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ABSTRACT OF A THESIS

HOW MANY CARPENTER APPRENTICES
SHOULD BE IN TRAINING
IN THE LINCOLN ILLINOIS AREA?

Submitted by

Jack O. Hodgson

In partial fulfillment of the requirements
for the Degree of Master of Science
Colorado State College
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ABSTRACT OF A THESIS

Building contractors and union officials in the Lincoln, Illinois, area are finding it increasingly difficult to get young men who have had any formal type of pre-apprentice training to enter the building industry. Lincoln High School is the only school in these five cities that offers such training.

Need for apprentice training

In a recent meeting with the vocational instructors of Lincoln High School, building contractors and union officials decided that there was a definite need for an apprentice training program, in carpentry, in this area.

Evidence shows that there has recently been an increase in the amount of building, and that there is a shortage of skilled craftsmen to carry on this building program. As a result of this the community is faced with an acute problem. Research studies reveal that this situation is general in many parts of the United States.

The purpose of this study was to find an answer to the following question, "How many carpenter apprentices should be in training in the Lincoln, Illinois, area? Before answering the above question it was necessary to find answers to the following subordinate questions:

1. What is the population of the Illinois cities being studied?
2. What has been the trend in amount and type of building during the past five years in the selected cities in Illinois?

3. What has been the trend in employment of journeymen carpenters in each city during the past five years?
4. How many union carpenters were employed in each of these cities from 1935 to 1940?
5. As revealed by the union records how many carpenter apprentices were employed in each of these cities?
6. If union apprenticeship quotas were not filled how many union apprentices should have been in training in each of these cities (1935-40)?
7. To what extent is there a need for a training program to actually supply the replacements in the carpenter trade in each of these cities?
8. How can the number of trained journeymen needed be determined?

The records of the carpenters union in each city, the records of the city clerks in each city, and the records of the building contractors were the main sources of information for this study. The information needed was transcribed from the above records.

The population of each of the major cities of the area was needed so that the methods formulated by Frasier (4) and Land (6) could be applied to them to predict the number of apprentices that should be in training. The number of journeymen and apprentices needed are in proportion to the population of a community.

The building situation was studied in order to find the trend in the amount and type of building that has been done in Peoria, Bloomington, Decatur, Springfield, and Lincoln since 1935. It was found that there has been quite a large increase in residential building, as well as commercial building, in this area.

Some sections of the country do considerable more building than others. Consequently, the journeymen-population ratio varies somewhat, depending on the prosperity of a community.

Gain in number of carpenters

The total number of journeymen carpenters in this area increased from 1695 in 1935 to 1836 in 1940, which is about 12 percent. This information was secured from the carpenter unions' records in each city. This gain seems insufficient when it is known how much the building has increased in this area during the same years. But when one considers the variables that have tended to cut down the work of a carpenter, such as the increased use of plywood, the sub-division of crafts, increased fireproof construction, the increasing amount of millwork, the change in the cost of building materials, and the fact that carpenters now are working about fifty percent longer per year than they did in 1935, (the carpenters averaged $7\frac{1}{2}$ working months per year in 1935 and $10\frac{1}{2}$ in 1940), one can readily see that there is considerable difficulty in predicting the number of carpenters needed.

The number of union carpenters was secured from the secretaries of the carpenters' unions in each city. The total number of union carpenters increased from 1400 in 1935 to 1650 in 1940, a gain of nearly 20 percent. The increase results from the fact that unions have become stronger since 1935, and now control more than 90 percent

of all the carpenters in this area.

Table 7 also shows the number of apprentices that were employed in this area from 1935 to 1940, inclusive. This information also was secured from the secretaries of the carpenter unions in each city.

Gain in number of apprentices

There were 57 apprentices in this area in 1935, and 123 in 1940, an increase of about 235 percent.

In the past few years many of the building contractors in this area have had to hire carpenters from outside the city, as shown in Table 9. This fact indicates that there has been a definite shortage of skilled men in carpentry in this area. More than three-fourths of the contractors who were interviewed said that since 1935 they could have used more carpenter apprentices. Of all the contractors interviewed, not one was against a training program for carpenter apprentices. In fact, they were in favor of having a training program to the extent that many of them offered their services in establishing one.

Table 11.--NUMBER OF APPRENTICES THAT SHOULD BE INDENTURED ACCORDING TO POPULATION PREDICTIONS FOR 1945

Cities	Present number	Frasier--number needed	Frasier--num-ber to be in training	Land--number needed	Land--number to be in training	Average number under union regulations	Average of columns 3, 5, and 6	Added number to be trained
	1	2	3	4	5	6	7	8
Peoria. .	44	29	58	25	51	74	61	17
Bloom- ington .	10	9	19	7	14	13	15	5
Decatur .	32	16	33	18	36	50	40	8
Spring- field. .	43	21	42	16	33	46	41	-2
Lincoln .	6	3	7	3	7	9	8	2
Total number .	135	78	159	69	141	192	165	30

Table 11 should be read as follows: In Peoria there are at present 44 apprentices in training; there are 29 needed according to Frasier which means 58 should be in training; there are 25 needed according to Land which means 51 should be in training. The average number of union apprentices, according to the union regulations, that should be indentured is 74. The number of apprentices, by averaging Frasier's number to be in training with Land's and the union quotas, is 61. The difference between the present number, which is 44, and the number that should be in training, which is 61, is 17, which is

the number of apprentices that should be added to the present number to be in training.

Determining the number
of apprentices needed

In determining the number of apprentices that should be in training in each of these cities, the methods of Frasier (4) and Land (6) were used, and the results were checked against the present number and against the average number under the union regulations. These results are tabulated in Table 11.

According to Land (6:86) about fifty percent of the apprentices that start training drop out for various reasons before they finish their training. At present there are about eight apprentices to each one hundred journeymen, but the average number based on the union regulations indicates that ten indentured apprentices to each one hundred journeymen are needed. This average number was used because it is considered about the right number under normal conditions and because this number of apprentices will get more personal attention, during their indenture, from the journeymen with whom they are working. By the use of Frasier's method, column 3 of Table 11 was formulated; by the use of Land's method, column 5 was formulated. By averaging the number attained by the use of the methods of Frasier and Land with the average number allowed under the union regulations, a general average was found as shown in column 7.

This general average is the number of apprentices recommended for training now, and who should become journeymen carpenters in 1945. The number of apprentices recommended for each city are as follows: Peoria, sixty-one; Bloomington, fifteen; Decatur, forty; Springfield, forty-one; and Lincoln, eight.

By considering the present number of apprentices employed now, the following number should be added for training to make up the deficit: 17 in Peoria; 5 in Bloomington; 8 in Decatur; -2 in Springfield; and 2 in Lincoln. This makes a total of 30. It is therefore recommended that thirty carpenter apprentices be added to the present number in training in the Lincoln Illinois area.

Recommendations for further study

It is recommended that there be a study to determine whether or not it might be feasible and desirable to establish a common center for training apprentices for the entire area; i. e., Peoria, Bloomington, Decatur, Springfield, and Lincoln. There are three reasons for believing that such a procedure might be desirable:

(1) the needs of these cities are much the same; (2) the carpenter unions in these cities have an agreement enabling a member of a union in one city to work in any other city without transferring his membership; and (3) such a center perhaps would make good training less expensive, to the community, than it is at present.

It is recommended that there be further study of variables--such as the increased use of plywood, the increase of fireproof construction, the amount of millwork done, changes in the cost of building materials, and the increased use of power tools and machinery. It would be preferable to have a knowledge of variables before they actually become effective; that perhaps is impossible. A better understanding of them where they have become effective appears possible, and certainly would be valuable. It would be valuable in two ways: (1) it would aid in determining the number of apprentices that should be trained; and (2) it would help determine the nature of the skills which apprentices should have.

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T H E S I S

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COLORADO STATE COLLEGE

OF

AGRICULTURE AND MECHANIC ARTS

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July 31, 1944

I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY SUPERVISION BY Jack O. Hodgson

ENTITLED HOW MANY CARPENTER APPRENTICES SHOULD BE IN TRAINING IN THE LINCOLN ILLINOIS AREA?

BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF Science

MAJORING IN Trade and Industrial Education

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Permission to publish this thesis or any part of it must be obtained from the Dean of the Graduate School.

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Chapter I

INTRODUCTION

Peoria, Illinois, is the home of the Caterpillar Tractor Company, one of the largest factories in the world. This company's building expansion alone, during the past few years, has furnished employment for many men. But this is only a small part of the building that has been done in this area, which also includes Bloomington, Decatur, Springfield, and Lincoln. Several smaller factories and commercial buildings have been constructed, and the State Capitol, six colleges and universities, and two state institutions have expanded tremendously--all of which has caused a shortage of skilled craftsmen and apprentices in almost all of the building trades.

According to the building permits issued during the years 1935-40, there were nearly 3,000 new homes built in this area, which, together with a vast amount of commercial building, required large numbers of carpenters. Large areas of "slums" have been cleared, and new Public Works Administration apartment houses have been built to replace them. Highways have been constructed through sections of each of these cities, causing many homes to be razed or moved and new ones built.

