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by

Bradley Allen Hyatt

2003

**Comparison of Naval Construction Force Personnel and Civilian
Construction Workers in the United States Utilizing the Workforce
Assessment Package**

by

Bradley Allen Hyatt, B.S.

Thesis

Presented to the Faculty of the Graduate School of
The University of Texas at Austin
in Partial Fulfillment
of the Requirements
for the Degree of

Master of Science in Engineering

**The University of Texas at Austin
December 2003**

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Assessment Package**

**Approved by
Supervising Committee:**

Dedication

I would like to dedicate this to my wife. Without your support I would not have been able to accomplish this goal. You are truly my best friend and the love of my life.

Acknowledgements

This thesis would not have been completed without the assistance of several key people:

LT Walter Ludwig and CWO3 Glenn Richardson were instrumental in compiling the data for this thesis. These individuals were Training Officers for Naval Construction Training Centers in Port Hueneme, California and Gulfport, Mississippi. They contributed their time and effort in ensuring the questionnaires were accurately completed by nearly 150 Seabees.

The people involved with The Construction Industry Institute's Project Team 182 provided crucial insight and patience in bringing me up to speed on their work addressing the shortage of skilled construction craft workers in the U.S. Dr. Carl Haas, Stefanie Brandenburg, Issam Srour, and Mike Pappas were critical in providing input and guidance while I developed and completed my work.

Finally, I would like to acknowledge all the Seabees who were sent to the Persian Gulf to support the efforts of our military during the past year. Their dedication and hard work allowed me to be here today.

Abstract

Comparison of Naval Construction Force Personnel and Civilian Construction Workers in the United States Utilizing the Workforce Assessment Tool

Bradley Allen Hyatt, M.S.E.

The University of Texas at Austin, 2003

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The U.S. Navy and civilian construction industry both encountered problems recruiting, training, and retaining qualified craft workers over the past few years. The Construction Industry Institute's Project Team 182, commissioned to address the shortage of skilled craft workers in the U.S., developed the Workforce Assessment Package to aid organizations in identifying and addressing workforce issues. This thesis utilizes this tool to compare U.S. Navy construction workers with civilian construction workers. In addition, this thesis provides recommendations to both groups according to the strengths and weaknesses of the groups found in the studies.

Table of Contents

List of Tables	ix
List of Figures	x
Chapter 1: Introduction	1
1.1 History of Work	1
1.2 Purpose	3
1.3 Scope	4
1.4 Thesis Structure	4
Chapter 2: Naval Construction Force	5
2.1 History	5
2.2 Organization	6
2.3 Deployment and Training	8
2.4 Seabee Culture	10
Chapter 3: Research Methodology	11
3.1 Background of Research	11
3.2 Collection of Data	11
3.3 Organization of Data	12
3.4 Validity of Data	13
Chapter 4: Quantitative Data Analysis	14
4.1 Data Summary	14
4.2 Comparison of Data	16
4.2.1 Demographics	16
4.2.2 Training	18
4.2.3 Career Satisfaction	19
4.3 NCF Skill Levels	21
4.4 Career Satisfaction	26
4.5 Other Interesting Data	28

Chapter 5: Conclusions and Recommendations	29
5.1 Conclusions.....	29
5.2 Recommendations.....	30
Appendices.....	33
Appendix A – Workforce Assessment Questionnaires.....	34
Appendix B – NCF Workforce Data	43
Appendix C – Tier II Evaluation of NCF Workforce Data	66
Appendix D – CCIS PT-182 Data Summary.....	73
Appendix E – NCF Deployment and Training Plans.....	77
Appendix F – Seabee Skills	79
Glossary	84
Bibliography	86
Vita.....	89

List of Tables

Table 4.1:	Summary of Completed Questionnaires	14
Table 4.2:	Highest Level of Education Comparison of US, NCF, and CII Personnel.....	17
Table 4.3:	Summary of Training Hours	18
Table 4.4:	Receptiveness to Two-Tier Elements	19
Table 4.5:	Comparison of Construction Craftsmen Annual Salaries.....	21

List of Figures

Figure 2.1: NMCB 10-Month Homeport Training Template.....	9
Figure 4.1: Distribution of Survey Responses by NCF Construction Rate.....	15
Figure 4.2: Comparison of Career Satisfaction Ratings.....	20
Figure 4.3: Histogram of NCF Craft Certifications.....	22
Figure 4.4: Average Crafts Certifications by NCF Construction Rate.....	23
Figure 4.5: Percentage of Proficiency in Job Management Skills.....	24
Figure 4.6: Histogram of Tier II Workers' Scores	25
Figure 4.7: Comparison of NCF and CII Tier II Workers' Scores.....	26
Figure 4.8: Job Performance Ratings by NCF Personnel.....	27

Chapter 1: Introduction

The shortage of skilled craft workers in the U.S. has become very apparent within the last several years. The Navy has also faced similar problems in retaining skilled construction workers during this period. Reenlistment rates dropped dramatically for extensively trained recruits during the past several years (*Business Week* 2001). Attracting, training, and retaining a skilled workforce is a crucial goal to both the civilian and military organizations.

A lot of research has been done on civilian construction workers in the United States during recent years. Likewise, the U.S. Navy continually surveys its construction workers in order to keep up with the dynamic nature of military construction work. This research tries to bring together some of these ideas in order to provide recommendations based on the positive attributes of each group.

1.1 HISTORY OF WORK

The Center for Construction Industry Studies (CCIS) and the Construction Industry Institute (CII), at The University of Texas at Austin, have conducted numerous studies on the condition of the civilian construction workforce. These studies have led to the development of better methods to recruit, train, and retain qualified craft workers.

CCIS was created in 1996 to address key issues in the construction industry. This included workforce issues as one of the key areas. During the second phase of the workforce research, CCIS developed the Two-Tier concept to address workforce issues within any organization. The Two-Tier strategy specifically addresses the development of efficient management techniques (Tier I) and highly skilled work

teams (Tier II). CCIS developed the metrics and basic organization of the Tier II model. (Howard 2001)

CII commissioned Project Team 182 (PT-182) in 2001 to conduct a survey on recruiting and training qualified craft workers. This team identified the key demographics and issues attributing to the shortage of skilled workers in the construction industry. In addition, PT-182 further developed the Two-Tier concept by creating metrics for the Tier I model. The team organized a series of questionnaires that allows organizations to assess the current level of their workforce. This Workforce Assessment Package (WAP) was generated while the team surveyed hundreds of workers on projects throughout the United States. (Byrom 2003)

The Navy has also conducted studies during the past several years to improve their workforce. The Navy recently commissioned Task Force EXCEL to address the training of all Navy personnel. Task Force EXCEL shifts the focus of training from the requirements of functional areas to the needs of the individual. The premise is that through proper leadership the needs of the individual will meet the needs of all functional areas. Prior to this initiative, the Navy focused solely on meeting training requirements. Further more, this created inefficiencies in training and utilizing qualified personnel throughout the Navy. Task Force EXCEL addresses these inefficiencies with a new concentration on individual based training. (TF EXCEL 2002)

The Naval Construction Force (NCF) is now in the process of developing training methods to meet the guidelines set by Task Force EXCEL. The NCF is currently re-structuring training to concentrate on the individual skills within each construction rate. This will allow the NCF to diminish the degree of overtraining. It

will also address the underutilization of various skills within individual commands.
(McGrey 1997)

1.2 PURPOSE

The CII workforce team developed the WAP to assist organizations in identifying the skill level of their workers. It will also help determine the appropriate management techniques for maximum project efficiency. In addition, this tool allows organizations to identify problem areas within the workforce. Based on these objectives, the purpose of this research will utilize the WAP to:

- Compare NCF and civilian journeymen
- Determine the skill level of NCF personnel
- Determine career satisfaction level of NCF personnel
- Present any interesting and/or unexpected data

The first objective is to compare a sample of NCF journeymen to a sample of civilian journeymen in the United States. This involves comparing the demographics of each group, as well as the technical, computer, and management skills of the groups.

This research will also attempt to determine the skill level and career satisfaction of the NCF workforce. It will also discuss the reasons for these responses.

The third and final area analyzes and presents any interesting or unexpected findings. There are many common misconceptions concerning construction workers and military personnel. This research provides insight and contributing factors of these misconceptions.

1.3 SCOPE

Journeyman within the civilian construction workforce and the NCF are the basis for the comparisons in this research. The civilian workforce personnel were surveyed by members of the PT-182 during the past several years. The workers represent a cross-section of workers on various jobs within the United States.

The NCF personnel were U.S. Navy petty officers currently occupying construction rates. Petty officers are enlisted personnel with the rank of E-4 through E-6 in the U.S. Navy. Construction rates are jobs held by enlisted personnel that have completed training in the Navy Occupational Field 13 (OF-13). OF-13 rates encompass all construction trades for the U.S. Navy (NAVFAC 1985). The data utilized in this research was collected from personnel at the major training command for the NCF.

1.4 THESIS STRUCTURE

Chapter 2 provides a brief description on the history and organization of the Naval Construction Force. Chapter 3 presents further background on recent workforce studies and the research methodology for this study. Chapter 4 provides a quantitative data analysis of the research. Finally, Chapter 5 provides conclusions and recommendations based on the results of the data.

Chapter 2: Naval Construction Force

The Naval Construction Force has a relatively short, but distinguished history in the U.S. military. The NCF was created with a specific purpose and has not wavered from that purpose throughout its illustrious tenure. The NCF is comprised of the U.S. Navy Seabees. Seabees, derived from the letters "C" and "B" synonymous for "Construction Battalion" have always been known for making the impossible happen. This chapter will provide a general overview of the history and organization of the NCF and Seabees.

2.1 HISTORY

The United States Construction Battalions were created in 1942 during World War II to provide a construction force for the Marines who were island-hopping across the Pacific. The "Seabees" quickly adopted the motto: "construimus, batuimus" or "we build, we fight" as they built airfields and bases from Guadalcanal to Okinawa. In addition, the Seabees were present during amphibious landings from Sicily to Normandy in Europe. Throughout World War II the Seabees adopted a "can do" spirit, taking on all challenges despite their obstacles. (NAVFAC 1992)

After World War II, Seabees were instrumental in amphibious landings during the Korean War and advanced base construction in the Vietnam War. During peace time, Seabee civic action teams built hospitals, clinics, schools, churches and other humanitarian projects throughout the world. In the 1980's, the Seabees led the construction of a Navy base on the island of Diego Garcia, located in the Indian Ocean. This facility is now a large base capable of supporting both ships and aircraft. (Buffington 1994)

In recent history the Seabees have been involved in both Gulf Wars, conflicts in Somalia and Bosnia, and nearly all natural disasters that the U.S. military has been mobilized to support. There are over 10,000 active duty and 16,000 reserve Seabees in the Navy today (2NCB 1999).

2.2 ORGANIZATION

The Naval Facilities Engineering Command (NAVFAC) is in charge of the operation and administration of the NCF. NAVFAC provides all logistic support in order to facilitate the effective training and operation of the Seabees in the U.S. Navy. The mission of the NCF is to provide support to the Navy and Marine Corps, and other services and agencies when directed, in the following areas:

- Responsive military advanced base construction support, including operational, logistics, underwater, shore, and deep ocean facilities construction, maintenance and operation
- Military construction in support of Marine Air-Ground Task Force (MAGTF) operations
- Capability to defend projects, camps and convoys
- Amphibious assault and ship-to-shore construction support
- Battle damage repair operations
- Disaster control and recovery operations
- Civic action employment (Buffington 1994)

The Naval Construction Force is made up of several components in order to complete this mission. The first is a Naval Mobile Construction Battalion (NMCB). A

NMCB is comprised of nearly 700 personnel ready to deploy, with full construction capability, to any region of the world in less than seven days. A NMCB is totally self-sufficient, but usually deploys in support of a Marine Air Ground Task Force. Another type of unit is a Construction Battalion Unit (CBU). A CBU deploys in support of a Navy fleet hospital. The last major component is an Amphibious Construction Battalion (ACB). An ACB assists the Marine Corps in offloading supply ships in a contingency situation where limited or no pier facilities are available.

The key personnel in the NCF are the OF-13 rates. These personnel are trained in all construction rates necessary to support the Navy and Marine Corps team. There are seven enlisted OF-13 rates in the Navy:

- Equipment Operator (EO) – Operation of construction equipment, transportation, blasting/rock crushing, well drilling, and paving.
- Construction Mechanic (CM) – Construction and automotive equipment maintenance, repair, overhaul, and management.
- Builder (BU) – Carpentry, masonry, reinforced concrete, roofing, and interior finish work.
- Steelworker (SW) – Welding, structural steel erection, sheet metal and ductwork fabrication.
- Construction Electrician (CE) – General electrical, telephone systems, and power generation and distribution.
- Utilitiesman (UT) – Plumbing, air conditioning systems, water production and distribution, sanitary and waste disposal.
- Engineering Aid (EA) – Engineering technician, drafting and surveying, and soils and material testing. (Buffington 1994)

All Seabees, regardless of Navy rate, are expected to learn defensive positioning, radio communications, first aid, and weapons employment in a combat situation. Seabees are considered a crucial support element of the Marine Corps and must be able to defend themselves in combat. In addition, each Seabee job rating combines several construction crafts. Therefore, all Seabees are inherently multi-skilled by nature.

2.3 DEPLOYMENT AND TRAINING

The typical cycle of a NMCB includes a period in homeport for training, 10 months, and a period forward deployed throughout the world, 6 months. During the deployment cycle, the NMCB is deployed to one of three locations in the world. These locations include Guam, Spain, and Okinawa. From these deployment locations, the NMCB completes repair, renovation, and construction projects throughout the specified region. However, the NMCB is always available for redeployment to any area within that region of the world should any contingency arise.

