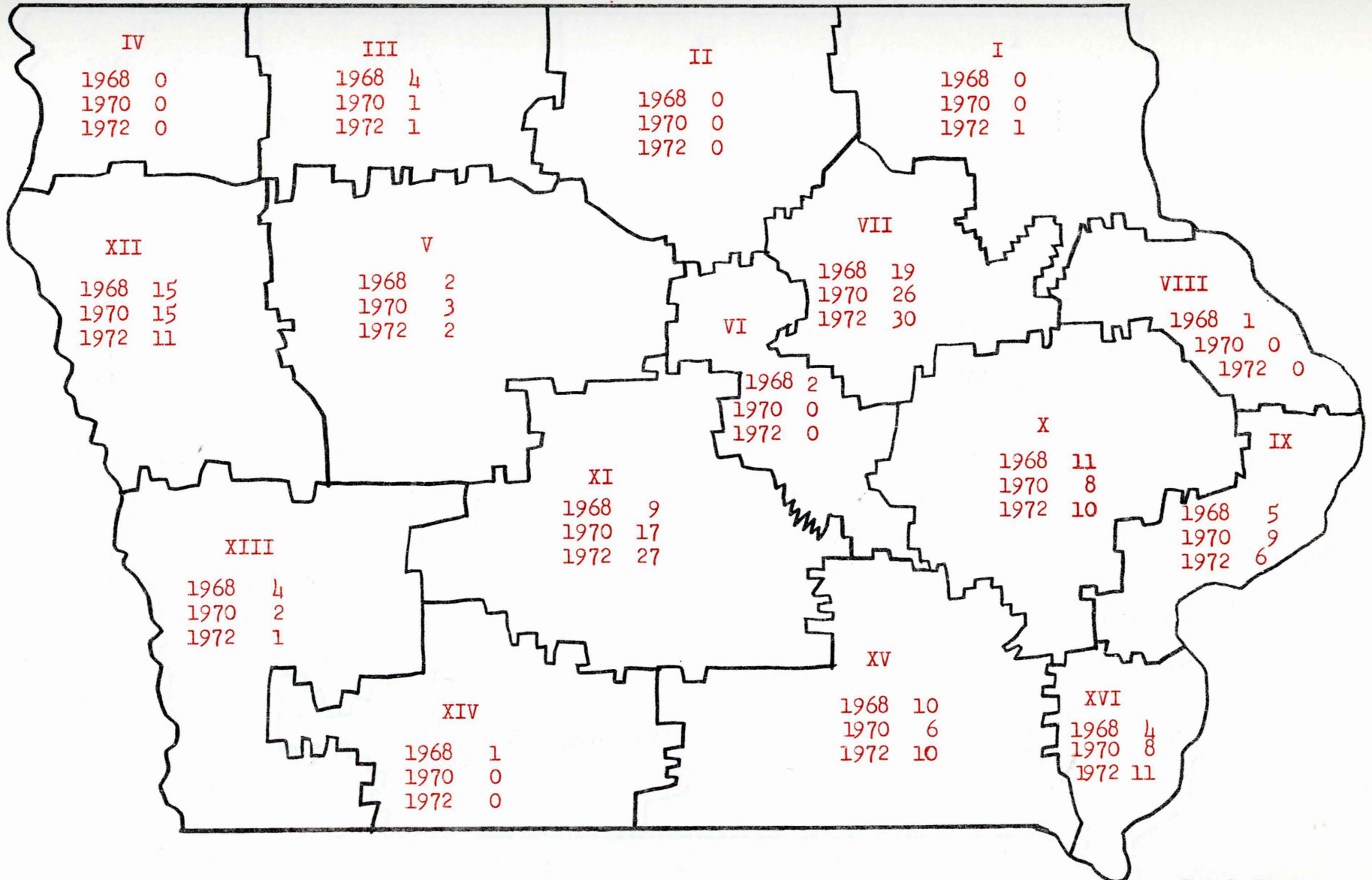
TABLE XI



NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
BY MERGED AREAS FOR FORGE PRESS OPERATORS

Total State	
1968	39
1970	41
1972	53

TABLE XII

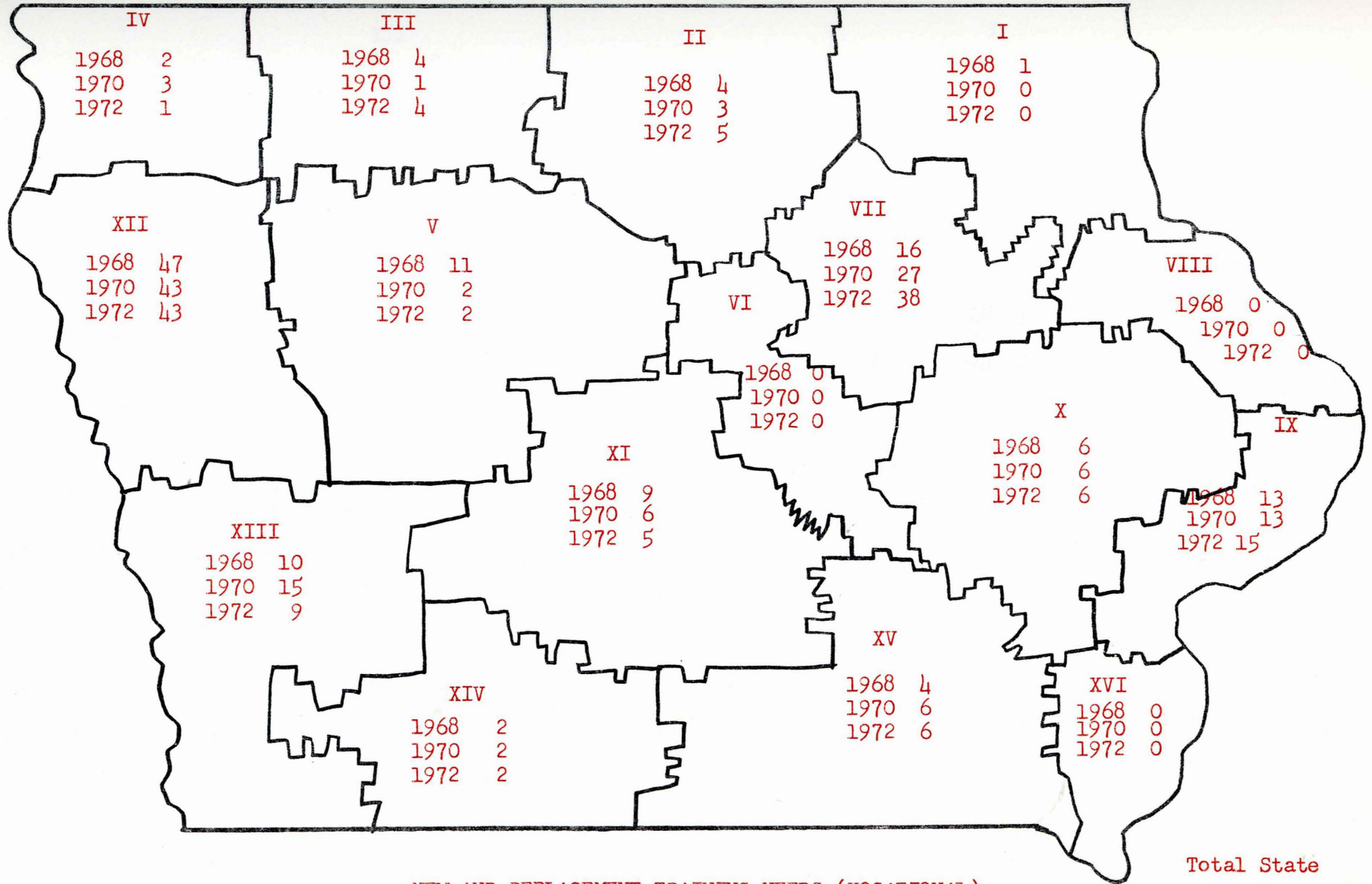


NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
 BY MERGED AREAS FOR HYDRAULIC MECHANIC

Total State
 1968 81
 1970 94
 1972 103

31

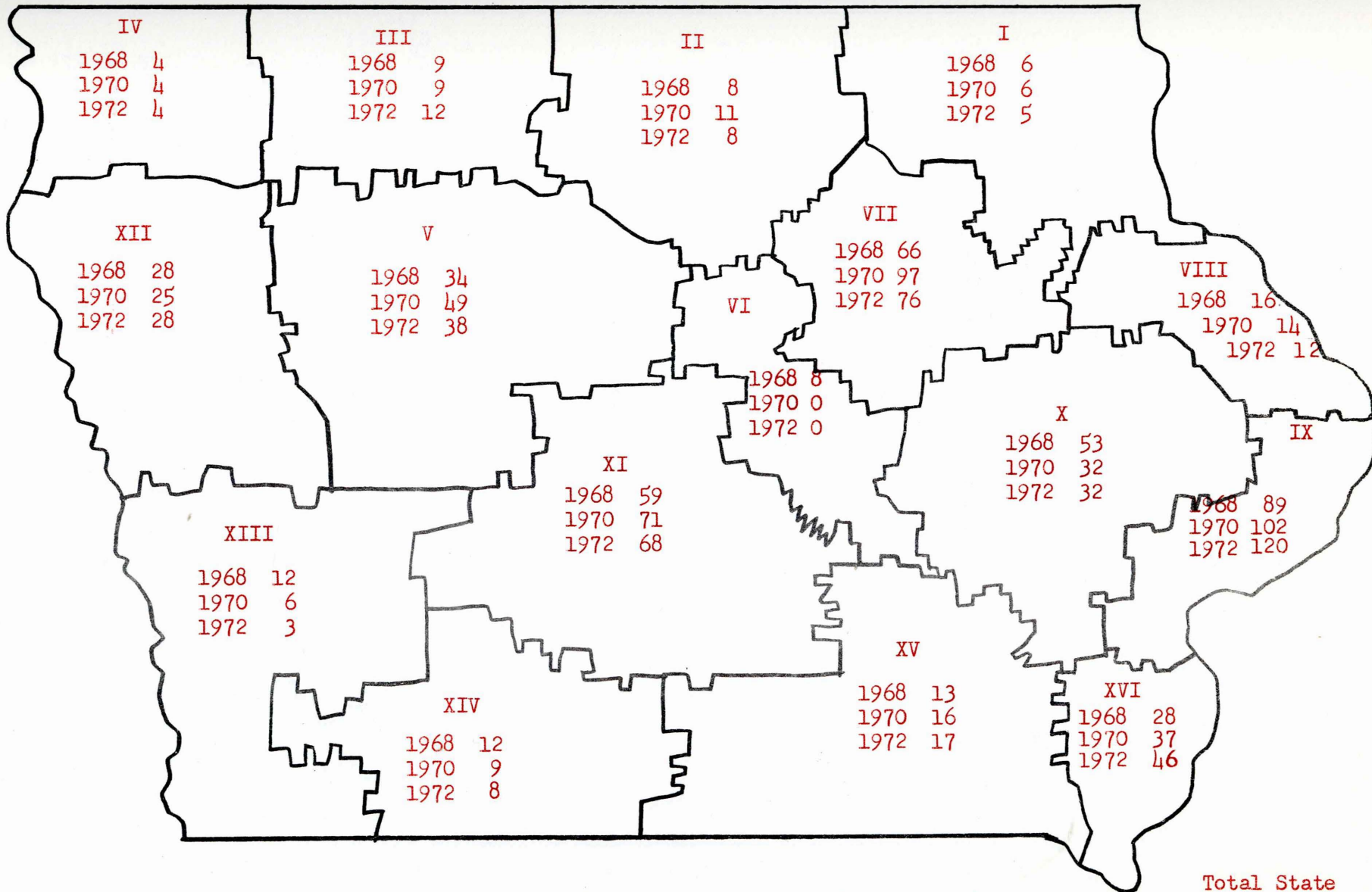
TABLE XIII



NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
 BY MERGED AREAS FOR INDUSTRIAL EQUIPMENT SALESMAN

Total State	
1968	129
1970	127
1972	146

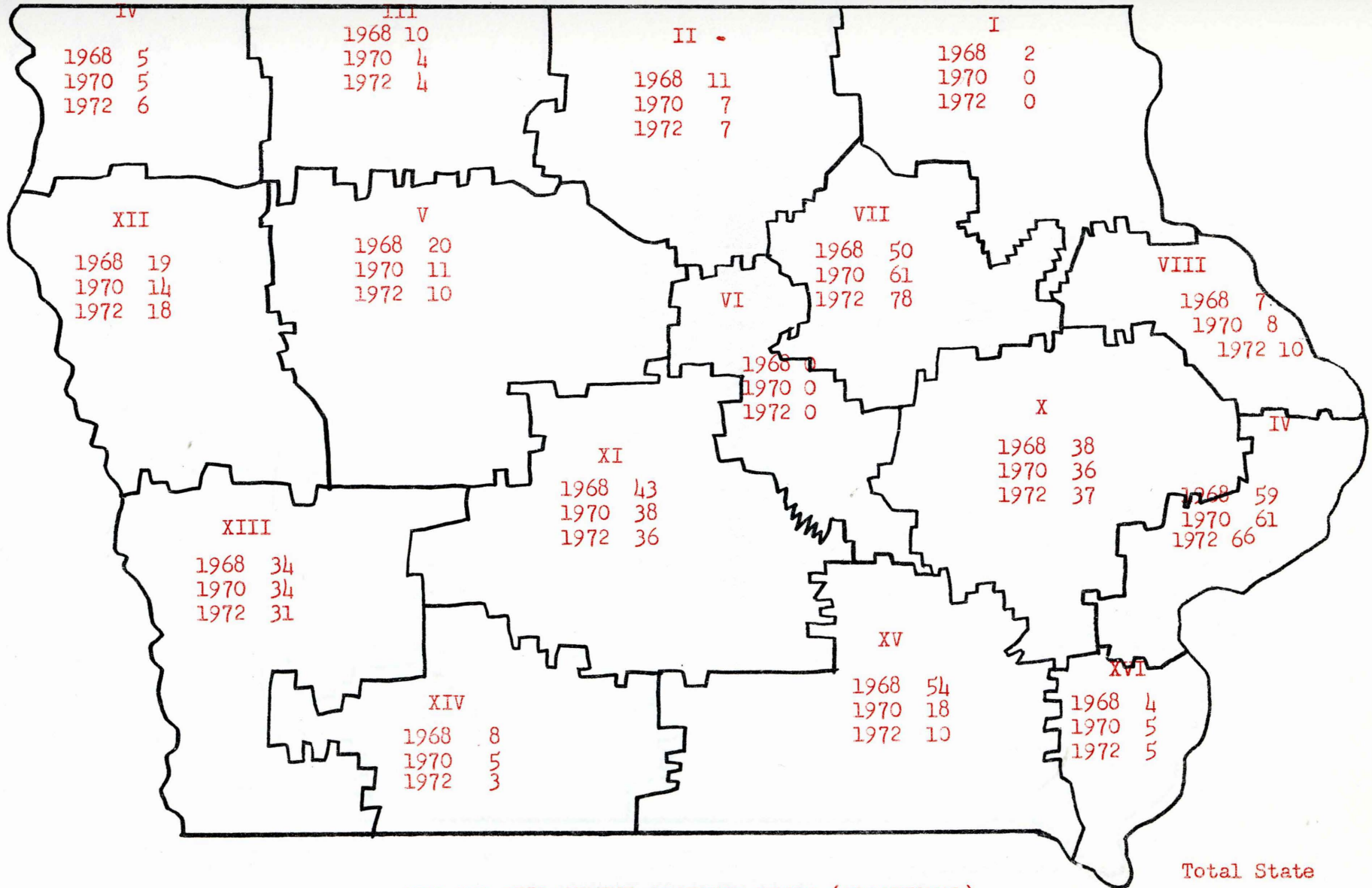
TABLE XIV



NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
BY MERGED AREAS FOR MACHINE REPAIRMAN

