

**AMERICAN INSTITUTE OF CONSTRUCTORS**



**CERTIFIED PROFESSIONAL CONSTRUCTOR**

**LEVEL II – ADVANCED CONSTRUCTION APPLICATIONS**

***PREPARING FOR THE LEVEL II (CPC) EXAMINATION***

**AIC**

**Accelerating Constructor Excellence**

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The following study materials on the examination topics are suggested to assist in preparation for the CPC Level II - Advanced Construction Applications Examination. Candidates are encouraged to review these materials, as well as other related sources of information.

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## **CERTIFIED PROFESSIONAL CONSTRUCTOR EXAMINATION**

### **Examination Qualifications to Become a Certified Professional Constructor**

To qualify for Certified Professional Constructor, an individual must meet the qualifications and have passed or been exempted from the Level 1 - Construction Fundamentals and attain four (4) years of additional Acceptable Professional Experience beyond that required to sit for Level 1. Acceptable Professional Experience must include a minimum of two (2) years managing the execution of construction work. Working in a related profession having its own standards of professional performance such as, architecture, engineering design, inspection, land surveying or accounting, are not included as Professional Experience.

Specific information concerning the qualifications necessary to sit for the Level 1 Construction Fundamentals Examination can be found in the Certified Professional Constructor Candidate Handbook, published by the AIC Constructor Certification Commission. For the entire qualifications please refer to the CERTIFICATION EXAMINATIONS FOR LEVEL I – CERTIFIED ASSOCIATE CONSTRUCTOR AND LEVEL II – CERTIFIED PROFESSIONAL CONSTRUCTORS Handbook for Candidates. The Handbook can be accessed at [www.aic-builds.org](http://www.aic-builds.org).

### **Definition of a Certified Professional Constructor**

A professional practitioner of construction as defined by the AIC Constructor Certification Commission is an individual who possesses the skills and knowledge acquired by education and experience to manage the execution of all or a substantial portion of construction works. The practitioner is recognized by the construction industry as a "Constructor." The Constructor is an individual who commits to serve the construction industry in a professional and ethical manner and engages in the continued development of his/her skills and education to meet increasing industry challenges and changes. The profession of Constructor encompasses job titles such as, but not limited to, Project Manager, General Superintendent, Project Executive, Operations Manager, Construction Manager, Chief Executive Officer, etc.

### **Benefits of Certification**

Certification benefits all parties involved in the construction industry, including society at large. **Benefit to the Constructor include:**

- An internationally recognized certification of constructor skills and knowledge
- An analysis of individual strengths and weaknesses as determined by the examination process
- The professionalism of the Constructor to the public, the client and the employer
- A marketable credential to an employer, prospective employer or client
- A systematic plan of Continuing Professional Development for career advancement

### Benefits to the Employer include:

- An independent assessment of an employee's skills and knowledge based on high national standards
- A credentialing of professionals within the company that is marketable to clients
- Assurance that the employee will seek to upgrade professional competencies through the required Continuing Professional Development program

### Objectives of the Certified Professional Constructor Examination

The Level II Advanced Construction Applications Examination is designed to test your ability to apply recognized principles and use your professional work experience to solve constructor problems, evaluate information and predict the outcome. This examination consists of analysis and problem solving multiple choice questions. This examination requires a greater depth of knowledge than is required in the Construction Fundamentals Examination.

### Organization of the Level II (CPC) Examination

The Level II examination is an on-line examination composed of 175 multiple-choice questions for a total testing time of four (4) hours. The questions for the examination are obtained from individuals with extensive expertise in construction that hold the Certified Professional Constructor (CPC) designation. These questions are reviewed for construction accuracy by the AIC Constructor Certification Commission – Exam Committee.

### Content Overview - Level II (CPC) Examination

The CPC Level II - Advanced Construction Applications Examination is divided into nine major subject areas or content areas to evaluate your applications, analysis and evaluation abilities. The number of questions in each content area is determined from data derived from validation studies on relative frequency of use and importance of the skills tested. The major descriptors for each of the nine content areas for the Level II (CPC) Examination is shown in the following table:

LEVEL 2 ADVANCED CONSTRUCTION APPLICATIONS EXAMINATION	
Content Overview- Level II (CPC) Examination	
Content Area	
I.	PROJECT SCOPE DEVELOPMENT
II.	EMPLOYMENT PRACTICES
III.	WORKING RELATIONSHIPS
IV.	CONSTRUCTION START-UP AND SUPPORT
V.	CONSTRUCTION RESOURCE MANAGEMENT
VI.	CONSTRUCTION COST CONTROL
VII.	PROJECT CLOSEOUT
VIII.	CONSTRUCTION SAFETY MANAGEMENT
IX.	ETHICS
X.	CONTRACT INTERPRETATIONS APPLIED TO A SET OF DOCUMENTS

Note: Section X Contract Interpretation tests the candidates knowledge of the nine content areas.

For the most recent area percentages and a breakdown of the major subject categories please refer to the CERTIFICATION EXAMINATIONS FOR LEVEL I – CERTIFIED ASSOCIATE CONSTRUCTOR AND LEVEL II – CERTIFIED PROFESSIONAL CONSTRUCTORS Handbook for Candidates. The Handbook can be accessed at [www.aic-builds.org](http://www.aic-builds.org).

### **Subcategories Content Outline – Level II (CPC) Examination**

The nine areas of the examination specifications have been further broken down into their component parts to clarify the level of understanding expected. The following information provides the name of each content area, a written description of the focus for each content, a detailed outline of the subcategories in an outline format using key words.

#### **I. PROJECT SCOPE DEVELOPMENT**

This section focuses on the Professional Constructors numerous roles as a project participant during the initial development of the project. It is now routine for owners to require professional constructors to participate from the onset of the project to solve increasingly complex construction problems. In many cases, the professional constructor's firm is the leader of the project, and project professional, from concept to occupancy. Professional Constructors are thereby being required to take on new leadership roles for the entire project.

- A. Project Participants Roles
- B. Conceptual Estimating
- C. Budget Monitoring
- D. Design Schedule
- E. Design Review/Recommendation Process
- F. Cost Analysis Design Phases
- G. Site Analysis
- H. Bid Scope Development
- I. Bid Document Development
- J. Bid Analysis and Selection/Recommendations
- K. Construction Contracts and Construction Schedule

## **II. EMPLOYMENT PRACTICES**

This section concentrates on the ability to establish personnel requirements, implement policies and procedures, determine job descriptions, analyze EEOC and ADA requirements, interpret government regulations, write and enforce procedures and communicate requirements to subcontractors and vendors.

- A. Employment Law
- B. Discrimination Law
- C. Management Responsibilities
- D. Construction Labor Law

## **III. WORKING RELATIONSHIPS**

This section is concerned with the ability to develop effective team building skills, assess team strengths and weakness, identify risk areas, resolve conflicts, minimize risks, review, update and improve team effectiveness, train and educate team, analyze performance problems, discuss performance, solve problems, conduct effective meetings and resolve differences.

- A. Team building Skills
- B. Presentation and Facilitation Skills
- C. Problem Solving and Negotiation Skills

## **IV. CONSTRUCTION START-UP and SUPPORT**

This section centers on the ability to determine and analyze all procedural and documentation requirements for the project including field office procedures, material receiving, quality control systems and submittal requirements.

- A. Project Site Set-up
- B. Site Procedures

## **V. CONSTRUCTION RESOURCE MANAGEMENT**

This section is concerned with the ability to monitor and control shop drawings, determine compliance with progress schedules, maintain ongoing project records, evaluate the effect of change orders, monitor and control materials, subcontractors, tools, equipment and evaluate performance of site personnel.

- A. Project Progress
- B. Material Control
- C. Subcontractor Control
- D. Tools and Equipment Control
- E. Personnel Control

## **VI. CONSTRUCTION COST CONTROL**

This section focuses on the ability to compare expenditures and budget, evaluate the cost breakdown structure, allocate costs, determine progress, project cost overruns and cost savings, document contract change orders, interpret the contract provisions, calculate payroll burden, calculate the time-value of money, forecast overhead, evaluate financial statements, determine the rights and responsibilities of each party, develop graphs, analyze the project using statistical measurements, prepare progress payment schedules, and evaluate subcontractors and vendors progress payment schedules, forecast project resources, analyze cash flow, compare actual to budgeted, calculate profit margins, manage the risk, control equipment use, and assess personnel allocation

- A. Cost Comparison and Forecasting
- B. Changes and Claims Impact
- C. Change Documentation
- D. Progress Payment Submittal
- E. Financial Statements

## **VII. PROJECT CLOSEOUT**

This section centers on the ability to create punch lists, finalize inspections, determine claims, analyze claims, resolve claims, demobilize the site, determine final draw and implement effective closeout procedures.

- A. Closeout Process
- B. Claims Closeout Procedures
- C. Documentation Turnover
- D. Final Payment Procedures

## **VIII. CONSTRUCTION SAFETY MANAGEMENT**

This section concentrates on the ability to interpret federal, state, and local safety and health legislation, establish effective safety processes, incorporate safety into the planning process, analyze workers' compensation records, calculate workers' compensation rates and experience modifiers, evaluate jobsite safety using established statistical methods, analyze safety orientation program and evaluate pre-task planning activities.

- A. Risk Assessment
- B. Workers Compensation Costs and Liability
- C. Safety Process and Culture
- D. Safety Procedures Interpretation

## **IX. ETHICS**

This section focuses on the ability to identify deceptive practices, analyze breach of confidentiality and define code of conduct of the constructor and their relationships with clients, engineers, architects, vendors, subcontractors, general public and employees.

- A. Business Ethics
- B. Professional Practice Ethics

## **X. CONTRACT INTERPRETATIONS APPLIED TO A SET OF DOCUMENTS**

This 4 hour portion of the exam tests the candidate's ability to apply knowledge from the nine content areas of the body of knowledge and apply it to a set of construction documents .



## Examination Preparation And Test-Taking Strategies

### How to Prepare for the Examination

Familiarize yourself with the examination process

Determine how long the examination will be and what kinds of questions will be on it. Ask which concepts are most important, which content to focus on, and what you will have to do on the examination. Your aim is to determine both the content of the questions and the type of memory and intellectual skills you will be asked to use. These skills include the following.

- A. Comparing, contrasting, and otherwise interpreting meaning in the information.
- B. Applying principles and theories to solve problems  
(These may not have been covered explicitly in the materials)
- C. Predicting possible outcomes given a set of variables
- D. Evaluating the usefulness of certain ideas, concepts, or methods for a given event
- Establish an overall study schedule to review all the work to be done  
On the basis of your familiarity with the examination content, make a list of all the tasks you must complete to prepare for it. Given what topics you expect to be most important on the test, set priorities among your study tasks and plan to do the most important ones first. In scheduling your test preparation work, maintain your own routines.

### Months Prior to the Examination

- Familiarize yourself with the examination content areas.
- Identify your strengths and weakness in each content area of the examination.
- Study each content even if it is a strength to recognize other approaches to the content.
- Acquaint yourself with the examination process. This is a two part 4-hour, online, examination.

### Certified Professional Constructor Material Mastery

The Certified Professional Constructor Level II - Advanced Construction Applications Examination is designed to test the candidate's ability to apply recognized principles and use their professional work experience to analyze and solve construction problems. This examination is designed to make you think independently - do not count on recognizing the correct answer. Instead, prepare yourself for a high level of critical thinking which requires you to make a fine discrimination to determine the "best answer." In other words, they are all correct answers. One is just the best answer for the situation encountered.

You know you have mastered the information if you can complete the following tasks:

- Distinguish and categorize the ways in which facts, concepts, principles, procedures or other observations differ from each other
- Answer the questions and solve the problems in the reference material
- Create your own questions
- Evaluate specific situations and identify the ideas, concepts, principles or procedures
- Predict the best possible outcome given a set of correct options

### **The Day Before the Examination - Relieving the Anxiety**

- Set out all necessary materials to bring with you to the test center (your letter, photo identification, a calculator with fresh batteries, your watch, a snack, some water, and of course, plenty of extra number 2 pencils). The use of a calculator with trigonometry functions is permitted as long as it is non-printing, non-programmable, and it does not have an alpha keyboard
- Make sure you have arranged a ride to the testing center and know where the center is
- Eat a good meal prior to the examination, exercise to reduce tension and stimulate thinking and take a shower to help you relax
- Allow enough time to arrive at the designated location without hurrying
- Provide yourself with time in the classroom to relax and compose yourself

### **The Day of the Examination**

- Bring all necessary materials with you to the test center (your letter, photo identification, a calculator with fresh batteries, your watch, a snack, some water, and of course, plenty of extra number 2 pencils). The use of a calculator with trigonometry functions is permitted as long as it is non-printing, non-programmable, and it does not have an alpha keyboard.
- Eat a good breakfast.
- Arrive early so you can have enough time to compose yourself.  
If you're early, don't discuss the test with other candidates. Their concerns and worries will increase any anxieties you might have.  
  
If you're late, you may miss important verbal directions. Arriving late also makes you feel anxious. If so, take a minute to relax and organize your thoughts.
- Reference your notes directly next to the test question number in the booklet. Find the formula page(s) provided in the booklet.

- Preview the entire examination. Estimate the amount of time to spend on each item.
- Read all directions slowly and carefully. Many candidates ignore the directions. However, directions often state information you need to receive full credit. They also provide information about the way answers should be marked on the Scantron sheet.  
Underline key terms and steps in directions and in the test item.
- Answer the easiest questions first. This builds your confidence and triggers your memory.
- Answer every question, even with a best guess as you go.
- Change answers ONLY if you are sure they are wrong.
- Work at your own pace. Don't be concerned about others. They may be just guessing.
- If time permits, review all of your answers. Verify that you marked all responses.

### **During the Examination**

- Maximize your chances of passing the examination by maximizing your effort. Don't spend too much time on one question. If you don't know the answer to a question, mark it, go on to the next question, and return to those difficult questions if time permits.
- If a question is presented in a context you are unfamiliar with, do not assume that you cannot answer the question due to its context. The application problem presented in the question will probably be applicable to all types of projects. For example, if the question focuses on a problem at a hospital, and you have never done a hospital project, DO NOT PASS OVER the questions.
- Fill out the answer sheet carefully and keep track of where you are in the test at all times.
- Don't spend too much time on one question.
- Guess wisely, eliminate choices.
- Try to relax and keep things in perspective.
- You are allowed to leave the room and go to the bathroom with a pass. Only one person is allowed out of the room at a time and they will be monitored.

## Multiple-Choice Test Questions

The Level 2 - Advanced Construction Applications Examination consists of test questions in the multiple-choice format. Most of these questions were designed to test your ability to solve construction-related problems, predict outcomes, or evaluate complex situations and select the “best answer” response. Our test item development process utilized the following definitions of the terms provided below. Multiple-choice test questions consist of 2 parts. They are the Stem and the Response Options.

- The **stem** is the statement or question.
- The **responses** are the four choices or options for each stem.  
These are also known as the distractors or plausible distractors.  
The correct response is considered the plausible answer.

## Question Strategies - Selection of the Best Response

The multiple-choice questions are used to test your ability to solve problems, analyze and synthesize information. Therefore, some helpful hints are provided below:

- Read the stem as if it were an independent, free standing statement. Anticipate the phrase that would complete the thought expressed, then evaluate *each* answer choice against your anticipated answer. It is important that you read each option, even if the first choice matches the answer you anticipated,. There may be a *more plausible or better* response.
- Read the stem together with each answer choice as if it were a true-false statement. If the answer makes the statement a false one, cross it out. Mark the choices that complete the stem as true. Suspend judgment about the true choices until you have read all the options.
- Beware of words like *not, but, except*. Mark these words because they specify the direction and limits of the answer.
- Watch out for words like *always, never, and only* . These must be interpreted as meaning all of the time, not just 99% of the time. These options are frequently incorrect because there are few statements that have no exceptions.
- If there are two or more options that could be the correct answer, compare them to each other to determine the differences between them. Then, relate these differences with the stem to deduce which of the responses is the best response or the most complete.
- Make an educated guess by eliminating the options that you know are incorrect.
- Test questions which ask for the best answer requires you to make a fine discrimination. The best approach if you don’t know the answer is to apply the following strategies:
  - A. Examine the responses for partially false statements
  - B. Consider the responses which are more general and eliminate
  - C. Look for statements which are false or impossible

## Strategies For the 4 - Hour Project Document Search & Interpretation Session Searching and Interpreting the Construction Documents.

The Professional Constructor is an individual who possesses the skills and knowledge acquired by education and experience to manage and execute all or a substantial portion of the construction process. Therefore, it is imperative that the Constructor has a solid understanding of the legal ramifications and risk associated with specific clauses within the numerous documents provided.

This section on searching and interpreting the construction documents does not appear in a specific section of the test specifications because the test specifications are content specific and this section includes test items from numerous subject areas of the test specifications. However, the professional Constructor must be able to understand the basic rules for interpreting the contract if a conflict arises between two clauses and which one rules in specific instances. Also, a Constructor must be able to determine the ramifications to the Contractor if certain clauses are omitted or not discussed. Finally, the Constructor must be able to determine the amount of risk involved due to certain disclaimer clauses.

### Strategies for Selecting the Best Response from a Set of Project Documents

These multiple-choice questions are used to test your ability to search the numerous documents and extrapolate the correct answer based upon the court's established contract interpretation principles or rules. This portion of the examination requires you to identify contradictions, errors or omissions and solve the problems based upon the application of general construction contract interpretation principles. Therefore, some helpful hints are provided below:

- Verify that the Practice Search Activity Documents are Present

BLUE LAKE TOWNSHIP OFFICE BUILDING Cover and Project Manual Arrangement	
Specification Index	i, ii
Drawing Index	DI 1 - 2
Addenda	ADM - 1
Bid Breakdown Form	ADM - 2
Instruction to Bidders	ITB 1 - 4
Information Available to Bidders - Report of Soil Investigation	IAB 1 - 28
Bid Proposal Form	BPF 1 - 2
Architectural Bid Supplements	ABS 1 - 8
Non-Collusive Affidavit	NCA 1 - 2
Prevailing Wage Rate Forms	PWF 1 - 4
Agreement between Owner and Contractor	AGM 1 - 4
Application & Certificate for Payment with Continuation Sheets	PMF 1 - 6
General Conditions	GC - 1
Supplementary Conditions	SC 1 - 11

<b>DIVISION 01</b>	<b>GENERAL REQUIREMENTS</b>	
01010	Summary of Work	01010-1
01011	Summary of Project	01011-1
01020	Allowances	01020-1
01025	Measurement and Payment	01025-1
01030	Alternates	01030-1
01035	Modification Procedures	01035-1
01400	Quality Control	01400-1
01500	Construction Facilities and Temporary Controls	01500-1
01600	Material and Equipment	01600-1
01655	Starting of Systems	01655-1
01700	Contract Closeout	01700-1

- Prepare yourself for a high level of critical thinking which requires you to make a fine discrimination to determine the correct answer based upon this set of documents
- Establish a system for finding the table of contents for each document
- Mark or identify the specific references to a particular clause you are trying to find
- Determine the order of precedence principle and read the highest priority document first
- Next to each test question, identify the name of the document, the name of the documents and the article number or the division section number, the title of the article or description, and possibly the page number.
- Apply one of the general contract interpretation principles such as the Supplementary General Conditions take precedence over the Preprinted Standardized General Conditions because the Supplementary General Conditions are written for a specific project. It should be understood that if both Supplementary General Conditions and the General Conditions are both written for a specific project, then the Order of Precedence clause establishes the order
- Assume that all documents are enforceable and do not READ into the test question
- Review the rules for omitted clauses such as the soil report, liquidated damages, or claims
- Review the rules if a conflict exists between the specifications, plans, and plan notes
- Before deciding on the best or correct answer decide if any conflict exists between the various documents

## EXAMPLE

Assume that you are using the Southwest Barry County Wastewater Treatment documents which contains the Engineers Joint Contract Documents (EJCDC) General Conditions 1910-8 1990 edition.

Question #22 asks what is the warranty period?

The solution is found in the Supplementary General Conditions, article #3.5 called Warranty, and it is found on page SGC-4.

Also, with in the documents warranty submittal procedures are found in the General Requirements (01) number 01800 - 1.08 Warranties, and it is found on page 01800 -3.

Based upon finding this clause in several locations, the correct answer is based upon one of the general interpretation principles, such as the most stringent rules, or the order of precedence clause also known as a Rank Order clause state the order of document interpretation.

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**LEVEL II – ADVANCED CONSTRUCTION APPLICATIONS**

**EXERCISES**

**AIC**

**Accelerating Constructor Excellence**



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## Table of Contents

<b>I.</b>	<b>PROJECT SCOPE DEVELOPMENT.....</b>	<b>1</b>
	Delivery Methods and Types of Contracts Exercise.....	1
	Conceptual Estimating Model & Assemblies Exercise.....	4
	Bid Scope, Document Development and Analysis Exercise.....	17
	Design Schedule and Cost Exercise .....	26
<b>II.</b>	<b>EMPLOYMENT PRACTICES.....</b>	<b>32</b>
	Employment Laws and Discrimination Exercise.....	32
<b>III.</b>	<b>WORKING RELATIONSHIPS.....</b>	<b>39</b>
	Leadership Exercise .....	39
	Coaching Process Exercise.....	43
	Communication Exercise .....	47
	Meeting Leadership Exercise .....	54
<b>IV.</b>	<b>CONSTRUCTION START-UP and SUPPORT.....</b>	<b>57</b>
	Contract Documents Exercise .....	57
	Site Layout Exercise.....	60
<b>V.</b>	<b>CONSTRUCTION RESOURCE MANAGEMENT.....</b>	<b>61</b>
	Work Improvement Exercise .....	69
	Project Documentation Exercise .....	55
	Supplier and Vendor Agreements Exercise.....	73
	Sub Coordination Exercise.....	76
	Sub Proposal and Agreement Exercise.....	78
	Wood Sheet Piling Material and Unit Cost Exercise .....	83
	Equipment Production and Unit Cost Exercise.....	86
<b>VI.</b>	<b>CONSTRUCTION COST CONTROL .....</b>	<b>.97</b>
	Cost Reports Exercise .....	97
	Financial Analysis Exercise.....	106
	Changes Exercise .....	111
	Claims Exercise.....	114
<b>VII.</b>	<b>PROJECT CLOSEOUT.....</b>	<b>121</b>
	Project Closeout Exercise.....	121

VIII.	<b>CONSTRUCTION SAFETY MANAGEMENT</b> .....	<b>124</b>
	Construction Safety Management Exercise .....	124
	Excavation Competent Person Exercise.....	133
	Soil Classification Exercise.....	136
	OSHA Visual and Manual Soil Observation Exercise.....	140
	OSHA Excavation Trench Failure Exercise.....	143
VIII.	<b>ETHICS</b> .....	<b>149</b>
	Constructor Ethics Exercise .....	149
X.	<b>CONTRACT INTERPRETATION PRINCIPLES</b> .....	<b>153</b>
	Document Search Exercise.....	153

## I. PROJECT SCOPE DEVELOPMENT

### Delivery Methods and Types of Contracts Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer**

1. The Owner wants to fast-track a construction project. Which project delivery system best supports this process?
  - A. Partnering
  - B. Design- Bid-Build
  - C. Construction Management
  - D. Design-Build
2. A clause in the contract states that "if the Quantities of an item of work varies from the estimated quantities by more than 20 percent, then the price will be adjusted." Which type of contract will this clause be primarily used in?
  - A. Cost Plus
  - B. Unit Price
  - C. Fixed Price
  - D. Turnkey
3. A contract has been entered into whereby the Contractor agrees to design, build, purchase the land and finance the project. What is this type of contract called?
  - A. Cost Plus
  - B. Turn Key
  - C. Unit Price
  - D. Fixed Price
4. A contract is entered into whereby the design and scope are undefined and the Owner agrees to pay for all direct labor, materials, equipment plus some agreed upon fee to the Contractor for their services. What is this type of contract called?
  - A. Cost Plus
  - B. Turn Key
  - C. Unit Price
  - D. Lump Sum
5. A contract is entered into whereby the bid quantities are stated and payment for the work is based upon the actual quantities placed. What is this type of contract called?
  - A. Cost Plus
  - B. Fixed Price
  - C. Unit Price
  - D. Fixed Price

## Delivery Methods and Types of Contracts Exercise (continued)

6. A contract is entered into whereby the Design and Scope are partially undefined, the Owner holds a contract with the A/E, the Owner holds the contracts with each trade and the Owner also holds a contract with a management service company to perform the trade coordination, cost control and scheduling services. What is this project delivery called?
  - A. Partnering
  - B. Joint Venture
  - C. Design-Build
  - D. Construction Management
  
7. What are the two FEE methods that an Agency CM firm may offer an Owner?
  - A. Incentive or Target
  - B. Unit Price or Alternate Prices
  - C. Fixed Price or Guaranteed Maximum Price
  - D. Cost-Plus a Percentage or Cost-Plus Fixed Price
  
8. Which of the following contract formation principles are needed to form a valid contract?
  - A. Offer, Acceptance, Meeting of the Minds and Consideration
  - B. Performance, Technical Specifications and Consideration
  - C. General Conditions, Supplementary Conditions and a Proposal
  - D. Plans, Technical Specifications, General and Supplementary Conditions
  
9. The owner requests that you submit a proposal supplement titled "Statement of Contractors' Qualifications - All Contracts" and under the officers/principals section it requests the names and titles of the vice president and the president. A proposal is submitted to the Owner with a bid bond, signed addenda, and the proposal form is attached and signed by the chief estimator. Have all of the contract formation principles been satisfied and would the proposal be considered responsive?
  - A. The principle of Consideration has been met, therefore, responsive bid
  - B. The principle of Legal Capacity has been met, therefore, responsive bid
  - C. The principle of the meeting of the minds has been met, therefore, responsive bid
  - D. The principle of Legal Capacity has not been met, therefore, a non-responsive bid
  
10. Which type of contract has low Owner involvement and high Contractor risk?
  - A. Cost Plus
  - B. Turn Key
  - C. Unit Price
  - D. Lump Sum

## **Delivery Methods and Types of Contracts Exercise Solutions**

1. D
2. B
3. B
4. A
5. C
6. D
7. C
8. A
9. D
10. D

## Conceptual Estimating Model & Assemblies Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer**

1. What is the name of the conceptual estimating classification system?
  - A. UniFormat
  - B. Page Format
  - C. MasterFormat
  - D. Section Format
2. How does the conceptual estimating system organize information?
  - A. Divisions and levels
  - B. Systems and assemblies
  - C. Products or methods
  - D. Work results or construction practices
3. What stages of the project is the conceptual estimating system used for?
  - A. Construction and project closeout
  - B. Schematic design and design development
  - C. Facility management and decommissioning
  - D. Construction documents and bidding documents
4. How many categories are in the conceptual estimating classification system?
  - A. 9
  - B. 16
  - C. 31
  - D. 49
5. How are the conceptual estimating categories identified?
  - A. Numbers
  - B. Capital letters
  - C. Roman numerals
  - D. Written out numbers

**Conceptual Estimating Model & Assemblies Exercise (continued)**

6. What is the descriptor for the level 1 category A of the UniFormat classification system?
  - A. Shell
  - B. Interiors
  - C. Services
  - D. Substructure
7. What is the descriptor for the level 1 category B of the UniFormat classification system?
  - A. Shell
  - B. General
  - C. Building Sitework
  - D. Equipment and Furnishings
8. What is the descriptor for the level 1 category D of the UniFormat classification system?
  - A. Services
  - B. Interiors
  - C. Special Construction
  - D. Equipment and Furnishings
9. What types of systems are under level 1 category D?
  - A. Doors, windows, drywall and painting
  - B. Structural steel, concrete, masonry and roofing
  - C. Mechanical, electrical, fire protection and electrical
  - D. Site utilities for plumbing, mechanical and electrical
10. What types of conceptual estimates utilize the UniFormat classification system?
  - A. Range and Parameter estimates
  - B. Unit price and the Budget estimates
  - C. Square Foot Model and Assemblies estimates
  - D. Square Foot/Cubic Foot and the Detailed cost estimates
11. Which conceptual estimating method provides the most accurate estimate?
  - A. Range
  - B. Assemblies
  - C. Square Foot Model
  - D. Square Foot/Cubic Foot



**Conceptual Estimating Model & Assemblies Exercise (continued)**

Questions 12 through 17

Using the SF Model number M.570 UniFormat page, described as a School, High, 2-3 Story attached.

Answer the following questions:

12. What is the model's gross square foot?
- A. 81,250
  - B. 130,000
  - C. 150,000
  - D. 162,500
13. How many stories for the model?
- A. 1
  - B. 2
  - C. 3
  - D. 4
14. What is the Story height for the model?
- A. 10' - 4"
  - B. 11' - 4"
  - C. 12' - 0"
  - D. 17' - 0"
15. What are the Sub-Total and the Total Building Cost amounts and the in cost per SF?
- A. 52.75 and 68.90
  - B. 56.28 and 69.25
16. What costs per SF are included in the difference between the Sub-total and the Total?
- A. General Conditions (O&P) and Architect Fee
  - B. Contractors Fee (General Requirements; O&P) and Architect Fee
17. Which level 1 system category is not included in any of the models?
- A. B. Shell
  - B. C. Interiors
  - C. D. Services
  - D. G. Building Sitework

**Conceptual Estimating Model & Assemblies Exercise (continued)**

Questions 18 through 39

Using the Square Foot Model Tables, number M.570 described as a School, High, 2-3 Story attached.  
Answer the following questions:

18. What is the shaded amount for the model in cost per square foot?
- A. 64.70
  - B. 66.30
  - C. 68.90
  - D. 69.25
19. Using the shaded column, what is the square foot (SF) area for the model?
- A. 70,000
  - B. 130,000
  - C. 150,000
  - D. 162,500
20. Using the shaded column, what is the lineal foot (LF) perimeter for the model?
- A. 1083
  - B. 1290
  - C. 1433
  - D. 1450
21. Using the shaded column, what is the Perimeter Adjustment (+ or -) and the unit of measure for the model?
- A. .55 per 100 LF
  - B. .55 per 1 Foot
  - C. .65 per 100 LF
  - D. .65 per 1 Foot
22. Using the shaded column, what is the Story Height Adjustment (+ or -) and the unit of measure for the model?
- A. .55 per 100 LF
  - B. .55 per 1 Foot
  - C. .65 per 100 LF
  - D. .65 per 1 Foot

**Conceptual Estimating Model & Assemblies Exercise (continued)**

Question 23 - 39 Using the Square Foot Model Tables, number M.570 described as a School, High, 2-3 Story attached. The proposed building has the following criteria:

Proposed Building: 2- Story Senior High School in Battle Creek, MI49001

Exterior Wall: Decorative Concrete Block Frame:  
Reinforced Concrete Frame

Ground Floor Area:  $250 \times 325 = 81,250$  Square Feet

Gross Floor Area (Excludes Basement):  $2 \times 81,250 = 162,500$  Square Feet

Story Height 17 feet

Perimeter: 1150 Lineal Feet Basement Area:

32,500 Square Feet

Additives: 1- 2500# capacity Elevator  
8 - Emergency Lights Nickel Cadmium 1 - 50  
Room Clock System

23. What is the base cost per square foot for the 2-story high school with an Exterior wall of Decorative Concrete and a Reinforced Concrete (RC) using the closest model SF?
- A. 63.45
  - B. 66.65
  - C. 67.55
  - D. 69.25
24. What is the perimeter adjustment in (+ or -) lineal feet for the proposed high school?
- A. -140
  - B. +283
  - C. -283
  - D. -300
25. What is the perimeter adjustment to the total base cost (+ or -) in \$ per SF?
- A. +1.42
  - B. -1.42
  - C. +1.56
  - D. -141.50

**Conceptual Estimating Model & Assemblies Exercise (continued)**

26. What is the story height adjustment in (+ or -) feet for the proposed high school?
- A. 0
  - B. +1
  - C. -5
  - D. +5
27. What is the story height adjustment to the total base cost (+ or -) in \$ per SF?
- A. +0.50
  - B. -0.55
  - C. +2.50
  - D. -2.50
28. Assume that the base cost per square foot is \$87.80/SF, the story height adjustment is +2.75/SF, and the perimeter adjustment is -1.56/SF. What is the total adjusted cost per square foot?
- A. 83.49
  - B. 87.80
  - C. 88.99
  - D. 92.11
29. Using an adjusted base cost of \$75.00/SF, what is the total adjusted base cost for the proposed high school?
- A. 6,093,750
  - B. 10,830,625
  - C. 12,187,500
  - D. 14,460,875
30. What is the total cost of the high school basement?
- A. 557,375
  - B. 2,166,125
  - C. 13,934,375
  - D. 27,868,750

**Conceptual Estimating Model & Assemblies Exercise (continued)**

31. What is the total cost of the common additives for the high school?
- A. 39,400
  - B. 49,800
  - C. 51,440
  - D. 68,800
32. Using the SF Model UniFormat page for the high school attached. What is the level 1 and level 2 number for the basement walls, 4 foot high foundation?
- A. A Substructure 1010
  - B. A Substructure 2010
  - C. A Substructure 2020
  - D. B Shell 1010
33. Using the SF Model UniFormat page for the high school attached. What is the model cost per SF for the 4-foot-high basement wall?
- A. 0.41
  - B. 0.45
  - C. 0.61
  - D. 61
34. Using the SF Model UniFormat page for the high school attached. What is the model unit cost in dollars and cents and the unit of measure for the 4-foot high basement wall?
- A. 0.82 per SF Ground
  - B. 0.91 per SF Ground
  - C. 2.73 per SF Slab
  - D. 61 per LF Wall
35. Using the SF Model, Cost per Square Foot page attached the shaded column. How many lineal feet (LF) of perimeter for the Model high school?
- A. 1150
  - B. 1290
  - C. 1300
  - D. 1433

**Conceptual Estimating Model & Assemblies Exercise (continued)**

36. What is the total cost of the 4-foot-high basement wall for the high school model?
- A. 874
  - B. 78,690
  - C. 87,413
  - D. 99,125
37. Using the UniFormat detailed page and the Assemblies Cost Data Table A 20, Basements and instead of the high school's Model 4-foot-high foundation wall, the proposed high school has a 14-foot-high poured concrete foundation wall that is 16 inches thick and the walls are poured using a crane and bucket. What is the total cost of the substitute foundation wall based upon the model?
- A. 288,650
  - B. 318,630
  - C. 323,790
  - D. 353,951
38. Assume that the total cost of the substitute 14-foot high poured concrete wall is \$300,000. Using the UniFormat detailed page for the high school, what is the Cost per SF for the substitute wall, which will be compared to the 4-foot-high model wall?
- A. 1.76
  - B. 1.85
  - C. 2.00
  - D. 2.31
39. Assume that the substitute 14-foot-high wall cost \$1.82 per SF. Using the UniFormat detailed page for the high school model and the cost per SF for the 4-foot-high foundation wall. What is the increase or decrease in the models cost per SF?
- A. +1.21
  - B. -1.21
  - C. 59.18
  - D. 62.82

## Conceptual Estimating Model & Assemblies Exercise (continued)

COMMERCIAL/ INDUSTRIAL/INSTITUTIONAL			M.570		School, High, 2-3 Story		
Square Foot Model - School, High, 2-3 Story							
Exterior Wall	S.F. Area	70,000	90,000	110,000	130,000	150,000	170,000
	L.F. Perimeter	1083	1100	1300	1290	1450	1433
Face Brick with Concrete Block Backup	Steel Frame	71.85	68.75	68.05	66.30	65.90	64.80
	R/Conc. Frame	74.60	71.60	70.95	69.25	68.90	67.80
Decorative Concrete Block	Steel Frame	69.30	66.70	66.15	64.70	64.40	63.45
	R/Conc. Frame	72.50	69.90	69.35	67.85	67.55	66.65
Precast Concrete Panels	Steel Frame	75.30	71.50	70.75	68.55	68.15	66.75
	R/Conc. Frame	78.90	75.05	74.35	72.15	71.75	70.30
Perimeter Adj., Add or Deduct	Per 100 L.F.	1.10	.85	.75	.65	.55	.50
Story Hgt.Adj., Add or Deduct	Per 1 ft.	.85	.65	.65	.55	.55	.50
For Basement, add \$17.15 per square foot of basement area							

Square Foot Model - Common Additives					
Description	Unit	\$ Cost	Description	Unit	\$ Cost
			Closed Circuit Surveillance, 1station		
Clock System			Camera and monitor	Each	1525
20 Room	Each	10,400	Additional cameras, add	Each	820
50 Room	Each	25,000	Elevators, Hydr passenger, 2 stops		
Kitchen Equipment			1500# capacity	Each	38,200
Broiler	Each	2800	2500# capacity	Each	39,400
Cooler, 6 ft long, reach-in	Each	2525	Additional stop, add	Each	6550
Dishwasher, 10-12 racks /hr	Each	2375	Emergency Lighting, 25watt battery		
Food warmer, counter, 1.2 KW	Each	660	Lead battery	Each	355
Freezer, 44 CF reach-in	Each	6125	Nickel cadmium	Each	550

## Conceptual Estimating Model & Assemblies Exercise (continued)

COMMERCIAL/ INDUSTRIAL/INSTITUTIONAL			M.570	School, High, 2-3 Story		
Model costs calculated for a 2- story building with 12'-0" story height and 130,000 square feet of floor area			UNIT	UNIT COST	COST PER S.F.	% OF SUB-TOT
A. SUBSTRUCTURE						
1010	Standard Foundations	Poured concrete, strip footings, 4' fdn wall	SF Ground	.91	.45	5.0%
1030	Slab on Grade	4" reinforced conc, barrier, granular base	SF Slab	2.73	1.37	
2010	Basement Excavation	Site prep for slab and trench fdn wall, ftg	SF Ground	.82	.41	
2020	Basement Walls	4' Foundation wall	LF Wall	61	.61	
B. SHELL						
	B10 Superstructure					
1010	Floor Construction	Open web joist, form, conc, steel col	SF Floor	8.33	5.82	17.8%
1020	Roof Construction	Open web joist, a rib metal deck, steel col	SF Roof	7.99	3.99	
	B20 Exterior Enclosure					
2010	Exterior Walls	Face brick w/ concrete block backup 86%	SF Wall	17.52	3.13	9.4%
2020	Exterior Windows	Aluminum Horizontal Sliding	Each	31	1.88	
2030	Exterior Doors	Aluminum and glass	Each	1154	.25	
	B30 Roofing					
3010	Roof Coverings	Built-up tar, gravel, EPC insulation	SF Floor	3.02	1.51	2.7%
C. INTERIORS						
1010	Partitions	Gypsum on metal 8SF Floor/LF Partitions	SF Partitions	5.95	2.38	20.4%
1020	Interior Doors	15% solid wood, 85% hollow 160SF Fir/door	Each	506	.72	
1030	Fittings	Kitchen cabinet's	SF Floor			
2010	Stair Construction	Concrete filled metal pan	Flight	4420	.20	
3010	W all Finishes	70% paint, 25% vinyl, 5% ceramic tile	SF Surface	3.87	1.49	
3020	Floor Finishes	60% carpet, 30% vct, 10% ceramic tile	SF Floor	3.91	3.91	
3030	Ceiling Finishes	Painted gypsum board on resilient channel	SF Ceiling	2.96	2.96	



## Conceptual Estimating Model & Assemblies Exercise (continued)

COMMERCIAL/ INDUSTRIAL/INSTITUTIONAL			M.570	School, High, 2-3 Story		
Model costs calculated for a 2- story building with 12'-0" story height and 130,000 square feet of floor area			UNIT	UNIT COST	COST PER S.F.	% OF SUB-TOT
D. SERVICES						
	D 10 Conveying					
1010	Elevators & Lifts	Two general passenger elevators	Each	39,000	.30	0.5%
	D 20 Plumbing					
2010	Plumbing Fixtures	Kitchens, bath, service 1 Fixture/215 SF	Each	2115	2.46	4.35%
2020	Domestic Water Dist	Gas Fired Water Heater	SF Floor			
2040	Rain Water Drainage	Roof Drains	SF Roof			
	D 30 HVAC					
3010	Energy Supply	Oil fired hot water, baseboard radiation	SF Floor	2.77	2.77	22.62%
3030	Cooling system	Chilled water, air cooled condenser sys	SF Floor	9.99	9.99	
	D 40 Fire Protection					
4010	Sprinklers	Wet pipe sprinkler system	SF Floor	1.20	1.20	2.13%
4020	Standpipes	Standpipe	SF Floor	-	-	
	D 50 Electrical					
5010	Electric Service/Distrib	1600 ampere service, panelboards, feeders	SF Floor	.35	.35	13.9%
5020	Lighting & branch wiring	Incandescent fixtures, receptacles, switch	SF Floor	5.37	5.37	
5030	Communication/Security	Alarm, emergency lighting, intercom	SF Floor	2.08	2.08	
5090	Other Electrical	Emergency Generator, 11.5 kW	SF Floor	-	-	
E. EQUIPMENT AND FURNISHINGS						
1010	Commercial Equipment	N/A	-	-	-	0.00%
F. SPECIAL CONSTRUCTION						
1020	Integrated Construction	Whiteboards, laboratory counters, Built-in athletic equipment	SF Floor	.68	.68	1.2%
G. BUILDING SITEWORK						
1010	Trenching	N/A	-	-	-	0.00%
Sub-Total					56.28	100%
GENERAL CONDITIONS (Overhead: 5% , Profit: 10%)				15%	8.44	
ARCHITECT FEES				7%	4.53	
TOTAL BUILDING COST					69.25	

**Conceptual Estimating Model & Assemblies Exercise (continued)**

Assemblies Cost Data Table								
A20		Basement Construction						
A2020			Basement Walls					
A2020 110		Walls, Cast in Place						
	Wall Height (Feet)	Placing Method	Conc (Y/LF)	Reinf (LBS/L F)	Wall Thickness (Inches)	COST PER LF		
						MAT	INST.	TOTAL
7260	12'	Pumped			12	58.50	130	188.50
7280					14	65.50	134.50	200
7300					16	72	138	210
7460	12'	Crane & Bucket			12	58.50	133.50	192
7480					14	65.50	136	201.50
7500					16	72	145	217
8260	14'	Pumped			12	68.50	153	221.50
8280					14	76	156	232
8300					16	86	161	247
8460	14'	Crane & Bucket			12	68.50	154.50	223
8480					14	76	160.50	236.50
8500					16	86	165	251
9260	16'	Pumped			12	78.50	175	253.50
9280					14	87	178	265
9300					16	97.50	184.50	282
9460	16'	Crane & Bucket			12	78.50	178	256.50
9480					14	87	182	269
9500					16	97.50	188.50	286

**Conceptual Estimating Model & Assemblies Solutions**

- |   |  |
|---|--|
| 1. A                                    | 21. C \$0.65 per 100 LF                |
| 2. B                                    | 22. B \$0.55 PER 1-foot                |
| 3. B                                    | 23. B \$66.65 Using 170,000 SF         |
| 4. A                                    | 24. C 1150 LF Proposed - 1433 LF Model |
| 5. B                                    | 25. B -283 x \$0.50 per 100 LF         |
| 6. D                                    | 26. D 19' Proposed - 12' Model         |
| 7. A                                    | 27. C +5' x \$0.50 per 1-Foot          |
| 8. A                                    | 28. C \$87.80 + \$2.75 - \$1.56        |
| 9. C                                    | 29. C \$75/SF x 162,500 SF             |
| 10. C                                   | 30. A \$17.15/SF x 32,500 SF           |
| 11. B                                   | 31. D \$39,400 + \$4,400 + \$25,000    |
| 12. B 130,000 SF                        | 32. C A 20 2020                        |
| 13. B 2-STORIES                         | 33. C                                  |
| 14. C 12' - 0"                          | 34. D                                  |
| 15. B \$56.28 Sub-Total & \$69.25 Total | 35. B 1,290 LF                         |
| 16. A                                   | 36. B 1,290 LF x \$61.00 per LF        |
| 17. D                                   | 37. C 1,290 LF x \$251 per LF          |
| 18. D \$69.25                           | 38. D \$300,000/130,000 SF             |
| 19. B                                   | 39. A New \$1.82/SF - \$0.61/SF        |
| 20. B 1,290 LF                          |  |

## Bid Scope, Document Development and Analysis Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer**

1. Which of the following principles of law states that if the prime contractor reasonably relies on the promise or price of the subcontractor to its detriment, then the subcontractor must be held to its promise in order to avoid harm to the prime contractor even though a signed contract between the contractor and subcontractor does not exist at the bidding phase of a project?
  - A. Consideration
  - B. Legal Purpose
  - C. Promissory Estoppel
  - D. Equitable Adjustment
2. At which point in time must the agreement be provided to each prospective bidder?
  - A. At the bid opening
  - B. During the bidding phase of the project
  - C. At the signing of the Owner-Contractor Agreement
  - D. Just before the signing of the Owner-Contractor Agreement
3. What is the primary purpose of providing the agreement to each prospective bidder?
  - A. Describes the bidder's willingness to enter into a contract
  - B. Allows the bidders to find mistakes in the agreement
  - C. Allows the Contractor to hold the party making the promise to the agreement
  - D. Describes how the bidders will perform the work
4. Which of the following sub bid organization documents is used to list the technical specifications Division/Section numbers & assign the work to a specific trade or vendor?
  - A. Bid Division Index
  - B. Bid Scope Description
  - C. Subcontract Agreement
  - D. Subcontract Bid Breakdown and Proposal Form
5. What is the purpose of the Exclusions section of a Bid Division Scope Description?
  - A. Exclude the General Inclusions section
  - B. Exclude the Specific Inclusions section
  - C. Exclude the Other Considerations section
  - D. Exclude the other related work from within that bid packa

## Bid Scope, Document Development and Analysis Exercise (continued)

6. When writing the Bid Division Scope Description, a portion of the Specific Inclusions section can be obtained by consulting the
  - A. General Conditions
  - B. General Requirements
  - C. Instruction to Bidders
  - D. Technical Specifications Division/Level number
  
7. Which of the following Content items are included in the Specific Inclusions section of a Bid Division Scope Description?
  - A. Trade Activities, Systems & Locations, Complete and Operational and Accepted by the Owner
  - B. Scaffolding, Unload Materials, Material Storage, Layout Work, Test and Inspect, Material Protection, Temporary Facilities, and Cleanup
  - C. Shop Drawings, Owner & Operating Manuals, Prevailing Wages, Permit Fees, Meetings, Lien Waivers, Licensed Contractor, and Warranties
  - D. Document list, Bid Scope Description, Contract Price, Bid Breakdown, Leadtime Dates and Crew Size, Scheduled Dates and Enumeration of Documents
  
8. Which of the following content items are included in the General Inclusions section of a Bid Division Scope Description?
  - A. Trade Activities, Systems & Locations, Complete and operational and Accepted by the Owner
  - B. Scaffolding, Unload Materials, Material Storage, Layout Work, Test and Inspect, Material Protection, Temporary Facilities, and Cleanup
  - C. Document list, Bid Scope Description, Contract Price, Bid Breakdown, Leadtime Dates and Crew Size, Scheduled Dates and Enumeration of Documents
  - D. Document List, Scope Description, Addenda Numbers, Base Bid Price, Bid Breakdown, Alternates, Bonds, Leadtime Dates, Crew Size and Manufacturers
  
9. Which of the following content items are included in the Other Considerations section of a Bid Division Scope Description?
  - A. Unload, Rehandle Materials, Scheduled Maintenance, Trade Coordination, Supervision, Safety Activities, Training and Rework
  - B. Shop Drawings, Owner & Operating Manuals, Prevailing Wages, Permit Fees, Meetings, Lien Waivers, Licensed Contractor, and Warranties
  - C. General Conditions, Supplementary Conditions, General Requirements, Technical Specifications, Bid Documents, Modifications and the Agreement
  - D. Notice of Award, Notice to Proceed, Stop Work Order, Stop Work Notice, Schedule of Values, Construction Schedule and the Lien Waive

**Bid Scope, Document Development and Analysis Exercise (continued)**

10. Which of the following are the writing principles that apply for the Specific Inclusions section of a Bid Division Scope Description?
  - A. Use action verbs and write in paragraph form
  - B. Use action verbs and write a separate line for each activity
  - C. Use action verbs, write in a paragraph form and state time frame
  - D. Use action verbs, write a separate line for each activity and state time frame
  
11. Which of the following are the writing principles that apply for the Other Considerations section of a Bid Division Scope Description?
  - A. Use action verbs and write in paragraph form
  - B. Use action verbs and write a separate line for each activity
  - C. Use action verbs, write in a paragraph form and state time frame
  - D. Use action verbs, write a separate line for each activity and state time frame
  
12. Which of the following responses is the best answer for a written description in the Other Considerations section of the Bid Division Scope Description?
  - A. Provide the Insurance certificates
  - B. Provide the Insurance certificates at the close out of the project
  - C. Provide the Insurance certificates at the signing of the Agreement
  - D. Provide the Insurance certificates according to the Contract Documents
  
13. Which of the following content items are included in the Subcontract Proposal Form according to the principles outlined in the reading?
  - A. Scaffolding, Unload Materials, Material Storage, Layout Work, Test and Inspect, Material Protection, Temporary Facilities, and Cleanup
  - B. Shop Drawings, Owner & Operating Manuals, Prevailing Wages, Permit Fees, Meetings, Lien Waivers, Licensed Contractor, and Warranties
  - C. Enumeration of Documents, Payment Terms, Insurance Amounts, Safety, Bonds, Warranties, Termination, Changes, Claims and Dispute Resolution
  - D. Bid Scope Description, Contract Price, Addenda Numbers, Base Bid Price, Bid Breakdown, Alternates, Leadtimes, Crew Size, Start Date, and Manufacturers
  
14. Which party is responsible for assigning the work for the project?
  - A. Owner
  - B. Subcontractor
  - C. Contractor or CM
  - D. Architect/Engineer

**Bid Scope, Document Development and Analysis Exercise (continued)**

15. Investigative Reports be considered a part of the contract?
- A. If it is listed in the General Conditions
  - B. If it is listed in the General Requirements
  - C. If it is listed in the Owner/Contractor Agreement
  - D. If it is listed in the Listed in the Instructions to Bidders
16. According to numerous court decisions, under which of the following conditions will the Soil Investigative Reports be considered a part of the contract?
- A. If it is listed in the Project Index and the Drawing Index
  - B. If it is listed in the Project Index and the Index is listed in the Agreement
  - C. If it is listed in the General Conditions and the Supplementary Conditions
  - D. If it is included with the Bid Package and the Project Index listed the Soil Report
17. According to numerous court decisions, under which of the following conditions will the Soil Investigative Reports be considered a part of the contract?
- A. If it is numbered sequentially within the project manual
  - B. If it is numbered according to the format utilized for an outline
  - C. If it is numbered non consecutively separated by 10 numbers
  - D. If it is continuously numbered in a Division along with the other Section numbers
18. A conflict arises between the documents provided below, which item will be given highest Priority by the Courts?
- A. Drawings
  - B. Drawing Notes
  - C. Technical Specifications
  - D. Supplementary Conditions
19. A conflict arises between the documents provided below, Which of the Documents listed below would be given the highest Priority?
- A. Drawings
  - B. General Conditions
  - C. General Requirements
  - D. Supplementary Conditions

**Bid Scope, Document Development and Analysis Exercise (continued)**

20. What are the essential items the Contractor must prove to bind the Subcontractor to their price quotation?
  - A. Transposing, Quantity or Judgement error
  - B. Judgement error which caused Substantial Harm to Contractor
  - C. Agreement existed, Contract Documents were Complete, and Fixed Price Quote
  - D. Offer was received, Offer was relied upon and Reliance caused Substantial Harm
  
21. What are the Contractors Responsibilities Prior to Submitting a Bid Proposal?
  - A. Visit the Site, Verify the working drawings and the Shop drawings
  - B. Visit the Site, Verify the Design, the Working drawings and the Shop Drawings
  - C. Visit the Site, Verify the Design, the Schematic Design & the Working drawings
  - D. Visit the Site, Verify Existing Conditions, Field conditions & Infer soil conditions
  
22. According to the legal system, which of the following site activities shall the Contractor be expected to perform prior to bid opening?
  - A. Attend the pre-bid meeting and hire an independent soil testing company
  - B. Conduct separate soil tests, drill for the water table & hire a soil consultant
  - C. Attend the pre bid meeting, conduct an inspection, verify field dimensions
  - D. Attend the pre bid meeting, conduct an inspection & conduct separate soil tests
  
23. The Contractor has submitted a Bid Proposal and after the Bid opening the Contractor discovers an error. They request to withdraw. One of the essential conditions that the Contractor must prove to withdraw their bid is that the error is so great that to enforce it is unconscionable. What are the other essential conditions that the Contractor must prove to withdraw?
  - A. Transposing, Quantity and Judgement error, visited the site and notified the owner
  - B. Error in judgement, and they must prove where, how, used care, visited the site and notified the Owner
  - C. Transposing error, and they must prove where, how, used care, visited the site and notified the Owner
  - D. Error in judgement, used due care, visited the site, substantial Harm to Contractor, and notified the Owner



## Bid Scope, Document Development and Analysis Exercise (continued)

24. On a \$27 Million project, a Contractor priced the Bid on the assumption that it would not be responsible for the height pay to workers under a collective bargaining agreement. The Contractor's Bid Proposal was low. After the Bid Opening the contractor learned that the collective bargaining agreement required the Contractor to provide height pay worth \$375,000. The Contractor Requested to withdraw due to the error. What type of error or bid mistake is this called?
  - A. Quantity error
  - B. Judgment error
  - C. Arithmetic error
  - D. Transposing error
  
25. On a \$12 Million project, a Contractor submitted the low bid and after the bid opening the Contractor determined that a \$250,000 error in judgement was found and the low bid is not an unconscionable error. Under what conditions can the Contractor withdraw their bid?
  - A. Notify the Vendors in writing and document that you used due care
  - B. Notify the Bonding company and document that you used due care
  - C. Notify the Subcontractors in writing and document that you used due care
  - D. Notify the Owner immediately in writing and document that you used due care
  
26. The Equal Employment Opportunity clause states that “on this project a total of 13 percent of the contract award value shall be for minorities,” What is this minority hiring percentage considered according to the law?
  - A. A goal
  - B. An obligation
  - C. A minimum requirement
  - D. A maximum requirement
  
27. During the Bidding phase of a project, which of the following are the Pre bid Categories that the Contractor should gather for developing their bid proposal?
  - A. Shop Drawings, Product Data Sheets, Samples and Submittal Logs
  - B. Schematic Drawings, Design Development Drawings, Contract Documents and Bid Documents
  - C. Adjacent Site Conditions, Existing Surface Conditions Existing Utility Locations, Field Dimensions
  - D. Value Engineering, Design Considerations, Total Quality Management Procedures, Safety Management Procedures

**Bid Scope, Document Development and Analysis Exercise (continued)**

28. During the Bidding phase of a project, Which of the following are the Pre-bid Categories that the Contractor should gather for developing their bid proposal?
- A. Uniform Commercial Code, State Tax Laws, Covenants, and Administrative Laws
  - B. Plans, Technical Specifications, General Requirements and Information Available to Bidders
  - C. Material Availability, Labor Availability, Site Accessibility, and Transportation Considerations
  - D. Design, Conceptual Estimating, Bid Document Development and Project Manual
29. Which of the following is considered a physical site condition that the Contractor must interpret from the pre-bid site inspection or examination of the site?
- A. Soft Rock outcropping
  - B. Site plan with dimensions
  - C. Soil Report and the soil borings
  - D. Site location plan with building location
30. According to the courts, the bidder must interpret or make an inference considering all physical site condition that are observed during the pre-bid site inspection. You have observed cattails in a certain area of the project. What inference must be made?
- A. Organic material is present and not suitable for structure. Hence remove and replace
  - B. Civil plans do not show the low wet area, Therefore, a contract change order can be requested later
  - C. The Soil Investigation Report does not address the soil condition. Therefore, an RFI can be requested and converted into a contract change order
  - D. The Design Development drawings do not address the soil condition. Therefore, an RFI can be requested and converted into a contract change order
31. Which document is signed by the Contractor indicates that their bid was arrived at without any conferring with other bidders?
- A. Bid Breakdown
  - B. Pre-qualification
  - C. Notice to Proceed
  - D. Non-collusive Affidavit

## Bid Scope, Document Development and Analysis Exercise (continued)

32. Which of the following bid items are "Commonly Overlooked when Evaluating Subcontractor Bids."
  - A. Per Diem
  - B. Office Supplies
  - C. Main Office Expenses
  - D. Trenching, excavation and Backfill for Electrical
  
33. Which of the following bid items are "Commonly Overlooked when Evaluating Subcontractor Bids."
  - A. Prevailing Wages
  - B. Craft Changehouses
  - C. Automobile Insurance
  - D. Workers Compensation
  
34. Which of the following bid items are "Commonly Overlooked when Evaluating Subcontractor Bids."
  - A. Labor
  - B. Material
  - C. Equipment
  - D. Temporary electrical
  
35. Which of the following bid items are "Commonly Overlooked when Evaluating Subcontractor Bids."
  - A. Per Diem
  - B. Office Supplies
  - C. Electrical Hookups to Process Equipment
  - D. Social Security (FICA)
  
36. Which of the following bid items are "Commonly Overlooked when Evaluating Subcontractor Bids."
  - A. Profit
  - B. Sales and Use Taxes
  - C. Main office expenses
  - D. Management Experience

**Bid Scope, Document Development and Analysis Solutions**

- |     |   |     |   |
|-----|---|-----|---|
| 1.  | C | 21. | D |
| 2.  | B | 22. | C |
| 3.  | C | 23. | C |
| 4.  | A | 24. | B |
| 5.  | D | 25. | D |
| 6.  | D | 26. | A |
| 7.  | A | 27. | C |
| 8.  | B | 28. | C |
| 9.  | B | 29. | A |
| 10. | A | 30. | A |
| 11. | D | 31. | D |
| 12. | C | 32. | D |
| 13. | D | 33. | A |
| 14. | C | 34. | D |
| 15. | C | 35. | C |
| 16. | B | 36. | B |
| 17. | D |     |   |
| 18. | B |     |   |
| 19. | D |     |   |
| 20. | D |     |   |

## Design Schedule and Cost Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer**

1. Which of the following is the proper design activity sequence that is used for every design discipline (such as mechanical, electrical and structural) on a Design/Build logic network according to acceptable legal practices?
  - A. Engineer, Design, and Build
  - B. Design, Procurement, and Construction
  - C. Prepare Schematic Diagrams, Prepare Preliminary Plans, Develop Contract Documents, and Issue Bid Plans
  - D. Obtain Construction Contract, Request Plans, Receive Plans, Award Subcontracts, Procure materials, and Construct activities
  
2. Which of the following is the proper procurement activity sequence that is used for every Vendor or Supplier (such as rebar, structural steel and sheet metal) on a Design/Build logic network according to acceptable legal practices?
  - A. Design, Procurement, and Construction
  - B. Order & Deliver Materials, Place Forms, Place Rebar, Pour Concrete, Strip Forms
  - C. Award Vendor Contract, Vendor Prepares Shop Drawings, Contractor Reviews Shops, A/E Reviews Shops, Vendor Fabricates and Delivers
  - D. Prepare Design Plans, Award Vendor Contract, A/E Approves Design, Order Materials, Fabricate, A/E Approves Shop Drawings, Contractor Approves Shop Drawings, Vendor Delivers Materials
  
3. Which phase of the project is a variance analysis calculated?
  - A. Design
  - B. Construction
  - C. Contract Document
  - D. Project Closeout
  
4. To calculate the variance analysis for a specific project, which drawings are utilized to calculate the currently estimated quantities?
  - A. Shop drawings
  - B. Record drawings
  - C. Construction issued drawings
  - D. Design development drawings

**Design Schedule and Cost Exercise (continued)**

5. To calculate the variance analysis for a specific project, what is the most cost effective source to derive the actual prices from?
  - A. Budget estimate
  - B. Conceptual estimate
  - C. Means cost data book
  - D. Vendor and Labor Agreements
6. What is the purpose of calculating the total variance?
  - A. Identify the projected cost at completion
  - B. Determine the net effect of the variances
  - C. Determine the gross effect of the variances
  - D. Identify the individual variances during construction
7. What are the constants when calculating the total variance?
  - A. There are no constants
  - B. Currently estimated quantity and the Conceptual quantity
  - C. Currently Estimated and the Conceptual dollars per workhours
  - D. Currently Estimated a Conceptual productivity rate in workhour per unit
8. What are the constants when calculating the productivity variance?
  - A. Currently Estimated quantity and the Conceptual dollars per workhours
  - B. Currently Estimated quantity and the Currently Estimated workhours per unit
  - C. Conceptual quantity and the Conceptual productivity in workhours per unit
  - D. Currently Estimated quantity and Conceptual Unit Costs in dollars per workhours
9. What are the constants when calculating the labor quantity variance?
  - A. Currently Estimated quantity and Conceptual quantity
  - B. Currently Estimated workhours per unit and Currently Estimated dollars per unit
  - C. Conceptual quantity and the Conceptual productivity in workhours per unit
  - D. Conceptual productivity in workhours per unit and Conceptual Unit Cost in \$/WH
10. What are the constants when calculating the labor rate variance?
  - A. Currently Estimated quantity and Conceptual quantity
  - B. Currently Estimated quantity and the Currently Estimated Productivity
  - C. Conceptual price per unit and the Currently Estimated price per unit
  - D. Conceptual quantity and the Conceptual workhours per unit

**Design Schedule and Cost Exercise (continued)**

Given the following labor variance information for the piling system, answer the following questions:

Systems	Piling Labor
Currently Estimated Quantity	304 EA
Conceptual Quantity	101 EA
Currently Estimated Productivity Rate in Whr/Unit	9.64 Whr/EA
Conceptual Productivity Unit Rate in Whr/Unit	6.6 Whr/EA
Currently Estimated Labor Rate in \$/Whr	\$9.75/Whr
Conceptual Labor Rate in \$/Whr	\$12.51/Whr

11. Using the Total Variance form, what are the currently estimated workhours?
  - A. 667
  - B. 1,264
  - C. 2,931
  - D. 3,803
  
12. Using the Total Variance form, what is the total currently estimated cost in whole dollars?
  - A. 6,503
  - B. 8,344
  - C. 28,578
  - D. 36,667
  
13. Using the Total Variance form, what is the total variance (Over) or Under + budget?
  - A. (20,233)
  - B. +20,233
  - C. (25,647)
  - D. +28,323

**Design Schedule and Cost Exercise (continued)**

Total Variance - Labor										
Desc	Currently Estimated Quantity	Conceptual Quantity	Unit	Currently Estimated Workhours	Conceptual Workhours	Currently Estimated Unit Cost (\$/WH)	Conceptual Unit Cost (\$/WH)	Total Currently Estimated Cost	Total Conceptual Cost	Total Variance (Over)/ Under

Quantity Variance - Labor										
Desc	Currently Estimated Quantity	Conceptual Quantity	Unit	Conceptual Productivity Rate (WH/Unit)	Currently Estimated Conceptual Workhours	Total Conceptual Workhours	Conceptual Unit Cost Rate (\$/WH)	Total Conceptual Current (\$)	Total Conceptual (\$)	Quantity Variance (\$)
	Variable	Variable		Constant			Constant			

Desc	Current Estimated Quantity	Unit	Current Estimated Productivity (Whr/Unit)	Total Current Estimated Whrs	Conceptual Unit Cost (\$/WH)	Current Estimated Unit Cost (\$/WH)	Total Current Estimated Cost (\$)	Total Current Conceptual Cost (\$)	Labor Rate Variance	Conceptual Productivity Rate Whr/Unit	Currently Estimated Conceptual Workhours	Total Conceptual Current Cost (\$)	Productivity Variance
Labor Rate Variance - Labor													
Productivity Variance - Labor													



Design Schedule and Cost Exercise - **SOLUTIONS**

1. C
2. C
3. A
4. D
5. D
6. B
7. A
8. A
9. D
10. B
11. C
12. C
13. A

Quantity Variance	(\$16,751)
Labor Rate Variance	+\$8,090
Productivity Variance	(\$11,572)
Total Variance (Over)/ +Under	(20,233)

Design Schedule and Cost Exercise - **SOLUTIONS**

Total Variance - Labor										
Desc	Currently Estimated Quantity	Conceptual Quantity	Unit	Currently Estimated Workhours	Conceptual Workhours	Currently Estimated Unit Cost (\$/WH)	Conceptual Unit Cost (\$/WH)	Total Currently Estimated Cost	Total Conceptual Cost	Total Variance (Over)/ Under
Piles	304	101	EA	2,931	667	\$9.75	\$12.51	\$28,578	\$8,344	(\$20,233)
Quantity Variance - Labor										
Desc	Currently Estimated Quantity	Conceptual Quantity	Unit	Conceptual Productivity Rate (WH/Unit)	Currently Estimated Conceptual Workhours	Total Conceptual Workhours	Conceptual Unit Cost Rate (\$/WH)	Total Conceptual Current (\$)	Total Conceptual (\$)	Quantity Variance (\$)
Piles	304	101	EA	6.6	2,006	667	\$12.51	\$25,095	\$8,344	(\$16,751)

Desc	Current Estimated Quantity	Unit	Current Estimated Productivity (Whr/Unit)	Total Current Estimated Workhours	Conceptual Unit Cost (\$/WH)	Current Estimated Unit Cost (\$/WH)	Total Current Estimated Cost (\$)	Total Current Conceptual Cost (\$)	Labor Rate Variance	Conceptual Productivity Rate Whr/Unit	Currently Estimated Conceptual Workhours	Total Conceptual Current Cost (\$)	Productivity Variance
Labor Rate Variance - Labor													
Piles 304 EA			9.64	2,931	\$12.51	\$9.75	\$28,577	\$36,667	\$8,090				
Productivity Variance - Labor													
Pile 304 EA			9.64	2,931	\$12.51			\$36,667		6.60	2,006	\$25,095	(\$11,572)

## II. EMPLOYMENT PRACTICES

### Employment Law and Discrimination Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. Phillip, a project engineer at the jobsite, has been asked to interview a female applicant for a jobsite position as a carpenter. Which of the following questions is the best interview question?
  - A. You look very attractive for a carpenter. Will you be able to handle the teasing?
  - B. Which do you think is more important to you, family or a career?
  - C. What are your career goals and how do they blend with the company's goals?
  - D. Do you have children? What arrangements can you make for taking care of your children? Are you considering more children? Will you be able to work when you're pregnant?
  
2. Jim, also a project engineer at the jobsite, has been also asked to interview a male applicant for a jobsite position as a carpenter. Which of the following questions is the best interview question?
  - A. Do you have children?
  - B. We often work on weekends. How do you feel about that?
  - C. You're very overweight? Will you be able to get around, okay?
  - D. Which do you think is more important to you, family or a career?
  
3. In an interview with an applicant for a carpenter position, you have a gut feeling that they may not be eligible for work in the United States. Which of the following questions is the best interview question?
  - A. Which country are you from?
  - B. Are you from the Middle East or Asia?
  - C. Do you have a United States drivers license?
  - D. Do you have a United States social security card?
  
4. A male employee is constantly calling co-worker women "girl," "doll," or "babe," and he also is constantly blocking the women's way, and he stares at their breasts. What is the best action to take?
  - A. Fire the man
  - B. Suspend the woman with pay for dressing too provocatively
  - C. Suspend the man with pay for the remarks and review the policies
  - D. Review the anti harassment policy and ask the woman to file a complaint

**Employment Law and Discrimination Exercise (continued)**

5. The contract with the client requires you to accelerate to overtime. You've decided to work overtime on Friday evening and all day on Saturday. One of your employees' religious beliefs prevents them from working after 5:00 on Friday and all-day Saturday. What is the best action to take?
  - A. Fire the employee for insubordination
  - B. Provide them with a written warning that this will not continue
  - C. Ignore the situation and hope that it resolves itself
  - D. Accommodate the person's religious beliefs
  
6. Jennifer, a project manager for your company, approaches you and asks you, the field superintendent, to hire her 17-year-old boy to work at the jobsite. What is the best action?
  - A. Hire the boy to work in the site trailer
  - B. Hire the boy to work with the laborers
  - C. Ignore the request and assume that the top executives understand
  - D. Refuse the request and suggest the boy work in the home office
  
7. You are on an addition to an existing Elementary school project and as you are walking the site you notice a roofing subcontractor's employee relieving themselves off the third floor. What is the first step to take?
  - A. Search for the person and ask around for the person
  - B. Go directly to the roofing supervisor and have them fire someone
  - C. Find the forklift and lift a Porta-John to the third floor
  - D. Ignore the situation and hope that no one else witnessed the situation
  
8. Recently a union began its organizing campaign at your jobsite. Both Mary and Ed are first-line supervisors and they have a personal interest in what was happening. Mary asked one of her employees, "How are things going with the union campaign?" Ed stopped a female employee and raised the same issue. "Think the union will come in?" When the employee did not respond, Ed added, I'm just curious. You know, person to person. The woman answered, "I guess so." Ed continues, "Why? Do you think you've gotten a bad shake from the company? The employee responds, "I really don't want to talk about it." What is the best course of action to take?
  - A. No action is needed. The supervisors were just curious and using small talk
  - B. Train the supervisors not to ask any questions because this is considered hostile
  - C. Retaliate against the supervisors and fire them
  - D. Coerce the supervisors into agreeing that it was their fault

**Employment Law and Discrimination Exercise (continued)**

9. You are in the preliminary stages of placing an addition onto an existing power plant, and you have been informed that the project may be a mixture of union and merit shop contractors. What is the best course of action?
- A. Install one gated entrance for the contractor, subcontractors and the owner
  - B. Install one gated entrance for the contractor, and one for subs and the owner
  - C. Install one for the job deliveries, a separate gate for each trade, one for owner
  - D. Install one gated entrance for the deliveries, one for the subs, and one for owner
10. According to the information on Disciplinary Memos, there are three (3) Primary Content Areas of a Disciplinary Memo that a Manager must take into consideration when writing. Which of the following lists constitutes the three primary content areas of a Disciplinary Memo?
- A. Format, Vocabulary and Tone
  - B. Subject, Purpose, and Specific Purpose
  - C. Introduction, Main Points and Conclusions
  - D. Introduction with Praise, Body and Recommendations
11. The Civil Rights Act of 1991 added new provisions to the existing employment discrimination laws that allows employees to recover compensatory and punitive damages for specific new discriminatory activities. Which of the following are the added provisions?
- A. Emotional pain, suffering, inconvenience, mental anguish, and loss of enjoyment
  - B. Race, color, ethnic identification, sexual orientation, and age
  - C. Age, disability, veteran status, religion, and obesity
  - D. Toxic environments, gender, sex changes, willful or reckless indifference
12. Which of the following activities creates a hostile work environment?
- A. Using humor in the work place
  - B. Bystanders listening to ethnic and racist remarks or comments
  - C. Talking with other co-workers about social activities
  - D. Consenting verbal flirtations with co-workers

**Employment Law and Discrimination Exercise (continued)**

13. Someone calls you for a recommendation concerning a former employee. Which of the following actions is most appropriate?
- A. Discuss their performance appraisals
  - B. Discuss their medical treatments and medical problems
  - C. Provide their dates of employment and their final job title
  - D. Send them a service letter describing the ex-employee's work history

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Questions 14 - 23. Review the following DISCIPLINARY MEMORANDUM and answer the questions.

TO: JIM APS, PERSONNEL DEPARTMENT

FROM: DAVID COR, SUPERVISOR

SUBJECT: ED BRAYTON - DISCIPLINARY ACTION

DATE: DECEMBER 7, 20\_\_

Mr. Brayton is one of our safest employees but lately he has been throwing the materials off the structure without using a chute. Mr. Brayton has been ignoring our trash disposal rules. Therefore, I have given him a written reprimand.

Would you please file this in his personnel file.

Sincerely,

David Cor, Supervisor

cc: Ed Brayton File

14. After reviewing the memorandum, determine the most important correction to be made or if there are any incorrect messages in the body of the disciplinary memorandum.
- A. This memorandum is correct as it stands
  - B. Remove the reference to "is one of our safest employees"
  - C. Remove the reference to the personnel file in the last sentence
  - D. The memorandum is totally incorrect and must be completely rewritten

**Employment Law and Discrimination Exercise (continued)**

15. Which of the following steps is the best action for managers to undertake to avoid discrimination liability?
- A. Maintain personal files in a secured location about a person's true performance
  - B. Establish clear job traits, and ensure that the performance evaluations are job-related, objective, and they state facts concerning performance
  - C. Include personal comments from all managers about their non job-related activities or appearances in their performance evaluation
  - D. Establish a sequenced or step grievance procedure within the company to handle all employees' complaints
16. Management and the Labor Union cannot come to an agreement; therefore, they are considering filing unfair practice charges against each other. Whom are the charges filed with?
- A. Union
  - B. Court
  - C. National Labor Relations Board
  - D. Labor Management Relations Board
17. You are on a project which has established the minimum wage rate for an electrician at a \$20.21 base rate per hour and \$3.71 benefits per hour. Your subcontractor is a non-union contractor currently paying their electricians \$19.21 as a base rate per hour plus \$3.71 in benefits. What is the best course of action?
- A. Require the subcontractor to raise the base pay \$1.00 and certify it
  - B. Nothing. The subcontractor assured you that their fringes are \$4.71
  - C. Allow the subcontractor to bank the hours and pay, then pay employees later
  - D. Place a stop work order against the subcontractor until they resolve the issue
18. Which of the following union versus management actions is considered illegal?
- A. The Owner exerts pressure on the contractor to settle the dispute with the union
  - B. A dispute between pipefitters and teamsters over moving the pipe from storage to staging area. This dispute requires the contractor to assign the work to one union
  - C. A dispute procedure in the labor agreement that provides for meetings between successively higher levels of the union-contractor to resolve employee disputes without work stoppage
  - D. A dispute between a contractor and a union that causes the union to go on picketing and threatening a strike against the contractor to settle the dispute

**Employment Law and Discrimination Exercise (continued)**

19. To ensure that a union has the right to picket the primary contractor without affecting the neutral contractors on a multi-employer jobsite, labor law has established specific picketing guidelines. What are the common situs picketing guidelines?
  - A. Picketing during working hours, signs clearly marked and close to the work
  - B. Picketing unlimited hours, signs clearly marked, and anywhere in the vicinity
  - C. Picketing unlimited hours, signs with no limitations, and anywhere in the vicinity
  - D. Picketing during working hours at all site gates without any other restrictions
  
20. What has been found to be the key element of an effective safety approach?
  - A. A written safety program
  - B. An inspection and compliance-oriented safety program
  - C. An integrated behavior-based safety management process
  - D. A safety program which focuses on disciplinary action, poster slogans and talks
  
21. Which of the following is the definition of a willful violation against the manager?
  - A. A violation which has no direct or immediate relationship to safety and probably would not cause death or serious harm
  - B. A violation where a hazardous condition exists and the supervisor makes no reasonable attempt to eliminate or they are recklessly indifferent to the incident
  - C. A violation where there is a substantial probability that death or serious physical harm could result
  - D. A direct assault on the safety inspector or otherwise resisting, opposing intimidating, or interfering with them in the performance of their inspection
  
22. Which of the following activities is considered a willful violation?
  - A. Not installing safety handrails on all scaffolding
  - B. Not having a written safety program at the jobsite
  - C. Not having ground fault circuit interrupters (GFCI's) on all electrical equipment
  - D. Allowing a worker to weld two piles together under a suspended piling and the Operator leaves the crane cab unattended to have lunch with the contractor
  
23. Which of the following is the best test of due diligence in a court of law?
  - A. Telling workers constantly to put on their hard hats and gloves
  - B. Comply with the safety standards and conduct tool box talks at the jobsite
  - C. Write a disciplinary warning letter to the workers' outlining their noncompliance
  - D. Train yourself, train workers, inspect and correct hazards at the jobsite constantly



**Employment Law and Discrimination Exercise - SOLUTIONS**

- |     |   |     |   |
|-----|---|-----|---|
| 1.  | C | 21. | B |
| 2.  | B | 22. | D |
| 3.  | D | 23. | D |
| 4.  | C |     |   |
| 5.  | D |     |   |
| 6.  | D |     |   |
| 7.  | C |     |   |
| 8.  | B |     |   |
| 9.  | C |     |   |
| 10. | A |     |   |
| 11. | A |     |   |
| 12. | B |     |   |
| 13. | C |     |   |
| 14. | B |     |   |
| 15. | B |     |   |
| 16. | C |     |   |
| 17. | A |     |   |
| 18. | A |     |   |
| 19. | A |     |   |
| 20. | C |     |   |

### III. WORKING RELATIONSHIPS

#### Leadership Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. A new company executive is described as energetic, demanding, market-oriented, and their primary contributions involve redesigning the management structure, installing a new product design strategy, and emphasizing the bottom line. What qualities is this description of the new executive describing?
  - A. Leadership
  - B. Management
  - C. Supervision
  - D. Technical abilities
2. What is true leadership based upon?
  - A. Short-term results
  - B. Position authority
  - C. Organizational skills
  - D. Voluntary followership
3. Which of the following is an example of leadership?
  - A. Planning
  - B. Giving Orders
  - C. Creating policies
  - D. Focus on long-term results
4. Which of the following is an example of leadership?
  - A. Directing
  - B. Delegating
  - C. Focusing internally
  - C Focusing externally
5. Which of the following is an example of leadership?
  - A. Managing the technical contributions to the organization
  - B. Challenging the system, enabling others to perform and grow
  - C. Getting involved in the process of accomplishing defined objectives
  - D. Installing a new product design strategy, and emphasizing the bottom line

**Leadership Exercise (continued)**

6. Which of the following is an example of leadership?
  - A. Making people into effective collaborators
  - B. Communicating effectively with employees
  - C. Delegating work to the people that are best qualified
  - D. Giving orders and enforcing them through their authority
7. What must leaders have to be successful leaders?
  - A. Position power
  - B. Willing followers
  - C. Authority to make decision
  - D. Special skills including persuasion
8. What are the conditions for leadership?
  - A. A willingness to lead and a willingness to follow
  - B. Authority to lead and a willingness to follow
  - C. A willingness to lead and the responsibility to follow
  - D. Authority to lead and the responsibility to follow
9. Where in an organization can you find successful leaders?
  - A. Any level
  - B. Managers
  - C. Supervisors
  - D. Top executives
10. What is a key element of leadership?
  - A. Authority to set policy
  - B. Unique skill set
  - C. Unique set of traits
  - D. Relationship between leaders and followers
11. Which of the following creates great leaders?
  - A. Great followers
  - B. Great managers
  - C. Great supervisors
  - D. Other great leaders

**Leadership Exercise (continued)**

12. Which of the following is a reason that may prompt a person to follow a true leader? It is their:
- A. Unique skill set
  - B. Ability to see the big picture
  - C. Ability to persuade people to follow
  - D. Managerial and technical contributions
13. Which of the following is a reason that may prompt a person to follow a true leader? It is their:
- A. Well defined vision
  - B. Title as manager
  - C. Ability to communicate
  - D. Authority to get things done
14. Which of the following is a reason that may prompt a person to follow a true leader? It is their focus on:
- A. People's ideas and objectives
  - B. Short term results
  - C. The bottom line for the company
  - D. Existing internal management structures
15. Which of the following is a reason that may prompt a person to follow a true leader? It is their:
- A. Charismatic personality
  - B. Ability to persuade people
  - C. Long term Commitment to the organization
  - D. Ability to help others meet their full potential
16. Which of the following is a reason that may prompt a person to follow a true leader? It is their:
- A. Results are accomplished through other people
  - B. Results are accomplished through their unique skill set
  - C. Ability to get involved in the process of accomplishing defined objectives
  - D. Ability to write a strategic plan, then implement and assess the results
17. Which of the following is a common practice for exemplary leadership?
- A. Enabling others to act
  - B. Persuading people to act
  - C. Managing people effectively
  - D. Influencing people based upon their authority

**Leadership Exercise Solutions**

1. B
2. D
3. D
4. D
5. B
6. A
7. B
8. A
9. A
10. D
11. A
12. B
13. A
14. A
15. D
16. A
17. A

## Coaching Process Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. What is the best measure of your Success as a Manager?
  - A. Fame
  - B. Money
  - C. The things that your employees do
  - D. The Planning and organizing that you do
  
2. What is Management?
  - A. Controlling people's behavior
  - B. Getting things done through other people
  - C. Scolding people for not producing fast enough
  - D. Discussing the poor performance with the person
  
3. What is the manager's most important task?
  - A. Planning the work
  - B. Documenting the work
  - C. Selecting the right person
  - D. Communicating with people
  
4. Which of the behavior modification principles are most effective in trying to Modify someone's Behavior?
  - A. View the consequences from your perspective, describe to them the things that you don't want and scold them
  - B. View the consequences from the receiver's perspective, describe to them the things that you do want and provide positive feedback
  - C. Describe to them the things that are wrong and provide positive feedback
  - D. Describe to them the things that you do want and criticize them by yelling at them
  
5. What is successful communication?
  - A. The transmission of information
  - B. The transmission of thoughts
  - C. Hearing what was said properly
  - D. Interpreting, filtering and attaching meaning to the transmission

**Coaching Process Exercise (continued)**

6. What are some of the reasons for managers not taking proper action concerning employee's poor performance?
- A. Managers talk in general terms and they believe compliments are improper
  - B. Managers' analysis is broad and they believe that planning is more important
  - C. Managers believe planning and organizing are more important activities
  - D. Managers believe looking for the negative things people do and screaming is best
7. Which of the following is the best example of the little things that effective managers use frequently?
- A. Focus on the group's work activities first
  - B. Focus on their work activities in their office alone
  - C. Talk with workers about their work activities first
  - D. Talk with workers about their personal interests first
8. Managers obtain their desired outcomes most consistently when they concentrate on which of the following activities?
- A. Solving problems
  - B. Controlling the content
  - C. Developing a satisfying process
  - D. Focusing on the desired performance
9. Which of the following is the manager's primary task?
- A. Create employee commitment
  - B. Create money for the organization
  - C. Instill high performance standards
  - D. Implement organizational goals and values

**Coaching Process Exercise (continued)**

10. What type of coaching conversation improves performance?
- A. Mentoring
  - B. Confronting
  - C. Goal setting
  - D. Problem solving
11. What are the abilities needed of a manager to become an effective coach and superior leader?
- A. Their ability to create and manage the process of a coaching conversation
  - B. Their ability to plan, organize, direct, staff and control in their assigned role
  - C. Their ability to manage their time by setting goals, planning and scheduling
  - D. Their ability to set priorities, analyze time usage, and control interruptions
12. While approaching an employee you notice that they are doing something wrong, what approach should you take, that would be the most effective?
- A. Scream at the worker
  - B. Send them to more training
  - C. Look for the things they are doing right and correct the things that are wrong
  - D. Ignore the situation but tell worker's peers what the other person is doing wrong
13. Which of the following would a successful project manager use to improve the relationships on the job site?
- A. Call a meeting to discuss the things that are going wrong
  - B. Walk the job twice/day and identify things that need to be corrected
  - C. Walk the job twice/day and talk with the crafts about the work activities
  - D. Walk the job twice/day & talk with the crafts about things that are important to them
14. Which of the following would a successful project manager use to improve the relationships on the job site?
- A. Limit the interaction with the workers is the best approach
  - B. Limit the compliments to the workers because they are inappropriate
  - C. Create a list of the things that the employee did wrong throughout the year
  - D. Create a list of things that are important to the worker such as their names, birthday



## Coaching Process Exercise Solutions

1. C
2. B
3. D
4. B
5. B
6. A
7. D
8. C
9. A
10. C
11. A
12. C
13. D
14. D

## Communication Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. Which one of the following is transferred from one mind to another?
  - A. Words
  - B. Meaning
  - C. Information
  - D. Understanding
  
2. What is the primary function of listening?
  - A. Put meaning to that transmission
  - B. Agree with what the other person is saying
  - C. Disagree with what the other person is saying
  - D. Accepts the sound waves and transmits them to the brain
  
3. What is a definition of thought transmission?
  - A. Place meaning on the transmission
  - B. Meaning is transmitted from one mind to another
  - C. Accepts sound waves and transmits them to the brain
  - D. The things the sender says act as a trigger to create other thoughts as a reaction
  
4. X According to Fournies', what is his solution to improving the thought transmission?
  - A. Tell them what you said and ask them do you understand
  - B. Talk with them politely and they will understand what you mean
  - C. Ask open-ended questions and make the word come out of their mouth
  - D. Initiate Feedback by asking them do you understand the instructions completely
  
5. Listening is affected by selective filtering information. What are the listeners' filters?
  - A. Attention, Interpretation and Retention
  - B. Technical Listening, Situations and Environment
  - C. Communication Skills, Team-Building and Conflict Resolution
  - D. Under-stimulation, Over-stimulation and Different Purposes

**Communication Exercise (continued)**

6. What are the primary causes for Tuning out a person?
- A. Poor, Rude and inflexible listening Habits
  - B. Under-Stimulation, Different Purposes and Pace
  - C. Communication does not occur, Meaning was not transferred
  - D. Different Communication Rates, Different Purposes, Bad Listener
7. What are the keys to more effective listening?
- A. Place your own meaning, ask closed ended questions, and restate
  - B. Utilize selective listening, node politely, utilize your primary listening style
  - C. Tune into words and body language, Ask open-ended questions, summarize
  - D. Tune into their purpose and motivation and behavioral indicators for meaning
8. What is the listening rate in word per minute?
- A. 200
  - B. 300
  - C. 600
  - D. 900
9. What is the speaking rate of a sender in words per minute?
- A. 200
  - B. 400
  - C. 600
  - D. 800
10. What is the net result between our rate of speech and our rate of listening called?
- A. Tuning in
  - B. Tuning out
  - C. Active Listening
  - D. Non-verbal communication

**Communication Exercise (continued)**

11. Which of the following communication activities is the most time spent on?
- A. Talking
  - B. Writing
  - C. Reading
  - D. Listening
12. According to Albert Mehrabian's Research Study on verbal and nonverbal Communication, What percentage is for the Word category?
- A. 7%
  - B. 20%
  - C. 50%
  - D. 70%
13. X According to Albert Mehrabian's Research Study on verbal and nonverbal Communication, What percentage is for the Tone of Voice category?
- A. 5%
  - B. 25%
  - C. 38%
  - D. 55%
14. X According to Albert Mehrabian's Research Study on verbal and nonverbal Communication, What percentage is for the Body Language category?
- A. 10%
  - B. 25%
  - C. 55%
  - D. 80%
15. What is the typical retention percentage of a listener in an oral conversation?
- A. 10
  - B. 20
  - C. 50
  - D. 90

**Communication Exercise (continued)**

16. What is the typical retention percentage of a listener based upon what they hear and see?
- A. 10
  - B. 20
  - C. 50
  - D. 90
17. What percentage of a conversation does the sender typically remember of what they say and do?
- A. 10
  - B. 30
  - C. 50
  - D. 90
18. There are 500 words that are common in the Construction industry. Approximately how many definitions are there to these 500 most common construction words?
- A. 500
  - B. 1,000
  - C. 14,000
  - D. 64,000
19. How can the communication process be improved using the telephone?
- A. Sender states their goals, fears and emotions to the receiver
  - B. Ask the receiver their opinion about the information provided
  - C. Sender initiates feedback by asking did you get all of those instructions down
  - D. Sender leaves a message that can be acted upon and provide the why, what & who
20. How can the communication process be improved using sketches provided to the listener?
- A. Sender states their overall goals, name each view and state polar direction
  - B. Sender states their overall goals, perspectives, learning and behavioral indicator
  - C. Sender initiates feedback by asking did you get all of those instructions down
  - D. Listener initiates the conversation by asking about what needs to be done next
21. What are the communication barrier categories?
- A. Message, sender, physical, and listener
  - B. Motivation, communication, learning and evaluation
  - C. Focus, motivation, behavioral indicator, and strategy
  - D. Specific, measurable, achievable, realistic and time-scheduled

**Communication Exercise (continued)**

Given the conversation below for Questions 24 and 25, answer the following two questions.

Hi! Jim I just looked over the pump alignments and I figured you would be finished over an hour ago. After turning away, you remember to say to Jim Oh! By the way, don't forget to install the "o" rings and grease the pumps in storage area."

22. What is the Communication Barrier Category?
- A. Focus
  - B. Message
  - C. Physical
  - D. Strategy
23. What is the Primary Cause of the communication barrier?
- A. Criticizing
  - B. Confronting
  - C. Too many issues
  - D. Not enough Time

Given the conversation below for Questions 26 and 27, answer the following two questions.

Chris, "we need erection of the formwork braced as follows ..." and as you are continuing to speak, Bill, says "yeah, I know what you want. No Problem, I'll have it done by 3:00" Later you find out that the formwork was not properly braced.

24. What is the Communication Barrier Category?
- A. Focus
  - B. Sender
  - C. Strategy
  - D. Listener
25. What is the Primary Cause of the communication barrier?
- A. Danger Present
  - B. Nearby Distractions
  - C. Jumps to Conclusion
  - D. Turns off the Listener.

**Communication Exercise (continued)**

26. What are the steps you must take to overcome resistance to providing a set of instructions to a reluctant listener?
- A. Initiate feedback by asking, “Do you have those instructions down”
  - B. Leave a message that can be acted upon, and provide the why, what, who when and where you can be reached
  - C. Recognize resistance, understand the person’s ideas and feelings, show understanding and respect for their ideas
  - D. Verify understanding, listen quickly and paraphrase frequently of what you think they are saying, and criticize their poor understanding of the message
27. Which of the following questions is the best example of an effective question from the senders perspective?
- A. Do you understand the instructions for assembling the items?
  - B. What steps are you going to take to complete the assigned work?
  - C. Do you know what I want completed and when it must be completed?
  - D. Do you know what I want assembled and when it needs to be completed?

