FINAL DRAFT

WELDING AND FABRICATING TECHNOLOGY PROGRAM
Needs Assessment

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Office of Institutional Planning and Analysis
Oakland Community College

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WELDING AND FABRICATING
NEEDS ASSESSMENT

EXECUTIVE SUMMARY

- This needs assessment relates to the proposal, developed in March 1992, for a one year Welding Certificate program at O.C.C.

- Information on the need for the Welding program was obtained from a survey of employers and businesses in the field, a survey of students enrolled in existing courses, a literature search, data from state and federal government sources, information from professional organizations, and a study of programs offered by other four year and community colleges.

- The welding industry, long recognized as a cyclical industry, has experienced a difficult time in recent years as a result of the economic downturn. However, it is predicted to grow by 6% a year over the next six years. A majority of employers surveyed, (58%) rated welding as a good or excellent field to enter.

- Industry analysts recognize that welding has "an image problem" in attracting trainees. In addition, the American Welding Society is attempting to develop a job classification system within welding which would better reflect the different levels of skill and qualification, together with the appropriate training required for each level.

- Current employment prospects in the industry are limited; total employment has been declining on both the national and local level. A considerable majority (85%) of employers reported that they are not currently hiring entry level personnel. However, there is a recognized need for welding engineers, with four year degree qualifications.

- Future employment in welding is predicted to decline overall, although growth is anticipated in the construction and repair sectors of the industry. There is a perception among analysts and employers that welding is becoming more of a skill required by many manufacturing tradespeople rather than an occupation.

- The preferred credential for employment among those employers surveyed was prior work experience, preferred by 36%. Only 5% of employers required an Associate degree. An additional 5% required a one year certificate.

- A considerable number of community colleges in Michigan that offer programs in welding are currently reviewing or phasing out their programs. However, the O.C.C. student survey indicated a high level of satisfaction with the content and quality of instruction provided in welding.

OAKLAND COMMUNITY COLLEGE
WELDING AND FABRICATING PROGRAM
NEEDS ASSESSMENT

INTRODUCTION

The purpose of this report is to present information to assist in reviewing and evaluating the proposed changes in the existing Welding and Fabricating Program at Oakland Community College. The needs assessment was initiated by Dr. Bill Rose, Dean of Academic Services, and members of the Welding department. It includes a comprehensive literature review, data supplied by the U.S. Department of Labor, Michigan Occupational Information System (MOIS) and the Michigan Employment Security Commission (MESC), industry forecasts, an examination of related programs in other institutions of higher education, phone surveys of employers in the welding industry and students who have recently enrolled in Welding courses.

Description of the Proposed Program

In March 1992 Dr Bill Rose, the Welding department, and the Marketing Review Committee proposed the creation of a new Welding Certificate program, which could be completed by a student in one year (Appendix A). The Welding department expressed concern that enrollment figures in the existing two year Associate degree program had been showing a downward trend over a number of years. As indicated by the Ten Year Enrollment Trends report prepared by the Office of Institutional Planning and Analysis (Appendix B) there was an 82% decline in student headcount and student credit hours in Welding between 1981 and 1991. This trend was also supported by data reported in O.C.C.'s Instructional PRIME report.

It was felt that the new Certificate program would be more responsive to the current needs of students and employers. The program would consist of nine courses, ranging from a basic level introduction to the kinds of welding most needed in industry today, (MIG), (TIG), (ARC and GAS), to pipe welding, advanced robotic programming, robotic spot and continuous welding. The new program would be accompanied by a marketing plan designed to target individuals who might be interested in welding as a career, inform parents and counselors of high school students of opportunities in the field, and to liaise with prospective employers and professional organizations (Appendix C).

Description of Occupation

The Dictionary of Occupational Titles defines Welding as "those occupations primarily concerned with joining, surfacing, or otherwise fabricating or repairing structures or parts of metal or other weldable material, such as plastic or glass, applying the following welding or cutting processes: arc: gas: resistance: solid state (friction, ultrasonic, cold explosion, diffusion) and other processes, such as electroslag, electron beam, induction, thermic and laser beam."

The Welding and Fabricating program provides the necessary theory and "hands-on" training to gain entry level job positions in a wide variety of welding occupations. Respondents to the O.C.C. employers survey reported fourteen different job titles for their entry level employees in the field:-

1. Machinist/Machine Operator
2. Apprentice/Trainee
3. Welder
4. Metal Model Maker B
5. Metal Model Maker C
6. Technician
7. Welding Engineer
8. Journeyman
9. Millwright
10. Fabricator
11. Fitter
12. Pipe Welder
13. Tool Maker
14. Semi-skilled Worker

METHODOLOGY

Methods of Data Collection

In order to obtain background information on the Welding industry a literature search was performed and a variety of professional, industry, public and regulatory bodies were contacted.

This was followed by a survey of employers, in which companies in the welding and fabricating field were asked to respond to telephone interviews conducted between April 22 and 29, 1992, regarding actual and potential employment opportunities (Appendix D). More detailed information was sought from these employers with regard to desired qualifications and specific skill levels for employees. The employers contacted were randomly selected from a variety of sources, including lists supplied by welding materials suppliers, existing contacts of the O.C.C. Welding department, information from the American Welding Society and from Macomb Community College, Department of Research and Evaluation. An attempt was made to include companies of different sizes and interests in order to obtain a comprehensive view of employer expectations. Employers were grouped in three categories; Manufacturing, Contractor/Testing, and Repair (Appendix E).

An additional phone survey was carried out of students who enrolled in Welding courses during the Fall, 1991 and Winter,1992 terms. Students were questioned with regard to their motivation in taking welding courses, their current and prospective employment and their satisfaction level with aspects of the program (Appendix F). This survey was completed by telephone interviews between April 20 and 27, 1992.

Finally, a review was made of existing Welding and Fabricating programs in Michigan. Comparisons of enrollment and graduation trends were made and an examination of program content was completed.

Methods of Data Analysis

A total of 39 employers responded to the O.C.C. employers telephone survey. The data was analyzed by means of frequency distributions and content analysis of verbal responses.

Table 1
Number of Employers Responding in Each Category

	Number	Percent
Manufacturing	25	64%
Contractor/Testing	10	26%
Repair	4	10%
Total	39	100%

A total of 28 of the 44 students (63%) who took Welding courses in the Fall of 1991 and Winter of 1992 responded to the telephone survey. Their replies were similarly analyzed, both by frequency analysis and content analysis of verbal responses.

ANALYSIS

Employment

The American Welding Society (AWS), the leading professional organization in the welding field, has estimated that at least 50% of U.S. GNP is related to welding. It is difficult to gauge this figure in an industry which has no "output" factor such as the number of completed products. On a national scale, the "welding apparatus" sector, which includes electric and gas equipment as well as welding consumables, has often been used as an indicator of the state of the industry as a whole and this sector has experienced a difficult time in the 1990s. The recession, defence cutbacks, the downturn in construction, machinery, shipbuilding, auto and other fabrication industries have all affected demand. However, welding has long been recognized as a cyclical industry and should, therefore, benefit from the recovery in the overall economy. The U.S. Department of Commerce has estimated that welding should grow 6% annually during the next six years.

The American Welding Society and other industry analysts have also recognized that the industry has "an image problem". The AWS is actively trying to upgrade the popular impression of welding employment from that of "hot sweaty labor" involving helmet, goggles, smoke and sparks to a more technical image requiring greater education in chemistry, metallurgy, and the understanding of new materials and techniques.

They are currently directing their efforts at the 7th and 8th grade school levels to move the image of welding away from vocational education to higher technology.

An additional problem facing the industry is that of job classification. Dr. David Dickinson, Chairman of the Welding Engineering Department at Ohio State University and Vice-President of the AWS has written at length about this problem of identity. Even at the top end of the profession some companies do not recognize the qualities of a Welding Engineer. He believes that the industry needs to establish a classification system including complete job descriptions, then accurately survey employment needs in each classification level and determine the required training for entry level positions. The AWS has proposed that the classification should range from Welding Engineer with a four year Bachelor's degree, Welding Supervisor, Welding Technician with an Associates degree, to a welder with vocational qualifications. The AWS is working closely with the International Institute of Welding to develop this classification, under pressure from the European Economic Community which is trying to introduce international regulation of production requirements. These would mandate certain processes which could only be performed by particular classifications of welder.