During the depression years very few young men entered the trade of carpentry. The United States Census

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of 1930 showed that the average age of all persons employed in the construction industry was 40, while in 1935 it was 45 (10, 15). Many of these carpenters were without work during the depression years and have, as a consequence, become less proficient. Many have left the trade to take steadier employment. Then, too, "pre-fabricated" houses and new construction materials are being used more and more. These facts show that there is a definite need for a larger supply of newly trained carpenters in the near future (5). There is no reservoir from which to make replacements (5).

Most of the contractors have not been able to get desirable apprentices because the Lincoln (Illinois) High School is the only school in this entire area where there is any apprentice training in the building trades.

Within a 50-mile radius of Lincoln, Illinois, there are several large cities with a combined population of nearly one-half million. A diversification of industries, from the rich farms and coal mines in the surrounding country to the extensive manufacturing in these cities, and the Illinois River for power and navigation, make this a combined industrial and agricultural area.

In a recent meeting with the vocational instructors of Lincoln High School, contractors and union officials in this area decided that a larger group of apprentices in the building trades should be in training. Many of these men were willing to donate their services

to help in this training.

Because the evidence shows that there has recently been a vast increase in the amount of building and a seeming shortage of skilled craftsmen, the community faces an acute problem. As the idea of training carpenter apprentices is just a small part of the larger problem that exists, the purpose of this study is to try to find an answer to the following question, "How many carpenter apprentices should be in training in the Lincoln, Illinois, area?"

The scope of this study will include only those cities within a radius of 50 miles from Lincoln, Illinois.

The term "carpenters in training" means young men who are not journeymen carpenters regardless of whether they are union apprentices or open shop employees. The term "apprentices" refers to those who are regular, indentured apprentices under the supervision of the carpenters' union.

It is assumed that, if this study reveals a need for carpenters in this locality, the high schools will gladly cooperate in training more apprentices.

In analyzing this problem the following subordinate questions have arisen:

- A. What cities geographically located around Lincoln, Illinois, should be selected for study?
- B. What has been the trend in amount and type of building during the past five years in the selected cities in Illinois?

- C. What has been the trend in employment of journeymen carpenters in each city during the past five years?
- D. How many union carpenters were employed in each of these cities from 1935 to 1940?
- E. As revealed by the union records, how many carpenter apprentices were employed in each of these cities from 1935 to 1940?
- F. If union apprenticeship quotas were not filled, how many union apprentices should have been in training in each of these cities during 1935-40?
- G. To what extent is there a need for a training program that will actually supply trained replacements in the carpenter trade in each of these cities?
- H. How can the needed number of trained journeymen be determined?

To find what has been done toward answering these questions a review of research is presented in the following chapter.

Chapter II
REVIEW OF LITERATURE

A desire on the part of the community as a whole to have a higher type of individual in the various crafts is becoming more common every day. To gain this end, the tradesmen must be happy in their work. This may be accomplished by paying them fair wages in order that they may have a good standard of living and by giving them a chance to get an education, especially in their own line of work. The more efficient a craftsman is, the less chance he will have of lay-offs or even of being "fired." Consequently, the more steadily a man is employed, the more satisfied he usually becomes, which tends to make him a better citizen.

Many interesting investigations have been made concerning question B, "What has been the trend in amount and type of building during the past five years in the selected cities in Illinois?"

Mason (7), in 1935, in a study based on building statistics of the federal government, said that Peter Grim, special assistant to the Secretary of the Treasury, predicted a 1936 residential volume of four to five times that of 1935 with a probable construction of at least 450,000 residential units. He predicted also a construction of at least 6,000,000 new homes in the next ten

years.

Robinson (1), in 1939, in a general survey of the building industry from Pittsburgh, Pennsylvania, stated:

1928: a seven billion dollar industry employing millions of men in its main and subsidiary branches.

1933: down to a billion dollars or less, with armies of skilled tradesmen out of work.

1939: business on the increase. 1938 better than 1937. Well over a billion dollars of residential building forecast for the current year...much new construction needed...builders hopeful.

Some say prosperity will be with us for keeps if building booms again, especially in the field of housing. Some observers demand more governmental subsidies for low-cost housing.

If pre-fabrication cheapens housing, the demand may grow rapidly, the volume of construction may increase tremendously, and employment may be given to many more thousands of men.

A United States Government Bulletin (13:109), in 1938 relates, in Stories of American Industries that--

American homes of today are valued at seventy billion dollars. Next to the land itself, they are the greatest single item of our national wealth.

According to many leaders in home building industry, the greatest future of home building lies in providing small homes for families of moderate means.

During 1937 and 1938 many thousands of small homes costing from three to five thousand dollars including the land were built as part of the National Small Home Demonstration.

The Federal Housing Administration also cooperated in this national demonstration, which is designed to prove that desirable, efficient, attractive homes can now be built at a price the average family can afford to pay.

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Deal (2:6), in 1935, in The American Architect, stated that an old-timer in the building industry wrote from New York that--

Steel and cheap labor are not the solution of the housing problem. Pre-fabricated construction in man production may be the solution; but not in steel, until steel is cheaper; not in concrete, until concrete is cheaper and more workable; not in plastic, until we know more about their lasting qualities.

Private construction companies are already beginning to cry aloud for skilled craftsmen. During the past six years we have been unable to develop new talent. The youngsters who have followed in their fathers' footsteps have turned to other trades, to C. C. C., or enforced idleness, and hundreds of men who were active six or eight years ago are now on the retired list.

Here is a problem that needs immediate attention from the trade schools, through every branch of the industry, down to the private architect's office.

The above findings, national in scope, will be used as a means of comparison in considering similar data for the Lincoln, Illinois, area.

Research findings that have a bearing on question C, "What has been the trend in employment of journeymen carpenters in each city during the past five years?", are listed as follows:

Creswell (3), in 1937, from a compilation of newspaper clippings between 1932 and 1937 from all over the United States, reported, there was a shortage of skilled labor in a large number of industrial occupations. Various reasons were advanced for this seeming lack of trained workers. Chief among them was a reference to the

more than five years of depression, when few men were trained in the skilled trades. The reduction of immigration also played a part in this. Also lay-offs during depression forced others to pursue other occupations. Five percent accounted for retirement and death annually. New machines were also a factor. Many men who had difficulty working with new machines could work without machines.

Patterson (9:22-3), in 1937, in an address before the department of vocational education, N. E. A., Detroit, Michigan, said,

America needs skilled workers, and if it is to obtain them, then apprenticeship must provide them.

It has been said the automatic machine would make and was making the skilled workmen unnecessary. The inaccuracy of this statement can be shown at once by figures of the United States Office of Education demonstrating that in the past three decades the need for skilled workers, both in numbers and in relation to the total number of all workers, has steadily risen. It appears, then, that while the number of skilled workers in certain trades has been reduced, the number of all skilled workers has been increased.

Because of the rather common belief, however, that the need for skilled workers was becoming less urgent, attention to the training of the future skilled workers was neglected. Also in the past a number of skilled workers came in from Europe, but the immigration law of 1924 put a stop to that. Likewise, many skilled workers are leaving the United States for foreign countries. Consequently, in the past four years, we have lost 25,000 skilled workers through immigration.

There are approximately 6,000,000 skilled workers in the United States. Four percent die each year. This would amount to 1,200,000 in the past five years.

Wilson (15:21-23), in 1937, in a survey of 257 cities for the period 1932-1937, reported that, when compared with occupations in its own census classification, the construction industry headed the list of seventy-nine occupations.

Roger Babson's recent statement is worth repeating, "Watch home building figures for cue to future business prospects. They are the key to coming American booms!"

There are two and one-half million people working in the building industry and four and one-half million people are dependent on this industry for a livelihood through manufacturing, transportation, and selling of numerous building materials.

The 1940 census is still unavailable, but the situation is no better. Some of the facts of the 1930 census, according to Wilson, are as follows:

1. The average age of all persons employed in the construction industry is 40....In 1935 it was 45.
2. During the past five years many of the older men have left the construction trades never to return, naturally some are deceased.
3. A look at the nationality situation in the building trades shows that one-fourth are foreign born.
4. Due to the drop in building in the past few years, very few young men have entered the industry.
5. Due to the immigration law of 1924 very few skilled craftsmen enter the United States.

These statements, when considered as a whole, reveal the opportunity and encourage young men to train for the building industry.

The trend in employment presented above shows

an increasing need for craftsmen in most parts of the United States. These data, which are general throughout the country, will be used as a means of comparison in considering similar data for the Lincoln, Illinois, area.

Research findings that have a bearing on question G, "To what extent is there a need for a training program actually to supply trained replacements in the carpenter trade in each of these cities?", are as follows:

Land (6:39:35), in 1937, in a labor wage survey conducted for the Heating, Piping, and Air Conditioning Contractors Association of New York, stated that during the past six years very few apprentices have been employed.

The period 1929 to 1935 was a period of low volume in the construction industry. Previous to this period we maintained a well-rounded program of apprenticeship and apprentice training throughout our industry. During the more recent period of low volume, however, a number of factors have been operating to create a potential shortage of skilled mechanics. Men who have been trained and who are skilled at the trade, on finding lack of opportunity to work, have gone into other work where opportunities for steady employment were more favorable. Many of these men, even if they decide to return to the field, have lost their skills and are "rusty."