The NCF recently shifted from an equal homeport/deployment cycle (7 months each) to 6 and 10 month cycles to provide more training time for Seabees. This shift called for the creation of a new training cycle for Seabees. Since the period was increased by 66%, a more structured approach to training was possible. Figure 2.1 shows the 3 main divisions of homeport training as the technical period, the military period, and the skills application period (Engle 2003). Previous training cycles only allowed for technical and military periods, with little emphasis on skills

application while in homeport. This new training concept focuses on providing Seabees with necessary technical skills prior to deployment.

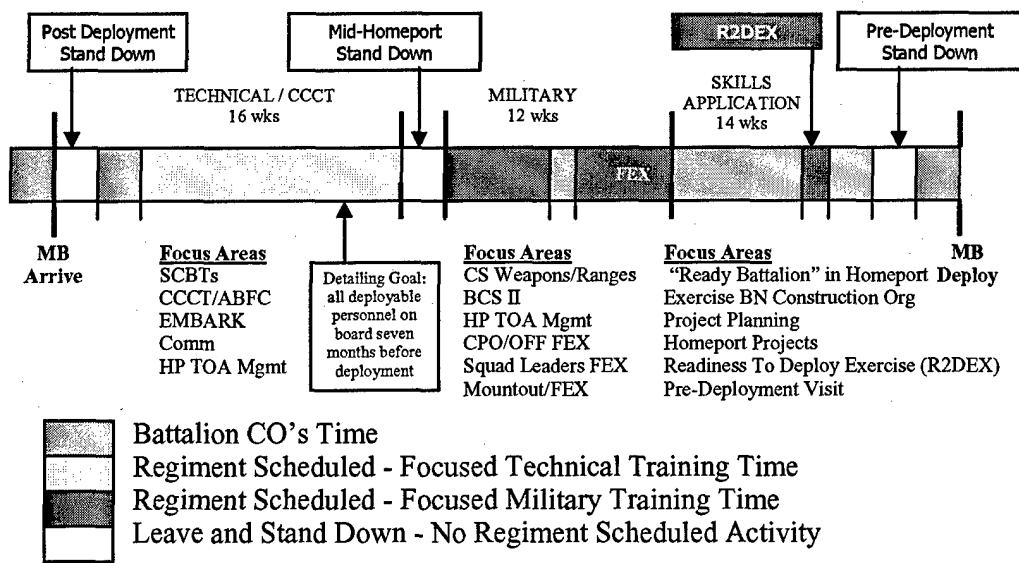


Figure 2.1: NMCB 10-Month Homeport Training Template

In addition to changes in the homeport training period, Seabees are changing the way that they train each other. In 2001, the U.S. Navy began an initiative to change training methods. It established the Executive Review of Navy Training which formulated a plan to improve Navy training by focusing on the individual versus the job that the Navy required. This led to the establishment of Task Force EXCEL, which is leading the Navy's revolutionary approach to training. This approach focuses on meeting the training needs of the individual in order to meet the goals of the Navy (TF EXCEL 2002). The NCF is currently changing its training methods to meet these goals by identifying the individual skills required to complete Seabee projects.

2.4 SEABEE CULTURE

The Seabees have always been known for their "Can Do" spirit. Seabees take pride in making projects successful regardless of the obstacles. A favorite saying of senior enlisted Seabees is "the difficult we do today, the impossible takes just a little longer". This sums up the attitude of the Seabees.

The method that Seabees utilize is ensuring that all personnel accept the fact that they will need to be multi-skilled. Multi-skilled workers are the backbone of the Seabees. In addition, many Seabees have technical skills outside their rate. For instance, an equipment operator may be experienced in welding, carpentry, and surveying. This not only makes the Seabees successful in contingency situations, but is also makes them different than construction workers in all other U.S. military services.

Construction workers in other military services are trained and qualified in specific construction trades or areas. Once they receive this training they are expected to work strictly in this trade throughout their time in service. Therefore, they receive only minimal experience in other trades. Seabees are different in that they not only expect their workers to gain experience in other areas, but they require it in order to complete projects. Seabees may never master a single construction trade, but they become well rounded in many different areas.

Chapter 3: Research Methodology

During the past several years many studies have researched various issues within the construction workforce in the United States. Both CII and CCIS at The University of Texas at Austin have been at the forefront of these studies. This research is based on a study conducted by CII PT-182 over the past several years. This study also utilizes the WAP developed in the PT-182 study.

3.1 BACKGROUND OF RESEARCH

PT-182 visited 19 projects sites and interviewed over 900 construction workers in order to identify the issues contributing to the current craft worker shortage. The data found in this research provided a foundation to develop a method to address the workforce shortage in the U.S. PT-182 developed the WAP as a tool to assess the workforce of any organization. The team also developed the Tier I concept as a method to address workforce issues. Tier I focuses on task training and improving the skills of supervisors and management. (Byrom 2003)

3.2 COLLECTION OF DATA

The data in this research was collected by employing the Workforce Assessment Package. Specifically, the Individual Background Questionnaire and the Individual Skill Assessment were the basis of the data collection. The terminology in these questionnaires was altered slightly in order to correlate with that commonly utilized by Seabees. In addition, several other questions were added to address specific areas of concern within the Seabees. For instance, questions concerning the length of service (Time-In-Service) and recent deployments were among those added.

Petty officers were chosen as the primary group because their skill levels correlate directly to those of journeyman-level workers in the civilian sector. Seabee petty officers are considered the key craftsman within the NCF. Also, all construction rates were included in the sample in order to reflect all workers within the NCF.

Surveys were sent to the Naval Construction Training Centers (NCTC) in Gulfport, Mississippi and Port Hueneme, California. These are the major training commands for the NCF which provide technical training to all construction rates within the Navy. NCTC's always have a number of courses going on at any time. In addition, a majority of the personnel within these courses will be petty officers sent to learn about a new craft necessary for an upcoming deployment. For these reasons, NCTC's were chosen as the best location from which to collect data on these personnel.

3.3 ORGANIZATION OF DATA

The data was organized according to the source of the data and by the major areas of concern as presented in the PT-182 report. The sources of the data were the two main questionnaires in the WAP: the Individual Background Questionnaire and the Individual Skill Assessment form. These two questionnaires were treated as separate sources of data.

The CII Research Summary 182-1 provides the results of the workforce surveys completed in this research. It identifies the key areas of interest concerning the demographics and skills of the U.S. construction workforce. The NCF study highlights these same areas in this research. These areas are the basis for comparison in the quantitative data analysis section.

3.4 VALIDITY OF DATA

The research strives to provide an accurate sample of construction workers within the Navy. All of the OF-13 rates and petty officer ranks are represented within the sample. Most of the respondents were students at the NCTC's during this research. Most of these students were given the opportunity to attend these skills courses due to their above average performance in the field.

The surveys were administered by staff at the respective NCTC's. All staff members were either senior enlisted or officers in the U.S. Navy familiar with the procedure of administering surveys. Detailed directions were sent with the surveys in order to alleviate questions about the surveys. Positive feedback from the NCTC's proved that these questionnaires were easily administered to the respondents.

Specific survey questions inquired about recent deployments to validate responses within the sample. Deployments, especially during wartime, can be very stressful and can lead to negative feelings toward the military. Under these circumstances, the responses of recently deployed personnel may differ greatly from the remainder of the sample.

Chapter 4: Quantitative Data Analysis

4.1 DATA SUMMARY

Approximately 140 questionnaires were completed by NCTC personnel. Of these completed forms, there were 140 Individual Skill Assessment forms and 139 Individual Background Questionnaires. NCTC Port Hueneme provided 54 completed forms and NCTC Gulfport provided an additional 86 completed forms. Table 4.1 summarizes the completed questionnaires according to total numbers, source of data, and data not utilized in the analysis.

	Total	NCTC		non-PO	non-OF-13	Sample
		Gulfport	Port Hueneme			
Background	140	86	54	28	4	108
Skill Assessment	139	86	53	13	5	121

Table 4.1: Summary of Completed Questionnaires

Questionnaires completed by non-petty officers or non-OF-13 rates were dropped from consideration in the analysis because both of these groups are outside the scope of this research. Note that the number of non-petty officers doubles between the two questionnaires. This is mainly because the skill assessment questionnaires did not list the rank of the respondent. Therefore, it was impossible to identify and exclude those questionnaires that may not be petty officers.

Another unexpected finding in the data was the number of respondents that stated they were not certified in any crafts (21 on the Individual Background Questionnaire and 32 on the Individual Skill Assessment). However, by completing military "A" School it is assumed that they have received the appropriate training for

certification in the craft relative to their rate. Therefore, they were left in the data sample in order to analyze their responses to the remaining questions.

Figure 4.1 shows the breakdown of construction rates surveyed in this study. This breakdown shows that all of the construction rates are represented in this sample. This approximately matches the actual distribution of construction rates within the Seabees, with the exceptions that equipment operators and engineering aides are overrepresented in the sample (BUPERS 2003). Also, less than 15 percent of the respondents were E-4 personnel. The majority of personnel were almost equally split between E-5 and E-6 personnel.

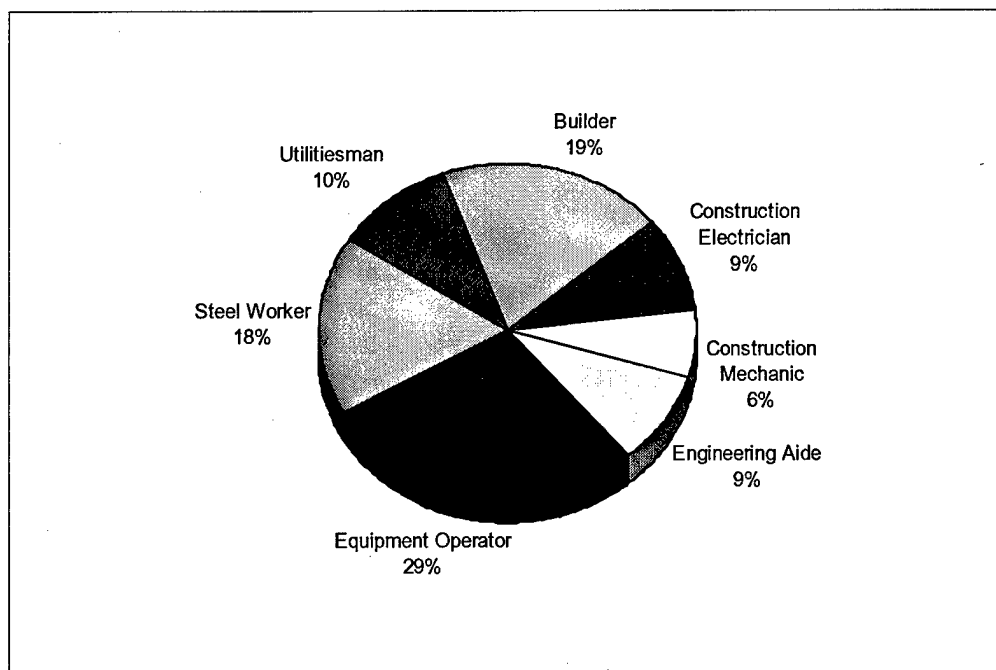


Figure 4.1: Distribution of Survey Responses by NCF Construction Rate

4.2 COMPARISON OF DATA

In June 2003, CII presented its findings on the shortage of skilled craft workers in the U.S. during its 2003 Annual Conference in Orlando, Florida (Goins 2003). These findings showed the general demographics and trends of craft workers in the U.S. This section will compare the results found in this research to the findings presented during the 2003 CII Annual Conference.

4.2.1 Demographics

The average age of a civilian journeyman level worker is nearly 41 years. The average age of a NCF journeyman level worker in this study is slightly over 30 years. The major difference between these two groups is that the NCF worker begins at an earlier age when joining the Navy straight out of high school. Civilian journeymen often begin construction craft training after working in various other jobs and sectors.

Both studies found that 86 percent of respondents were originally from the U.S. The CII study found that the largest group in the remaining portion, 12 percent, reported to be from Mexico. The largest secondary group in the NCF was respondents from the Philippines (8 percent). Also, 83 percent of CII responses reported to be native English speakers, compared to 88 percent of NCF personnel.

The number of women in the CII study was 2% compared to over 8% percent found in this study. Overall, there is a large percentage of women in the NCF due to specific attempts to achieve greater diversity within the Navy. As of March 2002, women comprised nearly 15% of personnel in the U.S. Navy (BUPERS 2002). Despite this fact, the percentage of women in the NCF remains at a low level due the nature of the work.

NCF journeymen have more formal education than their civilian counterparts. Table 4.2 shows the breakdown in education levels for personnel in the NCF and CII study. Additionally, these are compared against data compiled for all of the U.S. in the 2000 Census. This can be attributed partially to the fact that high school graduation, or equivalency, is a required for joining the Navy.

	US	NCF	CII
Less than 9th Grade	7.5%	0.0%	6.6%
9th to 12th grade, no diploma	12.1%	0.0%	11.5%
High school graduate (includes equivalency)	28.6%	43.5%	49.3%
Some college, no degree	21.0%	42.6%	26.3%
Associate degree	6.3%	6.5%	3.9%
Bachelor's degree	15.5%	6.5%	2.1%
Graduate or professional degree	8.9%	0.9%	0.4%
Percent high school graduate or higher	80.4%	100.0%	82.0%
Percent bachelor's degree or higher	24.4%	7.4%	2.5%

Table 4.2: Highest Level of Education Comparison of US, NCF, and CII Personnel

It is important to note that a majority of NCF personnel have taken some college courses, but have not completed a degree. According to Task Force EXCEL, a 1999 new recruit survey found that 91 percent of new recruits joined the Navy to achieve their educational goals. Also, 84 percent of new recruits planned to work on college while in the Navy (TF EXCEL 2002).