The issue of job classification also closely relates to issues of employment because of the adverse effect of technical changes on low skill, production welding jobs. Demand for welders in manufacturing and production type jobs will drop as more robots are used in manufacturing. According to the U.S. Department of Labor and MESC, both nationally and in Michigan, demand for more skilled and specialized workers is expected to be more stable. As Olin Norman, Head of the Welding department at Columbus Technical Institute, Columbus, Georgia commented, " You are never going to design a robot to do every manipulative skill a human being can do." Currently robots cannot perform the most complex assembly jobs and although the use of robotics may threaten some jobs it may equally improve the status of welding equipment engineers and make welding a more high tech profession with an increased need for high level skills in inspection, monitoring and metallurgy. An improved job classification system would allow the industry more accurately to chart in which areas job losses and gains are being made.

Current Employment

The Department of Labor, Bureau of Statistics reports that total employment in the Welding and Fabrication industry in the U.S. has shown a long term trend decline in recent years. Employment in the industry dropped by 63,000 between 1989 and 1991.

Table 2
Employment in the Welding and Fabricating Industry in the U.S.

1989	1990	1991
612,000	593,000	549,000

Source: Department of Labor, Bureau of Statistics

Available MOIS and MESC data indicates that in 1988 14,700 welders were employed in Michigan. Approximately 6% of the total were self employed, the majority of others (69%) were involved in the manufacture of durable goods.

Table 3
The Distribution of Welding Employees in Michigan, by Industry.

Industry	Percent employed
Manufacturing	69%
Services	12%
Wholesale Trade	5%
Construction	3%
Transport & Utilities	2%
Mining	2%
Other	7%

MESC further reports that 47% of all welders in Michigan work in the transportation equipment and motor vehicle industries, 15% in the fabricated metal products industries, 18% in services, including repair shops and related services. Employers contacted in the O.C.C. survey also reflect this distribution by industrial sector.

When asked if currently hiring, only six of the thirty-nine companies surveyed (15%) were considering offering employment in welding occupations at the present time. Of those who were currently hiring, 5 of the 6 companies (83%) indicated that their reason for doing so was expansion of the company.

Despite this low rate of current hiring, 58% of employers contacted rated welding as a good or excellent field to enter. Narrative comments reflected the opinion that "there will always be a need for welding as long as you need to join metal." Other narrative comments reflected concern with the effects of the current recession in Michigan, particularly with regard to downsizing by the auto companies. Typical opinions expressed were;

"Poor field to enter because of the economy; there are too many tradesmen and too many businesses in the field."

"Industry is slow right now because we are predominantly affected by the auto industry."

"The economy is so questionable right now. Auto companies are shutting down."
"Presently there is not very much work."

Several employers responding to this question about hiring expressed opinions on the changing nature of employment in the industry:

"Twenty to thirty years ago welding was a profession. Now it is only a tool used in trades."

"Welding is a side talent with other skills."

"We need to be more definitive. Welding now is part of a larger technology."

Reference to the need for computer skills combined with those of welding was made by several of the employers.

"Generally go into computer aided welding now."

"Welder with computer skills is excellent. Just welder not excellent, average."

A majority of the employers contacted (67%) reported that they had experienced no problem in finding entry level employees for welding related positions. Those respondents who did experience difficulty identified the major problems as follows:-

"They don't have the experience they say they have."

"We want a balanced background of a decent education and hands-on experience."

"Can't read, write, comprehend. We need people who can be taught."

Others commented on the need for the ability to read blueprints, possess math skills and the right attitude to work.

Future Employment

The MESC Bureau of Research and Statistics, Occupational Employment Projections predicts that employment in welding occupations will decline by an estimated 18-23% from the 14,700 individuals employed in the industry in 1988 to 12,020 in the year 2000. The major decline in employment is expected to be in the area of transportation/motor vehicles and equipment, which is estimated to drop from 47% of welding employment currently to 26% in the year 2000.

The data available from MOIS confirms this trend of an overall decline in welding employment. MOIS comments that the employment of welders in construction and manufacturing is usually vulnerable to periodic layoff, due to economic downturns. In the long term it predicts that manufacturing employment in Michigan will drop as a result of greater use of welding robots and other technologies as well as the substitution of high strength composite materials and plastics. The trend is for the elimination of routine jobs in manufacturing and industry. Analysts point to the downsizing of the auto industry in

line with the "lean" concept which requires fewer people with more skills and greater flexibility. Jim Dolfi of the Systems Applications Unit at Ford Motors and Keith Green of Manufacturing Structures Training at Chrysler Corporation both emphasized this change towards welding being considered as one more skill expected of their skilled tradesmen rather than a single occupation.

MOIS does predict an increase in the next decade in the need for welders in the construction and repair sectors of industry. However, these sectors currently comprise a comparatively small segment of welder employment in Michigan. The repair sector estimated at 9% in 1988 is predicted to expand to 15% in 2000, an increase of approximately 400 welders.

According to MOIS, most job openings in welding will be available as a result of retirement or employees leaving the occupation. Dan Grubbs, education director of AWS concurred with this and commented that a survey conducted for them suggested that the high average age of existing metalworkers (55 years) would lead to a retirement rate possibly as high as 60% in the next few years. His belief is that on the national scale there could be a shortfall in the numbers of welders currently being trained.

In addition, there is a strongly perceived need within the welding industry and among education experts for larger numbers of welding engineers, the highest level of welding qualification. These are graduates of four year specialized programs, which are currently offered by only six universities in the U.S. Ferris State University, the closest of the six schools, reports a 100% placement rate of its graduates over the last seven years. The average starting salary of graduates from Ferris State was $32,000 p.a., that of Ohio State graduates was $30,094. These were rated among the highest starting salaries given to engineering students, another indication of the way in which demand exceeds supply. Employers who employ welding engineers report difficulty in retaining them when other companies frequently make job offers to them. Uma Mahesh, Plant Manager for Budd Company referred to a six month unsuccessful search for a welding engineer. They finally had to re-train a mechanical engineer for the position.

Dr. David Dickinson and other commentators have pointed out the concern that the U.S. is uncompetitive in this field, with the rest of the world. The former U.S.S.R. has 41 institutions of higher education training welding engineers. The European Economic Community has 18,500 currently active welding engineers; German universities alone provide 600 new graduates each year. Japan graduates each year, from a considerably smaller population base, more welding engineers than the U.S.

Demand for Retraining of Current Employees

In response to questions which asked employers to rate how well prepared entry level employees were for their positions, 23% reported that they found employees to be "adequately prepared", 39% "sometimes prepared", 33% "usually not prepared". Those employers who replied "usually not" prepared, frequently commented on the need for employees to be trained to their specific requirements, machinery or regulatory codes. The lack of basic skills in math and blueprint reading were cited by several employers. Others quoted deficiencies in reading, report writing, communication skills and attitude problems.

Twenty-seven of the thirty-nine companies contacted (69%) did not provide any kind of formal job training for their employees. The most frequently mentioned means of training were courses with the vendors of their welding equipment or specific training in skills required by the company. Larger companies such as Ford, General Motors and Chrysler usually run their own training programs. General Motors, for example, offers a program with 160 hours of MIG and TIG plus 120 hours of plasma cutting and shielded metal arc welding.

The percentage of employers contacted who expressed an interest in sending employees to O.C.C. for training was 36%. Fifty-four percent would not consider it. The highest positive response came from employers who were interested in short, custom designed courses and specific skills. The larger companies were interested in additional training for skilled tradespeople and for employees such as machine operators whose job descriptions have been expanded. The possibility of courses designed to upgrade the certification of some welders was also mentioned. For example, Keith Green of Chrysler Manufacturing Training Services, has expressed an interest in a joint training venture with O.C.C., using the O.C.C. welding lab and a Chrysler instructor who normally has to travel around the plants. The plants are responsible for their own training costs so such a program would have to be very time and cost effective.

Employee Benefits

Wage and Salary

According to data provided by MOIS, wages and salaries for welders depend upon the experience, skill and specialization of the individuals, size and type of employer, geographic location of the employment and the extent of unionization in the industry.

Nationally, the median weekly earnings of welders were $423 in 1990, approximately $10.57 an hour based on a forty hour week. Welders in the automobile industry in 1991 had above average earnings of $16.40 to $19.18 per hour plus a cost of living allowance of $0.23 per hour.

Average hourly earnings of welders in the Detroit Metropolitan area ranged from $9.98 to $15.48 per hour in 1991, slightly above the national average. One Michigan utility company paid a base rate of $14.53 to $18.19 per hour in late 1991 with an additional cost of living allowance. These figures are consistent with data from the O.C.C. employers survey which indicated a salary range for all job titles between $12,480, ($6 per hour), to $42,640 per annum,($20.50 per hour). The highest salaries reported by respondents to the O.C.C. survey were obtained by pipe welders ($41,600 per annum), millwrights ($39,187 per annum), metal model makers B ($42,640 per annum) and welding engineers ($33,666 per annum).