New skills have been introduced in the meantime. Death has taken its toll, but the biggest factor contributing to the present need for new recruits in the industry is the fact that since 1929 practically no new apprentices have been brought in. We have no reservoir from which to make new replacements. Therefore, those who have recently predicted a coming shortage of skilled labor in building industry, including our branch of it, are not mere alarmists but are simply facing facts.

On every hand are evidences of the need for a revival of our program of apprenticeship and the aggressive promotion of a well-rounded program of training new recruits coming into our industry. In our last Labor Wage Survey, in response to the question, "Do you expect an increase or decrease in business?" seventy-three percent indicated that an increase was anticipated and many comments were made with reference to the labor supply, such as:

1. Expect shortage of mechanics in our state.
2. We expect a healthy increase and we may be short of men.
3. I think we are facing an acute shortage of mechanics in the near future.
4. Prospects look bright...expect a shortage of men in the spring.
5. Present indications point to a shortage of skilled mechanics in the near future.

Now is the time to make plans to avoid the repetition of a similar situation in the years ahead, when there will undoubtedly be a steady increase in the volume of business in the construction field.

From the standpoint of the boy, to take from the best part of his life a period of time for training and preparation for opportunities which do not exist is, of course, an injustice to him, and from this standpoint alone the careful determination of the actual number needed in a system of apprenticeship in any city is most important.

Johnson (8,60:46-7), in 1938, from statistics of the Federal Government, Washington, D. C., stated that the number of homes built in 1937 was five times greater than in 1933, but only 40 percent of 1920's average of 703,000 new homes per year.

From 1920 to 1938 an average of 470,000 new homes was erected annually. This indicates our annual needs, because the 17-year average is spread over a complete building cycle from low to boom-time peak and back to an all-time low. Approximately 150,000 homes are destroyed each year by fire,

floods, and being demolished through absolescence, while 320,000 are needed to take care of population growth.

At present our population is increasing 800,000 to 900,000 a year. From 1920 to 1924 our population growth was 1,800,000 persons per year. People born during the early 1920's become of marriageable age between 1944 and 1948 and will create a huge market for new homes at that time.

Mr. O. E. Loomis, Federal Home Loan Bank Board, in a recent address before the annual convention of the American Institute of Architects, predicted that within the next ten years approximately 8,000,000 dwellings must be provided for American families. Two-thirds of these are to be single family dwellings, one-tenth, two-family dwellings, and the remainder multi-family units.

Smith (14:38), in 1940, in Washington, D. C., from the United States Department of Labor, related how
a--

Little publicized unit of the Labor Department comes to the fore with craft programs as army looks for safeguards against shortage of skilled workmen.

For long range insurance of an adequate supply, however, employers, unions, and the government are actively supporting the apprentice training. The army has been disturbed by reports of shortage of skilled labor. A skilled labor force adequate for present defense needs would have to be doubled or tripled if this country entered war.

Data presented above are also national in scope. They show that, in general, there is a decided need for apprenticeship training. This material will be used as a means of comparison in considering similar data for the specific question.

Research findings that are pertinent to question H, "How can the number of trained journeymen needed to determined?", are as follows:

Land (6:83-4), in 1931, cited the following table taken from the United States Census of 1920:

Table 1.--THE RATIO OF APPRENTICES NEEDED IN SIX PRINCIPAL BUILDING TRADES

Building trades	Average number (per 1000 journeymen)
Carpenters	5.3
Electricians	37.4
Plumbers	33.4
Brick masons	10.5
Plasterers	10.9
Painters	7.4

He also gave another table taken from the Metropolitan Life Insurance Company for the number of new men needed annually in the basic building trades. The figures given are the ratio of men needed to every 1000 engaged in the trade.

Table 2.--RATIO OF MEN NEEDED IN FIVE PRINCIPAL BUILDING TRADES To every 1000 engaged in the trade

Building trades	Needed because of			Total needed
	Death	Retirement	Increase of population	
Carpenters	17.4	4.8	14.0	36.2
Brick masons	17.6	5.0	14.0	36.6
Plasterers	16.6	4.3	14.0	34.9
Plumbers	11.5	.8	14.0	26.3
Electricians	9.3	.4	14.0	23.7

The following data were secured from 20 cities concerning 607 apprentices. Of the 607 apprentices that had been registered over a period of five years, 55.6 percent were still connected with the industry and 21.7 percent had advanced to the ranks of journeymen. Three had become contractors, and 22.6 percent had gone into other employment.

Frasier (4), in 1939, in a bulletin for the State of Iowa, Board for Vocational Education, gave the following technique for finding the number of replacements needed in a trade.

SUMMARY OF PROCEDURE

The method used in this study for determining the number of students to be admitted into training in order to supply a sufficient number of trained workers to maintain the working force in a trade, and thus to maintain a balanced labor market is as follows:

1. Establish a Journeyman-Population ratio for the United States.
 - a. Predict the estimated population of the United States for the specific year.
 - b. Predict the total number of journeymen needed in each of the five basic building trades.
 - c. Divide the total population by the total number of journeymen.

2. Predict the total number of journeymen that will be needed in each of the five basic building trades in a given community for that year.
 - a. Predict the total estimated population of a given community for that year.
 - b. Divide the population of the community for the year under consideration by the Journeyman-Population ratio for that year for each trade.

3. Predict the journeyman losses to each trade due to each of the following causes:
 - a. Death.
 - b. Retirement.
 - c. Transfer.

4. Predict the number of trained workers received from immigration and apprenticeship.

5. Predict the training losses during--
 - a. The school period.
 - b. The apprenticeship period.

FORMULA USED

1. Population of the United States divided by the journeymen in the United States equals the Journeyman-Population ratio.

2. Population of the community divided by the Journeyman-Population ratio equals the number of journeymen needed.

3. Journeymen needed divided by 1000 times total mortality rate equals replacements.

In the preceding pages some very startling facts have been reviewed. It was found that American homes of today are valued at seventy billion dollars. From 1920 to 1928 there was an average of 470,000 homes built annually, of which 320,000 were needed to take care of the population growth alone. Predictions were made that there will be 6,000,000 to 10,000,000 new homes built in the next ten years.

So far as craftsmen are concerned, there were, from 1929 to 1936, very few apprentices in training, chiefly because of the depression. There are very few tradesmen entering the United States, and we are losing 25,000 tradesmen each year because of emigration. It was also found that four percent of the workers die each year, and many more become too old to work. The average age of all workers in the building industry in 1930 was 40 years, while in 1935 it was 45 years.

The construction industries are facing an acute shortage of skilled workmen and the apprenticeship training seems to be our best solution to the problem. Furthermore, if the United States enters war, the skilled labor force will have to be doubled or even tripled to care for our adequate defense needs.

The above facts, however, are national in scope, but they will be used as a working background in considering similar data found in the Lincoln, Illinois, area.

The techniques of Frasier (4) and Land (6) will be used in determining the number of apprentices to be trained.

Complete answers to the subordinate questions will be found according to the methods described in the following chapter.

Chapter III

MATERIALS AND METHODS

The problem of determining the number of apprentices to be trained was divided into two parts. The first part was to secure information on construction, repair work, commercial work, and residential work done in Peoria, Bloomington, Decatur, Springfield, and Lincoln during the period 1935-40.

The population of each of these cities for each of the five years was also needed.

Sources

The records of the official building permits of the city clerks in the above-mentioned cities became the authentic sources for the information in regard to the amount and type of building done in that area. The records of the United States census were used to get the population growth of each city for each of the five years.

Methods

The method used in securing the amount and type of building done was to transcribe official information from the records of each of the five city clerks. In every case the transcriptions were checked against originals to verify them and make them reliable.

As the official United States census records for

1940 are unavailable until the spring of 1942, it was necessary to secure the information in regard to the population of each city for 1940 from the city clerks in each city. The population of each city for 1930 was taken from the United States census. The specific numbers for each year from 1930 to 1940 were interpolated.

The second part of the problem was to secure the number of union carpenters and apprentices and the non-union carpenters and apprentices in each of these cities for the years 1935-1940 to set up a trend in employment. The apprenticeship-journeyman ratio that the unions use was also needed.

Finally it was necessary to find out if there was a need for carpenter training.

Sources

The records of the secretaries of each carpenters' union in each city became the main source of information for securing the number of carpenters and carpenter apprentices, both union and non-union, in each city.

The records of the union officials were also used to find the allowable apprenticeship-journeyman ratio.

Fifteen building contractors in these various cities were interviewed to determine what their ideas were in regard to the need for the training of more carpenters.

Methods

The method used to secure the number of union and non-union carpenters and apprentices was to transcribe official information from the records of each of the union secretaries in the various cities. In every case the transcriptions were checked against the originals to verify them and make them reliable.

In determining the contractors' ideas concerning the need for a carpenter-training program, fifteen building contractors, or their foremen, were interviewed. Their names and reports are recorded in the Appendix.

This personal interview was conducted on the basis of the following questions:

- A. Have you had to hire carpenters from outside the city?
- B. Could you use more beginning carpenters?
- C. Do you think a training program in this area would be beneficial?

These questions served as a guide in the interviews, which in turn helped to determine the extent of the need for a training program in this area.

