Federal Lands Highway

Construction Manual

A guide for FLH field project and contract administration personnel

To be used with FLH Standard Specifications for Construction
of Roads and Bridges on Federal Highway Projects

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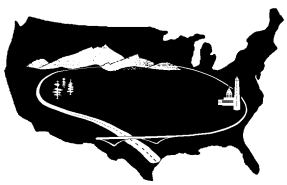

Federal Lands Highway
"Commitment to Excellence"

PREFACE

This Federal Lands Highway Construction Manual is intended to provide guidance to field construction engineering staff personnel, as well as those who support those personnel in their contract administration function, and in their role as first line representatives of the Federal Highway Administration at the site of all construction work administered directly by FLH. The Manual, supplemented by the FLH Field Materials Manual, other FLH standards, and Division technical and administrative instructions, pertains to the period from contract award through final payment and disposition of field records.

The Manual is intended to provide a framework for the Federal Lands construction contract administration process. This process is intended to provide quality, cost effective and timely construction meeting customer expectations, while at the same time accomplishing agency goals with respect to training, technology and customer service. The Manual is also intended to promote uniform application of contract requirements by FLH and contract inspection personnel, as well as cooperation with construction contractors in the achievement of successfully completed projects. The Project Engineer will encounter situations during the administration of the contract which are not covered by the Manual and other operating instructions. In these instances it will be necessary to use common sense, experience, or seek advice of the COE and Division specialists when time permits. Although having a standard, documented process is an objective of the Manual, it is not intended to discourage innovation and the appropriate response to unique problems when they occur.

The Manual is written to be compatible with the FLH standard specifications, the Federal Acquisition Regulation and other prevailing standards. However, it is not a contract document. Contractor obligations and expectations referred to in the Manual must be stated or implied by actual contract language.

The Manual belongs to all of us. In order for it to be continually useful and usable it will be necessary to have periodic revisions and supplements as the environment in which we work changes. Users are encouraged to submit suggestions for improvements to the manual through the COE's and Division process owners. The participation of many FLH personnel who contributed to this 1996 rewrite is very much appreciated.

Hugh B. Jones
Chief, Engineering and Operations Division
December 1996

FEDERAL LANDS CONSTRUCTION MANUAL

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ORGANIZATION AND RESPONSIBILITIES

1-1 PURPOSE AND USE OF THE MANUAL

As stated in the *Preface*, the purpose of this Manual is to assist field personnel engaged in administering contracts on projects undertaken directly by the Federal Highway Administration by providing a framework for that process.

It is stressed that this Manual is a guide, for the most part, not a compilation of mandatory instructions. Unless the language is explicitly mandatory, such as that related to regulatory requirements, operations personnel are expected to be innovative, and within the constraints of Division policies, procedures and delegations, to apply their own reasoning to unique project situations. Those unique situations may sometimes lead to conclusions and actions contrary to what may be written in this Manual.

The manual does not contain detailed discussions of every technical area of construction engineering. To effectively carry out their responsibilities, users will find it necessary to also refer to other sources of information such as the *FLH Field Materials Manual*, the *Manual on Uniform Traffic Control Devices (MUTCD)*, and various publications by AASHTO, ASTM, Federal Regulations and construction industry standards.

1-2 ABBREVIATIONS AND DEFINITIONS

The Standard Specifications include the intent and meaning of abbreviations and definitions of terms most commonly used in connection with highway construction projects under the direct supervision of the Federal Highway Administration. These terms should be used in all reports and correspondence relating to such projects.

The terms cited above, and other terms, defined or explained as follows, will be used frequently in this manual.

Contracting Officer (CO) - The Agency representative having full authority to execute and administer the contract on behalf of the Government, or a warranted delegate of that official who has been delegated some of that authority, e.g. contract administration.

As this term is used in the Standard Specifications it also includes the COTR (see below) operating within his/her delegated authority.

Contracting Officer's Technical Representative (COTR) - The FLH employee or employees having onsite support authority on behalf of the Contracting Officer as provided in Division delegations. For construction contracts, this person is normally the Project Engineer. For Contract Inspector Contracts (CIC) it may be the COE.

Construction Operations Engineer (COE) - The immediate supervisor of the Project Engineer who may also be a warranted Contracting Officer with limited contract administration delegations with respect to construction contracts. The COE is also a COTR with respect to Contract Inspector Contracts (CIC).

Construction Engineer (CE) - The immediate supervisor of the COE who may also be a warranted Contracting Officer with delegations for most contract administration functions.

Denver Service Center (DSC) - The organization in the National Park Service which provides technical, administrative and funds management liaison between FLH and other Park Service organizational entities.

Division Engineer (DE) - The immediate supervisor of the CE, and the person in charge of one of the Federal Lands Highway Divisions; also, normally a warranted Contracting Officer with unlimited authority.

Division Office or Division - The Federal Lands Highway Division with jurisdiction for the project. References to Federal-Aid Division Offices will be specified.

Federal Acquisition Regulation (FAR) - The uniform Federal Government-wide procurement regulations found in the Code of Federal Regulations (CFR) at 48 CFR, Chapter 1. Some parts will be made contract clauses. Others will be furnished separately to the Project Engineer, depending on need.

FLH Field Materials Manual - A companion to this manual giving FLH test methods as well as policies and procedures for monitoring materials and materials related functions on construction contracts.

Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) - The industry standard for design and utilization of standard traffic control devices.

Project Engineer or Engineer - The authorized representative of the Contracting Officer who is delegated the responsibility for quality assurance, inspection, payment and otherwise representing the interests of the Government onsite.

1-3 ORGANIZATION OF FIELD WORK

Full authority for executing and administering Federal Lands highway construction is held by the Division Engineer. Division Engineers delegate and assign specific authorities and responsibilities to lower level Contracting Officers and to COTR's including the Project Engineer. The Project Engineer cannot formally redelegate authority or responsibility. Therefore, all inspectors and other subordinates act on behalf of the Project Engineer with apparent authority limited by the Project Engineer's supervision.

The Contractor must be informed of the authority of FLH personnel, including the Project Engineer for administering the contract. This is properly done with a letter from the Contracting Officer. Questions of authority should be considered at the *Preconstruction Conference*. Normally, the Contractor provides a description of the authorities of his or her representative at the site. Authority to agree to contract modifications and otherwise agree to contract changes is of particular interest for efficient contract administration.

1-4 RESPONSIBILITIES OF THE ENGINEER

1-4.1 General

The Project Engineer should attempt to conduct all activities in accordance with assigned authority in a manner that will be in the best interest of, and will reflect well upon the Government.

1-4.2 Plans and Specifications

The Project Engineer should carefully analyze the plans, specifications, special contract requirements, and all other relevant documents referenced therein. The Project Engineer should also examine the entire area of the proposed construction and compare existing field conditions with those shown on the plans. Any significant differences should be reported immediately to the Construction Operations Engineer. The Project Engineer must investigate any Contractor reported errors or omissions in the contract documents, and notify the Construction Operations Engineer of complete details.

1-4.3 Showing Project to Prospective Bidders

If assigned to show prospective bidders the proposed project, the Project Engineer should make available to them, information listed in the invitation for bids. He/she should not volunteer other information without clearance from the Construction Operations Engineer.

The Project Engineer should not provide information concerning available aggregate sources, haul roads, access roads, water and power sources, burning restrictions, use permits, and other matters that may be pertinent to the work, unless these are covered in the contract or are known to have been offered by the agencies or individuals having jurisdiction.

No statements should be made by the Engineer regarding possible or probable changes in the plans or specifications. An accurate record should be kept of the identity and affiliation of each person who inspects the design data and study information, core samples, materials sources, or other available information, together with the dates of such inspections. The Project Engineer should make careful notes of all questions asked by Contractors and the answers given them. He/she should endeavor to answer questions concisely, providing the same information to all.

The Project Engineer should notify the Construction Operations Engineer immediately if questions give rise to the possibility of errors or ambiguities in the plans or specifications. Likewise questions which suggest areas of unforeseen risk which may inflate bid price should also be discussed with the COE in case an amendment needs to be considered.

The Project Engineer should furnish to the COE a log of Contractors' questions and his/her answers on a frequent basis. See **Figure 1-4, Log of Contractor's Questions**. Telephone reporting is appropriate late in the advertisement period.

If Division procedures do not assign the Project Engineer responsibility for showing a proposed project, or answering questions of prospective bidders, then he/she and other FLH employees having knowledge of the project should politely refuse to discuss it with those prospective bidders. All inquiries should be referred to the person or office assigned that responsibility.

A formal prebid meeting and showing may be desirable for a large complex project. The COE will coordinate such a meeting, including the distribution of minutes, if it is provided for in the solicitation.

1-4.4 Plan of Operations

It is the responsibility of the Project Engineer to become fully acquainted with the Contractor's plan of operations, planned progress schedule

and other submittals such as safety, erosion control, and traffic control plans. This information should be obtained at the preconstruction conference or prior to the start of work. It is often helpful to set up a submittal log to track submittals, approvals and pending approvals. Such a log, jointly reviewed by the Project Engineer and the Contractor can help avoid surprises and disputes.

The Project Engineer should keep current with all changes in the Contractor's plans, and report all significant changes to the Construction Operations Engineer. All changes in the Contractor's plan of operations must be included on the construction schedule updates. See Section 7-3.

Normally, the Project Engineer should make no effort to dictate a sequence of operations except as specified in the Contract. When the progress of work is unsatisfactory, based on the accepted construction schedule, he/she should evaluate the situation and consult with the Construction Operations Engineer.

1-4.5 Project Stakeout

When staking by the Contractor is specified, the Government remains responsible for providing initial staking control and design information which is not shown on the plans.

The Project Engineer should make every effort to keep construction staking activities well in advance of construction operations. For staking which is the responsibility of the Government, consideration needs to be given to the Government's liability under the suspension of work clause of the contract for any increase in costs that may be caused by unreasonable staking delays.

When the Contract provides for staking work by the Contractor, the Project Engineer should develop and follow a systematic method of monitoring of the Contractor's staking process, including documentation thereof. Corrective measures are to be made by the Contractor's forces. Taking over staking work, which is the responsibility of the Contractor, is not an acceptable solution; nor is continuous monitoring and oversight. The Project Engineer has the authority to demand competence and quality under the Contract.

The Contract specifies staking standards or tolerances, but not necessarily the slope and grade tolerances controlled by that staking. This means construction is to be consistent with the *Standards of the Industry*. The Project Engineer and the Contractor's management personnel should go over these standards before work begins, and hopefully agree on them. If the Contractor's operations result in slope tolerances and other physical attributes which are excessive, and the Project Engineer cannot, through negotiation, resolve the problem, the COE should be consulted and a written order stopping unacceptable operations until acceptable work can be performed, should be considered.

See Section 4-3 for more on construction staking.

1-4.6 Inspection

It is the responsibility of the Project Engineer to verify and document that the project is constructed in reasonably close conformity with the plans and specifications, and in compliance with the terms of the contract. In order to accomplish this the Project Engineer must conduct periodic inspection and testing as each phase or element of the work is completed. Continuous or full time inspection should be avoided whenever possible as it tends to result in FLH taking over the Contractor's quality control responsibilities. However, it is recognized that some work is of such criticality or is being obscured by subsequent construction to the extent that continuous inspection is prudent.

Unless otherwise provided for in the plans or specifications, construction methods and sources of materials are the Contractor's option. However, the Project Engineer has the authority to reject both unsatisfactory workmanship and

materials. The Project Engineer may suggest methods of improving workmanship, and may suggest sources of better materials. However, it should always be clear that these are just suggestions, and that the decision is up to the Contractor. In the event the Contractor's methods continue to produce unsatisfactory work, and the Contractor will not accept suggestions, the Project Engineer should discuss with the COE the possibility of ordered changes, stoppage of nonconforming work or a "Show Cause" notice.

When rejecting work for either unsatisfactory materials or workmanship, the cause for rejection should be documented and photographed if appropriate. The contract provision or specification being violated should also be clearly documented.

1-4.7 Measurement and Payment

The Project Engineer is responsible for the measurement of quantities on the project, computations, and receiving reports to validate Contractor invoices. Clear and fair standards as to how quantities are measured as well as prompt submission of receiving reports will contribute to good Project Engineer/Contractor relations. Instructions for measurement and payment are contained in Chapter 8.

1-4.8 Changes

The Project Engineer should try to anticipate necessary changes in design or specifications as early as possible. Instructions for preparation of contract modifications are contained in Chapter 3.

1-4.9 Personnel

The Project Engineer is responsible for all official activities of the project staff. As discussed elsewhere in this chapter, the Project Engineer is responsible for the safety of the staff while they are on duty and may prescribe appropriate dress and methods for the work being performed. It is the duty of the Project Engineer to instruct personnel in the performance of their assigned tasks, and to assist in training them for more advanced assignments. The Project Engineer should strive to support any prescribed training program and recommend additional training when appropriate.

The Project Engineer should consult the Division administrative procedures or operations manual and the employee handbook, *Your Job in the Federal Highway Administration* for guidance relative to personnel questions or problems. Consultation with the COE or the Personnel Office may be appropriate.

1-4.10 Equipment

The Project Engineer is responsible for all Government equipment on the project, and for the protection and preservation of all rented or leased property and equipment. Proper precautions should be taken to prevent loss by fire or theft. The Project Engineer must instruct personnel in the care of vehicles and equipment, and make personal inspections of such property to assure proper maintenance. The Project Engineer should promptly report all damaged or otherwise unsatisfactory equipment to the proper authorities and make recommendations for repair or replacement. Unsafe equipment shall not be used or operated. Additional instructions for the handling of equipment matters will be prescribed by the Division.

1-4.11 Records and Reports

The Project Engineer is responsible for the preparation and maintenance of all books and other records on the project. Instructions covering records and reports are contained in Chapter 2.

The Contractor is responsible for maintaining records required by the Contract. Access to, or in some cases copies of such records are to be provided to the Project Engineer within specific

time frames.

1-4.12 Project Costs

The keeping of official project cost records is a function of the accounting units of the Divisions. However, the Project Engineer should have access to sufficient cost records to be able to estimate the total accrued costs of both construction and construction engineering at any given time. As the work progresses, the Project Engineer must keep a check on how these costs relate to the work completed and amount of work remaining to be done, taking into consideration any necessary changes.

The Project Engineer should carefully examine any anticipated overruns and underruns, and keep the COE informed. Instructions covering project cost reporting are contained in Chapter 2.

1-5 FIELD OFFICE

If Division procedures require the Project Engineer to find and negotiate a lease for office or trailer space, he/she should coordinate with Administration in accordance with Division procedures to accomplish this.

After establishing a project office, the Project Engineer should inform the Construction Operations Engineer of the address and telephone number. A well-built sign shall be placed on the office, neatly lettered as follows:

OFFICE OF PROJECT ENGINEER
DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

1-6 CLOTHING

All FLH personnel are required to wear hard hats on construction project work sites. This *badge of the industry* is worn in part to demonstrate emphasis on employee safety, and therefore is not dependent on the relative hazard of operations on any particular occasion.

When working in areas subject to traffic, personnel must wear some distinctive article of protective clothing, such as a bright orange vest or jacket. Such protective clothing should also be worn in undeveloped areas during local hunting seasons. All articles of special protective clothing should be provided at Government expense.

Suitable footwear, normally steel-toed, laced boots, is required. The FLH Division will, within FLH and Division guidelines, provide, or provide reimbursement, for safety (steel toed) footwear, or other special personal safety equipment.

1-7 SAFETY AND REPORTS OF ACCIDENTS

The safety of Government employees on the project is the responsibility of the Project Engineer. He/she must become familiar with all prescribed accident report forms and promptly report all accidents to the Construction Operations Engineer. The Project Engineer shall orient new employees as to the special safety concerns of the project, and shall instruct all personnel by holding frequent safety meetings, and should emphasize those areas of danger that might be encountered on the project.

The Project Engineer should become familiar with regulations regarding operation of Government vehicles, and with local traffic laws and regulations. He/she shall see that all personnel required to operate vehicles are properly licensed. The Project Engineer should withdraw authority to operate Government vehicles assigned to the project, from anyone who commits serious or repeated safety violations, or who otherwise seems incapable of safety operating Government vehicles. Special situations should be discussed with the COE.

Additional safety requirements and motor vehicle management requirements applicable under this section are available in Division operating and administrative procedures.

The working environment of all FLH construction projects is largely under the control of the Contractor. In fact the Contract, *FAR Clause 52.236-13, Accident Prevention*, specifically requires, among other things, the Contractor to maintain a work environment that will safeguard the health of the public and Government personnel. However, it is the Project Engineer's responsibility to see that the Contractor effectively fulfills this responsibility. FLH employees cannot be permitted to work in an environment that is unsafe in ways that are correctable or controllable.

Accidents and injuries often result in inquiries from insurance investigators and attorneys. Any subpeonas, depositions and requests for information associated with accidents on the project should immediately be referred to legal counsel through the COE.

See Section 6-8 for further guidance in monitoring and interacting with the Contractor on construction safety issues.

1-8 LABOR REQUIREMENTS

Contract labor compliance requirements are included in standard contract clauses. The *FHWA Labor Compliance Manual* provides some explanation and guidance. But since recent changes may not be in this manual, specific problems should be discussed with the COE who may decide to get advice from legal counsel.

The Project Engineer should monitor Contractor payrolls for prompt submission and proper certification. Spot checks should be made of classifications and wage rates. **Figure 1-8** is an example **Contractor Payroll Checklist**. Checks should also include whether all covered personnel, including owner operators are included on a certified payroll. This includes all personnel who operate equipment or perform labor in the construction of the project. It does not include supplier employees working at a commercial plant or delivering materials. Nor does it include salaried professional services personnel, like surveyors and materials testers unless their jobs are specifically included in the Contract Davis-Bacon wage decision.

The preconstruction conference should include an overview of the labor and payroll reporting requirements, and the minutes should reflect that these items were covered.

If the Contractor does not make timely submission of certified payrolls, the Project Engineer may, after written notice, withhold progress payments until compliance is secured. In the case of subcontractor nonsubmission, the withholding of only the subcontractors portion of the work may be appropriate. These actions should be discussed with the COE if they are deemed necessary.

1-9 EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS

1-9.1 Nondiscrimination

Discrimination on the basis of race, color, religion, sex or national origin is prohibited by Federal law. The Department of Labor (DOL), Office of Federal Contract Compliance Programs (OFCCP), is responsible for enforcement and the imposition of civil sanctions (termination, debarment, etc.). OFCCP may also refer serious violation to the Justice Department for criminal prosecution.

FLH employees, as representatives of the contracting agency, have no formal authority to monitor nondiscrimination or to impose sanctions for apparent violations. However, project personnel should be alert to indications of such violations and will report them through supervisory channels for possible referral to the OFCCP.

At preconstruction conferences, FLH will emphasize the prohibition against discrimination on the basis of race, color, religion, sex, or national origin. This emphasis should be reflected in the minutes of such meetings.

Any FLH employee who receives a discrimination complaint (verbal or otherwise) or observes a case of apparent discrimination will report the incident immediately through supervisory channels for resolution or referral to the OFCCP.

1-9.2 Affirmative Action

Affirmative action programs to correct past discriminatory practices are permitted by the 1964 Civil Rights Act. Monitoring and enforcement responsibilities related to affirmative action programs are delegated to the Department of Labor, Office of Federal Contract Compliance Programs (OFCCP).

At preconstruction conferences, FLH will emphasize the Contractor's obligations to engage in an effective affirmative action program. This emphasis will be reflected in the minutes of such conferences.

1-9.3 Reports

Civil rights related correspondence will be maintained in the field project files. Copies of all material will be forwarded through the COE to Division files.

Copies of the following items should be requested from the Contractor and included in the files:

Notice of Subcontract Award

This is required by *FAR Clause 52.222-23, Notice Requirement for Affirmative Action to Ensure Equal Opportunity*. The notice is to be submitted directly to OFCCP for each onsite [but not materials supply] subcontract exceeding $10,000.

Veteran's Employment Report VETS-100

This is required by *FAR Clause 52.222-37, Employment Reports on Special Disabled Veterans and Veterans of the Vietnam Era*. It must be submitted annually by March 31, to the Department of Labor.

SF 100 (EEO-1)

This form is required by *FAR Clause 52.222-26, Equal Opportunity*. It is required to be submitted directly to the EEOC, Joint Reporting Committee, annually by March 31.

1-10 RELATIONS WITH THE CONTRACTOR

1-10.1 Conduct of FLH Employees in the Administration of the Work

All FLH personnel engaged in any phase of a construction project must remember they are at all times representatives of the Government and, as such, shall conduct themselves in a courteous, and business-like manner.

Integrity on the part of all employees is essential. The acceptance of most gifts and favors from Contractors and others doing business with FLH is strictly forbidden. Federal law and regulations prohibit the acceptance of (1) unsolicited gifts with a market value of more than $20 ($10 for designated procurement officials) per occasion, (2) gifts of any value aggregating to more than $50 in a calendar year, or (3) gifts of any value that are solicited, or which are associated with an expectation, stated or implied, of a return favor. It is FLH policy that acceptance of any gift or favor, regardless of value, which might give the appearance of impropriety is unacceptable. Gifts should therefore be avoided except in situations where refusing a small gift (such as a calendar intended as a promotional item) would embarrass either or both parties.

Employees must never place themselves under obligation to the Contractor, as this would impair their ability to effectively represent the Government, and might create a condition where more serious improprieties could occur. Offers of gifts, or other actions on the part of the Contractor or its representatives that could be construed as an attempt to influence the actions of an FLH employee, should be immediately reported to the COE. Other offers of gifts should also be reported to the COE who will advise as to a polite refusal.

Inspectors should endeavor to maintain a fair and impartial attitude without undue display of emotions, and should not engage in arguments with members of the Contractor's organization. If disagreements cannot be settled in a reasonable time with mutual satisfaction, the matter should be referred to the Project Engineer. FLH project personnel do not have the authority to alter or waive the provisions of the Contract, to issue instructions contrary to the plans and specifications, or to act as foreman for the Contractor. They do have authority to reject noncomplying materials or work, or to suspend work which is being performed in apparent noncompliance, or in a manner which creates unfunded liability to the Government until the matter is referred to a higher authority.

All nonroutine orders to the Contractor are to be given by the Project Engineer to the Contractor's superintendent on the project, unless circumstances make it necessary to communicate with lower level personnel. Such orders should be confirmed with the superintendent as soon as possible. Orders which alter the Contract or create additional liability to the Government must be in writing and must be executed (signed) in accordance with prevailing construction contract administration delegations. Except for certain minor orders, this means a warranted Contracting Officer.

Discussions concerning the Contractor's organization, equipment, methods, and/or efficiency, should be limited to those undertaken by the Project Engineer with appropriate representatives of the Contractor.

It is recommended that the Project Engineer hold regularly scheduled meetings with the Contractor's superintendent to discuss the Contractor's plan, schedule of work, and problems arising on the project. The substance of such discussions shall be recorded in the project diary. See Section 1-11, *Partnering with the Construction Contractor*, below.

At the conclusion of the project the Contractor will be asked to complete a Quality Improvement Survey. This survey allows the Contractor to identify problem areas in our design, payment and contract administration processes. Periodically our processes are

reviewed using this feedback.

1-10.2 Preconstruction Conference

As soon as practical after the Contract is awarded and before issuance of the Notice to Proceed (NTP), the COE or the Project Engineer will arrange a conference with the Contractor. FLH personnel in attendance will normally include the Project Engineer, the Construction Operations Engineer and specialized personnel as needed. Representatives of Federal cooperating agencies, States, utility companies, and any other groups that will be significantly affected by the construction, should be invited. The purpose of the conference, however, is best served when the number in attendance is kept low.

The COE will prepare and send to the Contractor, a meeting agenda and other information to assist in preparing for the conference. See **Figure 1-10.2a** for a basic **Preconstruction Conference Agenda**. This agenda should be augmented to reflect unique features of the Contract, and Division specific issues. **Figure 1-10.2b** is an **Example Letter Setting up the Preconstruction Conference**.

The purpose of the conference is to discuss the plans and specifications for the project; unusual conditions; the Contractor's plan and schedule of operation; type and adequacy of equipment; labor requirements; equal employment opportunity requirement; maintenance of traffic; requirements for traffic control; the Contractor's responsibilities for accident prevention; material sources and testing requirements; subcontracting requirements; required submissions; and any other pertinent items which will result in a better job understanding. The person conducting the conference [usually the Project Engineer or COE] should explain the FLH organization as it pertains to the administration of the Contract, specifically covering channels of authority and methods of conveying instructions and orders. The relationship of FLH to the cooperating agency(s) should also be explained. It should be emphasized that all orders to the Contractor relating to the Contract will be issued by FLH. Similarly, the Contractor's representatives should explain its organization, and designate or identify a representative who will be assigned to the project with full authority to act for the Contractor. See *FAR Clause 52.236-6, Superintendence by the Contractor*. If a representative is not identified at the conference, the Contractor should be requested to submit a written designation at a later date.

A written report or minutes will be prepared for each preconstruction conference. This report may consist of a summary of the discussions with the conference agenda attached. The report of minutes will document the Engineer's explanation of authority and duties of FLH personnel, and the Contractor's explanation of its organization and designation of authorized representative. One or more copies of that report or minutes will be furnished to the Contractor, and other major participants, with a specific request that omissions and misrepresentations, in their view, be documented in writing to FLH.

1-10.3 Claims and Disputes

In the course of construction, it is not uncommon for differences of opinion to arise between the Contractor and Project Engineer over interpretation of the Contract provisions, or as to whether increased costs or time extensions are allowable for changes, differing site conditions, or delays. The Contractor may also express dissatisfaction or disagreement with contract modifications.

FLH endorses the philosophy of *partnering* to avoid and resolve contract disputes. See Section 1-11. Most differences can be resolved by negotiation that leads to appropriate contract modifications. Prompt action should be taken to resolve issues and to make any equitable adjustments, giving full consideration to the terms of the Contract.

The Project Engineer must keep the Construction Operations Engineer informed of issues that arise. The Construction Operations

Engineer will keep the legal office and higher level Contracting Officers informed as necessary; and will advise the Project Engineer on appropriate actions in the meantime.

The Project Engineer should use the project diaries, *Inspector's Daily Reports*, and any other available records to make a proper evaluation of all issues. Photographs are an important part of the documentation.

Since recorded information is invaluable in the event of a claim, and claims may occur on any project, and with short notice, the importance and need for regular and routine preparation of adequate records cannot be over emphasized. Chapter 2 is devoted exclusively to the subject of records and reports.

The Project Engineer is required to maintain a daily diary. Project diaries should contain sufficient factual information to reveal the nature of the Contractor's complaint, circumstances involved, and the substance of any statements made by either party. A thorough coverage of the Contractor's operations relative to the work in question should be maintained in the diaries and in the *Inspector's Daily Reports*. Descriptions of the equipment and/or materials that may be involved, construction progress or lack thereof etc., should be included. If opinions or conclusions are included, they should be labeled as such with their factual basis described. See Section 2-3.

If the Contractor indicates intention to file a claim, its attention should be directed to the provisions of the Contract, particularly the disputes, changes, differing site conditions, suspension of work and other provisions relating to Contract time. The Contractor should be reminded of the timely notice requirements. FLH personnel should avoid letting personal opinions, and/or the opinions or intentions of designers bear heavily on their response to a possible claim. What matters most are the specific provisions of the Contract - what they say and what a reasonable bidder would assume is required by them. See **Figure 1-10.3a, "Preventive Medicine for Claims"**, a claims prevention checklist.