MOIS reports that 1989 graduates of high school vocational education programs in Michigan who were employed in jobs related to welding earned an average starting salary of $6.52 per hour in 1990. The O.C.C. employers survey indicated a very similar figure of $6.75 per hour for apprentices and trainees.

In addition, MOIS reports that welders may receive paid vacations and holidays, life, accident and health insurance, sick leave and retirement plans, paid for in part at least by their employers.

Advancement Opportunities

MOIS reports that the normal career progression in the welding occupation moves from apprentice/trainee to welder, welder fitter, to supervisor. Advancement to inspector or supervisory positions usually depends upon training, experience and supervisory ability. After gaining experience some welders open their own shops.

Evidence from the O.C.C employers survey suggests that there is little real advancement available in large companies for those with purely welding qualifications, unless they have a four year welding engineering degree. Typical responses from employers questioned about advancement opportunities were:

"None for welders with no other skills."

"Difficult advancement opportunities unless employees have more than just welding skills."

Lynn Markarcwicz, UAW Training Representative for Skilled Trade Metal Model Makers at General Motors, agreed that employees with only welding skills have no advancement opportunities within GM. At GM the highest position available using welding skills is a metal model maker. James Dolfi of Ford and Keith Green of Chrysler both made similar comments.

Within smaller companies respondents reported that career advancement usually involves moving to another company or starting their own business. There was also some perception among employers that employment opportunities might increase in the smaller companies with an upturn in the economy and possible increased outsourcing by auto and other large companies.

Opportunities for Minorities

The U.S. Department of Labor, Bureau of Statistics 1991 employment figures indicate that of the 549,000 individuals employed nationally in welding related occupations only 4.1% are women , 6.8% are black, and 10.6% are Hispanic. These figures are considerably below the national averages for minority representation but are consistent with those for community college enrollment in Welding programs, in Michigan which reflects 95% enrollment by males.

Occupation

Level of Training Needed

Employers responding to the O.C.C. survey were asked to indicate the minimum level of experience or credentials required for entry level employment. The most commonly required qualification was that of prior work experience which was requested by 36% of employers. Thirteen percent of employers required no prior work experience, 13% asked for prior related work experience. Only 5% of the respondents required a one year certificate and the same number (5%) asked for an Associate degree. Twenty-six percent of employers contacted specified that they had other qualifications for employment than those already mentioned. Further questioning revealed that this usually involved the employers own selection techniques or certification. One employer used a practical welding test, others looked for potential "trainability".

Table 4
Minimum Entry Level Qualifications Required by Employers

Qualification	Percent	Number
Prior work experience	36%	14
Other	26%	10
No prior work experience	13%	5
Prior related work experience	13%	5
Certificate in welding	5%	2
Associate Degree	5%	2
Bachelor's Degree	3%	1

Source: O.C.C. Survey

An additional question asked if employers recognized a need for a two year community college program in welding. Fifty-six percent of respondents answered positively, with 36% not recognizing such a need. When asked if a one year certificate would be better, 51% employers answered no, while 36% thought it would be preferable. Narrative comments indicate the concern of employers with the desirability of the general education aspects of the Associate Degree. One employer referred to trade school programs which he believed to be inadequate in their scope. These comments are consistent with the views of Dan Grubbs, director of education for the AWS, who reported that he believed employers saw less value in one year certificate programs and would prefer to train employees themselves in specific techniques.

A more detailed analysis of employers requirements was made by the O.C.C. employers survey which requested information on both the techniques and the skills required of entry level employees. The welding techniques surveyed were identified from the literature on the subject and those specified by O.C.C. faculty in the proposed one year certificate program. Of the techniques surveyed, MIG and TIG were identified by 78% of respondents as important or very important. TIG received the highest number of "very important" ratings of any of the techniques.

Table 5
Welding Techniques Rated by Employers

Technique	Very important	Very important and important
TIG	33%	78%
Arc Welding/Flat	31%	70%
MIG	26%	78%
Arc Welding/Vertical	18%	60%
Advanced Gas	18%	60%
Robotic Spot/Continuous	15%	38%
Robotic Programming	13%	38%
Pipe Welding	8%	32%

Source: O.C.C. Survey

Employers comments reflected the view of many industry commentators that arc welding is becoming less important, except in shipbuilding. TIG is seen as a growing sector together with more advanced techniques such as heli-arc, plasma and robotics. Other techniques suggested by employers included blueprint reading, metallurgy and computer skills.

When asked to rate the general skills needed by entry level employees, interpersonal skills, the ability to be a team member, the ability to use individual initiative, organizational skills and problem solving skills were rated most highly by the majority of employers.

Table 6
Skills Rated by Employers

Skill	Very important	Very important and important
Team Member	59%	97%
Individual Initiative	59%	95%
Problem Solving	51%	90%
Interpersonal skills	46%	97%
Organizational skills	39%	90%
Writing skills	36%	63%
Speaking skills	33%	82%

Source: O.C.C. Survey

An open ended question with regard to other skills desired by employers again elicited replies related to general education skills, communication and motivation. Typical comments were:-

"Willing to work, willing to learn, desire to learn."

"Well-educated in Mathematics, English. A general studies education is important."

"All people skills are needed,-very important."

Forty-six percent of employers contacted, reported that they would be unwilling to employ an O.C.C. welding intern, while 26% would be willing to do so. Further comments revealed that the issue of liability was a major concern for many respondents, particularly the smaller companies.

Adequacy of Currently Available Training

A total of fifteen community colleges and universities in Michigan currently offer programs in Welding and Fabricating. Ferris State University and Ohio State University provide four year degree programs. The latest enrollment figures available are shown below:-

Table 7
Enrollment in Community College Welding Programs.

	1988-89	1989-90
Welding/Brazing/Soldering	122	133
Welding Technology	539	672

Source: Michigan Department of Education

Welding programs are offered by the following Community colleges and Four year institutions in Michigan:

Ferris State University: One of only six colleges in the U.S. offering a Bachelor of Science degree in Welding, the program works on a laddered concept specially designed to meet the needs of community colleges in Michigan. It offers a B.S. in Welding Engineering Technology, an Associate Degree in Applied Science and a Certificate in Welding. Associate Professor Ken Kuk, who articulated the program, explained that it is essentially a 2+2 program, with 90% of the two year students going into the Bachelor's program. Many of the welding instructors in Michigan graduated from Ferris and they direct their students there. Enrollment in the Bachelor's program is limited to 15 students to allow sufficient time on the automated equipment; their aim is to produce "hands-on, plant floor level people." Ferris recently added a resistance welding lab, helped by industry groups who required the course. In this way it has been possible to keep up to date despite the high costs of equipment.

Grand Rapids Community College: Offers an Associate in Applied Arts and Science degree in Welding Technology and a Welding Certificate program. The latter is run on a 26 week, 40 hour per week basis. The programs offer Gas, Arc, MIG and TIG courses for the manufacturing, construction, and maintenance industries. Dr. Till Peters, Dean of Occupational Programs indicated that MIG and TIG courses were in most demand. He estimated current enrollment to be 260 but commented on the low graduation rate, only 3 graduates in 1991.

Henry Ford Community College: Offers a series of courses in welding which operate in sequence and which can lead to an in-house certificate. The courses are primarily regarded as part of the trade and apprenticeship program and are closely directed to the needs of industry. Ed Allard, of the trade and apprenticeship program indicated that their needs assessment had found insufficient evidence of available employment to justify an Associate degree program.

Kalamazoo Valley Community College: Offers an Associate of Applied Science degree in Welding with an emphasis on welding and cutting techniques. Credits will transfer to the Welding Engineering Technology program at Ferris State University but the program has had only 12 graduates since 1987. Total enrollment over the last five years was 206 students.

Lansing Community College: Offers an Associates degree in Welding Technology and a one year certificate program. Over the last five years 15 Associate degrees and 8 certificates have been awarded. Faculty members commented that a considerable percentage of their students are interested primarily in personal development and the leisure use of welding techniques.

Macomb Community College: Dave Pilon, Associate Dean of Technology, reported that Macomb intends to discontinue its Associate degree program in Fall, 1992. He commented that a needs assessment in 1989 indicated interest in welding courses from both students and employers but the majority do not require a certificate or degree program. He believes that employers are more interested in certification in specific areas and students require sufficient courses to gain employment.