**Communication Exercise Solutions**

- |     |   |     |   |
|-----|---|-----|---|
| 1.  | A | 19. | D |
| 2.  | A | 20. | A |
| 3.  | D | 21. | A |
| 4.  | C | 22. | B |
| 5.  | A | 23. | C |
| 6.  | B | 24. | D |
| 7.  | C | 25. | C |
| 8.  | C | 26. | C |
| 9.  | A | 27. | B |
| 10. | B |     |   |
| 11. | D |     |   |
| 12. | A |     |   |
| 13. | C |     |   |
| 14. | C |     |   |
| 15. | A |     |   |
| 16. | C |     |   |
| 17. | D |     |   |
| 18. | C |     |   |



## Meeting Leadership Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. What is the best time to distribute the Working Agenda to the Participants?
  - A. As a follow-up to the meeting
  - B. At the beginning of the meeting
  - C. About one day after the meeting
  - D. About one day prior to the meeting
  
2. Which document describes the Suggested Agenda for the Preconstruction Meeting?
  - A. General Conditions
  - B. General Requirements
  - C. Technical Specifications
  - D. Supplementary Conditions
  
3. What is the best time to distribute the Meeting Minutes to the Participants?
  - A. At the beginning of the meeting
  - B. About one day after the meeting
  - C. About one hour prior to the meeting
  - D. About one day prior to the meeting
  
4. Which of the following are the primary content items for the Meeting Minutes?
  - A. To, from, project, date, time place and subject
  - B. Purpose, specific objectives, time frame, topical headings with paragraph, role
  - C. Objective clear and measurable, attendance, role of each person, their expertise
  - D. Attendance, topical headings with paragraph stating person assigned, completion
  
5. Which of the following are the primary content items for the Meeting Working Agenda?
  - A. Workers present, weather, activities completed, materials received and equipment
  - B. Purpose, specific objectives, time frame, topical headings with paragraph, role
  - C. Activity description, days, information needed crew size, material & equipment
  - D. Attendance, topical headings with paragraph stating person assigned, completion

**Meeting Leadership Exercise (continued)**

6. What are the Mental Activities that must be taken into consideration for each topic during the planning phase of a meeting?
  - A. Coordinating, Listening Attentively, Responding Critically, and Soliciting Ideas
  - B. Planning, Timing, Coordinating, Probing, Responding Critically, and Follow-up
  - C. Goals, Gathering, Problem Solving, Decision Making, Action Plan & Monitoring
  - D. Goals, Planning, Scheduling, Priorities, Analyzing, Delegating, and Monitoring
7. What are the Leadership Skills needed to conduct a productive Meeting?
  - A. Planning, Probing Questions, Responding Critically, and Decision Making
  - B. Planning, Timing, Coordinating, Probing, Responding Critically, and Followup
  - C. Listening Attentively, Responding Constructively, Soliciting All Ideas, and Matching Decision Making to the Situation
  - D. Coordinating, Listening Selectively, Responding Critically, Soliciting supportive Ideas and Adjusting Decision Making to the situation
8. Clear goals are SMART goals. What does the SMART criteria mean?
  - A. Simple, Manageable, Active, Related and Technical
  - B. Specific, Measurable, Achievable, Realistic and Time-scheduled
  - C. Spiritual, Measurable, Attainable, Relative and Targeted
  - D. Sustainable, Meaningful, Analysis, Required and Time-wasters

## Meeting Leadership Exercise Solutions

1. D
2. B
3. B
4. D
5. B
6. C
7. C
8. B

## IV. CONSTRUCTION START-UP and SUPPORT

### Contract Documents Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. Which document informs a Contractor that their proposal has been accepted?
  - A. Pre-qualification
  - B. Notice of Award
  - C. Notice to Proceed
  - D. Contract Change Order
  
2. Which document lists the contract documents that are be used to interpret the contract?
  - A. General Conditions
  - B. Technical Specifications
  - C. Supplementary Conditions
  - D. Owner/Contractor Agreement
  
3. Which document informs the Contractor that the work on the project is being stopped?
  - A. Notice of Award
  - B. Stop Work Order
  - C. Stop Work Notice
  - D. Notice to Proceed
  
4. Which document protects the Owner from third party financial claims against the Owner's property while the project is being constructed?
  - A. Bid Bond
  - B. Performance Bond
  - C. Insurance Certificate
  - D. Labor and Material Bond

**Contract Documents Exercise (continued)**

5. Which document establishes the actual start date from which the project is calculated?
- A. Notice of Award
  - B. Notice to Proceed
  - C. Contractor's Proposal
  - D. Supplementary Conditions
6. Which document is used to request the estimated costs for the items listed and for requesting partial payments?
- A. Addenda
  - B. Schedule of Values
  - C. Construction Schedule
  - D. Certificate of Substantial Completion
7. Assume that the Contractor has not been paid according to the contract payment due date. According to the contract documents, which document must the contractor complete and submit to ensure that they do not lose their rights under the contract for late payment?
- A. Sworn Statement
  - B. Stop Work Order
  - C. Stop Work Notice
  - D. Schedule of Values
8. According to the project documents, after the signing of the Agreement which documents must be submitted by the contractor within a specified time period (usually) fourteen days of executing the Agreement?
- A. Performance Bond and Labor/Material Bond
  - B. Extra Work Order and Contract Change Order
  - C. Construction Schedule and Schedule of Values
  - D. Stop Work Notice and Contract Change Order Proposal

## Contract Documents Exercise (continued)

9. What is the procedure and the name of the document that you use to inform the Architect/Engineer of a change notation you would like to make to a shop drawing?
  - A. Inform the A/E using a contract change order
  - B. Inform the A/E using a Letter of Intent to change a shop drawing
  - C. Make the change on the shop drawing and specify on the Change Directive
  - D. Make the change on the shop drawing and specify on the Letter of Transmittal
  
10. Under what conditions are a soil erosion permit required?
  - A. Whenever general permits are required on a project
  - B. If any excavation is within 500 feet of a body of water
  - C. Only if it is stated in the permit article number of the General Conditions
  - D. Only if it is stated in the permit article number of the General Requirements

## Contract Documents Exercise Solutions

1. B
2. D
3. B
4. D
5. B
6. B
7. C
8. C
9. D
10. B

## Site Layout Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. Which of the following temporary facilities should be closest to the work area?
  - A. Parking lot
  - B. Guard house
  - C. Fabrication shop
  - D. Sanitary Facilities
  
2. Which of the following temporary facilities should be closest to the work area?
  - A. Test shops
  - B. Batch plant
  - C. Laydown areas
  - D. Craft Change houses
  
3. Which of the following temporary facilities should be closest to the work area?
  - A. Job office
  - B. Eating facilities
  - C. Warehouse office
  - D. Equipment maintenance shop

## Site Layout Exercise Solutions

1. D
2. D
3. A

## V. CONSTRUCTION RESOURCE MANAGEMENT

### Work Improvement Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

Most of these questions are based upon James J. Adrian's work on productivity.

1. According to Adrian, what percentage of the word day consists of non-productive activities:  
  - A. 20
  - B. 35
  - C. 50
  - D. 80
  
2. According to Adrian, what is the effect of a 5% increase in labor and equipment productivity on the project's profit?  
  - A. None
  - B. Double
  - C. Triple
  - D. Quadruple
  
3. According to Adrian, which of the following non-productive activities has the highest percentage?  
  - A. Rework
  - B. Accidents
  - C. Substance abuse
  - D. Waiting on resources
  
4. Which of the following activities improves productivity?  
  - A. Attitude of the workers
  - B. Field Look-ahead planning
  - C. Stacking the trades on a high rise
  - D. Contractual work rules from labor agreements



**Work Improvement Exercise (continued)**

5. Which of the following factors improves productivity?
- A. Overtime
  - B. High absenteeism
  - C. Good site planning
  - D. Material location
6. Which of the following factors improves productivity?
- A. Labor Availability
  - B. Congested work area
  - C. Effective people skills
  - D. Stringent QA and QC requirements
7. Which of the following controllable factors have the greatest detrimental effects on productivity?
- A. Weather
  - B. Walking time
  - C. Building height
  - D. Congested work area
8. Which of the following controllable factors have the greatest detrimental effects on productivity?
- A. Worker breaks
  - B. Worker accidents
  - C. Contract change orders
  - D. Contractual work rules
9. Which of the following controllable factors have the greatest detrimental effects on productivity?
- A. Plan errors
  - B. Stacking of trades
  - C. Rehandling of materials
  - D. Inadequate temporary facilities

**Work Improvement Exercise (continued)**

10. Which of the following strategies reduces the detrimental effect of walking time on productivity?
- A. Feed materials to the workers and keep them in the work area
  - B. Utilize a different entrance for construction project deliveries
  - C. Utilize BIM to reduce interferences and contract change orders
  - D. Pre-establish crew sizes and daily output requirements for each trade
11. Which of the following safety processes improves productivity, saves lives and money?
- A. Tell the young workers they have high accident rates so be careful
  - B. Establish different contractual work rules for 16 - 21-year-old workers
  - C. Place the sanitary facilities as close to the work area as possible for workers
  - D. Look for workers doing things right, and correct the things they are doing wrong
12. Which of the following safety processes improves productivity, saves lives and money?
- A. Protect workers, give 'em a second chance. Do not use warning systems
  - B. Assemble components inside heated area out of the weather
  - C. Schedule overtime on alternate weeks rather than continuously
  - D. Require workers to take their breaks and lunch in the work area
13. Which of the following strategies reduces the detrimental effect of change orders on productivity?
- A. Help the workers improve their mental attitude
  - B. Read each local labor contract concerning the work rules
  - C. Require a time limit for acceptance from Owner of 12 - 24 hours
  - D. Establish a different entrance for Owner deliveries separate from the Contractor

## Work Improvement Exercise (continued)

Using the Adverse Effect's of Overtime Chart, answer the following:

Adverse Effects of Overtime on Productivity								
	Four-day Week		Five-day Week		Six-day Week		Seven-day Week	
Hours/ Day	Productivity	Loss Productivity	Productivity	Loss Productivity	Productivity	Loss Productivity	Productivity	Loss Productivity
8			100%	0%	97.5%	2.5%	92%	8%
9	100%	0%	95%	5%	88%	12%	83%	17%
10	100%	0%	92%	8%	82%	18%	78%	22%
11	95%	5%	89.5%	10.5%	78%	22%	75%	25%
12	92%	8%	86%	14%	75%	25%	72%	28%

14. What is the loss productivity percentage for working 5-days per week 10-hours per day?

- A.0
- B.8
- C.18
- D.92

## Work Improvement Exercise (continued)

Using the Adverse Effects of Temperature and Humidity Table, answer the following:

Adverse Effects of Weather on Productivity						
Effective Temperature	30 % Relative Humidity		60 % Relative Humidity		90 % Relative Humidity	
	Productivity	Loss Productivity	Productivity	Loss Productivity	Productivity	Loss Productivity
- 10 F	62%	38%	60%	40%	55%	45%
0 F	78%	22%	76%	24%	71%	29%
10 F	88%	12%	87%	13%	82%	18%
20 F	94%	6%	94%	6%	89%	11%
30 F	98%	2%	98%	2%	93%	7%
40 F	100%	0%	100%	0%	96%	4%
50 F	100%	0%	100%	0%	98%	2%
60 F	100%	0%	100%	0%	98%	2%
70 F	100%	0%	100%	0%	96%	4%
80 F	99%	1%	98%	2%	93%	7%
90 F	93%	7%	93%	7%	84%	16%
100	83%	17%	80%	20%	57%	43%
110 F	62%	38%	57%	43%	?	?

Note: The conditions considered are those which will be encountered in the area where work is actually being performed. Thus, if a large building under construction is enclosed during the winter in plastic film and space heaters are employed to protect workers inside, there would be no degradation of performance even though outside conditions are extremely cold.

15. What is the temperature range in degrees(F) that achieves 100% relative efficiency?
  - A. 20 - 39
  - B. 40 - 79
  - C. 80 - 99
  - D. 100 - 110
  
16. Assume on a large building under construction is enclosed during the winter in plastic film and uses space heaters and ventilation system. The outside temperature is 10 F and RH of 30%. What is the productivity loss percentage?
  - A. 0
  - B. 2
  - C. 12
  - D. 88

## Work Improvement Exercise (continued)

Using the Congested Work Area table, answer the following:

Adverse Effects of Congested Work Area		
	Productivity	Loss Productivity
Adequate Crew Work Space	100%	0%
Crowded. Approximately One-half Space Desired	74%	26%
Very Congested. Approximately One-third Space Desired	65%	35%

17. Assume that the work area is 50% of the desired space. What is the loss productivity percentage for the area?
  - A. 0
  - B. 26
  - C. 35
  - D. 74
  
18. Assume the work area is 33% of the desired space and normally the workhours estimated for the work is 10,000 workhours for an adequate work space for the crew. How many workhours are estimated for this project?
  - A. 3,500
  - B. 10,000
  - C. 12,600
  - D. 13,500
  
19. Assume that the work area is 33% of the desired spaced. What is the productivity percentage for that area?
  - A. 0
  - B. 35
  - C. 65
  - D. 100

**Work Improvement Exercise (continued)**

Using the Multi-Story Buildings above 3<sup>rd</sup> Floor table, answer the following:

Multi-Story Buildings above 3 <sup>rd</sup> Floor		
	Minimum Increase in Total Whrs	Maximum Increase in Total Whrs
Third Floor and Below	No Change	No Change
Above the Third Floor	1% per Floor	2% per Floor

20. What is the minimum change percentage per floor above the third floor?
- No change
  - 1.0
  - 1.5
  - 2.0
21. What is the maximum change percentage per floor above the third floor?
- No change
  - 1.0
  - 1.5
  - 2.0
22. What is the change percentage per floor for a three-story building?
- No change
  - 1.0
  - 1.5
  - 2.0
23. Given a 23-Story building, what is the average percentage increase in total workhours?
- 20
  - 23
  - 30
  - 40

**Work Improvement Exercise Solutions**

- |     |   |     |   |
|-----|---|-----|---|
| 1.  | C | 21. | D |
| 2.  | B | 22. | A |
| 3.  | D | 23. | C |
| 4.  | B |     |   |
| 5.  | C |     |   |
| 6.  | C |     |   |
| 7.  | B |     |   |
| 8.  | A |     |   |
| 9.  | C |     |   |
| 10. | A |     |   |
| 11. | D |     |   |
| 12. | A |     |   |
| 13. | C |     |   |
| 14. | B |     |   |
| 15. | B |     |   |
| 16. | A |     |   |
| 17. | B |     |   |
| 18. | D |     |   |
| 19. | C |     |   |
| 20. | B |     |   |

## Project Documentation Exercise

Each multiple choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. What are the general rules the courts require for considering the job diary to be admissible evidence in a court of law?
  - A. Place in a three Ring Binder, completed closest to the event as possible by the home office, place entries only when problems arise and Signed/Dated each day
  - B. Place in a Bound book, Pages Numbered randomly, completed closest to the event as possible by the secretary, erase entries that are wrong and make change
  - C. Place in a Bound book, Pages Numbered consecutively, completed closest to the event as possible by Person with direct knowledge, and Signed/Dated each day
  - D. Place in a three Ring Binder, Pages Numbered consecutively, completed closest to the event as possible by Person with direct knowledge Signed/Dated each day.
  
2. Which of the following statements would be considered admissible evidence?
  - A. At 7:30 AM, Ed was drunk. He was coming from the bar
  - B. At 7:30 AM, Ed's breath smelled of alcohol and his clothes of marijuana
  - C. At 8:00 AM, Ed was carrying a bag of crack cocaine and he was swaying
  - D. At 8:00 AM, Ed was staggering and he arrived at the job site drunk again
  
3. Which of the following descriptions provides the best example of how to report progress on the jobsite?
  - A. Poured Concrete for the Columns
  - B. Installed Rebar and Poured Concrete
  - C. Poured 75 CY Concrete Placed Rebar, Stripped Forms for Columns D1 -D4
  - D. Poured 75 CY Concrete, Placed Rebar and Stripped Forms for the Building
  
4. Which of the following items must be on an equipment time card for it to be admissible evidence in a court of law?
  - A. Fuel Consumption and quantity moved
  - B. Estimated durations, weight of the materials and cycle time
  - C. Total hours worked for each employee by day and their total hours for the week
  - D. Hours distributed by work activities performed and idle time and extra work



**Project Documentation Exercise (continued)**

5. In addition to the Project Name, Date and Job Number, and Weather Conditions, which of the following Categories are contained in the Daily Construction Report?
  - A. Daily Materials Needed, Material Quantity at Site, Material Quantity Needed
  - B. Construction Labor Requirements, Material Requirements, Tools and Equipment Requirements, Safety Requirements, and Sketch Requirements
  - C. Construction Activities Completed, Equipment on Site, Meetings at Job Site, Workers Present, Visitors at Job Site, Materials Placed and Materials Received
  - D. Construction Activities Planned, Technical Information Needed, Safety Plan, Activity Sequence Plan, Quality Requirements, Materials and Quantities needed
6. In addition to the Project Name, Date and Job Number, and Weather Conditions, which of the following Categories are contained in the Daily Job Diary?
  - A. Construction Activities Completed and Conversations
  - B. Meeting Purpose, Objectives, Topic Heading, Topic Description and Times
  - C. Activities Performed, Extra Work Orders and Time on activities Performed
  - D. Technical Problems & Solutions, Safety Recommendations and Conversations
7. What is the most common frequency at which you must distribute time to construction activities on the time cards to ensure admissible evidence in court?
  - A. At the end of the week
  - B. At the end of every hour
  - C. Morning and afternoon each day
  - D. Bi weekly at the end of the week
8. How should you record a telephone conversation or a face-to-face conversation with solutions to ensure admissible evidence in court?
  - A. At the end of each day
  - B. Hour and minute of each conversation for each day
  - C. Minute and second of each conversation for each day
  - D. Morning and afternoon each day

**Project Documentation Exercise (continued)**

9. What is the most common frequency at which you must record weather conditions to ensure proper evidence?
- A. At the end of each day
  - B. At the end of each week
  - C. At the beginning of each day
  - D. Morning and afternoon each day
10. For a Contractor to submit a weather claim, which of the following weather reports would be considered admissible evidence in a court of law?
- A. National weather station report
  - B. Local radio station weather report
  - C. Contractor's job site weather report
  - D. Contractor's home office weather report
11. How is the wind recorded on the report?
- A. Still, Moderate or High once per day
  - B. Still, Moderate or High in the morning and in the afternoon
  - C. Dry, Moderate or High in the morning and in the afternoon
  - D. Temperature in Fahrenheit in the morning and in the afternoon
12. You are an earthmoving contractor, which of the following items must be shown as a part of your records for hauling the soil?
- A. Fuel Consumption, and Quantity moved
  - B. Load size, distance, type of material and weight of the material
  - C. Leadtime, cost of fuel, and extra work
  - D. Hours distributed by work activities performed, extra work, and idle time
13. Which of the following activities must the supervisor prove concerning the document for the documentation to be admissible evidence in court?
- A. Completed periodically with details of problems by home office person
  - B. Completed daily with details to reconstruct by supervisor with direct knowledge
  - C. Completed daily with details concurrent with the events by field office clerk
  - D. Completed periodically with details of problems by supervisor with direct knowledge

**Project Documentation Exercise (continued)**

14. Which of the following descriptions would be the best way to record the wind on the report?
- A. Still, Moderate or High once per day
  - B. Speed in miles per hour once per day
  - C. Still, Moderate or High in the morning and in the afternoon
  - D. Speed in miles per hour in the morning and in the afternoon
15. Which of the following systems is the most common method for filing field documentation?
- A. UniFormat
  - B. MasterFormat
  - C. CSI's Project Resource Manual
  - D. Contractor's field filing system

**Project Documentation Exercise Solutions**

- 1. C
- 2. B
- 3. C
- 4. D
- 5. C
- 6. D
- 7. C
- 8. B
- 9. D
- 10. C
- 11. B
- 12. B
- 13. B
- 14. D
- 15. B

## Supplier and Vendor Agreement Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. Which of the following contract formation principles is the primary difference between a subcontract agreement and a purchase agreement?
  - A. Meeting of the minds exists in a Subcontract but not in a Purchase Order
  - B. Meeting of the minds exists in a Purchase Order but not in a Subcontract
  - C. Consideration exists in a Subcontract but not in a Purchase Order
  - D. There are not any differences between a Subcontract & a Purchase Order
2. Which law establishes basic rules governing the sale of goods, used to establish a Purchase Order?
  - A. Davis Bacon Act
  - B. Uniform Commercial Code
  - C. National Labor Relations Act
  - D. Uniform Transportation Code
3. Which of the following items must never be agreed upon utilizing a form titled Purchase Order?
  - A. Labor
  - B. Materials
  - C. Overhead
  - D. Rental Equipment
4. Which test is most commonly used to determine if a contract is predominantly for services or for the sale of goods?
  - A. Policy Test
  - B. Goods Supplied Test
  - C. Predominate Thrust Test
  - D. Predominate Service Test
5. Which test focuses primarily on that part of the contract that UCC applies to goods and general contract law applies to the services portion of the transaction?
  - A. Gravamen Test
  - B. Divisibility Test
  - C. Predominate Thrust Test
  - D. Contract Language Test

**Supplier and Vendor Agreement Exercise (continued)**

6. Assume that you are utilizing the verbiage Purchaser and Supplier in the terms and conditions of the contract. How will the courts interpret this type of contract?
  - A. Services contract
  - B. Sales of good contract
  - C. The words are unimportant
7. Other than the most commonly utilized test, what other tests are suggested by McLaughlin and Jensen to prove your arguments for a specific type of contract?
  - A. Language Test and the Divisibility Test
  - B. Policy Test and the Goods Supplied Test
  - C. Gravamen Test and the Predominate Service Test
  - D. Predominate Thrust Test and the Predominate Service Test
8. If the terms on the purchase order indicate F.O.B. Factory. At which point does the responsibility for the goods change?
  - A. Passes at the invoice date
  - B. Passes at the payment due date
  - C. Passes at time of pickup by carrier
  - D. Passes at time of receipt at the jobsite
9. If the Shipping terms are FOB JOBSITE, which parties is the Bill of Lading between?
  - A. Vendor and the contractor
  - B. Common carrier and the vendor
  - C. Common carrier and the architect
  - D. Common carrier and the contractor
10. If Damages should occur during shipment of construction materials and the terms on the Bill of Lading are FOB Factory, who would be required to recover the loss from the common carrier?
  - A. Vendor
  - B. Owner
  - C. Architect
  - D. Purchaser

**Supplier and Vendor Agreement Exercise Solutions**

1. A
2. B
3. A
4. C
5. B
6. B
7. A
8. C
9. B
10. D

## Sub Coordination Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. The Owner has awarded five (5) separate contracts for the foundation concrete, process equipment, the conveyor system, the controls, and the electrical portions of the project. Which of the following responsibilities does the General Contractor have towards these separate contractors according to the separate contract clause?
  - A. Install the conveyor system
  - B. Schedule each separate contractor's work
  - C. Unload each separate contractor's materials
  - D. Submit each separate contractor's progress payment requests
  
2. The Owner has awarded five (5) separate contracts for the foundation concrete, process equipment, the conveyor system, the controls, and the electrical portions of the project. Which of the following responsibilities does the General Contractor have towards these separate contractors according to the separate contract clause?
  - A. Store each separate contractor's materials
  - B. Install the controls for the various systems
  - C. Submit each separate contractor's claims to owner
  - D. Make progress payments to each separate contractor
  
3. The Owner has awarded five (5) separate contracts for the foundation concrete, process equipment, the conveyor system, the controls, and the electrical portions of the project. Which of the following responsibilities does the General Contractor have towards these separate contractors according to the separate contract clause?
  - A. Place the foundations
  - B. Purchase the long lead time equipment
  - C. Accept each separate contractor's work to continue the project
  - D. Submit payment requests to the owner on each separate contractor's behalf

**Sub Coordination Exercise (continued)**

4. Which of the following is the proper procurement activity sequence that is used for every vendor or supplier (such as Rebar, Structural Steel and Sheet Metal) on a Design/Build logic network according to acceptable legal practices?
- A. Design, procurement, and construction
  - B. Order and deliver materials, place forms, place rebar, pour concrete, and strip forms
  - C. Award vendor contract, vendor prepares shop drawings, contractor reviews shops, a/e reviews shops, vendor fabricates and deliver materials
  - D. Prepare design plans, award vendor contract, a/e approves design, order materials, fabricate, a/e approves shop drawings, contractor approves shop drawings, deliver materials

**Sub Coordination Exercise Solutions**

- 1. B
- 2. A
- 3. C
- 4. C



## Sub Proposal and Agreement Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. What phase of a project must the General Contractor provide the Subcontract Agreement to the Subcontractor to avoid the Subcontractor from refusing to sign the agreement?
  - A. At the bid opening
  - B. During the bidding phase of the project
  - C. After the Owner-Contractor Agreement is signed
  - D. At the signing of the Contractor-Subcontractor Agreement
  
2. What type of information should be on the Subcontractor Proposal Form?
  - A. Bid Breakdown request and Overlooked items
  - B. Total Price and the subcontractors' terms and conditions
  - C. Bid Breakdown, crew size, leadtimes, completion time
  - D. Scope, General inclusions, Document List and Document Enumeration
  
3. Which of the following items are found in the Bid Division Scope Description General Inclusions section?
  - A. Bid Scope, Documents Utilized, Insurance Amounts, and Crew Size
  - B. Unloading, Permits, Material Allowances, Patching and Labor Agreements
  - C. Trade activities, Bid Breakdown, Typical Questions included and Leadtimes
  - D. Change Orders, Stop Work Order, Arbitration, Claims and Termination Procedures

QUESTIONS 4 through 9 refer to Section 2 - SCOPE OF WORK, of the Subcontract Agreement

4. Which of the following items must be consulted to write the Scope for this section?
  - A. Specifications, General Requirements, General Conditions
  - B. Bid Division Scope Description content and the Bid Breakdown & Proposal
  - C. Instruction to Bidders, Information Available to Bidders and Change Orders
  - D. Shop Drawings, Product Data, A/E Drawings and Supplementary Conditions
  
5. Which of the following content items is contained within the Scope of Work Description section of the Subcontract Agreement for it to be clear and complete?
  - A. Working Drawings
  - B. General Requirements
  - C. Supplementary Conditions
  - D. Specific Trade Inclusions

**Sub Proposal and Agreement Exercise (continued)**

6. Which of the following content items is contained within the Scope of Work Description section of the Subcontract Agreement for it to be clear and complete?
- A. Enumeration
  - B. Other Considerations
  - C. General Conditions
  - D. Technical Specifications
7. Which of the following content items is contained within the Scope of Work Description section of the Subcontract Agreement for it to be clear and complete?
- A. Bid Breakdown
  - B. General Conditions
  - C. Leadtime Durations
  - D. Systems or Locations
8. Which of the following content items is contained within the Scope of Work Description section of the Subcontract Agreement for it to be clear and complete?
- A. Complete and Operational
  - B. List of Reference Standards
  - C. Prevailing Wage Rate Table
  - D. List of the Contract Documents
  - E.
9. Which of the following content items is contained within the Scope of Work Description section of the Subcontract Agreement for it to be clear and complete?
- A. Reference Standards
  - B. List of Shop Drawings
  - C. Instructions to Bidders
  - D. Accepted by the Owner

**Sub Proposal and Agreement Exercise (continued)**

QUESTIONS 10 through 13 refer to Section 5, titled PROJECT CONTRACTUAL PROVISIONS section of the Subcontract Agreement

10. Which of the following items is contained in Section 5, titled PROJECT CONTRACTUAL PROVISIONS section of the Subcontract Agreement?
  - A. Number of skilled crafts
  - B. Change order procedures
  - C. Scope of work description.
  - D. Comprehensive general liability insurance
  
11. Which of the following items is contained in Section 5, titled PROJECT CONTRACTUAL PROVISIONS section of the Subcontract Agreement?
  - A. Claims procedures
  - B. Shop Drawing Submittal duration
  - C. List of the contract documents
  - D. Automobile Insurance coverage
  
12. Which of the following items is contained in Section 5, titled PROJECT CONTRACTUAL PROVISIONS section of the Subcontract Agreement?
  - A. Bond values
  - B. Contract price
  - C. Material delivery date
  - D. Termination procedures
  
13. Which of the following items is contained in Section 5, titled PROJECT CONTRACTUAL PROVISIONS section of the Subcontract Agreement?
  - A. Submittal procedures
  - B. Work completion duration
  - C. General conditions incorporated
  - D. Sub Bid Scope Description bid number and date

**Sub Proposal and Agreement Exercise (continued)**

QUESTIONS 14 through 17 refer to Section 3, titled the ENUMERATION OF THE DOCUMENTS section of the Subcontract Agreement. Answer the following questions.

14. Which of the following is the proper manner to reference the set of plans for a project?
- A. A1.1 - A8.1B
  - B. C1.1, C1.2, and C3.1
  - C. Per plans and specifications.
  - D. All plans designated A, C, S, M, E.
15. Which of the following items must be provided in addition to the Name of the document for it to be clear and complete?
- A. Page Numbers
  - B. Project Number
  - C. Article Numbers
  - D. Supplementary Conditions
16. Which of the following items must be provided in addition to the Name of the document for it to be clear and complete?
- A. Dates
  - B. Scope of Work
  - C. Section Numbers
  - D. Technical Specifications
17. Which of the following items must be provided in addition to the plan numbers for it to be clear and complete?
- A. Volume Number
  - B. Chapter Number
  - C. Issued for Bids
  - D. Article Number

**Sub Proposal and Agreement Exercise Solutions**

1. B
2. C
3. B
4. B
5. D
6. B
7. D
8. A
9. D
10. A
11. B
12. C
13. B
14. B
15. A
16. A
17. C

## Wood Sheet Piling Material and Unit Cost Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

Given the information below for a cofferdam that is 60 feet wide by 100 feet long and 10 feet deep enclosed with a 3 foot toe, answer the following questions:

Material	Size	Prices or Percentages
Sheet Piling (Toe = 3 feet)	3" x 13"	\$550.MBF
Wales - 3 lines around the outside perimeter	6" x 8"	\$550.MBF
Braces - 3 lines, 12 Pcs per line, each 60 feet l o n g	6" x 6"	\$550.MBF
Nails - 12 Lbs/100 Square Feet Contact Area		\$35/Box, Box = 50 Lbs
Salvage Value		60%
Transportation & Shipping		\$3.78/MBF
Sales Tax on Materials		4%
Timber Waste Factor	12%	

- How many total square feet of contact area (S.F.C.A.) are required for the sheet piling?
  - 3,200
  - 4,160
  - 6,000
  - 60,000
- How many total vertical lineal feet (VLF) of sheet piling?
  - 320
  - 2,960
  - 3,848
  - 60,000
- Approximately how many total board feet (BF) for all of the cofferdam components including the waste?
  - 16
  - 16,164
  - 25,565
  - 27,229

### Wood Sheet Piling Material and Unit Cost Exercise (continued)

Given the information below and assuming a Grand Total of 11,000 Board Feet, 3690 Square Feet of Contact Area, 5500 Vertical Lineal Feet including the piling, wales, braces and waste for a cofferdam, answer the following questions:

Material	Size	Prices or Percentages
Sheet Piling (Toe = 3 feet)	3" x 13"	\$550.MBF
Wales - 3 lines	6" x 8"	\$550.MBF
Braces - 3 lines 12 Pcs per line. Each 9 feet l o n g	6" x 6"	\$550.MBF
Nails - 12 Lbs/100 Square Feet Contact Area		\$35/Box, Box = 50 Lbs
Salvage Value		60%
Transportation & Shipping		\$3.78/MBF
Sales Tax on Materials		4%
Timber Waste Factor	12%	

4. What is the Total Lumber Cost allocated to this project?
  - A. \$2,420
  - B. \$6,050
  - C. \$24,200
  - D. \$60,500
  
5. Approximately how many pounds of nails are required?
  - A. 66
  - B. 443
  - C. 1,320
  - D. 44,280
  
6. Assuming the Total Material Costs for the Cofferdam above is \$17,000 and using the information provided above, what is the Material Unit Costs per Vertical Lineal Feet (\$M/VLF)?
  - A. \$0.65
  - B. \$1.55
  - C. \$3.09
  - D. \$4.61

## Wood Sheet Piling Material and Unit Cost Exercise Solutions

1. B  $60 + 100 \text{ } 6 + 100 = 320 \text{ LF} \times 13 \text{ Feet} = 4,160 \text{ SFCA}$

2. C  $\frac{320 \text{ LF}}{13''/12''} = 296 \text{ PCS} \times 13' \text{ long} = 3848 \text{ VLF}$   
 $1.083'$

3. C

Component	Calculations	Board Feet
Piling	$3848 \text{ VLF} \times \frac{3'' \times 13''}{12} (3.25 \text{ BF/VLF}) =$	12,506
Wales	$3 \text{ lines} \times 320 \text{ Feet} = 960 \text{ Lineal Feet} \times \frac{6'' \times 8''}{12} (4.0 \text{ BF/LF}) =$	3,840
Braces	$3 \text{ lines} \times 12 \text{ PCS/line} \times 60' \text{ long} = 2,160 \text{ LF} \times \frac{6'' \times 6''}{12} (3 \text{ BF/LF})$	6,480
	Subtotal Board Feet	22,826
Waste	$12\% \times 17,318 \text{ BF} =$	2,739
	Total Board Feet	25,565

4. A

Component	Calculations	Cost
Lumber	$11,000 \text{ BF} \times \$550/\text{MBF} (M= 1000) =$	\$ 6,050
Salvage	$\text{Deduct } 60\% \times \$6,050) =$	(\$3,630)
	Total Allocated to this Project	\$2,420

5. B

Nails  $12 \text{ Lbs}/100 \text{ SFCA} \times 3,690 \text{ SF} = \frac{442.8 \text{ Lbs}}{50 \text{ Lbs/Bxs}} = 9 \text{ Bxs} \times \$35/\text{Bxs}$

6. C  $\frac{\$17,000}{5,500 \text{ VLF}} = \$3.09/\text{VLF}$



## Equipment Production and Unit Cost Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

Given that you must excavate 7,255 CY, the equipment production rates, the equipment hourly rates, mobilization and the Crew, the Crew Hourly Rates and the Payroll Burden for Excavating provided below, answer the following:

No.	EQUIPMENT		Equipment Hourly Rate	Total Costs
1	Backhoe	80 CY per hour	\$55.20 per hour	
	Backhoe Mobilization		\$1.95 per hour	\$177
	Total Backhoe Costs			
	Trucks		\$22.77 per hour	

### Excavation Crew

No.	CRAFT		Hourly Rate
1	Crew Leader		\$12.35 per hour
1	Backhoe Operator		\$11.85 per hour
1	Oiler		\$10.15 per hour
	Subtotal		\$34.35 per hour
	Payroll Insurance	6.87%	
	Payroll Taxes	12.55%	
			Total Hourly Costs

### Hauling Crew

No.	CRAFT		Hourly Rate
	Truck Drivers		\$ 9.30 per hour

- The 1.5 CY Hydraulic Backhoe will load at rate of 80 CY/hr and the Trucks will Haul 10 CY per load to the Disposal Site 12 Miles Away. The Trucks will average 35 Miles per Hour (MPH) Loaded and 45 MPH empty. Assume the Truck Unload Time is 6 minutes. What is the truck round trip cycle time in hours (decimal of an hour)?
  - 0.343
  - 0.720
  - 0.835
  - 6.620

**Equipment Production and Unit Cost Exercise (continued)**

2. Assume that the round-trip time is .266. How many Round Trips per hour for one-truck?
- A. 0.266
  - B. 3.759
  - C. 15.960
  - D. 225.563
3. Assume that the round trips per hour for one truck is 1.197 Trips per hour. How many whole Trucks are needed to keep the Backhoe working efficiently?
- A. 2
  - B. 7
  - C. 8
  - D. 16
4. What is the Backhoe Equipment Cost per Cubic Yard?
- A. \$ 0.01
  - B. \$ 0.71
  - C. \$ 0.97
  - D. \$36.80
5. Assume you are going to utilize 9 trucks. What is the Hauling Equipment Cost per Cubic Yard?
- A. \$ 0.32
  - B. \$ 2.56
  - C. \$ 8.08
  - D. \$ 204.93
6. What is the Labor cost per CY (\$L/CY) to EXCAVATE including Payroll Burden?
- A. \$ 0.51
  - B. \$ 0.83
  - C. \$ 2.14
  - D. \$41.02

**Equipment Production and Unit Cost Exercise (continued)**

7. What is the Labor cost per CY (\$/CY) to HAUL using 6 Trucks Drivers needed to keep the Backhoe productive including payroll burden?
- A. \$ 0.12
  - B. \$ 0.83
  - C. \$ 1.20
  - D. \$66.63

Given the Backhoe Equipment Production Rates and Equipment Hourly Rates and the Labor Hourly Labor Rates below, answer the following questions:

No.	EQUIPMENT	Production Information	Equipment Hourly Rate	
1	1.5 CY Backhoe	23 Seconds	\$55.20 per hour	
	Efficiency	45 minutes per hour		
	10 CY Trucks	3 Trips per hour	\$10.20 per hour	

8. How many Bucket cycles per hour can the backhoe complete?
- A. 0.006
  - B. 0.383
  - C. 2.610
  - D. 156.5
9. What is the (Theoretical) Production Rate for the Backhoe in Cubic Yards per hour?
- A. 80.00
  - B. 104.30
  - C. 156.50
  - D. 234.75
10. What is the true (Actual) output for the Backhoe in Cubic Yards per hour?
- A. 60.00
  - B. 78.23
  - C. 117.38
  - D. 176.06

## Equipment Production and Unit Cost Exercise (continued)

Given the Steel Drum Roller Compaction Production information, you must compact 7,500 CY of fill. The equipment production rates, the equipment hourly rates, mobilization and the Crew, the Crew Hourly Rates and the Payroll Burden for compacting are provided below, answer these questions:

No.	EQUIPMENT	Production Information	Equipment Hourly Rate	
1	Vibrating Roller	9 Ton Roller, 4 feet wide	\$22.00	
	Operating Costs		\$1.00	
	Mobilization			\$3,000

No.	CRAFT	Hourly Rate
1	Roller Operator	\$20.20 pe hour
		Subtotal
	Payroll Insurance	6.87%
	Payroll Taxes	12.55%

11. The Steel Drum Roller Compactor moves at 2 Miles per Hour working a 50-minute hour, and 95% Proctor Density is developed after 8 passes for the 6-inch lifts. What is the true (Actual) Production rate in Cubic Yards per Hour?
  - A. 0.017
  - B. 1.832
  - C. 81.480
  - D. 21160.000
  
12. The Vibrating Plate is 24" wide and 26" long. The vibrating plate moves at 35 feet per minute (FPM) working a 45-minute hour, and 95% modified Proctor Density is developed after 3 passes for the 6-inch lifts. What is the production rate in Cubic Yards per hour for the vibrating plate?
  - A. 0.32
  - B. 19.44
  - C. 38.89
  - D. 76,999.99

**Equipment Production and Unit Cost Exercise (continued)**

13. Assume that the round-trip time is .266. How many Round Trips per hour for one-truck?
- A. 0.266
  - B. 3.759
  - C. 15.960
  - D. 225.563
14. Assume that the round trips per hour for one truck is 1.197 Trips per hour. How many whole Trucks are needed to keep the Backhoe working efficiently?
- A.2
  - B.7
  - C.8
  - D.16
15. What is the Backhoe Equipment Cost per Cubic Yard?
- A. \$ 0.01
  - B. \$ 0.71
  - C. \$ 0.97
  - D. \$36.80
16. Assume you are going to utilize 9 trucks. What is the Hauling Equipment Cost per Cubic Yard?
- A. \$ 0.32
  - B. \$ 2.56
  - C. \$ 8.08
  - D. \$ 204.93
17. What is the Labor cost per CY (\$L/CY) to EXCAVATE including Payroll Burden?
- A. \$ 0.51
  - B. \$ 0.83
  - C. \$ 2.14
  - D. \$41.02

**Equipment Production and Unit Cost Exercise (continued)**

18. What is the Labor cost per CY (\$/CY) to HAUL using 6 Trucks Drivers needed to keep the Backhoe productive including payroll burden?

A. \$ 0.12  
 B. \$ 0.83  
 C. \$ 1.20  
 D. \$66.63

Given the Backhoe Equipment Production Rates and Equipment Hourly Rates and the Labor Hourly Labor Rates below, answer the following questions:

No.	EQUIPMENT	Production Information	Equipment Hourly Rate	
1	1.5 CY Backhoe	23 Seconds	\$55.20 per hour	
	Efficiency	45 minutes per hour		
	10 CY Trucks	3 Trips per hour	\$10.20 per hour	

19. How many Bucket cycles per hour can the backhoe complete?

A. 0.006  
 B. 0.383  
 C. 2.610  
 D. 156.5

20. What is the (Theoretical) Production Rate for the Backhoe in Cubic Yards per hour?

A. 80.00  
 B. 104.30  
 C. 156.50  
 D. 234.75

21. What is the true (Actual) output for the Backhoe in Cubic Yards per hour?

A. 60.00  
 B. 78.23  
 C. 117.38  
 D. 176.06

## Equipment Production and Unit Cost Exercise (continued)

Given the Steel Drum Roller Compaction Production information, you must compact 7,500 CY of fill. The equipment production rates, the equipment hourly rates, mobilization and the Crew, the Crew Hourly Rates and the Payroll Burden for compacting are provided below, answer these questions:

No.	EQUIPMENT	Production Information	Equipment Hourly Rate	
1	Vibrating Roller	9 Ton Roller, 4 feet wide	\$22.00	
	Operating Costs		\$1.00	
	Mobilization			\$3,000

No.	CRAFT		Hourly Rate
1	Roller Operator		\$20.20 pe hour
			Subtotal
	Payroll Insurance	6.87%	
	Payroll Taxes	12.55%	

22. The Steel Drum Roller Compactor moves at 2 Miles per Hour working a 50-minute hour, and 95% Proctor Density is developed after 8 passes for the 6-inch lifts. What is the true (Actual) Production rate in Cubic Yards per Hour?
- A. 0.017  
 B. 1.832  
 C. 81.480  
 D. 21160.000
23. The Vibrating Plate is 24" wide and 26" long. The vibrating plate moves at 35 feet per minute (FPM) working a 45-minute hour, and 95% modified Proctor Density is developed after 3 passes for the 6-inch lifts. What is the production rate in Cubic Yards per hour for the vibrating plate?
- A. 0.32  
 B. 19.44  
 C. 38.89  
 D. 76,999.99

## Equipment Production and Unit Cost Exercise (continued)

Given the Steel Drum Roller Compaction Production information, you must compact 7,500 CY of fill. The equipment production rates, the equipment hourly rates, mobilization and the Crew, the Crew Hourly Rates and the Payroll Burden for compacting are provided below, answer these questions:

No.	EQUIPMENT	Production Information	Equipment Hourly Rate	
1	Vibrating Roller	9 Ton Roller, 4 feet wide	\$22.00	
	Operating Costs		\$1.00	
	Mobilization			\$3,000

No.	CRAFT		Hourly Rate
1	Roller Operator		\$20.20 pe hour
			Subtotal
	Payroll Insurance	6.87%	
	Payroll Taxes	12.55%	

24. The Steel Drum Roller Compactor moves at 2 Miles per Hour working a 50-minute hour, and 95% Proctor Density is developed after 8 passes for the 6-inch lifts. What is the true (Actual) Production rate in Cubic Yards per Hour?
- A. 0.017  
 B. 1.832  
 C. 81.480  
 D. 21160.000
25. The Vibrating Plate is 24" wide and 26" long. The vibrating plate moves at 35 feet per minute (FPM) working a 45-minute hour, and 95% modified Proctor Density is developed after 3 passes for the 6-inch lifts. What is the production rate in Cubic Yards per hour for the vibrating plate?
- A. 0.32  
 B. 19.44  
 C. 38.89  
 D. 76,999.99



## Equipment Production and Unit Cost Exercise Solutions

1.	C	
Categories	Calculation	Decimal of an Hour
Position	0 Minutes/60 minutes =	.000
Load	10 CY Truck/80 CY Backhoe =	.125
Haul Away	12 Miles Away/35.0 Miles Per hour Loaded	.343
Unload	6 minutes/ 60 minutes	.100
Return	12 Miles Away/ 45.0 MPH empty	..267
	Total Round Trip Time for 1 Truck	.835

2.	B	1 HOUR/.266 = 3.759 Trips per hour
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3.	B	<div> <div>Backhoe Production</div> <div>Haul Unit Production</div> </div> <div> <div>= 80 CY per Hour</div> <div>10 CY x 1.197 Trips per hr.</div> </div> <div> <div>= 6.72 Trucks</div> <div>USE 7 Trucks</div> </div>
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4.	B	<div>7255CY/80CY/hour = 90.68-hour    \$177/90.68 hour = \$1.95/hour mobilization</div> <div>\$55.20 + 1.95 mobilization =    <u>\$57.15 per hour</u></div>
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5.	B	<div> <div><u>9 Trucks x \$22.77 per hour</u></div> <div>80 CY per hour</div> </div> <div> <div>= <u>\$204.93 per hour</u></div> <div>80 CY per hour</div> </div> <div>=    \$2.56/CY</div>
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## Equipment Production and Unit Cost Exercise Solutions (continued)

6.		A			
No.		CRAFT		Hourly Rate	Total Hourly Costs
1		Crew Leader		\$12.35 per hour	\$12.35 per hour
1		Backhoe Operator		\$11.85 pe hour	\$11.85 pe hour
1		Oiler		\$10.15 per hour	\$10.15 per hour
				Subtotal	\$34.35 per hour
		Payroll Insurance	6.87% x \$34.35		\$2.36 per hour
		Payroll Taxes	12.55% x \$34.35		\$4.31 per hour
				Total Hourly Costs	\$41.02 per hour

Labor cost per CY (\$/CY) to EXCAVATE:  $\frac{\$41.02 \text{ per hour}}{80 \text{ CY per hour}} = \$0.51/\text{CY}$

	7. B				
No.		CRAFT		Hourly Rate	Total Hourly Costs
6		Truck Drivers		\$9.30 per hour	\$55.80 per hour
				Subtotal	\$55.80 per hour
		Payroll Insurance	6.87% x \$55.80		\$03.83 per hour
		Payroll Taxes	12.55% x \$55.80		\$07.00 per hour
				Total Hourly Costs	\$66.63 per hour

Labor cost per CY (\$/CY) to HAUL:  $\frac{\$66.63 \text{ per hour}}{80 \text{ CY per hour}} = \$0.83/\text{CY}$

### Equipment Production and Unit Cost Exercise Solutions (continued)

8.	D	$\frac{60 \text{ seconds} \times 60 \text{ minutes}}{23 \text{ Seconds per Cycle}} = \frac{3600 \text{ seconds}}{23 \text{ Sec./Cycle}} = 156.5 \text{ Cycles per Hour}$
9.	D	$1.5 \text{ CY per Cycle} \times 156.5 \text{ Cycles per Hour} = 234.75 \text{ CY/Hour}$
10.	D	$234.75 \text{ CY/Hour} \times \frac{45 \text{ Minutes}}{60 \text{ Minutes}} = 176.06 \text{ CY/Hour}$
11.	C	$\frac{4 \text{ feet wide} \times 2 \text{ miles per hour} \times 5,280 \text{ Feet} \times 6" \times 50 \text{ minutes}}{8 \text{ passes} \times 27 \text{ CF per Cubic Yard} \times 12" (60 \text{ Minutes})} = 81.48 \text{ CY/hr}$
12.	B	$\frac{[2 \text{ feet Wide} \times 35 \text{ FPM} \times 45 \text{ minutes/hour}] \times 06 \text{ inches}}{[3 \text{ passes} \times 27 \text{ Cubic Feet per CY}] \times 12 \text{ inches}} = 19.44 \text{ CY/Hour}$

## VI. CONSTRUCTION COST CONTROL

### Cost Reports Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

Using the Earned Workhour Report information provided, answer the following questions:

1. What is the Budgeted Unit Workhours in Whr per Unit for the Column Forms?
  - A. 0.045
  - B. 0.171
  - C. 0.241
  - D. 5.838
2. What is the Weekly Unit Workhours in Whr per Unit for the Column Forms?
  - A. 0.007
  - B. 0.195
  - C. 4.919
  - D. 5.118
3. What is the To Date Unit Workhours in Whr per Unit for the Column Forms?
  - A. 0.011
  - B. 0.241
  - C. 3.821
  - D. 4.148
4. What are the Total Earned Workhours for the Column Forms?
  - A. 19
  - B. 27
  - C. 465
  - D. 2387
5. What is the Total Projected Workhours at Completion for the Column Forms?
  - A. 27
  - B. 104
  - C. 602
  - D. 2472

**Cost Reports Exercise (continued)**

6. What is the projected gain or loss in Workhours for the Column Forms?

- A. (174)
- B. 325
- C. 1897
- D. 2396

Using the Labor Cost Report attached, answer the following questions.

7. What is the Budgeted Labor Unit Cost in Dollars per unit for the Concrete Footings?

- A. 0.047
- B. 21.45
- C. 137.25
- D. 256.00

8. What is the Week Labor Unit Cost in Dollars per unit for the Concrete Footings?

- A. 0.70
- B. 1.43
- C. 3.14
- D. 14.60

9. What is the To Date Labor Unit Cost in Dollars per unit for the Concrete Footings?

- A. 0.32
- B. 3.14
- C. 20.12
- D. 5125.00

10. What is the Total Projected Labor costs at Completion for the Concrete Footings?

- A. \$81.41
- B. \$803.84
- C. \$5,150.72
- D. \$1,0615.00

**Cost Reports Exercise (continued)**

11. What is the projected gain or loss in Labor Dollars for the Concrete Footings?

- A. \$(1.20)
- B. \$(4685.00)
- C. \$338.00
- D. \$5452.46

Using the Project Cost Summary Report attached and the Forecast information below, answer the following questions:

FORECAST the Current Projection column as follows:

QUANTITY - Project the REVISED ESTIMATE column WORKHOURS -  
 Project using the Straight-Line Method LABOR COST - Project using the  
 Straight-Line Method MATERIAL COST - Project the REVISED  
 ESTIMATE column EQUIPMENT COST - Project the TOTAL  
 EXPENDED column  
 SUBCONTRACT COST - Project the TOTAL EXPENDED column

12. What is current projection for the quantities in Vertical Lineal Feet (VLF)?

- A. 680
- B. 5300
- C. 5980
- D. 6700

13. What is the current projection for the Workhours at completion?

- A. 78
- B. 473
- C. 618
- D. 686

14. What is the current projection for the labor costs at completion?

- A. \$11,960
- B. \$13,557
- C. \$14,917
- D. \$16,817

**Cost Reports Exercise (continued)**

15. What is the current projection for the material costs at completion?
- A. \$7,080
  - B. \$3,3470
  - C. \$40,550
  - D. \$45,225
16. What is the current projection for the equipment costs at completion?
- A. \$1,400
  - B. \$14,640
  - C. \$16,040
  - D. \$16,960
17. What is the current projection for the subcontract costs at completion?
- A. \$0
  - B. \$7,000
  - C. \$14,000
  - D. \$21,000
18. What is the current projection total costs at completion?
- A. \$29,957
  - B. \$70,170
  - C. \$76,470
  - D. \$85,080
19. What are the projected workhours gain or loss?
- A. 0
  - B. 67
  - C. (134)
  - D. (218)

**Cost Reports Exercise (continued)**

20. What is the projected labor cost gain or loss?
- A. \$(1,900)
  - B. \$1,900
  - C. \$2,957
  - D. \$13,557
21. What is the projected material cost gain or loss?
- A. \$0
  - B. \$4,675
  - C. \$7,080
  - D. \$11,755
22. What is the total projected gain or loss?
- A. \$(6,363)
  - B. \$(9,843)
  - C. \$7,975
  - D. \$14,589
23. The estimated cost of a project if built today is \$4,000,000 and the costs are expected to rise 3.5 percent for the next 5 years. What will be the estimated cost if the project is built five years from now?
- A. \$4,700,000
  - B. \$4,750,745
  - C. \$17,936,133
  - D. \$24,213,779
24. The budget calls for 40,000 Lineal Feet of lumber and the labor is budgeted at \$26,000. The work completed to date is 8,000 Lineal Feet of lumber and the labor cost is \$6,000. What is the projected total labor cost savings or labor cost overrun at completion?
- A. \$2,000 savings.
  - B. \$4,000 savings.
  - C. \$4,000 overrun.
  - D. \$10,000 savings



**Cost Reports Exercise (continued)**  
**Earned Workhour Report Information**

DESCRIPTION	QUANTITIES			UNIT	EXPENDED WORKHOURS		WORKHOURS		UNIT WORKHOURS			PROJECTED	
	BUDGET	WEEK	TO DATE		WEEK	TO DATE	EARNED	BUDGETED	BUDGET	WEEK	TO DATE	COMPLETION	GAIN/LOSS
Col. Forms	2499	87	112	SFCA	17	27		428					
Concrete Ftg	256	25	40	CY	40	85		360					
Concrete Wa	453	30	34	CY	40	44		634					
Footing Frms	2417	210	410	SFCA	42	102		499					
Wall Forms	25,560	1880	3090	SFCA	364	664		5544					

**Cost Reports Exercise (continued)****Labor Cost Report Information**

CODE	DESCRIPTION	QUANTITIES			UNIT	EXPENDED COST		TOTAL BUDGET \$	UNIT COST			PROJECTED	
		BUDGET	WEEK	TO DATE		WEEK \$	TO DATE		BUDGET	WEEK	TO DATE	COMPLETION	GAIN/ LOSS
	Col. Forms	2499	87	112	SFCA	223	355	8022					
	Concrete Ftg	256	25	40	CY	365	805	5490					
	Concrete Walls	453	30	34	CY	394	431	9669					
	Footing Form	2417	210	410	SFCA	449	1038	8154					
	Wall Forms	25,560	1880	3090	SFCA	3812	6855	90370					

**Cost Reports Exercise (continued)****Project Cost Summary Report Information**

CODE	ITEM	ORIGINAL ESTIMATE	SCOPE CHANGE	REVISED ESTIMATE	EXPENDED		COMMITTED	TOTAL EXPEND	CURRENT PROJECTION	PROJECTED GAIN (LOSS)
					WEEK	TO DATE				
035600	PILES									
	Quantity	6700 VLF	(720)	5980 VLF		680	0	680		
	Workhours	618 WHR	(67)	551 WHR		78	0	78		
	Labor	\$16817	\$(1900)	\$14917		\$1360	0	\$1360		
	Material	\$45225	\$(4675)	\$40550		\$10000	\$23470	\$33470		
	Equipment	\$16040	\$(1400)	\$14640		\$7600	\$9360	\$16960		
	Subcontract	0	0	0		\$7000	0	\$7000		
		\$78082	\$(7975)	\$70107		\$25960	\$32830	\$58790		

**Cost Reports Exercise Solutions**

- |     |   |     |   |
|-----|---|-----|---|
| 1.  | B | 21. | A |
| 2.  | B | 22. | A |
| 3.  | B | 23. | B |
| 4.  | A | 24. | C |
| 5.  | C |     |   |
| 6.  | A |     |   |
| 7.  | B |     |   |
| 8.  | D |     |   |
| 9.  | C |     |   |
| 10. | C |     |   |
| 11. | C |     |   |
| 12. | C |     |   |
| 13. | D |     |   |
| 14. | A |     |   |
| 15. | C |     |   |
| 16. | D |     |   |
| 17. | B |     |   |
| 18. | C |     |   |
| 19. | C |     |   |
| 20. | C |     |   |

## Financial Analysis Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

Using the Balance Sheet, Income Statement and the Cash Flow Statement provided below and the Summary of Financial Ratios and the Construction Industry Average Table, answer the following questions:

1. What is the Working Capital for this company at the end of the year?
  - A. \$0,176, 177
  - B. \$0,733,154
  - C. \$1,463,403
  - D. \$1,633,389
  
2. What is the Current Ratio for this company at the end of the year?
  - A. 0.47
  - B. 1.97
  - C. 2.07
  - D. 4.36
  
3. What is the Acid Test Ratio for this company at the end of the year?
  - A. 0.51
  - B. 0.95
  - C. 1.00
  - D. 2.07
  
4. What is the Leverage Ratio of Total Debt to Total Assets for this company at the end of the year?
  - A. 0.30
  - B. 0.51
  - C. 0.96
  - D. 1.97

**Financial Analysis Exercise (continued)**

5. What is the Construction Industry Average Percentage for the Leverage Ratio?
- A. 5%
  - B. 10%
  - C. 20%
6. What is the Debt-to-Equity Ratio for this company at the end of the year?
- A. 0.22
  - B. 0.47
  - C. 1.03
  - D. 1.96
7. What is the Times Interest Earned Ratio for this company at the end of the year?
- A. 0.25
  - B. 0.51
  - C. 1.03
  - D. 4.07
8. What is the Construction Industry Average Times Interest Earned Ratio?
- A. 5.50
  - B. 8.00
  - C. 9.00
  - D. 33.0
9. Assuming the Times Interest Earned Ratio for this company was calculated to be 5.00, how does this compare to the Construction Industry Average Times Interest Earned Ratio?
- A. This company exceeds the average
  - B. This company is equal to the average
  - C. This company is significantly below the average
  - D. Not enough information to make a comparison

**Financial Analysis Exercise (continued)**

10. What is the Return on Sales Percentage for this company at the end of the year?

- A. 4.0
- B. 6.2
- C. 25.0
- D. 37.1

**BALANCE SHEET**

<b>Assets</b>	<b>End of Year</b>	<b>End of Previous Y</b>
Cash	\$ 260,631.00	\$ 233,171.00
Contracts Receivable	423,731.00	385,259.00
Inventory	640,020.00	517,936.00
Prepaid expenses	91,433.00	85,559.00
Total Current Assets	<u>\$1,415,815.00</u>	<u>\$1,221,925.00</u>
Property, Plant, Equipment	2,317,500.00	2,089,336.00
Accumulated Depreciation	(753,917.00)	(764,900.00)
Cost Less Accumulated Depreciation	<u>1,563,583.00</u>	<u>1,324,436.00</u>
Total Assets	<u><u>\$2,979,398.00</u></u>	<u><u>\$2,546,361.00</u></u>

<b>Liabilities and Owners' Equity</b>	<b>End of Year</b>	<b>End of Previous Y</b>
Accounts Payable - Operating	281,915.00	242,294.00
Accrued Operating Expenses	142,246.00	126,264.00
Income Tax Payable	8,500.00	15,018.00
Short-Term Debt Payable	250,000.00	196,113.00
Total Current Liabilities	<u>682,661.00</u>	<u>579,689.00</u>
Long-Term Debt Payable	833,334.00	650,000.00
Total Liabilities	<u>\$1,515,995.00</u>	<u>\$1,229,689.00</u>
Capital Stock	509,722.00	489,167.00
Retained Earnings	953,681.00	827,505.00
Total Owners' Equity	<u>\$1,463,403.00</u>	<u>\$1,316,672.00</u>
Total Liabilities & Owners' Equity	<u><u>\$2,979,398.00</u></u>	<u><u>\$2,546,361.00</u></u>

**Financial Analysis Exercise (continued)****INCOME STATEMENT FOR THE YEAR**

Contract Revenues	4,406,806.00
Cost of Contracts Completed	2,773,417.00
Gross Margin	<u>1,633,389.00</u>
Operating Expenses	1,263,032.00
Depreciation Expense	<u>10,983.00</u>
Operating Earnings	359,374.00
Interest Expense	<u>88,333.00</u>
Earnings before Taxes	271,041.00
Income Tax Expense	<u>94,864.00</u>
Net Income	<u><u>176,177.00</u></u>

**CASH FLOW STATEMENT FOR THE YEAR****Cash Flows from Operating Activities**

Net Income from Income Statement	176,177.00
Contracts Receivable Increase	(38,472.00)
Inventory Increase	(122,084.00)
Prepaid Expenses Decrease	(5,874.00)
Depreciation Expense	85,383.00
Accounts Payable Increase	39,621.00
Accrued Expenses Increase	15,982.00
Income Tax Payable Decrease	(6,518.00)
	<u>(31,962.00)</u>
Cash Flow Adjustments to Net Income	
Cash Flow from Operating Activities	<u><u>144,215.00</u></u>

**Cash Flows from Investing Activities**

Purchases of Property, Plant & Equipment	(\$354,028.00)
Proceeds from Disposals of Property, Plant & Equipment	<u>29,498.00</u>
Cash Used in Investing Activities	<u><u>(\$324,530)</u></u>

**Cash Flows from Financing Activities**

Short-Term Debt Borrowing	53,887.00
Long-Term Debt Borrowing	183,334.00
Capital Stock Issue	20,554.00
Dividends Paid Stockholders	<u>(50,000.00)</u>
Cash from Financing Activities	207,775.00
Increase (Decrease) in Cash during Year	<u>27,460.00</u>



**Financial Analysis Exercise Solutions**

1. B  $1,415,815 - 682,661 = \$733,154$
2. C  $\frac{\$1,415,815}{\$682,661} = 2.07$
3. C  $\frac{\$1,415,815 - \$640,020 - 91433}{\$682,661} = \frac{\$684,362}{\$682,661} = 1.00$
4. B  $\frac{\$1,515,995}{\$2,979,398} = .51$
5. D Construction average is 33%. See Summary of Financial ratio table
6. C  $\frac{\$1,515,995}{\$1,463,403} = 1.03$
7. D  $\frac{\$359,374}{\$88,333} = 4.07$
8. B Construction average is 8.00 Times. See the Summary of Financial ratio table
9. C The assumption is 5 times. The Construction average is 8.00 Times
10. A  $\frac{\$176,177}{\$4,406,806} = 4.00\%$

## Changes Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. According to the project documents, which document lists and describes the itemized content required for submitting a Contract Change Order Proposal?
  - A. General Conditions
  - B. General Requirements
  - C. Instructions to Bidders
  - D. Supplementary Conditions
2. What are the names of the parties signing an Extra Work Order?
  - A. Owner and Contractor
  - B. Surety and the Owner
  - C. Architect and the Subcontractor
  - D. Architect and the Superintendent
3. Which of the following item (s) is changed in the Contract Agreement using an Extra Work Order?
  - A. Time
  - B. Scope and Price
  - C. All of the above
  - D. None of the above
4. Which items are shown on the New Change Order Proposal Bid Breakdown Support page?
  - A. To, From, FOB Terms and Accounting Terms
  - B. To, From, Job Number, Project Name, Original Price and New Price
  - C. Retainage Percentage, Overhead Percentage, Main Office Percentage
  - D. Crew Sizes, Quantities, Wage Rates, Daily Outputs, and Overhead Items
5. To determine the proper pricing for a New Change Order Proposal, for a road and bridge project, which of the following items must be consulted to properly price the proposal?
  - A. General Conditions and General Requirements
  - B. Detailed Estimate and the Condensed Estimate Summary
  - C. Supplementary Conditions and Prevailing Wage Rate Table
  - D. Project Overhead Summary sheet and the Original Estimate

**Changes Exercise (continued)**

6. Which of the following cost items are not part of a Net change?
- A. Labor and Materials
  - B. Overhead and Profit
  - C. Equipment and Subcontracts
  - D. Vendor and Suppliers
7. To Perfect a Contract Change Order Proposal, it must contain four different content items. Which of the following are the most important content items that establishes a complete contract change order proposal?
- A. TO, FROM, Project Name, Project Number
  - B. Labor, Material, Equipment and Subcontract
  - C. Scope, Price, Time extension and Acceptance Time
  - D. Proposal Number, Request number, Change Order Number and date

Given the amounts shown on a Change Order Proposal to an existing item on a project. Answer the follow question:

Direct Job Cost - Original	Original Amount	Direct Job Cost - New	New Amount
Material	\$3,000	Material	\$6,000
Labor	\$6,600	Labor	\$3,600
Equipment	\$1800	Equipment	0
Total Direct Job Cost Original	\$11,400	Total Direct Job Costs - New	\$9,600
		Overhead	\$2,700
		Total	\$12,300

8. What is the correct net change amount?
- A. \$ 900 Increase
  - B. \$ 900 Decrease
  - C. \$1,800 Decrease
  - D. \$1,800 Increase

**Changes Exercise Solutions**

1. D
2. D
3. D
4. D
5. C
6. B
7. C
8. C

## Claims Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. What is the name of the clause that states that “the Slack time in the schedule is for the exclusive use of the Contractor”?
  - A. Disclaimer
  - B. Concurrent delay
  - C. Ownership of the float
  - D. Intermediate form of indemnification
2. If the Contractor is going to make a claim under the DSC clause, which of the following must the Contractor prove that they performed?
  - A. Visited the Site
  - B. Indemnified the Owner
  - C. Planned for the disruption in their schedule
  - D. Developed and updated the schedule monthly
3. What is the name of the clause that states that “the Contractor will protect the Owner and Designer from Claims, even if the Owner or Designer is wholly responsible for the loss?”
  - A. DSC Type II
  - B. Change Directive
  - C. No Damage for Delay
  - D. Broad form of Indemnification
4. What is the name of the clause that states that “if the Contractor wishes to make Claim for an increase in time for adverse weather conditions, such Claim shall be documented by substantiating that weather conditions were abnormal and if the claim is substantiated then a time extension will be granted?”
  - A. Inexcusable Delay
  - B. Compensable Delay
  - C. Constructive Change
  - D. No Damage for Delay

**Claims Exercise (continued)**

5. What is the name of the clause that states that “if the actual physical conditions differ materially from those conditions ordinarily encountered or that exists in the area?”
- A. Addendum
  - B. DSC Type II
  - C. Cardinal Change
  - D. Constructive Change
6. What is the name of the clause that states that “This site condition data is provided solely for the use of bidders only?”
- A. Intent
  - B. Disclaimer
  - C. Change Directive
  - D. Contract Change Order
7. What is the name of the clause that states “If the Contractor is delayed in the Progress of the Work by an act or neglect of the Owner or Engineer beyond the Contractors control, a contract time extension shall be the sole remedy?”
- A. Inexcusable delay
  - B. Concurrent Delay
  - C. Compensable delay
  - D. No Damage for Delay
8. What is the name of the clause that is described as a method or specification change forced upon the Contractor, either implied or expressed, that requires performance beyond the Scope?
- A. Cardinal Change
  - B. Job Acceleration.
  - C. Constructive Change
  - D. Contract Change Order
9. The Owner fails to provide timely access to the site because the earlier separate prime contractors have not completed their portion of the work. What type of delay is this called?
- A. Subsequent
  - B. Compensable
  - C. Non-excusable
  - D. No Damage for delay

**Claims Exercise (continued)**

10. The Contractor decides to pick up the pace on the project because they are behind schedule but they still complete the project late. What type of delay is this called?
- A. Excusable.
  - B. Concurrent
  - C. Compensable
  - D. Non-excusable
11. If a changed condition clause does not exist in the contract, how is the risk allocated?
- A. Owner assumes all of the risk
  - B. Contractor assumes all of the risk
  - C. Owner and Engineer share the risk equally
  - D. Owner and Contractor share the risk equally
12. What effect does the omission of a changed condition clause have on the owner?
- A. None, because the risk is shared
  - B. None, because the engineer has assumed all of the risk
  - C. Lower prices because the Owner has assumed all of the risk
  - D. Higher prices because the Contractor has assumed all of the risk
13. What are the recognized legal methods that the contractor can utilize to recover for compensable delay damages?
- A. Time and materials, lump sum, cost plus and unit costs
  - B. Total costs, modified total cost, Eichleay formula, quantum merittum
  - C. Actual costs, estimated costs, fixed overhead costs and maintenance costs
  - D. Forecasted costs, negotiated costs, cost to date and projected at completion costs
14. According to the AIA contract documents, for a Contractor to demand the next step, what condition precedence must have taken place?
- A. Perfected a Claim and Stopped Work
  - B. Perfected a Claim and the A/E made a decision
  - C. Perfected a Claim of Lien and the A/E made a decision
  - D. Perfected a Stop Work Notice until the A/E made a binding decision

**Claims Exercise (continued)**

15. A changed condition's clause can limit the contractor's ability to request a change by using specific words. Which of the following words can limit the clause interpretation?
  - A. Insure and indemnify
  - B. Subsurface and concealed
  - C. Excusable and inexcusable
  - D. Unconscionable and compensable
  
16. A project owner wants to place all of the risk of the differing site conditions on the Contractor. Which of the following actions will the Owner take?
  - A. Omit the clause and use a disclaimer
  - B. Misrepresent and withhold information
  - C. Request Insurance and Indemnification
  - D. Issue Stop Work and claim they own the float
  
17. Which of the following occurrences must have taken place for a Contractor to recover Under a Differing Site Condition or remedy-granting change clause?
  - A. Issued a Stop notice and left the jobsite
  - B. Visited the site during bidding and requested a claim
  - C. Claim misrepresentation and owner withheld information
  - D. Submitted insurance certificates and requested indemnification from the DSC
  
18. Which of the following specific conditions must be established by the Contractor to recover damages under a Differing Site Condition (DSC)?
  - A. Mutual mistake, unjust enrichment, and a patent condition
  - B. Anticipated physical condition, immaterially different, and a design error
  - C. Prove poor productivity, bankruptcy of subcontractor, and poor coordination
  - D. Provided timely notice, prove materially different, and relied on the documents
  
19. Which of the following situations is considered a change that was forced upon the Contractor that required performance beyond the scope and that the A/E refused to approve?
  - A. Paint coverage per square foot varied from the anticipated
  - B. Paint quantity estimated from the bid plans varied from the actual quantity
  - C. Specifications call for two coats of paint and the Engineer requires three coats
  - D. Room dimensions have changed, therefore, a Change order for paint is approved.



**Claims Exercise (continued)**

20. What must the Contractor prove to recover for a change forced upon them that the A/E refused to approve?
- A. Ordered by the owner, beyond the scope of work, and increased the cost
  - B. Mutual mistake, unjust enrichment by the owner, and anticipated condition
  - C. Prove poor productivity, bankruptcy of subcontractor, and poor coordination
  - D. Impossibility to perform, owner misrepresentation, and owner failure to disclose
21. What is the type of change that occurs when the owner denies a valid time extension for an excusable delay and requires the Contractor to complete the work by the original completion date?
- A. Cardinal Change
  - B. Constructive Change
  - C. Contract Change Order
  - D. Job Acceleration Change
22. What is the type of change that occurs when the Engineer on a public project drastically alters the identity of the original intent of the contract and creates a new contract agreement?
- A. Cardinal Change
  - B. Constructive Change
  - C. Contract Change Order
  - D. Job Acceleration Change
23. The Contractor is the low bidder on a public building and after the project is well under way the public authority requires the Contractor to submit a Change Order Proposal to make the repairs on the roof of the adjacent building. How is this viewed by the courts?
- A. Compensable
  - B. Non-compensable
  - C. Contract Change Order
  - D. Indemnity or Hold Harmless
24. According to acceptable legal practices, what is the proper method to show weather on the planned schedule to receive legal relief?
- A. An activity each week with the loss workdays for that week
  - B. An activity each month with the loss workdays for that month
  - C. An activity with the total loss workdays for the entire project
  - D. Does not need to be shown, Contractor can request if encountered

**Claims Exercise (continued)**

25. The contractor wishes to make a claim for weather extension. Which of the following must the contractor have documented to be entitled to the claim for weather conditions?
- A. Shown by month on the updated schedule and documented daily occurrences at site
  - B. Shown by month on the planned schedule and documented daily occurrences at site
  - C. Shown as a total on the updated schedule and documented from national weather
  - D. Shown as a total on the planned schedule and documented from the radio station
26. The contractor wishes to make a claim for weather extension. Which of the following must the contractor have documented to be entitled to the claim for weather conditions?
- A. Prove the weather had an adverse effect on the construction schedules' critical path
  - B. Prove the weather had an adverse effect on the construction schedule
  - C. Prove the weather forced job changes and the Contractor implemented overtime
  - D. Prove that the act of God for abnormal rainfall forced the Contractor to use overtime
27. For a construction schedule to be admissible evidence, it must meet specific principles of law, Which of the following must be shown on the schedule as work progresses?
- A. Claims recovery method utilized, weather planned, subs and owner delays
  - B. Contractor, owner, sub, and vendor delays, interrelated activities, sequence changes
  - C. Planned weather, show the adverse effect of weather, forced job acceleration and interrelated activities
  - D. Planned versus late activities, bar-chart of activities, and subcontractor and owner delays
28. According to acceptable legal practices, which of the following items must the General Contractor display and estimate the time for on the planned schedule to receive legal relief?
- A. Notice of Furnishing, Notice of Award, Notice to Proceed
  - B. Bid Bond, Performance Bond, Payment Bond and Insurance
  - C. Change Orders, Extra Work Orders, Delays and Punch List Items
  - D. Inspections, Weather, Owner Furnished Items, and Separate Owner Contracts
29. According to acceptable legal practices, which of the following items must the General Contractor estimate time and display on the updated progress schedule to receive legal relief?
- A. Lien waivers, application for payment, warranties, and insurance
  - B. Change orders, extra work orders, delays and punch list items
  - C. Inspections, weather, owner furnished items, and separate owner contracts
  - D. Stop work order, stop work notice and the substantial completion certificate

**Claims Exercise Solutions**

- |     |   |     |   |
|-----|---|-----|---|
| 1.  | C | 21. | D |
| 2.  | A | 22. | A |
| 3.  | D | 23. | B |
| 4.  | D | 24. | B |
| 5.  | B | 25. | B |
| 6.  | B | 26. | A |
| 7.  | D | 27. | B |
| 8.  | C | 28. | D |
| 9.  | B | 29. | B |
| 10. | D |     |   |
| 11. | B |     |   |
| 12. | D |     |   |
| 13. | B |     |   |
| 14. | B |     |   |
| 15. | B |     |   |
| 16. | A |     |   |
| 17. | B |     |   |
| 18. | D |     |   |
| 19. | C |     |   |
| 20. | A |     |   |

## VII. PROJECT CLOSEOUT

### Project Closeout Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. Which document terminates any liquidated damages from being assessed any further?
  - A. Notice of Award
  - B. Stop Work Notice
  - C. Contract Change Order
  - D. Certificate of Substantial Completion
2. When is the Certificate of Substantial Completion prepared?
  - A. bid opening
  - B. signing of the agreement
  - C. end of the construction process
  - D. beginning of the bidding process
3. Which of the following items is contained in the Certificate of Substantial Completion?
  - A. process payment schedule
  - B. starting date of the project
  - C. a list of items to be completed
  - D. a list of contract documents to be submitted
4. For a Contractor to receive FINAL payment and retainage, which documents must have been submitted?
  - A. Notice of Furnishing, Claim of Lien and Stop Work Notice
  - B. Partial Lien Waiver and Application for Payment
  - C. Full Lien Waivers, Warranties, As-built Drawings, Completed punch list
  - D. Construction Schedule, Schedule of Values, Substantial Completion Certificate
5. Final Acceptance is the point at which the following occurs?
  - A. The punch list is created and the project can be occupied by the Owner
  - B. The contract is terminated by the Owner for lack of progress by the Contractor
  - C. The punch list is complete, accepted by the Owner and Contractor receives payment
  - D. The punch list created and the Insurances and maintenance is carried by the Owner

**Project Closeout Exercise (continued)**

6. A completion date of December 24 is stated in the Agreement but there is no reference made to the amount of the liquidated damages and the contract states “time is of the essence”. The project is completed on January 14. What can the Contractor be assessed for missing the completion date?
  - A. Nothing because no damages were incurred by the Owner
  - B. Nothing because the damages amount was not stated in the contract
  - C. Actual damages can be assessed using the owner’s loss revenue records
  - D. Actual damages can be assessed using the contractor’s loss revenue records
  
7. Which party must prove their estimate of liquidated damages?
  - A. Owner
  - B. Engineer
  - C. Contractor
  - D. Subcontractor or Vendor
  
8. According to the legal system, which of the following damage assessment methods is illegal in the contract?
  - A. Penalty amount
  - B. Liquidated damages amount
  - C. Good faith estimate amount
  - D. Liquidated damages amount using similar project average amounts
  
9. Which of the following processes is the best when planning for project closeout?
  - A. Continuously collect Owner’s manuals during walks of the project
  - B. start collecting the paper work just before reaching substantial completion
  - C. Request the A/E’s inspection for substantial completion as early as possible
  - D. Request the Project Manager’s inspection for substantial completion early
  
10. Which of the following is the best suggestion for reducing the punch list?
  - A. Do a walk thru with the A/E before the official substantial completion inspection
  - B. Do a walk thru with each trade before the actual substantial completion inspection
  - C. Supervisor sits in the area, creates their punch list and gets trades to fix before A/E
  - D. Focus on cleaning up the jobsite before the actual substantial completion inspection

**Project Closeout Exercise Solutions**

1. D
2. C
3. C
4. C
5. C
6. C
7. A
8. A
9. A
10. C

## VIII. CONSTRUCTION SAFETY MANAGEMENT

### Construction Safety Management Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. Which items are covered under workers compensation if a person is injured on the job?
  - A. All medical expenses and 100% of lost wages from 1<sup>st</sup> day
  - B. All employee benefits and 100% of lost wages after seven days
  - C. All medical expenses and 67 - 80% of lost wages after seven days
  - D. All unemployment benefits and 100% of lost wages from 1<sup>st</sup> day
2. What are the factors used to establish the workers' compensation manual rate?
  - A. The EMR and the accident claims for that craft for past three years
  - B. The craft classification and the accident claim for that craft for past three years
  - C. The total annual payroll, number of workers and the company's safety record
  - D. The total employee benefits, number of workers and the company's safety record
3. What is the purpose of an EMR?
  - A. Reduce Workers Compensations Rates
  - B. Cover Medical Costs and Lost Wages due to an injury
  - C. Adjust Workers Compensation Manual Rate to reflect a company
  - D. Compare Actual Occurrences of Accidents to Predicted Occurrences
4. Which entity establishes the EMR?
  - A. State
  - B. Federal
  - C. Contractor
  - D. Insurance Company
5. Which entity sets the worker's compensation manual rates?
  - A. State
  - B. Federal
  - C. Contractor
  - D. Insurance Company

**Construction Safety Management Exercise (continued)**

- 6, According to the statistics, what is the minimum multiplier of the insured costs to attain the uninsured costs?
- A. 1.0
  - B. 2.5
  - C. 3.0
  - D. 4.0
7. Which of the following items are considered uninsured costs due to an injury occurring?
- A. EMR, Accident Claims Costs and Unemployment Benefits
  - B. Employee Benefits, Social Security, Unemployment Benefits
  - C. Medical Expenses, Insurance Premiums and Workers Compensation
  - D. Substitute Worker, Training, Material/Equipment damage, Ambulance, Drug test
8. Which party pays for the uninsured cost items due to an injury occurring?
- A. State
  - B. Owner
  - C. Contractor
  - D. Insurance Company
9. According to the safety statistics discussed, which time frame is most likely for workers to be injured on the jobsite?
- A. within the first few hours
  - B. within the first week
  - C. within the first three months
  - D. within the first eighteen months
- 10, According to the safety statistics discussed, which age group of workers is most likely to be injured on the job site?
- A. 18 - 20
  - B. 21 - 25
  - C. 26 - 30
  - D. 55 - 60



**Construction Safety Management Exercise (continued)**

11. According to the safety studies, which of the following safety activities has the greatest potential for reducing the costs of accidents?
  - A. Safety meetings
  - B. A traditional safety program
  - C. Behavior-based safety process
  - D. Yelling at employees about their safety behavior
12. According to OSHA, what is the most frequently occurring type of construction injury?
  - A. Fractures
  - B. Dislocation
  - C. Electrocution
  - D. Over-exertion
13. According to OSHA, what is the Most frequent cause of Construction Fatalities?
  - A. Electrocution
  - B. Struck by an Object
  - C. Cave-ins or crushed
  - D. Falls from Elevations
14. Which of the following factors is used to determine if a manager has liability?
  - A. Advise
  - B. Assist
  - C. Control
  - D. Consult
15. Which of the following circumstances is considered a willful violation under the Occupational Safety and Health Act?
  - A. Issued a serious violation and abated the hazard
  - B. Issued a safety violation, but it probably would not cause death or serious harm
  - C. Aware of the standard, the condition in violation and made no attempt too correct
  - D. Issued a safety violation for complaints by employees which have no direct effect

**Construction Safety Management Exercise (continued)**

16. Which of the following circumstances is considered a willful violation under the Occupational Safety and Health Act? The violation was:
- A. Deliberate, voluntary or intentional
  - B. Inadvertent, accidental or ordinarily negligence
  - C. Committed with a bad purpose or an evil intent
  - D. Unwillingly, unconsciously or unintentionally negligence
17. Which of the following actions are considered criminal and the Attorney Generals charging officers and managers with criminal negligence for workplace accidents?
- A. Malice, the act was a serious violation and an injury occurred
  - B. Indifference, the act was a willful violation, and a fatality occurred
  - C. Reasonable, the act was a willful violation, and an injury occurred
  - D. Unintentional, the act was a serious violation and no accident occurred
18. What are the modes of culpability or fault elements under the Penal Code for criminal liability?
- A. A guilty mind, bad purpose and evil intent
  - B. Purposely, knowingly, recklessly, and negligently
  - C. Malice aforethought, unlawful killing, conduct resulting in death was intentional
  - D. Committed the crime, whether they intended to commit the crime and reasonable
19. The Preamble to the OSHA Construction Safety Standards states that “the company representative must provide a place of employment free from known and recognized hazards.” What is the name of this clause?
- A. Duty’s clause
  - B. Indemnification
  - C. Constructional article
  - D. General Duty clause
20. Which type of law case requires you to prove due diligence?
- A. Civil law
  - B. Criminal law
  - C. Statutory law
  - D. Administrative law

**Construction Safety Management Exercise (continued)**

21. Which party must prove that “Due diligence” was employed?
- A. Engineer
  - B. Employee
  - C. Government entity
  - D. Managers having control
22. In a court case that requires the person to prove “Due Diligence.” Which of the following would be the best example of due diligence?
- A. Reporting violations
  - B. Telling employees to be careful
  - C. Correcting hazards immediately
  - D. Threatening the workers with being fired if they do not comply
23. Which of the following actions is the best example of “Due Diligence” toward safety?
- A. Aware of a comparable safety standard and made no effort to communicate
  - B. Ignorance of the hazard and showed no concern for the safety of employees
  - C. Recognize things that workers are doing right and correct the things that wrong
  - D. Convey the importance of being careful and communicated wishes to employees
24. Which of the following is the best approach to effective job site safety management?
- A. Complying with the standards
  - B. Measuring safety using a Behavior-based safety approach
  - C. Measuring safety using incident rates or OSHA recordable
  - D. Establishing a safety reward system with posters and reward parties
25. According to studies by Bird, Adams and Weaver, what is the leading cause of accidents?
- A. Indifference
  - B. Poor work habits
  - C. Family or marital problems
  - D. Management ineffectiveness

**Construction Safety Management Exercise (continued)**

26. Which of the following actions is the best example of “Due Diligence “toward safety?
  - A. A safety reward program with posters and reward parties
  - B. Identified employee violations and yelled at them to make the corrections
  - C. Consulted, observed, documented, inspected regularly and corrected violations
  - D. Told workers to be careful and reprimanded them consistently for a violation
27. What are the mandatory OSHA Focused four that must be covered in training sessions?
  - A. Personal protection equipment, fire hazards, tools and scaffolding
  - B. Fall protection, being struck by fall objects, trench hazards and electrical
  - C. Health hazards, hazardous substances, hazard communication and respirators
  - D. OSHA Inspections, abatement procedures, recordkeeping, and safety training
28. Which of the following actions is the best example of “Due Diligence “toward safety?
  - A. Incorporate daily safety plans into all crew instructions
  - B. Place the Job Safety and Health poster in an accessible location
  - C. Train supervisors and managers on safety liability and the ramifications to them
  - D. Develop a safety program manual for your company and require employees to sign
29. What is the most important determinant of employee behavior and supervisor’s safety performance?
  - A. Safety director’s management style
  - B. Top management’s actions toward safety
  - C. Safety committees’ action to solve safety problems
  - D. Supervisor’s compliance with OSHA’s Regulations
30. According to the study by Gary Benjamin, what is the common link between safety and return on investment?
  - A. Perceptions by employees
  - B. Compliance by supervisors
  - C. Training programs for employees
  - D. Accident investigation by top management
31. According to the safety experts, which safety system approach is the most effective?
  - A. Loss control program
  - B. Safety Investigation of accidents
  - C. Compliance with regulatory standards
  - D. Management problem-solving processes

**Construction Safety Management Exercise (continued)**

32. According to Petersen, which of the following changes will improve safety?
- A. Focus on unsafe acts and unsafe conditions which cause accidents
  - B. Build the safety system into the organization's management structure
  - C. Increase our focus on accident investigation and our accident records
  - D. Increase our safety audits and improve of safety program compliance guidelines
33. Which of the following safety philosophies will improve safety within the organization?
- A. Create a better safety program
  - B. Create safety accountability at all levels
  - C. Implement the Job Safety Analysis technique to identify unsafe acts
  - D. Analyze OSHA's accident incident rate to determine training needs
34. Which of the following safety philosophies will improve safety within the organization?
- A. Search for unsafe acts by employees
  - B. Apply static process control tools to drive continuous improvement
  - C. Conduct accident investigations and safety audits to improve the safety record
  - D. Implement a rigorous safety training program for employees
35. Which of the following safety philosophies will improve safety within the organization?
- A. Increase the effectiveness of the safety training program to employees
  - B. Implement a Job Hazard Analysis technique to identify unsafe conditions
  - C. Involve employees in safety problem-solving and decision-making
  - D. Develop a better safety investigation technique to detect unsafe acts of employees
36. Which of the following safety philosophies will improve safety within the organization?
- A. Implement a safety program using OSHA's Focused Four
  - B. Increase the number of safety slogans and posters at the job site
  - C. Utilize safety engineering methods of safety audits and investigation
  - D. Utilize Juran's control cycle, Johnson's MORT and Kepner-Tregoe's sequence
37. Which of the following safety philosophies will improve safety within the organization?
- A. Build a new organizational culture that embraces safety
  - B. Implement a more effective warning system for the job site
  - C. Build a new safety program which focuses on unsafe acts of employees
  - D. Continuously review accident statistics and create improved safety programs

**Construction Safety Management Exercise (continued)**

38. Which of the following safety philosophies will improve safety within the organization?
- A. Utilize upstream measures such as behavioral sampling to make improvements
  - B. Utilize accident-based statistics within the company to focus on unsafe acts
  - C. Develop a Loss control program based upon OSHA's focused-four hazards
  - D. Hire more safety specialists to detect the safety hazards and abate the hazards
39. Which of the following safety philosophies will improve safety within the organization?
- A. Develop an accident-based statistics approach to improve compliance
  - B. Develop an accountability measurement system for first-line supervisors
  - C. Utilize accident investigation techniques to focus on unsafe conditions
  - D. Utilize downstream measures such as perception surveys to make improvements
40. Which of the following safety philosophies will improve safety within the organization?
- A. Implement fishbone diagrams to search for multiple causes of accidents
  - B. Have management create more safety rules for employees to follow
  - C. Increase the engineering, education and enforcement of safety regulations
  - D. Conduct accident investigations and accident audits to comply with regulations
41. Which of the following safety philosophies will improve safety within the organization?
- A. Conduct job safety analysis technique more frequently
  - B. Change the safety slogans and signs more often at the job site
  - C. Find the root-causes of human errors and correct the safety problem
  - D. Implement flow diagrams, which will diagnose system weaknesses

**Construction Safety Management Exercise Solutions**

- |     |   |     |   |
|-----|---|-----|---|
| 1.  | C | 21. | D |
| 2.  | B | 22. | C |
| 3.  | C | 23. | C |
| 4.  | D | 24. | B |
| 5.  | A | 25. | D |
| 6.  | D | 26. | C |
| 7.  | D | 27. | B |
| 8.  | C | 28. | A |
| 9.  | C | 29. | B |
| 10. | A | 30. | A |
| 11. | C | 31. | D |
| 12. | D | 32. | B |
| 13. | D | 33. | B |
| 14. | C | 34. | B |
| 15. | C | 35. | C |
| 16. | A | 36. | D |
| 17. | B | 37. | A |
| 18. | B | 38. | A |
| 19. | D | 39. | D |
| 20. | B | 40. | A |
|     |   | 41. | D |

## Excavation Competent Person Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer**

### OSHA SOIL CLASSIFICATION AND THEIR CHARACTERISTICS

SOIL TYPE	CHARACTERISTICS				
	Water Table	Visual	Tilted Soil Layers	Soil Layers	Unconfined Compressive Strength
<b>TYPE A SOILS</b> Intact Hard Soils *cohesive soils *unconfined compressive strength *Examples of Type A Soils Clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam & sandy clay loam.	Above a water table  Not saturated	No fissures, cracks, or weak layers	No tilting layers dipping into the trench with a slope of 4H: 1V or steeper	No soil layers below bed rock layers	More than 1.5 tons per sq. ft.
<b>TYPE B SOILS</b> * cohesive soils *unconfined compressive strength Examples of Type B Soils are: angular gravel, silt, silt loam, fissured or subject to vibration, dry unstable rock.	Above water table  Not saturated	May have Fissures or Cracks	No tilting layers dipping into the trench with a slope of 4H:1V or steeper	No soil layers below bed rock layers	Between 0.5 - 1.5 tons per sq. ft.
<b>TYPE C SOILS</b> *cohesive soils *granular soils such as gravel, sand and loamy sand, submerged soil, soil from which water is freely seeping, and submerged rock that is not stable.	Maybe within a water table or Saturated	May not be able to stand on slope of 3H:1V without slumping	May contain layers tilting in at 4H:1V slope or greater		0.5 tons per sq. ft. or less
Stable Rock					



**Excavation Competent Person Exercise (continued)**

1. Under the OSHA Competent Person Compliance Directive, what duties and responsibilities listed below must a competent person at the jobsite possess?
  - A. Nothing has been agreed upon
  - B. Conduct periodic inspections
  - C. Knowledge of the excavation standards, experience and training to observe changing conditions, and have the authority to take corrective action
  - D. Interpret the excavation standard, conduct a daily inspection and conduct manual and visual tests, proficient in classifying soil and selecting shoring, sloping or benching
2. How often must a competent person inspect a trench or excavation?
  - A. Hourly
  - B. Weekly
  - C. Daily continuously
  - D. Daily prior to the start of each shift and when conditions change
3. According to the standards, under what conditions shall additional inspections be required?
  - A. Before every rainstorm or other hazard increasing occurrence
  - B. Daily after every rainstorm or after other hazard increasing occurrence
  - C. Weekly after every rainstorm or after other hazard increasing occurrence
  - D. After another hazard increasing occurrence or after every rainstorm during the shift
4. What tests must be conducted at the job site for an open excavation or trench?
  - A. Soil boring test
  - B. No tests are required
  - C. Manual test, pocket Penetrometer and visual inspection
  - D. Proctor or Modified Proctor tests with a 95% compaction rate
5. You have decided not to conduct any field testing for the open excavation. What must you do?
  - A. Classify the soil as type C and shore the excavation
  - B. Call the home office and tell them they must conduct an inspection
  - C. Hope and pray that the inspector does not arrive on site and nothing goes wrong
  - D. Consult with the Registered Professional Engineer and assign the liability to them

**Excavation Competent Person Exercise (continued)**

6. Under what conditions must you consult with a Registered Professional Engineer?
- A. For all excavations
  - B. If the excavation is over 20' deep
  - C. If the excavation is in a Type C soil
  - D. If the excavation is open less than 2 hours
7. Which of the following is the correct definition of a competent person?
- A. Successfully demonstrated their ability to solve or resolve problems
  - B. Authorization to take prompt corrective measures to eliminate the hazards
  - C. Authorization to approve designs for manufacture's tabulated data
  - D. Identify known and recognized hazards that are causing or likely to cause injury
8. According to the Excavation Checklist, if one manual and visual test for each is not done, what is the soil classified as?
- A. Type A
  - B. Type B
  - C. Type C
  - D. Type C and shored
9. Which of the following is the best procedure for maintaining the Trench Safety Report?
- A. Completed weekly and kept at the jobsite
  - B. Completed daily and kept in the home office
  - C. Completed once in the morning, once in afternoon, and kept at jobsite
  - D. Completed once in the morning, once in afternoon, and kept in the home office

**Excavation Competent Person Exercise Solutions**

- 1. D
- 2. D
- 3. D
- 4. C
- 5. A
- 6. B
- 7. B
- 8. D
- 9. C

## Soil Classification Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer**

### OSHA Soils Classification and their Characteristics

SOIL TYPE	CHARACTERISTICS				
	Water Table	Visual	Tilted Soil Layers	Soil Layers	Unconfined Compressive Strength
<b>TYPE A SOILS</b> Intact Hard Soils *cohesive soils *unconfined compressive strength *Examples of Type A Soils Clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam & sandy clay loam.	Above a water table  Not saturated	No fissures, cracks, or weak layers	No tilting layers dipping into the trench with a slope of 4H: 1V or steeper	No soil layers below bed rock layers	More than 1.5 tons per sq. ft.
<b>TYPE B SOILS</b> * cohesive soils *unconfined compressive strength Examples of Type B Soils are: angular gravel, silt, silt loam, fissured or subject to vibration, dry unstable rock.	Above water table  Not saturated	May have Fissures or Cracks	No tilting layers dipping into the trench with a slope of 4H:1V or steeper	No soil layers below bed rock layers	Between 0.5 - 1.5 tons per sq. ft.
<b>TYPE C SOILS</b> *cohesive soils *granular soils such as gravel, sand and loamy sand, submerged soil, soil from which water is freely seeping, and submerged rock that is not stable.	Maybe within a water table or Saturated	May not be able to stand on slope of 3H:1V without slumping	May contain layers tilting in at 4H:1V slope or greater		0.5 tons per sq. ft. or less
Stable Rock					

**Soil Classification Exercise (continued)**

1. You have performed the following Visual inspection and manual tests. How would you classify a soil that has the following properties?

Visual Observations:	Trench 12 feet deep
Soil Observation:	Angular Gravel
Unconfined Compressive strength:	1.12 tsf
Surrounding Area & Trench Conditions:	an open field

- A. Type A soil
- B. Type B soil
- C. Type C soil
- D. Stable Rock

2. You have performed the following Visual inspection and manual tests. How would you classify a soil that has the following properties?

Visual Observations:	Trench 16 feet deep
Soil Observation:	Sand
Unconfined Compressive strength:	0.43 tsf
Surrounding Area & Trench Conditions:	an open field

- A. Type A soil
- B. Type B soil
- C. Type C soil
- D. Stable Rock

3. You have performed the following Visual inspection and manual tests. How would you classify a soil that has the following properties?

Visual Observations:	Trench 6 feet deep
Soil Observation:	Clay
Unconfined Compressive strength:	1.73 tsf
Surrounding Area & Trench Conditions:	Open Farmers Crop Field

- A. Type A soil
- B. Type B soil
- C. Type C soil
- D. Stable Rock

**Soil Classification Exercise (continued)**

4. You have performed the following Visual inspection and manual tests. How would you classify a soil that has the following properties?