Formal claims are required to be submitted to a delegated Contracting Officer for decision. If the Project Engineer receives what is apparently intended to be a claim, it must be referred to the COE or higher level Contracting Officer for review as to legal sufficiency and acknowledgment. The COE will seek advice of Counsel and other specialists as necessary. A **Example Acknowledgment of Receipt of Claim** is shown in **Figure 1-10.3b**.

See Chapter 3, Contract Modifications for discussion of the FAR clauses usually used as grounds for a dispute, and the specific notice and administrative requirements associated with those clauses.

1-11 PARTNERING WITH THE CONSTRUCTION CONTRACTOR

1-11.1 Background

The term *Partnering* has recently been introduced into the heavy construction industry, including highways; primarily by the Corps of Engineers with nationwide support of the Associated General Contractors (AGC). Several State highway agencies, the Federal Highway Administration (FHWA), and in particular, the FHWA's Federal Lands Highway (FLH) program has officially adopted the concept for use in both administering construction contracts and for improving internal agency and client relationships. The FLH definition is:

Partnering - *A formal process of bringing teams from different organizations together where they cooperate to achieve separate but mutually beneficial objectives.*

While the Contract establishes the legal relationships, the partnering process attempts to establish working relationships among the parties (stakeholders) through a mutually-developed, formal strategy of commitment and communication. It attempts to create an environment where trust, continuous communication, and teamwork prevent disputes, foster a cooperative bond to everyone's benefit, and facilitate the completion of a successful project.

The basic intent of partnering is to bring key managers of the project together to open channels of communication, set complimentary goals and foster a climate in which issues can be openly raised, discussed and jointly settled at the lowest practical level of responsibility. The goal of this concept is to create a cooperative team spirit, trust between team members, and a step-by-step joint issue identification and resolution process so that the number and contentiousness of disputes are minimized.

Making changes to the Contract requirements or relaxation of the specifications are not a part of the partnering process. However, when changes are appropriate to solve a problem or make the project run smoother, partnering is the forum that the stakeholders can use to, recognize the need for the change and to quickly reach an equitable agreement.

See **Figure 1-11.1, What is Partnering?**, an excerpt from the Corps of Engineers pamphlet, *Partnering a Concept for Success*.

1-11.2 Policy for Partnering

Policy guidance contained in the *FLH Manual, Subsection 1-C-3, Partnering*, is summarized, as follows:

- Partnering should be offered to the Contractor on a voluntary basis and not mandated.

- Formal partnering using a trained facilitator, is to be offered to contractors on all major projects.

- As FLH and contractor personnel become knowledgeable in partnering, smaller/less complicated projects can be partnered on an informal or abbreviated basis.

- The development of a partnering agreement, or charter, signed by all the partners is suggested for all partnered projects (both formal and informal) to document the goals and objectives agreed upon.

- Key decision makers for FLH and the Contractor may be involved in partnering, as well as major subcontractors, the clients, and other regulatory agencies, such as the Corps of Engineers, US Fish and Wildlife, etc. who have specific interest in the project.

- The use of a professional and experienced facilitator is recommended for all formal partnering.

- The cost of partnering should be shared equally by the FLH and the Contractor. A

contract modification is generally issued to cover the Government's share of the facilitator's travel, fees, related expenses, and for the meeting facilities. As a rule, the participants pay their respective travel and lodging expenses. For informal partnering session, similar reimbursement concepts should be used on an actual cost basis.

- As the partnered project develops, feedback and continuous evaluation needs to be discussed and documented at the project level on a weekly basis or whatever the agreed on frequency of meetings is. Summary reporting on a monthly basis to the Construction Engineer will be the responsibility of the Construction Operations Engineer (COE).

- A major objective of partnering is for the individuals at the project level to make timely decisions, work as a team, and resolve all conflicts or issues to the extent possible. It is also important to have a clear and expeditious *escalation procedure*, so that conflicts which cannot be resolved at the project, may be escalated to the appropriate level as quickly as possible.

1-11.3 Formal Partnering

As part of the notice to bidders, an invitation to partner is typically included in the Contract. After Contract award, a letter signed by the DE or CE, should be sent to the Contractor which highlights the benefits of partnering on the project; emphasizing the FLH support of the partnering concept; and requesting the Contractor to be prepared to indicate at the preconstruction conference whether to accept our invitation to partner. This partnering request can be incorporated in the letter scheduling the preconstruction conference.

Prior to, or during the preconstruction conference, the COE, or the Project Engineer, will determine from the Contractor if the project will be partnered. Jointly, they will agree upon the level of the partnering effort, the location and tentative date of the workshop, and most importantly, who should participate.

Next, the COE or Project Engineer and the contractor will determine, for a formal partnering effort, who will facilitate the workshop. Generally, if the Contractor has a preference, FLH will honor that selection. Each Division has a list of acceptable facilitators and may offer to share the list with the Contractor. If prior arrangements and commitments are made, consideration should be given to have the partnering workshop in conjunction (before or after) with the preconstruction conference.

Based upon experience within the FLH Divisions, the success of most partnering efforts often rests with the facilitator; therefore, the selection process is most important. If a nominated facilitator (or firm offering such services) is not well known, a qualification review should be done by the COE, particularly through telephone contact with references, other clients, and State agencies. Since the cost of their services will often range from $1,000 to $2,000 per day, the need to evaluate the facilitator's capabilities and credentials is essential.

Following selection of the facilitator, the COE or Project Engineer should finalize the attendance list with the Contractor. The availability and role of key decision makers in the management of the Contract is very important. Ideally, both FLH and the Contractor should strive to have their respective key persons attend all formal partnering workshops.

A successful match-up for a partnering workshop could include:

For the Contractor	For FLH
Senior Vice-President	Division Engineer/CO
Branch Manager	Construction Engineer/ACO
Project Manager	Construction Operations Engineer
Project Superintendent	Project Engineer
Foreman	Assistant Project Engineer
Subcontractors	Inspectors

Other representation should include the clients or customers, the State or county maintaining agencies, regulatory or compliance groups and others that may impact the project during construction.

When deciding on the appropriate attendees, do not unnecessarily expand the size of the group to the extent that the partnering process may fail. Keep in mind the success of the partnering workshop depends on the expertise and actions of the facilitator and most importantly, the cooperation and commitment of the key decision makers.

Another critical question in scheduling a formal partnering workshop is: "How long should the session last?" Since key individuals must allot their time carefully due to their respective positions and responsibilities, it is suggested that one to two days is ideal for the typical large or complex Federal Lands contract. Of course, if all parties agree, additional time should be scheduled. Often the selected facilitator can provide input here. But, follow the rule: Don't make the partnering workshop too long; it will deter from the intended goals and expectations.

Beyond the workshop, it will be necessary to agree on the approximate frequency of subsequent meetings of the stakeholders, and if those meetings will be facilitated. Generally, facilitated meetings are more formal and less frequent - say quarterly - than nonfacilitated meetings. However, if serious conflicts develop, facilitated meetings may be more effective than nonfacilitated.

Once all the details are agreed to, FLH can execute a contract modification agreeing to pay its share of the costs of the workshops and follow up sessions. The costs can than be paid directly by the Contractor with the Government's share reimbursed as a part of progress payments. **Figure 1-11.3a** is an example **Contract Modification for the Payment of the Government's Portion of a Partnering Workshop**.

The Project Engineer or COE should then proceed to contact the individual participants by telephone and personally invite them to the workshop, identify the facilitator, and present an overview of the partnering concept. At this time, the date and location of the workshop should be confirmed. Often the facilitator will wish to call each of the participants to outline the partnering process and establish common goals. Finally, the Project Engineer or COE will send an invitation letter to each participant, together with an appropriate attachment describing the Partnering process. **Figure 1-11.3b** is an **Example Partnering Workshop Invitation Letter**.

At the workshop, the participants agree on a charter which is normally a written commitment to work together to successfully complete the project, and supplement that overall charter with agreed processes (Action Planning Processes) for handling general categories of potential problems. An **Example Partnering Agreement** including three typical **Action Planning Processes** agreed to at the workshop is included in **Figure 1-11.3c**.

1-11.4 Informal Partnering

Partnering on a formal or informal basis is encouraged and recommended for all projects. The reference document from EFLHD, *Partnering Implementation Guide*, has an excellent overview of the informal partnering process. Basically, the COE is the key stakeholder for FLH; and his or her counterpart for the Contractor (usually the project manager or project sponsor) is the other stakeholder. The concept is similar to the formal partnering process, but the stakeholders are fewer in

number, usually limited to representatives of the Contractor and FLH, and an outside facilitator is usually not utilized. However, trained in-house staff members can serve as facilitators. Team development occurs as part of the project management. Early in the project the COE and his/her counterpart develop the partnering agreement, escalation procedure, and common goals. It is suggested that the agreement and related resolution procedures and action plans be prepared in draft prior to the informal partnering session. Minutes should be kept of both formal and informal partnering sessions.

1-11.5 Emphasis is on Attitude

At any time in the partnering process, COE's and their counterparts may move from informal to formal partnering if they perceive that informal partnering is not adequate to fulfill their expectations. Anytime the Contractor requests a change from informal to formal, that request will be honored by FLH.

When formal partnering is in place and partners desire a transition to informal process, the partners must agree that such a move is in the best interests of all. Further, the parties have a responsibility to the facilitator to ensure that his/her contract is settled.

1-11.6 Follow-up Evaluations and Measurement

As the construction progresses, partnering evaluations and documentation are an important component for both formal and informal efforts. Long term reduction in program growth, total cost of quality, and outstanding claims are the benefits most clearly definable and measurable. Many partnering agreements contain commitments for informal weekly or monthly onsite meetings to revisit the overall effort in support of partnering and to judge its effectiveness, and provide feedback. When less frequent facilitated meetings are scheduled, formal evaluation may be deferred until those meetings. **Figures 1-11.6a and 1-11.6b are Examples of Individual and Joint Partnership Performance Evaluations**. Individual evaluations should be completed by each stakeholder and collated by the group. Joint evaluations are completed by consensus in an open meeting. In both cases, either poor average ratings, or a diversity of ratings (lack of consensus) should be considered cause for additional focus by the group.

Closeout, or post partnering meetings, are encouraged to further assess the success, or lack thereof, of the overall efforts.

1-11.7 Reporting

Feedback by the project staff and the COE is essential to the overall evaluation of FLH's partnering program. The *FLH Manual, Subsection 1-C-3, Partnering,* details the reporting requirements for each Division. Spreadsheets of key information and dates are to be submitted quarterly to the FLH headquarters office.

1-12 CONTRACT INSPECTORS

1-12.1 General

The number and complexity of FLH construction contracts is increasing yearly. At the same time, the number of available Federal employees is declining. This situation is creating a gap between the needs of FLH and the available resources. To fill this gap, certain contract administration support functions, which are not inherently governmental, such as routine inspection and documentation are being contracted to private sector firms.

This section describes the duties that may be assigned to contract inspectors (CI's), their authority, their interactions with the contractor and the duties and responsibilities of the FLH Project Engineer with respect to the CI.

1-12.2 Contract Inspection Contract (CIC)

Planning and Coordination (P&C) in conjunction with Construction, is responsible for initiating a contract (CIC) with a qualified A&E or Technical Services firm which will provide support services to FLH employees in administering the construction contract. Generally the services will be performed by contract inspectors (CI's) assigned to the construction project for the duration of the need. The CIC describes several standard levels of expertise for the CI's. For example, a requirement for the highest level CI might be that the individual holds a NICET Level IV certification. Also listed in the CIC are the various notice requirements for obtaining CI's and releasing them from a project. Any equipment requirements are also provided.

Prior to obtaining proposals from the prospective firms, P&C, in conjunction with Construction, estimates the number of CI's needed on future projects, and the duration of those needs. The project advertisement schedule is a tool used in this analysis. The Project Engineer may be requested by the COE to provide input into the process. Other than this the Project Engineer will most likely have no other involvement with procuring the CIC. However, the CIC should be available in the project office for reference and for monitoring the CI's performance.

Once the CIC is executed it also establishes the hourly compensation rates, both regular and overtime, for the various levels of CI's, and the per diem rates should FLH request assistance in a remote location. Compensation rates include firm's overhead, profit, insurance and peripheral expenses in addition to the actual salary paid the CI.

1-12.3 Work Orders

Once the CIC has been executed, the Contracting Officer's Technical Representative (COTR) will be responsible for the day to day management of the CIC. The COTR will perform or coordinate such functions as issuing work orders to obtain CI's, monitoring the performance of the firm, approving invoices from the firm, etc. The Project Engineer will be asked to assist the COTR in these duties, which are described below. Normally the COTR will be a COE.

As the construction projects on which the CI's will be needed are awarded, the Project Engineer may be asked for the time periods and how many CI's will be needed on his/her project. Or the COE, with the Project Engineer, will review the individual project needs to determine the number of CI's needed. Some things which should be considered when determining the number of CI's include; how many shifts, how many different operations and their locations, how many FLH employees (including HET's and CO-OP's) will be available, will weather affect the operations, etc.

Once the need for a CI has been determined, a CI work order will be prepared by the COTR and issued to the firm by the Contracting Officer. The order should specify the expected

duration of the assignment so the firm can plan accordingly.

Normally, the Project Engineer and/or COE will request and review the résumé of each proposed CI, and may schedule an interview with the CI. This interview is to determine such things as whether the proposed CI has the communicative skills and technical knowledge to perform the required duties, when that is not apparent from the resume. In some cases the CIC may permit or require the firm to provide more than one proposed CI for each request, with the Government to choose the CI which would meet its needs through evaluation of the résumés and interviews. Interviews should be held to the minimum number necessary to identify a qualified CI. Unlike interviews to hire a Federal employee, there is no obligation to interview and rank all applicants, and then pick the most qualified. The COTR will inform the firm of the acceptance of a proposed CI. Regardless of the terms of the CIC, FLH always has the option of rejecting or removing CI's which after being assigned, cannot perform to the required level of competence, or whose résumés falsified or misrepresented their qualifications.

1-12.4 CI Duties

The CIC outlines the duties that will be expected from the CI. Normally, this includes inspection duties to confirm and document that the construction contractor is complying with the terms of its contract with the Government. The FLH Project Engineer must review these duties with any CI assigned to the project.

The CI *may not provide direction* to the construction contractor, or take any other action which could be construed as committing the Government. The CI *may not order work* including work provided for in the contract which requires a separate authorization from the Government, e.g. subexcavation or erosion control devices. The CI must report the facts and circumstances to the Project Engineer, in a timely manner, who will then provide direction to the construction contractor, or authorize the CI to convey information to the contractor. The CI *may not, in interacting with the construction contractor, be required to make subjective judgements and interpretations* as to the construction contract requirements or whether the construction contractor is in compliance with those requirements. Such judgements and interpretations shall be referred to the Project Engineer before being conveyed to the construction contractor.

The CI may be assigned to take tests and measurements required by the contract, and complete inspection reports documenting the details of the construction contractor's work. The CI may communicate to the contractor the results of measurements and tests, and other quantified data from the contract and other sources intended to be available to the construction contractor. This includes communicating to the construction contractor that the results of tests, measurements and inspections indicate (without the need for interpretation) compliance or noncompliance with the contract.

Other CI duties may include assisting with the office functions, e.g. completing inspector daily reports, maintaining the materials register, assist in completing the monthly receiving report, etc.

1-12.5 Project Engineer Duties

The Project Engineer should be sure that construction contractor management personnel understand who the CI's on the project are, what they will be doing and the limits of their authority.

The Project Engineer assists the COTR in administering the CI contract. Duties include monitoring the individual and collective performance of the CI's to insure the requirements of the CI contract are met, processing invoices, etc. Some of these duties are described below.

1-12.6 CI Time and Attendance

Each CI is responsible for keeping track of his/her time and attendance (T & A) on the project. Every day, the CI should report his/her hours to the Project Engineer. The firm will most likely have some form of a time card which must be kept up to date by the CI. If there is no time card, the Project Engineer and CI can develop a form. See **Figure 1-12.6** for an **Example Contract Inspection Time Sheet - Receiving Report**. At the end of each work week, the CI should sign the time card and have it countersigned by the Project Engineer. The original and one copy of the form should given to the CI who will send the original to the firm. One additional copy is retained by the Project Engineer, and one copy is sent to the COE to become the **Receiving Report** to verify the firms monthly invoice (see below). Note that the hours of regular and overtime reported on the project time cards do not necessarily correspond to the hours the firm is required to pay the employee under State and Federal law or its agreement with the employee (the CI). For example CI's which report late in the week may have already worked 40 hours on another (non-FLH) project, and therefore be eligible for overtime, while FLH's card may show only regular time. Holidays or sick leave may be compensable per agreement with the employee, but not under the terms of the CIC. The firm is obligated to resolve these kinds of problems in it's own administrative office. FLH is not obligated to honor agreements between the firm and its employees which are inconsistent with the terms of the CIC.

1-12.7 CI Invoices

The CIC will specify the billing period, usually monthly. The COTR will receive the CI invoice. The CI firm should provide a minimum of one copy and the original of the invoice to the CI. The firm must include copies of the completed weekly T & A cards as submitted by the CI (after being countersigned by the Project Engineer), with the invoice.

The COE will compare the invoice and the receiving reports for all CI's on his/her projects. Per diem time must also be verified. The original with COE concurrence, and one copy will be forwarded to the COTR who will collate with packages from other COE's and approve it's payment. The COTR will then forward the original to the appropriate personnel for processing.

The Prompt Payment Act applies to CIC invoices. The invoice must be paid within 30 days [as opposed to 14 days for construction contracts] after receipt by FLH, otherwise interest is due the firm. The Project Engineer should forward CI receiving reports to the COE as promptly as possible, as the COE needs to forward the invoice to the COTR promptly too.

1-12.8 CI Performance and/or Conduct

Should a problem develop with the CI performance or conduct, the Project Engineer should contact the COE promptly. Examples of problems include:

- The CI does not demonstrate knowledge or experience of the duties assigned and/or for the level at which they were certified and hired.

- The CI is giving improper direction to the contractor without Project Engineer knowledge or consent.

- The CI demonstrates personal problems which affect his/her work. Examples include apparent substance abuse, being continually tardy, belligerent, etc.

- The CI fails to recognize and report problems in a timely manner.

- The CI fails to maintain a professional relationship with both FLH employees and the construction contractor employees. This means the avoidance of both fraternization and personal animosity which might give the appearance of lack of objectivity in carrying

out assigned duties.

The COE will discuss possible actions with the Project Engineer. Technically, all actions should be through the firm. FLH has no obligation to provide career counseling to CI's, or to deal directly with the CI's to resolve performance problems. From a practical standpoint however, many minor problems can be resolved by providing feedback to the CI. The COTR should be kept advised on these matters. On more serious issues or when minor problems cannot be resolved on the project, the firm should be advised, through the COE and the COTR, and either requested to correct the problem, or to replace the CI.

When the CI is assigned to an FLH project, the Project Engineer should complete the top of the **Contract Inspector Rating Form**. See **Figure 1-12.8** for an example of the form. A copy of the form is then sent to the COTR through the COE. The remainder of the form should be completed by the Project Engineer and concurred in by the COE every six months or when the CI is released from a project assignment. A copy of the form should be sent to the COE, who will forward it to the COTR for filing. Ratings should relate specifically to the duties, knowledge, skills and abilities described in the CIC. A superior rating in any category indicates that the CI is performing at a significantly higher level than is required by the assignment. Such a rating can be useful in evaluating a CI if he/she is are proposed for future assignments. However, it has no relevance with respect to the current contract. CI's may not automatically be converted to a higher CIC level by virtue of superior ratings on a given assignment. Unsatisfactory ratings, on the other hand, must be acted on by the COTR, who will discuss them with the firm. Detailed documentation will probably be requested by the COTR when discussions with the firm are conducted. Ratings are not normally shown to, or discussed with the CI. They are an internal means used by FLH for documenting the firm's performance. However, the FLH Project Engineer may discuss a CI's performance with him/her. This discussion could include ways to improve performance or suggested training.

1-12.9 CI's and Government Furnished Equipment

The CIC will specify the type and amount of equipment to be supplied to the CI by the firm and by the Government. The Project Engineer should be familiar with these requirements. The firm may be required to furnish items such as vehicles, and safety items, such as hard hats. The Government may provide such things as office supplies and two-way radios and safety lights. When accountable Government property is assigned to a CI on other than a "day use" basis, the CI should be required to sign for the equipment.

1-12.10 CI Releases and Transfers

The CIC provides a minimum notification period in which the COTR notifies the firm when a CI will no longer be needed. Some reasons for release include: end of the project, a winter shutdown or other work slow down, or unacceptable performance by the CI. The CIC may provide that certain kinds of unacceptable performance (such as unethical behavior or an intentional violation of the terms of the CIC) may be considered so severe as to waive any notification period requirements.

If a release is contemplated for reasons other than unsatisfactory performance, and there is more than one CI at the level in question, and with the needed skills on a particular project, then the firm should be allowed to select which CI is transferred or terminated. Likewise if FLH desires to transfer a CI from one project to another, it has no contractual right to do so, except by ordering the firm to reduce the number of assignments on one project, while increasing the assignments on the other. The COTR may suggest or offer a preference as to which CI should be released or transferred, but the final determination should be the firm's. This is because the CIC is a technical services contract, not a personal services contract. As

long as the firm can provide the required services, the selection of the CI's should be the firm's responsibility.

1-13 RELATIONS WITH COOPERATING AND OTHER AGENCIES

1-13.1 General

As soon as possible after assignment to the project, the Project Engineer should become acquainted with the local State, county, Forest Service, National Park Service, and/or other interested officials, and discuss with them any phases of the work pertinent to them.

It should be emphasized to these officials, that contact with the Contractor, on Contract issues should be exclusively through the Project Engineer. However, this should not preclude them dealing directly with the Contractor on non-contract issues, such as overweight permits, pollution regulations, speeding enforcement, etc.

Local officials should also be advised of limitations in our ability to add to, or change contract work; and that such requests should be in writing and will have to be cleared by all appropriate officials.

These issues should be discussed at the Preconstruction Conference so that Contractor understands the relationship involved.

At the conclusion of construction, the cooperating agency and other third party entities involved in the project will be asked to complete a *Completed Project Survey* providing feedback on the quality of the project and our delivery of the construction. The Project Engineer should assure, to the extent possible that these surveys are completed and returned to the Division.

1-13.2 Forest Service

The U.S. Forest Service is one of the *Tri-Agency* group charged with overall administration of the Forest Highway Program. Therefore, Forest Service officials have legitimate interest beyond the immediate relationship of the project and its National Forest environs.

During the project development stage of the project, most of FLH's contact with the Forest Service will be through the Regional Forester's Office (including the Regional Engineer). During construction the Project Engineer should be careful to avoid taking actions, making changes or making informal agreements with local officials which are inconsistent with previous agreements, unless such issues are adequately coordinated.

During the construction of a Forest Highway project, the Project Engineer should maintain close liaison with the District Ranger assigned to the locality of the project. The Ranger and his/her staff may be most interested in the following: erosion control, landscape preservation, prevention of fires and damage outside the right-of-way, sources of borrow and aggregates, other matters pertaining to land use, and the preparation and disposal of merchantable timber.

In addition to visits by the District Ranger, the project may also be visited by the Forest Supervisor, Forest Engineer, Regional Engineer, and Regional Forester. Generally speaking, however, these officials should be encouraged to channel all requests or requirements through a single contact official designated by the Forest Service for the project.

The Project Engineer should take immediate action on all appropriate Forest Service requests that are within the scope of the Contract. Requests or instructions that are not of an emergency nature, and that would necessitate a contract modification should be in writing and referred to the Construction Operations Engineer. Requests or instructions that are of an emergency nature shall be acted on promptly, and the Construction Operations Engineer notified as soon as possible thereafter.

1-13.3 National Park Service

Since the National Park Service normally owns

the highway right-of-way, adjacent property and is responsible for maintenance and operation after construction, it maintains an active interest in all phases of FLH Park Service projects. Under normal conditions, the Park Service is represented on the project by a designated liaison from the Denver Service Center (DSC). However, the Project Engineer should also develop a good working relationship with the Park Superintendent, local Park Rangers and maintenance personnel.

Park Service requests or instructions are to be coordinated through the designated DSC liaison. If conflicting instructions, or changes become a problem the COE should be advised so that coordination above the project level can be improved.

1-13.4 Other Federal Cooperating Agencies

Other Federal agencies, with whom FLH has an active relationship include the Department of Interior's Fish and Wildlife Service and Bureau of Land Management, and the Department of Defense. The relationship of FLH to these agencies varies. Some are land owning agencies like the Park Service and have interest in all aspects of the project, including maintenance. Others, like DOD have a stake in programming and funding as well as the operational functioning of the project. But DOD projects are usually destined to become State or county highway with respect to maintenance. Therefore a "tri-agency" relationship is created.

Whenever a construction project is undertaken for, or involving one of these agencies, the COE will assure that the Project Engineer is aware of all necessary administrative information regarding our obligations to the agency, and furnish copies to the Project Engineer as appropriate. This documentation will usually include a Memorandum of Agreement (MOA) for the project.

1-13.5 Other Cooperating Agencies

Except in National Parks and on National Parkways, the maintenance of roads constructed by FLH is generally performed by States or counties in accordance with a previously executed agreement. In such cases, the maintaining agency will be asked to inspect the project prior to assuming the maintenance obligation. It is therefore important to identify these officials early in the Project and to maintain a good working relationship with them. Their interest in the project will mostly focus on the technical details and maintainability rather than impact on the surrounding environment. They will also be interested in traffic control, and whether hauling might adversely impact adjacent roads. When changes are proposed which impact these technical details, maintainability and traffic operations, they should be coordinated with these officials. Their requests should be promptly honored if reasonable, and within the Project Engineer's authority. Other requests should be referred to the COE.

With respect to Forest Highways, the State highway department is another of the "Tri-Agency" (See Subsection 1-13.2 above) group charged with overall administration of the Forest Highway program. With respect to other Public Lands highways, the Forest Service has less of a role in planning and setting priorities, but has an interest in the highway's impact on the environment. The State may also have specific assigned responsibilities for local roads in the State regardless of whether or not they are on the State system. Therefore, even if the county is the maintaining agency for a particular project, the State may also have legitimate interest and should be consulted appropriately.

The acquisition of rights-of-way across private lands is generally a function of the cooperating agencies. In some instances, only a right-of-entry or easement for a construction project will have been obtained prior to construction. In such cases, the Project Engineer should cooperate fully with appraisers and other agents in their work of obtaining the actual right-of-way. The Project Engineer must also be aware of the limitations (if any) of the right-of-entry

and attempt to maintain good relations with the property owner during construction.

The Project Engineer should also be aware of any limitation in the Government's authority to approve or agree to any work that would change the limit of construction with respect to available right-of-way. The COE should be consulted if any uncertainty develops.

1-13.6 Regulatory Agencies

A number of Federal and State agencies have regulatory responsibilities that might result in their coming onto the project and interacting with the Contractor or FLH personnel. These agencies include those responsible for water pollution control, air pollution control, occupational safety, erosion control, storm water management, or protection of endangered species.

