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ABSTRACT

Programs in pursuit of national goals can be expected to lead to rapid growth in job openings in the skilled construction crafts during the coming decade by creating an average of nearly 300,000 job openings a year. Compared to the 68,000 people completing training for these occupations in 1966, there is a definite lack of an adequate supply of trained manpower which in turn may complicate the attainment of national objectives. This rapidly growing demand for construction manpower, coupled with a slowly increasing supply, has two principal implications for planning in vocational education. First, rapid expansion in construction means parallel expansion in a broad spectrum of needs for skilled labor. Secondly, it implies an expanding base of job opportunities for individuals in the "left out" groups in American society. An enlarged role for vocational education in the construction field would further the broad objectives of national policy, and would serve to implement the purposes of the 1968 amendments. (Author/JS)

The Pursuit of National Goals and Career Opportunities in the Construction Crafts in the 1970's

Working Paper

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SUMMARY

Programs in pursuit of national goals can be expected to lead to rapid growth in job openings in the skilled construction crafts during the coming decade. New construction is required to rebuild urban areas, improve utilities and public services, replace substandard housing and to develop and construct new urban transportation networks. Intercity high speed rail links will be developed similar to the pioneer venture in the Northeast Corridor, and major highway systems will be constructed in areas such as Appalachia. New water storage systems and recreation areas will be required for our expanding population. Moreover, construction projects to replace, modernize, and expand industrial, commercial, military and other governmental plant and buildings will continue to expand rapidly in the foreseeable future despite occasional slowdowns due to tight money conditions.

Lack of an adequate supply of trained manpower in the construction crafts can frustrate the attainment of high-priority national objectives in many fields in the 1970's. In discussing the Housing and Urban Development Act enacted by Congress in 1968, for example, the President's Council of Economic Advisers has pointed out that "Success in meeting the national target for housing recently adopted by the Congress will depend upon the availability of enough skilled workers."(1) A rapidly growing demand for construction manpower, coupled with a slowly increasing supply has two principal implications for planning in vocational-technical education. First, rapid expansion in construction means parallel expansion in a broad spectrum of needs for skilled labor.

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(1) Annual Report of the Council of Economic Advisers, January, 1969, p. 104.

Secondly, it implies an expanding base of job opportunities for individuals in the "left out" groups in American society.

A high priority assigned to goals involving substantial construction requirements, e.g., urban development, could be expected to create an average of nearly 300,000 job openings a year in the skilled building trade occupations in the 1970's to meet needs arising both from employment growth and the replacement of attrition losses. Yet, in 1966, only 68,000 persons completed training for these occupations in the established sources of formal preparation, i.e., vocational education, apprenticeship, and the programs sponsored under the Manpower Development and Training Act. Of this total, some 38,000 represented completions in vocational-technical education programs. Thus, it is clear that if enrollments in vocational education courses related to the construction trades continue at or near their present levels, persons completing vocational-technical education programs will account for only a small fraction, between a seventh and an eighth, of the job openings in the coming decade in the construction crafts.(2)

A continued discrepancy between enrollments in occupational preparation programs and manpower needs in the building trades poses a major problem in planning to relate vocational education more closely to job openings and to national needs. Utilization of poorly trained or untrained workers, particularly in the South, would be likely to contribute to low productivity per worker and, in this way, to continue to inflate already inflated construction costs. Absence of adequate opportunities for young persons in the economically and socially disadvantaged groups to prepare for the relatively well-paid construction

(2) This estimate does not include foremen who are grouped together with craftsmen in the census statistics.

occupations can be expected to add to the unemployment, the poverty, and the unrest among these groups, and especially so in the non-white ghettoes in the large central cities. While the vocational education system is only one agency which is concerned with these problems, an enlarged role for vocational education in the construction field would further the broad objectives of national policy, and it would serve to implement the purposes of the 1968 Amendments to the Vocational Education Act.

CAREER OPPORTUNITIES IN CONSTRUCTION IN THE 1970's

Manpower needs in construction will serve as an important source of employment for skilled blue collar workers in the 1970's. Although structural changes in the economy are likely to continue the shift from a goods-producing to a service economy, and from a blue-collar to a white-collar labor force, the pursuit of goals in areas such as urban development, housing and transportation can create a significant growth in opportunities for skilled craftsmen, and also for semi-skilled operatives, and unskilled laborers. Concentrating resources on rebuilding cities, to cite the leading instance, could create as many as 10 million jobs in the next decade. Three million of these jobs would represent requirements for craftsmen and foremen, most of whom would be employed in the construction trades.(3)

Between 1960 and 1965, the supply of workers in the building trades, as indicated by the employment figures, increased slowly, at an average rate of about 1 per cent a year. The pool of persons employed as carpenters actually decreased in the eight-year period before 1965.(4) To achieve the goals involving substantial construction requirements would involve annual increases in employment for construction workers of approximately 3 per cent in the 1970's. In absolute numbers, there were some 3.4 million construction craftsmen employed in 1966. By the mid-1970's, this total is projected to increase to 4.5 million, a growth of 1.1 million, or 33 per cent.

