TRAMCON Data Collection Final Report

Jonathan W. Elliott, Ph.D. and Melissa K. Thevenin, M.S.

Colorado State University

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Purpose

Colorado State University (CSU) collected numerous data during the four-year Training for Manufactured Construction (TRAMCON) project. This document represents the final report and discussion(s) of data collected by CSU (in light of the original, proposed, data collection protocol). Please note that this report does not include the analysis of the third party external evaluator(s). CSU summary level data analysis as well as results aggregated by each participating college are presented herein.

This document references and summarizes several sections of the April 2016 TRAMCON Cognitive Assessment Policy and Practice report, authored by Jonathan W. Elliott. The Cognitive Assessment Policy and Practice report described the proposed methodology for data collection. Therefore, since the final report is intended to be a stand-alone document, much of the information in the current report restates the method of data collection from the Cognitive Assessment Policy and Practice report. Please see the previous report for additional detail regarding definitions, data collection protocols, tables, appendices, etc.

Knowledge, Skills, Abilities, and Other (KSAO) Overview and Definitions

The data collected from TRAMCON participants were broad, in that they covered several student characteristics in a series of instruments intended to measure or assess the student's Knowledge, Skills, Abilities, as well as Other (KSAO) characteristics. In the case of TRAMCON, these four broad areas were grouped under three general constructs as defined below:

<u>Knowledge</u>: This report classifies knowledge as the requisite understanding of the manufactured construction-specific training content covered in each level of training (Foundation, Basic, Advanced and Supervisory). Appropriate content knowledge for each level of training were determined through collaboration with key industry members and national certifying organizations that specialize in manufacturing, construction and TRAMCON's target jobplacement market of manufactured construction (MC). In layperson's terms, these categories of assessment included instruments and tests that determine the participant's level of understanding of the critical concepts, industry practices and terminology required to enter, and perform well in, the field of manufactured construction.

<u>Skills and Abilities</u>: TRAMCON assessed student abilities and skills using hands-on performance demonstrations, tests and assessments. Students were required to physically perform construction and manufacturing-related tasks at given levels of proficiency in order to successfully complete the training and receive certifications. The appropriate level of participant skill and ability was based on the criteria of existing national certifications. For example, the National Center for Construction Education and Research (NCCER) has identified necessary construction-related skills (such as the use of hand tools) and the proficiency levels required to achieve an NCCER Certification such as "Carpentry Level 1". These performance tests are included in the majority of NCCER training modules. Table 1 provides an example of NCCER Construction Core performance tests that were conducted as part of the TRAMCON Foundation Level Training. Passing of the performance tests for national certifications constitute a trainee's demonstration of proficiency in the critical skills and abilities required of TRAMCON graduates.

NCCER Construction	NCCER		NCCER-Derived Performance
Core	Module ID	NCCER Module Name	Test
1	00101-15	Basic Safety (Construction Site Safety Orientation)	Yes
2	00102-15	Introduction to Construction Math	No
3	00103-15	Introduction to Hand Tools	Yes
4	00104-15	Introduction to Power Tools	Yes
5	00105-15	Introduction to Construction Drawings	Yes
7	00107-15	Basic Communication Skills	Yes
8	00108-15	Basic Employability Skills	No
9	00109-15	Introduction to Materials Handling	Yes

<u>Other</u>: TRAMCON surveys assessed 'Other' student characteristics shown in occupational and educational research to enhance student learning and better understand training program attrition. These psychological and learning related characteristics included both stable and dynamic traits such as manufactured construction domain-level self-efficacy and motivation as well as resilience (e.g., grit) and learning style. It should be noted that participant responses to psychological construct survey items have neither correct nor incorrect answers. Rather, these data were used to determine/identify students who may be more likely to drop out of training. TRAMCON instructors could use student learning style data to gain an understanding of an individual student (or group of students in a training cohort) characteristics in order to better align content delivery with preferred learning method and/or identify students who may need additional assistance. The constructs in the 'Other' category were intended to help training organizations and colleges identify students, at program intake, who may benefit from additional support services intended to increase training program completion rates.

As described, each KSAO assessment included multiple constructs. However, it should be noted that not all constructs were included in each and every KSAO assessment. Rather, the inclusive list of KSAO constructs below were assessed at strategic points in the training curriculum. Further information regarding the measurement of KSAO data, including which constructs were assessed at specific times in the program, is provided under the 'Instrumentation' section of this report. The following section describes the constructs included within each category of the KSAO and their respective definition under the TRAMCON program.

Knowledge-Specific Survey Constructs

<u>NCCER Content Questions</u>: The NCCER KSAO content questions were extracted from the NCCER text books and the presentation slides covered in the TRAMCON instruction. The content of NCCER questions were tailored to the specific NCCER modules included in each level of the training. It should be noted that the NCCER content questions in the KSAO surveys were not used as the means for certifying students in a NCCER Module(s). That is, TRAMCON students were required to pass NCCER-generated exams that are administered by an NCCER certified trainer or training center in order to receive the NCCER certifications. NCCER items within the KSAO surveys were used to determine student knowledge of NCCER content at pre-and post-training intervals.

<u>Manufacturing Skill Standards Council (MSSC) Certified Production Technician (CPT) Content</u> <u>Questions</u>: The MSSC CPT KSAO content questions have been extracted from the MSSC student handbooks and the presentation slides covered in the TRAMCON instruction. The content of MSSC-CPT questions were tailored to the specific MSSC-CPT modules included in each level of the training. In should be noted that the MSSC-CPT content questions in the KSAO are not used as the means for certifying students in MSSC-CPT. That is, TRAMCON students are required to pass MSSC-generated exams that are administered by MSSC certified training centers in order to receive the MSSC-CPT certification. MSSC-CPT Items included within the KSAO surveys were used to determine students' knowledge of MSSC-CPT Content at pre- and post-training intervals.

<u>TRAMCON Manufactured Construction (MC) Level 1 and Level 2 Content Questions:</u> The MC KSAO content questions were extracted from the MC student handbook(s) and the presentation slides covered in the TRAMCON instruction. MC Level 1 and Level 2 items included within the KSAO surveys were used to determine students' knowledge of MC content at pre- and post-training intervals.

Skill and Ability-Specific Survey Constructs

<u>NCCER Hands-on Proficiency Demonstrations/Performance Tests</u>: TRAMCON students were required to pass NCCER-generated performance tests which were administered by an NCCER certified trainer or training center in order to receive the NCCER certifications. NCCER items within the KSAO survey were used to determine student performance on NCCER content at preand post-training intervals. Each participating college provided data describing whether a student received or did not receive an NCCER and or MSSC certification after taking the certification exam; these data were gathered by colleges and reported to CSU. A student's actual score and a NCCER (or other) certification exam was not provided to CSU for data analysis.

Other-Specific Survey Constructs

<u>Manufactured Construction Training Domain-Level Self-Efficacy</u>: According to Bandura (1986), self-efficacy is one's judgment(s) of their capabilities to organize and execute courses of action required to attain designated types of performance. Self-efficacy was operationalized within the domain of construction training by Elliott and Lopez del Puerto (2015). Manufactured construction training domain-level self-efficacy (CTSE) survey items can be found in Appendix A.

<u>Manufactured Construction Training Domain-Level Motivation</u>: Motivation and motivated behavior, respectively, are defined by Eagle (2011) as an individual's reason(s) for carrying out an action or a behavior intended to accomplish a particular purpose. Motivation was operationalized within the domain of construction training by Elliott and Lopez del Puerto (2015). Manufactured construction training domain-level motivation (TMA) survey items can be found in Appendix B.

<u>Manufactured Construction Training Domain-Level Planned Behavior</u>: This construct, rooted in Ajzen's (1991) Theory of Planned Behavior, contained two of the theory's constructs; intentions and perceived behavioral control. Intentions are defined as the perceived ease or difficulty of

performing a behavior that reflects past experience as well as anticipated impediments and obstacles. Planned behavioral control constitutes a person's perception of the ease or difficulty of performing a behavior of interest. Planned Behavior was operationalized within the domain of construction training by Elliott and Lopez del Puerto (2015). Manufactured construction training domain-level planned behavior (PTB) survey items can be found in Appendix C.

<u>Grit/Resilience</u>: Grit is defined as one's perseverance and passion for long-term goals (Duckworth, Peterson, Matthews and Kelly, 2007). The grit scale (Appendix D) is a generalized measure and was not specifically operationalized to the manufactured construction domain in the KSAO surveys. The grit scale consists of two factors: consistency of interest (CI) and perseverance of effort (PE). The response options and attribute are positively associated on the PE items, so higher PE scores indicate greater perseverance of effort. Conversely, the response options and attribute are negatively associated on the CI items; therefore, CI items are reversescored so higher CI scores indicate greater consistency of interest. The PE items and reversescored CI items are combined to calculate an overall grit score (O).

Learning Style Inventory: The Learning Style Inventory (LSI) comprises a block of questions that TRAMCON participants complete. This measure (Appendix E) was intended to help respondents (and their instructors) identify their learning style preferences (Tactile, Auditory, and Visual) as well as provide strategies that may benefit a learner of a particular style in retaining the topical content covered in an educational environment. The LSI (Odessa, N.D.) utilized in TRAMCON is a generalized assessment and was not specifically operationalized to the manufactured construction training domain in the KSAO surveys.

Data Sources: Linking of Data and KSAO Constructs

Since data were collected from multiple sources, and at different times during the training, linking of the student data between assessments was critical. Data linking was accomplished through the collection of three unique participant identifiers. These identifiers included the participant's college of attendance, date of birth (DOB), and a unique college-assigned student identification number. It should be noted that the participant's personal data (i.e., name, social security number, etc.) were not included in the KSAO data collection instruments, rather the college data collection and/or recruitment specialists were responsible for linking the KSAO data collected to the individual students who were attending their respective college to participate in the TRAMCON program.

As described above, each category of the KSAO assessment included multiple constructs and data collected from various sources. The KSAO data were compiled by CSU with in a comprehensive database, college-specific data were distributed to each college via a secure file sharing software. The original grant plan was to utilize the Education to Outcomes (ETO) software interface, however this system was problematic throughout the grant. Therefore, colleges entered their data in ETO and Miami Dade College (MDC) provided selected and de-identified data from ETO to CSU in a spreadsheet format. Data collected in the ETO interface and provided to CSU were demographic and included: Students' unique, college-specific, Identification Number and their Date of Birth (for data linking purposes) as well as Gender, Ethnicity, Primary Race, Certifications Received, Highest Level of Education, Veteran Status, Disability Status, and Employment Status.

Data Collection Protocol

The original data collection protocol, described in the *April 2016 Cognitive Policy and Practice* report, was applied at each college. However, it should be noted that the length and content of the training was modified to fit the specific requirements and capabilities of each respective college. For example, while all colleges covered the NCCER core content as part of the Foundation Level training, not all colleges included the MSSC-CPT training module(s). It should also be noted that all colleges offered the Foundation Level program, but not all colleges offered the subsequent levels of the training (Basic, Advanced and Supervisory). CSU's ability to provide empirically sound findings was limited by the small sample sizes (n) observed in the training level subsequent to the Foundation Level. Therefore this report provides statistical comparisons and results for the Intake, Foundation Level pre-test, and Foundation Level posttest, where adequate sample sizes where observed, as depicted in Figure 1.



Figure 1: Data Collection Protocol, Intake Survey, Foundation Pre-Test, and Foundation Post-Test

Instrumentation

There were nine KSAO instruments developed by CSU and administered within the TRAMCON curriculum (Appendices F-N). However, only the intake, foundation pre-test and post-test produced large enough sample sizes at each college to warrant analysis. Also, as previously noted, not all KSAO constructs are administered in every survey. Rather, selected constructs were administered based on the curricular content, the appropriateness/usefulness of the construct in determining a participant's understanding of the topical content covered, and in the case of the psychological constructs, their level of confidence and/or need for additional support services.

Within the TRAMCON Intake survey, there were additional demographic survey items that addressed a participants' level of construction experience, family involvement in the construction industry and the existence of supporting individuals in a participant's life (i.e., mentors and role models). Figures 2, 3 and 4, respectively, provide a visual representation of the KSAO constructs included in the TRAMCON Intake, Foundation Level Pre-Test and Foundation Level Post-Test instruments, respectively. The survey items included in the TRAMCON Intake, Foundation Level Pre-Test and Foundation Level Post-Test instruments can be found in Appendices F, G and H, respectively. Surveys for the Basic, Advanced and Supervisory Training follow the same framework as the Foundation level training but are tailored to the content-specific knowledge items appropriate for each respective level of TRAMCON training.

Colleges Linking Data:

- 1) Unique Student ID Number Assigned at Intake
- 2) Date of birth
- 3) College for Linking

Demographic Data (CSU is Providing)

1) Construction Exp. Hands-On

- 2) Construction Exp. Management
- 3) Family Involvement in Construction
- 4) Mentors and Role Models

Other Data

1) Construction Training Attitudes and Intention Scale (CTAIS)

- Self-Efficacy
- Motivation
- Planned Training Behavior
- 2) Grit Scale
 - Resilience
- 3) Learning Styles Inventory
 - Identifies Student Learning Styles



Colleges Linking Data:

1) Unique Student ID Number Assigned at Intake

- 2) Student Date of Birth
- 3) Student College Attending

Knowledge, Skills, Abilities (KSA) Data

1) NCCER CORE (Selection of Modules 1, 2, 3, 4, 5, 7, 8, 9)

2) MSSC Knowledge Items (Selection Module 1, 2, 3, 4)

3) MC Level 1 (Selection of all content)

Figure 3: CSU KSAO Constructs includes the TRAMCON Foundation Pre-Test Survey

Colleges Linking Data:

1) Unique Student ID Number Assigned at Intake

2) Student Date of Birth

3) Student College Attending

Knowledge, Skills, Abilities (KSA) Data

1) NCCER CORE (Selection of Modules 1, 2, 3, 4, 5, 7, 8, 9)

- 2) MSSC Knowledge Items (Selection Module 1, 2, 3, 4)
- 3) MC Level 1 (Selection of all content)

Other Data

1) Construction Training Attitudes and Intention Scale (CTAIS)

- Self-Efficacy
- Motivation
- Planned Training Behavior
- 2) Grit Scale
 - Resilience

* The CTAIS and GRIT survey items are also included in the intake survey (that is, it serves as a pre-test) for these constructs. Since these dynamic/changing constructs may be impacted by the completion of the training (the intervention), we will investigate increases in student selfefficacy etc. after the foundation level is completed.

Figure 4: CSU KSAO Constructs includes the TRAMCON Foundation Post-Test Survey

TRAMCON Participants and CSU Analysis Sample

The TRAMCON program served over 3000 unique participants during the 4-year grant period. However, the sample for this report does not include all of these individuals. There were four major reasons for this difference, and it should be noted that CSU was conservative in their approach to data cleaning and screening to ensure a valid and comparable sample; 1) Participants completing only the OSHA-30 training were not included in the original data collection protocol and are not included in this report, 2) participants from correctional facilities in Florida were not included in the original data collection protocol and are not included in this report, 3) several instances occurred in which data were lost due to failure to follow the protocol, and 4) CSU data had to be matched with ETO data in order to ensure the sample was valid. After taking these limiting factors into account, the analysis sample comprised the 729 unique participants included in this report. It should be noted that the sample sizes for individual analysis will be fewer than 729, since data were sub-aggregated based on the college, participant characteristic(s) or variable(s) being investigated.

Results

The following section of the report contains selected results of the analysis of the valid sample, $n \le 729$, as previously described. The sample includes 729 participants who took at least one survey from the four colleges; Miami Dade College (n = 151, 20.7%), Polk State College (n = 193, 26.2%), Santa Fe College (n = 244, 33.5%), and Seminole State College (n = 142, 19.5%). It should be noted that some participants took the foundation pre-test, but never completed the intake survey. Table 2 below provides the breakdown of TRAMCON participants by training level, in total and aggregated by college.

Miami				
Dade	Polk	Santa Fe	Seminole	Total
82	186	236	125	629
107	149	235	124	615
43	58	64	76	241
24	0	66	20	110
24	0	0	14	38
23	0	9	2	34
10	0	4	0	14
21	0	0	0	21
20	0	0	0	20
	Miami Dade 82 107 43 24 24 24 24 23 10 21 20	Miami Polk B2 186 107 149 43 58 24 0 24 0 23 0 100 0 21 0 20 0	Miami Santa Fe Dade Polk Santa Fe 82 186 236 107 149 235 43 58 64 24 0 66 24 0 9 10 0 4 23 0 9 10 0 4 21 0 0 20 0 0	Miami DadePolkSanta FeSeminole 82 186236125 107 149235124 43 586476 24 06620 24 092 10 092 10 040 21 000 20 000

Table 2: Valid Surveys by Training Level and College

Note. Surveys for OSHA 30-only participants (i.e., participants enrolled only in OSHA 30 training or with unknown enrollment status) were excluded.

Demographics:

The demographic characteristics (Age, Gender, Ethnicity, Primary Race, and Highest Level of Education) of participants (n = 729) are displayed in Table 3. Demographics were extracted from the ETO interface and extracted by Miami Dade College for all participating colleges and provided to CSU for analysis. The same demographic characteristics of participant aggregated by college can be found in Appendix O.

Characteristic	n	%
Age (years)		
18-21	123	16.9
22-34	291	39.9
35-44	142	19.5
45-54	105	14.4
55-64	63	8.6
65+	5	0.7
Gender		
Female	135	19.7
Male	547	80.0
Ethnicity		
Non-Hispanic	457	71.2
Hispanic	185	28.8
Primary Race		
American Indian or Alaskan Native	10	1.8
Asian	13	2.3
Black or African American	240	42.8
More than one race	8	1.4
Native Hawaiian or Other Pacific Islander	5	0.9
White	285	50.8
Highest Level of Education		
Some High School Education	20	3.1
HS Diploma/GED	296	46.6
Currently Attending Schools	44	6.9
Post-Secondary Vocational/Skills Credential	30	4.7
Some College	113	17.8
AA/AS	61	9.6
BA/BS	50	7.9
Master's +	21	3.3
<i>Note</i> . All percentages are calculated based on number of valid cases.		

Table 3: Demographic Characteristics of Participants (n = 729)

Group and Sub-Group Demographic Information:

The following section of the report provides grouped and sub-aggregated portions of the sample. This information is provided to inform the reader of additional analysis completed based on pertinent educational and other groupings. For example, the researchers completed statistical comparisons of traditional (18-23 years of age) and non-traditional students (24 years of age and older) per the United States Department of Education's definitions of such groups. It should be noted that dropped and finished groups below were defined as students who started the training but did not complete the training, some of these participants would be defined as "completers" given the Department of Labor's definition. Participant program retention data (e.g., dropped or finished training) were provided to CSU by each colleges as students who started the training but did not complete the training. These data are presented in Tables 4 and 5.

	Mia Da	ami de	Po	olk	Sant	a Fe	Semi	inole	To	tal
Classification	n	%	n	%	n	%	n	%	n	%
Traditional										
(Ages 18-23)	42	27.8	54	28.1	65	26.6	17	12.0	178	24.4
Non-Traditional										
(Ages 24+)	109	72.2	138	71.9	179	73.4	125	88.0	551	75.6
<i>Note</i> . All percentages are calculated based on number of valid cases.										

Table 4: Traditional and Non-Traditional Student Classifications by College) (n = 729)

Table 5: Foundation-Level Training Status for Participants (n = 721)

	Mi	ami								
	Dade		Dade Polk		Santa Fe		Seminole		Total	
Status	n	%	n	%	n	%	n	%	n	%
Dropped	26	17.3	27	14.6	71	29.1	15	10.6	139	19.3
Finished	114	76.0	158	85.4	163	66.8	127	89.4	562	77.9
Not Enrolled	10	6.7	0	0.0	10	4.1	0	0.0	20	2.8
Note. All percentages are calculated based on number of valid cases.										

Among participants that finished training, CSU tracked and compared groups given the receipt of the NCCER Core certification as part of the foundation level training. As noted previously, receiving a NCCER certification were participant data that were reported back to the colleges by the NCCER certified training organization. For the purposes of this report, the NCCER certification was a dichotomous (e.g. certification received/no certification received) variable. A student's scores (i.e. the "NCCER score" variable presented herein) on NCCER related questions were created from NCCER question banks and included on the Foundation Level training pre- and post-tests. While the content of NCCER questions on the Foundation Level training pre- and post-tests were taken from NCCER materials, as noted previously, receiving the NCCER certifications were awarded when trainees completed the NCCER certification test(s), at a given level of proficiency, at a certified NCCER testing center.

Table 6: NCCER Core Certifications Received by College (n = 562)

Miami Dade			Ро	olk	Sant	a Fe	Sem	inole	Та	otal
Status	n	%	n	%	n	%	п	%	n	%
No Certification	6	5.9	32	20.6	29	20.6	33	28.0	100	19.4
Certified	95	94.1	123	79.4	112	79.4	85	72.0	415	80.6

Note. Only includes participants with Foundation training status reported as "finished;" excludes participants reported as "dropped" or "not enrolled" after intake survey completion. All percentages are calculated based on number of valid cases.

A participant's level of experience in a given training domain, such as manufacturing and construction, can impact one's self-efficacy, motivation and performance with a domain-focus

training program. CSU classified relevant experience in four categories (e.g. Construction Management Experience, Hands-On Construction Experience, Manufactured-Construction Experience and Manufacturing Experience) and defined these experience types for the participants within the surveys as identified below. Experience related demographic data are provide in Table 7.

<u>Construction Management Experience</u>: In this study "construction management experience" is considered field or office management tasks such as submittal/shop drawing review, writing requests for information (RFIs), preparing estimates or budgets, preparing or updating schedules, and so on.

<u>Hands-On Construction Experience</u>: In this study "hands-on construction experience" is considered labor related tasks. Such as, installing roofing materials, cleaning up the site, assisting in the installation of brick, placing concrete, placing reinforcing, and so on.

<u>Manufactured-Construction Experience</u>: In this study "manufactured construction experience" is considered factory work constructing homes, other building components (trusses, structural panels, etc.), or precast, metal, and panelized buildings.

<u>Manufacturing Experience</u>: In this study "manufacturing experience" is considered any factory work (excluding manufactured construction) such as using tools, machines, and your hands to make and assemble finished products or the parts that go into them.

Type of Experience	п	%
Construction Management (CM) Experience		
None	461	74.1
More than none but less than 6 months	54	8.7
More than 6 months but less than 12 months	37	5.9
More than 12 months but less than 18 months	25	4.0
More than 18 months	45	7.2
Hands-On Construction (H-O) Experience		
None	337	54.1
More than none but less than 6 months	74	11.9
More than 6 months but less than 12 months	53	8.5
More than 12 months but less than 18 months	45	7.2
More than 18 months	114	18.3
Manufactured Construction (MC) Experience		
None	457	73.6
More than none but less than 6 months	62	10.0
More than 6 months but less than 12 months	34	5.5
More than 12 months but less than 18 months	20	3.2
More than 18 months	48	7.7
Manufacturing (MF) Experience		
None	401	64.3
More than none but less than 6 months	67	10.7
More than 6 months but less than 12 months	40	6.4
More than 12 months but less than 18 months	35	5.6
More than 18 months	81	13.0
Note. All percentages are calculated based on number of valid cases.		

Table 7: Levels of Construction and Manufacturing Experience (n = 626)

Comparative Analyses:

The following section of the report provide statistical results for the comparison of all participants for all colleges combined. In the case of comparisons using dichotomous variables (i.e., comparison of students who received a given certification to those who did not receive a given certification) t-tests or the non-parametric Mann-Whitney U test were performed. Paired samples t-tests were used for repeated measures such as the comparison of NCCER score at pretest to NCCER score at post-test for the same group of participants before and after the Foundation Level training. In the case of multi-level variables (i.e., experience level categories: None, More than none but less than 6 months, More than 6 months but less than 12 months, More than 12 months but less than 18 months, and More than 18 months) analysis of variance (ANOVA) or the non-parametric, Kruskal-Wallis, test were performed. When multi-level variable comparisons were observed, "post hoc" analyses were conducted to isolate statistical differences between specific groupings. In some cases, t-tests or Mann-Whitney U tests were conducted for isolated subgroups in the sample (e.g., comparing participants reporting "More than 18-months" of experience to those reporting "More than none but less than 6 months" of experience to confirm observed differences seen in the post hoc analysis).