The involvement of these Federal and State regulatory agencies has increased in recent years as a result of changes in Federal regulations requiring compliance with all local and State regulations. Most FLH permits allow these agencies the right to inspect the project and to review project records at any reasonable time.

In additon to diary notation, the COE should be notified of all visits, and any anticipated further action. When regulatory agencies take issue with FLH's compliance with permit or project agreements, the COE should be advised and arrange for technical assistance from Division office specialists.

See Chapter 6 for more on this subject.

1-14 RELATIONS WITH THE PUBLIC

Field personnel of FLH are in daily contact with, and under the critical eyes of our ultimate customer, the public. This might include adjacent property owners, daily commuters, residents of nearby communities, tourists, groups with special environment or other interests, and representatives of various news media. For these and other reasons, it is essential that all employees strive to conduct themselves in a manner that will command respect and confidence.

In any community, information concerning highway improvement is of primary interest. From the standpoint of good public relations, it is important that information pertaining to FLH projects be made available as soon as possible, and that it be both accurate and complete.

On most Park Service and similar projects where there is a single, strong cooperating agency, all questions and requests from the public dealing with the project should be referred to and coordinated by a designated cooperating agency contact. Sometimes, especially on low profile projects, the cooperating agency(s) will defer to FLH for routine public interaction. If the COE advises that this is the case, the Project Engineer should become acquainted with local editors, reporters, and heads of civic groups, and furnish such information of local interest as it is pertinent to the project to which they are assigned. Care must be exercised to avoid the release of information concerning controversial matters or items which might be misconstrued or misunderstood. Reference to any conflict or disagreement between FLH and the State, county, or another Federal agency should be avoided. A statement such as the "the matter is being jointly studied" is preferred over "there is a conflict".

When the Project Engineer is specifically assigned to be the focal point of public contacts and information, the following are some guides as to the kinds of information that should be of interest to the public, along with the actions to be taken in making timely releases with the object of establishing and maintaining good public relations:

- Information concerning road closures, detours, speed restrictions, or other items related to public safety, and of general interest to motorists should be given timely publicity. In some instances, sketch maps will be helpful in conveying such information.

- Refrain from stating opinions on local issues that have no connection with the project, or involve choices that are the prerogative of the local authorities.

- Questions directed to survey crew, construction engineering crew members, or contract inspectors should generally be referred to the Project Engineer for an answer.

- Requests for information pertaining to matters of recognized public interest that cannot be completely answered at the project level should be promptly referred to the COE.

FLH is very sensitive to the public's opinion of our projects and the quality of the project delivery process. The *Completed Project Survey* is often requested from local officials attuned to local public opinion. The public often write their elected officials to provide input or to voice complaints relative to our projects. It is important to respond professionally and to accommodate if possible, public requests and input.

REFERENCES

Federal Lands Highway Manual, Chapter Subsection 1-C-3, *Partnering*

Partnering, A Concept for Success, Associated General Contractor (AGC), Washington, DC

A Guide to Partnering for Construction Projects, Corps of Engineers, Mobile District, January 1990

Partnering Implementation Guide, Eastern Federal Lands Highway Division

Partnering Guide for Arizona Department of Transportation, by Colonel Charles E. Cowan

Managing Conflict on Construction Contracts (Partnering), by Norman C. Anderson

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Program

Log of Contractor's Questions

Information Furnished Prospective Bidder on

(State) _____ Project No. _____

Highway _____

_____

_____

_____

On _____ Mr. _____

of _____

requested information about the subject project. The question(s) and the answer(s) is (are) as follows:

Question:

Answer:

cc: Construction Operations Engr., _____

Files

Figure 1-4
Log of Contractor's Questions

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Program

CONTRACTOR PAYROLL CHECKLIST

Project Number: _____ Payroll Number: _____
Contractor: _____ Week Ending: _____
check one: [ ]Prime [ ]Sub Date Received: _____

PAYROLL	YES	NO
Project number, location, etc. shown		
Period covers entire week		
Employee name, address, and social security number shown		
Employee classification correct for work performed		
Wage rates in accordance with general wage schedule		
Hours worked in reasonably close conformity with project records		
Net pay calculations correct (Spot check as necessary)		

STATEMENT OF COMPLIANCE		
Project number, location, etc. shown		
Deductions statement		
Fringe benefits statement		
Signed, title shown		
Two copies of each received		

Remarks and/or Deficiencies:

Checked by: _____ Date: _____

Project Engineer: _____ Date: _____

Figure 1-8
Contractor Payroll Checklist

PRECONSTRUCTION CONFERENCE AGENDA

Based on DOT F 4220.3 and Typical Contract Requirements

1. Date and location of conference
2. Attendees including names and organizations
3. Organizational makeup and lines of authority (Government and Contractor)
   - A. Government
     - Contracting Officer(s)
     - Project Engineer/COTR
     - Inspectors
     - Contract Inspectors
   - B. Contractor
     - Project Manager
     - Superintendent
     - Quality Control Personnel
     - Traffic and Safety Supervisor
     - EEO Officer
     - Subcontractors
   - C. Cooperating and other agencies
     - Agency liaison
     - Local contact
4. Commencement, progress and completion of work
   - A. Insurance requirements
   - B. Notice to Proceed
   - C. Construction schedule submittal, approval, updates
   - D. Retent for poor progress and/or delinquent submittals
   - E. Completion date
   - F. Liquidated damages

Figure 1-10.2a
Preconstruction Conference Agenda

G. Intended shifts, Saturday, Sunday, holiday, night work

5. Correspondence

   A. To Contractor

   B. To FLH - Division and Project Engineer

6. Partnering

7. Other contracts at or near the project site

8. Utilities

   A. Relocation responsibility and schedule

   B. Location, protection, notification

   C. Coordination with utility companies

9. Operations and storage

   A. Storage/staging areas to be authorized or approved

   B. Government Project Engineer's field office

   C. Access and hauling limitations

   D. Employee parking

   E. Disposal areas

   F. Bulletin board (posters, emergency phone numbers, EEO policy, minimum wage schedule)

10. Layout of work

    A. Government established base line and bench marks

    B. Contractor responsibilities for stakeout, line and grades

    C. Responsibility to notify Government of missing or conflicting stakeout information

11. Government furnished property and salvaged material

    A. Furnished property - Location, delivery, storage, protection, damage

    B. Salvaged material - Identification, who will salvage, delivery location, storage, damage

12. Protection of material and work

    A. Protection of existing structures, utilities, vegetation, adjacent property and Government property

Figure 1-10.2a (Continued)
Preconstruction Conference Agenda

B. Protection of completed work until acceptance

13. Erosion, sedimentation and other environmental concerns

A. Authority of, and inspection by regulatory agencies

B. Protection of completed work until acceptance

14. Compliance with local rules and regulations

A. Fire hazards and forest fires

B. Burn permits

15. Safety

A. Contractor's safety plan

B. Protection of the public and Government employees

C. Protection of contractor employees

D. Accident reports

E. No inspection/acceptance under unsafe conditions

F. Hazardous/toxic materials

G. Blasting

16. Shop and falsework drawings

A. Submittal, approval and review time

B. Rejection and corrections

C. Signed and sealed by a professional engineer

D. Notify Government of incomplete information

17. Traffic Control

A. Ordering signs and devices

B. Approving alternates to TCP

C. Ordering changes to TCP

D. Monitoring and QC of TCP

E. Flagging and pilot cars

F. MUTCD - minimum standards

Figure 1-10.2a (Continued)
Preconstruction Conference Agenda

G. Maintenance of devices

18. Drainage and underdrain

A. Designing, approving the design, and staking of culverts

B. Identifying need for and ordering underdrain

19. Earthwork and subgrade

A. Erosion control and temporary seeding

B. Responsibility to utilize excavated materials and topsoil efficiently

C. Balanced earthwork vs. contractor responsible for borrow/waste

20. Inspection

A. Contractor's inspection system - QC personnel

B. Government's right to: inspect, reject defective material and workmanship, stop noncomplying work

C. COTR's/inspectors not authorized to waive or change contract requirements.

D. Responsibility to notify Government of conflicts in contract documents.

E. Acceptance - partial & final

21. Changes

A. Contract Modifications - Supplemental Agreements & Change Orders

B. All contract modifications in writing

C. Written notice of: constructive changes, delays, differing site conditions

D. Detailed cost proposal for any request for equitable adjustment

E. Advanced pricing vs. post work pricing.

F. Value Engineering Change Proposals

22. Subcontracting

A. Notice to OFCCP and SF 1413 for onsite subcontracts more than $10,000

B. Report all subcontracts (onsite, offsite and materials supply) on Form FHWA 1775

C. Responsibility for coordination of, and contract compliance of all subcontractors

D. Small business and small disadvantaged business subcontracting plan

Contractor's liaison officer

Figure 1-10.2a (Continued)
Preconstruction Conference Agenda

Records

Reporting (SF 294/295)

Liquidated damages

E. DBE/WBE subcontracting compensation clause

DBE/WBE certification

Submittals

Threshold for Compensation

Compensation (monetary and contract time)

23. Labor

A. Equal opportunity - SF 100, EEO policy, VETS-100

B. Contract Work Hours Standards Act

C. Davis-Bacon Act - minimum wage decision, additional classifications

D. Payrolls and basic records

E. Retent for nonpayment of wages or delinquent payrolls

F. Owner operators, salaried employees

G. Apprentices

H. Copeland (Anti-Kickback) act

I. Subcontractor labor compliance

24. Payment to Contractor

A. Prompt payment

B. Invoices - Receiving reports

C. Electronic Funds Transfer Payment

D. Contractor responsibility to provide stakeout/measurement data

E. Lump sum items - breakdown of contract price

F. Weighing and certifying materials for payment

G. Obligation to pay subcontractors, including suppliers

H. Interest, penalties, certification

Figure 1-10.2a (Continued)
Preconstruction Conference Agenda

I. No invoices for work associated with delinquent payrolls, test reports, materials certifications, or construction schedule

J. Bond premiums

K. Stockpiled materials - storage and protection, test reports, certifications

L. Mobilization item, other preparatory work, percentages payments

25. Notice of delays, disputes, claims

A. Responsibility to notify Government

B. No contract time adjustment except if delay is beyond control and without fault or negligence of Contractor. Delay must impact construction schedule.

21. Materials

A. Sources

Contractor vs. Government sources

Borrow areas, limits, etc.

Staking, stripping, pit cleanup

B. Specifications for materials

Source approval

Quality control

Quality assurance sampling & testing

Documentation of Compliance

Production Documentation

Commercial Product Documentation

Acceptance, Statistical Analysis, QL-Pay Program

Figure 1-10.2a (Continued)
Preconstruction Conference Agenda

U.S. Department
of Transportation
Federal Highway Administration

Idaho Sand & Gravel Co., Inc.
Route 10, Box 203
Caldwell, Idaho 83742

April 7, 1994

Gentlemen:

RE: Idaho Forest Highway Project PLH 82-1(1), Yellow Pine-Challis Highway
Contract No. DTFH70-93-C-00092

Confirming our telephone conversation of April 6, 1994, the Preconstruction Conference for the above referenced project will be held on Thursday, May 2, 1994, at 8 AM, at the Forest Service offices, 6376 Main Street, Yellow Pine, Idaho. You are requested to be represented at the conference by management and other key personnel from your company and major subcontractors.

The following items are required by the Contract at or before the time work begins. We offer this list to you so that you can prepare for the conference, and so that the items might be brought to the meeting and discussed which will hopefully expedite any required approvals.

- Proposed preliminary construction schedule
- Designations of Contractor's authorized representatives including officials with authority to commit the company, superintendent, quality control supervisor, traffic & safety supervisor, and EEO official
- Shop drawings and/or submittals required by contract, including Quality Control Plan, materials sources, mix designs, materials certifications and/or materials test data
- Blasting plan and other submittals required by Section 205
- SF 1413 and supplemental information not previously submitted for subcontracts
- Certificates of liability insurance
- Electronic funds transfer information - FAR 52.232-28
- Certified cost breakdown of lump sum items

Figure 1-10.2b
Example LetterSetting Up Preconstruction Conference

The following additional items are enclosed for your information and reference.

- Basic preconstruction conference agenda
- A letter designating and detailing the authority of the Project Engineer (Contracting Officer's Technical Representative (COTR).
- OSHA Construction Safety and Health Requirements, and Recordkeeping *Requirements*
- Work Zone Traffic Control booklet
- Guide for value engineering change proposals
- Government furnished posters for your bulletin board, including the Davis-Bacon wage decision for the project
- *Information package on construction partnering*
- Six extra copies of the Standard Specifications, Contract Booklet and Plans

After reviewing your plan for grading and drainage work this construction season, the Government will provide written authorization for you to order and install the required quantities of erosion control devices.

After reviewing your plan of operations on, or adjacent to public roadways, the Government will provide written authorization for you to order and install the required quantities of traffic control devices.

We look forward to meeting your personnel at the conference. If you have need of any additional information, please contact me at (206) 696-7700.

Sincerely yours,

J. K. Brunel

I. K. Brunel
Construction Operations Engineer

Enclosures
cc: All attendees

Figure 1-10.2b (Continued)
Example Letter Setting Up Preconstruction Conference

"Preventive Medicine"

For Claims

- Develop a thorough knowledge of plans and specifications.
- Read all relevant portions of the Contract before answering questions or making decisions.
- Perform accurate and consistent timely inspections, testing and reporting.
- Strictly adhere to established testing procedures.
- Accept nothing less, nor require nothing more than required by the Contract.
- Insure that all inspectors are properly instructed to apply consistent standards for the work being performed.
- Maintain professional and cooperative attitude with Contractor personnel.
- Be sympathetic to Contractor's problems, complimentary when Contractor delivers exceptional quality.
- View project accomplishments as a team effort between Contractor and FLH personnel.
- Deal with the superintendent or at least the same people on the same issues all the time.
- Try to anticipate and recognize potential claim situations.
- Face problems including FLH mistakes, and seek fair and equitable resolutions.
- Track proposed CM to be sure those charged with making decisions know that the project is waiting for those decisions.
- Act promptly and decisively in dealing with problems. If you can't resolve an issue, refer it to someone who can.
- Realize that communication is probably the most effective deterrent to claims -- thorough documentation is the best defense.

Figure 1-10.3a
Preventive Medicine for Claims

U.S. Department
of Transportation
Federal Highway Administration

Old MacDonald Construction Co., Inc.
P. O. Box 4115
Elko, Nevada 67499

July 17, 1993

Gentlemen:

RE: Nevada Forest Highway, PLH 34-2(2), Austin-Tonopah Highway

This acknowledges receipt of your claim dated June 12, 1993, for $776,000 for compensable costs you allege to have incurred in the construction of the above referenced project.

Your claim requested a decision of the Contracting Officer, and was properly certified in accordance with FAR Clause 52.233-1, Disputes.

Your claim has been referred to Mr. J. L. Budwig, Contracting Officer, in accordance with the delegated authorities of Central Federal Lands Highway Division.

This office will conduct an audit of your cost data within the next 30 days. Your office will be contacted as soon as the audit is scheduled. After the audit is complete, a Contracting Officers Decision will be issued within 60 days. This is estimated to be on or before November 1, 1993. If that estimate changes due to unforeseen circumstances, you will be so advised.

If you have any questions on this issue, please refer them to Ms. S. L. Brandt at (303) 776-0521.

Sincerely yours,

R. L. Seedworth

R. L. Seedworth
Construction Engineer

Figure 1-10.3b
Example Letter - Acknowledgment of Receipt of Claim

WHAT IS PARTNERING?*

The Partnering concept is not a new way of doing business--some have always conducted themselves in this manner. It is going back to the way people used to do business when a person's word was their bond and people accepted responsibility. Partnering is not a contract, but a recognition that every contract includes an implied covenant of good faith.

While the contract establishes the legal relationships, the Partnering process attempts to establish working relationships among the parties (stakeholders) through a mutually-developed, formal strategy of commitment and communication. It attempts to create an environment where trust and teamwork prevent disputes, foster a cooperative bond to everyone's benefit, and facilitate the completion of a successful project.

For the most effective results, stakeholders should conduct a Partnering workshop, ideally at the early stages of the contract. The sole agenda of the workshop is to establish and begin implementing the Partnering process. This forum produces the opportunity to initiate the key elements of Partnering.

The key elements of Partnering are:

- **Commitment** - Commitment to Partnering must come from top management. The jointly-developed Partnership charter is not a contract, but a symbol of commitment.

- **Equity** - All stakeholders' interests are considered in creating mutual goals and there is commitment to satisfying each stakeholder's requirements for a successful project by utilizing win/win thinking.

- **Trust** - Teamwork is not possible where there is cynicism about others' motives. Through the development of personal relationships and communication about each stakeholder's risks and goals, there is better understanding. With understanding comes trust and with trust comes the possibility for a synergistic relationship.

- **Development of Mutual Goals/Objectives** -At a Partnering workshop the stakeholders identify all respective goals for the project in which their interests overlap. These jointly-developed and mutually agreed to goals may include achieving value engineering savings, meeting the financial goals of each party, limiting cost growth, limiting review periods for contract submittals, early completion, no lost time because of injuries, minimizing paperwork generated for the purpose of case building or posturing, no litigation, or other goals specific to the nature of the project.

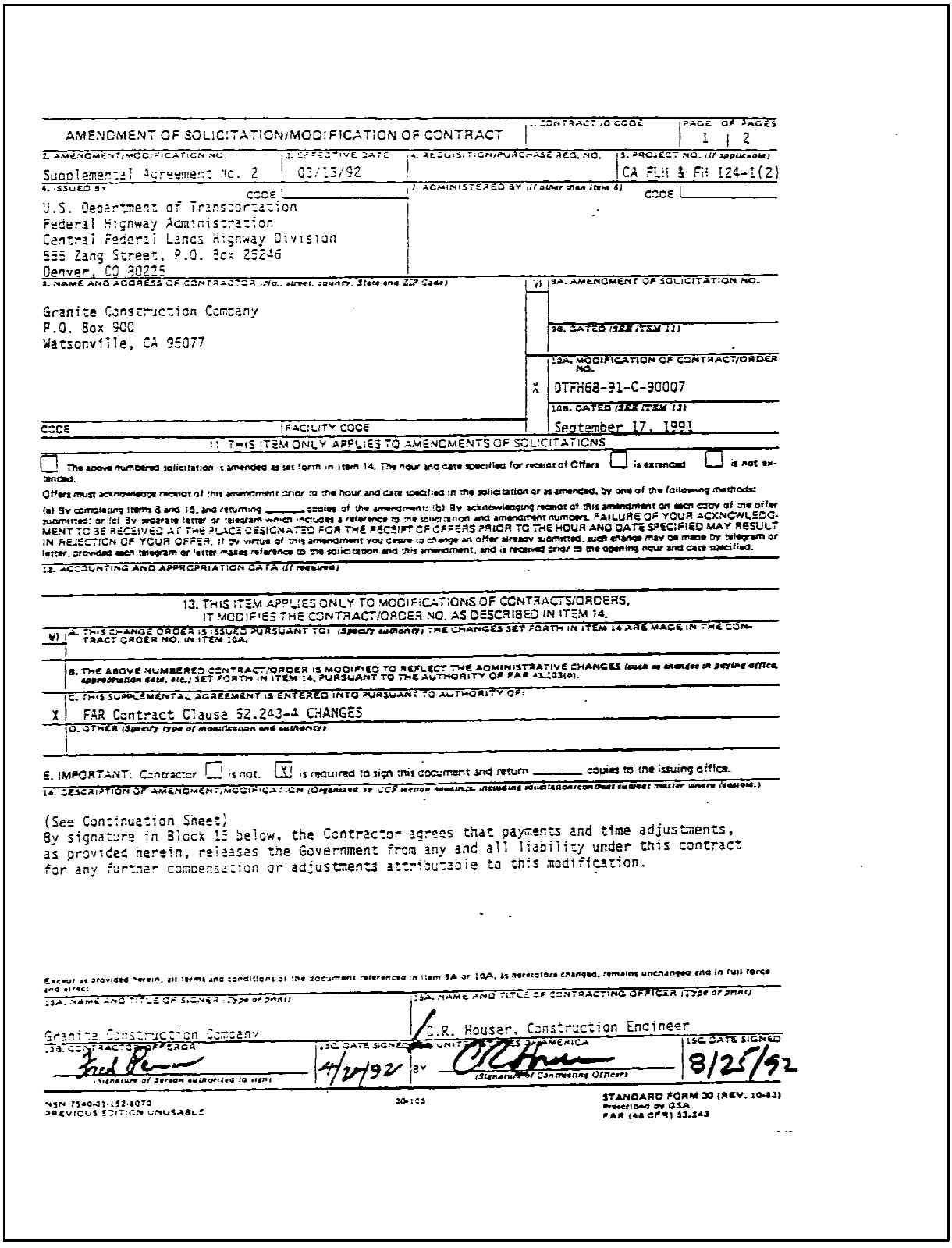
- **Implementation** - Stakeholders together develop strategies for implementing their mutual goals and the mechanisms for solving problems.

- **Continuous Evaluation** - In order to ensure implementation, the stakeholders agree to a plan for periodic joint evaluation based on the mutually agreed to goals - to ensure the plan is proceeding as intended and that all stake-holders are carrying their share of the load.

- **Timely Responsiveness** - Timely communication and decision making not only saves money, but also can keep a problem from growing into a dispute. In the Partnering workshop the stakeholders develop mechanisms for encouraging rapid issue resolution, including the escalation of unresolved issues to the next level of management.

*Excerpt from Corps of Engineering pamphlet: *Partnering, A Concept For Success*.

Figure 1-11.1
What Is Partnering?



AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
Supplemental Agreement No. 2	03/13/92		CA FLH & FH 124-1(2)

6. ISSUED BY — CODE

U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
555 Zang Street, P.O. Box 25246
Denver, CO 80225

7. ADMINISTERED BY (If other than Item 6) — CODE

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

Granite Construction Company
P.O. Box 900
Watsonville, CA 95077

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

10A. MODIFICATION OF CONTRACT/ORDER NO.
X DTFH68-91-C-90007

10B. DATED (SEE ITEM 13)
September 17, 1991

CODE — FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
FAR Contract Clause 52.243-4 CHANGES

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not. ☒ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

(See Continuation Sheet)
By signature in Block 15 below, the Contractor agrees that payments and time adjustments, as provided herein, releases the Government from any and all liability under this contract for any further compensation or adjustments attributable to this modification.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
Granite Construction Company	C.R. Houser, Construction Engineer
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED — 16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign) 4/27/92	BY (Signature of Contracting Officer) 8/25/92

NSN 7540-01-152-8070
PREVIOUS EDITION UNUSABLE

30-105

STANDARD FORM 30 (REV. 10-83)
Prescribed by GSA
FAR (48 CFR) 53.243

Figure 1-11.3a
Example Contract Modification to Pay Government's Share of Partnering Workshop

MODIFICATION OF CONTRACT
(CONTINUATION SHEET)

Contractor: Granite Construction Company
Contract: DTFH68-91-C-90007 dated September 17, 1991
Project No: CA FLH & FH .24-1(2), Soda Springs-Auburn
Contract Modification Number: Supplemental Agreement No. 2

Block 14. Description of Modification: (Continued)

In a Wednesday, October 30, 1991 telephone conversation, Mr. Jerry L. Budwig, Division Engineer, Central Federal Lands Highway Division and Mr. William G. Dorsy, Senior Vice-President, Branch Division Manager, Granite Construction Company, agreed to pursue a partnering agreement.

It was subsequently agreed to share "Partnering" costs as follows: Costs incurred in consulting fees, associated expenses, and the meeting facility were to be borne equally by both parties. Employee expenses, including travel, lodging and salaries were to be borne by the respective employers. A cost breakdown follows:

Pay 1/2 of the following:

1. Consulting Fee, Donald C. Mosley, President, Synergistic Consulting Group: $2,700.00 (subtotal)

2. Expenses, Donald C. Mosley:

Air Fare	$1,130.00	
Car Rental	132.64	
Airport Parking	10.00	
Meals	57.01	
		$1,329.65 (subtotal)

3. Service Charges, Red Lion Hotels and Inns:

#224025	$ 536.22	
#224059	459.53	
		$1,015.75 (subtotal)

4. Motel Room, Donald C. Mosley: 331.17 (subtotal)

Total 1 through 4 above: $5,375.57

Pay this Amount: $5,375.57 divided by 2 = $2,688.29

This modification is intended to initiate "Partnering" with Granite Construction Company to be used during the course of the contract. There will be no change in the Contractor's responsibilities with regard to all other aspects of the contract. This CM will be amended when additional workshops resulting in similar expenses are necessary.

The final contract amount will be increased $2,688.29 as a result of this modification.

There will be no change in the time allowed for completion of the contract as a result of this modification.

Figure 1-11.3a (Continued)
Example Contract Modification to Pay
Government's Share of Partnering Workshop

U.S. Department of Transportation
Federal Highway Administration

555 Zang Street
P.O. Box 25246
Denver, Colorado 80225-0246

February 12, 1993

Ms. Kathy Moss
Contract Administrator
Harper Contracting, Inc.
4655 West 5415 South
Kearns, UT 84118

Dear Ms. Moss:

Subject: Partnering Conference - Wolf Creek Road Project
March 17-18, 1993

Thank you for your excellent assistance during the past several days in preparing for the subject conference. Based on our conversations, I have prepared a final attendance list which is enclosed. Additionally, I have provided a brief statement on partnering from the Associated General Contractors booklet on the subject.

Your selection of the Cliff Lodge in Snowbird, Utah, for the conference location sounds exciting and should inspire the group to achieve our mutual goals. According to Ms. Ruth Johnson our facilitator, the conference hours are 8 a.m. to 4 p.m. on March 17, and 8 a.m. to 3 p.m. on March 18.

A copy of this letter will be forwarded to the other attendees together with directions indicating the conference location in proximity to Salt Lake City. Since lodging is at a premium at the Cliff Lodge facility, I foresee most of the attendees will overnight in the Salt Lake City area.

Our staff at FHWA look forward to being in Snowbird with your company representatives and the entire partnering group.

Please contact Mr. Bill Dixon or me at (303) 969-5958 if you have any questions or need additional information or assistance.

Sincerely yours,

Norm Merrill

Norm Merrill
Project Engineer

Enclosures

Figure 1-11.3b
Example Partnering Workshop Invitation Letter

PARTNERING AGREEMENT FOR
THE FORESTHILL HIGHWAY PROJECT

The Federal Highway Administration and Granite Construction Company agree to work together as a team exhibiting a cooperative spirit to complete a safe, quality project within budget, on time, while being sensitive to public interest.

Accordingly, we are committed to incorporating the following core values:

- Integrity/Honesty
- Openness/Trust
- Pride/Professionalism
- Fairness/Flexibility
- Integrity

We agree to timely resolution of disputes at the lowest level with the goal of no unresolved disputes at the completion of the project.