Planning based on estimates of employment growth alone in construction

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(3) Lecht, Leonard A., Manpower Needs for National Goals in the 1970's, 1969, p. 97.

(4) U.S. Department of Labor, Occupational Employment Statistics, 1966, p. 8 (mimeo).

would substantially underestimate career opportunities in the craft fields because many job openings will arise from the need to replace attrition losses. The average age in many of the skilled building trades is high since few young persons have entered these occupations in the recent past. For this reason, more job openings in construction are likely to come about in the next ten years because of needs to replace attrition losses than because of employment growth. This replacement demand is expected to create 1.8 million job openings in the ten year period beginning in 1966. Added to the employment growth, this amounts to 2.9 million career opportunities in the skilled building trades. However, the estimates for employment growth are themselves significant for educational planning because, typically, the more rapid the employment increase in an occupation, the better are the prospects for improvements in wages and fringe benefits.

The increase in job openings because of employment growth or attrition will vary considerably in the different occupations related to construction. Some of the building crafts are numerically much more important than others. In 1966, for example, ten carpenters were employed for every structural metal worker. Moreover, occupational patterns of employment will change in response to changes in technology, or shifts in the distribution of economic activity by region and industry, or because of union strategies. While employment for excavating, grading, and road machinery operators is expected to grow by over half, the corresponding employment for tinsmiths and sheet metal workers is projected to grow by one-tenth.(5) In addition, the average age, and hence, attrition losses, tends to be relatively greatest in the occupations which have been growing slowly.

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(5) See Appendix Table 2.

The broad outlines of changes in job openings in the skilled construction trades in the 1970's can be summarized in terms of three groups of occupations, the structural, mechanical, and finishing trades. The career opportunities anticipated in the three fields, and in selected individual occupations, are listed in Table 1.

Table 1

Estimated Annual Average Job Openings in Construction Crafts, by Occupational Category, 1966 to 1975[1]
(in 000)

Occupational Category	Employment in 1966	Employment in 1975	Average Annual Job Openings, 1966 to 1975: From Employment Growth	From Replacement Demand	Total
Structural crafts	1,753	2,421	67	92	159
Bricklayers, stonemasons, & tilesetters	193	291	10	9	19
Carpenters[2]	861	1,087	23	47	70
Cranemen, derrickmen, & hoistmen	146	195	5	4	9
Excavating, grading & road machinery operators	305	471	17	17	34
Mechanical crafts	929	1,197	27	47	74
Electricians	439	549	11	24	35
Plumbers & pipefitters	334	472	14	14	28
Finishing crafts	721	905	18	40	58
Painters	474	586	11	26	37
TOTAL	3,403	4,523	112	179	291

(1) Source: See Appendix Table 3.
(2) Detailed occupations are illustrative. They do not exhaust the total.

Employment growth and replacement demand are expected to create an average of 291,000 job openings a year in the construction trades in the ten-year period begin-

ing in 1966. Over half of this increase will take place in the structural crafts, the largest single segment in the skilled building trades occupations. This means a substantial growth in employment opportunities for carpenters, for brickmasons, and for excavating, grading, and road machinery operators. Most of this increase in the mechanical trades is accounted for by two occupations, electricians, and plumbers and pipefitters. The finishing trades are dominated numerically by painters. Because of the high average age of painters, replacement demand is responsible for most of anticipated job openings in this area. The slow employment growth listed for the finishing crafts is also partially based on the expectation that technological advances, such as the development of new types of paint applied by mechanical devices, will reduce the input of finishing craft labor required to build a house.

These projections would probably require some modification if greater-than-anticipated changes were to occur in the application of technological advances in the construction industry or in the updating of building codes and work practices. The use of mass production methods by large firms with elaborate research facilities is still in its initial applications in most of construction and particularly so in home building. Greater receptiveness to innovation, however, is apparent in the work of the large merchant builders who manufacture mass-produced homes. This mass-produced private housing frequently makes use of prefabricated housing components which are assembled on the site. In the large cities, construction of multi-story office and apartment buildings has come to involve increasing use of new materials, such as aluminum and glass, and more utilization of mechanized equipment to shorten the time required to construct a large building. Rapid acceleration of these

advances would tend to reduce opportunities for some on-site construction craftsmen, e.g., plumbers, and to increase requirements for others such as structural metal workers and glaziers. Greater emphasis on the use of prefabricated components would concentrate more of the growth in employment linked to construction in the durable goods industries and in the operatives group of occupations, and reduce overall job openings in the skilled building trades.