Means (*M*), Standard Deviations (*SD*), Level of Significance (*p*) and Effect Size (*d*) are reported below for several variables. For this report "significant differences" were defined as observed *p* values of ≤ 0.05 . When *p* values ≤ 0.05 are reported herein, a statistical difference between the mean scores of the groups identified in the table were observed. From a practical perspective *p* values below the 0.05 benchmark are an indication that the groups being compared are recognizably different from a statistical perspective. For example, in the case of Table 8, these results indicate that students who dropped from the Foundation Level training program scored lower at pre-test on the NCCER and Manufacturing Skill Standards Council (MSSC) Certified Production Technician (CPT) at the *p* < 0.001 level than did participants who completed the training. However, there was not a statistically discernable difference in student scores on the Intro to Manufactured Construction (INMC) score when compared by Foundation Level training completion status.

Comparison on NCCER, INMC, and MSSC-CPT Scores (e.g., "Knowledge" in the KSAO):

Variable	n	M	SD	t	df	р	d
NCCER				4.40	590	0.000	0.44
Dropped Training	129	24.56	6.08				
Finished Training	463	27.00	5.43				
INMC				1.33	573	0.183	0.13
Dropped Training	128	9.33	2.89				
Finished Training	447	9.70	2.77				
MSSC-CPT				3.65	569	0.000	0.37
Dropped Training	128	9.50	3.53				
Finished Training	443	10.76	3.43				

Table 8: Comparison of Participants that Dropped and Finished Training on Pre-Test Knowledge Scores

Note. Excludes participants with Foundation Training status reported as "not enrolled."

The paired samples t-test (Table 9) indicated that students who completed the Foundation Level training scored higher (statistically, $p \le 0.001$) on NCCER, INMC, and MSSC at post-test than at pre-test. Practically, this indicates that, on average, students answered more knowledge-based questions correctly after participating in the Foundation Level training course than they did at the pre-test administered before training commenced. This results indicates that the Foundation Level training was effective in increasing student knowledge on the NCCER, INMC and MSSC content.

Variable	n	Pre-Test M (SD)	Post-Test M (SD)	% Changes	t	р	d
NCCER Score	196	26.86 (5.63)	31.13 (5.15)	15.90	11.50	0.000	0.79
INMC Score	194	9.54 (3.05)	11.03 (2.38)	15.62	7.39	0.000	0.54
MSSC-CPT Score	191	10.65 (3.5)	13.29 (3.65)	24.72	9.41	0.000	0.74

Table 9: Comparison of Participants Pre-Test and Post-Test Knowledge Scores

Student intake knowledge scores were compared by gender for all participants (Table 10). There were no significant differences in the intake knowledge scores on the NCCER, INMC or MSSC-CPT knowledge items when compared by the participants' reported gender.

** • • •			a b		10		
Variable	п	M	SD	t	df	р	d
NCCER Pre-Test Score				1.22 ^a	207 ^a	0.226	0.12
Female	119	25.92	5.05				
Male	458	26.58	5.81				
INMC Pre-Test Score				0.50	558	0.621	0.05
Female	112	9.73	2.83				
	448						
Male		9.59	2.76				
MSSC-CPT Pre-Test Score				0.06	554	0.955	0.01
Female	112	10.51	3.45				
Male	444	10.53	3.40				

Table 10: Comparison of Female and Male Students on Pre-Test Knowledge Scores

^a *t* and *df* were adjusted due to unequal variances

Note. Excludes participants with Foundation Training status reported as "not enrolled."

Student post-test knowledge scores were compared by gender for all participants (Table 11) after the completion of the Foundation Level training. There were no significant differences in post-test knowledge scores on the NCCER, INMC or MSSC-CPT items when compared by the participants' reported gender.

Variable	n	M	SD	t	df	р	d
NCCER Post-Test Score				0.07	223	0.948	0.01
Female	41	30.71	4.56				
Male	184	30.77	5.97				
INMC Post-Test Score				1.16	219	0.247	0.20
Female	40	11.30	2.13				
Male	181	10.77	2.72				
MSSC Post-Test Score				0.62	219	0.536	0.11
Female	40	13.18	3.60				
Male	181	12.76	3.85				

Table 11: Comparison of Female and Male Students that Finished Training on Post-Test Knowledge Scores

Note. Only includes participants with Foundation training status reported as "finished;" excludes participants reported as "dropped" or "not enrolled."

Comparison on Psychometric Characteristics (e.g., "Other" in the KSAO):

The research team measured and compared students on their reported mean level of constructionmanufacturing domain level training self-efficacy (CTSE), Training Motivation (TMA), Planned Training Behavior (PTB) and Resilience (GRIT). As previously described, Grit items were separated in to two subconstructs: Consistency of Interest (CI) and Perseverance of Effort (PE). These psychometric characteristics were measured and compared given participants reported demographic information. The table below provides these results which are explained with the accompanying verbiage.

The results of comparisons of participants level of CTSE, TMA, PTB and GRIT overall as well as CI or PE at intake and post-Foundation Level training by gender are reported in Tables 12-15. Comparisons by gender (Tables 12 and 13) indicate no observed significant differences in CTSE, TMA, PTB or GRIT (Overall, CI or PE) at intake. It was noted that, while not statistically significant, female participants reported higher levels of CTSE, TMA, PTB and GRIT overall as well as CI or PE at intake than did their male counterparts.

Variable	n	М	SD	t	df	р	d
CTSE at Intake				0.08	503	0.938	0.01
Female	98	8.79	1.03				
Male	407	8.78	1.21				
TMA at Intake				2.22 ^a	211ª	0.027	0.20
Female	100	9.43	0.78				
Male	423	9.22	1.14				
PTB at Intake				1.63 ^a	213 ^a	0.105	0.15
Female	108	9.64	0.74				
Male	431	9.50	0.99				

Table 12: Comparison of Female and Male Students on CTAIS Variables at Intake

^a t and df were adjusted due to unequal variances

Variable	п	М	SD	t	df	р	d
Grit at Intake				1.19	568	0.236	0.12
Female	113	4.09	0.53				
Male	457	4.02	0.55				
CI at Intake				1.02	580	0.306	0.11
Female	115	3.80	0.71				
Male	467	3.72	0.75				
PE at Intake				1.08	571	0.279	0.11
Female	113	4.39	0.56				
Male	460	4.33	0.56				

Table 13: Comparison of Female and Male Students on Grit Variables at Intake

The results of comparisons of participants level of CTSE, TMA, PTB and GRIT overall as well as CI or PE at post-Foundation Level training by gender are reported in Tables 14 and 15. Comparison by gender at post-test indicated significant differences in TMA, PTB and the PE subconstruct of Grit by gender. It was noted that, in all cases, female participants reported significantly higher levels of TMA, PTB and the PE subconstruct of GRIT after Foundation training than did their male counterparts.

Table 14: Comparison of Female and Male Students that Finished Training on CTAIS Variables at Post-Test

Variable	n	М	SD	t	df	р	d
CTSE at Post-Test				0.94	192	0.350	0.17
Female	37	8.99	1.37				
Male	157	8.73	1.57				
TMA at Post-Test				2.06^{a}	106 ^a	0.042	0.27
Female	38	9.40	0.86				
Male	154	9.01	1.58				
PTB at Post-Test				3.67 ^a	178 ^a	0.000	0.39
Female	38	9.72	0.53				
Male	154	9.15	1.63				

^a t and df were adjusted due to unequal variances

Note. Only includes participants with Foundation training status reported as "finished."

Table 15: Comparison of Female and Male Students that Finished Training on Grit Variables at Post-Test

Variable	п	M	SD	t	df	р	d
Grit at Post-Test				0.58	192	0.566	0.11
Female	35	3.96	0.61				
Male	159	3.90	0.59				
CI at Post-Test				0.39	194	0.700	0.07
Female	36	3.43	1.06				
Male	160	3.49	0.85				
PE at Post-Test				2.28	196	0.024	0.42
Female	36	4.54	0.47				
Male	162	4.31	0.58				

Note. Only includes participants with Foundation training status reported as "finished."

Student intake levels of CTSE, TMA, PTB and GRIT were also compared by age for all participants. Analyses were conducted to compare between six age groups (i.e., 18-21, 22-34, 35-44, 45-54, 55-64, and 65+) as well as between participants defined as traditional (i.e., ages 18-23) and non-traditional (i.e., age 24 and older) students. The results of comparisons of participants' levels of CTSE, TMA, PTB, and GRIT overall as well as CI or PE at intake and post-Foundation Level training by age groups are reported below.

Non-traditional students reported significantly higher levels of TMA at intake than traditional students (Table 16); there were no significant differences in CTSE or PTB by dichotomous age group at intake. When ANOVA or Kruskal-Wallis tests indicated the six age groups differed on these psychometric characteristics, Mann-Whitney U tests were performed to compare groups. Students in the 18-21 and 22-34 age groups had significantly lower mean ranks than 35-44 year old students on CTSE at intake (p = 0.005 and p = 0.021, respectively). It was noted that the mean comparison between the 18-21 and 45-54 age groups were nearly significant (p = 0.052); see Table 17 for means and standard deviations for each group. The 18-21 age group also had significantly lower mean ranks than 45-54 year old students on TMA at intake (p = 0.010). Significant differences among age groups were not observed on PTB at intake.

Variable	n	М	SD	t	df	р	d
CTSE at Intake				1.88	537	0.061	0.18
Traditional	143	8.64	1.23				
Non-Traditional	396	8.85	1.16				
TMA at Intake				2.12 ^a	229 ^a	0.035	0.22
Traditional	148	9.10	1.21				
Non-Traditional	409	9.33	1.03				
PTB at Intake				1.64 ^a	227 ^a	0.102	0.17
Traditional	151	9.41	1.08				
Non-Traditional	423	9.57	0.89				

Table 16: Comparison of Traditional and Non-Traditional Students on CTAIS Variables at Intake

^a t and df were adjusted due to unequal variances

Note. Traditional defined as ages 18-23; Non-traditional defined as age 24 older.

Table	17:	Means	and	Standard	Devia	tions	Com	baring	Age	Group	s on	CTA	AIS V	/ariable	es at	Intak	e

	CTSE at Intake			TM	[A at Int	ake	PTB at Intake			
Age Groups	п	M	SD	n	M	SD	n	M	SD	
18-21	92	8.55	1.27	98	8.98	1.35	99	9.28	1.23	
22-34	231	8.72	1.25	234	9.23	1.17	244	9.56	0.99	
35-44	95	9.05	1.02	102	9.39	0.90	105	9.62	0.67	
45-54	74	8.96	0.98	75	9.52	0.73	77	9.56	0.86	
55-64	44	8.89	1.15	44	9.41	0.64	45	9.63	0.58	
65+	3	8.08	1.23	4	9.41	0.62	4	9.81	0.38	

Non-traditional students reported significantly higher levels of overall Grit and CI at intake than traditional students (Table 18), but there were no significant differences in PE by dichotomous

age group at intake. Multi-level variable comparisons were conducted to compare GRIT variables by the six age groups; see Table 19 for means and standard deviations for each group. Students in the 18-21 age group had significantly (p < 0.05) lower mean ranks than students in the 22-34, 35-44, 45-54, and 55-64 age groups on overall GRIT and CI at intake. Students in the 22-34 age group had significantly lower mean ranks than 45-54 and 55-64 year old students on CI at intake. Significant differences among age groups were not observed on PE at intake.

Table 18: Comparison of Traditional and Non-Traditional Students on Grit Variables at Intake

Variable	n	М	SD	t	df	р	d
Grit at Intake				4.12	605	0.000	0.38
Traditional	160	3.89	0.57				
Non-Traditional	447	4.10	0.53				
CI at Intake				4.58	618	0.000	0.42
Traditional	163	3.52	0.75				
Non-Traditional	457	3.82	0.71				
PE at Intake				1.87	608	0.062	0.17
Traditional	160	4.27	0.58				
Non-Traditional	450	4.36	0.55				

Note. Traditional defined as ages 18-23; Non-traditional defined as age 24 older.

	Overall Grit at Intake			C	CI at Intake			PE at Intake		
Age Groups	п	М	SD	n	M	SD	п	М	SD	
18-21	107	3.82	0.57	109	3.42	0.80	107	4.23	0.59	
22-34	259	4.02	0.57	263	3.72	0.71	260	4.31	0.60	
35-44	110	4.13	0.49	111	3.85	0.68	111	4.41	0.49	
45-54	78	4.23	0.46	82	4.00	0.72	79	4.45	0.47	
55-64	48	4.18	0.44	50	3.96	0.57	48	4.41	0.51	
65+	5	3.88	0.38	5	3.63	0.52	5	4.13	0.27	

Among students that finished Foundation training, there were no significant differences in CTSE, TMA, or PTB at post-test between traditional and non-traditional students (Table 20); however non-traditional students reported significantly higher levels of overall Grit at the post-test than traditional students (Table 21).

Table 20: Comparison of Traditional and Non-Traditional Students that Finished Training on CTAIS Variables at Post-Test

Variable	n	М	SD	t	df	р	d
CTSE at Post-Test				1.36	199	0.176	0.26
Traditional	32	8.43	1.60				
Non-Traditional	169	8.84	1.52				
TMA at Post-Test				1.15	198	0.252	0.22
Traditional	34	8.84	1.64				
Non-Traditional	166	9.15	1.41				
PTB at Post-Test				0.61	198	0.541	0.12
Traditional	31	9.13	1.65				
Non-Traditional	169	9.30	1.44				

Note. Traditional defined as ages 18-23; Non-traditional defined as age 24 older. Only includes participants with Foundation training status reported as "finished."

Variable	n	М	SD	t	df	р	d
Grit at Post-Test				2.08	200	0.038	0.40
Traditional	33	3.71	0.63				
Non-Traditional	169	3.94	0.58				
CI at Post-Test				1.44	202	0.151	0.27
Traditional	33	3.28	0.85				
Non-Traditional	171	3.52	0.89				
PE at Post-Test				1.85ª	39ª	0.072	0.42
Traditional	33	4.14	0.71				
Non-Traditional	173	4.38	0.54				

Table 21: Comparison of Traditional and Non-Traditional Students that Finished Training on Grit Variables at Post-Test

^a t and df were adjusted due to unequal variances

Note. Traditional defined as ages 18-23; Non-traditional defined as age 24 older. Only includes participants with Foundation training status reported as "finished."

Student intake scores on psychometric constructs were compared given their amount of experience for each of the four experience variables: Construction Management (CM), Hands-On Construction (H-O), Manufactured Construction (MC), and Manufacturing (MF) experience. Further, an overall Construction and/or Manufacturing Experience variable was aggregated from the four experience items (i.e., CM, H-O, MC, and MF). Analyses were conducted to compare between the five levels of experience (e.g., None, More than none but less than 6 months, etc.) as well as between participants with some experience and no experience (i.e., levels of experience were grouped into dichotomous variables). The results of comparisons of participants' levels of CTSE, TMA, PTB, and GRIT (O, CI and PE) at intake and post-Foundation Level training by overall experience as well as CM, H-O, MC, and MF experience are reported below.

Students with some construction and/or manufacturing experience reported significantly higher levels of CTSE at intake than students without any experience (Table 22); there were no significant differences in TMA or PTB by dichotomous overall experience at intake. Comparisons by dichotomous CM, MC, and MF experiences indicated no statistically significant differences in CTSE, TMA, or PTB at intake. Students with some hands-on (H-O) experience (n = 291; M = 8.93) reported significantly (p = 0.012) higher levels of CTSE at intake than students without any H-O experience (n = 243, M = 8.67); there were no significant differences in TMA or PTB by dichotomous H-O experience at intake.

Variable	п	М	SD	t	df	р	d
CTSE at Intake				2.03	534	0.043	0.17
Has Some Experience	266	8.89	1.14				
No Experience	270	8.68	1.21				
TMA at Intake				0.66	552	0.508	0.06
Has Some Experience	272	9.30	1.09				
No Experience	282	9.24	1.08				
PTB at Intake				1.68ª	520ª	0.093	0.14
Has Some Experience	280	9.60	0.76				
No Experience	291	9.46	1.09				
No Experience	291	9.46	1.09				

Table 22: Comparison of Students with and without Construction and/or Manufacturing Experience on CTAIS Variables at Intake

^a t and df were adjusted due to unequal variances

Note. The Construction and/or Manufacturing Experience variable was aggregated from the four experience items: Construction Management (CM), Hands-On Construction (H-O), Manufactured Construction (MC), and Manufacturing (MF) Experience.

Multi-level variable comparisons were conducted to compare CTSE, TMA, and PTB by the five levels of experience; see Table 23 for means and standard deviations for each group. Students without H-O experience had significantly (p < 0.05) lower mean ranks than students with more than 18 months of H-O experience on CTSE at intake. Significant differences among CM, MC, and MF experience groups were not observed on TMA and PTB at intake.

	CTSE at Intake		TM	TMA at Intake			PTB at Intake		
Experience	n	M	SD	п	M	SD	n	M	SD
CM Experience									
None	396	8.75	1.18	408	9.25	1.08	421	9.52	0.99
More than none but less									
than 6 months	44	8.80	1.02	47	9.33	0.81	48	9.64	0.77
More than 6 months but									
less than 12 months	32	8.64	1.09	33	9.32	0.80	34	9.39	0.87
More than 12 months but									
less than 18 months	22	8.72	1.86	23	9.17	2.02	23	9.70	0.93
More than 18 months	39	9.31	0.84	40	9.37	0.92	41	9.54	0.72
H-O Experience									
None	291	8.67	1.23	303	9.21	1.09	314	9.45	1.10
More than none but less									
than 6 months	63	8.86	0.93	64	9.26	0.86	67	9.58	0.81
More than 6 months but									
less than 12 months	43	8.66	1.47	45	9.17	1.52	46	9.57	0.72
More than 12 months but									
less than 18 months	38	8.93	0.91	40	9.53	0.83	40	9.77	0.52
More than 18 months	99	9.09	1.08	100	9.38	1.05	102	9.65	0.71
MC Experience									
None	391	8.75	1.20	405	9.22	1.08	420	9.50	1.01
More than none but less									
than 6 months	51	8.67	1.31	54	9.13	1.39	53	9.61	0.66
More than 6 months but									
less than 12 months	29	8.66	1.06	32	9.42	0.89	32	9.65	0.72
More than 12 months but									
less than 18 months	17	8.91	0.96	16	9.43	0.84	17	9.65	0.53
More than 18 months	43	9.22	0.98	43	9.63	0.83	44	9.57	0.91
MF Experience									
None	342	8.73	1.20	358	9.25	1.07	369	9.51	1.02
More than none but less									
than 6 months	56	8.77	1.03	57	9.19	1.02	59	9.43	0.95
More than 6 months but									
less than 12 months	34	8.79	1.08	34	9.19	1.04	37	9.49	0.80
More than 12 months but				-	-	-		-	
less than 18 months	32	8.85	1.13	31	9.38	1.05	32	9.48	0.90
More than 18 months	70	9.02	1.25	72	9.36	1.26	72	9.77	0.54

Table 23: Means and Standard Deviations Comparing Level of Experience Groups on CTAIS Variables at Intake

Note. Construction Management (CM), Hands-On Construction (H-O), Manufactured Construction (MC), and Manufacturing (MF) Experience.

Although students with some construction and/or manufacturing experience reported higher levels of GRIT overall, CI, and PE at intake than students without experience, the differences were not significant on this aggregated experience variable (Table 23). Students with some hands-on (H-O) experience (n = 273; M = 4.09) reported significantly (p = 0.012) higher levels of GRIT overall at intake than students without any H-O experience (n = 329, M = 3.99). Students with some MC experience (n = 154; M = 4.11) also reported significantly (p = 0.047) higher levels of GRIT overall at intake than students without any MC experience (n = 446, M = 4.01). Comparisons by dichotomous CM and MF experiences indicated no statistically significant differences in GRIT overall, CI, and PE at intake.

Variable	п	М	SD	t	df	р	d
Grit at Intake				1.49	602	0.138	0.12
Has Some Experience	299	4.07	0.52				
No Experience	305	4.01	0.56				
CI at Intake				1.64	615	0.101	0.13
Has Some Experience	308	3.79	0.71				
No Experience	309	3.69	0.74				
PE at Intake				0.73	605	0.467	0.06
Has Some Experience	301	4.35	0.54				
No Experience	306	4.32	0.57				

Table 23: Comparison of Students with and without Construction and/or Manufacturing Experience on GRIT Variables at Intake

Note. The Construction and/or Manufacturing Experience variable was aggregated from the four experience items: Construction Management (CM), Hands-On Construction (HO), Manufactured Construction (MC), and Manufacturing (MF) Experience.

Multi-level variable comparisons were conducted to compare GRIT overall, CI, and PE by the five levels of experience; see Table 24 for means and standard deviations for each group. Students with less than 6 months of CM experience (including those without any CM experience) had significantly (p < 0.05) lower mean ranks than students with more than 18 months of CM experience on GRIT overall at intake. On CI at intake, students with less than 6 months of CM experience (including those without any CM experience) also had significantly (p < 0.05) lower mean ranks than 12 months of CM experience. On PE at intake, students with less than 12 months of CM experience. On PE at intake, students with less than 12 months of CM experience (including those without CM experience) had significantly lower mean ranks than students with more than 18 months of CM experience. These particular findings should be interpreted with caution given the small sample sizes produced when groups were subaggregated as described above.

Comparisons on levels of H-O experience show that students with less than 6 months of H-O experience (including those without H-O experience) had significantly lower mean ranks than students with more than 18 months of H-O experience on GRIT overall at intake. On CI at intake, students with less than 6 months of H-O experience (including those without H-O experience) also had significantly (p < 0.05) lower mean ranks than students with more than 12 months of H-O experience. Mean ranks on PE at intake were not significantly different when compared by participant's level of H-O experience. These particular findings should be interpreted with caution given the small sample sizes produced when groups were subaggregated as described above.

	CTSE at Intake		TM	IA at Ir	ıtake	РТ	B at In	take	
Experience	n	М	SD	n	М	SD	n	М	SD
CM Experience									
None	446	4.02	0.56	455	3.72	0.75	448	4.32	0.57
More than none but less									
than 6 months	53	3.96	0.43	53	3.58	0.63	53	4.33	0.51
More than 6 months but									
less than 12 months	35	3.95	0.51	36	3.69	0.76	36	4.16	0.53
More than 12 months but									
less than 18 months	23	4.24	0.46	24	4.06	0.63	23	4.41	0.43
More than 18 months	44	4.27	0.51	45	3.99	0.64	44	4.54	0.52
H-O Experience									
None	329	3.99	0.56	334	3.69	0.73	330	4.30	0.58
More than none but less									
than 6 months	72	3.94	0.53	73	3.56	0.75	72	4.33	0.53
More than 6 months but									
less than 12 months	51	4.03	0.47	52	3.74	0.69	51	4.27	0.54
More than 12 months but									
less than 18 months	43	4.15	0.52	43	3.91	0.73	43	4.39	0.52
More than 18 months	107	4.19	0.52	112	3.93	0.69	109	4.45	0.53
MC Experience									
None	446	4.01	0.57	453	3.71	0.75	448	4.32	0.58
More than none but less									
than 6 months	61	4.06	0.46	61	3.78	0.71	61	4.34	0.51
More than 6 months but									
less than 12 months	31	3.93	0.43	33	3.53	0.62	31	4.28	0.47
More than 12 months but									
less than 18 months	19	4.25	0.52	19	4.06	0.61	19	4.45	0.60
More than 18 months	43	4.23	0.43	46	3.96	0.63	44	4.50	0.41
MF Experience									
None	391	4.01	0.56	397	3.70	0.74	393	4.32	0.58
More than none but less									
than 6 months	65	3.97	0.49	66	3.61	0.72	65	4.34	0.50
More than 6 months but									
less than 12 months	38	3.96	0.56	39	3.62	0.74	38	4.25	0.59
More than 12 months but									
less than18 months	33	4.17	0.52	34	3.96	0.75	33	4.38	0.54
More than 18 months	76	4.22	0.44	79	4.00	0.58	77	4.45	0.44

Table 24: Means and Standard Deviations Comparing Level of Experience Groups on GRIT Variables at Intake

Note. Construction Management (CM), Hands-On Construction (H-O), Manufactured Construction (MC), and Manufacturing (MF) Experience.