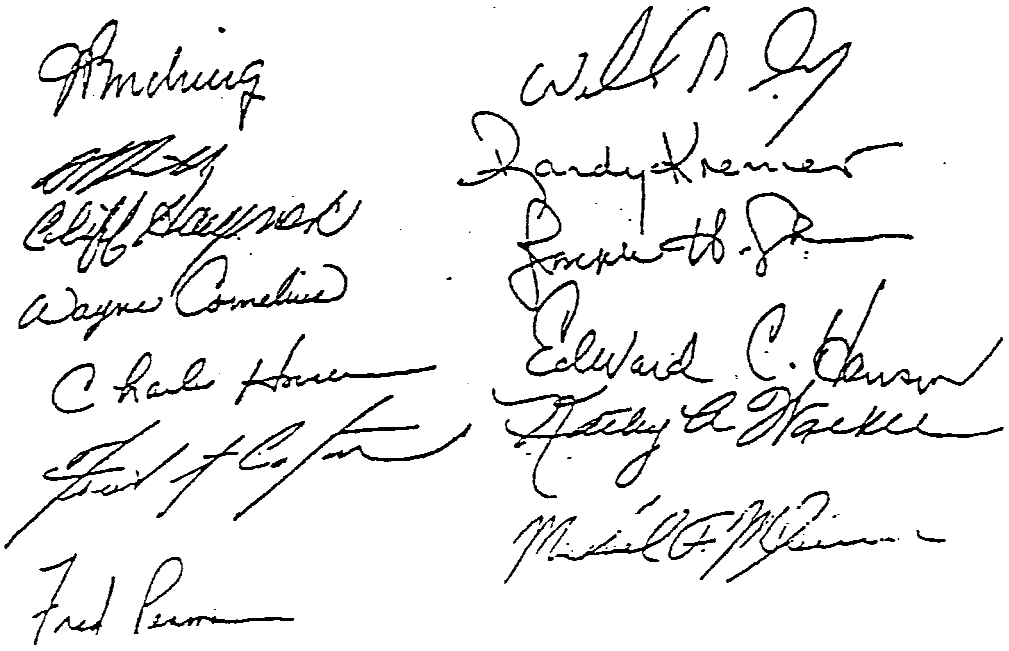


Figure 1-11.3c
Example Partnering Agreement

Action Planning Process

I. Problem: Communication

II. Solution:

A. Up-to date progress schedules (subcontractors, suppliers)
B. Weekly staff meeting (Granite-Government)
C. Daily drive through (P.E. - Supt.)
(Insp.- Foreman)
D. Anticipate traffic control needs.
E. Required submittals well in advance as per specification.
F. Attempt to build personal relationships.
G. Discuss potential conflict and determine whether it can be solved informally.
H. Attempt to minimize posturing letters.
I. No surprises.
J. Objective listening and avoid vindictiveness.
K. Be open to suggestion.
L. Anticipate problems, changes, needs.
M. Keep participating agencies updated (utility companies).

III. Feedback:

Charlie and Wayne communicate on progress of partnering effort.

Figure 1-11.3c (Continued)
Example Partnering Agreement

Action Planning Process

I. Problem: Specification Interpretation

II. Analyzing the problem:

A. Causes

1. Specifications are capable of varied interpretation.
2. Overzealous enforcement.
3. Specifications don’t accurately address particular situation.

B. Impact

1. Results in adversarial relationship.
2. Poor quality
3. Delays

III. Solutions:

A. Weekly planning meetings which include appropriate specification discussions.
B. Discuss material specifications in advance. Use full production trials.
C. Ability to discuss “end result” vs “strict method”.
D. Notification.
E. Forthright presentation of alternate solutions.

Figure 1-11.3c (Continued)
Example Partnering Agreement

Action Planning Process

I. Dispute Resolution Process

1. It is preferred that conflict be discussed and resolved at the project level immediately not to exceed 5 working days.

2. When conflict is not resolved at the project level, it will be taken to the next level of supervision immediately not to exceed 5 working days.

   Granite - Booth and Haynes
   FHWA - Clem

3. When conflict is not resolved in step 2, it then goes to (notification in writhing):

   FHWA - Contracting officer (Houser)
   Granite - Wayne Cornelius

4. When not resolved in step 3, it then is handled in accordance with the provisions of the contract. ADR is encouraged.

II. Goal

No disputes shall go beyond Level 2.

Figure 1-11.3c (Continued)
Example Partnering Agreement

PARTNERSHIP PERFORMANCE EVALUATION

Name/Title: _____ Date: _____
Project: _____
Please evaluate work on the above project during the last month (circle your response and comment as appropriate)

1. Safety record and attitude — Comment:
poor — excellent
1 2 3 4 5 6 7

2. Public Relations — Comment:
poor — excellent
1 2 3 4 5 6 7

3. Completion of work — Comment:
tedious — expeditious
1 2 3 4 5 6 7

4. Teamwork — Comment:
poor — excellent
1 2 3 4 5 6 7

5. Value engineering — Comment:
no new savings — substantial savings
1 2 3 4 5 6 7

6. Quality of work — Comment:
poor — excellent
1 2 3 4 5 6 7

7. Team morale — Comment:
poor — excellent
1 2 3 4 5 6 7

8. Dispute resolution — Comment:
poor — excellent
1 2 3 4 5 6 7

9. Communication — Comment:
poor — excellent
1 2 3 4 5 6 7

10. Trust — Comment:
poor — excellent
1 2 3 4 5 6 7

11. Effectiveness of joint meetings — Comment:
poor — excellent
1 2 3 4 5 6 7

12. Timely paperwork — Comment:
poor — excellent
1 2 3 4 5 6 7

13. Total partnership effort — Comment:
poor — excellent
1 2 3 4 5 6 7

Figure 1-11.6a
Example Individual Partnership Evaluation

PARTNERING JOINT EVALUATION FORM

PERFORMANCE FACTORS	Low 1	Below Average 2	Average 3	Above Average 4	High 5	COMMENTS
Understanding of Mission						
Candor, Honesty, Trust						
Project Execullon/Progress within Time Frames						
Issue/Conflict Resolution						
Communication						
Logistics						
Leadership						
Health of the Partnership						

Name: _____ Date: _____

Figure 1-11.6b
Example Joint Partnership Evaluation

FEDERAL LANDS HIGHWAY
CONTRACT INSPECTION TIME SHEET - RECEIVING REPORT

PROJECT NAME/NUMBER:_____

CONTRACT INSPECTION FIRM: _____

CONTRACT INSPECTOR (NAME): _____

DATES INCLUDED ON THIS REPORT: FROM_____ TO _____

Date	Regular Time	Overtime	Per Diem
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
TOTALS	_____	_____	_____

Certified Correct

CI(Signature):_____ Date:_____

Project Engineer: _____ Date:_____

COE: _____ Date: _____

Approved for Payment:

COTR:_____ Date:_____

Figure 1-12.6
Contract Inspection Time Sheet - Receiving Report

FEDERAL LANDS HIGHWAY
CONTRACT INSPECTOR RATING FORM

PROJECT NAME/NUMBER:_____

CONTRACT INSPECTION FIRM:_____

CONTRACT INSPECTOR: _____

INSPECTOR CLASSIFICATION: _____

RATING PERIOD(DATES) FROM:_____ TO: _____

Project Engineer to rate the CI in the following areas and comment in the remarks section

	Superior	Satisfactory	Unsatisfactory
Documentation:	_____	_____	_____
Monitoring the Contractor's Inspection System	_____	_____	_____
Recognizing, analyzing, and proposing workable solutions to problems	_____	_____	_____
Inspecting the various construction elements of the project	_____	_____	_____
Interactions with the construction contractor and others	_____	_____	_____

REMARKS:

PROJECT ENGINEER (Signature):_____ Date:_____

CONTRACT INSPECTOR (Signature):_____ Date:_____

COE:_____ Date:_____

COTR: _____ Date: _____

Figure 1-12.8
Contract Inspector Rating Form

CHAPTER 2 - RECORDS AND REPORTS

CONTENTS

FIGURES

2-1 GENERAL

This chapter provides a basic outline for record preparation and report requirements for a typical construction project. Additional reports may be considered necessary for the proper administration of projects with unique features, or to satisfy Division specific needs.

A uniform filing system should be established by each Division and used in the construction field offices. Uniformity in filing will simplify the training of field office personnel and reduce training time upon reassignment to other projects. A uniform filing system will help other FLH personnel who have need to review or check project files.

Project records must be maintained properly and be readily available when needed. Much reporting is done with standard forms. Many of the more common forms are listed and their uses described throughout this manual. Some forms are made mandatory by the Federal Acquisition Regulation (FAR). Special forms to meet special needs may be developed by the Project Engineer. A list of available forms should be available from the Federal Lands Division office. This list should include the form number, title or purpose, frequency of submission, distribution, and number of copies.

Instructions for record preparation and reporting by the Project Engineer are also included in the FLH Field Materials Manual, and in Division administrative and technical manuals.

2-2 CORRESPONDENCE

All correspondence, including reports originating from the Project Engineer's office, should be signed or initialed by the Project Engineer, or the acting Project Engineer.

The Contractor and others who may need to correspond regarding the Project, should be advised of the FLH names and addresses with whom we prefer they correspond. The Project Engineer will forward to Division files through the Construction Operations Engineer (COE) copies of all incoming or outgoing correspondence, and retain a copy in the project office files. Correspondence covering matters outside the authority of the Project Engineer should be noted for the Construction Operations Engineer's action. Copies of correspondence to State or county highway agencies should be furnished to the appropriate FHWA Division Administrator.

The Project Engineer should maintain a complete list of contacts related to the project - name, agency or company, phone and FAX number, relationship to project. This list will expedite appropriate communication of project problems and assist new personnel assigned to the project.

The handling of Contractor submittals, payrolls, test reports and other non-correspondence items should be in accordance with Division policy as to whether copies are required for central files or Division technical specialists.

2-3 PROJECT DIARIES AND INSPECTOR'S DAILY REPORTS (IDR'S)

2-3.1 Project Diaries

It is mandatory that diary records be kept for each project and filed with other records when the project is complete.

These diaries may include but are not necessarily limited to the following:

Engineer's (Project) Diary
Staking Diary
Inspector's Diary (or IDR)
Erosion Control Diary
Materials Diary
Traffic Control Diary

The Project Engineer shall maintain diaries which contain appropriately signed daily entries. If the Engineer is absent from the project, daily entries shall be made and signed by the person in charge during the absence.

Diaries are most important. Diary entries should be factual, concise, complete, and legible. Entries should avoid vague generalizations like, "Contractor operations remain inefficient." State why they are inefficient and how long they have been that way. If there is a dispute in, say, interpretation of the specifications, try to express both [Government's and Contractor's] points of view. When a decision is made, or agreement reached on further action, state what the outcome was. If no agreement was reached, state what instructions were given to the Contractor. If an opinion is included, identify as an opinion, not fact.

It is intended that information recorded in the diaries and/or on the Inspector's Daily Report be of sufficient detail so that the events can be reconstructed later as they actually happened. On projects where the Contractor is required to maintain records of equipment, personnel and construction operations, it is not intended that FLH personnel duplicate those records. However, the Project Engineer should establish a process of reviewing, endorsing, and providing feedback as necessary, on Contractor produced records.

All diary entries should be in permanent ink. Diaries may be kept in either bound books or books featuring paper that will provide a duplicate copy if desired. The Project Engineer may find a voice recorder helpful, either for recording notes to be used at the end of the day in making diary entries, or for recording events which can later be transcribed into the diary and signed by the Project Engineer. It may be helpful to file certain tapes regarding claims and disputes in addition to the transcription. If this occurs, there should be a notation in the diary or in the transcription.

The use of a computer or word processor to generate the diary is permissible, provided that a hard copy is generated, signed and filed at the end of each daily entry. In the event of a dispute and litigation, it is important to clearly establish who made the entry, and when it was made.

Federal Regulations generally allow inspection of public records, such as FLH diaries, by the Contractor and even the general public. Certainly, all entries should be made as if they will eventually be seen by the Contractor and others involved in the Contract. Requests to inspect diaries or other records should be referred to the COE. Depending on the circumstances and Division procedures, the COE may authorize inspection and copying limited records in the project office; or the requester may be required to make a written request to the Division pursuant to the Freedom of Information Act (FOIA). Of particular concern however, are requests by a subcontractor or contractor which is in a dispute with another subcontractor or contractor. FLH may be obligated to protect privacy type information provided by a company doing business with the Government.

Unless otherwise directed, field measurements and notes for documenting monthly progress estimate quantities should not be recorded in the project diary.

Diaries should be considered an official government document and must be turned in with other project records at the conclusion of a project. This is also applicable to any retained voice recordings.

Daily entries for each type of diary should include the following as appropriate for each diary, plus any additional pertinent information:

- Date and weather conditions.
- Work of Project Engineer.
- Work of inspectors and/or project staff.
- Names of visitors to the project

.

- Construction work in progress, unless otherwise covered by **Inspectors Daily Reports (IDR's). See Subsection 2-3.2**. At a minimum, this should include a list of the equipment and labor force being used on each construction activity, where and what the activity is.
- Comments on the progress of operations as compared to the Contractor's approved schedule.
- The substance of important conversations with the Contractor concerning conduct, progress, changes, interpretation of specifications, or other details.
- Comments on construction safety hazards and corrective measures.
- Discussion of erosion control and other environmental concerns as appropriate.
- Information concerning accidents occurring on the project or incidental to the construction work.
- Comments on traffic control and signing.
- Any information not covered in other notebooks that might have a bearing in case of future disagreement, such as difficulties encountered in construction and their causes, delays caused by breakdowns of equipment, comments relative to improper use of equipment reflecting inefficient operations by the Contractor, etc.

The best record will be produced by the Project Engineer who looks ahead at potential problems, and prepares for those problems. Such a record would include diary notes on equipment or material moved to the project for use, subsequent actual use; pertinent conversations; and preparatory or production work on items that may be deleted or reduced. The record would, of course, not be limited to this information. It would include anything considered likely to be helpful in determining a fair amount of compensation.

2-3.2 Inspector's Daily Report (IDR)

The project staff should fully document the Contractor's construction operations. The **Inspector's Daily Record of Construction Operations,(See Figure 2-3)** may be used. This form will provide a concise, readily retrievable record of equipment, time, and work hours for each significant construction operation underway. The record will facilitate verification of the Contractor's cost in connection with any equitable adjustments or claims.

IDR's may be used to document quantities in accordance with Division procedures. Such procedures should include the following:

- It should be clear whether documentation is for progress payment purposes only, or both progress and final payment.
- All quantities entries should be stamped or otherwise noted to indicate posting to the Summary Book.
- Procedures should address how partially completed work will be documented and

the documentation finalized when the work is ultimately completed.

- Procedures should provide reasonable fail-safes against duplicate entries or other confusion resulting from multiple inspectors and documentation styles.

2-4 FIELD NOTE BOOKS AND COMPUTATIONS

2-4.1 General

Quantities should be documented in accordance with the Contract requirements and Division procedures. See **Chapter 8, Measurement and Payment.**

The number and content of field notebooks and computation documentation depends upon the type of construction involved. Each Federal Lands field Division will issue instructions or guidelines for standard notes and methods of computations.

When field notes and computations are recorded in loose-leaf books, care must be exercised to prevent the possibility of pages becoming lost. Notes must be recorded neatly, clearly, uncrowded, and in sufficient detail to be easily understood. Too much detail is better than too little.

Original entries, later determined to be in error or no longer applicable, should not be erased. A line should be drawn through them and the correction or explanation entered directly above. When revisions require the abandonment of a considerable portion of the notes, these should be crossed out and a notation made of the book and page number where the revised notes may be found.

Each book should have all pages numbered, and there should be an index of its contents on the first page. Field notebooks should show the date, weather conditions, and personnel at the beginning of each day's notes. Computations should show the date, and the names of the persons who made and checked the computations.

When records are required to be kept by Contractor personnel, the Project Engineer should go over the required format, timeliness, etc.; and provide constructive feedback to the Contractor if the records are deficient.

The project records should include a tabulation of the names, signatures, and initials of all FLH, CI, and Contractor personnel whose names or initials will appear in source records such as ticket books, survey notes, or test reports. All notebooks and other records shall be plainly marked for identification showing State, project number, contents of the book, and the date(s).

2-4.2 Field Notes

Field note books are used as source documentation for work which necessitates field measurement, stakeout or verification. Listed below are some of the field note books generally required on construction. Notes for small quantity items should be combined, insofar as practicable, in one or more *Miscellaneous* books.

- Diaries
- Surveying and Stakeout Books
- Deliveries and Stockpiled Materials
- Bituminous Materials
- Concrete Production
- Structures (Major structures should each have a separate book.)
- Culverts and Drainage Structures
- Piling
- Grade Control and Computations
- Miscellaneous Excavation and Subexcavation
- Erosion Control
- Traffic Control
- Utilities
- Topsoil and Turf Establishment

- Miscellaneous Items

2-4.3 Computations and Summary Book

Field notes and measurements are converted to quantities for progress payments by the computations required or implied in the Contract. For simple items the computations may be included in the field book.

For complex items it may be necessary to use a computer spreadsheet or preformatted software, e.g. for cross section computations, as an intermittent step between the field notes or measurements and the summary book totals.

The term *Summary Book* used in this manual refers to documentation which computes and summarizes field notes and measurements, as well as information from the plans, into quantity totals for entry in the Receiving Report to be used for progress and final payment. In the past, the summary book was prepared as a field book with manual entries, totals, etc. However, with today's use of computers, the summary book is more commonly a collection of spreadsheets - usually one for each item - which provide a format for tabulating and totaling the quantities to be paid on progress and final payments.

When computer files are used to compute and tabulate quantities, it is recommended that a printout of the summary for each item active during the month be printed out to be a part of the documentation for that estimate period; or other acceptable backup or file retention system be used to minimize reconstruction of computations which would be necessary in the event of a hard drive failure or other catastrophe.

2-5 MATERIALS RECORDS

The Project Engineer is responsible for records and reports of materials used in the construction. The details of these requirements are discussed in the *FLH Field Materials Manual*.

2-6 PHOTOGRAPHS

Photographs are an important part of the project records. They serve to document the record with respect to slides, cave-ins, floods, and other unusual occurrences; actual conditions when a contractor alleges *Differing Site Conditions*; unusual construction features or practices; accidents involving death, personal injury or property damage; encroachments within the right-of-way; and other such occurrences and conditions. They are useful in illustrating reports on experimental features and unusual construction practices, final construction reports, and other reports. They are invaluable as evidence in case a controversy develops during the Contract which results in litigation. They are especially useful when a construction contract encompasses a long period of time, as much as 2 or 3 years. As memories fade and Project Engineers are transferred to other projects or retire, photographs provide direct evidence of the conditions that existed at the time the dispute arose. The old adage that "a picture is worth a thousand words" applies here.

In order to best serve the intended purpose, a photographic history of all construction projects should be made. Photographs should be taken of the construction site before construction begins, during each stage of construction as it progresses, and of the completed project. For example, during a project on which major excavation is to be accomplished, photographs should be taken on a regular basis (perhaps as often as once a week) to document progress made by the Contractor. Such photographs should be taken from the same location and the camera should be aimed at the same reference point in order that a person looking at the pictures can actually see the progress, or lack of progress, which was made by the Contractor during a certain period of time.

If a project is of sufficient length, several reference points should be chosen by the Project Engineer from which photographs can be taken during the course of a project. Special consideration should be given to those areas along the project length where experience has shown that difficulties may be encountered. For example, if there are unusual rock formations that might be encountered as excavation progresses, that site should be chosen and photographs should be taken on a regular basis.

In addition to photographs taken from specified reference points on a regular basis, photographs also should be taken immediately after unusual occurrences and before unusual conditions are disturbed. The Project Engineer and all inspectors should have, or have easy access to a camera and film at all times during construction. The use of these resources should be emphasized by the Project Engineer.

Clarity and good composition are very important, and proper identification is necessary. In some cases, it would be appropriate to have an individual stand by the unusual condition in order that the relative size of the condition may be determined. The identification record for each photograph should include the location from which the picture was taken (including references to project stations if applicable), time of day and date taken, weather conditions at the scene, name and signature of photographer, and serial number of photograph and negative. In addition, the type of camera should be recorded. All this information is particularly important for photographs that may be used as evidence in legal proceedings.

The photograph identification record should be organized so that all photographs can be easily located, and should be maintained as a part of the project filing systems.

2-7 COST RECORDS AND REPORTS

As part of the monthly progress payment procedure, the Project Engineer should estimate the total expected quantity for each item - its *probable*. The Contract quantity may be used for each item initially, unless there is information to the contrary. Quantities are then updated based on best available information as the project progresses. The Project Engineer prepares the estimate of probables, consulting with the Construction Operations Engineer or designers as needed for computation factors and methods. The Project Engineer may wish to refer to design calculations for any item for which the amount estimated probable quantity is significantly different from the contract quantity.

Probable quantities translate to probable costs. If there is a significant net change to the contract amount due to changes in probable quantities Division procedures may compel the processing of a contract modification to obtain additional funding. This need must be anticipated as far in advance as possible to avoid surprises and *emergency* reprogramming of funds.

The Project Engineer should monitor records of construction engineering cost and maintain an estimate of the probable construction engineering cost to complete the project. Such estimates should be compared to the amount assigned to the project. Any significant difference should be discussed with the COE. The Project Engineer should consult with the financial office and/or with the COE for assistance in finding and interpreting Division financial records.

2-8 PERSONNEL, SUPPLIES, AND EQUIPMENT

Records and reports on personnel, supplies, and equipment are a necessary part of the administration of each project. Instructions relative to these can be found in the Administrative Procedures Manual, Operations Manual or other Division policy and procedure instructions.

2-9 PROJECT STATUS REPORTS

The Project Engineer is required to submit a status report of project activity monthly or otherwise in accordance with Division procedures.

Division procedures will specify the format. **Figure 2-9** is an **Example Project Status Report**. The Construction Operations Engineer will inform the Project Engineer of report distribution, such as to the National Park Service.

The Project Engineer should submit reports only when the project is active, unless other instructions are received from the Construction Operations Engineer. *Active* means some type of construction or construction engineering being managed by the Project Engineer is in progress, up to and including submission of the final construction records.

The Project Engineer may also wish to, or be directed to, prepare a weekly forecast of upcoming construction operations. This is mainly used on more visible, controversial projects to keep management, the cooperating agency, and the public (through the cooperating agency) well informed of project issues. It may be a computer updated newsletter or notice. Its function is to apprise all who have legitimate interest of expected traffic delays, intermediate completions, etc. The Construction Operations Engineer will be able to furnish examples of such reports.

2-10 PROGRESS CHART

The Project Engineer may consider maintaining a progress chart for each project to show the relationship between contract time and contract earnings, as well as to assist in monitoring the maintenance and updating of the *construction schedule* discussed in Chapter 7, which the Contractor is required to furnish under the provisions of the Federal Acquisition Regulation and the Standard Specifications.

The Project Engineer compares actual progress with the Contractor's proposed progress to determine the need for requesting revision of the construction schedule, and for taking other action determined appropriate, in consultation with the Construction Operations Engineer, such as withholding a portion of progress payments.

The relationship between money earned and progress is not expected to be linear throughout the project. It is often significantly skewed by high value items such as paving, and by seasonal weather constraints.

2-11 REPORT ON PARTIALLY COMPLETED PROJECT

When a project is inactive for the winter or other long period of time, or when the Project Engineer may retire or transfer, the Construction Operations Engineer may request a detailed project status report on the project. This should be a memorandum report containing a brief outline of the work done, work remaining, problems outstanding, and suggestions and ideas which might be helpful to a new Project Engineer unfamiliar with the project. Winter maintenance responsibility and anticipated activities might be described in such a report. Agency contacts should be identified.

Prior to temporary shutdowns or other discontinuity, it is also a good idea to prepare a status report for all pending CM's. This will be a useful reminder of issues that may need to be attended to, such as:

- Complete vs. incomplete work
- Submittals due from Contractor
- Pending negotiations relative to contract time or payment
- Documentation of effects on other work

2-12 CONTRACTOR PERFORMANCE EVALUATION

Regulations require a performance evaluation of most contractors. While there are certain exceptions, it is safe to assume one will be required for each highway construction contract. The Construction Engineer or other delegated contracting officer will make the official evaluation. The Project Engineer will furnish a recommendation. **Standard Form 1420, Performance Evaluation - Construction Contracts** can be used. See **Figure 2-12**. For that, the Project Engineer notes the recommended evaluation on a copy of the form and furnishes it to the Construction Operations Engineer who prepares the official evaluation. Alternatively, the Project Engineer and COE may meet to jointly prepare the evaluation.

The Project Engineer should be aware that if it is contemplated to rate a contractor's performance unsatisfactory, the project records should clearly support that rating; and the contractor should have been advised of the unsatisfactory performance during the course of the contract, and failed to correct such performance.

2-13 FINAL CONSTRUCTION REPORT

Final construction reports are required for all Federal Lands Highway projects. The Project Engineer may be required to draft final reports for assigned projects. He/she should check with the Construction Operations Engineer. The report is to be drafted within two months of agency acceptance of the construction project. For an **Example Final Construction Report**, see **Figure 2-13**. Whether the Project Engineer or Construction staff draft final reports, the directions below apply:

I. Project Description

A. Project Number - Name of park, forest, Indian reservation, etc., route number, county, state, should all be included.

B. Description of Work - Should be described in brief narrative form. The various activities that went into the job should be included. The description of work in the contract should be referenced for guidance.

C. Environmental Considerations - Any extraordinary environmental considerations pertinent to the project should be described. All clearances and/or permits obtained for the project should be listed.

II. Project Data

A. Specifications - The standard Federal or state specification that was the basis for project specifications should be included.

B. Termini - The beginning and ending of the project should be described in terms of stations and/or other significant and reasonably precise information. For National Park Service projects, the Road Inventory Program (RIP)/Bridge Program (BIP) Section(s) should be referenced.

C. Length - Mainline length is to be summarized. Incidental road lengths are to be shown separately.

D. Width - The predominant width of paved roadway and shoulders should be included. Any significant changes in the typical section stations should be noted.

E. Pavement Structure - The depth of wearing course, binder, base stone, etc, should be included.

F. Structures - The type, length, and location should be described. (BIP Section and structure number are to be referenced for NPS projects.)

G. Contract Number and Date -

H. Contracting Officers - Contracting Officer(s), and others involved in administering the contact and project should be listed; these include COE, Construction Engineer, and Division Engineer.

I. Contract Bid Amount -

J. Engineer's Estimate -

K. Final Contract Amount -

L. Contract Time -

Any significant dates should be shown. These include the award date, date of notice to proceed, original completion date, authorized extended completion date, date of substantial completion, date of final completion, date final estimate completed, date of final settlement. Any periods of liquidated damages, special periods for plant establishment, stream work restrictions, etc. should be summarized.

M. Contractor - The contractor's name, address, and category (i.e., small

business, DBE, etc.) should be shown.

N. Subcontractors - All first tier and large second tier subcontractors' names should be listed along with a description of the work each was involved in. The category of each (i.e., Small Business, DBE, WBE, etc.) should be shown, along with the original or reported amount of each subcontract. If the prime contract required a subcontracting plan, the comparison of goals with levels achieved should be shown.

O. Construction Engineering Costs - The total FLH costs, including contract inspection costs should be shown. These costs as a percentage of the final contract amount (construction costs) should be computed and shown. [(CE + CI) x 100/contract amount]

P. Maintaining Agency - The agency which is responsible for maintenance of the road the project is on should be shown.

III. Construction

A. Materials - Sources of significant raw materials and manufactured items and their quality indicators are to be listed; e.g., for aggregates: include type, wear, soundness, specific gravities; for bituminous mixes: include grading used, densities, average asphalt content; etc. Manufacturers, suppliers, and fabricators of significant structural items and assemblies are to be listed. Problems encountered in materials control, if significant, should be described. Quantities of recycled materials incorporated in the work should be shown. The pay factor for any item where it was other than 1.0 (100%) should be indicated.