JOB OPENINGS IN CONSTRUCTION AND THE ECONOMICALLY AND SOCIALLY DISADVANTAGED

The job openings anticipated in the building trades present many potential opportunities for the economically and socially disadvantaged. Pursuit of national objectives in urban development and in housing creates more employment per billion dollars spent for craftsmen than pursuit of other goals. A high priority assigned to these goals would provide a significant basis for increasing and upgrading job opportunities for Negroes and other nonwhites. For these reasons, expanding vocational-technical programs in work areas related to construction can help to implement the national policies expressed in the 1968 Vocational Act Amendments stressing the objective of reorienting vocational education to concentrate more heavily on serving the needs of persons in the "left out" groups in our society.

The potentials for upgrading and increasing employment opportunities for persons in disadvantaged groups by preparation for careers in skilled fields related to construction are illustrated by the estimates for nonwhites. Negroes and other nonwhites are substantially underrepresented in most of the more skilled and better paid building trades. In the mid-1960's, for example, less than 3 per cent of all electricians and only about five per cent of all plumbers and pipefitters were nonwhites. By contrast, nonwhites made up an estimated 30 per cent of the laborers employed in activities associated with urban development. If nonwhite males had been employed in the construction crafts in the mid-1960's in the same proportion they made up of the total male labor force, 10 per cent, there would have been 32,000 more nonwhite carpenters, 31,000 more electricians, and 15,000 more plumbers and pipe-

fitters.[6]

Expanding employment opportunities in the construction trades for nonwhites and for whites depends both on the availability of job openings, and also on policies of organized labor which, in the past, have frequently served to limit manpower supply in these occupations. There has been a tendency to restrict union memberships by limiting the size of apprenticeship programs -- an attractive means of entry -- and by the use of temporary union cards issued only for peak building seasons. The seasonal nature of much of construction work has often prompted unions to take measures to increase wage rates and annual earning by limiting admissions to training and to full union membership. Nonwhites, accordingly, have often encountered difficulties in obtaining admission to apprenticeship programs. In the early 1960's, for example, they constituted less than 2 per cent of the apprentices in skilled building trades such as carpenters, electricians, or plumbers and pipefitters.[7] However, in spite of these restrictions, nonwhites have succeeded in obtaining more or less adequate representation as journeymen in several construction trades, particularly as cranemen, derrickmen, and hoistmen; as brickmasons, and as painters.

It is apparent that the unions involved, at least on the national level, are committed to increasing opportunities for nonwhites in the craft fields. Sponsorship of construction work in slack seasons, now technically feasible, would create a climate encouraging the elimination of restrictive practices

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(6) Derived from unpublished Census Current Population Survey data for 1964.

(7) Marshall, Ray F., and Briggs, Vernon M., Negro Participation in Apprenticeship Programs, Report to the Office of Manpower Policy, Evaluation, and Research, U.S. Department of Labor, 1966, p. 85.

based on insecurity of employment. More liberal union policies, in turn, would make construction work more attractive to the nation's youth, white and nonwhite. However, easing admission requirements, in and of itself, would be insufficient to encourage nonwhites to enter the building trades on a large scale. Inadequate education and training, and low aspiration levels also help account for the underrepresentation of nonwhites in many of the building trades. Vocational education and guidance programs in the schools can help to overcome these barriers by providing the minimum of training needed for entrance to employment, by encouraging students to complete high school, and by motivating Negroes, Puerto Ricans and others to aspire to careers in the building trades.

It would be difficult to significantly reduce the discrepancy between the anticipated growth in supply and requirements in the construction crafts unless substantially more opportunities are created for young persons in the "left out" groups to obtain admission to these occupations. Taking into account past trends in the employment of nonwhites in the building trades, and allowing for the impact of current civil rights and education programs, Table 2 summarizes the anticipated increases in employment opportunities for nonwhites in a number of selected building trades in the coming decade.