Total State
1968 445
1970 488
1972 477

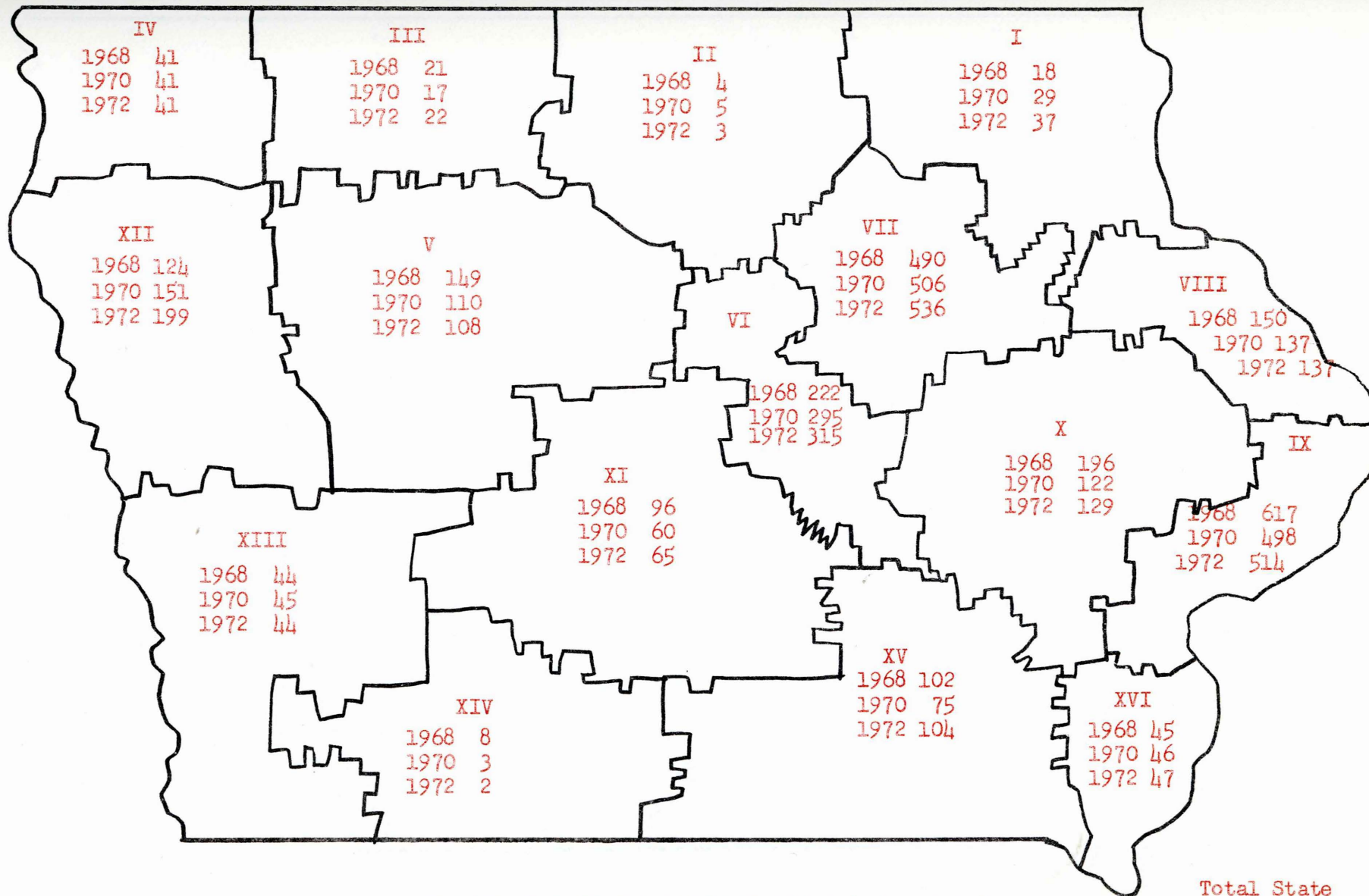
TABLE XV



NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
BY MERGED AREAS FOR MACHINIST (JOB SHOP)

Year	Needs
1968	364
1970	307
1972	361

TABLE XVI

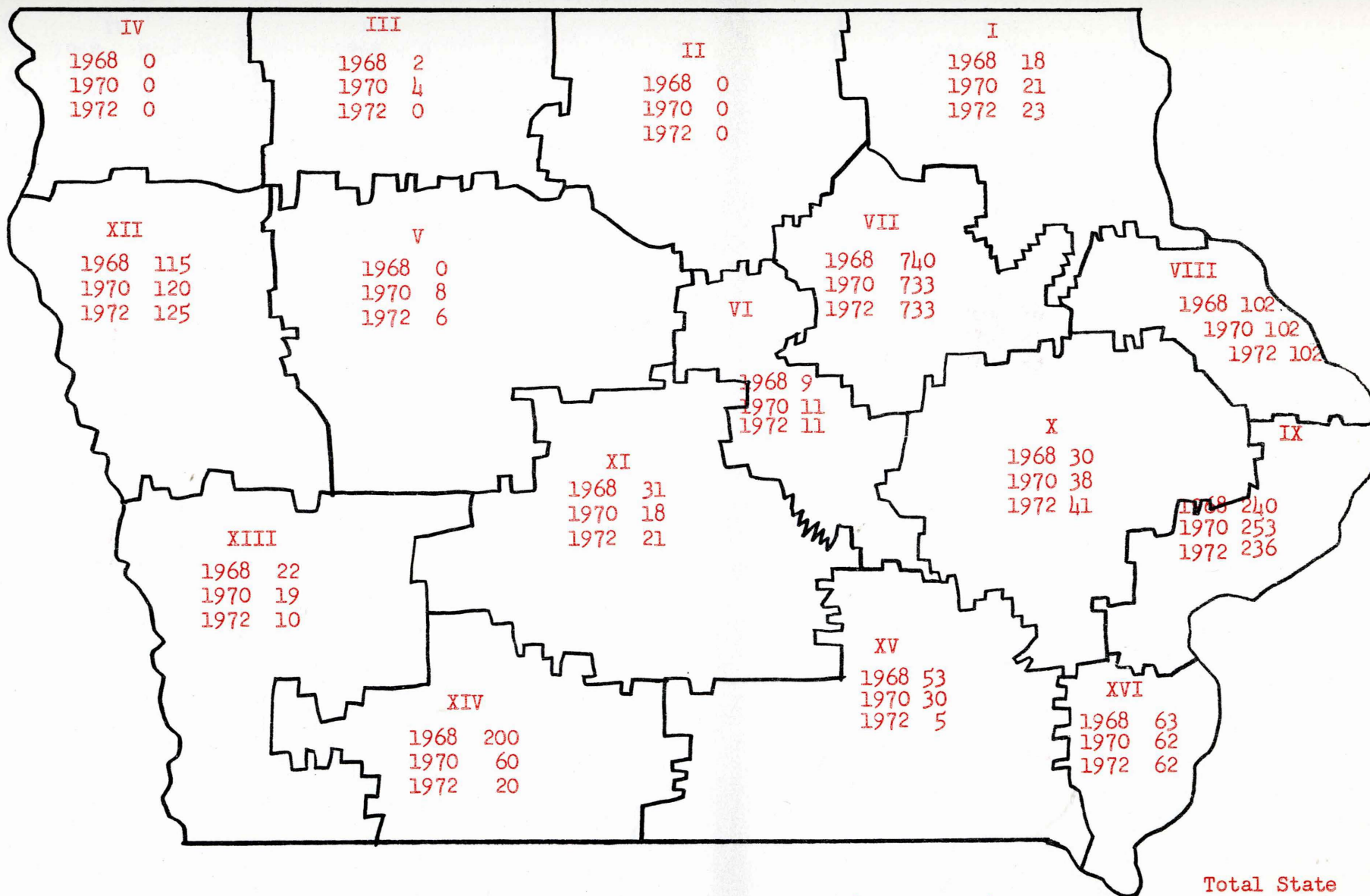


NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
BY MERGED AREAS FOR MACHINIST (PRODUCTION)

Total State

1968	2327
1970	2140
1972	2304

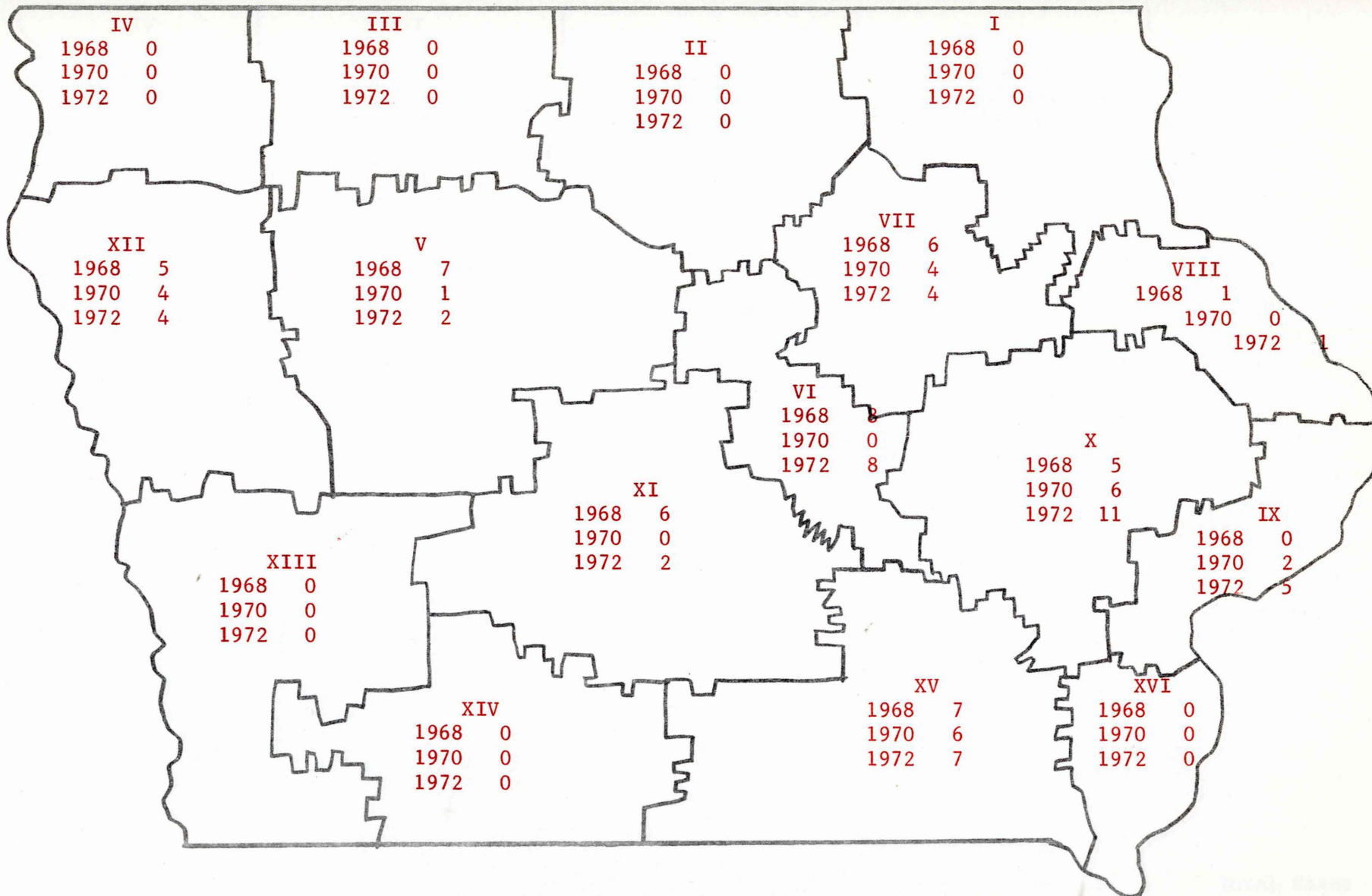
TABLE XVII



NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
 BY MERGED AREAS FOR MOLDER-FOUNDRY WORKER

Total State
 1968 1625
 1970 1479
 1972 1395

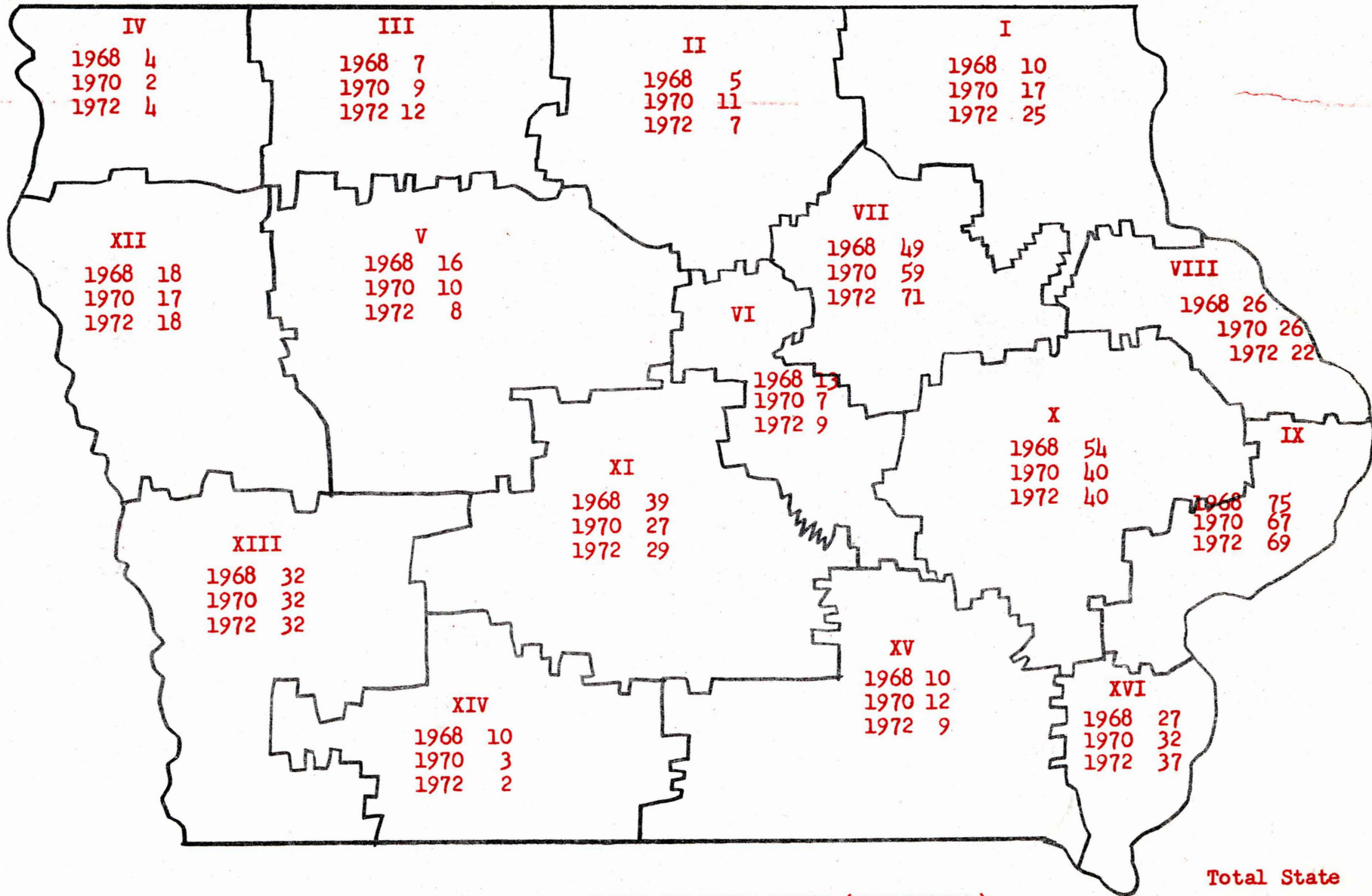
TABLE XVIII



NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
BY MERGED AREAS FOR PATTERNMAKER