Monroe Community College: Offers both an Associate degree and a certificate program in welding. Enrollment has shown a gradual decline from 49 in 1987 to 23 in 1991. There have been a total of 31 graduates in the last five years.

Mott Community College: Offers a two year Associate degree program in Welding but is currently providing limited courses.

Muskegon Community College: Offers an Associate degree in Applied Science and a one year certificate program in Welding. A total of 102 students were enrolled in the programs between 1987 and 1991 but only one graduated in the period. Welding department faculty indicated that the majority of students only complete sufficient courses to qualify for employment.

Northern Michigan University: Offered an Associates degree in Welding but has suffered low enrollment over some years, currently six students. The program is being phased out and no new students will be accepted in Fall 1992. It was felt that little employment was available locally.

Ohio State University: Has one of the best known programs in the U.S., offering Welding Engineering from Bachelor to Doctorate level. The Department leans towards high tech development and investment in research. Even so a significant amount of their enrollment comes from students transferring from other engineering programs at the University. As much of Engineering becomes less hands-on and more theoretical, some students find welding more attractive. The department does considerable marketing, directed towards Middle and High school students, particularly minorities.

Schoolcraft Community College: Offers a one year certificate program including Arc Welding, Gas Metallic, Gas Tungsten, advanced shielded metallic, advanced programs in Gas Tungsten, Ceramic and Polymer welding. The Dean of Vocational Education reported that Schoolcraft changed the direction of their program from a two year associate degree to a one year certificate, and since that time has seen enrollment increase from a low of 35 in 1989 to 121 in 1992. At the time of the change extensive review was made of the program to determine the needs of industry. Scheduling was completely re-vamped to offer courses in much shorter blocks of time, usually in the evenings to make the courses more time and cost effective for industry and students. An extensive marketing campaign was launched, with the aid of the advisory committee, involving direct contact with companies purchasing welding supplies, trade union organizations and hand delivered fliers to prospective industrial employers. Graduation numbers from the program remain low, faculty estimate that 80% of students require only one, two or three courses.

St. Clair County Community College: Offers an Associate degree and a one year certificate in Welding and Cutting Technology. Total enrollment over the last five years has been 144 with 4 graduates in the period. The Dean of Vocational Education indicated that she believed the program to be meeting a community need in terms of courses for leisure or personal development but it is clearly not a major degree program and is undergoing review.

Washtenaw Community College: Offers an Associate degree in Welding Technology, which has experienced falling enrollment in the last five years from 219 in 1987 to 159 in 1991. Only 10 students have graduated in that period.

Wayne Community College: Donald Olson, Dean of Career and Technical Education reported that the Welding program is in the process of being phased out. Enrollment has been low over a period of time, currently 14 students in both programs. There have been no graduates in the last five years from the Associate degree program. He had not tracked graduates from the certificate program but believed the number to be low. Dean Olson commented that he believed that, in this area, welding has become a skill required of workers rather than an occupation. He believes that specialist welders are still needed for pipe line and construction work but these do not offer sufficient employment locally to justify programming. Currently, the college is using its welding labs to provide business courses for companies but he believed them to be under-utilized.

The information relating to other college programs is consistent with the data obtained from the O.C.C. student survey. It was determined that the primary reason for taking welding courses at O.C.C., given by 32% of those asked, was for personal development. Twenty-one percent of the students wished to obtain a certificate or degree, 21% were fulfilling their employers requirements. Furthermore, 43% of the total would use the courses to improve their skills and knowledge, 32% to obtain a job. A

majority (61%) responded that welding was not their main field of study. The survey also, revealed a very high level of satisfaction among current students. A total of 89% indicated that they were very satisfied or satisfied with the quality of faculty and instruction; narrative comments made frequent reference to the high quality of instructors in the program. Ninety percent of students were also satisfied with the equipment and technology provided, 79% with the content of the courses and 70% with the variety of courses. The major area of dissatisfaction mentioned was scheduling, which was also mentioned by the two instructors contacted. It was felt that more advanced classes were not always available and scheduling was not always in a logical sequence.

Preliminary Cost Estimate

Costs involved in the change to a revised Welding and Fabricating program at O.C.C. would be concentrated in two main areas. Firstly, it is proposed to update the ventilation system of the welding lab at O.C.C. The present system is inadequate for the number of stations being used and O.C.C. has commissioned an engineer's report. John Tobin commented that the report is expected to estimate both the cost involved in providing adequate ventilation for the existing number of stations and the maximum number of stations that could be used with the current system.

Secondly, it is proposed to update the welding equipment available for the program, particularly in the areas of MIG and TIG. Dr. Bill Rose estimates that this will cost approximately $20,000.

SUMMARY

The majority of employers expressed positive views about the future of welding, despite the affects of the current recession. There is concern among industry experts about the poor image of the occupation and the need for clearer job classification. The professional organizations are working to remedy these problems. Industry analysts and employers identified a movement towards welding being considered a skill required by tradesmen rather than an occupation. However, there is a clear need at the top end of the occupation for welding engineers; a shortage of supply and increased automation may accentuate the need for greater skill development. It would seem that at the present time both employers and students rate work experience as the preferred requirement for employment rather than an Associate degree or Certificate. A considerable number of existing community college programs in welding are currently under review or are being phased out. Graduation rates are typically low and it would seem that many students prefer either to obtain skills for personal development or to obtain only a sufficient level of skill to gain employment. The O.C.C. survey indicated a high level of satisfaction among current students.

APPENDIX A

WELDING CERTIFICATE PROGRAM AVAILABLE

Oakland Community College has created a new Welding Certificate Program which a student can complete in one year. This program begins at a basic level to introduce the various kinds of welding needed in industry today. It advances to include robotic spot and continuous welding, We have the newest equipment for the student to practice on and have instructors from industry.

The following courses are required for a Welding Certificate:

ATW 810	Welding Manufacturing Processes and Robotic Programming
TEW 110	Introduction to Gas, Arc, MIG, and TIG Welding
ATW 811	Arc Welding in Flat and Horizontal Positions
ATW 812	Arc Welding in the Vertical Up and Overhead Positions
ATW 822	Advances Gas Welding Applications, Gas and Plasma Cutting
ATW 831	MIG (Metal Insert Gas) Welding
ATW 832	TIG (Tungsten Inert Gas) Welding
ATW 841	Pipe Welding, All Positions
ROB 164	Interpolated/Welding Robotic Applications

The following courses will be offered during the coming Spring term which begins May 6, 1992:

ATW 811	Introduction to Arc Welding	Tues. and Thurs. 6:00-9:00 p.m.
ATW 821	Introduction to Gas Welding	Tues. and Thurs. 6:00-9:00 p.m.

For further information, please call Steve Atma at 340-6888.

APPENDIX B

APPENDIX C

APPENDIX D

Survey Number_____

OAKLAND COMMUNITY COLLEGE WELDING AND FABRICATING TECHNOLOGY
NEEDS ASSESSMENT TELEPHONE SURVEY

Name of Business: _____

Type of Business: _____

City and Zip Code:_____

Telephone # : _____

Hello, this is _____ **(insert your name).** I'm calling from Oakland Community College, Department of Planning and Analysis. May I please speak to the Director of Personnel or Human Resources?

1. If the person answering is the person to whom you wish to speak go to A.

2. If the person to whom you wish to speak is not available, try to arrange a convenient callback time or leave your name and number. You may need to explain more about why you are calling. If so, use the following explanation:

"OCC is in the process of evaluating our Welding and Fabricating Technology program. We would like to ask _____(the name of the personnel director) about employment opportunities and training requirements at your company."

Enter possible callback times below:

Day:_____ Date:_____ Time:_____

Day:_____ Date:_____ Time:_____

If you left name and number -- check here: _____

A. Once you reach the Director of Personnel or Human Resources be sure to record

Name: _____

Title:_____

Phone:_____

"Hello, this is _____ **(your name).** I'm calling from OCC. We are in the process of reviewing our Welding and Fabricating Technology program. Your knowledge and experience in the field would be very helpful to us in our current

review. Would you be willing to take just a few minutes to answer some questions about welding?"

If "yes", go on to the next page.

Survey

1. Which entry level positions in your company are held by employees with backgrounds or qualifications in welding and fabricating technology?

   What is the entry level salary range for these positions?

	Job Titles	Entry Level Salary Range
a)	_____	_____ to _____
b)	_____	_____ to _____
c)	_____	_____ to _____

2. Are you currently hiring in these areas?

   Yes _____ **Go to #3**
   No _____ **Skip to #4**

3. What is the primary reason for hiring these employees?

   Expansion of the company _____
   Employee turnover _____
   Other reasons _____
   Please explain _____

   _____

4a). How would you rate welding and fabricating as a field to enter currently?

   a) Excellent _____
   b) Good _____
   c) Average _____
   d) Fair _____
   e) Poor _____

4b). Could you explain why you hold this opinion?