Procedure

The methods described above were applied to the sources according to the following procedure:

A search was made of the United States census to get the population of Peoria, Bloomington, Decatur, Springfield, and Lincoln.

The building permits of each city were checked to get the amount of money spent in new construction, repair work, commercial work, and residential work in each of these cities.

The carpenter union records were checked to get the total number of union and non-union carpenters and carpenter apprentices employed in Peoria, Bloomington, Decatur, Springfield, and Lincoln. With these data available, the trend in the number of carpenters employed was established for the years 1935-1940.

A personal interview was held with the carpenters' union officials in each of these cities to obtain the allowable apprenticeship-journeyman ratio.

A personal interview with each of fifteen building contractors, or their foremen, was held to get his answers to the following questions:

- A. Have you had to hire carpenters from outside the city?
- B. Could you use more beginning carpenters?
- C. Do you think a training program in this area would be beneficial?

By using the apprenticeship-journeyman ratio together with the answers given by the building contractors, or their foremen, the extent of the need of training was determined.

Two determinations of the number of apprentices that should be trained were made. The first was made by applying Frasier's (4) formula, as shown in table 8; and

the second by the average number of apprentices allowed under the union regulations. The average of the two is the number that should have been in training.

The information secured by following the methods and procedures described above has been summarized and tabulated.

Chapter IV

RESULTS

It is interesting to note that the industrial character of cities is determined by their access to transportation, natural resources, and proximity to other important areas. In each one of these centers people take up homes and carry on their usual business pursuits. The number of residences, store buildings, factories, and other structures in an area increases as the population increases. Basic to the number of craftsmen needed in any community is the population of the community and its trend.

Population

Population data for cities included in this study are presented in Table 1.

Table 1.--CITIES AND THEIR POPULATION

Years 1930 and 1940 are from the United States census;
intervening years are by interpolation

CITIES	POPULATION			
	1930	1935	1936	1937
Peoria	101,969	103,484	103,787	104,090
Bloomington. . .	30,900	31,865	32,058	32,251
Decatur.	57,510	58,320	58,482	58,644
Springfield. . .	71,864	73,684	74,048	74,412
Lincoln.	12,355	12,536	12,572	12,608

Table 1.--CITIES AND THEIR POPULATION--Continued

Years 1930 and 1940 are from the United States census;
intervening years are by interpolation

CITIES	POPULATION		
	1938	1939	1940
Peoria	104,393	104,696	105,003
Bloomington. . .	32,444	32,637	32,828
Decatur.	58,806	58,968	59,129
Springfield. . .	74,776	75,140	75,503
Lincoln.	12,644	12,680	12,717

Pecoria, with a population of 105,003 for 1940, is the largest city, while Lincoln, with a population of 12,717, is the smallest. The average population of these five cities for 1940 was 57,036. Each city has gained from one to nine percent in population since 1930.

Amount and type of building

These gains in population have been responsible for new building in this area. The amount and type of building done are shown in Tables 2, 3, 4, 5, and 6. Each city has had a steady increase in its building program. Peoria had approximately four times as much building done in 1940 as in 1935. Bloomington had more than ten times as much building in 1940 as in 1935. Decatur tripled its building in the same number of years. Springfield was building twelve times as much in 1940 as in 1935, while Lincoln was building six times as much in the same period of time.

Table 2.--THE AMOUNT AND TYPE OF BUILDING DONE IN PEORIA FROM 1935 TO 1940

TYPE	1935		1936		1937	
	No. of permits	Amount	No. of permits	Amount	No. of permits	Amount
Repair work . . .	436	\$337,251	874	\$670,661	842	\$436,093
Commercial work . . .	365	1,454,091	605	3,943,419	550	1,936,043
New residences	72	302,295	223	947,685	231	962,296
Total new construction . . .	437	\$1,756,386	828	\$4,891,104	781	\$2,898,739

Table 2.--THE AMOUNT AND TYPE OF BUILDING DONE IN PEORIA FROM 1935 TO 1940--Continued

TYPE	1938		1939		1940	
	No. of permits	Amount	No. of permits	Amount	No. of permits	Amount
Repair work . . .	824	\$514,822	720	\$443,939	729	\$521,005
Commercial work . . .	557	1,913,533	796	1,966,393	725	5,787,010
New residences	223	981,948	265	1,370,680	339	5,116,002
Total new construction . . .	780	\$2,895,481	1061	\$3,337,073	1064	\$10,903,012

Table 3.--THE AMOUNT AND TYPE OF BUILDING DONE IN BLOOMINGTON FROM 1935 TO 1940

TYPE	1935		1936		1937	
	No. of permits	Amount	No. of permits	Amount	No. of permits	Amount
Repair work . . .	22	\$54,048	27	\$182,927	27	\$89,950
Commercial work . . .	32	468,596	31	65,138	38	198,170
New residences	8	67,921	14	59,000	15	186,016
Total new construction . . .	40	\$590,565	45	\$307,065	53	\$474,136

Table 3.--THE AMOUNT AND TYPE OF BUILDING DONE IN BLOOMINGTON FROM 1935 TO 1940--Continued

TYPE	1938		1939		1940	
	No. of permits	Amount	No. of permits	Amount	No. of permits	Amount
Repair work . . .	22	\$41,500	25	\$133,770	29	\$94,284
Commercial work . . .	35	184,660	46	675,855	37	326,714
New residences	15	119,000	34	182,281	63	425,693
Total new construction . . .	50	\$345,160	80	\$724,366	100	\$658,123

Table 4.--AMOUNT AND TYPE OF BUILDING DONE IN DECATUR FROM 1935 TO 1940

TYPE	1935		1936		1937	
	No. of permits	Amount	No. of permits	Amount	No. of permits	Amount
Repair work . . .	130	\$190,179	126	\$190,195	124	\$147,548
Commercial work . . .	117	235,123	114	559,274	162	497,641
New residences	22	164,600	25	143,350	38	237,500
Total new construction . . .	139	\$399,723	126	\$682,624	200	\$645,141

Table 4.--AMOUNT AND TYPE OF BUILDING DONE IN DECATUR FROM 1935 TO 1940--Continued

TYPE	1938		1939		1940	
	No. of permits	Amount	No. of permits	Amount	No. of permits	Amount
Repair work . . .	121	\$158,420	143	\$163,575	150	\$208,285
Commercial work . . .	102	1,253,891	150	246,964	204	1,568,250
New residences	26	164,380	76	506,160	130	754,920
Total new construction . . .	128	\$1,418,271	226	\$753,124	334	\$2,322,170

Table 5.--THE AMOUNT AND TYPE OF BUILDING DONE IN SPRINGFIELD FROM 1935 TO 1940

TYPE	1935		1936		1937	
	No. of permits	Amount	No. of permits	Amount	No. of permits	Amount
Repair work . . .	306	\$223,226	256	\$324,271	194	\$210,289
Commercial work . . .	86	124,310	123	2,322,436	144	835,516
New residences	25	108,917	62	243,850	130	578,780
Total new construction . . .	111	\$233,227	185	\$2,566,286	274	\$1,414,296

Table 5.--THE AMOUNT AND TYPE OF BUILDING DONE IN SPRINGFIELD FROM 1935 TO 1940--Continued

TYPE	1938		1939		1940	
	No. of permits	Amount	No. of permits	Amount	No. of permits	Amount
Repair work . . .	155	\$145,402	321	\$321,319	327	\$365,610
Commercial work . . .	115	1,345,807	218	292,474	262	210,086
New residences	106	455,259	231	934,965	270	2,949,827
Total new construction . . .	221	\$1,801,066	449	\$1,237,439	532	\$3,159,913

Table 6.--AMOUNT AND TYPE OF BUILDING DONE IN LINCOLN
FROM 1935 TO 1940

TYPE	1935		1936		1937	
	No. of permits	Amount	No. of permits	Amount	No. of permits	Amount
Repair work . . .	27	\$12,762	31	\$16,109	21	\$14,607
Commercial work . . .	13	43,347	24	331,573	19	351,299
New residences	5	28,019	5	37,261	6	38,912
Total new construction . . .	18	\$71,364	29	\$368,834	25	\$390,211

Table 6.--AMOUNT AND TYPE OF BUILDING DONE IN LINCOLN
FROM 1935 TO 1940--Continued

TYPE	1938		1939		1940	
	No. of permits	Amount	No. of permits	Amount	No. of permits	Amount
Repair work . . .	32	\$19,191	27	\$17,111	36	\$29,017
Commercial work . . .	21	340,951	24	265,886	26	335,870
New residences	7	62,415	7	42,115	14	145,374
Total new construction . . .	28	\$403,366	31	\$308,001	40	\$481,244

In all five cities there was a fairly large gain in building in 1936 over 1935. In 1937 there was a decline in new construction, and from then until 1939 the increase was more gradual, with 1940 showing a sharp upturn.

Building permits issued

The total number of building permits issued in these five cities for new residences, as revealed in Tables 2 - 6 inclusive, was 132 in 1935, and in 1940 had gone up to 816, more than six times as many. The total number of permits issued for repair work in these five cities varied from 921 in 1935 to 1221 in 1940. In 1940 more than twice as many permits were issued in commercial building as in 1935: 613 in 1935 and 1251 in 1940.