Visual Observations:	Trench 14 feet deep
Soil Observation:	Sandy Clay
Unconfined Compressive strength:	1.63 tsf
Surrounding Area & Trench Conditions:	water is freely seeping

- A. Type A soil
- B. Type B soil
- C. Type C soil
- D. Stable Rock

5. You have performed the following Visual inspection and manual tests. How would you classify a soil that has the following properties?

Visual Observations:	Trench 9 feet deep
Soil Observation:	Silty Clay
Unconfined Compressive strength:	1.60 tsf
Surrounding Area & Trench Conditions:	Previously Disturbed Soil

- A. Type A soil
- B. Type B soil
- C. Type C soil
- D. Stable Rock

6. You have performed the following Visual inspection and manual tests. How would you classify a soil that has the following properties?

Visual Observations:	Trench 16 feet deep
Soil Observation:	Silt loam
Unconfined Compressive strength:	1.00 tsf
Surrounding Area & Trench Conditions:	Sloped Layered system with 4H:1V

- A. Type A soil
- B. Type B soil
- C. Type C soil
- D. Stable Rock

### Soil Classification Exercise (continued)

7. You have performed the following Visual inspection and manual tests. How would you classify a soil that has the following properties?

Visual Observations:	Trench 13 feet deep
Soil Observation:	Clay loam
Unconfined Compressive strength:	1.56 tsf
Surrounding Area & Trench Conditions:	Vibration Nearby

- A. Type A soil
- B. Type B soil
- C. Type C soil
- D. Stable Rock

8. You have performed the following Visual inspection and manual tests. How would you classify a soil that has the following properties?

Visual Observations:	Trench 7 feet deep
Soil Observation:	Sandy Clay
Unconfined Compressive strength:	1.75 tsf
Surrounding Area & Trench Conditions:	Fissured

- A. Type A soil
- B. Type B soil
- C. Type C soil
- D. Stable Rock

### Soil Classification Exercise Solutions

- 1. B
- 2. C
- 3. A
- 4. C - Water is freely Seeping
- 5. B - Previously Disturbed
- 6. C - Sloped-Layered soil system
- 7. B - Vibration
- 8. B - Fissured

## OSHA Visual and Manual Soil Observation Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. What do the field thumb penetration, pocket penetrometer and the shear vane measure?
  - A. Shear Stress
  - B. Impact Load
  - C. Surcharge Load
  - D. Unconfined Compressive Strength
2. Which field manual test is used to differentiate between cohesive material with fissures, unfissured cohesive material and granular material?
  - A. Pat Test
  - B. Drying Test
  - C. Plasticity Test
  - D. Dry Strength Test
3. Which field manual test checks for a cohesive soil?
  - A. Pat Test
  - B. Drying Test
  - C. Plasticity Test
  - D. Thumb Penetration Test
4. Which field manual test is used to determine the presence of cohesive clay or silt?
  - A. Pat Test
  - B. Drying Test
  - C. Plasticity Test
  - D. Thumb Penetration Test
5. Which test instrument measures the unconfined compressive strength of soil?
  - A. Standard Proctor
  - B. Modified Proctor
  - C. Pocket Penetrometer
  - D. Standard Penetration

**OSHA Visual and Manual Soil Observation Exercise (continued)**

6. During a visual soil observation of an excavated soil sample, the visual inspection finds that the soil is composed of primarily a fine-grained material. Which of the following soils is this considered?
- A. Moist
  - B. Layered
  - C. Cohesive
  - D. Granular
7. During a visual observation the excavated soil breaks up easily and does not stay in clumps. Which of the following soils is this considered?
- A. Plastic
  - B. Fissured
  - C. Saturated
  - D. Granular
8. Which of the following soils is considered a cohesive soil?
- A. Clay
  - B. Loam
  - C. Gravel
  - D. Topsoil
9. What of the following soils is considered granular?
- A. Clay
  - B. Sand
  - C. Loam
  - D. Topsoil
10. Which of the following soil types have the highest unconfined compressive strengths?
- A. Silt
  - B. Gravel
  - C. Sandy clay
  - D. Angular gravel



## **OSHA Visual and Manual Soil Observation Exercise Solutions**

1. D
2. B
3. C
4. A
5. C
6. C
7. D
8. A
9. B
10. C

## OSHA Excavation Trench Failure Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

1. What is the earth material drawn from an excavation called?
  - A. Spoil
  - B. Saturated Soil
  - C. Submerged Soil
  - D. Cohesionless Soil
  
2. What is the approximate average weight in pounds of one cubic foot of soil?
  - A. 50
  - B. 62
  - C. 90
  - D. 140
  
3. What is the approximate average weight in pounds of one cubic foot of water?
  - A. 50
  - B. 62
  - C. 90
  - D. 140
  
4. How fast does soil cave-into trenches in Miles per hour?
  - A. 5
  - B. 10
  - C. 35
  - D. 75
  
5. You have an excavation 8 feet deep, 7 feet long and a fissure exists 2 feet from the face in a clay soil. What is the total weight in pounds of this soil if it collapses into the trench?
  - A. 5600
  - B. 7840
  - C. 10080
  - D. 15680

**OSHA Excavation Trench Failure Exercise (continued)**

6. What type of material is the most dangerous because the faces appear too solid and stable but they are drastically affected by water, wind, and pressure?
- A. Clay
  - B. Gravel
  - C. Sand
  - D. Rock
7. According to OSHA, What is the minimum ratio for a layered soil system?
- A. 1H:1V
  - B. 3H:1V
  - C. 4H:1V
  - D. 5H:1V
8. What is the visual inspection term called for observing that a small amount of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation?
- A. Spalling
  - B. Heaving
  - C. Toppling
  - D. Raveling
9. What is the visual inspection term called for observing that the layers on the face of the wall slope dramatically at a ratio of four horizontal to one vertical (4H:1V)?
- A. Sliding
  - B. Toppling
  - C. Undercutting
  - D. Sloped system
10. What is the visual inspection term called for observing that upward water flow into the bottom of the excavation?
- A. Boiling
  - B. Sloughing
  - C. Submerged
  - D. Surcharge Load

**OSHA Excavation Trench Failure Exercise (continued)**

11. What is the visual inspection term called for observing that the soil has sunk on the horizontal surface?
- A. Boiling
  - B. Bulging
  - C. Heaving
  - D. Subsidence
12. What is the visual inspection term called for observing that the soil is protruding from the face of the open excavation into the excavation?
- A. Boiling
  - B. Bulging
  - C. Heaving
  - D. Subsidence
13. What is the visual inspection term called for observing that the soil is protruding up from the bottom of the excavation?
- A. Boiling
  - B. Bulging
  - C. Heaving
  - D. Subsidence
14. What is the visual inspection term called for observing that the soil has open cracks on the horizontal ground or on the open face of the excavation?
- A. Fissure
  - B. Bulging
  - C. Sloughing
  - D. Subsidence
15. What is the term for an excessive vertical load caused by the spoil pile or construction equipment being too close to the trench edge?
- A. Impact load
  - B. Undercutting
  - C. Underpinning
  - D. Surcharge load

**OSHA Excavation Trench Failure Exercise (continued)**

16. What is the visual inspection term called for observing that small fragments of rock break up or scale off the excavation face?
- A. Spalling
  - B. Heaving
  - C. Toppling
  - D. Raveling
17. What is the visual inspection term called for observing that the trenches vertical face shears along the tension crack line and falls into the excavation?
- A. Spalling
  - B. Heaving
  - C. Toppling
  - D. Raveling
18. What is the visual inspection term called for observing that the soil is underwater or it is freely flowing into the trench?
- A. Bulging
  - B. Submerged
  - C. Subsidence
  - D. Undercutting
19. What is the term for excavating below the foundation of an existing nearby structure?
- A. Subsidence
  - B. Undercutting
  - C. Underpinning
  - D. Surcharge load

**OSHA Excavation Trench Failure Exercise (continued)**

20. According to the National Institute for Occupational Safety and Health (NIOSH) study. What are the sequence and signs of trench failure?
- A. Surface cracks parallel to trench, horizontal cracks on the face, bottom kicks in and rain flowing into the cracks
  - B. Heaving in the bottom of the excavation, fissured cracks on the excavation surface, soil topples into the excavation, and the soil is submerged
  - C. Spalling of the excavation face, sloughing sides fall into the excavation, boiling in the bottom of the trench and a surcharge load due to the spoil pile too close

**OSHA Excavation Trench Failure Exercise Solutions**

1. A
2. D
3. B
4. C
5. D
6. A
7. C
8. D
9. D
10. A
11. D
12. B
13. C
14. A
15. D
16. A
17. C
18. B
19. B

20. A

**IX. ETHICS****Construction Ethics Exercise**

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

These situations were adapted from the Column Mr. Ethics presented in previous issues of the American Institute of Constructors (AIC) Newsletter. Read the situations below and circle the best response to the situation.

1. Contractor "A" was low bidder on a general-contracted project which has an extensive number of alternatives during bidding and negotiations. Contractor "A" received a standard contract from Mary, the lead Architect, a source of business for several years. While reviewing the proposed contract, Ed, the Estimator at Contractor "A," discovers the contract value was erroneously issued at \$365,000 instead of the \$355,000. How should Ed handle this situation?
  - A. Ignore the error and sign the contract
  - B. Call Mary, the lead architect, and inform her of your discovery
  - C. Inform Mary, the lead architect, of the error but encourage them to leave the difference in the contract as a contingency
  - D. Inform Mary, the lead architect, of the error and tell them to leave the amount in the contract to cover the potential errors in the numerous alternatives
  
2. Constructor "Z" is building an addition to an existing pharmaceutical plant of approximately 20,000 square feet. There is space on the site for one more future addition. After installing foundations, Ed, the Constructors Superintendent, is verifying the dimensions with Jim the Bricklayer crew leader and they discover that the addition has been laid out 1' - 0" out of square. All work can still be performed with very minor field adjustments. The error will compound itself if the future addition ever takes place. Ed has worked on Mary the Architect's projects for over twenty years but never for this owner. What should Ed do?
  - A. Ignore the error and tell no one
  - B. Inform Mary the architect only
  - C. Inform the Owner and Mary the Architect
  - D. Have Ed, the superintendent, and Jim, the Bricklayer adjust as required



**Construction Ethics Exercise (continued)**

3. A city electrical inspector makes the following statement after discovering that the new condominium building # 13 of 25 buildings has been drywalled without an electrical inspection. The inspector says to you, the superintendent, “Gee! It will be pretty expensive to remove all of the drywall. I’d bet it will cost you at least \$5, 000. I’d like to have that kind of money myself!” (You suspect that the inspector is asking for a bribe.)
  - A. Contact the building department supervisor and ask to have hidden areas removed
  - B. Instruct your workers to remove all of the drywall for the electrical inspection
  - C. Pay the inspector because you don’t want to be bothered with the situation
  - D. Contact the City Commissioners and the local newspaper and have the inspector relieved of their duties
  
4. You, as a Masonry Subcontractor, recently submitted a bid of \$450,000 to a General Contractor for the masonry portion of a new office building. You are invited to the General Contractor’s office to discuss the project. In the midst of negotiations, the General Contractor’s representative is called out of the room. In their absence, you notice the spread sheet listing all the bids received including yours. It is apparent from the spread sheet that you are \$22,000 higher than the low bidder. The next highest bidder is \$8,000 above you. What action should you take?
  - A. Lower your price by \$25,000 upon the General Contractor’s return, giving the reason that you had a chance to re-examine your numbers
  - B. Be concerned that the spread sheet may be a decoy with the intention of getting you to lower your price enough to become the lowest bidder
  - C. Continue negotiating with the General Contractor over price upon the General Contractor’s return to the meeting, always knowing you have the upper hand
  - D. Maintain your original price quotation, extol the virtues of your company to be able to meet the schedule, the high quality of your work and your relationship

**Construction Ethics Exercise (continued)**

5. After a \$15,000,000 bid on a new pump house, you are publicly regarded as the apparent second low bidder. The following day one of the subcontractors for a \$4,500,000 portion of the project calls and asks how they compared with their competitors. The Subcontractor is the low bidder to the Contractor. What do you tell the subcontractor?
  - A. Divulge all and hope to put your competitor at a negotiating disadvantage
  - B. Maintain your silence in respect for the other subcontractors who provided quotes
  - C. Provide the subcontractor a ball park idea where they stood, but don't be specific
  - D. Tell him that it is none of their business and hang up on him for bothering you
  
6. According to the Constructor's Code of Ethics, The Constructor shall insure that when providing a service or advice such advice shall be to treat all parties in a fair and unbiased way. What is the best way for a Constructor to achieve this?
  - A. Fire someone for being considered unethical
  - B. Review your mission and goal statement on ethical behavior
  - C. Follow the guidelines provided in your employment contract
  - D. Don't engage in any practice which creates an unfair advantage for one party
  
7. According to the Constructor's Code of Ethics, The Constructor shall not maliciously or recklessly injure or attempt to injure the professional reputation of others. You have just been notified in writing that you have not met the minimum score required to pass the Level 2 Advanced Construction Applications Examinations even though you have over twenty years of experience. What is the Best way to proceed?
  - A. Call the Commission office and criticize the poor quality of the examination
  - B. Submit a written request to the Commission, postmarked no later than thirty days after the notice of failure according to the Appeals Process procedures
  - C. Obtain the e-mail addresses of all members and send a letter criticizing the quality of the test questions and that certain portions of the examination were wrong
  - D. Call the Commission office and ask for hints on how close you were to passing and what questions should be appealed. Then provide a solid grounds for appeal

## **Construction Ethics Exercise Solutions**

1. B
2. C
3. A
4. D
5. B
6. D
7. B

## X. CONTRACT INTERPRETATION PRINCIPLES APPLIED TO A SET OF PROJECT DOCUMENTS

### Document Search Exercise

Each multiple-choice question below will be followed by four choices or responses. Only one of the four choices is the correct or best answer. **Circle the one correct answer.**

Using the project manual documents attached for the project, answer the following questions by circling the letter (A, B, C, D).

1. Which General Conditions are incorporated into this project manual?
  - A. Owner Developed General Conditions
  - B. American Institute of Architects (AIA - A-201 - 2007)
  - C. American Institute of Architects (AIA - A-201 - 1997)
  - D. Engineers Joint Contract Documents Committee (EJCDC - 1910-8 (1990))
2. What are the MBE and WBE goals stated in these documents?
  - A. The MBE is \$37,000
  - B. They are not discussed
  - C. The MBE is 12 percent and the WBE is \$37, 000
  - D. The MBE is 12 percent and the WBE is not discussed
3. Which Type of construction, county, and state is the Prevailing Wage Rate Schedule for?
  - A. Commercial construction in Mecosta County, Michigan
  - B. Airport and Highway construction in Blue Lake County, Michigan
  - C. Sewer and Water treatment construction in Mecosta County, Michigan
  - D. Commercial and Industrial construction in Big Rapids County, Michigan
4. What is the basic hourly, fringe benefit, and total prevailing wage rates for a Millwright?
  - A. Basic rate is \$13.94, fringes are \$2.22, and the total is \$16.16 per hour
  - B. Basic rate is \$14.58, fringes are \$3.01, and the total is \$17.59 per hour
  - C. Basic rate is \$16.85, fringes are \$2.20, and the total is \$19.05 per hour
  - D. Basic rate is \$15.85, fringes are \$4.40, and the total is \$20.25 per hour
5. What is the start date of the project?
  - A. Within fourteen days after the Notice to Proceed, and no later than May 15
  - B. Within fourteen days after the Notice of Award, and no later than May 15
  - C. Within fourteen days after the Notice to Proceed, and no later than December 18
  - D. Within fourteen days after the Notice to Award, and no later than December 18

**Document Search Exercise (continued)**

6. What are the Contractors' responsibilities as far as permits are concerned?
  - A. Submit plans and specifications to local authority for the purpose of obtaining and paying for the general building permit
  - B. Submit plans and specifications to local authority for the purpose of obtaining and paying for the electrical permit
  - C. Submit plans and specifications to local authority for the purpose of obtaining and paying for the mechanical building permit
  - D. Submit plans and specifications to local authority for the purpose of obtaining and paying for the general building permit, State, County deposits and highway repair
7. Which permit is not mentioned but would be required according to Federal and State law?
  - A. Landscaping and Exterior permit
  - B. Soil Erosion and Sedimentation permit
  - C. Maintenance and Traffic Control permit
  - D. Highway, Street, Sidewalk and Alley permit
8. Who is responsible for paying the Sales Taxes on this project?
  - A. Owner
  - B. Contractor
  - C. State, it has a tax-exempt status
  - D. Federal government because it is tax exempt
9. During the bidding stage of the project, you call the architect for clarification of the type of underground sewer piping materials required, The architect provides you with an answer. What is the procedure established in the documents?
  - A. Price the work as instructed by the Architect
  - B. Have the Architect fax, you, the Contractor their clarification
  - C. Send a request in writing to the Owner and have them issue an addendum
  - D. Send a request in writing to the Architect and have them issue an addendum.
10. What is the required coverage for the Project Management Protective Liability Insurance and which party will pay for the coverage?
  - A. None is required on this project
  - B. \$500,000 each occurrence and \$1,000,000 Aggregate, Contractor paid
  - C. \$500,000 for each person and \$1,000,000 for each accident, Owner paid
  - D. \$500,000 for each person and \$1,000,000 for each accident, Contractor paid

**Document Search Exercise (continued)**

11. What is the required coverage for the Owner's Liability insurance and who will pay for the policy?
  - A. \$500,000 each occurrence and \$1,000,000 Aggregate, Contractor paid
  - B. \$500,000 for each person and \$1,000,000 for each accident, Owner paid
  - C. \$5,000,000 for each person and \$10,000,000 for each accident, Owner paid
  - D. \$500,000 for each person and \$1,000,000 for each accident, Contractor paid
12. What types of insurance coverages are required under the Contractor's Liability Insurance policy for this project?
  - A. Property Insurance, Boiler, Machinery, and Loss of Use Insurance
  - B. Marine, Railroad, Contractor's Tools and Longshoreman Insurance
  - C. Worker's Compensation, General Liability, Umbrella Excess and Auto Liability
  - D. General Comprehensive, Project Management, Performance & Property Damage
13. Which type of insurance covers damage to the materials and equipment to be incorporated into the project?
  - A. Property Insurance
  - B. Owner's Liability
  - C. Contractor's Liability
  - D. Project Management Liability
14. You have set up 3/4 of the concrete formwork and placed the rebar for a water storage clarifier tank which is 100 feet long, 60 feet wide and 40 feet high. A wind storm blows down the forms and mangles the forms and rebar for the tank. Which items are covered under the Builders Risk policy?
  - A. Nothing is covered under the Builder's Risk policy
  - B. Material, labor and equipment to replace and repair the rebar
  - C. Material, labor and equipment to replace and repair for all items
  - D. Material, labor and equipment to replace and repair the concrete formwork
15. Which party will pay for the Property Insurance normally called Builder's Risk?
  - A. Owner
  - B. Architect
  - C. Contractor
  - D. Subcontractor

**Document Search Exercise (continued)**

16. How many Alternates are there on this project?
- A. 0
  - B. 1
  - C. 3
  - D. 5
17. Which party will select the Alternates (Alternatives)?
- A. Owner
  - B. Architect
  - C. Engineer
  - D. Contractor
18. How are days defined on this project?
- A. Working days
  - B. Calendar days
  - C. Scheduled days
  - D. Does not indicate
19. When must the Contractor's construction schedule be submitted?
- A. Within 14 calendar days of the Notice to Proceed
  - B. After the Notice of Award and at a maximum of one month
  - C. Within 10 working days after the date on the Notice of Award
  - D. Within 14 calendar days after the date of the Notice of Award
20. What are the consequences if the Contractor fails to submit the Contractors' construction schedule within the time frame?
- A. Nothing
  - B. Deduct \$1200 from their progress payment
  - C. Withhold first progress payment request until the following month
  - D. Withhold progress payments until the construction schedule is submitted
21. When must the schedule of values be submitted?
- A. Within 14 calendar days of the Notice to Proceed
  - B. Within 10 working days of the Notice to Proceed
  - C. Within 10 working days after the date on the Notice of Award
  - D. Within 14 calendar days after the date of the Notice of Award

**Document Search Exercise (continued)**

22. What is the completion date of the project?
- A. December 10
  - B. December 12
  - C. December 18
  - D. December 21
23. What action must the contractor take if they encounter any hazardous materials including but not limited to asbestos or (PCB) at the job site?
- A. Stop work on the entire project
  - B. Stop work in the affected area and report condition to the Owner in writing
  - C. Stop work in the affected area and notify the Architect
  - D. Continue working and tell the workers to be careful and request additional time
24. Which area potentially needs temporary shoring and bracing, but it's up to the Contractor to determine?
- A. Parking lot
  - B. West side because of the high hill
  - C. North end of the project because its low
  - D. East side because it is adjacent to the wetlands
25. What compliance standards must be met for sheeting, shoring and bracing?
- A. Insurance industry standards
  - B. Builders Risk requirements
  - C. Architects and Engineers standards
  - D. Federal Occupational Safety and Health Act
26. How many copies of the Operations and Maintenance data must be submitted?
- A.0
  - B.1
  - C.2
  - D.7



## Document Search Exercise Solutions

- |   |  |
|---|--|
| 1. - See GC -1                                | 21. D - See Supplementary Cond, 9.2.1  |
| 2. C - See 01060 Part 1.04 D.                 | 22. B - Agreement, Art 4, AGM Rules  |
| 3. A - See PWF - 1                            | 23. B - Best Answer, GC, Art 10.1.2  |
| 4. C - See PWF - 2                            | 24. D - Soil Investigation rpt, p 10 and<br>Supplementary Cond 10.2.3.1<br>(2) |
| 5. A - See ITB article 8, page ITB-2          | 25. D- See Supplementary Cond 10.2.2   |
| 6. A - See Supplementary Cond 3.7.1.1<br>1.06 | 26. C - See General Req. 01700 Part  |
| 7. B - See Soil Investigation p 16, Pond      |  |
| 8. B - See AIA General Cond, Art 3.6          |  |
| 9. D - See ITB, Article 4, No Oral Interp     |  |
| 10. A - See AIA General Cond, Art 11.3        |  |
| 11. D - See Supplementary Cond, 11.2.1        |  |
| 12. C - See Supplementary Cond, 11.1.1        |  |
| 13. A - See Supplementary Cond, 11.4          |  |
| 14. B - See Supplementary Cond, 11.4          |  |
| 15. A - See Supplementary Cond, 11.4          |  |
| 16. C - See 01030 Part 1.08 A                 |  |
| 17. A - See ITB, Article #23                  |  |
| 18. B - See AIA General Cond, Art 8.1.4       |  |
| 19. A - Supplementary Cond, 3.10.2            |  |
| 20. C - Supplementary Cond, 3.10.2            |  |

**Document Search Exercise Exhibit**

Blue Lake Township Office Building

The Construction Documents  
for the  
Blue Lake Township Office Building  
9565 Blue Ridge Lane  
The Village of Mecosta  
Mecosta County, Michigan 49332

PREPARED BY  
Brayton AEC  
P.O. Box 224  
001 Maple Street  
Big Rapids, MI 49307

PROJECT NO. 9111-31

## CSI - PROJECT MANUAL ARRANGEMENT

<b>INTRODUCTORY INFORMATION</b>	00 01 0 1	TITLE PAGE
	00 01 0 5	CERTIFICATION PAGE
	00 01 10	TABLE OF CONTENTS
<b>PROCUREMENT REQUIREMENTS</b>	<b>00 10 0 0</b>	<b>SOLICITATION</b>
	00 11 13	Advertisement for Bids
	00 11 16	Invitation to Bid
	<b>00 20 0 0</b>	<b>INSTRUCTIONS FOR PROCUREMENT</b>
	00 22 13	Supplementary Instructions to Bidders
	<b>00 30 0 0</b>	<b>AVAILABLE INFORMATION TO BIDDERS</b>
	00 31 13	Preliminary Schedules
	00 31 16	Geotechnical Data - Geotechnical Report & Soil Boring Data
	00 31 19	Existing Conditions -
	<b>00 40 0 0</b>	<b>PROCUREMENT FORMS AND SUPPLEMENTS</b>
	<b>00 41 0 0</b>	<b>Bid Forms</b>
	<b>00 42 0 0</b>	<b>Proposal Forms</b>
	<b>00 43 0 0</b>	<b>Procurement Forms Supplements</b>
	<b>00 45 0 0</b>	<b>Representations and Certifications</b>
<b>CONTRACTING REQUIREMENTS</b>	<b>00 50 0 0</b>	<b>CONTRACTING FORMS AND SUPPLEMENTS</b>
	<b>00 52 0 0</b>	<b>Agreement Forms</b>
	<b>00 60 0 0</b>	<b>PROJECT FORMS -</b>
	<b>00 61 0 0</b>	<b>Bond Forms</b>
	<b>00 62 0 0</b>	<b>Certificates and Forms - Non-collusive Affidavit</b>
	<b>00 70 00</b>	<b>CONTRACTING FORMS AND SUPPLEMENTS</b>
	<b>00 72 00</b>	<b>General Conditions</b>
	<b>00 73 00</b>	<b>Supplementary Conditions</b>
<b>SPECIFICATIONS</b>	<b>DIVISION 01</b>	<b>GENERAL REQUIREMENTS</b>
	<b>DIVISIONS 02 - 19</b>	<b>FACILITY CONSTRUCTION</b>
	<b>DIVISIONS 20 - 29</b>	<b>FACILITY SERVICES</b>
	<b>DIVISIONS 30 - 39</b>	<b>SITE AND INFRASTRUCTURE</b>
	<b>DIVISIONS 40 - 49</b>	<b>PROCESS EQUIPMENT</b>

# Blue Lake Township Office Building

## SPECIFICATIONS INDEX

Table of Contents	i
Drawing Index	DI - 1

### ***BIDDING REQUIREMENTS***

Addenda	ADM - 1
Bid Breakdown Form	ADM - 2
Instructions to Bidders	ITB - 1
Information Available to Bidders - Report of Soils Investigation	IAB - 1

### ***BID FORMS***

Bid Proposal Form	BPF - 1
Architectural Bid Supplements	ABS - 1
Non-Collusive Affidavit	NCA - 1
Prevailing Wage Rate Forms	PWF - 1

### ***CONTRACT FORMS***

Agreement between Owner and Contractor	AGM - 1
Application & Certificate for Payment with Continuation Sheets	PMF - 1

### ***CONTRACT CONDITIONS***

General Conditions	GC - 1
Supplementary Conditions	SC - 1

## **Blue Lake Township Office Building**

### ***DIVISION 01    GENERAL REQUIREMENTS***

01010	Summary of Work	01010-1
01011	Summary of Project	01011-1
01020	Allowances	01020-1
01025	Measurement and Payment	01025-1
01030	Alternates	01030-1
01035	Modification Procedures	01035-1
01400	Quality Control	01400-1
01500	Construction Facilities and Temporary Controls	01500-1
01600	Material and Equipment	01600-1
01655	Starting of Systems	01655-1
01700	Contract Closeout	01700-1

## Blue Lake Township Office Building

DRAWING INDEX	
T	TITLE SHEET
CIVIL	
C101	Site Layout Plan
C102	Site Grading and Paving Plan
C103	Site Details
ARCHITECTURAL	
A101	Lower-Level Floor Plan
A102	Upper-Level Floor Plan
A103	Enlarged Plans
A201	Door Schedule, Frame Types, and Detail
A301	Exterior Elevations
A401	Building Sections
A501	Interior Details
A502	Enlarged Stair Plans and Stair Details
A601	Interior Details
STRUCTURAL	
S101	Foundation Plan
S102	Foundation Details
S201	Upper-Level Floor Framing Plan
S202	Roof Framing Plan
S301	Bridge Layout and Details

## Blue Lake Township Office Building

DRAWING INDEX	
MECHANICAL	
M101	Lower-Level Plumbing and Fire Protection
M102	Upper-Level Plumbing and Fire Protection
M201	Lower-Level HVAC Plan
M202	Upper-Level HVAC Plan
M203	Enlarged Mechanical Plans and Sections
M204	Mechanical Details
M301	Mechanical Schedules
ELECTRICAL	
E101	Schedules
E102	Electrical Details
E103	Site Electrical Plan
E201	Lower-Level Lighting Plan
E201	Upper-Level Lighting Plan
E301	Lower-Level Power Plan
E302	Upper-Level Power Plan

**BLUE LAKE TOWNSHIP OFFICE BUILDING**

**ADDENDUM NO. 1**

TO: ALL BIDDERS  
DATE: DATE: JANUARY 05,

RE: Change to Bidding Documents

The following changes to the Contract Documents are made:

**ITB - INSTRUCTIONS TO BIDDERS**

Article 7. of the Instructions to Bidders, shall be modified as follows:

**ADD:**

- 7.1 All Proposals submitted must include an itemized bid breakdown upon the Bid Breakdown Form Attached and must give the amounts for each item.
- 7.2 In order to ensure consideration, the Non collusive Affidavit and all addenda must be signed, and enclosed in a 9" X 12" sealed opaque envelope with the Contractor's Proposal Form.

**DIVISION 1 - GENERAL REQUIREMENTS**

01010 SUMMARY OF WORK of the General Requirements, shall be modified as follows:

Add to 01010.1:

- 01010.1 C. The Non-collusive Affidavit and the Bid Breakdown Form will be included as part of the contract documents.

All bidders are required to execute this addendum and submit with their Proposal Documents.

I hereby acknowledge receipt of this Addendum and agree to the terms therein.

---

(Signature & Title)

---

Date



## BLUE LAKE TOWNSHIP OFFICE BUILDING

### BID BREAKDOWN FORM

The Proposal will be accompanied by the following Bid Breakdown.

ALL ENTRIES MADE ON THIS PAGE SHALL BE HANDWRITTEN IN INK.

ITEM DESCRIPTION	DIV. NO	TOTAL \$
GENERAL REQUIREMENTS	01000	
SITEWORK, UNDERGROUND UTILITIES	02000	
CONCRETE, DAMPROOFING, INSULATION	03, 07	
MASONRY	04000	
STRUCTURAL STEEL	05000	
CARPENTRY	06000	
PREFORMED METAL SIDING	07400	
ROOFING	07500	
STOREFRONTS, DOORS & WINDOWS	08000	
DRYWALL	09200	
ACOUSTICAL CEILING	09500	
FLOORING	09600	
PAINTING	09900	
SPECIALTIES	10 - 12	
PLUMBING	15400	
HYDRONIC HEATING, PIPING, PROCESS PIPE	15500	
SHEET METAL, AIR DISTRIBUTION, MAU	15600 -15900	
ELECTRICAL, COMMUNICATION, SECURITY	16000	
TOTAL BID PRICE		

# **BLUE LAKE TOWNSHIP OFFICE BUILDING**

## **INSTRUCTIONS TO BIDDERS**

### **1. OPENING OF PROPOSALS**

Sealed proposals for the Construction of the Blue Lake Township Office Building will be received until 8:00 A.M., E.S.T. on Wednesday, April 3, by Jim Brayton with Brayton AEC. The bid opening will be held in Room 205 of the Mecosta County Building at 605 S. Warren St, Big Rapids, MI 49307. Proposals will be publicly opened at that time and read aloud.

### **2. COPIES OF BID DOCUMENTS**

The drawings and specifications, together with all necessary forms and other contract documents for bidders may be examined at:

Builders Exchange - Grand Rapids, Traverse City, Lansing  
F.W. Dodge - Grand Rapids, Flint, Lansing, Kalamazoo

### **3. DOCUMENT DEPOSIT AND SHIPPING AND HANDLING FEE**

General Contractors, Electrical and Mechanical Contractors may obtain one set of drawings and specifications from the Architect upon deposit of \$25.00 which is refundable only when drawings and specifications are returned intact and without marks within five (5) days after bids are due. A shipping and handling fee of five (\$5.00) per set will be charged for mailing.

### **4. INTERPRETATIONS BY ADDENDUM ONLY**

**No oral interpretations** will be made to any bidder as to the meaning of the drawings and specifications or other contract documents. Every request for such an interpretation shall be made in writing and addressed and forwarded to the Architect five (5) or more days before the date fixed for opening of proposals. Every interpretation made to a bidder will be in the form of an addendum to the contract documents which, if issued, will be sent as promptly as is practical to all persons to whom the drawings and specifications have been issued. **All such addenda shall become part of the contract documents.**

### **5. BIDDERS' QUALIFICATIONS**

Contractors for this project shall have qualifications as follows:

1. Shall be a reputable organization with at least five (5) years of successful experience on work of this type.
2. Shall have a license where required by public authorities
3. Shall be able to submit at least four (4) calendar days prior to date of bid opening, if requested, prequalification evidence in affidavit form of experience, financial resources, work now in hand and organization.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **INSTRUCTIONS TO BIDDERS**

#### **6. EXAMINATION OF DOCUMENTS AND SITE**

Before submitting proposals, bidders shall carefully examine all drawings and read all divisions of the specifications and all contract documents in order to avoid omissions or duplications and to insure a complete job. Bidders should also visit premises, verify site conditions and conditions under which work under this contract must be conducted.

Submission of proposal signifies that bidder has visited the premises, has made examinations and verifications and is fully conversant with the conditions. No claims for additional compensation will be considered or paid to any contractor, due to said Contractor's failure to be so informed.

#### **7. BID PROPOSAL SUBMITTAL PROCEDURES**

All proposals must be made upon the contractor's proposal form attached hereto, in triplicate form and should give the amounts bid for the work, both in words and in figures, and must be signed and acknowledged by the Contractor. In order to ensure consideration, the Proposal should be enclosed in a sealed opaque envelope bearing the following inscriptions: **Proposal for the Construction of the Blue Lake Township Office Building, at 9565 Blue Ridge Lane in the Village of Mecosta, Mecosta County, MI to be opened at 8:00 A.M., E.S.T., on Wednesday April 3. Address all Proposals to: Jim Brayton, Brayton AEC, Big Rapids, MI 49307.** The sealed opaque envelope must show the return address of the sender and all addenda received shall be listed on the outside of the bid envelope. Any proposals received without each addendum listed by number and date received on the outside of the bid proposal envelope may be declared a non- responsive bid.

#### **8. PROJECT START AND COMPLETION DATES**

The Contractor will commence work within fourteen (14) days after the date of the issuance of Notice of Award of contract which shall be considered as the Notice to Proceed, and no later than May 15. The Contractor shall diligently prosecute and complete such construction to the satisfaction of the Owner and the Architect on or before December 18. All trades of work specified in that Contract Documents shall be completed by date specified above, except for minor replacement, correction or adjustment items which do not interfere with the complete operation and utilization of all parts of the contracted work.

#### **9. PROPOSAL AND PERFORMANCE GUARANTEES**

A certified check, cashier's check, or bid bond for an amount equal to at least five percent (5%) of the total amount bid, shall accompany each proposal as evidence of good faith and as a guarantee that if awarded the Contract, the bidder will execute the Contract and provide Performance and Payment bonds as required. The successful bidder's check or bid bond will be retained until he has entered into a satisfactory contract and furnished required contract bonds. The owner reserves the right to hold the certified checks, or bid bonds of the three lowest bidders until the successful bidder has signed.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **INSTRUCTIONS TO BIDDERS**

#### **10. BID PROPOSAL SUPPLEMENT SUBMITTAL PROCEDURES**

Submit one copy of the proposal supplement for Trade Name or supplier, completely filled in on the form provided in the documents. Proposal Supplement shall be received in the Architect's office no later than 48 hours after date of bid opening. Failure to submit said form may be considered as grounds for rejection of bid.

#### **11. TIME FOR EXECUTING CONTRACT AND PROVIDING CONTRACT BONDS**

Within fourteen (14) days after date of issuance of Notice of Award of the contract, which shall be considered as the Notice to Proceed, the successful bidder shall enter into a contract for performance with the Owner and shall execute and file with the Owner, a Performance Bond and a Labor/ Material Bond. Both bonds shall be in an amount equal to the full contract price. Said contract and bonds shall be in such form and with such surety company as approved by the Owner.

#### **12. APPLICATION AND CERTIFICATE FOR PAYMENT FORMS**

Within fourteen (14) days after date of issuance of written Notice to Proceed, the successful bidder shall submit a cost breakdown to the Architect on the Continuation sheets of the application and Certificate for Payment Forms bound herein. The contractor shall follow The format shown in the continuation sheets for cost breakdowns, and shall enter costs of all items applicable to the contract. The prices indicated shall be the total erected or installed prices. Overhead and profit shall be pro-rated over each item, such that the sum of all items should tally with the amount of the base bid. Copies of these forms shall be used for requesting partial payments.

#### **13. CERTIFICATES OF INSURANCE**

The contractor shall obtain and file with the Owner at the signing of the contract, the certificates of all Insurance required by the General and Supplementary Conditions.

#### **14. CORPORATE OR PARTNERSHIP BID AUTHORIZATIONS**

PARTNERSHIPS: shall contain the names of each partner and shall be signed in the firm name, followed by the signatures of the persons authorized to sign and a certificate copy of the Power of Attorney authorizing the individual signing to bind all.

CORPORATIONS: it shall be signed by the name of the corporation, followed by the written signature of the officer signing, and the printed or typewritten designation of the office he holds in the corporation, together with the corporation seal and a certified copy of the resolution of the Board of Directors authorizing the individual signing to bind the corporation. All blank spaces shall be properly filled in.

#### **15. SPECIFIED ITEMS**

Where items of equipment and/or materials are specifically identified by a manufacturer's name, model or catalog number, only such specified items may be used in the base bid. Manufacturers desiring approval of products not specified, may submit data for Architect's consideration not less than ten (10) days prior to bidding. Contractors will be notified only by Addendum of additional approved manufacturers.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **16. TAXES**

The Contractor shall pay all sales, consumers, use and other taxes required.

### **17. ACCEPTANCE OF PROPOSALS**

Within thirty (30) days after receipt of the proposals the owner will act upon them. The acceptance of a proposal will be a Notice of Award in writing signed by a duly authorized representative of the owner and no other act of the owner shall constitute the acceptance of a proposal. The acceptance of a proposal shall bind the successful bidder to execute the contract. The rights and obligations provided for in the contract shall become and binding upon the parties only upon its execution.

### **18. WITHDRAWAL OF PROPOSALS**

At any time prior to the scheduled closing time for receipt of proposals, any bidder may withdraw his proposal, either personally or by telegraphic or written request. If withdrawal is made personally, proper receipt shall be given thereof. After the scheduled closing time for the receipt of proposals and before award of contract, no bidder will be permitted to withdraw his proposal unless said award is delayed for a period exceeding thirty (30) days. Negligence on the part of the bidder in preparing his bid confers no rights for the withdrawal of the proposal after it has been opened.

### **19. REJECTION OF PROPOSALS**

The owner reserves the right to reject any or all proposals. Without limiting the generality of the foregoing, any proposal which is incomplete, obscure, or irregular may be rejected; any proposal which omits a bid of any one or more items in the price sheet may be rejected; any proposal in which unit prices are omitted or in which unit prices are obviously unbalanced may be rejected; any proposal accompanied by an insufficient or irregular certified check, or bid bond may be rejected.

### **20. ERASURES**

The proposal submitted must not contain erasures, interlineations or other corrections unless each such correction is suitably authenticated by affixing in the margin immediately opposite the correction the surname(s) of the person(s) signing the bid.

### **21. PREMATURE OPENING OF ANY PROPOSAL**

No responsibility shall attach to the Architect, the Owner or the authorized representatives of either one, for the premature opening of any proposal which is not properly addressed and identified.

### **22. THE CONTRACT AGREEMENT**

The contract documents, as outlined in the Agreement between the Owner and the Contractor, when executed, shall imply the inclusion of the entire agreement between the parties thereto and the contractor shall not claim any modification.

### **23. SELECTION OF SPECIFIED ALTERNATIVES**

Selection of specified alternates will be made by the Owner, acting upon the Architect's recommendations, for the best interest of the project commensurate with available funds. The Contract will be awarded to the bidder with the lowest combination of base bid plus any individual alternates or combination of alternates which the Owner may select.

**BLUE LAKE TOWNSHIP OFFICE BUILDING  
INFORMATION AVAILABLE TO BIDDERS**

**GEOTECHNICAL INVESTIGATION REPORT**

**FOR THE**

**PROPOSED BLUE LAKE TOWNSHIP OFFICE BUILDING  
at 9565 Blue Ridge Lane  
The Village of Mecosta, Mecosta County, Michigan**

**Requested by:**

**Brayton Architects, Engineers and Constructors (Brayton AEC)**

**Big Rapids, MI**

**Grand Rapids Testing Service, Inc.**

**Project No. 15-1291**

**December 27,**

# **BLUE LAKE TOWNSHIP OFFICE BUILDING**

## **Report of Soils Investigation**

**Proposed**

**Blue Lake Township Office Building at  
9565 Blue Ridge Lane**

**Village of Mecosta, Mecosta**

**County, Michigan**

**Grand Rapids Testing Service (GRTS), Inc.**

**GRTS Project # 15-1291**

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

Blue Lake Township Office Building  
9565 Blue Ridge Lane  
Mecosta, MI 49332  
GRTS Project # 15-1291  
December 27,

### Purpose:

The purpose of this report is to present the results of a soils investigation performed at the project site located at 435 N. Michigan Avenue, City of Big Rapids, Mecosta County, Michigan. We have appended Drawing No. 1 which identifies the project site location in Big Rapids.

### Procedure:

Soil borings were the primary method of investigation used for determining soil classification, soil shearing strength, and groundwater information.

Ten soil borings (designated #1 through #10) were drilled at the project site. Five borings (designated #1, #2, #3, #4, and #7) were drilled for the proposed building area and five borings (designated #5, #6, #8, #9 and #10) were drilled for the proposed pavement areas.

The borings were drilled by Grand Rapids Testing Service (GRTS), Inc., using a CME model 45 "skid" drill rig. The drill rig utilized hollow stem augers to sample depths where samples were obtained in a two-inch O.D. split spoon sampler driven by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler three six-inch increments are recorded on the boring logs. The first six inches is considered the seating drive. The summation of the number of blows required for the second and third six inches is termed the penetration resistance "N" value in blows per foot (bpf). This field procedure is referred to as the Standard Penetration Test (SPT) and is an American Society for Testing and Materials test procedure (ASTM D-1586).

The "N" values from the SPT are used for the determination of the relative density of granular soils (sand, gravel, low plasticity silt, and mixtures of sand and gravel) or the consistency of cohesive soils (clay and plastic silts). A chart is provided at the back of this report which provides a correlation between "N" values and the relative density of granular soils or the consistency of cohesive soils.

The borings were drilled to depths ranging from 7.5 feet to a maximum of 40 feet below existing surface grade at the boring locations. The borings were started on Monday, December 16 and completed on Tuesday, December 17. The borings were submitted to GRTS. The boring location at the project site are shown on Drawing #2. It should be noted that boring #5 had to be re-located or "off-set" towards the west due to the presence of surface water in the project area where boring #5 was supposed to be located.



## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **Project Information:**

According to our understanding, the proposed project is to consist of design and construction of a building which will be the new Big Rapids Public Safety Building in Big Rapids, MI. The building is planned to be approximately 90 feet by approximately 180 feet in length. The location of the building at the project area is shown on Drawing #2.

We are aware that the design lower-level floor grade for the new building is tentatively set at EL 686.0 which is approximately 22 feet below the high ground elevation (EL 708) at the project site.

### **Project Site Information:**

At the present time, the project site for the new building is relatively undeveloped with numerous trees ranging in size from small to large diameter trees. It is apparent that a structure had occupied the project site area since remnants of a former residence were observed at the project site.

In terms of topography, the project site can be described as moderately “hilly” with ground surface relief on the order of 25 to 30 feet between the low and high elevation areas. The ground surface elevations at each of the boring location was determined by the project geotechnical engineer with GRTS. We assumed that the top of the sanitary sewer manhole (located in Road) was equal to EL 697.8  $\pm$ . The location of the sanitary sewer manhole is shown on Drawing #2.

It should be noted that a “pond” containing “cat-tails” and thick amounts of vegetation is located directly east of the proposed building area as shown on Drawing #2. Also, standing water was present at the low elevation area situated north of the north end of the proposed building area.

### **General Subsurface Soil Information:**

Based on the soil borings, the project site area is underlain by natural soils being predominantly granular in composition.

At the existing ground surface, approximately 4" to 8" of vegetation and organic topsoil was encountered at the boring locations. The maximum amount of organic matter was found at the location of boring #5 with a thickness of 2.5 feet.

Below the organic topsoil, natural soil described as brown fine to coarse sand was encountered to depths on the order of 40 feet below the existing surface grade. Based on the “N” values from the Standard Penetration Test, the natural sand was found to be primarily in a very

## BLUE LAKE TOWNSHIP OFFICE BUILDING

loose to loose condition (borings #2 through #10). At the location of boring #1, the natural sand at a depth of approximately 20 to 30 feet below existing surface grade was found to be in a medium loose to medium dense condition.

It should be noted that sand with lenses of clay was found at boring #3 from a depth of 12.1 to 14.0 feet below existing surface grade. Also, at the location of bring #4, silty sand was found from a depth of 18.0 to 22.5 feet below existing surface grade.

For a more detailed representation of the subsurface solid information encountered at the boring locations, please refer to the attached boring logs.

It should be understood that the subsurface soil conditions encountered at the boring locations are representative only at the boring locations and variations in soil conditions may be encountered during construction activities.

### General Groundwater Information:

Subsurface groundwater was encountered at most of the boring locations at depths shown below:

Boring	Ground Surf. Elev.	Approx. Depth to Groundwater	Groundwater Elevation
1	709.9 ±	29.0'	680.9 ±
2	703.2 ±	23.0'	680.2 ±
3	696.6 ±	16.0'	680.6 ±
4	690.7 ±	9.0'	681.7 ±
5	683.3 ±	1.0'	682.3 ±
6	705.9 ±	> 10.5'	-----
7	686.9 ±	5.0'	681.9 ±
8	683.6 ±	3.0'	680.6 ±
9	684.3 ±	3.0'	681.3 ±
10	686.4 ±	4.0'	682.4 ±

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

As shown above, the groundwater grade was found to vary from EL 680.2  $\pm$  to EL 682.4  $\pm$  with an average of EL 681.3  $\pm$  during the time (mid-December,) that the borings were drilled at the project site.

It should be remembered that the borings represent very short-term groundwater readings and may not be truly reflective of the actual groundwater level below the proposed building site during construction activities. Groundwater levels will fluctuate (up or down) at a project site depending on hydrological and hydraulic factors. Long-term readings via monitor wells are more accurate in terms of the actual groundwater level and potential fluctuation.

### Geotechnical Conclusions and Recommend

Based on the information obtained in the field during the drilling operation, we have formulated our conclusions and recommendations for Geotechnical design and construction of the proposed Big Rapids Public Safety building to be constructed for the City of Big Rapids in Mecosta County, MI.

### Conclusions:

It is our opinion that the project site area is a viable building site although the existing very loose to loose sand encountered at the boring locations should be densified below the proposed building so that the buildings' foundation system and floor slab does not experience excessive total and differential settlement. We will provide specific recommendations regarding supplementary compaction of the very loose to loose granular soils as a means of increasing the available strength of the loose sand and decreasing the potential for settlement of the proposed building later in this report.

Subsurface groundwater may impact the design and construction of the proposed Big Rapids Public Safety building if the proposed building is planned to be constructed at the indicated location.

Inspection and evaluation of the bearing soils during initial site preparation and footing construction is considered to be important to verify that the bearing soils at each footing location can adequately support the recommended footing bearing pressure.

It is our opinion that the project owner should give consideration to the possibility of re-locating the proposed building at the project site. If the subsurface soils encountered at boring #1 is representative of the natural soil situated west of the proposed building location, it is possible that better quality natural soil, i.e., higher strength and lower compressibility soil, may be encountered below the proposed building. This aspect will be discussed later in this report.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **Recommendations for Site Preparation:**

Initial site preparation will require clearing and removing trees from the proposed building and pavement areas. As we mentioned, the site area contains a relatively large number of trees situated in the proposed building and pavement areas. The site contractor should totally remove all tree stumps and root bulbs from below the future building and pavement areas.

After clearing the trees, the site contractor should strip and remove the existing surface stratum of vegetation and underlying organic topsoil. As we mentioned, approximately 4" to 8" of vegetation/topsoil was encountered at the boring locations. Greater or lesser amounts of vegetation/topsoil may be encountered at other locations of the proposed building and/or pavement areas. It should be noted that 2.5 feet of organic topsoil was found at boring #5.

In addition, initial site preparation will require demolition and removal of the existing old residence situated near the project area where the proposed building is to be constructed. The demolition contractor should totally excavate and remove any subsurface footings associated with the old residence.

After completion of the above, the future building and pavement areas should be “filled” or excavated to achieve the design subgrade elevation. Based on the existing topography of the project site area, we anticipate that site excavation or “cut” will be required for most of the proposed building area. The amount of excavation will vary from approximately 22 feet near the southwest corner of the proposed building (boring #1) to a relatively small amount \*1 to 2 feet) near the northeast corner of the proposed building (boring #7). The average amount of excavation in the project area where the proposed building will be situated was determined to be approximately 10 feet.

If the existing grade is low and requires fill soil to raise the existing grade, the stripped subgrade soils should be compacted in accordance with our recommendation for compacted structural fill prior to the placement of the initial layer of fill soil.

We anticipate that the major “fill” areas will be required for the future pavement areas, i.e., parking and roadways.

To provide stable support to the floor slab of the proposed building, we recommend that, during initial site preparation, a minimum of two feet of densified soil should be provided below the future floor slab. The soil at the design subgrade elevation should be compacted by using a steel drum vibratory roller or similar compaction machinery. The soil should be densified to a minimum of 98% of the maximum dry density as determined by ASTM D-1557 (Modified Proctor) for a minimum depth of 12" in addition to a minimum of 95% to a minimum depth of 24" below design subgrade elevation. The soil should be tested by a GRTS soils technical using a nuclear density test device.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

Fill soil which will be supporting future footings or floor slab areas should be considered structural fill and should be placed, compacted and tested in accordance with our recommendations for compacted structural fill which are provided later in this report.

### Foundation Recommendations:

As we mentioned, the existing very loose to loose sand encountered at most of the boring locations for the proposed building should be improved by supplementary compaction in order for the soil to be capable of providing satisfactory support for a typical foundation system, i.e., shallow footings. If our recommendations (which follow) are implemented, the footings below the proposed building may consist of strip (wall) footings, minimum depth of 42" below adjacent exterior grade for frost protection of the foundation soils. The base of exterior footings which will not be adversely affected by freezing temperatures may be situated directly below the lower-level floor slab for foundation support. The base of interior footings should be placed at a minimum depth of 24" below top of floor grade for bearing capacity purposes.

Specifically, for supplementary compaction purposes, we recommend that the site contractor should use a large backhoe-mounted "Ho-Pak" to thoroughly densify the bearing soils below the footing areas so that the soil is compacted to a minimum of 98% of the maximum dry density as determined by ASTM D-1557 (Modified Proctor) for a minimum of 12" below the design footing grade.

We are concerned about the possibility of soil "pumping" if a "ho-Pak" tamping plate is applied at the design footing grade (assumed EL 683) which may be on the order of 12" to 18" above the existing groundwater level. Application of the vibratory compaction device in such close proximity to the underlying saturated sand may cause subgrade "pumping" which may cause a reduction in the available strength of the existing sand (instead of increasing the strength of the sand). To reduce the possibility of subgrade "pumping", we recommend that the site contractor should not excavate to the design footing grade where the "ho-Pak" device should be used to densify the sand. After satisfactory compaction using the Ho-Pak, the site contractor should excavate to the design footing grade where the sand should be tested to verify compliance with our compaction criteria (indicated above).

We recommend that the site contractor should use the "ho-Pak" at a test area at the project site initially to better define the effects of using the "Ho-Pak" at the project site.

It will be important to test the soil to verify that the soil has been compacted to 98% of ASTM D-1557. The soil at the base of each footing area should be tested by a GRTS soils technician to verify achievement of the 98% criteria.

With satisfactory completion of the above testing, we recommend that the footings supporting the proposed building should be designed based on an allowable soil bearing pressure

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

of 1,000 PSF for the northeast quadrant of the proposed building and an allowable soil bearing pressure of 1,500 PSF for the remainder of the proposed building. This recommendation is based on limiting long-term total and differential footing settlement to values of 1" and ½", respectively.

### Alternative Footing Recommendations:

A higher allowable soil bearing pressure, e.g., 3,000 PSF, is possible for footing design purposes; however, soil over-excavation and re-placement of the excavated soil in a compacted condition will be required. Also, based on the presence of the groundwater level at an average grade of EL 681.4, a groundwater dewatering system will be required.

To design shallow footings based on an allowable soil bearing pressure of 3,000 PSF, we recommend the following procedure be implemented at the project site:

- 1) Initially, a groundwater dewatering system should be installed and allowed to operate to "pull" the groundwater level to a depth below the anticipated depth of excavation.
- 2) After installation of the dewatering system and adequate time has elapsed to allow the dewatering system to "pull" the groundwater to a depth below the maximum depth of excavation, the site contractor should commence excavation of the existing very loose to loose sand below the future wall and spread footings as described below. If excavated from below the existing groundwater level, the excavated soil may be too wet to use for compaction purposes until the soil has been dried to an acceptable moisture content level.
- 3) At the location of all footing locations, i.e., exterior and interior footings, the site contractor should excavate and stockpile the natural soils below design footing grade to a depth equal to 2-times the footing width for spread footings and 3.5 times the footing width for strip footings. The side slopes of the excavation should be laid back on a stable slope on the order of 1H:1V or flatter if the sides slough during excavation. We are appending Drawing No. 3 which illustrates the required area associated with excavating to the recommended depth below design footing grade for both spread and strip footings.
- 4) After excavation to the required depth, the site contractor should compact the natural soil at the base of the excavation to a minimum of 95% of the maximum dry density as determined by ASTM D-1557 (Modified Proctor).
- 5) After satisfactory completion of the above, the site contractor should replace the stockpiled natural soil in thin horizontal, 9" layers and densify each layer to 95%

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

of Modified Proctor. The contractor should continue placement of the soil in compacted layers until the design footing grade is achieved.

With completion of the above method, shallow footings may be safely designed based on 3,000 PSF.

### **Footing Construction Recommendations:**

Concrete should be placed for the footings soon after the soil is checked and approved by GRTS. If the bearing soils are exposed to rain or freezing temperatures which causes a reduction in the strength of the soil, the affected soils should be excavated and replaced prior to placement of concrete for the footing. All loose and/or disturbed soil should be removed from the footing areas. We recommend that the contractor maintain heat with excavated foundation areas via tarps, plastic sheeting, straw, etc, to prevent the soil from freezing during the winter and spring months. Concrete for the footings should not be placed on frozen soil.

### **Discussion Regarding Other site Remediation Foundation Methods:**

The project owner should be aware that other site remediation methods and/or procedures are possible with respect to treatment of the very loose to loose sand encountered at the project building area.

For example, the injection of cementitious grout into the very loose to loose sand below the buildings's foundation system is a viable method to improve the bearing capacity of the existing sand. The sand may be treated in-situ and the groundwater level should not be an adverse factor for grout injection.

Also, other methods are possible, e.g., piling in the form of auger-cast piles or "vibro-flotation".

We would be pleased to discuss the other remediation methods in more detail if requested.

### **Floor Slab Recommendations:**

If the site is prepared in accordance with our recommendations as described in the report section "Recommendations for Site Preparation", the compacted subgrade soils should provide satisfactory support for the anticipated floor loads associated with the proposed Big Rapids Public Safety building. It will be important that the site contractor provides uniform coverage of the compaction device over the total building area to assure uniform subgrade support below the new floor slab.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

If the site is prepared in accordance with our recommendations, the floor slab may consist of a conventional concrete slab-on-grade supported by the underlying compacted soils.

The concrete slab should be isolated from all walls and interior footings by incorporating an isolation joint between the slab and the foundation system. This recommendation is provided to allow independent movement between the floor slab and the footings supporting the frame of the structure.

### Recommendations for Below-Grade Walls:

For the lower level portion of the proposed building, it is apparent that below-grade walls will be required around the perimeter of the proposed building.

We recommend that the below-grade walls should be designed as conventional reinforced concrete walls which should resist the applied lateral loads associated with soil backfill.

We recommend that the soil backfill placed against the exterior side of the below-grade walls be placed, compacted and tested in accordance with our recommendations for compacted structural fill. A light hand-operated compactor should be used in close proximity to the wall. A larger compaction device may be used at a greater distance from the wall. For design purposes, we recommend that the soil backfill be assigned an equivalent fluid unit weight of 50 PCF to estimate the lateral earth pressure supplied to the below-grade wall. This value of equivalent fluid unit weight should be used strictly for the lateral pressure supplied by the soil backfill. This value does not incorporate the effect of surcharge loads in loose proximity to the below-grade walls.

### Suitability of Existing Subsurface Soils:

Based on the type of subsurface soils encountered within the top 15 to 20 feet below surface grade at the boring locations, it is our opinion that the existing subsurface soils should be suitable for re-use as compacted structural fill in site areas which require compacted fill. We are referring to the subgrade soils consisting of brown fine to medium sand which should be excavated during site and/or footing excavation. The existing soils should qualify as MDOT Class II fill based on our visual evaluation of the soil samples collected during the drilling operation. Any excavated subsurface soils containing excessive amounts of silt, clay or organic soils should not be used as structural fill.

Also, any subgrade soil excavated from below the groundwater level will be too wet for immediate compaction purposes. The soil should be allowed to dry to a lower acceptable moisture content level prior to placement and compaction of the soil.



## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **Recommendations for Control of Groundwater During Site Excavation:**

With respect to the proposed building, based on the design floor grade of EL 686 (and the assumed footing grade of EL 683) in comparison to the existing average groundwater level (EL 681.3), the site contractor should not encounter groundwater unless the groundwater level rises below the project building area or the depth to install subsurface materials or structures, i.e., sanitary or storm water pipe, mechanical piping, manholes or other structures, will penetrate to or below EL 681 to 682. If excavation of the existing subgrade soils will penetrate to a grade on the order of EL 681 to 682, a temporary groundwater dewatering system will be required to operate full-time during the time that the contractor is working and backfilling has been completed around the subsurface structure.

With respect to the future pavement area, site excavation to remove the 2 ½ feet of organic soil at boring #5 will encounter subsurface groundwater since groundwater was encountered at a depth of 1 foot during drilling of boring #5. To effectively excavate the organic soil and to be able to compact the underlying very loose to loose sand, a temporary groundwater dewatering system will be required at the project area around boring #5.

The contractor selected to install the dewatering system should review the boring logs attached to this report to determine the most appropriate type of dewatering system to install at the project site. We recommend that the groundwater should be lowered to a minimum depth of 18" below the maximum depth of excavation.

(It should be understood that the groundwater level may be higher or lower during the time of construction of the proposed project. If construction of the proposed project begins during the summer months, the groundwater level may be lower than the groundwater readings which we obtained in mid-December.)

### **Long-Term Control of Groundwater:**

To minimize the infiltration of surface or subsurface water into the below-grade portion of the proposed building, we recommend that exterior footing drainage pipe should be installed around the perimeter of the proposed building. Interior drainage pipe below the lower level floor slab may be required if moisture-sensitive equipment will be present in the lower level of the proposed building.

The exterior drainage pipe should be installed adjacent to the side of the perimeter footings to collect and discharge any accumulations of water which may congregate in the vicinity of the below-grade walls of the building.

Based on the type of soil below the proposed building, water should drain below the building down to the groundwater level. However, for precautionary measures, it may be

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

advisable to install interior drainage pipe(s) if moisture-sensitive machinery or equipment, e.g., computers or reference books, will be present in the lower level of the proposed building.

We normally recommend that a gravel “blanket” (capillary barrier) should be installed directly below the lower-level floor slab for the total building area.

Also, we recommend that a good quality waterproofing substance should be applied on the exterior side of the below-grade walls.

In addition, landscaping adjacent to the proposed building should slope away from the building to drain surface water away from the building.

### **Pavement Recommendations:**

During initial site preparation, the site contractor should strip and remove the existing surface layer of vegetation and organic topsoil. The site contractor should be aware that relatively thick deposits of organic matter may be encountered at the low elevation areas of the project site. For example, at the location of boring #5, 2.5 feet of organic topsoil was encountered. Greater amounts of organic soil may be encountered at other unexplored locations of the project site. All organic matter should be totally excavated and removed from below the future pavement areas.

After satisfactory stripping and removal of the vegetation/organic topsoil from below the future pavement areas, the underlying subgrade soil should be densified to a minimum of 95% of the maximum dry density as determined by ASTM D-1557 (Modified Proctor) for a minimum depth of 12".

If structural fill is required to raise the stripped grade to a higher design grade, the site contractor should place, compact and test the structural fill in accordance with our recommendations for compacted structural fill.

If the site areas for future pavement are prepared in accordance with our recommendations, it is our opinion that bituminous concrete may be used as the surface layer for direct support of vehicular traffic. We recommend that conventional amounts of aggregate based course and bituminous concrete may be used for design purposes.

### **Recommendations for Compacted Structural Fill:**

We recommend that sample(s) of soil to be used for structural fill or backfill should be tested for Modified Proctor analysis by GRTS prior to their use at the project site. We recommend that the structural fill should consist of a good quality, predominantly granular soil meeting the gradation requirements of MDOT Class II fill.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

A 50-pound sample of the fill soil should be obtained and tested a minimum of 3 working days before commencement of the fill operation.

Structural fill should be placed in thin, horizontal layers with a maximum loose thickness of 9 inches. Each layer should be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D-1557 (Modified Proctor method).

We recommend that nuclear density tests should be performed by GRTS on a full-time basis to verify that the contractor is achieving the required degree of compaction during placement of the fill. Any fill areas indicating less than 95% compaction should be re-compacted and re-tested until the required density is obtained prior to the placement of subsequent lifts.

During the winter months, frozen soils (or soil containing snow or ice) should not be used as fill or backfill due to the obvious difficulty in achieving the required degree of compaction.

### Recommendations for Additional Study:

With the proposed location of the new Big Rapids Public Safety building, it is our opinion that the presence of the very loose to loose sand will increase the site preparation costs if our recommendations to modify the very loose to loose sand are implemented during initial site preparation.

The extra costs associated with initial site preparation may be reduced if the proposed location of the new Big Rapids Public Safety building is shifted towards the west. Based on the presence of medium loose to medium dense sand at boring #1 (southwest corner of building), it is possible that more dense sand may be present towards the west of the presently-located building area.

If present below the re-located building area, it is our opinion that the medium loose to medium dense will not require the extra site preparation activities and should allow a higher allowable soil bearing pressure to be used for footing design purposes. A higher allowable soil bearing pressure will decrease the size and volume of concrete for the footings which, in effect, will reduce the costs of the proposed building.

If the proposed building location is shifted towards the west, we recommend that additional supplementary soil borings should be performed at the new location to better define the actual subsurface soil conditions which exist below the re-located building area. We will be pleased to submit a estimated cost proposal to perform the supplementary soil borings and to submit a revised soils engineering report.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **LIMITATIONS**

This soils investigation report has been prepared for the exclusive use of Brayton Architecture Engineering and Construction, or their agents, for specific application to the proposed Big Rapids Public Safety building to be constructed at 435 N. Michigan Avenue in the City of Big Rapids, Mecosta County, Michigan.

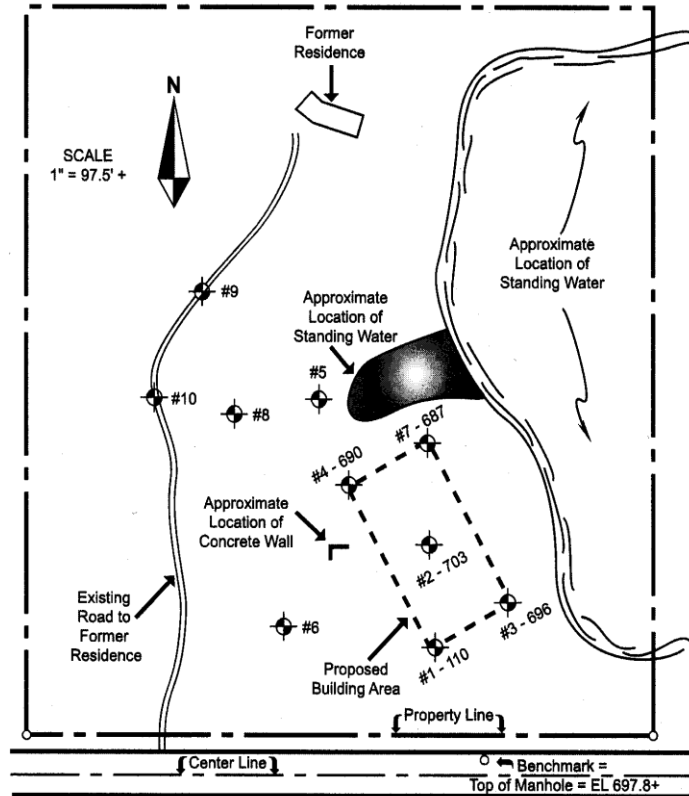
This report has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made. Our conclusions and recommendations are based on design information provided to us, the data obtained from the previously described subsurface exploration program and our experience from previous soils investigations performed in the proximity of the referenced project. These conclusions and recommendations do not reflect variations in subsurface conditions which could exist intermediate for the boring locations or in unexplored areas of the site. Should such variations become apparent at a later date, it will be necessary to re-evaluate our conclusions and recommendations based upon an on-site observation of the conditions and further study.

In the event that changes are made in the design or location of the proposed building, the recommendations presented in this report shall not be considered valid unless the changes are reviewed by our firm and the conclusions and recommendation of this report modified or verified in writing.

We recommend that this report, in its entirety, be made available to any bidding contractors or subcontractors for information purposes. The boring logs should not be separated from the contents of this report.

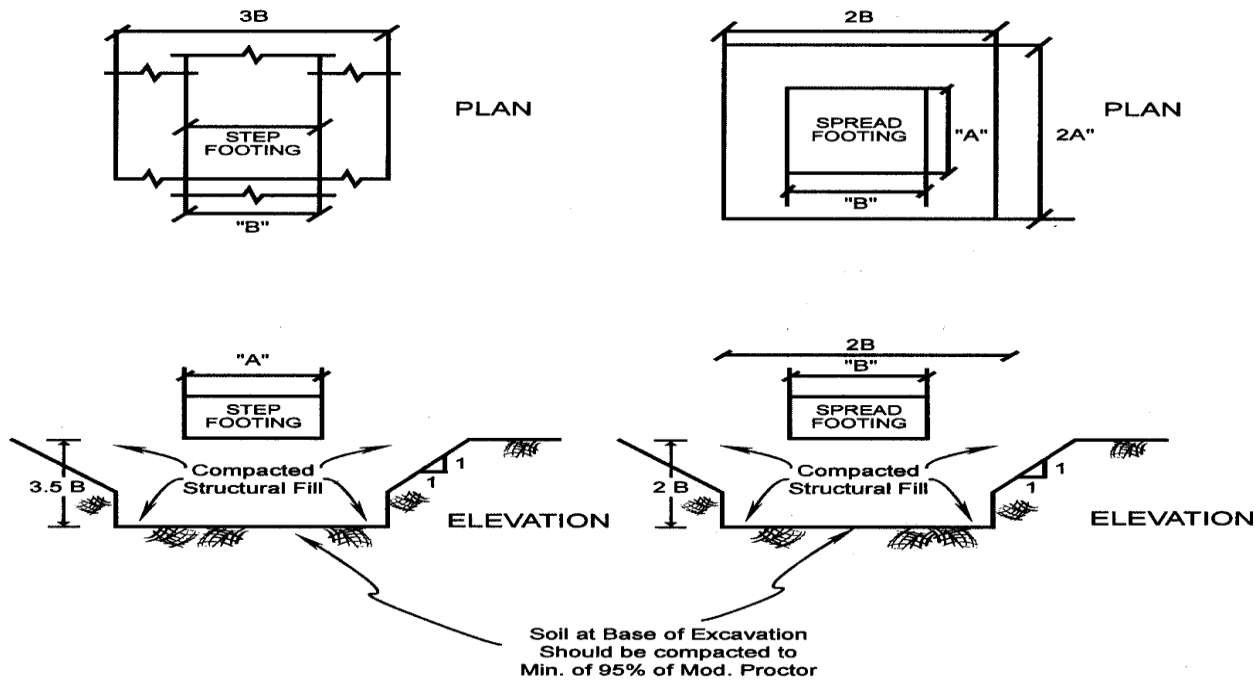
If the propertyowner sells the referenced project site area, the new owner should not use the information of this report without authorization from GRTS. The information provided in this report should not be used for purposes other than that described in this report.

## BLUE LAKE TOWNSHIP OFFICE BUILDING



BORING LOCATION PLAN DRAWING #2

BLUE LAKE TOWNSHIP OFFICE BUILDING



STEP FOOTING PLAN

DRAWING #3

## BLUE LAKE TOWNSHIP OFFICE BUILDING

PROJECT	Blue Lake Township Office	DATE STARTED	12/17/
LOCATION	9565 Blue Ridge Lane Mecosta, MI	DATE COMPLETED	12/17/
CLIENT	Brayton AEC of Big Rapids	DRILLER: S. Dweb	HELPER: M. Buck
PROJECT NO.	15-1291	DRAWING: #1	Date: 12/19/

Boring No.		1 (SW Corner)			Weather		Cloudy and Snow	
Ground Surface Elev.		709.9±			Rig No.		807	
Datum		Top of Sanitary Manhole = EL 697.8			Water Data		29' During drilling (EL 680.9±)	
For location - see drawing #2								
DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION BLOW COUNT			LINER √	SOIL CLASSIFICATION	
			1	2	3			
						0.5'	Organic topsoil	
5								
10							Auger Down to 20.0'	
15								
20			4	7	8			
			5	7	8			
			5	7	9		Medium Loose to Medium Dense Brown Fine to Coarse Sand	
25			5	8	10			
			5	7	9			
			6	7	9			
30			6	5	5	30.0'		
						32.5'±	Loose Brown Fine to Coarse Sand	
35			2	4	7			
							Medium Loose to Loose Brown Fine to Coarse Sand	
40			2	2	2	40.0'		
							Boring Terminated at 40.0'	
45								
50								
55								
60								

Plugging Method		Natural Soil		Job. No.		15-1291	
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Plugging Method

Natural Soil

Job. No. 15-1291

## BLUE LAKE TOWNSHIP OFFICE BUILDING

PROJECT	Blue Lake Township Office	DATE STARTED	12/17/
LOCATION	9565 Blue Ridge Lane Mecosta, MI	DATE COMPLETED	12/17/
CLIENT	Brayton AEC of Big Rapids	DRILLER: S. Dweb	HELPER: M. Buck
PROJECT NO.	15-1291	DRAWING: #1	Date: 12/19/

Boring No. <u>2 (Center)</u>		Weather <u>Cloudy and Snow</u>	
Ground Surface Elev. <u>703.2±</u>		Rig No. <u>807</u>	
Datum <u>Top of Sanitary Manhole = EL 697.8</u>		Water Data <u>23' During drilling (EL 680.2±)</u>	
For location - see drawing #2			

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION BLOW COUNT			LINER √	SOIL CLASSIFICATION
			1	2	3		
5							Auger Down to 15.0'
10							
15							
16			3	4	4		
17			3	3	4		
18			3	3	3		
19			3	2	3		
20			2	3	4		
21			3	4	6		
22			2	2	3		
25							Loose Brown Fine to Coarse Sand
30							
35			3	2	3	35.0'	
40							
45							
50							
55							
60							
65							
70							

Plugging Method
Natural Soil
Job. No. 15-1291



## BLUE LAKE TOWNSHIP OFFICE BUILDING

PROJECT	Blue Lake Township Office	DATE STARTED	12/17/
LOCATION	9565 Blue Ridge Lane Mecosta, MI	DATE COMPLETED	12/17/
CLIENT	Brayton AEC of Big Rapids	DRILLER: S. Dweb	HELPER: M. Buck
PROJECT NO.	15-1291	DRAWING: #1	Date: 12/19/

Boring No. <u>3 (SE Corner)</u>		Weather <u>Cloudy and Snow</u>					
Ground Surface Elev. <u>696.6±</u>		Rig No. <u>807</u>					
Datum <u>Top of Sanitary Manhole = EL 697.8</u>		Water Data <u>16' During drilling (EL 680.6±)</u>					
For location - see drawing #2							
DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION BLOW COUNT			LINER √	SOIL CLASSIFICATION
			1	2	3		
5			3	3	3		Loose Brown Fine to Coarse Sand with a Little Gravel
			3	2	3		
			3	4	6		
10		EL 686 (Lower Level Floor Grade) ↓	4	3	3		
			3	3	5	12.0'	
			4	5	5	14.0'	Loose Brown Fine to Coarse Sand With Lenses of Clay
15			3	3	4		Loose Brown Fine to Coarse Sand
20			2	2	3		
			2	2	2	25.0'	
25							Boring Terminated at 25.0'
30							
Plugging Method		Natural Soil		Job. No.		15-1291	

## BLUE LAKE TOWNSHIP OFFICE BUILDING

PROJECT	Blue Lake Township Office	DATE STARTED	12/17/
LOCATION	9565 Blue Ridge Lane Mecosta, MI	DATE COMPLETED	12/17/
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PROJECT NO.	15-1291	DRAWING: #1	Date: 12/19/

Boring No. <u>4 (NW Corner)</u>		Weather <u>Cloudy and Snow</u>							
Ground Surface Elev. <u>690.7±</u>		Rig No. <u>807</u>							
Datum <u>Top of Sanitary Manhole = EL 697.8</u>		Water Data <u>9' During drilling (EL 681.7±)</u>							
For location - see drawing #2									
DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION BLOW COUNT			LINER ✓	SOIL CLASSIFICATION		
			1	2	3				
<div>5</div> <div>10</div> <div>15</div> <div>20</div> <div>25</div> <div>30</div>	<div>EL 686 (Lower Level Floor Grade)</div>		2	3	3		Loose to Medium Loose Brown Fine to Coarse Sand		
			3	2	3				
			2	3	2				
			2	2	2				
			2	2	3				
			2	3	6				
			5	5	8		18.0'	Loose Grey Silty Sand	
			5	5	5		22.5'±		
			12	17	19		25.0'	Dense Brown Fine to Coarse Sand	
								Boring Terminated at 25.0'	

Plugging Method	Natural Soil	Job. No. 15-1291
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Plugging Method

Natural Soil

Job. No. 15-1291

## BLUE LAKE TOWNSHIP OFFICE BUILDING

PROJECT	Blue Lake Township Office	DATE STARTED	12/17/
LOCATION	9565 Blue Ridge Lane Mecosta, MI	DATE COMPLETED	12/17/
CLIENT	Brayton AEC of Big Rapids	DRILLER: S. Dweb	HELPER: M. Buck
PROJECT NO.	15-1291	DRAWING: #1	Date: 12/19/

Boring No. <u>5 (Pavement Area)</u>		Weather <u>Cloudy and Snow</u>					
Ground Surface Elev. <u>683.3±</u>		Rig No. <u>807</u>					
Datum <u>Top of Sanitary Manhole = EL 697.8</u>		Water Data <u>1' During drilling (EL 682.3±)</u>					
For location - see drawing #2							
DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION BLOW COUNT			LINER √	SOIL CLASSIFICATION
			1	2	3		
				1/12"	1		Organic Topsoil
				1/12"	3	2.5'	
			3	3	4		
5			2	2	2		Loose to Very Loose Brown Fine to Coarse Sand
			2	1	1		
			3	1/12"	1		
10			2	2	3		
15			3	4	4	15.0'	Boring Terminated at 15.0'
20							
25							
30							

Plugging Method                      Natural Soil                      Job. No.    15-1291

## BLUE LAKE TOWNSHIP OFFICE BUILDING

PROJECT	Blue Lake Township Office	DATE STARTED	12/17/
LOCATION	9565 Blue Ridge Lane Mecosta, MI	DATE COMPLETED	12/17/
CLIENT	Brayton AEC of Big Rapids	DRILLER: S. Dweb	HELPER: M. Buck
PROJECT NO.	15-1291	DRAWING: #1	Date: 12/19/

Boring No. <u>6 (Pavement Area)</u>		Weather <u>Cloudy</u>	
Ground Surface Elev. <u>705.9±</u>		Rig No. <u>807</u>	
Datum <u>Top of Sanitary Manhole = EL. 697.8</u>		Water Data <u>None during drilling</u>	
For location - see drawing #2			

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION BLOW COUNT			LINER √	SOIL CLASSIFICATION
			1	2	3		
			2	1	1		
			1	1	2		
			2	1	2		
5			2	2	2	7.0'	Very Loose to Loose Brown Fine to Coarse Sand
			2	3	2		
			3	3	3		Loose Brown Fine Sand
10			2	2	2	10.5'	
							Boring Terminated at 10.5'
15							
20							
25							
30							

Plugging Method

Natural Soil

Job. No.

15-1291

## BLUE LAKE TOWNSHIP OFFICE BUILDING

PROJECT	Blue Lake Township Office	DATE STARTED	12/17/
LOCATION	9565 Blue Ridge Lane Mecosta, MI	DATE COMPLETED	12/17/
CLIENT	Brayton AEC of Big Rapids	DRILLER: S. Dweb	HELPER: M. Buck
PROJECT NO.	15-1291	DRAWING: #1	Date: 12/19/

Boring No. <u>7(NE Corner)</u>		Weather <u>Cloudy</u>	
Ground Surface Elev. <u>686.9±</u>		Rig No. <u>807</u>	
Datum <u>Top of Sanitary Manhole = EL 697.8</u>		Water Data <u>5' during drilling (EL 681.9 ±)</u>	
For location - see drawing #2			

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION BLOW COUNT			LINER ✓	SOIL CLASSIFICATION
			1	2	3		
						0.33'	Organic Topsoil
			1	1	1		
			1	1	1		
5			2	2	3		
			2	2	2		
			2	1	1		
			1	1	1		Very Loose to Loose Brown Fine to Coarse Sand
10			1	1	1		
15			1	2	2	15.0'	Boring Terminated at 15.0'
20							
25							
30							

Plugging Method

Natural Soil

Job. No.

15-1291

## BLUE LAKE TOWNSHIP OFFICE BUILDING

PROJECT	Blue Lake Township Office	DATE STARTED	12/17/
LOCATION	9565 Blue Ridge Lane Mecosta, MI	DATE COMPLETED	12/17/
CLIENT	Brayton AEC of Big Rapids	DRILLER: S. Dweb	HELPER: M. Buck
PROJECT NO.	15-1291	DRAWING: #1	Date: 12/19/

Boring No. <u>8 (Pavement Area)</u>		Weather <u>Cloudy</u>					
Ground Surface Elev. <u>683.6±</u>		Rig No. <u>807</u>					
Datum <u>Top of Sanitary Manhole = EL 697.8</u>		Water Data <u>3' During drilling (EL 680.6±)</u>					
For location - see drawing #2							
DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION BLOW COUNT			LINER ✓	SOIL CLASSIFICATION
			1	2	3		
			2	2	3	0.67'	Organic Topsoil
			2	3	3		Very Loose to Loose Brown Fine to Coarse Sand
			2	2	3		
5			2	3	3		
			3	3	3	7.5'	
							Boring Terminated at 7.5'
10							
15							
20							
25							
30							

Plugging Method Natural Soil Job. No. 15-1291

## BLUE LAKE TOWNSHIP OFFICE BUILDING

PROJECT	Blue Lake Township Office	DATE STARTED	12/17/
LOCATION	9565 Blue Ridge Lane Mecosta, MI	DATE COMPLETED	12/17/
CLIENT	Brayton AEC for Big Rapids	DRILLER: S. Dweb	HELPER: M. Buck
PROJECT NO.	15-1291	DRAWING: #1	Date: 12/19/

Boring No. <u>9 (Pavement Area)</u>		Weather <u>Cloudy</u>	
Ground Surface Elev. <u>684.3±</u>		Rig No. <u>807</u>	
Datum <u>Top of Sanitary Manhole = EL 697.8</u>		Water Data <u>3' During drilling (EL 681.3±)</u>	
For location - see drawing #2			

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION BLOW COUNT			LINER √	SOIL CLASSIFICATION
			1	2	3		
			2	2	2	0.5'	Organic Topsoil
			2	2	3		
			2	2	2		
5			2	2	2		Loose Brown Fine to Coarse Sand
			3	2	3	7.5'	
10							Boring Terminated at 7.5'
15							
20							
25							
30							

Plugging Method                      Natural Soil                      Job. No.    15-1291

## BLUE LAKE TOWNSHIP OFFICE BUILDING

PROJECT	Blue Lake Township Office	DATE STARTED	12/17/
LOCATION	9565 Blue Ridge Lane Mecosta, MI	DATE COMPLETED	12/17/
CLIENT	Brayton AEC of Big Rapids	DRILLER: S. Dweb	HELPER: M. Buck
PROJECT NO.	15-1291	DRAWING: #1	Date: 12/19/

Boring No. <u>10 (Pavement Area)</u>		Weather <u>Cloudy</u>					
Ground Surface Elev. <u>686.4±</u>		Rig No. <u>807</u>					
Datum <u>Top of Sanitary Manhole = EL 697.8</u>		Water Data <u>4' During drilling (EL 682.4±)</u>					
For location - see drawing #2							
DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION BLOW COUNT			LINER ✓	SOIL CLASSIFICATION
			1	2	3		
			2	2	2	0.5'	Organic Topsoil
			2	3	4		Loose Brown Fine to Coarse Sand
			3	3	4		
5			4	4	4		
			4	3	3	7.5'	
							Boring Terminated at 7.5'
10							
15							
20							
25							
30							

**Plugging Method**                      **Natural Soil**                      **Job. No.**      **15-1291**



## BLUE LAKE TOWNSHIP OFFICE BUILDING

### RELATIVE DENSITY AND CONSISTENCY TABLE

Sand and Silt, Relative Density		Consistency of Clay	
No. of blows required to drive a sampler 1 foot, using a 140 pound hammer falling 30"  2" O.D. Samplers	RELATIVE DENSITY	No. of blows required to drive a sampler 1 foot, using a 140 pound hammer falling 30"  2" O.D. Samplers	CONSISTENCY
< 4	Very Loose	< 2	Very Soft
4 - 10	Loose	2-4	Soft
11-15	Medium Loose	5-6	Medium Soft
16-30	Medium Dense	7-8	Medium Stiff
31-50	Dense	9-15	Stiff
> 50	Very Dense	16-30	Very Stiff
		>30	Hard

## BLUE LAKE TOWNSHIP OFFICE BUILDING

### PROPOSAL FORM

BLUE Lake Township Office Building  
9565 Blue Ridge Lane  
Village of Mecosta  
Mecosta, Michigan 49332

Gentlemen:

The undersigned, having familiarized themselves with the local conditions affecting the cost of the work and having examined the Contract Documents on file at the office of BRAYTON AEC, 001 Maple Street, Big Rapids, Michigan 49307, hereby propose to furnish all labor, materials, equipment, and services for the proper completion in a workmanlike manner of the following:

In connection with the construction of The Blue Lake Township Office Building, project of the Owner, in accordance with the Contract documents, as prepared by BRAYTON AEC, including all addenda issued thereto, for the sum of:

\_\_\_\_\_  
\_\_\_\_\_. Dollars (\$\_\_\_\_\_).

The said amount constituting the Base Bid.

Base Bid amount may be increased or decreased in accordance with such of the following alternate proposals as may be selected, following the procedures stated in the Instructions to Bidders. Refer to Section #01030 of Division 01 for detailed explanation of Alternates.

#### Alternate #1

Provide Vinyl Composition Tile flooring in lieu of quarry tile flooring.

Deduct \_\_\_\_\_ Dollars (\$\_\_\_\_\_).

#### Alternate #2

Provide Vinyl Composition Tile flooring in lieu of carpeting.

Deduct \_\_\_\_\_ Dollars (\$\_\_\_\_\_).

#### Alternate #3

Provide 2' x 4' acoustical grid ceiling in lieu of 2' x 2'.

Deduct \_\_\_\_\_ Dollars (\$\_\_\_\_\_).

## BLUE LAKE TOWNSHIP OFFICE BUILDING

### ACKNOWLEDGMENT OF ADDENDA

The following addenda have been received, are hereby acknowledged, and their execution is included in the above proposal amount:

Addendum No. _____ Dated _____	Addendum No. _____ Dated _____
Addendum No. _____ Dated _____	Addendum No. _____ Dated _____
Addendum No. _____ Dated _____	Addendum No. _____ Dated _____

### PROPOSAL SECURITY

Accompanying this proposal as required by Item 9, of the Instructions to Bidders, is a proposal security in the form of the following: (to be supplied by bidder)

Cash, a Certified Check, A Bank Draft, A Cashier's Check or a Bidder's Bond (cross out all but one) in the amount of:

\_\_\_\_\_, Dollars (\$ \_\_\_\_\_), payable to the Owner, which it is agreed, shall be retained as liquidated damages by the Owner, if the undersigned fails to execute the contract in conformity with the form of contract incorporated in the Contract Documents and furnish bonds as specified within fourteen (14) days from date of issuance of written notice of the award of the contract to the undersigned.

If awarded this contract, the undersigned agrees to commence work within fourteen (14) days from date of issuance of written notice of award of contract, which shall be considered as the notice to proceed, and to complete the work by December 18, .

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(If a corporation, affix Seal)

Respectfully submitted,

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

By

Title

Official Address

Telephone No. ( )

Date of Proposal

## BLUE LAKE TOWNSHIP OFFICE BUILDING

### PROPOSAL SUPPLEMENT - GENERAL CONSTRUCTION TRADE NAME OR SUPPLIER FOR EQUIPMENT OR MATERIAL

The following list shall name the trade name or supplier for equipment or material to be incorporated into this project. This form, completely filled in, shall be submitted within 48 hours after date of bid opening. NOTE: where specific classification is not applicable for this particular project, the Bidder shall write "none" in the space provided. Where line is shown under Product Name, supply the appropriate information (asterisk indicates Product Name required).

	SUPPLIER OR SUBCONTRACTOR	PRODUCT NAME
Excavating and Grading		
Asphalt Paving		
Ready-Mixed Concrete		
Reinforcing Steel		
Masonry Work		
Structural Steel		
Miscellaneous Metal		
* Roof Deck		
* Metal Wall Panels		
* Hollow Metal		
* Aluminum Entrances & Store Front Mat.		
* Metal Windows		
* Roofing (Roofing Product Name Only)		
* Tile Work		
* Resilient Floors		
Glass & Glazing		
* Acoustical Ceiling Treatment		
* Painting & Finishing		

Firm \_\_\_\_\_

General Contractor's Signature \_\_\_\_\_ Date \_\_\_\_\_

**BLUE LAKE TOWNSHIP OFFICE BUILDING**

**PROPOSAL SUPPLEMENT - MECHANICAL TRADES  
TRADE NAME OR SUPPLIER FOR EQUIPMENT OR MATERIAL**

The following list shall name the trade name or supplier for equipment or material to be incorporated into this project. This form, completely filled in, shall be submitted within 48 hours after date of bid opening. NOTE: where specific classification is not applicable for this particular project, the Bidder shall write "none" in the space provided.

	MANUFACTURER
Valves	
Piping Insulation	
Pressure Gauges	
Temperature Controls	
Traps & Strainers	
Plumbing Fixtures	
Drainage Products	
Condensate Pump & Receiver	
Circulating Pumps	
Air Handling Units	
Fintube Radiation	
Cabinet Unit Heaters	
Air Cooled Conditioning Units	
Heat Exchanger	
Cooling Towers	
Makeup Air Units	
Unit Heaters	
Fans	
Fire Dampers	

Firm \_\_\_\_\_

Mechanical Contractor's Signature \_\_\_\_\_ Date \_\_\_\_\_

**BLUE LAKE TOWNSHIP OFFICE BUILDING**

**PROPOSAL SUPPLEMENT  
UNIT PRICES FOR DISPLAY CASES**

The unit prices listed below shall be submitted with the bid. The unit prices shall be utilized in conjunction with deletion to the work of the contract or for works required due to unforeseen conditions. Unit Prices shall include all cost of materials, labor, insurances, taxes, bond premiums, overhead and profit.

**UNIT PRICE**

The cost of works omitted from this contract shall be completed at the prices listed below.

**GENERAL CONSTRUCTION**

delete display cases (per 6'-0" unit)                      \$ \_\_\_\_\_

Firm \_\_\_\_\_

General Contractor's Signature \_\_\_\_\_ Date \_\_\_\_\_

## BLUE LAKE TOWNSHIP OFFICE BUILDING

### PROPOSAL SUPPLEMENT UNIT PRICES FOR ELECTRICAL

The unit prices listed below shall be submitted 48-hours after date of bid opening. The unit prices shall be utilized in conjunction with the minor additions or deletions to the work of the contract, or for works required due to unforeseen conditions. Unit Prices shall include all cost of materials, (including equipment and power for operating same), labor, (including Social Security and other required contributions), insurances, taxes, bond premiums, overhead and profit.

#### UNIT PRICES

The cost of works omitted from this contract shall be completed at the prices listed below.

#### ELECTRICAL CONSTRUCTION

FUSIBLE BUS PLUGS FUSETRON FUSE	ADD
3P30A at 240V	
3P60A at 240V	
3P100A at 240V	
3P30A at 600V	
3P60A at 600V	

Firm \_\_\_\_\_

Electrical Contractor's Signature \_\_\_\_\_ Date \_\_\_\_\_

**BLUE LAKE TOWNSHIP OFFICE BUILDING**

**PROPOSAL SUPPLEMENT**

**STATEMENT OF CONTRACTORS' QUALIFICATIONS**

**ALL CONTRACTS**

This form, completely filled in and with attachments, shall be submitted within 48-hours after date of bid opening. Failure to submit this form may be grounds for rejection of bid. Contractors who have this form on file with the Architect, within the past two years, may submit a certified updating of the information requested herein.

1. Date of Organization/Incorporation	
2. Type of Organization (Corp, Partnership	
3. Officers/Principals (Titles & Names	
4. States Legally Qualified to do Business	
5. Current Bonding Capacity	
6. Name of Proposed Bonding Company	
Agent	
Address	
City, State, Zip	
Telephone Number	
7. Attach financial statement, with latest balance sheet & income statement	
8. List on an attachment, all projects currently in progress, including type of work, contract amount, percentage of completion, name and telephone number of Owner, or Owners Representative.	



**BLUE LAKE TOWNSHIP OFFICE BUILDING**

**PROPOSAL SUPPLEMENT CONTINUATION**

**STATEMENT OF CONTRACTORS' QUALIFICATIONS**

9.	List on an attachment, all projects completed within the last 5 years, including type of work, contract amount, percentage of contract performed by your own forces.	
10.	Has your organization ever failed to complete any contract? If yes, list on an attachment, when, where and why:	
11.	Has your organization, or any predecessor or affiliate thereof, been involved on bankruptcy, insolvency, or receivership proceedings under federal or state law within the past 10 years? If yes, describe date and nature of proceeding and court involved on an attachment.	
12.	Has your organization been involved in any law suits with Owners, Architects or Engineers or Other Contractors involving any projects within the past five years? If, yes, describe date and nature of proceeding and court involved on an attachment.	
13	Are there any outstanding liens filed against your organization? If yes, explain on an attachment.	
14.	List the type of Work normally performed by your own forces:	
15.	List names of Project Managers and Project Superintendent proposed for this Project. Attach Resumes.	

I hereby certify to the accuracy and completeness of all information on this form and on all attachments.

Firm \_\_\_\_\_

General Contractor's Signature \_\_\_\_\_ Date \_\_\_\_\_

**BLUE LAKE TOWNSHIP OFFICE BUILDING**

**PROPOSAL SUPPLEMENT - ELECTRICAL TRADES**

**TRADE NAME OR SUPPLIER FOR EQUIPMENT OR MATERIAL**

The following list shall name the trade name or supplier for equipment or material to be incorporated into this project. This form, completely filled in, shall be submitted within 48 hours after date of bid opening. NOTE: where specific classification is not applicable for this particular project, the Bidder shall write "none" in the space provided.