   _____

   _____

5. What do you see as the future of the welding industry over the next five years?

6a). Do you experience any difficulty finding entry level employees?

Yes _____ **Go to 6b**
No _____ **Skip to 7**

6b). What kind of problems do you encounter?

7. Do you feel that entry level personnel you hire are:

Adequately prepared? _____
Sometimes prepared? _____
Usually not prepared? _____

7b) **If they answered "usually not prepared", ask them to explain in what ways employees are unprepared for employment.**

8. What are the minimum qualifications required by your company for entry level employees in welding and fabricating positions?

a) No prior related work experience or education _____
b) Prior related work experience _____
c) Prior work experience in welding _____

d) Certificate in welding _____
e) Associates degree _____
f) Bachelors degree _____
g) Other, please explain: _____

_____

_____

9a) Please rate the importance of the following techniques for entry level employees, using the scale: Very Important, Important, Not Important.

	VI.	I.	NI.
a) Arc welding in flat and horizontal positions	1	2	3
b) Arc welding in vertical and overhead positions	1	2	3
c) Advanced gas welding, gas and plasma cutting	1	2	3
d) M.I.G. (Metal Inert Gas) welding	1	2	3
e) T.I.G. (Tungsten Inert Gas) welding	1	2	3
f) Pipe welding	1	2	3
g) Robotic spot and continuous welding	1	2	3
h) Robotic programming	1	2	3

9b) Are there any other techniques you would like your entry level employees to have learnt? Please explain. _____

_____

10a) Please rate the importance of the following skills for entry level employees, using the same scale: Very Important, Important, Not Important.

	VI.	I.	NI.
a) Ability to work as a team member	1	2	3
b) Organizational skill	1	2	3
c) Ability to use individual iniative	1	2	3
d) Writing skills	1	2	3
e) Good speaking skills	1	2	3
f) Problem solving skills	1	2	3
g) Interpersonal skills	1	2	3

10b) Are there any other skills you would like your entry level employees to have? Please explain. _____

_____

11) What related advancement opportunities are available for employees with welding skills? Please give examples of job titles.

_____

_____

_____

12a) Does your company provide any formal welding training for employees?

Yes _____ **Go to 12b**
No _____ **Skip to 13**

12b) **If "yes",** would you explain the nature of the training?

_____

_____

13. Would you consider sending your employees to OCC for training in our Welding program?

Yes _____
No _____

14. Do you perceive a need for a two-year community college welding degree program?

Yes_____
No _____

15. Would a one year certificate program in welding be more useful, in your opinion?

Yes _____ Why? _____

_____

No _____ Why not? _____

_____

THIS IS OUR LAST QUESTION:

16. Would your company consider offering non-paid internships for OCC students in the welding program at OCC?

Yes _____
No _____
Uncertain, please explain _____

_____

17. Are there any other comments you would like to make at this time?

_____

_____

_____

Thank you for your time and assistance. We appreciate your help and believe that your responses will help to influence what happens at OCC in the future. If you have any further questions please contact the Office of Planning and Analysis at (313) 471-7746.

Interviewer: _____

Date: _____

Time interview began: _____

Time interview finished: _____

APPENDIX E

OAKLAND COMMUNITY COLLEGE
WELDING FABRICATION TECHNOLOGY
EMPLOYERS LIST

ABC Portable Welding
7695 St. John
Utica, MI 48317
(313) 254-1811

Ace Controls Inc.
23435 Industrial Park Dr.
Farmington, MI
(313) 476-0213

Acorn Tool & Die Inc.
2430 E. Walton Blvd.
Auburn Hills, MI 48326
(313) 373-4351

Aerotech Welding Co.
21114 Collingham
Farmington Hills, MI
(313) 473-3973

American Sunroof
1 Sunroof Ctr.
Southgate, MI
(313) 285-4911

Applied Industries
Ecorse, MI
(313) 381-0550

Budd Co.
Division Headquarters
2573 S. Rochester Rd.
(313) 853-1200

Candid Logic Ind.
31681 Dequindre
Madison Heights, MI 48071
(313) 583-9266

Chrysler Corporation
Jefferson North Assembly
Detroit, MI
(313) 956-7683

Creative Industries
12501 E. Grand River
Brighton, MI
(313) 227-9300

C & R Manufacturing
Shawnee, KS 66216
(913) 441-4120

Cummins Diesel
Wheel & Brake Division
24755 Halstead Rd.
Farmington Hills, MI
(313) 473-9000
Corporate Headquarters
(313) 478-9700

Detroit Precision Tool
1505 W. Hamlin Rd.
Rochester Hills, MI 48309
(313) 853-5888

D-M Fabricating Inc.
1195 Marc
Clawson, MI 48017
(313)726-8390

Dixie Fabricating Co.
11333 Dixie Hwy.
Holly, MI 48442
(313) 695-3460

Fenkel Welding
15536 Telegraph
Detroit, MI
(313) 532-4676

Flex-Cable
1875 Stephen Hwy.
Troy, MI 48083
(313) 689-4666

Ford Motor Company
Training Dept.
Dearborn, MI
(313) 322-6822

General Motors Corp.
West Grand Blvd.
Detroit, MI 48202
(313) 492-9258
(313) 575-3915

Great Lakes Welding Co.
130 W. Pleasant
River Rouge, MI
(313) 843-8740

Hi-Tech Tool Industries, Inc.
1600 W. Maple Rd.
Troy, MI 48084
(313) 649-0690

Industrial Welding Co.
Warren, MI
(313) 294-7430

JLC Fabricating
Oxford, MI
(313) 628-0280

Johnston Fabrication
St. Clair Shores, MI
(313) 791-6680

Mayo Welding & Fabricating Co.
5061 Delemere
Royal Oak, MI 48073
(313) 435-2730

Mercury Metalcraft
Roseville, MI
(313) 779-6800

Metropolitan Welding Co.
Van Dyke
Utica, MI
(313) 731-8752
(313) 731-8750

Michigan Caterpillar
Novi, MI
(313) 349-4800

Milco
2147 E. Ten Mile Rd.
Warren, MI 48091
(313) 755-7320

MPD Welding Center
1025 E. Maple Rd.
Troy, MI
(313) 585-7240

National Testing & Research Lab Inc.
11301 Schaefer
Detroit, MI 48227
(313) 834-7500

Roman Manufacturing Inc.
861 47th St. S. W.
Grand Rapids, MI 49509
(616) 530-8641

Rouge Steel
Dearborn, MI
(313) 845-3473

Smillie Group, C.M.
Ferndale, MI 48220
(313) 544-3100

Tesco Engineering Inc.
1809 Rochester Industrial Dr.
Rochester Hills, Mi 48309
(313) 656-7755

Thompson Welding Systemsn
40000 Grand River Ave. Suite 105
Novi, MI 48375
(313) 477-4472

Webasto Sunroofs Inc.
2700 Product Dr.
Rochester Hills, MI
(853) 2270

Weld Mold Company
750 Richett Rd.
Brighton, MI 48166
(313) 229-9521

Zantop Airlines
Ypsilanti, MI
941-8900

APPENDIX F

Survey Number_____

OAKLAND COMMUNITY COLLEGE
WELDING AND FABRICATING TECHNOLOGY PROGRAM
NEEDS ASSESSMENT STUDENT SURVEY

Name:_____

S.S. Number:_____

Telephone:_____

Introduction:
"Hello, this is _____ . I'm calling from Oakland Community College. May I please speak to _____
_____?"

1. If the person answering is the person you wish to speak to, go to A.

2. If the person you wish to speak to is not available try to arrange a convenient callback time.

Enter possible callback times below:

Day:_____ **Date:**_____ **Time:**_____
Day:_____ **Date:**_____ **Time:**_____

A. Once you reach the right person:

" We are in the process of assessing the welding program at the OCC and our records indicate that you are currently taking or have recently taken a welding course. We would value your assistance in answering a few questions. Would you be willing to take part in a short survey for us?"

If "yes", go on to the survey.

SURVEY

1. What was your primary reason for taking welding courses at OCC? **(Let the respondent answer and then record the answer.)**

_____ To obtain a certificate or a degree.
_____ To complete courses necessary for transfer to another college.
_____ To prepare for a new career.
_____ To improve your knowledge, technical skill or competency for your job.
_____ To comply with your employer's requirements.
_____ To increase your chances for a raise and/or promotion.
_____ For personal development.
_____ Other._____

2. What is your current employment situation?

_____ a) Employed full-time.
_____ b) Employed part-time.

Go to question 3.