Among students that finished Foundation training, there were no significant differences in CTSE, TMA, PTB, or GRIT (Overall, CI, and PE) at post-test between those with some construction and/or manufacturing experience and those without any experience (Tables 25 and 26). Comparisons by dichotomous CM, H-O, MC, and MF experiences also indicated no statistically significant differences in these psychometric characteristics among finishers at post-test.

Variable	n	M	SD	t	df	р	d
CTSE at Post-Test				0.67	165	0.502	0.10
Has Some Experience	79	8.72	1.50				
No Experience	88	8.87	1.46				
TMA at Post-Test				1.80	163	0.074	0.28
Has Some Experience	78	8.90	1.48				
No Experience	87	9.29	1.32				
PTB at Post-Test				0.53	164	0.597	0.08
Has Some Experience	80	9.19	1.39				
No Experience	86	9.31	1.47				

Table 25: Comparison of Students with and without Construction and/or Manufacturing Experience that Finished Training on CTAIS Variables at Post-Test

Note. Only includes participants with Foundation training status reported as "finished." The Construction and/or Manufacturing Experience variable was aggregated from the four experience items: Construction Management (CM), Hands-On Construction (H-O), Manufactured Construction (MC), and Manufacturing (MF) Experience.

Table 26: Comparison of Students with and without Construction and/or Manufacturing Experience that Finished Training on Grit Variables at Post-Test

Variable	n	M	SD	t	df	р	d
Grit at Post-Test				0.62	164	0.534	0.10
Has Some Experience	76	3.95	0.58				
No Experience	90	3.89	0.60				
CI at Post-Test				0.61	166	0.542	0.09
Has Some Experience	77	3.56	0.84				
No Experience	91	3.48	0.85				
PE at Post-Test				0.39	168	0.700	0.06
Has Some Experience	79	4.36	0.59				
No Experience	91	4.33	0.58				

Note. Only includes participants with Foundation training status reported as "finished." The Construction and/or Manufacturing Experience variable was aggregated from the four experience items: Construction Management (CM), Hands-On Construction (H-O), Manufactured Construction (MC), and Manufacturing (MF) Experience.

Conclusion

The findings presented in this report should be of interest to training practitioners because they provide insight regarding differences in TRAMCON participant characteristics among those who completed training and those who did not complete training, as well as those who received or did not receive a training certification through TRAMCON. Moving forward in construction-specific workforce development, this report provides important information that contributes to a more thorough understanding of what characteristics, when observed at intake and after training completion, are impactful in predicting participant program completion and/or the gaining of certifications. The instruments use within TRAMCON were intended to provide practitioners with one data source that can be evaluated, as part of a comprehensive and robust system, for

providing appropriate training services to individual trainees. It is the sincere hope of the research team that the instruments developed for TRAMCON by CSU, and the data presented herein, can be used as tools to better serve trainees by allowing practitioners to effectively align participant needs with training provider services. The ultimate goal of this report was to provide data that are helpful in reducing construction training program attrition so that trainees can gain skills that are helpful in finding fulfilling and sustainable employment.

References

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179-211.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. (2007). Grit: Perseverance and passion for long-term goals, *Journal of Personality and Social Psychology*, *92*(6), 1087–1101. DOI: 10.1037/0022-3514.92.6.1087

Eagle, M. N. (2011). Theories of motivation. In G. Gabbard, B. Litowitz & P. Williams (Eds.), *Textbook of psychoanalysis* (2nd ed., pp. 39-52). Arlington, VA: American Psychiatric Publishing.

Elliott, J. W., & Lopez del Puerto, C. (2015). Development of an attitudes and intention scale for construction skills training programs. *Journal of Employment Counseling*, *52*(3), 131-144. DOI: 10.1002/joec.12011

Oddessa College Student Success Center (N.D.). Learning Style Inventory. Retrieved 4-9-2016 from: <u>http://www.sjsu.edu/eop/students/workshops/ACADEMIC_Learning%20Style%20Inventory.pdf</u>

Appendix A: Self-Efficacy Survey Items

Manufactured Construction Training Self-Efficacy Survey Items

	Questions/Items	Response Options (Likert Scale)
1	My past experiences and accomplishments increase my confidence that I will be able to perform well in manufactured construction education.	Strongly Disagree - Strongly Agree
2	Manufactured construction education is within the scope of my abilities.	Strongly Disagree - Strongly Agree
3	Successfully completing a manufactured construction education program is within the scope of my abilities.	Strongly Disagree - Strongly Agree
4	Other people that know me well perceive me as being a capable person.	Strongly Disagree - Strongly Agree
5	My estimates of how well I can deal with a new situation are usually very accurate.	Strongly Disagree - Strongly Agree
6	I expect to be able to do things that need to be done to successfully complete a manufactured construction education program.	Strongly Disagree - Strongly Agree
7	If I take manufactured construction courses which involved many different tasks, some easy and some difficult, I would probably do very well at almost all of them.	Strongly Disagree - Strongly Agree
8	If I take a manufactured construction course in an unfamiliar area, I expect to be able to successfully complete the course.	Strongly Disagree - Strongly Agree
9	If I were asked to take a course in an area of manufactured construction which I didn't know much about, I could do well in the course.	Strongly Disagree - Strongly Agree
10	If I were asked to take a course in an area of manufactured construction which I didn't know much about, I could successfully complete the course.	Strongly Disagree - Strongly Agree
11	I can generally do the work necessary to accomplish my goals in education courses.	Strongly Disagree - Strongly Agree
12	I am confident that I can do well in manufactured construction education that deal with tool operation, using tools or body to move objects.	Strongly Disagree - Strongly Agree

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Appendix B: Motivation Survey Items

Manufactured Construction Training Motivation Survey Items

	Questions/Items	
	Questions/items	Response Options (Likert Scale)
1	I value manufactured construction-related education.	Strongly Disagree - Strongly Agree
2	Manufactured construction education is useful for my development.	Strongly Disagree - Strongly Agree
3	I will be able to apply what I have learned in manufactured construction education to a job.	Strongly Disagree - Strongly Agree
4	I am motivated to learn the skills taught in manufactured construction education programs.	Strongly Disagree - Strongly Agree
5	I would like to improve my manufactured construction-related skills.	Strongly Disagree - Strongly Agree
6	I am willing to invest effort to improve my skills and competencies in order to prepare myself for a manufactured construction-related job.	Strongly Disagree - Strongly Agree
7	Taking manufactured construction education courses is a high priority for me.	Strongly Disagree - Strongly Agree
8	I am willing to invest effort on my personal time to develop manufactured construction-related skills.	Strongly Disagree - Strongly Agree

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Appendix C: Planned Behavior Survey Items

Manufactured Construction Training Planned Behavior Survey Items

	Questions/Items	Response Options (Likert Scale)
1	I will successfully complete this manufactured construction education course:	Extremely Unlikely - Extremely Likely
2	I would make an effort to successfully complete a manufactured construction education program:	I Definitely Will Not - I Definitely Will
3	I intend to successfully complete manufactured construction education:	Strongly Disagree - Strongly Agree
4	For me to complete a manufactured construction education program is:	Extremely Worthless - Extremely Valuable
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Appendix D: Grit Scale Survey Items

12-Item Grit Scale

Directions for taking the Grit Scale: Please respond to the following 12 items. Be honest – there are no right or wrong answers!	Response Options (Likert Scale)		
	Very much like me - Not Like me at al		
1 I have overcome setbacks to conquer an important challenge.	Very much like me - Not Like me at al		
2 New ideas and projects sometimes distract me from previous ones.	Very much like me - Not Like me at all		
3 My interests change from year to year.	Very much like me - Not Like me at all		
4 Setbacks don't discourage me.	Very much like me - Not Like me at al		
5 I have been obsessed with a certain idea or project for a short time but later lost interest.	Very much like me - Not Like me at al		
6 Lam a hard worker.	Very much like me - Not Like me at all		
7 I often set a goal but later choose to pursue a different one.	Very much like me - Not Like me at al		
8 I have difficulty maintaining my focus on projects that take more than a few months to complete.	Very much like me - Not Like me at all		
9 I finish whatever I begin	Very much like me - Not Like me at all		
10 I have achieved a goal that took years of work	Very much like me - Not Like me at al		
11 become interested in new pursuits every few months.	Very much like me - Not Like me at al		
12 Lam diligent.	Very much like me - Not Like me at al		
	Very much like me - Not Like me at al		

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Appendix E: Learning Style Inventory Survey Items

Respond to each statement as nonestry as you can.		Response Options	
Questions/Items	Often	Sometimes	Seldom
1 I can remember best about a subject by listening to a lecture that includes information, explanations and discussion	ns		
2 I prefer to see information written on a whiteboard and supplemented by visual aids and assigned readings			
3 I like to write things down or to take notes for visual review			
4 I prefer to use posters, models, or actual practice and other activities in class			
5 I require explanations of diagrams, graphs, or visual directions			
6 I enjoy working with my hands or making things.			
7 I am skillful with and enjoy developing and making graphs and charts			
8 I can tell if sounds match when presented with pairs of sounds			
9 I can remember best by writing things down.			
0 I can easily understand and follow directions on a map.			
1 I do best in academic subjects by listening to lectures and tapes			
2 I play with coins or keys in my pocket.			
3 I learn to spell better by repeating words out loud than by writing the words on paper			
4 I can understand a news article better by reading about it in a newspaper than by listening to a report about it on th	he radic		
5 I chew gum, smoke or snack while studying.			
6 I think the best way to remember something is to picture it in your head			
7 I learn the spelling of words by "finger spelling" them.			
8 I would rather listen to a lecture than read about the same material in a textbook			
9 I am good at working and solving jigsaw puzzles and mazes.			
0 I grip objects in my hands during learning periods.			
1 prefer listening to the news on the radio rather than reading the paper			
2 I prefer obtaining information about an interesting subject by reading about it			
3 I feel very comfortable touching others, hugging, handshaking, etc			
4 I follow oral directions better than written ones			

Appendix F: Intake Survey

Foundation Survey: Intake

BEFORE you begin the survey, we want to give you some information about this survey by answering a couple of frequently asked questions:

Why am I taking this survey?

The purpose of this survey is to help the instructors understand your level of experience, academic decisions, and learning style.

How will my answers be used?

The survey is not graded, nor does it directly impact your ability to gain certifications or pass the training course. Instead, your honest answers will help the instructors make the content covered more specific to the students taking the training.

<u>Is there a time limit for taking the survey?</u> There is no time limit for taking the survey, but we expect it will take about <u>20</u> minutes.

Is completing the survey required for the training?

The survey is voluntary and you will not be penalized for not completing it. However, we would really appreciate it if you would complete the survey. The information we collect using the survey helps us better fit the course material to your needs as a student. Thanks you for completing the survey.

Do I have to enter any personal information on the survey?

At the bottom of this page, you will be required to enter your Student ID number, your date of birth, and the college you are attending. This information will be used to connect the survey answers to the group of students in your class.

Thank you for completing the survey and helping us fit the course material to your needs as a student!

To begin, provide the following information:

Today's Date: Your Student ID number: Your Date of Birth (mm/dd/yyyy): Select your college:

- Miami Dade College
- **O** Polk State College
- **O** Santa Fe College
- **O** Seminole State College of Florida

Section 1

- 1. Do you have any manufacturing or construction experience?
 - O Yes
 - O No

Directions: If your answer to Question 1 was "No", skip to Question 6. If your answer to Question 1 was "Yes", please continue to Question 2.

2. How much construction management experience* do you have?

*In this study "construction management experience" is considered field or office management tasks such as submittal/shop drawing review, writing requests for information (RFIs), preparing estimates or budgets, preparing or updating schedules, and so on.

- O None
- O More than "none" but less than 6 months
- More than 6 months but less than 12 months
- More than 12 months but less than 18 months
- More than 18 months ► Please write the number of YEARS of experience on the line:
- 3. How much hands-on construction experience* do you have?

*In this study "hands-on construction experience" is considered labor related tasks. Such as, installing roofing materials, cleaning up the site, assisting in the installation of brick, placing concrete, placing reinforcing, and so on.

- O None
- O More than "none" but less than 6 months
- **O** More than 6 months but less than 12 months
- More than 12 months but less than 18 months
- More than 18 months ► Please write the number of YEARS of experience on the line:
- 4. How much manufactured construction experience* do you have?

*In this study "manufactured construction experience" is considered factory work constructing homes, other building components (trusses, structural panels, etc.), or precast, metal, and panelized buildings.

- O None
- **O** More than "none" but less than 6 months
- More than 6 months but less than 12 months
- More than 12 months but less than 18 months
- More than 18 months ► Please write the number of YEARS of experience on the line:

5. How much manufacturing experience* do you have?

*In this study "manufacturing experience" is considered any factory work (excluding manufactured construction) such as using tools, machines, and your hands to make and assemble finished products or the parts that go into them.

- O None
- **O** More than "none" but less than 6 months
- More than 6 months but less than 12 months
- More than 12 months but less than 18 months
- More than 18 months ► Please write the number of YEARS of experience on the line:
- 6. Does anyone in your family work in the construction industry*?

*In this study the "construction industry" is considered a construction-related business such as a general contractor or subcontractor, construction material supplier, etc.

- O Yes
- O No

Section 2

- 7. Is there someone who has influenced your academic decisions? This may be someone you know personally, or someone you simply know of.
 - O Yes
 - O No

Directions: If your answer to Question 7 was "No", skip to <u>Section 3</u>. If your answer to Question 7 was "Yes", please continue to Question 8.

If you have more than one person of influence, answer the following questions based on the person that has the greatest influence on your academic decisions:

- 8. Select the category that describes your relationship with this person of influence.
 - Family Member ► Please describe the relationship further (example: father, sister, uncle):
 - Friend, Peer, or Significant Other (Spouse, Partner) ► Please describe the relationship further (example: high school friend, girlfriend):
 - Professor, Instructor, or Academic Advisor ► Please describe the relationship further (example: high school teacher):
 - Co-Worker or Supervisor ► Please describe the relationship further (example: coworker at my current job):
 - O Other ► Please describe the relationship further:

- 9. What is the gender of this person of influence?
 - **O** Female
 - O Male
- 10. Does this person work in the construction industry*?

*In this study the "construction industry" is considered a construction-related business such as a general contractor or subcontractor, construction material supplier, etc.

- O Yes
- O No
- 11. Do you consider this person to be a mentor or role model, as defined below?

In this study, a "mentor" is considered a person who has influenced your academic decisions by actively giving advice, encouraging (or discouraging), supporting, providing information, or helping you make decisions.

In this study, a "role model" is considered a person who, either by doing something or by being admirable to you in one or more ways, has had an impact on the academic decisions you have made in your life. Role models may be people you know personally, or they may be people you simply know of.

- Mentor
- **O** Role Model
- **O** Both a Mentor and Role Model
Section 3

Directions: In this section, please select your level of agreement with each statement using this scale:

Strong	Strongly Disagree Strong									ongly Agree
	1	2	3	4	5	6	7	8	9	10
										Your Level of Agreement (1-10)
My past exp be able to p	perience erform	es and well i	accomp n manuf	lishmer actured	ts incre constru	ase my ction ec	confide lucatior	ence than.	at I will	
Manufactur	ed cons	tructio	on educa	ation is v	within t	he scop	e of my	abiliti	es.	
Successfull within the s	y compl cope of	eting my al	a manut bilities.	factured	constru	iction e	ducation	n progr	am is	
Other peopl	le that k	now r	ne well	perceive	e me as	being a	capable	e perso	n.	
My estimate accurate.	es of ho	w we	ll I can c	leal with	n a new	situatio	n are us	sually v	very	
I expect to l manufacture	be able t ed const	to do t tructio	things th on educa	nat need ation pro	to be dogram.	one to s	uccessf	ully co	mplete a	ı
If I take ma tasks, some all of them.	nufactur easy an	red co d son	onstructi ne diffic	on cours ult, I wo	ses which	ch invol bably d	ved ma o very v	ny diff well at	erent almost	
If I take a m be able to s	nanufact uccessfi	tured outputs	construc omplete	tion cou	urse in a se.	ın unfan	niliar ar	ea, I ez	spect to	
If I were as I didn't kno	ked to ta w much	ake a abou	course in t, I coul	n an area d do we	a of ma ll in the	nufactur course.	red cons	structio	on which	L
If I were as I didn't kno	ked to ta w much	ake a abou	course in t, I coul	n an area d succes	a of ma sfully c	nufactur complete	red cons e the co	structic urse.	on which	L
I can genera courses.	ally do t	he wo	ork nece	ssary to	accomp	olish my	y goals i	in educ	ation	
I am confid deal with to	ent that	I can ation,	do well using to	in manu ols or b	ifacture ody to 1	d constr nove ob	ruction pjects.	educati	ion that	

Directions: In this section, please select your level of agreement with each statement using this scale:

Strong	v Disa	gree							Stro	ngly Agree
	1	2	3	4	5	6	7	8	9	10
		_								
										Your Level of Agreement (1-10)
I value manu	ufacture	ed cons	struction	n-relate	d educa	tion.				
Manufacture	ed cons	truction	n educa	tion is	useful f	or my c	levelopı	nent.		
I will be able education to	e to app a job.	oly wha	at I hav	e learne	ed in ma	anufactu	ired cor	structio	on	
I am motivat education pr	ted to lo ograms	earn th	e skills	taught	in manı	ıfacture	ed const	ruction		
I would like	to imp	rove m	y manu	ıfacture	d const	ruction-	related	skills.		
I am willing prepare myse	to inve elf for a	est effo a manu	rt to im Ifacture	prove r d const	ny skill ruction	s and co -related	ompeter job.	ncies in	order to)
Taking manu	ufacture	ed cons	structio	n educa	ation co	urses is	a high	priority	for me	·
I am willing construction	to inve -related	est effo I skills	rt on m	y perso	nal time	e to dev	elop ma	anufact	ured	

Directions: In this section, please select the response which best describes your feeling about each statement.

I will successfully complete this manufactured construction education course:											
Extrem	ely Un	likely							E	xtremely	y Likely
	1	2	3	4	5	6	7	8	9	10	
	О	0	0	0	О	0	0	0	О	О	
I would make an effort to successfully complete a manufactured construction education program:											
I Definitely Will Not I Definitely Wi											tely Will
	1	2	3	4	5	6	7	8	9	10	-
	0	0	0	0	0	0	0	0	0	0	
I intend to successfully complete manufactured construction education:											
Strong	ly Disa	agree								Strong	ly Agree
	1	2	3	4	5	6	7	8	9	10	• •
	О	0	0	0	0	0	0	0	0	0	
For me to complete a manufactured construction education program is:											
Extremely Worthless Extremely Valuable											
	1	2	3	4	5	6	7	8	9	10	
	О	0	0	0	0	0	0	0	О	0	

I will successfully complete this manufactured construction education course:

Section 4

Directions: Please respond to the following 12 items. Be honest – there are no right or wrong answers!

	Very much like me	Mostly like me	Somewhat like me	Not much like me	Not like me at all
I have overcome setbacks to conquer an important challenge.	0	О	0	О	О
New ideas and projects sometimes distract me from previous ones.	0	0	О	0	0
My interests change from year to year.	0	О	О	0	0
Setbacks don't discourage me.	0	0	0	0	0
I have been obsessed with a certain idea or project for a short time but later lost interest.	0	О	О	0	0
I am a hard worker.	0	0	0	0	0
I often set a goal but later choose to pursue a different one.	0	0	0	0	0
I have difficulty maintaining my focus on projects that take more than a few months to complete.	0	О	0	О	0
I finish whatever I begin.	0	0	0	0	0
I have achieved a goal that took years of work.	О	О	О	0	0
I become interested in new pursuits every few months.	0	О	О	0	0
I am diligent.	0	0	О	0	0

Section 5

Directions: To better understand how you prefer to learn and process information, select the appropriate response after each statement below. Respond to each statement as honestly as you can.

	Often	Sometimes	Seldom
I can remember best about a subject by listening to a lecture that includes information, explanations and discussions.	0	0	0
I prefer to see information written on a whiteboard and supplemented by visual aids and assigned readings.	0	О	О
I like to write things down or to take notes for visual review.	0	0	0
I prefer to use posters, models, or actual practice and other activities in class.	О	О	0
I require explanations of diagrams, graphs, or visual directions.	0	0	О
I enjoy working with my hands or making things.	0	0	О
I am skillful with and enjoy developing and making graphs and charts.	0	0	0
I can tell if sounds match when presented with pairs of sounds.	0	0	0
I can remember best by writing things down.	0	0	0
I can easily understand and follow directions on a map.	0	0	0
I do best in academic subjects by listening to lectures and tapes.	0	0	0
I play with coins or keys in my pocket.	О	0	0

	Often	Sometimes	Seldom
I learn to spell better by repeating words out loud than by writing the words on paper.	0	0	0
I can understand a news article better by reading about it in a newspaper than by listening to a report about it on the radio.	0	0	О
I chew gum, smoke or snack while studying.	0	0	0
I think the best way to remember something is to picture it in your head.	0	0	0
I learn the spelling of words by "finger spelling" them.	О	О	О
I would rather listen to a lecture than read about the same material in a textbook.	0	0	0
I am good at working and solving jigsaw puzzles and mazes.	0	0	0
I grip objects in my hands during learning periods.	0	0	0
I prefer listening to the news on the radio rather than reading the paper.	0	0	О
I prefer obtaining information about an interesting subject by reading about it.	0	0	О
I feel very comfortable touching others, hugging, handshaking, etc.	0	0	О
I follow oral directions better than written ones.	0	0	0

Thank you for completing this survey!

Appendix G: Foundation Level Training Pre-test Survey

Foundation Survey: Pre-Test

BEFORE you begin the survey, we want to give you some information about this survey by answering a couple of frequently asked questions:

Why am I taking this survey?

The purpose of this survey is to help the instructors understand what you currently know about construction, manufacturing, and the manufactured construction process. Since you have NOT completed the training yet, it is NOT expected that you would know all or any of the answers! Therefore, PLEASE BE HONEST when answering the questions and we ask that you do not use the internet or other material to assist you in finding the "right" answers.

How will my answers be used?

The survey is not graded, nor does it directly impact your ability to gain certifications or pass the training course. Instead, your honest answers will help the instructors determine what parts of the course should be focused on and what parts of the course you already understand. With your honest answers, we hope to make the content covered more specific to the knowledge of the students taking the training.

Can I use a calculator during the survey?

Yes, you can use a calculator to help you answer any questions on the survey.

Is there a time limit for taking the survey?

There is no time limit for taking the survey, but we expect it will take about <u>45</u> minutes.

Is completing the survey required for the training?

The survey is voluntary and you will not be penalized for not completing it. However, we would really appreciate it if you would complete the survey. The information we collect using the survey helps us better fit the course material to your needs as a student. Thanks you for completing the survey.

Do I have to enter any personal information on the survey?

At the bottom of this page, you will be required to enter your Student ID number, your date of birth, and the college you are attending. This information will be used to connect the survey answers to the group of students in your class.

Thank you for completing the survey and helping us fit the course material to your needs as a student!