In addition to more formal education, NCF personnel also have more computer skills than CII respondents. Nearly 58 percent of civilian respondents knew how to use the computer compared to almost 97 percent of NCF respondents. In 1989 only 15 percent of households had a computer. However by 1998, that number jumped to over 42 percent (Newburger 2001). One main reason that NCF personnel

may be more computer literate is that they are in a younger age demographic, and thus more exposed to computers at a younger age.

4.2.2 Training

Both groups reported that they received only a few hours of craft training each year. In addition, they also reported that they received minimal training in planning and job management skills during their careers. Table 4.3 shows the breakdown of hours of training in craft skills (over the past three years), in planning skills (throughout career), and in job management skills (throughout career).

Hours of Training	Craft Skills		Planning Skills		Job Management Skills	
	NCF	CII	NCF	CII	NCF	CII
0-50	55.4%	39.9%	54.5%	55.5%	61.2%	50.5%
51-100	14.0%	26.1%	17.4%	15.1%	14.0%	14.7%
101-150	0.0%	11.0%	2.5%	8.7%	4.1%	10.1%
151-200	5.8%	3.2%	6.6%	1.4%	2.5%	2.8%
201-250	0.8%	9.6%	1.7%	5.5%	0.0%	6.4%
251-300	1.7%	0.9%	0.0%	0.9%	0.8%	0.5%
301-350	0.8%	2.3%	2.5%	0.5%	0.0%	0.5%
351-400	0.8%	0.9%	0.0%	0.5%	0.8%	0.5%
401-500	1.7%	2.3%	5.0%	1.4%	4.1%	0.5%
501-600	0.8%	0.9%	1.7%	1.4%	0.8%	3.7%
601-700	0.0%	1.4%	0.0%	0.9%	0.0%	0.9%
701-800	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%
801-1000	6.6%	0.0%	4.1%	0.0%	5.0%	0.5%
1000+	11.6%	0.9%	4.1%	8.3%	6.6%	8.7%

Table 4.3: Summary of Training Hours

The low level of craft training in civilian companies is most often attributed to the high turn over in personnel and the high cost of training (Canon 2001). The low level of craft training in the NCF can be attributed to inefficient training methods (McGrey 1997). Training methods in the NCF focus on meeting the skills necessary to complete construction projects in upcoming deployments. Personnel are selected

for training according to performance and availability, not according to individual's career goals. Very rarely are the two synergistic to allow personnel to meet career goals while providing the skills that the Navy needs. However, Task Force EXCEL is changing this process in order to encourage personnel to meet professional goals.

Despite this lack of training, both groups are extremely receptive to receiving more training in skills associated with the Two-Tier concept developed by CCIS. Table 4.4 shows that both groups responded positively to the Two-Tier elements. These elements provide the basis for improving productivity on all projects.

	NCF	CII
Willing to adapt to new technology	88.9%	79.7%
Willing to train in administrative skills	79.6%	81.6%
Willing to train in computer skills	83.3%	81.1%
Willing to train in planning skills	82.4%	86.8%
Willing to train in management skills	82.4%	84.9%

Table 4.4: Receptiveness to Two-Tier Elements

4.2.3 Career Satisfaction

The career satisfaction rating for both groups was very high. Figure 4.2 shows a comparison of the satisfaction levels of the two groups. These ratings demonstrate that these groups truly enjoy their careers. The most common positive comments are that the workers enjoy working with their hands and that they feel a sense of accomplishment in construction work. The most common negative comments concern poor training and low pay.

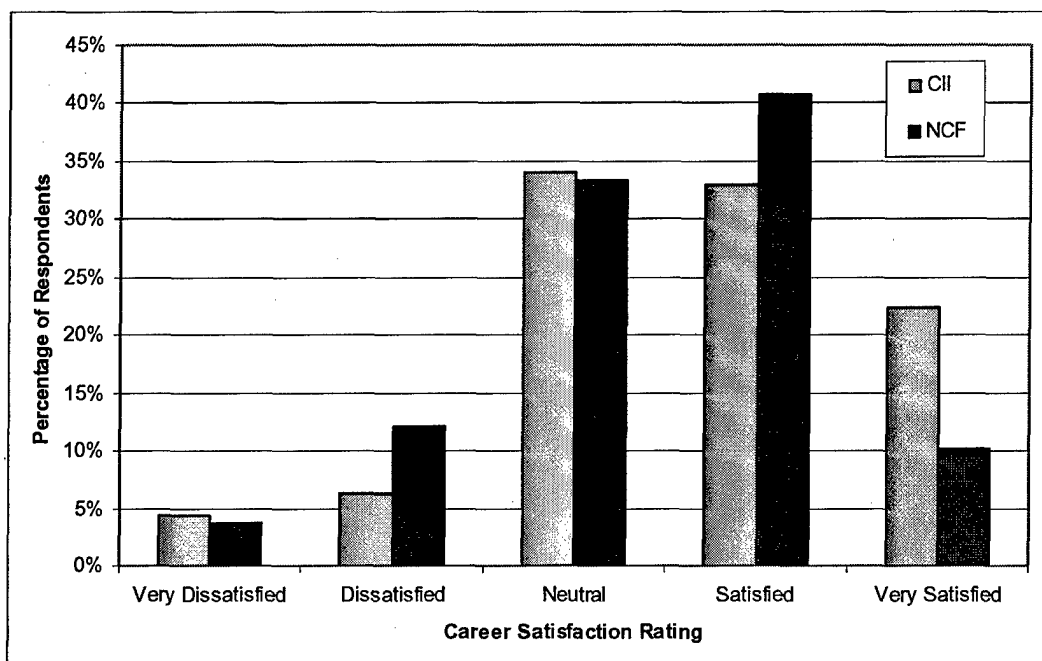


Figure 4.2: Comparison of Career Satisfaction Ratings

Additionally, both groups agreed that they were not satisfied with their current pay level. Only 36 percent of CII respondents and 30 percent of NCF respondents stated that they were satisfied with their pay. Construction wages have not kept pace with other industries during the past 20 years (Tucker 1999). This has been a major concern in attracting and retaining qualified workers in both the Navy and the civilian sector.

A comparison of the annual salary of civilian construction craftsmen and enlisted Navy construction workers shows that the groups compare closely in annual earnings. Table 4.5 provides a comparison of the annual salary of these groups. The figures for civilian construction crafts were found in *The Construction Chart Book* distributed in September 2002 by The Center to Protect Workers' Rights. The figures for the NCF personnel were found on the Defense Finance and Accounting Service

and the Stay Navy websites. All figures reflect the year 2000 salaries for both groups. NCF personnel in each construction rate are shown according to the average rank and time in service from this survey.

<u>NCF Rank & Rate</u>	<u>Equivalent Civilian Craft</u>	<u>Civilian Pay</u>	<u>Military Pay</u>
BU E-6 w/ 9+ Years	Carpentry	\$ 34,820	\$ 40,477.20
CE E-6 w/ 10+ Years	Electrical	\$ 39,790	\$ 41,366.40
UT E-5 w/ 10+ Years	Plumbing	\$ 36,870	\$ 39,138.00
SW E-5 w/ 7+ Years	Sheet metal	\$ 33,650	\$ 37,374.00
EO E-5 w/ 7+ Years	Heavy (non-highway)	\$ 37,820	\$ 37,374.00

Table 4.5: Comparison of Construction Craftsmen Annual Salaries

4.3 NCF SKILL LEVELS

The assertion that Seabees are inherently multi-skilled was exemplified in the data provided by the NCF respondents. Figure 4.3 provides a histogram of the number of craft certifications for the respondents. This excludes personnel that reported they did not receive any type of craft certification. In this survey, the average NCF respondent was certified in two crafts.

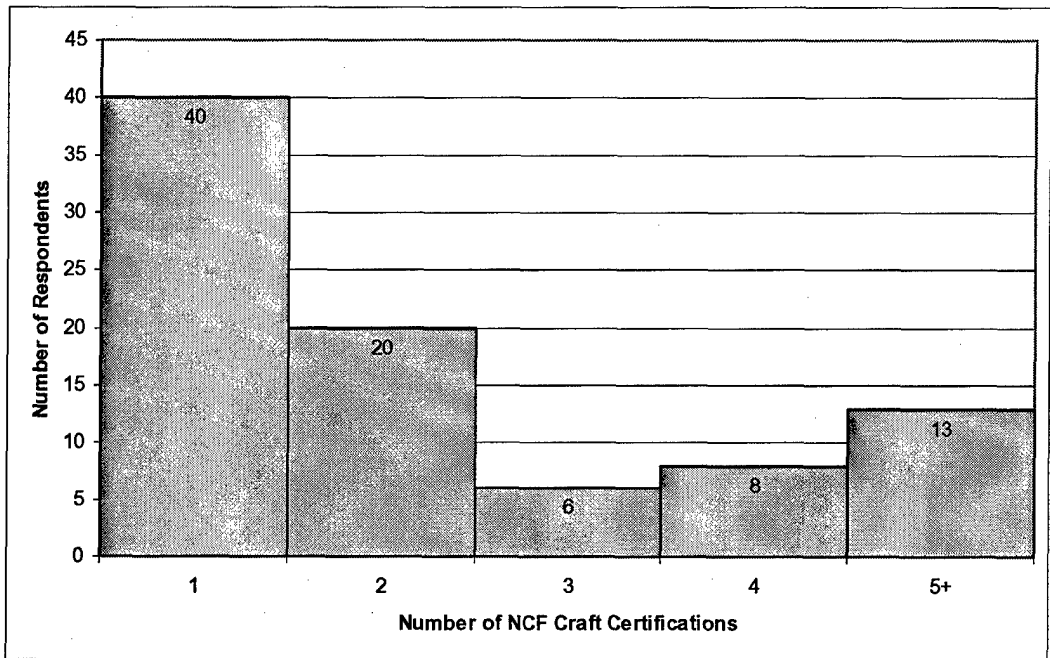


Figure 4.3: Histogram of NCF Craft Certifications

Some NCF construction rates are more likely to obtain multiple craft certifications. Figure 4.4 shows the average current and future (expected to complete within one year) craft certifications for each construction rate. Builders and equipment operators are called upon to do a wider variety of jobs than any other rate and thus have more craft certifications. Steel workers, on the other hand, require extensive training to receive welding certifications, which often precludes them from receiving training to obtain additional certifications. Regardless, nearly 90 percent of all respondents felt that multi-skilled workers were important.

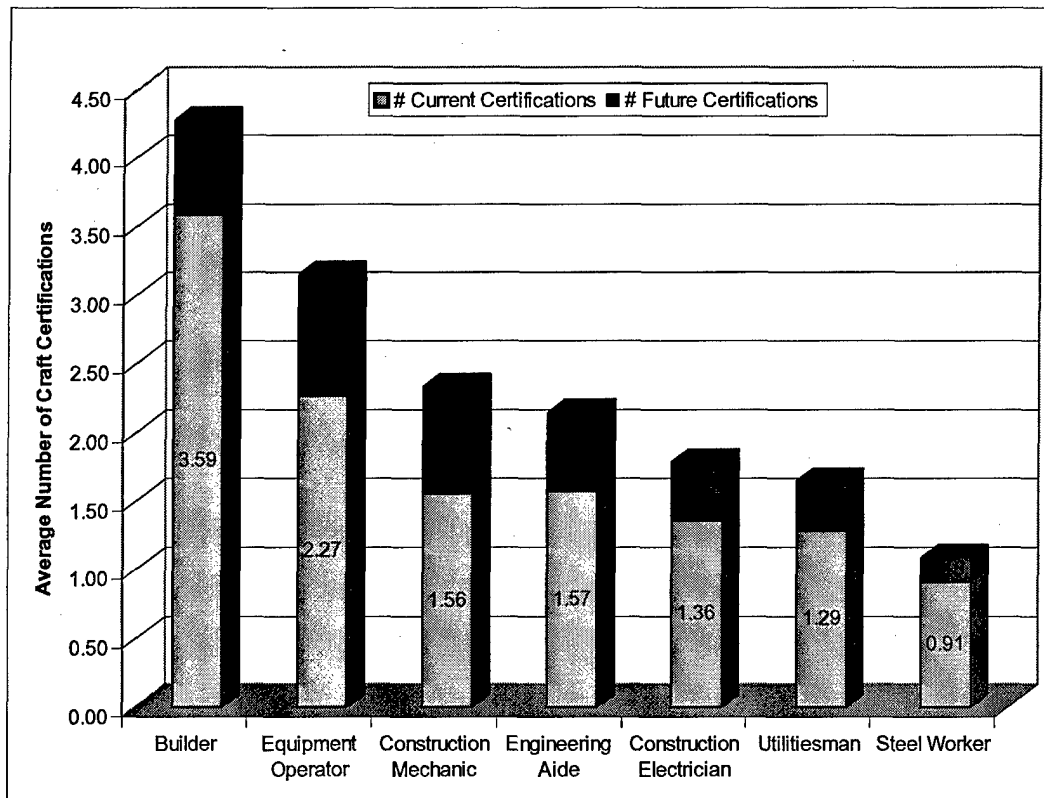


Figure 4.4: Average Crafts Certifications by NCF Construction Rate

Despite the fact that respondents received very little training in planning and job management skills, over half of respondents stated that they were proficient in those skills. Over 63 percent of personnel received the skills by on the job training, while only 11 percent received these skills through formal training. This explains why less than 20 percent of respondents stated that they were certified in these skills.