	<b>MANUFACTURER</b>
Primary Transformers	
Primary Switchgear	
Secondary Switchboards	
Panelboards	
Secondary Transformers	
Busway	
Primary Cable	
Disconnect switches	
Motor Controllers	
Wiring Devices	
Clock Systems	
Fire Alarm System	

**BLUE LAKE TOWNSHIP OFFICE BUILDING**

**PROPOSAL SUPPLEMENT - ELECTRICAL TRADES**

**TRADE NAME OR SUPPLIED EOD EQUIPMENT OR MATERIAL**

	<b>MANUFACTURER</b>
Lighting Fixture - Type A	
Lighting Fixture - Type B	
Lighting Fixture - Type C	
Lighting Fixture - Type D	
Lighting Fixture - Type E	
Lighting Fixture - Type F	
Lighting Fixture - Type G	
Lighting Fixture - Type H	
Lighting Fixture - Type J	
Lighting Fixture - Type L	
Lighting Fixture - Type M	
Lighting Fixture - Type N	
Lighting Fixture - Type O	
Lighting Fixture - Type P	
Lighting Fixture - Type Q	
Lighting Fixture - Type R	

Firm \_\_\_\_\_

Electrical Contractor's Signature \_\_\_\_\_ Date \_\_\_\_\_

**BLUE LAKE TOWNSHIP OFFICE BUILDING**

**NONCOLLUSIVE AFFIDAVIT**

“State of Michigan )  
County of \_\_\_\_\_) ss.

\_\_\_\_\_, being duly sworn,  
deposes and says that:

1. The bid has been arrived at by the bidder independently and has been submitted without collusion with, and without any agreement, understanding, or planned common course of action with, any other vendor of materials, supplies, equipment, or services described in the invitation to bid, designed to limit independent bidding or competition, and
2. The contents of the bid have not been communicated by the bidder or its employees or agents to any person not an employee or agent of the bidder or its surety on any bond furnished with the bid, and will not be communicated to any such person prior to the official opening of the bid.

\_\_\_\_\_  
Signature of Bidder

Subscribed and sworn to before me this  
\_\_\_\_\_ day of

\_\_\_\_\_, AD 19 , and notary public  
in and for said county.

\_\_\_\_\_  
Notary Public, \_\_\_\_\_ County, MI

My commission expires \_\_\_\_\_”

Instruction: Submit with the form of proposal and retain on copy for your file.

# BLUE LAKE TOWNSHIP OFFICE BUILDING

## PROHIBITION OF DISCRIMINATION IN STATE CONTRACTS

In connection with the performance of work under this contract; the contractor agrees as follows:

1. In accordance with Act No. 453, Public Act of 1976, the contractor hereby agrees not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, height, weight, or marital status. Further, in accordance with Act No. 220, Public Act of 1976 as amended by Act No. 4789, Public Acts of 1980 the contractor hereby agrees not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of a handicap that is unrelated to the individual's ability to perform the duties of a particular job or position. A breach of the above covenants shall be regarded as a material breach of this contract.
2. The contractor hereby agrees that any and all subcontracts to this contract, whereby a portion of the work set forth in this contract is to be performed, shall contain a covenant the same as herein before set forth in Section 1 of this Appendix.
3. The contractor will take affirmative action to insure that applicants for employment and employees are treated without regard to their race, color, religion, national origin, age, sex, height, weight, marital status or a handicap that is unrelated to the individual's ability to perform the duties of a particular job or position. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.
4. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, age, sex, height, weight, marital status or handicap that is unrelated to the individual's ability to perform the duties of a particular job or positions.
5. The contractor or his collective bargaining representative will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contact or understanding, a notice advising the said labor union or workers' representative of the contractor's commitments under this appendix.
6. The contractor will comply with all relevant published rules, regulations, directives, and orders of the Michigan Civil Rights Commission which may be in effect prior to the taking of bids for any individual state project.
7. The contractor will furnish and file compliance reports within such time and upon such forms as provided by the Michigan Civil Rights Commission, said forms may also elicit information as to the practices, policies, program, and employment statistics of each subcontractor as well as the contractor himself, and said contractor will permit access to his books, records, and accounts by the Michigan Civil Rights Commission, and/or its agent, for purposes of investigation to ascertain compliance with this contract and relevant with rules, regulations, and orders of the Michigan Civil Rights Commission, and/or its agent, for purposes of investigation to ascertain compliance with this contract and relevant with rules, regulations, and orders of the Michigan Civil Rights Commission.
8. In the event that the Civil Rights Commission\* finds, after a hearing held pursuant to its rules, that a contractor has not complied with the contractual obligations under this agreement, the Civil Rights commission may, as part of its order based upon such findings, certify said findings to the Administrative Board of the State of Michigan, which Administrative Board may order the cancellation of the contract found to have been violated, and/or declare the contractor ineligible for future contracts with the state and its political and civil subdivisions, departments, and officers, and including the governing boards of institutions of higher education, until the contractor complies with said order of the Civil Rights Commission. Notice of said declaration of future ineligibility may be given to any or all of the persons with whom the contractor is declared ineligible to contract as a contracting party in future contracts. In any case before the Civil Rights Commission in which cancellation of an existing contract is a possibility, the contracting agency shall be notified of such possible remedy and shall be given the option by the Civil Rights Commission to participate in such proceedings.
9. The contractor will include, or incorporate by reference, the provisions of the foregoing paragraphs (1) through (8) in every subcontract or purchase order unless exempted by the rules, regulations or orders of the Michigan Civil Rights Commission, and will provide in every subcontract or purchase order that said provisions will be binding upon each subcontractor or seller.

# BLUE LAKE TOWNSHIP OFFICE BUILDING

MICHIGAN DEPARTMENT OF LABOR  
BUREAU OF EMPLOYMENT STANDARDS  
WAGE HOUR ADMINISTRATION  
MICHIGAN PREVAILING WAGE RATE SCHEDULE  
COMMERCIAL  
EXPIRATION: 9/30/

PROJECT NO: 850 C 54 01/30/ 714 0

COUNTY: MECOSTA

PROJECT SITE: 9565 BLUE RIDGE LANE

DATE ISSUED: 01/30/

DESCRIPTION: BLUE LAKE TOWNSHIP BUILDING

VILLAGE OF MECOSTA, MECOSTA COUNTY, MI

STATE UNIT:

CONSTRUCTION MECHANIC CLASSIFICATIONS(S)	BASIC HOURLY RATE	FRINGE BENEFIT RATE	PREVAILING WAGE RATE TOTAL	OVERTIME PROVISION *
ASBESTOS WORKER	\$13.93	\$7.50	\$21.43	DDDDDDDD
BOILERMAKER	\$17.64	\$6.00	\$23.64	HHDDHHDD
BRICKLAYER	\$14.05	\$1.86	\$15.91	HHHHDDDD
CARPENTER				HHHHDDDD
CARPENTER	\$13.94	\$2.22	\$16.16	HHHDHDDD
CARPENTER DRYWALL HANGER	\$13.94	\$2.22	\$16.16	HHHHDDDD
CARPENTER INSULATOR	\$13.94	\$2.22	\$16.16	HHHHDDDD
CEMENT MASON	\$12.87	\$1.75	\$14.62	HHHHDDDD
ELECTRICIAN (REV.10-30- )	\$13.09	\$2.59	\$15.68	
ENGINEER				
AIR COMPRESSOR	\$12.55	\$4.40	\$16.95	HHHDDDDD
BOOMER	\$13.95	\$4.40	\$18.35	HHDDHDDD
BOB CAT AND SIMILAR EQUIPMENT	\$14.25	\$4.40	\$18.65	HHHDDDDD
CRANE OPERATOR	\$15.85	\$4.40	\$20.25	HHHHDDDD
DOZER OPERATOR	\$15.85	\$4.40	\$20.25	HHHHDDDD
EQUIPMENT OPERATOR	\$15.85	\$4.40	\$20.25	HHHHDDDD
FORK TRUCK (LESS THAN 20' LIFT)	\$12.55	\$4.40	\$16.95	HHDDHDDD
FORK TRUCK (OVER 20' LIFT)	\$14.25	\$4.40	\$18.65	HHHDDDDD
GANTRY CRANE	\$16.35	\$4.40	\$20.75	HHHDDDDD
MAIN BOOM AND JIB 140'	\$16.35	\$4.40	\$20.75	HHHDDDDD
MAIN BOOM AND JIB 220'	\$16.60	\$4.40	\$21.00	DDDDDDDD
MATERIAL HOIST	\$14.25	\$4.40	\$18.65	HHDDHDDH
OILER AND FIREMAN	\$11.70	\$4.40	\$16.00	HHHHDDDD
SCRAPER OPERATOR	\$15.85	\$4.40	\$20.25	DDDDDDDD
TOWER CRANE	\$16.35	\$4.40	\$20.75	HHDDHHHD
WHIRLEY DERRICK	\$16.35	\$4.40	\$20.75	HHHHDDDD
WELDER	\$12.55	\$4.40	\$16.95	HHHHDDDD
GLAZIER	\$11.80	\$1.66	\$13.46	HHHHHHHD

## BLUE LAKE TOWNSHIP OFFICE BUILDING

CONSTRUCTION MECHANIC CLASSIFICATIONS(S)	BASIC HOURLY RATE	FRINGE BENEFIT RATE	PREVAILING WAGE RATE TOTAL	OVERTIME PROVISION **
IRONWORKERS				
IRONWORKERS	\$13.12	\$2.99	\$16.11	HHHHHHHD
BUCKER-UP	\$13.12	\$2.99	\$16.11	HHHHHHHD
FENCE ERECTOR	\$13.12	\$2.99	\$16.11	HHHHHHHD
PRE-FAB METAL BUILDING ERECTOR	\$13.12	\$2.99	\$16.11	HHHHHHHD
ORNAMENTAL	\$13.12	\$2.99	\$16.11	HHHHHHHD
REINFORCED IRONWORKER	\$13.12	\$2.99	\$16.11	HHHHHHHD
STRUCTURAL	\$13.12	\$2.99	\$16.11	HHHHHHHD
WELDER	\$13.12	\$2.99	\$16.11	HHHHHHHD
LABORER				
AIR TOOL OPERATOR	\$9.56	\$2.24	\$11.80	HHHHHHHD
BUILDING LABORER	\$9.56	\$2.24	\$11.80	HHHHHHHD
CAISSON WORKER	\$9.81	\$2.24	\$12.05	HHHHHHHD
CROCK LAYER	\$9.81	\$2.24	\$12.05	HHHHHHHD
CONCRETE SAW OPERATOR	\$9.56	\$2.24	\$11.80	HHHHHHHD
ELECTRIC TOOL OPERATOR	\$9.56	\$2.24	\$11.80	HHHHHHHD
GASOLINE TOOL OPERATOR	\$9.56	\$2.24	\$11.80	HHHHHHHD
GASOLINE VIBRATOR	\$9.56	\$2.24	\$11.80	HHHHHHHD
HOT DOPE CARRIER	\$9.56	\$2.24	\$11.80	HHHHHHHD
JACKHAMMER	\$9.81	\$2.24	\$12.05	HHHHHHHD
LANDSCAPER	\$9.56	\$2.24	\$11.80	HHHHHHHD
LANDSCAPER SPECIALIST (POWER TOOL)	\$9.56	\$2.24	\$11.80	HHHHHHHD
MORTAR MIXER	\$9.71	\$2.24	\$11.95	HHHHHHHD
PLASTER TENDER	\$9.71	\$2.24	\$11.95	HHHHHHHD
SIGNALMEN AND TOPMEN ON SEWER	\$9.56	\$2.24	\$11.80	HHHHHHHD
LABORER (UNDERGROUND)				
AIR TOOL OPERATOR	\$10.50	\$2.61	\$13.11	HHHXHHHD
CEMENT FINISHER	\$10.50	\$2.61	\$13.11	HHHXHHHD
CONCRETE FORM MAN	\$10.40	\$2.61	\$13.01	HHHXHHHD
CONSTRUCTION LABORER	\$10.28	\$2.61	\$12.89	HHHXHHHD
DRILLER	\$10.50	\$2.61	\$13.11	HHHXHHHD
EXCAVATING GRADEMAN	\$10.50	\$2.61	\$13.11	HHHXHHHD
ELECTRIC TOOL OPERATOR	\$10.50	\$2.61	\$13.11	HHHXHHHD
FENCE ERECTOR	\$10.50	\$2.61	\$13.11	HHHXHHHD
GUARDRAIL BUILDER	\$10.50	\$2.61	\$13.11	HHHXHHHD
GASOLINE TOOL OPERATOR	\$10.50	\$2.61	\$13.11	HHHXHHHD
MANHOLE	\$10.40	\$2.61	\$13.01	HHHXHHHD
MORTAR AND MATERIAL	\$10.28	\$2.61	\$12.89	HHHXHHHD
PIPE LAYER (CROCK OR OTHER CONDUIT)	\$10.50	\$2.61	\$13.11	HHHXHHHD
REINFORCED STEEL MAN	\$10.50	\$2.61	\$13.11	HHHXHHHD
SIGNALMAN	\$10.40	\$2.61	\$13.01	HHHXHHHD
TUGGER	\$10.50	\$2.61	\$13.11	HHHXHHHD
TRENCH MAN	\$10.50	\$2.61	\$13.11	HHHXHHHD
TAR KETTLE OPERATOR	\$10.50	\$2.61	\$13.11	HHHXHHHD
VIBRATOR OPERATOR	\$10.50	\$2.61	\$13.11	HHHXHHHD
LATHER	\$14.58	\$3.01	\$17.59	HHHDDDDD
MILLWRIGHT	\$16.85	\$2.20	\$19.05	HHHDDDDD

## BLUE LAKE TOWNSHIP OFFICE BUILDING

CONSTRUCTION MECHANIC CLASSIFICATIONS(S)	BASIC HOURLY RATE	FRINGE BENEFIT RATE	PREVAILING WAGE RATE TOTAL	OVERTIME PROVISION **
PAINTERS				
PAINTERS	\$11.75	\$1.92	\$13.67	HHHHHHHD
BOATSWAIN	\$12.25	\$1.92	\$14.17	HHHHHHHD
BRUSH	\$11.75	\$1.92	\$13.67	HHHHHHHD
DRYWALL	\$12.00	\$1.92	\$13.92	HHHHHHHD
SPRAY	\$12.50	\$1.92	\$14.42	HHHHHHHD
SANDBLASTING	\$12.50	\$1.92	\$14.42	HHHHHHHD
STEAMCLEANING	\$12.50	\$1.92	\$14.42	HHHHHHHD
SWINGSTAGE	\$12.25	\$1.92	\$14.17	HHHHHHHD
STEEPLEJACK	\$13.25	\$1.92	\$15.17	HHHHHHHD
TAPER	\$11.75	\$1.92	\$13.67	HHHHHHHD
WALLCOVERING	\$12.00	\$1.92	\$13.92	HHHHHHHD
PLUMBERS				
PLUMBERS	\$13.87	\$4.62	\$18.49	HHHHHHHD
GAS LINE INSTALLER	\$9.51	\$3.62	\$13.13	HHHHHHHD
PIPEFITTER	\$13.87	\$4.62	\$18.49	HHHHHHHD
SPRINKLERFITTER	\$17.51	\$3.40	\$20.91	HHHHHHHD
WELDER	\$16.62	\$3.62	\$20.24	HHHHHHHD
RESILIENT FLOORLAYER				
RIGGER	\$11.60	\$2.10	\$13.70	HHHHDDDD
ROOFER	\$13.12	\$2.99	\$16.11	HHHHHHHD
ROOFER				
ROOFER HELPER	\$11.15	\$3.25	\$14.40	HHHHHHHD
SHEET METAL WORKER	\$5.20	\$3.25	\$8.45	HHHHHHHD
	\$13.89	\$5.49	\$19.38	DDDHDDDD
TEAMSTERS				
TRUCK DRIVER	\$13.99	\$3.69	\$17.68	HHHXHHHD
TILE AND TERRAZZO	\$12.51	\$1.60	\$14.11	XXXXXXXXD



## BLUE LAKE TOWNSHIP OFFICE BUILDING

UNDERGROUND ENGINEER				
AIR COMPRESSOR OPERATOR	\$12.98	\$6.11	\$19.09	HHHHHHHD
BOILER OPERATOR	\$12.73	\$6.08	\$18.81	HHHHHHHD
BOOM TRUCK (SWINGING)	\$13.42	\$6.17	\$19.59	HHHHHHHD
BOOM TRUCK (NON-SWINGING)	\$12.98	\$6.11	\$19.09	HHHHHHHD
BACKHOE OPERATOR	\$13.95	\$6.23	\$20.18	HHHHHHHD
CRANE	\$13.95	\$6.23	\$20.18	HHHHHHHD
CURING MACHINE OPERATOR	\$12.73	\$6.08	\$18.81	HHHHHHHD
CONCRETE SAW	\$12.73	\$6.08	\$18.81	HHHHHHHD
DOZER (9 FT. AND OVER BLADE)	\$13.95	\$6.23	\$20.18	HHHHHHHD
DOZER (UNDER 9 FT. BLADE)	\$13.42	\$6.17	\$19.59	HHHHHHHD
DRAG LINE OPERATOR	\$13.95	\$6.23	\$20.18	HHHHHHHD
END LOADER (OVER 1 ½ CU. YD.	\$13.95	\$6.23	\$20.18	HHHHHHHD
END LOADER (1 ½ CU. YD. & UNDER)	\$13.42	\$6.17	\$19.59	HHHHHHHD
FIREMEN & OILER	\$12.73	\$6.08	\$18.81	HHHHHHHD
GRADER OPERATOR	\$13.95	\$6.23	\$20.18	HHHHHHHD
HOIST OPERATOR	\$13.42	\$6.17	\$19.59	HHHHHHHD
SCRAPER OPERATOR	\$13.95	\$6.23	\$20.18	HHHHHHHD
STUMP REMOVER	\$12.73	\$6.08	\$18.81	HHHHHHHD
TRACTOR (PNEU-TIRED)	\$13.42	\$6.17	\$19.59	HHHHHHHD
TRENCHER (OVER 8 FT. DIGGING)	\$13.95	\$6.23	\$20.18	HHHHHHHD
TRENCHER (UNDER 8 FT. DIGGING)	\$13.42	\$6.17	\$19.59	HHHHHHHD
WELDER	\$12.98	\$6.11	\$19.09	HHHHHHHD
WELL DRILLER				
WELL DRILLER	\$10.07	\$1.76	\$11.83	HHHHHHHD
HELPER	\$7.80	\$1.19	\$8.99	HHHHHHHD
PUMP MECHANIC	\$9.52	\$1.68	\$11.20	HHHHHHHD

BLUE LAKE TOWNSHIP OFFICE BUILDING

# AGREEMENT BETWEEN OWNER AND CONTRACTOR

AGREEMENT made this \_\_\_\_\_ day of \_\_\_\_\_ in the year \_\_\_\_\_

BETWEEN the Owner: \_\_\_\_\_

\_\_\_\_\_ and the Contractor: \_\_\_\_\_

The Owner and the Contractor agree as set forth below.

## ARTICLE 1. SCOPE

The Contractor shall furnish all the materials and perform all the work for the erection and completion of \_\_\_\_\_

\_\_\_\_\_ as shown on the Drawings, Dated \_\_\_\_\_ and described in the Specifications entitled \_\_\_\_\_

File # \_\_\_\_\_ prepared by BRAYTON ARCHITECTURE, ENGINEERING & CONSTRUCTION acting as and, in the Construction Contract Documents, entitled the Architect, and shall do everything required by the Contract Documents itemized in Article 2 below.

## ARTICLE 2. THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Contractor Proposal Supplement, General conditions of the Contract, Supplementary Conditions and General Requirements, Specification Divisions, Drawings and all Addenda issued prior to execution of this Agreement and all Modifications issued subsequent thereto. These form the contract and all are as fully a part of the Contract as if attached to this Agreement or repeated herein.

## AGREEMENT BETWEEN OWNER AND CONTRACTOR

### ARTICLE 3. INDEMNIFICATION

The Contractor agrees to defend and indemnify the Owner and the Architect from any and all claims asserted against them, or either of them, arising out of the Contractor's performance of the Contract, including, without limitation, claims, alleging negligence on the part of the Owner or the Architect in supervision, inspection or enforcement of contract provisions; claims alleging the creation or failure to correct or warn of dangerous or hazardous conditions; claims alleging lack of compliance with common-law or administrative rules and regulations relating to safety on the job site, and claims alleging the failure on the part of the Owner or the Architect to provide a safe place in which to work; provided, however, that said duty to defend and indemnify shall not apply:

1. In the event of the sole negligence of either the Owner or Architect or their respective agents or employees other than Contractor, but shall apply in the event of claimed or actual negligence of the Owner or Architect, their agents or employees, jointly or concurrently with the claimed or actual negligence of the Contractor or his Subcontractors, their agents and employees;
2. To claims arising out of the Architect's negligent preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications; but only to the extent such preparation or approval is required by the contract between the Owner and Architect.
3. To claims arising out of the Architect's giving or the failure to give directions or instructions, provided such giving or failure to give such directions or instructions is the primary cause of the bodily injury or property damage.

Nothing contained in this Article 3 shall be construed as limiting the obligations of the Contractor under the Articles of the General Conditions and the Supplementary Conditions.

### ARTICLE 4. TIME OF COMMENCEMENT AND COMPLETION

The work to be performed under this Contract shall be commenced within fourteen (14) days from date of issuance of written notice of award of contract, which shall be considered as the notice to proceed.

The Contractor will complete the work as specified in the Contract by December 12,\_\_\_\_\_.

AGREEMENT BETWEEN  
OWNER AND CONTRACTOR

ARTICLE 5. CONTRACT SUM

The Owner shall pay the Contractor for the performance of the work, subject to additions and deductions by Change Order as provided in the Conditions of the Contract, in current funds, the contract Sum of \_\_\_\_\_ (\_\_\_\_\_) dollars, computed as follows:

ARTICLE 6. PROGRESS PAYMENTS

Based upon Applications for Payment submitted to the Architect by the Contractor on the \_\_\_\_\_ day of each month, Certificates for Payment shall be issued by the Architect to the Owner whereupon the Owner shall make progress payments on account of the contract sum to the Contractor on the \_\_\_\_\_ day of each (the following) month as provided in the conditions of the Contract as follows:

Ninety-five (95%) percent of the portion of the Contract Sum properly allocable to labor, materials, and equipment incorporated in the Work , and seventy-five percent (75%) of the portion of the Contract Sum properly allocable to materials and equipment suitably stored at the site, or in bonded storage and insured at some other location agreed upon in writing, for the period up to the twenty-fifth (25) day of the previous month, less the aggregate of previous payments, less such retainage as the Architect shall determine for all incomplete work and unsettled claims.

ARTICLE 7. FINAL PAYMENT

Final payment, constituting the entire unpaid balance of the Contract sum, shall be paid by the Owner to the Contractor thirty (30) days after Substantial Completion of the Work unless otherwise stipulated in the Certificate of Substantial Completion, provided the Work has then been completed, the Contract fully performed, and a final Certificate for Payment has been issued by the Architect.

AGREEMENT BETWEEN  
OWNER AND CONTRACTOR

ARTICLE 8. ENUMERATION

8.1 Terms used in this Agreement which are defined in the Condition of the Contract shall have the meanings designated in those Conditions.

8.2 The Contract's Documents, which constitute the entire agreement between the Owner and the Contractor, are listed in Article 2 and, except for Modifications issued after execution of this Agreement, are enumerated as follows:

(List, below the Agreement, the conditions of the contract (General, Supplementary, and other conditions), the Drawings, the Specifications, and any Addenda and accepted alternates, showing page or sheet numbers in all cases, and dates, revision numbers and "Issued for" where applicable.)

This AGREEMENT executed the day and year first above written.

In Presence of:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

In Presence of:

\_\_\_\_\_

OWNER: \_\_\_\_\_

\_\_\_\_\_

By \_\_\_\_\_  
Name Title

By \_\_\_\_\_  
Name Title

CONTRACTOR: \_\_\_\_\_

\_\_\_\_\_

By \_\_\_\_\_  
Name Title

6. (If Corporation, Affix Corporate Seal)

## BLUE LAKE TOWNSHIP OFFICE BUILDING

<b>APPLICATION AND CERTIFICATE FOR PAYMENT</b>	
PROJECT: (NAME, ADDRESS)	PROJECT NO:
TO:	CONTRACTOR:
	CONTRACT FOR:
	APPLICATION DATE:                      APPLICATION NO.
ATTN:	PERIOD FROM:                      TO:
<p>The undersigned Contractor certifies that the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by him for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that the current payment shown herein is now due:</p> <p>Contractor:</p> <p>By:    Date:</p>	<p>Application is made for Payment, as shown below, in connection with the Contract. The present status of the account for this Contract is as follows.</p> <p>ORIGINAL CONTRACT SUM..... \$ _____</p> <p>Change Modification Order:</p> <p>Addition..... \$ _____</p> <p>Deductions ..... \$ _____</p> <p>Net change by Change Orders ..... \$ _____</p> <p>CONTRACT SUM TO DATE ..... \$ _____</p> <hr/> <p>TOTAL COMPLETED &amp; STORED TO DATE ..... \$ _____</p> <p>RETAINAGE _____% ..... \$ _____</p> <p>TOTAL EARNED LESS RETAINAGE ..... \$ _____</p> <p>LESS PREVIOUS CERTIFICATES FOR PAYMENT ...\$ _____</p> <p>CURRENT PAYMENT DUE ..... \$ _____</p>
<p>In accordance with the Contract and this Application for Payment the Contractor is entitled to payment in the amount shown above.</p> <p style="text-align: right;"> <input type="checkbox"/> Owner  <input type="checkbox"/>  <input type="checkbox"/> Contractor  <input type="checkbox"/>  <input type="checkbox"/> </p> <p>By:</p>	

This certificate is not negotiable. It is payable only to the payee named herein and its issuance, payment and acceptance are without prejudice to any rights of the Owner or contractor under their Contract.

CONTINUATION SHEET

CONTRACTOR'S signed Certification is attached.  
In tabulation below, amounts are stated to the nearest dollar

APPLICATION NUMBER:  
BRAYTON ASSOCIATES FILE NO:

ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		STORED MATERIALS	TOTAL COMPLETED AND STORED TO DATE		BALANCE TO FINISH
			Previous Applications	This Application			%	
A	<u>GENERAL CONDITIONS:</u>							
1	Bond & Insurance							
2	Site Utilities, Sheds, ets							
B	<u>SITEWORK</u>							
1	Tree Removal							
2	Clear and Grub							
3	Strip Topsoil							
4	Earthwork							
5	Site Sanitary Sewer							
6	Site Storm System							
7	Water mains, Incl. Fire Hydrants							
8	Retaining Walls							
9	Bituminous Paving							
10	Curbs							
11	Sidewalks							
12	Elect, Power & Telephone Poles							
13	Topsoil Distribution							
C	<u>FOUNDATIONS:</u>							
1	Spread Footings							
2	Excavation and Backfill							
3	Perimeter Insulation							
4	Cast-In Place Foundation Wall							
	SUB TOTAL OR TOTAL							

CONTINUATION SHEET								
CONTRACTOR'S signed Certification is attached. In tabulation below, amounts are stated to the nearest dollar						APPLICATION NUMBER: BRAYTON ASSOCIATES FILE NO:		
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		STORED MATERIALS	TOTAL COMPLETED AND STORED TO DATE		BALANCE TO FINISH
			Previous Applications	This Application			%	
D	<u>STRUCTURAL SYSTEMS:</u>							
1	Metal Roof Deck							
2	Steel Roof Joists							
3	Steel Roof Beams							
4	Composite Floor Deck W/Concrete							
5	Precast Concrete Floor							
6	Cast-In-Place Concrete Slab							
7	Concrete Columns							
8	Steel Columns							
9	Erection-Where Material by Others							
10	Lintels							
E	<u>EXTERIOR SKIN:</u>							
1	Block							
2	Metal Stud							
3	Insulated Metal Panels							
4	Metal Panels (non-insulated)							
5	Glazing							
6	Insulation							
7	Others							
F	<u>SLAB ON GRADE:</u>							
G	<u>LOADING DOCK:</u>							
	SUB TOTAL OR TOTAL							



CONTINUATION SHEET								
CONTRACTOR'S signed Certification is attached. In tabulation below, amounts are stated to the nearest dollar						APPLICATION NUMBER: BRAYTON ASSOCIATES FILE NO:		
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		STORED MATERIALS	TOTAL COMPLETED AND STORED TO DATE		BALANCE TO FINISH
			Previous Applications	This Application			%	
H	<u>INTERIOR WALLS:</u>							
1	Block							
2	Others							
I	<u>WALL FINISHES:</u>							
1	Painting							
2	Ceramic Tile							
3	Others							
J	<u>FLOOR FINISHES:</u>							
1	Quarry Tile							
2	Vinyl Tile							
3	VAT							
4	Ceramic Tile							
5	Sealers							
6	Others							
K	<u>CEILING FINISHES:</u>							
1	Drywall							
2	Non-Fire-Rated Lay-in Panels							
3	Painting							
4	Others							
L	<u>METALS</u>							
1	Miscellaneous Metals							
	SUB TOTAL OR TOTAL							

CONTINUATION SHEET

CONTRACTOR'S signed Certification is attached. In tabulation below, amounts are stated to the nearest dollar						APPLICATION NUMBER: BRAYTON ASSOCIATES FILE NO:		
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		STORED MATERIALS	TOTAL COMPLETED AND STORED TO DATE		BALANCE TO FINISH
			Previous Applications	This Application			%	
M	<u>DOORS AND DOOR FRAMES:</u>							
1	Hollow Metal Frames							
2	Aluminum Frames							
3	Rated Hollow Metal Doors							
4	Non-Rated Hollow Metal Doors							
5	Aluminum Doors							
7	Sectional Overhead Doors							
8	Non-Rated, Roll-up Doors							
9	Others							
N	<u>HARDWARE:</u>							
O	<u>CARPENTRY</u>							
1	Rough Carpentry							
2	Millwork and Cabinet Work							
P	<u>ROOFING AND FLASHING:</u>							
1	Single-ply Roof Membrane							
2	Insulation							
3	Roof Hatches							
4	Flashing and Sheet Metal							
5	Others							
Q	<u>MISCELLANEOUS:</u>							
1	Chalkboards							
2	Toilet Room Accessories							
3	Louvers							
4	Caulking							
5	Others							
	SUB TOTAL OR TOTAL							

CONTINUATION SHEET								
CONTRACTOR'S signed Certification is attached. In tabulation below, amounts are stated to the nearest dollar						APPLICATION NUMBER: BRAYTON ASSOCIATES FILE NO:		
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		STORED MATERIALS	TOTAL COMPLETED AND STORED TO DATE		BALANCE TO FINISH
			Previous Applications	This Application			%	
R	<u>ELECTRICAL SYSTEM:</u>							
S	<u>PLUMBING SYSTEM:</u>							
T	<u>FIRE PROTECTION SYSTEM:</u>							
U	<u>HVAC SYSTEM:</u>							
V	<u>HEATING SYSTEM:</u>							
W	<u>DUCTWORK &amp; VENTILATION SYSTEM</u>							
	SUB TOTAL OR TOTAL							

# **BLUE LAKE TOWNSHIP OFFICE BUILDING**

## **GENERAL CONDITIONS**

- 1.1 NOTICE
- 1.2 The General Conditions of the Contract for Construction (AIA Document A201, 2007), Articles 1 through 15, as published by the American Institute of Architects are herewith made a part of the specifications.
- 1.3 Reference to the General Conditions can be obtained from the American Institute of Architects, 1735 New York Avenue, NW, Washington, DC 20006.
- 1.4 The General Conditions are modified in certain particulars. See Supplementary Conditions.

# **BLUE LAKE TOWNSHIP OFFICE BUILDING**

## **SUPPLEMENTARY GENERAL CONDITIONS**

### **ARTICLE 1 - GENERAL PROVISIONS**

#### **1.2 EXECUTION, CORRELATION AND INTENT**

Add to the first sentence of Paragraph 1.2.3 to read as follows: ""The intent of the Contract documents is to include all items necessary for the proper execution and completion of the work, and to make all working systems operational.""

Add to 1.2.3:

1.2.3.1 Figures given on the drawings govern scale measurements and large scale governs small scale. Discrepancies shall be brought to the attention of the Architect for interpretation and the Architect's decision, in writing, shall govern.

1.2.3.2 If the drawings and specifications disagree in themselves or with each other, estimate on and furnish the greater quantity or better quality unless otherwise instructed in writing by the Architect.

Add to 1.2.4:

1.2.4.1 The Contractor, all separate Contractors and all Subcontractors shall conduct all their operations on this project in such manner that no jurisdictional disputes arise regarding unloading, handling, installation and connections of the various items in the several trades involved

### **ARTICLE 2 - OWNER**

#### **2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER**

Add to 2.2.3:

2.2.3.1 The Owner shall also be responsible for securing and paying for such items as zoning approvals, environmental impact statements and other approvals which may be required before construction can commence, but he will not be responsible for securing or paying for items stated in 3.7.1.

Revise 2.2.5 to read as follows: "The Contractor will be furnished by the Architect, free of charge, copies of drawings and specifications (with amendments), as follows:

1. General Contractor: Ten (10) copies

Additional copies of drawings and specifications (with amendments) may be obtained from the Architect at a price per set which will cover the cost of reproduction and mailing."

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **2.4 OWNER'S RIGHT TO CARRY OUT THE WORK**

Revise 2.4.1, third sentence, to read as follows: "Such action by the Owner and the amount charged to the Contractor are both subject to the recommendations of the Architect."

## **ARTICLE 3 - CONTRACTOR**

### **3.2 REVIEW OF CONTRACT DOCUMENTS**

Revise 3.2.1, last sentence to read as follows: "The Contractor shall perform no portion of the work at any time without contract documents or, where required, shop drawings, product data, or samples reviewed by the Architect for such portion of the work."

### **3.5 WARRANTY**

Paragraph 3.5.1; Add the following:

"The Contractors shall guarantee their work for a period of 1 year from the date of acceptance by the Architect, shall leave the work in perfect order at completion; and neither the final certificate of payment nor any provision in the contract documents shall relieve the Contractor of the responsibility for negligence of faulty material or workmanship within the extent and period provided by law. Upon written notice, he shall remedy the defects due thereto and pay all expenses for any damage to other work resulting therefrom. Any material specifically specified to have a longer guarantee period shall be guaranteed for the length of the specified time."

### **3.7 PERMITS, FEES AND NOTICES**

Add to 3.7.1:

3.7.1.1 The General Contractor shall submit plans and specifications to the local building authority for the purpose of obtaining and paying for the general building permit only. For other permits and fees, each separate Contractor shall submit plans and specifications to the office of the building inspector and/or any other department having jurisdiction over work of this character, and shall obtain and pay for examination fees, construction permits, and any other fees required by said departments.

Unless otherwise specified, General Contractor shall make all cash deposits required by State, County or City authorities and also pay for repairing of all highways, streets, sidewalks and alleys damaged by execution of the Contract.

The Electrical Contractor or Electrical Sub-contractor shall secure all necessary permits and certificates, pay all fees, and arrange for all necessary inspections required by State, County, or City authorities for all electrical work, meters, lighting fixtures and other electrical items, and pay all expenses for repairing highways, streets, sidewalks and alleys, occasioned by execution of his work.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

Each Mechanical Work Contractor or Mechanical Work Sub-Contractor shall secure all necessary permits and certificates, pay all fees, and arrange for necessary inspections required by State, County or City authorities and pay all expenses for repairing highways, streets, sidewalks and alleys, occasioned by execution of his work.

Add to 3.7.2:

3.7.2.1 The Contractor shall be responsible for properly notifying all utility companies of any proposed excavation required by the work and obtaining the location of any underground facilities, before commencing with any digging operations. Any charges resulting from damaged facilities due to the lack of adequate notification and coordination with utility companies shall be borne by the contractor.

### **3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES**

Revise 3.10.1, first sentence to read as follows: "The Contractor, must submit a Precedence construction schedule within fourteen days of the Notice to Proceed. Failure to submit within the time frame will be grounds for withholding the first progress payment from the Contractor. The Contractor shall prepare and keep current, for the Architect's/Owner's review, a Contractor's construction schedule for the entire project.

### **3.11 DOCUMENTS AND SAMPLES AT SITE**

Revise 3.11.1 to read as follows: "The Contractor shall maintain at the site for the Owner 1 record copy of all drawings, specifications, addenda, change orders and other modifications, in good order and marked currently to record all changes made during construction; and Contractor approved shop drawings, product data and samples which have been reviewed by the Architect. These shall be available to the Architect and shall be delivered to him for the Owner upon completion of the work."

### **3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

Revise 3.12.5, first sentence to read: "By approving, stamping and submitting ...."

Revise 3.12.6, first sentence to read: "... submittal has been reviewed by the Architect."

Revise 3.12.8 to read: "The Contractor shall not be relieved of responsibility for any deviation from the requirements of the contract documents by the Architect's review of shop drawings, product data, samples, or similar submittals unless the Contractor has specifically informed the Architect, in writing, by specific reference in the accompanying transmittal letter of such deviation at the time of submittal, the Architect has commented in writing on the specific deviation and the Architect has reviewed and marked with appropriate "Action" the specific deviation as outlined in 4.2.7.1. The Contractor shall not be relieved from responsibility for errors or omissions in the shop drawings, product data or samples by the Architect's review thereof."

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **3.14 CUTTING AND PATCHING OF WORK**

Add to 3.14.2:

3.14.2.1 Permission to patch any areas or items of work does not imply a waiver of the Architect's right to require complete removal and replacement if, in Architect's opinion, said patching does not satisfactorily restore the quality and appearance of the work.

### **3.15 CLEANING UP**

Add 3.15.3: "Contractor shall also clean and remove all broken or scratched glass and replace it with new glass meeting the requirements of the specifications, shall remove all paint droppings, spots, stains and dirt from finished surfaces and shall thoroughly clean all plumbing fixtures, hardware and floors, carpet shall be vacuum cleaned. To the maximum extent that is reasonably possible, each Contractor shall keep the interior of the building free from combustible material and debris at all times."

## **ARTICLE 4 - ADMINISTRATION OF THE CONTRACT**

### **4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT**

Revise 4.2.3, first sentence to read as follows:

"The Architect will not be responsible for, and will not have control or charge of, or have authority over the Contractor for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work, and he will not be responsible for the Contractor's failure to carry out the work in accordance with the Contract Documents."

Revise 4.2.7, first sentence to read as follows:

"The Architect will review or take other..." and delete the last sentence of 4.2.7

Add to 4.2.7:

4.2.7.1 Architect's Action: "General: Except for submittals for the record and similar purposes, where action and return on submittals is required or requested, the Architect will review each submittal, mark with appropriate "Action" and with reasonable promptness. Where the submittal must be held for coordination, the Architect will so advise the Contractor without delay. The Architect's review of a specific item shall not indicate review of an assembly of which the item is a component."

- A. Architect's Action Stamp: The Architect will stamp each submittal to be returned with a uniform, self-explanatory action stamp, appropriately marked and executed. It shall read as follows:



## BLUE LAKE TOWNSHIP OFFICE BUILDING

"Corrections or comments made on the shop drawings during this review do not relieve Contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner."

### 4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

Add to 4.2.7:

#### 4.2.7.1 Architect's Action continued:

1. Marking X Reviewed

Final Unrestricted Release: Where the submittals are marked as above, the work covered by the submittal may proceed provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.

2. Marking X Furnish as Corrected

Final but Restricted Release: When the submittals are marked as above, the work covered by the submittal may proceed provided it complies with both the Architect's notations or corrections on the submittal and with the requirements of the contract documents; acceptance of the work will depend on that compliance.

3. Marking X Revise and Resubmit

Returned for Resubmittal: When the submittal is marked as above, revise the submittal or prepare a new submittal in accordance with the Architect's notations stating the reasons for returning the submittal; resubmit the submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the above marking to be used at the project site, or elsewhere where work is in progress.

4. Marking X Rejected

Returned for Resubmittal: When the submittal is marked as above, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery or other activity. Revise the submittal or prepare a new submittal in accordance with the Architect's notations stating the reasons for returning the submittal; resubmit the submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the above marking to be used at the project site or elsewhere where work is in progress.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **ARTICLE 7 - CHANGES IN THE WORK**

#### **7.2 CHANGE ORDERS**

Add to 7.2.2:

7.2.2.1 The Contractor's itemized quotation shall include the actual cost of:

- a. Labor, including field supervisors and field office personnel directly attributable to the change;
- b. Materials entering permanently into the work, including sales tax and cost of delivery;
- c. Equipment, including ownership or rental equipment used during the installation of the item directly attributable to the change;
- d. Power and consumable supplies for the operation of power equipment;
- e. Worker's Compensation Insurance directly attributable to the change;
- f. Social Security, Unemployment and fringe benefits required by agreement directly attributable to the change;
- g. To the cost there shall be added a fixed fee to be agreed upon, but not to exceed fifteen percent (15%) of the cost of the work for work done by the Contractor's own personnel. The fee shall be compensation to cover the cost of supervision, overhead, bond, profit and any other general expense;
- h. On that portion of the work done under Subcontract, the contractor may include not over seven and one-half percent (7-1/2%) supervision, overhead, bond, profit and any other general expense;

add to 7.2.2:

7.2.2.2 In the case of an increase in the contract sum, a reasonable allowance for overhead and profit, mentioned in 7.3.6 and 7.3.3.3 of the General Conditions, shall not exceed fifteen percent (15%) for work done by the Contractor's own personnel, or shall not exceed seven and one-half percent (7-1/2%) for work done under Subcontract.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **7.3 CONSTRUCTION CHANGE DIRECTIVES**

Revise 7.3.3.2 as follows: "By unit Prices when requested in the Bidding Documents or subsequently agreed upon."

## **ARTICLE 8 - TIME**

### **8.2 PROGRESS AND COMPLETION**

Add 8.2.4 The Contractor will complete All Work by December 18.

## **ARTICLE 9 - PAYMENTS AND COMPLETION**

### **9.2 SCHEDULE OF VALUES**

Add to 9.2.1:

9.2.1.1 Forms entitled "Application and Certificate for Payment," bound into the bidding documents are true samples of those which the Architect will require for the Schedule of Values and Applications for Payments. These forms must be submitted within fourteen (14) days after the Acceptance of the Contractor's proposal. Failure to submit within the time frame will be grounds for withholding the first progress payment from the Contractor.

### **9.3 APPLICATIONS FOR PAYMENT**

Paragraph 9.3.1: Add the following:

9.3.1.1 Applications for payment shall be submitted to the Architect on or Before the Twenty Fifth day of each month and the Owner will make payment by the Fifth of the following month. In making such partial payments, there shall be retained five percent (5%) of the estimated amounts properly allocable to labor, materials and permanent materials incorporated into the work. There will be twenty-five percent retained on materials and equipment properly stored and agreed upon by the Architect and the Contractor.

Submit the forms in triplicate, including attachment of waivers and similar documentation with 1 copy.

"The amount is not to exceed the value of the work performed. The Owner has the right to withhold an amount sufficient to complete the contract .

"No payment can be expected before 10 business days after submitting an invoice.

"45 days after substantial completion, the balance is due under the contract, provided the work be then fully completed and the contract fully performed.

"Each Contractor requesting payment from the Owner shall include, along with request for payment, a sworn statement and partial conditional waiver. The final request for payment shall include a sworn statement and a full conditional waiver."

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **9.8 SUBSTANTIAL COMPLETION**

Revise Paragraph 9.8.2:

Add to the fourth sentence: "...and if he concurs that the contract is substantially complete he will make arrangements with the Contractor and the Owner to meet for the purpose of making a joint inspection of the building, whereby all parties can be properly advised and decisions weighed with full agreement of the combined inspection party, the Architect will prepare typewritten copies of a "punch list" for issuance to all members of the inspection party."

Change the fifth sentence to read: "...if the work or designed portions thereof is deemed to be substantially complete by the inspection party, the Architect will prepare typewritten copies of a punch list for issuance to all members of the inspection party."

Add Paragraph 9.8.2.1: "The Contractor is obligated to complete the punch list items of the work within the time specified in the Certificate of Substantial Completion. In the event the Contractor fails to complete the punch list items to the satisfaction of the Owner and within the time specified, the Owner may elect to give notice and complete the work in accordance with Article 2.4."

Add Paragraph 9.8.4

If the contractor does not complete the work according to the completion date stated, the owner will withhold from the Contractor's progress payments, as liquidated damages and not as a penalty, the sum of \$1200 per day for each day that the work remains incomplete beyond the date specified for completion.

## **ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY**

### **10.2 SAFETY OF PERSONS AND PROPERTY**

Add to Paragraph 10.2.1:

10.2.1.4 "The Contractor shall assume the responsibility for the protection of all finished construction under his Contract and shall repair and restore any and all damage to his finished construction to its original state."

Add the following to Paragraph 10.2.2:

"All work shall comply with the General Safety Rules and Regulations for the construction industry under the authority of the State of Michigan Occupational Safety and Health Act and the Construction Safety Standards as set forth in the Federal Occupational Safety and Health Act of 1970 under Public Law 91-596."

The contractor shall notify the Owners of corporate or private property if their property interferes with the work so that arrangements for proper protection can be made. The contractor shall also provide easy access to the entire building by the public fire department, and shall maintain unobstructed and free passage for egress from the building.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

Add the following to Paragraph 10.2.3:

10.2.3.1 In addition to compliance required of each Prime Contractor, the General Contractor shall:

1. Provide, erect and maintain all required planking, barricades, guardrails, temporary walkways, etc., of sufficient size and strength necessary for protection of material storage, sidewalks, curbs, streets drives, adjoining properties and the new buildings as well as to prevent accidents to the public and the workers at the job site, all in compliance with requirements of authorities stated in 10.2.2.
2. Provide and maintain proper sloping, shoring and bracing to prevent earth from caving or washing into the building excavation.

### **ARTICLE 11 - INSURANCE AND BONDS**

#### **11.1 CONTRACTOR'S LIABILITY INSURANCE**

Revise 11.1.1:

Add in the first line, following the word "business," insert the following: "...and acceptable to the Owner..."

Paragraph 11.1.1: Add the following:

"The insurance required by Subparagraph 11.1.1 shall be written for not less than any limits of liability required by law or by those shown below and shall include contractual liability insurance as applicable to the Contractor's obligations under Paragraph 3.18:"

1. Workmen's Compensation: Statutory  
Employer's Liability:  
\$ 500,000--Each accident  
\$ 500,000--Disease, policy limit  
\$ 500,000--Disease, each employee
2. General Liability (Including Premises - Operations; Independent Contractors' Protective; Products and Completed Operations; Broad Form Property Damage):
  - a) Bodily Injury: \$ 500,000-Each occurrence  
\$1,000,000--Aggregate or combined single limit
  - b) Property Damage: \$ 500,000--Each occurrence  
\$1,000,000--Aggregate or combined single limit

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

c) Products and completed operations insurance shall be maintained for a minimum of 2 years after final payment with evidence of such coverage being provided on an annual basis.

d) Property damage liability insurance shall include coverage for explosion, collapse and underground hazards.

e) Contractual Liability (Hold Harmless):

Bodily Injury: \$ 500,000--Each occurrence

Property Damage: \$ 500,000--Each occurrence

Property Damage: \$1,000,000--Aggregate

f) If the general liability policy includes a general aggregate, such general aggregate shall not be less than \$1,000,000.

### **3. Umbrella Excess Liability:**

Over Primary Insurance: \$5,000,000

Retention: \$ 10,000

### **4. Automobile Liability (Owned, non-owned, hired):**

Bodily Injury: \$ 500,000--Each person

\$1,000,000--Each accident

Property Damage: \$ 500,000--Each occurrence

Add to 11.1.3: "Certificate called for herein shall be furnished in triplicate and shall specifically set forth evidence of all coverage required by 11.1.1 and the Contractor shall furnish to the Architect/ Owner copies of all endorsements that are subsequently issued amending coverage or limits. Certificates of insurance shall name as the insured the Owner and the Architect/Engineer as well as the Contractor."

## **11.2 OWNER'S LIABILITY INSURANCE**

Revise 11.2.1 to read as follows:

The Contractor shall procure, maintain and pay for the Owner's Liability Insurance. The amount of Insurance shall be \$500,000 for each person and \$1,000,000 for each accident. The Certificate of Insurance shall be filed with the Architect.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **11.4 PROPERTY INSURANCE**

Add to 11.4.1.2: Coverage purchased by the Owner will include all materials and equipment to be incorporated into the project, but, excludes the Contractor's tools, equipment, trailers and storage sheds, contents, etc., used during the project, whether owned or rented, including those of his employees, subcontractors and employees of subcontractors and so forth.

### **11.5 PERFORMANCE AND PAYMENT BOND**

Add to 11.5.1: The Performance Bond, Labor/Material (Payment) Bond and Insurance certificates as stated in the Bidding Documents shall be furnished at the signing of the Owner-Contractor Agreement.

## **ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK**

### **12.2 - CORRECTION OF WORK**

Add to 12.2.2: If any Contractor or any of his subcontractors chooses to use any system, equipment, facilities or services which have been installed into the building as a permanent part thereof by any other Contractor, said contractor shall assume full responsibility for damage to said system, equipment, facilities or services and shall make such arrangements with the installing contractor as are necessary, so that in no case the performance for the period mentioned above shall be jeopardized as a result of such use.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **DIVISION 01 - GENERAL REQUIREMENTS**

01000 NOTICE

01001 All sections within Division 1 are to be used with all product sections in Divisions 2 through 16 inclusive, either separately or collectively. The contents of the sections in Division 1 are administrative, procedural, non-product requirements applying to product specification sections.



# **BLUE LAKE TOWNSHIP OFFICE BUILDING**

## **SECTION 01010 - SUMMARY OF WORK**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Work by others.
- B. Owner-furnished products.
- C. Contractor use of site and premises.
- D. Future work.
- E. Work sequence.
- F. Owner occupancy.

#### **1.2 WORK BY OWNER**

- A. Owner may award separate contracts for the following work:
  - 1. Casework shown to be by tenant on contract documents.
  - 2. Furnishings
  - 3. Sound masking, telephone paging, and network cabling.
- B. Items noted NIC (not in contract) will be furnished and installed by others.

#### **1.3 OWNER-FURNISHED PRODUCTS**

Not used.

#### **1.4 CONTRACTOR USE OF PREMISES**

- A. Limit use of site and premises to allow:
  - 1. Owner occupancy.
  - 2. Work by Owner.
- B. Coordinate use of the premises under direction of the Architect/Engineer.
- C. Construction Operations: Limited to areas noted on drawings.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **1.5 FUTURE WORK Not**

Used.

### **1.6 WORK SEQUENCE**

- A. Construct work to accommodate Owner's occupancy requirements as follows:
  - 1. Start work on May 18, and finish by December 18,
  - 2. Punch list items shall be completed by December 18,

### **1.7 OWNER OCCUPANCY**

- A. The Owner will occupy the building on December 21,
- B. Schedule the work to accommodate this requirement.

**END OF SECTION**

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **SECTION 01011 - SUMMARY OF PROJECT**

#### **1.01 SECTION INCLUDES**

- A. Project: Work covered by contract documents.
- B. Contracts.
- C. Administrative and procedural sections.
- D. Temporary facility and service sections.

#### **1.02 PROJECT: WORK COVERED BY CONTRACT DOCUMENTS.**

- A. The work of this contract comprises the general construction (all trades) for the following:
  - 1. A new Public Safety building identified as the City of Big Rapids design by Brayton AEC as File No. 9111.
- B. Execution of the contract signifies that the Contractor is fully conversant with all requirements of all divisions and documents. No claims for additional compensation will be entertained or paid to any Contractor on account of his failure to be fully informed of all requirements of all documents.
- C. The General Conditions, Supplementary Conditions, General Requirements, and Owner-contractor Agreement are a part of all divisions and all project documents.

#### **1.03 CONTRACTS**

- A. Construct the work under a single cost of the work plus a fee with a guaranteed maximum price, AIA Document A111, latest edition. Coordination of the work will be provided as specified in Section 01040.
- B. Requirements for a specific trade or contract are generally described in that portion of the specifications or drawings related to that trade or contract. Such requirements, however, may be described in other sections of the contract documents. Contractors will be held responsible for having carefully examined all drawings and read all divisions of the specifications and all contract documents to avoid omissions or duplications and to ensure a complete job.

**END OF SECTION**

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **SECTION 01020 - ALLOWANCES**

#### **PART 1 GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Cash allowances.
- B. Contingency allowance.

##### **1.2 CASH ALLOWANCES**

- A. Costs Included in Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts; delivery to site and applicable taxes.
- B. Costs Not Included in Allowances: Product handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage, and labor for installations (the cost of these items is included in the contract sum).
- C. Funds will be drawn from cash allowances only by change order.
- D. Cash Allowances:
  - 1. Section 04300 - Unit Masonry System: Allow the stipulated sum of \$375 per thousand for purchase (including sales tax) and delivery of brick for job site.
  - 2. Section 08712 - Door Hardware: Allow the stipulated sum of \$10,000 for the purchase (including sales tax) and delivery of door hardware. Contractor shall provide a schedule based on specification requirements.
  - 3. Section 09688 - Carpet: Allow the stipulated sum of \$30 per square yard for the purchase (including sales tax) and delivery of carpet.
  - 4. In case service or product selected costs more or less than the amount specified, adjustments, plus or minus, will be made in contract sum to cover the difference in cost.

##### **1.3 CONTINGENCY ALLOWANCE**

- A. A contingency allowance will be established between the General Contractor and the Owner.

**END OF SECTION**

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **SECTION 01025 - MEASUREMENT AND PAYMENT**

#### **PART 1 GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Schedule of values
- B. Application for payment
- C. Change procedures

##### **1.2 SCHEDULE OF VALUES**

- A. Submit schedule on AIA Form G703 or Contractors' computer-generated equivalent.
- B. Schedule of Values dated May 15,\_\_\_\_\_, on file with Architect/Engineer.

##### **1.3 APPLICATIONS FOR PAYMENT**

- A. Submit 3 copies of each application on AIA Form G702.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Payment Period: 30 days

**END OF SECTION**

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **SECTION 01030 - ALTERNATES**

#### **PART 1 GENERAL**

##### **1.1 SECTION INCLUDES**

###### **A. Alternates**

##### **1.2 ALTERNATES**

###### **A. Individual Alternates Consist of Adding or Deducting Certain Work from the Base Bid as Follows:**

Alternate #1. This alternate consists of furnishing and installing vinyl Composite Tile Flooring for all rooms that are called to receive Quarry Tile.

Alternate #2. This alternate consists of furnishing and installing vinyl Composite Tile Flooring for all rooms that are called to receive Carpeting.

Alternate #3. This alternate consists of furnishing and installing 2' x 4' acoustical grid ceiling in lieu of the 2' x 2' ceiling indicated.

**END OF SECTION**

**BLUE LAKE TOWNSHIP OFFICE BUILDING**  
**SECTION 01035 - MODIFICATION PROCEDURES**

**PART 1      GENERAL**

**1.1           SECTION INCLUDES**

    A.      Change Procedures.

**1.2           CHANGE PROCEDURES**

    A.      Change Order Forms: AIA G701 are used on this project.

END OF SECTION

# **BLUE LAKE TOWNSHIP OFFICE BUILDING**

## **SECTION 01040 - COORDINATION**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Coordination.
- B. Field engineering
- C. Alteration project procedures.
- D. Cutting and patching.

#### **1.2 COORDINATION**

- A. It shall be the full responsibility of the General Contractor to expedite all phases of the work and coordinate scheduling, submittals, and work of the various sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements, regardless of whether or not the Owner awards separate contracts for any trades, items of work or equipment.
- B. Verify that utility requirement characteristics of operating equipment are compatible with building utilities.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable.
- D. In finished areas, conceal pipes, ducts, and wiring within the construction.
- E. Verify all dimensions shown on the drawings and/or shop drawings and obtain all measurements and information required for proper execution of work.
- F. Each Contractor shall examine all spaces, surfaces and areas indicated on drawings to receive his work and that of his subcontractors. Report necessary corrections in writing immediately to the Architect. Do not proceed until corrections (if any required) have been made. Commencing work signifies this Contractor's acceptance of said spaces, surfaces, areas and of job conditions.



## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

- G. When materials and finish are of such nature that it is necessary to temporarily omit certain portions of work in order to make final installation, the Contractor whose work is involved shall omit such parts of this work or finish as are necessary until other work and/or materials have been installed and shall then return and install such omitted parts of his work.

### **1.3 FIELD ENGINEERING**

- A. Preliminary information shown on drawings or included in the specifications pertaining to surveys, location of utilities, existing structures and test borings must be verified at the site by the Contractor utilizing the data. There is no expressed or implied guarantee that actual existing conditions are the same as represented or that unforeseen developments may not occur. The information is merely provided to assist the Contractor(s).
- B. The General Contractor shall develop and make all detail surveys needed for construction and to establish, protect and maintain slope stakes, batter boards, bench marks and other working points, lines and elevations from survey information provided by Owner. Certify elevations and locations of the work conform with the contract documents.

### **1.4 CUTTING AND PATCHING**

- A. Employ a skilled and experienced installer to perform cutting and patching new work; restore work with new products.
- B. Submit written request in advance of cutting or altering structural or building enclosure elements.
- C. Fit work tight to adjacent work. Maintain integrity of wall, ceiling or floor construction; completely seal voids.
- D. Execute work by methods which will avoid damage to other Work, and provide proper surfaces to receive patching and finishing.
- E. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

**END OF SECTION**

**BLUE LAKE TOWNSHIP OFFICE BUILDING**  
**SECTION 01060 - REGULATORY REQUIREMENTS**

**PART 1      GENERAL**

**1.1          SECTION INCLUDES**

- A.      Inspection and testing.
- B.      Regulatory Requirements.

**1.2          INSPECTION AND TESTING**

- A.      General:
  - 1.      During and after installation, those tests required by the local, county, and state inspection bureaus or the Engineers shall be performed in strict compliance with the department concerned and at the full expense of the Contractor.
- B.      The Contractor shall furnish all equipment, apparatus, and labor necessary for the tests. All defects disclosed by the tests shall be borne by the Contractor

**1.3          CODE REQUIREMENTS**

- A.      Comply with all local, state and federal laws and ordinances governing construction of this project. In addition, the following list of codes is provided to assist the Contractor.
- B.      BUILDING CODES
  - 1.      International Building Code
  - 2.      State of Michigan, Department of Labor Construction Code, Barrier Free
  - 3.      American With Disabilities Act (ADA), Title III,
  - 4.      NFPA 101, as amended by State of Michigan, Fire Marshall Division.
- C.      MECHANICAL CODES
  - A.      International Building Code
- D.      ELECTRICAL CODES
  - The electrical must comply with the National Electrical Code (N.E.C.)
- E.      SOIL EROSION AND SEDIMENTATION
  - 1.      Comply with the Soil Erosion and Sedimentation Act 347, 1972, Amendments.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **1.4 EMPLOYMENT LAW REQUIREMENTS AND GOALS**

- A. **EQUAL EMPLOYMENT OPPORTUNITY (EEO)**  
Contractors will comply with all applicable provisions of the Civil Rights Act and the Michigan Fair Employment Practices Act, and a violation of either shall be cause for cancellation of this contract. The contractor and the subcontractors shall not discriminate against any employee or applicant for employment because of race, color, creed, religion, age, sex, national origin or ancestry. You must place an EEO poster in an employee accessible area.
- B. **AMERICAN with DISABILITIES ACT (ADA)**  
The contractor and the subcontractors, in accordance with the Americans with Disabilities Act shall not discriminate against any employee or applicant for employment because of a know disability.
- C. **DISADVANTAGED BUSINESS ENTERPRISE (DBE)**  
The contractor must provide certified credentials for all DBE firms.
- D. **MINORITY (MBE) AND WOMEN BUSINESS ENTERPRISE (WBE)**  
The Contractor shall provide a sworn statement certifying that they are in compliance with the minimum MBE and WBE percentages and the contractor must provide certified credentials from each firm. The MBE percentage for this project is 12 percent. The WBE value for this project is \$37,000.
- E. **OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)**  
The contractor shall have a competent safety person on the jobsite during construction. You must place a Job Safety and an MSDS poster in the employee area.

**END OF SECTION**

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **SECTION 01200 - PROJECT MEETINGS**

#### **PART 1 GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Conferences.
- B. Progress meetings.

##### **1.2 CONFERENCES**

- C. Architect/Engineer will schedule a preconstruction conference after Notice of Award for all affected parties.
- D. When required in an individual specification section, convene a pre-installation conference at work site prior to commencing work of the section.

##### **1.3 PROGRESS MEETINGS**

- A. Schedule, attend, and administer meetings throughout progress of the work at maximum monthly intervals.
- B. Preside at meetings, record minutes and distribute copies within 2 days to those affected by decisions made.

**END OF SECTION**

# **BLUE LAKE TOWNSHIP OFFICE BUILDING**

## **SECTION 01300 - SUBMITTALS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed products list.
- D. Shop drawings.
- E. Product data.
- F. Samples.
- G. Manufacturers' instructions.
- H. Manufacturers' certificates.
- I. Construction photographs.
- J. Material Safety Data Sheets (MSDS).

#### **1.2 SUBMITTAL PROCEDURES**

- A. Submittal form to identify project, Contractor, subcontractor or supplier and pertinent contract document references.
- B. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the work and contract documents.
- C. Identify variations and deviations from contract documents and product or system limitations which may be detrimental to successful performance of the completed work in writing using a Letter of Transmittal form. .
- D. Revise and resubmit submittals as required, identify all changes made since previous submittal in writing on a letter of transmittal form.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

- E. Asbestos-free product certification shall be made on forms included in this specification. All products used to construct and/or incorporated into this project shall be free of asbestos whether or not specifically required in the individual sections of the specifications.

### **1.03 CONSTRUCTION PROGRESS SCHEDULES**

- A. Submit an initial progress schedule in duplicate within 10 working days after date of Notice of Award for Architect/Engineer review. If the schedule is not submitted and approved within the time frame stated the first progress payment will be withheld.
- B. Submit revised schedules with each Application for Payment, identifying changes since previous versions.
- C. Submit a Time Scaled Network with separate line for each major section of work or operation identifying first work day of each week. Submit computerized schedule in Sure-Trak to the Owner with updates weekly.

### **1.04 PROPOSED PRODUCTS LIST**

- A. Within 15 working days after date of Owner-Contractor Agreement, submit a complete list of major products proposed for use with name of manufacturer, trade name, and model number of each product.

### **1.05 SHOP DRAWINGS**

- A. Submit the number of opaque reproductions that Contractor requires plus 2 copies that will be retained by Architect/Engineer.
- B. Shop drawings will not be approved via fax.

### **1.06 PRODUCT DATA**

- A. Submit the number of copies which the Contractor requires plus 2 copies that will be retained by the Architect/Engineer.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information that is unique.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **1.07 SAMPLES**

- A. Submit samples to illustrate functional and aesthetic characteristics of the product.
- B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Architect/Engineer's selection.

### **1.08 MANUFACTURER'S INSTRUCTIONS**

- A. When specified in individual specification sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing in quantities specified for product data.
- B. Identify conflicts between manufacturers' instructions and contract documents.
- C. Maintain 1 set of manufacturers' printed instructions at job site for worker's reference.

### **1.09 MANUFACTURER'S CERTIFICATES**

- A. When specified in individual specification sections, submit manufacturers' certificate to Architect/Engineer for review in quantities specified for product data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

### **1.10 CONSTRUCTION PHOTOGRAPHS**

Not used.

### **1.11 MATERIAL SAFETY DATA SHEETS**

- A. Provide 1 copy of Material Safety Data Sheets (MSDS) bound in 3-ring binders for all products that are to be incorporated into the project. Information is for Contractor's and Owner's benefit and will not require formal review by Architect/Engineer. Retain 1 additional copy of each MSDS at the job site.
- B. MSDS for products used in the course of construction but not incorporated into the project shall be retained by the Contractor at the job site.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **1.12 ASBESTOS-FREE CERTIFICATION**

- A. Local Education Agencies (LEA) are required by law to comply with the Asbestos Hazard Emergency Response Act (A.H.E.R.A.) As published in the Federal Register dated October 30, 1987 (40 CFR Part 763). Federal law strictly prohibits any asbestos-containing material from being installed or introduced into a public building.
- B. All Contractors and/or subcontractors will be required to complete and sign Form 201 stating all products are asbestos-free and shall be accompanied by MSDS. All product Material Safety Data Sheets (MSDS) shall be submitted in a separate 3-ring folder to the school district's designated person upon completion and final inspection of the project.



## BLUE LAKE TOWNSHIP OFFICE BUILDING

### ASBESTOS-FREE PRODUCTS

It is hereby understood and agreed that no products and/or materials containing any form or forms of asbestos shall be installed or introduced into the buildings or onto the premises of

\_\_\_\_\_ by any contractor, or his suppliers, employees, agents, or subcontractors.

All contractors will be required to sign a certification statement ensuring that all products or materials installed or introduced into any public buildings shall be asbestos-free.

The contractor will also be required to furnish statements from all manufacturers verifying their products to be asbestos-free.

Date: \_\_\_\_\_

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Company)

\_\_\_\_\_  
(Position)

EMB: slw      Form 201.  
3/3/

**BLUE LAKE TOWNSHIP OFFICE BUILDING**

Name of Building \_\_\_\_\_ Bldg. # \_\_\_\_\_

Address \_\_\_\_\_

Street City State Zip

Phone ( ) \_\_\_\_\_

Contractor \_\_\_\_\_

Address \_\_\_\_\_

Street City State Zip

Project Name and Number \_\_\_\_\_

Brief Scope of Contracted Activities

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I \_\_\_\_\_, representing and having authority for

\_\_\_\_\_, hereby certify that any and all

(Company)

all products/materials which will be and/or have been installed or introduced into the  
above-mentioned Building, \_\_\_\_\_ are asbestos-free.

(Project Name and Number)

Date: \_\_\_\_\_

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Company)

\_\_\_\_\_  
(Position)

EMB:slw Form: 201

END OF SECTION

# **BLUE LAKE TOWNSHIP OFFICE BUILDING**

## **SECTION 01400 - QUALITY CONTROL**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Quality assurance and control of installation.
- B. References.
- C. Field samples.
- D. Mock-up.
- E. Inspection and testing laboratory services.
- F. Manufacturers' field services and reports.

#### **1.2 QUALITY ASSURANCE/CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of specified quality.
- B. Comply fully with manufacturers' instructions.
- C. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

#### **1.3 REFERENCES**

- A. Conform to reference standard by date of issue current on date of contract documents.
- B. Should specified reference standards conflict with contract documents, request clarification from Architect/Engineer before proceeding.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **1.04 FIELD SAMPLES**

- A. Construct field samples at the site as required by individual specifications sections for review. Acceptable samples represent a quality level for the work.

### **1.05 MOCK-UP**

- A. Assemble and erect specified items with specified attachment and anchorage devices, flashing, seals, and finishes.

### **1.06 INSPECTION AND TESTING LABORATORY SERVICES**

- A. Contractor will employ and pay for services of an independent firm to perform inspection and testing. The independent firm will perform inspections, tests, and other services as required by the technical specifications.
- B. Cooperate with independent firm; furnish samples and incidental labor as requested and customary.
- C. Retesting required because of nonconformance to specified requirements is the responsibility of the Contractor.
- D. Testing, inspection, and/or sampling is required for:
  - 1. Soils compaction control.
  - 2. Bituminous surfacing or asphalt concrete.
  - 3. Concrete.
  - 4. Masonry blocks.
  - 5. Masonry grout and/or mortar.
  - 6. Steel, structural welding.

### **1.7 MANUFACTURERS' FIELD SERVICES AND REPORTS**

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions that are supplemental or contrary to manufacturers' written instructions.

**END OF SECTION**

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

#### **PART 1 GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Temporary electricity
- B. Temporary lighting
- C. Temporary heat
- D. Temporary ventilation
- E. Telephone service.
- F. Temporary water service
- G. Temporary sanitary facilities
- H. Barriers.
- I. Fencing.
- J. Water control.
- K. Exterior enclosures.
- L. Interior enclosures.
- M. Protection of installed work.
- N. Security.
- O. Access roads.
- P. Parking.
- Q. Progressive cleaning
- R. Project identification.
- S. Field offices and sheds.
- T. Removal of utilities, facilities and controls.

##### **1.2 TEMPORARY ELECTRICITY**

- A. Connect to existing power service for construction operations. Power consumption shall not disrupt Owner's need for continuous service. Owner to pay for power consumed.
- B. Provide power outlets for construction operations, branch wiring, distribution boxes and flexible power cords as required.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **1.03 TEMPORARY LIGHTING**

- A. Provide and maintain temporary lighting for construction operations.
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Permanent building lighting may be utilized during construction. Repair, clean, and replace lamps at end of construction.

### **1.04 TEMPORARY HEAT**

- A. Utilize Owner's existing heat plant; extend and supplement with temporary units as required to maintain specified conditions for construction operations, as required to meet Owner occupancy date of December 21.
- B. Owner will pay cost of energy used.
- C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

### **1.05 TEMPORARY VENTILATION**

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes vapors, or gases.
- B. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

### **1.06 TELEPHONE SERVICE**

- A. Contractor to provide, maintain, and pay for telephone service to field office at time of project mobilization.

### **1.07 TEMPORARY WATER SERVICE**

- A. Contractor to provide, maintain, and pay for suitable quality water service required. Connect to existing water source for construction operations.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **1.08 TEMPORARY SANITARY FACILITIES**

- A. Contractor to provide and maintain required facilities and enclosures. Existing facilities shall not be used.
- B. Maintain in clean and sanitary condition.
- C.

### **1.09 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage.
- B. Construction: Contractor's option.

### **1.10 FENCING**

- A. Provide temporary snow fence around construction areas to prevent entry by public.

### **1.11 WATER CONTROL**

- A. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

### **1.12 EXTERIOR ENCLOSURES**

- A. Provide temporary weather tight closures to exterior openings to permit acceptable working conditions and protection of the work.

### **1.13 PROTECTION OF INSTALLED WORK**

- A. Protect installed work and provide special protection where specified in individual specification sections.
- B. Prohibit traffic or storage upon waterproofed or roofed surfaces.

### **1.14 ACCESS ROADS**

- A. Existing on-site roads may be used for construction traffic.

### **1.15 PARKING**

- A. Arrange for temporary parking areas to accommodate construction personnel.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **1.16 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

### **1.17 PROJECT IDENTIFICATION**

- A. Provide 1 project sign of exterior grade plywood and wood frame construction, painted, to Architect/Engineer's design and colors. The project sign will contain three separate sections. The top section is 6 feet wide and 4 feet deep. It contains the Job Name in 2 lines using 3-inch letters with 1 inch between the lines and the Job Location is in 1 line using 2-inch letters with 2.5 inches below the job name. The second section is 6 feet wide and 1 foot 6 inches deep. It contains the name of the Architectural firm using 3-inch letter with 1.5 inches between lines. The bottom section is 6 feet wide 2 feet 8 inches. It contains the General Contractor's Name with the title General Contractor under it and right justified. Also, it contains the Mechanical Contractors Name with the title General Contractor under it and right justified. Finally, this section contains the Electrical Contractors Name with the title General Contractor under it and right justified.
- B. Erect on at location established by Architect/Engineer.

### **1.18 FIELD OFFICES AND SHEDS**

- A. Office: Weather tight, with lighting, electrical outlets, heating, cooling, and ventilating equipment; and equipped with sturdy furniture and drawing display table of suitable size for intended use.
- B. Provide space for project meetings, with table and chairs to suit 6 people.

### **1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

**END OF SECTION**



## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **SECTION 01600 - MATERIAL AND EQUIPMENT**

#### **PART 1 GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Products
- B. Transportation and handling.
- C. Storage and protection.
- D. Product options.
- E. Substitutions.

##### **1.2 PRODUCTS**

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the work but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the work. Products may also include existing materials or components when specified for reuse.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the contract documents.
- C. Do not use products or materials containing asbestos whether or not this specific requirement is included in the individual sections of the technical specifications.

##### **1.3 TRANSPORTATION, HANDLING, STORAGE, AND PROTECTION**

- A. Transport, handle, store, and protect products in accordance with manufacturer's instructions.

##### **1.4 STORAGE AND PROTECTION**

Not used.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **1.05 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming 1 or More Manufacturers: Products of manufacturers named and meeting specifications; no options or substitutions allowed.
- C. Products Specified by Naming 1 or More Manufacturers with a Provision for Substitutions: submit a request for substitution for any manufacturer not named.

### **1.06 SUBSTITUTIONS**

- A. Substitutions will only be considered when a product becomes unavailable through no fault of the Contractor.
- B. Document each request with complete data substantiating compliance of proposed substitution with contract documents.
- C. Contractors requesting substitutions after award of contract shall submit 3 copies of request of substitution for consideration. Limit each request to 1 proposed substitution. Also submit review fee of \$200 per proposed substitution with each request. Check shall be made payable to the Architect.

**END OF SECTION**

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **SECTION 01655 - STARTING OF SYSTEMS**

#### **PART 1 GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Starting systems.
- B. Demonstration and instructions.
- C. Testing, adjusting, and balancing.

##### **1.2 STARTING SYSTEMS**

- A. Provide 7 days notification prior to start-up of each item.
- B. Ensure that each piece of equipment or system is ready for operation.
- C. Execute start-up under supervision of responsible persons in accordance with manufacturers' instructions.
- D. Submit a written report that equipment or system has been properly installed and is functioning correctly.

##### **1.3 DEMONSTRATION AND INSTRUCTIONS**

- A. Demonstrate operation and maintenance of products to Owner's personnel 2 weeks prior to date of final inspection.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within 6 months.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated locations.

##### **1.4 TESTING, ADJUSTING, AND BALANCING**

- A. Not used

**END OF SECTION**

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **SECTION 01700 - CONTRACT CLOSEOUT**

#### **PART 1 GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Project record documents.
- E. Operation and maintenance data.
- F. Warranties.
- G. Spare parts and maintenance materials.

##### **1.2 CONTRACT CLOSEOUT PROCEDURES**

- A. Following completion of the following requirements, final payment request may be submitted:
  - 1. Complete work listed as incomplete at time of substantial completion or otherwise assure Owner of subsequent completion of individual incomplete items.
  - 2. Settle liens and other claims or assure Owner of subsequent settlement.
  - 3. Submit proof of payment of fees, taxes, and similar obligations.
  - 4. Transfer operational, access, security, and similar provisions to Owner and remove temporary facilities, tools and similar items.
  - 5. Completion of requirements specified in Project Closeout section.
  - 6. Obtain consent of surety for final payment.
- B. Following issuance by Architect/Engineer of Certificate of Substantial Completion, Contractor may submit special payment request provided the following have been completed:
  - 1. Obtain permits, certificates of inspection, and other approvals and releases by governing authorities, required for Owner's occupancy and use of project.
  - 2. Submit warranties and similar documentation.
  - 3. Complete final cleaning of the work.
  - 4. Submit record documents.
  - 5. Submit listing of work to be completed before final acceptance.
  - 6. Submit asbestos-free certifications and bound MSDS sheets.

## **BLUE LAKE TOWNSHIP OFFICE BUILDING**

### **1.03 FINAL CLEANING**

- A. Execute final cleaning prior to final inspection.
- B. Clean interior and exterior glass and surfaces exposed to view. Vacuum carpeted and soft surfaces.
- C. Clean debris from site, roofs, gutters, downspouts, and drainage systems.
- D. Replace filters of operating equipment.
- E. Remove waste and surplus materials, rubbish, and construction facilities from the site.

### **1.04 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operations.

### **1.05 PROJECT RECORD DOCUMENTS**

- A. Maintain on site, 1 set of contract documents to be utilized for record documents.
- B. Record actual revisions to the work. Record information concurrent with construction progress.
- C. Specifications: Legibly mark and record at each product section description of actual products installed.
- D. Record Documents and Shop Drawings: Legibly mark each item to record actual construction.
- E. Submit documents to Architect/Engineer with claim for final Application for Payment.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit 2 sets prior to final inspection, bound in 8 ½ x 11-inch text pages, 3-ring binders with durable plastic covers.
- B. Prepare binder covers with printed title “OPERATION AND MAINTENANCE INSTRUCTIONS,” title of project.
- C. Internally subdivide the binder contents with permanent page dividers, logically organized, with tab tilting clearly printed under reinforced laminated plastic tabs.
- D. Contents:
  - 1. Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, subcontractors, and major equipment suppliers.
  - 2. Operation and maintenance instructions, arranged by system.
  - 3. Project documents and certificates.

1.07            WARRANTIES

- A.     Provide duplicate notarized copies.
- B.     Execute and assemble documents from subcontractors, suppliers, and manufacturers.
- C.     Submit prior to final Application for Payment.

1.08            SPARE PARTS AND MAINTENANCE MATERIALS

- A.     Provide products, spare parts, maintenance, and extra materials in quantities specified in individual specification sections.
- B.     Deliver to project site, and place in location as directed; obtain receipt prior to final payment.

END OF SECTION

**AMERICAN INSTITUTE OF CONSTRUCTORS**



**CERTIFIED PROFESSIONAL CONSTRUCTOR**

**LEVEL II – ADVANCED CONSTRUCTION APPLICATIONS**

**STUDY GUIDE EXAMPLES AND EXHIBITS**

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## Table of Contents

<b>I.</b>	<b>PROJECT SCOPE DEVELOPMENT</b> .....	1
	Square Foot Method Model Example .....	1
	Square Foot Model – System Line Item Costs.....	4
	Square Foot Model – Adjusted System Item Using the Assemblies Method. ....	5
	Bid Division Index Examples .....	11
	Bid Package Bid Breakdown and Proposal Example.....	16
	Guide Pre-bid Check List Example.....	18
	Bid Analysis Sheet Example.....	21
	Check List of Commonly Overlooked Items for Subcontractor Bids .....	22
	Lead Time Report Examples.....	23
	Design Phase Cost Variance Analysis Example. ....	25
	Design Phase - Cost Variance Analysis. ....	26
<b>II.</b>	<b>EMPLOYMENT PRACTICES.</b> .....	26
	Example of a Grievance Procedure Flow for an Individual.....	26
<b>III.</b>	<b>WORKING RELATIONSHIPS.</b> .....	33
	Fourines Coaching Analysis Flow Chart .....	33
	Fournies Face to Face Discussion Process for Coaching .....	34
	Overcoming Listener Barriers Example.....	35
	Overcoming Listener Barriers Discussion .....	37
	Working Agenda Example.....	38
	Meeting Minutes Example .....	39
<b>IV.</b>	<b>CONSTRUCTION START-UP AND SUPPORT</b> .....	40
	Notice of Award.....	40
	Notice To Proceed.....	41
	Performance Bond.....	42
	Labor & Material Payment Bond.....	43
	Schedule of Values Continuation Sheet Example.....	44
	Temporary Office Space Requirements Table.....	45
	National Electrical Contractors Study on the Effects of Temperature and Humidity....	46
<b>V.</b>	<b>CONSTRUCTION RESOURCE MANAGEMENT</b> .....	47
	Completed Job Diary.....	47
	Daily Construction Report.....	48
	Daily Time Example and Card Procedures.....	50
	Daily Time Card Description of Work Performed.....	51
	Hauling Record Example.....	53
	Completed Daily Equipment Time Card Example.....	54
	Subcontractor Bid Breakdown & Proposal Form Example.....	55

	Subcontractor Agreement Example.....	57
	Material Control and Equipment Production Estimating.....	65
	Estimating Wood Sheet Piling Material Quantities.....	65
	Estimating Wood Sheet Piling Unit Costs.....	66
	Hauling Equipment Production Example.....	67
	Hauling Equipment Unit Cost Example .....	68
	Power Shovel Production Example.....	69
	Steel Roller Compaction Production Example.....	70
	Vibrating Plate Production and Equipment Unit Cost Example.....	72
VI.	CONSTRUCTION COST CONTROL.....	73
	Earned Workhour Report Example and Instructions. ....	73
	Labor Cost Report Example and Instructions. ....	79
	Project Cost Summary and Example.....	82
	Balance Sheet Examples.....	89
	Income Statement Example.....	91
	Cash Flow Statement Example.....	92
	Change Order Request Memo Example.....	93
	Change Order Form Example .....	94
	Construction Change Directive Form Example.....	95
	Minor Changes in the Work Form Example.....	96
	Extra Work Order Example.....	97
	Contractor Change Order Proposal Example.....	98
	Contractor's New Change Order Proposal Example.....	100
VII.	PROJECT CLOSEOUT.....	101
	Certificate of Substantial Completion .....	101
	Typical Punch List .....	102
VIII.	CONSTRUCTION SAFETY MANAGEMENT.....	103
	Workers' Compensation Insurance Premium Calculation Example.....	103
	Cost of Accident Calculation Example.....	104
	Potential Savings from establishing an Effective Safety Program .....	105
	Examples – Cases That Resulted in Criminal Charges for Safety Violations.....	106
	OSHA Criteria for a Willful Violation.....	107
	Situations Where a Manager Can Be Subject to Criminal Charges.....	108
	Competent Person Evaluation Form based upon CPL 2.87.....	109
	Daily Inspection Checklist Example.....	112
	Trench Safety Daily Field Report.....	115
	Daily Excavation Log Example.....	117
	OSHA Soil Classification and Their Characteristics.....	121
	Examples and Illustrations of the Theory of Basic Trench Failure.....	122

IX.	ETHICS (no examples or exhibits).....	126
X.	CONTRACT INTERPRETATION PRINCIPLES. ....	127
	Contract Interpretation Principles Summary .....	127

## I. PROJECT SCOPE DEVELOPMENT

### Square Foot Model Method Example

The proposed Square Foot model building description is shown below:

1. BUILDING TYPE: 7- Story Apartment
2. ADDRESS, ZIP CODE: 55 Pinewood Rd., Grand Rapids, MI 49546
3. BUILDING DIMENSIONS: 191 Feet by 60 Feet.  
North and South = 191 feet.  
East & West 60 Feet.
4. EXTERIOR WALL CONSTRUCTION:  
Face Brick W/concrete Block Back up. North wall = 191 Feet  
Decorative Concrete Block. East, West, & South Walls =  $60' + 191' + 60' = 311$  Feet
5. FRAME: Steel
6. GROUND FLOOR AREA:  $60 \times 191 = 11,460$  SQ.FT.
7. GROSS FLOOR AREA (EXCL BASEMENT):  $7 \times 11,460$  SF = 80,220 S.F.
8. NUMBER OF STORIES: 7
9. STORY HEIGHT: 11' - 4"
10. PERIMETER: 502 Lineal Feet
11. BASEMENT AREA: 60 feet x 70 feet = 4200 S.F.
12. COMMON ADDITIVES: 70 Smoke Detectors, Ceiling type

## Square Foot Model Method Example (continued)

SECTION: Commercial/Industrial/Institutional  
 MODEL USED: M.020 Apartment, 4 - 7 Story, 10' 4" Story Height, 60,000 Square Feet

### BUILDING DESCRIPTION

GROSS SF = 80,220 Square Feet

PERIMETER = 502 Lineal Feet

#### EXTERIOR WALL:

North wall is Face Brick with Concrete Block Back Up. 191 feet long.

East, West, & South Walls are Decorative Concrete Block. 311 feet in total.

FRAME: Steel

COMMERCIAL/ INDUSTRIAL/INSTITUTIONAL				M.020	Apartment, 4-7 Story		
Costs per square foot of floor area - SQUARE FOOT MODEL							
Exterior Wall	S.F. Area	55,000	60,000	70,000	80,000	90,000	100,000
	L.F. Perimeter	466	500	510	530	550	594
Face Brick with Concrete Block Backup	Steel Frame	123.70	123.05	120.45	118.75	117.45	116.90
	R/Conc. Frame	128.90	128.25	125.25	123.30	121.80	121.15
Decorative Concrete Block	Steel Frame	116.90	116.40	114.20	112.90	111.80	111.30
	R/Conc. Frame	118.70	118.25	116.00	114.60	113.55	113.00
Precast Concrete Panels	Steel Frame	121.10	120.55	117.85	116.20	114.90	114.25
	R/Conc. Frame	122.80	122.15	119.45	117.75	116.45	115.85
Perimeter Adj., Add or Deduct	Per 100 L.F.	3.70	3.50	3.00	2.60	2.35	2.05
Story Hgt.Adj., Add or Deduct	Per 1 ft.	1.50	1.60	1.35	1.25	1.10	1.15
For Basement, add \$25.70 per square foot of basement area							

Using the proposed 80,220 Gross Square Feet with the North wall is Face Brick with Concrete Block Back Up, the East, West, & South Walls are Decorative Concrete Block, and the Frame is Steel. What are the Model Cost per SF using the closest column of 80,000 SF?