To begin, provide the following information:

Today's Date: Your Student ID number: Your Date of Birth (mm/dd/yyyy): Select your college:

- Miami Dade College
- **O** Polk State College
- **O** Santa Fe College
- **O** Seminole State College of Florida

- 1. To properly dispose of oily rags, they must be
 - **O** stored in a container designed for the purpose
 - **O** washed thoroughly and returned to use
 - **O** taken outdoors and thrown into a dumpster
 - **O** burned at the end of the shift
- 2. When something is plumb, it is _____.
 - O exactly vertical
 - horizontally level
 - at a 30-degree angle
 - O bobbed
- 3. Part of the construction drawing, the ______ gives information about the structure and is numbered for easy filing.
 - **O** legend
 - O scale
 - **O** specification
 - title block
- 4. You need to cut a 90.5-inch pipe into as many 3.75-inch pieces as possible. How many complete 3.75-inch pieces will you be able to cut?
 - **O** 14
 - **O** 24
 - **O** 34
 - **O** 44
- 5. Which of the following is the best advice for sending an email?
 - **O** Treat a business email the same way you would treat a formal business letter.
 - Type in all capital letters in order to emphasize the importance of your email and set it apart from others.
 - Send bad news or emotional information via email so that the recipient can read the message in privacy.
 - Spelling and grammar do not matter in email communication since it is informal.
- 6. A saber saw is an effective tool for _____.
 - O drilling holes in concrete or pavement
 - Making long straight cuts through thick metal
 - Cutting through walls in demolition jobs
 - doing delicate work on thin materials
- 7. A total of 1,478 feet of cable was supplied for a job. Only 489 feet were installed. How many feet of cable remain?
 - **O** 978
 - **O** 980
 - **O** 989
 - **O** 1,099

- 8. A person who works without constant supervision is showing ______.
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 - **O** fortitude
 - **O** respect
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- being sick
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- alcohol and drug abuse
- **O** overtime
- 10. In the fraction 3/4, 4 is called the _____.
 - O numerator
 - O denominator
 - **O** whole number
 - **O** divider

11. Find the equivalents of the following fraction: 3/16 equals how many thirty-seconds?

- **O** 2/32
- **O** 4/32
- **O** 6/32
- **O** 8/32
- 12. Ceramic tile weighs 4.75 pounds per square foot. Therefore, 128 square feet of ceramic tile weighs _____.
 - \bigcirc 598 pounds
 - \bigcirc 608 pounds
 - \bigcirc 908 pounds
 - **O** 1108 pounds
- Construction workers write a(n) ______ to list deficiencies requiring correction at completion.
 - **O** punch list
 - appendix
 - O change order
 - O table of contents

14. Express the number 0.479 as a percentage.

- **O** 0.00479%
- **O** 0.479%
- **O** 47.9%
- **O** 479%

15. If the scale on a site plan reads SCALE: 1" = 20'-0", then every _____.

- O 1/20th of an inch on the drawing represents 20 feet, 0 inches
- 20 inches on the drawing represents 1 foot, 0 inches
- O inch on the drawing represents 20 feet, 0 inches
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16. Metal ladders should not be used near _____.

- **O** stairways
- \mathbf{O} scaffolds
- **O** electrical equipment
- **O** windows
- 17. An estimate for a commercial flooring job requires one thousand, six hundred ninetythree square meters of carpet to complete the first floor. How would you write this amount as a whole number?
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- horizontal surface
- **O** amount of bubbles
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 - ground fault protection
 - ground fault protect • trigger locks

 - O auger bits
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 - **O** fluid pressure
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22. A fire extinguisher labeled C would be used to fight a(n) _____.

- electrical fire
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- paper fire
- **O** gasoline fire
- 23. When positioning a straight ladder against a wall, how far from the wall should the base of the ladder be?
 - **O** Four feet (1.2 m)
 - One-fourth the distance from the ground to the point where the ladder touches the wall
 - **O** The height of the wall minus 4 feet (1.2 m)
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 - **O** hold the lower blade guard up to position the blade on the cut mark
 - press the blade against the material being cut and set the saw rpm to Low
 - **O** tilt the front edge of the baseplate upward and push the saw forward
- 25. The decimal equivalent of the fraction 7/8 is _____.
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 - **O** 0.75
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 - **O** 12 sq ft
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 - **O** 32 sq ft
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29. The longer the ratchet handle, the better the _____.

- O reach
- O leverage
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- O torque

30. The ______ of the drill holds the drill bit.

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- 32. The combined thickness of a piece of sheet metal 0.078 centimeters (cm) thick and a piece of band iron 0.25 cm thick is _____.
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 - **O** hidden line
 - O schematic
 - **O** dimension line
- 34. The proper way to get tools to a worker on a higher level is to _____.
 - **O** toss them up carefully
 - C carry them by hand up a ladder
 - **O** climb up with them in your pocket
 - **O** hoist them up with a rope and bucket
- 35. The person primarily responsible for your safety is _____.
 - **O** your foreman
 - **O** your instructor
 - **O** yourself
 - **O** your employer

36. What is the length (in feet and inches) of the section of duct using the architect's scales shown in *Figure 1*?



- O 6 feet, 3/4 inches
- \bigcirc 6 feet, 10 inches
- O 44 feet, 3/4 inches
- O 48 feet, 4 inches
- 37. Complete numerical units without fractions or decimals are called ______.
 - **O** numerators
 - **O** denominators
 - **O** whole numbers
 - **O** dividers
- 38. The carpenter's square is also called a _____.
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 - **O** speed square
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 - O magic square
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 - **O** sections
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- 41. When stacking or storing light materials that have a large surface area and could easily be moved by the wind, _____.
 - \mathbf{O} keep the stack height less than four feet
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42. A ______ is a steel frame that supports and carries a home to its destination.

- O template
- O chassis
- O jig
- O vise
- 43. A(n) ______ is any failure to comply with an applicable Federal manufactured home construction and safety standard that renders the manufactured home or any part thereof not fit for the ordinary use for which it was intended and which results in an unreasonable risk of injury or death to the occupants of the affected manufactured home.
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- 44. A ______ is used in a factory to control the location and/or motion of another tool; they increase the speed and accuracy of production.
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 - O level
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- 45. If an employee takes longer than the assigned time at his or her station, it will not delay the other stations and employees.
 - O True
 - O False
- 46. _____ homes are constructed in a factory and delivered to the home site; they are built on a permanent frame with wheels and can be moved from site to site.
 - stick-built
 - modular
 - O mobile
 - \mathbf{O} custom

- 47. Before an owner can move in to a site-built home, the building-code official must perform a final inspection and issue a C.O. What does C.O. stand for?
 - Certificate of occupancy
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48. To select the proper size crane, you must consider_____.

- **O** the number of building modules
- **O** the building weight and site conditions
- **O** the placement of lifting straps on each module
- **O** the operator's level of experience
- 49. _____ is a failure of the manufactured home to comply with a Federal manufactured home construction or safety standard that does not constitute a defect, serious defect, or imminent safety hazard.
 - nonconformity
 - O noncompliance
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- 50. Before the floor decking can be installed, the electrical work must be inspected.
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- 51. If you make a mistake or identify a problem during production, you should ______.
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- 52. A building component's dimension may deviate from the drawing a maximum of
 - **O** 1/2"
 - **O** 3/8"
 - **O** 1/4"
 - **o** 1/8"
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 - **O** danger of risk
 - **O** OSHA violation
 - **O** serious defect
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- 54. _____ homes consist of multiple sections that are first constructed in a factory, then trucked to the home site, set onto a foundation, and finally the sections are joined on-site to complete the building.
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- 55. All of the functions within a manufactured construction plant are interrelated and timesensitive; the performance of one job is dependent on the previous task.
 - O True
 - O False
- 56. A(n) ______ is a failure to comply with an applicable Federal manufactured home safety and construction standard that renders the manufactured home part or component thereof not fit for ordinary use for what it was intended, but does not result in an unreasonable risk of injury or death to occupants of the affected manufactured home.
 - O injury
 - O defect
 - **O** rejection
 - O claim
- 57. A pressure gauge that measures pounds per square inch gauge (psig) indicates a reading of 45. The local atmospheric pressure is 14.7 psi. What is the absolute pressure (psia) that corresponds to the psig reading?
 - **O** 3.1
 - **O** 30.3
 - **O** 45
 - **O** 59.7
- 58. When doing a(n) _____, only a portion of the product are inspected in order to determine whether to accept or reject an entire lot or run of products.
 - acceptance sampling
 - quality circle
 - **O** enterprise resource plan
 - **O** corrective action report
- 59. When using a ladder to gain access to an upper landing, the ladder should be extended at least ______ feet (or rungs) above the upper landing.
 - **O** 1
 - **O** 2
 - **O** 3
 - **O** 4

- 60. Per the specifications, a part length is 3.00 +/- 0.004 and the width is 1.75 +/- .02. Which part is acceptable to use?
 - Length: 2.96, Width: 1.73
 - **O** Length: 2.997, Width: 1.765
 - O Length: 3.01, Width: 1.875
 - **O** Length: 3.002, Width: 1.55
- 61. Scaffolding that is greater than _____ feet high must include guardrails, midrails, and toe boards.
 - **O** 5
 - **O** 10
 - **O** 15
 - **O** 20
- 62. If a motor circuit starts blowing fuses/tripping thermals, the most likely cause is _____.
 - **O** commutation
 - O flux
 - **O** resistance
 - O overload
- 63. Once a fuse has opened it must be replaced.
 - O True
 - O False

64. Oxygen cylinders should be kept at least ______away from points of combustion.

- O 5 feet
- **O** 15 feet
- **O** 25 feet
- **O** 35 feet
- 65. A _____ product is a good or service that doesn't meet the quality standard or customer expectation.
 - incorrect
 - **O** variation
 - **O** nonconforming
 - **O** defective
- 66. A part measures 15.035 mm. If the tolerance for the part is +/- 0.007, would a part measuring 15.041 be acceptable?
 - O Yes
 - O No

- 67. A Safety Data Sheet (SDS) gives information about _____.
 - **O** hazardous chemicals
 - **O** injuries in the workplace
 - **O** medical examinations
 - machinery maintenance
- 68. A pressure gauge is in PSIA if it reads 0 when exposed to the atmosphere.
 - O True
 - O False
- 69. What is the OSHA-designated color for equipment being repaired (caution against starting or moving)?
 - O yellow
 - O purple
 - \mathbf{O} orange
 - o blue

70. Convert the following measurement: 32 degrees Fahrenheit = _____ degrees Celsius

- **O** 0
- **O** 32
- **O** 100
- o 212
- 71. An employee worked 10 hours and made 200 parts, of which 180 were acceptable for use. What was the employee's productivity?

_____ parts per hour

- 72. Electrical current can travel multiple paths in a _____ circuit.
 - **O** voltage resistive
 - series resistive
 - **O** parallel resistive
 - o element resistive
- 73. A ______ describes a product in terms of its assemblies, sub-assemblies, and basic parts.
 - **O** pareto chart
 - **O** bill of material
 - **O** histogram
 - O scatter diagram
- 74. Chain tension should be such that the chain sags approximately ______ of the distance between the shaft centers.
 - **O** 2%
 - **O** 3%
 - **O** 4%
 - **O** 5%

75. Calculate the mean of the following series of numbers: 1.93, 2.05, 1.75, 2.00, 2.11, 1.98

Provide two decimal places in your answer (for example: X.XX):

- 76. A machine produces 3,500 parts. Out of these, 500 parts are defective. What is the ratio of defective parts to acceptable parts?
 - **O** 1:6
 - **O** 6:1
 - **O** 1:7
 - **O** 7:1
- 77. Periodic inspections, non-destructive testing, and the calibration of instruments are functions of _____.
 - equipment life cycle
 - **O** breakdown maintenance
 - **O** standard operating procedure
 - **O** preventative maintenance
- 78. What is the OSHA-designated color for dangerous parts of machinery or energized equipment?
 - **O** yellow
 - O purple
 - **O** orange
 - O blue

79. Tribology is used in equipment condition monitoring to _____.

- **O** measure and analyze heat
- detect defects in materials
- analyze vibrations
- analyze lubricating oil
- 80. If the gear ratio is 1:4 and the driver gear has a speed of 800 RPM, what is the speed of the driven gear?
 - 200 RPM
 - **O** 800 RPM
 - 2400 RPM
 - 3200 RPM
- 81. Who can remove the lock during a lockout/tagout (LOTO) procedure?
 - **O** supervisor
 - affected employee
 - O authorized employee
 - **O** OSHA inspector

- 82. When a product is not made to specification, it is called _____. O incorrect

 - **O** variation
 - nonconforming
 - **O** defective

Thank you for completing this survey!

Appendix H: Foundation Level Training Post-test Survey

Foundation Survey: Post-Test

BEFORE you begin the survey, we want to give you some information about this survey by answering a couple of frequently asked questions:

Why am I taking this survey and how will my scores be used?

The purpose of this survey is to understand how students learned in the course. The survey is not graded, nor does it directly impact your ability to gain certifications or pass the training course. Instead, answers are used to help the instructors improve the course for future students. Therefore, PLEASE BE HONEST when answering the questions and we ask that you do not use the internet or other material to assist you in finding the "right" answers.

Can I use a calculator during the survey?

Yes, you can use a calculator to help you answer any questions on the survey.

<u>Is there a time limit for taking the survey?</u> There is no time limit for taking the survey, but we expect it will take about 45 minutes.

Is completing the survey required for the training?

The survey is voluntary and you will not be penalized for not completing it. However, we would really appreciate it if you would complete the survey. The information we collect using the survey helps us better fit the course material to your needs as a student. Thanks you for completing the survey.

Do I have to enter any personal information on the survey?

At the bottom of this page, you will be required to enter your Student ID number, your date of birth, and the college you are attending. This information will be used to connect the survey answers to the group of students in your class.

Thank you for completing the survey and helping us fit the course material to your needs as a student!

To begin, provide the following information:

Today's Date:

Your Student ID number:

Your Date of Birth (mm/dd/yyyy):

Select your college:

- **O** Miami Dade College
- **O** Polk State College
- O Santa Fe College
- **O** Seminole State College of Florida

Section 1

- 1. To properly dispose of oily rags, they must be _
 - **O** stored in a container designed for the purpose
 - **O** washed thoroughly and returned to use
 - **O** taken outdoors and thrown into a dumpster
 - **O** burned at the end of the shift
- 2. When something is plumb, it is _____.
 - **O** exactly vertical
 - **O** horizontally level
 - **O** at a 30-degree angle
 - **O** bobbed
- 3. Part of the construction drawing, the _____ gives information about the structure and is numbered for easy filing.
 - O legend
 - O scale
 - **O** specification
 - title block
- 4. You need to cut a 90.5-inch pipe into as many 3.75-inch pieces as possible. How many complete 3.75-inch pieces will you be able to cut?
 - **O** 14
 - **O** 24
 - **O** 34
 - **O** 44
- 5. Which of the following is the best advice for sending an email?
 - Treat a business email the same way you would treat a formal business letter.
 - Type in all capital letters in order to emphasize the importance of your email and set it apart from others.
 - Send bad news or emotional information via email so that the recipient can read the message in privacy.
 - Spelling and grammar do not matter in email communication since it is informal.
- 6. A saber saw is an effective tool for _____.
 - O drilling holes in concrete or pavement
 - Making long straight cuts through thick metal
 - **O** cutting through walls in demolition jobs
 - doing delicate work on thin materials

- 7. A total of 1,478 feet of cable was supplied for a job. Only 489 feet were installed. How many feet of cable remain?
 - **O** 978
 - **O** 980
 - **O** 989
 - **O** 1,099

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 - **O** rejection
 - O claim
- 57. A pressure gauge that measures pounds per square inch gauge (psig) indicates a reading of 45. The local atmospheric pressure is 14.7 psi. What is the absolute pressure (psia) that corresponds to the psig reading?
 - **O** 3.1
 - **O** 30.3
 - **O** 45
 - **O** 59.7
- 58. When doing a(n) _____, only a portion of the product are inspected in order to determine whether to accept or reject an entire lot or run of products.
 - **O** acceptance sampling
 - quality circle
 - **O** enterprise resource plan
 - **O** corrective action report
- 59. When using a ladder to gain access to an upper landing, the ladder should be extended at least feet (or rungs) above the upper landing.
 - **O** 1
 - **O** 2
 - **O** 3
 - **O** 4

- 60. Per the specifications, a part length is 3.00 +/- 0.004 and the width is 1.75 +/- .02. Which part is acceptable to use?
 - Length: 2.96, Width: 1.73
 - Length: 2.997, Width: 1.765
 - O Length: 3.01, Width: 1.875
 - **O** Length: 3.002, Width: 1.55
- 61. Scaffolding that is greater than _____ feet high must include guardrails, midrails, and toe boards.
 - **O** 5
 - **O** 10
 - **O** 15
 - **O** 20
- 62. If a motor circuit starts blowing fuses/tripping thermals, the most likely cause is _____.
 - **O** commutation
 - O flux
 - resistance
 - O overload
- 63. Once a fuse has opened it must be replaced.
 - O True
 - O False

64. Oxygen cylinders should be kept at least ______away from points of combustion.

- O 5 feet
- **O** 15 feet
- **O** 25 feet
- **O** 35 feet
- 65. A _____ product is a good or service that doesn't meet the quality standard or customer expectation.
 - O incorrect
 - **O** variation
 - **O** nonconforming
 - **O** defective
- 66. A part measures 15.035 mm. If the tolerance for the part is +/- 0.007, would a part measuring 15.041 be acceptable?
 - O Yes
 - O No

- 67. A Safety Data Sheet (SDS) gives information about .
 - hazardous chemicals
 - **O** injuries in the workplace
 - **O** medical examinations
 - **O** machinery maintenance
- 68. A pressure gauge is in PSIA if it reads 0 when exposed to the atmosphere.
 - **O** True
 - **O** False
- 69. What is the OSHA-designated color for equipment being repaired (caution against starting or moving)?
 - **O** yellow
 - **O** purple
 - **O** orange
 - **O** blue
- 70. Convert the following measurement: 32 degrees Fahrenheit = _____ degrees Celsius
 - **O** 0
 - **O** 32
 - **O** 100
 - **O** 212
- 71. An employee worked 10 hours and made 200 parts, of which 180 were acceptable for use. What was the employee's productivity? _____parts per hour
- 72. Electrical current can travel multiple paths in a circuit.
 - **O** voltage resistive
 - **O** series resistive
 - **O** parallel resistive
 - **O** element resistive
- 73. A _______describes a product in terms of its assemblies, sub-assemblies, and basic parts.
 - pareto chart
 - **O** bill of material
 - **O** histogram
 - scatter diagram
- 74. Chain tension should be such that the chain sags approximately of the distance between the shaft centers.
 - **O** 2%
 - **O** 3%
 - **O** 4%
 - **O** 5%

75. Calculate the mean of the following series of numbers: 1.93, 2.05, 1.75, 2.00, 2.11, 1.98

Provide two decimal places in your answer (for example: X.XX):

- 76. A machine produces 3,500 parts. Out of these, 500 parts are defective. What is the ratio of defective parts to acceptable parts?
 - **O** 1:6
 - **O** 6:1
 - **O** 1:7
 - **O** 7:1
- 77. Periodic inspections, non-destructive testing, and the calibration of instruments are functions of _____.
 - equipment life cycle
 - **O** breakdown maintenance
 - **O** standard operating procedure
 - **O** preventative maintenance
- 78. What is the OSHA-designated color for dangerous parts of machinery or energized equipment?
 - **O** yellow
 - O purple
 - **O** orange
 - O blue

79. Tribology is used in equipment condition monitoring to _____.

- **O** measure and analyze heat
- detect defects in materials
- analyze vibrations
- analyze lubricating oil
- 80. If the gear ratio is 1:4 and the driver gear has a speed of 800 RPM, what is the speed of the driven gear?
 - 200 RPM
 - **O** 800 RPM
 - 2400 RPM
 - 3200 RPM
- 81. Who can remove the lock during a lockout/tagout (LOTO) procedure?
 - **O** supervisor
 - affected employee
 - authorized employee
 - **O** OSHA inspector

- 82. When a product is not made to specification, it is called _____. O incorrect

 - **O** variation
 - variationo nonconformingo defective

Section 2

Directions: In this section, please select your level of agreement with each statement using this scale:

Strong	ly Disa	agree									
Strongly Ag	ree	•	2		-	(-	0	0	10	
	↓	<u>/</u>	3	<u>4</u>		0 _	/	ð	9	1 0	
	I	I	I	I	I	I	I	I	I	Your Level of Agreement (1-10)	
My past exp be able to p	perienc erform	es and well in	accomp manuf	olishme Factured	nts incr	ease my uction e	confided ducation	ence the	at I will		
Manufactur	ed con	structio	n educa	ation is	within	the scop	be of my	y abiliti	es.		
Successfull within the s	Successfully completing a manufactured construction education program is within the scope of my abilities.										
Other peopl											
My estimate accurate.	es of h	ow well	I can o	deal wit	h a new	v situati	on are u	sually	very		
I expect to l manufacture	be able ed cons	to do ti structio	hings tł n educa	nat need ation pr	l to be c ogram.	lone to	successi	fully co	mplete a		
If I take manufactured construction courses which involved many different tasks, some easy and some difficult, I would probably do very well at almost all of them.											
If I take a manufactured construction course in an unfamiliar area, I expect to be able to successfully complete the course.											
If I were asked to take a course in an area of manufactured construction which I didn't know much about, I could do well in the course.											
If I were asked to take a course in an area of manufactured construction which I didn't know much about, I could successfully complete the course.											
I can genera courses.	ally do	the wor	rk nece	ssary to	accom	plish m	y goals	in educ	ation		
I am confid deal with to	ent tha	t I can o ration, u	lo well using to	in man ools or l	ufactur ody to	ed cons move o	truction bjects.	educat	ion that		

Directions: In this section, please select your level of agreement with each statement using this scale:


Directions: In this section, please select the response which best describes your feeling about each statement.

I will successfully complete this manufactured construction education course:												
Extrem	ely Ur	ılikely							E	xtremely	y Likely	
	1	2	3	4	5	6	7	8	9	10		
	0	0	0	0	0	0	0	0	О	Ο		
I would ma program:	ake an	effort to) succes	sfully c	omplete	e a man	ufacture	ed const	truction	educatio	on	
I Definite	ely Wil	ll Not								I Defini	tely Will	
	1	2	3	4	5	6	7	8	9	10	•	
	0	0	0	0	0	0	0	0	0	0		
I intend to	succes	sfully c	omplete	e manuf	actured	constru	iction e	ducation	n:			
Strong	ly Disa	agree								Strong	y Agree	
	1	2	3	4	5	6	7	8	9	10		
	0	0	0	0	0	0	0	0	О	0		
For me to o	comple	ete a ma	nufactu	red con	structio	n educa	tion pro	ogram is	5:			
Extremely	Wort	hless							Ext	tremely `	Valuable	
U	1	2	3	4	5	6	7	8	9	10		
	0	0	0	0	0	0	0	0	0	0		

fully com plate this manufactured construction advactic

Directions: Please respond to the following 12 items. Be honest – there are no right or wrong answers!

	Very much like me	Mostly like me	Somewhat like me	Not much like me	Not like me at all
I have overcome setbacks to conquer an important challenge.	0	0	0	0	0
New ideas and projects sometimes distract me from previous ones.	0	0	0	0	О
My interests change from year to year.	0	0	0	0	О
Setbacks don't discourage me.	О	0	0	0	0
I have been obsessed with a certain idea or project for a short time but later lost interest.	0	О	О	О	0
I am a hard worker.	О	0	0	0	0
I often set a goal but later choose to pursue a different one.	0	0	0	0	0
I have difficulty maintaining my focus on projects that take more than a few months to complete.	О	О	О	О	0
I finish whatever I begin.	О	0	0	0	О
I have achieved a goal that took years of work.	О	0	0	0	О
I become interested in new pursuits every few months.	О	0	0	0	О
I am diligent.	0	0	О	0	0

Thank you for completing this survey!

Appendix I: Basic Level Training Pre-test Survey

Basic Survey: Pre-Test

BEFORE you begin the survey, we want to give you some information about this survey by answering a couple of frequently asked questions:

Why am I taking this survey?