Number of carpenters and apprentices

There has been a steady gain in the number of carpenters and apprentices in each city from 1935 to 1940 as revealed in Table 7.

Table 7.--TOTAL NUMBER OF CARPENTERS AND APPRENTICES
IN SPECIFIED CITIES FOR 1935-40

Cities	1935						1936					
	Union		Non-union		Total		Union		Non-union		Total	
	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices
Peoria...	603	23	32	3	635	26	660	32	14	2	674	34
Bloom- ington..	62	2	29	3	91	5	65	3	25	3	90	6
Decatur..	354	4	105	9	459	13	360	9	105	12	465	21
Spring- field...	330	4	107	5	437	9	412	16	90	5	502	21
Lincoln..	51	2	22	2	73	4	58	2	22	2	80	4

Table 7.--TOTAL NUMBER OF CARPENTERS AND APPRENTICES
IN SPECIFIED CITIES FOR 1935-40--Continued

Cities	1937						1938					
	Union		Non-union		Total		Union		Non-union		Total	
	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices
Peoria...	619	29	0	0	619	29	611	35	0	0	611	35
Bloom- ington..	65	4	21	6	86	6	74	4	21	4	93	8
Decatur..	367	19	90	7	457	26	395	22	85	7	480	29
Spring- field...	351	26	77	4	428	30	378	31	79	6	457	37
Lincoln..	62	4	16	1	78	5	55	4	14	2	69	6

Table 7.--TOTAL NUMBER OF CARPENTERS AND APPRENTICES
IN SPECIFIED CITIES FOR 1935-40--Continued

Cities	1939						1940					
	Union		Non-union		Total		Union		Non-union		Total	
	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices	Jour- neymen	Appren- tices
Peoria...	618	38	0	0	618	38	690	44	0	0	690	44
Bloom- ington..	79	5	19	2	98	7	89	8	12	2	108	10
Decatur..	382	22	85	9	467	31	407	27	75	5	482	32
Spring- field...	380	41	65	3	445	41	395	41	52	2	447	43
Lincoln..	70	4	14	1	84	5	78	5	7	1	85	6

There has been a larger percentage of gain among union carpenters and apprentices, while the percentage of non-union carpenters and apprentices has diminished.

Since 1937 the carpenters and apprentices in Peoria have been 100 percent unionized, whereas Decatur with the smallest percentage of union men is approximately 80 percent unionized.

Of the total number of carpenters in these five cities approximately 90 percent are union men.

Table 8 gives data concerning the present number of apprentices; the number of apprentices that should be in training as determined by Frasier's formula; the maximum number of apprentices permissible under union regulations; and the average of these for each city.

Table 8.--COMPARISON OF APPRENTICES IN TRAINING WITH A NEED FOR APPRENTICES

Based on 1940 figures

Cities	Present no. of apprentices	Frasier	Land	Avg. under union regulations	Avg. of columns 3, 4, and 5
1	2	3	4	5	6
Peorie	44	57	49	69	58
Bloomington. .	10	18	13	11	14
Decatur. . . .	32	32	35	48	38
Springfield. .	43	41	33	44	37
Lincoln. . . .	6	7	6	9	7

These figures differ greatly, as the maximum number of apprentices that could have been employed under the union regulations is from two to four times as many as were actually employed. This number of union apprentices, however, is not recommended by the union but it is used as a check for "boom time" building and where a small contractor works but a few men.

Interviews with building contractors

As a result of the interviews with the fifteen building contractors, it was found that each one was definitely in favor of a training program for carpenter apprentices, as revealed in Table 9.

Table 9.--FIFTEEN BUILDING CONTRACTORS' ANSWERS TO THE FOLLOWING QUESTIONS

	Yes	%	No	%
Have you had to hire carpenters from outside the city?	11	73	4	27
Could you have used more beginning carpenters?	12	80	3	20
Do you think a carpenter apprentice training program would be beneficial? .	15	100	0	0

Table 10.--THE NUMBER OF MONTHS PER YEAR THE AVERAGE CARPENTER HAS BEEN EMPLOYED SINCE 1935

CITIES	Number of contractors interviewed	Avg. no. of months worked per year					
		1935	1936	1937	1938	1939	1940
Pecoria	2	7	7	8	8½	9	10½
Bloomington.	2	8	9	9	9	10	10
Decatur.	2	9	9½	9½	7	8½	10½
Springfield.	0	-	-	-	-	-	-
Lincoln.	1	7	8	9	10	10	11
TOTAL AVERAGE		7½	8	9-	9-	9	10½

Four-fifths of the contractors interviewed could have used more beginning carpenters; and approximately the same number of contractors had hired carpenters from other cities, on different occasions, since 1935.

The average carpenter, in these five cities, was working four months longer per year in 1940 than they were in 1935. These figures are shown in Table 10. This is a gain of more than 50 percent in their working year, which partly accounts for the fact that a small increase in the number of carpenters took care of a larger increase in the amount of building done in this area.

A complete discussion of the problem will be found in the next chapter.

Chapter V
DISCUSSION

The data needed to answer the questions in the problem analysis are summarized in Chapter IV. Data on the first question, "What is the population of the Illinois cities being studied?" were secured for all five cities, because they were needed in applying the method of Frasier (4) and Land (6) for predicting apprentice training needs.

Population gain

Each city has gained from two to three percent in population since 1935, as revealed in Table 1. This increase in population calls for a larger number of carpenters and apprentices to care for the increased needs in building (8). As revealed in Table 11, the populations of Peoria, Bloomington, Decatur, Springfield, and Lincoln, were predicted for 1945 by interpolation. The difference in population for each of these cities from 1930 to 1940 was divided by ten to get the approximate increase per year for the intervening years. This method of interpolating was approved by Professor L. A. Moorehouse, Head of the Economics and Sociology Department, Colorado State College, Fort Collins, Colorado. The annual increase in population was estimated until the end of 1945, for two reasons: first, the number of apprentices depends

somewhat on the population of the community, and second, the number of apprentices started in training now would become journeymen carpenters in 1945, as an indentured apprentice has to serve four years before becoming a journeyman carpenter.

During the depression period previous to 1935 there were very few carpenter apprentices in training (5). At this time the average age of all building tradesmen in the United States was 45 years (10). This, together with the increase in population, indicates that probably there will be a demand for more apprentices in the near future, and that suitable training should be provided for them.

Amount and type of building

The question of how much building had been done in this area was investigated, because a city that is replacing old buildings and adding new structures is regarded as being in a healthy condition. It is of interest to note, however, that the research on needs for building tradesmen, research which makes possible prediction of the number of carpenters needed, omits this item. This omission seems to have been made because of the large number of variables entering the picture when building trends are considered. Some of these variables are pre-fabrication of houses, increasing amounts of millwork done in the mills, greater sub-division of crafts, fireproof and combination types of construction, amount of time worked per

year by the journeymen, and the changes in cost of building materials.

The city of Peoria has made considerable progress in its building program since 1935. There were 72 new houses built there in 1935, and 339 in 1940. The total number of permits issued in new construction was 437 in 1935, and 1064 in 1940, as revealed in Table 2. The total amount spent for commercial building grew from approximately one-half million dollars in 1935 to more than six million dollars in the next five years. During this period the amount spent on new houses had increased to more than five million dollars, making the total amount spent for new construction more than eleven million dollars for 1940.