Exterior Wall type and Frame	Cost per SF
Face Brick with Concrete Block Back Up, Steel Frame	\$118.75/SF
Decorative Concrete Block, Steel Frame	\$112.90/SF

## Square Foot Model Method Example (continued)

Square Foot Model Adjustments Example							
Exterior Wall Variation		Wall: Perimeter		Percent	Model Cost	ADJ Model \$	
North Wall		191 Feet/502 Feet =		38% x	\$118.75	\$45.13/SF	
East, West, and South		311 Feet/502 Feet =		62% x	\$112.90	\$70.00/SF	
Exterior Wall Adjusted SF Total						\$115.13/SF	
Perimeter Adjustment		Model	Building	Difference + or -	\$ per 100 LF		
Perimeter Lineal Feet		530	502	- 28' x	\$2.60/100 LF	(\$0.73)	
Height Adjustment:		Model	Building	Difference + or -	\$ per 1 Foot		
Story Height in Feet		10' 4" -	11' 4" =	+1 Foot x	\$1.25 per 1 Foot =	+1.25/SF	
Total Adjusted Base Cost per Sq. Ft. =						\$115.65/SF	
TOTAL BUILDING COSTS in U.S.							
Descriptions		Quantity		Total Adjusted Cost/SF		Total Costs	
Building Costs		80.220 SF		\$115.65/SF		\$9,277,443	
Basement Costs		4,200 SF		\$25.70/SF		\$107,940	
Common Additives		70 Smoke Detectors		\$161.00/Ea		\$11,270	
Total Building Costs						\$9,396,653	
COMMON ADDITIVES - SQUARE FOOT MODEL							
Description		Unit	\$ Cost	Description		Unit	\$ Cost
Refrigerator, no frost, 10-12cf		Each	550 - 860	Ceiling type		Each	161
18-20 cf		Each	645 - 1100	Duct type		Each	425

TOTAL BUILDING COSTS in Grand Rapids, MI 49546				
Location Modifier	Grand Rapids, MI 49546	.84	\$9,396,653	\$7,893,189

LOCATION FACTORS - SQUARE FOOT MODEL							
State/ZIP	City	Residential	Commercial	State/ZIP	City	Residential	Commercial
MASSACHUSETTS				MICHIGAN			
025	Buzzards Bay	1.10	1.05	493,495	Grand Rapids	.83	.84

## Square Foot Model - System Line-Item Costs

The Square Foot Model Costs UniFormat Detail table for the 6 story apartment building containing 60,000 square feet and the Cost per Square Foot Model table under the 60,000 SF column, the systems components can be calculated for the model building components as shown below:

COMMERCIAL/INDUSTRIAL/INSTITUTIONAL			M.020	Apartment, 4-7 Story		
Model costs calculated for a 6-story building with 10'-4" story height and 60,000 square feet of floor area			UNIT	UNIT COST	COST PER S.F.	% OF SUB-TOT
<b>A. SUBSTRUCTURE</b>						
1010	Standard Foundations	Poured concrete, strip footings, 4' fdn wall	SF Ground	5.58	.93	2.3%
1030	Slab on Grade	4" reinforced conc, barrier, granular base	SF Slab	3.98	.67	
2010	Basement Excavation	Site prep for slab and trench fdn wall, ftg	SF Ground	.22	.04	
2020	Basement Walls	4' Foundation wall	LF Wall	61	.51	

COMMERCIAL/INDUSTRIAL/INSTITUTIONAL				M.020	Apartment, 4-7 Story		
Costs per square foot of floor area - SQUARE FOOT MODEL							
Exterior Wall	S.F. Area	55,000	60,000	70,000	80,000	90,000	100,000
	L.F. Perimeter	466	500	510	530	550	594

Using the A. SUBSTRUCTURE, under 2020 titled Basement Walls and the specifications is titled 4 foot foundation wall. The Unit Cost is \$61.00 per L.F. Wall and the Cost per S.F. is \$0.51 per S.F. The Cost per Square Foot is derived by taking the \$61.00 per lineal foot and multiplying by the model lineal feet of 500 LF = \$30,500 total. Then divide the \$30,500 by the model square feet which is 60,000 SF. Therefore, the Cost per SF is \$0.51 per SF as shown below:

Uniformat #	Model \$ per .L.F.	Model L.F.	Model Total \$	Model SF	Proposed \$/SF	Model \$/SF	+ or - \$/SF
<b>A. SUBSTRUCTURE</b>							
A2020	\$61.00	x 500 LF	\$30,500	60,000		.51	



## Square Foot Model - Adjusted System Item Using the Assemblies Method

Assume that the proposed basement will have 16 feet high, 12 inches thick Cast-in-Place Concrete pumped. This requires you to develop the total cost using the Assemblies method and adjust the cost per SF line item. Using the Assemblies for A. SUBSTRUCTURE, A20 Basement Construction, A2020 Basement Walls, A2020 10 Walls, Cast in Place and 9260 Wall Height 16 Feet, Pumped, Wall Thickness 12 inches. The Cost per Lineal Foot Total for the 16-foot-high basement wall is \$253.50 as shown below:

ASSEMBLIES COST DATA TABLE								
A20	Basement Construction							
A2020	Basement Walls							
A2020 110	Walls, Cast in Place							
	Wall Height (Feet)	Placing Method	Concrete (Y/LF)	Reinforcing (LBS/LF)	Wall Thickness (Inches)	COST PER LF		
						MAT	INST.	TOTAL
7220	12'	Pumped			8	42.50	125.00	167.50
7240					10	50.50	127.00	177.50
7262					12	58.50	130.00	188.50
9220	16'	Pumped			8	57.00	165.00	222.00
9240					10	67.50	169.00	236.50
9260					12	78.50	175.00	253.50

Therefore, using the information from the model, which indicates that the Model contains 500 Lineal Feet, calculate the new assembly total cost and the new assembly cost per square foot based upon the model. The new assembly costs are compared to the model assembly cost per square foot for the 4-foot-high model basement wall assembly and the net increase or decrease in cost per square foot is shown below:

Uniformat #	Assembly \$ per L.F.	Model L.F.	Assembly Total \$	Model SF	Assembly \$/SF	Model \$/SF	+ or - \$/SF
A2020 110 9260	\$253.50	x 500 LF	\$126,750	60,000	\$2.11	0.51	+\$1.60

## Square Foot Model - Adjusted System Item Using the Assemblies Method (continued)

Assemblies Cost Data Table - Basement Walls								
A20	Basement Construction							
A2020	Basement Walls							
A2020 110	Walls, Cast in Place							
	Wall Height (Feet)	Placing Method	Concrete (Y/LF)	Reinforcing (LBS/LF)	Wall Thickness (Inches)	COST PER LF		
						MAT	INST.	TOTAL
1500	4'	Direct chute			6	11.35	39.00	50.35
1520					8	14.20	40.00	54.20
1540					10	16.85	40.50	57.35
1561					12	19.50	41.50	61.00
1600					16	25.00	43.50	68.50
3000	6'	Direct chute			6	17.05	58.50	75.55
3020					8	21.50	60.00	81.50
3040					10	25.00	61.00	86.00
3061					12	29.50	62.50	92.00
5000	8'	Direct chute			6	22.50	78.00	100.50
5020					8	28.50	80.00	108.50
5040					10	34.00	81.50	115.50
5061					12	39.00	83.50	122.50
6020	10'	Direct chute			8	35.50	100.00	135.50
6040					10	42.00	102.00	144.00
6061					12	49.00	104.00	153.00
7220	12'	Pumped			8	42.50	125.00	167.50
7240					10	50.50	127.00	177.50
7262					12	58.50	130.00	188.50
9220	16'	Pumped			8	57.00	165.00	222.00
9240					10	67.50	169.00	236.50
9260					12	78.50	175.00	253.50

## Square Foot Model - Adjusted System Item Using the Assemblies Method (continued)

COMMERCIAL/ INDUSTRIAL/INSTITUTIONAL			M.020	Apartment, 4-7 Story			
Square Foot Model - Apartment, 4 - 7 Story							
Exterior Wall	S.F. Area	55,000	60,000	70,000	80,000	90,000	100,000
	L.F. Perimeter	466	500	510	530	550	594
Face Brick with Concrete Block Backup	Steel Frame	123.70	123.05	120.45	118.75	117.45	116.90
	R/Conc. Frame	128.90	128.25	125.25	123.30	121.80	121.15
Decorative Concrete Block	Steel Frame	116.90	116.40	114.20	112.90	111.80	111.30
	R/Conc. Frame	118.70	118.25	116.00	114.60	113.55	113.00
Precast Concrete Panels	Steel Frame	121.10	120.55	117.85	116.20	114.90	114.25
	R/Conc. Frame	122.80	122.15	119.45	117.75	116.45	115.85
Perimeter Adj., Add or Deduct	Per 100 L.F.	3.70	3.50	3.00	2.60	2.35	2.05
Story Hgt.Adj., Add or Deduct	Per 1 ft.	1.50	1.60	1.35	1.25	1.10	1.15
For Basement, add \$25.70 per square foot of basement area							

Square Foot Model - Common Additives					
Description	Unit	\$ Cost	Description	Unit	\$ Cost
Appliances			Closed Circuit Surveillance, 1station		
Cooking range, 30" free standing			Camera and monitor	Each	1525
1 Oven	Each	330 - 1800	Additional cameras, add	Each	820
2 Oven	Each	1700 - 1775	Elevators, Elec passenger, 5stops		
30" built-in			2000# capacity	Each	110,300
1 Oven	Each	570 - 1875	3500# capacity	Each	116,800
2 Oven	Each	1250 - 2050	5000 capacity	Each	121,800
Microwave oven	Each	212 - 675	Additional stop, add	Each	6550
Emergency Lighting, 25watt battery			Smoke Detectors		
Lead battery	Each	247	Ceiling type	Each	161
Nickel cadmium	Each	695	Duct type	Each	425

## Square Foot Model - Adjusted System Item Using the Assemblies Method (continued)

COMMERCIAL/ INDUSTRIAL/ INSTITUTIONAL			M.020	Apartment, 4-7 Story			
Model costs calculated for a 6-story building with 10'-4" story height and 60,000 square feet of floor area				UNIT	UNIT COST	COST PER S.F.	% OF SUB-TOT
A. SUBSTRUCTURE							
1010	Standard Foundations	Poured concrete, strip footings, 4' fdn wall	SF Ground	5.58	.93	2.3%	
1030	Slab on Grade	4" reinforced conc, barrier, granular base	SF Slab	3.98	.67		
2010	Basement Excavation	Site prep for slab and trench fdn wall, ftg	SF Ground	.22	.04		
2020	Basement Walls	4' Foundation wall	LF Wall	61	.51		
B. SHELL							
	B10 Superstructure						
1010	Floor Construction	Open web joists, forms, conc, steel col	SF Floor	18.83	15.69	18.3%	
1020	Roof Construction	Open web joist, a rib metal deck, steel col	SF Roof	6.84	1.14		
	B20 Exterior Enclosure						
2010	Exterior Walls	Face brick w/ concrete block backup 86%	SF Wall	18.61	8.07	10.8%	
2020	Exterior Windows	Aluminum Horizontal Sliding	Each	346	1.66		
2030	Exterior Doors	Aluminum and glass	Each	2915	.20		
	B30 Roofing						
3010	Roof Coverings	Built-up tar, gravel, EPC insulation	SF Roof	4.32	.72	0.8%	
C. INTERIORS							
1010	Partitions	Gypsum on metal 8SF Floor/LF Partitions	SF Partitions	5.57	5.57	28.3%	
1020	Interior Doors	15% solid wood, 85% hollow; 160SF Flr/door	Each	516	6.45		
1030	Fittings	Kitchen cabinet's	SF Floor	2.41	2.41		
2010	Stair Construction	Concrete filled metal pan	Flight	5150	1.38		
3010	W all Finishes	70% paint, 25% vinyl, 5% ceramic tile	SF Surface	2.47	2.47		
3020	Floor Finishes	60% carpet, 30% vct, 10% ceramic tile	SF Floor	4.68	4.68		
3030	Ceiling Finishes	Painted gypsum board on resilient channel	SF Ceiling	3.12	3.12		

## Square Foot Model - Adjusted System Item Using the Assemblies Method (continued)

COMMERCIAL/ INDUSTRIAL/INSTITUTIONAL			M.020	Apartment, 4-7 Story		
Model costs calculated for a 6 story building with 10'-4" story height and 60,000 square feet of floor area			UNIT	UNIT COST	COST PER S.F.	% OF SUB-TOT
D. SERVICES						
	D10 Conveying					
1010	Elevators & Lifts	Two general passenger elevators	Each	147,900	4.93	5.4%
	D20 Plumbing					
2010	Plumbing Fixtures	Kitchen, bath, service 1 Fixture/215 SF	Each	1642	7.64	11.0%
2020	Domestic Water Dist.	Gas Fired Water Heater	SF Floor	2.34	2.34	
2040	Rain Water Drainage	Roof Drains	SF Roof	.90	.15	
	D30 HVAC					
3010	Energy Supply	Oil fired hot water, baseboard radiation	SF Floor	4.72	4.72	12.2%
3030	Cooling gen system	Chilled water, air cooled condenser sys	SF Floor	6.52	6.52	
	D40 Fire Protection					
4010	Sprinklers	Wet pipe sprinkler system	SF Floor	1.73	1.73	2.2%
4020	Standpipes	Standpipe	SF Floor	.33	.33	
	D50 Electrical					
5010	Electric Service/Distrib	1600 ampere service, panelboards, feeders	SF Floor	1.78	1.78	8.6%
5020	Lighting & branch wiring	Incandescent fixtures, receptacles, switch	SF Floor	5.76	5.76	
5030	Communication/Security	Alarm, emergency lighting, intercom	SF Floor	.26	.26	
5090	Other Electrical	Emergency Generator, 11.5 kW	SF Floor	.14	.14	
E. EQUIPMENT AND FURNISHINGS						
1010	Commercial Equipment	N/A	-	-	-	0.00%
F. SPECIAL CONSTRUCTION						
1020	Integrated Construction	N/A	-	-	-	0.00%
G. BUILDING SITEWORK						
1010	Trenching	N/A	-	-	-	0.00%
Sub-Total					92.01	100%
CONTRACTOR FEES ( General Requirements: 10%, Overhead: 5%, Profit: 10%)				25%	22.99	
ARCHITECT FEES				7%	8.05	
					123.05	

## Square Foot Model - Adjusted System Item Using the Assemblies Method (continued)

Square Foot Model Location Factors							
State/ZIP	City	Residential	Commercial	State/ZIP	City	Residential	Commercial
MASSACHUSETTS				MICHIGAN			
010-011	Springfield	1.05	1.03	480,483	Royal Oak	1.03	1.00
012	Pittsfield	1.02	1.01	481	Ann Arbor	1.03	1.01
013	Greenfield	1.01	1.01	482	Detroit	1.10	1.07
014	Fitchburg	1.08	1.06	484-485	Flint	.97	.97
015-016	Worcester	1.11	1.09	486	Saginaw	.94	.95
018	Lowell	1.13	1.11	488-489	Lansing	.96	.96
019	Lawrence	1.12	1.10	490	Battle Creek	.93	.92
020,022,024	Boston	1.19	1.15	491	Kalamazoo	.92	.91
023	Brockton	1.11	1.08	492	Jackson	.94	.94
025	Buzzards Bay	1.10	1.05	493,495	Grand Rapids	.83	.84

## Bid Division Index Examples

Bid No.	Spec Division	Bid Division Scope Description	Name of the Trade Contractor or Vendor
100	31 11 31 23 32 11 33 11	Clear and Grubb Site Excavate, Backfill & Compact Soil Grade Roads, Parking Lot, and Site Furnish and Install Site Utilities	EXCAVATOR

If a Bid Division Scope Description requires the trade contractor to provide both materials and perform the work, then Bid Division Scope Description should read as follows:

Bid No.	Spec Division	Bid Division Scope Description	Name of the Trade Contractor or Vendor
110	03 11 03 21 03 31 07 11	Furnish and Install Forms Furnish and Install Rebar and Accessories Furnish and Install Concrete Furnish and Apply Waterproofing	CONCRETE

If a Bid Division Scope Description requires the trade contractor to perform the work and a separate supplier or vendor there will be two bid division scopes. The Bid Division Scope Descriptions should read as follows:

Bid No.	Spec Division	Bid Division Scope Description	Name of the Trade Contractor or Vendor
120	08 11 08 14	Furnish Metal Overhead Door Furnish Wood Doors and Windows	DOOR SUPPLIER
130	08 11 08 14	Install Metal Overhead Doors Install Wood Doors and Windows	CARPENTER

**Bid Division Index Examples (continued)**

	<b>Division/ Section</b>	<b>BID DIVISION AND SECTION DESCRIPTION</b>	<b>TRADE ASSIGNED</b>
090	General Conditions	Comply with the American Institute of Architects A201, 2007	All Trades
	11	Provide Insurance Coverage for Contractor's Liability, Owner's Liability, Property, Machinery, Loss of Use, Workers Comp., Unemployment, Automobile \$100,000.	
	10	Safety	
		Indemnify the Owner	
	15	Submit Change Orders in 21 Days	
	01 31 19	Attend Meetings	
100	01 30	Alternate Number 1: Door & Window Quote Steel Bifold Doors in Lieu of wood or particle bifold doors	Door Supplier
110	03 11, 03 31	Furnish and Place Concrete Forms	Concrete Form setter
120	03 21	Furnish and Install Rebar	Rodbuster
130	07 11 07 21	Furnish and apply damp proofing Furnish and Install Perimeter Insulation	Damproofer
140	04 21 04 22	Furnish and Install Bricks Furnish and install Blocks	Mason
150	05 51	Furnish and Fabricate Structural Steel	Steel Fabricator
160	05 12 05 21 05 31 23 05 31 13	Erect Structural Steel Erect Steel Joists and Joist Girders Erect Steel Roof Deck Erect Steel Floor Deck	Ironworkers
170	06 11 06 21 06 41 07 21 07 31 07 61 07 81 08 14 10 21 10 11 11 31	Furnish & install rough carpentry and studs Metal studs, finish carpentry Install kitchen cabinets Furnish & install insulation Furnish & install roofing Furnish & install flashing Furnish & install caulking Install wood doors and windows Install bathroom accessories Install Whiteboards Install laundry equipment	Carpenter



**Bid Division Index Examples (continued)**

<b>BID #</b>	<b>Division/ Section</b>	<b>BID DIVISION AND SECTION DESCRIPTION</b>	<b>TRADE ASSIGNED</b>
180	08 14	Furnish Wood doors and windows	Door & Window Supplier
185	08 71	Owner-furnished door hardware	Owner
190	08 43	Furnish & install pane glass Storefront Style	Glaziers
195	09 29	Furnish & hang drywall Cathedral Ceiling Second floor &	Drywall
200	09 29	Tape Drywall	Joint taper
210	09 31	Furnish ceramic tile and slate	Tile Supplier
220	09 31	Install ceramic tile and slate	Tile Setter
230	09 51 09 53	Furnish & install acoustical ceiling Furnish and install suspension system	Acoustical
240	09 64 09 65	Furnish & install wood parquet floor Furnish and install resilient floor	Floor supplier
250	09 91	Furnish & apply painting	Painter
260	10 21	Furnish bathroom accessories	Bath Supplier
270	11 31	Furnish kitchen and laundry appliances	Appliance Supplier
280	06 41	Furnish kitchen cabinets	Cabinet Mfg
290	33 21	Furnish and install well and equipment Furnish and install pipe from the well to the well pump	Well Driller
300	22 11 22 13	Furnish and install domestic water supply, drain waste and vent piping and plumbing, fixtures: install a garbage disposer.	Plumber
310	23 31 23 82	Furnish and install sheet metal and furnace for the heating and air conditioning systems	Sheet Metal
320	26 12 01 51	Furnish and install all electrical for the power and lighting syst Furnish and install temporary power pole with temp power box	Electrical
330	27 13	Furnish and install TV cable, telephone and doorbell systems	Comm Electrician
340	31 11 31 23 33 11 33 41 33 31	Clear site, excavate, backfill & Compact Excavate, Trench and Backfill Furnish and Install Ext. Water Distribution Piping Furnish and Install Ext. Storm Sewer System Piping Furnish and Install Ext. Sanitary Sewer Piping	Excavator
350	32 12	Furnish & place Asphalt paving with Subbase	Asphalt Paving

**Bid Division Index Examples (continued)**

PROJECT: CLEAR LAKE HOME

Bid No	Spec Div/Sec	Bid Division Scope Description	Trade Contractor/Vendor
195	09250	Furnish and Install Drywall	Drywaller
<b>Exclusions</b>		<b>DESCRIPTION OF THE EXCLUSION</b>	<b>Other Bid Division</b>
		Furnish and Install Metal Stud Wall Framing	06100
		Furnish and Install Wood Furring	09205
		Furnish and Install Plastering	09210
		Furnish Drywall Compounds and Taping of Joints	09250
		Furnish Paint and Paint Surfaces	09900
		Furnish and Install Wall Covering	09950

**Specific** (Written in Paragraph Form)**Inclusions:**

- Furnish, cut, frame and install all drywall, corner bead, ceiling insulation, joint compound, tape, metal suspension systems, access panels and openings for the walls and ceilings to make the drywall system complete and operational in compliance with the specifications, codes and accepted by the Owner.

**General** (Written as One Line Descriptions)**Inclusions:**

- Receive & unload all drywall materials installed by you or furnished by others Layout and coordinate all wall and ceiling penetrations
- Provide all allowances noted in specifications Cut and patch all necessary openings in dry wall
- Furnish labor and materials to plaster and texture ceilings Provide own scaffolding and inspect each day
- Call for all inspections three days in advance Provide temporary storage and protection for all materials required Provide daily clean up and housekeeping

**Bid Division Index Examples (continued)**

**Other Considerations:** (Each is written as a One line Description with TimeFrame)

- Maintain daily construction reports
- Attend all weekly planning and Safety meetings
- Pay all fees required to obtain all permits prior to commencement
- Provide copy of the insurance policies at the signing of the Agreement Provide updated insurance certificates one week prior to expiration
- Indemnify the Owner and Architect before commencement of work
- Provide evidence of proof of licensing prior to commence
- Provide required bonds at the signing of the Agreement
- Attend the preconstruction meeting, review and approve the schedule Comply with all labor agreements
- Comply with prevailing wage rates established for the project
- Provide all shop drawing and product data submittals prior to starting work
- Furnish guarantees for all materials and workmanship prior to final payment
- Comply with safety and Right to Know laws
- Submit an Application for Payment Form and Lien Waivers each month on the date specified in the Agreement

## Bid Package Bid Breakdown and Proposal Form Example

PROJECT:	<i>Brayton's Clear Lake Home 15595 Colfax Cove Big Rapids, MI 49307</i>	ARCHITECT:	<i>Architects, Inc. 145 Oak Street Portland, MI 48875</i>
CONTRACTOR	<i>Contractor, Inc. 345 Michigan Avenue Big Rapids, MI 49307</i>	OWNER:	<i>Edward Brayton 605 S. Warren Street Big Rapids, MI 49307</i>
SUBCONTRACTOR	<i>Drywall, Inc. 143 Huron Street Reed City, MI 49677</i>	ENGINEER:	<i>Architect's &amp; Engineers, Inc. 145 Oak Street Portland, MI 48875</i>
BID NO.	SPEC DIV	BID DIVISION SCOPE DESCRIPTION	TRADE CONTRACTOR
195	09250	<i>Furnish &amp; Hang Drywall</i>	<i>Drywall</i>

The items that are *italicized* below are completed by the Trade Contractor or Subcontractor when submitting their bid proposal:

We hereby submit the following proposal in accordance with:

*Division 01 - General Requirements*

*Division 9 - FINISHES of the Technical Specifications. Bid*

*Division Scope Description Number 195 - Drywall*

The following addenda numbers have been included in our proposal:

*Addendum No. 1, dated April 28, \_\_*

*Addendum No. 2, dated May 6, \_\_\_\_*

Our Lump Sum Base Bid for the work outlined in this Bid Division Scope is:

*Nineteen Thousand Four Hundred & Ninety-Three Dollars (19,493.00)*

We agree to Add or Deduct from our Base Bid the following alternates:

No.	ALTERNATE DESCRIPTION	ADD OR DEDUCT AMOUNT
3	<i>Performance and Payment Bonds</i>	<i>Add Two Thousand Dollars +\$2,000</i>

## Bid Breakdown and Proposal Form Example (continued)

Our past Experience Tells Us That Not All Contractors Will Do All of the Work as Specified. Therefore, Please Submit Your Bid Breakdown as Follows So That We Can Evaluate All Bids:

PROPOSAL ITEM DESCRIPTION BID BREAKDOWN:		PRICE BREAKDOWN
Metal Suspension System		\$ 8,940.00
Drywall		\$6,131.00
Taping		-0-
Plastering and Texturing		\$1,921.00
Insulation		\$2,501.00
TOTAL BID		\$19,493.00
We, the Bidder, Anticipate the Following Time Durations:		
Submittal Date for Shop Drawings is		May 20, 20 __
Number of Weeks for Material Delivery		One Week
Installation Start Date		May 25, 20 __
Number of Skilled Trade Workers		Four Employees
Total Number of Weeks to Complete		Three Weeks
We, the Bidder, propose to use the following Materials by these Manufacturer's:		
ITEM DESCRIPTION		MANUFACTURER
Drywall		Gold Bond

SIGNATURE OF RESPONSIBLE PARTY AND DATE:

\_\_\_\_\_  
 signed by *Lynn Oberg, Owner President, Drywall, Inc.*  
*143 Huron Street, Reed City, MI 49677*

Date \_\_\_\_\_

ACCEPTANCE OF THE BID PROPOSAL BY\*

\_\_\_\_\_  
 signed by *R. Sherry, President, Contractor, Inc.*  
*345 Michigan Avenue, Big Rapids, MI 49307*

Date \_\_\_\_\_

- This is completed after the Contractor has a signed Agreement with the Owner.

## Guide Pre-bid Check List Example

### Surface Conditions

1. Material
2. Brush and tree removal
3. Effect of rain, snow, tidewater and season of the year
4. Depth of topsoil
5. Waterways (streams, lakes, ponds, rivers)

### Sub-surface Conditions

1. Material Type
2. Geological faults--rocks, seams, etc.
3. Water level
4. Soil Erosion Control and Sedimentation Plan.
5. Installation of permanent structures such as caissons, piling and deep foundations

### Access to the Site

1. Turning Radius
2. Union Work Rules
3. Notice to Proceed
4. Local Permits

### Adjacent Site Conditions

1. Physical conditions as related to shoring and cribbing and underpinning
2. Local laws or regulations which will govern the condition in which borrow pits, stock piles, surrounding ground surfaces must be left in original conditions

### Temporary Services

1. Available power source
2. Power panel boxes
3. Temporary Heat
4. Temporary Sanitary Facilities
5. Temporary Storage
6. Temporary Parking
7. Temporary Fencing
8. Job Trailers
9. Detour Routes and Signage

## Guide Pre-bid Check List (continued)

### Temporary Structures

1. Installation of temporary structures such as sheet pilings, shoring, cofferdams, dewatering, underpinning
2. Installation of scaffolding
3. Crane locations, Crane mats, Rigging and Jin Poles

### Ordinances

1. Laws regarding working hours
2. Laws regarding noise
3. Laws regarding burning
4. Laws regarding water pollution
5. Laws regarding removal of soils
6. Laws regarding Sunday and Holiday work
7. Laws regarding Seasonal weather limitations
8. Status of adjoining contracts

### Transportation

1. Water - Barges
2. Railroads
3. Trucking
4. Airplane
5. Traffic problems - height restriction
6. Road - load limits and surface condition
7. Local laws governing movement of equipment

### Weather Conditions

1. Historical Local Weather Reports
2. Anticipated monthly rainfall
3. Anticipated monthly humidity
4. Anticipated monthly temperatures
5. Anticipated monthly snowfall
6. Anticipated monthly loss work days

**Guide Pre-bid Check List (continued)****Material Availability**

1. Quantity Available
2. Quality of the materials
3. Distance or location of materials
4. Fuel supply

**Labor Availability**

1. Number of Craft workers available
2. Travel Distance
3. Work rules
4. Craft Change houses
5. Labor contracts
6. Transportation of workers
7. Housing facilities
8. Training Requirements

**Public Safety Requirements**

1. Need for police, flag, and traffic control
2. Need for fencing animals
3. Need for shoring of bridges and adjacent structures
4. Need for detours
5. Laws regarding public safety (State)
6. Laws regarding public safety (Federal)
7. Occupational Safety and Health Administration (OSHA)

**Hauling Conditions**

1. Grades or Elevation changes
2. Surface
3. Width
4. Height
5. Length of Haul
6. Load Size or Weight
7. Traffic Conditions
8. Road and Bridge Limitations
9. Railroad, traffic lights or lift bridges



**Bid Analysis Sheet Example**

PROJECT NUMBER \_\_\_\_\_ DUE DATE SEPT 15 \_\_\_\_

PROJECT NAME Jobsite USA TIME 4:20 P.M.

MAJOR ITEMS	JIM'S Plumbing	Quality Plumbing	Plumbing ,Inc.	
Fixtures	10,176	9446	8940	
Drain, Waste, Vent	5747	5376	6131	
Insulation	1843	-0-	1935	
Exterior Domestic	925	947	-0-	
Exterior Storm	-0-	-0-	1676	
Exterior Sanitary	-0-	-0-	245	
Domestic Water	925	967	937	
Hot Water Heater	1515	1474	1564	
Total Bid Submitted	21,131	18,210	21,428	
Add Exceptions				
Insulation	0	1900	0	
Exterior Domestic	0	0	950	
Exterior Storm	1676	1676	0	
Exterior Sanitary	245	245	0	
Balanced Base Bid	23,052	22,031	22,378	
Overlooked Items				
Temporary Storage			800	
Sales Tax			824	
TOTAL PRICE			24,052	

## **Checklist of Commonly Overlooked Items for Subcontractor Bids**

- Installation of temporary facilities (gas, water, electrical, heat)
- Trenching, Excavation and Backfill
- Concrete placing and embedments for Plumbing, electrical, HVAC Cutting and Patching
- General Cleanup
- Scaffolding
- Temporary Offices
- Structural problems
- Painting of Exposed Surfaces
- Punch list Items
- Electrical hookups to furnaces, fans, pumps, controls
- Manholes
- Connecting to existing facilities
- Balancing the system
- Start-up testing
- Transportation Costs Sales and Use Taxes
- The length of the guarantee on equipment and performance
- Prevailing Wages
- Weather Protection

## Lead Time Report Examples

Leadtime Report for Structural Steel and Welding

	1										2														3														TOTAL IN WEEKS
MATERIALS/EQUIPMENT	BID TIME (IN WEEKS)										PREPARE SHOP DRAWINGS & OTHER DATA (IN WEEKS)														SHIPMENT (IN MONTHS)														
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
SHEET METAL: HVAC, FABRICATED																																						14 +	
																																						9	
STEEL: STOREFRONTS																																						7	
																																						12 +	
STEEL: DETENTION SYSTEM																																						20 +	
STEEL: REBAR FABRICATED																																						5	
STEEL: STRUCTURAL FABRICATED																																						5	
STEEL: METAL STUDS																																						10	
																																						6	

+ or - Denotes a change from the previous report

## Lead Time Report Examples (continued)

Leadtime Report for  
Instrumentation

	1										2														3														TOTAL IN WEEKS
MATERIALS/EQUIPMENT	BID TIME (IN WEEKS)										PREPARE SHOP DRAWINGS & OTHER DATA (IN WEEKS)														SHIPMENT (IN MONTHS)														
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
ANALYZERS: PH, ETC.																																						19 +	
ANNUNCIATORS: STANDARD																																						14 +	
GAGES, PRESSURE																																						12	
INSTRUMENTS: ELEC - CONTROLS																																						14	
INSTRUMENTS: PNEUMATIC -CONTROL																																						14	
METERS: POSITIVE DISPLACEMENT																																						17	
METERS: TURBINE																																						17	
PANELS: CONTROL SEMIGRAPHIC																																						27	
TRANSMITTERS: ELECTRICAL																																						18 +	
TRANSMITTERS: PNEUMATIC																																						18 +	
VALVES: CONTROL BUTTERFLY																																						19	
VALVES: CONTROL GLOBE																																						19	
VALVES: SAFETY 150 - 300																																						19	
VALVES: 600 - 1500																																						28	
VALVES: 2500																																						32	
VALVES: SOLENOID																																						19	

+ or - Denotes a change from the previous report

## Design Phase - Cost Variance Analysis Example

1. The *Total Labor Variance* for the concrete sample indicates that it is Under budget by +\$4,082. This is the Net effect of the variables. In the Total Labor Variance everything varies and there are no constants. The Labor *Total Variance Net* result for the concrete sample indicates that if we add the Labor Quantity variance of + \$1,096, add the Labor Rate variance of (\$434) and add the Productivity variance of + \$3,420. These variances added together will equal the +\$4,082.
2. The *Labor Quantity Variance* for the concrete sample indicates that it is under budget by +\$1,096. The variables are the Currently Estimated Quantity and the Conceptual Quantity. The constants in the Labor Quantity variance are the Conceptual Productivity rate in Workhours per Unit (Whr/Unit) and the Conceptual Unit Cost rate in dollars per workhour (\$/WH).
3. The *Labor Rate Variance* for the concrete sample indicates that it is (over) budget by (\$434). The variables are the Conceptual Labor rate and the Current Estimated Labor Rate both in dollars per workhours (\$/WH). The constants are the Current Estimated Quantity and the Current Estimated Productivity rate in Workhours per unit (WH/Unit).
4. The *Labor Productivity Variance* for the concrete sample indicates that it is under budget by + \$3,420. The variables are the Current Estimated Productivity rate and the Conceptual Productivity rate both in workhours per unit (WH/Unit). The constants are the Current Estimated Quantity and the Conceptual Unit Cost rate in dollars per workhours (\$/WH).

There are three material variances. They are the Total Material Variance, the Material Price Variance and the Material Quantity Variance. The concrete example for Materials indicates that the Total Net Material Variance is Under budget by +\$9,077. The concrete sample also indicates that the Material Price Variance is \$6,743 and the Material Quantity Variance is \$2,334. These individual variances added together equal the net Total Material Variance of +9,077.

**Design Phase - Cost Variance Analysis Example - Continued**

Concrete Sample - Total Labor Variance - Area 01

Variables - Everything

Constants - Nothing

Desc	Currently Estimated Quantity	Conceptual Quantity	Unit	Currently Estimated Workhours	Conceptual Workhours	Currently Estimated Unit Cost (\$/WH)	Conceptual Unit Cost (\$/WH)	Total Currently Estimated Cost	Total Conceptual Cost	Total Variance (Over)/ Under
Concrete	846	905	CY	1,497	2,045	\$8.53	\$8.24	\$12,769	\$16,851	\$4,082
	846 CYx 1.77Whr/CY = 1,497Whr				x	8.53/Whr =		\$12,769		
		905 CY x 2.26 Whr/CY = 2.045 Whr				x	8.24/Whr=		\$16,851	
								\$16,851 - \$12,769 = \$4,082		
TOTAL VARIANCE										
System Description					Concrete Labor					
Currently Estimated Quantity					846 CY					
Conceptual Quantity					905 CY					
Currently Estimated Productivity Rate in Whr/Unit					1.77 Whr/CY					
Conceptual Productivity Rate in Whr/Unit					2.26 Whr/CY					
Currently Estimated Labor Rate in \$L/Whr					\$8.53/Whr					
Conceptual Labor Rate in \$L/Whr					\$8.24/Whr					

**Design Phase - Cost Variance Analysis Example - Continued****Concrete Sample - Labor Quantity Variance - Area01**

Desc	Currently Estimated Quantity	Conceptual Quantity	Unit	Conceptual Productivity Rate (WH/Unit)	Currently Estimated Conceptual Workhours	Total Conceptual Workhours	Conceptual Unit Cost Rate (\$/WH)	Total Conceptual Current (\$)	Total Conceptual (\$)	Quantity Variance (\$)
	Variable	Variable		Constant			Constant			
Conc	846	905	CY	2.26	1,912	2,045	\$8.24	\$15,755	\$16,851	\$1,096
	846 CY x 2.26 Whr/CY = 1,912 Whr					x	\$8.24/Whr = \$15,755			
		905 CY x 2.26 Whr/CY = 2,045 Whr					\$8.24/Whr = \$16,851			
QUANTITY VARIANCE								\$16,851 - \$15,755 = \$1,096		

## Design Phase - Cost Variance Analysis Example - Continued

### Concrete Sample - Labor Rate Variance and Productivity Variance - Area 01

Desc	Current Estimated Quantity	Unit	Current Estimated Productivity (Whr/Unit)	Total Current Estimated Whrs	Conceptual Unit Cost (\$/WH)	Current Estimated Unit Cost (\$/WH)	Total Current Estimated Cost (\$)	Total Current Conceptual Cost (\$)	Labor Rate Variance	Conceptual Productivity Rate Whr/Unit	Currently Estimated Conceptual Workhours	Total Conceptual Current Cost (\$)	Productivity Variance	
LABOR RATE VARIANCE														
	Constant		Constant		Variable	Variable								
Conc	846	CY	1.77	1,497	\$8.24	\$8.53	\$12,769	\$12,335	(\$434)					
LABOR RATE VARIANCE														
PRODUCTIVITY VARIANCE														
	Constant		Variable		Constant					Variable				
Conc	846	CY	1.77	1,497	x \$8.24			\$12,335		2.26	1,912	\$15,755	\$3,420	
	846	CY	X								2.26 Whr/CY = 1,912 Whr			
										1,912 Whr x \$8.24/Whr = \$15,755				
	PRODUCTIVITY VARIANCE										\$15,755 - \$12,335 = \$3,420			



## Design Phase - Cost Variance Analysis Example - Continued

Concrete Sample - Total Material Variance - Area 01

Variables - Everything

Constants - Nothing

Description	Currently Estimated Quantities	Conceptual Quantities	Unit	Currently Estimated Unit Costs	Conceptual Unit Costs	Total Currently Estimated Cost	Total Conceptual Cost	Total Variance (Over)/Under
Concrete	846	905	CY	\$31.59	\$39.56	\$26,725	\$35,802	\$9,077
	846 CY x \$31.59/ CY = \$26,725							
		905 CY x \$39.56/CY = \$35,802						
							\$35,802 - \$26,725 = \$9,077	
MATERIAL TOTAL VARIANCE								
System Description				Concrete				
Currently Estimated Quantity				846 CY				
Conceptual Quantity				905 CY				
Currently Estimated Material Rate in \$M/Unit				\$31.59/CY				
Conceptual Material Rate in \$M/Unit				\$39.56/CY				

**Design Phase - Cost Variance Analysis Example - Continued****Concrete Sample - Material Price Variance & Quantity Variance - Area 01**

Desc	Currently Estimated Quantities	Conceptual Quantities	Unit	Currently Estimated Unit Cost	Conceptual Unit Cost	Total Currently Estimated Cost (\$)	Total Current Conceptual Cost (\$)	Price Variance (Over)Under	Total Conceptual Cost	Quantity Variance (Over)Under
MATERIAL PRICE VARIANCE										
	Constant			Variable	Variable					
Conc	846		CY	\$31.59	\$39.56	\$26,725	\$33,468	\$6,743		
	846 CY x \$31.59/CY					= \$26,725				
	846 CY x \$39.56/CY					= \$33,468				
							\$33,468 - \$26,725 = \$6,743			
MATERIAL PRICE VARIANCE										
QUANTITY VARIANCE										
	Variable	Variable			Constant					
Conc	846	905	CY		\$39.56		\$33,468		\$35,802	\$2,334
	846 CY x \$39.56/CY					= \$33,468				
		905 CY x \$39.56/CY					= \$35,802			
									\$35,802 - \$33,468 = \$2,334	
QUANTITY VARIANCE										

## II. EMPLOYMENT PRACTICES

### Example of a Grievance Procedure Flow for an Individual

#### Step 1 (Immediate supervisor)

Within twenty (20) days of the time a grievance might reasonably be known to exist, the affected member of the bargaining unit shall present the grievance in writing to his or her immediate supervisor with a copy to HRD.

The immediate supervisor shall respond in writing to the grievant no later than ten (10) days after the grievance has been received.

Any withdrawal of a grievance at this step shall not constitute a binding precedent in the disposition of similar grievances.

#### Step 2 (Department level)

Department level, unless the department head is the immediate supervisor, then advance to Step 3. If the grievance is not resolved at step 1, it shall be presented in writing to the department manager or, where appropriate, the equivalent supervisory level, with a copy to HRD, within seven (7) days after the response of the immediate supervisor or the date the response was due, whichever is sooner. The grievance shall state the reasons the step 1 response is unsatisfactory. The Department manager or appropriate supervisor shall meet with the grievant within seven (7) days and, if the grievant wishes, with a representative of the Association. A written response shall be made not later than seven (7) days after the meeting at which the grievance was discussed.

#### Step 3 (HRD level)

If the grievance is not resolved at the above steps, it shall be presented in writing to HRD within seven (7) days after the decision at step 1 or 2, whichever applies, or the date the response was due, whichever is sooner. The grievance must be signed by an authorized representative of the Association and shall be part of the original grievance form. It must include the reason the grievant considers the prior response unsatisfactory.

Following receipt, a meeting must be held between the representative of the Association and the Director of HRD, or his/her designee, within ten (10) days. The Director of HRD, or his/her designee, shall respond in writing within seven (7) days from the date of the meeting.

#### Step 4 (Arbitration)

If the Association is not satisfied with the response at step 3, the grievance may be submitted to arbitration by so notifying the Director of HRD in writing within two (2) weeks of the step 3 response, or the date such response was due, whichever is sooner.

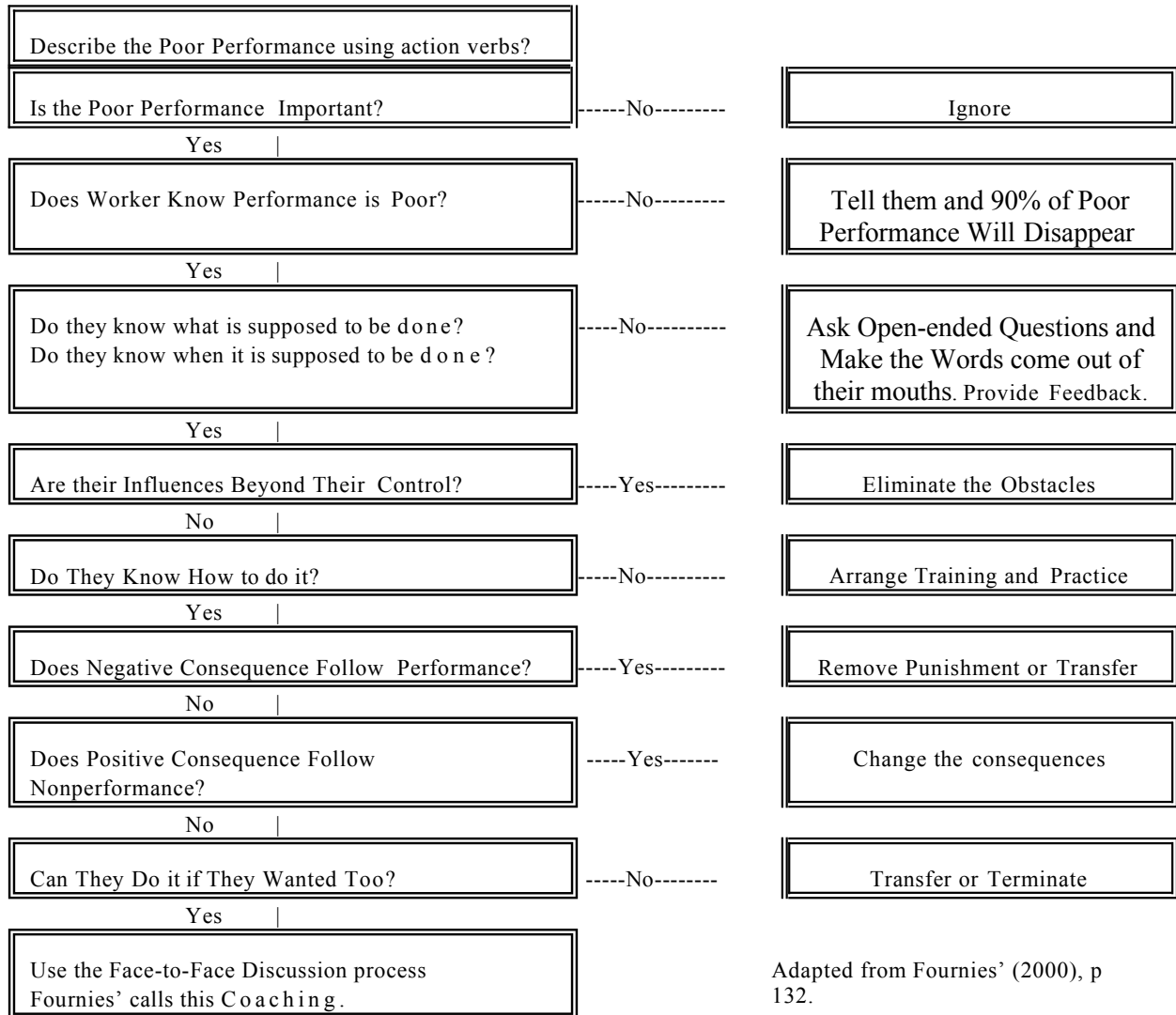
**Example of a Grievance Procedure Flow for an Individual (continued)**

Once notified, the University and the Association will agree to an arbitrator within two (2) weeks. If the parties cannot agree, the arbitrator shall be selected by alternately striking one name from the following list. Determination of who strikes the first name will be by a flip of a coin. The name remaining is selected as the arbitrator.

The American Institute of Architects (1997), General Conditions of the Contract A201-2007 edition has established a claims procedure which requires mediation before arbitration.

### III. WORKING RELATIONSHIPS

#### Fournies' Coaching Analysis Flowchart (shows systematic questioning steps with solutions)

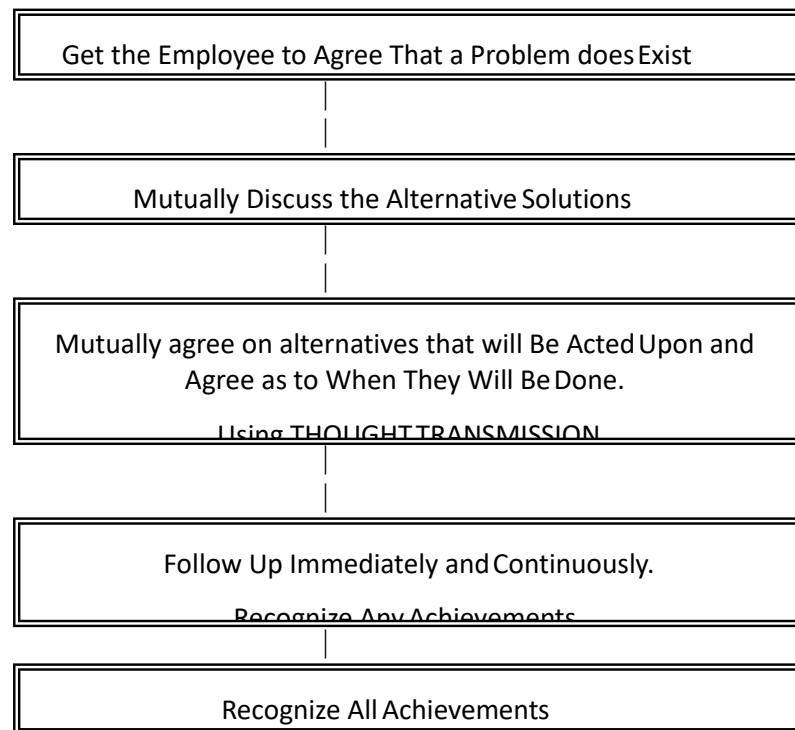


Adapted from Fournies' (2000), p 132.

## Fournies' Face-to-Face Discussion Flowchart

The Face-to Face Discussion process Flowchart requires the manager to effectively ask open-ended questions that will require thought transmission. It also requires the manager and the worker to mutually agree upon a set of alternatives with specific dates for implementation. The Coaching Face-to-Face Discussion process flowchart contains the following systematic steps.

### Fournies' Face-to- Face Discussion Process Flowchart for Coaching



Adapted from Fournies' (2000), p 166.

## Overcoming Listener Barriers Example

An example of the four step communication processes for neutralizing listener barriers are provided below and, in this example, James is explaining to Victoria, the crew leader, how he would like to install the new prefabricated metal form system from Armstrong. The conversation goes as follows:

**James:** "Victoria, we are going to use the Prefabricated Metal Forming System for this project. The panels are 2' by 8' and they will go together either vertically or horizontally to fit our requirements. We are going to start receiving delivery of them tomorrow, and someone from Armstrong will be arriving tomorrow to show us how to set up the system. Let's look at the prints, and I'll show you in general how I want you to approach this project. James continues to discuss his approach to performing the work for approximately five minutes.

"O.K., and that's the way I see the project. To see if I made myself clear, tell me what you understand my instructions to be?"

**Victoria:** "You want to use Prefabricated Steel panels. But, James, we can use Plyform. There won't be much cutting, and the company will own the material when we're through."

**James:** "What I asked you, Victoria, was if you understand my instructions to be on the approach to this project?"

**Victoria:** "I guess you'll have to go over that again. It must not have stuck with me the first time."

This is a very obvious example of **Step 1: Recognize and Acknowledge the Resistance**

**James:** "It seems to me you've got something on your mind distracting you from what I was saying. If you do, there's no sense in my trying to explain it again until we deal with what's on your mind."

**Victoria:** "James, I don't see why we need some specialist to help us. We've been putting up plyform for years without any help. It's just going to cost you extra money to have him out here. Besides, if you rent the forms, you don't have anything to show for the rental fee."

This statement is further evidence of the resistance. It's now time for **Step 2:**

## Step 2: Understand the Other Person's Ideas & Feelings

**James:** "Victoria, why are you asking about a management decision. It's not like you to argue about management decisions . . . which leads me to believe you are not too high on prefabricated metal forming systems."

**Victoria:** "I don't know if I am or not. I've never used them before."

**James:** "OK, so what's bugging you is that you're a little uneasy about using a completely new system?"

**Victoria:** "How am I supposed to be a lead person to erect a prefabricated forming system when I've never used them myself?"

Now, you know the basis of the resistance. She's not familiar with the new system. It's now time for Step 3:

### **Step 3: Show Understanding and Respect for Her Feelings.**

**James:** "If it's any comfort to you, I consider it a plus mark for you that you are so concerned about wanting to do a good job. There's no reason for you to feel bad about being uptight over starting to use a new forming system. We knew none of our crew had worked with this system when we decided it would be the one, we would use. We also believe very strongly that you can learn the new system without any problems."

**Victoria:** "OK, as long as we both know where we stand."

**James:** "Does that mean you are ready to learn about the prefabricated forming system?"

**Victoria:** "Yes, we might as well get on with it."

At this point, she is receptive to the instructions. She may still not understand everything perfectly the first time you go through it, but she has indicated her willingness to give it her full attention. Now it is time for **Step: 4**

### **Step 4: Restate Your Message**



## Overcoming Listener Barriers Discussion

The discussion above provided you with an example of the four-step communication process required to neutralize listener barriers. This procedure is used to achieve an exchange of understanding when listener resistance is discovered after the communication effort has already been started. Many times, the sender expects listener resistance before the message ever starts. For example, a subcontractor has not been sending enough people to a project to keep their progress current with the rest of the project. The sender expects a confrontation from the subcontractor before they even pick up the phone to talk.

Once the problems are stated, write out the objective of your communication. You, as a sender, must be comfortable with your objective and committed to achieving your communication objective. The sender should do everything possible to have the self-confidence necessary that will not allow the conversation to get away from the objective specified.

A very effective way to open the communication is to begin by stating the problem statement. Say, "My problem is . . . ." The psychology is that you are not pointing blame at someone else. Furthermore, without directly asking for help, you indirectly invite the listener to help you solve the problem. This method lets you control the communication process by invitation rather than by coercion. By stating the communication process this way, it is very likely that the listener will immediately reveal his or her point of view which accounts for the expected resistance. This usually saves a lot of time and establishes a safe place to launch into the key part of the communication. This is a very low key, nonthreatening way to come immediately to the point and stay on it.

One way to soften up the initial statement even more is to replace the word "problem" with the word "concern and say "My concern is..." This will usually accomplish the same thing as "My problem is..." The difference is that the word concern often seems to be less charged up than the word "problem." Once the communication is underway, follow the remaining communication steps to exchange understanding.

### What are Some Steps for Overcoming Communication Barriers using the Phone?

The first step is the sender must leave a message that can be acted upon by the listener. The sender should provide the reason for the call, what action needs to be taken by the listener, who you are and how you can be reached.

### What are Some Steps for Overcoming Communication Barriers using Sketches?

The sender should state the overall goal, label the name of each view, such as cross section, plan or elevated, and state the polar direction on each sketch, such as North, South, etc.

## Working Agenda Example

TO: Jim, Carol, Ken, Vicki, Keith, Deb  
 FROM: Ed B.  
 PROJECT: Jobsite, USA PROJECT NO. 001

SUBJECT: Activities Planned for September 2 - 15  
 DATE/TIME: Wednesday, August 27 from 10:00 A.M. - 11:15 A.M.  
 PLACE: Jobsite, USA in the Conference Room 107

PURPOSE: To Identify Potential Problems with the Schedule  
 SPECIFIC Review the Planned Activities  
 OBJECTIVES: Generate Ideas for the Material Delay and Sub Problems

10:00 - 10:15 CONSTRUCTION ACTIVITIES THAT MUST BE COMPLETED  
 Ed will discuss the completion dates of the activities for two weeks.

10:15 - 10:30 MATERIAL DELAYS  
 Carol says there will be a two-week delay on CU #1 & ACCU #4. Jim will discuss the impact on the erection of the structural steel. Keith will discuss the impact on the electrical and HVAC. Vicki will discuss the impact on the process piping and instrumentation.

10:30 - 10:45 INCREASE IN CREW SIZES AND AREA RESTRAINTS  
 The structural concrete, steel erection and precast concrete erection are behind schedule. Carol, Deb, and Jim will discuss increasing crew sizes.

10:45 - 11:00 DESIGN CHANGES  
 We will discuss how these changes will be implemented. There has been a major footing design change to Pier F2. Ken will discuss the completion.

11:00 - 11:15 NEXT MEETING  
 The date, time and location will be determined

**Meeting Minutes Example:**

SUBJECT: MINUTES OF THE PLANNING MEETING  
 DATE/TIME: Wednesday, August 27 from 10:00 A.M. - 10:45  
 A.M. PLACE: Jobsite, USA in the Conference Room 107  
  
 PRESENT: Carol, Ken, Vicki, Keith, Deb,  
 Ed ABSENT: Jim - Vacation  
 PROJECT: Jobsite, USA PROJECT NO. 001

**CONSTRUCTION ACTIVITIES THAT MUST BE COMPLETED**

Ed indicated that the redesigned Pier Footing F2 must be stripped by Sept. 6, all step footings by Sept. 8, and structural steel columns and beams by Sept. 12. Deb indicated that the South wall footing detail is needed. Ed said he would obtain a drawing by Aug. 28 at 10:00 A.M.

**MATERIAL DELAYS**

Carol indicated that the supplier said that Cooling Unit #1 (ACCU #1) will not arrive at the site until Sept. 27. Ken suggested that we leave an opening in the Roof to drop the unit through. Bob indicated that this will affect the Crane expected to leave the site on Sept. 15. Deb agreed to call and request that the date be extended to Sept. 17.

**INCREASE IN CREW SIZES AND AREA RESTRAINTS**

Deb and Ken agreed to increase their crew sizes on the structural concrete and steel erection. There will be 10 concrete workers and 6 ironworkers. Due to limited storage, Keith and Carol will store their materials and equipment at the Maple Street Building.

**DESIGN CHANGES**

Carol asked for a Contract Change Order for drawing E3, Revision #7. Ken said that the footing design change to Pier F2 is expected to be completed by Sept. 2.

**ADDITIONAL CONCERNS**

Deb said that the unloading of deliveries has been extremely difficult. Therefore, we will implement a daily schedule of times for material arrivals. Ed said he would develop a sign-up sheet by Aug 28.

NEXT MEETING: Thursday September 6, at 3:45 PM in Conference Room 107

#### IV. CONSTRUCTION START-UP AND SUPPORT

##### Notice of Award

TO: Harmony Enterprises  
12909 Royal Road  
Big Rapids, MI 49307

##### PROJECT Description:

Jones Commercial Building, 300 Main Street, corner of Main Street and Hynes, Big Rapids, MI 49307. Legal description Lot 15 of the recorded plat of main street as recorded in Liber 384 of Plats, Pg 587 f the Mecosta, County, Michigan records.

The \*OWNER has considered the BID submitted by you for the above described WORK in response to its advertisement for Bids dated September 5, 20 , and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$ 429,981. You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days of this notice to you.

If you fail to execute said agreement and to furnish said BONDS within Fourteen (14) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this 18\_\_day of November, 20 .

_____	By _____
Raymond P Jones, Sr. Owner	Title Edward M. Brayton, Architect

##### ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hearby acknowledged

Print Name\_\_\_\_\_this the\_\_\_\_day of\_\_\_\_\_,20\_\_\_\_

Signature\_\_\_\_\_ Title \_\_\_\_\_

**NOTICE TO PROCEED**

To: Harmony Enterprises	DATE
12909 Royal Road Big Rapids, MI 49307	PROJECT NAME PROJECT NUMBER:

You are hereby notified to commence WORK in accordance with the Agreement dates \_\_  
November 27\_\_, 20\_\_, on or before December 10\_\_, 20\_\_, and you are to complete the  
 WORK within 380 consecutive calendar days thereafter. The date of completion of all  
 WORK is therefore January 1\_\_, 20\_\_.

Printed Name \_\_\_\_\_ Title \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

**ACCEPTANCE OF NOTICE**

Receipt of the above NOTICE TO PROCEED is hereby acknowledged

Print Name \_\_\_\_\_ this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_

Signature \_\_\_\_\_ Title \_\_\_\_\_

## PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that \_\_\_\_\_,  
as Principal, hereinafter called Contractor, and, \_\_\_\_\_, as Surety,  
hereinafter called Surety, are held and firmly bound unto \_\_\_\_\_, as  
Obligee, hereinafter called Owner, in the amount of \_\_\_\_\_  
\_\_\_\_\_dollars ( \_\_\_\_\_ )

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators,  
successors and assign jointly and severally, firmly by this presence.

WHEREAS,

Contractor has by written agreement dated \_\_\_\_\_ entered into an agreement with Owner for

\_\_\_\_\_ in accordance with Drawings and Specifications prepared by \_\_\_\_\_

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_

\_\_\_\_\_  
(Contractor)

\_\_\_\_\_  
(Surety)

## LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that \_\_\_\_\_,  
as Principal, herinafter called Contractor, and, \_\_\_\_\_,  
as Surety, hereinafter called Surety, are held and firmly bound unto \_\_\_\_\_,  
as Obligee, hereinafter called Owner, in the amount of \_\_\_\_\_  
\_\_\_\_\_dollars ( \_\_\_\_\_ )

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assign jointly and severally, firmly by this presence.

WHEREAS,

Contractor has by written agreement dated \_\_\_\_\_ entered into an agreement with Owner for

\_\_\_\_\_ in accordance with Drawings and Specifications prepared by \_\_\_\_\_

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_

\_\_\_\_\_  
(Contractor)

\_\_\_\_\_  
(Surety)

**Schedule of Values Continuation Sheet Example**

CONTINUATION SHEET								
CONTRACTOR'S signed Certification is attached. In tabulation below, amounts are stated to the nearest dollar						APPLICATION NUMBER: BRAYTON ASSOCIATES FILE NO:		
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		STORED MATERIALS	TOTAL COMPLETED AND STORED TO DATE		BALANCE TO FINISH
			Previous Applications	This Application			%	
A	<u>GENERAL CONDITIONS:</u>							
1	Bond & Insurance							
2	Site Utilities, Sheds, ets							
B	<u>SITEWORK</u>							
1	Tree Removal							
2	Clear and Grub							
3	Strip Topsoil							
4	Earthwork							
5	Site Sanitary Sewer							
6	Site Storm System							
7	Water mains, Incl. Fire Hydrants							
8	Retaining Walls							
9	Bituminous Paving							
10	Curbs							
11	Sidewalks							
12	Elect, Power & Telephone Poles							
13	Topsoil Distribution							
C	<u>FOUNDATIONS:</u>							
1	Spread Footings							
2	Excavation and Backfill							
3	Perimeter Insulation							
4	Cast-In Place Foundation Wall							
	SUB TOTAL OR TOTAL							



## Temporary Office Space Requirements Table

*The Layout of Temporary Construction Facilities, Rad and James (article)*

RANGE OF TEMPORARY OFFICE SPACE REQUIREMENTS	
OFFICE	SIZE RANGE (S.F.)
Project Manager	130-275
Const. Manager	100-150
Mech./Elec./Civil Engr.	100-120 per engineer
Purchasing	500-900 (total)
Schedule & Cost Control	300-1000 (total)
Accounting	400-900 (total)
First Aid & Safety	180-200 per office
Clerical	300-800 (total)
Estimator	120

Rad and James recommend the following space requirements for sizing permanent offices. According to their survey, the size of the *Warehouse Office* should be based on the number of workers with an average of 100 square feet (9 m<sup>2</sup>) per person. The size of the *Payroll Office* should be determined in the same manner. Rad and James recommend the following areas according to the Table below:

RECOMMENDED VALUES OF INDUSTRIAL OFFICE SPACE			
OFFICE	SPACE REQUIREMENTS SF/PERSON		
	Minimum	Average	Optimum
General Office Work - Clerical	69	70	80-100
Engineers, Specialist	70	80	90-100
Double-Occupancy Office	100	112	125
Single Office specialist:	100	150	160
private Office Sub-Manager:	120	150	160-175
private Office Section manager.	200	300	325
Private Office General Manager:	350	400	425-450
Conference Room	22	25	30
Drafting Room	80	90	100

## National Electrical Contractors Study on the effects of Temperature and Humidity

According to the studies provided below, the Temperature and the Relative Humidity are the factors that must be taken into account when determining the detrimental effects of weather on productivity.

The table below provides some information concerning the loss of productivity at 30, 60 and 90 percent relative humidity at varying temperatures.

Adverse Effects of Weather on Productivity						
Effective Temperature	30 % Relative Humidity		60 % Relative Humidity		90 % Relative Humidity	
	Productivity	Loss Productivity	Productivity	Loss Productivity	Productivity	Loss Productivity
- 10 F	62%	38%	60%	40%	55%	45%
0 F	78%	22%	76%	24%	71%	29%
10 F	88%	12%	87%	13%	82%	18%
20 F	94%	6%	94%	6%	89%	11%
30 F	98%	2%	98%	2%	93%	7%
40 F	100%	0%	100%	0%	96%	4%
50 F	100%	0%	100%	0%	98%	2%
60 F	100%	0%	100%	0%	98%	2%
70 F	100%	0%	100%	0%	96%	4%
80 F	99%	1%	98%	2%	93%	7%
90 F	93%	7%	93%	7%	84%	16%
100	83%	17%	80%	20%	57%	43%
110 F	62%	38%	57%	43%	?	?

Adapted from a study done by the National Electrical Contractors' Association (NECA). The participants were journeymen electricians, between 40 and 50 years of age and they had worked 15 years on inside electrical installation.

It should be noted that, if conditions outside the normal (0.0) range are seldom encountered, it would be appropriate to ignore any adjustment. Another cautionary note is in order. The conditions considered are those which will be encountered in the area where work is actually performed. Thus, if a large building under construction is enclosed during the winter in plastic film and space heaters are employed to protect workers inside, there would be no degradation of performance even though outside conditions are extremely cold.

## V. CONSTRUCTION RESOURCE MANAGEMENT

### Completed Daily Job Diary

PROJECT <i>JOBSITE, U.S.A.</i>	REPORT NO.: 262							
JOB NO.: <u>001</u>	DATE: <i>AUGUST 5</i>							
CLIENT: <i>OWNER, INC</i>	DAY	M	T	W	Th	F	S	Su
	TEMPERATURE				50 AM		75 PM	
	WEATHER CONDITIONS:							
CONTRACTOR: <i>CONTRACTOR, INC</i>	AM	Bright	Clear	OVER	FOG	RAIN	CLOUDY	
	PM	Bright	Clear	OVER	FOG	RAIN	CLOUDY	
	WIND CONDITIONS							
SUPERINTENDENT: <i>JIM BOW</i>	AM	STILL		MODERATE		HIGH		
	PM	STILL		MODERATE		HIGH		
SAFETY ENGINEER: <u>JOHN CAP</u>	HUMIDITY CONDITIONS							
	AM	DRY		MODERATE		HUMID		
INSPECTOR: <i>KEN OVERTURE</i>	PM	DRY		MODERATE		HUMID		

#### Conversations:

9:15 a.m. Mr. Lineman of L.A. Testing phoned and said that Walker hired him for mix designs and Walker told him that he had talked to the civil engineering department and was given the OK to use A Laguna Mix Design, which contains Plastiment. I disagreed with him because these specs allow only air entrained.

9:30 a.m. Phoned Mr. Blume to verify the concrete mix design criteria and he said that the Laguna Mix Design is not approved for this project and that the design must be based on Air Entrainment.

**Technical Problems & Solutions:** A waiver of continuous inspections at batch plant has been signed and approved by Blume and he will accept certificates instead, but we must call for occasional inspections.

**Safety Recommendations:** The state inspector approved the temporary Railing & False work which is required for us to redirect the Tubers to the East Side of the river to avoid injuring anyone from falling objects.

Signature \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_

## Daily Construction Report

PROJECT <i>JOBSITE, U.S.A.</i>				REPORT NO.: <i>262</i>							
JOB NO.: <i>001</i>				DATE: <i>AUGUST 5</i>							
CLIENT: <i>OWNER, INC</i>				DAY	M	T	W	Th	F	S	Su
				TEMPERATURE			50 AM		75 PM		
				WEATHER CONDITIONS:							
CONTRACTOR: <i>CONTRACTOR, INC</i>				AM	Bright	Clear	OVER	FOG	RAIN	CLOUDY	
				PM	Bright	Clear	OVER	FOG	RAIN	CLOUDY	
				WIND CONDITIONS							
SUPERINTENDENT: <i>JIM BOW</i>				AM		STILL		MODERATE		HIGH	
				PM		STILL		MODERATE		HIGH	
SAFETY ENGINEER: <i>JOHN CAP</i>				HUMIDITY CONDITIONS							
				AM		DRY		MODERATE		HUMID	
INSPECTOR: <i>KEN OVERTURE</i>				PM		DRY		MODERATE		HUMID	

CRAFT	CONTRACTORS WORKERS				SUBCONTRACTORS WORKERS			
	CREW LEADER	APPRENTICE	JOURNEY	TOTAL	CREW LEADER	APPRENTICE	JOURNEY	TOTAL
Boilermakers					1		2	3
Carpenters	1	3	4	8				
Electricians					1	2	2	5
Insulators								
Iron Workers	1	2	7	10				
Laborers	1	1	4	6				
Operators					1	1	1	3
Pipe Fitters					1	1	2	4
Riggers								
Rod Busters	1	1	3	5				
SUB TOTALS	4	7	18	29	4	4	7	15
GRAND TOTAL					8	11	25	44

## Daily Construction Report (continued)

### Construction Activities:

Prefabricated wall forms @ Col. Line D Tied column rebar for Col A & B @ Col. Line B-B; Placed Forms for Col C & D Stripped Wall Forms @ Col line B-B; Placed 100 Ft of 24" RCP Drainage Pipe from Manhole #30 to #31; Subcontractor Excavated and Hauled 400 Cy of Dirt south Lane of the Roadway from Sta 00 to Sta 1 +01.

### Materials Used:

400 SF forms wall; 1.5 tons rebar columns; 100 lf reinforced concrete pipe; 400 PCS - 8" wall ties

### Materials Received:

10 tons rebar; 4000 LF electrical conduit.

### Construction Equipment at Site:

Cat D-7; Cat 955K; Cat D-3; Gradall; Manitowoc 3000B; 2 Front End Loaders H90 & 570A; 2 Clamshell Buckets; 2 Backhoes H2254 & Koring; 2 Sets of Cutting Torches; Generator; 1 Pump.

### Visitors to the Site:

City Inspector; Architect Jim Shane; Inland Steel.

### Meetings That Took Place:

Steel Fabrication Problems; Tool box Talk Monthly Safety Meeting; Progress Meeting.

## Daily Time Example and Card Procedures

The *Description* section describes the construction activities worked on that day by 1.

**operations**, such as mixing mortar, rehandling brick, setting scaffolding, cleanup, layout, form or place rebar and by 2. **types of work location**, such as footings, walls, stairs, second floor, roof.

Also, any **extra work** should be described in a separate column under its own description such as EWO for Brown Brick Retaining wall. An article in ENR, stated that Contractor's lose \$5 billion per year that they are entitled to because they do not have the time cards to backup their claims for extra work.

The *Activity Hours* section requires the supervisor to place: Below the line / \_\_\_ the straight time hours an employee worked on for each specific construction activity. The activity hours above the line \_\_\_/ the overtime hours, if any, that an employee worked for each specific construction activity.

To total the time card for each employee on the Daily Time Card follow the steps below:

1. Add each row of straight time hours, and place in the total HOURS column below the line.
2. Add each row of overtime time hours, and place in the total hours column above the line.

For the Total Hours Column:

1. Add up the straight time hours in the total hours column, and place in the grand total column below the line.
2. Add up the overtime time hours in the total hours column, and place in the grand total column, above the line.

For the Total Construction Activity Hours:

1. Add up the straight time hours for each construction activity and place in the grand total column, below the line.
2. Add up the overtime time hours for each construction activity and place in the grand total column, above the line.

To Balance the Activity Hours to the Grand Total Hours:

1. Add all straight time hours for each activity and this should balance to the grand total of the total hours column.
2. Add all overtime time hours for each construction activity and this should balance to the grand total of the total hours column.

## **The Daily Time Card Description of Work Performed**

In order to obtain accurate production rates about specific work items, this portion of the time card is the foundation for establishing the production rates (workhours/unit or unit/workhours), crew sizes, and daily outputs, therefore, the crew leaders should be instructed to identify all work items performed. This work item allocation must take place one in the morning and once in the afternoon each day to have an accurate distribution by activities performed at the job site. The work performed should identify direct construction operations, and material handling, layout, scaffolding, authorized extra work, rework, and idle time. An example time card filled out is shown below.

DAILY TIME CARD		COST CODE		033300	035300	033600	033800	036600	036800			
SIGNED: <u>J. Zinc</u> Crew Leader  APPROVED: <u>J. Bow</u>		Description of Work	Placed Footing Forms	Place Manu. Wall Forms	Poured Concrete Footings	Finish Concrete Footing	Poured Concrete Piers	Finished Concrete Piers	E W O 27 Retain Fig	DATE: <u>August 5</u> DAY: <u>FRIDAY</u>		
CRAFT	NAME								TOT HRS	RATE	AMOUNT	
Carp App	J. Cooper	/1	/3	/1	/	/1	/	/2	/8	/5.00	/40.00	
Carp Fore	J. Zinc	/2	/3	/1	2/2	/1	/	/1	2/10	4.25/8.50	8.50/85.00	
Carpenter	K. Silver	/1	/3	/1	/	/1	/	/2	/8	8.00	/64.00	
Cement Fin	P. Gold	/	/	0/1	0/2	0/3	2/4	/	2/10	3.50/7.00	7.00/70.00	
		/	/	/	/	/	/	/	/	/	/	
	Grand Total	/4	/9	/4	2/4	/6	2/4	/5	4/36	X	15.50/259.00	



**Hauling Record Example**

Requested Information	Actual Information
Load Size	16 Cubic Yard Truck
Distance and Time	2 miles in Ten (10) minutes
Weight of the Material	32, 000 Pounds
Number of Trips per Hour	4.76 Trips per Hour
Activities Performed	Hauling Clay to Disposal

## Completed Daily Equipment Time Card Example

			Cost Code Number															
DAILY EQUIPMENT REPORT			Description of Work															
JOB NAME:																		
PREPARED BY:																		
EQUIP. FOREMAN:																		
DATE:                      SHIFT:																		
EQUIP #		DESCRIPTION OF EQUIP.																
173	Crane	I		1	1									2				
		W		4	2									6				
201	Backhoe	I						1						1				
		W						5	2					7				
333	Bulldozer	I								2				2				
		W								6				6				
	Total Hours			5	3			6	2	8				24				
TOTAL HOURS - IDLE TIME (I)				5	TOTAL COSTS - IDLE TIME (I)													
TOTAL HOURS - WORK TIME (W)				19	TOTAL COSTS - WORK TIME (W)													

## Subcontractor Bid Breakdown & Proposal Form Example

Note: all items in *italics* are completed by the subcontractor.

**Project:** *Brayton's Clear Lake Home  
15595 Colfax Cove Big  
Rapids, MI 49307*

Bid No.	Specification Division/Level	Bid Division Scope Description	Name of the Trade Contractor
195	09 29 10	<i>Furnish &amp; hang drywall</i>	<i>Drywall</i>

**We hereby submit the following proposal in accordance with:**

*Division 01 - General Requirements*

*Division 09 - FINISHES of the Technical Specifications. Bid*

*Division Scope Description Number 195 - Drywall*

**The following addenda numbers have been included in our proposal:**

*Addendum No. 1, dated April 28, 20\_\_*

*Addendum No. 2, dated May 6, 20\_\_*

**Our past experience tells us that not all contractors will do all of the work as specified.**

**Therefore, please submit your bid breakdown as follows so that we can evaluate all bids:**

<i>Proposal Item Description Breakdown :</i>	Price Breakdown
<i>Metal Suspension System</i>	<i>\$ 8,940.00</i>
<i>Dry Wall</i>	<i>\$6,131.00</i>
<i>Taping</i>	<i>0.00</i>
<i>Plastering and Texturing</i>	<i>\$1,921.00</i>
<i>Insulation</i>	<i>\$2,501.00</i>
<i>TOTAL BID</i>	<i>\$19,493.00</i>

**Our Lump Sum Base Bid for the work outlined in this Bid Division Scope is:**

*Nineteen thousand four hundred & ninety-three Dollars (\$19,493.00)*

**We agree to Add or Deduct from our base bid the following Alternates:**

No.	Alternate Description	Written Amount	\$ Amount
3	<i>Performance and Payment Bonds</i>	<i>Add Two thousand Dollars</i>	<i>\$2,000</i>

## Subcontractor Bid Breakdown & Proposal Form Example (continued)

**We Anticipate the following crew sizes and time durations for the activities below:**

Submittal Date for Shop Drawings is	<i>May 20, 20__</i>
Number of Weeks for Delivery	<i>one week</i>
Installation Start Date	<i>May 25, 20__</i>
Number of Skilled Trade Employees	<i>four</i>
Total Number of Weeks to Complete	<i>three weeks</i>

**We propose to use the following Vendors or Suppliers:**

Material Item Description	Vendor/supplier
<i>Drywall</i>	<i>Gold Bond</i>

**Signature of Responsible Party and Date:**

\_\_\_\_\_ Date \_\_\_\_\_  
*signed by Lynn Oberg, Owner President, Drywall, Inc.*

**Acceptance of Proposal, Signed and Dated**

\_\_\_\_\_ Date: \_\_\_\_\_  
*signed by R. Sherry, President, Contractor, Inc.*

## Subcontractor Agreement Example

### SUBCONTRACT AGREEMENT

#### Section 1. PARTIES

THIS SUBCONTRACT AGREEMENT made and entered into the 25<sup>th</sup> day of December 20  
made at the offices of \_\_\_\_\_  
and between the CONTRACTOR *Contractor Inc.* \_\_\_\_\_ at

*345 Michigan Ave  
Big Rapids, MI 49307*  
hereinafter referred to as the Contractor,

and the SUBCONTRACTOR *Drywall, Inc* \_\_\_\_\_ at

*143 Huron Street Reed City,  
MI 49677*

hereinafter referred to as the Subcontractor, to perform part of the Work on the  
following Project:

PROJECT: *Brayton's Clear Lake Home  
15595 Colfax Cove Big  
Rapids, MI 49307*

OWNER: *Edward Brayton  
605 S. Warren Street  
Big Rapids, MI 49307*

ENGINEER: *Architects & Engineers, Inc.,  
145 Oak Street\_ Portland,  
MI 48875\_*

Drywall Inc. ("SUBCONTRACTOR"). WITNESSETH, That the CONTRACTOR and  
SUBCONTRACTOR for the consideration hereinafter set forth agrees as follows.

In consideration of the amount, the Subcontractor agrees to furnish all labor, materials, supplies, tools, equipment, supervision, utilities, testing, shop drawings and all else necessary to satisfactorily complete the Work described in Section 2 for *Brayton's Clear Lake Home 15595 Colfax Cove Big Rapids, MI* ("Project") on which the Contractor on behalf of *Edward Brayton* ("Owner"), said Work to be in accordance with this Subcontract, the Agreement between the Owner and *Contractor, Inc.*, and the applicable General Conditions, Special Conditions, Supplementary and General Conditions, drawings, plans, specifications, changes thereto ("Contract Documents") prepared by *Architects & Engineers, Inc.*, ("Architect" or "Engineer") for the Project, said Documents being incorporated herein by reference the same as if fully set forth herein

## Subcontractor Agreement Example (continued)

### Section 2. THE SCOPE OF WORK

Subcontractor shall provide all necessary materials and perform all of the following work, to be installed on the premises of Owner, in accordance with terms and requirements of this Subcontract Agreement. The Subcontractor shall perform the following described Work:

*The Drywall subcontractor will obtain and pay for all permits, include all costs for prevailing wages allowances, freight, sales tax, unloading materials, unloading and installing items furnished by others, removing existing drywall, cleaning up the site each day and calling for inspections required. Provide insurance certificates, trade license to do the work, attend all meetings and comply with labor agreements in your area. Guarantee the work for one year.*

*Furnish, cut, frame and install all studs, corner bead for all drywall ceilings and walls in the Building and Garage. Furnish and install all compounds to plaster and texture all ceilings and walls in the buildings. Furnish and install the materials for the acoustical metal suspension systems including access panels in the buildings. Furnish and install all insulation materials to insulate the ceilings and walls to make the drywall systems complete and operational in compliance with the specifications, codes and accepted by the Owner.*

The Subcontractor agrees to perform such part of the Work (hereinafter called "Subcontractor's Work": under the general direction of the Contractor and subject to the final approval of the Architect/Engineer or other specified representative of the Owner, in accordance with the Contract Documents. The Subcontractor will furnish all of the Labor and materials, along with competent supervision, shop drawings and samples, tools, equipment, scaffolding, and permits which are necessary for such performance. The Subcontractor binds himself to the Contractor for the performance of Subcontractor's Work in the same manner as Contractor is bound to the Owner for such performance under Contractor's contract with the owner. The pertinent parts of such contract will be made available upon Subcontractor's request.

Should any question arise with respect to the interpretation of the drawings and specifications, such questions shall be submitted to the Architect/Engineer and his decision shall be final and binding. If there is no Architect/Engineer for this Project, the Contractor's decision shall be followed by the Subcontractor.

## Subcontractor Agreement Example (continued)

### Section 3. ENUMERATION

The Contract's Documents, which constitute the entire agreement between the Owner and the Contractor and, except for Modifications issued after execution of this Agreement, are enumerated as follows: (List, below the Agreement, the conditions of the contract (General, Supplementary, and other conditions), the Drawings, the Specifications, and any Addenda and accepted alternates, showing page or sheet numbers in all cases and dates where applicable.)

*All Drawings and specifications entitled Jobsite USA, and dated March 6,*

<i>T1</i>	<i>dated 6/20/20 _ issued for Construction</i>	<i>S 1</i>	<i>dated 6/20/20 _ issued for Construction</i>
<i>L1</i>	<i>dated 6/20/20 _ issued for Revisions</i>	<i>S 2</i>	<i>dated 6/20/20 _ issued for Construction</i>
<i>A1</i>	<i>dated 6/20/20 _ issued for Construction</i>	<i>S 3</i>	<i>dated 6/20/20 _ issued for Construction</i>
<i>A 2</i>	<i>dated 6/20/20 _ issued for Approval</i>	<i>M 1</i>	<i>dated 6/09/20 _ issued for Permits</i>
<i>A 3</i>	<i>dated 6/20/20 _ issued for Construction</i>	<i>M 2</i>	<i>dated 6/09/20 issued for Permits</i>
<i>A 4</i>	<i>dated 6/20/20 _ issued for Approval</i>	<i>E 1</i>	<i>dated 6/20/20 issued for Construction</i>

*General Conditions pages 1 through 19 dated March 16, 20\_\_ Supplementary*

*Conditions pages SC1 - SC5 Dated March 17, 20\_\_*

*Prevailing Wage Rate Table, Harris County, Houston, TX dated February 24, 20\_\_ Bidding Requirements, Volume 1, dated March 14, 20\_\_*

*General Requirements Division 01 Volume 2, dated March 15, 20\_\_*

*Contract Conditions & Technical Specifications Divisions 02-49 Volume 2, dated March 15, 20\_\_*

*Alternate No. 3, Performance and Payment Bond Subcontract*

*Agreement, dated December 25, 20\_\_*

*Sub Bid Scope Description, Bid No. 195, Furnish and Hang Drywall dated April 15, 20 Subcontract*

*Bid Breakdown and Proposal Form signed and dated April 30, 20\_\_*

### Section 4. PAYMENT

The Contractor agrees to pay to the Subcontractor for the satisfactory completion of Subcontractor's Work the Lump Sum of *Nineteen Thousand Four Hundred and Ninety-Three Dollars (\$19,493)*.

The Subcontractor has agreed to *Add Two Thousand dollars (\$2,000) for the Performance and Payment bond.*

**Subcontractor Agreement Example (continued)**

After Contractor receives payment for said Work from the Owner, the Contractor shall pay Subcontractor monthly progress payments based upon the value of Work completed, less ten percent (10%) retention. Subcontractor shall furnish Contractor certified payroll information whenever requested by Contractor. Payment for any Work performed by Subcontractor shall not constitute acceptance nor relieve within thirty (30) days after Contractor receives final payment from the Owner provided all Work is completed, all Subcontractor obligations have been paid in full, all required documentation has been provided to Contractor and Subcontractor has executed standard Receipt and Release form. All amounts due Subcontractor shall be subject to any back charges for work performed or bills paid on behalf of the Subcontractor.

Payments made on account of materials not incorporated in the work, but delivered and suitably stored at the site, or at some other location agreed upon in writing, shall be in accordance with the terms and conditions of the Contract Documents. Subcontractor will provide monthly completed lien waivers and supplier affidavit forms, in a form satisfactory to the Owner and Contractor. Payment of the approved portion of the Subcontractor's monthly estimate shall be conditioned upon receipt by the Contractor of this payment from the Owner. Approval and payment of Subcontractor's monthly estimate is specifically agreed not to constitute or imply acceptance by the Contractor or Owner of any portion of the Subcontractor's Work.

In the event the subcontractor does not submit to the Contractor such monthly estimates by the tenth of each month then the Contractor may at this option include in his monthly estimate to the Owner for work performed during the preceding month such amount as they may deem proper for the Work of the Subcontractor for the preceding month and the Subcontractor agrees to accept such approved portion thereof in lieu of monthly payments based upon the Subcontractor's estimate.

In the event it appears to the Contractor that the labor, material and other bills incurred in the performance of Subcontractor's Work are not being currently paid, the Contractor may take such steps as he deems necessary to insure that the money paid with any progress payment will be utilized to pay such bills.



## Subcontractor Agreement Example (continued)

### Section 5. PROJECT CONTRACTUAL PROVISIONS

Subcontractor agrees to a Submittal Date for Shop Drawings of *May 20*,  
Subcontractor agrees to Deliver the Materials to the job site within *one week*.

Subcontractor agrees to a Start Date of *May 25*,  
Subcontractor agrees to supply a minimum of *Four (4)* skilled crafts.

Subcontractor agrees to complete the work within *three weeks*.

This Agreement shall be governed by the law in effect in Big Rapids, MI  
This agreement shall be governed by the prevailing wages in Mecosta, County, Michigan

### Section 6. PROJECT PROGRESS

Time is of the essence for both parties, and they mutually agree to see to the performance of their Work and the Work of their subcontractors so that the entire project may be completed in accordance with the Contract Documents. The Subcontractor shall provide the Contractor with scheduling information and Subcontractor's proposed schedule for the Subcontractor's Work.

The Contractor shall then prepare the Schedule of the Work and, as may be necessary, revise such schedule as the Work progresses. Subcontractor acknowledges that revisions may be made in such schedule and agrees to make no claim for acceleration or delay by reason of such revisions is of the type normally experienced in Work of this scope and complexity.

The Subcontractor shall keep the building and premises reasonably clean of debris resulting from the performance of Subcontractor's Work. If the Subcontractor fails to comply with this paragraph within 48 hours after receipt of notice of noncompliance from the Contractor, the Contractor may perform such necessary clean up and deduct the cost from any amounts due to the Subcontractor. The Subcontractor shall prosecute Subcontractor's Work in a prompt and diligent manner in accordance with the Schedule of Work without hindering the Work of the Contractor or any other subcontractor. If work of others is damaged by Subcontractor, the Subcontractor will cause such damage to be corrected to the satisfaction of and without cost to the Contractor and Owner. In the event Subcontractor fails to maintain his part of the Schedule of the Work, he shall, without additional compensation, work such overtime as the Contractor may direct until Subcontractor's Work is in accordance with such schedule.

**Subcontractor Agreement Example (continued)**

The Subcontractor shall comply with all Federal, State and local laws, Social Security Laws and Unemployment Compensation Laws, Worker's Compensation Laws and Safety Laws insofar as applicable to the performance of this Agreement. He shall pay all taxes applicable to the performance of Subcontractor's Work. He shall also maintain his own safety program for compliance with such laws.

**Section 7. WARRANTY**

The Subcontractor agrees to promptly make good without cost to the Owner or Contractor any and all defects due to faculty workmanship and/or materials which may appear within the guarantee or warranty period so established in the Contract Documents; and if no such period is stipulated in the contract Documents, then such guarantee shall be for a period of one year from date of completion and acceptance of the project by the Owner. The Subcontractor further agrees to execute any special guarantees as provided by the terms of the contract Documents, prior to final payment.

**Section 8. OVERTIME**

Should the Contractor request the Subcontractor to work overtime in order to expedite the final completion of the work, Subcontractor shall do so in accordance with the Contract Documents.

**Section 9. INSURANCE**

Unless otherwise required by the Contract Documents, the Subcontractor shall purchase and maintain insurance covering Worker's Compensation, Employer Liability Insurance, Comprehensive General Liability Insurance with contractual coverage, Automobile Liability Insurance and such other insurances, to the extent required by the Contract Documents for the Subcontractor's Work. The Subcontractor's Comprehensive General and Automobile Liability Insurance, as required by Paragraph 5.1 shall be written for not less than limits of liability as follows: The Comprehensive General Liability Insurance (including operations, personal injury, property damage, sublet, completed operations, contractual, explosion, collapse and underground hazards shall contain the following minimum limits: \$200,000 combined single limit bodily injury and property damage).

### **Subcontractor Agreement Example (continued)**

The Contractual Liability (Hold Harmless) Insurance shall be *\$250,000 for Bodily Injury and Property Damage for Each Occurrence and \$500,000 for the Aggregate.*

The Automobile Liability Insurance shall contain the following minimum limits: *\$300,000 for Bodily Injury for Each person and \$600,000 for Each Accident.*

The Worker's Compensation is *Statutory for state of operations.*

The Employer's Liability Insurance shall contain the following minimum limits: *\$100,000.*

The Umbrella Excessive Liability Insurance shall contain a *\$700,000 over the Primary Insurance*

Before commencing work, Subcontractor shall provide with a current Certificate of Insurance on forms provided by Contractor indicating the type and amount of coverages insuring Subcontractor with provision for thirty (30) days prior written notice of cancellation or material modification.

#### **Section 10. PERFORMANCE BOND AND PAYMENT BOND**

A Performance Bond and a Labor and Material Payment Bond in a form satisfactory to the Contractor shall be furnished in the full amount of this Agreement, if required by the Contractor. This obligation shall continue throughout the agreement and may be required at any time during the performance of Subcontractor's Work by a change.

#### **Section 11. CHANGES AND CLAIMS**

The Contractor and Subcontractor agree that the Contractor may add to or deduct from the amount of Work covered by this Agreement, and any changes so made in the amount of Work involved, or any other parts of this Agreement, shall be by a written amendment hereto setting forth in detail the changes involved and the value thereof which shall be mutually agreed upon between the Contractor and Subcontractor. The Subcontractor agrees to proceed with the Work as changed when so ordered in writing by the Contractor so as not to delay the progress of the Work, and pending any determination of the value thereof unless Contractor first requests a proposal of cost before the change is effected. If the Contractor requests a proposal of cost for a change, the Subcontractor shall promptly comply with such request. The Subcontractor agrees to give Contractor written notice of any claims for any cause whatsoever within fourteen (14) days of its initial occurrence unless a shorter notice period is required by the Contract Documents.

Notwithstanding any other provision, if the work for which the Subcontractor claims extra compensation is determined by the Owner or Architect not to entitle the Contractor to a Change Order or extra compensation, then the Contractor shall not be liable to the Subcontractor for any extra compensation for such Work, unless Contractor agreed in writing to such extra compensation.

## Subcontractor Agreement Example (continued)

### Section 12. MEDIATION AND ARBITRATION

Should the Contractor enter into arbitration with the Owner or others regarding matters relating to this Agreement, the Subcontractor shall be bound by the result of the arbitration to the same degree as the Contractor. The Subcontractor shall carry on Subcontractor's Work and maintain his progress during any arbitration proceedings.

### Section 13. TERMINATION

If the Subcontractor fails at any time to supply a sufficient number of properly skilled workers or sufficient materials and equipment of the proper quality, or fail in any respect to prosecute the Work with promptness and diligence, or fails to promptly correct any breach within Seven (7) days after receipt of written notice thereof from the Contractor, then without further notice to Subcontractor or prejudice to any other right which Contractor may have pursuant to this Subcontract or by law, the Contractor may terminate all or any portion of this Subcontract for default, the Contractor may, at his option, provide such labor, materials and equipment and to deduct the cost thereof, together with all loss or damage occasioned thereby, from any money then due or thereafter to become due to the Subcontractor under this Agreement. In the event that the unpaid balance due exceeds the Contractor's cost of completion, the difference shall be paid to the Subcontractor; but if such expense exceeds the balance due, the Subcontractor agrees promptly to pay the difference to the Contractor.

IN WITNESS the parties have executed this Agreement, the day and year written above.

Contractor, Inc.	Drywall, Inc.
By _____	By _____
R. Sherry, President    Date: May 26, 20	Lynn Oberg, Owner    Date: May 26, 20

## Material Control and Equipment Production Estimating

### Estimating Wood Sheet Piling Material Quantities

The Wood Sheet Piling Quantities and the materials cost for a Cofferdam that is 10 feet wide by forty-four feet long by nine feet deep enclosed with a three-foot toe is shown below. The Wales are placed at a Maximum Vertical Spacing of Four Feet. The Wale at the bottom must not exceed 1 foot. The Top Wale must be flush with the top of the upright. The Braces are 10' maximum on- center and along each line of wales with one for the starter within 2.5 feet of ends.

MATERIAL	COM PONENT SIZES	PRICES
Sheet Piling	3" x 14"	\$390/M BF
Wales	6" x 8"	\$390/M BF
Cross braces	10" x 10"	\$390/M BF
Lumber Waste	5%	

#### 1. What is the total Square Feet of Contact Area (S.F.C.A.) for the Cofferdam Sheet Piling

Description	Ltr	No	Length	Width	Depth	SFCA	
Sheet Piling	A		10				
	B		44				
	C		10				
	D		44				
			108		12	1,296	

#### 2. What is the Total Vertical Lineal Feet (VLF) of Sheet Piling?

Description	Ltr	No	Total Length	Width of Piece (Decimal)	Number Pieces (Whole)	Depth of a Piece	Total VLF
Sheet Piling				14"/12"			
			108	1.17	93	12	1,116

#### 3. What is the Total Board Feet (BF) for these Cofferdam Components?

Description		O.C.	No +1	Lines	L	Total LF	Timber Size	BF per LF	Total BF
Sheet Piling	108	1.17	93		12	1,116 VLF	3" x 14"	3.5	3,906
Wales	9	4	3		108	324	6" x 8"	4.0	1,296
Cross braces	44	10	5	3	10	150	10" x 10"	8.33	1,250
Subtotal									6,452
Waste	5%	6,452							323
Total									6,775

## Material Control and Equipment Production Estimating (continued)

### Estimating Wood Sheet Piling Material Unit Costs

Given the following material prices, calculate the Total Material Costs for the wood cofferdam system and calculate the Material Unit costs in SFCA and VLF:

MATERIAL	COMPONENT SIZES	PRICES
Cofferdam Lumber		\$390/MBF
Nails	8Lbs/100 S.F.C.A..	\$77 per 50 bs Box
Salvage	45%	
Transportation		\$40/MBF
Sales Tax	4% of all Costs exclude Transportation	

1. What is the Total Lumber Cost and the Lumber Cost Allocated to this project?

Description	Calculations	Total Quantity	Unit	Unit Price	Total Material Cost
Lumber	6,775 BF/1000MBF	6.775	MBF	\$390	\$2,642
(Deduct) Salvage	45% (\$2,642)				(\$1,189)
Total Lumber Allocated to this Project					\$1,453

2. What are the Pounds of Nails and the Total Cost of the nails?

Nails	8 lbs/100 S.F.C.A. x 1,296 S.F.C.A. = 104 L b s .	50Lbs/Box = 3 Bx	\$77/B	\$231
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3. What are the Costs for the remaining items?

Sales Tax	4% (\$2,642 + \$231) =	\$115
Transportation	6,775 BF x \$40/1000 BF =	\$271

4. What is the Total Material Cost allocated to this project?

Total Material Costs for this Project	\$1,453 + \$231 + \$115 + \$271 =	\$2,070
---------------------------------------	-----------------------------------	---------

5. What are the material costs per Square Foot Contact Area (\$M/S.F.C.A.)?

$$\frac{\$2,070}{1,296 \text{ S.F.C.A.}} = \$1.60/\text{S.F.C.A.}$$

6. What is the material cost per Vertical Lineal Feet (\$M/VLF)?

$$\frac{\$2,070}{1,116 \text{ VLF}} = \$1.85/\text{VLF}$$

## Material Control and Equipment Production Estimating (continued)

### Hauling Production Example

Given that the 3 CY hydraulic backhoe will load at a rate of 150 CY/Hr and the trucks will haul 12 CYs per load to the disposal site 3 miles away. The trucks will average 12 Miles per hour (MPH) Loaded and 22 MPH Empty. Assume the truck Unload Time is 3 minutes.

1. Determine the truck round trip cycle time in hours (decimal of an hour).

Categories	Calculation	Time
Position	0 Minutes/60 minutes =	.000
Load	12 CY Truck/150 CY Backhoe =	.080
Haul Away	3 Miles Away/12.0 Miles Per hour Loaded	.250
Unload	3 minutes/ 60 minutes	.050
Return	3 Miles Away/22.0 MPH empty	.140
	Total Round Trip Time for 1 Truck	.520

2. Determine the Number of Round Trips/hours for one-truck

$$\frac{1}{.52/\text{hr}} = 1.92 \text{ trips/hour}$$

3. Determine the Number of Trucks needed to keep the Backhoe working efficiently.

$$\frac{\text{Backhoe Production}}{\text{Haul Unit Production}} = \frac{150 \text{ CY/hr}}{12 \text{ cy} \times 1.92 \text{ Trips/hr}} = 6.5 \text{ use } 7$$

4. Verify the Production Rate by back-checking.

$$\frac{7 \text{ trucks} \times 1.92 \text{ trips/hr} \times 12 \text{ CY Truck capacity}}{150 \text{ cy/hr backhoe capacity}} = 1.07 \text{ hour or } 64.26 \text{ minutes. backhoe}$$

## Material Control and Equipment Production Estimating (continued)

### Hauling Equipment Unit Cost Example

Given that you must excavate 2,532 CY and the equipment production rates and hourly rates, mobilization, the crew size and hourly rates and the payroll burden:

No.	EQUIPMENT		Equipment Hourly Rate	Total Costs
1	Backhoe	$\frac{2,532 \text{ CY}}{150 \text{ CY/Hr.}} = 16.88 \text{ hr.}$	\$48.00 per hour	\$810.24
	Backhoe Mobilization	\$200/16.88 hr.	\$11.85 per hour	\$200.00
	Total Backhoe Costs			\$1,010.24
	Trucks		\$13.10 per hour	

No.	CRAFT		Hourly Rate	Total Hourly Costs
1	Crew Leader		\$15.25 per hour	\$15.25 per hour
1	Backhoe Operator		\$12.45 per hour	\$12.45 per hour
			Subtotal	\$27.70 per hour
	Payroll Insurance	$9.87\% \times \$27.70$		\$2.74 per hour
	Payroll Taxes	$14.55\% \times \$27.70$		\$4.03 per hour
			Total Hourly Costs	\$34.47 per hour

- Determine the Backhoe Equipment Cost per Cubic Yard

$$\frac{\$1,010.24}{2,532 \text{ CY}} = \$0.40/\text{CY} \quad \text{or} \quad \frac{\$59.85 \text{ per hour}}{150 \text{ CY per hour}} = \$0.40/\text{CY}$$

- Assume 7 trucks. Determine the Hauling Equipment Cost per Cubic Yard.

No.	EQUIPMENT	Equipment Hourly Rate	Total Hourly	CY per Hour	Cost per CY
7	12 CY Trucks	\$13.10/hour	\$91.70	/150.00	=\$0.61/CY

- Determine the Labor Cost per Cubic Yard To Excavate.

$$\frac{\$34.47/\text{hour}}{\text{CY/hour}} = \$0.23/\text{CY}$$

- The rate includes burden. Determine the Labor Cost per Cubic Yard to haul.

No.	CRAFT	Craft Hourly Rate	Total Hourly	CY/Hour	Cost per CY
7	Truck Drivers	\$14.85/hour	\$103.95	/150.00	=\$0.69/CY



## Material Control and Equipment Production Estimating (continued)

### Power Shovel Production Example

Given the Equipment Production Rates and Equipment Hourly Rates and the Labor Hourly Labor Rates below, answer the following questions concerning the Backhoe Production:

No.	EQUIPMENT	Production Information	Equipment Hourly Rate	Craft Hourly Rate (Including Burden)
1	2.5 CY Shovel	36 Seconds	\$55.00 per hour	\$30.00 per hour
	Efficiency	50 minutes per hour		
	12 CY Trucks	2 Trips per hour	\$37.50 per hour	\$ 25.65 per hour

1. Determine the Bucket cycles per hour.

$$\frac{60 \text{ seconds} \times 60 \text{ minutes}}{36 \text{ seconds per cycle}} = \frac{3600 \text{ seconds per hour}}{36 \text{ seconds per cycle}} = 100 \text{ cycles/hour}$$

2. Determine the (Theoretical) Production Rate for the 2-1/2 C.Y. shovel in CY per hour.

$$\text{Bucket size/cycle} \times \text{\#cycles/hour} = \frac{2.5 \text{ CY}}{\text{cycle}} \times \frac{100 \text{ cycles}}{\text{hour}} = 250 \text{ cy/hour (Theoretical)}$$

3. Determine the true (Actual) output for the shovel in Cubic Yards per hour.

$$\frac{50 \text{ minutes}}{60 \text{ minutes}} = 83.3\% \times 250 \text{ cy/hours} = 208 \text{ cy/hour}$$

4. Determine the number of trucks required to keep the Shovel working efficiently.

$$\frac{\text{Backhoe Production}}{\text{Haul Unit Production}} = \frac{208 \text{ CY/hr}}{12 \text{ CY} \times 2.00 \text{ Trips/hr.}} = 8.66 \text{ use 9 Trucks}$$

5. Using 1 standby truck, determine the Hauling Equipment Cost per Cubic Yard.

No.	EQUIPMENT	Equipment Hourly Rate	Total Hourly	CY per Hour	Cost per CY
10	12 CY Trucks	\$37.50/hour	\$375.00	/208.00	=. \$1.80/CY

## Material Control and Equipment Production Estimating (continued)

### Steel Drum Roller Compaction Production Example

Given that a total of 12,000 CY of fill must be compacted and the equipment production rates, the equipment hourly rates, mobilization and the crew size and hourly rates and the payroll burden for compacting provided below, answer these questions:

No.	EQUIPMENT	Production Information	Equipment Hourly Rate	
1	Vibrating Roller	10 Ton Roller, 5 feet wide	\$12.00	
	Operating Costs		\$1.50	
	Mobilization			\$3,500

No.	CRAFT		Hourly Rate	Total Hourly Costs
2	Laborers		\$12.00 per hour	\$24.00 per hour
1	Roller Operator		\$20.65 pe hour	\$20.65 pe hour
			Subtotal	\$44.65 per hour
	Payroll Insurance	9.87% x \$44.65		\$4.41 per hour
	Payroll Taxes	14.55% x \$44.65		\$6.50 per hour
			Total Hourly Costs	\$55.56 per hour

#### Compaction Production Information

The Steel Drum Roller Compactor moves at 1.5 Miles per hour working a 45-minute hour and 97% Proctor Density is developed after 6 passes for the 8-inch lifts.