The crafts listed in Table 2 make up four-fifths of all employment in the skilled construction trades in 1966. If the increases projected for nonwhites were to materialize, their representation would grow from 6.5 per

Table 2

Estimated Nonwhite Employment in Selected Construction Occupations, 1966 and Projected 1975

Occupational Category	Number Employed (in 000) in 1966[a]	Number Employed (in 000) Projected for 1975[a]	Per cent Increase, 1966 to 1975
Brickmasons, stonemasons, & tilesetters	27	52	93%
Carpenters	48	86	79
Cranemen, derrickmen, & hoistmen	21	39	86
Electricians	11	16	45
Excavating, grading, & road machinery operators	16	31	94
Painters	41	83	102
Plumbers & pipefitters	16	30	87
Total	180	337	87

(a) 1966 estimates are from Current Population Survey data (unpublished). 1975 projections are based on manpower requirements for achieving aspiration goals involving substantial construction requirements.

cent of total employment in the seven crafts in 1966 to over 9 per cent by 1975. Employment growth alone would create over 150,000 new job openings for nonwhites in these fields. Attaining increases of this dimension would require a far-reaching and coordinated effort by government, employers, trade unions, and the vocational education system to continue enlarging education and training opportunities and eliminating racial barriers in employment.

IMPLICATIONS FOR VOCATION-TECHNICAL EDUCATION

The Need for More Training

While the estimates for the 1970's indicate annual openings for an anticipated 291,000 skilled workers in the construction crafts, the primary sources of formal training, including the vocational education system, turned out only 68,000 students who had completed training programs in these occupations in 1967. This imbalance underscores the need for reassessing priorities in planning in vocational-technical education.

A number of institutions participate in preparing craftsmen in the building trades. Aside from the vocational education system, MDTA, and apprenticeship programs, they include proprietary institutions, and the specialized training offered by business firms and the armed forces. While lack of information makes it difficult to generalize about these other programs, it is apparent that much of this instruction is specialized to the needs of the particular institution which offers the training. The armed forces training programs are an illustration.

Allowing for these missing pieces would be unlikely to seriously reduce the discrepancy between the expected job openings and the projected increases in supply. Evaluation of this imbalance must also allow for the fact that many graduates of vocational or other training programs do not enter the fields for which they are trained. On the basis of past experience, it is estimated that about 45,000 of the 68,000 graduates of the formal courses in 1967 took on construction jobs shortly after completing their training. This is a small percentage, 15 per cent, of the 291,000 openings a year projected for the 1970's.

The current training programs come closer to meeting needs in some occupations, electricians are an instance, than in others such as cranemen or operators of excavating and grading machinery. The relationship between training completions in the construction trades and the estimated annual job openings is described in Table 3.

Table 3

Estimated Job Openings and Training Program Completions by Occupational Category, Construction Trades (1)
(in 000)

Occupational Category	Average Annual Job Openings 1966 to 1975	Training Program Completions in Fiscal Year 1967		
		Vocational Education	Apprenticeship and MDTA	Total
Structural Crafts	159.0	18.5	15.0	33.5
Bricklayers, stonemasons, & tilesetters(2)	19.0	3.8	3.2	7.0
Carpenters	70.0	10.1	6.9	17.0
Cranemen, derrickmen, & hoistmen	9.0	0.9	3.3	4.2
Excavating, grading, & road machinery operators	34.0			
Mechanical Crafts	74.0	18.6	12.8	31.4
Electricians	35.0	7.5	4.2	11.7
Plumbers & pipefitters	28.0	1.7	5.5	7.2
Tinsmiths, coppersmiths, & sheet metal workers	9.0	9.4	3.1	12.5
Finishing Crafts	58.0	0.5	2.2	2.7
Painters	37.0	0.5	1.0	1.5
Total	291	37.6	30.0	67.6

(1) Source: See Appendix Table 4.
(2) Detailed occupations listed as illustrative, and they do not exhaust the total.

The data in Table 3 show that the vocational education system is far and away the largest source of formal training for the skilled construction trades although this training is often preparatory to more specialized training as in apprenticeship programs. The vocational education programs provide most of the occupational preparation for tinsmiths, coppersmiths, and sheet metal workers. Like the apprenticeship system and MDTA, the vocational programs come closest to filling job openings in the mechanical trades. Yet even for this group, the vocational program completions in 1967 were only one-fourth of the expected annual job openings. The vocational programs were least successful in bridging the expected imbalance between supply and requirements in the finishing crafts. Completions in this group were approximately 1 per cent of the projected annual job openings. The imbalance is partially attributable to the many opportunities for acquiring painting skills outside of formal job training programs.

The estimates of job openings and training completions point to the necessity for expanding occupational preparation in the construction trades. They also spell out the importance of reconsidering the distribution of resources for particular programs. In one of the mechanical crafts, tinsmiths, coppersmiths, and sheet metal workers, the number of persons completing the vocational education programs in 1967 was greater than the anticipated annual job openings in the 1970's. The low ratio of training completions to anticipated job openings for cranemen and road machinery operators creates a presumption that sizeable returns would be likely to result from a considerably greater concentration on programs in these fields.