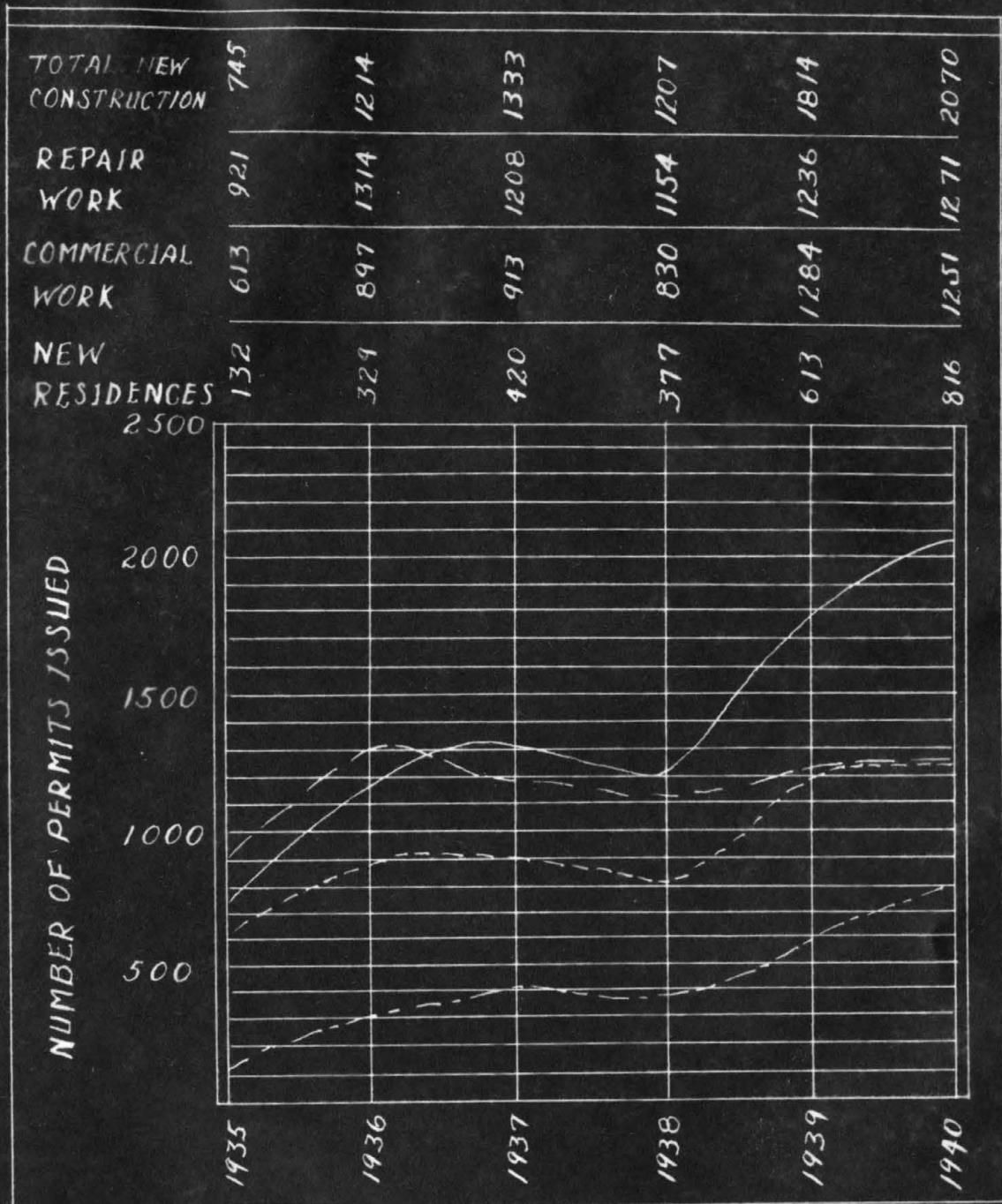
The price of building materials had risen approximately 15 percent in the same period, according to Carl Trostel, manager of the Trostel Lumber Company, Fort Collins, Colorado. This rise accounts in part for the increase in the amount spent on building construction.

The largest number of building permits issued in Bloomington was for house construction. Table 3 reveals that there were 8 houses built in 1935, and 63 in 1940. Bloomington spent \$67,921 in 1935 for house construction, and \$425,693 in 1940.

The work on the part of a carpenter in new house construction has been reduced materially. This is true because most of the cabinets, stairs, frames,

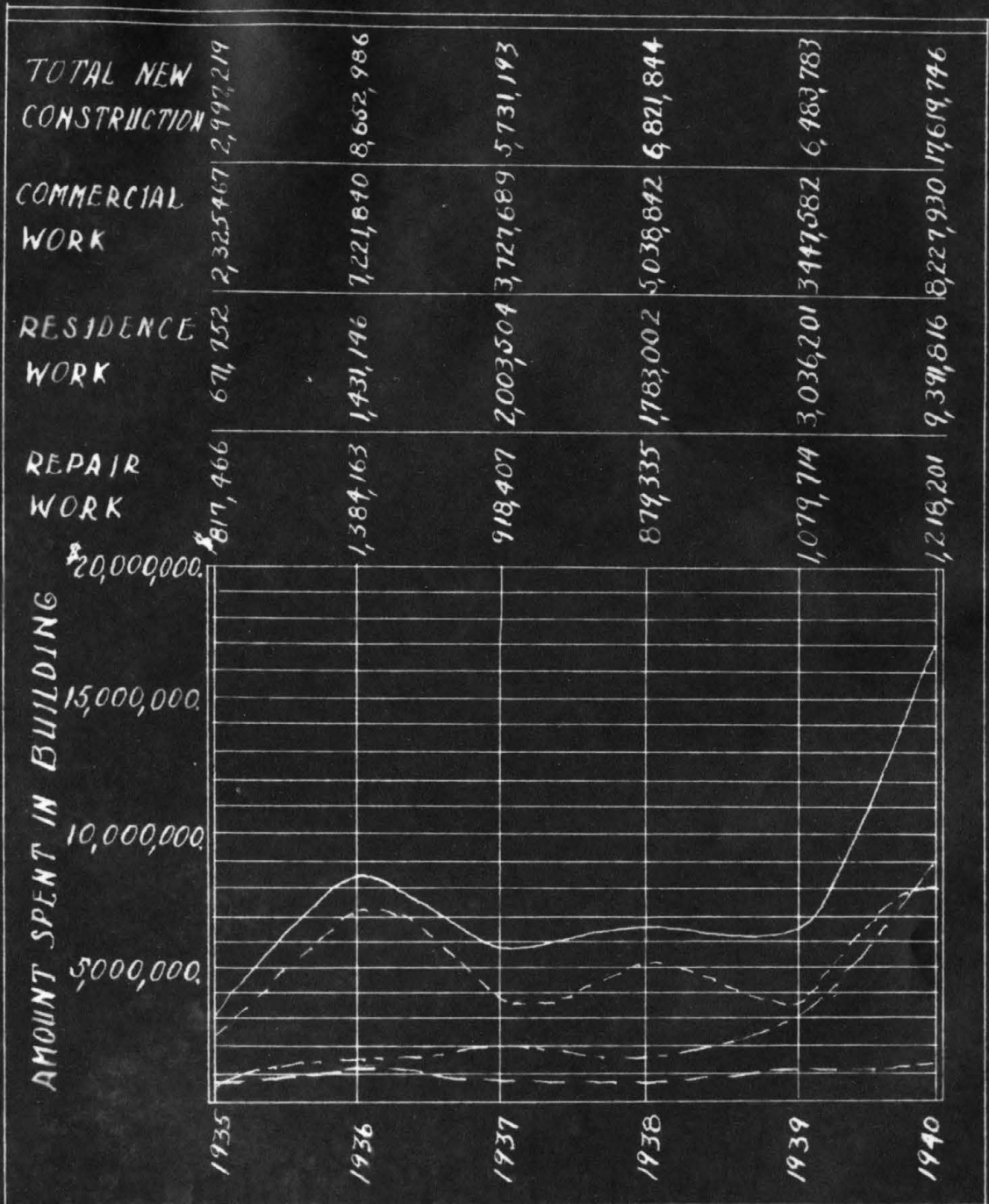
cupboards, and the like, are now being assembled in the mills. These basic elements in house construction formerly were built and assembled on the job by the carpenter, but recently pre-fabrication has made rapid gains. Window frames, for example, are delivered on the job now, direct from the planing mill, with the sash already fitted with the weatherstripping in place, and with the casings cut to fit. Stairs are placed on the job much in the same manner.

There are factories now that sell framed roofs, trusses, and arches that formerly took considerable time for the carpenter to build. Some idea of how the type of work in question has shifted to the factories is given by Charles Routson, manager of the Routson Planing Mill, Lincoln, Illinois, who says that he has tripled his force in his planing mill in the last few years.



- - - - - NEW RESIDENCES - - - - - COMMERCIAL WORK
 - - - - - REPAIR WORK - - - - - TOTAL NEW CONSTRUCTION

Fig. 1. Total number of building permits issued in Peoria, Bloomington, Decatur, Springfield, and Lincoln from 1935-40, inclusive.



- - - - - NEW RESIDENCES - - - - - COMMERCIAL WORK
 - · - · - REPAIR WORK ——— TOTAL NEW CONSTRUCTION

Fig. 2. Total amount spent on building in Peoria, Bloomington, Decatur, Springfield, and Lincoln from 1935-40, inclusive.

There were 22 new houses built in Decatur in 1935, and by 1940 the number had risen to 130, as seen in Table 4. The total number of building permits issued for new construction work rose in the same period from 139 to 334. The amount spent on commercial work was about one-fourth of a million dollars in 1935; in 1940 this amount had risen to one and one-half million dollars, bringing the total amount spent for commercial and residential work for 1940 to nearly two and one-half million dollars.

Society as a whole is becoming "fireproof conscious"; consequently, a great deal of this increase in building is with brick, stone, and tile. For example the building codes of larger cities forbids the use of wood shingles in restricted areas. Such buildings as the Public Works Administration apartment houses and factories, with fireproof construction throughout, tend to cut down the work formerly done by carpenters.

The state capitol at Springfield has done considerable building in recent years. Table 5 reveals that there were 86 commercial buildings being constructed in 1935 at a cost of \$124,310; in 1940 there were 262, costing \$210,086. New residences had a greater gain, from 25 in 1935 to 270 in 1940. Springfield spent more than \$3,000,000 on new construction in 1940, while in 1935 less than a quarter of a million dollars was spent for this purpose.