- Determine the true (Actual) Production rate in Cubic Yards per Hour.

$$\frac{\text{width}}{\# \text{ Passes} \times 27 \text{ CF/CY}} \times \text{lift} \times \text{efficiency}$$

Note: The lift must be in a decimal of a foot

The efficiency must be in a decimal equivalency.

$$\begin{aligned}
 &= \frac{[5' \times 1.5 \text{ mph} \times 5280 \text{ feet per mile}]}{\text{passes} \times 27 \text{ cf/cy}} \times \frac{(8'') \times (45 \text{ minutes})}{(12'') \times (60 \text{ minutes})} \\
 &= \frac{244.43}{39,600} \times .67 \times .75 = 122.83 \text{ CY per hour} \\
 &\quad 162
 \end{aligned}$$

## Material Control and Equipment Production Estimating (continued)

### Steel Drum Roller Compaction Unit Cost Example (continued)

2. Determine the Equipment Cost per Cubic Yard (\$EQ/CY) for the Steel Drum Roller.

No.	EQUIPMENT		Hourly Rate	Total Costs
1	Vibrating Roller	$\frac{12,000 \text{ CY}}{122.83 \text{ CY/ Hr.}} = 98 \text{ Hr.}$	\$12.00 per hour	\$1,176.00
1	Operating Costs	= 98 Hr.	\$1.50 per hour	\$0,147.00
	Mobilization			\$3,500.00
			Total Equipment \$	\$4,823.00

$\frac{\$4,823}{12,000 \text{ CY}} = \$0.40/\text{CY} \text{ or}$	$\frac{\$13.50 \text{ per hour}}{122.83 \text{ CY/hour}} =$	\$0.11/CY
	$\frac{\$3,500}{12,000 \text{ CY}} =$	\$0.29/CY
		\$0.40/CY

3. Determine the Labor Cost per Cubic Yard (\$L/CY) for the Steel Drum Roller.

$$\frac{\$55.56/\text{hour}}{122.83 \text{ CY/hour}} = \$0.45/\text{CY}$$

## Material Control and Equipment Production Estimating (continued)

### Vibrating Plate Production and Equipment Unit Cost Example

No.	EQUIPMENT	Production Information	Equipment Hourly Rate	
1	Vibrating Plate	21" wide and 24" long	\$4.13	
	Operating Costs		\$0.69	
		Total Equipment	\$4.82	

No.	CRAFT		Hourly Rate	Total Hourly Costs
1	Laborer		\$15.50 per hour	\$15.50 per hour
	Payroll Insurance	9.87% x \$15.50		\$1.53 per hour
	Payroll Taxes	14.55% x \$15.50		\$2.26 per hour
			Total Hourly Costs	\$19.29 per hour

#### Compaction Production Information

The vibrating plate moves at 50 feet per minute (FPM) working a 50-minute hour and 97% Modified Proctor Density is developed after 4 passes for the 8-inch lifts.

Given that a total of 12,000 CY of fill must be compacted and the equipment production rates and hourly rates, mobilization the crew size and hourly rates and the payroll burden for compacting provided below, answer these questions:

1. Calculate the production rate in Cubic Yards per hour for the vibrating plate.

$$\frac{21''/12'' \text{ (plate width)} \times 50 \text{ FPM}}{4 \text{ passes (8' lift)} \times 27 \text{ CF/CY}} \times (8''/12'') \text{ ft. per lift} \times 50 \text{ Minutes} = 27.14 \text{ CY/hour}$$

$$= \frac{1.75 \times 50}{108} = \frac{87.5}{108} = .81 \times 0.67 \times 50 = 27.14 \text{ CY/hour}$$

2. Determine the Equipment Cost per Cubic Yard (\$EQ/CY) for the vibrating plate.

$$\frac{\$4.82/\text{hour}}{27.14 \text{ CY/hour}} = \$0.18/\text{CY}$$

3. Determine the Labor Cost per Cubic Yard (\$L/CY) for the vibrating plate.

$$\frac{\$19.29}{27.14 \text{ CY/hour}} = \$0.71/\text{CY}$$

## VI. CONSTRUCTION COST CONTROL

### Earned Workhour Report Example and Instructions

#### Prepare the Earned Workhour Report

The following discussion describes each column of the Earned Workhour Report and the procedure used to arrive at the correct answer.

1. *Cost Code.* The Cost Code in the Example is 035300.
2. *Activity Description.* The cost code and description from the contractor's master code of accounts assigned to each activity that must be performed on the project. The Activity Description in the example is *Wall Forms 12"*.

#### QUANTITIES

3. *Budgeted quantities* are calculated from the plans and reflect the actual quantities that must be placed. The Budgeted Quantity is found in the Estimate Ledger and for the example it is:  
1120 Square Feet of Contract Area.

4. *Weekly quantities* are the accumulated quantities that have been placed during the week. The Weekly Quantity is found in the Inplace Quantity Report and for the example it is:

60 Square Feet of Contract Area

5. *To Date quantities* are an accumulation of all previous weekly quantities. The Current Weekly Quantities are added to the To Date Quantity to arrive at the current To Date quantity placed. The To Date Quantity is found in the Inplace Quantity Report and for the example it is

60 for Week + 64 (Previous Weeks) = 124 Square Feet of Contract Area

6. *Unit* is the unit of measure used for that cost code. The Unit of measure in the example is SFCA, which is an abbreviation for Square Feet of Contract Area.

#### EXPENDED WORKHOURS (Whr)

7. *Weekly workhours* are the accumulated workhours spent for the week. The Weekly workhours are found in the Weekly Labor Distribution and in the example, it is 9 whr under the straight time (ST) column, which are all hours worked.
8. *To Date Workhours* are an accumulation of all previous weekly workhours. The Current Weekly Workhours are added to the To Date Workhours to arrive at the current To Date Workhours expended. The To Date Workhours are:

the current week of 9 workhours plus the previous workhours from the Detail Cost Ledger which is 15 workhours = 24 whr To Date.

## Earned Workhour Report Example and Instructions (continued)

### EARNED WORKHOURS

9. *Earned Workhours* in this column are the total workhours earned to date using the budgeted workhour unit rate and the quantities placed To Date. The earned workhours are calculated by multiplying the To Date Quantities times the Budgeted Workhour/Unit. The Earned Workhours in the example are earned at the Budgeted Unit Rate which is 192 Whr/1120 SF = .171 Whr/SF. Therefore, the total workhours earned is calculated as

$$\text{placed } 124 \text{ SF} \times 0.171 \text{ Whr/SF} = 21 \text{ Whr.}$$

10. *Budgeted Workhours* are the total workhours estimated to perform this activity. The Budgeted Workhours are found in the Estimate Ledger and is 192 Whr.

### UNIT WORKHOURS

11. *Budgeted Unit Workhour Rate* is expressed in Whr per unit (Whr/Unit). The budgeted standard rate is established companywide for each activity. The budgeted unit rate is calculated by taking the total Budgeted Workhours and dividing by the Budgeted Quantities. The Budgeted Workhours per unit rate in the example is:

$$192 \text{ Whr}/1120 \text{ SF} = 0.171 \text{ Whr/SF}$$

12. *Weekly Unit Workhour Rate* is expressed in Whr per unit (Whr/Unit). The weekly unit rate is calculated by taking the Weekly Expended Workhours and dividing by the Weekly Quantities placed. The Weekly Workhour per unit rate in the example is:

$$9 \text{ Whr}/60 \text{ SF} = 0.150 \text{ Whr/SF.}$$

13. *To Date Unit Workhour Rate* expressed in Whr per unit (Whr/Unit). The To Date Unit Rate is calculated by taking the To Date Expended Workhours and dividing by the To Date Quantities placed. The To Date Workhour per unit rate in the example is:

$$24 \text{ Whr}/124 \text{ SF} = 0.194 \text{ Whr/SF.}$$

PERCENTAGE are used to compare the total Earned to the Budgeted.

14. *Earned Percentage* is calculated by taking the total Earned Workhours and dividing by the total Budgeted Workhours. The Earned Percentage in the example is  $21 \text{ Whr} / 192 \text{ Whr} = 10.9\%$
15. *Expended Percentage* is calculated by taking the total Expended Workhours and dividing by the total Budgeted Workhours. The Expended Percentage in the example is  $24 \text{ whr To Date expended} / 192 \text{ Whr Budgeted} = 12.5\%$ .

## Earned Workhour Report Example and Instructions (continued)

### PROJECTED WORKHOURS

16. *Projected at Completion Workhours* are a forecast of the total Workhours to be spent when the estimated quantity is 100% complete. Using the *Straight-Line projection* method, the projected workhours at completion is calculated by multiplying the To Date Workhour Unit Rate times the Total Budgeted Quantities. The Workhours Projected at Completion in the example is:

$$1120 \text{ SF} \times 0.19 \text{ Whr/SF} = 213 \text{ Whr. (Three decimals } 0.194 \text{ Whr/SF} = 217 \text{ Whr.)}$$

17. *Projected Gain or (Loss)* is calculated by subtracting the Projected Workhours at Completion from the Total Budgeted Workhours and showing the net result. A (loss) is shown in parenthesis. If the Projected Workhours at Completion is greater than the Total Budgeted Workhours, you will show a (LOSS) in this column. If the Projected Workhours at Completion is less than the Total Budgeted Workhours, you will show a GAIN in this column. The Projected Workhour Gain or (Loss) in the example is:

$$\text{Budgeted Whr} = 192 \text{ Whr} - 213 \text{ Projected} = (21) \text{ a loss.}$$

The completed Earned Workhour Report is shown on the following page:

# Earned Workhour Report Example and Instructions (continued)

## EARNED WORKHOUR REPORT EXAMPLE

PROJECT NAME: Jobsite USA

PROJECT NUMBER: 001

CODE	DESCRIPTION	QUANTITIES			UNIT	EXPENDED WORKHOURS		WORKHOURS		UNIT WORKHOURS			PERCENT		PROJECTED	
		BUDGET	WEEK	TO DATE		WEEK	TO DATE	EARNED	BUDGETED	BUDGET	WEEK	TO DATE	EARNED	EXPENDED	COMPLETION	GAIN/LOSS
035300	Wall Forms	1120	60	124	SF	9	24	21	192	.17	.15	.19	10.9	12.5	213	(21)
		Estimate Ledger	In place Qty Current Week	In place Qty Current Week + Previous Qty's 60 + 64 124		Labor Dist Current Week	Labor Dist Current Week + Detail cost 9+15		Estimate Ledger	192 W hr 1120 Sf	9W hr 60 Sf	24 W hr 124 Sf	21 W hr 192 W hr	24 W hr 192 W hr		
		1120 SF	TIMES .17 W hr /SF =					21								
		1120 SF	TIMES									.19 =	0		213	
									1'92	MINUS					213	(21)



## Earned Workhour Report Example and Instructions (continued)

INPLACE QUANTITIES REPORT FOR THE EXAMPLE

PROJECT NAME Jobsite USA

PROJECT NUMBER 001

Cost Code	Description	Unit	M	T	W	T	F	Week Total	Previous Total	To Date Total
035300	Wall Forms	SFCA	0	0	0	0	60	60	64	124

WEEK 2 LABOR DISTRIBUTION REPORT FOR THE EXAMPLE

PROJECT NAME Jobsite U.S.A. PAYROLL ENDING August 5

PROJECT NUMBER 001 PAYROLL NUMBER 6\_

Cost Code	Craft	WORKHOURS							TOTALHRs		RATE \$/Hr		TOTAL \$	
		M	T	W	Th	F	S	S	PT	ST	PRM	REG	PRM	REG
035300	Carp Appr					2/3			2	3	2.50	5.00	\$5.00	\$15.00
	Carp Leader					1/3			1	3	4.25	8.50	\$4.25	\$25.50
	Carpenter					/3				3		\$8.00		24.00
Total						3/9			3	9			\$9.25	\$64.50

Note: PT indicates Premium Time.

ST indicates Straight Time.

PRM means Premium or the Overtime Pay a person earns.

REG Means the Regular Pay a person earns.

## Earned Workhour Report Example and Instructions (continued)

### ESTIMATE LEDGER FOR THE EXAMPLE

PROJECT NAME <u>JOBSITE USA</u> PROJECT NUMBER <u>001</u>					COST CLASSIFICATION				
					1	2	4	5	
Cost Code	Description	Quantity	Unit	Workhours	Labor Cost	Material Cost	Equipment	Subcontract	Total
	Wall Form - Original	720	SFCA	122.00	\$2310.00	\$400.00			\$2710.00
	C.C.O. #7	400	SFCA	70.00	\$1285.00	\$504.00	\$300.00	\$207.00	\$2296.00
035300	Wall Forms 12"	1120	SFCA	192 Whr	\$3595.00	\$904.00	\$300.00	\$207.00	\$5006.00

### DETAILED COST LEDGER FOR THE EXAMPLE

PROJECT NAME <u>JOBSITE USA</u> PROJECT NUMBER <u>001</u>						COST CLASSIFICATIONS				
						1	2	4	5	
Cost Code	Date	Description	Ref	Quantity	Workhours	Labor Cost	Material Cost	Equipment	Subs Cost	Total Cost
035300	7/24	Wall Forms	PR 5	SFSC	15	\$105.45				\$105.45
	7/24		EQ 5					\$421.00		\$421.00
	8/01		PO 7				\$1141.00			\$1141.00
	8/01		SC 44						\$220.00	\$220.00
					15	\$105.45	\$1141.00	\$421.00		\$1887.45

## Labor Cost Report Example and Instructions

1. *Cost Code*. The Cost Code in the Example is 035300.
2. *Activity Description* is the cost code and description from the contractor's master code of accounts assigned to each activity that must be performed on the project. The Activity Description in the example is *Wall Forms 12"*.

### QUANTITIES

3. *Budgeted quantities* are calculated from the plans and reflect the actual quantities that must be placed. The Budgeted Quantity is found in the Estimate Ledger and for the example it is:  
1120 Square Feet.
4. *Weekly quantities* are the accumulated quantities that have been placed during the week. The Weekly Quantity is found in the In-place Quantity Report and for the example it is:  
60 Square Feet.
5. *To Date quantities* are an accumulation of all previous weekly quantities. The Current Weekly Quantities are added to the To Date Quantity to arrive at the current To Date quantity placed. The To Date Quantity is found in the In place Quantity Report and for the example it is:  
60 for Week + 64 (Previous Weeks) = 124 Square Feet.
6. *Unit* is the unit of measure used for that cost code. The Unit of measure in the Example is SFCA, which is an abbreviation for Square Feet of Contact Area.

### EXPENDED LABOR DOLLARS

7. *Weekly Expended Labor Costs* are obtained from the Weekly Labor Distribution by adding the Total Premium (PRM) costs plus the Total Regular (Reg) cost. The Weekly Expended Cost from the Labor Distribution Week 2 is:  
\$9.25 (PRM) + \$64.50 (Reg) = \$73.75.
8. *To Date Expended Labor Costs* are an accumulation of all previous weekly labor costs. The Current Weekly Labor Costs from the Weekly Labor Distribution are added to the To Date Labor Costs from the Detail Cost Ledger to arrive at the Current to Date Labor Cost. In the example, it is:

$$\$73.75 \text{ for the Week plus } \$105.45 \text{ from the Detail Cost Ledger} = \$179.20.$$

### BUDGETED COST

9. *Total Budgeted Costs* are obtained from the Estimate Ledger. This figure is the original estimated labor costs plus or minus all approved contract change orders. The Total Budgeted Cost in the Estimate Ledger from the labor column is \$3,595.00.

## Labor Cost Report Example and Instructions (continued)

### UNIT COSTS

10. *Budgeted Unit Costs* are calculated by taking the total estimated labor costs and dividing by the Budgeted Quantities. The unit costs are always expressed in LABOR COSTS per unit (\$/unit). The Budgeted Labor Cost per unit in the example is:

$$\$3,595/1120 \text{ SF} = \$3.21/\text{SF}$$

11. *Weekly Unit Costs* are calculated by taking the Weekly Expended Labor Costs and dividing by the Weekly Quantities placed. The example Weekly Labor Cost per unit is:

$$\$73.75/60 \text{ SF} = \$1.21/\text{SF}$$

12. *To Date Unit Costs* are calculated by taking To Date Expended Labor Costs and dividing by the To Date Quantities placed. The To Date Labor Cost per unit in the example is:

$$\$179.20/124 \text{ SF} = 1.44/\text{SF}$$

### PROJECTED LABOR COST

13. *Projected at Completion Labor Costs* is a forecast of the total labor cost to be spent when the estimated quantity is 100% complete. Using the Straight-Line projection method, the projected labor cost at completion is calculated by multiplying the To Date Unit Cost (\$/unit) times the Total Budgeted Quantities. The Projected Labor Cost at Completion is:

$$1120 \text{ SF} \times \$1.44/\text{SF} = \$1,613$$

14. *Projected Gain or (Loss)* is calculated by subtracting the Projected Labor Cost at Completion from the Total Budgeted cost and showing the net result. A (LOSS) is shown in parenthesis. If the Project Labor Cost at Completion is greater than the Total Budgeted Cost, you will show a (LOSS) in this column. If the Projected Labor Cost at Completion is less than the Total Budgeted Cost, you will show a GAIN in this column. The Project Labor Cost Gain or (Loss) is:

$$\$3595 \text{ Budgeted} - \$1,613 \text{ Projected} = \$1,982.$$

The Labor Cost Report is shown below:

**Labor Cost Report Example and Instructions (continued)**PROJECT NAME JOBSITE USA PROJECT NUMBER 001

LABOR COST REPORT FOR THE EXAMPLE

CODE	DESCRIPTION	QUANTITIES			UNIT	EXPENDED COST		BUDGET TOTAL	UNIT COST \$/UNIT			PROJECTED	
		BUDGET	WEEK	TO DATE		WEEK	TO DATE		BUDGET	WEEK	TO DATE	COMPLETION	GAIN/LOSS
035300	Wall Forms	1120	60	124	Sf	73.75	179	3595	\$3.21/Sf	1.21/Sf	1.44/Sf	\$1,613	\$1,982
		Estimate Ledger	Inplace Qty Current Week	Inplace Qty Current Week + Previous Qty's 60 + 64 124		Labor Dist. Current Week \$9.25 + 64.50 =	Labor Dist. Current Week + Detail Cost \$73.75 + 105.45	Estimate Ledger	<u>\$3595</u> 1120Sf	<u>\$73.75</u> 60 Sf	<u>170.20</u> 124 Sf		
		1120			SF	Times					\$1.44/sf	\$1,613	
								\$3,595	Minus			\$1,613	\$1,982

## Project Cost Summary and Example

The following discussion describes each column of the Project Cost Summary Report and the procedure used to arrive at the correct answer.

1. *Cost Code*. The Cost code for the example is 035300.
2. *Activity Description* The activity description associated with the cost code of 035316 is Wall Forms - 12".
3. *Item*, column summarizes the Budget, Actual Costs and Projected costs for each cost code by the following items:

CODE	ITEM
	Quantity
	Workhours
	Labor
	Material
	Equipment
	Subs
Sub Total Costs	

BUDGET INFORMATION from the Estimate Ledger

4. *Original Budgeted column* should reflect the quantities, workhours and cost classifications taken from the original column in the estimate ledger. The Original Budget in the example is 720 SF.
5. *Scope changes* are increases or decreases in quantities, workhours and cost classifications through approved contract change orders. The Scope changes are obtained from the estimate ledger. Also, internal shifts in the cost classifications from the original estimate to reflect the actual project being built called the budget are recorded here, but they must be kept separated from the contract change orders. The Scope Changes in the example resulted in an additional 400 SF.

## Project Cost Summary and Example (continued)

6. *Revised Budget* is the Accumulative total for the actual project budget. The revised budget is calculated by adding the Original Budgeted to the Scope Changes and showing the net increase or decrease in the Revised Budget column. The Revised Budget in the example is:

$$720 \text{ SF Original Budget} + 400 \text{ SF Scope changes} = 1120 \text{ SF}$$

EXPENDED INFORMATION from the Detail Cost Ledger

7. *Period Expended* column reflects the quantities, workhours and cost classifications that have been expended since the last report. Normally, the period consists of one month. The period items are obtained from the detail cost ledger. This is a stand-alone column for reference purposes only.
8. *Expended To Date*, column reflects the quantities, workhours and cost classifications that are an accumulation of previous period items expended. The Period items are added to the To Date figure from the Previous report to arrive at the Current Expended To Date figure in this report. The To Date Expended column in the example indicates that:

	Expended To Date	Committed Cost	Expended Total Costs
Quantity	124 SF	0	124 SF
Workhours	24 Whr	0	24 Whr
Labor Costs	\$179	0	\$179
Material Costs	\$800	\$341	\$1,141
Equipment Costs	\$421	0	\$421
Subcontract Costs	\$100	\$120	\$220
Sub Total Costs for Cost Code 035316	\$1,500	\$461	\$1,961

## Project Cost Summary and Example (continued)

9. *Committed Costs* are shown separately from the To Date Expended costs to indicate that the contractor is contractually required to pay for an item but it has not actually been paid for yet. This column is used to put cost items that you have contracted for such as subcontracts and purchase orders, immediately into the ledger system. The accounting system usually only reflects actual expended costs, therefore, to obtain the Expended Total Cost when the contract is 100% paid for, it is placed into this column first. The Committed Costs in the Example are:

Material Costs	\$341.00
Subcontract Costs	\$120.00
Subtotal Costs	\$461.00

10. *Expended Total* column is calculated by adding the Expended To Date column to the Committed Costs column for each item. The Expended Totals in the example are:

Expended Total
124 SF
24 Whr
\$179
\$1.141

### Committed Cost Example

For example, assume that you have signed a subcontract Agreement with the Electrical contractor for \$350,000. The contract calls for three monthly payments of \$100,000 at the end of the first month with subsequent payments of \$125,000 and \$125,000. Upon signing the contract, the \$350,000 would be placed into the Committed Cost column immediately and the Committed Cost would be added to the Expended To Date Costs, which is \$0 in the first month. Therefore, the Expended Total Cost column would be \$350,000.

Transaction Date	Expended To Date	Committed Cost	Expended Total Cost
Electrical Sub-Now	0	\$350,000	\$350,000



## Project Cost Summary and Example (continued)

In the second month, the Expended to Date Costs would be \$100,000, \$250,000 would be placed into the Committed Cost column and the Committed Cost would be added to the Expended to Date Costs of \$100,000. Therefore, the Expended Total Cost column would still be \$350,000.

Transaction Date	Expended To Date	Committed Cost	Expended Total Cost
ElectricalSub, Month 2	\$100,000	\$250,000	\$350,000

The purchase orders, subcontracts and rental equipment are recorded into the detail cost ledger as committed costs at the time they are written.

### PROJECTIONS BY THE PROJECT MANAGER

11. *Current projection at Completion* is a prediction of the total to be spent when the item is 100% complete. There are three methods for projecting at completion:

Using the *Straight-Line Projection Method* and projecting the at completion (Forecast) number by multiplying the To Date Unit Cost (\$/unit) times the Total Budgeted Quantities.

Using the *Expended Total Column* and projecting the Expended Total column as the projected at completion number.

Using the *Revised Budget Column* and projecting the Revised Budget as the projected at completion number.

The Current Projection in the example were made based upon the following methods.

	Current Projection	Projection Method
Quantity	1120 SF	Revised Budget
Workhours 24 Whr/124 SF = .19 x 1120 SF	213 Whr	Straight Line
Labor Costs \$179/124 SF = \$1.44/SF x 1120 SF	\$1,613	Straight Line
Material Costs	\$1,141	Expended
Equipment Costs	\$421	Expended
Subcontract Costs	\$220	Expended
Sub Total Costs for Cost Code 035316	\$3,395	////////////////////

## Project Cost Summary and Example Continued

12. *Projected Gain or (Loss)* is calculated by subtracting the Current Projection from the total Revised Budget and showing the net result: a gain or a (loss) shown in parenthesis. If the Projected Labor Cost at Completion is greater than the Total Revised Budgeted Cost, you will show a **(loss)** in this column. If the Projected Labor Cost at Completion is less than the total Revised Budgeted Cost, you will show a gain in this column.

	Revised Budget	Current Projection	Gain/(Loss)
Quantity	1120 SF	1120 SF	0
Workhours	192 Whr	213 Whr	(21) Whr
Labor Costs	\$3,595	\$1,613	\$1,982
Material Costs	\$904	\$1,141	(\$237)
Equipment Costs	\$300	\$421	(\$121)
Subcontract Costs	\$207	\$220	(\$13)
Sub Total Costs    035316	\$5,006	\$3,395	\$1,611

The completed Project Cost Summary Report is shown on the following page:

## Project Cost Summary and Example Continued

PROJECT NAME JOBSITE USA

\_PROJECT NUMBER 001

CODE	ITEM	ORIGINAL BUDGET	SCOPE CHANGES	REVISED BUDGET	EXPENDED		COMMITTED COST	EXPENDED TOTAL COST	CURRENT PROJECTED COST	PROJECTED GAIN/LOSS
					PERIOD	TO DATE				
035316	Wall Forms									
	Quantity	720 SF*	400 SF	1120 SF	60 SF	124 SF		124 SF	1120 SF	0 SF
	Workhours	122Whr	70Whr	192Whr	9	24Whr		24Whr	213Whr	(21) Whr
	Labor	\$2310	\$1285	\$3595		\$179		\$179	\$1613	\$1982
	Material	\$400	\$504	\$904		\$800	\$341	\$1141	\$1141	\$(237)
	Equipment	-0-	\$300	\$300		\$421		\$421	\$421	\$(121)
	Subcontracts	-0-	\$207	\$207		100	`120	\$220	\$220	\$(13)
Sub Total Costs		\$2710	\$2296	\$5006		\$1500	\$461	\$1961	\$3395	+\$1611
		W _ + W _ = W				W_____+ W_____ = W				
REVISED ESTIMATE 5006 MINUS CURRENT PROJECTION \$ 3395 EQUALS PROJECTED GAIN(LOSS) BUDGET +\$1611										

Note: SF is short for SFCA, which means Square Feet of Contact Area.

## Project Cost Summary and Example (continued)

### Procedures for Completing the Productivity and Labor Cost Reports.

1. **Put in all Budgeted** Quantities, Budgeted Workhours and Budgeted Labor Cost information from the Estimate Ledger.
  - A. On the Earned Workhour Report, Calculate the Unit Workhour Budgeted Rate by taking the Total Workhours Budgeted and Dividing by the Quantities Budgeted.
  - B. On the Labor Cost Report, Calculate the Labor Unit Cost Budgeted Rate by taking the Total Labor Cost Budgeted and Dividing by the Quantities Budgeted.
2. **Put in all Weekly** Quantities, Weekly Workhours Expended and Weekly Labor Cost information from the In place Quantity report and the current week Labor Distribution.
  - A. On the Earned Workhour Report, Calculate the Unit Workhour Weekly Rate.
  - B. On the Labor Cost Report, Calculate the Labor Unit Cost for the Week Rate.
3. **Put in all To Date** Quantities, To Date Workhours Expended and To Date Labor Cost information from the In place Quantity report and the current week Labor Distribution.
  - A. On the Earned Workhour Report, Calculate the Unit Workhour To Date Rate.
  - B. On the Labor Cost Report, Calculate the Labor Unit Cost for the To Date Rate.
4. **Calculate the Earned Workhours column**, on the Earned Workhour Report, by taking the In place Quantities To Date and multiplying by the Budgeted Workhour Unit Rate.
5. **Calculate the Earned and Expended Percentage columns**, on the Earned Workhour Report.
6. **Calculate the Projected at Completion number**, Using the **Straight Line projection** method by multiplying the To Date Unit Cost (\$/unit) times the Total Budgeted Quantities.
7. Calculate the Project Gain or (Loss).

## Balance Sheet Examples

### BALANCE SHEET

Assets	End of Year	End of Previous Y
Cash	\$ 565,807.00	\$ 750,000.00
Contracts Receivable	1,000,000.00	825,000.00
Inventory	1,690,000.00	1,250,000.00
Prepaid expenses	160,000.00	185,000.00
Total Current Assets	\$3,415,807.00	\$3,010,000.00
Property, Plant, Equipment	3,000,000.00	2,250,000.00
Accumulated Depreciation	(800,000.00)	(540,000.00)
Total Assets	\$5,615,807.00	\$4,720,000.00

Liabilities and Owners' Equity	End of Year	End of Previous Y
Accounts Payable - Inventory	\$ 520,000.00	\$ 450,000.00
Accounts Payable - Operating	120,000.00	85,000.00
Total Accounts Payable	\$ 640,000.00	\$ 535,000.00
Accrued Operating Expenses	\$ 240,000.00	\$ 185,000.00
Accrued Interest Payable	17,167.00	12,500.00
Total Accrued Expenses	\$ 257,167.00	\$ 197,500.00
Income Tax Payable	23,940.00	36,000.00
Short-Term Notes Payable	625,000.00	600,000.00
Total Current Liabilities	\$1,546,107.00	\$1,368,500.00
Long-Term Notes Payable	750,000.00	600,000.00
Total Liabilities	\$2,296,107.00	\$1,968,500.00
Capital Stock	775,000.00	725,000.00
Retained Earnings	2,544,700.00	2,026,500.00
Total Owners' Equity	\$3,319,700.00	\$2,751,500.00
Total Liabilities Owners' Equity	\$5,615,807.00	\$4,720,000.00

## Balance Sheet Examples (continued)

From the Example Balance Sheet (below), if you compare the columns labeled End of Year and Start of Year, the result will be a change in assets, liabilities, and owner's equities. These increases and decreases from the balance sheet tie directly in with the cash flow statement. For example, the balance sheet Contracts Receivable line item indicates an increase of \$175,000, and the heading Cash Flows from Operating Activities contains a line labeled Accounts Receivable, which shows a figure of (\$175,000).

<b>BALANCE SHEET</b>			
<b>Assets</b>	<b>End of Year Changes</b>	<b>End of Previous Y</b>	
Cash	\$ 565,807.00	\$ 750,000.00	(\$184,193.00)
Contracts Receivable	1,000,000.00	825,000.00	\$175,000.00
Inventory	1,690,000.00	1,250,000.00	\$440,000.00
Prepaid expenses	160,000.00	185,000.00	(\$25,000.00)
Total Current Assets	\$3,415,807.00	\$3,010,000.00	
Property, Plant, Equipment	3,000,000.00	2,250,000.00	\$750,000.00
Accumulated Depreciation	(800,000.00)	(540,000.00)	(\$260,000)
Total Assets	\$5,615,807.00	\$4,720,000.00	
<b>Liabilities and Owners' Equity</b>			
	<b>End of Year</b>	<b>End of Previous Y</b>	
Accounts Payable - Inventory	\$ 520,000.00	\$ 450,000.00	
Accounts Payable - Operating	120,000.00	85,000.00	
Total Accounts Payable	\$ 640,000.00	\$ 535,000.00	\$105,000.00
Accrued Operating Expenses	\$ 240,000.00	\$ 185,000.00	
Accrued Interest Payable	17,167.00	12,500.00	
Total Accrued Expenses	\$ 257,167.00	\$ 197,500.00	\$59,667.00
Income Tax Payable	23,940.00	36,000.00	(\$12,060.00)
Short-Term Notes Payable	625,000.00	600,000.00	\$25,000.00
Total Current Liabilities	\$1,546,107.00	\$1,368,500.00	
Long-Term Notes Payable	750,000.00	600,000.00	\$150,000.00
Total Liabilities	\$2,296,107.00	\$1,968,500.00	
Capital Stock	775,000.00	725,000.00	\$50,000.00
Retained Earnings	2,544,700.00	2,026,500.00	\$518,000.00
Total Owners' Equity	\$3,319,700.00	\$2,751,500.00	
Total Liabilities and Owners' Equity	\$5,615,807.00	\$4,720,000.00	

## Income Statement Example

### INCOME STATEMENT FOR THE YEAR 20--

Contract Revenues	\$10,400,000.00
Cost of Contracts	<u>6,760,000.00</u>
Gross Margin	\$ 3,640,000.00
Operating Expenses	2,080,000.00
Depreciation Expense	<u>260,000.00</u>
Operating Earnings	\$ 1,300,000.00
Interest Expense	<u>103,000.00</u>
Earnings before Taxes	\$ 1,197,000.00
Income Tax Expense	<u>487,800.00</u>
Net Income	<u>\$ 709,200.00</u>

## Cash Flow Statement Example

From the Cash Flow statement below, the business realized \$540,807 from Operating Expenses for the year ended. The company spent \$750,000 on capital expenditures. Its financing activities provided \$25,000 net of \$200,000 cash dividends to stockholders. In summary, the three sources of income, (1) Cash Flows from Operating Activities, (2) Cash Flows from Investing Activities, (2) and Cash Flows from Financing Activities, were less than the company's capital expenditures during the year. Therefore, the company's cash balance decreased by \$184,193.

<b>CASH FLOW STATEMENT FOR THE YEAR</b>		
<b>Cash Flows from Operating Activities</b>		
Net Income from Income Statement		\$718,200.00
Contracts Receivable Increase	(\$175,000.00)	
Inventory Increase	(440,000.00)	
Prepaid Expenses Decrease	25,000.00	
Depreciation Expense	260,000.00	
Accounts Payable Increase	105,000.00	
Accrued Expenses Increase	59,667.00	
Income Tax Payable Decrease	(12,060.00)	
Cash Flow Adjustments to Net Income		(\$177,393.00)
Cash Flow from Operating Activities		\$ 540,807.00
<b>Cash Flows from Investing Activities</b>		
Purchases of Property, Plant & Equipment		(\$750,000.00)
<b>Cash Flows from Financing Activities</b>		
Short-Term Debt Borrowing	\$ 25,000.00	
Long-Term Debt Borrowing	150,000.00	
Capital Stock Issue	50,000.00	
Dividends Paid Stockholders	(200,000.00)	\$ 25,000.00
Increase (Decrease in Cash during Year)		(\$184,193.00)



## Change Order Request Memo Example

### CHANGE ORDER REQUEST MEMO

FROM: Owner, Inc.  
261 Wash Ave.  
Houston, TX  
TO: Contractor, Inc.  
345 Michigan Ave.  
Houston, TX  
PROJECT NAME: Jobsite, U.S.A., Houston, TX

CHANGE REQUEST  
NUMBER 1

DATE July 25,

SUBJECT: Addition of Face brick

The enclosed drawing shows the addition of face brick to the north exposed concrete block basement wall.

Please submit a detailed bid breakdown indicating the net price. To ensure that this change can be implemented, we must receive your quotation by July 28 so that a change order, if approved, can be issued.

REQUESTED BY: \_\_\_\_\_  
Authorized Signature

**Change Order Form Example****CONTRACT CHANGE ORDER FORM**

**PROJECT:** JOBSITE, USA  
**OWNER:** Owner, Inc

**CHANGE ORDER NO.** \_\_\_\_\_  
**DATE** August 29, \_\_

**A/E PROJECT NO.:** 99-116

261 Wash Ave.

Houston, TX

**TO:** Contractor, Inc.  
345 Michigan Ave.  
Houston, TX

The contract is changed as follows:

---

Not valid until signed by the Owner, A/E and Contractor

---

ORIGINAL CONTRACT SUM \$ \_\_\_\_\_

NET CHANGE BY PREVIOUSLY AUTHORIZED CONTRACT CHANGES \$ \_\_\_\_\_

CONTRACT SUM PRIOR TO THIS CHANGE ORDER \$ \_\_\_\_\_

CONTRACT SUM WILL INCREASE/DECREASE BY THIS CHANGE ORDER \$ \_\_\_\_\_

NEW CONTRACT SUM INCLUDING THIS CHANGE ORDER WILL BE \$ \_\_\_\_\_

CHANGE IN CONTRACT TIME WILL BE (DAYS) \_\_\_\_\_

NEW DATE OF SUBSTANTIAL COMPLETION IS \_\_\_\_\_

---

Owner's Signature	Architect's/Engineers Signature	Contractors Signature
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---

**CONTRACT FOR:** JOBSITE, USA

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## Construction Change Directive Form Example

### CONSTRUCTION CHANGE DIRECTIVE FORM

<b>PROJECT:</b> <u>JOBSITE, USA</u> <b>OWNER:</b> <u>Owner, Inc</u> <u>261 Wash Ave.</u> <u>Houston, TX</u>  <b>TO:</b> <u>Contractor, Inc.</u> <u>345 Michigan Ave.</u> <u>Houston, TX</u>	<b>DIRECTIVE NO.</b> _____  <b>DATE</b> <u>August 22,</u> ____ <b>A/E PROJECT NO.:</b> <u>99-116</u> _____  <b>CONTRACT FOR:</b> <u>JOBSITE, USA</u> ____
--	--

You are hereby directed to make the following change(s) in this Contract:

#### PROPOSAL ADJUSTMENTS

1. The proposed basis of adjustment to the Contract Sum is:

\_\_\_ Lump Sum (increase) (Decrease) of \$ \_\_\_\_\_

\_\_\_ Unit Price of \$ \_\_\_\_\_ per \_\_\_\_\_

2. The Contract Time is Proposed to be (an increase or decrease of: \_\_\_\_\_ (days)

Owner's Signature

Architect's/Engineers Signature

Contractors Signature

Signature indicates Contractor's Agreement

## Minor Change In The Work Form Example

### MINOR CHANGE IN THE WORK FORM

<b>PROJECT:</b> <u>JOBSITE, USA</u> <b>OWNER:</b> <u>Owner, Inc</u> <u>261 Wash Ave.</u> <u>Houston, TX</u>  <b>TO:</b> <u>Contractor, Inc.</u> <u>345 Michigan Ave.</u> <u>Houston, TX</u>	<b>SUPPLEMENTAL INSTRUCTION NO.</b> <u>8</u> <b>DATE</b> <u>SEPTEMBER 14</u>  <b>A/E PROJECT NO.:</b> <u>99-116</u>  <b>CONTRACT FOR:</b> <u>JOBSITE, USA</u>  <b>A/E FIRM:</b> _____
--	--

The Work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Sum or Contract Time. Prior to proceeding in accordance with these instructions, indicate your acceptance of these instructions for minor change to the Work as consistent with the Contract Documents and return a copy to the Architect/ Engineer.

#### Description:

*As discussed in our telephone conversation at 10:15 A.M. on September 13, install Acme "Desert Beige" ceramic tile, mfg. #701, in lieu of Star "Chatum Tan" ceramic tile in the mens's and women's bathrooms.*

*You reported that Star Manufacturing Company's "Chatum Tan" ceramic tile is currently out of stock and unavailable for delivery.*

#### Attachments:

Issued By \_\_\_\_\_  
Architect's/Engineer's

Accepted By \_\_\_\_\_  
Superintendent

## Extra Work Order Example

### EXTRA WORK ORDER

**PROJECT:** \_\_\_\_\_

EXTRA WORK ORDER NO. \_\_\_\_\_

**OWNER:** \_\_\_\_\_

DATE: \_\_\_\_\_

\_\_\_\_\_

A/E PROJECT NO: \_\_\_\_99-116\_\_\_\_

**TO CONTRACTOR:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

The scope is changed as follows: (Describe scope)

\_\_\_\_\_  
Architect's/Engineer's Signature

\_\_\_\_\_  
Superintendent's Signature

## Contractor's Change Order Proposal Example

A New Change for the Change Request Memo #1 is shown below with a Summary Page and the Backup Page:

FROM: Contractor, Inc. 345 Michigan Ave, Houston, TX	CHANGE ORDER NUMBER 1926
	CHANGE REQUEST (E.W.O) NUMBER 2
	CHANGE ORDER PROPOSAL NO. 47
TO: Owner, Inc., 261 Wash Ave, Houston, TX	PROJECT NAME Jobsite, U.S.A., Houston, TX

**WORK:** We submit the following quotation to cover the addition of brown Chippewa brick 4" x 2-2/3" x 8" to the North exposed basement wall.

**SUM**

Direct Job Costs	Amount
Material	\$113.50
Labor	\$104.13
<b>Total Direct Costs</b>	<b>\$217.63</b>
<b>Total Indirect Costs</b>	<b>\$68.91</b>
Subtotal	\$286.54
Main Office 7%	20.06
Subtotal	\$306.60
Profit 10%	30.66
<b>TOTAL SUM</b>	<b>\$337.26</b>

**TIME**

**EXTENSION:** We request a time extension of zero (0) working day(s) for this change.

**ACCEPTANCE:** Please issue a contract change order if you wish to proceed with this change.

**TIME:** We will not proceed without further written instructions. This change order proposal is good for three days from the date above.

## Contractor's Change Order Proposal Example (continued)

### New Change Order Proposal Bid Breakdown Support Page

A *Change Order Proposal Bid Breakdown Support Page* will be submitted as backup with the change order proposal summary page to the owner. The bid breakdown page shows how the Direct Costs and Indirect Costs on the Change Order Proposal Summary page were arrived at by the contractor. This Change Order Proposal Backup or Breakdown page is for New Changes to the Scope and must follow the crew sizes, prevailing wages established on public projects, crew costs per day, total costs for materials, labor and equipment by type of work/locations and operations. The direct and indirect itemized costs that a Contractor can change on a Change Order Proposal are stated in the Supplementary Conditions.

Direct Costs	Masonry Face Brick Quantity, Crew Size and Crew Work hours		Amount
Material	500 Brick @ \$227/1000		\$113.50
Labor	2-2/3 hr. 3 BL 8.01 Whr x \$9.00/hr.		72.09
	2-2/3 hr. 2 BLH 5.34 Whr x \$6.00/hr.		32.04
	<b>Total Workhours = 13.35</b>	<b>Total Direct Costs</b>	<b>\$217.63</b>
Indirect Costs	Indirect Labor (1 hr.)		20.00
	Insurance 1% Job Cost		2.18
	Small Tool 1% Labor		1.00
	Job Truck 1% Labor		1.00
	Job Office 2% of Labor		2.00
	Sales Tax 4% of Material		4.54
	Social Security: Contractors Portion 6.5% of Labor		6.77
	Unemployment 4.5% of Labor		4.69
	Workers Compensation \$8.87/\$100 Labor		9.23
	Public Liability Insurance \$.37/\$100 Labor		.38
	Property Damage Insurance \$.30/\$100 Labor		.30
	Health & Welfare Fringe Benefit \$.60/hr. x 13.35 W h r s		8.01
	Pension Fringe Benefit \$.65/hr. 13.35 Whrs.		8.68
	Apprentice .01/hr. 13.35 hrs.		.13
	<b>Total Overhead or Indirect Costs</b>		<b>\$68.91</b>

## Contractor's New Change Order Proposal

The net change should reflect the difference between the Original Direct Costs and the New Direct Costs. The Net change for the Change Request Memo #2 is shown below:

FROM: Contractor, Inc.	CHANGE ORDER NUMBER 2009
345 Michigan Ave.	CHANGE REQUEST (E.W.O) NUMBER 2
Houston, TX	CHANGE ORDER PROPOSAL NO. 47
TO: Owner, Inc. , 261 Wash Ave, Houston, TX	

PROJECT NAME: Jobsite, U.S.A., Houston, TX

SCOPE: In reference to your change order request No. 2, we submit the following quotation to cover the relocation of the Domestic water line as shown on drawing DW001  
Revision No. 4

SUM:

Direct Job Cost - Original	Original Amount	Direct Job Costs - New	New Amount	Net Change
Material	\$1500	Material	\$1000	\$(500)
Labor	\$ 978	Labor	\$ 652	\$(326)
Subcontractors	0	Subcontractors	0	0
<b>Total Direct Job Cost Original</b>	<b>\$2478</b>	<b>Total Direct Job Costs - New</b>	<b>\$1652</b>	<b>\$(826)</b>
		Net Decrease		\$(826)

TIME

EXTENSION: We request a time extension of one (1) working day(s) for this change.

ACCEPTANCE

TIME: Please issue a contract change order if you wish to proceed with this change. We will not proceed without further written instructions. This change order proposal is good for three days from the date above.



## VII. PROJECT CLOSEOUT

### Certificate of Substantial Completion

#### CERTIFICATE OF SUBSTANTIAL COMPLETION

DISTRIBUTION TO:  
 OWNER ☐  
 ARCHITECT ☐  
 CONTRACTOR ☐  
 FIELD ☐  
 OTHER ☐

AIA DOCUMENT G704 CONTRACTOR

PROJECT: Jobsite, USA ARCHITECT: Architects, Inc. (name,address)  
 corner of Bell & Ring ARCHITECTS PROJECT NUMBER: \_\_\_\_\_  
 Houston, TX  
 TO: (OWNER): Owner, Inc. CONTRACTOR: Contractor, Inc.  
 + 261 Washington Ave., CONTRACT FOR: Jobsite, USA  
 Houston, TX  
 Contract Date: December, \_\_

DATE OF ISSUANCE: November 19, 20\_\_

PROJECT OR DESIGNATED PORTION SHALL INCLUDE: All work associated with the construction of the Jobsite, USA project.

The Work performed under this Contract has been reviewed and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby established as November 19, \_\_\_\_\_ which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

#### **DEFINITION OF DATE OF SUBSTANTIAL COMPLETION**

The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Architect when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for the use for which it is intended, as expressed in the Contract Documents.

#### Certificate of Substantial Completion

A list of items to be completed or corrected, prepared by the Contractor and verified and amended by the Architect, is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. The date of commencement of warranties for items on the attached list will be the date of final payment unless otherwise agreed to in writing.

\_\_\_\_\_  
 ARCHITECT BY DATE

The Contractor will complete or correct the Work on the list of items attached hereto within days from the above Date of Substantial Completion.

\_\_\_\_\_  
 CONTRACTOR BY DATE

The owner accepts the Work or designated portion thereof as substantially complete and will assume full possession thereof at \_\_\_\_\_ (time) on \_\_\_\_\_ (date).

\_\_\_\_\_  
 OWNER BY DATE

The responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance shall be as follows:

*(Note-Owner's and Contractor's legal and insurance counsel should determine and review insurance requirements and coverage; Contractor shall secure consent of surety company, if any.)*

## **Punch List**

Typical Punch List Items that Must be Addressed at Project Closeout

Punch lists for each section of the specifications

Warranties

Owner Installation, and Operating and Maintenance manuals

Record drawing for the owner

Keys and a key schedule for the owner

Executed Contract Change Orders Payment

affidavits and lien waivers Copies of test

reports for the owner Release from a

construction lender Mechanical system

records

Product data and list of spare parts

Elevator inspection affidavit

Fire Marshall's inspection affidavit

Sprinkler insurance inspection

Occupancy permit

Application for final payment

Architect or Engineers certificate of final completion

Owner's final acceptance of the project

## VIII. CONSTRUCTION SAFETY MANAGEMENT

### Workers Compensation Insurance Premium Calculation Example

Assume that the Worker's Compensation manual rate is \$10 on every \$100 of a payroll for an electrical contractor. If the EMR is 1.9, you will be paying \$19 on every \$100 of a payroll ( $1.9 \times \$100$  per \$100 of a payroll) while your competitors may be paying an average of \$10 ( $1 \times \$10$  per \$100 of a payroll).

For Example, each Contractor has 30 employees with an annual payroll of \$600,000, and a Manual rate of \$10 per 100.

The first contractor has an EMR of 1.9. The premium would be  $\$10 / \$100 \times 1.9 \times \$600,000 = \$114,000$ .

The second contractor has an EMR of 1.0. The premium would pay  $\$10 / \$100 \times 1.0 \times \$600,000 = \$60,000$ . This is a savings for an average contractor of \$54,000.

The third contractor has an excellent EMR of 0.5. The premium would be  $\$10 / \$100 \times 0.5 \times \$600,000 = \$30,000$ . This is a savings of \$30,000 or one-half the cost of the average contractor's premium, which is based upon an EMR of 1.0. Also, this contractor saves \$84,000 in premiums over the first contractor.

## Cost of Accident Calculation Example

Research conducted by Levitt and Samelson indicates that the Contractor's average cost of an accident expressed in a percentage of direct labor costs is as follows:

Accident Costs	Accident Percentages	DIRECT LABOR COSTS	AVERAGE CLAIM COST %
Insurance Cost	(7% worker's Compensation) (1% Liability Insurance)	8%	
Accident Claims	(65% of Insurance Costs) (65% x 8%) =	5.2%	5.2%
Uninsured Costs	(4 times Accident Claims) (4 x 5.2%) =	20.8%	20.8%
Average Claim Cost as a Percentage of Direct Labor for Accidents			26.0%

Using the percentages above and assume that a Contractor is doing \$5 million in Total Revenue and the direct Labor is \$1,200,000. The Contractor's Insurance premium and the average claims costs are shown below:

Accident Costs		Insurance Premium	Accident Claims Cost
Insurance Cost	8% (\$1,200,000) =	\$96,000	
Accident Claims	5.2% (\$1,200,000) =		\$62,000
Uninsured Costs	20.8% (\$1,200,000) =		\$249,600
Average Claim Cost			\$311,600

## Potential Savings from Establishing an Effective Safety Program

According to the Business Roundtable CICE report, A-3, (as cited in Levitt and Samelson in their book *Construction Safety Management*) an investment of 2.5 percent of direct labor costs or less will decrease claims cost by a minimum of 25 percent. For example, assume a Contractor with direct costs of \$1,200,000 can decrease their claims cost by 25 percent with an investment of 2.5 percent. The investment would be  $(2.5\% \times \$1,200,000) = \$30,000$  and the savings potential would be as follows:

	NEW COSTS	SAVINGS
Accident claims $5.2\% \times .75 = 3.9\%$ (1,200,000)	\$46,800	
25% Savings $(5.2\% - 3.9\% = 1.3\%)$ (1,200,000)		\$15,600
Uninsured Costs $(20.8\% \times .75 = 15.6\%)$ (1,200,000)	187,200	
25% Savings $(20.8\% - 15.6\%) = 5.2\%$ (1,200,000)		\$62,400
Total Savings $(1.3\% + 5.2\%) = 6.5\%$ (1,200,000)		\$78,000
Investment $(2.5\% \times 1,200,000)$		(\$30,000)
Net Savings $(6.5\% - 2.5\%) = 4\%$ (1,200,000)		\$48,000

### What Is the Savings Potential for Implementing an Effective Safety Training Process?

A study done by the Business Roundtable in the CICE Report concerning supervisory training found that "construction companies can expect a return on the training investment of at least 3:1." In other words, for every dollar invested, you will realize a \$3 savings from increased productivity, lower workers' compensation premiums and increased profit margins.

Another three-year study done by experts at Michigan State University and the W.E. Upjohn Institute for Employment Research and funded by the Michigan Department of Labor indicates that "companies that aggressively promote on-the-job safety, lose far fewer workers - and profits to disabling workplace injuries." One company in the study had about \$300,000 worth of workers compensation claims per year prior to the study. Since the company has received safety hazard recognition and inspection training for their employees, supervisors and managers, they have cut their claims costs to \$3,000 per year, a savings of \$297,000.

## Examples - Cases that Resulted in Criminal Charges for Safety Violations

Criminal charges are becoming more common and in most cases' prosecutors are establishing criminal liability under general state criminal laws instead of under the state OSHA laws.

In Wisconsin the owner of a fireworks plant was arrested and charged with homicide by reckless conduct following an accident in which an employee was killed in an explosion and fire.

Similarly, in Texas a corporation and its president were indicted for criminally negligent homicide in the aftermath of a trench collapse that killed two employees. In Illinois an employer was charged with aggravated battery for exposing employees to federally regulated substances and for violating OSHA standards for working conditions.

In Illinois the State Supreme Court exposed management to criminal charges involving workers' safety. A Cook County grand jury had indicted five executives of Chicago Magnet Wire Co. on charges of aggravated battery, reckless conduct and conspiracy. The indictment charged that 42 workers of the company suffered scars from metals, nerve and lung disorders and other problems from exposure to hazardous chemicals. Prosecutors said that the company's plant lacked safety equipment, proper cooling and ventilation and that workers were exposed to what a doctor who examined them called a "toxic cocktail" of hazardous chemicals.

In Michigan a provision in their Occupational Safety and Health Administration Act, Public Act 154, as amended, states "every willful violation, which is connected to a fatality, is referred to the Michigan Attorney General's Office for criminal investigation and/or prosecution" (as cited from the Michigan.gov website under the Department of Energy, Labor & Economic Growth, retrieved September 27, 2010). In this landmark worker's safety case in Michigan, the "Construction Company was convicted of the MIOSHA Willful Criminal felony violation" and "the Court found that, Defendant consciously and callously neglected to train both the hourly and supervisory personnel in its workers' safety rules, which failure led to the death of" a worker (p1). Judge O'Brien said, "The Conduct of the Defendant's employees on the day of this fatality was, indeed, willful. Clearly, there was no 'justifiable excuse for failing to slope, shore or otherwise protect the employees within the excavation . . ."

In another construction safety case in Michigan, one employee was fatally injured and another was injured. The supervisor/owner and the fatally injured employee were cutting a hole in an underground gas tank using a cutting torch when it exploded. The supervisor/owner was found guilty of manslaughter for reckless endangerment of an employee and he was sentenced to jail for up to five years. The third construction safety case in Michigan was the result of a truck driver's raised dump box coming in contact with the high-power lines and electrocuting the driver. The supervisor was found guilty of manslaughter and he was sentenced to up to five years in prison.

## OSHA Criteria for a Willful Violation

(1) “A willful violation exists under the Act where the evidence shows either an intentional violation of the Act or plain indifference to its requirements.”

(a) the employer committed an intentional and knowing violation if:

1. An employer representative was aware of the requirements of the Act, or the existence of an applicable standard or regulation, and was also aware of a condition or practice in violation of those requirements, and did not abate the hazard.
2. An employer representative was not aware of the requirements of the Act or standards, but was aware of a comparable legal requirement (e.g., state or local law) and was also aware of a condition or practice in violation of that requirement, and did not abate the hazard.

C.2.d.(1)(b) The employer committed a violation with plain indifference to the law where:

1. Higher management officials were aware of an OSHA requirement applicable to the company's business but made little or no effort to communicate the requirement to lower level supervisors and employees.
  2. Company officials were aware of a continuing compliance problem but made little or no effort to avoid violations (p 1).
  3. An employer representative was not aware of any legal requirement, but was aware that a condition or practice was hazardous to the safety or health of employees and made little or no effort to determine the extent of the problem or to take the corrective action. Knowledge of a hazard may be gained from such means as insurance company reports, safety committee or other internal reports, the occurrence of illnesses or injuries, media coverage, or, in some cases, complaints of employees or their representatives.
  4. Finally, in particularly flagrant situations, willfulness can be found despite lack of knowledge of either a legal requirement or the existence of a hazard if the circumstances show that the employer would have placed no importance on such knowledge even if he or she had possessed it, or had no concern for the health or safety of employees.
- (2) It is not necessary that the violation be committed with a bad purpose or an evil intent to be deemed "willful." It is sufficient that the violation was deliberate, voluntary or intentional as distinguished from inadvertent, accidental or ordinarily negligent (p 2).

## **Situations Where A Manager Be Can Subject To Criminal Charges (for Safety Violations)**

The first situation is the supervisor allowing the employees to enter a confined space without testing for appropriate oxygen level, toxic substances and flammability. In this case the two employees were killed due to lack of oxygen. The supervisor was negligent for not testing the atmosphere and allowing the employees to enter. The manager has acquired liability because the supervisor is not certified to perform the tests and this would be considered a willful violation.

Another situation has the crane operator and the supervisor leaving a crane unattended while the suspended steel H-pile is being welded to the driven steel H-pile. In this case the suspended H- pile slipped off and struck the welder killing him. Upon investigation the company had ordered the brake drum gear because the cable drum was slipping. The supervisor and the crane operator were negligent in their duties, therefore, they have acquired criminal liability.

A third situation is exposing the workers too hazardous chemical and not providing any respirators per the instructions in the MSDS sheet. The supervisor has liability for not providing respirators. The manager has acquired liability because the supervisor is not certified to perform the respirator selection or fit-tests and this would be considered a willful violation.

A fourth situation is the supervisor lowering the worker into a 18-inch diameter by 30 feet deep shaft using a rope tied around the employee's waist and without any proper atmospheric testing. In this case the employee passed out in the shaft and died of suffocation. The supervisor was found guilty of murder. The supervisor/owner was negligent for not testing the atmosphere, not shoring the shaft, and not using a harness.



## Competent Person Evaluation Form based upon CPL 2.87

This Evaluation Form establishes the criteria the officer will use to evaluate the effectiveness of the competent person at the site. These Evaluation Forms are provided under a Compliance Directive number 2.87 (CPL - 2.87).

Employee Name: \_\_\_\_\_ Phone: \_\_\_\_\_  
 Occupation: \_\_\_\_\_  
 Employer Name: \_\_\_\_\_ Length  
 of experience in this occupation: \_\_\_\_\_  
 Length of service with this employer: \_\_\_\_\_

### 1. Competent Person Evaluation

1.1 Training and Knowledge - Does the designated individual have training in and knowledge of:

- |                                     |                    |
|-------------------------------------|--------------------|
| 1.11. Soils Analysis?               | Yes _____ No _____ |
| 1.12. Use of Protective Systems?    | Yes _____ No _____ |
| 1.13. Requirements of the Standard? | Yes _____ No _____ |
| 1.14. Hazardous environments?       | Yes _____ No _____ |

1.2 Authority - Does the designed individual have authority to:

- |  |                    |
|--|--------------------|
| 1.21. Take prompt corrective measures to eliminate existing and predictable hazards? | Yes _____ No _____ |
| 1.22. To stop work?  | Yes _____ No _____ |

### 2. Inspections

2.1 Has the competent person conducted daily inspections of the excavation?

- 2.11. Of the adjacent areas?  
 2.12. Of protective systems?

2.2 When were these inspections conducted?

- |   |       |
|---|-------|
| 2.21. Prior to the start of work?                             | _____ |
| 2.22. As needed throughout the work shift?                    | _____ |
| 2.23. After rainstorm or other hazard increasing occurrences? | _____ |

2.3 Based on Officer's observation, what situations has the "competent person failed to recognize that could result in cave-ins?

## Competent Person Evaluation Form based upon CPL 2.87 (continued)

### 3. Protective Systems

#### GENERAL

- 3.1 If the excavation is less than 5 feet deep, has the competent person examined the ground for indication of cave-in potential? Yes\_\_\_\_No\_\_\_\_
- 3.2 Has the competent person inspected any damaged material or equipment used for protective systems and evaluated its suitability for continued use? Yes\_\_\_\_No\_\_\_\_
- 3.3 USE OF APPENDIX A & B
- 3.31 Is the employer relying upon Appendix A & B to design a sloping and shoring system (Option 2) or on Appendix A & D to select and construct a protective system (Option 1)? Yes\_\_\_\_No\_\_\_\_
- 3.32 If YES, has the competent person properly classified the soil used Appendix A? Yes\_\_\_\_No\_\_\_\_
- If yes, when?\_\_\_\_\_
- 3.321 What type of soil does the competent person say is in the excavation?\_\_\_\_\_
- 3.222 What visual test(s) did the competent person perform?  
\_\_\_\_\_
- 3.223 What manual test(s) did the competent person perform?  
\_\_\_\_\_
- 3.224 Have conditions changed since the classification was made? Yes\_\_\_\_No\_\_\_\_
- If yes, has it been reclassified? Yes\_\_\_\_No\_\_\_\_
- 3.33 Did the competent person choose the proper sloping or benching configuration from Appendix B (or the proper shoring from Appendix C or D)? Yes\_\_\_\_No\_\_\_\_
- 3.331 If NO, detail: \_\_\_\_\_

## Competent Person Evaluation Form based upon CPL 2.87 (continued)

### 4. Water Conditions

- 4.1 Is dewatering equipment being used on the site? \_\_\_\_\_
- 4.2 If YES, is the competent person monitoring the equipment and its proper operation?  
\_\_\_\_\_
- 4.3 Has the excavation been subjected to water accumulation? \_\_\_\_\_
- 4.4 If YES, has the competent person inspected the excavation and compiled with precaution of (h)(1) and (h)(2)? \_\_\_\_\_

### 5. Ramps

- 5.1 Is the employer using a structural ramp? Yes\_\_\_\_No\_\_\_\_  
If NO, skip to next section.
- 5.2 Is ramp used solely for employee access? Yes\_\_\_\_No\_\_\_\_
- 5.3 If YES, was it designed by competent person for safe access and egress? Yes\_\_\_\_No\_\_\_\_
- 5.4 Is ramp used for access and egress of equipment? Yes\_\_\_\_No\_\_\_\_
- 5.5 If YES, is the competent person who designed the ramp qualified in structural design? Yes\_\_\_\_No\_\_\_\_
- 5.6 List qualification: \_\_\_\_\_
- 5.7 Does ramp meet design specifications? \_\_\_\_\_

### 6. Confined Space

- 6.1 Does trench or excavation meet definition of confined space? Yes\_\_\_\_No\_\_\_\_  
If NO, skip to next section.)
- 6.2 If yes, is the competent person (qualified person:) trained to recognize and evaluate confined space hazards? Yes\_\_\_\_No\_\_\_\_
- 6.21 Detail: \_\_\_\_\_  
\_\_\_\_\_
- 6.3 Is the competent person capable of specifying necessary control measures to assure worker safety? Yes\_\_\_\_No\_\_\_\_

## Daily Inspection Checklist Example

Competent Person \_\_\_\_\_ Date \_\_\_\_\_

Use one or more of the following: A "check mark" to indicate yes, Comment Codes listed below, or fill in the blank with applicable information or description.

### COMMENT CODES

SOIL TYPE: Rock, Slate rock, "A" "B" "C"  
 DESCRIPTIONS: (G) Good (P) Poor (S) Stable (U)  
 Unstable HYDROSTATIC (M) Moist (D) Dry (R) Rainstorm  
 CONDITIONS: (SA) Saturated (PS) Partial Saturation

### JOB SITE DESCRIPTION

LOCATION \_\_\_\_\_ AREA CONGESTED \_\_\_\_\_ BLUE  
 STAKE DATE \_\_\_\_\_ RIGHT OF WAY & CLEARANCE OK \_\_\_\_\_  
 TRENCH DEPTH \_\_\_\_\_ WIDTH \_\_\_\_\_ LENGTH \_\_\_\_\_ INTERSECT OR \_\_\_\_\_  
 ANGU  
 LAR CROSSING TRENCH: LINES \_\_\_\_\_ ROAD/ALLEY \_\_\_\_\_  
 PARALLEL TO TRENCH: LINES \_\_\_\_\_ ROAD/ALLEY \_\_\_\_\_ BUILDING(s) \_\_\_\_\_  
 POLE BRACING \_\_\_\_\_ OVERHEAD LINES \_\_\_\_\_ STRUCTURAL BRACING \_\_\_\_\_  
 OPEN DATE/TIME \_\_\_\_\_ JOB # \_\_\_\_\_  
 RPE CONSULTED \_\_\_\_\_ REASON: \_\_\_\_\_

### TRENCH/EXCAVATION INSPECTION COMMENTS

Soil Type \_\_\_\_\_  
 Time(s) Inspected \_\_\_\_\_  
 Describe any changing conditions, plans, or shoring equipment damage in space below:

### EMPLOYEE & PUBLIC SAFETY INSPECTION

Ladders \_\_\_\_\_ Ramp for Employees \_\_\_\_\_ Ramp for Equipment \_\_\_\_\_ Emergency  
 equipment \_\_\_\_\_ Air Quality Testing \_\_\_\_\_ Water Removal \_\_\_\_\_  
 Lighted Barricades \_\_\_\_\_ Barricade Tape \_\_\_\_\_ Cones \_\_\_\_\_ Fencing \_\_\_\_\_  
 Traffic Control Officer \_\_\_\_\_ Weekend Protection \_\_\_\_\_ Steel Plating \_\_\_\_\_

**Daily Inspection Checklist Example (continued)****PROTECTION SYSTEM SELECTED**

Installed according to Excavation Safety Manual Chapter  
 6 Hydraulic Shores(size)\_\_\_\_\_Sheeting Thickness\_\_\_\_\_No.\_\_\_\_\_  
 Horizontal Walers(size)\_\_\_\_\_Timber shores\_\_\_\_\_  
 Trench Shield(size)\_\_\_\_\_  
 Slope Angle of Repose\_\_\_\_\_Bench\_\_\_\_\_Unsupported Wall Height\_\_\_\_\_

**SOIL CONDITIONS FOR TYPE\_\_\_\_\_SOIL**

\_\_\_\_\_ If one manual & visual test for each not done, trench must be shored for Type "C" soil.

For hydraulic shoring specs in "C" soil, refer to Excavation Safety Manual.

**Manual Tests:**

	Fissured	Cohesive	Granular
Plasticity & Pat	_____	_____	_____
Dry Strength	_____	_____	_____
Drying	_____	_____	_____
Thumb Penetration	Type A_____1/4" or less Type B_____1/4" to 1" Type C_____1" or more		

Pocket Penetrometer Test\_\_\_\_\_

Other Tests\_\_\_\_\_

Visual Tests: Recommend doing as many as possible

Cohesive

Granular

Spoil Pile: Remains in clumps\_\_\_\_\_Breaks up easily\_\_\_\_\_  
 Fine grained clay \_\_\_\_\_  
 Coarse grained silt, sand or gravel \_\_\_\_\_

**Daily Inspection Checklist Example (continued)**

Trench Sides: Stands vertical for over 2 hrs. \_\_\_\_\_

Sloughs into trench \_\_\_\_\_

Fine grained clay \_\_\_\_\_

Coarse grained silt, sand or gravel \_\_\_\_\_

Fissures-Trench side (cracks or spalls) \_\_\_\_\_

Fissures-Top of trench (cracks, openings) \_\_\_\_\_

Soil layers slope into trench 4:1 or steeper \_\_\_\_\_

Rock layer above soil layer \_\_\_\_\_

No sloughing of sides into trench at 3:1 slope or steeper. \_\_\_\_\_

Less than 10% by weight gravel or rock \_\_\_\_\_

Seepage into trench from sides \_\_\_\_\_, surface \_\_\_\_\_, bottom... \_\_\_\_\_

Water up to bottom 1/2 of trench with last 24 hrs..... \_\_\_\_\_

Vibration sources may affect trench stability..... \_\_\_\_\_

Prior or existing excavation crossing \_\_\_\_\_ trench \_\_\_\_\_ parallel. \_\_\_\_\_

**Construction/Design Comments**

\_\_\_\_\_ Tailboard

\_\_\_\_\_ On-site Review with Construction Supervisor &amp; Design

The "Competent Person" is responsible for all checklist items and has authority to make prompt corrective decisions to remedy any existing or predictable hazard.

**Trench Safety Daily Field Report**

DATE: \_\_\_\_\_

JOB NO: \_\_\_\_\_

Project name: \_\_\_\_\_

Project owner: \_\_\_\_\_

Project Supt.: \_\_\_\_\_

Location: \_\_\_\_\_

Weather Condition: \_\_\_\_\_

\_\_\_\_\_ Rainfall amounts 24 hrs previous \_\_\_\_\_

I hereby attest that the following conditions existed and that the following items were checked or reviewed during the inspection: (circle appropriate response--circling **boldface letter** requires additional comment).

- |     |   |     |
|-----|---|-----|
| 1.  | All open trench was inspected   | Y N |
| 2.  | All surcharge was located proper distance from toe of slopes                                | Y N |
| 3.  | Were any tension cracks observed along top of any slopes?                                   | Y N |
| 4.  | Were slopes cut at design angle of repose?  | Y N |
| 5.  | Was any water seepage noted in trench walls or trench bottom?                               | Y N |
| 6.  | Was bracing system installed in accordance with design?                                     | Y N |
| 7.  | Was there evidence of shrinkage cracks in trench walls?                                     | Y N |
| 8.  | Was there evidence of caving or sloughing of soil since the last field inspection?          | Y N |
| 9.  | Were there any zones of unusually weak soils or materials not anticipated?                  | Y N |
| 10. | Was there any evident of significant fracture planes in soil or rock?                       | Y N |
| 11. | Was there any noted dramatic dips in bedrock?   | Y N |
| 12. | All short-term trench(s) covered within 24 hours?   | Y N |
| 13. | Non-compliance items photographed?  | Y N |
| 14. | Trench box(s) certified?  | Y N |
|     | Shield Capacity in pounds per square ft   | Y N |
| 15. | Were hydraulic shores pumped to design pressure?  | Y N |
| 16. | Type shoring being used _____ secure?   | Y N |
| 17. | Did shoring plan include adequate safety factor to allow for equipment actually being used? | Y N |
|     | Traffic in area adequately away from trenching operations with barricades?                  | Y N |

**Trench Safety Daily Field Report (continued)**

18. Trees, boulders or other hazards in area Y N

19. Vibrations from equipment or traffic too close to trenching operation? Y N

20. List heavy equipment near operation

21. Heavy equipment in use on site: \_\_\_\_\_

22. Contractor personnel by trade on site: \_\_\_\_\_

23. Excavation supervisor on site was: \_\_\_\_\_

24. Compliance photo activity by station # and direction: \_\_\_\_\_

25. Changed subsurface condition from those anticipated: \_\_\_\_\_

26. Activity by station:

Trench Box

\_\_\_\_\_

Man Hole Construction

\_\_\_\_\_

Side Sloping

\_\_\_\_\_

Bracing

\_\_\_\_\_

\_\_\_\_\_

Other

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

27. Observations: \_\_\_\_\_

Contractor Representative Safety Coordinator

Project Inspector \_\_\_\_\_

Copies of this form are to be kept at the jobsite for review by safety coordinator, owner project inspector at all time as well as copies mailed to each of these individual's workplace.



Note: THIS FORM MAY BE REPRODUCED  
**Daily Excavation Log Example**

**Current Conditions**

PROJECT	REPORT NO.							
JOB NO.:	DATE:							
CLIENT:	DAY	M	T	W	Th	F	S	Su
	TEMPERATURE				AM		PM	
	WEATHER CONDITIONS:							
CONTRACTOR:	AM	Bright	Clear	OVER	FOG	RAIN	CLOUDY	
	PM	Bright	Clear	OVER	FOG	RAIN	CLOUDY	
	WIND CONDITIONS							
SUPERINTENDENT: <i>JIM BOW</i>	AM		STILL		MODERATE		HIGH	
	PM		STILL		MODERATE		HIGH	
SAFETY ENGINEER: <i>JOHN CAP</i>	HUMIDITY CONDITIONS							
	AM		DRY		MODERATE		HUMID	
INSPECTOR: <i>KEN OVERTURE</i>	PM		DRY		MODERATE		HUMID	

**TRENCH INFORMATION:**

Trench Depth \_\_\_\_\_ Width \_\_\_\_\_ Length \_\_\_\_\_

Greater than 20 feet deep \_\_\_\_\_ Consulted Registered Professional Engineer (RPE) \_\_\_\_\_

Date with RPE \_\_\_\_\_ Name of RPE \_\_\_\_\_

**EXISTING ADJACENT STRUCTURES:**

Undercut of the Adjacent Structure \_\_\_\_\_

Existing Trench Crossing New Trench \_\_\_\_\_

Existing Trench Parallel to New Trench \_\_\_\_\_

**CONGESTED AREA:**

Existing Road \_\_\_\_\_

Blasting Nearby \_\_\_\_\_

Vibration Nearby \_\_\_\_\_

## Daily Excavation Log Example (continued)

### WORK AREA:

Excavation Access	Protection
Ladder access	Barricades
Employee Ramp	Fencing
Equipment Ramp	Traffic Control
Dewatering	Plating
Overhead lines	Certified First Aid
	Emergency Plan

### VISUAL INSPECTIONS:

SOIL	COHESIVE SOIL	GRANULAR SOIL
SPOIL PILE	Clumps	Breaks up easily
TRENCH SIDES	Vertical over 2 hours	Sloughs in trench
FISSURES		
BOILING		
SPALLING		
SURCHARGE		
SLOUGHING OR CAVING OF SIDES		
LAYERED SOIL		
RAVELLING		
ORGANIC SOIL PRES		

**Daily Excavation Log Example (continued)**

<b>MANUAL TESTS:</b>	<u>Cohesive Fissured</u>	<u>Cohesive Unfissured</u>	<u>Granular</u>
1) Plasticity/Pat	_____	_____	_____
2) Dry Strength	_____	_____	_____
3) Drying	_____	_____	_____
4) Thumb nail: Type "A", 1/4" or less _____; Type "B", 1/4" to 1" _____; Type "C", 1" or more _____			
5) Pocket Penetrometer _____			
6) Other tests _____			

**SOIL CLASSIFICATION SELECTED:**

Using the soil information from the visual and manual tests conducted you have concluded that this excavation is classified as a:

<b>Type A</b>	<b>Type B</b>	<b>Type C</b>	<b>Hard Rock</b>
---------------	---------------	---------------	------------------

If no Manual or Visual Tests were performed:

Trench is shored for Type C soil; \_\_\_\_\_

**CHANGED SOIL CONDITIONS:**

Since classifying the soil have any of these conditions changed:

Rain	_____
Increased	_____
Vibration	_____
Water Seepage	_____
Layered Soil	_____
Undercutting	_____

**SLOPED OR BENCHED PROTECTION SYSTEM SELECTED:**

State the Soil Classification you have Selected \_\_\_\_\_

### Daily Excavation Log Example (continued)

Based upon soil classification, State the Sloping or Benching System requirements  
Protection System Selected.

SYSTEM		BENCHING	
Soil Type		Bench __ H __ V	
Adjustments			
Depth			
Width			
Slope __ H __ V			

### STATE SHORING AND TIMBERING PROTECTION SYSTEM SELECTED:

SOIL TYPE	
ADJUSTMENTS	
DEPTH	
WIDTH	
TYPE OF MATERIAL	

### SHORING REQUIREMENTS:

### TRENCH MONITORING:

### CREW INSTRUCTIONS:

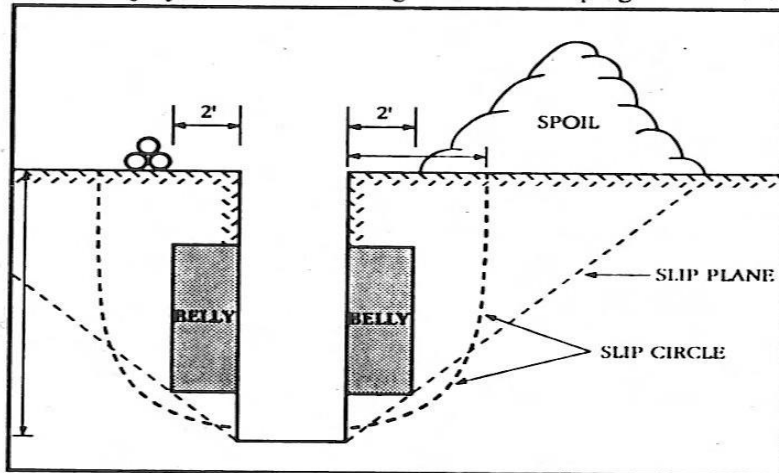
## OSHA SOIL CLASSIFICATION AND THEIR CHARACTERISTICS

SOIL TYPE	CHARACTERISTICS				
	Water Table	Visual	Tilted Soil Layers	Soil Layers	Unconfined Compressive Strength
<b>TYPE A SOILS</b> Intact Hard Soils *cohesive soils *unconfined compressive strength *Examples of Type A Soils Clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam & sandy clay loam.	Above a water table  Not saturated	No fissures, cracks, or weak layers	No tilting layers dipping into the trench with a slope of 4H: 1V or steeper	No soil layers below bed rock layers	More than 1.5 tons per sq. ft.
<b>TYPE B SOILS</b> *cohesive soils *unconfined compressive strength Examples of Type B Soils are: angular gravel, silt, silt loam, fissured or subject to vibration, dry unstable rock.	Above water table  Not saturated	May have Fissures or Cracks	No tilting layers dipping into the trench with a slope of 4H:1V or steeper	No soil layers below bed rock layers	Between 0.5 - 1.5 tons per sq. ft.
<b>TYPE C SOILS</b> *cohesive soils *granular soils such as gravel, sand and loamy sand, submerged soil, soil from which water is freely seeping, and submerged rock that is not stable.	Maybe within a water table or Saturated	May not be able to stand on slope of 3H:1V without slumping	May contain layers tilting in at 4H:1V slope or greater		0.5 tons per sq. ft. or less
Stable Rock					

## Examples and Illustrations of the Theory of Basic Trench Failure

### THEORY OF BASIC TRENCH FAILURE

Trench failure results in an enormous weight of soil moving very quickly into the trench. No time is available to move men and equipment out of the way. This is why trench failures usually result in injury or death. Six diagrams illustrate progressive trench failure.



1.

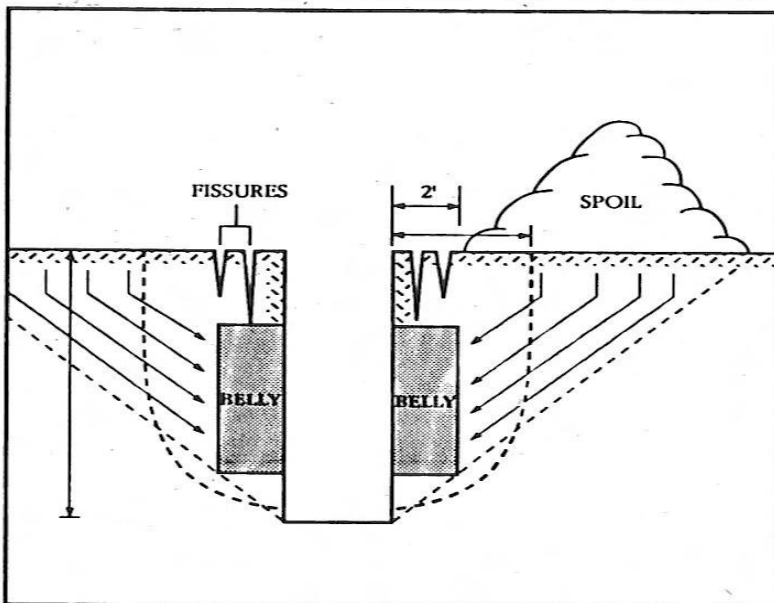
**Trench: 3' wide  
10' deep**

#### ACTIVE AREAS:

Belly may show first signs of slipping.

Slip Circle & Slip Plane  
May settle as soon as trench is cut.

Spoil Pile or Equipment  
is over a portion of slip circle.



2.

#### TRENCH WALL FAILURE FORCES

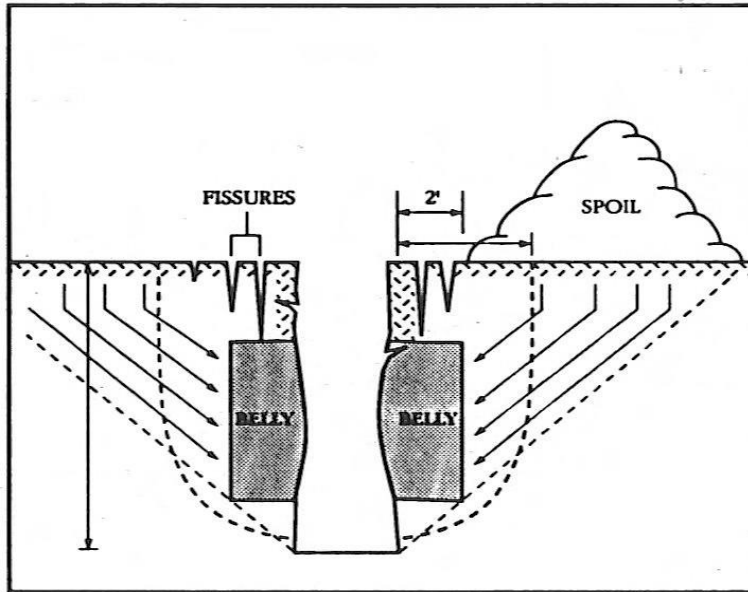
Weight of soil causes sideways (lateral) pressures on walls.

Additional surcharge loading, vibration, effects from previously disturbed soil, excess moisture, or less cohesive soils.

Fissures may begin to appear at top of trench. Any cracks are indications that trench sidewalls are progressing toward failure.

Theory of trench failure continued on next page

## Examples and Illustrations of the Theory of Basic Trench Failure (continued)

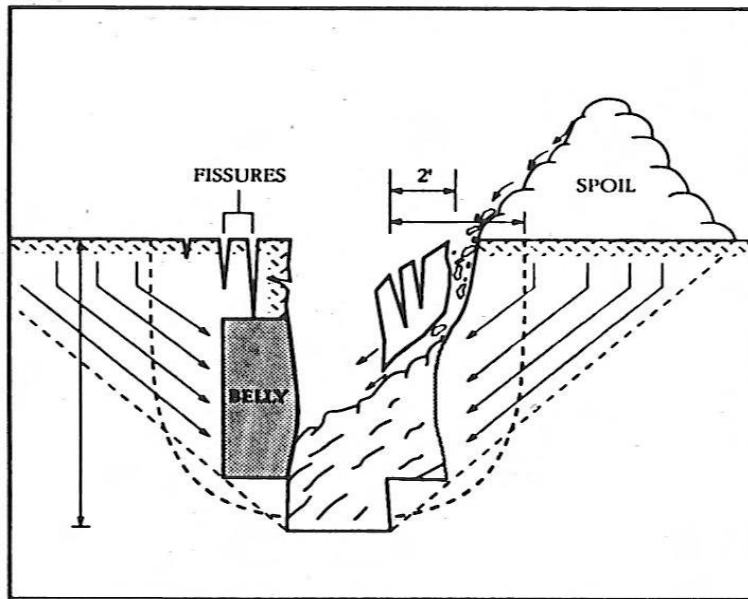


### 3. BELLY BULGES

Vertical & lateral pressures are exerting Belly Bulges.

Surface fissures are becoming more visible.

Newly formed fissures are opening further from the excavation or on the face of the trench sidewalls.



### 4. INITIAL CAVE-IN

Belly of the wall under spoil pile has just caved in. Ledges above belly may fall in first.

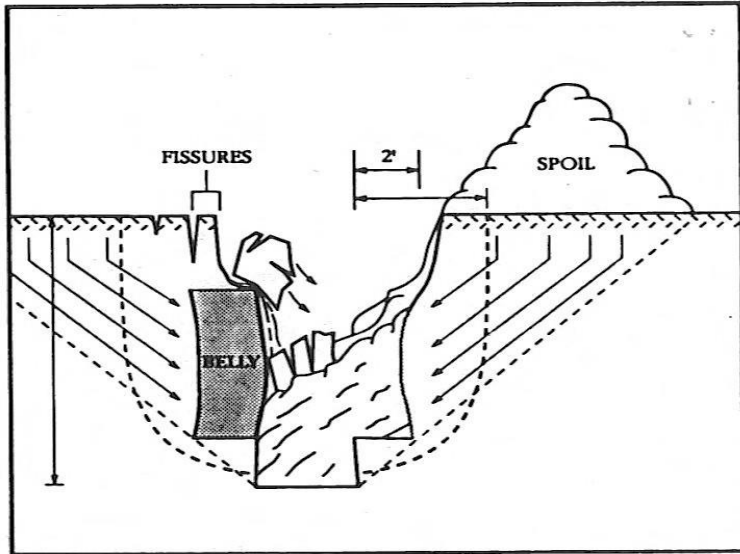
Remaining material and spoil pile above belly will cave in instantaneously.

Slip Circle may slip.

**EXAMPLE:**  
Cave-in from spoil pile side, in a trench 6' long, 8' deep & 2' wide, would weigh 12,000# (5 tons)

Theory of trench failure continued on next page

## Examples and Illustrations of the Theory of Basic Trench Failure (continued)

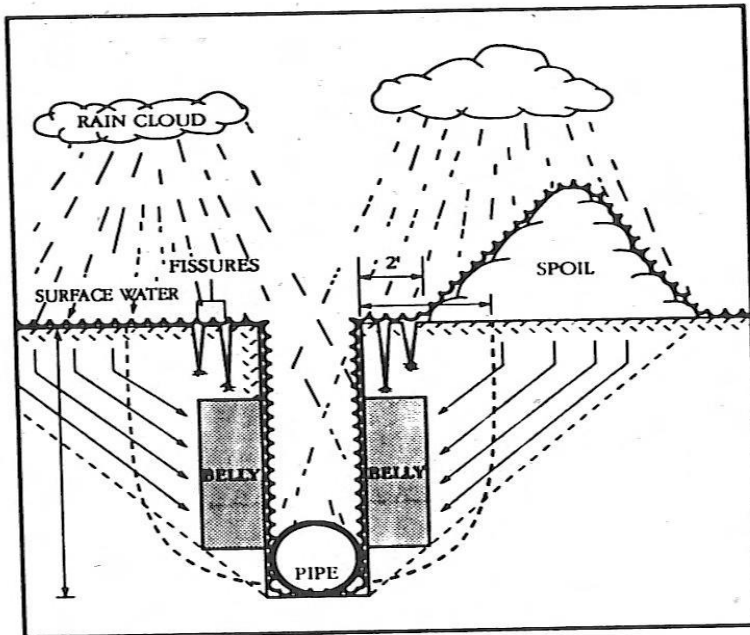


### 5. SECONDARY CAVE-INS

Portions of other wall begin to fail.

Both walls may continue to fail.

Move Spoil Pile back to a minimum of 2' from edge of excavation.



### 6. SURFACE WATER

Rain is flowing into surface cracks and fissures. Fissures may appear to heal while wet but they will reappear & will be wider after drying.

Slip Plane & Slip Circle will be negatively affected by water in the bottom half of trench causing belly to slip sooner.

Water retained in spoil pile will create additional surcharge loading conditions.

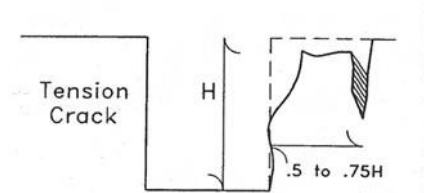
2-5

End of trench failure theory

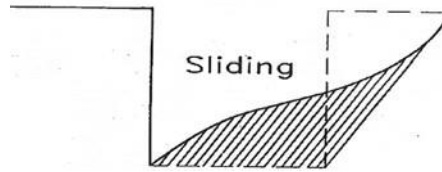


## Examples and Illustrations of the Theory of Basic Trench Failure (continued)

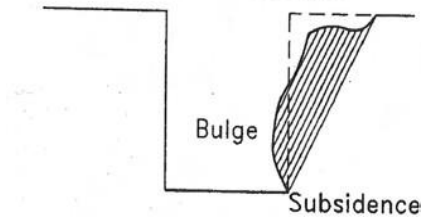
### TENSION CRACKS



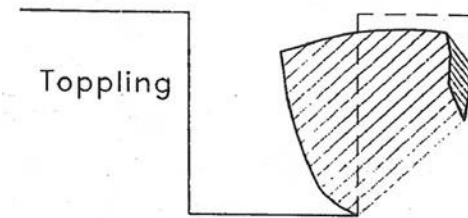
### SLIDING



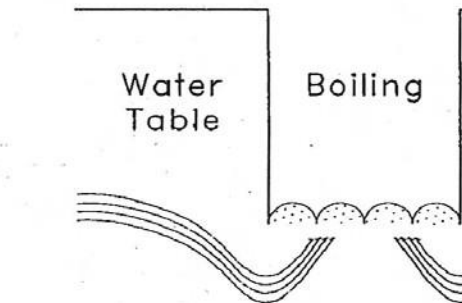
### SUBSIDENCE AND BULGING



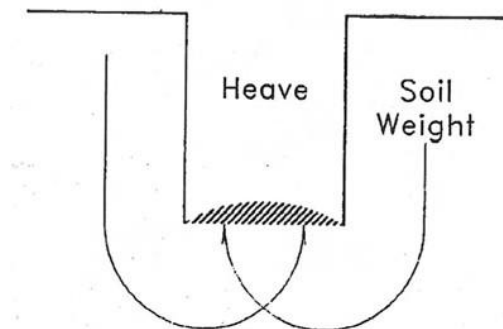
### TOPPLING



### BOILING



### HEAVING OR SQUEEZING



## **IX. ETHICS**

There are no illustrations or examples for this section.

## X. CONTRACT INTERPRETATION PRINCIPLES

### Contract Interpretation Principles Summary

Whenever a conflict exists from differing interpretations of the contract the courts will utilize the following rules to make a ruling. Therefore, it is good practice that the Professional Constructor have a good understanding of these principles and attempt to resolve the dispute before going to court.

Summary of the Contract Interpretation Principles	
13. The signed written Agreement rules	14. Specific over general
15. Only documents in the Agreement can be used	16. Hand Written over Typed
17. All provisions must be read as a whole	18. Words over Figures
19. All provisions are complimentary	20. Correct all Clerical Errors
21. All provisions are presumed to reflect intent	22. Owner gives Implied Warranty
23. Order of Precedence clause takes precedence	24. Conditions precedent are binding
25. The most stringent requirement prevails	26. Conditions subsequent are binding
27. Ambiguous clauses construed against the author	28. Conditions concurrent are binding
Ambiguous clauses. - Contractors can utilize Oral proof	
29. Construction industry trade terminology rules	30. Trade practices or customs in the area rule
31. Documents incorporated by reference are binding	

## **End of CPCSG Examples and Exhibits**

**AMERICAN INSTITUTE OF CONSTRUCTORS**



**CERTIFIED PROFESSIONAL CONSTRUCTOR**

**LEVEL II – ADVANCED CONSTRUCTION APPLICATIONS**

**STUDY GUIDE**

**AIC**

**Accelerating Constructor Excellence**

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The following study materials on the examination topics are suggested to assist in preparation for the CPC Level II - Advanced Construction Applications Examination. Candidates are encouraged to review these materials, as well as other related sources of information.