Total State	
1968	45
1970	23
1972	44

TABLE XIX

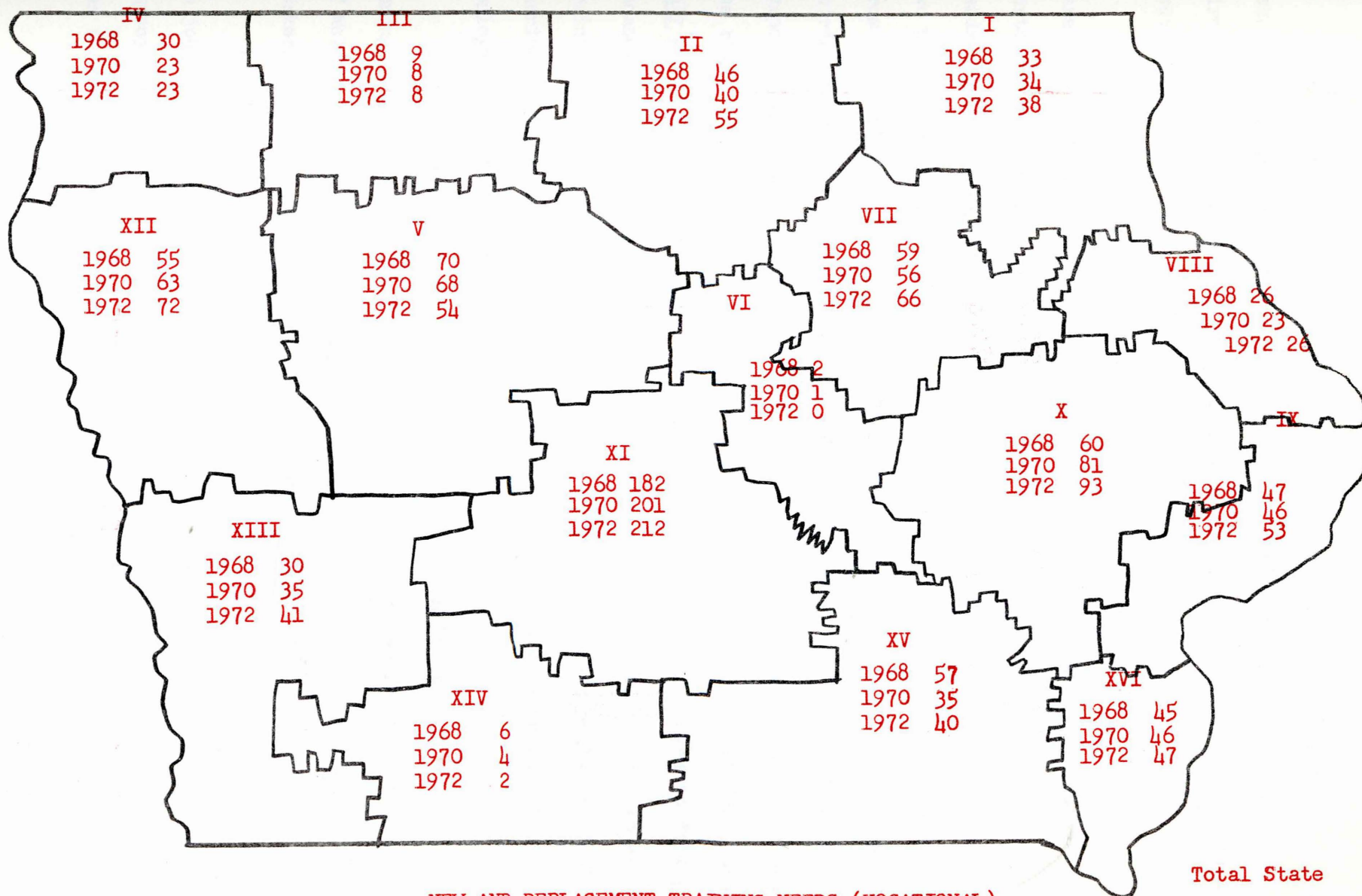


NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
BY MERGED AREAS FOR TOOL AND DIE MAKER

Total State

1968	395
1970	371
1972	394

TABLE XX



NEW AND REPLACEMENT TRAINING NEEDS (VOCATIONAL)
BY MERGED AREAS FOR WELDER (COMBINATION)

Total State	
1968	758
1970	764
1972	830

39

On-the-job training. Item six of the questionnaire used in this survey asked the respondent, "For positions in this job classification, would you hire graduates of vocational-technical programs possessing the skills listed above?"

The needs as expressed by those firms that answered NO to item six were tabulated as requiring on-the-job training. The respondent had the opportunity to elaborate in item seven, the method that would be used to fill needs if NO had been checked in item six. The choices in item seven included two which were variations of on-the-job training, one of hiring skilled workers from other firms, and "other". The number of responses indicating "other" and "hiring from other firms" were very small in number. For this reason all NO responses in item six were considered, "on-the-job training," in this study. The reader should realize that a YES response in item six did not imply that only graduates of vocational-technical programs would be employed to fill job vacancies. Many firms will undoubtedly continue to utilize their on-the-job training programs to fill job vacancies. However, if vocational-technical curriculum graduates are available they would be given the opportunity for employment in 440 firms in the State.

The greatest need for persons to be trained in the eleven occupations, through on-the-job training, is in the occupation of Assemblers. The occupation of Welding ranked second. Complete details on state-wide requirements for workers in eleven occupations are contained in Table XXI.

Occupations in which workers would be trained through on-the-job training in job classifications other than the eleven specifically included in this survey are listed in Table XXII. The greatest need expressed by employers was for packinghouse workers followed by the need for sheetmetal workers.

TABLE XXI

STATE-WIDE NEEDS FOR
NEW AND REPLACEMENT WORKERS TO BE ACQUIRED
BY ON-THE-JOB TRAINING

Occupations	<u>Employees to be Acquired by On-the-Job Training</u>								
	New Workers			Replacement Workers			Total New and Replacement Workers		
	1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	76	113	118	41	46	52	117	159	170
Forge Press Operators	10	13	12	7	6	7	17	18	19
Hydraulic Equipment Mechanic	15	15	13	4	9	9	19	24	24
Industrial Equipment Salesman	17	18	23	6	13	10	23	31	33
Machine Repairman	43	41	35	25	40	37	68	81	72
Machinist, Custom	18	24	26	14	14	17	32	38	43
Machinist, Production	43	44	13	31	23	19	74	67	32
Moulder-Foundry Worker	2	2	2	9	3	3	11	5	5
Patternmaker	15	7	9	2	3	2	17	10	11
Tool and Die Maker	31	20	21	22	13	17	53	33	38
Welder, Combination	40	51	43	53	63	59	93	114	102

TABLE XXII

STATE-WIDE NEEDS FOR WORKERS TRAINED BY
ON-THE-JOB TRAINING IN OCCUPATIONS OTHER THAN
THOSE SPECIFICALLY COVERED IN THIS SURVEY

	<u>Total 1968, 1970, 1972</u>
Electrician & Electrical Maintenance	7
Foreman and Supervisors	9
Galvanizer	3
Packinghouse Worker	145
Pipefitters	22
Printers and Related	12
Refrigeration Mechanic & Electrician	8
Sheetmetal Worker	44
Spray Painters	11
Wire Fabricator	7

III. NEEDS BY MERGED AREA DISTRICT

Vocational training. Tables XXIII through XXXVIII show employment patterns and new and replacement worker needs in the eleven occupations reported by industries in each Merged Area District. When analyzing the needs as reported in this summary it would be advisable that school administrators consider the replacement record in relation to total employment in the occupation during 1966. A high percentage of replacement may indicate further study is necessary on the part of local and area school officials before establishing a training program for an occupation in which there has been a record of high turn-over of personnel. Replacement rates computed on a state-wide basis may be found in Table VII.

When school officials consider the establishment of a training program, the need for workers in that occupation should be at least thirty annually before a program is established. This will provide for two classes to be offered in the same facility each day. Each class would then have the opportunity to use the shop facilities for five hours and also have the same facility available for part-time supplementary training. In some cases Merged Area Districts will need to combine needs to make efficient use of one shop facility in one of the Merged Area Districts. When training can be accomplished in a period of six months or less the number used above will need to be doubled in order to make year around use of the facility.

Supplemental training. Each responding industry was asked to estimate the number of employees they felt should be enrolled in part-time supplemental classes. These estimations are listed in Tables XXXIX through LIV. A tabulation of need for supplemental classes follow the tables showing employment patterns and preparatory training needs in each Merged Area District. These needs are shown by occupation. The reason for this is that, for instance,

the blueprint reading course content for a Machinist (Production) would be entirely different from the blueprint reading course content for a Welder. Instructor competencies would be different for each class also.

There will be a listing of need for trained workers in each Merged Area District in occupations not included in the eleven occupations surveyed by standard questionnaire. These needs will be shown for the six year period projection since, in the majority of cases, the needs are small.

TABLE XXIII

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING NEEDS
IN MERGED AREA DISTRICT I

11 FIRMS RESPONDING

Occupation	Employment Patterns					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
												1968	1970	1972
Assemblers	0	14	5	5	19	16	20	22	10	13	14	26	33	36
Hydraulic Equipment Mechanic	0	6	1	0	7	0	0	0	0	0	1	0	0	1
Industrial Equipment Salesman	0	4	0	1	4	0	0	0	1	0	0	1	0	0
Machine Repairman	0	12	0	1	12	3	3	2	3	3	3	6	6	5
Machinist, Custom	0	1	0	0	1	1	0	0	1	0	0	2	0	0
Machinist, Production	6	44	7	7	51	13	21	26	5	8	11	18	29	37
Moulder-Foundry Worker	0	15	4	13	19	7	7	7	11	14	16	18	21	23
Patternmaker	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tool & Die Maker	0	17	2	2	19	8	12	17	2	5	8	10	17	25
Welder, Combination	0	41	7	10	48	18	17	20	15	17	18	33	34	38

TABLE XXIV

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING NEEDS
IN MERGED AREA DISTRICT II

15 FIRMS RESPONDING

Occupation	Employment Patterns					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
												1968	1970	1972
Assemblers	0	3	0	0	3	0	0	1	0	0	1	0	0	2
Hydraulic Equipment Mechanic	0	5	0	0	5	0	0	0	0	0	0	0	0	0
Industrial Equipment Salesman	0	10	1	1	11	1	1	2	3	2	3	4	3	5
Machine Repairman-	0	82	7	19	89	3	4	3	5	7	5	8	11	8
Machinist, Custom	2	36	0	1	36	6	4	4	5	3	3	11	7	7
Machinist, Production	0	13	2	3	15	3	3	2	1	2	1	4	5	3
Moulder-Foundry Worker	0	4	0	0	4	0	0	0	0	0	0	0	0	0
Patternmaker	0	1	0	0	1	0	0	0	0	0	0	0	0	0
Tool and Die Maker	0	14	2	3	16	4	7	3	1	4	4	5	11	7
Welder, Combination	0	76	17	33	93	25	22	30	21	18	25	46	40	55

TABLE XXV

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT III

16 FIRMS RESPONDING

Occupation	Employment Patterns					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	0	32	11	19	43	15	12	6	9	3	3	24	15	9
Hydraulic Equipment Mechanic	0	5	0	0	5	2	1	1	2	0	0	4	1	1
Industrial Equipment Salesman	2	4	2	0	6	3	0	1	1	1	3	4	1	4
Machine Repairman	0	26	4	1	30	6	6	9	3	3	3	9	9	12
Machinist, Custom	0	15	0	1	15	7	3	3	3	1	1	10	4	4
Machinist, Production	3	33	9	6	42	14	10	12	7	7	10	21	17	22
Moulder-Foundry Worker	0	8	2	2	10	2	4	0	0	0	0	2	4	0
Patternmaker	0	0	1	0	1	0	1	0	0	0	0	0	1	0
Tool and Die Maker	1	15	4	3	19	4	7	9	3	2	3	7	9	12
Welder, Combination	0	79	3	89	82	6	6	5	3	2	3	9	8	8

TABLE XXVI

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT IV

6 FIRMS RESPONDING

Occupation	Employment Pattern					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	0	3	3	2	6	2	2	2	0	0	0	2	2	2
Forge Press Operators	0	2	0	0	2	0	0	0	0	0	0	0	0	0
Hydraulic Equipment Mechanic	0	6	1	0	7	0	0	0	0	0	0	0	0	0
Industrial Equipment Salesman	0	8	2	1	10	2	2	1	0	1	0	2	3	1
Machine Repairman	0	14	1	2	15	2	2	1	2	2	3	4	4	4
Machinist, Custom	0	38	8	15	46	5	4	4	0	1	2	5	5	6
Machinist, Production	0	112	15	37	127	11	9	11	30	32	31	41	41	42
Tool and Die Maker	0	10	1	0	11	4	2	3	0	0	1	4	2	4
Welder, Combination	0	53	15	19	68	11	10	10	19	13	13	30	23	23

TABLE XXVII

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT V

35 FIRMS RESPONDING

Occupations	Employment Pattern					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	0	97	28	0	125	14	17	22	30	28	30	44	45	52
Forge Press Operators	0	16	3	5	19	2	1	1	2	2	2	4	3	3
Hydraulic Equipment Mechanic	1	6	0	0	6	2	3	2	0	0	0	2	3	2
Industrial Equipment Salesman	0	38	10	2	48	7	2	2	4	0	0	11	2	2
Machine Repairman	0	143	6	16	149	12	24	13	22	25	25	34	49	38
Machinist, Custom	0	26	4	5	30	13	8	7	7	3	3	20	11	10
Machinist, Production	1	147	33	106	180	60	43	42	89	67	66	149	110	108
Moulder-Foundry Worker	0	2	1	0	3	0	6	4	0	2	2	0	8	6
Patternmaker	0	4	3	3	7	5	1	1	2	0	1	7	1	2
Tool and Die Maker	0	30	3	10	33	9	7	4	7	3	4	16	10	8
Welder, Combination	0	170	30	55	200	37	37	31	33	31	23	70	68	54

TABLE XXVIII

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT VI

16 FIRMS RESPONDING

Occupation	Employment Pattern					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	0	134	30	40	164	0	0	0	0	0	0	0	0	0
Hydraulic Equipment Mechanic	0	2	0	0	2	2	0	0	0	0	0	2	0	0
Industrial Equipment Salesman	0	2	0	0	2	0	0	0	0	0	0	0	0	0
Machine Repairman	0	42	6	4	48	3	0	0	5	0	0	8	0	0
Machinist, Custom	0	23	4	3	27	0	0	0	0	0	0	0	0	0
Machinist, Production	0	591	100	162	691	111	184	202	111	111	113	222	295	315
Moulder-Foundry Worker	0	109	9	28	118	7	8	8	2	3	3	9	11	11
Patternmaker	0	4	2	0	6	4	0	4	4	0	4	8	0	8
Tool and Die Maker	1	44	4	9	48	7	4	6	6	3	3	13	7	9
Welder, Combination	0	54	11	12	65	0	0	0	2	1	0	2	1	0

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT VII

41 FIRMS RESPONDING

Occupation	Employment Pattern					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	0	590	47	51	637	50	49	53	31	33	32	81	82	85
Forge Press Operators	0	7	1	0	8	0	0	0	1	0	1	1	0	1
Hydraulic Equipment Mechanic	0	55	7	6	62	11	14	16	8	12	14	19	26	30
Industrial Equipment Salesman	2	42	7	10	49	3	2	4	13	25	34	16	27	38
Machine Repairman	0	282	35	57	317	28	60	39	38	37	37	66	97	76
Machinist, Custom	0	250	16	28	266	32	37	52	18	24	26	50	61	78
Machinist, Production	0	2953	184	244	3137	220	231	259	270	275	277	490	506	536
Moulder-Foundry Worker	0	1027	365	310	1392	210	203	203	530	530	530	740	733	733
Patternmaker	0	73	3	2	76	2	2	2	4	2	2	12	13	14
Tool and Die Maker	0	162	17	19	179	40	47	59	9	12	12	49	59	71
Welder, Combination	2	253	43	59	296	36	33	39	23	23	27	59	56	66