Also, it is interesting to note that a majority of the respondents consider themselves proficient in estimating and material management. In addition, nearly 50 percent of the respondents consider themselves proficient in scheduling. Figure 4.5 shows the percentage of respondents that rank themselves proficient in specific job

management skills. This is interesting since these skills are crucial in the successful completion of any project. It is common in the NCF for most crew leaders (E4 and E5 personnel) to plan and estimate their work activities for a project. This provides them with the experience necessary to plan and estimate a future project as a project supervisor.

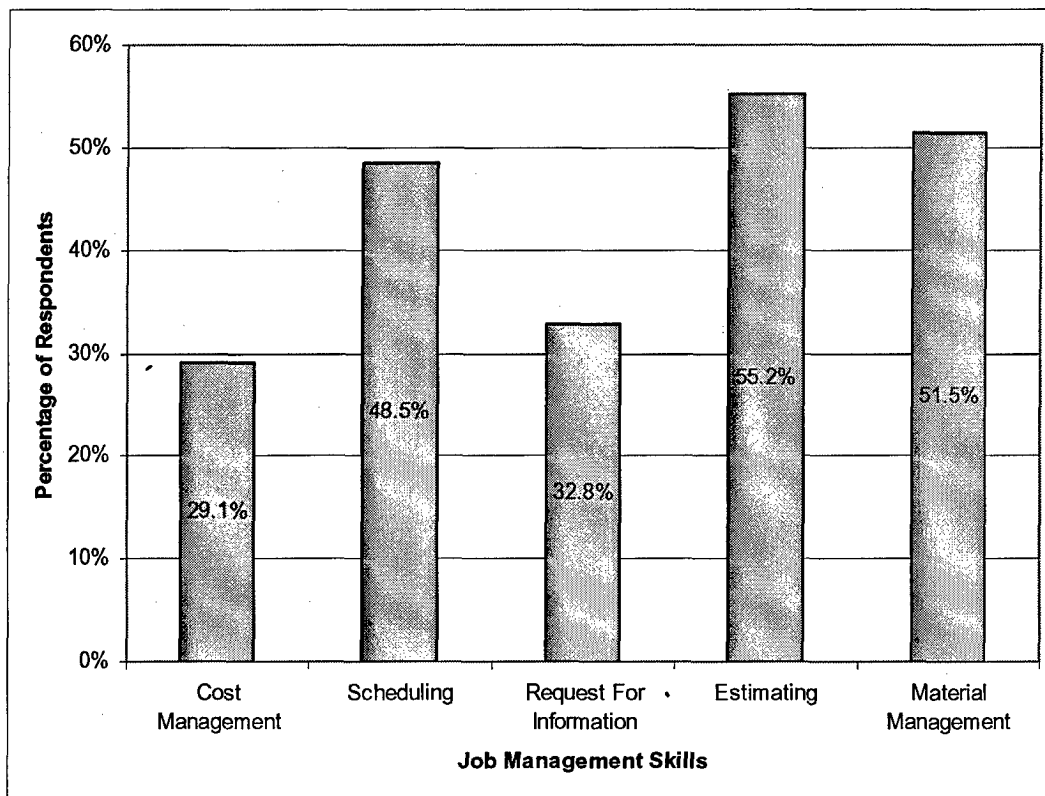


Figure 4.5: Percentage of Proficiency in Job Management Skills

The Tier II strategy provides a metric that measures project worker skills and project execution (Castañeda-Maza 2003). The skills above are measured in order to provide a quantitative method to measure the overall skill level of any project. The Individual Skill Assessment questionnaire in the WAP generates the data necessary to

complete the project worker skill portion of the Tier II metric. This portion of the Tier II metric is based on a scale of 0 to 200, with 200 being the best score possible. Figure 4.6 shows this Tier II metric score for NCF personnel in this study. This figure shows that the group is not evenly distributed, but has a higher number of respondents in the 20-40 point range and the 120-140 point range. However, a majority of the respondents scored less than 100 using this metric. This shows that the NCF still has room to improve skills training in order to attain a higher skill level for all workers. Furthermore, 10% of the respondents would be certified as Tier II workers having scored more than 150 points. Only 4% of civilian respondents scored more than 150 points required to be Tier II workers.

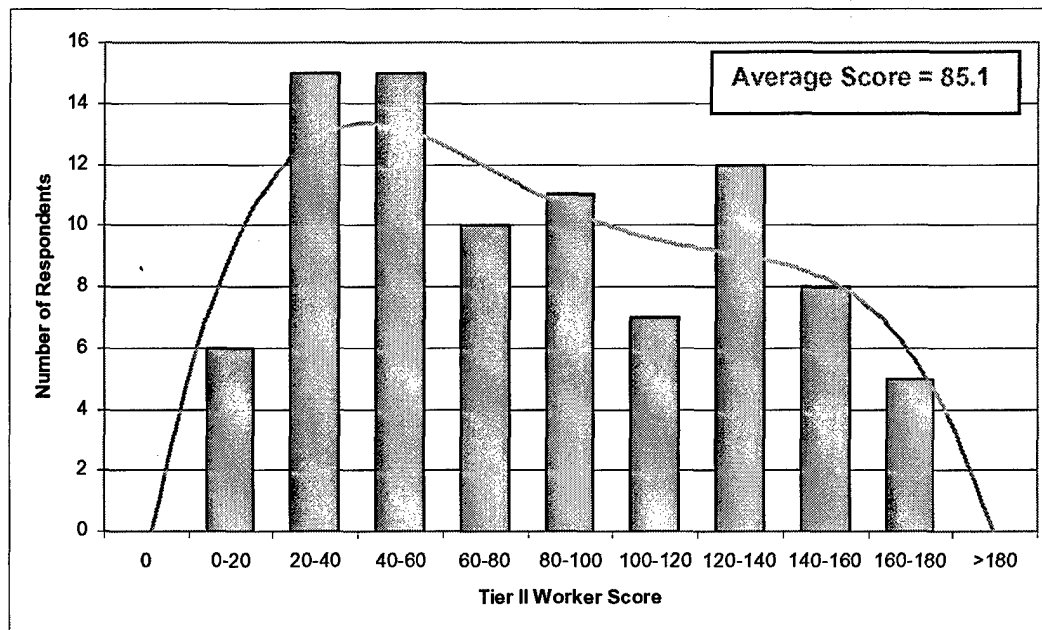


Figure 4.6: Histogram of Tier II Workers' Scores

Figure 4.7 compares the Tier II workers' scores of the NCF and the CII respondents. This demonstrates that the skill level of the civilian workforce is evenly

distributed. However, the average score of civilian journeymen was 88.3, marginally higher than the 85.1 of the NCF workforce. Overall, like in previous comparisons, these groups continue to show similar characteristics.

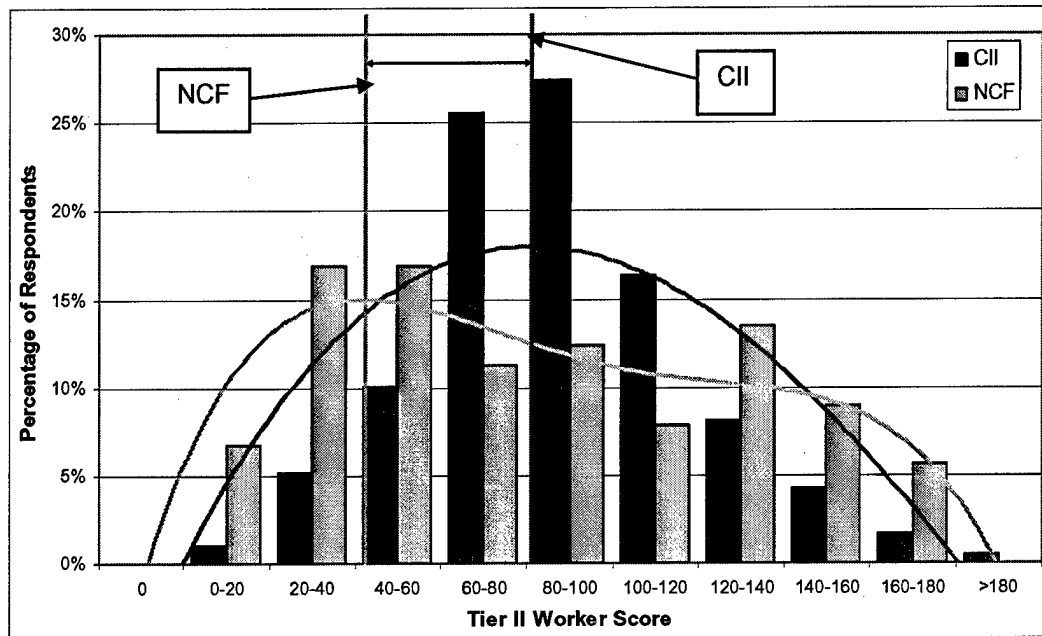


Figure 4.7: Comparison of NCF and CII Tier II Workers' Scores

4.4 CAREER SATISFACTION

Career satisfaction rating was discussed earlier in the comparison section. This section will further discuss the reasons for the career satisfaction rating. Comments on the surveys ranged from positive to extremely negative. The comments were generally concerned four areas: job, military, pay, and personal. Most of the job comments pointed out the lack of training, good projects, and good tools. The military comments focused on advancement in rank and bureaucracy. The comments on pay most commonly stated that the pay was not adequate. The personal comments ranged

from respondents that “did not enjoy construction” to those that were “content with their life in the military”. Regardless of the individuals’ satisfaction rating, the most common responses dealt with improving training, tools, and pay.

The Individual Skill Assessment questionnaire required the respondents to rate their job performance. NCF personnel rated themselves an average of 8.1 out of 10 in job performance. Figure 4.8 shows the breakdown of job rating responses. It is interesting to note that not one person rated themselves below 5 on the question. This shows that these NCF personnel generally considered themselves proficient at their job.

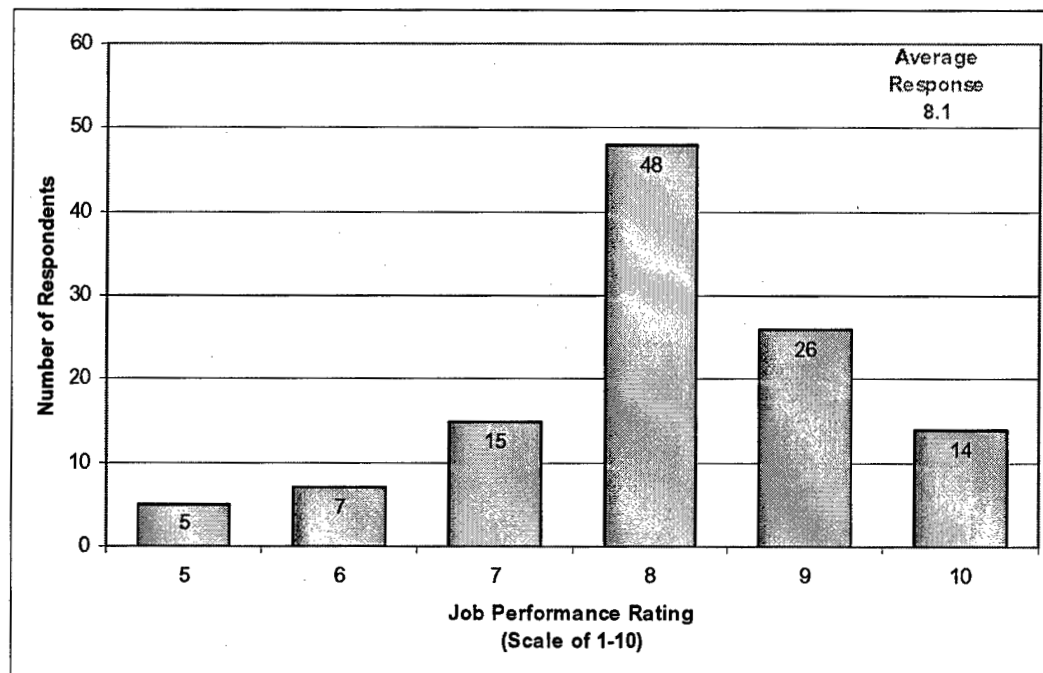


Figure 4.8: Job Performance Ratings by NCF Personnel

4.5 OTHER INTERESTING DATA

Only 74 percent of respondents stated that they were currently in a supervisory position. This includes crew members, riflemen, or students, traditionally non-leadership positions. However, it is interesting that nearly half of these respondents claiming not to be in supervisory positions marked they were in leadership positions. The question may have been confusing, but it is more likely the Navy has engrained in them that all petty officers are in leadership positions, regardless of their current job.

Deployment can be a very stressful endeavor, especially those during contingency and combat periods such as during the time of this survey. It is interesting that respondents having been deployed within the last 3 months or will be deployed in the next 2 months rated their career satisfactions lower than the group average. Only 33 percent of those personnel that had recently returned from a deployment were satisfied with their career. This is a significant difference and can be expected due to the stress of being deployed.

Over 40 percent of personnel that will be deployed within the next 2 months were satisfied with their career, which is much close to the group average of 50 percent. Additionally, respondents that indicated they had been deployed within the last year provided an average 7.92 job performance rating. This is very close to the overall average of 8.1 for the group.

Chapter 5: Conclusions and Recommendations

The research done on civilian craft workers and NCF craft workers provided interesting results. These groups have some distinct similarities and differences. Based upon these findings, some general recommendations are provided in this chapter.