It would be unreasonable to expect a neat balance between training completions and job openings in construction or elsewhere. Formal job training is not always necessary for successful performance in a skilled job, and in some instances it may not be the most efficient way of preparing a young person for employment in the building trades. It is still possible in many of these crafts to begin as a laborer, and to progress to semi-skilled work such as a carpenter's helper, and to become qualified, with experience, as a journeyman without the benefit of specific training programs. However, in a world of increasingly complex technology, and reliance on credentials as a prerequisite for employment, participation in vocational programs can reduce the time required for attaining the journeyman's status, and it can provide the credentials needed for admission to employment or to more specialized training programs.

The Organization of Job Training in the Construction Field

Vocational education in the areas related to construction is primarily significant as adult education for persons who are already in the labor force. In 1967, more than 200,000 adults were enrolled in the adult construction-related vocational programs. This represented about two-thirds of all vocational enrollments in the construction occupations.(8) Most of this training was at the secondary level, and the bulk of it was probably received in comprehensive high schools. While there is a need for expanding programs in the construction trades for high school students, the national policy of increasing and upgrading employment opportunities for the disadvantaged implies a continued emphasis on adult programs in the construction fields.

(8). Source: Unpublished data on vocational education enrollments and completions for fiscal year 1967, U.S. Office of Education.

More than in most other occupational areas, vocational education programs in construction exist side-by-side with another highly structured job training system preparing young persons for employment in the same fields, the apprenticeship system. Part of the rationale for this dual system of training lies in the limited enrollments and completions in the apprenticeship programs. Completions in apprenticeship programs in the construction trades in 1967 amounted to 16,500, or a little more than two-fifths of the completions of the vocational education programs in the same trades. Even with a substantial expansion in apprenticeship programs and enrollments, accordingly, this system of training would be insufficient to supply more than a small proportion of the skilled workers who would be required in construction in the 1970's.

The relationship between the vocational education system, the apprenticeship system, and the unions which sponsor the apprenticeship programs varies considerably from city to city. Vocational training in the public schools frequently serves as pre-apprenticeship education. The students are prepared to enter the construction trades either as apprentices or helpers, although many others choose to work in allied fields such as producing or selling building materials and equipment or providing services such as repair or maintenance services to the construction industry. Students trained in a vocational program can usually proceed more rapidly through the apprenticeship system. Most apprenticeship programs will not accept applicants under 18, and they usually require a high school education or the equivalent for admission. Enrollment in high school vocational courses, therefore, can provide pre-apprenticeship training, and it can encourage students to remain in school and acquire the

educational credentials for entrance into an apprenticeship program or other specialized training. For these reasons, increasing the scope of the apprenticeship system would be more likely to result in a growth in high school vocational programs than in providing a substitute for them.

Consideration of vocational education in construction must also take into account the basic education and occupational training courses established in the 1960's to serve the needs of unemployed workers or workers whose job skills had been made obsolete by economic and technological changes. These courses are mainly conducted under the auspices of the Manpower Development and Training Act, and, to a lesser extent, as part of the Job Corps programs for teenagers and young adults. All told, in 1967, some 14,000 persons completed MDTA programs in construction occupations, or something over a third of the completions in the vocational programs. The MDTA courses have concentrated in training persons for work as carpenters, plumbers and pipefitters, cranemen and hoistmen, or as excavating, grading, and road machinery operators. While comparable data are unavailable for the Job Corps, it is known that a number of young persons who had been school dropouts have acquired skills in heavy equipment operation and maintenance in the Job Corps centers.

While most vocational education in construction is at the secondary level, a greater emphasis on goals involving substantial construction requirements would also lead to large increases for technicians and semi-professionals who frequently receive their occupational preparation in community colleges. Community colleges also offer training in several skilled building trades

occupations such as electricians. The potentials for growth for community colleges in meeting demands for technicians and semi-professionals are illustrated by the projections for the urban development goal. Concentrating resources on rebuilding the nation's cities in the 1970's could generate employment for as many as 110,000 technicians and 80,000 designers and draftsmen.(9) Requirements of these dimensions underscore the need for a significant expansion in the scope, and sometimes in the calibre, of the community college programs.

Implications for New Directions

The vocational programs in the construction trades have achieved considerable success. But this is not to say that they should be continued pretty much as they are now in a society which is going through rapid and pronounced transformations. Some of the new directions which are relevant for vocational education are quantitative. They concern expansion of courses, enrollments, and completions. Others are qualitative. They involve who is being taught, what they are being taught and how, and the relationship between the vocational programs and the community.