TABLE XXX

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT VIII

18 FIRMS RESPONDING

Occupation	Employment Patterns					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
												1968	1970	1972
Assemblers	0	436	30	15	466	45	42	41	11	11	10	56	52	51
Forge Press Operators	0	2	1	1	3	0	0	0	0	0	0	0	0	0
Hydraulic Equipment Mechanic	0	5	0	0	5	1	0	0	0	0	0	1	0	0
Industrial Equipment Salesman	0	9	2	3	11	0	0	0	0	0	0	0	0	0
Machine Repairman	0	103	10	14	113	11	9	7	5	5	5	16	14	12
Machinist, Custom	1	75	22	7	97	5	5	6	2	3	4	7	8	10
Machinist, Production	0	1028	143	61	1171	105	97	97	45	40	40	150	137	137
Moulder-Foundry Worker	0	389	50	56	439	75	75	75	27	27	27	102	102	102
Patternmaker	0	23	1	2	24	0	0	0	1	0	1	1	0	1
Tool and Die Maker	0	59	28	16	87	18	20	16	8	6	6	26	26	22
Welder, Combination	0	87	18	20	105	15	14	15	11	10	11	26	23	26

TABLE XXXI

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT IX

56 FIRMS RESPONDING

Occupation	Employment Patterns					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	0	362	58	315	420	125	129	131	210	211	211	330	340	342
Forge Press Operators	0	18	20	9	38	3	7	7	4	4	5	7	11	12
Hydraulic Equipment Mechanic	0	8	1	0	9	4	5	5	1	4	1	5	9	6
Industrial Equipment Salesman	0	24	2	2	26	9	9	12	4	4	3	13	13	15
Machine Repairman	1	614	27	72	641	44	50	59	45	52	61	89	102	120
Machinist, Custom	0	212	1	48	213	29	31	34	30	30	62	59	61	66
Machinist, Production	5	715	101	365	816	311	216	224	306	282	290	617	498	514
Moulder-Foundry Worker	0	80	52	182	132	29	42	20	211	211	216	240	253	236
Patternmaker	0	21	0	0	21	0	1	3	0	1	2	0	2	5
Tool and Die Maker	0	139	19	11	158	42	35	38	33	32	31	75	67	69
Welder, Combination	1	138	26	44	164	20	20	27	27	26	26	47	46	53

TABLE XXXII

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT X

56 FIRMS RESPONDING

Occupation	Employment Patterns					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	3	331	58	57	399	36	29	30	23	22	24	59	51	54
Forge Press Operators	0	34	3	6	37	1	2	2	1	1	1	2	3	3
Hydraulic Equipment Mechanic	0	13	5	5	18	7	5	5	4	3	5	11	8	10
Industrial Equipment Salesman	0	24	0	1	24	3	3	3	3	3	3	6	6	6
Machine Repairman	0	236	43	32	279	35	17	17	18	15	15	53	32	32
Machinist, Custom	1	138	17	16	155	32	30	31	6	6	6	38	36	37
Machinist, Production	2	990	200	450	1190	92	57	64	104	65	65	196	122	129
Moulder-Foundry Worker	0	108	83	114	191	11	19	23	19	19	18	30	38	41
Patternmaker	0	10	0	0	10	4	6	11	1	0	0	5	6	11
Tool and Die Maker	1	155	19	11	174	32	20	19	22	20	21	54	40	40
Welder, Combination	1	284	78	75	362	40	55	59	20	26	34	60	81	93

TABLE XXXIII

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT XI

66 FIRMS RESPONDING

Occupation	Employment Pattern					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	0	169	87	66	256	24	12	16	26	26	32	50	38	48
Forge Press Operators	0	0	2	0	2	0	2	4	0	0	1	0	2	5
Hydraulic Equipment Mechanic	0	37	3	6	40	4	6	10	5	11	17	9	17	27
Industrial Equipment Salesman	0	44	11	8	55	7	4	3	2	2	2	9	6	5
Machine Repairman	3	346	39	26	385	34	40	34	25	31	34	59	71	68
Machinist, Custom	0	91	11	18	102	29	21	21	14	17	25	43	38	46
Machinist, Production	0	399	179	87	578	60	32	33	36	28	32	96	60	65
Moulder-Foundry Worker	0	53	4	48	57	19	10	13	12	8	8	31	18	21
Patternmaker	0	4	5	4	9	5	0	0	1	0	2	6	0	2
Tool and Die Maker	1	63	25	16	88	31	20	21	8	7	8	39	27	29
Welder, Combination	0	556	147	188	703	99	115	120	84	86	92	182	201	212

TABLE XXXIV

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT XII

28 FIRMS RESPONDING

Occupation	Employment Pattern					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers 1968	1970	1972
Assemblers	1	56	45	56	101	75	88	100	48	61	32	123	149	132
Forge Press Operators	0	5	3	4	8	7	13	19	6	7	8	13	20	27
Hydraulic Equipment Mechanic	0	12	4	5	16	10	10	8	5	5	3	15	15	11
Industrial Equipment Salesman	0	9	3	26	12	32	32	32	15	11	11	47	43	43
Machine Repairman	0	67	16	20	83	16	13	14	12	12	14	28	25	28
Machinist, Custom	0	19	3	5	22	11	10	11	8	4	7	19	14	18
Machinist, Production	0	204	24	58	228	71	100	125	53	51	74	124	151	199
Moulder-Foundry Worker	3	56	0	200	56	30	35	40	85	85	85	115	120	125
Patternmaker	0	3	0	0	3	4	3	3	1	1	1	5	4	4
Tool and Die Maker	0	15	3	5	18	12	12	13	6	5	5	18	17	18
Welder, Combination	1	89	42	51	131	28	35	45	27	28	27	55	63	72

TABLE XXXV

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT XIII

12 FIRMS RESPONDING

Occupation	Employment Pattern					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	2	51	20	19	71	25	24	19	4	4	2	29	28	21
Forge Press Operators	0	17	4	4	21	3	1	1	3	1	1	6	2	2
Hydraulic Equipment Mechanic	0	5	0	0	5	3	2	0	1	0	1	4	2	1
Industrial Equipment Salesman	0	25	3	6	28	6	10	12	4	5	7	10	15	19
Machine Repairman	0	38	4	10	42	9	6	3	3	0	0	12	6	3
Machinist, Custom	1	47	4	11	51	18	19	17	16	15	14	34	34	31
Machinist, Production	0	55	10	24	65	24	28	25	20	17	19	44	45	44
Moulder-Foundry Worker	0	15	1	2	16	12	10	6	10	9	4	22	19	10
Tool and Die Maker	0	46	5	11	51	18	19	20	14	13	12	32	32	32
Welder, Combination	0	40	13	26	53	17	18	26	13	17	15	30	35	41

TABLE XXXVI

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT XIV

7 FIRMS RESPONDING

Occupation	Employment Pattern					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
												1968	1970	1972
Assemblers	0	9	3	3	12	2	0	0	2	0	0	4	0	0
Hydraulic Equipment Mechanic	0	1	0	0	1	1	0	0	0	0	0	1	0	0
Industrial Equipment Salesman	0	1	0	0	1	2	2	2	0	0	0	2	2	2
Machine Repairman	0	31	5	2	36	8	6	6	4	3	2	12	9	8
Machinist, Custom	0	10	3	0	13	5	4	2	3	1	1	8	5	3
Machinist, Production	0	6	1	3	7	6	2	1	2	1	1	8	3	2
Moulder-Foundry Worker	0	240	20	120	260	100	30	10	100	30	10	200	60	20
Tool and Die Maker	0	6	1	1	7	7	2	1	3	1	1	10	3	2
Welder, Combination	0	7	2	2	9	3	2	1	3	2	1	6	4	2

TABLE XXXVII

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT XV

26 FIRMS RESPONDING

Occupation	Employment Pattern					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	0	245	90	28	335	12	6	6	17	5	5	29	11	11
Forge Press Operators	0	4	2	1	6	6	0	0	0	0	0	6	0	0
Hydraulic Equipment Mechanic	1	19	1	4	20	8	4	7	2	2	3	10	6	10
Industrial Equipment Salesman	0	12	1	2	13	3	4	4	1	2	2	4	6	6
Machine Repairman	0	112	4	15	116	6	8	10	7	8	7	13	16	17
Machinist, Custom	0	62	15	23	77	29	16	7	25	2	3	54	18	10
Machinist, Production	0	221	161	92	382	60	50	73	42	25	31	102	75	104
Moulder-Foundry Worker	0	97	8	36	105	22	12	0	31	18	5	53	30	5
Patternmaker	1	13	1	2	14	4	3	5	3	2	2	7	5	7
Tool and Die Maker	0	39	3	1	42	7	10	7	3	2	2	10	12	9
Welder, Combination	0	200	54	35	254	27	23	25	30	12	15	57	35	40

TABLE XXXVIII

EMPLOYMENT PATTERNS AND PREPARATORY TRAINING
NEEDS IN MERGED AREA DISTRICT XVI

31 FIRMS RESPONDING

Occupation	Employment Pattern					Employees Needed by Vocational Training								
	Number of Positions Closed in 1966	Number Employed in January 1966	New Employees Jan.-Dec. 1966	Replacements Jan.-Dec. 1966	Total Employees January 1967	New Employees 1968	New Employees 1970	New Employees 1972	Replacements 1968	Replacements 1970	Replacements 1972	Total New and Replacement Workers		
						1968	1970	1972	1968	1970	1972	1968	1970	1972
Assemblers	0	251	36	96	287	20	30	51	29	44	50	49	74	101
Hydraulic Equipment Mechanic	0	24	2	5	26	1	3	5	3	5	6	4	8	11
Industrial Equipment Salesman	0	6	1	1	7	0	0	0	0	0	0	0	0	0
Machine Repairman	0	211	21	50	232	13	17	20	15	20	26	28	37	46
Machinist, Custom	0	33	2	2	35	2	2	3	2	3	2	4	5	5
Machinist, Production	0	225	55	24	280	37	46	67	22	27	37	59	73	104
Moulder-Foundry Worker	0	68	9	63	77	0	0	0	63	62	62	63	62	62
Patternmaker	0	13	0	1	13	0	0	0	0	0	0	0	0	0
Tool and Die Maker	0	93	7	7	100	11	14	18	16	18	19	27	32	37
Welder, Combination	0	232	35	35	267	23	23	24	22	23	23	45	46	47

TABLE XXXIX

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT IHYDRAULIC EQUIPMENT MECHANICS

<u>1</u>	Gasoline Engine Tune-up
<u>5</u>	Electric Motor Controls
<u>4</u>	Industrial Hydraulic Controls
<u>2</u>	Electrical Machinery Controls

MACHINE REPAIRMAN, MAINTENANCE

<u>10</u>	Maintenance Welding
<u>8</u>	Industrial Hydraulic Circuits
<u>8</u>	Electrical Motor Controls
<u>8</u>	Machine Tool Operation
<u>5</u>	Use of Machinery's Handbook
<u>4</u>	Other (Specify)

MACHINIST (CUSTOM, JOB SHOP)

<u>1</u>	Blueprint Reading
<u>1</u>	Applied Mathematics
<u>1</u>	Tool Grinding

MACHINIST (PRODUCTION)

<u>10</u>	Applied Shop Mathematics
<u>1</u>	Turret Lathe Set-up
<u>7</u>	Blueprint Reading

MOLDER-FOUNDRY WORKER

<u>1</u>	Non-Ferrous Metallurgy
<u>1</u>	Pattern Repair

TOOL AND DIE MAKER

<u>2</u>	Ferrous Metallurgy
<u>8</u>	Tool and Die Design
<u>2</u>	Fixture Design
<u>1</u>	Electric and Gas Welding
<u>3</u>	Machine Tool Operation
<u>8</u>	Applied Plane Trigonometry
<u>1</u>	Tool Grinding

WELDER, COMBINATION

<u>8</u>	Vertical and Overhead Welding
<u>7</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>10</u>	Blueprint Reading for Welders
<u>4</u>	Mathematics for Welders
<u>7</u>	Heat Treatment of Metals
<u>7</u>	Welding of Non-Ferrous Metals
<u>10</u>	Weld Fixture Design
<u>4</u>	Applied Geometric Layout

TABLE XL

NEEDS FOR PART TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT II

ASSEMBLERS

1 Use of Measuring Instruments

INDUSTRIAL EQUIPMENT SALESMAN

1 Time and Motion Study
2 Industrial Cost Estimating
1 Specification and Bid Writing

MACHINE REPAIRMAN, MAINTENANCE

21 Maintenance Welding
4 Industrial Hydraulic Circuits
21 Electrical Motor Controls
16 Machine Tool Operation
12 Use of Machinery's Handbook
2 Other (Specify)

MACHINIST (CUSTOM, JOB SHOP)

13 Blueprint Reading
3 Ferrous Metallurgy
6 Applied Mathematics
12 Tool Grinding
13 Welding
3 Use of Measuring Instruments
3 Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

1 Applied Shop Mathematics
1 Screw Machine Set-up
2 Gear Cutting Machinery Set-up
3 Blueprint Reading

TOOL AND DIE MAKER

5 Ferrous Metallurgy
6 Tool and Die Design
4 Fixture Design
1 Machine Tool Operation
1 Applied Plane Trigonometry
3 Tool Grinding

WELDER, COMBINATION

4 Vertical and Overhead Welding
3 Inert Gas Welding (M.I.G. & T.I.G.)
6 Blueprint Reading for Welders
6 Mathematics for Welders
6 Welding of Non-Ferrous Metals

TABLE XLI

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT III

ASSEMBLERS

<u>42</u>	Blueprint Reading
<u>42</u>	Applied Mathematics
<u>45</u>	Use of Measuring Instruments
<u>4</u>	Industrial Hydraulic Circuits

HYDRAULIC EQUIPMENT MECHANICS

<u>2</u>	Gasoline Engine Tune-up
<u>2</u>	Industrial Hydraulic Controls
<u>4</u>	Electric Motor Controls

INDUSTRIAL EQUIPMENT SALESMAN

<u>3</u>	Industrial Cost Estimating
<u>6</u>	Industrial Electrical Circuits
<u>1</u>	Industrial Hydraulic Circuits
<u>2</u>	Specification and Bid Writing
<u>1</u>	Salesmanship Principles
<u>3</u>	Machine Tool Operation

MACHINE REPAIRMAN, MAINTENANCE

<u>11</u>	Maintenance Welding
<u>3</u>	Electrical Motor Controls
<u>13</u>	Machine Tool Operation
<u>14</u>	Use of Machinery's Handbook

MACHINIST (CUSTOM, JOB SHOP)

<u>5</u>	Blueprint Reading
<u>2</u>	Ferrous Metallurgy
<u>5</u>	Applied Mathematics
<u>3</u>	Tool Grinding
<u>4</u>	Welding
<u>3</u>	Use of Measuring Instruments
<u>3</u>	Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

<u>34</u>	Applied Shop Mathematics
<u>14</u>	Screw Machine Set-up
<u>18</u>	Turret Lathe Set-up
<u>3</u>	Gear Cutting Machinery Set-up
<u>30</u>	Blueprint Reading

TOOL AND DIE MAKER

<u>6</u>	Ferrous Metallurgy
<u>10</u>	Tool and Die Design
<u>10</u>	Fixture Design
<u>8</u>	Use of Mechanics' Handbooks
<u>7</u>	Electric and Gas Welding
<u>11</u>	Machine Tool Operation
<u>5</u>	Applied Plane Trigonometry
<u>8</u>	Tool Grinding

WELDER, COMBINATION

<u>10</u>	Vertical and Overhead Welding
<u>10</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>5</u>	Blueprint Reading for Welders
<u>6</u>	Mathematics for Welders
<u>3</u>	Applied Geometric Layout
<u>7</u>	Heat Treatment of Metals
<u>13</u>	Welding of Non-Ferrous Metals
<u>6</u>	Weld Fixture Design