B. Experimental or New Features - Any significant experimental, demonstration, new, innovative, or unusual features, methods, and/or materials should be described. A separate report may be referenced, if one is available, or being written. Funding of special work, if separate from basic contract funds, should be explained.

C. Changes & Problems - Contract modifications with a brief description of each are to be listed. The amount of each and any associated time change are to be described.

Problems encountered including delays, *unusual* weather, traffic control, design and construction changes, and errors are to be discussed. Be constructive, factual, and identify personal opinions when they are used.

A general description of *significant* plan versus field differences should be written. Any overrun or underrun items of 15 percent or more should be explained.

Conditions encountered which might *significantly* and adversely affect future maintenance, design, or construction are to be described.

D. Recommendations - Any recommendations for future design, construction, or maintenance based on experience from the project should be made. Staff specialists, such as the Bridge Design Engineer, Geotech Engineer, etc., should be consulted in advance of making recommendations which relate to their work. It should be kept in mind that the report may be distributed widely.

E. Claims - Each claim with a brief description and status or disposition should be listed. "No known claims" should be indicated if such is the case. If a claim is in litigation, a note should be attached reminding the Construction

Operations Engineer to clear the report through the Regional Counsel prior to its being finished.

The resolution of significant disagreements that did not become formal claims should be described. Any pertinent supplemental agreements should be referenced.

IV. Construction Engineering

A. Project Personnel - Names (not grades) of Project Engineer and major staff should be listed. Inclusive dates if there has been more than one Project Engineer should be shown.

B. Contract Inspection - If contract inspection services were utilized describe the character of these service - number of personnel, assignment durations, nature of inspection duties, etc.

C. Other Contacts - Name(s) and title(s) of cooperating agency personnel directly involved with the project, and other individuals who have impacted the work or its time for completion should be listed.

D. Partnering - If the project was *partnered*, the process should be summarized, along with the principal participants. Overall results should be described.

V. Appendix

A. Title Sheet, Location Map and Typical Sections - As-built sections (include bridge sections and layouts) should be included.

B. Tabulation of Bids

C. Final Voucher Assembly (See Subsection 8-4.9)

D. Project Materials Certification - See FLH Field Materials Manual.

E. Project Photographs - Before and after pictures should be included. These should not be repetitious; e.g, shot after shot of a completed paving project. Critical stages of major operations should be shown; e.g. excavation and embankment operations, including benching, structure foundation, and falsework in place (anything which would be useful at a later date should a slide, structural, or other failure occur). Views of new or experimental features or equipment should be shown. The report should not be loaded with pictures showing the same thing, or standard, or insignificant operations.

F. Special Reports - If appropriate, copies of reports on special or experimental features incorporated into the project should be included.

2-14 AS-CONSTRUCTED PLANS

As-constructed plans are required on all Federal Lands Highway projects. For situations when these plans are not required of the construction contractor, it is the Project Engineer's responsibility to record plan changes on full-scale prints as such changes occur. The following items are to be covered:

I. Plans

A. Alignment - All revised alignment should be shown. Where bearings, curve data, etc., do not change, the data should be checked for accuracy.

B. Changes - Changes in construction limits, if any, should be shown.

C. Bridges - Stations of all bridge ends should be shown.

D. Ties - Ties to any additional found corners should be shown.

E. Approach Roads - The constructed location of all road approaches are to be shown.

F. Right-of-Way - All right-of-way adjacent to private property is to be shown with care for correctness.

G. Monuments - All monuments should be shown.

H. Utilities - All utilities should be shown (e.g., gas, water, commercial power, sewers, etc.), including new, existing, abandoned, and removed facilities.

I. Underdrains - Location, size, and depth of underdrains should be shown.

J. Channel Changes - As-constructed channel changes should be shown.

K. Crossings - Elevations for all aerial and underground crossings of utilities should be shown. (One should not attempt to measure directly from the road to the sag in overhead crossings.)

II. Profile

A. Grades - Corrected grades and grade points of intersection (P.I.s) should be shown.

B. Equations - All equations and stationing should be shown.

C. Culverts - Correct culvert lengths, type, invert elevations, and stations are to be shown. Skew angles and as-built grades should be shown.

D. Extensions - On culvert extensions, the length of existing pipe, as well as extension, should be shown.

III. Permanent Bench Marks

A. Monuments - Data on monuments should be shown.

B. Datum - Datum used for levels should be shown.

IV. Retaining Walls

Limits and type of wall are to be shown on profile sheets.

V. Guardrail

Corrected stationing, lengths, and offsets from edge of pavement or travel lane, if different than original plans, should be shown.

VI. Fencing

Construction limits of fencing in relation to centerline should be shown.

VII. Typical Sections

Any revisions in both dimensions and materials should be shown. Also, stations, if termini were revised, should be shown.

VIII. Bridges

Any changes in bridge plans should be shown. If built without changes, it should be indicated on the plans that no changes were made.

Information required for bridges includes the following:

A. Subsurface Log - A log of foundation material encountered if substantially different than information shown on plans. Log sheets should be attached to plans if necessary or convenient.

B. Pile Driving Records - Pile driving records including size, length, type, bearing, and tip elevation should be included. Record sheets should be attached to plans if necessary or convenient.

C. Elevations - Footing and seal elevations, if different than plan, should be included.

D. Changes - Any changes in plan or dimensions should be noted, including any major changes in reinforcing.

At the completion of the project, the marked plans should be sent to the Federal Lands Highway Division office. There the Project Development Branch will be responsible for transferring the changes to the contract tracings, and making the proper distribution.

2-15 DISPOSITION OF RECORDS

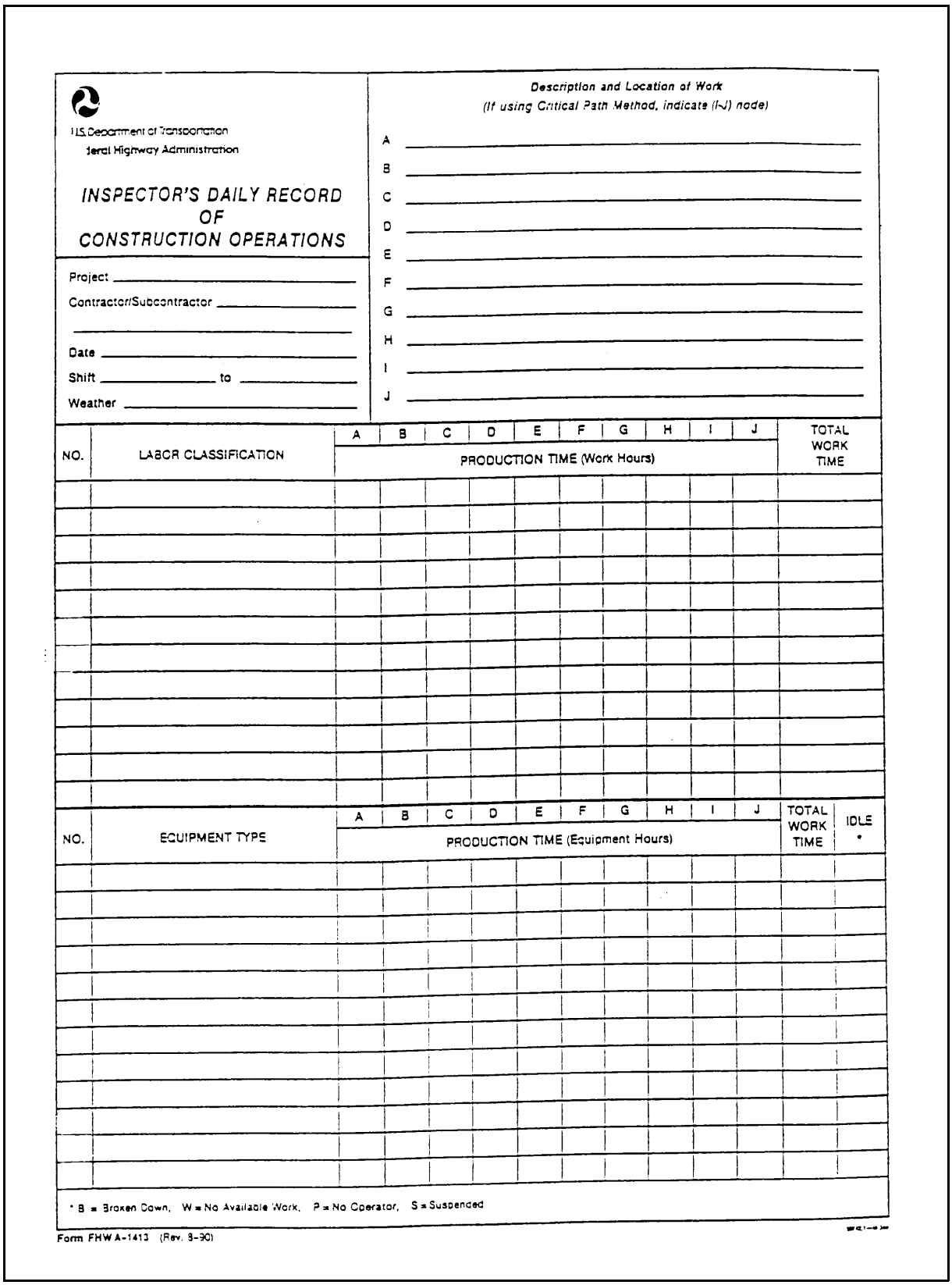
The Project Engineer should send the original or a copy (in accordance with Division procedures) of all correspondence received from contractors to the Division Headquarters for the central, official file.

Division procedures relative to checking of field books and records should be followed. The Project Engineer should arrange for checking of field books and other source records as they are completed, rather than all at once at completion. This will provide early notice of any deficiencies in record keeping, and therefore facilitate more efficient management of the contract.

The Project Engineer should mail or deliver all field notebooks, computation books, other project records supporting payment, maps, plans, cross-section rolls, diaries, etc., to the appropriate Federal Lands Highway Division office upon completion of a project.

A transmittal letter, or a form similar to that shown in **Figure 2-15, Example Transmittal Form**, should be used to transfer records from the Project Engineer to central files.

Project records of internal matters, transfers, T&A reports, service contracts no longer in effect, etc., should be disposed of at the end of each construction season or when the project is completed, in accordance with Division policy.



U.S. Department of Transportation
Federal Highway Administration

INSPECTOR'S DAILY RECORD OF CONSTRUCTION OPERATIONS

Project _____

Contractor/Subcontractor _____

_____

Date _____

Shift _____ to _____

Weather _____

Description and Location of Work
(If using Critical Path Method, indicate (I-J) node)

A _____
B _____
C _____
D _____
E _____
F _____
G _____
H _____
I _____
J _____

NO.	LABOR CLASSIFICATION	PRODUCTION TIME (Work Hours) A	B	C	D	E	F	G	H	I	J	TOTAL WORK TIME

NO.	EQUIPMENT TYPE	PRODUCTION TIME (Equipment Hours) A	B	C	D	E	F	G	H	I	J	TOTAL WORK TIME	IDLE *

* B = Broken Down, W = No Available Work, P = No Operator, S = Suspended

Form FHWA-1413 (Rev. 8-90)

Figure 2-3
Inspector's Daily Record of Construction Operations

Traffic Control Checked	☐ YES	☐ NO	Traffic Control Problems	☐ YES	☐ NO
Erosion Control Checked	☐ YES	☐ NO	Erosion Control Problems	☐ YES	☐ NO
Unsafe Operations	☐ YES	☐ NO	Accidents	☐ YES	☐ NO

NARRATIVE REPORT: *Descriptions, Problems, Progress, Visitors, Materials Received, etc.*

REVIEWED BY		REPORTED BY	
SIGNATURE *(Project Engineer)*	DATE	SIGNATURE *(Inspector)*	DATE

*U.S. Government Printing Office: 1991 — 282-640-28572

Figure 2-3 (Continued)
Inspector's Daily Record of Construction Operations

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

PROJECT ENGINEER'S MONTHLY STATUS REPORT

% Work Complete _____ Date Time Began _____
% Time Elapsed _____ Est. Completion Date _____
% CE Used _____ Act. Completion Date _____
DBE SCC Payments $_____ Final Insp. Date _____

STAFFING:

ENGINEERING:

CONSTRUCTION:

REMARKS:

SUBMITTED BY: _____
(Submit to COE between the 20th and 24th of each month)

Figure 2-9
Example Project Status Report

FOR OFFICIAL USE ONLY
(WHEN COMPLETED)

PERFORMANCE EVALUATION – CONSTRUCTION CONTRACTS

1. CONTRACT NUMBER

PART I – GENERAL CONTRACT DATA

2. CONTRACTOR *(Name, address and ZIP code)*

3. TYPE OF CONTRACT *(Check)*
- A. ADVERTISED
- B. NEGOTIATED
  - ☐ CPFF
  - ☐ FIRM FIXED PRICE
  - ☐ OTHER *(Specify)*

4. COMPLEXITY OF WORK
- ☐ DIFFICULT
- ☐ ROUTINE

5. DESCRIPTION AND LOCATION OF WORK

	A. AMOUNT OF BASIC CONTRACT	B. TOTAL AMOUNT OF MODIFICATION	C. LIQUIDATED DAMAGES ASSESSED	D. NET AMOUNT PAID CONTRACTOR
6. FISCAL DATA	$	$	$	$
7. SIGNIFICANT DATES	**A. DATE OF AWARD**	**B. ORIGINAL CONTRACT COMPLETION DATE**	**C. REVISED CONTRACT COMPLETION DATE**	**D. DATE WORK ACCEPTED**

8. TYPE AND EXTENT OF SUBCONTRACTING

PART II – PERFORMANCE EVALUATION OF CONTRACT *(Check appropriate box)*

9. PERFORMANCE ELEMENTS	OUTSTANDING	SATISFACTORY	UNSATISFACTORY
A. QUALITY OF WORK			
B. TIMELY PERFORMANCE			
C. EFFECTIVENESS OF MANAGEMENT			
D. COMPLIANCE WITH LABOR STANDARDS			
E. COMPLIANCE WITH SAFETY STANDARDS			

10. OVERALL EVALUATION

☐ OUTSTANDING *(Explain in Item 13, on reverse)* ☐ SATISFACTORY ☐ UNSATISFACTORY *(Explain in Item 14, on reverse)*

11. EVALUATED BY

A. ORGANIZATION *(Type or print)*

B. NAME AND TITLE *(Type or print)*	C. SIGNATURE	D. DATE

12. EVALUATION REVIEWED BY

A. ORGANIZATION *(Type or print)*

B. NAME AND TITLE *(Type or print)*	C. SIGNATURE	D. DATE

NSN 7540-01-150-0326

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(WHEN COMPLETED)

STANDARD FORM 1420 (10-83)
Prescribed by GSA
FAR (45 CFR) 53.236-1(b)

Figure 2-12
SF 1420, Performance Evaluation, Construction Contracts

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13. REMARKS ON OUTSTANDING PERFORMANCE - AS INDICATED BY THE CONTRACTOR'S PERFORMANCE ON THIS CONTRACT, IF YOU CONSIDER THE CONTRACTOR TO BE OUTSTANDING, SET FORTH FACTUAL DATA SUPPORTING THIS OBSERVATION. THESE DATA MUST BE IN SUFFICIENT DETAIL TO ASSIST CONTRACTING OFFICERS IN SELECTING CONTRACTORS THAT HAVE DEMONSTRATED OUTSTANDING QUALITY OF WORK AND RELIABILITY. *(Continue on separate sheet, if needed.)*

14. EXPLANATION OF UNSATISFACTORY EVALUATION - FOR EACH UNSATISFACTORY ELEMENT, PROVIDE FACTS CONCERNING SPECIFIC EVENTS OR ACTIONS TO JUSTIFY THE EVALUATION *(e.g., extent of Government inspection required, rework required, subcontracting, cooperation of contractor, quality of workmen and adequacy of equipment)*. THESE DATA MUST BE IN SUFFICIENT DETAIL TO ASSIST CONTRACTING OFFICERS IN DETERMINING THE CONTRACTOR'S RESPONSIBILITY. *(Continue on separate sheet, if needed.)*

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(WHEN COMPLETED)

STANDARD FORM 1420 BACK (10-83)

Figure 2-12 (Continued)
SF-1420, Performance Evaluation, Construction Contracts

FINAL CONSTRUCTION REPORT

Project PRA-COLO 1D40,E13
Colonial National Historical Park

I. PROJECT DESCRIPTION

A. Project Number - Project PRA-COLO 1D40,E13 was located on the Colonial Parkway in James City County, Virginia.

B. Description of Work - The project consisted of the following work:
Rehabilitation and reconstruction of reinforced concrete pavement, rehabilitation of one bridge, grading, drainage, base, hot asphaltic concrete pavement, and other work.

C. Environmental Considerations - The Environmental Assessment was completed by the National Park Service in June 1989 with a Finding of No Significant Impact. It was determined by the National Park Service that the repair of the Colonial Parkway from Yorktown to Jamestown Island is a Categorical Exclusion.

The following permits were obtained for this project:

- A U.S. Army Corps of Engineers permit for temporary bridge support and falsework, dated July 19, 1992.

- A Stormwater Management And Sediment Erosion Control Permit from Virginia Department of Environment Quality, dated August 7, 1992.

- A Waterway Construction Permit from Virginia Department of Natural Resources, dated August 16, 1992.

II. PROJECT DATA

A. Specifications - Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-92.

B. Termini - The project began at State Route (S.R.) 199 and ended at the Jamestown Entrance Station.

C. Length - Parkway Mainline: 11.424 kilometers
Incidental Road Construction: 1.572 kilometers
Total: 12.996 kilometers

D. Width -

Parkway Mainline:

Concrete Slab Rehabilitation - 13.2 meter roadway

Figure 2-13

(9.0 meter concrete pavement, 2.1 meter shoulders).

S.R. 199 Ramps:

9.6 to 11.4 meter roadway (5.4 to 7.2 meter hot asphaltic concrete pavement, 2.1 meter shoulders).

E. Pavement Structure -

Parkway Mainline:

Concrete Slab Rehabilitation - 175 millimeters exposed aggregate reinforced portland cement concrete pavement.

Concrete Slab Reconstruction - Variable depth subbase (lightweight aggregate or crushed aggregate base), 175 millimeters exposed aggregate reinforced portland cement concrete pavement.

S.R. 199 Ramps:

Mill 50 millimeters existing asphalt pavement, place 50 millimeters hot asphaltic concrete pavement, Class C, grading D.

F. Structures -

Halfway Creek Bridge, BIP Structure No. 4290-022P, 259 meter concrete slab and girder bridge.

G. Contract Number and Date - DTFH71-92-C-00039, September 30, 1992

H. Contracting Officers -

Gary L. Klinedinst, Division Engineer
Donald W. Miller, Construction Engineer
Gary L. Brown, Construction Operations Engineer

I. Contract Bid Amount - $4,339,431.20

J. Engineer's Estimate - $4,400,000.00

K. Final Contract Amount - $5,253,290.55

L. Contract Time -

Notice To Proceed: November 18, 1992
Original Completion Date: June 8, 1994

Figure 2-13 (Continued)

Total Extensions Granted: 40 calendar days
Revised Completion Date: July 18, 1994
Date Substantially Complete: May 21, 1994
Date All Work Complete: May 30, 1994
Date Plant Establishment Complete: June 5, 1995
Stream Restriction Dates: March 1 - 31
Liquidated Damages Assessed: None

M. Contractor -

Central Atlantic Contractors, Inc. (Small Business)
P. O. Box A
Aberdeen, Maryland 21001

N. Subcontractors -

Henry S. Branscome, Inc. (Small Business)
Excavation, aggregate base, lightweight aggregate base, and asphalt paving

Bryant Contracting, Inc. (Small Business)
Bridge piles and structural concrete

Dalton Contracting, Inc. (DBE)
Concrete curb, paved waterways, stone masonry

Clinton Painting (WBE)
Bridge structural painting

Shores Safety Co. (Small Business)
Steel backed timber guardrail and signs

O. Construction Engineering Costs -

FLH CE Costs	$ 239,136
CI Costs	$ 74,560
Total Costs	$ 313,696
% of Final Contract Amount	6.0 %

P. Maintaining Agency - National Park Service, Colonial National Historical Park

III. CONSTRUCTION

A. Materials -

Item 30101 Aggregate Base, Grading C or D
Gradation: Virginia Gradation 21A

Figure 2-13 (Continued)

Supplied by Luck Stone, Boscobel, Richmond, Virginia.
L. A. Abrasion - 19.4 %
Sodium Sulfate Soundness Loss - 1.32 %
CBR - 98
Bulk Specific Gravity - 2.562
Modified Proctor Density - 2413 kilograms per cubic meter
Average Field Density - 2340 kilograms per cubic meter (96.9 %)
Final Pay Factor - 1.04

Item 30101A Aggregate Base, Lightweight Aggregate
Supplied by the Solite Corporation, Richmond, Virginia.
L. A. Abrasion - 32.8 % to 38.1 %
Sodium Sulfate Soundness Loss - 6.5 % to 7.25 %

Item 40101CD Hot Asphalt Concrete Pavement, Class C, Grading D
Asphalt cement was Grade AC-20, supplied by the Amoco Oil Company, Savannah,Georgia. Asphalt cement properties:
Specific Gravity @ 25 degrees C - 1.031
Penetration @ 25 degrees C - 71
Kinematic Viscosity @ 135 degrees C - 365 square millimeters per second
Absolute Viscosity @ 60 degrees C - 180 pascal seconds
Average Asphalt Content - 5.15 %

Aggregates were No. 8 crushed gravel and No. 10 screenings supplied by Luck Stone, Boscobel, Richmond, Virginia.
No. 8 Crushed Gravel
Bulk Specific Gravity - 2.548
L. A. Abrasion - 41.9 %
Sodium Sulfate Soundness Loss - 0.82 %
No. 10 Screenings:
Bulk Specific Gravity - 2.627
Sand Equivalent - 69
Sodium Sulfate Soundness Loss - 3.31 %

Asphalt mix properties:
Average Asphalt Content - 5.15 %
Maximum Theoretical Density - 2465 kilograms per cubic meter
Average Field Density - 2324 kilograms per cubic meter (94.3 %)
Final Pay Factor - 1.03.

Items 50101P Reinforced PCC Pavement and 50103P RPCC Pavement Patch
Concrete supplied by Custom Concrete Co., Williamsburg, Virginia.
Cement, Type I/II - Lehigh Portland Cement Co., Union Bridge, Maryland.
Fly Ash, Class F - Monex Resources, Inc., Belews Creek Plant, Walnut Cove, North Carolina.

Figure 2-13 (Continued)

Fine Aggregate, Natural Sand - Custom Sand & Gravel, Providence Forge, Virginia.
Coarse Aggregate, No. 57 and No. 3 - Sadler Materials Corporation, Sandston, Virginia.
Water, Private Well - Custom Concrete, Williamsburg, Virginia.
Air Entraining, MB-VR Concentrated - Master Builders, Inc.,Cleveland, Ohio.
Water Reducer, LL 960 - Master Builders, Inc., Cleveland, Ohio.
Average Compressive Strength - 22.00 megapascals
Final Pay Factor - 0.98

Item 55213 Seal Concrete Surface

Sealer and stain for the bridge concrete surface was Hydro-Shield Stain manufactured by Horsey-Set Products. Supplied by Robson Downes Associates, Inc., Oxford, Maryland.

Item 60201 Pipe Culverts

Reinforced concrete pipe culverts supplied by Empire Sales, Inc., Hampton, Virginia.

Item 61701H Guardrail System SBTB

Timber supplied by Taylor-Ramsey Corporation, Blackstone, Virginia.
Steel supplied by Elderlee, Inc., Oaks Corner, New York.

B. Experimental or New Features -

See special report titled "Use of Lightweight Aggregate (Solite) in Roadway Embankments" included elsewhere in this report.

C. Changes & Problems -

1. Changes

Contract Modification No. 1 provided for a 0.3 meter grade revision from Station 6+658 to 6+878 to avoid a potential problem with surging high tidewaters. his contract modification also deleted the removal of slabs 139 through143 because no grade change was originally indicated and the problem with standing water could be eliminated by grading the high shoulders to drain. Net decrease of $ 51,433.

Contract Modification No. 2 provided for removal of concrete pavement slabs encountered below existing pavement slabs, excavation, installation of underdrain and lightweight aggregate from slabs No. 171 to 173. Net increase of $ 33,619.

Contract Modification No. 3 provided for the removal and replacement of approximately 9.8 meters of 600 mm reinforced concrete pipe and headwall found broken beneath slab No. 111. Net increase of $ 9,956.

Figure 2-13 (Continued)

Contract Modification No. 4 provided for the removal and replacement of Belgian Blocks in the median island between slabs No. 700(a) and 700(b) and between slabs No. 608, 609,and 583, 584 at the request of the National Park Service. Net increase of $ 19,000.

Contract Modification No. 5 provided for an increase in the final quantity for the contract item 555(9), Clean and Paint Structural Steel (Final Quantity). This item was increased by 55 square meters due to field measurement. Net increase of $ 5,292.

Contract Modification No. 6 finalized the quantity of concrete patches under Item 502(13). It also granted the agreed time extension and additional costs due to this overrun. Net increase of $ 551,546 and 10 calendar days.

Contract Modification No. 7 provided for an equitable adjustment in the total cost for Item 202(7AB) Removal of Concrete (Bridges) due to an overrun in the contract quantity. Net increase of $ 8,391.

Contract Modification No. 8 provided compensation under the DBE/WBE Subcontracting Compensation Clause. Total payment was $ 56,243 and 30 calendar days.

2. Problems

a. Sounding of the concrete adjacent to the transverse slab joints using a chain-drag identified additional deteriorated concrete which doubled the Concrete Patching item quantity thereby considerably increasing the contract cost and requiring a time extension to complete this work.

b. The transverse construction joints required bushhammering and epoxy bonding of the full depth sawcut joint face. In most cases this did not adequately bond the new concrete patch to the existing slab and these joints have opened.

c. Concrete piling in steel shells was used underneath the approach slabs at Powhatan Creek and Mill Creek Bridges. Estimated length of piles was 12 meters to obtain a bearing of 177 kilonewtons. It actually required 24 meters to obtain minimum bearing.

d. See problems with use of lightweight aggregate indicated in the separate report.

D. Recommendations -

1. All concrete joint areas and bridge decks should be sounded prior to determining the extent of work. For 18 meter slab joints, it is recommended that all lanes at a transverse joint patch be removed and replaced such that the third (middle) joint can be eliminated.

2. A concrete paving machine should not be used to finish exposed aggregate

Figure 2-13 (Continued)

concrete due to the rollers forcing the aggregate down into the concrete every time the rollers change direction. This leaves dents and streaks in the finished surface. Recommend stating this in the contract to make potential bidders aware of this problem.

E. Claims -

There were no claims on this contract.