5.1 CONCLUSIONS

According to the results from these studies, demographically these groups have some distinct differences. NCF personnel are generally younger, more educated, and more computer literate. These characteristics can be attributed to the nature of the NCF personnel being military personnel in a training command. Despite these differences, it is interesting that both groups are comprised of mostly English speaking men from the U.S. In addition, both groups receive very little training in craft, job management, and planning skills. However, these groups are very receptive to getting more training and accepting new technologies that would increase productivity. Finally, both groups are generally satisfied with their careers, but not with their pay.

A majority of the NCF respondents indicated that they are certified in more than one skill. Multi-skilled workers are more common in the equipment operator and builder rates because these rates are given more diverse tasking in projects. Also, a majority of the NCF respondents indicated that they have some planning and job management skills, despite a lack of training in these areas. And last, this group rated themselves highly in job performance.

Some final interesting notes on the data are the amount of respondents that were not in supervisory positions. Since petty officers are in positions of authority, nearly half of these personnel responded that they were in leadership positions. Also, the effects of deployment can be seen in the lower career satisfaction ratings of those personnel recently deployed.

5.2 RECOMMENDATIONS

Both CII and the Navy studies provide valuable ideas on meeting the current needs of the craft person workforce. According to the results from these recent studies there are four general recommendations that have been formulated. These recommendations include:

- Using education as a retention tool
- Improving training methods
- Increasing pay
- Encouraging multi-skilled workers

Education is a highly effective tool in retaining good personnel. Most people that join the Navy do so to achieve their educational goals (TF EXCEL 2002). The Navy has a highly structured and effective method of allowing people to meet their educational goals. In turn, personnel who have completed college credits have higher re-enlistment rates. Over half of personnel that have completed at least 60 college credits re-enlisted in the Navy, compared to only 30 percent of those personnel without any college credits (TF EXCEL 2001). Whether it is a college education or

personal development, continuing education is a very strong tool in retaining qualified workers.

Training needs to focus on improving the skills of an individual worker in order to attain the needs of the organization. It should balance needs of the individual worker first with the needs of the organization. The Navy is currently making this change with its new approach to training (TF EXCEL 2002). Task Force EXCEL strives to individualize the training methods of the Navy and move away from training solely for the purpose of achieving the appropriate number of skills in any given area. Focusing on the individuals' skills will provide the appropriate base for developing and retaining qualified workers. In addition, it will meet the skill needs of the Navy by providing an adequate skill base within each area.

Pay is one of the largest issues in both the military and the civilian sector. Both groups verbalized their dissatisfaction with the current pay levels. The military has had several pay raises in order to bring pay more in line with the civilian sector equivalents. However, the civilian sector equivalents are not considered adequate by the workforce. In addition, civilian construction wages have not kept up with pay raises in other industries over the past 20 years (Tucker 1999). Thus, increasing pay needs to be addressed by both groups.

The Tier II concept provides a structured system that recognizes and promotes higher workers skills in the construction industry (Castañeda-Maza 2003). The NCF provides an excellent example of promotions based upon experience and skill level. NCF personnel are promoted based upon Time-In-Rate (experience), technical expertise (both in-rate knowledge and management skills), and job performance. These factors correspond directly with Tier II metrics and provide a direct correlation between pay, skill level, and Tier II scores.

Finally, the importance of multi-skilled workers is imperative for the Navy and the civilian workforce to continue to improve productivity. Multi-skilled workers will allow the civilian sector to reduce workforce requirements and retain highly skilled workers (Stanley 1997). In addition, the use of multi-skilled workers can provide cost savings on a project (Burleson 1997). The NCF effectively utilizes multi-skilled workers; however the NCF needs to remain cognizant of the general limitations of these workers. Some issues that limit the use of a multi-skilled workforce include ensuring adequate worker proficiency and craft testing for certification, efficiently tracking skills within the workforce, and preventing the deterioration of unused skills (Stanley 1997).

The NCF and the civilian construction workforce both face critical issues in recruiting, training, and retaining skilled workers. Several key common areas must be addressed in order to ensure that these issues are dealt with effectively. The improvement of training methods and use of multi-skilled workers are extremely important in achieving a highly skilled workforce. In addition, increasing pay and providing educational opportunities will aid in retaining skilled workers.

The next step is to implement innovative solutions to address these problems. The next step is now. By utilizing methods and techniques provided by Task Force EXCEL and CII PT-182, the Navy and civilian construction industry can start to address some of the critical issues that face the craft worker shortage in the United States. These new and innovative ideas provide systematic methods to assist any organization in the improving the project success. However, the first step in improving the skills of craft workers is to identify the problem and provide a solution.

Appendices

Appendix A – Workforce Assessment Questionnaires

NCF WORKFORCE ASSESSMENT TOOL

Individual Background Questionnaire

1. What is your age? _____
2. What is your gender? Female Male
3. What is your country of origin? USA Other (*please specify*) _____
4. What is your native language? English Spanish
 Other (*please specify*) _____

1. What is your highest level of education achieved?

<input type="checkbox"/> 0-8 years of school	<input type="checkbox"/> Associate degree (2 year program)
<input type="checkbox"/> Some high school	<input type="checkbox"/> Bachelors degree (4 year program)
<input type="checkbox"/> High school diploma	<input type="checkbox"/> Some post graduate education (Masters, Ph.D.)
<input type="checkbox"/> GED equivalent	<input type="checkbox"/> Masters degree
<input type="checkbox"/> Completed vocational or technical program	<input type="checkbox"/> Ph.D.
<input type="checkbox"/> Some college (No degree)	<input type="checkbox"/> Other (<i>please specify</i>) _____

2. What is your present job title? (*Check all that apply*)

<input type="checkbox"/> Project Supervisor	<input type="checkbox"/> Platoon Commander
<input type="checkbox"/> Crew Leader	<input type="checkbox"/> Squad Leader
<input type="checkbox"/> Project Safety Supervisor	<input type="checkbox"/> Fire Team Leader
<input type="checkbox"/> Project QC Supervisor	<input type="checkbox"/> Rifleman
<input type="checkbox"/> Crew Member	<input type="checkbox"/> Other (<i>please specify</i>) _____

3. In what crafts have you been certified and/or completed a "C" school? (*Check all that apply*)

<input type="checkbox"/> Boilermaker	<input type="checkbox"/> Welder (What type of welder? _____)
<input type="checkbox"/> Carpenter	<input type="checkbox"/> Millwright
<input type="checkbox"/> Concrete Finisher	<input type="checkbox"/> Operating Engineer
<input type="checkbox"/> Crane Operator	<input type="checkbox"/> Plumber
<input type="checkbox"/> Equipment Operator	<input type="checkbox"/> Painter
<input type="checkbox"/> Electrician	<input type="checkbox"/> Pipe fitter
<input type="checkbox"/> Instrument Fitter	<input type="checkbox"/> Roofer
<input type="checkbox"/> Glass/Glazing Worker	<input type="checkbox"/> Reinforcing Rodman
<input type="checkbox"/> Instrument Technician	<input type="checkbox"/> Rigger
<input type="checkbox"/> Insulation Worker	<input type="checkbox"/> Structural Ironworker
<input type="checkbox"/> Laborer	<input type="checkbox"/> Sheetmetal Worker
<input type="checkbox"/> Mason	<input type="checkbox"/> Other (list) _____

If you checked more than one, please indicate which is your **primary** craft: _____

4. How did you receive your craft training? (Check all that apply)

- | | |
|--|---|
| <input type="checkbox"/> Passed NCCER Wheels of Learning Program in your craft | <input type="checkbox"/> Graduate of union sector apprenticeship program |
| <input type="checkbox"/> Basic military training in construction | <input type="checkbox"/> Graduate of company non-union apprenticeship program |
| <input type="checkbox"/> Military "C" school training in a craft | <input type="checkbox"/> Graduate of company craft certification program |
| <input type="checkbox"/> Vocational program | <input checked="" type="checkbox"/> On the job training only |
| | <input type="checkbox"/> Other (specify) _____ |

5. In your current job, do you have supervisory responsibility? Yes No

6. What is your current pay grade? E4 E5 E6

7. What is your current rate?

- BU CE CM EA EO SW UT

8. What is your Time-In-Rate? _____ Years

9. What is your Time-In-Service? _____ Years

10. Have you returned from deployment within the last 2 months? Yes No

11. Will you be deployed within the next 2 months? Yes No

12. How many **total weeks** were you deployed and/or worked in construction during 2002-2003? _____ Weeks

(52 weeks = 1 year)

On average, how many **hours per week** did you work in construction in 2003-2004? _____

13. Have you ever worked in construction outside the military? Yes No

14. For how many different construction companies have you worked? _____

15. How many years of experience in construction do you have **in each** of the following categories?

<i>Years</i>	<i>Position</i>
_____	Apprentice / Helper / Crew Member
_____	Journeyman / Craftsman / Certified Craft worker
_____	Crew Leader
_____	Project Supervisor
_____	Project Safety Supervisor
_____	Project QC Supervisor

Your Total years of experience in construction _____

16. Do you know how to use a computer? Yes No (if "No" jump to question 22)

17. How long have you been using a computer? _____ years

18. Where did you acquire your computer skills?

- Self-taught off the job
- By on-the-job use
- Through company sponsored training
- Formal education / schooling
- Other (please specify) _____

19. Do you have any job planning, management or administrative skills? (See box below for skills)

- Yes
- No (if "No" jump to question 24)

20. Where did you acquire those planning, management and administrative skills?

- Self-taught off the job
- By on-the-job use
- Through military training
- Formal education / schooling
- Other (please specify) _____

Example of skills: - Cost and materials management, Scheduling, Estimating, RFI, crew coordination, selection of work packages, leadership

21. Are you satisfied with your pay? Yes No

For the following questions, please indicate your response on a scale from 1 to 5.

22. How satisfied do you feel with your career in military construction?

1	2	3	4	5
Very Dissatisfied		Neutral		Very Satisfied

Why? _____

23. Planning and progress information should be shared between crews.

1	2	3	4	5
Not Desirable		Neutral		Desirable

24. How do you feel about entering and obtaining project information in a portable, wireless computer at the work face? *This information would include schedule, costs, material and equipment, management, safety, drawings and skills.*

1	2	3	4	5
Not Desirable		Neutral		Desirable

25. How do you feel about carrying around a portable, wireless computer (*from previous question*) at the work face?

1	2	3	4	5
Not Desirable		Neutral		Desirable

26. All crews on the project should include multi-crafted workers?

1	2	3	4	5
Not Desirable		Neutral		Desirable

Please give your perception of the following work practices at a construction site. Rate on a scale from 1 to 5. (Circle only one).

27. The job of the crew should be defined so that crew members see it as a team project. **All crew members** (not only the foreman) ensure that it is planned and executed properly.

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

28. There should be a rigid chain of command in which crew members do not participate in coordinating the job of the crew, **only the crew leaders** should do it.

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

29. Tasks should be assigned to the crew as a team, so that the **crew as a whole** has a responsibility for which the **crew as a whole is held accountable**.

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

30. Tasks should be assigned for **each** crew member so that the **individual** has a specific responsibility for which **only he/she is held accountable**.

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

31. It would be easier to get the job done if all experienced journeymen were also able to perform tasks that are typically considered "management" functions (*cost management, scheduling, estimating, materials management, Request for Information (RFI)*).

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

32. Craftsmen should adapt to the use of new technology that improves productivity or work conditions.

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

33. You would be willing to go through training in the following administrative skills: **cost management, scheduling, material management, Request for Information (RFI), and estimating.**

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

34. You would be willing to go through training in the following computer skills: **e-mail/internet, word processing, spreadsheets, scheduling, estimating, computer aided design (CAD) and materials management.**

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

35. You would be willing to go through training in the following planning skills: **materials, equipment, tools and information request, short-term planning, and scheduling.**

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

36. You would be willing to go through training in the following job management skills: **crew coordination, craft coordination, selection of work means and methods, and leadership.**

1	2	3	4	5
Strongly Disagree		Neutral		Strongly Agree

Thank you.

Your help is greatly appreciated!

WORKFORCE ASSESSMENT TOOL

INDIVIDUAL SKILL ASSESSMENT

1. In how many crafts are you certified? _____
Please list those crafts and who provided the certification:

In the next 12 months, how many additional crafts will you be certified in? _____
Please list those crafts:
2. How many years of experience, in your primary craft, do you have at the certified craft level? _____ yrs
3. How many hours of craft training and craft skill updating have you had in the last 3 years? (including recertification and safety) _____ Hrs
4. Please check each of the following administrative skills in which you are proficient*:
 Cost Management Request for Information Material Management
 Scheduling Estimating
5. Please check each of the following computer skills in which you are proficient*:
 E-mail/internet Scheduling Material Management
 Word processing Estimating
 Spreadsheet Computer Aided Design (CAD)
6. How many total hours of training do you have in planning skills? (*Material, equipment, tools and information request, short-term planning, and scheduling*) (Include FORMAL classroom training) _____ Hrs
Are you certified in planning? yes no
Are you proficient* in planning skills? yes no
7. How many combined hours of training do you have in job management skills? (*Crew coordination, inter-and intra- craft coordination, selection of work packages, and leadership*) (Include FORMAL classroom training) _____ Hrs
Are you certified in job management? yes no
Are you proficient* in job management skills? yes no
8. Have you worked for this company before this project? yes no

*Proficient- a skill in which you are competent and capable with little or no supervision

9. For the last year, please rate the your personal performance record (*including safety, attendance, quality, productivity, and initiative*) on a scale from 0 to 10 with 0 being weak, 5 being modest and 10 being superior.