TABLE XLII

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT IV

ASSEMBLERS

<u>3</u>	Blueprint Reading
<u>3</u>	Applied Mathematics
<u>3</u>	Use of Measuring Instruments
<u>4</u>	Industrial Hydraulic Circuits

HYDRAULIC EQUIPMENT MECHANICS

<u>2</u>	Electrical Machinery Controls
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INDUSTRIAL EQUIPMENT SALESMAN

<u>4</u>	Time and Motion Study
<u>4</u>	Industrial Cost Estimating
<u>3</u>	Industrial Electrical Circuits
<u>4</u>	Industrial Hydraulic Circuits
<u>4</u>	Salesmanship Principles
<u>4</u>	Specification and Bid Writing
<u>4</u>	Machine Tool Operation
<u>6</u>	Other (Specify)

MACHINE REPAIRMAN, MAINTENANCE

<u>3</u>	Maintenance Welding
<u>4</u>	Industrial Hydraulic Circuits
<u>4</u>	Electrical Motor Controls
<u>14</u>	Machine Tool Operation
<u>13</u>	Use of Machinery's Handbook

MACHINIST (CUSTOM, JOB SHOP)

<u>40</u>	Blueprint Reading
<u>40</u>	Applied Mathematics
<u>20</u>	Tool Grinding
<u>20</u>	Use of Measuring Instruments

MACHINIST (PRODUCTION)

<u>56</u>	Applied Shop Mathematics
<u>27</u>	Screw Machine Set-up
<u>12</u>	Turret Lathe Set-up
<u>4</u>	Gear Cutting Machinery Set-up
<u>71</u>	Blueprint Reading

TOOL AND DIE MAKER

<u>7</u>	Tool and Die Design
<u>4</u>	Fixture Design
<u>8</u>	Use of Mechanics' Handbooks
<u>11</u>	Electric and Gas Welding
<u>8</u>	Machine Tool Operation
<u>6</u>	Applied Plane Trigonometry
<u>6</u>	Tool Grinding

WELDER, COMBINATION

<u>14</u>	Vertical and Overhead Welding
<u>20</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>14</u>	Blueprint Reading for Welders
<u>14</u>	Mathematics for Welders
<u>14</u>	Applied Geometric Layout
<u>2</u>	Heat Treatment of Metals
<u>16</u>	Weld Fixture Design
<u>7</u>	Welding of Non-Ferrous Metals

TABLE XLIII

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT VASSEMBLERS

14 Blueprint Reading
2 Applied Mathematics
14 Use of Measuring Instruments

FORGE PRESS OPERATORS

7 Blueprint Reading
5 Ferrous Metallurgy
5 Applied Mathematics
5 Use of Measuring Instruments

HYDRAULIC EQUIPMENT MECHANICS

3 Industrial Hydraulic Controls
1 Electric Motor Controls
3 Electrical Machinery Controls

INDUSTRIAL EQUIPMENT SALESMAN

1 Time and Motion Study
1 Industrial Cost Estimating
6 Industrial Electrical Circuits
2 Industrial Hydraulic Circuits
2 Specification and Bid Writing
2 Salesmanship Principles
2 Machine Tool Operation
1 Other (Specify)

MACHINE REPAIRMAN, MAINTENANCE

12 Maintenance Welding
13 Industrial Hydraulic Circuits
17 Electrical Motor Controls
11 Machine Tool Operation
8 Use of Machinery's Handbook
2 Other (Specify)

MACHINIST (CUSTOM, JOB SHOP)

5 Blueprint Reading
5 Ferrous Metallurgy
6 Applied Mathematics
3 Tool Grinding
6 Welding
2 Use of Measuring Instruments
4 Use of Mechanics' Handbooks
3 Other (Specify)

MACHINIST (PRODUCTION)

99 Applied Shop Mathematics
20 Screw Machine Set-up
89 Turret Lathe Set-up
1 Gear Cutting Machinery Set-up
13 Blueprint Reading
3 Other (Specify)

MOLDER-FOUNDRY WORKER

2 Non-Ferrous Metallurgy
1 Pattern Repair
1 Cupola Operating Theory
3 Welding

PATTERNMAKER

7 Plastic Patternmaking
1 Applied Solid Geometry
1 Machine Tool Operation
1 Gas and Electric Welding
1 Applied Geometric Layout
1 Blueprint Reading

TOOL AND DIE MAKER

7 Ferrous Metallurgy
13 Tool and Die Design
11 Fixture Design
7 Use of Mechanics' Handbooks
3 Electric and Gas Welding
8 Machine Tool Operation
5 Applied Plane Trigonometry
12 Tool Grinding
2 Other (Specify)

WELDER, COMBINATION

28 Vertical and Overhead Welding
26 Inert Gas Welding (M.I.G. & T.I.G.)
27 Blueprint Reading for Welders
5 Mathematics for Welders
6 Applied Geometric Layout
13 Heat Treatment of Metals
22 Welding of Non-Ferrous Metals
19 Weld Fixture Design

TABLE XLIV

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT VI

ASSEMBLERS

2 Blueprint Reading
1 Applied Mathematics

HYDRAULIC EQUIPMENT MECHANICS

1 Industrial Hydraulic Controls
1 Electric Motor Controls
1 Electrical Machinery Controls

INDUSTRIAL EQUIPMENT SALESMAN

9 Time and Motion Study
2 Industrial Cost Estimating
10 Industrial Electrical Circuits
5 Industrial Hydraulic Circuits
3 Specification and Bid Writing
2 Salesmanship Principles
7 Machine Tool Operation

MACHINE REPAIRMAN, MAINTENANCE

10 Maintenance Welding
19 Industrial Hydraulic Circuits
21 Electrical Motor Controls
12 Machine Tool Operation
10 Use of Machinery's Handbook

MACHINIST (CUSTOM, JOB SHOP)

4 Blueprint Reading
2 Ferrous Metallurgy
1 Tool Grinding
5 Welding
18 Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

231 Applied Shop Mathematics
4 Screw Machine Set-up
331 Turret Lathe Set-up
4 Gear Cutting Machinery Set-up
142 Blueprint Reading

MOLDER-FOUNDRY WORKER

10 Ferrous Metallurgy
3 Non-Ferrous Metallurgy
2 Pattern Repair
3 Cupola Operating Theory
3 Welding

TOOL AND DIE MAKER

7 Ferrous Metallurgy
39 Tool and Die Design
32 Fixture Design
12 Use of Mechanics' Handbooks
30 Electric and Gas Welding
5 Machine Tool Operation
6 Applied Plane Trigonometry
4 Tool Grinding

WELDER, COMBINATION

6 Vertical and Overhead Welding
11 Inert Gas Welding (M.I.G. & T.I.G.)
1 Blueprint Reading for Welders
2 Mathematics for Welders
11 Applied Geometric Layout
29 Heat Treatment of Metals
30 Welding of Non-Ferrous Metals
4 Weld Fixture Design

TABLE XLV

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT VII

ASSEMBLERS

<u>216</u>	Blueprint Reading
<u>112</u>	Applied Mathematics
<u>157</u>	Use of Measuring Instruments
<u>87</u>	Industrial Hydraulic Circuits

FORGE PRESS OPERATORS

<u>2</u>	Blueprint Reading
<u>1</u>	Use of Measuring Instruments

HYDRAULIC EQUIPMENT MECHANICS

<u>1</u>	Gasoline Engine Tune-up
<u>28</u>	Industrial Hydraulic Controls
<u>7</u>	Electric Motor Controls
<u>4</u>	Electrical Machinery Controls

INDUSTRIAL EQUIPMENT SALESMAN

<u>7</u>	Time and Motion Study
<u>5</u>	Industrial Cost Estimating
<u>2</u>	Industrial Electrical Circuits
<u>5</u>	Industrial Hydraulic Circuits
<u>2</u>	Specification and Bid Writing
<u>22</u>	Machine Tool Operation
<u>2</u>	Other (Specify)

MACHINE REPAIRMAN, MAINTENANCE

<u>23</u>	Maintenance Welding
<u>60</u>	Industrial Hydraulic Circuits
<u>23</u>	Electrical Motor Controls
<u>40</u>	Machine Tool Operation
<u>16</u>	Use of Machinery's Handbook

MACHINIST (CUSTOM, JOB SHOP)

<u>41</u>	Blueprint Reading
<u>3</u>	Ferrous Metallurgy
<u>41</u>	Applied Mathematics
<u>12</u>	Tool Grinding
<u>5</u>	Welding
<u>3</u>	Use of Measuring Instruments
<u>62</u>	Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

<u>835</u>	Applied Shop Mathematics
<u>10</u>	Screw Machine Set-up
<u>27</u>	Turret Lathe Set-up
<u>1</u>	Gear Cutting Machinery Set-up
<u>554</u>	Blueprint Reading

MOLDER-FOUNDRY WORKER

<u>44</u>	Ferrous Metallurgy
<u>3</u>	Non-Ferrous Metallurgy
<u>2</u>	Pattern Repair
<u>14</u>	Cupola Operating Theory
<u>18</u>	Welding

PATTERNMAKER

<u>17</u>	Plastic Patternmaking
<u>3</u>	Applied Solid Geometry
<u>4</u>	Machine Tool Operation
<u>2</u>	Gas and Electric Welding
<u>4</u>	Applied Geometric Layout
<u>4</u>	Blueprint Reading

TOOL AND DIE MAKER

<u>5</u>	Ferrous Metallurgy
<u>28</u>	Tool and Die Design
<u>24</u>	Fixture Design
<u>45</u>	Use of Mechanics' Handbooks
<u>20</u>	Electric and Gas Welding
<u>35</u>	Machine Tool Operation
<u>19</u>	Applied Plane Trigonometry
<u>13</u>	Tool Grinding

WELDER, COMBINATION

<u>27</u>	Vertical and Overhead Welding
<u>30</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>52</u>	Blueprint Reading for Welders
<u>30</u>	Mathematics for Welders
<u>12</u>	Applied Geometric Layout
<u>6</u>	Heat Treatment of Metals
<u>20</u>	Welding of Non-Ferrous Metals
<u>11</u>	Weld Fixture Design

TABLE XLVI

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT VIII

ASSEMBLERS

<u>5</u>	Blueprint Reading
<u>4</u>	Use of Measuring Instruments

HYDRAULIC EQUIPMENT MECHANICS

<u>3</u>	Gasoline Engine Tune-up
<u>6</u>	Industrial Hydraulic Controls
<u>3</u>	Electric Motor Controls
<u>4</u>	Electrical Machinery Controls

INDUSTRIAL EQUIPMENT SALESMAN

<u>4</u>	Time and Motion Study
<u>4</u>	Industrial Cost Estimating
<u>10</u>	Salesmanship Principles

MACHINE REPAIRMAN, MAINTENANCE

<u>8</u>	Maintenance Welding
<u>9</u>	Industrial Hydraulic Circuits
<u>10</u>	Electrical Motor Controls
<u>9</u>	Machine Tool Operation
<u>10</u>	Use of Machinery's Handbook

MACHINIST (CUSTOM, JOB SHOP)

<u>7</u>	Blueprint Reading
<u>3</u>	Ferrous Metallurgy
<u>6</u>	Applied Mathematics
<u>7</u>	Tool Grinding
<u>2</u>	Welding
<u>6</u>	Use of Measuring Instruments
<u>12</u>	Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

<u>4</u>	Applied Shop Mathematics
<u>14</u>	Screw Machine Set-up
<u>19</u>	Turret Lathe Set-up
<u>26</u>	Blueprint Reading

PATTERNMAKER

<u>3</u>	Plastic Patternmaking
<u>2</u>	Applied Solid Geometry
<u>3</u>	Applied Geometric Layout

TOOL AND DIE MAKER

<u>14</u>	Tool and Die Design
<u>6</u>	Fixture Design
<u>6</u>	Use of Mechanics' Handbooks
<u>2</u>	Electric and Gas Welding
<u>4</u>	Machine Tool Operation
<u>10</u>	Applied Plane Trigonometry
<u>8</u>	Tool Grinding

WELDER, COMBINATION

<u>16</u>	Vertical and Overhead Welding
<u>2</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>21</u>	Blueprint Reading for Welders
<u>7</u>	Mathematics for Welders
<u>6</u>	Applied Geometric Layout
<u>7</u>	Heat Treatment of Metals
<u>10</u>	Welding of Non-Ferrous Metals
<u>6</u>	Weld Fixture Design

TABLE XLVII

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT IX

ASSEMBLERS

<u>48</u>	Blueprint Reading
<u>18</u>	Applied Mathematics
<u>19</u>	Use of Measuring Instruments
<u>8</u>	Industrial Hydraulic Circuits

FORGE PRESS OPERATORS

<u>15</u>	Blueprint Reading
<u>15</u>	Use of Measuring Instruments

HYDRAULIC EQUIPMENT MECHANICS

<u>3</u>	Gasoline Engine Tune-up
<u>7</u>	Industrial Hydraulic Controls
<u>5</u>	Electric Motor Controls
<u>1</u>	Electrical Machinery Controls

INDUSTRIAL EQUIPMENT SALESMAN

<u>2</u>	Time and Motion Study
<u>6</u>	Industrial Cost Estimating
<u>5</u>	Industrial Electrical Circuits
<u>2</u>	Industrial Hydraulic Circuits
<u>15</u>	Specification and Bid Writing
<u>21</u>	Salesmanship Principles
<u>4</u>	Machine Tool Operation
<u>1</u>	Other (Specify)

MACHINE REPAIRMAN, MAINTENANCE

<u>39</u>	Maintenance Welding
<u>20</u>	Industrial Hydraulic Circuits
<u>25</u>	Electrical Motor Controls
<u>77</u>	Machine Tool Operation
<u>28</u>	Use of Machinery's Handbook
<u>1</u>	Other (Specify)

MACHINIST (CUSTOM, JOB SHOP)

<u>31</u>	Blueprint Reading
<u>9</u>	Ferrous Metallurgy
<u>25</u>	Applied Mathematics
<u>16</u>	Tool Grinding
<u>14</u>	Welding
<u>22</u>	Use of Measuring Instruments
<u>5</u>	Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

<u>126</u>	Applied Shop Mathematics
<u>8</u>	Screw Machine Set-up
<u>78</u>	Turret Lathe Set-up
<u>26</u>	Gear Cutting Machinery Set-up
<u>144</u>	Blueprint Reading
<u>26</u>	Other (Specify)

MOLDER-FOUNDRY WORKER

<u>1</u>	Ferrous Metallurgy
<u>1</u>	Non-Ferrous Metallurgy
<u>3</u>	Pattern Repair
<u>3</u>	Cupola Operating Theory

PATTERNMAKER

<u>2</u>	Plastic Patternmaking
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TOOL AND DIE MAKER

<u>5</u>	Ferrous Metallurgy
<u>44</u>	Tool and Die Design
<u>46</u>	Fixture Design
<u>29</u>	Use of Mechanics' Handbooks
<u>8</u>	Machine Tool Operation
<u>14</u>	Applied Plane Trigonometry
<u>24</u>	Tool Grinding

WELDER, COMBINATION

<u>13</u>	Vertical and Overhead Welding
<u>20</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>23</u>	Blueprint Reading for Welders
<u>16</u>	Mathematics for Welders
<u>13</u>	Applied Geometric Layout
<u>5</u>	Heat Treatment of Metals
<u>16</u>	Welding of Non-Ferrous Metals
<u>6</u>	Weld Fixture Design

TABLE XLVIII

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT X

ASSEMBLERS

<u>25</u>	Industrial Hydraulic Circuits
<u>80</u>	Blueprint Reading
<u>45</u>	Applied Mathematics
<u>64</u>	Use of Measuring Instruments

FORGE PRESS OPERATORS

<u>3</u>	Blueprint Reading
<u>6</u>	Use of Measuring Instruments

HYDRAULIC EQUIPMENT MECHANICS

<u>5</u>	Gasoline Engine Tune-up
<u>9</u>	Industrial Hydraulic Controls
<u>6</u>	Electric Motor Controls
<u>1</u>	Electrical Machinery Controls