The purpose of this survey is to help the instructors understand what you currently know about construction, manufacturing, and the manufactured construction process. Since you have NOT completed the training yet, it is NOT expected that you would know all or any of the answers! Therefore, PLEASE BE HONEST when answering the questions and we ask that you do not use the internet or other material to assist you in finding the "right" answers.

How will my answers be used?

The survey is not graded, nor does it directly impact your ability to gain certifications or pass the training course. Instead, your honest answers will help the instructors determine what parts of the course should be focused on and what parts of the course you already understand. With your honest answers, we hope to make the content covered more specific to the knowledge of the students taking the training.

Can I use a calculator during the survey?

Yes, you can use a calculator to help you answer any questions on the survey.

Is there a time limit for taking the survey?

There is no time limit for taking the survey, but we expect it will take about <u>45</u> minutes.

Is completing the survey required for the training?

The survey is voluntary and you will not be penalized for not completing it. However, we would really appreciate it if you would complete the survey. The information we collect using the survey helps us better fit the course material to your needs as a student. Thanks you for completing the survey.

Do I have to enter any personal information on the survey?

At the bottom of this page, you will be required to enter your Student ID number, your date of birth, and the college you are attending. This information will be used to connect the survey answers to the group of students in your class.

Thank you for completing the survey and helping us fit the course material to your needs as a student!

To begin, provide the following information:

Today's Date:		
Your Student ID number:		
Your Date of Birth (mm/dd/yyyy):		
Select your college:		
	• •	

- O Miami Dade College
- O Polk State College
- O Santa Fe College
- **O** Seminole State College of Florida

- 1. If the rough opening for a window is 46" and $2 \times 6s$ are used for framing members, the header width would be
 - **O** 46"
 - **O** 49"
 - **O** 50"
 - **O** 58"
- 2. To make sure the water flows in only one direction in a hot water recirculating system, plumbers install
 - water softeners
 - check valves
 - **O** branches
 - hose bibbs
- 3. A ______ will de-energize a circuit or a portion of it if the current to ground exceeds some predetermined value.
 - **O** double-insulated/ungrounded tool
 - fuse puller
 - **O** grounded tool
 - **O** ground fault circuit interrupter (GFCI)
- 4. Prevent rust on the metal parts of tools by applying ______.
 - O water
 - O grease
 - **O** light oil
 - O petrol
- 5. If you find a leak when testing a connection, the connection must be ______.
 - **O** solvent welded
 - removed and replaced
 - **O** retested hydrostatically
 - **O** air tested
- 6. If a person's heart begins to fibrillate due to an electrical shock, the solution is

to

- **O** leave the person alone until the fibrillation stops
- **O** immerse the person in ice water
- **O** use the Heimlich maneuver
- have a qualified person use emergency defibrillation equipment
- 7. When the roof span is 36' and the pitch is 1/6, the total rise is ______.
 - **O** 3'
 - **O** 6'
 - **O** 8'
 - **O** 12'

- 8. To avoid double trapping, never attach another trap to a ______.
 - O sink
 - O tub
 - water closet
 - ${\bf O}$ shower assembly
- 9. In *Figure 1*, letter H is pointing to the _____.





- **O** sill plate
- O termite shield
- bearing plate
- **O** sill sealer
- 10. To move solid and liquid wastes through the pipes, drainage and waste systems depend on .
 - O seepage
 - O gravity
 - specifications
 - **O** adapters
- 11. Three-way switches are used to control lamps from _____ different locations (write the number of locations).

- 12. The light-gauge steel framing member typically used for top and bottom plates is called a
 - **O** C-shape
 - O track
 - **O** U-channel
 - **O** furring channel
- 13. On a cable puller, the ______ is the part on which the pulling rope is wrapped and pulled.
 - O capstan
 - **O** fish tape
 - O mouse
 - **O** wire grip
- 14. When routing plastic laminates and plywood, it is recommended that you use a(n)
 - high-speed steel bit
 - **O** aluminum bit
 - Carbide-tipped bit
 - **O** drill bit
- 15. The most life-threatening hazards on a construction site typically include all of the following except _____.
 - O falls
 - **O** electric shock
 - **O** being crushed or struck by falling or flying objects
 - O chemical burns
- 16. The circuit that is routed to a switch box for controlling electric lights is known as a(n)
 - range circuit
 - **O** branch circuit
 - feeder circuit
 - Service lateral circuit
- 17. The device that prevents waste from backing up into the dishwasher is called a(n)
 - O internal baffle
 - O air gap assembly
 - O directional tee
 - O discharge pipe

18. In order to ensure safety, before measuring low voltages, you should first test for

- **O** resistance
- O current
- **O** vibration
- higher voltages

19. The ______ is the point where power is supplied to a building.

- **O** service drop
- **O** service entrance
- **O** service feeder
- **O** service lateral

20. A(n) ______ is a manually operated device that is used to pull a wire through conduit.

- O capstan
- **O** fish tape
- O mouse
- **O** wire grip

21. The distance between two outside walls is referred to as the _____.

- O dead load
- \mathbf{O} live load
- O span
- O bearing capacity
- 22. When obtaining safety information about an adhesive, the best source of reliable information is _____.
 - **O** your supervisor
 - **O** a co-worker
 - **O** the applicable MSDS
 - a building supply dealer
- 23. A roof framing member that extends diagonally from the outside corner of the top plate to the ridge is the _____.
 - valley rafter
 - jack rafter
 - hip rafter
 - **O** ridgeboard

- 24. The main purpose of pipe hangers is to _____.
 - **O** ensure adequate pipe vibration
 - **O** allow pipes to bend easily
 - **O** maintain horizontal alignment of pipes
 - **O** maintain vertical alignment of pipes
- 25. A _____ has a three-prong plug at the end of its power cord or some other means to ensure that stray current travels to ground without passing through the body of the operator.
 - O double-insulated/ungrounded tool
 - fuse puller
 - grounded tool
 - **O** ground fault circuit interrupter (GFCI)
- 26. Use *Figure 2* to answer the following questions:



Figure 2

- ► Identify the single receptacle: _____ (write letter)
- ► Identify the split-wired receptacle: _____ (write letter)
- ► Identify the dryer receptacle: (write letter)
- ► Identify the range receptacle: _____ (write letter)
- Identify the duplex receptacle: (write letter)
- ► Identify the special-purpose outlet: _____ (write letter)

- 27. A box installed under a roofed open porch is considered a _____.
 - **O** dry location
 - **O** wet location
 - **O** damp location
 - **O** weatherproof location

28. A short framing member that fills the space between the rough sill and the soleplate is a

- O spacer
- O cripple stud
- **O** trimmer stud
- **O** top plate
- 29. The seal in a trap protects people from airborne pathogens (germs), foul odors, and potentially explosive sewer gases, is called a(n) _____.
 - O gas seal
 - **O** air seal
 - **O** pressure seal
 - **O** water seal

30. Long piping runs that bypass the water softener should serve _____.

- **O** fixtures
- **O** hose bibbs
- **O** water heaters
- **O** gas supplies
- 31. Windows that swing open like a door are _____.
 - **O** fixed windows
 - **O** awning windows
 - **O** hopper windows
 - O casement windows
- 32. Trusses must be temporarily braced until _____.
 - **O** the roof finish material is installed
 - **O** the foundation is backfilled
 - **O** the owner takes occupancy of the structure
 - **O** roof sheathing is in place

- 33. When checking the foundation for squareness, if the measured lengths of the opposite walls are equal and the diagonal measurements are unequal, the foundation is square.
 - **O** True
 - **O** False
- 34. For a 20' \times 40' building, how many 2 \times 8 joists are required if they are spaced 16" OC and two rows of joists are required?
 - **O** 20
 - **O** 42
 - **O** 62
 - **O** 108
- 35. GFCI protection is required for receptacles in residential bathrooms.
 - **O** True
 - **O** False
- 36. An ammeter is used to measure .
 - O current
 - **O** voltage
 - **O** resistance
 - **O** insulation value
- 37. What word or phrase best describes the NEC® requirements for the installation of electrical systems?
 - O minimum
 - **O** most stringent
 - O design specification
 - O complete
- 38. A box constructed so that moisture will not interfere with successful operation is said to be _____. O raintight
 - - **O** waterproof
 - watertight
 - **O** weatherproof

- 39. Four pieces of lumber measuring 2" thick, 12" wide, and 8' long contains a total of
 - \bigcirc 16 board feet
 - **O** 64 board feet
 - 256 board feet
 - **O** 768 board feet
- 40. How many joists are required for an $8' \times 10'$ tool shed when the joists are spaced 16" on center (OC)?
 - **O** 6
 - **O** 7
 - **O** 8
 - **O** 9
- 41. _____ are installed to allow proper air flow from the roof system through the ventilated soffit area.
 - **O** Baffles
 - **O** Conduits
 - \bigcirc Roof vents
 - **O** Gasketing Materials
- 42. A ______ is assigned to each factory built home and is used as a point of identification for the home throughout its life.
 - **O** data plate
 - model name
 - **O** home owner's name
 - **O** serial number
- 43. When completed units require storage in excess of _____ prior to their final installation, temporary blocking is required under the transportation system if the units are longer than _____.
 - one month; 35 feet
 - O one week; 35 feet
 - O one month; 48 feet
 - O one week; 48 feet
- 44. _____ testing are checks that ensure that there is no leakage in the drain system.
 - O Low pressure
 - **O** High pressure
 - O PCVC standard
 - **O** Flood level

- 45. The lean production assembly-line methodology was original developed by _____.
 - Ford for automobile production
 - **O** Toyota for automobile production
 - **O** the US government for building construction
 - The US Environmental Protection Agency (EPA) to reduce wasted material in manufacturing
- 46. The main purpose of ______ is to control the air infiltration through construction elements exposed to the outside.
 - **O** seam sealing agent
 - **O** gasketing material
 - **O** batt insulation
 - **O** roofing Material
- 47. A serial number is required to be stamped on the steel cross member to which the towing hitch is attached ______.
 - **O** on modular and HUD home units
 - **O** on HUD home units only
 - **O** on modular home units only
 - **O** on the truck towing the home unit
- 48. The ______ ensures that the electrical devices are not wired backwards and that there is no open grounding.
 - **O** polarity test
 - dielectric strength test
 - **O** voltage engagement test
 - **O** amperage verification test
- 49. The _____ has to be removed before welds can be inspected.
 - welding rod
 - O slag
 - bracing
 - spring hanger
- 50. The depth of the insulation will vary based on the _____.
 - rafter size
 - O desired R-value
 - $\mathbf O$ slope of the roof
 - **O** baffle locations

- 51. The air barrier wrap is installed
 - ____. **O** between the drywall and rafters
 - **O** between the wall studs and sheathing
 - **O** between the sheathing and exterior siding
 - **O** on the outside of the exterior siding
- 52. A ______ includes critical information relative to the design and construction of the home, such as wind speed, roof load limitations, and thermal design data.
 - design tag
 - **O** data plate
 - **O** design plate
 - O data tag

53. In manufactured housing, the "chassis" is

- **O** A) used to support the house during construction
- **O** B) used to transport the home to it's final destination
- **O** C) returned to the factor on HUD homes
- **O** D) Both A and B
- 54. Walls where two units are joined together during on-site installation are called .
 - **O** splicing walls
 - **O** connection walls
 - **O** partition walls
 - **O** marriage walls

Directions: In this section, please select your level of agreement with each statement using this scale:

Stro	Strongly Disagree Stron										gly Agree		
	1 	2 	3	4	5	6	7 	8	9 	10			
										Your Lev of Agreeme (1-10)	vel nt		
My past be able to	experienc o perform	ces and n well ir	accomp 1 manuf	lishme actured	nts incr l constr	ease my uction e	confid ducation	ence than n.	at I will				
Manufac	tured cor	nstructio	on educa	ation is	within	the scop	e of my	y abiliti	es.				
Successfully completing a manufactured construction education program is within the scope of my abilities.													
Other pe	ople that	know n	ne well	perceiv	e me as	s being a	ı capabl	e perso	n.				
My estimaccurate.	nates of h	low wel	l I can c	leal wit	th a new	v situatio	on are u	sually v	very				
I expect manufact	to be able tured con	e to do t structio	hings th n educa	at need tion pr	l to be o ogram.	lone to s	success	fully co	mplete	a			
If I take t tasks, so all of the	manufact me easy a m.	and som	nstructi e diffic	on cour ult, I w	rses wh ould pr	ich invo obably c	lved ma lo very	any diff well at	erent almost				
If I take a manufactured construction course in an unfamiliar area, I expect to be able to successfully complete the course.													
If I were I didn't k	asked to now muc	take a c h about	course in , I could	n an are d do we	ea of ma ell in th	anufactu e course	red con	structio	on whicl	1			
If I were I didn't k	asked to now muc	take a c h about	course in , I coule	n an are d succe	ea of ma ssfully	anufactu complet	red con	structio ourse.	on whicl	1			

I can generally do the work necessary to accomplish my goals in education courses.

I am confident that I can do well in manufactured construction education that deal with tool operation, using tools or body to move objects.

Directions: In this section, please select your level of agreement with each statement using this scale:

Strongly 1	Disa	gree							Stro	ongly Agree
1 -		2	3	4	5	6	7 	8	9	10
										Your Level of Agreement (1-10)
I value manufa	acture	ed cons	structio	on-relate	ed educa	ation.				
Manufactured construction education is useful for my development.										
I will be able to education to a	o apj job.	ply wha	at I hav	e learne	ed in ma	anufactı	ired cor	structio	on	
I am motivated education prog	l to l grams	earn th s.	e skills	taught	in manı	ufacture	d const	ruction		
I would like to	imp	rove m	iy mani	ufacture	ed const	ruction-	related	skills.		
I am willing to prepare myself	inve f for	est effo a manı	ort to in ifacture	nprove 1 ed const	ny skill ruction	s and co -related	ompeter job.	ncies in	order to	0
Taking manufa	actur	ed con	structio	on educa	ation co	urses is	a high	priority	for me	·
I am willing to construction-re	o inve elateo	est effo d skills	ort on m	ny perso	onal tim	e to dev	elop ma	anufact	ured	

Directions: In this section, please select the response which best describes your feeling about each statement.

I will succ	essfully	y compl	ete this	manufa	actured	constru	ction ed	ucation	course	:	
Extrem	nely Ur	ılikely							E	xtremely	Likely
	1 O	2 O	3 O	4 O	5 O	6 0	7 O	8 0	9 0	10 O	
I would make an effort to successfully complete a manufactured construction education program:											
I Definit	ely Wil	ll Not								I Defini	tely Will
	1 O	2 O	3 O	4 O	5 0	6 0	7 O	8 0	9 0	10 •	
I intend to	succes	sfully c	omplete	e manuf	actured	constru	iction e	ducation	n:		
Strong	gly Disa	agree								Strong	y Agree
	1 O	2 O	3 O	4 O	5 O	6 0	7 O	8 0	9 0	10 O	
For me to	comple	ete a ma	nufactu	red con	structio	n educa	tion pro	ogram is	s:		
Extremely	w Wort	hless							Ext	tremely	Valuable
	1 O	2 •	3 •	4 O	5 0	6 0	7 •	8 0	9 0	10 O	

Directions: Please respond to the following 12 items. Be honest – there are no right or wrong answers!

	Very much like me	Mostly like me	Somewhat like me	Not much like me	Not like me at all
I have overcome setbacks to conquer an important challenge.	0	0	0	0	О
New ideas and projects sometimes distract me from previous ones.	0	0	0	0	О
My interests change from year to year.	0	0	0	0	О
Setbacks don't discourage me.	0	0	0	0	0
I have been obsessed with a certain idea or project for a short time but later lost interest.	0	0	0	0	0
I am a hard worker.	0	0	0	0	О
I often set a goal but later choose to pursue a different one.	0	0	0	0	О
I have difficulty maintaining my focus on projects that take more than a few months to complete.	0	0	0	0	О
I finish whatever I begin.	0	0	0	0	О
I have achieved a goal that took years of work.	0	0	0	0	О
I become interested in new pursuits every few months.	О	0	0	0	О
I am diligent.	0	О	0	0	0

Thank you for completing this survey!

Appendix J: Basic Level Training Post-test Survey

Basic Survey: Post-Test

BEFORE you begin the survey, we want to give you some information about this survey by answering a couple of frequently asked questions:

Why am I taking this survey and how will my scores be used?

The purpose of this survey is to understand how students learned in the course. The survey is not graded, nor does it directly impact your ability to gain certifications or pass the training course. Instead, answers are used to help the instructors improve the course for future students. Therefore, PLEASE BE HONEST when answering the questions and we ask that you do not use the internet or other material to assist you in finding the "right" answers.

Can I use a calculator during the survey?

Yes, you can use a calculator to help you answer any questions on the survey.

Is there a time limit for taking the survey?

There is no time limit for taking the survey, but we expect it will take about 45 minutes.

Is completing the survey required for the training?

The survey is voluntary and you will not be penalized for not completing it. However, we would really appreciate it if you would complete the survey. The information we collect using the survey helps us better fit the course material to your needs as a student. Thanks you for completing the survey.

Do I have to enter any personal information on the survey?

At the bottom of this page, you will be required to enter your Student ID number, your date of birth, and the college you are attending. This information will be used to connect the survey answers to the group of students in your class.

Thank you for completing the survey and helping us fit the course material to your needs as a student!

To begin, provide the following information:

Today's Date: Your Student ID number: Your Date of Birth (mm/dd/yyyy): Select your college:

- Miami Dade College
- Polk State College
- O Santa Fe College
- **O** Seminole State College of Florida

- 1. If the rough opening for a window is 46" and $2 \times 6s$ are used for framing members, the header width would be _____.
 - **O** 46"
 - **O** 49"
 - **O** 50"
 - **O** 58"
- 2. To make sure the water flows in only one direction in a hot water recirculating system, plumbers install
 - water softeners
 - O check valves
 - **O** branches
 - **O** hose bibbs
- 3. A ______ will de-energize a circuit or a portion of it if the current to ground exceeds some predetermined value.
 - O double-insulated/ungrounded tool
 - **O** fuse puller
 - **O** grounded tool
 - **O** ground fault circuit interrupter (GFCI)
- 4. Prevent rust on the metal parts of tools by applying ______.
 - O water
 - **O** grease
 - light oil
 - O petrol
- 5. If you find a leak when testing a connection, the connection must be _____.
 - O solvent welded
 - **O** removed and replaced
 - **O** retested hydrostatically
 - **O** air tested

- 6. If a person's heart begins to fibrillate due to an electrical shock, the solution is to _____.
 - **O** leave the person alone until the fibrillation stops
 - **O** immerse the person in ice water
 - **O** use the Heimlich maneuver
 - **O** have a qualified person use emergency defibrillation equipment
- 7. When the roof span is 36' and the pitch is 1/6, the total rise is _____.
 - **O** 3'
 - **O** 6'
 - **O** 8'
 - **O** 12'
- 8. To avoid double trapping, never attach another trap to a ______.
 - O sink
 - O tub
 - **O** water closet
 - **O** shower assembly

9. In *Figure 1*, letter H is pointing to the _____.



Figure 1

- **O** sill plate
- termite shield
- **O** bearing plate
- **O** sill sealer
- 10. To move solid and liquid wastes through the pipes, drainage and waste systems depend

on

- O seepage
- O gravityO specifications
- **O** adapters
- 11. Three-way switches are used to control lamps from _____ different locations (write the number of locations).

- 12. The light-gauge steel framing member typically used for top and bottom plates is called a
 - **O** C-shape
 - O track
 - **O** U-channel
 - **O** furring channel
- 13. On a cable puller, the ______ is the part on which the pulling rope is wrapped and pulled.
 - O capstan
 - **O** fish tape
 - O mouse
 - **O** wire grip
- 14. When routing plastic laminates and plywood, it is recommended that you use a(n)
 - high-speed steel bit
 - **O** aluminum bit
 - Carbide-tipped bit
 - **O** drill bit
- 15. The most life-threatening hazards on a construction site typically include all of the following except _____.
 - O falls
 - **O** electric shock
 - **O** being crushed or struck by falling or flying objects
 - O chemical burns
- 16. The circuit that is routed to a switch box for controlling electric lights is known as a(n)
 - range circuit
 - **O** branch circuit
 - feeder circuit
 - Service lateral circuit
- 17. The device that prevents waste from backing up into the dishwasher is called a(n)
 - O internal baffle
 - O air gap assembly
 - O directional tee
 - O discharge pipe

18. In order to ensure safety, before measuring low voltages, you should first test for

- **O** resistance
- O current
- **O** vibration
- higher voltages

19. The ______ is the point where power is supplied to a building.

- **O** service drop
- **O** service entrance
- O service feeder
- **O** service lateral

20. A(n) ______ is a manually operated device that is used to pull a wire through conduit.

- O capstan
- **O** fish tape
- O mouse
- **O** wire grip

21. The distance between two outside walls is referred to as the _____.

- O dead load
- **O** live load
- O span
- O bearing capacity
- 22. When obtaining safety information about an adhesive, the best source of reliable information is _____.
 - **O** your supervisor
 - **O** a co-worker
 - **O** the applicable MSDS
 - **O** a building supply dealer
- 23. A roof framing member that extends diagonally from the outside corner of the top plate to the ridge is the _____.
 - O valley rafter
 - jack rafter
 - hip rafter
 - ridgeboard

- 24. The main purpose of pipe hangers is to _____.
 - **O** ensure adequate pipe vibration
 - **O** allow pipes to bend easily
 - **O** maintain horizontal alignment of pipes
 - Maintain vertical alignment of pipes
- 25. A _____ has a three-prong plug at the end of its power cord or some other means to ensure that stray current travels to ground without passing through the body of the operator.
 - O double-insulated/ungrounded tool
 - fuse puller
 - grounded tool
 - **O** ground fault circuit interrupter (GFCI)
- 26. Use *Figure 2* to answer the following questions:



Figure 2

- ► Identify the single receptacle: _____ (write letter)
- ► Identify the split-wired receptacle: _____ (write letter)
- ► Identify the dryer receptacle: (write letter)
- ► Identify the range receptacle: _____ (write letter)
- Identify the duplex receptacle: (write letter)
- ► Identify the special-purpose outlet: _____ (write letter)

- 27. A box installed under a roofed open porch is considered a _____.
 - **O** dry location
 - **O** wet location
 - \mathbf{O} damp location
 - **O** weatherproof location

28. A short framing member that fills the space between the rough sill and the soleplate is a

- O spacer
- cripple stud
- **O** trimmer stud
- **O** top plate
- 29. The seal in a trap protects people from airborne pathogens (germs), foul odors, and potentially explosive sewer gases, is called a(n) _____.
 - O gas seal
 - air seal
 - **O** pressure seal
 - **O** water seal

30. Long piping runs that bypass the water softener should serve _____.

- **O** fixtures
- **O** hose bibbs
- **O** water heaters
- **O** gas supplies
- 31. Windows that swing open like a door are _____.
 - **O** fixed windows
 - **O** awning windows
 - **O** hopper windows
 - O casement windows
- 32. Trusses must be temporarily braced until _____.
 - **O** the roof finish material is installed
 - **O** the foundation is backfilled
 - **O** the owner takes occupancy of the structure
 - **O** roof sheathing is in place

- 33. When checking the foundation for squareness, if the measured lengths of the opposite walls are equal and the diagonal measurements are unequal, the foundation is square.
 - **O** True
 - **O** False
- 34. For a 20' \times 40' building, how many 2 \times 8 joists are required if they are spaced 16" OC and two rows of joists are required?
 - **O** 20
 - **O** 42
 - **O** 62
 - **O** 108
- 35. GFCI protection is required for receptacles in residential bathrooms.
 - **O** True
 - **O** False
- 36. An ammeter is used to measure .
 - O current
 - **O** voltage
 - **O** resistance
 - **O** insulation value
- 37. What word or phrase best describes the NEC® requirements for the installation of electrical systems?
 - O minimum
 - **O** most stringent
 - O design specification
 - O complete
- 38. A box constructed so that moisture will not interfere with successful operation is said to be _____. O raintight
 - - **O** waterproof