IV. CONSTRUCTION ENGINEERING

A. Project Personnel -

Raymond Hatten, Project Engineer
William Fisher, Inspector

B. Contract Inspection -

Two Contract Inspectors (two Level II Inspectors) were provided by KCI, Inc. One worked as the office person. The other was assigned to inspect the bridge rehabilitation operations.

C. Other Contacts -

Roy Bigelow, Park Engineer, Colonial National Historical Park
Harry Sloat, Section Chief, Roads & Trails, Denver Service Center
John Haines, Landscape Architect, Denver Service Center

D. Partnering -

Formal partnering allowed a good relationship to be maintained between all stakeholders and resulted in no claims on this contract. The partnering workshop and two subsequent partnering meetings were facilitated by Dr. Jay Sullivan of Performance Training Corporation.

Figure 2-13 (Continued)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Program

Records Transmittal

Certified Mail No. _____

File: _____

State: _____ Date _____

Route: _____

Project: _____

FROM:

TO:

FILE NUMBER	DESCRIPTION	STATION TO STATION

Please acknowledge receipt by signing and returning 1 copy of this transmittal.

RECEIVED BY: _____

DATE: _____

DATE RECORDS WILL BE RETURNED: _____ BY: _____

Figure 2-15
Records Transmittal Form

CHAPTER 3 - CONTRACT MODIFICATIONS

CONTENTS

FIGURES

CONTRACT MODIFICATIONS

3-1 INTRODUCTION

3-1.1 General

The contract documents for a Federal Lands Highway construction project are intended to contain sufficient information for completing the work. When changes are necessary however, a contract modification (CM) is required.

The authority for the Government to order, recognize, or agree to a CM is contained in the Federal Acquisition Regulation (FAR). (FAR 43.101 defines *contract modification* as any written change in the terms of the contract.) Appropriate clauses from the FAR that are required for a construction contract are incorporated or referenced in the contract. The FAR, together with the Transportation Acquisition Regulation (TAR) contain the regulatory policies and procedures that govern the preparation and issuance of CM's.

Since a CM is a legal change to the Contract and often commits the Government to making additional payments, it must be executed (approved and signed) by a warranted Contracting Officer (CO). Any preparatory work, including discussions with the Contractor, which the Project Engineer performs in connection with a CM, should be under the authority of a warranted CO. The Contractor should also be clearly advised that a warranted CO must ultimately approve any CM.

In Federal contracts, the Government has broad authority to make changes to the contract. The Contractor has the right to an equitable adjustment (for both contract time and money) for changes ordered by the Government, as well as for deviations from the conditions represented in the Contract, whether or not a change is acknowledged. The CM is the contractual mechanism for both making changes and for authorizing an equitable adjustment. When a CM is issued without agreement on the equitable adjustment, that is called a *unilateral* change. When there is agreement by both parties the change is *bilateral*.

If there is a disagreement concerning a CM, the contractor is required to proceed with the work required by the CM as long as the work is within the scope of the Contract. The Contractor may however, dispute (to the courts if necessary), the amount of the equitable adjustment. It is FLH policy to always attempt to negotiate an equitable adjustment before or during the work covered by the CM.

CM's should only be used as necessary to complete a project to serve its intended purpose. All CM's should be within the general scope and terms of the contract.

3-1.2 Ripple or Cumulative Effects

Unilateral CM's contain risk to the Government, especially since the future effects of a modification cannot be readily identified when the CM is prepared. A CM that may seem insignificant when issued could cause a ripple effect that results in a major impact on project cost or the time required for completion. Claims are often the result of a CM that was thought to be insignificant when issued.

The cumulative effects of many small insignificant CM's can also be the basis for delays and claims.

3-1.3 Contract Scope

A unilateral change outside the general scope is a potential breach of contract by the Government and may be deemed nonenforceable.

The Supreme Court has defined general scope as *what should be regarded as fairly and reasonably within the contemplation of the parties when the contract was entered into*.

The *term beyond the general scope* includes work separate and distinct from the original concept of the contract, such as alterations that would require the contractor to make major changes in his methods, equipment, materials, or labor; or require it to have substantially more financial resources or experience than expected by the terms of the original contract.

The following are examples of work that could be considered beyond the general scope of a contract:

- A change of pavement type or the addition, elimination, or change in type of a major structure.

- Changes in plans that would shift a substantial part of the work into top-ographical, geological, or traffic conditions that are markedly different from those within the original, as-bid contract documents.

- Major construction operations necessitated in the repair of extensive damage such as that caused by abnormally severe floods or other catastrophes.

A CM for work outside the original scope of the contract must be a bilateral CM. The contractor's agreement must be obtained for the CM, and a justification for a procurement with other than full and open competition may be required in accordance with FAR Subpart 6.3 and the TAR Subpart 1206.3. Higher approval authorities and other enhanced paperwork requirements may also be necessary.

3-1.4 Lines of Communication

Keeping the next level of supervision fully informed of all developments, disputes, and contract interpretations, is absolutely basic to good contract administration, and the Project Engineer should always keep the COE fully informed. The Division may also require that the cooperating agency (owner agency) of the facility under construction be kept informed of all proposed CM's.

3-1.5 Incorporation of Other Documents

Contract documents relating to the proposed or anticipated change-FAR contract clauses, special contract requirements, plans, and standard specifications-should be carefully read. Care should be taken not to wrongly read information from other documents, reports, manuals (such as this Construction Manual) and recommendations, as being a part of the Contract. If a clause, requirement, item of work, etc., is not clearly referenced or included in the Contract documents, it is not a part of the Contract.

3-1.6 Unclear Specifications

A difference of opinion with the Contractor over the meaning of a specification may precipitate a dispute. The Contractor has a right to make a reasonable interpretation of Contract requirements and base its bid on that interpretation. If , during construction, the Project Engineer interprets the contract differently, a dispute may ensue and the Contractor may ultimately be entitled to an equitable adjustment if the Project Engineer's interpretation is later deemed unreasonable considering the specific requirements of the Contract. This is called a *constructive change order* (see Section 3-5). When the contract is ambiguous (or conflicts exist within the specifications) and more than one interpretation is reasonable, the Contractor may still be entitled to an equitable adjustment.

The Contractor has a right to clear direction from the Contract but is also obligated by the contract to bring errors and omissions to the attention of the Government.

The Coordination of Contract Documents in Subsection 104.04 of the FP is intended to be used to resolve conflicting requirements. This Subsection lists the order of precedence of the contract documents beginning with the Contract Clauses (i.e., the FAR and TAR) then the Special Contract Requirements, followed by the Plans, and Standard Specifications. However, the Project Engineer should discuss conflicts with the COE before invoking this clause, since both the Contractor's rights, and the Government's needs may transcend this listing; and therefore it is seldom used to resolve conflicts.

3-1.7 Documentation

Documentation concerning disputed work which relates to, or may result in a CM is essential. Refer to Chapter 2 of this manual for procedural details; however, documentation is emphasized here because its importance cannot be over stated. Photographs, diary entries of discussions, memos to the file or COE, video tape, actual cost records, inspector's reports, etc., are invaluable when later trying to determine the limits of liability.

It is very important to document all costs and time related to questioned, protested, or controversial work done by the Contractor. Normal inspector's reports can be insufficient documentation, unless the costs (labor, equipment, materials) used for the protested work can be segregated from other work. This segregation of costs can be difficult, especially if other work is underway, but it should be done as accurately as possible.

Normal reports should be supplemented with actual cost records, diary entries, photos, file notes, etc. Separating costs during the work phase is much preferred. An attempt to separate costs on completed work is very difficult.

3-1.8 Timely CM Issuance

It is always desirable that a written CM be issued before the work required by the CM is allowed to begin, even if that means the CM is issued while the amount of equitable adjustment is still unresolved. There may be occasions when it is in the Government's interest to allow the work to begin prior to the issuance of the CM. However, the CO with the authority to approve the CM should issue a letter or unilateral CM specifying the work required and establishing a limit on cost. This should be followed as quickly as possible by a definitized (cost agreed to), bilateral CM.

The most common reason that work is allowed to proceed before a written CM is issued, is that Government liability continually grows during a period of delay while the CM is being negotiated and finalized.

The FAR requires an assurance that funds are available before any CM work is started.

3-1.9 The Equitable Adjustment

For purposes of this manual, an equitable adjustment is the settlement with the contractor for the effects of a CM that altered the cost of, or time required for completing the work in a contract. An equitable adjustment usually consists of additional payment to the contractor, but can also involve other revisions of contract provisions, such as the following:

- A deduction in payment (a saving to the Government),
- A change in the contract time or completion date,
- A modification of material or other quality requirements, and
- A revision of restrictions on the method or manner of work.

An equitable adjustment is intended to leave the Contractor (financially and otherwise) where it would have been, but for the event which caused the change or CM. In the end, the determination is often made through compromise, personal judgement based on available information, and other influencing factors, only a part of which consists of hard documented costs.

A claim may result when a mutually agreed equitable adjustment cannot be reached. In some situations, the courts finally determine the amount of the equitable adjustment.

3-2 TYPES OF CM's

FAR 43.103 describes the various types and functions of CM's. The following are summaries on the various types and uses of CM's.

3-2.1 Supplemental Agreement (Bilateral CM)

The supplemental agreement is the preferred CM and most often used on FLH construction projects. This type of CM is issued bilaterally; that is, both the Contractor and the Government sign the document to mutually agree to all conditions of the CM. The equitable adjustment - a change in the contract price, time, and/or some other aspect - is also agreed to.

A contractor's statement of release (similar to that shown in FAR 43.204) should be included in a supplemental agreement. The statement releases the Government from any subsequent claims and confirms that all elements of the modification within the supplemental agreement have been addressed and resolved. The following is an example release statement:

> *By signature below, the Contractor agrees that payment and time adjustments as provided herein release the Government from any and all liability under this Contract for further compensation or adjustments relating to this modification.*

A. Follow-up Supplemental Agreements

A follow-up supplemental agreement is used to make an agreed equitable adjustment resulting from a previously issued change order. This supplemental agreement is required when agreement cannot be initially reached and a unilateral CM (change order) is issued.

B. Supplemental Agreements Pursuant to Other Clauses

Most supplemental agreements result from situations discussed in Section 3-5, Changes Clause (FAR 52.243-4), however the following are examples of agreements pursuant to other clauses:

- a supplemental agreement accepting a contractor's proposal under the Value Engineering Clause (FAR 52.248-3), and
- a supplemental agreement for an agreed time extension under the Suspension of Work Clause (FAR 52.242-14), or the Default Clause (FAR 52.249-10).

3-2.2 Change Order (Unilateral CM)

CM's can be issued unilaterally (i.e., without the contractor's agreement). A follow-up supplemental agreement is normally required.

Unilateral CM's can only be issued if permitted by a FAR clause, the most common of which is the Changes Clause (FAR 52.243-4). Other clauses which permit unilateral CM's include the Suspension of Work Clause (FAR 52.242-14) and the Differing Site Conditions Clause (FAR 52.236-2).

3-2.3 Administrative Change Orders

Some unilateral CM's are made for information or *housekeeping* purposes such as to correct an address or change an account number; or to document changes to the contract that do not impact the right of the Contractor such as to increase funding to cover routine quantity overruns. These kinds of changes are made with administrative change orders.

3-2.4 Credit CM's

A change or differing site condition may occur that decreases the contractor's costs to perform the work. In such cases the Government should initiate a CM to provide an equitable adjustment - usually consisting of a price reduction or credit. The Project Engineer should discuss such situations with the COE.

3-2.5 No-Cost CM's

A CM is necessary if the modification is of any magnitude, even if the price variation is

negligible. A major reason to prepare a no-cost CM is to document the Contractor's agreement. Examples could be a no-cost CM to modify an aggregate gradation, to change the grade of asphalt, or to change the point or method of acceptance, when it is agreed with the Contractor that no change in cost would occur.

If the agreement is not documented, a *no-cost* change can later become a claim.

3-3 APPROVAL AUTHORITY AND DELEGATION

3-3.1 Chief of Contracting Office (COCO)

The Chief of Contracting Office (COCO) is the Federal Lands Highway Program Administrator, Federal Lands Highway Office, Washington, DC.

As defined in FAR 2.101, the COCO has the overall responsibility for managing the contracting activities of Federal Lands, including the appointment of Contracting Officers.

3-3.2. Contracting Officer

The Contracting Officer (CO) is an FLH employee with the authority to enter into, administer, and/or terminate contracts. Many Contracting Officer functions are typically delegated to different Division personnel depending on their nature. However expending additional contract funds or changing a contract are not delegable, and therefore must be authorized by a CO. The COE may be a Contracting Officer with respect to most CM's, but may not be a CO with respect to major contract awards or settling claims.

From FAR 43.102:

> *(a) Only Contracting Officers acting within the scope of their authority are empowered to execute contract modifications on behalf of the Government. Other Government personnel shall not--*
>
> *(1) Execute contract modifications;*
>
> *(2) Act in such a manner as to cause the contractor to believe that they have authority to bind the Government; or*
>
> *(3) Direct or encourage the contractor to perform work that should be the subject of a contract modification.*

From FAR 43.202

> *Change orders shall be issued by the contracting officer except when authority is delegated to an Administrative Contracting Officer.*

And from FAR 2.101

> *The term [CO] includes authorized representatives [delegant] of the contracting officer acting within the limits of their authority as delegated by the Contracting Officer.*

FAR, Subparts 42.2 and 42.3, prescribes the policies and procedures for the CO's assignment of contract administration responsibilities to a delegant, such as the Construction Engineer, Claims Specialist, COE and Project Engineer.

3-3.3 Contracting Officer's Technical Representative (COTR)

The TAR authorizes the FLH to designate a Contracting Officer's Technical Representative to be the onsite contact person for the Contract, to represent the cooperating agency in dealings with the Contractor and to generally verify that the work performed meets the requirements of the Contract. That person is generally the Project Engineer.

In FLH, the Project Engineer is usually a subordinate of a Contracting Officer (the COE) and therefore may be delegated certain functions in assisting the CO in fulfilling his/her functions. An example might be in facilitating the negotiation of a CM. However the Project Engineer, unless he/she is a warranted CO, may not be delegated the authority to sign any document or otherwise commit the Government as a CO.

3-3.4 Division Delegations

Each Division has a written delegations of authority for approving CM's as well as other CO functions. Authority is predicated on the employee having a Contracting Officer Warrant issued by the Chief of the Contracting Office (COCO), who in FLH is the Federal Lands Highway Program Administrator. For

construction the Division Engineer, and the Division Procurement Specialist are delegated the highest levels of CO authority. The Construction Engineer, and the COE each in turn normally are delegated lower levels of CO authority.

The Project Engineer may be delegated support and verification functions, but not functions specifically reserved for CO's. The delegations should state the relevant contractual actions, maximum monetary contractual amounts, and other authorities of the delegant. They also may state any required administrative concurrences, input and consultations from other offices within the Division. The delegations will also typically address how the issue of funds availability is handled, i.e. who has the authority to certify that funds are available, which is essential for any CM which will necessitate additional funding. A summary of delegations relevant to the administration of a given construction contract is provided to the Contractor after award.

3-3.5 Focus on COE

The COE is normally the CO responsible for all routine contract administration functions. All proposed and potential CM's must be discussed with the COE. Keeping the COE informed is necessary because he/she is responsible for the commitment of additional funds. Additionally, he/she may need to discuss the CM with the relevant offices within the Division such as Project Development, Geotechnical, Contract Administration or Materials, and the owner agency. The COE must also obtain, or verify the availability of necessary funding.

The COE will also keep the Construction Engineer informed of all problem CM's; if not directly, then through summaries or trip reports. If a CM is outside the COE's delegated authority, the COE will need to ensure that the CO with authority for the change is kept informed and is comfortable with the CM.

3-3.6 Administrative/Technical Concurrences

Administrative delegations of authority might require consultations or concurrences from appropriate Division offices prior to the issuance of some types of CM's. Written documentation of consultations and concurrences is important, especially telephone or other verbal means, and should include names, dates, and a summary of the discussion. None of these delegations is related to CO authority or who signs the CM.

3-4 INITIATION OF CM's

Regardless of who proposes a modification, the proposed CM should be discussed with the COE prior to any detailed discussions with the Contractor. The Project Engineer should not acknowledge any change, differing site condition, delay, etc., to the Contractor prior to discussing the situation with the COE.

3-4.1 CM's Initiated by FLH

Throughout the construction of a project FLH engineers and technicians often see elements of the work that could perhaps be improved by a modification. CM's can be generated from the project staff's personal preference, past experience, opinion and *engineering judgement* concerning the end product and the methods used by the Contractor.

Although it is not always in the Government's interest, some CM's originate from the viewpoint that while the Contractor is on the site, it is in the Government's interest to do everything possible to improve the project. Most CM's proposed by the project staff are well intended and stem from FLH engineers and technicians wanting to do an excellent job. Some of these modifications are essential and should be pursued with a CM. However the FAR's and FLH policy discourage and put severe limitations on unnecessary modifications. The COE will therefore be very reluctant to approve CM's that are not clearly necessary to deliver a project meeting the needs of the customer.

3-4.2 CM's for Design Changes

Often CM's on construction projects originate because actual field conditions differ from those anticipated during the design. The differing condition or physical feature is usually not apparent until final staking or until the work begins. The required design changes are usually discovered by the project staff, but can also be identified by the Design, Geotechnical, Environmental, Materials, or Bridge offices within the Division. These modifications are often related to existing field conditions such as roadway alignment or soil conditions.

An office in the division or headquarters may also request a change and may therefore provide the necessary data for the CM. It is also appropriate for the COE to request the relevant office provide a modified design or assistance, based on new field data provided from the project site.

Prior to making any modifications, the COE or Project Engineer should check with the source of the original contract requirement, such as the Project Development or Materials office if practical to do so. Proposed safety related modifications such as changes in side slopes, intersections, guardrails, drop-offs, etc., should always be discussed with the COE.

3-4.3 CM's Requested by the Owner Agency

CM's are frequently requested by the cooperating Federal agency that is responsible for the land on which the project is being constructed (such as the National Park Service or U.S. Forest Service) or occasionally by the organization responsible for the maintenance of the highway following construction (referred to as the owner agency in this chapter).

FHWA has inter-agency agreements with the owner agencies concerning the administration of funds for the construction project.

An owner agency may have a designated representative responsible for coordination during the construction of the project. Requests for modifications should be submitted in writing from the owner-agency representative to the Division Engineer or the appropriate office designated to handle owner-agency requests.

When owner-agency requests are made directly to the Project Engineer, he or she should maintain a cordial and professional relationship with owner-agency personnel; the Project Engineer should consult the COE in regards to the requests.

Owner-agency requests should be evaluated technically, administratively, and contractually. The technical evaluation should address any

impact on the work, any extension of the completion date, cost, availability of funds, and potential claims.

3-4.4 CM's Requested by the Contractor

Modifications that require a CM may also be requested or proposed in writing by the Contractor. Contractor-requested CM's fall into one of the following six categories:

A. Substitution of alternate equipment, materials or processes specifically required by the contract.

FAR 52.236-5(a) states the following:

> *The contractor may at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in the contract.*

Proposals or requests from the Contractor for the use of materials or construction methods other than specified in the contract should be carefully evaluated. The Project Engineer, with support from the COE and appropriate division office staff, should evaluate the request and decide if the substitution should be approved. The evaluation should consider the following:

- The effect of the CM on the progress or completion of the work.
- Owner-agency concurrence, especially if the appearance of the completed work and/or maintenance costs may be affected.
- Designers intent. Is there a particular or *not obvious* reason for the original requirement?
- Cost. If a substantial savings is involved, the proposal should be processed under the Value Engineering clause (FAR 52.248-3).
- Risk of future maintenance and/or operating problems.

B. A Contractor initiated Value Engineering Change Proposal (VECP).

(See FAR Clause 52.248-3.) VECP's are formally submitted by the contractor to decrease the cost of a project, or the time required to complete it. The VECP must not:

- impair any essential functions or characteristics (such as life, reliability, economy of operations and ease of maintenance); or
- modify necessary standardized features (such as signing, lane width and safety features).

It is the policy of FLH to encourage VECP's. Project personnel should encourage and support VECP's and expedite their review and approval process. A CM for the acceptance of a VECP would normally be a supplemental agreement. However, FAR 52.248(e)(3) allows the CO to accept a VECP, in whole or in part, and to order the contractor to proceed with the VECP, even though an agreement on the price reduction has not been reached. This seldom happens because the risk of being accused of bad faith would obviously be substantial if the Government unilaterally imposed a change on the Contractor which was the Contractor's idea in the first place.

C. A price adjustment for acceptance of work or material which does not conform to the contract requirements.

(See FAR Clause 52.246-12.) The category does not include work accepted at a pay factor less than 1.00 in accordance with an acceptance plan specified in the Contract. Otherwise, the Contractor should be required to acknowledge the nonconforming material or work in writing, prior to, or as a part of, its acceptance by a CM.

D. A differing site condition or constructive change which has not been acknowledged by the Government.

(See FAR Clauses 52.236-2 and 52.243-4, and Sections 3-5 and 3-6 in this chapter.)

E. A proposal for an equitable adjustment to a unilateral change order.

(See FAR Clause 52.236-4 and Section 3-6 of this chapter.)

F. A request for an extension of contract time.

This type of CM is usually done in conjunction with D.or E., above, but it can also be done under the Suspension of Work Clause (FAR 52.242-14) or paragraph (b) of the Default Clause (FAR 52.249-10). (See section 3-8 in this chapter for further discussion on contract time.)

3-4.5 Claim Settlement by CM

From FAR 33.204

> *It is the Government's policy to try to resolve all contractual issues by mutual agreement at the CO level.*

A prudent effort should be made to achieve an early settlement of a dispute at the Project Engineer/COE level, prior to the Contractor's submission of a formal claim to the senior CO. Claims are settled by a supplemental agreement (bilateral CM) with similar support data and preparation as for any CM.

3-5 THE CHANGES CLAUSE

The Changes Clause (FAR Clause 52.243-4) allows for modifications to the Contract. This clause is one of the most important in a construction contract and serves as an *umbrella* authority under which the vast majority of CM's are executed.

3-5.1 Authority for Change

Paragraph (a) of the Changes Clause establishes the authority for the CO to make modifications to work within the general scope of the Contract. The CM must be in writing and must be designated as being a change order. The Changes Clause does not allow the CO to change to the following:

- Contract clauses which are matters of regulation and not related to the physical work, such as FAR Clauses; or

- Work outside the general scope of the contract.

The four broad categories of changes stated within paragraph (a) of the Changes Clause cover most aspects of a project. The clause allows for the extension of contract time due to the change, and paragraph (a)(4) allows for the directed acceleration of the work; but the clause does not deal with other types of delays or suspensions. These other types of time-related actions are covered, as appropriate, by the Suspension of Work Clause (FAR 52.212-12) or the Default Clause (FAR 52.249-10).

3-5.2 Constructive Changes

Paragraph (b) of the Changes Clause addresses the constructive or *unintentional* change order. The constructive change order can be verbal or written, (letters, faxes, reports, etc.). The effect of the communication is what is important; it is construed by the Contractor from the conduct of FLH personnel with real or apparent authority.

A constructive change order can be initiated by the action or inactions of the Government without realization or acknowledgment that an order was issued. An example of this situation could be overzealous inspector who requires subgrade tolerances which are later deemed to have been in excess of those required by the Contract or prevailing industry standards. The inspector could be considered as having issued a constructive change order.

A 1968 Board of Contract Appeals decision discusses the constructive change as follows:

> *The government's representative, by his words or deeds, must require the contractor to perform work which is not a necessary part of his contract. This is something which differs from advice, comment, suggestions or opinions which the government engineering or technical personnel frequently offer to the contractor's employees.*

Many constructive changes arise from differing interpretations of the plans and specifications or from the Project Engineer's insistence on a certain method for the Contractor to use to do the work. This does not mean that opinions, advice, or comments cannot be given to the Contractor. Good communication and frequent contact with the Contractor in regards to the project is necessary and encouraged.

Care should be taken to avoid the constructive change, but also the Project Engineer should be firm with the Contractor when the Government's intent has been established.

Although it should be used sparingly, paragraph (b) of the Changes clause does allow for immediately ordering work in an emergency situation, such as the protection of life or property.

A. Required Notice

Paragraph (b) of the Changes Clause requires the Contractor to give written notice of any constructive change. The notice should state:

- the date, circumstances, and source of the order; and

- that the Contractor regards the order to be a change order.

If the Contractor fails to make the required notice, recovery of costs is usually denied; providing the Government was somehow harmed (prejudiced) by the lack of notice, and was otherwise unaware of the situation.

There are a number of cases where a claim was denied as the Government was unaware of a change or differing site condition and no notice was received from the contractor.

Once an unintentional change order (i.e., a order not meeting the requirements of paragraph (a) of the Changes Clause) is issued, or notice has been received from the Contractor (written or oral), of an alleged constructive change, it is imperative that the COE be notified and that detailed documentation (actual cost type records) be kept of the work in question.

B. Time Limit on Costs

Paragraph (d) limits the costs to be considered under a constructive change to only those costs incurred 20 days prior to the Contractor submitting the notice required by paragraph (b). This 20-day limit on costs would more likely be applied to the constructive order which was unknowingly issued than to the situation where an order was knowingly issued. The exception to the 20-day limit on incurred costs is a claim concerning a defective specification.

3-5.3 Proposal Requirement

Paragraph (e) of the Changes clause requires the Contractor to submit a proposal for an equitable adjustment within 30 days after receipt of a unilateral change order, or within 30 days following their notification to the Engineer of the receipt of a constructive change order. This requirement has not been generally supported by the Courts, as it is the Government's burden to show that it was prejudiced (harmed) by the untimely submission of the proposal.

3-5.4 Impact and Ripple Effects

Paragraph (d) of the Changes Clause grants the Contractor or Government the right to an equitable adjustment (in money and/or time) if a CM increases or decreases the cost of (or time required for) the performance of any part of the work, whether or not changed by an order. A change ordered by a CM can indirectly affect other aspects of a project. Effects of this type should be recognized in the equitable adjustment of the CM. Note that these indirect effects can sometimes ripple (*snowball*) into additional costs and delays that exceed the expectations of the original CM.

The overall impact of each CM on all parts of the entire project (whether directly changed or not) should be carefully considered prior to its issuance.

3-6 DIFFERING SITE CONDITIONS

The Differing Site Conditions Clause (FAR 52.236-2) allows the Contractor to make assumptions with the understanding that if materially different conditions of an unusual nature are encountered that affect performance, an equitable adjustment will be made. The Government assumes the risk of a differing site condition to protect the bidder from possible financial loss. In turn, the Government usually receives lower bid prices.

Most CM's initiated by the Government are undertaken to change some feature of the plans or specifications to meet the existing field conditions; however, these conditions are seldom considered a differing site condition and the CM's are normally accomplished under the Changes Clause. Reference to the Differing Site Conditions Clause would more likely come from the Contractor, and many of the responses to these allegations are addressed under the Changes Clause.

3-6.1 Prompt Notice Requirement

The requirement in paragraph (a) of the Differing Site Conditions Clause for prompt notice by the contractor and a prompt investigation by the CO is of particular importance. A prompt investigation allows the Government to analyze the condition at the site, in its undisturbed state, and to make appropriate modifications. The following are two examples of modifications allowed through a prompt notice and investigation:

- Changing the profile or alignment of the roadway to avoid an unsuitable soil condition.
- Redesigning a footing or eliminating piles, if rock was encountered instead of an expected soil.