INDUSTRIAL EQUIPMENT SALESMAN

<u>2</u>	Time and Motion Study
<u>1</u>	Industrial Cost Estimating
<u>1</u>	Industrial Electrical Circuits
<u>1</u>	Industrial Hydraulic Circuits
<u>1</u>	Specification and Bid Writing
<u>1</u>	Salesmanship Principles
<u>2</u>	Machine Tool Operation

MACHINE REPAIRMAN, MAINTENANCE

<u>23</u>	Maintenance Welding
<u>36</u>	Industrial Hydraulic Circuits
<u>23</u>	Electrical Motor Controls
<u>28</u>	Machine Tool Operation
<u>33</u>	Use of Machinery's Handbook
<u>3</u>	Other (Specify)

MACHINIST (CUSTOM, JOB SHOP)

<u>35</u>	Blueprint Reading
<u>4</u>	Ferrous Metallurgy
<u>6</u>	Applied Mathematics
<u>4</u>	Tool Grinding
<u>16</u>	Welding
<u>27</u>	Use of Measuring Instruments
<u>16</u>	Use of Mechanics' Handbooks
<u>3</u>	Other (Specify)

MACHINIST (PRODUCTION)

<u>143</u>	Applied Shop Mathematics
<u>22</u>	Screw Machine Set-up
<u>89</u>	Turret Lathe Set-up
<u>10</u>	Gear Cutting Machinery Set-up
<u>159</u>	Blueprint Reading
<u>15</u>	Other (Specify)

TOOL AND DIE MAKER

<u>2</u>	Ferrous Metallurgy
<u>5</u>	Tool and Die Design
<u>3</u>	Fixture Design
<u>1</u>	Use of Mechanics' Handbooks
<u>2</u>	Machine Tool Operation
<u>7</u>	Applied Plane Trigonometry
<u>3</u>	Tool Grinding

WELDER, COMBINATION

<u>77</u>	Vertical and Overhead Welding
<u>54</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>69</u>	Blueprint Reading for Welders
<u>39</u>	Mathematics for Welders
<u>26</u>	Applied Geometric Layout
<u>5</u>	Heat Treatment of Metals
<u>16</u>	Welding of Non-Ferrous Metals
<u>15</u>	Weld Fixture Design

TABLE II

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT XI

ASSEMBLERS

<u>58</u>	Blueprint Reading
<u>56</u>	Applied Mathematics
<u>54</u>	Use of Measuring Instruments
<u>7</u>	Industrial Hydraulic Circuits
<u>6</u>	Other (Specify)

MACHINIST (PRODUCTION)

<u>51</u>	Applied Shop Mathematics
<u>8</u>	Screw Machine Set-up
<u>29</u>	Turret Lathe Set-up
<u>2</u>	Gear Cutting Machinery Set-up
<u>63</u>	Blueprint Reading
<u>1</u>	Other (Specify)

HYDRAULIC EQUIPMENT MECHANICS

<u>3</u>	Gasoline Engine Tune-up
<u>9</u>	Industrial Hydraulic Controls
<u>5</u>	Electric Motor Controls
<u>4</u>	Electrical Machinery Controls

MOLDER-FOUNDRY WORKER

<u>8</u>	Ferrous Metallurgy
<u>6</u>	Non-Ferrous Metallurgy
<u>7</u>	Pattern Repair
<u>9</u>	Cupola Operating Theory
<u>6</u>	Welding
<u>6</u>	Other (Specify)

INDUSTRIAL EQUIPMENT SALESMAN

<u>3</u>	Time and Motion Study
<u>3</u>	Industrial Cost Estimating
<u>6</u>	Industrial Electrical Circuits
<u>1</u>	Industrial Hydraulic Circuits
<u>7</u>	Specification and Bid Writing
<u>5</u>	Salesmanship Principles
<u>2</u>	Machine Tool Operation

TOOL AND DIE MAKER

<u>15</u>	Ferrous Metallurgy
<u>24</u>	Tool and Die Design
<u>10</u>	Fixture Design
<u>1</u>	Use of Mechanics' Handbooks
<u>3</u>	Electric and Gas Welding
<u>9</u>	Machine Tool Operation
<u>12</u>	Applied Plane Trigonometry
<u>5</u>	Tool Grinding

MACHINE REPAIRMAN, MAINTENANCE

<u>56</u>	Maintenance Welding
<u>29</u>	Industrial Hydraulic Circuits
<u>36</u>	Electrical Motor Controls
<u>29</u>	Machine Tool Operation
<u>10</u>	Use of Machinery's Handbook

WELDER, COMBINATION

<u>96</u>	Vertical and Overhead Welding
<u>88</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>134</u>	Blueprint Reading for Welders
<u>75</u>	Mathematics for Welders
<u>30</u>	Applied Geometric Layout
<u>21</u>	Heat Treatment of Metals
<u>28</u>	Welding of Non-Ferrous Metals
<u>25</u>	Weld Fixture Design

MACHINIST (CUSTOM, JOB SHOP)

<u>20</u>	Blueprint Reading
<u>9</u>	Ferrous Metallurgy
<u>15</u>	Applied Mathematics
<u>15</u>	Tool Grinding
<u>12</u>	Welding
<u>12</u>	Use of Measuring Instruments
<u>9</u>	Use of Mechanics' Handbooks

TABLE L

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT XIIASSEMBLERS

<u>15</u>	Blueprint Reading
<u>5</u>	Applied Mathematics
<u>6</u>	Use of Measuring Instruments
<u>5</u>	Industrial Hydraulic Circuits

FORGE PRESS OPERATORS

<u>3</u>	Blueprint Reading
<u>3</u>	Ferrous Metallurgy
<u>2</u>	Applied Mathematics
<u>2</u>	Use of Measuring Instruments

HYDRAULIC EQUIPMENT MECHANICS

<u>2</u>	Gasoline Engine Tune-up
<u>7</u>	Industrial Hydraulic Circuits
<u>2</u>	Electric Motor Controls
<u>3</u>	Electrical Machinery Controls

INDUSTRIAL EQUIPMENT SALESMAN

<u>16</u>	Time and Motion Study
<u>14</u>	Industrial Cost Estimating
<u>15</u>	Industrial Electrical Circuits
<u>11</u>	Industrial Hydraulic Circuits
<u>8</u>	Specification and Bid Writing
<u>22</u>	Salesmanship Principles
<u>16</u>	Machine Tool Operation

MACHINE REPAIRMAN, MAINTENANCE

<u>7</u>	Maintenance Welding
<u>12</u>	Industrial Hydraulic Circuits
<u>10</u>	Electrical Motor Controls
<u>12</u>	Machine Tool Operation
<u>14</u>	Use of Machinery's Handbook
<u>1</u>	Other (Specify)

MACHINIST (CUSTOM, JOB SHOP)

<u>8</u>	Blueprint Reading
<u>6</u>	Ferrous Metallurgy
<u>6</u>	Applied Mathematics
<u>11</u>	Tool Grinding
<u>12</u>	Welding
<u>6</u>	Use of Measuring Instruments
<u>8</u>	Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

<u>16</u>	Applied Shop Mathematics
<u>18</u>	Screw Machine Set-up
<u>28</u>	Turret Lathe Set-up
<u>9</u>	Gear Cutting Machinery Set-up
<u>28</u>	Blueprint Reading

MOLDER-FOUNDRY WORKER

<u>12</u>	Ferrous Metallurgy
<u>2</u>	Non-Ferrous Metallurgy
<u>5</u>	Pattern Repair
<u>6</u>	Cupola Operating Theory
<u>2</u>	Welding

PATTERNMAKER

<u>4</u>	Plastic Patternmaking
<u>2</u>	Applied Solid Geometry
<u>2</u>	Machine Tool Operation
<u>2</u>	Gas and Electric Welding
<u>2</u>	Applied Geometric Layout
<u>4</u>	Blueprint Reading

TOOL AND DIE MAKER

<u>5</u>	Ferrous Metallurgy
<u>10</u>	Tool and Die Design
<u>11</u>	Fixture Design
<u>12</u>	Use of Mechanics' Handbooks
<u>12</u>	Electric and Gas Welding
<u>7</u>	Machine Tool Operation
<u>5</u>	Applied Plane Trigonometry
<u>10</u>	Tool Grinding

WELDER, COMBINATION

<u>17</u>	Vertical and Overhead Welding
<u>17</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>13</u>	Blueprint Reading for Welders
<u>5</u>	Mathematics for Welders
<u>7</u>	Applied Geometric Layout
<u>6</u>	Heat Treatment of Metals
<u>13</u>	Welding of Non-Ferrous Metals
<u>16</u>	Weld Fixture Design

TABLE LI

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT XIII

ASSEMBLERS

<u>46</u>	Blueprint Reading
<u>36</u>	Applied Mathematics
<u>35</u>	Use of Measuring Instruments
<u>5</u>	Industrial Hydraulic Circuits

HYDRAULIC EQUIPMENT MECHANICS

<u>2</u>	Gasoline Engine Tune-up
<u>2</u>	Industrial Hydraulic Controls
<u>2</u>	Electric Motor Controls

INDUSTRIAL EQUIPMENT SALESMAN

<u>2</u>	Time and Motion Study
<u>3</u>	Industrial Cost Estimating
<u>11</u>	Industrial Electrical Circuits
<u>10</u>	Industrial Hydraulic Circuits
<u>3</u>	Specification and Bid Writing
<u>1</u>	Salesmanship Principles
<u>14</u>	Machine Tool Operation

MACHINE REPAIRMAN, MAINTENANCE

<u>19</u>	Maintenance Welding
<u>13</u>	Industrial Hydraulic Circuits
<u>3</u>	Electrical Motor Controls
<u>26</u>	Machine Tool Operation
<u>11</u>	Use of Machinery's Handbook

MACHINIST (CUSTOM, JOB SHOP)

<u>12</u>	Blueprint Reading
<u>11</u>	Tool Grinding
<u>15</u>	Welding
<u>12</u>	Use of Measuring Instruments
<u>12</u>	Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

<u>13</u>	Applied Shop Mathematics
<u>2</u>	Screw Machine Set-up
<u>1</u>	Turret Lathe Set-up
<u>1</u>	Gear Cutting Machinery Set-up
<u>15</u>	Blueprint Reading
<u>8</u>	Other (Specify)

MOLDER-FOUNDRY WORKER

<u>4</u>	Ferrous Metallurgy
<u>2</u>	Non-Ferrous Metallurgy
<u>2</u>	Pattern Repair
<u>3</u>	Cupola Operating Theory
<u>1</u>	Welding

TOOL AND DIE MAKER

<u>1</u>	Ferrous Metallurgy
<u>17</u>	Tool and Die Design
<u>16</u>	Fixture Design
<u>9</u>	Use of Mechanics' Handbooks
<u>8</u>	Electric and Gas Welding
<u>20</u>	Machine Tool Operation
<u>11</u>	Applied Plane Trigonometry
<u>13</u>	Tool Grinding

WELDER, COMBINATION

<u>5</u>	Vertical and Overhead Welding
<u>5</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>9</u>	Blueprint Reading for Welders
<u>2</u>	Mathematics for Welders
<u>1</u>	Applied Geometric Layout
<u>7</u>	Heat Treatment of Metals
<u>3</u>	Welding of Non-Ferrous Metals
<u>6</u>	Weld Fixture Design

TABLE LII

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT XIV

ASSEMBLERS

<u>7</u>	Blueprint Reading
<u>3</u>	Applied Mathematics
<u>3</u>	Use of Measuring Instruments

INDUSTRIAL EQUIPMENT SALESMAN

<u>1</u>	Time and Motion Study
<u>1</u>	Industrial Cost Estimating
<u>1</u>	Industrial Electrical Circuits
<u>1</u>	Industrial Hydraulic Circuits
<u>1</u>	Machine Tool Operation

MACHINE REPAIRMAN, MAINTENANCE

<u>4</u>	Maintenance Welding
<u>6</u>	Industrial Hydraulic Circuits
<u>2</u>	Electrical Motor Controls
<u>5</u>	Machine Tool Operation
<u>6</u>	Use of Machinery's Handbook

MACHINIST (CUSTOM, JOB SHOP)

<u>6</u>	Blueprint Reading
<u>4</u>	Ferrous Metallurgy
<u>4</u>	Applied Mathematics
<u>7</u>	Tool Grinding
<u>5</u>	Welding
<u>7</u>	Use of Measuring Instruments
<u>6</u>	Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

<u>3</u>	Applied Shop Mathematics
<u>6</u>	Screw Machine Set-up
<u>8</u>	Turret Lathe Set-up
<u>4</u>	Blueprint Reading

MOLDER-FOUNDRY WORKER

<u>10</u>	Non-Ferrous Metallurgy
<u>20</u>	Cupola Operating Theory

TOOL AND DIE MAKER

<u>2</u>	Ferrous Metallurgy
<u>6</u>	Tool and Die Design
<u>10</u>	Fixture Design
<u>6</u>	Use of Mechanics' Handbooks
<u>4</u>	Electric and Gas Welding
<u>6</u>	Machine Tool Operation
<u>11</u>	Applied Plane Trigonometry
<u>13</u>	Tool Grinding

WELDER, COMBINATION

<u>2</u>	Vertical and Overhead Welding
<u>1</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>2</u>	Blueprint Reading for Welders
<u>2</u>	Mathematics for Welders
<u>6</u>	Applied Geometric Layout
<u>3</u>	Heat Treatment of Metals
<u>5</u>	Welding of Non-Ferrous Metals
<u>2</u>	Weld Fixture Design

TABLE LIII

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT XV

ASSEMBLERS

<u>27</u>	Blueprint Reading
<u>27</u>	Applied Mathematics
<u>28</u>	Use of Measuring Instruments
<u>3</u>	Industrial Hydraulic Circuits

FORGE PRESS OPERATORS

<u>1</u>	Blueprint Reading
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HYDRAULIC EQUIPMENT MECHANICS

<u>3</u>	Industrial Hydraulic Controls
<u>1</u>	Electric Motor Controls
<u>1</u>	Electrical Machinery Controls

INDUSTRIAL EQUIPMENT SALESMAN

<u>2</u>	Salesmanship Principles
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MACHINE REPAIRMAN, MAINTENANCE

<u>21</u>	Maintenance Welding
<u>14</u>	Industrial Hydraulic Circuits
<u>19</u>	Electrical Motor Controls
<u>14</u>	Machine Tool Operation
<u>7</u>	Use of Machinery's Handbook

MACHINIST (CUSTOM, JOB SHOP)

<u>3</u>	Blueprint Reading
<u>1</u>	Ferrous Metallurgy
<u>3</u>	Applied Mathematics
<u>5</u>	Tool Grinding
<u>9</u>	Welding
<u>3</u>	Use of Measuring Instruments
<u>2</u>	Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

<u>149</u>	Applied Shop Mathematics
<u>6</u>	Screw Machine Set-up
<u>35</u>	Turret Lathe Set-up
<u>145</u>	Blueprint Reading

MOLDER-FOUNDRY WORKER

<u>21</u>	Ferrous Metallurgy
<u>8</u>	Non-Ferrous Metallurgy
<u>5</u>	Pattern Repair
<u>11</u>	Cupola Operating Theory
<u>4</u>	Welding

PATTERNMAKER

<u>4</u>	Plastic Patternmaking
<u>2</u>	Applied Solid Geometry
<u>5</u>	Machine Tool Operation
<u>1</u>	Gas and Electric Welding
<u>2</u>	Applied Geometric Layout
<u>3</u>	Blueprint Reading

TOOL AND DIE MAKER

<u>15</u>	Tool and Die Design
<u>15</u>	Fixture Design
<u>4</u>	Use of Mechanics' Handbooks
<u>2</u>	Electric and Gas Welding
<u>2</u>	Machine Tool Operation
<u>3</u>	Applied Plane Trigonometry
<u>7</u>	Tool Grinding