A recent survey of a large number of secondary schools indicated that 85 per cent of the schools included in the survey offered some courses in the construction trades. Yet the range of courses offered was frequently narrow. For example, of the schools surveyed, only 25 per cent had courses in carpentry, 13 per cent in bricklaying and in plumbing, while 8 per cent offered preparation for the painters' craft. By contrast, 90 per cent included courses in auto

(9) Lecht, L.A., Manpower Requirements for National Objectives in the 1970's, Report to the Office of Manpower Policy, Evaluation, and Research, 1968, Appendix Table 34-2.

mechanics in their vocational curriculum.(10)

Since seven basic crafts are likely to account for four-fifths of the future job openings in the skilled construction crafts, instruction in all of these trades should be readily available to students in any of the large urban school systems. The range and the emphasis in programs can be expected to vary from place to place. Schools in large urban centers should frequently offer programs in small but rapidly growing occupations. Glaziers are an instance. Suburban and rural schools, on the other hand, will often discover a greater return in introducing courses in floor covering and roofing in anticipation of a sizeable growth in residential construction in their localities.

For young persons from the disadvantaged groups in the inner cities, vocational education, by itself, is not enough, and, when undertaken simply as an extension of present programs, it is likely to constitute an incompleted dead end. Overcoming low levels of aspiration, cultural deprivation, and frequent histories of discrimination and disorganization will entail a multi-dimensional program combining vocational education with programs in recruitment, counseling, job coaching services, and remedial education. The teachers in the vocational programs will require both knowledge of the construction trades and an exposure to the kinds of education which produces insights into the problems and attitudes of their students.

Since experience in the past has convinced many nonwhites that the skilled construction crafts are closed to them, recruiting Negroes into the

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(10) Evenger, M.U., The Process and Product of T and I High School Level Vocational Education in the United States, 1968, pp. 5 ff.

construction courses will require an active program of counseling to motivate students to seek to prepare for these trades. Some in this group can probably be reached by occupational information programs which indicate the prospects for higher earnings, job security, and opportunities for advancement in the skilled building trades. Reaching and teaching others can be expected to involve utilizing techniques of remedial education and job coaching which have been found to be successful in the MDTA courses or the Job Corps. The "world of work" courses have also served as useful adjuncts to counseling and education for persons with special needs in poor neighborhoods.(11) In addition to its role as occupational preparation, much of the rationale for vocational education in construction in the central cities in the 1970's will grow of its potential for serving as a type of general education encouraging students with limited verbal skills to complete high school and thereby to upgrade their opportunities for employment or further training.

The vocational education system is more likely to achieve its objectives in the construction trades if it can draw on the resources of unions, employers, government, and other community institutions. Many administrators of vocational programs have attempted to make their programs relevant to local labor market needs by establishing advisory committees drawn from the local community. While these committees have frequently been successful in representing the viewpoints of employers and the public, they have often been less effective in securing participation from the local construction unions.

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(11) Thomas, A.I., "T and I for the Disadvantaged," American Vocational Journal, February, 1969.

In many instances, local unions can be involved in cooperating with the vocational programs by initially establishing working arrangements with the unions at the national level. One of the byproducts of this type of cooperation could be more widespread acceptance of work-study programs. These programs would enable pairs of students to take turns in attending school half-time and working half time in a job utilizing their training under the supervision of employers who are assured of uninterrupted service because the students alternate. Arrangements of this type are unlikely to be successful without the cooperation of local unions as well as employers. The anticipated rapid growth in job openings in construction can be expected to reduce the apprehension of unions that the work-study programs might serve as a device for restricting work opportunities for their members.

To make creative as well as prudent use of these and similar opportunities will entail a reassessment of priorities in vocational-technical education. This reassessment will involve greater emphasis on planning, on experimental and pilot projects, and on follow-up and other evaluation studies. Activities such as these will upgrade the status of vocational education by increasing its effectiveness. They will also enhance the nation's capacity for achieving its goals in urban development, housing, transportation, and in other areas in the decade ahead.

PRIORITIES FOR VOCATIONAL-TECHNICAL EDUCATION

This consideration of career openings in the construction trades in the 1970's is based on an assessment of recent developments and on several underlying assumptions concerning the decade ahead. It is assumed, for example, that present needs and pressures will lead our nation to accord a high priority to rebuilding cities, to constructing schools and hospitals, and to devising an efficient and safe transportation system in the next five or ten years. It is also regarded as probable that the on-site types of work now performed in building will continue to be required in the coming decade, i.e., that technological change is unlikely to shift much of what is now construction work into prefabricated mass production carried on in factories. And, finally, the projections take it for granted that the recent concern with enlarging educational and career opportunities for the disadvantaged will significantly influence vocational education and employment practices in the 1970's. These assumptions portray a future whose main features represent an outgrowth of the present and the recent past.