	Weak			Modest				Superior			
Performance Record	0	1	2	3	4	5	6	7	8	9	10

10. Do you have any experience in training unskilled workers in tasks as an instructor or a mentor? yes no

If yes, have you ever been certified as an instructor?

yes no

11. How many people are on your crew (not including the supervisor/foreman)?

How many craftsmen/journeymen are on your crew? _____

How many apprentice/helpers are on your crew? _____

Appendix B – NCF Workforce Data

NCF WORKFORCE ASSESSMENT TOOL
Individual Background Questionnaire
(108 Questionnaires Completed)

1. *What is your age?*

<u>Age</u>	<u>Frequency</u>	<u>Age</u>	<u>Frequency</u>
19	1	32	8
20	0	33	8
21	8	34	4
22	3	35	2
23	4	36	4
24	4	37	8
25	4	38	6
26	4	39	3
27	9	40	4
28	11	41	0
29	6	42	0
30	3	43	2
31	2		

<u>Average</u>	<u>Median</u>
30.4	30

2. *What is your gender?*

	<u>Male</u>	<u>Female</u>
No.	99	9
%	91.7%	8.3%

3. *What is your country of origin?*

	<u>US</u>	<u>Philippines</u>	<u>Other</u>
No.	93	9	6
%	86.1%	8.3%	5.6%

What is your native language?

	<u>English</u>	<u>Other</u>
No.	95	13
%	88.0%	12.0%

4. *What is your highest level of education?*

Education Level	No.	% Sample
0-8 years of school	0	0.0%
Some high school	0	0.0%
High school diploma	37	34.3%
GED equivalent	2	1.9%
Completed vocational or technical program	8	7.4%
Some college (No degree)	46	42.6%
Associate degree (2 year program)	7	6.5%
Bachelors degree (4 year program)	7	6.5%
Some post graduate education (Master, Ph.D.)	1	0.9%
Masters degree	0	0.0%
Ph.D.	0	0.0%
Other	0	0.0%

5. *What is your present job title?*

Current Job	No.	% Sample
Project Supervisor	9	8.3%
Crew Leader	13	12.0%
Project Safety Supervisor	5	4.6%
Project QC Supervisor	2	1.9%
Crew Member	11	10.2%
Platoon Commander	2	1.9%
Squad Leader	18	16.7%
Fire Team Leader	18	16.7%
Rifleman	9	8.3%

6. In what crafts have you been certified and/or completed a "C" school?

Certifications	No.	% Sample
Boilermaker	0	0%
Carpenter	16	15%
Crane Operator	9	8%
Concrete Finisher	14	13%
Equipment Operator	29	27%
Electrician	9	8%
Instrument Fitter	0	0%
Glass/Glazing Worker	1	1%
Instrument Technician	1	1%
Insulation Worker	1	1%
Mason	13	12%
Welder	9	8%
Millwright	0	0%
Operating Engineer	4	4%
Plumber	7	6%
Painter	11	10%
Pipe Fitter	9	8%
Roofer	10	9%
Reinforcing Rodman	6	6%
Rigger	10	9%
Structural Ironworker	5	5%
Sheet metal Worker	7	6%
Other Skill	30	28%

Number of Certifications	No.	% Sample
0	21	19.4%
1	40	37.0%
2	20	18.5%
3	6	5.6%
4	8	7.4%
5+	13	12.0%

What is your primary craft?

Rate	No.	% Sample
Builder	21	19.4%
Construction Electrician	10	9.3%
Construction Mechanic	7	6.5%
Engineering Aide	10	9.3%
Equipment Operator	30	27.8%
Steel Worker	19	17.6%
Utilitiesman	11	10.2%

7. *How did you receive your craft training?*

Certification Method	No.	% Sample
NCCER	0	0.0%
Basic Military Training	43	39.8%
"C" School	65	60.2%
Vocational School	13	12.0%
Union Sector Program	0	0.0%
Non-union Program	1	0.9%
Company Craft Program	1	0.9%
OJT	15	13.9%
Other Cert	11	10.2%

8. *In your current job, do you have supervisory responsibility?*

	<u>No.</u>	<u>% Sample</u>
Yes	80	74.1%
No	28	25.9%

9. *What is your current pay grade?*

Rank	No.	% Sample
E-4	15	13.9%
E-5	45	41.7%
E-6	48	44.4%

10. *What is your current rate?*

Same as primary craft data.

11. What is your Time-In-Rate (years)?

Time In Rate	No.	% Sample
0	3	2.8%
1	18	16.7%
2	17	15.7%
3	26	24.1%
4	11	10.2%
5	11	10.2%
6	7	6.5%
7	6	5.6%
8	0	0.0%
9	2	1.9%
10+	7	6.5%

Average
3.94

Median
3.00

Mode
3.00

12. What is your Time-In-Service (years)?

Time In Service	No.	% Sample
0-2	3	2.8%
3-4	19	17.6%
5-6	15	13.9%
7-8	18	16.7%
9-10	19	17.6%
11-12	5	4.6%
13-14	9	8.3%
15-16	10	9.3%
17-18	5	4.6%
19+	5	4.6%

Average
9.14

Median
8.00

Mode
3.00

13. Have you returned from deployment within the last 2 months?

	<u>No.</u>	<u>% Sample</u>
Yes	21	19.4%
No	87	80.6%

14. Will you be deployed within the next 2 months?

	<u>No.</u>	<u>% Sample</u>
Yes	9	8.3%
No	99	91.7%

15. How many total weeks were you deployed and/or worked in construction during 2002-2003?

Total Weeks Deployed	No.	% Sample
0	41	38.0%
1-12	6	5.6%
13-16	3	2.8%
17-20	1	0.9%
21-24	7	6.5%
25-28	16	14.8%
29-32	12	11.1%
33-36	7	6.5%
37-40	2	1.9%
41+	13	12.0%

On average, how many hours per week did you work in construction in 2002-2003?

Hours Worked Per Week	No.	% Sample
0	51	47.2%
1-10	7	6.5%
11-20	2	1.9%
21-30	5	4.6%
31-40	17	15.7%
41-45	1	0.9%
46-50	7	6.5%
51-55	6	5.6%
56-60	9	8.3%
61+	3	2.8%

16. Have you ever worked in construction outside the military?

	<u>No.</u>	<u>% Sample</u>
Yes	70	64.8%
No	38	35.2%

17. For how many different construction companies have you worked?

Number of Companies	No.	% Sample
0	47	43.5%
1	25	23.1%
2	19	17.6%
3	8	7.4%
4	2	1.9%
5+	7	6.5%

<u>Average</u>	<u>Median</u>	<u>Mode</u>
1.37	1.00	0.00

18. How many years of experience in construction do you have in each of the following categories?

Experience	Average Years of Experience
As Helper	3.81
As Journeyman	1.20
As Crew Leader	2.02
As Proj Sup	1.31
As Proj Safety	0.46
As Proj QC	0.26
Total years experience	8.88

19. Do you know how to use a computer?

	<u>No.</u>	<u>% Sample</u>
Yes	105	97.2%
No	3	2.8%

20. How long have you been using a computer?

Years of Computer Experience	No.	% Sample
0-2	12	11.1%
3-4	17	15.7%
5-6	25	23.1%
7-8	12	11.1%
9-10	21	19.4%
11+	21	19.4%

<u>Average</u>	<u>Median</u>	<u>Mode</u>
7.56	6.50	10.00

21. *Where did you acquire your computer skills?*

Training Method	No.	% Sample
Self taught Off the job	72	66.7%
On The Job training	50	46.3%
Company sponsored	8	7.4%
Formal education	27	25.0%

22. *Do you have any job planning, management or administrative skills?*

	<u>No.</u>	<u>% Sample</u>
Yes	89	82.4%
No	19	17.6%

23. *Where did you acquire those planning, management or administrative skills?*

Training Method	No.	% Sample
Self taught Off the job	38	35.2%
On The Job training	68	63.0%
Military training	39	36.1%
Formal education	12	11.1%

24. *Are you satisfied with your pay?*

	<u>No.</u>	<u>% Sample</u>
Yes	32	29.6%
No	76	70.4%

For the following questions, please indicate your response on a scale from 1 to 5.

25. *How satisfied do you feel with your career in military construction?*

Career Satisfaction Rating	No.	% Sample
1	4	3.7%
2	13	12.0%
3	36	33.3%
4	44	40.7%
5	11	10.2%

Why?

Career Comments

1	We don't receive any welding OJT
2	Need more jobs for steel workers
2	Never work in my rate
2	Not enough quality work
3	Not enough in rate work
3	Usually do construction on deploy, In HP skills lo
3	Not enough training projects in homeport.
3	Not enough time in primary craft.
3	More concerned with looking good than doing job
3	Would like more rate training
3	Still behind on technology
3	Not enough of it
4	More formal training and civilian certifications
4	Actual time doing rate
4	Need to update means and ways along with tools. Better equipment to work with, behind outside comp
4	Still learning my rate
4	Some times good projects but small budget n tools
5	Skills were are taught are used by contractors.
5	Diversity in projects and locations
5	I enjoy working with my hands

Military Comments

1	Advancement
2	Training and projects take a backseat to everything
3	Navy bureaucracy gets in the way
3	Good training, too much out of rate work
4	Advancement should be based on test, not TIR
4	I enjoy running a shop and teaching young troops
4	Reached E5 in 3.5 years.
5	Enjoy been in the military.

Pay Comments

2	Pay
2	Not enough pay, no time with family
4	Enjoy work, pay could be a bit better
4	The pay is not as good as the civilian world.
4	We need better pay
4	Content with way of life, not pay

Personal Comments

1	Too much politics, ridiculous deadlines
1	Not for me
2	No feedback - Not keep skills sharp
2	We have too many idiots and B.S. Getting out
2	Too much to list
2	I don't like construction
3	Work is good, but risk is high always a target
3	Only worked at public works so far
3	Not what I thought it would be
3	Should have chosen more technical field
4	I want more
4	It's enjoyable and filling
4	Always room for improvement
4	It has been very good to my family
4	A good general experience
4	I'm in the area I want to be in.
4	Career path coincides with goals
4	Been a good life - career
4	Room for improvement
4	I have learned a lot, but there is always room education
5	Rewarding
5	I can do anything I opt for
5	In 8 years I am on the right path to achieve goals

26. *Planning and progress information should be shared between crews.*

Response	No.	% Sample
0	1	0.9%
1	1	0.9%
2	4	3.7%
3	21	19.4%
4	49	45.4%
5	32	29.6%

27. *How do you feel about entering and obtaining project information in a portable, wireless computer at the work place?*

Response	No.	% Sample
0	1	0.9%
1	2	1.9%
2	1	0.9%
3	15	13.9%
4	36	33.3%
5	53	49.1%

28. *How do you feel about carrying around a portable, wireless computer at the work place?*

Response	No.	% Sample
0	1	0.9%
1	5	4.6%
2	4	3.7%
3	15	13.9%
4	35	32.4%
5	48	44.4%

29. *All crews on the project should include multi-crafted workers.*

Response	No.	% Sample
0	1	0.9%
1	0	0.0%
2	2	1.9%
3	15	13.9%
4	38	35.2%
5	52	48.1%

Please give your perception of the following work practices at a construction site.

Rate on a scale from 1 to 5. (Circle only one.)

30. The job of the crew should be defined so that crew members see it as a team project. All crew members (not only the foreman) ensure that it is planned and executed properly.

Response	No.	% Sample
0	0	0.0%
1	0	0.0%
2	1	0.9%
3	11	10.2%
4	37	34.3%
5	59	54.6%

31. There should be a rigid chain of command in which crew members do not participate in coordinating the job of the crew, only the crew leaders should do it.

Response	No.	% Sample
0	0	0.0%
1	22	20.4%
2	22	20.4%
3	26	24.1%
4	27	25.0%
5	11	10.2%

32. Tasks should be assigned to the crew as a team, so that the crew as a whole has a responsibility for which the crew as a whole is held accountable.

Response	No.	% Sample
0	0	0.0%
1	2	1.9%
2	13	12.0%
3	19	17.6%
4	43	39.8%
5	31	28.7%

33. *Tasks should be assigned for each crew member so that the individual has a specific responsibility for which only he/she is held accountable.*

Response	No.	% Sample
0	0	0.0%
1	5	4.6%
2	13	12.0%
3	29	26.9%
4	40	37.0%
5	21	19.4%

34. *It would be easier to get the job done if all experienced journeymen were also able to perform tasks that are typically considered "management" functions.*

Response	No.	% Sample
0	1	0.9%
1	2	1.9%
2	6	5.6%
3	36	33.3%
4	44	40.7%
5	19	17.6%

35. *Craftsmen should adapt to the use of new technology that improves productivity or work conditions.*

Response	No.	% Sample
0	1	0.9%
1	0	0.0%
2	0	0.0%
3	11	10.2%
4	43	39.8%
5	53	49.1%

36. You would be willing to go through training in the following administrative skills: cost management, scheduling, material management, Request For Information (RFI), and estimating.

Response	No.	% Sample
0	2	1.9%
1	1	0.9%
2	3	2.8%
3	16	14.8%
4	29	26.9%
5	57	52.8%

37. You would be willing to go through training in the following computer skills: e-mail/internet, word processing, spreadsheets, scheduling, estimating, computer aided design (CAD) and materials management.

Response	No.	% Sample
0	2	1.9%
1	1	0.9%
2	2	1.9%
3	13	12.0%
4	29	26.9%
5	61	56.5%

38. You would be willing to go through training in the following planning skills: materials, equipment, tools and information request, short-term planning, and scheduling.

Response	No.	% Sample
0	2	1.9%
1	1	0.9%
2	1	0.9%
3	15	13.9%
4	35	32.4%
5	54	50.0%

39. You would be willing to go through training in the following job management skills: crew coordination, craft coordination, selection of work means and methods, and leadership.