_____ c) Unemployed. **(Not employed but actively seeking employment)**
_____ d) Not employed and not seeking employment, **(because of choice, illness, full-time study, retirement, pregnancy or any other reason).**

Go to question 4

If respondent answered a) or b) GO TO QUESTION 3.
If respondent answered c) or d) GO TO QUESTION 4.

3. What is your current occupation?

_____

4. How do you plan to use the knowledge and skills gained in your welding courses at OCC, in the future?

_____

_____

5.a) Is welding your major field of study?

_____ Yes, **If yes, go to question 6.**
_____ No, **If no, go to question 5b)**

5.b) What is your major field of study?

_____

6. What do you or did you most like about the Welding course/program?

_____

_____

7. What do you or did you most dislike about the Welding course/program?

_____

_____

8. Please rate your level of satisfaction with some aspects of the Welding program using the following scale, **1**=Very satisfied, **2**=Satisfied, **3**=Neutral, **4**=Dissatisfied, **5**=Very dissatisfied.

	VS	S.	N.	D.	VD.
a) The variety of welding courses offered	1.	2.	3.	4.	5.
b) The content of welding courses taken.....	1.	2.	3.	4.	5.
c) The scheduling of welding courses	1.	2.	3.	4.	5.
d) The quality of faculty/instruction in welding.	1.	2.	3.	4.	5.
e) The equipment/technology available.....	1.	2.	3.	4.	5.

9. Is there any other comment you would like to make about the welding course/program at OCC? _____

_____

_____

CONCLUSION:

"Thank you very much for your time and assistance. We sincerely appreciate your help. If you have any further questions you may contact the Office of Planning and Analysis at (313) 471-7746."

APPENDIX G

4b. Could you explain why you hold this opinion?

SURVEY NO.	ANSWER
01	Poor field to enter because of economy, too many tradesmen and too many businesses in the field. Includes: repair, fabricating, commercial and industrial.
02	Not everyone off-the-street has welding skills. it takes time to get experience.
03	Fabricating is good. Backgrounds in metallurgy in demand.
04	20-39 years ago welding was a profession. Now only a "tool" used in trades.
05	More apprentice programs are being dropped. It is difficult to find metal model makers.
06	Presently there is not very much work.
07	There is a big demand short supply for qualified welding engineers. They are paid highly, have great job opportunities. He searched 6 months for a welding engineer and could not find one. He ended up hiring a mechanical engineer and training him in welding. Schools need to offer welding engineering degree. Only, to his knowledge Ohio State offers one. His welding engineers are being constantly offered jobs by other companies-hard to get a keep.
08	They lease employees. Their employees are hired by GM and General Dynamics. "Perhaps we train them too well, we hire the, train them and they leave." Welders are paid well. Within their company they get raises and opportunity for over time pay.
09	Welder with computer excellent. Just welder not excellent, average.
10	Generally go into computer aided welding now. The welding we do here is of extremely technical nature.
11	His company does make machining which requires welding. He sees welding as a side talent with other skills.

SURVEY NO.	ANSWER
12	Don't know, mostly mechanical ability needed. Degrees with welding ability is an asset.
13	n/a
14	The amount of work that's out there right now, the economy is bad.
15	The economy is so questionable right now. Auto companies are shutting down.
16	Businesses down. There are many people looking for jobs, there aren't many to find.
17	Industry is slow right now because we are predominantly effected by the auto industry.
18	Less need for welders in the future, one skill.
19	Welders needed for fabricating (all phases of welding). Metal Model Makers use welding from design process through finished product. Welding, combines with other skills, enables tradesmen to be able to follow process through.
20	There isn't much of a demand for them. I would go into fabricating now and tank welding.
21	We need to be more definitive. Welding now is part of a larger technology. There will always be a need for welders as long as there is metal, used in manufacturing, that to be joined together.
22	Because everything is slow.
23	The companies that he deals with do little/some welding in-house. For specialized welding or big jobs they have to job it out to companies like JLC. There is a need for specialized welders.
24	Economy.
25	Economy, job availability in area that he is familiar with.
26	Not expanding. If good welder one can always find a job. Need for pipe welders in industry (not Murcury Metallcraft); Heli-arc needed.

SURVEY NO.	ANSWER
27	Welding is a specialized field-There are many kinds of welding. Need specialists-heli-arc needed.
28	Limited. Welding is a secondary skill needed in CATS industry. They do hire/have certified welders on their payroll. Their mechanics and mechanic trainees need to know how to weld.
29	They are a supplier to the auto industry. If the auto industry is good their business will "succeed" and grow.
30	Hard to get, welders (tool and die) are impossible to find.
31	The need for welding grows even though the economy is bad.
32	It is a service industry-the service industry is growing. Almost all industrial companies have need for in-house welders.
33	There is a shortage.
34	Good opportunity. Skill is required. The future is fabrication is unlimited. However, it involves manual labor and it is a tough job.
35	Welders will always be needed. However, it is a rough job. Most welders do not want to stay welders, they want to move onto something else. The work is hard, dirty, hot, heavy. Welders get burned- the pay is mediocre.
36	Any specialization is good.
37	We are using people.
38	Due to lack of work.
39	For us it's more than just being a welder.

5. What do you see as the future of the welding industry over the next five years?

SURVEY NO.	ANSWER
01	The future is poor.
02	No answer-she has no idea.
03	More specialized welding is needed. TIG welding is popular. DIE repair and sheet metal fabricating experience is needed.
04	Going to expand as new, higher strength materials are introduced. In Detroit, arc gas welding may be phased out. It is still used in ship building. Welding skills are good to have as it is needed in almost every trade.
05	Welding per se is going by the way. It is done by robot. Welding is a small sub-function of a bigger job. Today there are no welders per se.
06	"It's hard to say-it depends on the economy."
07	Welding has advanced to a great extent. There is room for growth in the high tech areas of electronics, sophisticated controls. Quality welding is needed. Non destructive welding is needed. Lasers in welding are greatly innovative and becoming mass produced.
08	Not qualified to answer. Her observation: They have had a welding lab for 6 years. It has constantly grown; there is always a steady stream of work; it is a good source of income for their company. Most of their work is done for General Motors.
09	Going to robot, computers, robotic controls.
10	Virtually a status quo.
11	Welding will go to more automation, less labor.
12	Can't answer. Not a profession to his employees.
13	She said that she doesn't know. They farm out a lot of welding jobs.
14	It's good.

SURVEY NO.	ANSWER
15	I really don't know. The Japanese are coming here and bringing

	their own suppliers and not using companies like mine.
16	It could only get better.
17	It will pick up.
18	Not good.
19	Good. Outside of GM companies are looking for welders. Many tradesmen are self employed using at-home portable machines using TIG and making money doing it. GM is in the process of condensing and combining skills.
20	In my end of the business it will stay the same.
21	As long as manufacturing continues, welders will be needed. Arc welders will be replaced by plasma arc welders/laser welders.
22	it depends on the economy. If it picks up, the outlook will be good-otherwise, not good.
23	From his standpoint, in the last 5 years, his work load had doubled or tripled. He sees no end to it.
24	Expect to stay about the same as it is.
25	Very specialized. Need lots more schooling to know special machines that are being developed.
26	Decline-going to mechanical ways to fasten things together-epoxies. Use lots of electricity-hazardous.
27	With the introduction of new "revolutionary" technology, welding will become a whole new field.
28	Should remain status quo. Sees no expansion, some shrinkage. The cast of labor in a dealership is so high that is cheaper to buy new parts rather than to remake and rebuild as they did in the past. Welding was used in the part to remake/rebuild parts.
29	If the auto industry picks up, the need for welders will grow.

SURVEY NO.	**ANSWER**
30	Over the next 5 years good. In the next 3 years the outlook is especially good as companies consumers will be making up for "lost time" buying cars and products that they delayed buying during the recession.

31	The future of MIG is not good-it is only for production work. The future is excellent for all types of flux wire. Continuous feed welding.
32	In resistance welding he sees a steady level of growth.
33	Plasma arc technology, lasers and robotics cell.
34	The future is "solid". Until new technology comes out welding is needed. The field will grow as the economy grows.
35	Industry will remain about the same. Welders will always be needed to make machines.
36	Good. New techniques are being introduced, they are more precise, better quality.
37	As long as cars are made with metal components I see it a viable.
38	It's going to get better.
39	I couldn't answer that.