A prompt investigation is necessary to minimize the Government's liability for any costs and delays, and to protect the Contractor's rights with respect to the conditions actually encountered.

3-6.2 Physical Conditions

The Differing Site Conditions Clause addresses only physical conditions. The physical condition can be natural or man-made. The condition must differ *materially* - which is a judgement and can lead to disagreements. The COE should be informed as soon as the Contractor makes a written or verbal notification of a differing site condition.

Economic, political non-site related conditions that differ are not considered under this clause. Examples of differing conditions that should not be considered under the Differing Site Conditions Clause are:

- an increase in labor costs due to a change in wage rates or other construction in the area,
- a change in the local government so that existing regulations (e.g., load limits) were more strictly enforced,
- a change to a more critical or strict inspector (as long as the inspection standards applied are consistent with the Contract.).

A. Weather

Unusually severe weather conditions (such as excessive rainfall, snow, drought, and hurricanes) often justify an excusable delay - time extension only (FAR 52.249-10). The courts, have generally ruled these situations do not fall in the category of differing site conditions. An exception has been when a subsurface condition, such as the water table, is materially changed by long term weather conditions.

B. The Site

The condition must also exist at the site - not only within the bounds of the project limits but also including any designated sources in the Contract, such as borrow pits, quarries, supply sites, etc.

3-6.3 Ripple Effect

The differing Site Conditions Clause contains

language similar to the Changes Clause concerning the indirect effects of the CM that affect other aspects of a project. The indirect affects of this type should be addressed in the equitable adjustment to avoid later claims for possible ripple or snowball effects.

3-6.4 Two Types of Differing Site Conditions

The Clause recognizes two general categories of Differing Site Conditions.

A. Type 1--Differing Site Conditions

> *Subsurface or latent physical conditions at the site which differ materially from those indicated in the contract.*

Differing site conditions falling under the Type 1 category are those normally encountered on construction projects. The conditions are not limited to those underground (subsurface). Latent conditions are any that are not evident and that are materially different from the conditions represented or implied in the Contract documents.

Below are examples of possible Type 1 differing site conditions:

- Encountering rock or water at a substantially different level than indicated by the boring logs.
- Finding utilities or foundations in areas indicated in the contract as being clear of these.
- Encountering a large quantity of unsuitable material in a designated borrow pit when the plans showed a minimum of this material.
- Finding the actual elevations of the existing ground substantially lower or higher than those shown on the plans (a latent condition).
- Encountering rock in an excavation when no rock, substantially less rock, or substantially harder or softer rock was indicated by the boring logs included in the contract documents.

In deciding whether a differing site condition should fall under a Type 1 category, the existing condition is compared to the condition depicted in the Contract documents. If the Contract makes no representations directly or indirectly, concerning the condition, a Type 1 differing site condition cannot exist (provided the Government had no prior or superior knowledge of the condition. See below.).

B. Type 2--Differing Site Conditions

> *Unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and [which are] generally recognized as [inherent] in work of the character provided for in the Contract.*

The Type 2 differing site condition is established differently from the Type 1. In Type 2, the condition encountered is not compared to the condition represented by the Contract documents. Instead, a situation must have the following characteristics for it to fall under the Type 2 category:

- Unknown [to either party] conditions.
- Unusual conditions.
- Materially different and not ordinarily encountered conditions.

Establishing a condition to be *unknown, unusual, differing materially and not ordinarily encountered* is usually very difficult; therefore, few CM's are prepared under this portion of the clause.

3-6.5 Superior Knowledge

The doctrine of superior knowledge means that information regarding the performance of the work which is not available from other sources but is known to the Government, should not be withheld from the Contractor. This doctrine does not apply to some existing feature that is readily visible or available for inspection. The doctrine of superior knowledge means that where there is

superior knowledge on the part of the Government, the Contractor does not necessarily have to show that the condition is unusual, or not normally encountered in order to be entitled to an equitable adjustment. In extreme cases the Government can be found to have breached the Contract.

3-7 CM's UNDER OTHER CONTRACT CLAUSES

The previous two sections described the Changes Clause (FAR 52.243-4) which is the basis for the majority of CM's, and by the Differing Site Conditions Clause (FAR 52.236-2) or the two in combination. The following describes FAR clauses which less frequently can be the basis of a CM:

3-7.1 Variation in Estimated Quantity Clause (FAR 52.211-18).

This clause entitles either the Government or the Contractor to request an equitable adjustment if a contract item overruns or underruns by 15% or more. The adjustment covers only the quantities exceeding the 15% overrun or underrun. That is, the contractor must absorb costs up to that point. The clause also permits the Contractor to request a time extension for the quantity variation.

If the variation results from a change or differing site condition then those clauses (FAR 52.243-4 or FAR 52.236-2) would take precedence and the equitable adjustment should be computed under one of them. The principal difference would be that the entire overrun or underrun would be considered, not just the amount over 15%.

It is the burden of the party invoking the clause to present the cost data supporting the equitable adjustment. That is, if it is the Government which wants a contract price reduction it must generate the data supporting it. It is not permissible to simply demand that the Contractor *justify* a high bid price when an item overruns. For this reason it is not recommended that the Government routinely invoke the clause unless potential benefits are significant - say $5000 or more per incident.

The following guidelines and examples are based on a traditional understanding of the principle of equity. However, in recent years the courts have been inconsistent in their rulings. Because of the difficulty in predicting an outcome to litigation, all requests and disputes under the clause should be negotiated with the Contractor.

The equitable adjustment should be computed as a lump sum after quantities for the item are final.

It is usually easier to deal with *net* costs, i.e. the contractor's cost less what has been, or would be paid under the Contract.

An equitable adjustment to the Contractor for an overrun would occur when the Contractor underbid the item, or incurred significant additional costs as a result of the overrun. A equitable adjustment to the Government for an overrun would occur when the Contractor overbid the item, or had significant fixed or startup costs included in the bid quantity, which were not incurred with respect to the overrun quantity.

An equitable adjustment to the Contractor for an underrun would normally occur when the Contractor has large fixed or startup expenses that are then unabsorbed as a result of the underrun. *There are no conditions which would result in a equitable adjustment to the Government for an underrun*.

Documentation of the proposed equitable adjustment should follow this process:

(1) Computation of the contractor's fixed and unit costs including reasonable overhead and profit. Overhead should be the audited or certified overhead rate. Profit should be negotiated in the approximate 0% to 10% range depending on the Contractor's profit on the rest of the work and its efficiency in managing costs on this item. All costs must be verified as having been reasonably incurred.

(2) Computation of the Contractor's net costs that would have been associated with the item at a 15% overrun (or 15% underrun).

(3) Computation of the Contractor's net costs associated with the item at the actual overrun (or underrun) greater than 15%.

(4) Verify that the costs are reasonable and that they have been incurred.

(5) Equitable Adjustment -

Overruns - For an adjustment in favor of the contractor **(3)** must be greater than **(2)**. For an adjustment in favor of the Government **(2)** must be greater than **(3)**. The equitable adjustment is **(3)** minus **(2)**.

Underruns - **(3)** must be a positive value, greater than **(2)**. The equitable adjustment in favor of the contractor is **(3)** minus **(2)**, but not more than **(3)** if **(2)** is negative.

Example #1 - Overrun (Contractor Initiated)

(1) Cost Data -

Contract Quantity : 5000 Units
Contract Bid : $ 4.50/Unit
Actual Quantity : 7000 Units
Actual Cost: $ 7.00/Unit

(2) Net costs @ 15% overrun -

5000 x 1.15 = 5750 Units
Cost - 5750 x $7.00 = $ 40,250
Pay - 5750 x $4.50 (25,875)
Net Costs = $ 14,375

(3) Net costs @ actual overrun -

Cost - 7000 x $7.00 = $ 49,000
Pay - 7000 x $4.50 (31,500)
Net Costs = $ 17,500

(4) Verify that costs are reasonable and that they have been incurred.

(5) Equitable Adjustment $17,500
- 14,375
$ 3,125

Example #2 - Overrun (Government Initiated)

(1) Cost Data -

Contract Quantity : 5,000 Units
Contract Bid : $15.00/Unit
Actual Quantity : 7,000 Units
Actual Cost: $3.00/Unit

(2) Costs @ 15% overrun -

5,000 x 1.15 = 5,750 Units
Cost - 5,750 x $3.00 = $ 17,250
Pay - 5,750 x $15.00 = (86,250)
Net(Profit)= $(69,000)

(3) Net costs @ actual overrun -

Cost - 7000 x $3.00 = $ 21,000
Pay - 7000 x $15.00 = (105,000)
Net(Profit)= $(84,000)

(4) Verify Costs

(5) Equitable Adjustment $(84,000)
-(69,000)
$(15,000)

A negative adjustment indicates payment to the Government.

Example #3 - Underrun (Contractor Initiated)

(1) Cost Data -

Contract Quantity: 5000 Units
Contract Bid: $4.50/Unit
Actual Quantity: 2000 Units
Actual Cost (Startup) $10,000
Actual Cost (Unit) $2.25/Unit

(2) Cost @ 15% Underrun -

5000 x 0.85 = 4250 Units
Startup Cost = $10,000.00
Unit Cost 4250 x $2.25 = $ 9,562.50
Pay - 4250 x $4.50 (19,125.00)
Net Costs = $ 437.50

(3) Net Costs @ Actual Underrun -

Startup Cost = $10,000
Unit Cost 2000 x $2.25 = 4,500
Pay - 2000 x $4.50 = (9,000)
Net Costs = $ 5,500

(4) Verify Costs

(5) Equitable Adjustment $5,500.00

- 437.50

Difference $5,062.50

Example #4 - Underrun (Contractor Initiated)

(1) Cost Data -
Contract Quantity: 5000 Units
Contract Bid: $4.50/Unit
Actual Quantity: 2000 Units
Actual Cost (Startup): $5,000
Actual Cost (Unit): $2.25/Unit

(2) Cost @ 15% Underrun -

5000 x 0.85 = 4250 Units
Startup Cost = $ 5,000.00
Unit Cost 4250 x $2.25 = $ 9,562.50
Pay - 4250 x $4.50 ($19,125.00)
Net Costs = ($ 4,562.50)

(3) Net Costs @ Actual Underrun -

Startup Cost = $ 5,000.00
Unit Cost 2000 x $2.25 = 4,500.00
Pay - 2000 x $4.50 = ($ 9,000.00)
Net Costs = $ 500.00

(4) Verify Costs

(5) Equitable Adjustment $= 500.00

Equitable adjustment is (3) minus (2), but not more than (3) if (2) is negative.

3-7.2 Value Engineering Clause - (FAR 52.248-3)

This clause is used to accept a VECP where appropriate, as discussed earlier in this chapter.

3-7.3 Inspection of Construction Clause (FAR 52.246-12)

This clause is used to accept work, usually at a reduced price, which does not conform to the contract requirements. It does not apply to marginal work accepted at a reduced pay factor pursuant to a contract acceptance plan.

3-7.4 Time Extensions

A time extension is most often included in the CM as a part of the equitable adjustment due to the change or differing condition. This is call a *compensable time extension* because it is combined in the CM with payment for the Contractor's increased costs also associated with the change or differing site condition. See Section 3-6.

For a Government caused delay that extends beyond a reasonable period of time, which causes an increase in the cost of (or the time required for) performing any part of the work, a compensable time extension is possible under the Suspension of Work Clause (FAR 52.212-12). If the delay is *reasonable* depending on the circumstances, there is no compensation required.

A noncompensable time extension (one not combined with entitlement to money) can more commonly be provided under the Default Clause (FAR 52.249-10(b)(1)) for an unforeseeable delay which is neither caused by, nor resulted from, the negligence of the Government or the Contractor, subcontractors or suppliers. Unusually severe weather is a typical cause of a noncompensable time extension. Regardless of costs incurred by the Contractor during most unusual weather delays, they are not compensable by the Government.

3-8 CONTRACT TIME IN THE CM

See also Chapter 7, *Prosecution and Progress*.

3-8.1 Amount of Time in the Equitable Adjustment

A time extension can be included in the *equitable adjustment* allowed in a CM issued under the remedy/relief clauses of the contract, such as the Changes Clause or the Differing Site Conditions Clause. The extension granted by the CM would normally be the number of days the contract completion date is extended due to the modification.

An equitable extension of time is not necessarily the total number of days required to mobilize and complete the additional work required by the CM. If the contract completion date for the entire contract is not extended by the additional work, no time should be granted. (i.e., if the work added by the CM was completed concurrently with other *critical* contract work.)

The accepted construction schedule should be used to analyze the contractor's entitlement to a time extension, or at least not be inconsistent with that analysis. See Section 7-3. This is one reason the construction schedule must be kept up-to-date. CPM formatted schedules usually provide a more definitive analysis of time associated with a CM, than do bar charts. This is because CPM schedules, by definition identify the critical or controlling items.

It is preferable to settle time considerations when negotiating the CM before the work is done. However, if this is not possible, settlement of the time effects due to the change should be accomplished with a supplemental agreement as soon as possible.

The overall impact on the contract completion time due to a CM, delay, disruption or suspension is sometimes difficult to predict. Contractors, therefore, will often seek to defer a time settlement until after the additional work has been completed, or the entire Contract is nearing completion.

When negotiating contract time, the value of the time involved should be assumed to be represented by the liquidated damages or incentive/disincentive provisions of the Contract. Time extensions should not be given just to settle a dispute unless an analysis of the time and money issues supports the settlement.

3-8.2 Acceleration

Acceleration occurs when the Contractor is compelled by the Government to increase the production rate on the Contract work. Increased production is obtained from an increase in resources, such as equipment, materials, personnel and/or by extending the normal daily work period (i.e., work overtime or double-shift). Acceleration may be ordered due to the Government's desire to:

- complete the work in advance of the Contract completion date, or
- meet a planned completion date when additional time cannot be granted for additional work, changes or differing site conditions.

A. Directed Acceleration

The *Changes Clause (FAR 52.243-4(a)(4))* allows the CO to issue a CM to order an acceleration in the performance of the work.

A CM for directed acceleration should be executed in accordance with the Changes Clause and handled like any CM. The *equitable adjustment* to the Contractor usually consists of the additional costs required to increase production rates.

A CM for directed acceleration should be negotiated in advance with the Contractor as to precisely what actions will be taken and what kinds of costs will be incurred in the acceleration effort. It is not desirable to simply change the Contract completion date to some earlier date, or to simply order *acceleration*. Acceleration CM's are enforceable only to the extent the Contractor is able, but refuses to take the ordered or agreed on actions. They are generally not enforceable

through the liquidated damages or default provisions unless the Contractor specifically agrees to be subject to these provisions as a condition of the CM.

Although directed acceleration is uncommon, it should be considered when a project must be completed by a certain date, and Government is willing to pay extra in an attempt to make that happen. The following are two examples of situations where directed acceleration might be considered:

- To meet a critical schedule commitment for a multi-contract project (such as the completion of a necessary access road to begin a missile silo).

- To get the Contractor back on schedule instead of granting an entitled, but costly, time extension. For example, acceleration may be directed to minimize an anticipated ripple effect claim, or to avoid a costly winter shut down.

Directed acceleration, as with all contract time adjustments, should be discussed with the COE prior to discussing the possibility with the Contractor.

B. Constructive Acceleration

Constructive acceleration occurs when the Contractor is entitled to, but is not granted, a time extension and is therefore compelled to increase performance to meet the original completion date. If the Government fails to grant a time extension when in a timely manner, constructive acceleration can result. By not granting the entitled time the Government causes the Contractor to accelerate to complete performance in a shorter period of time than should contractually be required - usually resulting in a claim.

Constructive acceleration can occur even if the event causing the entitled time extension was not the Government's fault. It is not necessarily the cause of the entitled time extension, but the Government's failure to grant the time, that results in the Contractor's need to accelerate. For example, if an extension for an excusable delay due to abnormally heavy rain (which is not the fault of the Government) is not granted, constructive acceleration can result.

3-8.3 Unilateral Time Extensions

When agreement on an equitable adjustment in a CM cannot be reached, a CM ordering the work would normally be unilaterally issued (i.e., a change order). In addition to the price to be paid for the work, a unilateral CM can also be used to grant a time extension.

If a time extension is due the Contractor, it is usually prudent to promptly grant the extension and avoid the possibility of constructive acceleration. The time extension should be justified by an analysis of the contractor's schedule and the impact of the CM on the overall performance of the Contract.

The possibility of a constructive acceleration claim is usually not so serious as to warrant granting time extensions in marginal situations just to avoid a claim. If the Government is responsible for the event that resulted in the time extension the Contractor will usually make a claim for indirect or impact costs associated with the added time. These costs are typically much larger than acceleration costs due the Government's failure to grant a time extension.

3-8.4 Compensable Delays

CM's which grant time extensions for events which are the responsibility of the Government should address indirect and/or impact costs because the delay is a compensable delay.

Examples of costs associated with compensable delays are as follows:

- **Home office overhead**. For work associated with changes and differing site conditions, overhead is usually audited as a percentage of direct costs. However, for a delay or time extension that is lengthy compared to the work in the CM, however, the Contractor may

attempt to justify overhead on a daily rate basis. When a CM includes both added work (costs) and delay or extended performance associated with the same work, overhead costs should not be paid on both a percentage and daily rate basis. Costs used to establish the home office overhead rate can include home office rental, staff salaries, utilities, etc.

- **Field Supervision and Overhead**. These types of costs include salaries and vehicles of supervisory personnel at the project site, utility bills, site offices and laboratories, etc.

- **Equipment**. This type of cost includes standby costs for the Contractor's equipment on the site and idle due to the CM - even if the equipment is unrelated to the CM. The Contractor must show that it was the event precipitating the CM that caused the equipment to remain idle and on the site. The equipment rates used to compute the costs are generally the standby rates, unless additional operating time was required also by the CM.

- **Traffic Control**. This cost type includes additional costs for the increased period that traffic control is required due to the CM.

3-8.5 Excusable Delays

Delays which are not the fault or responsibility of the Government but are also due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor are excusable delays. Paragraph (b) of the Default Clause (FAR 52.249-10) addresses excusable delays. Below are the eleven examples of delay listed in the Default Clause which are normally considered excusable. (This list is not intended to be all inclusive.)

- Acts of God or of the public enemy.

- Acts of the Government in either its sovereign or contractual capacity.

- Acts of another contractor in the performance of a contract with the Government.

- Fires.

- Floods.

- Epidemics.

- Quarantine restrictions.

- Strikes.

- Freight embargoes.

- Unusually severe weather.

- Delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the contractor and the subcontractor or supplier.

A. No Impact Costs Under an Excusable Delay

A CM recognizing an excusable delay under the Default Clause, FAR 52.249-10(b), should grant only additional contract time. The clause does not provide for payment to the Contractor for costs resulting from the delay (including indirect or impact costs).

B. Required Notice for Excusable Delay

FAR 52.249-10(b)(2) requires that the Contractor, within 10 days from the beginning of any delay, notify the CO in writing of the cause(s) of the delay. Like most other notice requirement, in order to be enforced, the Government may be required to show that it was prejudiced by a lack of timely notice.

C. Acts of God and Weather Delays

Acts of God have been defined by the Comptroller General as follows:

> *...some inevitable accident which cannot be prevented by human care, skill, or foresight, but results from natural causes such as lightening, tempest, floods, and undulations.*

Delay due to a tornado, earthquake, abnormal drought or other natural disaster can be excusable.

If the weather is abnormally severe (as compared to the normal weather for the location and time of year) then a time extension can usually be granted. Normal weather, including rain, snow, drought, etc. is not considered an *Act of God* under the FAR. Averages, based on minimum of the last ten years of data, are often used as the comparison to establish extremes in weather. This data is typically compiled monthly. However, an analysis of long term or chronic bad weather should look at the entire period in question - or even the entire period of the Contract - since unusually good weather sometimes offsets unusually bad weather when extended periods are evaluated.

3-8.6 Government Suspensions of Work

The Suspension of Work Clause (FAR 52.212-12) also addresses delays. There are two types of suspensions of work which are (1) for the convenience of the Government, and (2) constructive suspension.

A. Suspensions for Convenience

Paragraph (a) of the clause allows the CO to suspend, delay or interrupt a Contractor's work for the convenience of the Government (i.e., a suspension for convenience). In return, the Government agrees to pay the Contractor for any increase in costs (excluding profit, but including impact costs) *if the suspension is for an unreasonable period*. That is, the delay is compensable as described in Subsection 3-8.4 except that profit is not allowed.

A suspension for convenience is seldom used since there are very few situations where the Government would suspend the Contractor's work. However, an example where it might be appropriate is a project where a decision to modify work currently underway is pending, and the Contractor must wait for the redesign.

B. Constructive Suspension

Paragraph (b) of the Suspension of Work Clause establishes the concept of the constructive suspension. If the CO's act or failure to act delays the work for an unreasonable period, the Contractor is entitled to any increase in costs due to the delay. The burden of proof is on the Contractor to show that the CO or delegant did something or failed to do something that caused an unreasonable delay, suspension, or interruption to the work that caused an increase in costs.

The following are examples of constructive suspensions:

- Unreasonable delay for the approval of shop drawings.
- Delay in issuing a CM for which the Contractor is waiting.
- Failure to investigate a differing site condition in a timely manner.

A Contractor is entitled to any additional attributable costs for the unreasonable portion of the delay under the Suspension of Works Clause. Profit is excluded; however, indirect or impact costs should be considered in the equitable adjustment of the CM prepared to settle the effects of the delay.

3-8.7 Responsibility for Delay

The basic factor for consideration in any delay situation is who was responsible for the event(s) that caused the delay.

A. Contractor's Responsibility

If the Contractor is responsible for the event(s) which caused the delay(s), or inexcusably falls behind schedule there is no relief under the Contract and the Government can demand increased performance (acceleration). (Reference FAR 52.236-15).

B. Third Party Responsibility

If a third party, which would include an Act of God or an extreme act of nature, is responsible for the event, an excusable delay would be appropriate under paragraph (b) of the Default Clause (FAR 52.249-10).

C. Concurrent Responsibility

If the Government and a third party are concurrently responsible for the delay, e.g. the Government is late with a falsework approval, but a flood prevents the Contractor from working on the falsework anyway, the Contractor would be entitled to a time extension for an excusable delay, and the Government may avoid responsibility for increased (delay) costs since they would have been incurred anyway.

If the Contractor and Government are concurrently responsible for the delay, through interwoven events such that the relative causes cannot be analyzed separately, then traditionally the same has been true, i.e. the Contractor has been entitled to a time extension, but no compensatory damages.

However, recently some courts are taking the view that damages resulting during such concurrent delays should be apportioned between the Government and the Contractor based on their relative responsibilities for the delays. Although advice from counsel should be sought before implementing this method, it could provide a means of resolving a dispute.

D. Government's Responsibility

If the Government is solely responsible for the event that caused the delay, the Contractor is entitled to a time extension if the time required to complete the contract is increased. (Such an event could be the discovery of a differing site condition or a defective specification.) The Contractor is also normally entitled to additional costs incurred due to the delay.

Delay costs can always include profit unless they are under the Suspension of Work clause (FAR 52.212-12). For this reason Contractors typically argue for a change or differing site condition delay rather than a constructive suspension.

When performing CM work (unless directed to accelerate) the Contractor is not automatically obligated to hire additional people, rent additional equipment, or otherwise *force* the CM work into the original progress schedule. For this reason, the schedule and resources for performing CM work should be negotiated as a part of the CM. Otherwise, a Contractor can decide to delay the performance of CM work until near the end of the contract if all labor and equipment is allocated to critical items of work. If the Government insists on the immediate performance of the CM work, the Contractor may elect to pull resources off critical work in order to expedite the CM work. This could entitle the Contractor to a time extension even if the CM work itself is not theoretically critical.

3-8.8 Events Not Warranting Time Extensions

The following are examples of events which usually do not entitle the Contractor to a time extension, even if the events result in poor progress and increase the time required to perform the contract:

- Late or inadequate submissions (job mixes, shop drawings, etc.).
- Insufficient equipment or other resources.
- Poor workmanship, incompetent personnel.
- Poor or incomplete scheduling.
- Supplier fails to deliver on time.
- Rainy weather when rainy weather is normal.
- Subcontractor leaves project for other work.

Note that the Contractor is responsible for the performance of the subcontractors and suppliers. Subcontractor's and supplier's delay must meet the same requirements as the Contractor in order to justify a time extension.

3-9 COSTS AND PRICES FOR A CM

It is the Government's policy to pay a fair and reasonable price for work resulting from the CM. Fair and reasonable is a concept subject to varying interpretations involving personal viewpoints based on past experience, existing conditions, data available and whether or not the person is the buyer (Government) or seller (Contractor).

3-9.1 Price and Cost

FAR 15.801 defines *price* as cost plus profit. A price simply includes everything in a single amount. The components of costs and profit are not separated. Only the single bottom line amount is considered, be it the contract price for an entire project, a lump-sum for a small or large amount of work, or an individual unit-price for an item of work.

FAR 31.201-3 defines *reasonable* in relationship to cost as follows:

> *A cost is reasonable if, in its nature and amount, it does not exceed that which would be incurred by a prudent person in the conduct of competitive business.*

Although a CM is not done under competitive conditions, this definition is often used to describe the concept of reasonable cost.

Two examples of costs (or prices) being unreasonable due to the nature of the cost are a proposal to use hand labor to excavate a footing instead of a backhoe or, a proposal to use six trucks when the loader being used can only handle three trucks.

An amount could be unreasonable even if the nature is acceptable. For example, if the use of a backhoe is being proposed however, the price requested for its use is considered excessive. This is the most common reason for judging a cost or price to be unreasonable.

A. Allowable Costs

A cost must be allowable. Part 31 of the FAR, Contract Cost Principles and Procedures, addresses allowable costs and is the reference whenever a cost is questionable. Certain costs, although reasonable as a business expense and incurred by the Contractor, are not allowed by law to be paid under a Government contract.

B. Allocable Costs

- A cost must be *allocable*. That is, the cost must be somehow connected to the performance of the contract (completion of the project) or necessary for the operation of the Contractor's company. Allocability is discussed in FAR, Part 31. Allocability is easily recognized for direct costs, such as labor and materials used on a project; but allocability becomes more difficult to recognize when dealing with indirect costs, such as supervision or overhead.

In summary, costs must be allowable (as defined in FAR Part 31), reasonable and allocable in order to be included in the CM.

3-9.2 Contractor's Cost or Pricing Data

The requirements for Contractor's cost and pricing data, are in FAR 15.804 and TAR 1215.804. These regulations, which are summarized below, precisely define cost or pricing data, require it to be *certified* as correct by the Contractor, and define the conditions under which it may or may not be required.

Note that in A.,B., and C. below, even when cost or pricing data is not required, the CO always has the discretion, delegable to COTR's including Project Engineers, to request and obtain noncertified documentation or information to support Contractor price proposals if the CO cannot otherwise make a determination of price reasonableness. From a practical standpoint this noncertified information may be very similar in complexity and scope to cost or pricing data.

A. CM's Greater than $500,000

Cost or pricing data is required from the Contractor if the CM involves an aggregate

amount greater than $500,000. The aggregate amount is the total of all added work plus the total of all eliminated work (see FAR 15.804-2) associated with a single change or event.