WELDER, COMBINATION

<u>38</u>	Vertical and Overhead Welding
<u>36</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>46</u>	Blueprint Reading for Welders
<u>36</u>	Mathematics for Welders
<u>36</u>	Applied Geometric Layout
<u>1</u>	Heat Treatment of Metals
<u>2</u>	Welding of Non-Ferrous Metals
<u>9</u>	Weld Fixture Design

TABLE LIV

NEEDS FOR PART-TIME SUPPLEMENTAL CLASSES IN
MERGED AREA DISTRICT XVI

ASSEMBLERS

<u>26</u>	Blueprint Reading
<u>4</u>	Applied Mathematics
<u>4</u>	Use of Measuring Instruments
<u>11</u>	Industrial Hydraulic Circuits

HYDRAULIC EQUIPMENT MECHANICS

<u>8</u>	Gasoline Engine Tune-up
<u>17</u>	Industrial Hydraulic Controls
<u>11</u>	Electric Motor Controls
<u>7</u>	Electrical Machinery Controls

INDUSTRIAL EQUIPMENT SALESMAN

<u>1</u>	Industrial Cost Estimating
<u>2</u>	Industrial Electrical Circuits
<u>2</u>	Industrial Hydraulic Circuits
<u>4</u>	Specification and Bid Writing
<u>4</u>	Salesmanship Principles
<u>1</u>	Machine Tool Operation

MACHINE REPAIRMAN, MAINTENANCE

<u>27</u>	Maintenance Welding
<u>25</u>	Industrial Hydraulic Circuits
<u>30</u>	Electrical Motor Controls
<u>34</u>	Machine Tool Operation
<u>30</u>	Use of Machinery's Handbook
<u>4</u>	Other (Specify)

MACHINIST (CUSTOM, JOB SHOP)

<u>14</u>	Blueprint Reading
<u>4</u>	Ferrous Metallurgy
<u>6</u>	Applied Mathematics
<u>1</u>	Welding
<u>8</u>	Tool Grinding
<u>8</u>	Use of Measuring Instruments
<u>17</u>	Use of Mechanics' Handbooks

MACHINIST (PRODUCTION)

<u>11</u>	Applied Shop Mathematics
<u>6</u>	Screw Machine Set-up
<u>5</u>	Turret Lathe Set-up
<u>2</u>	Gear Cutting Machinery Set-up
<u>10</u>	Blueprint Reading

MOLDER-FOUNDRY WORKER

<u>2</u>	Ferrous Metallurgy
<u>1</u>	Pattern Repair
<u>1</u>	Cupola Operating Theory
<u>1</u>	Welding

PATTERNMAKER

<u>1</u>	Plastic Patternmaking
<u>1</u>	Applied Solid Geometry
<u>1</u>	Blueprint Reading

TOOL AND DIE MAKER

<u>6</u>	Ferrous Metallurgy
<u>23</u>	Tool and Die Design
<u>16</u>	Fixture Design
<u>14</u>	Use of Mechanics' Handbooks
<u>6</u>	Electric and Gas Welding
<u>8</u>	Machine Tool Operation
<u>20</u>	Applied Plane Trigonometry
<u>26</u>	Tool Grinding

WELDER, COMBINATION

<u>13</u>	Vertical and Overhead Welding
<u>26</u>	Inert Gas Welding (M.I.G. & T.I.G.)
<u>28</u>	Blueprint Reading for Welders
<u>15</u>	Mathematics for Welders
<u>5</u>	Applied Geometric Layout
<u>7</u>	Heat Treatment of Metals
<u>12</u>	Welding of Non-Ferrous Metals
<u>9</u>	Weld Fixture Design

Merged area needs in other occupations. The employers responding to this survey had the opportunity to report occupations in which they were experiencing shortages in skilled workers beside the eleven for which they were specifically requested to respond. Many firms capitalized on this opportunity. Tables LV through LXX report these occupations and the need for trained workers by Merged Area District for the six year period from 1968 through 1972. These needs are shown for a six year projection period since, in the majority of cases, the needs are small.

TABLE LV

NEEDS IN MERGED AREA DISTRICT I FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Foreman and Supervisors	13
Mechanical Technicians	5
Production Control	1
Sheetmetal Worker	32

TABLE LVI

NEEDS IN MERGED AREA DISTRICT II FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Carpenters and Cabinetmakers	110
Electrician, Industrial	7
Purchasing Agent	2
Cost Accountant	2

TABLE LVII

NEEDS IN MERGED AREA DISTRICT III FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Auto Mechanics	11
Mechanical Technician	12
Painter, Spray	15
Sheetmetal Worker	6
Tool Design Technician	9

TABLE LVIII

NEEDS IN MERGED AREA DISTRICT IV FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Foreman and Supervisors	3
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TABLE LIX

NEEDS IN MERGED AREA DISTRICT V FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Foreman	13
Mechanical Technician	7
Printer	6
Refrigeration Mechanic	2

TABLE LX

NEEDS IN MERGED AREA DISTRICT VI FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Air Conditioning and Heating Mechanic	5
Retort Operator	6

TABLE LXI

NEEDS IN MERGED AREA DISTRICT VII FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Draftsman	4
Foreman and Supervisors	7
Mechanical Technicians	1
Metal Spinner	18
Painter, Spray	5
Tool Design Technician	2

TABLE LXII

NEEDS IN MERGED AREA DISTRICT VIII FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Flask Builders (Foundry)	3
Foreman and Supervisors	36
Instrument Repairman	3
Mechanical Technician	1
Tool Design Technician	6

TABLE LXIII

NEEDS IN MERGED AREA DISTRICT IX FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Awning Installer	3
Chemical Technician	24
Electrician (Maintenance)	51
Electroplaters	2
Foreman and Supervisors	8
Gas and Diesel Engine Mechanic	3
Instrument Repairman	18
Machine Repairman (Printing)	2
Mechanical Technician	30
Pipefitter, Maintenance	9
Printer, Offset	54
Refrigeration Mechanic (ammonia)	3
Sewing Machine Operator	6
Sheetmetal Worker	2
Small Engine Mechanic	6

TABLE LXIV

NEEDS IN MERGED AREA DISTRICT X FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Automotive Machinist	2
Carpenters	161
Chemical Technician	1
Electro Plater	2
Electronic Technician	3
Mechanical Draftsman	7
Refrigeration Mechanic (ammonia)	2
Sales Correspondent	6
Sewing Machine Operator	20
Sheetmetal Workers	4
Spray Painter	5
Stenographers and Secretaries	2
Truck Mechanic	3
Upholsterer	12

TABLE LXV

NEEDS IN MERGED AREA DISTRICT XI FOR WORKERS TRAINED IN VOCATIONAL SCHOOLS IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Carpenter Cabinetmaker	12
Draftsman, Electrical	6
Draftsman, Mechanical	6
Draftsman, Structural	62
Electrician, Maintenance	6
Instrument Repairman	22
Mechanical Technician	6
Metal Polisher	18
Sewing Machine Operator	61
Spray Painter	4
Structural Steel Fitter	6

TABLE LXVI

NEEDS IN MERGED AREA DISTRICT XII FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Accountant	7
Electrician, Maintenance	6
Foreman and Supervisors	3
Inventory Control	26
Mechanical Technician	21
Truck Body Builder	26
Truck Mechanic	9

TABLE LXVII

NEEDS IN MERGED AREA DISTRICT XIII FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Spray Painters	1
Structural Steel Fabricator	21

TABLE LXVIII

NEEDS IN MERGED AREA DISTRICT XIV FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Sheetmetal Worker	3
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TABLE LXIX

NEEDS IN MERGED AREA DISTRICT XV FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Carpenters and Cabinetmakers	4
Diesel Mechanic	12
Foreman and Supervisors	1
Printer, Offset	24
Sheetmetal Worker	4

TABLE LXX

NEEDS IN MERGED AREA DISTRICT XVI FOR WORKERS TRAINED IN VOCATIONAL CURRICULA IN OCCUPATIONS OTHER THAN THOSE COVERED BY STANDARD QUESTIONNAIRES IN THIS SURVEY

Chemical Technician	6
Electrician, Maintenance	2
Electronic Technician	10
Mechanical Technician	3
Upholsterer	24

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter consists of the restatement of summations made earlier in this paper as well as conclusions drawn from selected tables. Recommendations are based on the findings of the study.

I. SUMMARY

Scope of the study. The study involved surveying by mail 823 metalworking manufacturing firms in Iowa plus 189 firms not classed as metalworking manufacturers that employed 100 or more persons. The number of firms included in the survey represented the total number listed in the Directory of Iowa Manufacturers¹⁷ in each classification. The population of this study involved 1012 firms. Four hundred and forty firms or 45.6% returned questionnaires. This study requested information from the industrial firms about eleven job classifications which included number of workers employed, number of positions closed, number of new positions, and number of replacement workers employed during 1966. In addition, the firms surveyed were requested to estimate their needs for new and replacement workers in 1968, 1970 and 1972 and specify how they would prefer to fill these needs. A third major phase of this study included responses to a question which identified needs for part-time classes to upgrade workers presently employed in the occupations surveyed.

Two blank questionnaire forms were sent to each firm which were to be completed for any job classification, other than the eleven specifically surveyed, in which the firm was experiencing a shortage of skilled help.

¹⁷Iowa Development Commission, loc. cit.

Method of the study. Data processing equipment was used to extract names and addresses of firms included in the study. Questionnaires were mailed to the firms. A maximum of one reminder was sent to firms not responding to the mailing of the questionnaire. Data processing equipment was also used to compile all data except for those not included in the eleven metalworking occupations. Responses were received on blank questionnaire forms for approximately 22 additional job classifications.

II. CONCLUSIONS

Employers responding to the questionnaires expressed desire to hire most of their new and replacement employees from those who will graduate from preparatory vocational-technical curricula. The need for new and replacement employees in 1968, 1970 and 1972 is nearly equal, in all eleven occupations, to the number the firms employed in 1966. Since only limited vocational and technical training was available in 1966 from which vocational graduates could be employed, one might conclude that the 440 firms in Iowa feel that public education should provide more occupational education. These 440 firms will need 3,560 metal tradesmen trained annually in the eleven occupations included in this survey. The greatest need for training occurs in the Machinist (Production) category and in the Molder-Foundry Worker category.

The number of positions closed in each of the eleven job classifications during 1966 ranged from 0% to 1.5%. In all cases it appeared that in Iowa the number of job closures was insignificant.

Needs as identified in Tables XXXIX through LIV for supplemental classes are greater than are being satisfied by area and local schools in the State at the present time. Some of the less populous merged areas show less need for supplemental classes. Efforts will need to be expanded to broaden

the offering of part-time supplemental classes. This might be accomplished by area schools employing persons with a broad industrial background to work with industry in developing classes.

III. RECOMMENDATIONS

The following recommendations, based on the findings of this study, appear to be appropriate for the improvement of the industrial climate in Iowa.

1. Where a Merged Area District finds insufficient need to justify economically offering a particular type of training to develop skilled and semi-skilled metal tradesmen the administrators and board should study Tables X through XX. Adjacent Merged Area Districts should combine needs so that one Merged Area District will provide training based on multi-merged area district need.
2. Training content for preparatory vocational programs should be developed by an advisory committee made up of equal representation of key workers employed in the occupation and foremen of workers in the occupation. The job descriptions used in this study were approved by a group of knowledgeable industrialists. Some variation from these job descriptions may be needed to tailor the training content to the needs of manufacturers in the Merged Area District. School administrators and boards should not misconstrue the preceding statement, however, to mean that one can train a person to set-up a multiple spindle automatic screw machine by using an engine lathe for training.
3. Additional State, Federal and Area funds will need to be expended in order to expand present offerings so that the industrial training needs of the State may be met. Once facilities are equipped it will be necessary to schedule multiple shifts for training in order to make efficient use of the equipment and facilities.

4. Further research should be done to more accurately determine the state-wide and area-wide training needs in the twenty, plus, occupations listed in Table IX and Tables LV through LXX. Needs reported in this study would provide justification for a limited number of training programs in each occupation. A study including each of these occupations may uncover a greater need.

5. Expanded offerings of part-time supplemental classes should occur in most areas of Iowa. Based on findings of this study some area schools should employ personnel competent in industrial education to work with industry in developing and implementing part-time supplemental classes.

6. Part-time supplemental classes should be offered during any hour of the day when persons are available for this training and sufficient interest is shown through enrollment.

7. An extensive advertising program should be developed with the cooperation of industrial management and organized labor to encourage enrollment in supplemental training. Some industries may wish to implement a tuition refund plan to encourage workers to upgrade themselves.

8. Some Merged Area Districts do not have sufficient industrial development to serve all workers and industries in their Merged Area District. More industrialized Merged Area Districts should organize short duration, full-time workshops to provide supplemental training for employees from industries located in other Merged Area Districts.

A P P E N D I X

Metalworking Survey on Jobs, Skills Begins

Manpower and specialized training needs for Iowa metalworking industries will be inventoried in a survey beginning this month among 995 metalworking manufacturers and 330 other Iowa industries employing 101 or more.

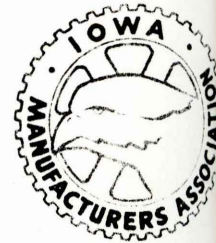
The survey is being conducted by Harlan E. Giese, state consultant, Trade and Industrial Education, Division of Vocational Education, Department of Public Instruction.

Cooperating in the survey are the Iowa Department of Public Instruction, Iowa Manufacturers Association, Business & Industry magazine and State College of Iowa, Cedar Falls.

The purpose of the survey will be to determine present and future educational needs for new and veteran metalworking employees. The results will enable the 16 new area vocational-technical schools and community colleges to provide occupational training to meet employment demands in metal fabrication occupations.

Metalworking and large industries will receive two mail pieces in the survey. The first will be a postcard seeking information on industrial usage of four fabrication processes: casting, welding, machining and forming and forging. A more detailed questionnaire will follow asking specifics on 11 skilled or semi-skilled occupations. These include welders, machinists (custom), machinists (production), pattern-makers, molders and foundry workers, tool and diemakers, machinery repairmen, forging operators, hydraulic equipment mechanics, assemblers and industrial equipment sales.

The study will provide information on what types of occupations are in short supply, what basic training is required and what retraining or upgrading is needed.



PRESIDENT HAROLD S. BOWN
 ARMSTRONG RUBBER CO. DES MOINES
VICE PRESIDENT LLOYD WINGER
 WINGER CONTRACTING CO. OTTUMWA
TREASURER BRUCE VAN DRUFF
 THE THOS. D. MURPHY CO. RED OAK
SECRETARY E. A. MCCARDELL
 WINPOWER MFG. CO. NEWTON

IOWA MANUFACTURERS ASSOCIATION

EXECUTIVE VICE PRESIDENT
 JAMES S. CRAIGER
ADMINISTRATIVE ASSISTANT
 DONALD G. HAUSER
OFFICE MANAGER
 FRANCES REICHOW

November 21, 1966

Dear Manufacturer:

Presently most Iowa manufacturers are experiencing shortages of skilled and semi-skilled workers in many occupations.

Training to be established in the area vocational-technical schools and community colleges now in the process of being organized should help alleviate some of these labor market shortages.

Mr. Harlan Giese of the Iowa Department of Public Instruction is conducting a survey to determine the training needs for skilled and semi-skilled metal tradesmen in Iowa. The findings of this survey will ascertain the need on which occupational training classes may be established in communities across the state.

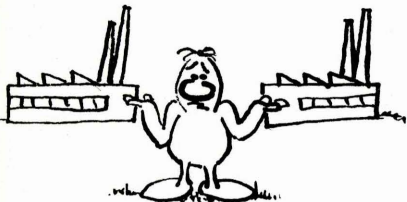
We heartily endorse this survey and would encourage you to take the time to complete the short questionnaires to follow.