Pre-fabrication of houses has contributed in

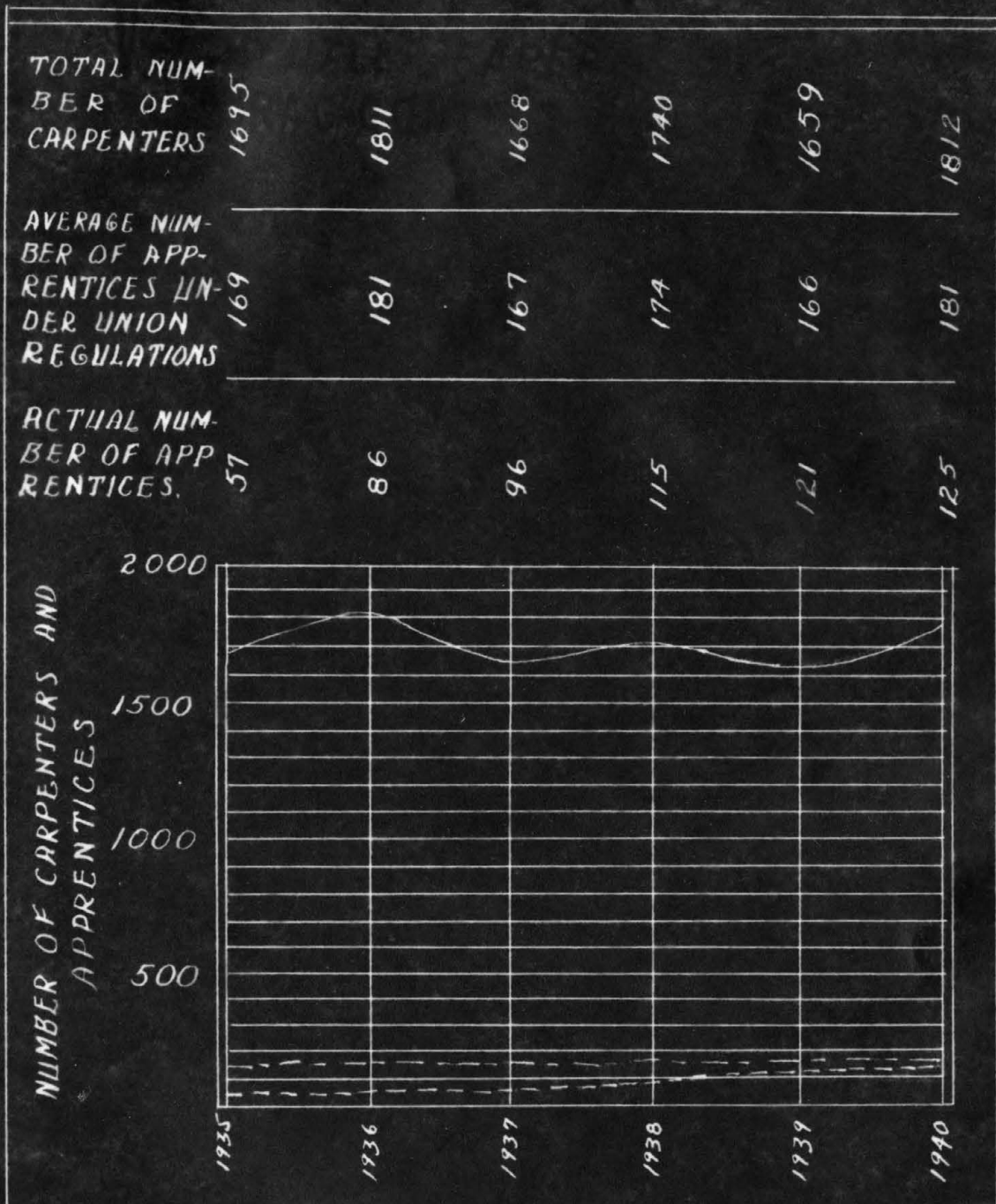
some measure to a reduction of the amount of carpenter work done on the job. The increased use of plywood for building purposes enables a carpenter to do a job much faster than he can with the ordinary small pieces of lumber. In a recent interview, Carl Trostel and David Mitchell, lumber dealers in Fort Collins, Colorado, and Lincoln, Illinois, respectively, stated that they sell a car load of plywood now where a few years ago they sold only a few hundred feet.

The smallest of the five cities is Lincoln, which is located in the center of these other four. The number of building permits issued for commercial work in 1940 was double that of 1935, while the number of residences tripled in the same number of years.

The amount spent on new residences in 1935 was only \$28,019. The amount gradually increased, until in 1940 there was more than \$145,000 spent for the same purpose. The amount spent on commercial work in Lincoln year after year seems enormous for a city of its size, when one stops to consider that the Lincoln State School and Colony, a state institution for the feeble-minded, housing more than 4000 inmates, is located here, one can readily see where the bulk of the building is done.

Considering all of the variables that tend to decrease the amount of work formerly done by the carpenters, such as the increased amount of millwork, the increase in the cost of building materials, the sub-division

of crafts for such workers as roofers and lathers, and the increased use of plywood, there has been a steady increase in the number of carpenters employed in this area. There has also been an increase in the number of months that carpenters have worked per year during the past five years.



----- ACTUAL NUMBER OF APPRENTICES
 - - - - - AVERAGE NUMBER UNDER UNION REGULATIONS
 _____ TOTAL NUMBER OF CARPENTERS.

Fig. 3 Total number of carpenters and apprentices, and the average allowable number of apprentices under union regulations, in this area from 1935-40, inclusive.

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Table 10 shows that during 1935 the carpenters in these five cities worked about seven and one-half months, while in 1940 they worked nearly 11 months.

Labor saving devices and the increased cost of building materials, along with the fact that carpenters are working about fifty percent more now than they were in 1935, tend to offset the apparent increased need for carpenters as suggested by the picture of the increased amount of building.

Since there are so many variables in the situation, it can readily be seen that the amount of building does not accurately indicate the number of carpenters needed.

The general increase in the amount of building done in these cities, with everything favoring its continuance (7), indicates that there is a need for more journeymen carpenters in this area. Since there is a need for more journeymen, the question arises as to where they are to be obtained. The best solution seems to be in a training program for carpenter apprentices (5,10).

Table 7 indicates that the total number of union carpenters and indentured apprentices has increased since 1935, while the total number of non-union carpenters and apprentices has decreased. This is because the unions in the cities have become stronger during this period. The city of Peoria has been 100 percent unionized in its building trades since 1937.

The total number of carpenter apprentices has increased approximately 235 percent in the past five years. This seemingly large gain is still insufficient, because during the depression years prior to 1935 there were practically no apprentices in training (15,3). The total number of carpenters has increased but twelve percent in the same period of years, as shown in Figure 3.

The percentage of increase in the number of carpenters seems small as compared to the percentage of increase in the amount of building that has been done. Also, the percentage of increase in the number of carpenters is a little more than that of the increase in population.

The increase in the number of indentured apprentices should be greater than it is now. The trend curve probably should be more in accordance with the trend curve in population, rather than in keeping with the trend curve in the amount of building.

In recent years the majority of the contractors have had to hire carpenters from outside the city, as revealed in Table 9. This is another indication that there is a shortage of carpenters in this area (10). Table 8 shows that 80 percent of the contractors interviewed could have used more beginning carpenters, while they were all in sympathy with a training program for carpenter apprentices.

Of the contractors and union officials

interviewed, many were willing to give time to help train carpenter apprentices. Here is another indication that there is a definite need for a training program in carpentry in this area.

The more building that is done, the more carpenters there are needed to do it, despite the fact that the number needed may not be so great as the increase in building might lead one to expect.

Neither Frasier nor Land take this fact into consideration in determining the number of apprentices needed. Consequently, the union regulation in regard to the number of carpenter apprentices should be considered, because their ruling that there shall be no more than one apprentice to five journeymen is flexible. This journeyman-apprentice ratio works well, because the more journeymen there are employed, the more apprentices there can be in training.

The fact that the numbers of union carpenters has increased steadily in the past five years, and that unions now control more than 90 percent of the combined journeymen in this area, seems to be all the more reason that union apprenticeship quotas should be considered in determining the number of apprentices to be trained.

The maximum number of indentured apprentices allowed under the union regulations is one apprentice to five journeymen. This maximum number is to take care of an extreme building expansion or a contractor who works

but a few men. For example, a contractor working five journeymen could not use two apprentices under the union regulations. This is one of the by-laws of the Carpenters' and Joiners' Union.

In determining the number of apprentices there should be in training, as seen in Table 11, it was found that the quotas obtained by using Frasier's method corresponded quite closely with the quotas obtained by using Land's method, and also with the average number of apprentices allowed by the union regulations.

The average number of indentured apprentices allowed by union regulations is ten for each one hundred carpenters. The maximum number permitted by union regulations is twenty for each one hundred carpenters. The average number permitted is discovered by averaging the maximum number permitted with the minimum number possible, which would be none. This average number was used because it is considered about the right number under normal conditions and because this number of apprentices will get more personal attention, during their indenture, from the journeymen with whom they are working (11:35).

The present number of apprentices, considered insufficient because many of the contractors in this area have had to hire carpenters from outside the city, and because contractors are asking for more beginning carpenters, is 8 apprentices to 100 journeymen.