6b. What kind of problems do you encounter?

SURVEY NO.	ANSWER
01	Concern about liability makes him cautious.
02	No problems, not hard to find.
03	People are not interested in going into welding-In the past students were introduced to welding at home or in farm repair work-they don't see that any longer.
04	Many welders know only one type of welding. It is difficulty to find employees who are "all around" welders.
05	n/a
06	Don't have experience they say they have.
07	They want a balanced background of a decent education and hands-on experience. They want entry level but end up paying big for education because they can't find good skilled people.
08 - 19	n/a
20	They don't have the submerged arc welding experience. Many can;t read blueprints and don't have mathematic skills.
21	Can't read, write comprehend. Need people who can be taught-need tools to learn with.
22	n/a
23	He has had no problems. He knows, however, that Oxford Welding Co. went through 150 applications before they found 3 or 4 people that they would hire.
24	None.
25	Hard time finding qualified ones with college background.
26	Need people who "want to work".

SURVEY NO.	ANSWER

27	n/a
28	Qualifications lacking.
29	n/a
30	Can't find anyone qualified. He hired a man from West Virginia because he couldn't find anyone around the Detroit area.
31	n/a
32	n/a
33	n/a
34	n/a
35	n/a
36	Getting reliable people who report on time-show up every day.
37	Attitudinal problems,they think they know everything, fail drug screening and they are not reliable.
38	n/a
39	n/a

7b. If they answer "usually not prepared", ask them to explain in what ways employees are unprepared for employment?

SURVEY NO.	ANSWER
01	n/a
02	n/a
03	The hiring process controls who they hire. They have to sort through numerous people before they find people with skills-they need blue print readers.
04	Community College level seems to have adequate knowledge. Welding depends on personal technique-better technique is needed.
05	n/a
06	Applicants are not truthful-they do not have the experience they claim to have.
07	Controlled by hiring process.
08	n/a
09	60-65% prepared.
10	Basic skill levels e.g. math.
11	n/a
12	n/a
13	n/a
14	n/a
15	Most have not had much formal training. What they need to learn in school is not directly what we do on the job. Reading blueprints is something they need.
16	Field experience.
SURVEY NO.	**ANSWER**
17	n/a

18	Most people from production.
19	n/a
20	See above.
21	High tech hires or qualified on ability to learn-they hire on potential.
22	n/a
23	He prefers to hire untrained people to teach them.
24	n/a
25	Lack of training. New need special skills. Welders need more then 10 credit college hours to be well trained.
26	n/a
27	n/a
28	Less than they desire. Many trainees deficient in reading report writing, communicating skills.
29	n/a
30	Lacking experience, don't want to work.
31	n/a
32	n/a
33	n/a
34	Believe in training on the job-need good work habits.
35	Even if employees have welding education, they most often lack on-the-job training. Book learning alone does not fully train a welder.
36	n/a
37	We have to retrain them.
SURVEY NO.	**ANSWER**
38	n/a
39	We are in a unique aspect of the industry, to work on an airplane he has to satisfy the FAA.

9b. Are there any other techniques you would like you entry level employees to have learnt? Please explain.

SURVEY NO.	ANSWER
01	Must know all positions. Arc no big deal any longer. Should know plasma, MIG and TIG.
02	Entry level does not require anything.
03	Acorn does nothing with (g) and (h).
04	Some knowledge of metallurgy and the properties of metals and things that can and cannot be done with a particular type of metal. Basic math skills are important.
05	Welders don't program.
06	Aluminum welding-TIG.
07	Know basics in weld control and resistance welding know properties of metals.
08	n/a
09	One or two people out of 2, 500 do arc welding. There is a great need for robotic programming skills.
10	n/a
11	Good math skills.
12	Welding-no major qualification. In truck repair only a sidelight ability to understand and utilize computers very important. Electronic experience important.
13	n/a
14	Blueprint reading.
15	Blueprint reading.
16	No.

SURVEY NO.	ANSWER

17	n/a
18	No.
19	n/a
20	Cutting with a torch.
21	They have programmers to program robots and to program for the robotic spot and continuous welding.
22	(d) and (e) MIG and TIG are somewhat important-they expect to train on-the-job for MIG and TIG.
23	Not into (g) and (h). He does all prototype work. Robotic is for production work.
24	No.
25	Basic computer skills, need problem solving, thought process skills. (c) Advanced gas welding not important, gas and plasma cutting is very important.
26	Heliarc needed for work on aluminum-TIG.
27	Used space program (TIG) and in TIG is the thing of the future-needed (welders) with skills in using new technology.
28	n/a
29	No.
30	Need good TIG and MIG.
31	Pipe welding, all position is important-few people can do it well.
32	(c) Advanced gas welding very important, gas and plasma cutting not important.
33	Tool and die welding skills.
34	n/a
35	Blueprint reading. Machining.
SURVEY NO.	**ANSWER**
36	General machine skills.

37	Braising.
38	n/a
39	n/a

10b. Are there any other skills you would like you entry level employees to have?

SURVEY NO.	ANSWER
01	No.
02	Eagerness to do the job.
03	Documentation is needed. It is important to write well. Self-motivation, desire to learn, advance and positive attitude needed.
04	n/a
05	High level math, blueprint reading, descriptive geometry, drafting, scient to first level physics.
06	n/a
07	Be able to take abuse.
08	Employees deal directly with client. Involves paper work; accounting; project time keeping. They prefer people who are comfortable with paper work.
09	In team concept must communicate with each other. All people skills needed-very important. These were not important in the past.
10	n/a
11	Willing to work, willing to learn, desire to learn.
12	Teach common sense (he wishes colleges/schools could teach).
13	c) ability to use initiative-VI if done properly. f) Problem solving skills VI-if conclusion is correct.
14	Blueprint reading.
15	Blueprint reading.
16	n/a
17	No.

SURVEY NO.	ANSWER
18	n/a
19	n/a
20	n/a
21	Potential, initiative.
22	n/a
23	n/a
24	No.
25	He needs people who are well educated in mathematics, English. A general studies education is important.
26	Good working habits-common sense-reliability.
27	Employees are not accustomed to dealing with people-need people skills.
28	Dependability, honesty, integrity.
29	(d)(e) Writing skills are very important in their sales dept. and speaking skills are very important in the sales dept. Otherwise, in the shop they are not that important.
30	Not afraid to work. Able to make decisions.
31	Work as team in fabrication. Blueprint reading class (or 2 or 3 classes is needed) pipe layout, 90% pipe fabrication.
32	General math, reading.
33	Blueprint reading.
34	Need people who want to assume responsibility.
35	c) he would rather have entry people feel free to ask questions rather than using their own initiative.
36	Attitude.

SURVEY NO.	ANSWER

37	Common sense.
38	n/a
39	n/a

11. What related advancement opportunities are available for employees with welding skills. Please explain.

SURVEY NO.	ANSWER
01	None.
02	Their company uses levels instead of titles. The level are 1 through 4.
03	Eventually a welder could advance to: Group Leader, Project Leader, Foreman, Engineer.
04	No. Leave his company form own business.
05	None, of only welding skills and no other skills-ability.
06	Welders generally remain as welders in his company.
07	Technicians can advance. They have education reimbursement program.
08	Their levels are: 1) technician 2) engineer 3) Engineer Manager is top level.
09	Maintenance facilitator (management) area coordinator, first line supervisor. Skilled trades people off the production line can upgrade. Must apply, are tested, get through a long waiting period-called an "Upgrader".
10	They can progress through the trainee ranks to upgrader and to apprentice journeymen.
11	Supervisor. Try to train their employees to become machinists, which is looked upon as an advancement over welder.
12	Technicians can advance up to managers, supervisors.
13	None for welders with no other skills.
14	Any kind of machining or building.
15	They can progress up into management.

SURVEY NO.	ANSWER

16	Be their own boss.
17	Sales-Field Sales Manager or District Manager. Engineer-Chief Engineer.
18	Minimal-difficult advancement opportunities unless employees have more than just welding skills.
19	None within GM. Highest hourly rate using welding tops out with Metal Model Maker.
20	To be a leader and possible a foreman.
21	Sky is the limit as long as welding is accompanied by broader skills.
22	Brasier, Lead Solderer.
23	He has one foreman who works next to and oversees other welders.
24	Depends on background. Foreman.
25	Welders many/can advance to machine building, tool and die work, metallurgical labs, sheet metal work.
26	Foreman, welding dept.
27	Advancement is unlimited-space program, air lines, employment in large companies.
28	Supervisor, Floor Supervisor, Service Supervisor, Sales, Management.
29	With what he is aware, there is very little turnover of employees-they advance with training and experience.
30	Foreman, Operations Manager.
31	Not a lot. Welders just stay welders-but with added education, can be inspectors, engineers.
32	Field service; field technician, design field; machine construction.
33	Leaders, welding engineers, manager, trainer.