 - **O** watertight
 - **O** weatherproof

- 39. Four pieces of lumber measuring 2" thick, 12" wide, and 8' long contains a total of
 - \bigcirc 16 board feet
 - **O** 64 board feet
 - 256 board feet
 - **O** 768 board feet
- 40. How many joists are required for an $8' \times 10'$ tool shed when the joists are spaced 16" on center (OC)?
 - **O** 6
 - **O** 7
 - **O** 8
 - **O** 9
- 41. _____ are installed to allow proper air flow from the roof system through the ventilated soffit area.
 - **O** Baffles
 - Conduits
 - **O** Roof vents
 - **O** Gasketing Materials
- 42. A ______ is assigned to each factory built home and is used as a point of identification for the home throughout its life.
 - **O** data plate
 - model name
 - **O** home owner's name
 - **O** serial number
- 43. When completed units require storage in excess of _____ prior to their final installation, temporary blocking is required under the transportation system if the units are longer than _____.
 - one month; 35 feet
 - O one week; 35 feet
 - one month; 48 feet
 - O one week; 48 feet
- 44. _____ testing are checks that ensure that there is no leakage in the drain system.
 - **O** Low pressure
 - **O** High pressure
 - O PCVC standard
 - **O** Flood level

- 45. The lean production assembly-line methodology was original developed by _____.
 - Ford for automobile production
 - **O** Toyota for automobile production
 - **O** the US government for building construction
 - The US Environmental Protection Agency (EPA) to reduce wasted material in manufacturing
- 46. The main purpose of ______ is to control the air infiltration through construction elements exposed to the outside.
 - **O** seam sealing agent
 - **O** gasketing material
 - **O** batt insulation
 - **O** roofing Material
- 47. A serial number is required to be stamped on the steel cross member to which the towing hitch is attached ______.
 - **O** on modular and HUD home units
 - **O** on HUD home units only
 - **O** on modular home units only
 - **O** on the truck towing the home unit
- 48. The ______ ensures that the electrical devices are not wired backwards and that there is no open grounding.
 - **O** polarity test
 - dielectric strength test
 - **O** voltage engagement test
 - **O** amperage verification test
- 49. The _____ has to be removed before welds can be inspected.
 - welding rod
 - O slag
 - O bracing
 - spring hanger
- 50. The depth of the insulation will vary based on the _____.
 - rafter size
 - O desired R-value
 - \mathbf{O} slope of the roof
 - **O** baffle locations

- 51. The air barrier wrap is installed
 - ____. **O** between the drywall and rafters
 - **O** between the wall studs and sheathing
 - **O** between the sheathing and exterior siding
 - **O** on the outside of the exterior siding
- 52. A ______ includes critical information relative to the design and construction of the home, such as wind speed, roof load limitations, and thermal design data.
 - **O** design tag
 - **O** data plate
 - **O** design plate
 - **O** data tag

53. In manufactured housing, the "chassis" is

- **O** A) used to support the house during construction
- **O** B) used to transport the home to it's final destination
- **O** C) returned to the factor on HUD homes
- **O** D) Both A and B
- 54. Walls where two units are joined together during on-site installation are called .
 - **O** splicing walls
 - **O** connection walls
 - **O** partition walls
 - **O** marriage walls

Directions: In this section, please select your level of agreement with each statement using this scale:

Strongl	y Disag	gree							St	rongly Agree
	1 	2	3	4	5	6	7 	8	9	10
										Your Level of Agreement (1-10)
My past exbe able to p	xperienc perform	ces and a well in	accomp manuf	lishme	nts incr l constr	ease my uction e	confide	ence the	at I will	
Manufactu	red con	structio	n educa	tion is	within	the scop	e of my	/ abiliti	es.	
Successful within the	Successfully completing a manufactured construction education program is within the scope of my abilities.									
Other peop	ole that	know m	ne well j	perceiv	e me as	s being a	capabl	e perso	n.	
My estima accurate.	tes of h	ow well	I can d	leal wit	th a new	v situatio	on are u	sually v	/ery	
I expect to manufactu	be able red con	to do tl struction	hings th n educa	at need tion pr	l to be o ogram.	lone to s	successf	fully co	mplete	a
If I take m tasks, some all of them	If I take manufactured construction courses which involved many different tasks, some easy and some difficult, I would probably do very well at almost all of them.									
If I take a be able to	manufae success	ctured c fully co	onstruc mplete	tion co the cou	urse in Irse.	an unfar	niliar a	rea, I ez	xpect to	
If I were as I didn't kno	sked to ow muc	take a c h about	ourse ir , I could	n an are 1 do we	ea of ma ell in th	anufactu e course	red con	structio	on whicl	n
If I were as I didn't kno	sked to ow muc	take a c h about	ourse ir , I could	n an are 1 succe	ea of ma ssfully	anufactu complet	red con e the co	structio ourse.	on whicl	a

I can generally do the work necessary to accomplish my goals in education courses.

I am confident that I can do well in manufactured construction education that deal with tool operation, using tools or body to move objects.

Directions: In this section, please select your level of agreement with each statement using this scale:



Directions: In this section, please select the response which best describes your feeling about each statement.

I will successfully complete this manufactured construction education course: **Extremely Unlikely Extremely Likely** 2 3 4 5 6 7 8 O O O O O O O 1 9 10 \mathbf{O} 0 Ο I would make an effort to successfully complete a manufactured construction education program: I Definitely Will Not I Definitely Will $\begin{array}{cccc} 2 & 3 & 4 \\ \bigcirc & \bigcirc & \bigcirc \end{array}$ 5 O 6 O 1 7 8 9 10 Ο Ο Ο Ο Ο I intend to successfully complete manufactured construction education: **Strongly Disagree Strongly Agree** 2 O 3 O 1 4 5 6 7 8 9 10 Ο Ο Ο Ο 0 Ο Ο Ο For me to complete a manufactured construction education program is: **Extremely Worthless Extremely Valuable** 1 2 3 5 6 7 8 9 10 4 0 Ο 0 0 Ο Ο Ο Ο Ο Ο

Directions: Please respond to the following 12 items. Be honest – there are no right or wrong answers!

	Very much like me	Mostly like me	Somewhat like me	Not much like me	Not like me at all
I have overcome setbacks to conquer an important challenge.	0	0	0	0	О
New ideas and projects sometimes distract me from previous ones.	0	О	0	0	О
My interests change from year to year.	0	0	0	0	О
Setbacks don't discourage me.	0	О	0	0	0
I have been obsessed with a certain idea or project for a short time but later lost interest.	0	0	0	0	0
I am a hard worker.	0	0	0	0	0
I often set a goal but later choose to pursue a different one.	0	0	0	0	О
I have difficulty maintaining my focus on projects that take more than a few months to complete.	0	0	0	0	О
I finish whatever I begin.	0	О	0	0	О
I have achieved a goal that took years of work.	0	О	0	0	О
I become interested in new pursuits every few months.	О	0	0	0	О
I am diligent.	0	О	0	0	0

Thank you for completing this survey!

Appendix K: Advanced Level Training Pre-test Survey

Advanced Survey: Pre-Test

BEFORE you begin the survey, we want to give you some information about this survey by answering a couple of frequently asked questions:

Why am I taking this survey?

The purpose of this survey is to help the instructors understand what you currently know about construction, manufacturing, and the manufactured construction process. Since you have NOT completed the training yet, it is NOT expected that you would know all or any of the answers! Therefore, PLEASE BE HONEST when answering the questions and we ask that you do not use the internet or other material to assist you in finding the "right" answers.

How will my answers be used?

The survey is not graded, nor does it directly impact your ability to gain certifications or pass the training course. Instead, your honest answers will help the instructors determine what parts of the course should be focused on and what parts of the course you already understand. With your honest answers, we hope to make the content covered more specific to the knowledge of the students taking the training.

Can I use a calculator during the survey?

Yes, you can use a calculator to help you answer any questions on the survey.

Is there a time limit for taking the survey?

There is no time limit for taking the survey, but we expect it will take about <u>45</u> minutes.

Is completing the survey required for the training?

The survey is voluntary and you will not be penalized for not completing it. However, we would really appreciate it if you would complete the survey. The information we collect using the survey helps us better fit the course material to your needs as a student. Thanks you for completing the survey.

Do I have to enter any personal information on the survey?

At the bottom of this page, you will be required to enter your Student ID number, your date of birth, and the college you are attending. This information will be used to connect the survey answers to the group of students in your class.

Thank you for completing the survey and helping us fit the course material to your needs as a student!

To begin, provide the following information:

Today's Date:

Your Student ID number: Your Date of Birth (mm/dd/yyyy): Select your college:

- Miami Dade College
- Polk State College
- O Santa Fe College
- Seminole State College of Florida

1. The value for total current in *Figure 1* is _____.





- **O** 1.25A
- **O** 2.50A
- **O** 5A
- **O** 10A
- 2. When installing flexible insulation between studs, staple the side flanges at intervals of
 - 3" • 6" • 9" • 12"
- 3. In a refrigeration system, heat is transferred from the indoor air to the refrigerant at the
 - O compressor
 - **O** furnace
 - **O** evaporator
 - O condenser
- 4. When building wrap is applied to the exterior of a structure, the wrap should be overlapped at the corners by _____.
 - **O** 2'
 - O 1'
 - **O** 3'
 - **O** 6'
- 5. In a multi-ply drywall application, the face-ply joints should be separated from the base-ply joints by at least _____.
 - **O** 6"
 - **O** 8"
 - **O** 10"
 - **O** 12"

- 6. If too little primary air is supplied to a gas burner, the flame will _____.
 - **O** lift off the burner surface
 - turn yellow
 - O turn blue
 - O turn orange
- 7. When the temperature of a liquid refrigerant is below its condensing temperature, the liquid is _____.
 - **O** superheated
 - O saturated
 - O subcooled
 - **O** boiling
- 8. When making a saddle bend, the center of the saddle will cause the conduit to shrink for every inch of saddle depth.
 - **O** 3/8"
 - **O** 3/16"
 - **O** 3/4"
 - **O** 3/32"
- 9. Underground steel pipe used for gas must have a protective coating on vertical sections of pipe that extends above the finished grade. This coating must extend a minimum of
 - $\overline{\mathbf{O}}$ 1 inch
 - O 2 inches
 - **O** 3 inches
 - **O** 4 inches

10. Multiplying the cross-sectional area of a duct by the air velocity is used to calculate

- **O** static pressure
- velocity pressure
- air volume
- air density
- 11. Which supply air diffuser or register location is usually best for cooling performance?
 - **O** Floor
 - **O** Low sidewall
 - **O** Ceiling
 - **O** Baseboard
12. Tubes that are measured in nominal sizing have an OD that is _____.

- **O** 1/8 inch larger than the nominal size
- **O** 1/4 inch larger than the nominal size
- \bigcirc 1/2 inch larger than the nominal size
- **O** 1 inch larger than the nominal size

13. The temperature at which fuel oil ignites is called its _____.

- **O** explosive index
- **O** flash point
- O evaporative level
- trigger point

14. Flexible metal conduit must be supported within _____ inches of each end.

- **O** 8
- **O** 10
- **O** 12
- **O** 18

15. External static pressure loss is the _____.

- **O** total pressure loss in the air handler and its component parts
- total pressure loss of an air distribution system, excluding the air handler
- total pressure drop across the air handler
- **O** difference between the total pressure and the static pressure
- 16. Use *Figure 2* to answer the following questions:



Figure 2

- ► In *Figure 2*, the letter A indicates the _____.
 - O flue
 - **O** thermostat
 - **O** cold water inlet
 - **O** heating unit

➤ In *Figure 2*, the letter B indicates the _____.

- **O** T/P relief value
- O flue
- **O** thermostat
- heating unit

► In *Figure 2*, the letter C indicates the _____

- **O** cold water inlet
- **O** T/P relief valve
- heating unit
- O flue

➤ In *Figure 2*, the letter D indicates the _____.

- **O** thermostat
- heating unit
- O flue
- \mathbf{O} cold water inlet

► In *Figure 2*, the letter E indicates the _____.

- Cold water inlet
- **O** heating unit
- **O** thermostat
- O T/P relief valve
- 17. A plastic drain body can be connected to a piping system by solvent welding or the use of a(n) _____ .
 - **O** threaded joint
 - O compression joint
 - expansion joint
 - caulked joint
- 18. NEC Section 376.56(A) limits wireway fill to no more than _____ of the cross-sectional area of the wireway.
 - **O** 40%
 - **O** 60%
 - **O** 75%
 - **O** 90%

- 19. The power in a circuit with 120 volts and 5 amps is _____.
 - **O** 24 watts
 - **O** 600 watts
 - **O** 6,000 watts
 - **O** 1/24 watt
- 20. Which refrigerant circuit accessory provides a place to store the system refrigerant charge during service procedures or prolonged shutdowns?
 - **O** Accumulator
 - **O** Receiver
 - **O** Muffler
 - **O** Heat exchanger
- 21. The change in voltage across a component is called _____.
 - **O** ampacity
 - O relay
 - **O** voltage drop
 - **O** transformation
- 22. The boiling temperature of a liquid is decreased _____.
 - **O** as the pressure is increased
 - **O** as the pressure is decreased
 - **O** in its solid state
 - **O** when it is subcooled
- 23. The length of the bent section of conduit measured from the bottom, centerline, or top of the straight section to the end of the bent section is called _____.
 - O rise
 - O developed length
 - **O** offset
 - O back-to-back length
- 24. When cutting the branch circuit wires in preparation for connecting a light fixture, you should leave at least ______ of free conductor length at the outlet box where the wire emerges from its cable sheath or raceway.
 - **O** 3"
 - **O** 5"
 - **O** 6"
 - **O** 8"
- 25. Recessed fixtures not labeled Type IC must be installed so that they are at a minimum distance of _____ from any adjacent insulation.
 - **O** 3"
 - **O** 5"
 - **O** 6"
 - **O** 8"

- 26. In the mechanical refrigeration cycle, the purpose of the evaporator is to _____.
 - **O** convert refrigerant from high pressure to low pressure
 - **O** transfer heat from the refrigerant to the outdoor air
 - **O** transfer heat from the indoor air to the refrigerant
 - **O** provide the pressure difference to circulate refrigerant

27. The formula for calculating the total resistance in a series circuit with three resistors is.

$$R_{T} = R_{1} + R_{2} + R_{3} \qquad \bigcirc \\ R_{T} = R_{1} - R_{2} - R_{3} \qquad \bigcirc \\ R_{T} = R_{x} R_{x} R_{3} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{3}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{3}} + \frac{1}{R_{3}}} \qquad \bigcirc \\ R_{T} = \frac{1}{\frac{1}{R_{1}} + \frac{1}{R_{3}} + \frac$$

28. When installing a roof drain over rigid insulation, _____.

- **O** install a deck clamp after positioning the drain body
- install a deck clamp before positioning the drain body
- **O** install a drain receiver after positioning the drain body
- install a drain receiver before positioning the drain body
- 29. The use of a(n) _____, a fixture in which the main line is smaller than the branch, can prevent turbulence in the system.
 - **O** bullhead tee
 - **O** compression joint
 - **O** ferrule
 - **O** regulator

30. Gypsum-board materials used behind brick, stucco, or siding are referred to as _____.

- paperless drywall
- O cement board
- abuse-resistant drywall
- **O** sheathing panels
- 31. Furnaces with an electric spark ignition often use _____ to prove the pilot flame has been established.
 - flame rectification
 - O gauge pressure
 - latent heat
 - O continuous pressure
- 32. To be effective, the metal foil surface of reflective insulation must face an open air space with a depth of at least _____.
 - O 1/4"
 - **O** 1/2"
 - **O** 3/4"
 - **O** 1"

- 33. In a parallel connection, the pipe leading from the feed lines to the cold water inlet, compared to the feed line of the hot water outlet, must be
 - **O** a smaller diameter
 - **O** shorter
 - O longer
 - equal in length
- 34. When cutting fiber-cement siding, proper respiratory protection must be worn to prevent inhaling toxic _____.
 - O fumes
 - O asbestos fibers
 - \mathbf{O} silica dust
 - **O** cement particles
- 35. A temperature of 80°F is equal to _____.
 - **O** 12°C
 - **O** 26.6°C
 - **O** 176°C
 - **O** 202°C

36. To prevent rust streaks when installing exterior finishing materials, use _____.

- **O** box nails
- **O** finish nails
- **O** non-galvanized nails
- **O** stainless steel nails
- 37. When a manufactured home is to be installed in an area where the water pressure exceeds _____ psi, a pressure reducing valve should be installed.

- 38. Each exterior door is required to have a floor or landing on each side of the door except when a stairway with _____ or fewer risers is located on the exterior side of the door.
 - O one
 - O two
 - O three
 - **O** four
- 39. The _____ the R-value, the _____ the amount of heat that can flow through the material per hour.
 - O lower; lower
 - O lower; higher
 - O higher; lower
 - higher; higher

- 40. A manufactured home designed and constructed for a Thermal Zone 2 area can be installed in a Thermal Zone 3 area.
 - O true
 - O false
- 41. The bottom of an egress window opening shall not be more than _____ inches above the floor.
 - **O** 18
 - **O** 24
 - **O** 30
 - **O** 36
- 42. _____ are loads produced by the use and occupancy of the building and do not include construction or environmental loads.
 - **O** dead loads
 - **O** flood loads
 - **O** live loads
 - **O** nominal loads
- 43. Use *Figure 3* to answer the following questions:





In *Figure 3*, see dimension A: the centerline of the toilet or bidet must be at least ______ inches from a wall or other obstruction.

In *Figure 3*, see dimension B: at least _____ inches of clear space shall be provided in front of each toilet.

Write the number on this line: _____

In *Figure 3*, see dimension C: a toilet should be separated from a sink by a minimum space of inches.

Write the number on this line: _____

In *Figure 3*, see dimension D: there should be a minimum of _____ inches forward clearance at all shower entrances.

Write the number on this line: _____

- 44. A manufactured home is inspected by a _____ during the manufacturing process and then by a _____ during the installation process on site.
 - federal inspector; local jurisdiction
 - **O** state regulator; federal inspector
 - **O** federal inspector; state regulator
 - **O** state regulator; local jurisdiction
- 45. The maximum height of a stair riser is _____ inches and the minimum tread depth is
 - . • 7-1/4": 9"
 - **O** 7-1/4"; 10"
 - **O** 7-3/4 ": 9"
 - **O** 7-3/4 ": 10"
- 46. The ______ test determines that all electrical wiring connections have been properly made.
 - O dielectric
 - **O** continuity
 - **O** operational
 - **O** polarity

- 47. The _____ the U-value, the _____ the resistance to heat flow.
 - O lower; lower
 - O lower; higher
 - **O** higher; lower
 - higher; higher
- 48. The surface temperature should be between _____ for vinyl flooring installation.
 - **O** 60°F-85°F
 - **O** 65°F-90°F
 - **O** 70°F-90°F
 - **O** 75°F-85°F
- 49. There cannot be more than _____ difference between the greatest riser height and the smallest riser height within a flight of stairs.
 - **O** 1/8"
 - **O** 1/4"
 - **O** 3/8"
 - **O** 1/2"
- 50. Hallways shall have a minimum horizontal dimension of ______ inches measured between the finished surfaces of opposite walls.

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51. Use *Figure 4* to answer the following questions:



Figure 4

- ► In *Figure 4*, the letter A indicates a _____ truss.
 - \mathbf{O} cambered
 - O double Howe
 - O jack
 - O scissor
 - \mathbf{O} studio

- ➤ In *Figure 4*, the letter B indicates a _____ truss.
 - O cambered
 - **O** double Howe
 - O jack
 - O scissor
 - O studio

➤ In *Figure 4*, the letter C indicates a _____ truss.

- O cambered
- **O** double Howe
- O jack
- O scissor
- O studio

➤ In *Figure 4*, the letter D indicates a _____ truss.

- **O** cambered
- O double Howe
- O jack
- O scissor
- O studio
- ➤ In *Figure 4*, the letter E indicates a _____ truss.
 - O cambered
 - O double Howe
 - O jack
 - O scissor
 - O studio

52. On an open roof valley, roof shingles should overlap the metal flashing at least _____.

- **O** 3"
- **O** 6"
- **O** 12"
- **O** 24"

53. Concrete surfaces need at least _____ days to finish curing concrete before painting.

- **O** 7
- **O** 14
- **O** 21
- **O** 28
- **O** 35

- 54. The ______ test checks if an electric circuit is in fact a complete circuit.
 - O dielectric
 - O continuity
 - \mathbf{O} operational
 - **O** polarity
- 55. There cannot be more than _____ difference between the greatest tread depth and the smallest tread depth within a flight of stairs.
 - **O** 1/8"
 - **O** 1/4"
 - **O** 3/8"
 - **O** 1/2"
- 56. _____ are the weight of materials of construction incorporated into the building, including walls, floors, roofs, ceilings, stairways, finishes, and heating, ventilating and air-conditioning systems.
 - **O** Dead loads
 - **O** Flood loads
 - **O** Live loads
 - **O** Nominal loads
- 57. A Thermal Zone with a design Uo value of 0.096 requires ______ thickness of insulation than a Thermal Zone with a design Uo value of 0.079.
 - O greater
 - O less
- 58. Vinyl sheet flooring seams should be _____ to the subfloor joints.
 - O perpendicular
 - parallel
 - diagonal
 - **O** any direction
- 59. A modular home is inspected by a _____ during the manufacturing process and again on site after installation on the foundation.
 - **O** federal inspector
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 - **O** state regulator

60. Use *Figure 5* to answer the following questions:



Figure 5

- ► In *Figure 5*, the tension web is located at letter _____.
 - ΟΑ
 - **O** B
 - **O** C
 - O D
- ► In Figure 5, the compression web is located at letter _____.
 - ΟΑ
 - **O** B
 - **O** C
 - O D
- ➤ In Figure 5, the third point is located at letter _____.
 - О А
 - **O** B
 - **O** C
 - **O** D

➤ In Figure 5, the quarter point is located at letter _____.

- ΟΑ
- **O** B
- **O** C
- O D

Section 2 Directions: In this section, please select your level of agreement with each statement using this scale:

Strongly Disagree							Strongly Agree						
	1	2	3	4	5	6	7	8	9	10			
										Your Level of Agreement			
										(1-10)			
My past end be able to	xperieno perform	ces and 1 well in	accomp n manuf	olishme factured	ents inci d constr	ease my uction e	confid ducatio	ence th n.	at I will				
Manufactu	ured cor	structio	on educa	ation is	within	the scor	be of my	y abiliti	es.				
Successfu within the	lly com scope c	pleting a	a manu pilities.	facture	d const	ruction e	educatio	on progi	ram is				
Other peo	ple that	know n	ne well	perceiv	ve me a	s being a	a capabl	le perso	on.				
My estima accurate.	ates of h	low wel	l I can o	deal wi	th a nev	v situati	on are u	sually	very				
I expect to manufactu	be able red con	e to do t structio	hings th n educa	nat need ation pr	d to be rogram.	done to	success	fully co	omplete	a			
If I take manufactured construction courses which involved many different tasks, some easy and some difficult, I would probably do very well at almost all of them.													
If I take a be able to	manufa success	ctured c fully co	construc mplete	ction co the cou	ourse in urse.	an unfa	miliar a	rea, I e	xpect to				
If I were a I didn't kn	sked to ow muc	take a c h about	course i , I coul	n an ar d do w	ea of m ell in th	anufactu e course	ired con	structio	on whiel	n			
If I were a I didn't kn	sked to ow muc	take a c h about	course i , I coul	n an ar d succe	ea of m essfully	anufactu comple	te the co	istructio ourse.	on whicl	h			
I can gene courses.	erally do	the wo	rk nece	ssary to	o accon	plish m	y goals	in educ	ation				
I am confi deal with	dent tha tool ope	at I can o pration, u	do well using to	in mar ols or	nufactur body to	ed cons move o	truction bjects.	educat	ion that				

Strongly Disagree Stron	gly Agree
1 2 3 4 5 6 7 8 9 	10
	Your Level of Agreement
	(1-10)
I value manufactured construction-related education.	
Manufactured construction education is useful for my development.	
I will be able to apply what I have learned in manufactured construction education to a job.	
I am motivated to learn the skills taught in manufactured construction education programs.	
I would like to improve my manufactured construction-related skills.	
I am willing to invest effort to improve my skills and competencies in order to prepare myself for a manufactured construction-related job.	
Taking manufactured construction education courses is a high priority for me.	
I am willing to invest effort on my personal time to develop manufactured construction-related skills.	