The new directions the developments considered signify for the vocational education system can be summarized by a series of priorities reflecting changes needed to realize the potentials inherent in the anticipated rapid growth in skilled job openings in construction. They are

1. There is a need to at least double enrollments in high school and special adult courses related to the construction trades in the next five years. The structural crafts, including occupations such as excavating, grading, and road machinery operation should figure prominently in this expansion.

2. The growing demand for manpower in the construction crafts suggests special opportunities for vocational education in serving the needs of inner-city youth and other disadvantaged groups. Coordinating vocational education with programs in remedial education, job coaching, vocational counseling, and recruitment will be necessary to reach and teach these studies.

3. Translating plans into programs will involve strengthening the ties between local vocational education systems and the construction community. This will mean developing new, or more vigorous ties, usually through the mechanism of advisory committees, with employers and unions in the building trades.

4. The search for new directions for vocational education in the construction field increases the importance of experimental programs and evaluation efforts as an essential aspect of on-going administrative programs. Work-study arrangements with employers, and joint apprentice-vocational education arrangements with unions can offer a fertile field for innovation.

5. Teacher education for the vocational programs in construction requires more emphasis on understanding the socio-economic problems of their students, and on teaching young adults from the "left out" groups in our society.

Appendix Table 2

Estimated Employment Growth in Construction Crafts to Achieve National Goals, 1966 to 1975

Occupational Category	Employment (in thousands) 1966	1975	Growth 1966-1975	Percent Increase 1966-1975
Structural Occupations	1753	2421	668	38
Boilermaker(a)	24	30	6	25
Bricklayers, stonemasons, & tilesetters	193	291	98	51
Cabinetmakers	69	106	37	54
Carpenters	861	1087	226	26
Cement masons(b)	68	102	34	50
Crane men, derrickmen, & hoistmen	146	195	49	34
Excavating, grading, & road machinery operators	305	471	166	54
Structural metal workers	87	139	52	60
Mechanical Occupations	929	1197	268	29
Electricians	439	549	110	25
Elevator constructors(c)	15	23	8	50
Plumbers & pipefitters	334	472	138	41
Tinsmiths, coppersmiths, & sheet metal workers	141	153	12	9
Finishing Occupations(c)	721	905	184	26
Asbestos workers	22	26	4	18
Floor covering	35	45	10	29
Glaziers	24	36	12	50
Lathers	30	40	10	33
Marble setters	40	50	10	25
Painters	474	586	112	24
Paperhangers	9	12	3	33
Plasterers	36	46	10	28
Roofers	51	64	13	25
Total	3403	4523	1120	33

(a) Assumed same percentage growth as carpenters.
(b) Assumed same percentage growth as bricklayers.
(c) Percentage increase from Costs of Construction, op. cit., p. 16, except for painters

Sources: Lecht, L., Manpower Needs for National Goals in the 1970's, New York, Praeger, 1969 (for 1975 estimates); Census Current Population Survey for 1966 (unpublished) for 1966 data; Costs of Construction, National Association of Homebuilders, 1968, for 1966 data in building trades occupations not reported in Census su

Appendix Table 2

Estimated Employment Growth in Construction Crafts to Achieve National Goals, 1966 to 1975

Occupational Category	Employment (in thousands) 1966	1975	Growth 1966-1975	Percent Increase 1966-1975
Structural Occupations	**1753**	**2421**	**668**	**38**
Boilermaker(a)	24	30	6	25
Bricklayers, stonemasons, & tilesetters	193	291	98	51
Cabinetmakers	69	106	37	54
Carpenters	861	1087	226	26
Cement masons(b)	68	102	34	50
Crane-men, derrickmen, & hoistmen	146	195	49	34
Excavating, grading, & road machinery operators	305	471	166	54
Structural metal workers	87	139	52	60
Mechanical Occupations	**929**	**1197**	**268**	**29**
Electricians	439	549	110	25
Elevator constructors(c)	15	23	8	50
Plumbers & pipefitters	334	472	138	41
Tinsmiths, coppersmiths, & sheet metal workers	141	153	12	9
Finishing Occupations(c)	**721**	**905**	**184**	**26**
Asbestos workers	22	26	4	18
Floor covering	35	45	10	29
Glaziers	24	36	12	50
Lathers	30	40	10	33
Marble setters	40	50	10	25
Painters	474	586	112	24
Paperhangers	9	12	3	33
Plasterers	36	46	10	28
Roofers	51	64	13	25
Total	**3403**	**4523**	**1120**	**33**