Response	No.	% Sample
0	2	1.9%
1	1	0.9%
2	2	1.9%
3	14	13.0%
4	32	29.6%
5	57	52.8%

NCF WORKFORCE ASSESSMENT TOOL
Individual Skill Assessment
(121 Questionnaires Completed)

1. *In how many crafts are you certified?*

Number of Certifications	No.	% Sample
0	32	26.4%
1	34	28.1%
2	23	19.0%
3	16	13.2%
4	5	4.1%
5	4	3.3%
6+	7	5.8%

Average
2.02

Median
1.00

In the next 12 months, how many additional crafts will you be certified in?

Number of Future Certifications	No.	% Sample
0	82	67.8%
1	28	23.1%
2	6	5.0%
3	3	2.5%
4	0	0.0%
5	0	0.0%
6+	2	1.7%

Average
0.57

Median
0.00

2. *How many years of experience, in your primary craft, do you have at the certified craft level?*

Years of Experience	No.	% Sample
0	31	25.6%
1-2	18	14.9%
3-4	12	9.9%
5-6	17	14.0%
7-8	19	15.7%
9-10	11	9.1%
11+	13	10.7%

Average
5.09

Median
4.00

3. *How many hours of craft training and craft skill updating have you had in the last 3 years?*

Craft Training Hours	No.	% Sample
0-50	67	55.4%
51-100	17	14.0%
101-150	0	0.0%
151-200	7	5.8%
201-250	1	0.8%
251-300	2	1.7%
301-350	1	0.8%
351-400	1	0.8%
401-500	2	1.7%
501-600	1	0.8%
601-700	0	0.0%
701-800	0	0.0%
801-1000	8	6.6%
1000+	14	11.6%

Average
490

Median
40

4. Please check each of the following administrative skills in which you are proficient:

Admin Skills	No.	% Sample
Cost Management	39	29.1%
Scheduling	65	48.5%
Request For Information	44	32.8%
Estimating	74	55.2%
Material Management	69	51.5%

The average responder marked 2.4 of these skills.

5. Please check each of the following computer skills in which you are proficient:

Computer Skills	No.	% Sample
Email Internet	107	79.9%
Word processing	68	50.7%
Spreadsheet	53	39.6%
Scheduling	41	30.6%
Estimating	51	38.1%
CADD	19	14.2%
Material Management	46	34.3%

The average responder marked 2.8 of these skills.

6. How many total hours of training do you have in planning skills?

Training in Planning Skills	No.	% Sample
0-50	66	54.5%
51-100	21	17.4%
101-150	3	2.5%
151-200	8	6.6%
201-250	2	1.7%
251-300	0	0.0%
301-350	3	2.5%
351-400	0	0.0%
401-500	6	5.0%
501-600	2	1.7%
601-700	0	0.0%
701-800	0	0.0%
801-1000	5	4.1%
1000+	5	4.1%

Are you certified in planning?

	<u>No.</u>	<u>% Sample</u>
Yes	18	13.4%
No	103	86.6%

Are you proficient in planning?

	<u>No.</u>	<u>% Sample</u>
Yes	70	52.2%
No	51	47.8%

7. *How many combined hours of training do you have in job management skills?*

Training in Job Management Skills	No.	% Sample
0-50	74	61.2%
51-100	17	14.0%
101-150	5	4.1%
151-200	3	2.5%
201-250	0	0.0%
251-300	1	0.8%
301-350	0	0.0%
351-400	1	0.8%
401-500	5	4.1%
501-600	1	0.8%
601-700	0	0.0%
701-800	0	0.0%
801-1000	6	5.0%
1000+	8	6.6%

Are you certified in job management?

	<u>No.</u>	<u>% Sample</u>
Yes	24	17.9%
No	97	82.1%

Are you proficient in job management?

	<u>No.</u>	<u>% Sample</u>
Yes	72	53.7%
No	49	46.3%

8. *Have you been deployed within the last 12 months?*

	<u>No.</u>	<u>% Sample</u>
Yes	55	45.5%
No	67	54.5%

9. *For the last year, please rate the your personal performance record (including safety, attendance, quality, productivity, and initiative) on a scale from 0 to 10 with 0 being weak, 5 being modest and 10 being superior.*

Note: Only 115 responded to this question (6 did not rate themselves). Also, none rated themselves below 5.

Personal Performance Rating	No.	% of Respondents
10	14	12.2%
9	26	22.6%
8	48	41.7%
7	15	13.0%
6	7	6.1%
5	5	4.3%

<u>Average</u>	<u>Median</u>
8.09	8.00

10. *Do you have any experience in training unskilled workers in tasks as an instructor or a mentor?*

	<u>No.</u>	<u>% Sample</u>
Yes	103	76.9%
No	18	23.1%

If yes, have you ever been certified as an instructor?

	<u>No.</u>	<u>% Sample</u>
Yes	44	32.8%
No	77	67.2%

11. How many people are on your crew (not including the supervisor/foreman)?

No. Personnel on Crew	No.	% Sample
0-4	66	54.5%
5-8	23	19.0%
9-12	13	10.7%
13-16	8	6.6%
17-20	2	1.7%
21-24	5	4.1%
25+	4	3.3%

Average
6.40

Median
4.00

How many craftsmen/journeymen are on your crew?

No. Craftsmen on Crew	No.	% Sample
0	75	62.0%
1	6	5.0%
2	5	4.1%
3	5	4.1%
4	9	7.4%
5	7	5.8%
6+	14	11.6%

Average
2.12

Median
0.00

How many apprentice/helpers are on your crew?

No. Helpers on Crew	No.	% Sample
0	62	51.2%
1-2	10	8.3%
3-4	15	12.4%
5-6	13	10.7%
7-8	2	1.7%
9-10	8	6.6%
11+	11	9.1%

Average
3.51

Median
0.00

Appendix C – Tier II Evaluation of NCF Workforce Data

CCIS developed the Tier II metric to measure project worker skills and project execution. The first portion utilizes data from the Individual Skill Assessment questionnaire in the WAP. This portion utilized two key areas for determining the metric score of the individual. The first area is the Individual's Technical Skills and the second area is the Individual's Management Skills. Each area provides a maximum of 100 points, for a total of 200 possible points for a worker. A minimum combined score of 150 points is necessary to qualify as a Tier II worker.

Tier II Metrics: Project Worker Skills

Individual's Technical Skills Score

Elements	Weights	Evaluation Criteria	Score	Value = Weight x Score
Craft Certification	4.0	Certified in 3 crafts	10	40
		Certified in 2 crafts	5	
		No certification	0	
Technical Experience	4.0	More than 10 years of experience at the certified craft level	10	40
		5 years of experience at the certified craft level	5	
		Less than 1 year of experience at the certified craft level	0	
Continuous Training and Education	2.0	More than 200 hours of training and skill updating in the last 3 years	10	20
		100 hours of training and skill updating in the last 3 years	5	
		No training or skill updating since first craft certification	0	

Total = 100

Individual's Management Skills Score

Elements	Weights	Evaluation Criteria	Score	Value = Weight x Score
Administrative	1.0	Certified in at least 4 administrative skills	10	10
		Certified in 2 administrative skills	5	
		No certified administrative skills	0	
Computer	1.0	Certified in at least 5 computer skills	10	10
		Certified in 3 computer skills	5	
		No certified computer skills	0	
Planning	3.0	Certified in planning skills	10	30
		160 hours of training, but not certified in planning skills	5	
		No training and certification	0	
Job Management	2.0	Certified in job management skills	10	20
		160 hours of training, but not certified in job management skills	5	
		No training and certification	0	
Work Record	3.0	Superior in all categories	10	30
		Superior in some, modest in others	5	
		Weak in most categories	0	

Total = 100

Tier II Metrics: NCF Respondent Scores

Builders Scores (Average = 105.4)

Primary Craft	Technical Skills Score	Management Skills Score	Total Skills Score
BU	20	35	55
BU	0	50	50
BU	40	15	55
BU	40	85	125
BU	20	25	45
BU	0	15	15
BU	60	40	100
BU	60	85	145
BU	80	75	155
BU	80	50	130
BU	70	35	105
BU	80	60	140
BU	80	65	145
BU	60	30	90
BU	80	20	100
BU	70	80	150
BU	40	0	40
BU	60	30	90
BU	80	65	145
BU	80	85	165
BU	60	50	110
BU	60	25	85
BU	80	85	165
BU	80	45	125

Construction Electricians Scores (Average = 70.9)

Primary Craft	Technical Skills Score	Management Skills Score	Total Skills Score
CE	0	5	5
CE	0	20	20
CE	40	50	90
CE	40	60	100
CE	30	15	45
CE	20	15	35
CE	20	0	20
CE	40	35	75
CE	60	85	145
CE	60	80	140
CE	80	25	105

Construction Mechanic Scores (Average = 83.6)

Primary Craft	Technical Skills Score	Management Skills Score	Total Skills Score
CM	20	20	40
CM	40	25	65
CM	30	35	65
CM	60	20	80
CM	40	60	100
CM	40	20	60
CM	100	75	175

Engineering Aid Scores (Average = 58.8)

Primary Craft	Technical Skills Score	Management Skills Score	Total Skills Score
EA	0	25	25
EA	0	40	40
EA	20	20	40
EA	80	50	130

Equipment Operator Scores (Average = 99.0)

Primary Craft	Technical Skills Score	Management Skills Score	Total Skills Score
EO	20	20	40
EO	40	20	60
EO	40	30	70
EO	0	15	15
EO	20	35	55
EO	20	30	50
EO	0	45	45
EO	60	25	85
EO	60	35	95
EO	40	40	80
EO	40	20	60
EO	40	65	105
EO	50	75	125
EO	70	55	125
EO	100	75	175
EO	80	95	175
EO	70	60	130
EO	90	60	150
EO	60	80	140
EO	60	80	140
EO	60	100	160

Steelworker Scores (Average = 58.8)

Primary Craft	Technical Skills Score	Management Skills Score	Total Skills Score
SW	0	20	20
SW	20	15	35
SW	20	40	60
SW	0	35	35
SW	10	25	35
SW	0	25	25
SW	20	20	40
SW	60	20	80
SW	40	20	60
SW	80	60	140
SW	90	15	105
SW	40	30	70

Utilitiesman Scores (Average = 66.0)

Primary Craft	Technical Skills Score	Management Skills Score	Total Skills Score
UT	0	25	25
UT	20	15	35
UT	40	50	90
UT	30	35	65
UT	20	25	45
UT	60	55	115
UT	20	20	40
UT	40	25	65
UT	100	20	120
UT	40	20	60

Appendix D – CCIS PT-182 Data Summary

This information is a summary of the data collected by the CII research team addressing the shortage of skilled craft workers in the U.S. Only a portion of the data will be summarized in this section.

1. Distribution of Crafts Surveyed in Study:

Crafts Surveyed	% Sample
Boilermaker	10.0%
Civil ¹	10.0%
Operators ²	4.0%
Electrician	19.0%
Instrumentation ³	3.0%
Insulation Worker	3.0%
Lineman	2.0%
Millwright	6.0%
Pipe fitter	16.0%
Rigger	1.0%
Sheet-metal Worker	2.0%
Structural Ironworker	10.0%
Welder	6.0%
Welder (pipe)	5.0%
Welder (structural)	1.0%
Other ⁴	2.0%

2. The average age of journey-level workers in this study is almost 41 years.
3. Of the respondents, over 86 percent were born in the U.S., while almost 12 percent were born in Mexico.
4. Over 83 percent of respondents indicated that English was their first language and almost 17 percent indicated Spanish as the primary language.
5. Only 2 percent of journey-level workers were women.
6. Nearly 58 percent indicated that they knew how to use a computer.
7. Only 36 percent of respondents indicated that they were satisfied with their pay.