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## Table of Contents

<b>I.</b>	<b>PROJECT SCOPE DEVELOPMENT.....</b>	<b>1</b>
	Project Participants Roles.....	1
	Project Delivery Methods.....	2
	Types of Contracts .....	3
	Contract Formation Principles. ....	7
	Conceptual Estimating .....	8
	The UniFormat Classification System. ....	8
	Coordination with MasterFormat. ....	11
	Square Foot Model Method.....	11
	Bid Scope Development - Work Packages.....	12
	Bid Division Index .....	12
	Exclusions. ....	13
	Principles for Writing the Bid Division Scope Description Section .....	14
	Bid Scope Bid Analysis.....	16
	Bid Document Development. ....	17
	The Information Available to the Bidders (IAB) .....	19
	Contractor's Mistakes in Bidding .....	21
	Subcontractors' Mistakes in Bidding. ....	21
	Design Phase - Schedule. ....	23
	Design Disciplines and their Connection to Procurement .....	23
	Procurement Sequence. ....	23
	Design Phase - Cost Variance Analysis. ....	25
<b>II.</b>	<b>EMPLOYMENT PRACTICES. ....</b>	<b>26</b>
	Employment Laws and Regulations.....	26
	Hiring Requirements. ....	26
	Employment Law Legislation. ....	28
	Employment Law Discrimination. ....	28
	Employment Documentation - <i>Disciplinary Memorandum</i> .....	30
	Management and Union Labor Laws. ....	31
	Labor Laws Terms & Definitions. ....	33

III.	<b>WORKING RELATIONSHIPS.</b>	36
	The Three Functions of Management	37
	Fourines Coaching Analysis Process	37
	Successful Communication	37
	Effective Meeting Skills	43
	Preconstruction Meeting Content	43
	Meeting Minutes Content	44
	Meeting Leadership Skills	44
	SMART Meeting Goals.	44
IV.	<b>CONSTRUCTION START-UP and SUPPORT.</b>	45
	Contract Documents.	45
	Site Layout of Construction Facilities.	49
	Material Handling Techniques.	51
V.	<b>CONSTRUCTION RESOURCE MANAGEMENT</b>	52
	Factors Which Influence Productivity?	52
	External Factors that have a Major Effect on Productivity?	52
	Overtime	53
	Congested Work Area	53
	Multi-Story Buildings above 3 <sup>rd</sup> Floor on Productivity	53
	Change Orders	54
	Contractual Work Rules.	54
	Project Documentation	55
	Daily Job Diary	56
	Rules for Keeping a Daily Job Diary as Admissible Evidence	57
	Job Site Records.	58
	Hauling Records.	59
	Subcontractor Agreements	61
	Supplier and Vendor Agreements	61
	The Hybrid Contract and the Tests to Determine Services or Goods	61
	Contractor's Coordination Responsibilities	62
	Contractor's Responsibilities for Separate Contracts	63
	Procurement Sequence (Material Leadtime) on a project	63
	Subcontractor Trade Scope Description and Agreement.	64
	Material Control and Equipment Production Estimating	65



VI.	CONSTRUCTION COST CONTROL .....	66
	Budgeting, Costs, and Cost Control .....	66
	Financial Statements .....	68
	Balance Sheet .....	68
	Balance Sheet Ratios .....	69
	Income Statement .....	71
	Income Statement Ratios .....	71
	Cash Flow Statement .....	73
	Owner and Contractor Change Requests .....	74
	Contract Change Order .....	74
	Construction Change Directive .....	74
	Minor Changes in the Work .....	75
	Extra Work Order .....	75
	Contractor Change Order Proposal .....	75
	Net Change Order Proposal .....	76
	Claims, Owner Disclaimers and Omission Clauses .....	77
	Types of Construction Claims .....	77
	Changed Conditions Recommendations .....	78
	Differing Site Conditions (DSC) Type I and Type II .....	78
	Types of Job Acceleration .....	79
	Delays .....	80
	Methods for Calculating Delay Damages on Compensable Delays .....	80
	Criteria for Obtaining a Weather Delay Time Extension .....	80
	Contractors Responsibility for Sequencing the Work .....	81
	Required Activities to be Shown on the Planned Schedule .....	81
	Required Activities on an “Updated” Progress Schedule .....	82
	How Does the Contract Address Float on a Schedule? .....	82
VII.	PROJECT CLOSEOUT .....	83
	Project Closeout Procedures .....	83
VIII.	CONSTRUCTION SAFETY MANAGEMENT .....	85
	Accident and Injury Cost .....	85
	Workers' Compensation Insurance .....	86
	Uninsured Cost Items for Work Accidents .....	87
	Construction Industry Accident Statistics .....	88
	Tort Law .....	89

## VIII. CONSTRUCTION SAFETY MANAGEMENT - Continued

Excavation Responsibilities & Visual Inspections.....	91
Soil Terminology and Soil Classification.....	94
OSHA Acceptable Visual and Manual Soil Observation Tests for Excavation.....	96
OSHA Excavation Trench Failure.....	98

## IX. ETHICS. .... 101

AIC Constructor Code of Ethics?.....	101
Ethics, Morals, Values and the Law.....	101
Bidding Deceptive Practices and Ethics Principles? .....	102

## X. CONTRACT INTERPRETATION PRINCIPLES. .... 104

Applied to a Set of Project Documents .....	104
Agreements.....	105
Contract Interpretation Principles. ....	109
Contract Interpretation Principles Summary.....	110

## I. PROJECT SCOPE DEVELOPMENT

### Project Participants Roles

The *Owner* refers to an individual or an entity. The owner may be from the private sector or be a government agency in the public sector. The owner initiates the project, secures the funding for the design, construction, and subsequent operating of the completed facility (p 1.3).

The *Architect* has an agent agreement with the Owner to determine the design requirements, design the project, produce the construction documents, and administer the construction contract. The American Institute of Architects defines design as occurring in three distinct phases: schematic design, design development, and construction documents.

During the schematic design phase, the deliverables include schematic drawings and preliminary project descriptions to illustrate the general form, scale, and relationship of the major project components, and the type of construction proposed (1.9).

During the design development phase, the deliverable include technical information about special systems to be incorporated into the project, outline specifications and drawings to establish the size and character of the entire project including architectural, structural, mechanical, and electrical systems (1.9).

During the construction documents phase, include the working drawings, the bid documents, supplementary conditions, the general requirements, and the specifications are written.

The *Engineers* are professionals providing design services sometimes employed by the A/E firm and sometimes the engineers are independent consultants to the project as civil engineers, mechanical engineers, electrical engineers and structural engineers, etc. According to the Engineers Joint Contract Document Committee (EJCDC) General Conditions 1910-8 (1996), in article 9.01 it states that the “ENGINEER will be OWNER’S representative during the construction period”(p 27). Also, all material substitutions, submittals, clarifications and interpretations, rejecting of defective work, Shop drawings, change orders, payments, determinations of unit prices and actual prices, and decisions on requirements of contract documents and acceptability of work are under the engineer’s authority (p 28).

The *Professional Constructor* is a practitioner of construction as defined by the AIC Constructor Certification Commission as an individual who possesses the skills and knowledge acquired by education and experience to manage the execution of all or a substantial portion of construction works.

The Constructor is an individual who commits to serve the construction industry in a professional and ethical manner and engages in the continued development of his/her skills and education to meet industry challenges. The profession of Constructor typically work for contractor's or construction management companies and encompasses job titles such as, Project Manager, Superintendent, Operations Manager, Construction Manager, Project Executive, and Chief Executive Officer, etc.

*Authorities Having Jurisdiction (AHJ)* as the inspectors at the federal, state, and local levels of government who are responsible for enforcing the laws and regulations to protect the health, safety, and welfare of the public and ensure the integrity of the completed projects. These authorities, including building code officials, zoning officials, inspectors, and regulatory agencies, protect the public's health, safety, and welfare by administering laws, codes, and other regulations governing the project.

The *Developer* is a company that acquires a site for the purpose of creating a facility for an owner. The developer may act as a design-builder and provide a build-to-suit, turnkey, or lease- back facility (p1.3).

The *Contractor (prime contractor)* has an agreement with the owner to construct the project for the owner with the contractor's own labor force, augmented with subcontractor labor forces, as needed.

The *Subcontractor* is an entity that has a direct contract with the contractor to perform a portion of the work on the project at the site.

The *Vendor (manufacturer)* is the entity that produces or fabricates products to be incorporated into the project.

The *Supplier* is an entity that furnishes or supplies manufactured products or services for the project, but does not perform labor at the site.

## **Project Delivery Methods**

The *delivery method* refers to the Owner's approach to developing the project team throughout the entire design, procurement, construction and commissioning process. The three most common project delivery methods are the design-bid-build, the design-build and the construction management approach. These project delivery methods and their variations are discussed below.

The *Design-Bid-Build* project delivery method requires the Owner to hire a design firm to prepare schematic drawings, develop working drawings, produce bid and contract documents, issues the documents and requests bids. The A/E design firm also opens all submittals at the bid opening and recommends to the Owner the best Contractor to build the project. Next, the Owner contracts with a Contractor, using an Owner-Contractor Agreement, to build the project.

The *Design-Build* project delivery method, sometimes referred to as Engineer-Construct project, is a contract that the Owner enters into with a company to provide all design, procurement and construction on the project. The Design-Build firm then enters into contracts with designers, contractors, subcontractors, vendors and suppliers to complete the project. One of the advantages for an Owner in selecting this method is the better communication that can occur between the design professionals and the construction professionals during the early design phases of the project. This collaboration allows the project to be fast-tracked, which can reduce the overall time of a project from schematic drawing to Owner occupancy. Fast-tracking is defined as the overlapping accomplishment of design, procurement, construction and commissioning of a project.

In the *Construction Management* project delivery method, the Owner hires both a design firm and a construction management firm during the pre-design phase of a project. Under the traditional Construction Management Contract, the CM firm is hired as an Agent for the Owner, similar to hiring the Architect/Engineer as an Agent. The Owner holds separate contracts with the A/E, the CM and each individual Trade Contractor. The CM's responsibility is to provide advice during the design phase and overall scheduling, trade coordination, cost control and management services during construction of the project. The CM receives a management fee for their services, similar to the A/E receiving a design fee for their services. This fee is called an agency fee, and the two methods that an Agency CM may offer an Owner is a Fixed Price Fee or a Guarantee Maximum Price Fee.

### **Types of Contracts**

The most common type of contract is the *Fixed Price*, commonly referred to as the Lump Sum contract. The Fixed Firm Price contract is primarily used for projects that are completely designed and the scope is clearly defined. A fixed price contract is a guarantee by the Contractor to perform the work and provide the necessary labor, material and equipment in a timely manner, no matter what the actual costs incurred by the Contractor. All financial risks are borne entirely by the Contractor in a Lump Sum contract. The Owner agrees to pay the Contractor, normally on a monthly basis, payments based upon progress.

*Unit Price Contract.* The Unit Price contract provides the Contractor with a list of items and the estimated quantities to be installed. The Contractor guarantees to perform an estimated quantity of work at a specified unit price. Conversely, the Owner agrees to pay the Contractor the agreed upon unit price for the actual quantity of work installed at the job site. Hence, the total contract amount will vary depending on the actual quantities installed. However, the unit price for each particular item listed will not change throughout the contract, unless there is a major variation in a particular line item. Normally, the Unit Price contract contains a quantity adjustment clause for these major variances which states that "if the Quantities of an item of work installed varies from the estimated quantities by more than 20 percent, then the price will be adjusted." A unit price contract is primarily utilized on civil projects such as roads, bridges and massive excavation projects.

*Cost-Plus Contract.* The Cost-Plus contract is used for projects that contain a substantial amount of undefined design, undefined scope, complex procurement system, and unstable or uncertain labor, material and equipment prices. In the Cost Plus contract the Owner agrees to pay the Contractor for all actual direct costs of labor, materials and equipment incurred on the project, and a fee for the Contractor's services. There are numerous methods used to calculate the Contractor's fee on a Cost-Plus contract, such as the Cost Plus a Percentage of Project Costs, a Cost Plus a Fixed Fee, a Cost-Plus Fixed Fee with a Target or Incentive Fee, and Cost Plus a Fixed Fee with a Guaranteed Maximum Price(GMP).

*Turn Key Contract.* The Turn key contract is used mostly by developers. The Contractor/Developer purchases the property, finances the project, builds the project according to the clients design, and turns over to the buyer in a ready-to-use condition, ready to produce cash flow for the Owner. The Owner agrees to make payment before receiving the keys to the building.

On long term construction projects, prices can fluctuate substantially from the time of submitting the bid until the time for delivery and installation because of the risk of inflation. Therefore, if the Contractor is forced to provide a fixed price at the bid proposal time they will often include in their bid a price contingency for anticipated cost increases. These anticipated cost increases may or may not actually materialize. Hence, the Owner should use an *escalation* clause in the contract to allow them to pay for actual changes in labor rates and material prices encountered while the project is in progress.

### **The major elements required to form an enforceable contract**

1. *Meeting of the Minds.* This is the signed Agreement between the parties. The Agreement must be provided to each prospective bidder during the bidding phase of the project. This allows the prospective bidders time to review the terms and conditions and determine any unusual risk involved before the Agreement is signed. The agreement provides for the signing, or "execution of the contract." In construction, the Subcontract Agreements are written and signed by both parties after the signing of the Owner - Contractor Agreement. The major elements needed to form a valid contract are:
  - *An offer is made.* Normally the Contractor is required to submit a bid proposal on the forms provided by the A/E firm. Note: It is a good practice to standardize the Subcontractor Bid Proposal form which includes a Bid Breakdown Section.
  - *Acceptance of the Offer.* The contractor receives a Notice to Proceed which indicates that the site is free of any encumbrances, and that the contractor can occupy the site. The date of the Notice to Proceed establishes the reference date from which the beginning of the project is calculated. The Notice to Proceed allows the Contractor to perform certain functions for the project.

2. *Consideration is received.* In the prime contract, this is something of values that each party furnishes. Consideration is almost always provided in the form of reciprocal promises, but in many cases the prime contractor's bid submittal requires a bid bond or certified check for a certain percentage of the total contract price. If the contractor decides not to sign the agreement, they will forfeit the value of their security to the owner. Consideration under the General-Subcontractor contract formation process must rely on the equitable doctrine of "promissory estoppel." This doctrine holds that if the prime contractor reasonably relies on the promise or price of the subcontractor to its detriment, then the subcontractor must be held to its promise in order to avoid harm to the prime contractor. To ensure that this promise isn't indefinite or unreasonable, the subcontractor provides a time limit for acceptance of their bid.
3. The Contract must be for a *Legal Purpose*.
4. The parties have the *legal capacity* to enter into a Contract. This means they must have the legal authority to sign the proposal being submitted. Under most types of ownership, the sole proprietor, the legal partners or the corporate officers have the legal authority. This becomes a problem when the estimator signs the proposal and is not recognized as a legal authority for the company.

## LEVEL II ADVANCED APPLICATIONS BODY OF KNOWLEDGE STUDY GUIDE



BRIEF IDENTIFICATION OF PRINCIPAL TYPES OF CONSTRUCTION CONTRACTS				
TYPE OF CONTRACT	BASIC CHARACTERISTIC OF CONTRACT	BEST APPLICATION	AFFECT ON and ADVANTAGES TO OWNER	AFFECT ON and ADVANTAGES TO CONTRACTOR
1. Bid - Lump Sum	Fixed firm price for completely designed and specified project.	Completely engineered and scheduled project in a well-developed technology with all reasonable risks clearly discernable. Example: highway work, civil work in established economic setting.	Project costs are firm. An owner may get advantage of lowest cost for below costs when bid too low.	Risks are identified and evaluated, may have opportunity through freedom of management and techniques to make significant profit. This works to the advantage of the Contractor very familiar with type and locale of work.
2. Bid - Unit Price	Firm prices for well-defined and understood unit cost. The Owner's position is the same as in Bid-Lump Sum above.	Partially engineered and scheduled project in a well-developed technology, with all reasonable risks clearly discernable. Quantities can vary to suit final design. This type of contract is mostly applicable to civil work.	Costs are predictable within know limits with varying scope. Work can proceed at an early stage of design.	Same as "1" above. Units' completion must be well documented. This type of contract often permits Contractor to aid financing by judicious selection of unit prices.
3. Negotiated - Lump Sum	Fixed firm price for completely designed and specified project. Owner/Contractor relations must be based on high level of mutual confidence in all negotiated contracts. The Owner generally does not have access to cost data.	Completely engineered and scheduled project. The Owner has exceptional confidence in the Contractor and project management team. Best suited to civil work or in technology where Contractor has proprietary position, i.e., chemical process offered on turnkey basis.	Price is fixed. Quality of work and performance know. The Owner concentrates on one selected contractor.	Essentially same as "1" above. As most negotiated work is on a single source basis, Contractor avoids overhead costs associated with bidding. As single source, Contractor has increased responsibility in quality and performance.
4. Negotiated - Unit Price	Firm prices for well-defined unit costs. Owner position variable.	Same "2" above, Owner having exceptional confidence in Contractor and project management teams.	Costs are predictable within know limits. Work can proceed earlier, quality and performance of work known.	Essentially same as "1" above.



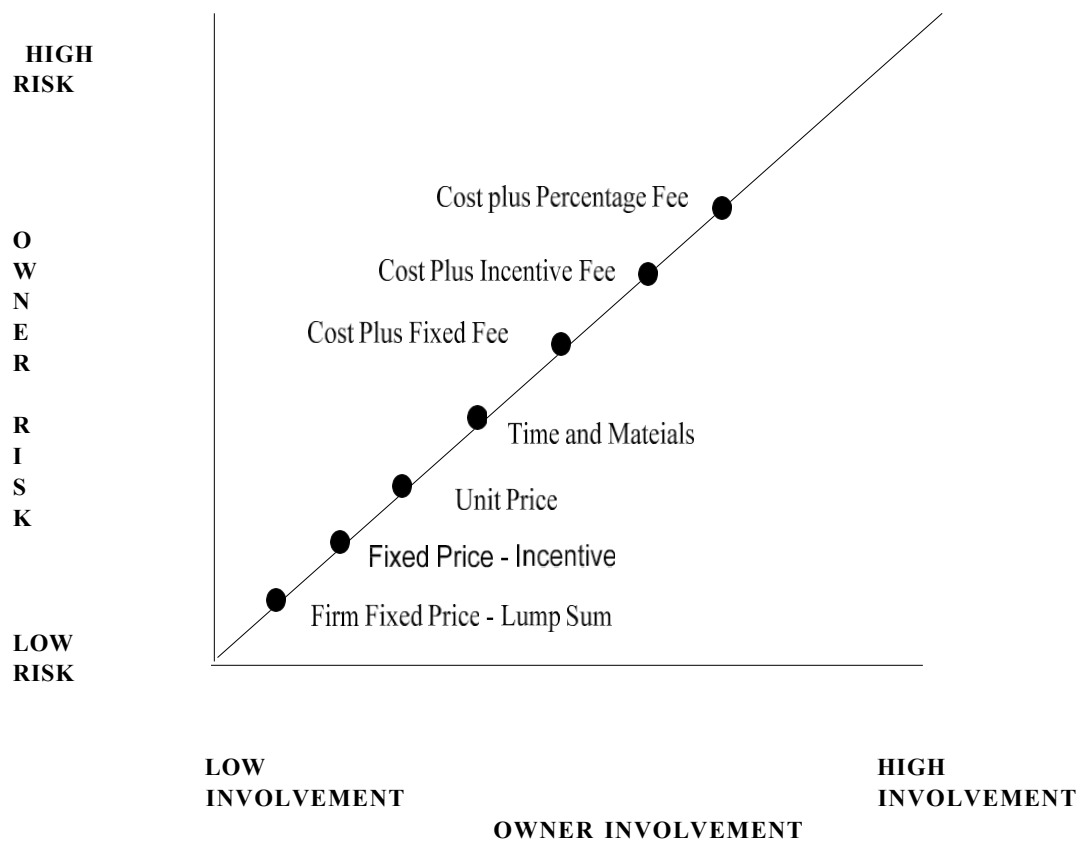
## Owner Risk and Involvement by Contract Types

BRIEF IDENTIFICATION OF PRINCIPAL TYPES OF CONSTRUCTION CONTRACTS				
TYPE OF CONTRACT	BASIC CHARACTERISTIC OF CONTRACT	BEST APPLICATION	EFFECT ON and ADVANTAGES TO OWNER	EFFECT ON and ADVANTAGES TO CONTRACTOR
5. Negotiated - Cost Plus Percentage Fee	Owner reimburses Contractor for all specified costs plus a fixed fee to cover specified items including profit. The Owner has complete access to cost data and may have a voice in project management structure.	Scope, duration, and scheduling of work ill defined, engineering proceeding with construction. Examples: emergency work; involvement in new "state of the art"; project in which scope and design being developed as project progresses. Exceptional confidence required.	Construction can proceed at once under Owner direction and control. This type of contract provides a high degree of flexibility. The Owner must follow work closely.	No other basis is available in view of indeterminate. Contractor position as "owner's agent" common. The type of contract eliminates price negotiations and delays.
6. Negotiated - Cost Plus Fixed Fee	Owner reimburses Contractor for all specified costs plus a fixed fee to cover specified items including profit. The Owner has complete access to cost data and generally has a voice in project management structure	Scope and duration fairly well fixed in concept, but subject to significant design interpretations. Engineering not complete. Example: construction in a technology with long background of similar projects, i.e., thermal power plants, offshore structures, paper plants. The Owner is experienced in project construction with confidence in Contractor.	Permits start of work at an early date. Owner, absorbing risks, pays lower profit to Contractor. This type of contract provides a high degree of flexibility. The Owner pays costs and picks up savings.	Removes the element of risk, assuring profit. Incentive is to finish project and move key people to another project.
7. Negotiated - Cost Plus Fixed Fee Target Estimate	Same as "6" except a target, cost and time schedule stated, with bonus and penalty related to the fixed fee. The Owner has complete access to cost data.	Scope and duration quite well fixed in concept and basic engineering completed. Examples as in "6" above. "Completion" must be clearly identifiable. Best suited where time is a major economic factor.	Costs reasonably predictable with incentives for early completion below target, in addition to advantages of "6" above. The Owner must have clear incentive for this type of contract and must follow work closely. The Owner must have confidence in a target-cost estimate.	Removes the element of risk. This type of contract provides for an opportunity for an increased fee and is likely to involve close supervision by Owner.
8. Negotiated - Cost Plus Fixed Fee Guaranteed Maximum Price (GMP)	Same as "6" except maximum cost guaranteed by Contractor.	Scope and duration fairly well fixed in concept but subject to significant design interpretations. The Engineering is not complete. The Owner must have maximum commitment. Owner/Constructor relations subject to unknown	Permits start of work at an early date. Owner, absorbing risks, could be paying lower profit to Contractor. This type of contract provides high degree of flexibility. The Owner has absolute limit on the cost of the project.	This type of contract can be seen as type "7" with no bonus but with a penalty. The Fee must recognize this. Risk is present and assumption of this type of contract must be taken cautiously.

### Economic Risk by Contract Type

CONTRACTOR RISK	CLIENT RISK	CONTRACT TYPE
LOWER	HIGHER	COST PLUS PERCENTAGE OF COST
		COST PLUS FIXED FEE
		COST PLUS INCENTIVE FEE
		LUMP SUM (FIXED PRICE)
HIGHER	LOWER	

### Owner Risk and Owner Involvement by Contract Types



## Conceptual Estimating

### The UniFormat Classification System

The Construction Specifications Institute (CSI) created the *UniFormat* as a uniform classification for organizing preliminary construction information in the early stages of a project. UniFormat organizes construction information based on the elements of a facility, otherwise known as *systems* and *assemblies*. UniFormat is chiefly used in the early design of a project, for preliminary project descriptions, and for performance specifying, and is frequently used for cost estimating.

The UniFormat is intended to provide a usable format for use at the early stages of a project before particular materials and methods have been determined and to classify data associated with performance and costs of completed projects for comparative analysis. UniFormat organizes construction information based on physical parts of a facility called systems and assemblies. These systems and assemblies are characterized by their function without identifying the products that compose them. The UniFormat systems and assemblies present a view of a proposed facility separate from the view presented by a breakdown of building materials, products, and activities. UniFormat breaks down a facility into systems, such as substructure, shell, interiors, services, equipment and furnishings, special construction and demolition, site work, and general (p 5.31).

### UniFormat Basic Organization - Level 1

UniFormat classifies information into nine *Level 1 Systems* with letter designations as follows:

A	Substructure
B	Shell
C	Interiors
D	Services
E	Equipment and Furnishings
F	Special Construction and Demolition
G	Building Sitework
Z	General

These nine systems can be used to arrange preliminary project descriptions and preliminary cost estimates into categories. The letter designations and titles of Level 1 are fixed. Category Z, General, is designated by the last letter of the alphabet so the classification can expand beyond building construction. When the list is expanded, category Z will remain last. When the UniFormat is included in project manuals, elemental (systems and assemblies) performance specifications can be located in the MasterFormat under Section 01 80 00 - Performance Requirements, in an order taken from these basic UniFormat categories.

Level 1 categories are designated by a letter of the alphabet in the first position. The second two digits designate the Level 2 categories. Only the letter of the alphabet and the two digits are used to designate a Level 2 category. The addition of two additional digits is used to designate Level 3 categories.

*UniFormat Level 2 numbering system* further classifies information into elements and systems under those nine systems categories. The Level 2 categories can be used to classify project descriptions and preliminary cost estimates in more detail. The letter and number designations and titles of Level 2 are also fixed.

The UNIFORMAT is the classification system used to organize preliminary project descriptions, preliminary cost estimates, and drawing detail filing.

- Preliminary Project Descriptions: The UNIFORMAT provides a system to describe a project by its basic elements or systems before the particular materials and methods have been chosen.
- Preliminary Cost Estimates: The UNIFORMAT also serves as the basis for the organization of preliminary cost estimates and parallels the organization of preliminary project descriptions.
- Drawing Detail Filing: The UNIFORMAT also serves as a system for filing and retrieving drawing details. The UNIFORMAT is used for the internal filing and retrieval of details in the office producing or using the details; it is not proposed for use in the identification of details on a set of drawings.
- Other potential uses of the UNIFORMAT include scheduling, value management, building performance, recording of design data, structuring of codes, and monitoring and management of design programs and costs.
- UniFormat is not a replacement or a competitor to MasterFormat. Each has its purpose and applications. Both can be used on the same construction project efficiently and successfully at various stages. Data compiled in accordance with UniFormat at the early stages of a project can be transferred to the MasterFormat at the later stages of the project.

*UniFormat Level 3 and Level 4 numbering system* classifications are also provided. These levels can be used for more detailed project descriptions and preliminary cost estimates. Any combination of classification from any of the levels can be used so that different levels of detail can be provided dependent upon the subject matter and the detail to which decisions can be made. Most project descriptions and preliminary cost estimates will utilize Levels 1 through 3.

Level 4 is available for use on detailed complex projects. Level 4 and the detailed listings under it provide checklists to ensure that the project descriptions and preliminary cost estimates are comprehensive and complete.

## Coordination with MasterFormat

The Levels 1-4 Outline and the Detailed Listings sections included in this document include related MasterFormat numbers for coordination and cross-referencing. The level at which there is a related MasterFormat number varies depending on the subject matter. In some cases, the related MasterFormat number is achieved at Level 3. In most cases the related MasterFormat number is not achieved until Level 4 or the detailed listings below Level 4.

The designation for the materials and methods can be added to the UniFormat designation system at Level 4 or beyond by adding the 5-digit MasterFormat related number as an extender after a decimal point. This MasterFormat number extension system is an available option for UniFormat users who want to indicate the direct relationship between the two formats in the designation system at some point during the design and construction process.

## Square Foot Model Method

The *Square Foot Model method* has the estimator select the model building type and uses the base cost table using the total square foot area of the proposed building type, the wall type, and the type of frame either a steel frame or a reinforced concrete frame.

The base cost per square foot is adjusted for different exterior wall systems, the different perimeters, and the different story heights.

This adjusted cost per square foot is then multiplied by the gross floor area to determine the subtotal cost of the building type.

Next, if a basement exists, the total square foot for the basement is multiplied by the cost per square foot for the basement area.

Common Additives which are not a part of the Model Costs are then added to the model cost.

The total of the building cost, plus the basement costs, plus the common additives equal the total cost of the building. Then a Zip Code Location factor is utilized to adjust the cost to a city within a state.

An example of a **Square Foot Building Cost Estimate** is contained in Section I of the Examples and Exhibits Booklet that accompanies this study guide.

## **Bid Scope Development – Work Packages**

*Work packages*, also called a bid package or trade package, is the organizational tool used to breakdown the construction project. These “work” bid packages are typically developed in the early design phases of the project if the project is fast-tracked. During the design phase of a project, the construction manager should begin to establish the bid packages. Even if the project is fully designed, typically the general contractor will break down the project into trade packages to allow for the work elements to be organized according to local trade practices in the region.

The work package contains the information necessary to describe the work that needs to be completed. In addition, the work package should include drawings, specifications, addenda the conditions under which the work must be performed and the sample of the trade contract if the bid is accepted. A sample contract provided at the bidding phase of the project with the terms and conditions under which the trade contractors or subcontractors shall perform will be upheld by the courts.

The bid scope documents for writing the work package may contain a bid division index, a bid division scope description, and a bid proposal and breakdown form. A description of the forms for creating the work or bid packages is described in detail in the next sections.

### **Bid Division Index**

The *Bid Division Index* requires the developer to review the General Conditions, Supplementary Conditions, General Requirements, Alternates, Addenda, the Index of the Technical Specifications and the Drawings to analyze and breakdown the project scope into a bid package for each trade. You will assign each section of a Division according to trade practices and vendor requirements. List all major trade topics using action verbs such as furnish, install, remove, fabricate and deliver, etc.

### **Principles for Writing the Bid Division Index**

Write a *complete bid division index* using action verbs such as furnish, install, remove, clear, excavate, compact, fabricate and deliver. This section requires the developer to refer to the index of the technical specifications and the drawings and assign each section of a Division according to trade practices and vendor requirements. The developer must list all major trade topics.

The *Bid Division Scope Description* requires the developer to specifically outline the bid scope for each trade shown on the Bid Division Index form. The Bid Division Scope Description for each trade consists of the following four sections:

## **Exclusions**

This section consists of work items that are furnished or installed by other trade contractors or the Owner to make the bid scope complete.

### *Specific Inclusions*

This section describes the specific trade activities, systems or type of work locations, and major components that the Trade Contractor will Furnish and Install. The bid scope description must be comprehensive in content and state that “the Trade Contractor will provide all resources necessary to make the scope complete and operational in compliance with codes and accepted by the Owner.”

The exclusions and specific inclusions sections are also referred to as subcontract trade instructions. These instructions are intended for a specific trade and they will tell the bidder what trade activities, systems and locations must be included in their bid.

### *General Inclusions*

This section will cover all support activities that must be performed. It clarifies "who does what" to the prospective bidder. Typical activities described in this section concern layout and coordination requirements, unloading, rehandling, storage and security of materials, assembly of scaffolding, installation of temporary facilities, demolition and material disposal requirements.

### *Other Considerations*

This section will include all general contract administrative procedures regarding daily reports, permits, fees, attendance at planning and safety meetings, bonds, insurance, indemnification, licensing, certification, prevailing wages, labor agreement compliance, OSHA and Right to Know compliance requirements, shop drawing submittal requirements, maintenance and installation manuals, warranties, and guarantees. The general inclusions and other considerations sections can also be written as: subcontract general bid instructions. These Instructions are intended to clarify all questions about "WHO DOES WHAT." These instructions should include items such as who will pay for the cost of permits, fees, meters, temporary facilities, unloading the materials, cleanup, excavation and guarantees.

## Principles for Writing the Bid Division Scope Description Section

A Bid Division Scope Description consists of four sections and each section has some general guidelines as outlined below:

### 1. *Exclusions:*

This section consists of work items that are furnished or installed by other trade contractors or the Owner to make the bid scope complete.

The writing principles for the Exclusions section are:

This section should use action verbs and clearly designate the excluded Trade Contractor, Vendor and Items Furnished by the Owner.

Examples:	Furnish Flag Pole - Owner	BD 160
	Fabricate and Deliver Structural Steel	BD 150
	Purchase and Install Anchor Bolts	BD 140

### 2. *Specific inclusions section* of the scope description:

This section describes the specific trade activities, systems or type of work locations, and major components that the Trade Contractor will Furnish and Install. The BID SCOPE Description must be comprehensive in content and state that the Trade Contractor will provide all resources necessary to make the scope complete and operational in compliance with codes and accepted by the Owner.

The writing principles for the Specific Inclusions section are:

This section should use action verbs, state the scope description in paragraph form, describe the specific trade activities, state the major components and systems or type of work locations. Finally, state that the “Bid Scope will be complete and operational and in compliance with codes and accepted by the Owner.”

Example: Provide and install conduit, hangers, wire and equipment for the power, lighting and communication systems to make the electrical systems complete and operational and in compliance with codes and accepted by the Owner.



3. *General Inclusions Section* of the Scope Description:

This section will cover all support activities that must be performed. It clarifies "Who does What" to the prospective Bidder. Typical activities described in this section concern layout and coordination requirements, unloading, rehandling, storage and security of materials, assembly of scaffolding, installation of temporary facilities, demolition and material disposal requirements.

The writing principles for the General Inclusions section are:

This section uses action verbs, and a separate line for each support

activity. Example: Receive, unload and rehandle all structural steel.

4. *Other Considerations Section* of the Scope Description:

This section will include all general contract administrative procedures regarding daily reports, permits, fees, attendance at planning and safety meetings, bonds, insurance, indemnification, licensing, certification, prevailing wages, labor agreement compliance, OSHA and Right to Know compliance requirements, shop drawing submittal requirements, maintenance and installation manuals, warranties, and guarantees.

The writing principles for the Other Considerations section are:

This section uses action verbs, a separate line for each activity and it states the frequency, dates or time frames that items must be submitted by.

Example: Submit certificates of insurance at signing of the contract.

### **Work Package Bid Breakdown and Proposal Form**

The *Bid Package Breakdown and Proposal Form* should be provided to the trade contractors to submit their bids on sometimes referred to as the bid submittal form. This is the Trade Contractors or Subcontractors offer to perform the work. This form standardizes the information requested from the Trade Contractors which eliminates some of the confusion during the bidding phase of the project. The proposal should be in writing and it should include a bid breakdown by categories of work to be performed.

An example of a **Drywall Bid Package Bid Breakdown and Proposal form** is contained in Section I of the Examples and Exhibits Booklet that accompanies this study guide.

:

## **Bid Scope Bid Analysis**

The American Institute of Architects, General Conditions states that “the Contractor shall be solely responsible for all construction means, methods, techniques, sequences, and for coordinating all portions of the work under the contract.” Furthermore, the Contractor shall be responsible for the acts and omissions of all Subcontractors. Therefore, since a major portion of most construction projects is subcontracted and the Contractor does not have direct control of the situation, the following steps can improve the Contractors chances of finding the lowest responsible bidders:

The CM can perform the following activities to minimize the problems with utilizing Trade Contractors or Subcontractors:

- Create a set of general bid instructions included with each work package to clarify who does what
- Write a Bid Division Scope Description for each work package and each work package contains these sections:
  - Exclusions
  - Specific Inclusions
  - General Inclusions
  - Other Considerations
- Require each bidder to submit their bids on a Standardized Proposal Form including a bid breakdown for each work package
- Require a bid breakdown to be submitted from all bidders
- Pre-qualification all bidders based upon the same criteria
- Place a time limit on bid submittals to allow some time for review prior to award or incorporation into the prime contractor’s bid

## Bid Document Development

The *Pre-qualification* process is usually announced in the advertisement to bidders. Contractors are asked to submit documents that establish the firm's expertise and capability in accomplishing similar types of work, before they can be issued bidding document & before they can submit their proposal. The purpose of pre-qualification is to allow the owner the opportunity to eliminate the incompetent, overextended, underfinanced, and inexperienced contractors from consideration. The American Institute of Architect and the Associated General Contractors recommend that the following information be contained in the Pre-qualification form.

- Submittal Parties
- Name of the Project
- Type of Work Performed
- Type of Organization
- Licensing Information
- Experience and Claims Record
- Laws and Regulations
- References: Trade, Banks and Surety
- Financial Statement
- Signatures and Notarized

Prepared by - Contractor

Sent to - Owners Representative or State Highway Dept.

Contractors Responsibility - Fill out pre-qualification questionnaires or other Owner documents prior to receiving the bidding documents

*Alternates* are used to request different methods of constructing a project. A Second purpose is to obtain bids on the basic contract and requesting additional alternatives on specific items that the owner may or may not decide to add or deduct from the Base bid. These Alternatives are requested during the bidding phase and they must be submitted by the contractor at the bid opening.

Prepared by - Contractor on the form provided in the bid package

Sent to - Owner with the Contractor's bid submittal

Contractors Responsibility - Submit addition or deduction in price with the bid submittal

The *Prevailing Wage Rate Schedule* is normally found at the beginning of the Bid Requirements. On public construction projects the wage rates by craft may be established. This is sometimes referred to as the Davis-Bacon Act.

Prepared by - Owner or Owner's  
Representative Sent to - Contractor

Contractor Responsibility - use these rates as a minimum

The *Minority Contractor Procedures* for the Disadvantaged Business Enterprises (DBE), Minority Business Enterprises (MBE), and Women Business Enterprises (WBE) are enforced by the federal agency called the Equal Employment Opportunity Commission.

The Requirements for DBE/MBE/WBE are described under the United States Department of Transportation (USDOT) Regulation 49 Code of Federal Regulations (CFR), Part 23 which contains definitions and goals of the statute. Also, many federally funded road projects have established Subletting Contract Work to DBE's procedures in the Special Provisions for the project. These provisions may also be in the Supplementary Conditions for the project.

*Executive Order number 11246* titled, *Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (EEO)* and *Executive Order 11375* specifies the goals, record keeping and compliance requirements. This requires the Contractor to execute and submit, as part of the bid proposal, a certification form relating to Disadvantaged Business Enterprises (DBE), Minority Business Enterprises (MBE), and Women Business Enterprises (WBE).

*DBE's, MBE's and WBE's* must apply to the Government and be certified by the agency to be recognized as DBE, MBE OR WBE registered company. In conclusion, it is the Contractors responsibility to prove that they have tried to meet the goal and that they have exhausted all contacts, documented each minority contacted and requested minority status documentation from all contacts.

*Addenda* are for any changes, modifications, corrections or additions that arise before the bids are opened. These will become a part of the bid package and they must be included in the bid price. This is the form that the Owner or the Owners Representative uses to modify the scope and detail of the work prior to the bid opening.

Prepared by - Owners Representative  
Sent to - All Bidders at least five days prior to bid opening

Contractors Responsibility - Sign all addenda  
Submit acknowledgment with the Contractor's bid submittal

A *No collusive Affidavit* is a sworn statement stating the bid submitted was arrived at without any agreement or cooperation with other prime bidders on the contract.

Prepared by : Contractor on the form provided in the presence of a Notary Public  
Sent to: Owner with the Contractor's bid submittal

Contractors Responsibility: Have the form notarized and submit with bid submittal

*Proposal Supplements* are used to request additional information concerning the bid proposal. Typically, the A/E will request the name of the subcontractors, material manufacturers and suppliers. This information will be used to determine the reliability of the contractor and whether the project materials are in compliance with the Specifications.

Prepared by: Contractor on the form provided in the bid package  
Sent to: Owner with the Contractor's bid submittal

Contractors Responsibility: Obtain from the Subcontractors and Suppliers  
and submit with the bid submittal.

### **The Information Available to the Bidders (IAB)**

The *Information Available to the Bidders (IAB)* consists of preliminary schedules, Geotechnical data (Report), Soil Boring Information, an existing condition's description, site maps, existing structures, existing substructure and property surveys for the contractor's review.

Prepared by: Owner, Owner's Representative and/or Testing Company  
Sent to Contractor with the bid package documents

Contractor's Responsibility: Review thoroughly and compare to Standard Table for Relative Density and Consistency. Also, most of the time these documents will be stamped "For Bidding Purposes Only." This normally means that the Contractor can utilize these for developing their bid, but they cannot utilize the documents for requesting a contract change order.

*Rules to Determine if the IAB is a Part of the Agreement:* This bidding requirements may or may not be a part of the contract documents depending on their disclaimers. The A/E firms strongly suggest that these bidding requirement and forms be excluded from the contract and in most cases, they are excluded but below are the questions that the courts have utilized to determine if the Information Available to Bidders are a part of the agreement:

QUESTIONS TO DETERMINE WHETHER INFORMATION IS PART OF THE A G R E E M E N T	Yes or No
Are these documents listed in the Owner/Contractor A g r e e m e n t ?	
Is the index listed in the Owner/Contractor A g r e e m e n t ?	
Is the Information Available listed in the I n d e x ?	
Is the report numbered continuously within a division, such as 31 21 - 1	

If you can answer yes to all of the questions, then the Information Available to the Bidders is included as a part of the Agreement.

The *Pre-bid Site Inspection* normally requires the bidder to visit the site, verify site conditions and other conditions under which work under this contract must be conducted. If a thorough pre-bid site inspection is not conducted, the contractor is responsible for all damages associated with any condition that is visible. The pre-bid site inspection requirements are normally stated in the Instructions to Bidders. The courts have outlined certain minimum activities that a Contractor must perform to be able to recover for an error. Hence, the Contractor must:

1. Visit the site,
2. Verify all field dimensions,
3. Verify existing structure's sizes, elevations, etc.,
4. Document all observations, and
5. Observe outcroppings and infer conditions. For example, if the Contractor observes clogged drains, then they must anticipate poor drainage.

This suggests that the Contractor should maintain a pre-bid checklist with surface conditions, sub- surface conditions, access to the site, adjacent site conditions, temporary services, local ordinances, transportation, storage facilities, weather conditions, material availability, labor availability, public safety requirements, and hauling conditions.

A **Pre-bid Check List** is provided in Section I of the Examples and Exhibits Booklet that accompanies this study guide.

### **Contractor's Risks if the Soil Report states "For information Only"**

If the Soil Report, the Soil Borings or the Soil Investigation Report state, "For Informational Purposes Only" or "For Bidding Purposes Only," then the Contractor must realize that they cannot utilize the documents for requesting contract change orders for compensation.

## Contractor's Mistakes in Bidding

*Bid Error Subject to Withdrawal* - There are two types of bid mistakes that allow a Contractor to withdraw their bid. They are:

1. Transposing figures, also called a mistake in transcription and
2. substantial quantity variations.

*Bid Error is Not Subject to Withdrawal* - The Contractor will not be allowed to rescind their bid for a mistake in judgement. For example, the contractor priced a bid based upon the assumption that it would not be responsible for the seat time under a Collective Bargaining Agreement. After the bid opening, the Contractor learned that the Collective Bargaining Agreement required the Contractor to provide seat time for each craft worker under the Agreement. This is a mistake in judgement.

### Steps that a Contractor must Take if a Bid Mistake is Found

- Inform the Owner immediately both orally and in writing.
- State what action it is the Contractor wants the Owner to consider: withdraw the bid or adjust the amount.
- Do Not sign the contract.
- Record all facts about the mistake from the Contractor's bid sheets.
- Record any knowledge the Owner has about the mistake.

### Essential Conditions for a Contractor to Rescind a Bid

A bid or contract can be rescinded for a contractor bid mistake if the Contractor can prove each of the following elements.

- The mistake is so great a consequence that to enforce the contract as proposed is unconscionable.
- The mistake relates to a material feature of the contract.
- The contractor must prove where and how the mistake was made.
- The contractor must prove that they used "due care" in preparing the bid, but the mistake was made anyway.
- The Owner should lose only the benefit of the bargain.

### Subcontractors' Mistakes in Bidding

The majority of states utilize *promissory estoppel* because no federal law exists in regard to subcontractors because state law governs all subcontracts.

*Promissory Estoppel* is defined as one party's promises to do something (Subcontractor) and the other party (Contractor) relies on that promise. Therefore, the promise can be binding upon the Subcontractor. Under *Promissory Estoppel*, a Contractor depended upon the Subcontractor's bid in submitting its bid to the Owner, and the Contractor cannot request more money from the Owner if the Subcontractor claims a mistake has been made. There are three different rules that apply to *Promissory Estoppel*.

*Drennan* is the rule in the majority of jurisdictions. This rule states that a subcontractor's bid is irrevocable for a reasonable amount of time after the award of the prime contract if the general contractor has relied on that bid in its bid to the owner. The drawback with the *Drennan* rule is that it is unfair. Whereas the subcontractor is obligated to the prime contractor, the prime is not obligated to the subcontractor. Once the prime contractor is awarded the prime contract, the prime contractor can legally give the subcontract to another subcontractor. In the industry this practice is called *bid shopping*.

*James Baird* is the minority rule. Under this rule the Subcontractor's bid is an offer revocable at any time prior to acceptance by the Contractor. This rule is consistent with general contract law. In jurisdictions using this rule the general contractor has no assurance that the subcontractors will perform at the price quoted. Contractors must include this risk in bidding projects.

Some California courts use the *California rule*, which balances the obligations of the contractor and the subcontractor. This rule also discourages bid shopping.

To hold a subcontractor to promissory estoppel, the contractor must prove that:

- The offer was received
- The Contractor relied on the offer
- That reliance on the offer caused irrevocable harm to the Contractor.

*Bid Comparison and Analysis Sheet* is a form used by the Construction Manager or the Contractor's Estimator to compare and evaluate the completeness of the bid proposal. This form requires you to compare like items by calculating the base bid price and then adding the overlooked items to determine the complete price for the same work package scope.

An example of a **Bid Analysis Sheet and a Checklist of Commonly Overlooked Items for Subcontractor Bids** is contained in Section I of the Examples and Exhibits Booklet that accompanies this study guide.

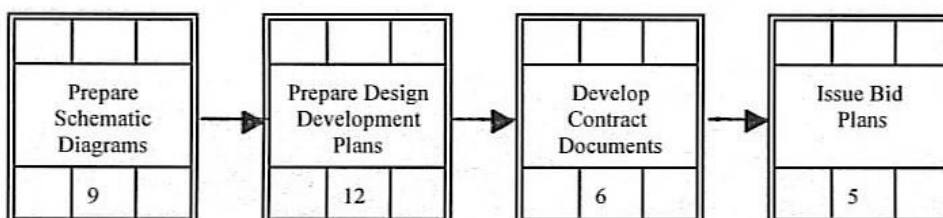


## Design Phase - Schedule

### Typical Sequence of Activities in the Design Sequence for a Project

The design sequence on an Engineer - Construct or a Design - Build Project typically contains an activity sequence showing the interrelationship of the design activities. This same sequence can apply for each discipline. This sequence is then connected to the procurement activity sequence. A typical sequence for each design discipline is as follows:

1. Prepare the Schematic or Process Diagrams
2. Prepare the Design Development Drawing Packages
3. Formalize the Final Design and Develop the Contract Documents
4. Client Approves the documents and the Bid Plans are Issued



### Design Disciplines and their Connection to Procurement and Construction

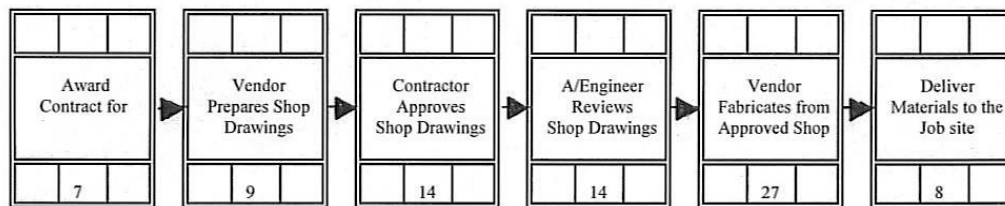
On an Engineer-Construct or Design-Build project the entire project may be fast-tracked to allow for portions of the design, procurement, and construction to occur concurrently. The overlapping accomplishment of design, procurement and construction activities allows the project to be completed faster. A fast-tracked project may require discrete packages of information or disciplines that are required at a predetermined construction milestone to permit portions of the construction to start prior to completion of the overall design. Some disciplines that may utilize the design sequence stated above are the following:

- The foundation is design by the civil engineer
- The structural steel is designed by the structural engineer
- The HVAC is designed by the mechanical engineer
- The electrical is designed by the electrical engineer
- The process piping is designed by the process engineer
- The temperature and flow instruments for process control is designed by the instrumentation engineer
- The sprinkler system for fire protection is designed by the fire protection engineer.

## Procurement Sequence

The procurement sequence on an Engineer-Construct or a Design-Build Project typically contains an activity sequence showing the interrelationship of the procurement activities so that the vendor's progress can be tracked against the schedule. This same sequence can apply for each vendor. This sequence is then connected to the construction activity sequence. A typical sequence for each design discipline is as follows:

1. Award the Contract to the Vendor or Subcontractor.
2. Vendor Prepares and Submits Shop Drawings, Product Data or Samples as outlined in the Technical Specifications
3. Contractor reviews & Approves Shop Drawings measurements and construction methods
4. A/E Reviews all Shop Drawings design criteria prior to the fabrication of the item
5. Vendor Fabricates the items according to the approved and revised drawings or the Subcontractor schedules the contract into their fabrication schedule
6. Deliver the Materials to the Job Site. Vendor arranges for shipment



Leadtime is the total amount of time required to receive materials on the jobsite.

The **LEADTIME REPORT** is a summary of the Procurement departments-estimated amount of time required to obtain specific materials and equipment. The Leadtime Report consists of:

1. **BID TIME IN WEEKS** is the Time required by the Vendor after receipt of the inquiry to prepare inquiry and mail bid. This excludes the Time required for the Contractor to prepare inquiry and mail time to the vendor.
2. **PREPARE SHOP DRAWINGS & OTHER DATA IN WEEKS** is the Time required after receipt of a purchase order to prepare and mail shop drawings and other data to Contractor for review and approval. This excludes Contractor and A/E review time,
3. **SHIPMENT** is the Time from receipt of complete drawing approvals for Fabrication by the vendor until shipment is made. This excludes transit time by the Common Carrier.

**Design Phase - Cost Variance Analysis**

Variance Analysis is completed on Design-Build or Engineer-Construct contracts during the Design Development phase of the project. It is used to compare the actual quantities from the Design Development plans to the Conceptual estimate quantities and prices. Normally quantities are sampled at four intervals by system. Samples are normally taken at 15%, 25%, 50% and 75% complete. The most cost-effective sources for the actual prices are the vendors' agreements, the purchase orders and labor agreements that the Project Manager has negotiated for the project.

Variance analysis is calculated on labor and materials. There are four labor variances.

An example of a Variance Analysis is contained in Section I of the Examples and Exhibits Booklet that accompanies this study guide.

## II. EMPLOYMENT PRACTICES

### Employment Laws and Regulations

There are numerous hiring information and employment law regulations that the supervisor must be in compliance with since they may be the first contact for the new employees. Therefore, your actions in labor matters can have a major effect on an employee's perception of the company and your concern for their well-being. It is the supervisor's responsibility to abide by the labor laws and/or to abide by the collective bargaining agreements (union) negotiated by the contractor. This requires the supervisor to have a basic knowledge of the following labor laws.

### Hiring Requirements

The *Fair Labor Standards (Wages and Hours Law) Act* requires a poster to be posted in clear view for all employees. This poster must be posted at the job site at the employee bulletin board. This law:

- Regulates methods of wage payment and hours of work for all industries engaged in construction between two or more states.
- Restricts the employment of children more than fourteen and less than sixteen to non-construction jobs and prohibits employment of children under the age of 18 in hazardous construction jobs is prohibited. They can be employed in construction between sixteen and eighteen only in nonhazardous jobs. It is the contractor's responsibility to verify their age.
- Can not work nonexempt employees for more than forty hours per week unless you pay them at least time-and-a-half their regular rate of pay for the overtime.
- Specifies that you cannot use gender as a basis for discriminating in wages, except where wages are based on a seniority system, a merit system, a piecework system, a commission or a bonus system.
- Specifies that wage rate of any employee can not be lowered just to settle a wage disparity.
- Allows a manager to create a class of employees called exempt employees. This allows you not to pay overtime to some people if they work more than forty hours per week. This class normally consists of executives, managers, and first-line supervisors, and other employees whose jobs require making decisions and using personal judgment, creativity, or innovativeness but they are not classified as managers.

The *Illegal Immigration Reform and Immigrant Responsibility Act* requires that:

- The supervisor ask for detailed proof of an applicant's eligibility to work in the United States.
- All non-U.S. citizens employed in the United States to complete an I-9 form at the time of hiring. The I-9 form must be submitted to the federal government within three days of hiring. This form must be completed at the time of hiring.. You can ask for proof of employment eligibility such as an alien registration card, U.S. passport, or a U.S. Social Security card. It is illegal for you to ask an applicant where they come from or which country they come from.
- Penalties be assessed to supervisors and companies for noncompliance

The *Employee Withholding Exemption Certificate* for Federal and State Tax Withholdings requires that:

- A W-4 form must be completed at the time of hiring to comply with Federal and State tax requirements. Each employee hired must fill out a W-4 form called the Employees Withholding Exemption Certificate indicating the employee's name, an address, social security number, marital status, the number of exemptions claimed. This is signed by the employee.

## **Employment Law Legislation**

*Employment law* covers numerous situations where managers' and supervisors' actions or inappropriate actions may have severe legal ramifications on the individual and the company. There are numerous possible actions which can be taken against an organization or its individuals if they do not take appropriate actions concerning employment issues. You or your company could face claims of breach of a contract for firing someone without just cause, retaliatory discharge for firing someone after they made a claim, slander or defamation of character for telling someone the reason for discharging an employee, sexual harassment for failure to take immediate action to remedy a hostile situation, wrongful discharge because you did not follow all of the progressive disciplinary steps, and the list is extensive.

*Civil Rights legislation* was enacted in 1964 and it defined discrimination, but discrimination still exists today and it is still illegal today. The primary reason for enacting numerous civil rights laws is prejudice against a group of people which cannot be erased by laws.

Prejudice means forming opinions or having feelings about a group of people (protected class) on the basis of special characteristics, such as race, color, religion, ethnicity, sex, age, disability, and veteran status or making a judgment in advance on the basis of stories, implications, or limited experience about people from a particular place or background.

## Employment Law Discrimination

Employment Discrimination can take many forms in the workplace. Some examples are Sex Discrimination, Sexual harassment, Promotion discrimination, Hostile work environment, Improper termination, Racial harassment, Recruitment discrimination of women and minorities.

Under *The Civil Rights Act of 1964*, the Federal District Court for the Western District of Missouri has ruled that individual employees in a position of authority can be sued, held accountable for and required to pay punitive damages for acts of discrimination. Recent cases that Supervisors have been held liable for Intentional Infliction of Emotional Distress, Defamation Assault and Battery, Malicious Interference with Employment, Invasion of Privacy and other common law theories.

The *Civil Rights Act of 1991*, expanded employment discrimination claims to allow for:

- Recovery of compensatory damages for Emotional Pain, Suffering, Inconvenience, Mental Anguish, and Loss of Enjoyment of Life. The act also allows for
- Recovery of punitive damages if the jury finds that the employer acted with malice or reckless indifference. If compensatory and/ or punitive are awarded, they are not covered by business liability insurance. The 1991 act also
- Employee jury trial
- Caps the compensatory and punitive damages.

The plaintiff is required only to show that the company's or its representatives reckless disregard for the consequences of an action is sufficient to prove intent to discriminate intended to produce the outcomes.

*Equal Employment Opportunity* (EEO) laws which are enforced by the Commission (EEOC) have identified guidelines for what a manager cannot do as follows:

- Failure to hire or to discriminate against any person in a protected group
- Limit, segregate, or classify applicants which have an adverse effect on their status
- Failure to provide training because they are members of a protected group
- Retaliation against any person because they made a claim or participated in an action
- Print any employment notices that may adversely affect members of a protected group
- Discharge any person because they are members of a protected group
- Failure to maintain and post, in a conspicuous place, the contents of a civil rights law

The *American with Disabilities Act* (ADA) of 1992 administered by the EEOC has expanded the list of ADA-covered disabilities. ADA defines disabled individuals as persons with a physical impairment, mental disorders, impaired or disabled persons including individuals with AIDS, epilepsy, obesity or diabetes which may affect the human biological system and/or creates a disability. Also, alcoholics and drug abusers who have successfully undergone treatment are covered under the Act. The ADA specifically excludes any employee or applicant who currently, knowingly uses a controlled substance. It also excludes homosexuals, bisexuals, transvestites, and persons whose sexual behaviors do not stem from physical impairments. Below is a list of things a manager cannot do to a qualified disabled person under the ADA guidelines:

- Limit, segregate, or classify applicants solely on the basis of the person's disability
- Participate in an arrangement with employment agencies, labor unions, benefit providers or training programs that subjects the qualified person to prohibited discrimination
- Use criteria or employment tests that are not bona fide occupational qualifications
- Exclude or deny equal employment or benefits to a qualified person solely because the qualified individual has a relationship with a disabled spouse
- Not make reasonable accommodations for a known physical or mental limitation
- Require medical examinations or ask a person whether they have a disability

The *Sexual Harassment Regulation* according to the Equal Employment Opportunity Commission's (EEOC) policy it states that an employer is liable for sexual harassment if it knew or should have known upon reasonable diligent inquiry about a situation which created a hostile work environment. EEOC policy also insists:

- That each company must have policy that has been "clearly and regularly" communicated to all employees.
- The company must affirmatively raise the subject with all employees.
- The company must express strong disapproval and it must explain the consequences to all employees.
- The company must have a sexual harassment complaint procedure that ensures confidentiality and provides effective remedies including protection of victims/witnesses.
- The company must investigate charges promptly and thoroughly.
- The company must take immediate and appropriate corrective action.
- The company must provide training on sexual harassment.

*Hostile Work Environment (Courts Definition)* A hostile environment is created when a supervisor's conduct:

- Had the purpose or effect of unreasonably interfering with the employee's work performance.
- Evidence can be submitted that a supervisor had sexually harassed others.
- Evidence can be submitted of racial and sexual hostility created a hostile environment.
- Created a hostile environment by name calling or slurs.
- Creates a hostile environment with offensive pictures or jokes
- Creates an invasion of privacy.
- Intentionally inflicts emotional distress

Supervisors can be held individually liable for sexual harassment claims and punitive damages have been awarded for pain and suffering.

Affirmative Action plans have been established to ensure equal employment opportunities on public projects. Many contracts with federal or state funds will establish goals and timetables for minority and female participation expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work. The Contractor must comply by executing and submitting with their bid proposal, certifications relating to the following:

*Minority Business Enterprises* (MBE) on government projects require a dollar value or percentage as a goal of the contract to be supplied by a registered MBE. *Women Minority Business Enterprises* (WBE) on government projects require a dollar value or percentage goal of the contract to be supplied by a registered WBE. *Disadvantaged Business Enterprises* (DBE) on government projects require a dollar value or percentage overall goal of the contract to be supplied by a registered DBE. If these goals cannot be met, then the contractor must provide complete documentation of the names of the contacts with times and dates each MBE or WBE or DBE was contacted. Without proper documentation a Contractor can be considered a non responsive bidder.

### **Employment Documentation - *Disciplinary Memorandum***

It is extremely important for managers to write the proper Disciplinary Memorandums. For example, in William E. Lissy (1991, November) article titled *Disciplinary memos in Supervision* states that managers should focus on the format, vocabulary and the tone of their disciplinary memos because they "may be sending totally different messages from what was intended" (p 19).

Therefore, it is imperative that all disciplinary memorandums contain these three sections. They are the format, vocabulary, and the tone. Whenever you are required to write a disciplinary memo or letter, the memorandum should *never start or contain praise*, it sends a Contradictory Message to the Employee. When sending a Disciplinary memorandum, you must focus on three items.



First, focus on the Format. Second, focus on the Vocabulary. Third, focus on the Tone.

- The Format section should contain these items: an introduction that should state what action is being taken and what caused the need for the disciplinary action; a supporting paragraph documenting the incident causing the action; a direct quotation from the company policy; a conclusion which focuses on the future; and the Format should include specific review periods and how they will be dealt with in the future.
- The Vocabulary section should contain words that are easily understood.
- The Tone section should state the facts only and the Tone should not be harsh, exaggerated or judgmental.

## Management and Union Labor Laws

There are numerous *Labor Laws* that apply to the construction industry which supervisor must be aware of to comply with the requirements. Also, these Labor Laws apply to all contractors' whether you are a union or merit shop contractor.

*The Sherman Anti-Trust Act of 1908* -Provided for court injunctions to be issued against unions for strikes, picketing, and boycotts.

The *Davis-Bacon Act* was enacted in 1931, this act requires that in a contract for construction work for the United States government there shall be stated the wage rates and benefits for workers that the contractor and subcontractors must undertake to pay and they shall not be less than those prevailing in the locality. It established prevailing wage rates for each craft classification on all federally funded projects. The prevailing rates form is normally provided in the Bidding Requirements section of the project. It identifies the name of the construction project site, the County, the Date Issued, and the basic hourly rate, the hourly fringe benefit rate, the total prevailing, and the overtime provisions. A contractor must ensure that all contractor employees and subcontractor employees are in compliance with this requirement.

The *Norris-LaGuardia Act* of 1932 (1) restricted the court's use of injunctions against union activities, (2) protected the right of workers to strike and picket peaceably, (3) prohibited *Yellow Dog Contracts* which is defined as a pre hiring agreement requiring the job applicant not to join a union or to renounce their membership while employed.

The *National Labor Relations Act* of 1935 (NLRA) (Wagner Act) put into law protects employees' rights to take concerted action, that is, work together, to alter work conditions by (1) using bulletin boards that publish general community information and (2) holding meetings during work hours, with no lost pay or threat of retaliation, to discuss safety or other working conditions.

It allows all workers to engage in other concerted activities for the purpose of collective bargaining through their own representatives. This includes forming, joining or assisting labor organizations, but at the same time, it prevents nonunion employees from being forced or coerced into joining a labor organization or engaging in collective bargaining except where membership in a labor organization is a condition of employment created by contract. The National Labor Relations Act created the National Labor Relations Board (NLRB), which is a decision-making board established to resolve conflicts between management and employees.

The *National Labor Relations Board* also defined unfair labor practices by employers. It states that as a manager you cannot:

- interfere with, restrain or coerce employees exercising their rights.
- discriminate against an employee in order to encourage or discourage union membership.
- discharge an employee because of membership or nonmembership.
- refuse to bargain collectively with the employees' representatives, and you must bargain in good faith.
- enter into a Hot-Cargo Agreement. A *Hot Cargo Agreement* is where the employer agrees not to do business with or purchase the products of another employer.
- discriminate in hiring or tenure on the basis of union or nonunion membership.
- fire or otherwise discriminate against an employee for filing charges or giving testimony under this act.
- require a worker to be a member of the appropriate union at the time of hiring (outlawed *closed shop* agreements).

As a manager as (as long as you do not interfere with your employees' rights to take collective action or form a union) you can:

- freely express your own viewpoints, arguments, or opinions in writing, print, graphics, or visuals about unions or collective bargaining while ensuring that what you say does not threaten reprisal or force someone from forming or joining a collective bargaining unit or promise benefits for not forming or joining.
- counter aggressive union recruiting tactics such as non employee labor organizers.
- hear employee grievances and adjust them without union representation.

The *Labor-Management Relations Act* of 1947 (Taft-Hartley Act) is primarily focused against unfair Union Management Practices against its members or nonmembers while trying to organize. Under this amendment to the NLRA, a manager cannot conduct unwarranted or sudden lockouts against employees. Second, you cannot pay, lend, or deliver money or other assets to a union, union official, union welfare fund, or an employee involved in a labor dispute.

The *Labor Management Relations Act* also included the following provisions against unions and union officials.

- It prohibits featherbedding. *Featherbedding* is defined as paying for services not performed.
- It made secondary boycotts illegal. A *Secondary boycott* is a boycott using a third party to put pressure on one of the other parties to conform.
- It allows you the right to make every reasonable effort to reach an agreement with your employees on rates of pay, hours, and working conditions including notice of changes, and to arrange promptly to hold a conference to settle any differences.
- If the conference is unsuccessful, the law requires that both of you participate fully in meetings by the Federal Mediation Service.

The *Labor-Management Disclosure Act* of 1959 (Landrum-Griffin Act) has language similar to that used in the NRLA, which says that you cannot interfere with employees' rights to work, to organize, to choose representatives, bargain collectively, or engage in concerted action for their mutual aid or protection. This act also requires the union officials to submit a personal financial statement and union financial statements to the government each year.

## **Labor Law Terms and Definitions**

The *Collective Bargaining Agreement* established the terms and working conditions agreed upon between the contractor and the union are described in this document. These collective bargaining agreements are usually negotiated by a contractor association such as the Associated General Contractors (AGC) and they are signed by the contractor members. The supervisor should attain a copy of the local agreements in effect before starting or the assigning work. Each local trade union has negotiated their own agreement. These agreements are normally negotiated by the contractor association and all local unions for its members.

The *Doctrine of "Separate Gates"* has established the rules for contractors to following in designating gates on a union construction project so that the owner's employees, the subcontractor's employees, the contractor's employees and the material deliveries are separated. Separate gates are established for each employer or each trade and they are in a different location from the job site deliveries. Also, the owner's employees entrance, and the owner's deliveries are usually away from the construction gates.

*Subcontract Clause* under the Wagner Act in Section 8e states that Contractor's can agree to restrictions on subcontracting if the owner requests restrictions.

*Double-breasted Operation* There are rules established for a construction company with a union arm and non-union arm. It must have separate management of the daily activities.

*Merit Shop Contractor.* This term was coined by John Trimmer when nonunion firms were struggling for a market share with union contractors. John Trimmer was the executive vice president from 1952 until 1976 and later he was the assistant to the ABC presidents. These are also referred to as Open Shop Contractors. Merit shop Contractors have the right to establish the crew size, the right to select the trade that will perform each work activity and the right to select the installation methods for installing the materials. Many Merit shop contractors belong to the Associated Builders and Contractors (ABC).

*Union Shop* requires employees to join within stipulated time after employment. Unions are under the Union Shops guidelines..

*Jurisdictional Dispute* is a disagreement of the work rules between two unions. Under a jurisdictional dispute the contractor must assign the work first. If assignment of the work does not resolve the dispute, then the Contractor must:

1. File with the National Labor Relations Board in the Region
2. NLRB schedules a hearing within 10 days. Seek an injunction to stop
3. If not resolved within 10 days, NLRB has a hearing and assigns work
4. If not obeyed, fined. Taft Hatley Act. Private parties can sue

Common Situs Picketing is used on a multiple-employer job site and it has established these rules:

1. Picketing is limited to working hours
2. Signs must indicate clearly
3. Picketing must be close to the work

*Lockout.* A lockout is a contractor who withholds employment from the workers.

*Primary boycotts* are legal. They are a dispute between the contractor and a specific union such as the painter. This dispute is primary if the painters' union strikes only the painting contractor.

*Secondary Boycott* which utilizes a third party to influence another party, such as the contractor or the union to settle a dispute, is illegal.

*Work Preservation* is a clause in the labor agreement which allows unions to negotiate with an employer to ban the use of prefabricated products in construction.

*Product Boycott* is a clause that the in the labor agreement which allows unions to negotiate with an employer to prohibit the use of a product to preserve work. But if the product is specified by the Architect or Engineer then it cannot be boycotted.

The *Grievance Procedure* is an internal step by step process up the organizational chart to resolve employee complaints. An example of a Grievance Procedure is contained in Section II of the Examples and Exhibits Booklet that accompanies this study guide.

*Mediation* is defined as a third party using their influence to force two parties to negotiate. Normally, the Contractor must conduct this dispute resolution method after they have perfected the claim and it has been rejected. The next step is Arbitration.

*Arbitration* is defined as a third party establishing a binding decision as outlined in the contract. Finally, if the previous methods have been exhausted and there is a legal flaw within the case then either party can file a law suit called *Litigation* which is a court decision.

### III. WORKING RELATIONSHIPS

*Leadership* is based upon voluntary followership. An individual earns their leadership through contributions deemed beneficial by others. These followers find that the leader's contributions enhance their well-being. People lead when others choose to follow them. A leader is a person who focuses people's ideas, thereby help others meet their full potential. A leader is someone who lifts us up and gives us the vision and the spirit to change. Finally, leadership is making people into effective collaborators.

*Management* is based on position authority. It is awarded to an individual by higher managers in the organization or by a board of directors. People manage when they delegate work and accomplish objectives with their authority. For example, managers plan, budget, organize, and control by performing the following duties:

- Creating policies and procedures
- Giving orders
- Focusing on short-term results
- Getting involved in the process of accomplishing defined objectives
- Focusing internally and working within existing structures

The dynamic relationship between leaders and followers is continually changing based on the needs of the situation.

Relationships develop and change, depending on the interests and abilities of the people involved and the needs of the given situation. The key points required for understanding the concept of leadership are: Leadership is a dynamic relationship between leaders and followers. Effective leaders focus on different things in response to changing needs. Leaders and followers may exchange roles as the needs of the situation change. In conclusion, leaders emerge in the natural course of business. Individuals do not have to hold the title of manager, supervisor, or executive to be an effective leader.

*Coaching* is the process of what (a manager) can do when people are not doing what they are supposed to do, or are doing something they shouldn't be doing. The true measurements of your successes are the things your people do, their results. When your people are successful, you will be recognized as a successful manager.

A successful people manager measures their ability to be successful based upon what their workers do. If a manager "believes the wrong things about their workers, those erroneous beliefs will lead managers into the self-destructive behavior of disrupting relationships, rather than helping to improve them". Therefore, the role of a successful people manager requires you to believe the right things and it requires you to recognize the following principles.

## The Three Functions of Management

1. Management is getting things done through others, you need your employees more than they need you, and that you get paid for what your workers do. This requires you to recognize that the rewards and punishments you get as a manager is not based on what you do, but on what your workers do. A worker's success or failure reflects upon you.
2. A manager's behavior has the greatest influence over workers in the work environment. If a manager does not do the right things, he will not be a successful manager.
3. There is no such thing as an amateur psychologist. Do not label people as lazy, unmotivated or uncooperative. Focus on the behavior that you want. Most of the reasons for failure to perform appear to be the result of a communication problem resulting from the lack of direction and feedback from the manager.

## Fournies' Coaching Analysis Process

- Step 1 requires the manager to analyze the reasons why unsatisfactory performance is occurring. This is called the coaching analysis process.
- Step 2 is the face-to-face discussion that a manager conducts to get the worker to change their behavior. This requires the manager to analyze the situation and determine the factor that is influencing the unsatisfactory performance.

Behavior that is followed by a positive consequence or result, as interpreted by the receiver, will tend to repeat itself if the positive consequence occurs soon after the action.

The purpose of the coaching analysis process is to analyze the situation to determine the specific cause for the nonperformance and to prevent the problem from escalating.

*Thought Transmission* - Most of the reasons for non-performance appear to be the result of a communication problem.

An example of Fournies' Coaching Analysis Flowchart showing systematic questioning steps is contained in Section III of the Examples and Exhibits Booklet that accompanies this study guide.

## Successful Communication

Successful communication is the result of thought transmission not information transmission. Thought transmission requires the manager to formulate effective open-ended questions that require the listener to think and provide feedback.

An example of **Fournies' Face-to-Face Discussion Flowchart** is contained in Section

III of the Examples and Exhibits Booklet that accompanies this study guide.

**Effective Managers** - Effective managers are polite and respectful.

Coaching conversations focus on the whole person as a performer and it includes any topic that concerns the employee. Coaching is the process by which managers stay in touch with their workers and it allows the manager a chance to clarify goals, priorities, and standards of performance (p 19). Kinlaw feels that “one of a manager’s primary tasks is to create commitment” in employees through effective coaching. He says that “commitment has four supports.” They are clarity, competence, influence and appreciation (p. 10).

### Coaching

The four coaching functions are:

- counseling
- mentoring
- tutoring
- confronting

Desired outcomes occur most consistently in coaching when managers concentrate on developing a satisfying process, rather than when they concentrate on controlling the content of the coaching conversation.

### Coaching Processes

Confronting/Presenting Stage Table	
GOALS	COMMUNICATION SKILLS
Limit resistance and negative emotions	<i>Being Specific:</i> Giving a clear statement of perceived performance problems.
Delimit performance topic	<i>Scoping the Problem:</i> Limiting a statement to a single p r o b l e m .
Establish a change focus	<i>Being Future Oriented:</i> Stating desire for change, not requesting reasons for failure.

Adapted from Kinlaw (1999). *Coaching for Commitment* (p 87).



Using Reaction To Develop Information Stage Table	
GOALS	COMMUNICATION SKILLS
Defuse resistance	<b>Dropping the Agenda:</b> Focusing on the employee's concerns, not on one's own.
Develop information	<b>Developing Information:</b> Attending, acknowledging, probing, reflecting, summarizing.
Agree on a problem and causes	<b>Confirming:</b> closing the loop; reaching mutual agreement on problems and causes.

Adapted from Kinlaw (1999). *Coaching for Commitment* (p 87).

Resolving Stage Table	
GOALS	COMMUNICATION SKILLS
Ownership of problem	Reviewing: Going over key points of a session to reinforce common understanding and ownership.
Next Step	Planning: Building strategies and agreeing on follow-up.
Positive relationship Commitment	Affirming: Commenting on employees' strengths and positive prospects.

Adapted from Kinlaw (1999). *Coaching for Commitment* (p 88).

## Listening

Why is Listening Good Business? Listening is our primary means of communication but it is the least understood method of communication. Listening effectively allows us to reach a clarity of understanding that is an essential component of the communication process.

The benefits of people responding appropriately according to the situation are that the communication is enhanced, it increases cooperation, improves morale, it increases job commitment and it focuses more on opportunities.

## The difference between Hearing and Listening

Hearing is the physical ability to accept and transmit sound waves from the eardrum to the brain. Listening is the ability to put meaning to that transmission. Listening is more than hearing. Listening enables us to put meaning to the sound that we hear. Listening is the ability to receive, attend to, interpret and respond to verbal messages, and other cues, like body language, in ways that are appropriate to the purpose.

## The Realities of Communication

The first reality about communicating is you cannot not communicate. Even when we are not verbally saying anything, we are transmitting messages through our non-verbal's, such as choice of dress, facial expressions, and mannerisms, etc. Another reality is whenever contact is made communication occurs. Words alone are only part of the message. Nonverbal cues, tone of voice, etc. are all part of the message.

There are *three major listening filters* that may affect the overall quality of our listening effectiveness.

- *Selective attention* means that we decide what we focus on or to what we give our attention.
- *Selective Interpretation* we place our own meaning on what the person is saying. Often this meaning comes from our own background or previous experiences.
- *Selective Retention*. Selective retention is the process by which the receiver decides what to give their full attention toward, they determine what meaning the message contains and make assumptions about the importance level of the communication.

What are the Rate of Listening and the Rate of Speaking?

- The average person speaks at about 100 to 200 words per minute.
- The average person listens, or can process data, at the rate of approximately 600 words per minute, which means that when the average person is listening to someone speak at 200 words per minute, they can process an additional 400 words per minute.

This leaves us a lot of time to think about things, and not necessarily about what the speaker is saying. Therefore, we basically have time to “tune out.”

### Tune Out

- When the receiver's purpose is different from the sender's purpose.
- Under-stimulation.
- Over-stimulation. Over-stimulation can be positive or negative. Positive over-stimulation occurs when you hear something that mentally causes you to say, “AHA, that's it!” Negative over-stimulation happens when someone uses a “hot button” or “red flag” word or phrase that negatively triggers you.
- Pace and delivery. To the extent someone speaks “like us,” it tends to be easier for us to listen to and understand them.
- Lack of listening skill development.

## Retention Rates of Listeners and Senders

Managing people means communicating effectively.

Communication is the actual exchange of understanding so that the other person behaves in a manner which demonstrates understanding.

The actual exchange of understanding so that both the sender and receiver understand the message in exactly the same manner after stating it only once is not normal. Therefore, the sender must constantly analyze the situation to ensure that you are communicating effectively and that the message is being understood.

### How Much Time Is Spent Communicating?

- Communicating makes up approximately 80% of your time. Most of this is done verbally.

### How Effective Is the Communication Process?

Research has proven that the retention rate of the listener (receiver) is

- 10% of What they Hear
- 20% of What they Read
- 20% of What they See
- 50% of What they Hear and See

What is even more impressive about the research is that the Sender remembers:

- 70% of What they Say
- 90% of What they Say and Do.

It is important for the sender to have the listener in their own words restate what they have understood to be the message.

## Communication Barriers

To ensure that your messages are being fully understood, the sender must be aware of the four causes of a communication breakdown. They are as follows:

CAUSES of COMMUNICATION BREAKDOWN	SOLUTION
SENDER CAUSED	SENDER CAN <b>CONTROL</b> and <b>ELIMINATE</b> THESE THREE
MESSAGE CAUSED	
PHYSICAL CAUSED	
LISTENER CAUSED	SENDER CAN <b>INFLUENCE</b> this one and SENDER CAN <b>NEUTRALIZE</b> this one using FEEDBACK.

*Feedback* is the process of the sender, verifying whether actual understanding has taken place. The sender uses feedback by performing the following:

- Asking open-ended questions
- Making the words come out of the listener's mouth

#### Sender-caused Communication Barriers

- sender assumes the listener has adequate knowledge
- sender uses unfamiliar words
- sender did not specify the behavior required for the listener.
- the sender continues talking through distractions
- sender mumbles while communicating the instructions.
- sender turns off the listener using foul or inappropriate language.

#### Message-caused Communication Barriers

- Words mean different things to different people.
- Inappropriate examples.
- Too many issues
- Too many words are used Some sender's messages just beat around the bush.

#### Physical-caused Communication Barriers

- noise,
- temperature,
- danger present
- nearby distractions.
- unwanted listeners

#### Listener-caused Communication Barriers

- listener jumps to conclusions about the message and goes off without the full instructions
- listener is daydreaming,
- listener does not ask questions.
- listener rejects the message that is contradicts their beliefs.
- listener does not admit their failure to understand.

### Steps to Influencing and Neutralizing the Listener-caused Communication Barriers

- recognize and acknowledge the listener's resistance to the message.
- understand the listener's ideas and feelings.
- show understanding and respect for the listener's feelings. (empathy).
- sender repeat the original message.

An example of the four step communication processes for neutralizing listener barriers is contained in Section III of the Examples and Exhibits Booklet that accompanies this study guide.

### Effective Meeting Skills

The purpose of an *Effective Meeting* is to bring together a group of people with a common interest who have relevant knowledge and expertise to accomplish some purpose or goal through a process of group interaction.

Preplanning - Answering the following questions prior to conducting the meeting will improve your chances of a productive and successful meeting:

1. What do I want to accomplish? (Task Oriented Meeting)
2. Are the members attending the meeting really necessary for its success?
3. What do I need from each person to accomplish the objectives of this meeting?
4. Have I provided each group member with a descriptive working agenda far enough in advance for members to be prepared?

### Preconstruction Meeting Content

The working agenda should follow the guidelines in the specifications.

An example of a **Working Agenda** is contained in Section III of the Examples and Exhibits Booklet that accompanies this study guide.

## Meeting Minutes Content

*Meeting Minutes* should be recorded during the meeting. The minutes should include the Members in Attendance, Members Absent, Date/Time, Place, Agenda Topics, A Summary of the Topics Discussed, Action to be Taken, Names of the Person(s) Responsible for Implementing and a Time Limit for Completion. The Minutes should be distributed within 24 hours to provide immediate feedback. The following minutes will provide you with the format and content:

An example of a set of **Meeting Minutes** is contained in Section III of the Examples and Exhibits Booklet that accompanies this study guide.

## Meeting Leadership Skills

- The leader must *listen attentively*.
- The leader must also *respond constructively to ideas*.
  - State what you like about the idea
  - State what you think are its weaknesses
  - Provide a suggestion for each weakness and always follow these in sequence
- The leader must be cognizant of is to *match their decision-making style to each situation*.
- The leader must ensure that they *solicit ideas from all group members* and resolve conflicts within the group.
- In a meeting, people should be facing each other.

## SMART Meeting Goals

- Specific
- Measurable
- Achievable
- Realistic
- Time-scheduled

## IV. CONSTRUCTION START-UP and SUPPORT

### Contract Documents

The *Notice of Award or Notice of Acceptance* is from the Owner and it is normally accomplished by a letter indicating selection and directing the Contractor to obtain necessary bonds, together with information concerning arrangements for the signing of the contract.

The *Letter of Intent* is from the Owner and it indicates selection and acceptance of the proposal and states intent of entering into a suitable contract at a later date. A Letter of Intent is used if encumbrances at the site have not been reconciled or the funding has not been secured.

Prepared by - Owner  
Sent to -  
Contractor

Contractors Responsibility - Acknowledge receipt, keeps copy and sends an original back to the owner within the specified amount of time, obtains bonds. If using the Letter of Intent, the Contractor should determine how long to guarantee prices.

An example of the Notice of Award is contained in Section IV of the Examples and Exhibits Booklet that accompanies this study guide.

The *Notice to Proceed* indicates that the site is free of encumbrances, and that the Contractor can occupy the site. The date of the Notice to Proceed establishes the reference date from which the beginning of the project is calculated.

Prepared by - Owner  
Sent to -  
Contractor  
or

Contractors Responsibility - acknowledge by signing, keeps copy, returns original to the owner, commences work within the specified amount of time.

An example of the **Notice to Proceed** is contained in Section IV of the Examples and Exhibits Booklet that accompanies this study guide.

The *Performance Bond* guarantees that the contract will be performed and that the owner will receive his structure in compliance with project specs and with the terms of the contract. If the contractor fails to fulfill his contractual obligations, the surety must complete the contract and pay all costs up to the face amount of the bond. The costs over and above the face value of the bond will be paid by the contractor and the contractor is responsible to the surety for the face value of the bond.

Prepared by - Surety  
Sent to - Owner

Contractors Responsibility - Obtain from the surety, submits at the signing of the agreement, exchange for the bid bond. Contractors responsible for the full- face value if invoked.

An example of a **Performance Bond** is contained in Section IV of the Examples and Exhibits Booklet that accompanies this study guide.

The *Labor & Material Bond*, also known as a *Payment Bond* guarantees the owner freedom from any liens against the project. If the Contractor does not pay Subcontractors or Vendors, the Surety must protect the Owner from their claims.

Prepared by - Surety  
Sent to - Owner

Contractors Responsibility - Obtain from the surety, submits at the signing of the agreement, exchange for the bid bond. Contractors responsible for the full- face value if invoked.

An example of a **Labor and Material Payment Bond** is contained in Section IV of the Examples and Exhibits Booklet that accompanies this study guide.

*The Owner and Contractor Agreement* is the formal contract agreement is the single document that binds the parties and by reference describes the work to be done and the prices to be paid for it and provides suitable spaces for the signatures of the parties. It pulls together all documents to include (1) the drawings, (2) general conditions, (3) supplementary conditions, (4) specs, and (5) any agenda describing changes published to these original documents. It is also common for the agreement to contain clauses on completion time of the project, liquidated damages, and payments to the contractor.

Prepared by - Owner  
Sent to - Contractor



Contractors Responsibility - Read and sign if doing business with a public entity must be aware of the laws governing its administration and the limitations on the powers and authority of the public officers. Also, a contract involving private financing, the contractor should make some investigation of the financial integrity of the owner for the source of this financing for the project. Submit Performance and Labor/Material Bonds at the signing of the agreement, in return, the Contractor receives the bid bond and a copy of the agreement. Check the Drawings, Specifications and Contract Document numbers listed in the agreement against the Drawings, Specifications and Contract Document numbers, dates and revision numbers the bid's estimate was made from to ensure that the price in the agreement reflects the bid estimate price.

The *Stop Work Order* is used to notify the Contractor to stop work on the project for a variety of reasons such as labor disputes, unsatisfied liens, failure to perform according to the specifications, Owners financial problems or that the Owners needs have changed.

Prepared by - Owner  
Sent to - Contractor

The *Stop Work Notice* is used to notify the owner that the work on the project is being stopped for non-payment. The AIA General Conditions states that if the contractor is not paid within seven days after the date stated in the contract or within seven days after receipt of Application or Payment or Sworn Statement then the contractor may, upon seven additional days written notice to the owner, Stop the Work until payment is received.

Prepared by - Contractor  
Sent to - Owner

Contractors Responsibility - Sign the form and send to the owner by certified or registered mail. Supply the construction labor, material and equipment according to the planned construction schedule and the crews' distribution chart provided at the commence of work.

*Procedures when the Contractor Encounters Hazardous Materials at the Site* - The Contractor should, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and A/E in writing and orally.

If the Contractor Disturbs the Hazardous materials before notifying the Contractor is responsible for disposing of the hazardous materials at their own expense.

The *Schedule of Values* is provided by the Contractor to the Owner within a specified number of days from the Notice of Award or Notice to Proceed and before the first Application for Payment. This schedule unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Application for Payment.

Prepared by - Contractor

Sent to: Owner's Representative, such as the Engineer or the Architect

Contractors Responsibility - Place the cost next to each item number in the scheduled value column of the Application and Certificate for Payment and submit to the Architect/Engineer. These values must be equal to the values provided on the Bid Breakdown Form and the total contract amount stated in the Proposal Form. The Bid Breakdown Form and the Proposal Form were submitted to the Owner at bid opening.

An example of a **Schedule of Values Continuation Sheet** is contained in Section IV of the Examples and Exhibits Booklet that accompanies this study guide.

The *Sworn Statement* is used on certain small commercial and residential construction projects in lieu of the Schedule of Values. This is an itemized list of all individuals who have provided improvements, materials, or labor and an accounting of all money due to them. A homeowner, upon paying the contractor, should expect him/her to pay the subcontractors, suppliers or laborers on the construction project. The Sworn Statement indicates who is owed money, the amounts, and for what supplies or work done. This gives an official record of the items for which the contractor is billing the homeowner. In addition, a subcontractor must also provide a sworn statement to the general contractor prior to presenting a claim of lien on the property. This serves to support the claim and certifies what work has been completed, and what materials were provided.

The *Construction Schedule* is provided by the Contractor to the Owner within a specified number of days from the Notice of Award or Notice to Proceed. The Contractor, promptly after being awarded the Contract, prepares and submits for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule may not exceed time limits current under the Contract Documents.

Prepared by – Contractor

Sent to – Owner/ Owner's Representative

## Site Layout of Construction Facilities

Proper planning of Temporary facilities can improve productivity by increasing the efficiency and effectiveness of the movement of materials, labor and equipment from storage areas to the staging areas.

*Temporary facilities that must be considered when planning the site layout:*

- *Power Pole Location* is crucial. Determine the nearest location and from which direction to run the pole. Avoid running the power lines over the material delivery area.
- *Portable Sanitary Facilities* should be placed closest to the work area. The number and type of portable toilets required on the project can be determined by consulting the OSHA Construction Safety Standards.
- *Portable Fire Extinguishers* are required as part of a fire prevention program. The locations and type of portable extinguishers required on the project can be determined by consulting the OSHA Construction Safety Standards.
- *First Aid and Medical Facilities* are required as part of a first aid treatment center. The items required on the project can be determined by consulting the OSHA Construction Safety Standards. The first aid kit must be accessible at all times. Emergency telephone numbers should be placed on the telephone.
- *Crane Location* is important for determining lifting requirements.
- *Mortar Mixing Areas* should be located near the masonry activities to reduce handling time.
- *Parking Areas* - Most companies provide 250 to 400 square feet (22.5m<sup>2</sup> to 36m<sup>2</sup>) of parking, turnaround and aisle space per vehicle and one parking space per office worker.
- *Project Sign* - The General Requirements will describe the size and location of the sign.
- *Job Trailer Space* or office space must be determined according to the number of construction staff personnel required on the project.
- *Owners Representative Office* - This is normally stated in the supplementary Conditions.

A **Temporary Office Space Table** is contained in Section IV of the Examples and Exhibits Booklet that accompanies this study guide.

- *Storage Area* - Material storage is generally accomplished in material staging areas, warehouses and laydown areas. Truck access and turnaround areas should be checked for maximum truck dimensions.
- *Laydown Areas* for items not requiring environmental controls during the storage period. Laydown areas should be designed for the effective storage, identification and removal of items.
- *Craft Change houses* may be required according to the Labor Agreement and the separation or combination of craft change houses will be specified in the agreement and based upon trades' ability to work effectively with each other.
- *Eating Facilities* may be required based upon working conditions and location of adjacent eating facilities. These should be provided as close to work area as possible. If at all possible, require each worker to stay in their work area for all breaks and lunch.
- *Time Office* size can be based on either the manual manpower population or the number of office workers.
- *Brass Alleys* are used for checking-in and out of manual workers.
- *Roads* may be required to access the site. These temporary access roads should be located where the permanent roads will be located later and they should provide the shortest route to the site. If a strike or picketing could occur, more than one access should be considered.
- *Traffic Patterns* arranged effectively can save workhours from idle time. A efficient method is to have a one way traffic flow pattern and to provide directional signs off-site for the deliveries.
- *Existing Roads and Bridges* must be evaluated to determine if the load limits and dimensions will allow passage of all equipment and vehicles.
- *Railroad* access may have to be considered for a remote site.
- *Fabrication Shop* is sometimes provided to allow for fabrication of work at the site. This facility can provide continuous operations regardless of the weather.
- *Equipment Maintenance Shop* may be effective for performing general equipment maintenance at the site.

- *Guard House* may be required by the owner. Normally this would be listed in the General Requirements. If a guard house is required this may also require *Security Guards* 24 hours per day.
- *Batch Plant* may be required to provide shorter transportation time.
- *Trash Containers* should be placed at specified locations at the site. Sizing will be determined upon the amount of waste gathering at the site. Also, if a Leadership in Energy Efficiency and Design (LEED) certified buildings or with recycling ordinances there may be a need for different bins labeled for different types of recyclable materials.
- *Additional Facilities* may be required for ensuring the quality of the installation. Some of the additional facilities are shown below:
  - Test Shops
  - Paint Shops
  - Sandblasting Shops
  - First-aid Facilities
- *Additional Utilities* that may be required can be found in the General Requirements. Some of the Additional utilities are shown below:
  - *Temporary Compressed Air* may be required. The OSHA Construction Safety Standards will state the storage requirements.
  - *Temporary Welding Gases* may be required. The OSHA Construction Safety Standards will state the storage requirements.
  - *Temporary Heating* requirements and temperature that must be maintained inside the incomplete structure will be stated in the General Requirements under the temporary facilities requirements.
  - *Temporary Lighting Requirements* can be found in the OSHA Safety Standards.

### **Material Handling Techniques**

- Hefty Hoists. Use oversized hoists and identify each hoist with a specific function..
- Segregate Deliveries to Prevent Truck Congestion.
- Palletize Materials
- Place Materials in the Same Location on Each Floor.
- Schedule Deliveries
- Establish a Formal Communication System.

## V. CONSTRUCTION RESOURCE MANAGEMENT

### Factors Which Influence Productivity (based on James J. Adrian recognized expert in construction productivity)

Productivity improvement is achieved by managing output on the jobsite in such a manner that labor, materials, and equipment are utilized as efficiently as possible. Productivity improvement can be achieved through improved project scheduling, better material handling techniques, pertinent Weekly look-ahead or preplanning, proactive management and appropriate data collect and analysis techniques. Therefore, managing a productive project is accomplished in these ways: First, by identifying the factors that adversely affect productivity. Second, by recognizing those factors that improve productivity. Third, by utilizing motivational techniques that improve productivity on the job site. Fourth, by applying various techniques that improve productivity.

### External Factors that have a Major Effect on Productivity

The major external factors that have an adverse effect on productivity are weather, overtime, congested work area, change orders, and contractual work rules. Below are the external factors that have the greatest negative effect on productivity and they should receive the most attention.

*Weather Temperature and Relative Humidity* - A National Electrical Contractors Study on the effects of Temperature and Humidity is provided in Section IV of the Examples and Exhibits Booklet that accompanies this study guide.

*Overtime* - An employee who knows he or she is going to work overtime will reduce his productivity throughout both the normal period of work and the overtime period. This is a psychological effect but nonetheless very real in its effect. A normal work day is 8 hours and a normal work week is 5 days. Thus, work beyond these normal periods will cause an overall reduction of productivity. The Bureau of Labor Statistics Bulletin number 917 shows the productivity as a function of workdays per week and work hours per day is shown below:

Adverse Effects of Overtime on Productivity						
	Five-day Week		Six-day Week		Seven-day Week	
Hours per Day	Productivity	Loss Productivity	Productivity	Loss Productivity	Productivity	Loss Productivity
8	100%	0%	97.5%	2.5%	92%	8%
9	95%	5%	88%	12%	83%	17%
10	92%	8%	82%	18%	78%	22%
11	89.5%	10.5%	78%	22%	75%	25%
12	86%	14%	75%	25%	72%	28%

### Strategies to Reduce the Detrimental Effects of Overtime on Productivity

- Utilize 4-day workweeks and 10 hours per day
- Stagger the Work Shifts
- Different Shifts
- Provide a Weekly list of Activities that must be Completed
- Only critical activities need to go on overtime
- Overtime should be scheduled on alternate weeks rather than continuous

*Congested Work Area* - Job Site Congestion has a considerable effect on productivity since people, machines, and material are competing for use of the same space. This problem can apply to total jobs or to parts of a job. The adjustment factors for various degrees of congestion are stated below:

Adverse Effects of Congested Work Area		
	Productivity	Loss Productivity
Adequate Crew WorkSpace	100%	0%
Crowded. Approximately One-half Space Desired	74%	26%
Very Congested. Approximately One-third Space Desired	65%	35%

### Strategies to reduce Congested Work Areas

- Sequence and Stagger Crews
- Provide Labor to Constantly Clean the Work Area
- Stagger Crew's Breaks
- Require just-in-time Material Deliveries
- Schedule Certain Crews on the Weekend

*Multi-Story Buildings* - above 3<sup>rd</sup> floor productivity declines

Adverse Effects of Multi-Story Buildings above 3 <sup>rd</sup> Floor		
	Minimum Increase in Total Whrs	Maximum Increase in Total Whrs
Below Third Floor	No Change	No change
Above the Third Floor	Minimum Increase 1% per Floor	Maximum Increase 2% per Floor

### Strategies Reduce the Detrimental Effects of Multi-Story Buildings on Productivity

- One-way traffic with an unloading lane and a drive through lane for exiting quickly
- Use Oversized Hefty Hoists for moving materials only during the work shift
- A turntable in the basement on a different side of the structure then material deliveries
- All materials palletized and used forklifts to unload materials and place on the hoists
- Use dollies on each floor to move materials. Push and pull motions are better than lifting.
- Daily material sign-up to control the delivery schedules from the command center

*Change Orders* have a disastrous effect on productivity because every subcontractor must alter their time schedules and sequences of operations. Therefore, there is a ripple effect on productivity.