Directions: In this section, please select your level of agreement with each statement using this scale:

Section 3

Directions: In this section, please select the response which best describes your feeling about each statement.

I will successfully complete this manufactured construction education course: **Extremely Unlikely Extremely Likely**
 3
 4
 5
 6
 7
 8

 O
 O
 O
 O
 O
 O
2 O 1 9 10 0 \mathbf{O} Ο I would make an effort to successfully complete a manufactured construction education program: I Definitely Will Not I Definitely Will 3 4 O O 2 O 5 O 6 O 1 7 8 9 10 Ο Ο Ο Ο Ο I intend to successfully complete manufactured construction education: **Strongly Disagree Strongly Agree** 2 O 3 O 1 4 5 6 7 8 9 10 Ο Ο Ο Ο 0 Ο Ο Ο For me to complete a manufactured construction education program is: **Extremely Worthless Extremely Valuable** 1 2 3 5 6 7 8 9 10 4 Ο Ο 0 0 Ο Ο Ο Ο Ο Ο

Section 4

Directions: Please respond to the following 12 items. Be honest – there are no right or wrong answers!

	Very much like me	Mostly like me	Somewhat like me	Not much like me	Not like me at all
I have overcome setbacks to conquer an important challenge.	0	0	0	0	0
New ideas and projects sometimes distract me from previous ones.	0	0	0	0	О
My interests change from year to year.	0	0	0	0	0
Setbacks don't discourage me.	0	0	0	0	0
I have been obsessed with a certain idea or project for a short time but later lost interest.	0	0	0	0	О
I am a hard worker.	0	0	0	0	О
I often set a goal but later choose to pursue a different one.	0	0	0	0	О
I have difficulty maintaining my focus on projects that take more than a few months to complete.	0	О	0	0	О
I finish whatever I begin.	0	0	0	0	0
I have achieved a goal that took years of work.	0	0	0	0	0
I become interested in new pursuits every few months.	0	0	0	0	О
I am diligent.	0	О	0	0	0

Thank you for completing this survey!

Appendix L: Advanced Level Training Post-test Survey

Advanced Survey: Post-Test

BEFORE you begin the survey, we want to give you some information about this survey by answering a couple of frequently asked questions:

Why am I taking this survey and how will my scores be used?

The purpose of this survey is to understand how students learned in the course. The survey is not graded, nor does it directly impact your ability to gain certifications or pass the training course. Instead, answers are used to help the instructors improve the course for future students. Therefore, PLEASE BE HONEST when answering the questions and we ask that you do not use the internet or other material to assist you in finding the "right" answers.

Can I use a calculator during the survey?

Yes, you can use a calculator to help you answer any questions on the survey.

Is there a time limit for taking the survey?

There is no time limit for taking the survey, but we expect it will take about 45 minutes.

Is completing the survey required for the training?

The survey is voluntary and you will not be penalized for not completing it. However, we would really appreciate it if you would complete the survey. The information we collect using the survey helps us better fit the course material to your needs as a student. Thanks you for completing the survey.

Do I have to enter any personal information on the survey?

At the bottom of this page, you will be required to enter your Student ID number, your date of birth, and the college you are attending. This information will be used to connect the survey answers to the group of students in your class.

Thank you for completing the survey and helping us fit the course material to your needs as a student!

To begin, provide the following information:

Today's Date: Your Student ID number: Your Date of Birth (mm/dd/yyyy): Select your college:

- **O** Miami Dade College
- Polk State College
- **O** Santa Fe College
- **O** Seminole State College of Florida

Section 1

1. The value for total current in *Figure 1* is _____.





- **O** 1.25A**O** 2.50A
- **O** 5A
- **O** 10A
- 2. When installing flexible insulation between studs, staple the side flanges at intervals of
 - · 3" • 6" • 9" • 12"
- 3. In a refrigeration system, heat is transferred from the indoor air to the refrigerant at the
 - O compressor
 - **O** furnace
 - **O** evaporator
 - O condenser
- 4. When building wrap is applied to the exterior of a structure, the wrap should be overlapped at the corners by _____.
 - **O** 2'
 - **O** 1'
 - **O** 3'
 - **O** 6'
- 5. In a multi-ply drywall application, the face-ply joints should be separated from the baseply joints by at least _____.
 - **O** 6"
 - **O** 8"
 - **O** 10"
 - **O** 12"

- 6. If too little primary air is supplied to a gas burner, the flame will _____.
 - **O** lift off the burner surface
 - turn yellow
 - turn blue
 - turn orange
- 7. When the temperature of a liquid refrigerant is below its condensing temperature, the liquid is .
 - **O** superheated
 - **O** saturated
 - O subcooled
 - **O** boiling
- 8. When making a saddle bend, the center of the saddle will cause the conduit to shrink for every inch of saddle depth.
 - **O** 3/8"
 - **O** 3/16"
 - **O** 3/4"
 - **O** 3/32"
- 9. Underground steel pipe used for gas must have a protective coating on vertical sections of pipe that extends above the finished grade. This coating must extend a minimum of _____
 - O 1 inch
 - \bigcirc 2 inches
 - **O** 3 inches
 - **O** 4 inches

10. Multiplying the cross-sectional area of a duct by the air velocity is used to calculate _____

- **O** static pressure
- velocity pressure
- air volume
- air density

11. Which supply air diffuser or register location is usually best for cooling performance?

- **O** Floor
- **O** Low sidewall
- **O** Ceiling
- **O** Baseboard
- 12. Tubes that are measured in nominal sizing have an OD that is _____.
 - **O** 1/8 inch larger than the nominal size
 - \mathbf{O} 1/4 inch larger than the nominal size
 - O 1/2 inch larger than the nominal size
 - **O** 1 inch larger than the nominal size

- 13. The temperature at which fuel oil ignites is called its _____.
 - **O** explosive index
 - **O** flash point
 - **O** evaporative level
 - trigger point

14. Flexible metal conduit must be supported within _____ inches of each end.

- **O** 8
- **O** 10
- **O** 12
- **O** 18

15. External static pressure loss is the _____.

- **O** total pressure loss in the air handler and its component parts
- total pressure loss of an air distribution system, excluding the air handler
- **O** total pressure drop across the air handler
- **O** difference between the total pressure and the static pressure
- 16. Use *Figure 2* to answer the following questions:





- ► In *Figure 2*, the letter A indicates the _____.
 - O flue
 - **O** thermostat
 - $\mathbf{O}\ \mbox{cold water inlet}$
 - heating unit

- ► In *Figure 2*, the letter B indicates the _____.
 - **O** T/P relief valve
 - O flue
 - **O** thermostat
 - heating unit
- ➤ In Figure 2, the letter C indicates the _____
 - O cold water inlet
 - **O** T/P relief value
 - **O** heating unit
 - O flue
- ► In *Figure 2*, the letter D indicates the _____.
 - **O** thermostat
 - heating unit
 - O flue
 - **O** cold water inlet

➤ In *Figure 2*, the letter E indicates the _____.

- **O** cold water inlet
- heating unit
- **O** thermostat
- **O** T/P relief valve
- 17. A plastic drain body can be connected to a piping system by solvent welding or the use of a(n) .
 - threaded joint
 - O compression joint
 - **O** expansion joint
 - caulked joint
- 18. NEC Section 376.56(A) limits wireway fill to no more than _____ of the cross-sectional area of the wireway.
 - **O** 40%
 - **O** 60%
 - **O** 75%
 - **O** 90%

19. The power in a circuit with 120 volts and 5 amps is _____.

- O 24 watts
- **O** 600 watts
- **O** 6,000 watts
- **O** 1/24 watt

- 20. Which refrigerant circuit accessory provides a place to store the system refrigerant charge during service procedures or prolonged shutdowns?
 - **O** Accumulator
 - **O** Receiver
 - **O** Muffler
 - Heat exchanger

21. The change in voltage across a component is called _____.

- **O** ampacity
- O relay
- voltage drop
- **O** transformation
- 22. The boiling temperature of a liquid is decreased _____.
 - **O** as the pressure is increased
 - **O** as the pressure is decreased
 - in its solid state
 - **O** when it is subcooled
- 23. The length of the bent section of conduit measured from the bottom, centerline, or top of the straight section to the end of the bent section is called _____.
 - O rise
 - developed length
 - O offset
 - O back-to-back length
- 24. When cutting the branch circuit wires in preparation for connecting a light fixture, you should leave at least _____ of free conductor length at the outlet box where the wire emerges from its cable sheath or raceway.
 - **O** 3"
 - **O** 5"
 - **O** 6"
 - **O** 8"
- 25. Recessed fixtures not labeled Type IC must be installed so that they are at a minimum distance of _____ from any adjacent insulation.
 - **O** 3"
 - **O** 5"
 - **O** 6"
 - **O** 8"

- 26. In the mechanical refrigeration cycle, the purpose of the evaporator is to _____.
 - Convert refrigerant from high pressure to low pressure
 - **O** transfer heat from the refrigerant to the outdoor air
 - **O** transfer heat from the indoor air to the refrigerant
 - **O** provide the pressure difference to circulate refrigerant
- 27. The formula for calculating the total resistance in a series circuit with three resistors is
 - $\begin{array}{c} \mathbf{O} & \mathbf{R}_{\mathrm{T}} = \mathbf{R}_{1} + \mathbf{R}_{2} + \mathbf{R}_{3} \\ \mathbf{O} & \mathbf{R}_{\mathrm{T}} = \mathbf{R}_{1} \mathbf{R}_{2} \mathbf{R}_{3} \end{array}$

$$O = R_T = R_x R_x R_3$$

O
$$R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

28. When installing a roof drain over rigid insulation, _____.

- install a deck clamp after positioning the drain body
- install a deck clamp before positioning the drain body
- **O** install a drain receiver after positioning the drain body
- install a drain receiver before positioning the drain body
- 29. The use of a(n) _____, a fixture in which the main line is smaller than the branch, can prevent turbulence in the system.
 - **O** bullhead tee
 - **O** compression joint
 - O ferrule
 - **O** regulator
- 30. Gypsum-board materials used behind brick, stucco, or siding are referred to as _____.
 - paperless drywall
 - O cement board
 - **O** abuse-resistant drywall
 - **O** sheathing panels
- 31. Furnaces with an electric spark ignition often use _____ to prove the pilot flame has been established.
 - **O** flame rectification
 - O gauge pressure
 - O latent heat
 - Continuous pressure
- 32. To be effective, the metal foil surface of reflective insulation must face an open air space with a depth of at least _____.
 - **O** 1/4"
 - **O** 1/2"
 - **O** 3/4"
 - **O** 1"

- 33. In a parallel connection, the pipe leading from the feed lines to the cold water inlet, compared to the feed line of the hot water outlet, must be
 - **O** a smaller diameter
 - O shorter
 - O longer
 - equal in length
- 34. When cutting fiber-cement siding, proper respiratory protection must be worn to prevent inhaling toxic _____.
 - O fumes
 - **O** asbestos fibers
 - \mathbf{O} silica dust
 - O cement particles
- 35. A temperature of 80°F is equal to _____.
 - **O** 12°C
 - **O** 26.6°C
 - **O** 176°C
 - **O** 202°C
- 36. To prevent rust streaks when installing exterior finishing materials, use _____.
 - **O** box nails
 - **O** finish nails
 - **O** non-galvanized nails
 - stainless steel nails
- 37. When a manufactured home is to be installed in an area where the water pressure exceeds ______psi, a pressure reducing valve should be installed.

- 38. Each exterior door is required to have a floor or landing on each side of the door except when a stairway with _____ or fewer risers is located on the exterior side of the door.
 - O one
 - O two
 - \mathbf{O} three
 - O four
- 39. The _____ the R-value, the _____ the amount of heat that can flow through the material per hour.
 - O lower; lower
 - O lower; higher
 - higher; lower
 - higher; higher

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 - O false
- 41. The bottom of an egress window opening shall not be more than _____ inches above the floor.
 - **O** 18
 - **O** 24
 - **O** 30
 - **O** 36
- 42. _____ are loads produced by the use and occupancy of the building and do not include construction or environmental loads.
 - O dead loads
 - flood loads
 - **O** live loads
 - **O** nominal loads
- 43. Use *Figure 3* to answer the following questions:





In *Figure 3*, see dimension A: the centerline of the toilet or bidet must be at least ______ inches from a wall or other obstruction.

Write the number on this line: _____

In *Figure 3*, see dimension B: at least _____ inches of clear space shall be provided in front of each toilet.

In *Figure 3*, see dimension C: a toilet should be separated from a sink by a minimum space of _____ inches.

Write the number on this line: _____

In *Figure 3*, see dimension D: there should be a minimum of _____ inches forward clearance at all shower entrances.

Write the number on this line: _____

Write the number on this line: _____

- 44. A manufactured home is inspected by a _____ during the manufacturing process and then by a _____ during the installation process on site.
 - federal inspector; local jurisdiction
 - State regulator; federal inspector
 - G federal inspector; state regulator
 - **O** state regulator; local jurisdiction
- 45. The maximum height of a stair riser is _____ inches and the minimum tread depth is
 - **O** 7-1/4"; 9"
 - **O** 7-1/4"; 10"
 - **O** 7-3/4 "; 9"
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46. The ______ test determines that all electrical wiring connections have been properly made.

- O dielectric
- **O** continuity
- **O** operational
- **O** polarity

47. The _____ the U-value, the _____ the resistance to heat flow.

- O lower; lower
- O lower; higher
- O higher; lower
- higher; higher

48. The surface temperature should be between _____ for vinyl flooring installation.

- **O** 60°F-85°F
- **O** 65°F-90°F
- **O** 70°F-90°F
- **O** 75°F-85°F
- 49. There cannot be more than _____ difference between the greatest riser height and the smallest riser height within a flight of stairs.
 - **O** 1/8"
 - **O** 1/4"
 - **O** 3/8"
 - **O** 1/2"
- 50. Hallways shall have a minimum horizontal dimension of _____ inches measured between the finished surfaces of opposite walls.

Write the number on this line: _____

51. Use *Figure 4* to answer the following questions:



Figure 4

- ► In *Figure 4*, the letter A indicates a _____ truss.
 - O cambered
 - **O** double Howe
 - O jack
 - O scissor
 - O studio

- ➤ In *Figure 4*, the letter B indicates a _____ truss.
 - O cambered
 - **O** double Howe
 - O jack
 - O scissor
 - O studio

➤ In *Figure 4*, the letter C indicates a _____ truss.

- **O** cambered
- **O** double Howe
- O jack
- O scissor
- O studio
- ➤ In *Figure 4*, the letter D indicates a _____ truss.
 - O cambered
 - **O** double Howe
 - O jack
 - O scissor
 - ${\mathbf O}$ studio
- ➤ In *Figure 4*, the letter E indicates a _____ truss.
 - O cambered
 - O double Howe
 - O jack
 - O scissor
 - O studio
- 52. On an open roof valley, roof shingles should overlap the metal flashing at least _____.
 - **O** 3"
 - **O** 6"
 - **O** 12"
 - **O** 24"

53. Concrete surfaces need at least _____ days to finish curing concrete before painting.

- **O** 7
- **O** 14
- **O** 21
- **O** 28
- **O** 35

- 54. The _____ test checks if an electric circuit is in fact a complete circuit.
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 - O greater
 - O less
- 58. Vinyl sheet flooring seams should be _____ to the subfloor joints.
 - O perpendicular
 - parallel
 - **O** diagonal
 - **O** any direction
- 59. A modular home is inspected by a _____ during the manufacturing process and again on site after installation on the foundation.
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 - local jurisdiction
 - **O** building code representative
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60. Use *Figure 5* to answer the following questions:



Figure 5

- ► In *Figure 5*, the tension web is located at letter _____.
 - ΟΑ
 - **O** B
 - **O** C
 - O D
- ► In Figure 5, the compression web is located at letter _____.
 - ΟΑ
 - **O** B
 - **O** C
 - O D
- ► In Figure 5, the third point is located at letter _____.
 - О А
 - **O** B
 - **O** C
 - **O** D

► In Figure 5, the quarter point is located at letter _____.

- ΟΑ
- **O** B
- **O** C
- O D

Section 2 Directions: In this section, please select your level of agreement with each statement using this scale:

Strongly Disagree							Strongly Agree						
	1	2	3	4	5	6	7	8	9	10			
	·	·	·	·	·	·	·	·	·	Your Level of Agreement			
										(1-10)			
My past e be able to	xperieno perforn	ces and n well ir	accomp n manuf	olishme factured	ents incr d constr	rease my ruction e	confid ducation	ence th n.	at I will				
Manufact	ured cor	nstructio	on educ	ation is	within	the scop	be of my	y abiliti	es.				
Successfu within the	lly com	pleting a	a manu pilities.	facture	d const	ruction e	educatio	n prog	ram is				
Other peo	ple that	know n	ne well	perceiv	/e me a	s being a	a capabl	e perso	n.				
My estima accurate.	ates of h	now wel	l I can o	deal wi	th a nev	v situati	on are u	sually	very				
I expect to manufactu	o be able ured con	e to do t istructio	hings tl n educa	hat need ation pr	d to be ogram.	done to	success	fully co	omplete	a			
If I take manufactured construction courses which involved many different tasks, some easy and some difficult, I would probably do very well at almost all of them.													
If I take a be able to	manufa success	ctured c fully co	onstruc mplete	ction co the cou	ourse in urse.	an unfa	miliar a	rea, I e	xpect to				
If I were a I didn't kn	If I were asked to take a course in an area of manufactured construction which I didn't know much about, I could do well in the course.							n					
If I were a I didn't kn	asked to low muc	take a c ch about	course i , I coul	n an ar d succe	ea of m essfully	anufactu comple	red con te the co	structio	on whicl	h			
I can gene courses.	erally do	the wo	rk nece	essary to	o accon	nplish m	y goals	in educ	ation				
I am confi deal with	ident tha tool ope	at I can or cration, u	do well using to	in mar	nufactur body to	red cons move o	truction bjects.	educat	ion that				

Strongly Disagree Strongly Ag								gree		
	1	2	3	4	5	6 	7 	8 	9 	10
										Your Level of Agreement
										(1-10)
I value ma	anufactu	ired con	structio	on-relate	ed educ	ation.				
Manufactured construction education is useful for my development.										
I will be able to apply what I have learned in manufactured construction education to a job.										
I am motivated to learn the skills taught in manufactured construction education programs.										
I would like to improve my manufactured construction-related skills.										
I am willing to invest effort to improve my skills and competencies in order to prepare myself for a manufactured construction-related job.							0			
Taking ma	anufactı	ured con	structio	on educ	ation co	ourses is	a high	priority	for me	·
I am willi constructi	ng to in on-relat	vest effo ed skills	ort on n s.	ny perso	onal tim	e to dev	elop m	anufact	ured	

Directions: In this section, please select your level of agreement with each statement using this scale:

Section 3

Directions: In this section, please select the response which best describes your feeling about each statement.

I will succ	essfully	y compl	ete this	manufa	actured	constru	ction ed	ucation	course	:		
Extre	Extremely Unlikely Extremely Likely											
	1 O	2)	3 O	4 O	5 0	6 0	7 0	8)	9 0	10 •		
I would make an effort to successfully complete a manufactured construction education program:												
I Definitely Will Not I Definitely Will												
	1 O	2 O	3 O	4 O	5 0	6 0	7 0	8 0	9 O	10 O		
I intend to	succes	sfully c	omplete	e manuf	actured	constru	iction e	ducation	n:			
Stro	ongly D	isagree							S	trongly Ag	gree	
	1 O	2)	3 O	4 O	5 O	6 0	7 0	8 0	9 0	10 O		
For me to complete a manufactured construction education program is:												
Extrem	ely Wo	rthless							Ext	remely Va	luable	
	1 O	2)	3 O	4 O	5 0	6 0	7 0	8 0	9 0	10 O		

Section 4

Directions: Please respond to the following 12 items. Be honest – there are no right or wrong answers!

	Very much like me	Mostly like me	Somewhat like me	Not much like me	Not like me at all
I have overcome setbacks to conquer an important challenge.	О	0	0	0	0
New ideas and projects sometimes distract me from previous ones.	О	0	0	0	О
My interests change from year to year.	О	0	0	0	0
Setbacks don't discourage me.	0	0	0	0	О
I have been obsessed with a certain idea or project for a short time but later lost interest.	О	0	0	0	О
I am a hard worker.	О	0	0	0	О
I often set a goal but later choose to pursue a different one.	О	0	0	0	О
I have difficulty maintaining my focus on projects that take more than a few months to complete.	О	0	0	0	0
I finish whatever I begin.	О	0	0	0	О
I have achieved a goal that took years of work.	0	0	0	0	О
I become interested in new pursuits every few months.	О	0	0	0	О
I am diligent.	0	0	0	0	0

Thank you for completing this survey!

Appendix M: Supervisory Level Training Pre-test Survey

Supervisor Survey: Pre-Test

BEFORE you begin the survey, we want to give you some information about this survey by answering a couple of frequently asked questions:

Why am I taking this survey and how will my scores be used?

The purpose of this survey is to understand how students learned in the course. The survey is not graded, nor does it directly impact your ability to gain certifications or pass the training course. Instead, answers are used to help the instructors improve the course for future students. Therefore, PLEASE BE HONEST when answering the questions and we ask that you do not use the internet or other material to assist you in finding the "right" answers.

Can I use a calculator during the survey?

Yes, you can use a calculator to help you answer any questions on the survey.

Is there a time limit for taking the survey?

There is no time limit for taking the survey, but we expect it will take about <u>25</u> minutes.

Is completing the survey required for the training?

The survey is voluntary and you will not be penalized for not completing it. However, we would really appreciate it if you would complete the survey. The information we collect using the survey helps us better fit the course material to your needs as a student. Thanks you for completing the survey.

Do I have to enter any personal information on the survey?

At the bottom of this page, you will be required to enter your Student ID number, your date of birth, and the college you are attending. This information will be used to connect the survey answers to the group of students in your class.

Thank you for completing the survey and helping us fit the course material to your needs as a student!

To begin, provide the following information:

Today's Date:	
Your Student ID number:	
Your Date of Birth (mm/dd/yyyy):	
Select your college:	
	~

- **O** Miami Dade College
- O Polk State College
- O Santa Fe College
- **O** Seminole State College of Florida

Section 1

- 1. Soil depletion, soil erosion, and urban heat islands are consequences of _____.
 - aquifer depletion
 - **O** biophilia
 - **O** deforestation
 - **O** embodied energy
- 2. An energy performance score of 75 or higher is required for which certification program?
 - Energy Star
 - **O** Green Globes
 - **O** Leadership in Energy and Environmental Design
 - **O** Living Building Challenge
 - **O** National Green Building Standard
- 3. A parcel of land in an area that needs to be restored economically is referred to as a:
 - **O** blackfield
 - O brownfield
 - **O** grayfield
 - **O** greenfield
- 4. Certified, Silver, Gold and Platinum are levels for which certification program?
 - Energy Star
 - **O** Green Globes
 - **O** Leadership in Energy and Environmental Design
 - **O** Living Building Challenge
 - National Green Building Standard
- 5. A parcel of land contaminated by previous industrial use is referred to as a:
 - **O** blackfield
 - **O** brownfield
 - **O** grayfield
 - **O** greenfield
- 6. A building with a HERS Index of 130 uses _____ than a building with a HERS Index of 65.
 - O less energy
 - O less water
 - more energy
 - more water
- 7. Desertification and aquifer depletion _____.
 - Cause soil and water pollution
 - increase ozone-depleting emissions
 - **O** increase embodied energy
 - **O** reduce potable water supplies

- 8. Graywater and potable water can use the same piping system.
 - O True
 - O False
- 9. A material's embodied energy is based on the following stages:
 - product manufacturing and final installation
 - product manufacturing, transportation, and final installation
 - **O** raw material extraction, product manufacturing, and final installation
 - raw material extraction, product manufacturing, transportation, and final installation
 - raw material extraction, product manufacturing, transportation, final installation, and final disposal
- 10. Which material has the most units of energy per unit weight?
 - O concrete
 - O masonry
 - O steel
 - O timber
- 11. Reducing a building's use of electricity by utilizing sunlight is an example of _____.
 - biomimicry
 - distributional equity
 - **O** passive design
 - **O** whole-building design

12. RFID and NFC are types of:

- O barcodes
- **O** building information modeling
- tracking technologies
- virtual design
- 13. A worker who misreads the drawings and cuts the studs too short is creating _____.
 - **O** defect waste
 - O inventory waste
 - **O** motion waste
 - **O** over-production waste
 - **O** over-processing waste
14. *Figure 1* is an example of a _____.