(a) Assumed same percentage growth as carpenters.
(b) Assumed same percentage growth as bricklayers.
(c) Percentage increase from Costs of Construction, op. cit., p. 16, except for painters

Sources: Lecht, L., Manpower Needs for National Goals in the 1970's, New York, Praeger, 1969 (for 1975 estimates); Census Current Population Survey for 1966 (unpublished) for 1966 data; Costs of Construction, National Association of Homebuilders, 1968, for 1966 data in building trades occupations not reported in Census su

Appendix Table 3

Sources of Job Openings in Skilled Construction Crafts

Occupational Category	Employment in 1966 (in thousands)	Overall attrition rate for 1966-1975	Sources of Job Openings, 1966 to 1975		
			Attrition loss[a]	Growth 1966-1975 (in thousands)	Total job openings
Structural Occupations	1753	52.6%	922	668	1590
Boilermakers	24	54.9	13	6	19
Bricklayers, stonemasons, & tilesetters	193	47.1	91	98	189
Cabinetmakers	69	54.9	38	37	75
Carpenters	861	54.9	473	226	699
Cement masons	68	75.0	51	34	85
Cranemen, derrickmen, & hoistmen	146	30.0	44	49	93
Excavating, grading, & road machinery operators	305	54.5	166	166	332
Structural metal workers	87	53.3	46	52	98
Mechanical Occupations	929	50.8	472	268	740
Electricians	439	55.0	241	110	352
Elevator constructors	15	66.7	10	8	18
Plumbers & pipefitters	334	42.9	143	138	281
Sheetmetalsmiths, coppersmiths, & sheet metal workers	141	54.5	77	12	89
Finishing Occupations	721	55.3	399	184	583
Asbestos workers	22	45.5	10	4	14
Floor coverers	35	57.1	20	10	30
Glaziers	24	80.0	19	12	31
Painters	30	50.0	15	10	25
Marble setters	40	50.0	20	10	30
Painters	474	55.6	263	112	375
Paperhangers	9	41.7	4	3	7
Plasterers	36	60.0	22	10	32
Roofers	51	50.0	26	13	39
Total	3403		1793	1120	2913

(a) The concept of attrition to which these attrition estimates refer includes losses due to deaths, retirements, and withdrawals from the labor force.

Sources: Census Population Survey, 1966, unpublished (for 1966 employment data); Lecht, L., Manpower, op. cit., 1969 (for 1975 estimates); Costs, op.cit., (for attrition and selected 1966 data).

Appendix Table 4

Estimated Job Openings and Training Completions by Program and and by Occupation, Construction Crafts
(in thousands)

Occupational Category	Average annual job openings 1966 - 1975	Annual Training Completions in 1966-67			
		Total	Apprenticeship(b)	Vocational education (b)	MDTA(c)
Structural Occupations	159.0	33.5	6.8	18.5	8.2
Boilermakers	1.9	(a)	(a)	(a)	(a)
Bricklayers	18.9	7.1	1.3	3.8	1.9
Cabinetmakers	7.5	2.8	.1	2.7	--
Carpenters	69.9	17.0	3.3	10.1	3.6
Cement masons	8.5	1.2	.3	.9	--
Cranemen, derrickmen, & hoistmen	9.3	4.3	.6	.9	2.7
Excavating, grading, & road machinery operators	33.2				
Structural metalworkers	9.8	1.1	1.1	--	--
Mechanical Occupations	74.0	31.4	7.9	18.6	4.9
Electricians	35.2	11.8	3.6	7.5	.6
Plumbers & pipefitters	28.1	7.2	2.7	1.7	2.3
Tinsmiths, coppersmiths, & sheetmetal workers	8.9	12.5	1.6	9.4	1.5
Other	1.8	--	--	--	--
Finishing Occupations	58.2	2.7	1.7	.5	.5
Painters	37.5	1.5	.8	.5	.2
Other	20.7	1.1	.9	0	.3
Total Construction Craftsmen	291.2	67.6	16.4	37.6	13.6

(a) Data not reported.
(b) Numbers for vocational education represent completions from programs eligible for federal funding in FY 1967. Data on apprenticeship refer to calendar year 1966.
(c) This is an estimate of fiscal year 1967 completions based on completions in the 1964 to 1966 period.

Source: Based on job openings data from Appendix Table 3; Vocational education data for fiscal year 1967 from unpublished report by U.S. Office of Education; Apprenticeship data from Bureau of Labor Statistics Bulletin, 67-120, 67-113, June, 1967, Trends in Apprentice Registrations.