Supervisors must recognize the adverse or detrimental effects of the following job factors due to change orders.

- Overtime required to perform the change order work interferes and disrupts the work flow.
- Morale and attitude deteriorate because of multiple changes or rework.
- Stacking of trades and concurrent work activities causes delays in the original schedule.
- Reassignment of workers and crew size efficiency is reduced and productivity loss occurs because the work flow is interrupted.
- Supervision is diverted from planning of the original work to completing change orders which impacts the work flow.

#### Strategies to Reduce the Detrimental Effects of Change Orders on Productivity

- Require a time limit for acceptance of 12 - 24 hours. This may reduce the impact
- Utilize a Building Information Model (BIM) to reduce interferences and the detrimental effects of a change order
- Read the Supplementary Conditions because it restricts:
  - The overhead and profit percentage
  - The cost items that you can charge the Owner
- Convert all Extra Work Orders to Contract Change Orders immediately

*Contractual Work Rules* - Union contractual requirements and non-contractual practices can effect productivity on the job site. Some contractual practices that effect productivity are restrictive work practices, preestablished crew sizes, crew ratios, working hours may vary by trade and there may be jurisdictional work rules on a union project.

*Crews starting late or quitting early, or the crew extends their lunch or break times.*  
*Detrimental effects on a union construction project.* Contractor must maintain a separate gate for each trade, a separate change house for each trade, a separate bus for each trade, a different location for project deliveries, a different entrance for the owners employees, different entrance for the owners deliveries.

#### Adverse Effects of Work Rules on Productivity

- Restrictive work practices in some union contracts
- Pre-established crew sizes
- Standby labor is sometimes required
- Restrictions on innovative materials or design
- Offsite prefabrication may not be allowed
- Work times and length of the work week may be pre-established
- Little opportunity to use 4 ten-hour days at straight time



### Adverse Effects of Work Rules on Productivity (continued)

- Jurisdictional disputes can result in work stoppage and slowdowns in productivity.
- Loss work time due to starting late, quitting early, uncontrolled lunch & break times

### Strategies to Reduce the Detrimental Effects of Work Rules on Productivity

- Read each local labor contract concerning the work rules.
- Require workers to take their breaks and lunch at the work area
- Establish separate gates for each trade at the beginning of the project
- Separate change house for each trade
- Separate bus for each trade
- Different entrance for construction project deliveries
- Different entrance from contractor for owners workers
- Different entrance from contractor for owners deliveries

### Controllable Factors that have the Greatest Adverse Effects on Productivity

- Walking time or Travel time
- Rehandling of materials

### Strategies to Reduce the Detrimental Effects of Controllable Factors on Productivity

- Place Materials Close to the installation or assembly area
- Feed materials to the workers. Keep them in the work area
- Do Not Allow Workers to Leave the work area for breaks or lunch
- The most important item for a productive project is Look-Ahead Planning

## Project Documentation

The courts have established specific rules for determining if the documentation is admissible evidence. The proof must follow these rules.

- First, the documentation must have originated as close to the event as possible.
- Second, The documentation must be based upon direct knowledge of the event. Therefore, you must be at the job site if the event took place at the job site.
- Third, the documentation must be maintained as a regular business record.
- Fourth, all work whether within the original scope or extra work must be broken down by activity description or extra work, and an accurate account of work hours against each work activity must be entered daily for the Contractor to recover for extra work or contract change orders.
- Fifth, the daily time cards, daily job diaries and in the daily construction report must contain enough detail to permit reconstruction of the project from the records.

Also, the courts have established specific rules for determining if the project schedule is admissible evidence. The proof must follow these rules.

- First, the project logic and schedule must be in a form of logic which shows the interrelationships of activities.
- Second, the schedule must show the planned sequence of activities to the actual sequence.
- Third, the schedule must show all sequence changes.
- Fourth, the schedule must utilize supporting evidence from the project records.
- Fifth, the updated progress schedule must show all causes of delays. The delay causes that must be documented on the updated schedule are Owners caused delays, Contractor caused delays, Subcontractor caused delays, Vendor caused delays, weather caused delays and Directed and Constructive Job Acceleration.

**The *Daily Job Diary* is the primary source of information about the construction job site completed by the construction supervisor.** Therefore, it is vitally important that the supervisor be aware of their responsibility to maintain an accurate and complete account of each days activities. The document used to record this information is called daily job diary. The daily job diary is used to record conversations, technical problems and solutions and safety recommendations with subcontractors, suppliers or the architect. The content will describe information concerning arrival dates, material delivery dates, design and contract changes. The supervisor should also maintain an accurate record of the material quantities and workhours spent. This information is very important because it is the basis for requesting changes in time and money for extra work.

The *conversations* portion of the daily job diary describes conflicts concerning coordination with other crews, conflict within your own crew, personal conversations and observations. But the daily job diary cannot contain your opinions.

The *technical problems/solutions* describe changes in drawings, elevations or construction erection problems and how they were resolved.

The *safety problems and solutions* describe all potential hazards and the recommended plan of action.

. The *signature/title & date* of the person completing the report must be signed each day in ink.

An example of a **Completed Job Diary** is contained in Section V of the Examples and Exhibits Booklet that accompanies this study guide.

### Rules for Keeping a Daily Job Diary as Admissible Evidence

- The general rules required for entering the job diary as court evidence is described below:
- Use only a bound book, such as used by surveyors for their note keeping
- Pages should be consecutively numbered in ink, and no numbers should be skipped
- No erasures should be made. In case of error, simply cross out the incorrect information and enter the correct data next to it
- No pages should be torn out of the book at any time. If a page is to be voided, place a large "X" through the page, and mark "void."
- Every day should be reported, and every calendar date should be accounted for. If there is no work performed on a given date, the date should be entered on the page followed by the words "no work" or similar wording. It is still desirable to record the weather on "no work" days, as it may have later bearing on why no work was performed in a case involving a claim for liquidated damages.

The *Daily Construction Report* is a report sent to the contractor's home office describing the progress at the job site each day. This report contains the weather conditions, the number of workers by craft, the construction activities completed and in progress, quantities placed, materials delivered, construction equipment, visitors to the site, and meetings at the site. The function and content are described below:

*Report No.* should be numbered consecutively. The *Weather Conditions* section must record the morning and afternoon conditions for the day. These could be used to verify your claim for a time extension.

The *Workers Present* section records the number of workers present by craft and within each craft-by-craft classification. Each craft should also indicate whether there are any employees that were absent, hired or terminated during the day. This section should include all of the contractor's employees and subcontractor employees.

The *Construction Activities* describe the activities completed that day for your crew. The activities must reference exact locations by floor, column number, bay range, or polar direction.

The *Materials Used* section should state the number of materials placed such as number of bricks, bags of mortar, cubic feet of sand. T

he *Construction Equipment* used that day, such as masonry saw, fork lifts, saw buck, radial arm, power hand saw, chisels, hammers, trowels, mixers, mixing box.

The *Visitors* section should indicate all visitors that arrived at the site such as the Architect, the Engineer, the Owner, material suppliers or an inspector.

The *Meetings* section should describe any meetings that took place such as a tool box meeting, a crew meeting, a planning meeting or a safety meeting.

An example of a **Completed Daily Construction Report** is contained in Section V of the Examples and Exhibits Booklet that accompanies this study guide.

### Job Site Records

The *Field Records* are the vital link between the home office and the job site. These records are utilized to calculate the percentage's complete, develop monthly progress payment requests, identify materials delivered to the site, determine productivity rates, estimate a change order proposal, calculate the payroll, compare actual progress to planned progress, establish a claim, and document problems or potential problems.

The field supervisor is required to maintain some daily construction records pertaining to the job site activities. Some examples are listed below:

One of the most efficient methods to organize the project records is to utilize the *Construction Specifications Institutes Master Format*. The Master Format facilitates construction communication, promotes standardization in the industry, and facilitates the retrieval of information. It is used for the organization of project manuals, detailed cost estimates, and product data filing. The Master Format with its Divisions and Levels is also an effective filing system for the typical field records listed below.

- The *Construction Reports* must be completed Daily.
- The *Job Diary*. This must be completed twice daily if it is going to become a legal document admissible in court. This should be filed under Division 01, Level 2 and Level 3 are 32 16 titled Construction Progress Schedule. Then file alphabetically within 01 32 16 under Job Diary. The Job Diary is numbered consecutively, dated and signed.
- The *Time Cards* must be completed twice daily and the hours must be allocated by construction activities. Time cards are dated and signed. The *Daily Time Card* serves two purposes. First, it distributes the workhours expended to a specific work item description for cost and productivity distribution purposes. Second, this is the daily documentation required to recover for extra work or contract changes. Time cards can also be used to distribute the major equipment hours..

An example of a **Completed Time Card** is contained in Section V of the Examples and Exhibits Booklet that accompanies this study guide.

- *Equipment Status Report* - is an internal report identifying the construction equipment on the job site or the time and date it was returned.

## Typical Field Records List (continued)

- The *Material Delivery Status Report* - is a an internal report identifying the materials delivered to the job site identifying the time, date it was delivered and any visible damage to the shipment.
- *Field Purchase Orders* - is an internal report identifying items purchased at or near the job site. These should state the intended use of the items.
- *Stock Requisition* - is an internal report which identifies the job number and quantity of materials taken out of the warehouse for a specific project.
- *Look Ahead Plan* - This is an internal form which identifies the planned daily output, crew size, materials needed, tools and equipment needed, technical information, safety plan, sequence plan, quality requirements, and sketches.
- *Visitors Log*. This form requires each person not assigned to this project to state the date and time of arrival, company name, their name printed, signatures and their departure time.
- *Permits* - Building permit, Soil Erosion permit, Mechanical and Electrical permits.
- The *Prevailing Wages*, *Minority Hiring* and the *Streams and Wetlands Acts* and *Environmental Acts* (if required)
- The *Union Collective Bargaining Agreements* (if applicable)
- The *Project Meetings* - Working Agendas and Meeting Minutes.
- The *Submittal Log or Time Table* - Submittals - Shop Drawings, Product Data.
- *Contractor's Progress Payments*
- *Change Requests, Change Order Proposal, Proposal Requests, Approved Contract Change Orders*
- *Requests for interpretation (RFI)*
- *Formal Purchase Orders and Purchase Order Changes*
- *Subcontract Agreements and Subcontract Change Orders*
- The *Subcontractor Progress Payment Requests*
- *Shop Drawings, Product Data and Samples.*
- *Owner Installation and Operating Manuals*
- The *Project Record Documents (As-Built Drawings)* must be maintained at the job site and marked currently to record field changes and selections made during construction. There should be only one master set where all changes are made.
- *Warranties*
- *Certificate of Substantial Completion & Certificate of Occupancy*

## Hauling Records

A construction project that is transportation intensive will require detailed hauling records. Each hauling ticket will require the load size, the distance and time, the weight of the material, the number of trips per hour and the activity performed.

An example of a **Hauling Record** is contained in Section V of the Examples and Exhibits Booklet that accompanies this study guide.

The *Equipment Time Card* serves the same purposes as the Daily Time Card for payroll. But it is used to distribute each piece of construction equipment hours expended to a specific work item, and it must indicate if the piece of equipment was working on a specific operation or whether it was idle waiting. This idle time or down time must be shown on the daily time card. Only productive time can be charged to extra work because the idle time was supposed to be included in the original bid price.

An example of a completed **Daily Equipment Time Card** is contained in Section V of the Examples and Exhibits Booklet that accompanies this study guide.

## Subcontractor Agreements

The contract formation principles outlined below are required to form an enforceable contract or subcontract. They are:

- **Meeting of the Minds.**
- **Offer.**
- **Acceptance.**
- **Consideration.** Consideration under the General-Subcontractor contract formation process must rely on the equitable doctrine of “*promissory estoppel*.”

Doctrine of “*promissory estoppel*.” This doctrine holds that if the prime contractor reasonably relies on the promise or price of the subcontractor to its detriment, then the subcontractor must be held to its promise in order to avoid harm to the prime contractor. To ensure that this promise isn’t indefinite or unreasonable, the subcontractor provides a time limit for acceptance of their bid.

- **Legal Capacity.** The Parties must have the legal capacity to form a contract.
- **Legal Subject Matter.** This means the law will uphold only contracts that have been entered into for a legal purpose.

## Supplier and Vendor Agreements

When contracting for labor services and to protect your rights under the common law contract formation principles, it is essential that you utilize a form of agreement that is titled Subcontract Agreement for all labor services. In other words, **never put labor** on any form titled Purchase Order because the elements of a contract and the terms and conditions do not apply. A different set of laws apply.

The *Uniform Commercial Code* applies to the sale of goods,.

## The Hybrid Contract and the Tests to Determine Services or Goods.

Many construction contracts are actually hybrid contracts - a mix of goods and services. How a court interprets a hybrid contract as either for labor services or one for goods will alter the outcome in court.

Tests to determine if a contract is predominantly for services or for the sale of goods.

The most commonly used is the *predominate thrust* test. . .whether their purpose is the rendition of service, with goods incidentally involved . . .or is a transaction of sales with labor incidentally involved . . .

- *predominate service test*, reviews the evidence regarding the intent of the parties to the contract, the purpose for creation of the contract.
- *goods supplied test*. This test focuses on the definition of goods as it applies to the UCC.
- *policy test*. This test the courts apply by considering the circumstances surrounding the making of the transaction as more important than the goods or services mix.
- *divisibility test*, where the UCC code applies to only that part of the contract that focuses on goods, and general contract law applies to the services portion of the transaction. The divisibility test is used infrequently.
- *contract language test*. This test relies upon the verbiage in the contract, such as utilizing the words Buyer and Seller indicate a contract for the sale of goods, whereas the words Owner or Contractor and Subcontractor indicate a contract for services.
- *gravamen test* focuses on the action at the center of the case. If the case is because of a mechanical failure, then it is a goods contract. If it is because of a failure of workmanship, then it is a service contract.

*Purchase orders* are under the Uniform Commercial Code (UCC). Under the UCC rules the only thing agreed upon being the prices and a merchant warranty is provided. A purchase order should be utilized for Materials only. A purchase order does not meet the first element of a contract which is a meeting of the minds.

### **Contractor's Sub or Trade Coordination Responsibilities**

Some of the major Contractor's responsibilities toward subcontractors and vendors are described below.

- The Contractor must *Define the Subcontractors Bid Scope*
- The Contractor must *Coordinate the Construction Activities*.
- The Contractor must *Schedule the Construction*
- The Contractor must *Follow the Approved Schedule*.
- The Contractor must *Schedule the Subcontractors and the Vendors Submittals*
- The Contractor must *Coordinate the Vendors and Suppliers*.
- The Contractor must *Sequence the Work so that it Does not cause any delays*.
- The Contractor must *Coordinate All Inspections*
- The Contractor will *Disclose the Schedule* to the Subcontractors.
- The Contractor must *Revise and Update the Schedule*



*Separate (Prime) Contract* - OWNER may perform other work related to the project at the site by OWNER's own forces, or let other direct contracts or have other work performed by utility owners. These are contracts that the Owner has written to a separate contractor not under the General Contractor's control.

### **Contractor's Responsibilities for Separate (Prime) Contracts under the Owner's Control**

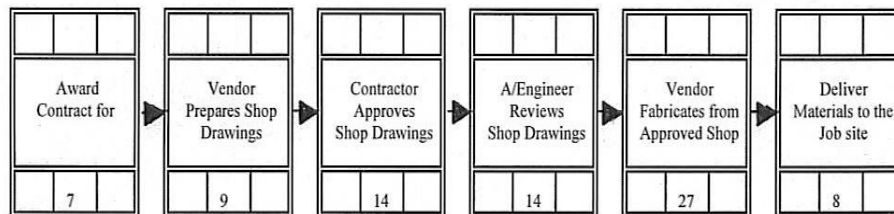
- *Store the Materials for Separate Contracts*
- Contractor must Accept the Separate Contracts Work
- Contractor must Notify the Owner of any Discrepancies.
- Contractor must Coordinate Separate Contracts

This suggests that the Contractor should develop a Design, Procurement and Construction sequence for each major discipline or trade. Also, it is recommended that each Design Discipline uses the same sequence. It is recommended that each Procurement has the same sequence.

### **Procurement Sequence (Material Leadtime) on a project**

Procurement is the process of obtaining materials and Leadtime is the amount of time that each activity within the procurement sequence requires prior to the item being installed at the jobsite. The following activities must be shown on the logic diagram to show the interrelationship of procurement activities.

1. Prepare bid package, request price quotations, select and award the contract to the vendor or subcontractor.
2. Vendor prepares and submits shop drawings, product data or samples as outlined in the technical specifications.
3. Contractor reviews & approves field measurements and field construction methods on the shop drawings.
4. Engineer reviews all design criteria prior to the fabrication or erection of the item.
5. Vendor fabricates or subcontractor schedules the contract into their fabrication schedule and shop fabricates the items according to the approved and revised drawings.
6. Vendor arranges for shipment, then the shipper delivers material to the job site.



## Subcontractor Trade Scope Description and Agreement

The General Conditions states that “the contractor shall be solely responsible for all construction means, methods, techniques, sequences, and for coordinating all portions of the work under the contract.” Furthermore, the contractor shall be responsible for the acts and omissions of all Subcontractors. Therefore, since a major portion of most construction projects is subcontracted and the contractor does not have direct control of the situation, the following steps can improve the contractors chances of finding the lowest responsible subcontractors.

- Provide each subcontractor with a *sample of the Subcontract Agreement*
- Require each subcontractor to submit their bid on their *Trade Bid Breakdown and Proposal Form* provided to them with the bidding documents.
- Provide each subcontractor with their *Trade Bid Division Scope Description*. *The Bid Division Scope Description* for each trade consists of these four sections.
- *The Exclusions* section consists of work items that are furnished or installed by other trade contractors or the Owner to make the bid scope complete.
- *The General Inclusions (Bid Instructions)* section shall cover all support activities that must be performed. It clarifies "who does what" to the prospective bidder. These instructions should include items such as who will pay for the cost of permits, fees, meters, temporary facilities, unloading the materials, cleanup, excavation and guarantees.
- *The Specific Inclusions (trade instructions)* section describes the specific trade activities, systems or type of work locations, and major components that the Trade Contractor shall Furnish and Install.
- *The Other Considerations* section includes all general contract administrative procedures regarding daily reports, permits, fees, attendance at planning and safety meetings, bonds, insurance, indemnification, licensing, certification, prevailing wages, labor agreement compliance, OSHA and Right to Know compliance requirements, shop drawing submittal requirements, maintenance and installation manuals, warranties, and guarantees.
- *Subcontractor Bid Breakdown & Proposal Form* - This form is provided to each prospective bidder during the bidding phase of the project. Each subcontractor is required to provide the information requested at bid opening.

An example of a completed **Subcontractor Bid Breakdown & Proposal Form** is contained in Section V of the Examples and Exhibits Booklet that accompanies this study guide.

The *Subcontract Agreement* is completed after the signing of the Owner and General Contractor. It is the formal agreement between the general contractor and the subcontractor outlining the specific scope of work, a list of the contract documents including the subcontract general bid instructions. It is The *Subcontractors Responsibility* is to compare the Page Numbers, Dates, Revision Numbers and Issuance Purpose of the Detailed List of Contract Documents with the documents the project was bid under. Read and sign.

The *Scope of Work* Section of the Subcontract Agreement is written from Subcontract Bid Scope Description including Exclusions, Specific Inclusions, the General Inclusions and the Other Considerations sections and the Subcontract Bid Breakdown form.

An example of a completed **Subcontractor Agreement** is contained in Section V of the Examples and Exhibits Booklet that accompanies this study guide.

### **Material Control and Equipment Production Estimating**

*Rough Lumber Quantities* are measured and sold by the board foot or by the thousand board feet which is expressed in M.B.F. A board foot measures 1 inch thick by 12 inches long and 12 inches  $\frac{2''}{12} \times 12' = .67' \times 12\text{-foot-long piece} = 8 \text{ BF}$

*Equipment Production Rates* are measured and calculated based on production rates for specific equipment and/or combinations of equipment. Considerations when calculating equipment production rates include such items as shovel capacity, haul road distances, speed of equipment, and unload times or for compactors drum roller width, speed, density requirements for compaction of material, etc.

*Cost calculations* for production are based on crew cost, equipment rental or use costs, fuel and oil (expendables) costs.

A **Wood Sheet Piling Material and Unit Cost** Example is contained in Section V of the Examples and Exhibits Booklet that accompanies this study guide.

**Equipment Production and Unit Cost Examples** are contained in Section V of the Examples and Exhibits Booklet that accompanies this study guide.

## VI. CONSTRUCTION COST CONTROL

### Budgeting, Costs, and Cost Control

#### Difference Between the Estimate and Project Budget

The *estimate* is a static document at a specific point in time (Bid time). The estimate reflects what the project was bid for and the quantities and unit prices used.

The *project budget* reflects the actual scope at the site and the actual quantities from construction issued drawings and a standard productivity rate. The project budget will always include change orders and extra work orders in terms of changed quantities and costs. The project budget should reflect the actual quantities placed and a standard unit rate for each work activity.

#### Cost Control Reports

The *Work Breakdown Structure* or the Master Code of Accounts should be developed by the contractor for use on all projects throughout the company. The master Work Breakdown Structure is a set of cost codes arranged into a hierarchy of recognizable categories used to compare all estimated and actual costs on a project.. The work breakdown structure must follow a logical sequence of events and provide a hierarchy of management reports designed to meet the information requirements at different levels of management. The work breakdown structure is intended to provide a common basis for integrating accounting, cost control, scheduling and estimating information.

The *Earned Workhour Report* is used by the superintendent to track productivity on each work activity. This report compares the actual workhour per unit rate to the budgeted workhour per unit rate on a daily or weekly basis for each activity. A budgeted Whr per unit rate is established for each work item (cost code) using the contractor's records for crew sizes and daily outputs.

This budgeted Whr per unit rate is standardized throughout the company so that all superintendents are compared to the same workhour per unit rate for each work item. This budgeted standard unit rate may or maynot be the rate used in the estimate, but for productivity purposes, all superintendents must be compared to the same rate. The budgeted standard unit rate is established by determining a base year, crew size and daily output for each activity. The budgeted standard will never change, but the standard can be adjusted for each job due to working conditions, location and trade agreements.

The Earned Workhour Report can be used to determine equipment production rates, expressed in equipment Hours per unit (EquipHr/unit), instead of workhour per unit rates for construction projects that are equipment intensive.

An *earned workhour* is defined as the budgeted workhours earned for the quantity placed using the budgeted standard.  $\text{Earned Workhour} = \text{Quantity Placed (units)} \times \text{Standard Workhours per Unit}$

The *budgeted quantities* should reflect the actual project being built; therefore, these quantities should be calculated by someone capable of determining the quantities for each work item from the construction issued drawings.

The **Earned Workhour Report Example and Instructions** are contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

The *Labor Cost Report* is used to compare the actual labor costs to the estimated labor costs and project the final cost for each activity. The estimated labor costs are obtained from the estimate ledger which shows the revised estimated cost. The actual labor costs are obtained from the weekly labor distribution and balanced with the detail cost ledger.

The *Labor Cost Report can be called the Equipment Cost Report*, and the report can be used to determine the equipment cost per unit (equip \$/unit) instead of labor cost per unit on construction projects that are equipment intensive.

The **Labor Cost Report Example and Instructions** are contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

**The Project Cost Summary Report** is the most valuable report in terms of the overall project because it sums up all actual and projected quantities, workhours and costs for the project by cost code and compares them to the budget by cost code. The projected cost compared to the estimated cost shows the latest prediction of a profit or loss for the overall project. This report forewarns management of specific work items that must be scrutinized closely to reduce losses to a minimum. If used properly, the project cost summary can be used to implement accurate decisions before the costs spiral out of control. The Projected Cost Summary Report is prepared from the budget and detail cost ledgers and balanced to the accounting ledgers.

The **Project Cost Summary Report** are contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

## Financial Statements

### Balance Sheet

The *Balance Sheet* is a summary of the existing conditions of the company and follows the standardized format for classifying and ordering the Assets, Liabilities, and Ownership interests in the business. The balance sheet accounts are subdivided into these basic groups in the following order for presentation:

Assets are subdivided into these groups:

- Current Assets
- Fixed Assets or Long-Term Property, Plant & Equipment
- Other Assets

Liabilities are subdivided into these groups:

- Current Liabilities
- Long-Term Liabilities
- Owner's Equity

Each separate asset, liability, and owner's equity reported in a Balance Sheet is called an account, and every account has a title and a dollar amount which is called its balance. The Balance Sheet is prepared at the close of business on the last day of the income statement period and lists the assets, liabilities and net worth. Assets minus Liabilities equals Net Worth. The balance sheet will always be in balance because Total Assets = Total Liabilities plus Net Worth.

*Current assets* are cash on hand, accounts receivable, Inventories, Prepaid Expenses, and other current assets that will be converted into cash during one operating cycle. The *Fixed assets*, or Long-term assets, are Land and Buildings and Equipment. The cost of a fixed asset is reduced by the depreciable amount allocable over the period.

*Current Liabilities*, or short-term liabilities, are accounts that will come due within one year. The accounts are Accounts Payable, Notes Payable, and Billings in excess of costs on uncompleted contracts. *Long-term Liabilities* are those that maturity dates are more than one year, such as a long-term loan. The Net Worth or Stock Holders' Equity accounts in the Balance sheet is comprised of Capital Stock and Retained Earnings.

*Working Capital* is the net amount of current assets available. It is computed as follows. Working Capital = Current Assets minus Current liabilities.

**Balance Sheet Examples** are contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

### Balance Sheet Ratios

The *Current ratio* is expressed as Current assets to Current liabilities. The Current ratio is always expressed as x to 1. The Current ratio is:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current Liabilities}} = \frac{\$3,415,807}{\$1,546,107} = 2.21$$

This ratio is favored by loan officers and creditors as an indicator of financial health. Generally, a 2 to 1 Current ratio is considered the satisfactory minimum. According to the Summary of Financial Ratios and the Construction Industry Average Table, the Current ratio in the example is 2.21 and the construction industry average is 2.50. This is slightly below the average.

The *Quick assets ratio*, sometimes called the “*Acid Test*”, is expressed as Current assets without inventories or Prepaid Expenses to Current Liabilities. The Quick assets ratio is as follows:

$$\begin{aligned} & \$1,565,807 = \text{Cash} + \text{Receivable} \\ = & \frac{\text{Current Assets} - \text{Inventories} - \text{Prepaid Expenses}}{\text{Current Liabilities}} = \frac{\$3,415,807 - 1,690,000 - \$160,000}{\$1,546,107} = 1.01 \end{aligned}$$

The *acid test* measures the immediate ability to pay current debts. This is a more conservative approach since inventories are not necessarily available and may not be readily available. Generally, a 1 to 1 minimum is considered a healthy ratio. The example shows a satisfactory ratio.

The *Debt to Total Assets Ratio* is an indicator of the company's Leverage. Leverage refers to using the equity capital base to raise additional capital from nonowner sources. The Debt to Total Assets ratio is calculated as follows:

$$\text{Debt to Total Assets Ratio} = \frac{\text{Total Liabilities}}{\text{Total Assets}} = \frac{(\$2,296,107) + \$750,000}{\$5,615,807} = 40\%$$

According to the Construction Industry Average Table, the industry standard is 33 percent, the Debt to Total Assets Ratio in the example is 40%, which is poor or high for this company.

The *Debt-to-Equity Ratio* is an indicator of whether a company is using debt prudently or whether they are overburdened with debt that may cause problems. The Debt-to-Equity ratio is as follows:

$$\text{Debt to Equity Ratio} = \frac{\text{Total Liabilities}}{\text{Total Owners Equity}} = \frac{\$2,296,107}{\$3,319,700} = .69 \text{ Debt to Equity Ratio}$$

This ratio says that the company is using \$.69 of liabilities in addition to each \$1.00 of Owners' Equity in the business. This business, with its .69 to 1.00 debt to equity, would be considered moderately leveraged.

Financial Ratios and the Construction Industry Average Table

Ratio	Formula for Calculation	Industry Average
Liquidity: Current Ratio	$\frac{\text{current assets}}{\text{current liabilities}}$	2.5 times
Quick Assets or Acid test	$\frac{\text{current assets} - \text{inventory} - \text{prepaid expenses}}{\text{current liabilities}}$	1.0 times
Leverage: Debt to total assets	$\frac{\text{total liabilities}}{\text{total assets}}$	33 percent
Times interest earned	$\frac{\text{operating earnings}}{\text{interest expenses}}$	8.0 times
Fixed charge coverage	$\frac{\text{income available for meeting fixed charges}}{\text{fixed charges}}$	5.5 times
Activity: Inventory turnover	$\frac{\text{Revenue}}{\text{inventory}}$	9 times
Average collection period	$\frac{\text{receivables}}{\text{Revenue per day}}$	20 days
Fixed assets turnover	$\frac{\text{sales}}{\text{fixed assets}}$	5.0 times
Total assets turnover	$\frac{\text{sales}}{\text{total assets}}$	2 times
Profitability: Return on Revenue	$\frac{\text{net income after taxes}}{\text{Revenue}}$	5 percent
Return on total assets	$\frac{\text{net income after taxes}}{\text{total assets}}$	8 percent
Return on Equity	$\frac{\text{net income after taxes}}{\text{Owners Equity}}$	15 percent
Break even	$\frac{\text{G\&A Overhead}}{\text{Gross Profit}}$	20 percent
Days of Cash	$\frac{(\text{Cash \& Cash Equivalents}) \times 360}{\text{Revenue}}$	
Working Capital	Current Assets minus Current Liabilities	
Working Capital Turnover	$\frac{\text{Revenue}}{\text{Working Capital}}$	



## Income Statement

The *Income Statement* summarizes sales revenue and expenses for a period of time, which is one year for the example. The ending date of that period is always the same as the closing date given on the balance sheet and the period covered is always specified on the top of the report, for example, Income Statement for the Year ending December 31. The income statement is broken down into these accounts. The Sales revenue is the top line and it is the total amount of income from contract sales. The bottom line is called net income or net earnings. Net income is the final profit after all expenses are deducted from sales revenue.

The income statement is designed to be read in a step-down process. Each step down is a deduction for one or more expenses. The first step deducts the cost of goods sold from the sales revenue of goods sold or completed contracts, which gives the *Gross Margin*, sometimes called the gross profit.

Next, operating expenses and depreciation expenses are deducted, giving *Operating Earnings* before interest and income tax expenses are deducted. Operating Earnings is also called “Earnings before Income Taxes” and is abbreviated EBIT.

Next, Interest expenses on debt are deducted, which results in *Earning before Income Taxes*. The last step is to deduct income tax expenses, which results in *Net Income*. Publicly owned business corporations report Earnings per Share, which is net income divided by the number of stock shares. Privately owned business does not have to report the Earnings per Share.

Revenue and expenses reported in income statements generally follow accepted accounting practices, which are summarized below:

*Completed Contract sales, or sales revenue*, is the total amount received or to be received from contract sales. Contract sales revenue is net.

*Cost of Completed contracts, or Cost of Goods Sold Expense*, is the total cost sold during the period.

*Operating Expenses* is a broad category of expenses such as contract overhead, selling expenses, general and administrative expenses and depreciation. This category excludes cost of completed contracts, interest, and income tax.

## Income Statement Ratios

*Times Interest Earned Ratio* is used to test the ability to pay interest from earnings. It is calculated below:

$$\frac{\text{Operating Earnings}}{\text{Interest Expenses}} = \frac{\$1,300,000}{\$103,000} = 12.6 \text{ Times Interest Earned Ratio}$$

According to the construction industry, the low Time Interest Earned Ratio is 8.0 times, but the example indicates a 12.6 Times Interest Earned ratio, which exceeds the average, which is good.

The *Return on Revenue Ratio* shows the margin of profit as a percentage. From the income statement, the company in this example earned \$718,200 net income on its sales revenue of \$10,400,000 for the year. The net income to contract sales is calculated as follows:

$$\frac{\text{Net Income}}{\text{Revenue}} = \frac{\$718,200}{\$10,400,000} = 6.9\% \text{ Return on Revenue Ratio}$$

According to the construction industry, the average percentage Return on Revenue is 5 percent and the example indicates a 6.9 percent return on sales, which is satisfactory.

The *Return on Equity Ratio (ROE)* shows this ratio as a percentage. It is calculated by dividing the annual net income from the Income Statement by the Owners' Equity from the Balance Sheet. The Return on Equity is calculated as follows:

$$\frac{\text{Net Income}}{\text{Owners' Equity}} = \frac{\$718,200}{\$3,319,700} = 21.6\% \text{ Return on Equity Ratio}$$

According to the construction industry, the average percentage Return on Equity is 15 percent and the examples indicate a 21.6% Return on equity, which is good.

The *Return on Assets Ratio (ROA)* indicates what the business earned before interest and income tax expenses on the total assets employed during the year. The Return on Assets is calculated by dividing the Operating Earnings from the Income Statement by the Total Assets from the Balance Sheet. The Return on Assets is calculated as follows:

$$\frac{\text{Operating Earnings}}{\text{Total Assets}} = \frac{\$1,300,000}{\$5,615,807} = 23.1\% \text{ Return on Assets}$$

The Return on Assets is compared to the annual interest rate on the company's borrowed money. According to the construction industry, the average percentage Return on Total Assets is 8 percent, and the business earned 23.1 percent on the money borrowed as a measure of Return of Assets. The difference between the two rates is a very favorable 15 percent.

**Income Statement Examples** are contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

## Cash Flow Statement

The *Cash Flow Statement* is a summary of the sources of and uses of cash indicating where it came from and where it went for the same period of time as the income statement. The cash flow statement example contains three sections. They are (1) Cash Flows from Operating Activities, sometimes referred to as cash flow from profit, (2) Cash Flows from Investing Activities, and (3) Cash flows from Financing Activities.

The cash flow statement reveals increases and decreases or changes in funds and is expressed as a change in the source and application of funds, and by the change in your working capital. In conclusion, a change in your cash flow is a result of a change in (1) Cash Flows from Operating Activities, (2) Cash Flows from Investing, (3) and Cash Flows from Financing Activities.

**A Cash Flow Statement Example** is contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

## Owner and Contractor Change Requests

The Owner has the right to issue change order requests to the Contractor for additions, deletions, or revisions in the work with an appropriate change in contract price or contract time. Change requests may also be submitted by the Contractor. Immediately after receiving a change request, from the Owner the Contractor should notify all parties who may be affected by the change, such as construction personnel, vendors and subcontractor. All change request for the subcontractors and Vendors must go through the Contractor to take advantage of more efficient construction methods or materials.

A **Change Order Request Memo** example is contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

## Contract Change Order

A *Contract Change Order* is defined in the American Institute of Architects (AIA) General Conditions as a written order, prepared by the A/E, to the Contractor issued after execution of the Contract Agreement. It is signed in agreement by the Owner, Architect/Engineer and Contractor. A Contract Change Order authorizes a change in the Contract Work or Scope and/or an adjustment in the Contract Sum and/or in the Contract Time.

A **Contract Change Order Form** example is contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

A **Construction Change Directive** is a written order, prepared by the A/E, to the Contractor issued after execution of the Contract Agreement. It is signed in agreement by the Owner and Architect/Engineer authorizing a change in the scope of work and/or an adjustment in the Contract Sum and/or an adjustment in the Contract Time.

If Contractor Disagrees, They Must:

- Proceed with the Directive
- Maintain All Cost Records
- Negotiate Approval into Change Order
- File a Claim.

If Contractor Agrees They Must:

- Proceed with the Directive
- Sign and Execute a Contract Change Order

A **Construction Change Directive** example is contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

## Minor Changes in the Work

A Minor Change in the Work is defined in the American Institute of Architects (AIA) General Conditions as a written order of the Architects/Engineers' supplemental instructions to the Contractor and issued after execution of the Contract Agreement. It is signed in agreement by the Architect/Engineer authorizing a change in the scope of work but it indicates that there will be no modification and/or an adjustment in the Contract Sum and/or an adjustment in the Contract Time.

A **Minor Changes in the Work Form** example is contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

## Extra Work Order

*Extra Work Orders* are frequently used to authorize the Contractor's field personnel (superintendent) to proceed with a change immediately, with the sum and time extension to be settled later. The work order is issued by the Architect/Engineer to the Superintendent, indicating the work order number, a full description of the scope of work and the method for determining the total cost. Most important, an Extra Work Order **does not** change the contract scope, price or time until it is converted to an executed contract change order.

Extra Work Orders place the contractor at an extreme disadvantage in settling the work order fairly because the work has already been completed. Therefore, it is required that the field personnel and subcontractors document all time, equipment and materials used daily by Extra Work activity. The field supervisor should also require the Architect/Engineer to approve these charges daily if possible.

Immediately after completion of the extra work order, the contractor should prepare a change order proposal and submit it to the Owner requesting a contract change order be issued.

A **Extra Work Order** example is contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

## Contractor's Change Order Proposal

A *New Change* requires the contractor to provide a Change Order Proposal Summary Cover page indicating the change in scope, price, time and the time limit for acceptance. The General, and Supplementary Conditions and the Prevailing Wage rates information will determine the direct and indirect cost items that can be included in the Proposal, the percentage for overhead and profit, and the wage rates, if they apply.

A **Contractor's New Change Order Proposal** example is contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

### **Net Change Order Proposal**

The *Net Change Order Proposal* is for an item that currently exists in the original estimate, and the change will result in either an increase or decrease in the contract price. The effect of the change request must be determined by the Contractor by comparing the original estimated cost of the item with the new estimated cost of the item. This results in a net change in price. Normally, the Contractor **does not** charge the Owner for overhead items.

A *Net Change* requires the contractor to provide a Change Order Proposal Summary Cover Page indicating the Change in Scope, Price, Time and the Time Limit for Acceptance.

A **Contractor's Net Change Order Proposal** example is contained in Section VI of the Examples and Exhibits Booklet that accompanies this study guide.

## **Claims, Owner Disclaimers and Omission Clauses**

The Claims process may be started through a variety of circumstances, including failure to agree upon the terms of a Change Order. Once the claim arises, the Owner and Contractor, together with the Architect/Engineer, seek resolution of the dispute by following specific steps established in the Contract Documents and in particular the General Conditions. The responsibility to substantiate Claims shall rest with the party making the claim.”

A Claim by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect or Engineer, if they are not the Initial Decision Maker. It is imperative that Contractors follow the claims and disputes procedures described in the contract documents and meet the notice time requirements stated.

The contract infers or says “time is of the essence.” Therefore, the Contractor must meet the crews’ distribution and the original schedule provided to the Owner at the beginning of the project.

## **Types of Construction Claims**

*Differing Subsurface or Physical Conditions*, it states that “if the Contractor believes any subsurface or physical condition is uncovered or revealed either is of such a nature as to establish that any technical data on which the Contractor is entitled to rely on is materially inaccurate; then the Contractor shall promptly and before further disturbing the conditions affected, Notify Owner and Engineer in writing about conditions.

The Contractor cannot rely on the completeness of technical data identified in the Supplementary conditions and these documents cannot be relied upon by the Contractor to make a claim, however the Contractor can file a Notice of Differing Subsurface or Physical condition, if the Contractor believes that the technical data is such a nature as to establish that any technical data on which the Contractor is entitled to rely is materially inaccurate or is of such a nature as to require a change in the Contract Documents, or differs materially from that shown or indicated in the Contract Documents, or is of an unusual nature, and differs materially from conditions ordinarily encountered.

## **Changed Conditions Recommendations**

The Contractor should review the contract and verify that a changed condition’s clause is specifically expressed. Also, if a changed condition clause does not exist, then the Contractor assumes all risks.

The Changed Condition Clause is limited in scope by using certain soil condition words.

- *Subsurface* is earth material near but not exposed at the surface of the ground.
- *Surface* is visible at or above the surface of the ground.
- *Concealed* prevents disclosure or recognition with the eyes.
- *Latent* is present but not visible or in sight.
- *Patent* is open, unobstructed, exposed and evident.
- *Hidden* is withdrawn or out of sight.

### **Differing Site Conditions (DSC) Type 1 And Type 2**

Principles for determining if the Soil Report is considered a part of the contract:

- The Soil Report is listed in the Index either under the Information Available to Bidders or under a Division and the page numbers for the soil report are numbered continuously as part of that Division. If, the Soil Report is not listed in the Index or it is not continuously numbered within a Division, then the Soil Report is not considered a part of the contract and it cannot be used as evidence.
- The Soils Report is listed in the Agreement or the Specifications Index listed in the Agreement.

*DSC Type I Clause.* Allows the Contractor to place a claim against the owner for subsurface or latent physical conditions at the site differing materially from that shown or indicated in the Contract Documents. Type I Clause is easier for a Contractor to recover under.

The Contractor is obligated to prove that it met the other relevant contractual requirements, such as *visited the site and conducted a pre-bid site investigation* and provided proper notice to the Owner and Engineer. For the Contractor to recover they must prove that *they did not disturb the conditions* and once they recognized them they stopped work in the affected area.

*DSC Type II Clause* allows the Contractor to place a claim against the Owner for an unusual condition that differs materially from those conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.

In a Type II DSC “the Owner has not made any substantive representations or indications in the contract documents relative to anticipated or anticipated site conditions. Since the Contractor cannot compare actual conditions to the contract documents, the Contractor’s burden of proof relative to a Type II DSC is significantly increased..



## Types of Job Acceleration

Under *voluntary acceleration*, the Contractor voluntarily shortens the project completion date. Therefore, this is not a claim against the Owner.

*Direct acceleration* (also known as affirmative acceleration) is authorized by the Owner and explicitly directs the Contractor to accelerate the work.

*Constructive acceleration* arises when a contractor is forced to perform an increased amount of work, by change order or otherwise, but the Owner refuses to grant additional performance time. Under constructive acceleration the Contractor is required to perform an increased quantity of work within the original scope and time period and this forces the Contractor to accelerate its work, then this is a compensable, but the Contractor must litigate.

For the Contractor to prove either directed or constructive acceleration, they must prove that

- they encountered an excusable delay
- they filed a timely notice to the Owner
- they submitted a request for additional time
- they must prove that the Owner refused to give a time extension.
- the Owner's implied or expressed actions required the work to be complete within the original contract time
- the Contractor did not attempt to accelerate
- they must have documented proof that additional costs were incurred because of the acceleration. (daily time cards showing the activities performed and the hours allocated to each activity).

*Constructive change* is a change in the scope or definition of the Contractor's work that is directed by the Owner or the Owner's authorized representative. These are implied changes forced or ordered upon the Contractor by situations that require performance above and beyond the contract terms.

For the Contractor to prove that a constructive change was encountered

- the Contractor show that the change was beyond the minimum standard
- they were ordered by words or deeds of others.

*Cardinal change* is a change on a public project which drastically alters the contract intent or a change on a public project which drastically alters the method or manner for completing the work, and this change creates an entirely new project beyond the scope of the original contract.

## Delays

- A *compensable delay* is in effect if the Owner fails to meet their obligations under the contract.
- An *identifiable compensable delay* is owner-caused delay and the Contractor receives damages and a time extension.
- *Excusable Delay* is where the Owner fails to make the jobsite available to the Contractor under the terms and conditions specified (ie. late arrival of Owner-Furnished items, the Owner interferes with the Contractor, weather conditions exceed specified conditions in the contract documents, or strikes by Contractor's or Subcontractor's employees (if stated in the documents)).

## Methods for Calculating Delay Damages on Compensable Delays

- Total Cost Method – difference between actual cost incurred plus overhead & profit and bid cost
- Modified Total Cost Method – acknowledges costs that were other parties responsibility
- Quantum Meritum Method - claim amount is calculated based on market value of services and are to establish a reasonable amount for compensation.
- Eichleay Formula - allows the Contractor to recover their unabsorbed home office

The *No Damage for Delay* clause indicates that the contractor will be entitled to a time extension only but not any additional compensation as long as the claim is submitted in accordance with the contract documents.

## Criteria for Obtaining a Weather Delay Time Extension

The criteria for obtaining a time extension due to weather conditions is the weather must be listed to request a time extension and the weather criteria must be stated. In addition, the weather must be documented at the job site. The Contractor must prove that the weather had an adverse effect on the construction schedules critical path.

How Does the Owner Shift Complete Responsibilities to the Contractor for Claims?

The *Claims, Changes in the Work or Modification clause* will sometimes be omitted from the documents because the Owner wants to shift all risk for changes to the Contractor. This would require the Contractor to sue the Owner for all changes under the contract.

*Disclaimer Clauses* are ones in which the Owner tries to eliminate, limit, or shift liability to the Contractor

The *Indemnification or Hold Harmless* clause is an agreement to protect another party and make them whole in the event a claim is asserted against them.

*Liquidated damages* are an assessment against the Contractor for late completion. They are intended to compensate the Owner for their lost revenue. It is customary to stipulate the amount per day in the Supplementary Conditions. When they are stated as an amount per day, this establishes the Owner's damages for late completion, and the Owner can recover that amount per day and the Owner only has to prove the number of days of late completion by the Contractor. For this clause to be enforceable it must meet two requirements: (1) actual damages difficult to measure, and (2) good faith effort by the Owner. The amount stipulated for liquidated damages cannot be intended as a penalty for late completion.

*Actual damages* incurred by the Owner is an assessment against the Contractor for late completion. The omission of a stipulated amount for liquidated damages allows the owner to recover actual delay damages and the contractor will be liable for the Owner's lost revenue for that project.

### **Contractor's Responsibilities for Scheduling and Sequencing the Work**

The Contractor must *develop and submit a preliminary progress schedule indicating the times (number of days or dates) for starting and completing* the various stages of the Work, including any milestones specified as stated in the contract documents.

The Contractor must *submit a preliminary schedule of Shop Drawings* and Sample submittals as stated in the contract documents

The Contractor must *adhere to the progress schedule* and they may *adjust the schedule periodically* as stated in the contract documents.

### **Required Activities to be Shown on the Planned Schedule**

- The schedule must be a precedence driven network.
- Design Sequence for all Disciplines and each Discipline must contain at least the four activity design sequence
- Procurement Sequence for each Material delivery and each material must contain at least the six activity procurement sequence
- Construction Sequence with a logical progression
- Inspections and Testing activities for all Disciplines
- Planned Weather with Loss Workdays shown by Month
- Owner Furnished Items
- Separate Contracts negotiated by the Owner

**Required Activities on an “Updated” Progress Schedule?**

According to the legal principle concerning admissible evidence, the following activities are required to be on the updated progress schedule:

- Change Orders.
- Extra Work Orders
- Owner Caused Delays
- Contractor Caused Delays
- Subcontractor Caused Delays
- Vendor Caused Delays
- Punch List Items

**How does the Contract Address Floats on the Schedule?**

The Supplementary Conditions generally states “Who Owns the Float.” The options are the Owner exclusively owns the float or it could state that the float is shared. If the Contract Documents does not address the question, then it is presumed that the Contractor owns the float. Normally, this suggests that each activity must be shown indicating the crew size and the daily output.

## VII. PROJECT CLOSEOUT

### Project Closeout Procedures

*Substantial Completion* is the completion date of the project and stops liquidated damages from continuing if the project was over the stated completion date. Substantial Completion the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use

The *Certificate of Substantial Completion or Substantial Performance* is used when the Contractor along with the Architect/Engineer deems that the project is complete enough to fulfill the intent of the contract. The Certificate of Substantial Completion is issued by the Architect when construction is sufficiently completion and it allows the Owner to occupy the structure while the Contractor completes the punch list items.

A **Certificate of Substantial Completion** example is contained in Section VII of the Examples and Exhibits Booklet that accompanies this study guide.

*Substantial performance* may be defined as an accomplishment by the contractor of all things essential to fulfillment of the purpose of the contract, although there may be inconsequential deviations from certain terms.

CONTRACTORS RESPONSIBILITY - "walk the job" and compile a "punch list" for final acceptance of subs work. Collect Owner and Operating Manuals continuously throughout the construction of the project while walking the jobsite. File these manuals using the CSI MasterFormat. Continuously update and maintain Record copy of the changes that have been made to the plans and Contract Documents.

*Punch List* - A list of items containing the corrections to be completed is developed on the contractor's final inspection. The punch list becomes the basis for accepting the work as completed and releasing the final payment to the contractor.

A **Typical Punch List** example is contained in Section VII of the Examples and Exhibits Booklet that accompanies this study guide.

*Final Acceptance of the Project* - Once the punch list is complete, the contractor requests a final inspection by the owner's representative. When an owner finally accepts a project, the owner loses the right to hold the contractor responsible for defects in the work which could have been detected during a reasonable final inspection.

Once the final inspection has determined that the punch list is complete, the owner formally accepts the project and pays the contractor the remaining contract balance being held as retainage. At this point, the owner has released any claims against the contractor except for warranty claims, and other claims pertaining to latent defects in the work.

Similarly, the contractor loses the right to assert claims for additional compensation against the project owner once the owner has finally accepted the project. Finally, if either party wants to reserve their rights for an unresolved claim to be pursued after final acceptance, it must do so in writing.

*Submitting Lien Waivers during Project Closeout - The Prime Contractor* must list and sign swearing that the list is complete an affidavit that all parties on the list have been paid in full. The prime contractor also must furnish executed full lien waivers from every party appearing on the list.

*Contractor's Responsibilities for Maintaining Record Documents at the Jobsite* – In accordance with the contract documents requirements the Contractor should maintain at the site one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record field changes and selections made during construction, and one record copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These should be available to the Architect and should be delivered to the Architect for submittal to the Owner upon completion of the Work.”

## VIII. CONSTRUCTION SAFETY MANAGEMENT

### Accident and Injury Cost

Construction jobs account for just 5 percent of the workforce in the United States but account for more than 17 percent of the workplace deaths every year. One construction employee in seven is injured every year.

The overall cost of accidents in the United States is approximately \$800 Billion annually.

How Does the National Safety Council Define Indirect Losses?

The Indirect losses for workplace accidents consist of costs associated with responding to accidents (i.e., giving first aid, completing accident reports, handling work slowdowns).

### Most Common Work-related Injuries

Type of Injury	Percentage
Back Strain	31
Other Sprains/strains	19
Concussion/bruises	11
Fracture	11
Laceration/puncture	10
Dislocation/crushing	3
Burn	3
Hernia	3
Infection/inflammation	3
Amputation	2
Cumulative Injury	2
Occupational Disease	2
Total	100

## Workers' Compensation Insurance

Workers' Compensation laws were designed to provide a prompt satisfactory means of resolving occupational injuries. The primary objectives of Workers' Compensation laws are these:

- Provide sure, prompt and reasonable income and medical benefits to work-accident victims, or income benefits to their dependents, regardless of who is at fault;
- Provide a single remedy and reduce court delays and costs.
- Eliminate payment of fees to lawyers and witnesses as well as time-consuming trials and appeals.
- Promote frank study of causes of accidents, reducing preventable accidents and human suffering.

Workers' compensation insurance pays for all medical expenses and a portion of the workers lost wages if hurt on the job no matter who is at fault. According to the workers compensation law an injured worker does not have to receive their pay for the loss time incurred until after one week or the first seven days.

The three factors that are used to calculate the Workers' Compensation Insurance Premiums (WCIP) are:

1. Manual Rate (Base Rate)
2. Payroll Units
3. Experience Modification Rate (EMR)

The formula for the calculation of Workers' Compensation Insurance Premiums is:

$$\text{WCIP} = \text{Manual Rate} \times \text{Payroll Units} \times \text{EMR}$$

The *Manual Rate* is established by each **State** based upon the **Classification of Work (Trade)** being performed. The manual rate is based upon losses incurred from the previous three years by trade or classification of the work.

*Payroll Units* are derived by dividing an employer's annual direct labor cost by 100.

The *Experience Modification Rate* (EMR) is the ratio of actual losses to expected losses **over a moving three-year period**. The basic EMR formula is shown below:

$$\text{EMR} = \frac{\text{Actual Losses}}{\text{Expected Losses}}$$

The EMR formula is adjusted so that it gives primary consideration to the number of claims (frequency) and secondary consideration to the severity of claims. The actual primary loss is the basic loss portion. It reflects claim frequency and is given full weight. Excess loss is the amount by which the actual loss exceeds the primary loss, and it reflects claim severity.



A **Workers Compensation Insurance Premium** calculation example is contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide.

#### Decreasing the Cost of an Injury

- Visit or call the injured worker and explain that you are not upset, and describe the benefits that the person can expect.
- Get workers back to work as soon as possible.
- Analyze the injury records and determine what is causing the most injuries.

*Indirect or Uninsured Costs* are four times the direct claim costs or 20.8% of the direct costs. What Is the Average Cost of an Accident?

A **Cost of Accident** calculation example is contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide.

*Potential Savings from Establishing an Effective Safety Program..* More profitable jobs are perceived as safer and that strong perceptions of safety are accompanied by fewer accidents." Therefore, one way to increase profit is by improving Safety. An investment of 2.5 percent of direct labor costs or less can decrease claims cost by a minimum of 25 percent.

A **Potential Savings from Establishing an Effective Safety Program** example is contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide.

#### Uninsured Costs for Work Accidents

- *Cost of wages paid for time lost by workers who were not injured.*
- *Cost of damage to material or equipment.*
- *Cost of wages paid for time lost by the injured worker, other than workers' compensation payments.*
- *Extra cost of overtime work due to the accident.*
- *Cost of the supervisor's wages for time spent on activities due to the accident.*
- *Wages from decreased output of an injured worker after they return to work.*
- *Cost of learning period of a new worker.*
- *Uninsured medical costs borne by the company.* These uninsured costs are usually first aid medical services, ambulance service and drug testing. There is no great difficulty in estimating an average cost per visit for this medical attention.
- *Cost of time spent by management and clerical workers on investigations or in the processing of compensation application forms.*
- *Miscellaneous or Unusual costs.* Possible costs are public liability claims, equipment rental, losses due to canceled contracts or lost orders if the accident causes an overall reduction in total sales, loss of company bonuses, cost of hiring new employees, cost of above-normal waste by new employees, and demurrage charges for leaving trailers.

## Construction Industry Accident Statistics

Management ineffectiveness is the *leading cause of accidents*. Managers believe that safety has little impact on operational goals, is compliance-oriented, and does not support line-management objectives or desired business outcomes

1. Least experienced workers incur the greatest number of accidents
2. Ages 18 - 20                      20 times the chance of an injury compared to workers 34 or Older
3. Ages 21 - 25                      10 times the chance of an injury compared to workers 34 or Older
4. Ages 26 - 30                      4 times the chance of an injury compared to workers 34 or Older

### *Most Frequent Causes of Fatalities -*

- Falls from Elevations accounted for 33 percent of the fatalities,
- Struck by Falling Objects accounted for 22 percent.
- Caught in or between an Object, accounted for 18 percent.
- Electrocution accounted for 17 percent of the fatalities.

### *Most Frequent Causes of Injury*

Overexertion represents the most frequently occurring type of injury (36% of the total).

### *Most Frequently Injured Part of The Body*

- The back accounted for 21%
- The feet and legs accounted for 12%
- the trunk accounted for 10%
- Fingers accounted for 10%

### *OSHA Focus - Construction Outreach Training Program Guidelines*

Four Hazards that must be covered are:

- Fall Protection, 1926.500 Subpart M - Fall Protection (e.g., floors, platforms, roofs)
- Being Struck by Falling Objects, 1926.550 Subpart N - Cranes, Derricks, Hoists, Elevators, and Conveyors; 1926. 600 Subpart O - Motor Vehicles, Mechanized Equipment, and Marine Operations, and 1926.700 Subpart Q - Concrete and Masonry specifically 1926.706 (e.g., falling objects, trucks, cranes, constructing masonry walls)
- Caught in or between an Object (e.g., trench hazards, unguarded machinery, equipment)
- Electrocution and Electrical Shock, 1926.400 Subpart K - Electrical 1926.300 Subpart I Tools - Hand and Power (e.g., overhead power lines, power tools and cords, temporary wiring, grounding).

A Manager can be subject to **criminal charges** for a workplace accident for maintaining an unsafe or unhealthy workplace. Federal and State occupational Safety and Health laws have always contained criminal enforcement provisions.

Some Cases that Resulted in Criminal Charges for Safety Violations example is contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide.

*OSHA Criteria for a Willful Violation* A willful safety violation exists if a director, corporate officer, manager or supervisor is aware that a hazardous condition exists and shows indifference to the standard, or knows that the condition violates a standard of the Act and does not abate the issue, or the manager makes no reasonable effort to eliminate the hazard. Any person cited under a willful violation can be prosecuted under criminal law for negligence, a type of tort.

The OSHA section describing the criteria for a Willful Violation is contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide.

One of the most recognized actions by corporate officers, directors, managers, supervisors, and crew leaders is *control*. This control can be in the form of giving instructions to the crew or making little or no effort to abate the safety violation or to little or no effort to communicate the standard to lower-level supervisors and employees. These are all examples of willful indifference, therefore, the person in control has liability.

## **Tort Law**

Under tort law a person in control has a duty to act reasonably toward another person, if they act unreasonably, they are negligence, therefore, they have liability. Tort duties are duties under the law that people have to one another regardless of the existence of any type of contract. The purpose of tort law is to prevent and punish certain acts against individuals that society has deemed unacceptable.

### **Tort Breaches:**

- *An unintentional breach* - The consequence for an unintentional tort is the guilty person pays damages.
- *An intentional breach* - The consequence for an intentional tort is the guilty person pays punitive damages.

### **Types of Torts**

- *Negligence* is the failure to act reasonably toward another person and this causes injury to the other person.
- *Fraud* is cheating someone out of something of value.
- *Libel* is the writing something untrue about a person.
- *Slander* is saying something untrue about a person.
- *Battery* is touching another person without their consent.
- *Assault* is threatening to touch someone without their consent.

The *tort of negligence* is the failure to act reasonably and consequently to cause injury.

The injured party must prove:

- A *Duty* existed to be reasonable toward another person
- There was a *Breach* of that duty using specific facts
- The injured party must prove *Damages* or injury
- The injured party must prove that the damage was *Caused* by the breach of duty

A negligence tort can be tried in either criminal law or civil law courts.

Also, OSHA has been utilizing the Williams-Steiger Occupational Safety and Health Act of 1970 as a basis for establishing negligence. This Act was enacted by the Senate and House of Representatives of the United States of America. This act is known as administrative law. Finally, Section 5(a)(1), an important section of this act and best referred to as “**The General Duty Clause**,” reads as follows:

### **Duties**

#### **(a) Each employer**

**(1)** *shall furnish to each of their employees’* employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to their employees

**(2)** *shall comply with* occupational safety and health standards promulgated under this Act

**(b) Each employee shall comply with** occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to an employee’s own actions and conduct.

If a manager violates a statute or a regulation such as the *1926 OSHA Construction Industry Regulations* the law principle is a person who violates a valid statute and thereby causes injury is liable for either damages (Civil Tort) or for the Crime (Criminal Tort). A manager having responsibility over a person(s), must have employed Due Diligence to prevent the occurrence of an injury or death to the person(s).

Due Diligence is established by:

- completing safety orientation and training for all employees
- managers’ taking an active role in safety using a behavioral approach such as looking for the things that workers are *doing* right and *correcting* the things they are doing wrong.
- abating the known hazards
- abating hazards that have caused previous injury
- inspecting for the OSHA “Focused Four,” and abating or correcting any violations immediately.
- having complete daily safety action plans for the crews.
- *having OSHA 1926 Construction Safety Standards*, the *ACI Formwork for Concrete* book, the *Riggers Manual* or *Riggers’ handbook*, and the *Crane tables* at the job site.
- consulting all of the references stated above.

Four tests are used to establish fault where a manager can be criminally charged.

- *Purposely* means the person has the “conscious object to engage in conduct or to cause a result.
- *Knowingly* means the person is “aware of the nature of one’s conduct or the existence of circumstances and aware that one’s conduct will be practically certain to cause the result.”
- *Recklessly* means the person’s “conscious disregard of a substantial and unjustifiable risk and a gross deviation from a law-abiding standard of conduct.
- *Negligently* means the person “should have been aware of a substantial and unjustifiable risk and a gross deviation from a reasonable person’s standard of care.”

**Examples of Situations Where A Manager Be Can Subject To Criminal Charges for Safety Violations** are contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide.

### **Excavation Responsibilities & Visual Inspections**

The law states that the person responsible for inspections and ensuring the safety of the workers is the person that is exposing the workers to the hazardous conditions.

OSHA defines a *competent person* as the person **on site** that has the knowledge, experience and training to observe changing conditions and has the authority to take corrective action. The competent person designated at the jobsite must possess the ability to:

- Interpret the Excavation standard
- Conduct daily inspection of the excavation
- Proficiently classify the soil and operate the soil testing equipment
- Specify the proper shoring or benching system
- Recognize and abate confined space hazards
- Take corrective action to eliminate all unsafe conditions and have the authority to stop work

Individual conditions at each site will govern the amount of time a competent person must spend at the site. Finally, if you allow your workers to work in an unprotected excavation or trench, the law holds you responsible even though you did not excavate the trench.

OSHA has also developed a **Competent Person Evaluation Form** of the typical questions that the OSHA compliance officer will ask during a site visit.

**Competent Person Evaluation Forms** are contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide.

*Duties of the Excavation Competent Person* - The competent person must perform the following duties to ensure safe working conditions:

- Describe the existing jobsite conditions to develop a safe and efficient plan
- Inspect daily, each shift and when conditions change
- Identify the soil conditions
- Classify the soil
- Conduct visual inspections
- Conduct manual inspections
- Review surrounding conditions & adjacent structures
- Determine the public protection required
- Design means of access and egress for workers in a trench excavation that is more than four feet deep and that requires no more than 25 feet of lateral travel for workers.
- Consult with a qualified structural designer to design employee walkways and equipment ramps
- Consult with a Registered Professional Engineer (RPE) when:
  - Trenches are over 20 feet deep
  - Underpinning is required
  - Designing structural ramps
  - Undercutting adjacent structures
- Select an allowable protection system
- Document the excavation inspections and the protection system selected
- Monitored the air quality before workers enter any excavation greater than 4 feet deep
- Monitor the water removal equipment
- Hold tool box talks with the crews
- Develop an emergency rescue plan

*Competent Person's Daily Inspection Requirements* - To ensure worker safety, the competent person must inspect the site and record the observations each day. An Excavation Competent Person must have a basic understanding of soil terminology so that they can properly identify and classify the soil.

**A Daily Excavation Inspection Log** Example is contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide.

Supervisors and workers should be trained to watch for conditions that can cause trench failure and to recognize indicators of potential cave-ins. When inspecting an excavation you should look for the following hazardous conditions:

*Material or equipment too near the edge* -- spoil piled at the edge of a trench can overload the soil and cause a cave-in. The spoil piles may also hide tension cracks that would warn of an unstable condition. Building materials too close to the edge can also cause a cave-in. Spoil piles and stored materials should be no closer than 2 feet from a trench edge. Equipment too close to the edge can slide into the excavation, or the vibration can cause a cave-in.

*Previously excavated areas* -- Trenches are particularly dangerous if they have been excavated through or adjacent to a backfilled area. Disturbed soil, even if it is in a compacted state, does *not* bind well to the natural soil.

*Intersecting trenches* -- Trenches that intersect another open trench, manhole excavation or a building excavation disturb the soil and can cause a cave-in. Crossing under an existing line can also cause a cave-in, or it can break the existing lines, thus causing flooding and cave-ins.

*Parallel Trenches* - Excavating alongside an old backfilled trench (previously disturbed soil) is an extremely dangerous situation.

*Vibration caused by traffic or blasting* -- Sandy soils are especially sensitive to vibration. Truck traffic, moving equipment or blasting may trigger a trench failure.

*Wet soils* -- Clayey and silty soils lose strength when they get wet. Water in the bottom of the trench is a danger signal.

*Load from adjacent existing structures* -- If the bottom of a trench is lower than the footings of an adjacent structure, loads from the structure can cause a cave-in.

*Changes in the weather* -- Spring thaws, prolonged dry spells and rainy weather can all increase the likelihood of a trench failure. Thawing can reduce the load-bearing capability of some soils. Drying causes clay soils to crack.

*Layers of different soils* -- Many soils are composed of two or more distinct materials such as clay and sand. A sudden change in these soils may be unstable.

**Trench Safety Daily Field Report and Daily Excavation Log** examples are contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide.

## Soil Terminology and Soil Classification

*Bank Soil* – “in place” or “in situ. *Bank Material* is in its natural state or undisturbed condition.

*Loose Material state* is material that has been excavated, stockpiled or loaded into a piece of equipment.

*Compacted Material* is soil after applying some type of compaction equipment to consolidate the material.

*Cemented Soil* - A soil which is held together by natural cement-like chemical agents. Hand-size samples cannot be crushed into powder or individual soil particles by finger pressure. Cemented soils include hardpan. These soils are EXTREMELY hard to excavate.

*Clay* - A soil that is hard to break up when dry, but can be crushed to a powder (fine-grained soil) and can be moldable when wet and sticks together (cohesive).

*Loam* - Soil that is composed of equal parts of sand silt and clay’

*Cohesive Soil* - A soil with a high clay content which sticks together when wet or dry. Cohesive soil does not crumble, can be dug with vertical sides, and is moldable when moist. Cohesive soil is hard to break up when dry, and sticks together when wet or underwater. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay

*Cohesionless Soil* - A loose sand or granular gravel that freely runs

*Dry Soil* - A soil that has very low water content and is not wet or moist

*Fissured* - A fissured soil is one that has a tendency to break along definite planes or a material that exhibits open cracks

*Granular Soil* - A Gravel or sandy soils, possibly including silt, with little or no clay content. Granular soil has very little or no cohesive strength. Some moist silts can stick together and temporarily stand on a vertical slope, but normally they cannot be dug with vertical sides. Granular soil cannot be molded when moist and crumbles easily when dry. All running soils are granular.

*Layered System* - Two or more different soils or rock types in layers. A layered system is controlled by its weakest layer. Clay or crystal seams in rock are considered layered.



*Moisture* - Freshly excavated, soil may appear to be cohesive. As the soil dries, the moisture evaporates and the trench walls may deteriorate until all that remains are piles of sand angled to their natural slope. Sheeting should be used. Excessive amounts of water, water seeping freely into the trench, can cause collapse. Water removal techniques should be used.

*Moist Soil* - A soil that looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small threads before crumbling. Moist granular soil that contains some cohesive material can be molded by hand.

*Plastic* - The ability to mold a soil without it cracking, crumbling, or shrinking

*Previously Disturbed Soils* - Once excavated, the soil will never return to its original position or stability. Soil does not completely "heal" even after backfill and compaction.

*Saturated Soil* - A very wet soil where water can be seen seeping from the sides of a trench; soil that is below the ground water table or underwater; the sides of a trench that has been flooded to more than one-half its depth and has not been drained for at least one day; soil in which water is held in by shoring.

*Spoil* - The earth and material drawn from an excavation

*Unconfined Compressive Strength* is the load per unit area at which soil will fail in compression. This measure can be determined by laboratory testing, or it can be estimated in the field using a pocket Penetrometer, Torvane Soil Tester or a thumb penetration test.

*Soil Types* - OSHA recognized four different soil types: A, B, C and Stable rock.

- A *Type A Soil* is defined as a Cohesive soil with an unconfined compressive strength of 1.5 tons per square Foot (tsf) or Greater. Cohesive soil examples are clay, silty clay, sandy clay, clay loam. However, *no soil is Type A if*:
  1. The soil is fissured; or
  2. The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
  3. The soil has been previously disturbed; or
  4. The soil is part of a sloped-layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
  5. The material is subject to other factors that would require it to be classified as a less stable material. (Blasting nearby).
  6. Water freely flowing into the trench (Excavation below the water table; 7. A Rock layer above a weaker soil layer; and 8.
- A *Type B Soil* means a cohesive soil with an unconfined compressive strength greater than 0.5 tons per square foot but less than 1.5 tsf; or Granular Cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam. Soil is a Type B if the soil was previously disturbed.

Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or dry rock that is not stable; or material that is part of a sloped-layered system where the layers dip into the excavation on a slope less steep than four horizontals to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

- A *Type C soil* means a cohesive soil with an unconfined compressive strength of 0.5 tsf or less; or granular soils including gravel, sand and loamy sand; or submerged soil or soil from which water is freely seeping; or submerged Rock that is not Stable; or material in a sloped-layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper.
- *Stable Rock* means a natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

The **OSHA Soil Classification And Their Characteristics Table** is contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide

### **OSHA Acceptable Visual Soil Observation Tests for Excavation**

The competent person must:

- observe the sample of soil that is excavated and the soil that is excavated from the *sides of the excavation*, and estimate the range of the particle's sizes and the relative amounts of the particle sizes.
- observe *the side of the opened excavation* and if crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and indications of potentially hazardous situations.
- observe *the opened side of the excavation* to identify layered soil system. Examine layered systems to identify if the layers slope toward the excavation and estimate the degree of slope of the layers.
- observe *the areas adjacent to the excavation and the sides of the open excavation* for evidence of surface water, water seeping from the sides of the excavation, or the location of the water table level.
- observe the *areas adjacent to the excavation and the area within the excavation* for sources of vibration that may affect the stability of the excavation face.

## OSHA Field Manual Tests for Soil Analysis

Tests that can be performed by a qualified person at the test site.

The *plasticity test* requires you to mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8 of an inch in diameter by two inches in length. Then the soil sample is held by one end and if the soil sample does not tear or break then it is considered a cohesive soil.

The *Pat Test* is used to determine the presence of cohesive clay or silt. This test is conducted by spreading a 1/8 inch to 1/4-inch-thick sample of wet soil on the palm of your hand and then remove any visible water from the surface. With the sample in the palm of your hand, slap the back of the hand moderately approximately eight times. If the surface appears shiny due to water rising to the surface, this soil consists mostly of granular silt or sand and it is considered a weaker soil. If no water appears on the surface, the soil consists of mostly cohesive clay and this is considered a stronger soil.

The *Dry Strength Test* is used to determine the amount of strength and the presence of fissures in dry soils. If the soil is dry and crumbles on its own or with moderate pressure into individual grains of fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and fall into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand, or silt. If the dry soil breaks into clumps which do not break into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

Difference between the soils using the dry test:

UNFISSURED COHESIVE SOIL	FISSURED SOIL
Surface drying cracks are not visible	Surface drying cracks are visible
Sample breaks with force	Sample breaks easily by hand
Clumps do not crush easily by hand or when stepped on.	Clumps do not crush easily by hand or when stepped on
Granular Soil	
Clumps crush easily	

The *Thumb Penetration Test* can be used to estimate the unconfined compressive strength of cohesive soils. (ASTM - Standard designation D2488 titled *Standard Recommended Practice for Description of Soils Visual - Manual Procedure*). This test should be conducted on an undisturbed soil sample as soon as practicable after excavation to keep the effects of exposure to drying influences to a minimum. The thumb penetration test is used to estimate the unconfined compressive strength of cohesive soils.

*Thumb Penetration Test* ASTM Standard Test D 2488:

THUMB PENETRATION (inches)	UNCONFINED (Tons per Square Foot)	SOIL TYPE
1/4 " or less	1.5 tsf. or greater	A
1/4" to 1"	0.5 to 1.5 tsf	B
1" or more	0.5 tsf or less	C

## OSHA Excavation Trench Failure

Primary Causes of Excavation Cave-in's

NIOSH most common causes of excavation cave-ins were from

- unprotected vertical- walled excavations
- inadequate shoring in an attempt to cut costs
- improperly stored spoil;
- soil classified incorrectly;
- ground vibration from equipment;
- changing weather conditions not taken into consideration and; 7. E
- excavation in previously disturbed soil. Finally, most of the cave-in fatalities happen
- trenches less than 20 feet deep on smaller job sites

*Trenches* exist if the depth of the trench is greater than its width, and the width (measured at the bottom) is **not greater than 15 feet (4.6 m)**.

*Excavation* is defined as any man-made cut in the earth's surface to remove soil.

One cubic foot of undisturbed soil weighs between 100 and 140 pounds.

Clay is one of the most dangerous materials because the vertical walls of an excavation appear to be solid and stable. However, clay is drastically affected by water, wind, and pressure. **Water** causes it to swell, **wind** causes it to dry and shrink rapidly, and the soil **pressure** causes clay to bulge. Any or all of the conditions described above can cause trench failure.

*Cave-in* is the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person. Cave-ins occur rapidly and the material falls at speeds of up to 35 miles per hours.

*Trench Failure* results in a tremendous amount of weight moving into a trench quickly with no time to move the workers out of the way.

*Distress* means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or surface of an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face; the bulging of the face of an excavation; the heaving of material from the bottom of an excavation; the spalling of material from the face of a rock excavation; the ravelling of small amounts of material trickling down into the excavation; and the seeping of water into the excavation.

### Signs of Trench Failure

- Immediately after removing the soil, the trench becomes unstable and the soil in the trench walls begins to move into the excavation.
- the weight of the soil causes surface cracks parallel to the trench, approximately one-third to two-thirds of the trench depth from the trench edge.
- The edge of the excavation may subside (but this is hard to see).
- cracks, normally horizontal, may appear on the face and the walls of the excavation may bulge into the excavation (these signs of failure are also hard to see).
- the bottom of the trench initially fails or kicks into the excavation. Soon after the first failure as the upper portion of the excavation collapses into the trench.
- weather change - rain flowing into the surface cracks increase the surcharge load in the soil.

### Types of Distress That Result in Trench Failure

*Fissured or Tension Cracks* in the soil has a tendency to break along definite lines and fractures easily. Fissured soil has open cracks, such as tension cracks, on the ground or on the excavation face.

*Bulging* occurs as a result of the vertical and lateral forces being exerted on the unsupported walls. Bulging will first appear on the face of the wall as protrusions into the open excavation.

*Sliding* or slumping may occur as a result of tension cracks, weak soil, water-soaked soil, hard soil or rock on top of a weak soil layer.

*Toppling* is also caused by tension cracks. Toppling occurs when the trench's vertical face shears along the tension crack line and topples into the excavation.

*Subsidence* occurs as a result of unbalanced stresses in the soil. Subsidence causes the soil to sink on the surface and bulging of the vertical face of the trench. If uncorrected, this condition can cause face failure and entrapment of workers in the trench.

*Heaving* or squeezing is caused by the downward pressure created by the weight of adjoining soil. This pressure causes a bulge in the bottom of the cut. Heaving and squeezing can occur even when shoring or shielding has been properly installed.

*Boiling* is evidenced by an upward water flow into the bottom of the cut. A high-water table is one of the causes of boiling. Boiling produces a "quick" condition in the bottom of the cut, and can occur even when shoring or trench boxes are used.

*Ravelling* is evidenced by small amounts of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

*Spalling* is evidenced by small fragments of rock break up or scale off the excavation face. This is caused by vibration near a fractured unstable rock face.

*Sloughing* is where the sides cave into the trench during excavation

*Surcharge Load* means an excessive vertical load or weight caused by the spoil pile being too close to the trench edge or equipment being too close to the trench edge. These activities affect the trench stability.

*Vibration* is a dynamic force introduced into the ground from blasting, pile driving, traffic, construction equipment and proximity to railroad tracks and industrial turbines.

*Undercutting* is caused by excavating below the existing foundation of a nearby structure and not providing enough clearance area. The previously disturbed soil will slide or ravel into the new excavation. You must consult a Registered Professional Engineer if this condition exists.

*Submerged* soil means soil which is underwater or is freely seeping into the trench.

*Layered Systems* are evident where the soil layers slope into the excavation at a four Horizontal to one Vertical (4H:IV) or steeper slope. This can result in a wedge failure.

**Examples and Illustrations of the Theory of Basic Trench Failure** are contained in Section VIII of the Examples and Exhibits Booklet that accompanies this study guide.

## IX. ETHICS

### AIC Constructor Code of Ethics

The construction profession relies upon a system of ethical competence, management excellence, and fair dealing in undertaking complex works to serve the public with safety, efficiency, and economy. The Constructor Code of Ethics principles and standards are below:

- I. The Constructor shall maintain full regard to the public interest in fulfilling their professional responsibilities to the construction industry.
- II. Constructor shall not engage in any deceptive practice, or in any practice that creates an unfair advantage for the Constructor or another.
- III. A Constructor shall not maliciously or recklessly injure or attempt to injure the professional reputation of others.
- IV. A Constructor shall insure that when providing a service that includes advice, and such advice shall be fair and unbiased.
- V. A Constructor shall not divulge to any person, firm or company, information of a confidential nature acquired during the course of professional activities.
- VI. A Constructor shall carry out responsibilities in accordance with current professional practice.
- VII. A Constructor shall keep informed of new concepts and developments in the construction process relative to his or her responsibilities.

### Ethics, Morals, Values and the Law

*Law* is the Constitutions, Statues, Administrative Regulations, and case law of the United States or other government entities. Law is the legal standard of behavior and it is generally the lowest level of acceptable behavior in society.

*Ethics* is a system or code of behavior adopted by a particular profession or group and it is a characteristic of that particular group. Every group of persons has an ethical system or code. Ethical standards usually require a higher or better level of behavior than the law. *Morality* is a system or code of behavior adopted by a particular person and it is a characteristic of that individual. Every person has morality. *Values* are the judgments of good or bad relating to worth or importance of any particular behavior.

### Six (6) Actions Of A Highly Ethical Person

- A. The Golden Rule. What is this approach to decide which acts are highly ethical?  
Do unto others as you would have done unto you.
- B. Profession's Code of Ethics. Does this meet the profession's ethic code?
- C. Utilitarianism. What is this approach to decide which acts are highly ethical?  
The proper behavior is the one that will produce the greatest good or the least harm for the greatest number of people.
- D. Categorical Imperative. What is this approach to decide which acts are highly ethical?  
Act in such a way that your actions (or the actions of your company) could be "universal law" - that is, if all people or organizations were to act in that manner, would it be proper?
- E. Veil of Ignorance. What is this approach to decide which acts are highly ethical?  
The proper action is the one the affected group of people or organizations would recommend. Go behind the Veil of Ignorance and determine the act that is acceptable by all parties to the transaction.
- F. Front Page Newspaper Test. What is this approach to determine highly ethical?  
Act in such a manner that would not embarrass you if your acts were to appear on the front page of the local newspaper.

### Bidding Deceptive Practices and Ethics Principles

#### Definitions:

*Bid Shopping occurs* "when, after the award of the contract, a contractor contacts several subcontractors of the same discipline in an effort to reduce the previously quoted price"

*Bid Peddling* "occurs when a sub-bidder approaches a general contractor who has been awarded a project with the intent of voluntarily lowering the original price below the price level established on bid day"

*Bid Rigging* occurs when a group of Contractors conspires with the implied or express purpose of defrauding owners..



The *Non-collusive Affidavit* form is a notarized statement stating that the bid submitted was arrived at without any agreement or cooperation with other bidders for the project. It is signed by each Contractor and submitted in the bid package at bid opening.

*Front Loading* is the process in which a contractor places all of their overhead and profit on the first line item of the Contractors Bid Breakdown form. Typically, this is done on Unit Price Contracts for public projects such as roads, bridges, dams, river control, water treatment and civil projects. Front Loading is considered illegal on most public projects. It is also considered unethical because the Contractor is recovering all of the overhead and profit before they are entitled to receiving the payments. Therefore, the practice is to have the first line item on a Unit Price contract to be titled Mobilization. This allows each Contractor to recover their start-up costs at the beginning of the construction project without front loading their bid.

## **X. CONTRACT INTERPRETATION PRINCIPLES**

### **Applied to a Set of Project Documents**

Over the years, courts have developed certain contract interpretation principles or rules to deal with disagreements between the parties with two conflicting interpretations. Therefore, whenever reading a contract and if a potential conflict exists between certain clauses these rules will apply to the situation.

1. The signed Agreement rules over all other documents
2. The documents that can be utilized for the project interpretation specifically for claims or disputes are listed in the Agreement.
3. The contract must be read as a whole
4. If an Order of Precedence clause exists, this rank order list takes precedence
5. If a provision of a contract is ambiguous, that provision will be constructed or interpreted against the party who prepared the document
6. When interpreting ambiguous contract details that conflict, the courts will use the trade practice or custom in an area or locale to determine the intended meaning
7. The specific item governs over the general item
8. The most stringent requirement prevails
9. Industry trade terms are interpreted according to their commonly accepted meaning within the construction industry
10. Owner extends an implied warranty to the contractor that the documents are accurate, complete, and suitable for their intended purpose
11. All conditions precedent, concurrent and subsequent are binding
12. Documents referenced in an agreement to other documents which are not physically part of the agreement stating that the other documents are hereby incorporated into and made a part of the agreement are binding by reference in the construction industry. This is called incorporation by reference.

## Agreements

In construction, the primary purpose of an Agreement, whether between the Owner and the Contractor, the Contractor and the Subcontractor, or the Contractor and the Vendor, is to provide timely skilled labor and materials to the project and coordinate the overall effort.

*Owner - Contractor Agreement.* This is the formal contract agreement. It is the single document that binds the parties and by reference describes the work to be done, the prices to be paid for it and provides suitable spaces for the signatures of the parties. The Agreement contains the names of the parties, project scope description of skilled labor provided, documents incorporated by reference, price, method of payment, completion time of the project, insurance requirements, liquidated damages, special contractual provisions, and an enumeration clause.

The Agreement must be provided to each prospective bidder during the bidding phase of the project. This allows the prospective bidders time to review the terms and conditions and determine any unusual risk involved before the Owner-Contractor Agreement is signed.

*Contractor - Subcontract Agreement.* This is completed after the signing of the Owner - Contractor Agreement. This formal agreement between the contractor and the subcontractor outlines the specific scope of work, a list of the contract documents including the Subcontract General Bid Instructions, the Subcontract Trade Instructions, and the warranties included in the subcontract agreement. The Subcontract Agreement must be provided to each prospective bidder during the bidding phase of the project. This allows the prospective bidders time to review the terms and conditions and determine any unusual risk involved before the Contractor-Subcontractor Agreement is signed.

The written Agreement Rules over all other documents.

If you are contracting for primarily labor, even though the Subcontractor may furnish the materials, you must use a form that says *Subcontract Agreement* on the top and throughout.

## The Agreement Clauses

The *Written Agreement* contains certain terms and conditions or contract clauses that take precedence over all other documents and it establishes the scope and intent of the parties. Most Agreements contain the following clauses.

- The *Whole Contract Clause* is a list of the contract documents that shall be utilized to interpret the contract if conflicts arise. This clause in the Agreement states that the documents listed “form the contract and all are as fully a part of the Contract as if attached to this Agreement.”

Many times, this clause does not contain the bidding requirement documents such as the Pre-Bid Information, Instructions to Bidders, Information Available to Bidders (Soil Reports, Site Plans), Bid Forms, Proposal Supplements, Proposal Bid Forms, Addenda, Alternates, Modifications, or it does not list the Specifications and Plans Index which would allow the use of the unlisted documents. Therefore, if a conflict arises from the bidding requirement documents, these normally are not admissible evidence.

- The *Intent of the Contract Clause* describes the specific work the contractor or subcontractor shall perform according to the Agreement. This description should include trade activities, systems and/or locations, general inclusions and the intent of the project.
- *Incorporated by Reference Clause* pulls together, and “incorporates by reference,” under one cover all documents such as the (1) General Conditions, (2) Supplementary General Conditions, (3) General Requirements, (4) Technical Specifications, (5) Plans, (6) Addenda describing changes published to these original documents, and normally a provision for Modifications after the Agreement is signed.
- *Contractual Provisions Clause* should contain the location the law is governed by, the prevailing wage rate table including the county and state, the minimum number of skills craft workers, the expected material lead-time, the start date of constructions, the number of days to complete construction, and an expected completion date.
- *Enumeration Clause* contains a list of each document used to price the work. Each document is preceded by page or sheet numbers, dates, “issued for” and revision numbers.

## Conditions of the Contract

*Standardized General Conditions* - Numerous construction associations have written their version of Standardized General Conditions. These documents define the basic rights, responsibilities and relationships of all parties involved in the construction process. It also sets forth the manner and general procedures whereby the provisions of the contract are to be implemented according to accepted business practices in the construction industry. This document has preprinted terms. These General Conditions are “incorporated by reference.” Some of the organizations and their variations of the Standardized General Conditions are described below:

The *Engineers Joint Contract Document Committee* (EJCDC) “Standard General Conditions of the Construction Contract” issued and published jointly by the American Consulting Engineers Council (ACEC), the National Society of Professional Engineers (NSPE), and the American Society of Civil Engineers (ASPE). This document has been approved and endorsed by the Associated General Contractor of America (AGC), and the Construction Specification Institute (CSI). The standardized general Conditions are referred to as the EJCDC No. 1910-8 (1996 Edition). They recommend that their General Conditions are prepared for use with the Owner-

Contractor Agreements (No. 1910-8-A-1 or 1910-8-A-2).

The *American Institute of Architects* (AIA) has developed the “General Conditions of the Contract for Construction” for various contract delivery systems. There is an AIA A-201 2007 version. Previous editions are the 1997, 1987 and 1976 Editions. These are sometimes still in use by certain Architects. There is also a construction management version which is referred to as the AIA A-201CMa (1992) version.

The *Construction Management Association of America* has prepared a construction Management delivery system version of their Standard General Conditions (CMAA).

The *Construction Owners Association of America* (COAA) has also prepared their standardized version of the General Conditions. The *Associated Owners and Developers* (AOD) has also prepared their standardized version of the General Conditions.

*ConsensusDOCS* according to their brochure are the only standard construction contracts written and endorsed by owners, contractors, subcontractors, designers and surety professionals.

*Federal Acquisition Regulations* (FAR) - The United States Government has also prepared their standardized version of the General Conditions. The Federal and State Departments of Transportation (DOT) have also standardized their General Conditions. They are normally referred to as *Standard Specifications*.

*Owner Developed General Conditions* - Some Owners draft their own set of General Conditions. In these cases, you must read and review the documents very carefully. You should be looking for omitted and disclaimers clauses which may shift liability to the Contractor.

*Supplementary General Conditions* - These provisions (clauses) are Written expressly for a given project, and they reflect the peculiarities and special needs of a specific job. This document revises and incorporates specific provisions that supersede particular provisions in the preprinted general conditions. Items contained in Supplementary conditions are of two types:

1. Modifications to the basic Articles of the General Conditions in the form of additions, deletions, or substitutions.
2. Additional Articles of a contractual-legal nature which may be desirable or necessary for a particular project.

Some typical provisions in the Supplementary General Conditions are the duration of the project, commencement of work, owner-procured materials, format required for project progress reporting, amount of liquidated damages, special instructions requesting material substitutions, changes in insurance, etc. The Supplementary General Conditions take precedence over the preprinted standardized general conditions because they are written for a specific project.

*General Requirements* - contains specific administrative and procedural requirements that apply to all of the Technical Specification sections. The General Requirements contain specifics directly applicable to a particular project and are written separately for each project. These expand the broad administrative and procedural requirements stated in the General and Supplementary Conditions documents, but they apply to the work of all Technical Specification sections. This document also Summarizes the Scope of Work, use of the site, Owner Occupancy of building during construction, Phased construction activities, multiple prime contract requirements, and exclusions and inclusions as they relate to the Plans. The General Requirements describe the Contractor's administrative, procedural and other activities that the Contractor must provide.

*Specifications* - contains written description of the specific requirements relating to a specific product or system, and establishes a legally precise picture of the technical aspects of the work to be performed. The specification provisions define and establish the quality level procedures, standards of work and material standards. Each subsection defines the scope, technical requirements, performance requirements, material suppliers, and quality requirements. These are frequently standardized, therefore, specific requirements over the general requirements, or the most stringent requirements prevail.

*Plans or Drawings* - graphically portrays the physical aspects of the structure, showing the arrangement, dimensions, construction details, materials, and other information necessary for estimating and building the project. A job covered by drawings that are complete, intelligible, accurate, detailed, and well correlated can be priced much more realistically and claims for extra payment during construction are minimized, and the owner is likely to get a much better finished product at a lesser cost.

*Plan Notes* - When contradictions exist between the plan notes and the specifications, *the more specific item governs over the general item*. The general principle of law described above is that the specific takes precedence over the general. In the event of a conflict between the Technical Specification and the Plans, the Plan or Plan notes typically more accurately reflect the intent of the A/E

*Owner's Implied Warranty* - The courts' have concluded that when a project owner provides a set of plans or site plans indicating utility locations and elevations to the contractor, they are extending an implied warranty that the documents are accurate, complete, and suitable for their intended purpose. This implied warranty has been upheld by the courts if the owner provides distances, elevations or measurements even though the contract documents were stamped "for information purposes only" as a contractual disclaimer.

## Contract Interpretation Principles

*Construed Against the Author* - If any clause of a contract is ambiguous then that provision will be interpreted against the party who prepared the document. The courts have ruled that if both interpretations are reasonable then the interpretation by the party that did not draft the clause will prevail.

*Trade Practices and Trade Terms* - if the contract documents included two typical details which were in conflict with each other regarding the installation, then the detail that was consistent with local trade practices will prevail. Also, construction trade terms such as rebar, caisson, sheet piles, and piles are distinctive to construction, and the courts will interpret the terms according to their commonly accepted meaning within the construction industry.

*Order of Precedence* - A clause in the documents that states that in the event of an internal conflict, error, ambiguity, or discrepancy within or between the contract documents, certain documents or portions of the document shall take precedence over other documents or portions of the document.

*Condition Precedent* - Promise is based upon events taking place before something else will occur. Common words used in these clauses are: "When" or "If." Some examples of a Condition Precedent are: "Licensed," "Waiver," "Pay when Paid." These words can limit your ability to recover.

*Condition Concurrent* - These are events that go on simultaneously. Some examples to look for are: "Install Pipe one block at a time," and "Close one block."

*Condition Subsequent* - If something is not done following to the event within the specified time limits, this event relieves the promissory of any liability already attached. Some examples are words such as: "Policy claim within time," "Claims for Contract Change Order."

A Contract Interpretation Principles Summary is contained in Section X of the Examples and Exhibits Booklet that accompanies this study guide.

### Contract Interpretation Principles Summary

Whenever a conflict exists from differing interpretations of the contract the courts will utilize the following rules to make a ruling. Therefore, it is good practice that the Professional Constructor have a good understanding of these principles and attempt to resolve the dispute before going to court.

Summary of the Contract Interpretation Principles	
13. The signed written Agreement rules	14. Specific over general
15. Only documents in the Agreement can be used	16. Hand Written over Typed
17. All provisions must be read as a whole	18. Words over Figures
19. All provisions are complimentary	20. Correct all Clerical Errors
21. All provisions are presumed to reflect intent	22. Owner gives Implied Warranty
23. Order of Precedence clause takes precedence	24. Conditions precedent are binding
25. The most stringent requirement prevails	26. Conditions subsequent are binding
27. Ambiguous clauses construed against the author	28. Conditions concurrent are binding
Ambiguous clauses. - Contractors can utilize Oral proof	
29. Construction industry trade terminology rules	30. Trade practices or customs in the area rule
31. Documents incorporated by reference are binding	