Sincerely,

Executive Vice President

J. S. Craiger/s

A FEW DIRECTIONS



Multi-Plant Operations - If you are answering for one of Iowa's manufacturers that has plants located in several cities in the state, answer the following questionnaires for your specific plant location only.



Insufficient or Confusing Information - If the questions on these questionnaires are phrased in such a way that you think your response may be confusing or you are not allowed to provide enough information, please feel free to write needed comments on the reverse side of the questionnaire.



Shortage Occupations Not Covered - In the event you are experiencing shortages of skilled or semi-skilled metal tradesmen in job classifications not covered in the questionnaires enclosed, use the blank white forms to provide information on these occupations. Be sure to provide title of job at top of form. Write a description of the responsibilities or skills of the worker on the lines provided.

Definitions



Estimate - Certain questions use phrases like ESTIMATE your needs, etc.....Do so in terms of present economic conditions. We are not asking you to predict the future.



New Positions - means positions added because of new products, increased sales, etc.,....Where estimating new positions for which you will employ workers assume that economic conditions will remain as they are today.



Replacement - means the hiring of new workers for existing jobs that have been vacated due to death, retirement, firing or quitting.

State of Iowa
Department of Public Instruction

217 - SEVENTH STREET

Des Moines, Iowa 50309

PAUL F. JOHNSTON
SUPERINTENDENTDAVID H. SECHTEL
ADMINISTRATIVE ASSISTANTL. N. JENSEN
ASSISTANT SUPERINTENDENT
INSTRUCTIONW. T. EDGREN
ASSISTANT SUPERINTENDENT
ADMINISTRATION

November 30, 1966

Metalworking Survey on Jobs, Skills Begins

Manpower and specialized training needs for Iowa metalworking industries will be inventoried in a survey beginning this month among 995 metalworking manufacturers and 330 other Iowa industries employing 101 or more.

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The study will provide information on what types of occupations are in short supply, what basic training is required and what retraining or upgrading is needed.

Dear Personnel Director:

You have an opportunity to help solve the manpower shortage of metal tradesmen in Iowa.

The article at the left appeared in the October issue of Iowa Business and Industry. That magazine and the Iowa Manufacturer's Association are cooperating with the State College of Iowa and the Iowa Department of Public Instruction in conducting a survey to determine the training needs for skilled and semi-skilled metal tradesmen.

The results of the survey will provide valuable information which will serve as a guide in the establishment of occupational training programs. Needed occupational training programs will be established in the new area vocational-technical schools or area community colleges in Iowa.

Industries responding to the enclosed questionnaires will be provided a summary of this state-wide survey. This will give you information about twelve occupational classifications of metal tradesmen. These survey summaries will also be provided to area school administrators, representatives of the Bureau of Apprenticeship and Training, Iowa State Employment Service, and any other interested persons or organizations.

This survey should be of real value to you! We need a 100% return. Please do your part by completing and mailing the enclosed simple forms.

Sincerely,



Harlan E. Giese, Consultant
 Trade and Industrial Education
 DIVISION OF VOCATIONAL EDUCATION

HEG/s

EXHIBIT 6

State of Iowa

Department of Public Instruction

217 - SEVENTH STREET

Des Moines, Iowa 50309

PAUL F. JOHNSTON
SUPERINTENDENT

DAVID H. BECHTEL
ADMINISTRATIVE ASSISTANT

W. T. EDGREN
ASSISTANT SUPERINTENDENT
ADMINISTRATION

L. N. JENSEN
ASSISTANT SUPERINTENDENT
INSTRUCTION

November 28, 1966

Dear Manufacturer:


One week ago a letter and reply post card were mailed to you which provided an opportunity for you to assist in solving your manpower shortages.

You may have misplaced this letter since we have not received your completed reply post card. We are including a second card with this letter.

This card is part of a survey which will eventually guide the vocational director in your area vocational-technical school or community college in establishing occupational training programs to serve your needs.

Now is the time to provide confidential information for a future solution to your manpower and training problems. Invest a few seconds now in an effort to alleviate some of your problems.

Sincerely,


Harlan E. Giese, Consultant
Trade and Industrial Education
DIVISION OF VOCATIONAL EDUCATION

HEG/s

EXHIBIT 7

State of Iowa

Department of Public Instruction

217 - SEVENTH STREET

Des Moines, Iowa 50309

PAUL F. JOHNSTON
SUPERINTENDENT

DAVID H. BECHTEL
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ADMINISTRATION

November 30, 1966

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The results of the survey will provide valuable information which will serve as a guide in the establishment of occupational training programs. Needed occupational training programs will be established in the new area vocational-technical schools or area community colleges in Iowa.

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This survey should be of real value to you! We need a 100% return. Please do your part by completing and mailing the enclosed simple forms.

Sincerely,



Harlan E. Giese, Consultant
Trade and Industrial Education
DIVISION OF VOCATIONAL EDUCATION

HEG/s

EXHIBIT 8

State of Iowa

Department of Public Instruction

217 - SEVENTH STREET

Des Moines, Iowa 50309

PAUL F. JOHNSTON
SUPERINTENDENT

DAVID H. BECHTEL
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L. N. JENSEN
ASSISTANT SUPERINTENDENT
INSTRUCTION

W. T. EDGREN
ASSISTANT SUPERINTENDENT
ADMINISTRATION

Metalworking Survey on Jobs, Skills Begins

November 21, 1966

Dear Sir:

The article to the left appeared in the October issue of Iowa Business and Industry.

This article tells of a labor market survey. The findings of this survey will be used to guide area school administrators in establishing occupational training programs for skilled and semi-skilled metal tradesmen. These training programs will help provide a reservoir of trained persons with metalworking skills for your manufacturing operations.

In addition, the findings of this survey will be used to strategically locate supplemental classes to upgrade your presently employed workers.

The first step in gathering this information is for you to complete and mail the enclosed post card. After we receive the enclosed post card, questionnaires will be sent to you which will pertain specifically to your manufacturing operations. You will not be bothered with unnecessary questions. The questionnaires have been reviewed by a group of well known Iowa industrialists. The questionnaires have been modified according to their recommendations.

Take the first step now in solving your labor shortages by completing the enclosed card and placing it in the mail today.

Sincerely,



Harlan E. Giese, Consultant
Trade and Industrial Education
DIVISION OF VOCATIONAL EDUCATION

Manpower and specialized training needs for Iowa metalworking industries will be inventoried in a survey beginning this month among 995 metalworking manufacturers and 330 other Iowa industries employing 101 or more.

The survey is being conducted by Harlan E. Giese, state consultant, Trade and Industrial Education, Division of Vocational Education, Department of Public Instruction.

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The study will provide information on what types of occupations are in short supply, what basic training is required and what retraining or upgrading is needed.

HEG/s

CONFIDENTIAL SURVEY TO DETERMINE THE IOWA TRAINING NEEDS FOR:

(Write Job Title Here)

(Write job skills or responsibilities below.)

1. How many positions in the above job classification do you have in your operation at this time? _____

2. How many replacement workers did you employ for positions in this job classification during the past 12 months? _____

3. How many new positions did you fill in this job classification during the past 12 months? _____

4. How many positions in the above job classification were permanently closed down during the past 12 months because of a decline in need? _____

5. Estimate the number of new positions you will have and the number of replacement workers you will need in this job classification in each of the following two year periods.

	New Positions	Replacements Needed
1968		
1970		
1972		

6. For positions in this job classification, would you employ graduates of vocational-technical programs possessing the skills listed above?

Yes _____ No _____

7. If you answered NO to item 6 but needed workers in this job classification, check the method(s) you would use to fill your future job vacancies.

- Promotion from lower skilled jobs _____
- Apprenticeship training of new employees _____
- Employing persons from other firms _____
- Other (specify) _____

8. List evening classes which your present workers in this job classification should attend. Estimate the number who should attend.

ASSEMBLERS

Assembles machinery from blueprints and other specifications by locating frames and main sections in assembly area. Positions gears, aligns shafts, installs bearings and clutches. Installs electric motors or gasoline engines, and hydraulic equipment. Fastens with bolts and installs piping, hoses and wires. Uses hoists, hand tools, torque wrenches, calipers, feeler gauges, rulers and squares to complete work.

FORGE PRESS OPERATOR

Sets up and operates closed die power presses according to specifications using hand tools and measuring instruments. Sets dies on ram and anvil using squares, shims, feelers and hand tools. Adjusts pressure of press. Heats stock and places on dies with tongs. Compresses metal by release of ram with foot treadle.

HYDRAULIC EQUIPMENT MECHANIC

Installs, tests, adjusts and repairs hydraulic units and systems following blueprints, schematic drawings, or verbal or written instructions. Uses test panels, supplementary equipment and electrical meters to check operation of hydraulic system and electrical and electronic controls. Identifies cause of malfunctions and makes necessary repairs.

INDUSTRIAL EQUIPMENT SALESMAN

Sells mechanical or electrical equipment, supplies or services which require technical knowledge. Makes judgements involving mechanical, electrical or economic principles and calculations. Persuades potential buyers or leasees of practical value of an item or service. Prepares financial and operational estimates from blueprints, plans or other information supplied by potential customers.

MACHINE REPAIRMAN, MAINTENANCE (any industry)

Repairs and maintains production machinery such as lathes, drill presses, milling and screw machines, conveyors and other machinery; realigns spindles, adjusts clutches, replaces bearings, and welds broken parts. Diagnoses and repairs hydraulic and electrical problems. Welds and/or machines replacement parts. May set up new machinery for operation.

MACHINIST (CUSTOM) (JOB SHOP)

Sets up and operates machine tools such as engine lathe horizontal and vertical milling machines, shaper, planer and grinder. Machines parts from blueprints, defective parts, or other specifications. Heat treats parts where necessary and uses handbooks. Uses hand tools and precision measuring instruments. May use welding processes to fabricate or repair items.

MACHINIST (Production)

Sets up and operates screw machines, die casting machines, turret lathes, broaching machines, production milling machines, brakes and punch presses, drill presses, grinders, gear cutting machines, and other metalworking machinery. Installs cutting tools, die sets, gears and cams. Completes set-ups according to part prints, job tickets and verbal directions. Produces proper number of parts. Feeds stock to machines.

MOLDER-FOUNDRY WORKER

Forms sand molds for metal castings. Charges furnaces and melts ferrous and non-ferrous metals. Reconditions cupolas, furnaces and ladles. Positions wire reinforcing, applies parting compounds, cuts runners and sprues. Cleans, chips and grinds the castings.

PATTERNMAKER

Builds and repairs foundry patterns, core boxes, and match plates, made of wood, plaster, metal and plastic. Completes layout of parts on rough stock and makes allowances for metal shrinkage. Sets up and operates wood and metalworking machine tools. Builds up and reinforces plaster or plastic molds. Uses hand tools to finish wood, metal or plastic patterns. Uses templates and measuring instruments to check pattern configuration. Casts metal pattern in plastic or sand cavity.

TOOL AND DIE MAKER

Builds punch press cutting and forming dies, milling and clamping fixtures, drill jigs, gauges and weld fixtures. Uses hand tools and precision instruments to layout work from blueprints and specifications. Machines component parts on engine lathes, milling machines, drill presses, shapers and planers, jig boring machines, and grinders. Heat treats to specifications. Uses handbooks as references to complete work.

WELDER COMBINATION

Joins metal parts by use of all gas and electric welding processes. Grinds and cuts metal. Uses blueprints and work orders to make layout, and fabricate items. Repairs broken or worn metal parts.

Exhibit 11

8. Assuming that the following evening classes were offered in or near your community, how many of your present work force in this job classification should attend to upgrade their skills and technical knowledge? (give number)

ASSEMBLERS

_____ Blueprint Reading	_____ Industrial Hydraulic Circuits
_____ Applied Mathematics	_____ Other (Specify) _____
_____ Use of Measuring Instruments	

FORGE PRESS OPERATOR

_____ Blueprint Reading	_____ Use of Measuring Instruments
_____ Ferrous Metallurgy	_____ Other (Specify) _____
_____ Applied Mathematics	

HYDRAULIC EQUIPMENT MECHANIC

_____ Gasoline Engine Tune-Up	_____ Electronic Machinery Controls
_____ Industrial Hydraulic Controls	_____ Other (Specify) _____
_____ Electrical Motor Controls	

INDUSTRIAL EQUIPMENT SALES

_____ Time and Motion Study	_____ Specification and Bid Writing
_____ Industrial Cost Estimating	_____ Salesmanship Principles
_____ Industrial Electrical Circuits	_____ Machine Tool Operation
_____ Industrial Hydraulic Circuits	_____ Other (Specify) _____

MACHINE REPAIRMAN (Maintenance)

_____ Maintenance Welding	_____ Machine Tool Operation
_____ Industrial Hydraulic Circuits	_____ Use of Machinery's Handbook
_____ Electrical Motor Controls	_____ Other (Specify) _____

MACHINIST (Custom) (Job Shop)

_____ Blueprint Reading	_____ Welding
_____ Ferrous Metallurgy	_____ Use of Measuring Instruments
_____ Applied Mathematics	_____ Use of Mechanics Handbooks
_____ Tool Grinding	_____ Other (Specify) _____

MACHINIST (Production)

_____ Shop Mathematics
 _____ Screw Machine Set-Up
 _____ Turret Lathe Set-Up

_____ Gear Cutting Machinery Set-Up
 _____ Blueprint Reading
 _____ Other (Specify) _____

MOLDER-FOUNDRY WORKER

_____ Ferrous Metallurgy
 _____ Non-Ferrous Metallurgy
 _____ Pattern Repair

_____ Cupola Operating Theory
 _____ Welding
 _____ Other (Specify) _____

PATTERNMAKER

_____ Plastic Patternmaking
 _____ Applied Solid Geometry
 _____ Machine Tool Operation
 _____ Gas and Electric Welding

_____ Applied Geometric Layout
 _____ Blueprint Reading
 _____ Other (Specify) _____

TOOL AND DIE MAKER

_____ Ferrous Metallurgy
 _____ Tool and Die Design
 _____ Fixture Design
 _____ Use of Machinery's Handbook

_____ Electric and Gas Welding
 _____ Machine Tool Operation
 _____ Applied Plane Trigonometry
 _____ Tool Grinding
 _____ Other (Specify) _____

WELDER, COMBINATION

_____ Vertical and Overhead Welding
 _____ Inert Gas Welding (M.I.G. -
 T.I.G.)
 _____ Blueprint Reading for Welders
 _____ Mathematics for Welders
 _____ Applied Geometric Layout

_____ Heat Treatment of Metals
 _____ Welding of Non-Ferrous Metals
 _____ Weld Fixture Design
 _____ Other (Specify) _____

EXHIBIT 12

State of Iowa
Department of Public Instruction

217 - SEVENTH STREET
Des Moines, Iowa 50309

PAUL F. JOHNSTON
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DAVID H. BECHTEL
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L. N. JENSEN
ASSISTANT SUPERINTENDENT
INSTRUCTION

W. T. EDGREN
ASSISTANT SUPERINTENDENT
ADMINISTRATION

December 13, 1966

Dear Manufacturer:

About two weeks ago you received a series of questionnaires to determine what your employment needs will be for skilled and semi-skilled metal tradesmen. To date we have not received your completed questionnaires.

Possibly you feel that this is another effort to gather information which will only be placed in some file and not be used. This is not the case. The information from this survey will be disseminated to agencies that are organized to provide training to meet your employment demands. You will also receive a copy of the findings from this survey if we receive your completed questionnaires. The summary of the findings from this research will show demands for skilled and semi-skilled metal tradesmen in your section of the state and for the state as a whole.

Naturally the degree of accuracy of this study is dependent on the number of manufacturers that respond by returning their questionnaires. Since you have not responded, the training needs in your geographic area will be biased. It may even inhibit the establishment of training programs.

Your response is important. Be sure to complete the enclosed questionnaires and mail today.

Sincerely,



Harlan E. Giese, Consultant
Trade and Industrial Education
DIVISION OF VOCATIONAL EDUCATION

HEG/s

STATE LIBRARY OF IOWA



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