ID	Task Name	Predecessors	Duration	Jul	23.	'06					Jul	30.	'06					Au	g 6	'06					Au	g 13	3, '0	6			-
				S	M	T	W	Т	F	S	S	M	T	W	Т	F	S	S	M	T	W	Т	F	S	S	M	T	W	Т	F	S
1	Start		0 days		-						1																				
2	a	1	4 days		1				հ																						
3	b	1	5.33 days			n fait	1		1				_	_	_																
4	c	2	5.17 days	1					Ū.							h															
5	d	2	6.33 days												No.								_			-					
6	e	3,4	5.17 days	1												T.		1.00													
7	f	5	4.5 days	1																						1					
8	9	6	5.17 days	1																			Ľ		Read.	64		1	100	h	
9	Finish	7,8	0 days																											۲	

Figure 1

- **O** clash analysis
- **O** Gantt chart
- **O** network diagram
- O value stream map
- work breakdown structure
- 15. A worker must take several steps to reach the rolls of insulation because a pallet was delivered and placed several feet away from the station; this creates _____.
 - defect waste
 - **O** inventory waste
 - O motion waste
 - **O** over-production waste
 - O over-processing waste

16. *Figure 2* is an example of a _____.



Figure 2

- **O** clash analysis
- O Gantt chart
- network diagram
- **O** value stream map
- **O** work breakdown structure

Write the number on this line: _____

18. During a pocket penetrometer test, reading should be taken at _____ locations around the perimeter of the manufactured home.

Write the number on this line: _____

- 19. The minimum distance between the finished floor and the blades of a ceiling fan is
 - 6'-2" • 6'-4" • 6'-6" • 6'-8"
- 20. On a level site, what is the minimum distance (in inches) between the finished grade and the bottom of the chassis I-beam?

Write the number on this line: _____

21. When using a pocket penetrometer, HUD requires a minimum soil bearing capacity of _____ psf.

Write the number on this line: _____

22. Concrete block piers must be double blocked and interlocked when the total manufactured house load exceeds _____ lbs.

Write the number on this line: _____

23. Use *Figure 3* to answer the following questions:



Figure 3

- Dimension A must be at least _____ feet. Write the number on this line:
- ► Dimension B must be at least _____ feet. Write the number on this line:

Section 2 Directions: In this section, please select your level of agreement with each statement using this scale:

Stron	gly Dis	agree						St	rongly	Agree
	1	2	3	4	5	6	7	8	9 	10
										Your Level of Agreement
										(1-10)
My past end be able to	xperieno perforn	ces and 1 well in	accomp n manuf	olishme factured	ents inci d constr	rease my ruction e	confid ducatio	ence th n.	at I will	
Manufactu	ured cor	structio	on educa	ation is	within	the scor	be of my	y abiliti	es.	
Successfu within the	lly com scope c	pleting a	a manu pilities.	facture	d const	ruction e	educatio	on prog	ram is	
Other peo	ple that	know n	ne well	perceiv	ve me a	s being a	a capabl	le perso	n.	
My estima accurate.	ates of h	low wel	l I can o	deal wi	th a new	v situati	on are u	sually	very	
I expect to manufactu	be able ared con	e to do t structio	hings th n educa	nat nee ation pi	d to be rogram.	done to	success	fully co	omplete	a
If I take m tasks, som all of then	nanufact ne easy a n.	ured co and som	nstructi e diffic	on cou sult, I w	rses wh vould pr	ich invo obably o	lved ma do very	any diff well at	ferent almost	
If I take a be able to	manufa success	ctured c fully co	construc mplete	ction co the cou	ourse in urse.	an unfa	miliar a	rea, I e	xpect to	
If I were a I didn't kn	isked to low muc	take a c h about	course i , I coul	n an ar d do w	ea of m ell in th	anufactu e course	ired con	structio	on whiel	n
If I were a I didn't kn	isked to ow muc	take a c h about	course i , I coul	n an ar d succe	ea of m essfully	anufactu comple	te the co	istructio ourse.	on whiel	h
I can gene courses.	erally do	the wo	rk nece	ssary to	o accon	ıplish m	y goals	in educ	ation	
I am confi deal with	dent tha tool ope	at I can o pration, u	do well using to	in mar ools or	nufactur body to	red cons move o	truction bjects.	educat	ion that	

Strong	gly Dis	agree							Stro	ongly Agree	
	1	2	3	4	5	6	7	8	9 	10 	
										Your Lev of Agreemer	el nt
										(1-10)	
I value man	nufactu	red con	structio	on-relat	ed educ	ation.					
Manufactu	red con	nstructio	on educ	ation is	useful	for my o	levelop	ment.			
I will be ab education t	ole to ap to a job	pply wh	at I hav	ve learn	ed in m	anufact	ured con	nstructi	on		
I am motiv education p	ated to progran	learn th ns.	ne skills	s taught	in man	ufacture	ed const	ruction			
I would lik	e to im	prove n	ny man	ufactur	ed const	truction	-related	skills.			
I am willin prepare my	g to inv self for	vest effo r a manu	ort to in ufacture	nprove ed cons	my skil truction	ls and c -related	ompeter l job.	ncies in	order t	0	
Taking ma	nufactu	ired con	structio	on educ	ation co	ourses is	a high	priority	for me		
I am willin constructio	g to inv n-relate	vest effo ed skills	ort on n s.	ny perso	onal tim	e to dev	elop m	anufact	ured		

Directions: In this section, please select your level of agreement with each statement using this scale:

Directions: In this section, please select the response which best describes your feeling about each statement.

I will successfully complete this manufactured construction education course: **Extremely Unlikely Extremely Likely** 2 3 4 5 6 7 8 O O O O O O O 8 9 10 1 0 \mathbf{O} Ο I would make an effort to successfully complete a manufactured construction education program: I Definitely Will Not I Definitely Will 3 4 O O 2 O 5 O 6 O 1 7 8 9 10 Ο Ο Ο Ο Ο I intend to successfully complete manufactured construction education: **Strongly Disagree Strongly Agree** 2 O 3 O 1 4 5 6 7 8 9 10 Ο Ο Ο Ο 0 Ο Ο Ο For me to complete a manufactured construction education program is: **Extremely Worthless Extremely Valuable** 1 2 3 5 6 7 8 9 10 4 Ο Ο 0 0 0 Ο Ο Ο Ο Ο

Directions: Please respond to the following 12 items. Be honest – there are no right or wrong answers!

	Very much like me	Mostly like me	Somewhat like me	Not much like me	Not like me at all
I have overcome setbacks to conquer an important challenge.	0	0	0	0	О
New ideas and projects sometimes distract me from previous ones.	0	0	0	0	О
My interests change from year to year.	О	0	0	0	О
Setbacks don't discourage me.	0	0	0	0	0
I have been obsessed with a certain idea or project for a short time but later lost interest.	0	0	0	0	О
I am a hard worker.	0	0	0	0	О
I often set a goal but later choose to pursue a different one.	0	0	0	0	О
I have difficulty maintaining my focus on projects that take more than a few months to complete.	0	0	0	0	О
I finish whatever I begin.	0	0	0	0	О
I have achieved a goal that took years of work.	0	0	0	0	0
I become interested in new pursuits every few months.	0	0	0	0	0
I am diligent.	0	О	0	0	0

Thank you for completing this survey!

Appendix N: Supervisory Level Training Post-test Survey

Supervisor Survey: Post-Test

BEFORE you begin the survey, we want to give you some information about this survey by answering a couple of frequently asked questions:

Why am I taking this survey and how will my scores be used?

The purpose of this survey is to understand how students learned in the course. The survey is not graded, nor does it directly impact your ability to gain certifications or pass the training course. Instead, answers are used to help the instructors improve the course for future students. Therefore, PLEASE BE HONEST when answering the questions and we ask that you do not use the internet or other material to assist you in finding the "right" answers.

Can I use a calculator during the survey?

Yes, you can use a calculator to help you answer any questions on the survey.

Is there a time limit for taking the survey?

There is no time limit for taking the survey, but we expect it will take about 25 minutes.

Is completing the survey required for the training?

The survey is voluntary and you will not be penalized for not completing it. However, we would really appreciate it if you would complete the survey. The information we collect using the survey helps us better fit the course material to your needs as a student. Thanks you for completing the survey.

Do I have to enter any personal information on the survey?

At the bottom of this page, you will be required to enter your Student ID number, your date of birth, and the college you are attending. This information will be used to connect the survey answers to the group of students in your class.

Thank you for completing the survey and helping us fit the course material to your needs as a student!

To begin, provide the following information:

Today's Date: Student ID number: Your Date of Birth (mm/dd/yyyy): Select your college:

- O Miami Dada Callaga
- O Miami Dade College
- O Polk State College
- O Santa Fe College
- Seminole State College of Florida

- 1. Soil depletion, soil erosion, and urban heat islands are consequences of _____.
 - aquifer depletion
 - **O** biophilia
 - **O** deforestation
 - **O** embodied energy
- 2. An energy performance score of 75 or higher is required for which certification program?
 - Energy Star
 - **O** Green Globes
 - **O** Leadership in Energy and Environmental Design
 - Living Building Challenge
 - **O** National Green Building Standard
- 3. A parcel of land in an area that needs to be restored economically is referred to as a:
 - **O** blackfield
 - **O** brownfield
 - **O** grayfield
 - **O** greenfield
- 4. Certified, Silver, Gold and Platinum are levels for which certification program?
 - Energy Star
 - **O** Green Globes
 - **O** Leadership in Energy and Environmental Design
 - **O** Living Building Challenge
 - **O** National Green Building Standard
- 5. A parcel of land contaminated by previous industrial use is referred to as a:
 - **O** blackfield
 - **O** brownfield
 - **O** grayfield
 - O greenfield
- 6. A building with a HERS Index of 130 uses _____ than a building with a HERS Index of 65.
 - O less energy
 - O less water
 - more energy
 - more water
- 7. Desertification and aquifer depletion _____.
 - Cause soil and water pollution
 - increase ozone-depleting emissions
 - **O** increase embodied energy
 - **O** reduce potable water supplies

- 8. Graywater and potable water can use the same piping system.
 - O True
 - O False
- 9. A material's embodied energy is based on the following stages:
 - **O** product manufacturing and final installation
 - product manufacturing, transportation, and final installation
 - **O** raw material extraction, product manufacturing, and final installation
 - **O** raw material extraction, product manufacturing, transportation, and final installation
 - raw material extraction, product manufacturing, transportation, final installation, and final disposal

10. Which material has the most units of energy per unit weight?

- O concrete
- O masonry
- O steel
- O timber

11. Reducing a building's use of electricity by utilizing sunlight is an example of _____.

- **O** biomimicry
- distributional equity
- passive design
- **O** whole-building design
- 12. RFID and NFC are types of:
 - O barcodes
 - **O** building information modeling
 - tracking technologies
 - virtual design

13. A worker who misreads the drawings and cuts the studs too short is creating _____.

- O defect waste
- O inventory waste
- **O** motion waste
- **O** over-production waste
- **O** over-processing waste

14. *Figure 1* is an example of a _____.

ID	Task Name	Predecessors	Duration	Jul	23.	'06					Jul	30.	'06					Au	g 6	'06					Au	g 13	3, '0	6			-
				S	M	T	W	Т	F	S	S	M	T	W	Т	F	S	S	M	T	W	Т	F	S	S	M	T	W	Т	F	S
1	Start		0 days		-						1																				
2	a	1	4 days		1				հ																						
3	b	1	5.33 days			n fait	1		1				_	_	_																
4	c	2	5.17 days	1					Ū.							h															
5	d	2	6.33 days												No.								_			-					
6	e	3,4	5.17 days	1												Ľ		1.00													
7	f	5	4.5 days	1																						1					
8	9	6	5.17 days	1																			Ľ		Read.	64		1	100	h	
9	Finish	7,8	0 days																											۲	

Figure 1

- **O** clash analysis
- **O** Gantt chart
- **O** network diagram
- O value stream map
- work breakdown structure
- 15. A worker must take several steps to reach the rolls of insulation because a pallet was delivered and placed several feet away from the station; this creates _____.
 - defect waste
 - **O** inventory waste
 - O motion waste
 - **O** over-production waste
 - over-processing waste

16. *Figure 2* is an example of a _____.



Figure 2

- **O** clash analysis
- O Gantt chart
- network diagram
- **O** value stream map
- **O** work breakdown structure

Write the number on this line: _____

18. During a pocket penetrometer test, reading should be taken at _____ locations around the perimeter of the manufactured home.

Write the number on this line: _____

- 19. The minimum distance between the finished floor and the blades of a ceiling fan is
 - 6'-2" • 6'-4" • 6'-6" • 6'-8"
- 20. On a level site, what is the minimum distance (in inches) between the finished grade and the bottom of the chassis I-beam?

Write the number on this line: _____

21. When using a pocket penetrometer, HUD requires a minimum soil bearing capacity of _____ psf.

Write the number on this line: _____

22. Concrete block piers must be double blocked and interlocked when the total manufactured house load exceeds _____ lbs.

Write the number on this line: _____

23. Use *Figure 3* to answer the following questions:



Figure 3

- Dimension A must be at least _____ feet. Write the number on this line:
- ► Dimension B must be at least _____ feet. Write the number on this line:

Section 2 Directions: In this section, please select your level of agreement with each statement using this scale:

Strong	gly Disa	agree							St	rongly Agree
	1 	2	3	4	5	6	7	8	9	10
										Your Level of Agreement (1-10)
My past ex be able to p	perienc perform	es and well in	accomp 1 manuf	olishme actured	nts incr l constr	ease my uction e	confid ducation	ence th n.	at I will	
Manufactu	red con	structio	n educa	ation is	within	the scop	e of my	y abiliti	es.	
Successful within the s	ly comp scope o	oleting a f my ab	a manuf pilities.	factured	l constr	uction e	ducatio	n prog	am is	
Other peop	le that	know n	ne well	perceiv	e me as	s being a	capabl	e perso	n.	
My estimat accurate.	tes of h	ow wel	l I can c	leal wit	h a new	v situatio	on are u	sually	very	
I expect to manufactur	be able red con	to do t structio	hings th n educa	nat need ation pro-	l to be o ogram.	lone to s	success	fully co	omplete	a
If I take ma tasks, some all of them	anufacti e easy a	ured co nd som	nstruction e diffic	on cour ult, I w	rses wh ould pr	ich invo obably c	lved ma lo very	any diff well at	erent almost	
If I take a r be able to s	nanufac	ctured c fully co	onstruc mplete	tion co the cou	urse in Irse.	an unfai	niliar a	rea, I e	xpect to	
If I were as I didn't kno	sked to w muc	take a c h about	course in , I could	n an are d do we	ea of ma ell in the	anufactu e course	red con	structio	on whicl	h
If I were as I didn't kno	sked to w muc	take a c h about	ourse in , I could	n an are d succe	ea of ma ssfully	anufactu complet	red con e the co	structio ourse.	on whiel	h
I can gener courses.	ally do	the wo	rk neces	ssary to	accom	plish m	y goals	in educ	ation	
I am confid deal with to	lent tha	t I can or ration, t	do well using to	in man ols or b	ufactur ody to	ed const move ol	ruction bjects.	educat	ion that	

Strong	gly Disa	agree							Stro	ongly Agree
	1 	2 	3	4	5 	6	7 	8 	9 	10
										Your Level of Agreement
										(1-10)
I value mar	nufactu	red con	structio	on-relate	ed educ	ation.				
Manufactur	red con	structio	n educa	ation is	useful	for my c	levelop	ment.		
I will be ab education to	le to ap o a job	oply wh	at I hav	ve learn	ed in m	anufact	ured con	nstructio	on	
I am motiva education p	ated to program	learn th ns.	e skills	taught	in man	ufacture	ed const	ruction		
I would like	e to im	prove m	ny man	ufacture	ed const	ruction	-related	skills.		
I am willing prepare my	g to inv self for	vest effc r a manu	ort to in ufacture	nprove ed cons	my skill truction	ls and controls an	ompeter job.	ncies in	order t	0
Taking man	nufactu	ired con	structio	on educ	ation co	ourses is	a high	priority	for me	
I am willing construction	g to inv n-relate	vest effo ed skills	ort on n	ny perso	onal tim	e to dev	elop m	anufact	ured	

Directions: In this section, please select your level of agreement with each statement using this scale:

Directions: In this section, please select the response which best describes your feeling about each statement.

I will successfully complete this manufactured construction education course:

Extremel	y Unlil	kely						Likel	y	Extremely
1 C		2	3 •	4 O	5 O	6 0	7 O	8 0	9 0	10 O

I would make an effort to successfully complete a manufactured construction education program:

I Definitely W	'ill Not						Will		I Definitely	
1	2	3	4	5	6	7	8	9	10	
O	O	•	O	O	0	O	0	O	O	

I intend to successfully complete manufactured construction education:

Strongl	y Di	isagree)					Agree	e	Strongly	
1	l)	2 O	3 O	4 O	5 O	6 0	7 O	8 0	9 O	10 O	

For me to complete a manufactured construction education program is:

Extreme	ly Wor	thless						Valua	able	Extremely
	1	2	3	4	5	6	7	8	9	10
	O)	O	O	0	0	O)	0	O

<u>Section 4</u> Directions: Please respond to the following 12 items. Be honest – there are no right or wrong answers!

	Very much like me	Mostly like me	Somewhat like me	Not much like me	Not like me at all
I have overcome setbacks to conquer an important challenge.	0	0	0	0	0
New ideas and projects sometimes distract me from previous ones.	О	0	0	0	О
My interests change from year to year.	О	0	0	0	О
Setbacks don't discourage me.	0	0	0	0	О
I have been obsessed with a certain idea or project for a short time but later lost interest.	0	0	0	0	0
I am a hard worker.	0	0	0	0	О
I often set a goal but later choose to pursue a different one.	О	0	0	0	О
I have difficulty maintaining my focus on projects that take more than a few months to complete.	О	0	0	0	О
I finish whatever I begin.	0	0	0	0	О
I have achieved a goal that took years of work.	0	0	0	0	0
I become interested in new pursuits every few months.	0	0	0	0	0
I am diligent.	О	0	0	0	0

Thank you for completing this survey!

	Mia	ımi								
	Dade		Polk		Santa Fe		Seminole		Total	
Characteristic	п	%	n	%	n	%	n	%	п	%
Participants	151	20.7	192	26.3	244	33.5	142	19.5	729	100.0
Age (years)										
18-21	31	20.5	34	17.7	44	18.0	14	9.9	123	16.9
22-34	47	31.1	89	46.4	113	46.3	42	29.6	291	39.9
35-44	30	19.9	36	18.8	37	15.2	39	27.5	142	19.5
45-54	28	18.5	24	12.5	29	11.9	24	16.9	105	14.4
55-64	15	9.9	9	4.7	17	7.0	22	15.5	63	8.6
65+	0	0.0	0	0.0	4	1.6	1	0.7	5	0.7
Gender										
Female	30	21.9	27	14.5	49	21.6	29	21.6	135	19.7
Male	107	78.1	159	85.5	176	77.5	105	78.4	547	80.0
Ethnicity										
Non-Hispanic	46	35.4	121	73.8	193	87.7	97	75.8	457	71.2
Hispanic	84	64.6	43	26.2	27	12.3	31	24.2	185	28.8
Primary Race										
American Indian or Alaskan Native	1	1.0	1	0.8	6	2.9	2	1.7	10	1.8
Asian	1	1.0	0	0.0	8	3.8	4	3.5	13	2.3
Black or African American	42	40.4	47	35.3	91	43.5	60	52.2	240	42.8
More than one race	0	0.0	4	3.0	3	1.4	1	0.9	8	1.4
Native Hawaiian or Other Pacific Islander	1	1.0	2	1.5	2	1.0	0	0.0	5	0.9
White	59	56.7	79	59.4	99	47.4	48	41.7	285	50.8
Highest Level of Education										
Some High School Education	1	0.7	7	4.5	11	5.0	1	0.8	20	3.1
HS Diploma/GED	60	44.8	89	56.7	100	45.7	47	37.6	296	46.6
Currently Attending Schools	16	11.9	6	3.8	14	6.4	8	6.4	44	6.9
Post-Secondary Vocational/Skills Credential	2	1.5	11	7.0	8	3.7	9	7.2	30	4.7
Some College	16	11.9	27	17.2	39	17.8	31	24.8	113	17.8
AA/AS	16	11.9	9	5.7	24	11.0	12	9.6	61	9.6
BA/BS	16	11.9	4	2.5	17	7.8	13	10.4	50	7.9
Master's +	7	5.2	4	2.5	6	2.7	4	3.2	21	3.3

Appendix O: Demographic Characteristics of Participants by College

Note. All percentages are calculated based on number of valid cases.

Appendix P: Levels of	Construction an	d Manufacturing	Experience	by College $(n = 626)$)
11		C	, ,		

	Miami Dade		Polk		Santa Fe		Seminole		Total	
Type of Experience	n	%	n	%	n	%	n	%	n	%
Construction Management (CM) Experience										
None	59	72.0	117	64.3	191	81.3	94	76.4	461	74.1
More than none but less than 6 months	4	4.9	22	12.1	18	7.7	10	8.1	54	8.7
More than 6 months but less than 12 months	7	8.5	10	5.5	15	6.4	5	4.1	37	5.9
More than 12 months but less than 18 months	2	2.4	10	5.5	6	2.6	7	5.7	25	4.0
More than 18 months	10	12.2	23	12.6	5	2.1	7	5.7	45	7.2
Hands-On Construction (H-O) Experience										
None	50	61.0	51	28.0	159	67.7	77	62.1	337	54.1
More than none but less than 6 months	10	12.2	34	18.7	18	7.7	12	9.7	74	11.9
More than 6 months but less than 12 months	5	6.1	22	12.1	17	7.2	9	7.3	53	8.5
More than 12 months but less than 18 months	7	8.5	16	8.8	15	6.4	7	5.6	45	7.2
More than 18 months	10	12.2	59	32.4	26	11.1	19	15.3	114	18.3
Manufactured Construction (MC) Experience										
None	69	84.1	102	56.7	187	79.6	99	79.8	457	73.6
More than none but less than 6 months	5	6.1	27	15.0	21	8.9	9	7.3	62	10.0
More than 6 months but less than 12 months	1	1.2	13	7.2	14	6.0	6	4.8	34	5.5
More than 12 months but less than 18 months	1	1.2	10	5.6	6	2.6	3	2.4	20	3.2
More than 18 months	6	7.3	28	15.6	7	3.0	7	5.6	48	7.7
Manufacturing (MF) Experience										
None	65	79.3	80	44.0	172	72.9	84	67.7	401	64.3
More than none but less than 6 months	7	8.5	30	16.5	21	8.9	9	7.3	67	10.7
More than 6 months but less than 12 months	2	2.4	14	7.7	14	5.9	10	8.1	40	6.4
More than 12 months but less than 18 months	1	1.2	15	8.2	13	5.5	6	4.8	35	5.6
More than 18 months	7	8.5	43	23.6	16	6.8	15	12.1	81	13.0

Note. All percentages are calculated based on number of valid cases.