SURVEY NO.	**ANSWER**
34	Team leader.

35 Machinery, Assembly.

36 For welder none-with other skills in addition to welding okay.

37 Apprentice programs-design or tool and die and die repair.

38 Full fledged welder, possible foreman, or traveling and sales.

39 Very little in our company.

12b. If "yes", would you explain the nature of the training?

SURVEY NO.	ANSWER
01-08	n/a
09	Programmable controls trained through vendors of equipment-not toe weld, to operate equipment.
10-13	n/a
14	We train them for what we do MIG and TIG and fabricating.
15	n/a
16	On the job.
17	n/a
18	n/a
19	160 hours in MIG and TIG plus additional 120 hours in plasma cutting (see notes on GM interview).
20	n/a
21	If they feel a certain employee has potential, they will pay for his education from beginning to Bachelor degrees. They have some degreed employees that they sent to Lawrence Tech.
22-24	n/a
25	On one-to-one basis, trains employees. They do not send to community college. He dies not like weld tech and Hobart tech students.
26	n/a
27	n/a
28	Spend excess of $300,000-$400,000 yearly in training in mechanical on site-some off site. Jim Lesher in charge of training.

SURVEY NO.	ANSWER

29	n/a
30	He is establishing a welding school which will serve his company and will be open to students (from outside his company).
31	n/a
32	n/a
33	Phase I through vertical and horizontal welding. Starting Phase II for certified pipe welding and multiple tasks.
34	n/a
35	May start.
36	n/a
37	Some specific areas e.g. gas welding 8 week program.
38	They learn our type of welding on the job.
39	We send them out for additional training as needed.

17. Are there any other comments you would like to make at this time?

SURVEY NO.	ANSWER
01	No.
02	No.
03	n/a
04	No.
05	n/a
06	No.
07	n/a
08	No.
09	No.
10-20	n/a
21	Most other schools, Macomb, Wayne, etc. have similar programs.
23	His general laborers are taught:welding, machining, fabricating, blueprint reading, then they re advanced in wages.
24	No.
25	n/a
26	In his industry, fewer people are needed with 4 year degrees-more are needed with skilled-labor skills.
27	Welding is a unique field-it can be used in auto repair, at home, in industry. It is something a skilled tradesman can always fall back on when looking for a job.
28-30	n/a

SURVEY NO.	ANSWER
31	Feel the instructors that it is important to get welders certified. Either AWS Structural or ASME pressure vessel. He certifies student for Henry Ford Community College.
32	n/a
33	The program should get started in the high school levels. The community Colleges should work with the high schools.
34	Internships are good. He had an internship when he was in school and it was a good experience-he learned a lot.
35	n/a
36	n/a
37	We had people attend classes at OCC. When they got into the more advanced levels many of the classes were canceled.
38	It would be good if there were specific courses in MIG, TIG and stick welding.
39	n/a

APPENDIX H

OAKLAND COMMUNITY COLLEGE
WELDING AND FABRICATING TECHNOLOGY PROGRAM
NEEDS ASSESSMENT STUDENT SURVEY
STUDENT SURVEY NARRATIVE COMMENTS
QUESTION NO. 3

3. What is your current employment situation?

SURVEY NO.	ANSWER
01	Orthodontist
02	n/a
05	Stationary engineer
06	n/a
07	Residential builder
09	Trims trees
10	Maintenance
12	Leader, prototype shop
13	Coal equipment operator
14	Employee in training for General Motors Stationary engineer
15	Burger King/Repair equipment (construction)
17	Tool and die welder
19	Wire panels
20	Work in engine shop
21	Selling welding equipment
25	n/a
26	Drives dump trucks

SURVEY NO.	ANSWER

27	Electrician
29	n/a
31	Cook
33	n/a
37	Production
38	Tire changer
40	Mold maker
41	Student
43	Inspector at General Motors, Pontiac Motor Div.
44	Tool and die apprentice

OAKLAND COMMUNITY COLLEGE
WELDING AND FABRICATING TECHNOLOGY PROGRAM
NEEDS ASSESSMENT STUDENT SURVEY
QUESTION NO. 6

6. What do you or did you like about the Welding course/program?

SURVEY NO.	ANSWER
01	I enjoyed developing the basic skill of art welding. The instructor was a nice fellow.
02	The teacher is good and easy to work with. He teaches on an individual basis. I like the equipment, it is kept up to date and fairly well maintained.
05	I liked the instructor and the way he ran the program.
06	The facilities are great. The instructor was very knowledgeable. Course layout is pretty good, progresses in a manner that encourages learning.
07	Instructor good-Bob Hughes.
09	Can't answer-it was a decent class. Before the class he knew how to weld-didn't learn anything new.
10	Gas welding and cutting.
12	It taught him all the welding he knows. They taught all t h e basics in arc and gas welding. He can do almost any type of welding in his shop. Good teacher.
13	He liked the hands-on approach. He thought that it was a good class.
14	He liked the teacher, Mr. Hughes. He was thorough a good welder. He took the class with other people that he works with at G.M.
15	I most like the teachers. Karl for Arc and Bob for MIG. They are very friendly and very helpful. They run the course at the students pace.
17	A few instructors were pretty good. I have been going here since 1982.

SURVEY NO.	ANSWER

18	That I can use it on home stuff. Just the general knowledge of having it has helped me out.
19	It seemed thorough to me, well organized. It had a lot of good equipment, up-to-date.
20	The teachers were good. The times and availability classes at night is good.
21	I like the fact that most of it was spent hands-on.
25	He liked the way teachers delivered the problems. Most problems were more demonstration rather than book theory. He like the "hands-on" approach.
26	Teacher-Bob Hughes. He taught a lot and was knowledgeable. Larry Bigelow was all right. Bob is a better welder.
27	People had a lot of lab time to work on their projects. Good hands-on training.
29	I liked the hands on.
31	He likes all welding classes, got straight A's.
33	The teacher. He was always helpful, knowledgeable, willing to help and available. (Bob Hughes)
37	Better than high school. More shop work-less book work. Good teacher.
38	The teachers are good. The facilities are good.
40	He was able to improve his skills-he is pleased that he improved so much.
41	He liked the hands on way it was taught. He like each person having their own machine to use. The teacher was good.
43	It was easier than he thought to learn to weld. "The instructor puts you at ease."
44	Teacher good.

OAKLAND COMMUNITY COLLEGE
WELDING AND FABRICATING TECHNOLOGY PROGRAM
NEEDS ASSESSMENT STUDENT SURVEY
QUESTION NO. 7

7. What do you or did you most dislike about the Welding course/program?

SURVEY NO.	ANSWER
01	I was very happy.
02	Nothing comes to mind.
05	Nothing specific, they have a hard time getting the classes together, e.g., it is often cancelled and you have to wait until the next term to take the class.
06	Lack of certification.
07	Class a little too fast.
09	Some equipment out dated. On the other hand some of it was good.
10	Scheduling of the classes. He wanted to take other courses but the time they were scheduled always clashed.
12	No dislikes
13	Nothing.
14	Nothing.
15	The ventilation is inadequate in the welding rooms.
17	The scheduling is bad. The more advanced courses are not offered enough.
18	Cancelling class in the fourth week of the semester. I was put into another class 4 weeks late.
19	OCC tends to bait and switch you. They offer a class and then it does not go. It's hard to get the classes when you need them.
20	The administration and the lack of offering hardly anything in the spring. They are only offering basic courses.

SURVEY NO.	ANSWER

21	More courses should be offered. The courses should go into more detail.
25	He did not dislike anything about the classes. He wished the classes would run longer than from 6-8:30 or 9 because he does not have access to welding equipment other than at OCC.
26	The classes only met once per week. Classes could run until 10 p.m. Actually, no complaint.
27	It didn't fit with my time schedule. Just having it one night was bad.
29	The days it was offered and they limited their courses available. Also, they only offered it in AH and I wanted RO.
31	Classes are too short.
33	No complaint.
37	He disliked the drive the Auburn Hills (the location). He had to withdraw from the class because of this.
38	They could not bring a car in there and work on a car with the welding equipment.
40	He would like the course/semester to run longer.
41	He disliked nothing.
43	Nothing.
44	That classes are not offered in succession. I.E., class #1, should be followed the next semester by class #2 and so on.