Table 11.--NUMBER OF APPRENTICES THAT SHOULD BE INDENTURED ACCORDING TO POPULATION PREDICTIONS FOR 1945

Cities	Present number	Frasier-- number needed	Frasier--num-ber to be in training	Land--number needed	Land--number to be in training	Average number under union regulations	Average of columns 3, 5, and 6	Added number to be trained
	1	2	3	4	5	6	7	8
Peoria. .	44	29	58	25	51	74	61	17
Bloom- ington .	10	9	19	7	14	13	15	5
Decatur .	32	16	33	18	36	50	40	8
Spring- field. .	43	21	42	16	33	46	41	-2
Lincoln .	6	3	7	3	7	9	8	2
Total number .	135	78	159	69	141	192	165	30

Land (6:86) states that nearly one-half of the apprentices who start training drop out, for various reasons, before finishing their course. Consequently, the number of apprentices to start training should be double that of the actual number needed. For this reason columns two and four in Table 11 are given as the number of apprentices that actually are needed according to Frasier and Land and columns three and five of Table 11 show the number of apprentices that should start training now to

become journeymen in 1945, according to the methods of Frasier and Land. Column six gives the number of apprentices that should be in training now according to the average union apprenticeship quotas. The quotas obtained by use of the methods of Frasier and Land and that allowed by the union regulations were averaged, as seen in column seven, to get the actual number of apprentices that should be in training now.

According to this procedure, there should be sixty-one apprentices in Peoria, fifteen in Bloomington, forty in Decatur, forty-one in Springfield, and eight in Lincoln.

Column eight of Table 11 shows the number of apprentices that should be added to the present number to start training now and become journeymen in 1945. There should be 17 added in Peoria, 5 in Bloomington, 8 in Decatur, -2 in Springfield, and 2 in Lincoln, making a total of 30 additional carpenter apprentices that should be in training now in this area.

A summary of this discussion will be found in the following chapter.

Chapter VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Building contractors and union officials in the Lincoln, Illinois, area are finding it increasingly difficult to get young men who have had any formal type of pre-apprentice training to enter the building industry. Lincoln High School is the only school in these five cities that offers such training.

Need for apprentice training

In a recent meeting with the vocational instructors of Lincoln High School, building contractors and union officials decided that there was a definite need for an apprentice training program, in carpentry, in this area.

Evidence shows that there has recently been an increase in the amount of building, and that there is a shortage of skilled craftsmen to carry on this building program. As a result of this the community is faced with an acute problem. Research studies reveal that this situation is general in many parts of the United States.

The purpose of this study was to find an answer to the following question, "How many carpenter apprentices should be in training in the Lincoln, Illinois, area? Before answering the above question it was necessary to

find answers to the following subordinate questions:

1. What is the population of the Illinois cities being studied?
2. What has been the trend in amount and type of building during the past five years in the selected cities in Illinois?
3. What has been the trend in employment of journeymen carpenters in each city during the past five years?
4. How many union carpenters were employed in each of these cities from 1935 to 1940?
5. As revealed by the union records how many carpenter apprentices were employed in each of these cities?
6. If union apprenticeship quotas were not filled how many union apprentices should have been in training in each of these cities (1935-40)?
7. To what extent is there a need for a training program to actually supply the replacements in the carpenter trade in each of these cities?
8. How can the number of trained journeymen needed be determined?

The records of the carpenters union in each city, the records of the city clerks in each city, and the records of the building contractors were the main sources of information for this study. The information needed was transcribed from the above records.

The population of each of the major cities of the area was needed so that the methods formulated by Frasier (4) and Land (6) could be applied to them to predict the number of apprentices that should be in training. The number of journeymen and apprentices needed are in proportion to the population of a community.

The building situation was studied in order to find the trend in the amount and type of building that has been done in Peoria, Bloomington, Decatur, Springfield, and Lincoln since 1935. It was found that there has been quite a large increase in residential building, as well as commercial building, in this area.

Some sections of the country do considerable more building than others. Consequently, the journeymen-population ratio varies somewhat, depending on the prosperity of a community.

Gain in number of carpenters

The total number of journeymen carpenters in this area increased from 1695 in 1935 to 1836 in 1940, which is about 12 percent. This information was secured from the carpenter unions' records in each city. This gain seems insufficient when it is known how much the building has increased in this area during the same years. But when one considers the variables that have tended to cut down the work of a carpenter, such as the increased use of plywood, the sub-division of crafts, increased fireproof construction, the increasing amount of millwork, the change in the cost of building materials, and the fact that carpenters now are working about fifty percent longer per year than they did in 1935, (the carpenters averaged 7½ working months per year in 1935 and 10½ in 1940), one can readily see that there is considerable difficulty in

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predicting the number of carpenters needed.

The number of union carpenters was secured from the secretaries of the carpenters' unions in each city. The total number of union carpenters increased from 1400 in 1935 to 1650 in 1940, a gain of nearly 20 percent. The increase results from the fact that unions have become stronger since 1935, and now control more than 90 percent of all the carpenters in this area.

Table 7 also shows the number of apprentices that were employed in this area from 1935 to 1940, inclusive. This information also was secured from the secretaries of the carpenter unions in each city.

Gain in number of apprentices

There were 57 apprentices in this area in 1935, and 123 in 1940, an increase of about 235 percent.

In the past few years many of the building contractors in this area have had to hire carpenters from outside the city, as shown in Table 9. This fact indicates that there has been a definite shortage of skilled men in carpentry in this area. More than three-fourths of the contractors who were interviewed said that since 1935 they could have used more carpenter apprentices. Of all the contractors interviewed, not one was against a training program for carpenter apprentices. In fact, they were in favor of having a training program to the extent that many of them offered their services in establishing one.

Table 11.--NUMBER OF APPRENTICES THAT SHOULD BE INDENTURED
ACCORDING TO POPULATION PREDICTIONS FOR 1945

Cities	Present number	Frasier-- number needed	Frasier--num- ber to be in training	Land--number needed	Land--number to be in training	Average number under union regulations	Average of columns 3, 5, and 6	Added number to be trained
	1	2	3	4	5	6	7	8
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Spring- field. .	43	21	42	16	33	46	41	-2
Lincoln .	6	3	7	3	7	9	8	2
Total number .	135	78	159	69	141	192	165	30

Table 11 should be read as follows: In Peoria there are at present 44 apprentices in training; there are 29 needed according to Frasier which means 58 should be in training; there are 25 needed according to Land which means 51 should be in training. The average number of union apprentices, according to the union regulations, that should be indentured, is 74. The number of apprentices, by averaging Frasier's number to be in training with Lands and the union quotas is 61. The difference

between the present number, which is 44, and the number that should be in training, which is 61, is 17, which is the number of apprentices that should be added to the present number to be in training.

Determining the number of apprentices needed

In determining the number of apprentices that should be in training in each of these cities, the methods of Frasier (4) and Land (6) were used, and the results were checked against the present number and against the average number under the union regulations. These results are tabulated in Table 11.

According to Land (6:86) about fifty percent of the apprentices that start training drop out for various reasons before they finish their training. At present there are about eight apprentices to each one hundred journeymen, but the average number based on the union regulations indicates that ten indentured apprentices to each one hundred journeymen are needed. This average number was used because it is considered about the right number under normal conditions and because this number of apprentices will get more personal attention, during their indenture, from the journeymen with whom they are working. By the use of Frasier's method, column 3 of Table 11 was formulated; by the use of Land's method, column 5 was formulated. By averaging the number attained by the use of the methods of Frasier and Land with the average number

allowed under the union regulations, a general average was found as shown in column 7.

This general average is the number of apprentices recommended for training now, and who should become journeymen carpenters in 1945. The number of apprentices recommended for each city are as follows: Peoria, sixty-one; Bloomington, fifteen; Decatur, forty; Springfield, forty-one; and Lincoln, eight.

By considering the present number of apprentices employed now, the following number should be added for training to make up the deficit: 17 in Peoria; 5 in Bloomington; 8 in Decatur; -2 in Springfield; and 2 in Lincoln. This makes a total of 30. It is therefore recommended that thirty carpenter apprentices be added to the present number in training in the Lincoln Illinois area.

Recommendations for further study

It is recommended that there be a study to determine whether or not it might be feasible and desirable to establish a common center for training apprentices for the entire area; i. e., Peoria, Bloomington, Decatur, Springfield, and Lincoln. There are three reasons for believing that such a procedure might be desirable: (1) the needs of these cities are much the same; (2) the carpenter unions in these cities have an agreement enabling a member of a union in one city to work in any other

city without transferring his membership; and (3) such a center perhaps would make good training less expensive, to the community, than it is at present.

It is recommended that there be further study of variables--such as the increased use of plywood, the increase of fireproof construction, the amount of millwork done, changes in the cost of building materials, and the increased use of power tools and machinery. It would be preferable to have a knowledge of variables before they actually become effective; that perhaps is impossible. A better understanding of them where they have become effective appears possible, and certainly would be valuable. It would be valuable in two ways: (1) it would aid in determining the number of apprentices that should be trained; and (2) it would help determine the nature of the skills which apprentices should have.

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List of Contractors and Construction
Companies Interviewed:

Peoria, Illinois:

Jobst-Berth Company
John Keamer
Mauritz Olson
W. E. Bauman

Bloomington, Illinois

John Felmev Construction Company
Eikenberry Construction Company
Charles Hall
Charles Bates
Paul Bell

Decatur, Illinois

Walter Ware
Lloyd Robbins
Glen Hennigh
Stouffer Brothers
James Savartz
Simons Construction Company

Springfield, Illinois

Evans Construction Company
Robert Evans
Clarence Hahn
C. H. Schenk

Lincoln, Illinois

Fred Stallbohm
Charles Routsen

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