8. Education Attainment Comparison:

	US	% Sample
Less than 9th Grade	7.5%	6.6%
9th to 12th grade, no diploma	12.1%	11.5%
High school graduate (includes equivalency)	28.6%	49.3%
Some college, no degree	21.0%	26.3%
Associate degree	6.3%	3.9%
Bachelor's degree	15.5%	2.1%
Graduate or professional degree	8.9%	0.4%
Percent high school graduate or higher	80.4%	82.0%
Percent bachelor's degree or higher	24.4%	2.5%

9. Job Satisfaction of Workers:

Job Satisfaction Rating	No.	% Sample
1	38	4.4%
2	54	6.3%
3	292	34.0%
4	283	32.9%
5	192	22.4%

10. Receptiveness to Tier I Elements:

	% Sample
Willing to adapt to new technology	79.7%
Willing to train in administrative skills	81.6%
Willing to train in computer skills	81.1%
Willing to train in planning skills	86.8%
Willowing to train in management skills	84.9%

11. Hours of Training Received by Field Supervisors:

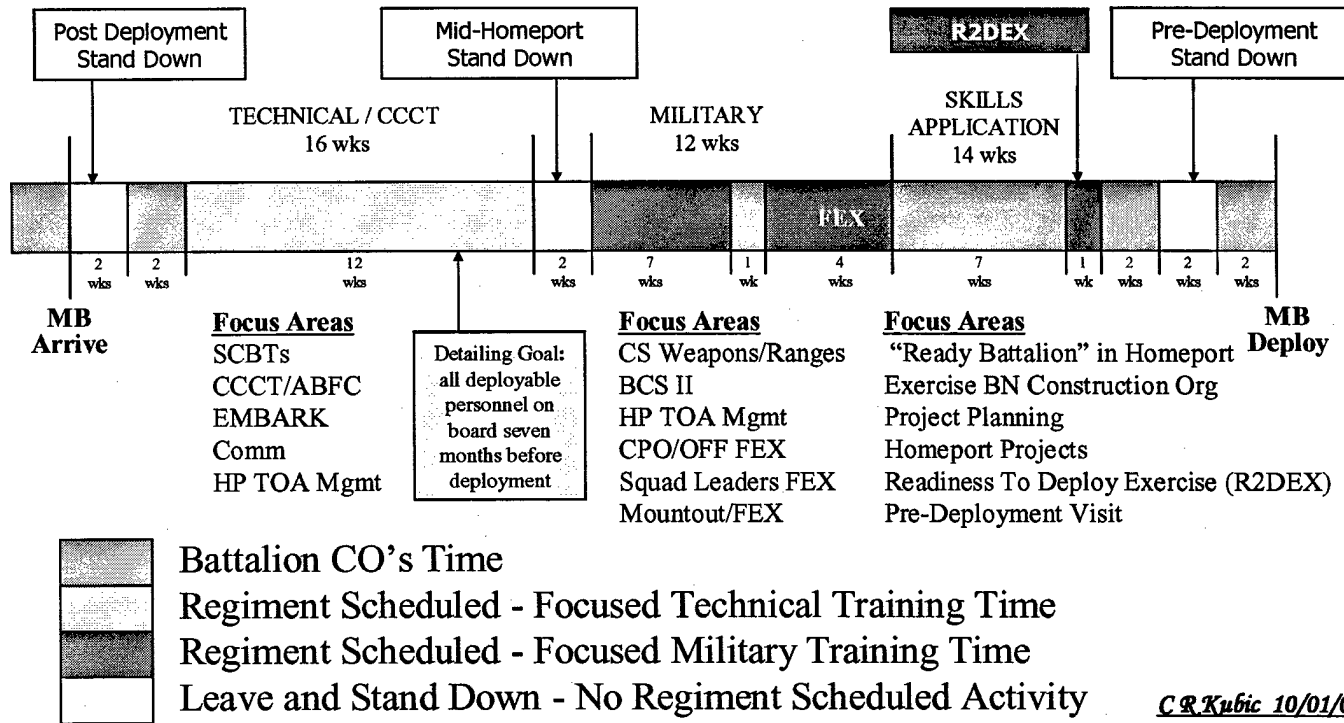
Hours of Training	Craft Skills Training		Training in Planning Skills		Training in Job Management Skills	
	#	percent	#	percent	#	percent
0-50	87	39.9%	121	55.5%	110	50.5%
51-100	57	26.1%	33	15.1%	32	14.7%
101-150	24	11.0%	19	8.7%	22	10.1%
151-200	7	3.2%	3	1.4%	6	2.8%
201-250	21	9.6%	12	5.5%	14	6.4%
251-300	2	0.9%	2	0.9%	1	0.5%
301-350	5	2.3%	1	0.5%	1	0.5%
351-400	2	0.9%	1	0.5%	1	0.5%
401-500	5	2.3%	3	1.4%	1	0.5%
501-600	2	0.9%	3	1.4%	8	3.7%
601-700	3	1.4%	2	0.9%	2	0.9%
701-800	1	0.5%	0	0.0%	0	0.0%
801-1000	0	0.0%	0	0.0%	1	0.5%
1000+	2	0.9%	18	8.3%	19	8.7%

Appendix E – NCF Deployment and Training Plans



FIRST Naval Construction Division

10 Month Homeport Template (1 October 2002)



78

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Appendix F – Seabee Skills

Builder (BU)

Woodworking
Forming, Reinforcing, and Placing Concrete
Masonry
Floor and Wall Framing
Roof Framing
Exterior Finish Carpentry
Composite Roof Shingles
Heavy Timber Bridge
Pre-Engineered Building Erection
Interior Finish and Drywall
Painting and Preservation
Doors and Windows
Suspended Ceiling
Floor and Wall Tile
Interior Trim
Hot Built-Up Roof
Tear Down and Demolition

Construction Electrician (CE)

Pole Climbing
Overhead Distribution Systems
Maintenance of Distribution Systems
Airfield Lighting
Interior Distribution Systems

NCCER Equivalent Skills

Commercial Carpentry
Industrial Carpentry
Industrial Insulating
Industrial Painting
Scaffold Building

NCCER Equivalent Skills

Commercial Electricity
Industrial Electricity
Industrial Maintenance Electric

Motor Controllers

MEP – Generators

Construction Mechanic (CM)

NCCER Equivalent Skills

Gasoline Engine and Lubricant Systems

None

Electrical Maintenance

Air Bags

Electrical Ignition Systems

On Board Computers

Hydraulic Systems

Steering

Clutches

Drive Train

Wheels and Tires

Hydraulic Brakes

Air Bags

Cummins Diesel Engines

Caterpillar Fuel System

Tracked Construction Equipment

Equipment Operator (EO)

NCCER Equivalent Skills

Tractor and Trailer Safety and Operation

Mobile Crane

Tie Down Procedures

Dump Truck Safety and Operation

Motorized Scraper Safety and Operation

Grader Safety and Operation
Crawler Tractor Safety and Operation
Push Loading Scrapers with Crawler Tractors
Scooploader Safety and Operation
Forklift Safety and Operation
Air Compressor Safety and Operation
Compaction Equipment Safety and Operation
Water Well Drilling
Crane Safety and Operation

Engineering Aid (EA)

Surveying
CADD Operation
Materials Testing
Soil Testing

NCCER Equivalent Skills

None

Steelworker (SW)

Steel Metal Layout
Steel Metal Fabrication
Reinforcing Steel
Fiber Line
Pre-Engineered Building Erection
Gas Cutting and Welding
Electric Arc Welding

NCCER Equivalent Skills

Boilermaker
Industrial Ironwork
Industrial Pipefitting

Utilitiesman (UT)

HVAC and Refrigeration Systems

Pump Maintenance

Electricity and Cathodic Protection

Silver Soldering Copper Pipe and Tube

Interior and Exterior Waste Systems

Fixture Installation

Non-Rate Specific Skills

Quality Assurance/Quality Control

Safety Inspection

Project Planning

Estimating

NCCER Equivalent Skills

HVAC

Industrial Pipefitting

Glossary

1. Naval Construction Force (NCF): A term used to identify all personnel directly involved in the U.S. Navy's internal construction capability.
2. Naval Construction Training Center (NCTC): A Naval Command with the mission of providing all levels of construction craft related training for members of the Naval Construction Force.
3. Navy Enlisted Classification (NEC): A numerical code assigned to an individual who has completed an advanced construction craft related technical school.
4. Naval Facilities Engineering Command (NAVFAC): The parent command of all Civil Engineering Corps (CEC) officers and the organization that establishes operating policy and procedure for all Navy construction and facilities related issues.
5. Naval Mobile Construction Battalion (NMCB): The fundamental construction element in the Naval Construction Force, consisting of personnel of varying construction crafts fully equipped and trained to perform construction work in a combat or contingency environment.
6. Petty Officer: An enlisted person in the U.S. Navy having obtained the rank E-4 through E-6. A third class petty officer is an E-4, a second class petty officer is an E-5, and a first class petty officer is an E-6, respectively.
7. Rate: The job of an enlisted person in the Navy.
8. Seabee: Any person attached to command within the Naval Construction Force. Traditionally this is U.S. Navy personnel in Occupational Field (OF) – 13, personnel that gain ratings in construction skills.

9. Special Construction Battalion Training (SCBT): A short, two to three week technical construction craft school conducted by a NCTC and oriented towards improving a craft person with a basic or fundamental skill level.

Bibliography

- "Basic Pay – Effective July 1, 2000." (2000). Defense Finance and Accounting Service (DFAS). <www.dfas.mil> (Sept. 2, 2003).
- Buffington, J. and Bowers, M. (1994). "Navy Seabees and the Civil Engineer Corps: Providing skills to the joint environment." *Engineer*, Dec., v24-i4, 11-16.
- Burleson, R. (1997). "An analysis of multiskilled labor strategies in construction." PhD Thesis, The University of Texas at Austin.
- Byrom, D., et al (2003). "The shortage of skilled craft workers in the U.S." *Construction Industry Institute Research Summary 182-1*, The University of Texas at Austin, Austin, Texas.
- Cannon, E. (2001). "Training curricula for construction craftworkers." Master's Thesis, The University of Texas at Austin.
- Castañeda-Maza, J., Tucker, R., Haas, C., Glover, R., and Shields, D. (2003). "A revolutionary and structured approach to construction work force management: The Tier II strategy." 2003 *Construction Research Congress*, ASCE.
- Center to Protect Workers' Rights. (2002). *The Construction Chart Book: The U.S. Construction Industry and Its Workers*. 3rd Edition. Silver Spring, MD: The Center to Protect Workers' Rights.
- Command History: Naval Facilities Engineering Command*. (1992). Commander Naval Facilities Engineering Command, NAVFAC P-1032, Washington, D.C.
- "Demographics of the Navy." (2002). Bureau of Naval Personnel (BUPERS). <www.bupers.navy.mil/mentor/demographics.html> (Oct. 1, 2003).
- Edward, D. (2001). "Distribution of craft management skills in a Tier II work team." Master's Thesis, The University of Texas at Austin.
- Engle, G. (2003). "First Naval Construction Division (1NCD)/Naval Construction Forces Command (NCFC)." *Junior Officer Development Brief*, May 27, Washington, DC.

- Goins, D., Haas, C., Evans, R., and Heath, R. (2003). "Addressing the skilled workforce shortage: A strategy driven model." *CII 2003 Annual Conference Implementation Session*, Orlando, Florida.
- Haas, C., Tucker, R., Glover, R., and Edward, D. (2002). "Distribution of craft management skills in a Tier II work team." *Center for Construction Industry Studies Report No. 23*, The University of Texas at Austin, Austin, Texas.
- Howard, L. (2001). "Evolution of the two-tier construction workforce concept." Master's Thesis, The University of Texas at Austin.
- McGrey, S. (1997). "Utilization of advanced journeyman training in the U.S. Naval Construction Force." Master's Thesis, The University of Texas at Austin.
- Moore, R. (1995). "Motivation factors of construction personnel in a United States Naval Construction Battalion Unit." Master's Thesis, The University of Texas at Austin.
- Morton, D. (1997). "Factors affecting productivity in the United States Naval Construction Force." Master's Thesis, The University of Texas at Austin.
- Naval Construction Force Manual* (1985). Commander Naval Facilities Engineering Command, NAVFAC P-315, Washington, D.C.
- Newburger, E. (2001). "Home computers and internet use in the United States: August 2000." *U.S. Department of Commerce, U.S. Census Bureau*, Sept., 1-2.
- Pappas, M. (2000). "Evaluating innovative construction management methods through the assessment of intermediate impacts." Master's Thesis, The University of Texas at Austin.
- "Percent of people in U.S. using the internet, 1998-2001." (2003). *World Almanac & Book of Facts*, World Almanac Education Group, Inc., 708.
- Quester, A. and Gilroy, C. (2002). "Women and minorities in America's volunteer military." *Contemporary Economic Policy*, Apr., v20-i2, 111.
- "Revolution in training." (2001). Executive Review of Navy Training, July 4.
- "Revolution in training 2001." (2002). Task Force EXCEL, March 12.
- Rosenberg, L. (2001). "Retention isn't about the economy, stupid." *Proceedings of the United States Naval Institute*, Oct., v127-i10, 98-99.

- Saillard, J. (2001). "Skill standards for the construction industry: Facing a structural skilled workforce shortage." Master's Thesis, The University of Texas at Austin.
- "Seabee Community Manager Brief." (2003). Bureau of Naval Personnel (BUPERS). <www.bupers.navy.mil/pers2/N132D16/seabee3.htm> (Oct. 1, 2003).
- Stanley, A. (1997). "Benefits, impediments, and limitations associated with the use of multiskilled labor strategies in construction." Master's Thesis, The University of Texas at Austin.
- Stay Navy. (2003). <www.staynavy.mil>. (Oct. 2, 2003).
- Tucker, R., Haas, C., Glover, R., Alemany, C., Carey, L., Rodriguez, A., and Shields, D.. (1999). "Key workforce challenges facing the American construction industry: An interim assessment." *Center for Construction Industry Studies Report No. 3*, The University of Texas at Austin, Austin, Texas.
- United States Department of Labor (DOL). (2003). <www.dol.gov>. (Sept. 13, 2003).
- The U.S. Navy Seabees: A Guide to Capabilities, Organization, and History of the Military's Construction Force of Choice.* (1999). Commander Second Naval Construction Brigade, Norfolk, Virginia.
- Villalobos, J. (1997). "Implementation of multiskilling in the construction industry." Master's Thesis, The University of Texas at Austin.
- "Yes, raise military pay. Just do it cleverly." (2001). *Business Week*, Feb. 12, i3719, 24.

Vita

Bradley Allen Hyatt was born on October 19, 1974, in Lexington, Kentucky. He grew up in Lexington, where he graduated high school in 1993 from The Lexington Christian Academy. He continued his education, studying civil engineering at the University of Kentucky. Upon graduation from the University of Kentucky in 1998, he moved to Pensacola, Florida to attend Officer Candidate School for the U. S. Navy. In October 1998, he completed the school and was commissioned as an Ensign in the U. S. Navy.

His experience as a civil engineer in the U. S. Navy included tours in the fields of public works management and project management with the U.S. Navy Seabees. During his deployments with the Seabees, he led numerous personnel in material management and construction activities in several locations throughout the world. He is an Engineer-In-Training in the state of Kentucky and in January 2003 began graduate studies at The University of Texas at Austin.

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