Certification of the cost or pricing data is required as soon as practical, after the prices are agreed to. See **Figure 3-13, Certificate of Current Cost or Pricing Data.** The cost or pricing data must be current. The certification is usually requested when the CM is sent to the Contractor for signature and is returned along with the signed CM. The format for the certification of current cost or pricing data is shown in FAR 15.804-4.

B. CM's Between $100,000 and $500,000

Cost or pricing data may be required from the Contractor, for CM's that involve an aggregate amount between $100,000 and $500,000 if the CO cannot make a determination of price reasonableness in accordance with the criteria in the FAR. Generally cost or pricing data is not required for commercial items and items which are priced competitively. (See FAR 15.804-1) If cost or pricing data is requested for CM's in this range, the reasons should be documented, and the request approved by the CO.

C. CM's Less than $100,000

Cost or pricing data may not be required for CM's under $100,000.

3-9.3 Methods of Payment

The method of payment for approximately 65 percent of FLH's CM's is by unit price. Often the unit prices used are the Contractor's unit bid prices included in the Contract. When adequate competition and quantities are present, and there are no indication of *unbalanced* bids, the prices obtained from the lowest responsive, responsible bidder can be considered fair and reasonable. However, not all unit bid prices reflect the cost plus a fair profit for completing the actual work required by a CM and should be appraised prior to their adoption in a CM.

A. Unit Prices

For items which may vary significantly in quantity, such as embankment, paving, or removal of unsuitable material, the unit price method of payment is preferred. Although the cost risk is shared between the Contractor and Government, the profit incentive for economy and efficiency should still exist.

B. Lump Sum

When quantities are fairly certain and not likely to vary, the preferred method of payment is by lump sum or firm fixed-price, as any cost risk is with the Contractor and the method contains the incentive of increased profit for the Contractor to complete the work efficiently and economically. There is also less documentation and no obligation for detailed measurement/-remeasurement of the work with this payment method.

C. Actual Cost

The method of payment least favored by the Government and often preferred by the Contractor, is by actual cost.

Profit for actual cost work should be negotiated as a fixed fee. The fixed fee is established at the time costs are estimated. The amount paid is the actual cost, plus the established fixed fee. When the profit fee is negotiated, since the risk factors to the Contractor are minimal, the fee should be in the 5 percent or less range, as a percentage of the estimated cost.

The actual cost payment method should only be used when it is not possible to accurately estimate the extent or duration of the work, or to anticipate costs with any reasonable degree of confidence; or when it is otherwise impossible to reach agreement and a unilateral CM is not desirable due to risk concerns.

The following are some of the kinds of problems encountered with actual cost:

- The Government assumes any risk and uncertainty in the work.

- The positive incentive to the Contractor for cost control or labor and equipment efficiency is removed.

- Increased surveillance or inspection by project staff is required.

- Increased expertise of the project staff is required to effectively monitor Contractor work processes.

- The administrative work load is increased with daily cost records, summaries, etc.

D. Retroactive or Post Work Pricing

This form of payment is done after the work is completed using records of actual costs to arrive at an agreed lump price. Typically this method is used to settle a dispute when the Government did not acknowledge liability for costs incurred until after the work was done. Retroactive pricing should be avoided if possible and done with care when necessity requires its use. The actual costs of a Contractor are not necessarily reasonable, especially if the Contractor has reason to believe that the Government will pay all of those costs. Also reported costs for the CM in question may not be effectively segregated from the costs of work already required as a part of the Contract.

The use of the Contractor's actual costs is discussed in FAR 31.201-3 as follows:

> *No presumption of reasonableness shall be attached to the incurrence of costs by a contractor*.

Also, the Contractor's risk in pricing the work is virtually eliminated by retroactive pricing; therefore, the profit paid should be minimal, such as less than 5 percent even with effective management and cost control.

E. Undefinitized (Unpriced) CM's

An undefinitized CM is a CM issued unilaterally with:

- A specific timetable for negotiation of price while the work is progressing.

- A not-to-exceed estimate of cost which is used to obligate funds for the CM.

FAR 43.102(b) states

> *Contract modifications, including changes that could be issued unilaterally, shall be priced before their execution if this can be done without adversely affecting the interest of the Government.*

In many cases, halting or impeding the Contractor's work until a CM is issued would adversely affect the Government's interests. However, the decision to allow work to begin on an undefinitized CM should be made by the CO with the authority to approve the definitization. When work is started on any unpriced CM detailed records (actual cost type) of the operations and incurred costs are absolutely necessary.

When work begins on an unpriced CM, the CO should establish a schedule with the Contractor for definitizing the CM. In order to encourage adherence to that schedule the CO may limit progress payments on the work until definitization is accomplished.

These procedures for unpriced CM's do not negate the obligation of the CO to be assured that funds are available for the estimated amount of the work. In extreme cases where for example, a differing site condition is impeding the remainder of the work, the authorization to proceed with the CM may have to be coupled with an intent to eliminate less critical work from the Contract in order that funds for the more critical CM work can be certified as available.

3-10 EQUIPMENT USE (RENTAL) RATES

There is no strict, unwavering equipment rate policy that will necessarily override all the other issues involved in negotiating a fair and reasonable agreement for a contract modification - either for extra work or to settle a dispute. All aspects of the modification, one of which is the estimate of equipment costs, should be collectively considered in the process.

3-10.1 Government Policy, FAR Part 31

If work which includes equipment is necessary, FAR Part 31, Contract Cost Principles and Procedures, Section 31.105 contains the Government's policy for the allowable ownership and operating costs (i.e., rental or use rates) for construction equipment. A summary of the FAR requirements are as follows:

- Equipment ownership and operation costs considered for payment should be in accordance with the cost principles within FAR Part 31.

- Actual costs to the Contractor for the ownership and operation of the equipment should be used if it is possible to determine the actual costs from the Contractor's records.

- If the Contractor's actual costs are used, the determination of those costs must be consistent with the requirements of FAR Part 31.

- When actual costs cannot be determined, the contracting agency (FLH Division office) may specify the use of a particular schedule of predetermined rates.

- If the predetermined rates do not consider costs of labor, mobilization, demobilization, or overhead and profit, additional payment may be necessary.

- If the predetermined rates contain elements which are obsolete or otherwise not applicable to the equipment in question, they shall be adjusted accordingly.

- Reasonable costs for the renting of construction equipment are allowable.

3-10.2 Implementation

The FLH's implementation of the FAR is accomplished by applying and supplementing FAR Section 31.105(d)(2) as follows:

- The predetermined schedule of construction equipment ownership and use rates is the Construction and Equipment Ownership and Operating Expense Schedule published by the United States Army Corps of Engineers for different geographical regions. This booklet and the rates it specifies are referred to as the *Corps Rates*.

- Personnel involved with the use of equipment ownership and operating rates should be familiar with the methodology used by the Corps to arrive at the rates. The initial chapters of the Corps Rates booklet contains this methodology.

- The Corps Rates do not include an overhead rate. Therefore, the contractor's actual overhead rate based on a recent audit report should be used.

- The Corps Rates do not include profit. Therefore, profit should be established, for the total CM, not just equipment in accordance with FAR Subpart 15.9.

- The standby allowance for owned equipment should be as shown in the Corps Rates book, not to exceed 8 hours in any 24 hour period and to be no more than 40 hours for a calendar-week period.

- Mobilization and demobilization costs are not included in the Corps Rates and therefore these costs may be considered for payment if the equipment is not available on the site. Payment of the applicable rate is appropriate for the hauling equipment plus the standby rate for the equipment being hauled to the

project and costs associated with any required assembly or disassembly of the equipment.

- The Corps Rates are based on the cost of diesel fuel, the current Treasury Department interest rate, age of the equipment, and other variables as noted within the booklet. If any existing condition is different than those assumed in establishing the rates, or if variables within the rates have changed significantly since they were last published, it may be necessary (and equitable) to adjust the rates. Adjustments to the rates should be based on the formulas, guidelines or adjustment tables within the Corps Rates booklet.

- If a piece of equipment is not shown within the Corps Rates booklet, a rate may be established as follows:

  (1) Use the rate for a similar piece of equipment.

  (2) Adjust the rate of a similar piece of equipment based on capacity, horsepower, size, etc.

  (3) Calculate a rate using the formulas and guidelines (methodology) contained in the Corps Rates booklet.

  (4) If the piece of equipment cannot be found in the Corps book, but can be found in another rate schedule such as the Blue Book or AGC Rate Book, establish a conversion factor based on similar equipment in both books, and compute an equivalent Corps rate for the piece in question using this factor. The use of rates directly from the Blue Book or other commercial schedule is not recommended unless the methodology for computing the rates is verified by Division office specialists as being consistent with FAR Part 31 requirements.

- Reasonable costs for the lease or rent of needed equipment from a commercial source are allowable. Supplier quotations or invoices are required to support costs for rented or leased equipment.

3-11 INDEPENDENT GOVERNMENT (ENGINEER'S) ESTIMATE (IGE)

An Independent Government Estimate (IGE), traditionally referred to in FLH as the *Engineer's Estimate* should be completed for all monetary CM's. The FAR, Section 36.203, only requires an IGE for CM's exceeding $25,000; however, an estimate should be prepared and recorded, at least informally, on all CM's. The level of detail should be commensurate with the complexity and value of the CM. The IGE should not be based on data furnished by the Contractor.

3-11.1 Estimate Data

An IGE can be based on prices that have previously been considered reasonable for similar work or established from known cost data and an awareness of the work required.

Data for the IGE could come from one or a combination of the following:

- Bid prices within the Contract or prices from other current, competitively bid contracts.
- Costs established from estimates of labor, equipment, materials, and amounts for overhead and profit (i.e., an actual cost analysis).
- Historical data (i.e., average bid prices).
- Quotations received from suppliers or other contractors.
- National averages or unit-prices from sources such as FHWA's *Price Trends for Federal-Aid Highway Construction, Engineering News Record,* or the *Means* or *Dodge* handbooks, can also be used to obtain *ball park* estimates or to ensure prices are within a reasonable range.

3-11.2 Adjustments to Data

The estimated prices obtained from any of these methods should also be adjusted for inflation, location, quantity, special conditions, trends, new technology, or any other information that could affect the Contractor's costs. The prices proposed by the unsuccessful bidders for the ongoing contract can also be useful for comparison purposes.

When using historical or comparable data the following should be considered and allowances made for any major differences.

- Were the prices obtained from full and open competition? Adequate competition is accepted as a method to produce fair and reasonable prices, but not sole source procurement.
- Are prices relatively current or do they need adjustment for inflation or other changes?
- Are similar quantities and specifications involved for those items being compared?
- Are overhead, profit, and other additions included in the prices?
- Is the project in a remote or special location such that costs are effected?

3-11.3 Compiled Estimates

FLH construction projects are often unique due to such elements as their location, aesthetic considerations, special features, terrain, environmental concerns, infrequency of work in some areas, and contractors unaccustomed to the FAR. Therefore, it is acknowledged that obtaining truly comparable prices is sometimes difficult. For these reasons, the IGE is often established from a combination of whatever data is available (e.g., known labor costs from the payrolls, the established unit bid prices, schedules of equipment use rates and estimates of production rates on equipment currently working on the project) plus an estimated amount for overhead and profit (e.g., 15 percent for overhead and 7 percent for profit).

3-11.4 Estimates from Unit-Prices

Often, unit bid prices can be proportioned or

interpolated to arrive at a reasonable estimate. Using half the unit price for half the thickness of the same material, such as for base course aggregates or asphalt pavement is an example. This method of proportioning unit prices has limited uses since the fixed costs in a material or item do not vary in relation to the thickness.

Sometimes adding or subtracting a price for the additional material or additional work to an existing unit price can be used. This method can often be used when the specification for an amount of a component material requires changing, such as the thickness of paint, type of geotextile fabric or cement type.

The estimated price should be likened to whatever comparable data is available, such as previously listed, to ensure the price is within the range of other reasonable prices and to highlight any inconsistencies.

3-11.5 Availability of Funds

Once the approximate monetary scope of a proposed CM is known, the COE should be notified for a preliminary verification that the required funding is or will be available. This early notification is needed because coordination with the Planning and Coordination office and possibly the funding agency could be necessary.

The CM might be based on, or limited to, the available funds. If funding is a problem, it is important to know before discussions and negotiation with the Contractor.

3-12 PRELIMINARY DISCUSSIONS AND PRICE PROPOSAL

The next or concurrent step to the preparation of the IGE (in the CM process) consists of introducing the proposed CM to the Contractor by means of the following two actions:

- Preliminary discussions concerning the CM and a field review of the work proposed by the CM are conducted with the Contractor.
- A pricing proposal for the CM is requested from the Contractor.

3-12.1 Preliminary Discussion and Field Review of the CM

With the consent of, or preferably in the presence of the COE, the Project Engineer should discuss and field review a proposed CM with the Contractor. These discussions are not negotiations and are not intended to compel the Contractor to accept any particular method to accomplish the work. The purpose of these discussions is to ensure the scope and intent of the CM is clearly understood by the Contractor, and to allow the Contractor to share its own ideas as to how best to accomplish the work.

The IGE should not be disclosed, and issues outside the Project Engineer's delegated authority should be discussed with the COE before being discussed with the Contractor.

Items for preliminary discussions with the Contractor might be

- scope and details of the CM,
- methods and manner of work to accomplish the CM,
- alternate materials or design revisions,
- time required for the CM work, or
- possible impact on the schedule.

3-12.2 Proposal Request to Contractor

A proposal should be requested from the Contractor for all CM's that involve price/cost changes. As this request usually initiates the CM process with respect to the Contractor, any relevant data that would assist the Contractor in the preparation of the proposal should be included. The proposal becomes a part of the basic documentation for pricing the CM.

3-12.3 Cost or Pricing Data Required

See Section 3-9.2. If the CM is estimated to cost more than $100,000 and cost or pricing data is required for all or part of the costs, the proposal must be submitted with an SF-1411 (**See Figure 3-12**) cover sheet, and in the format required by FAR 15.804-6.

3-12.4 Cost or Pricing Data Not Required

For CM's for which cost or pricing data is not required (See FAR 15.804-1) the format of the Contractor's proposal, including information other than cost or pricing data is flexible. The proposal must be sufficient for the CO to perform a price analysis (See FAR 15.805-2).

The Contractor's proposal should include sufficient information and detail for the CO to do the following:

- **Complete a Price Analysis** (i.e., a comparison with the IGE) or, if necessary, a cost analysis; **and**
- **Establish Prenegotiation Objectives, and**
- **Negotiate**

A. Marginally Complete Proposal

If the Contractor's proposal is only marginally complete, the Project Engineer may obtain the necessary clarification from discussions with the Contractor, or request clarification and additional information in writing. These discussions are not negotiations and the Contractor should be clearly so advised.

Following are possible topics for discussion with

the Contractor concerning a marginally complete proposal:

- Alternatives for doing the CM work more economically.
- Proposed price, labor, equipment, or materials which seem excessive or insufficient for the CM.
- Time or schedule problems in accomplishing the work.

If the Contractor wishes to modify the price proposal as a result of discussions, this should be noted in the files and considered during any negotiations or preparation of the CM.

It is permissible to consider revisions to the proposed CM if any relevant information is revealed in discussions or within the Contractor's proposal. The original IGE should be modified accordingly. Complex modifications to the proposal may necessitate and/or a written confirmation from the Contractor.

B. Proposal Containing Unreasonably High or Low Prices

When the Contractor's proposed price is judged to be significantly higher or less than fair and reasonable, the work should be discussed with the Contractor to ensure that no misunderstandings exist concerning the requirements of the CM. The definition of *significantly higher or lower* depends on numerous variables, such as the magnitude, location, and complexity of work; specialty items, techniques or capital investment required; or socioeconomic programs involved.

C. Incomplete Proposal

As discussed in FAR 36.402(b)(1), if the Contractor's proposal is incomplete or otherwise not sufficient for analysis, the Contractor should be advised of the insufficiency in writing. The Contractor should also be requested to supply the specific information concerning the elements of the proposal that differ significantly from the IGE.

Data other than cost or pricing data frequently requested from the Contractor due to an incomplete proposal are as follows:

1. Direct Costs

- **Materials** - Supplier quotations or paid invoices of previous transactions.
- **Labor** - Rates, fringes, etc., for all classifications of workers employed in the performance of the work related to the CM including a breakdown of payroll burden, such as FICA, FUTA, worker's compensation, insurance, etc.
- **Equipment rates** - A complete descriptive listing of equipment and data necessary to determine the equipment's ownership and/or operating costs. Vendor quotations are required to support costs for rented or leased equipment.
- **Other direct costs** - Bonds, mobilization, permits, demobilization, royalties, etc., require invoices, quotes or rates to support their costs.
- **Overhead** - Data on which the Contractor based overhead cost, such as a recent audit report. The overhead rate is usually applied to the direct costs allowed above. The prime contractor's overhead rate may be applied to subcontractor payments, provided it is an audited rate which was calculated to include subcontractor payments.
- **Subcontractor costs and profit** - Same support data as required of the contractor.

2. Other Data Frequently Requested

- **Production rates** - Hours of work required or projected for each labor classification and each piece of equipment.
- **Schedule** - Sufficient information and dates to demonstrate whether and to what extent the change will delay the contract.

D. Late or Reluctant Proposals

If the Contractor procrastinates in submitting the requested proposal or is reluctant to submit a proposal that seems reasonable, the issuance of a unilateral CM should be considered. Delays in issuing a CM, even when the Contractor is delaying the process, may result in additional liability to the Government due to delay (such as equipment standby costs or other impact from the CM on the existing schedule of work).

3-13 ANALYSIS AND NEGOTIATIONS

When a Contractor's proposal is complete as received or when sufficient data is eventually received, it should be reviewed and/or forwarded to the COE for review. Part of the review and evaluation is a cost or a price analysis to establish whether the prices proposed for inclusion in the CM are fair and reasonable.

3-13.1 Cost or Pricing Data Required

See Section 3-9.2. The use of the cost or pricing data from the Contractor's proposal is addressed in FAR 15.805-3. The FAR requires a cost analysis of the proposed prices when ever cost or pricing data is required.

A. Cost Analysis

A cost analysis must be performed when cost or pricing data has been requested from the Contractor, or when a price analysis cannot be used to judge that the proposed price is fair and reasonable.

From FAR 15.801

> *Cost analysis means the review and evaluation of the separate cost elements and proposed profit of (a) an offeror's or contractor's cost or pricing data or information other than cost or pricing data and (b) the judgmental factors applied in projecting from the data to the estimated costs in order to form an opinion on the degree to which the proposed costs represent what the cost of the contract should be, assuming reasonable economy and efficiency.*

A cost analysis is a review and evaluation of the following:

- Factual cost data obtained from the Contractor--verifiable from records, audits, etc. This is data, such as previously listed in this chapter as the cost or pricing data frequently requested from the Contractor to supplement a proposal (i.e., direct costs, such as for labor, materials; indirect costs, such as overhead rates, etc.).
- Judgments or projections (non-factual) made by the Contractor in estimating the future cost for the proposed items of work, such as anticipated productivity rates, an add-on for estimated inflation or an add-on for anticipated increase in labor.

B. Field Pricing Support

For CM's which exceed $500,000, field pricing support is required unless waived in accordance with agency procedures. For smaller CM's, the CO may request Field Pricing support to the extent necessary in accordance with FAR 15.805. Field pricing support may include, but is not limited to an audit. FAR 15.805-5 states:

> *Requests for field pricing support should be tailored to ask for minimum essential information needed to ensure a fair and reasonable price.*

C. Certification

Whenever cost or pricing data is required in accordance with the standards of FAR 15.804-6, a Certification of that data is (before execution of the CM) required in accordance with FAR 15.804-4. See **Figure 3-13, Certificate of Current Cost or Pricing Data.**

D. Price Analysis

A cost analysis should always be followed by a price analysis. That is, the final overall price including indirect costs and profit should be judged for reasonableness. See FAR 15.804-1(b)(iii).

When cost or pricing data is not required, or after the completion of cost analysis, a price analysis should be made to ensure that the overall price offered is fair and reasonable.

See FAR 15.805-2. A price analysis is the means to judge a price to be fair and reasonable without examining the details of the costs or profit which make up the price. Adequate independent data

(i.e., the engineer's estimate) or experience are necessary to judge if the proposed price is fair and reasonable.

For many CM's, a price analysis (i.e.,a comparison of the prices in the Contractor's proposal to the prices in the IGE.) is sufficient to determine if the proposed prices are fair and reasonable. If the proposed prices are not deemed fair and reasonable, negotiation should be considered.

Although it is not a FAR requirement, some form of breakdown may be necessary for a lump-sum price over $10,000. A simple division of the lump-sum price into two or more prices might be sufficient to judge them to be fair and reasonable.

E. Profit

From FAR 15.901

> *Both the Government and Contractors should be concerned with profit as a motivator of efficient and effective contract performance. Negotiations aimed merely at reducing prices by reducing profit, without proper recognition of the function of profit, are not in the Government's interest. Negotiation of extremely low profits, use of historical averages, or automatic application of predetermined percentages to total estimated costs do not provide proper motivation for optimum contract performance.*

Profit should be dependent on the risk involved (for work priced in advance), and the quality of management and cost control (for work priced after it is performed). Generally higher profit margins are used for advance pricing since risks are higher. The lower profits are used for post-work pricing. Profit is limited by statute to 10 percent for post-work pricing. See Subpart 3-10.4

3-13.2 Negotiations

The initial result of the review and evaluation of the Contractor's proposal that includes a cost and/or price analysis is either of the following:

- The proposal is reasonable and a supplemental agreement is issued.
- Negotiation is required.

Acceptance of proposed prices that originally seemed unreasonable sometimes happens when additional information, is considered during negotiations or review of the proposal.

Before or after negotiations, if the Contractor's proposed price is agreed to; but is significantly higher or lower than the IGE, the rationale for the agreement should be documented.

A. General

From FAR 15.803

> *Price negotiation is intended to permit the contracting officer and the offeror [Contractor] to agree on a fair and reasonable price. Price negotiation does not require that agreement be reached on every element of cost. Reasonable compromises may be necessary, and it may not be possible to negotiate a price that is in accord with all the contributing specialists' opinions or with the Contracting Officer's prenegotiation objective...*
>
> *...The Contracting Officer's primary concern is the price the Government actually pays; the contractor's eventual cost and profit or fee should be a secondary concern...*
>
> *...The Contracting Officer's objective is to negotiate a contract [supplemental agreement] of a type and with a price providing the contractor the greatest incentive for efficient and economical performance.*

The Government's negotiator should consider the following:

- The goal is to agree on a fair and reasonable price. For a price agreement, an accord on all cost elements is unnecessary.
- The primary concern is the price the Government pays (as compared to historical

prices, the IGE, etc.). The Contractor's cost and profit should be a secondary concern.

- A compromise may be necessary. Reconciliation of prenegotiation objectives, audit reports or other contributing inputs may not be achieved.

- The agreement should contain the incentive for the Contractor to exert an effort for an efficient and economical operation.

Successful negotiations, as with most facets of Government/Contractor relations, depend on genuine communication, mutual respect, cooperation, and an understanding of both parties interests.

B. Prenegotiation Objectives (FAR 15.807)

From FAR 15.807:

> *The contracting officer shall establish prenegotiation objectives before the negotiation of any pricing action. The scope and depth of the analysis supporting the objectives should be directly related to the dollar value, importance, and complexity of the pricing action.*

Prenegotiation objectives are the intended goals of the negotiations. The general prenegotiation objective is to reconcile difference between the Contractor's price proposal and the IGE so that an agreed price for the CM work can be reached. Any other significant objectives, such as Contract time effects, methods of work or price reductions on related work, should be established in preparation for the negotiations.

C. The Government's Negotiator

The Government may be represented by a CO with the delegated authority to approve the CM, or by someone with prenegotiation objectives and limits approved by the CO. Usually, the Government's negotiator is the Project Engineer, COE, Construction Engineer, or in some cases the Division Engineer. For the purposes of this chapter, the representative is called the *Government's Negotiator*.

The Contractor should be advised of the extent to which the Government's Negotiator has the necessary authority and intention to reach an agreement on the CM. If the Project Engineer is the Government's Negotiator, approval authority will be retained by the CO. The Contractor may have similar constraints on its representatives at the negotiations.

A negotiating session may be by telephone, but usually is done in person either by single negotiators from each party, or with the Project Engineer and COE facing equivalent Contractor personnel. For very large or complicated CM's, a team of negotiators may be appropriate.

D. Agenda for Negotiations

The agenda can play an important part in negotiations and should be prepared by the Government's Negotiator. Some negotiators will initially discuss non-controversial elements at the negotiations in order to create a climate of cooperation; others prefer to start by bringing up an issue where the Government has strength to create positive momentum. In any case, all elements of the CM should be clear to both parties, including the work involved, any unusual features or technicalities, time required for work, impact on existing schedule and estimated quantities.

The technical details and requirements of the CM should be understood prior to discussions on price, as usually the price would be dependent on the scope, specifications, and time effects.

E. New Information

During the negotiations, a new concept or additional information could be brought forth, which alters the basics of the prenegotiation objectives. The Government should review the new information, and, if additional time for study is required, the Contractor should be advised and negotiations rescheduled as appropriate. An

example of this situation might be a clarification which alters the Contractor's proposal, or undermines the assumptions on which the IGE was based.

From FAR 36.402:

> *If negotiations reveal errors in the Government estimate, the estimate shall be corrected and the changes shall be documented in the contract file.*

F. Memorandum of Negotiations (FAR 15.808)

At the conclusion of each negotiating session, the Government's Negotiator should document the session with a memorandum of the negotiations to the files to the CO, to become a part of the supporting documentation for the CM. The complexity of the memorandum will depend upon the nature of the CM and the negotiations. If cost or pricing data is required, Part 15 of the FAR should be reviewed for details of required documentation.

For most CM's, the memorandum of negotiations should list the following:

- The name, position, and organization of each person representing the Contractor and the Government in the negotiation.
- The results of the meeting, the agreements that were reached, the basis of these agreements, the remaining unresolved issues, and the understandings as to what should happen next.
- The technical, contractual, prices, and other notable aspects of the CM negotiated.
- The differences between the prenegotiation position and the final negotiated settlement, and the basis for those differences.
- The basis for determining the negotiated profit, if profit is negotiated separately.
- The extent to which the CO relied on cost or pricing data, if such were required.

3-13.3 Finalizing the CM

The CO has the sole responsibility for the final pricing decision and should review and approve all prices prior to any agreements with the Contractor. Input from all appropriate sources should be used as necessary to obtain, with or without negotiations, fair and reasonable prices. Regardless of the methods used, the end result often involves personal judgement and experience.

A. Partial Agreements

When only a portion of a CM can be agreed upon, a supplemental agreement should be prepared delineating the agreed elements. The elements not agreed can also be delineated and also any suggestions on how these outstanding elements might be settled. For example, the Contractor might be agreeable to the Government's proposed payment for the modification, but not to the proposed time effect. The resulting supplemental agreement should include the agreed price and defer the time settlement until the completion of the work.

B. No Agreement

If there is no agreement with the Contractor on a CM, the CO should consider:

- not proceeding with the CM,
- issuing the CM unilaterally (fixed price),
- issuing the CM unilaterally (undefinitized),or
- issuing the CM on an actual cost basis.

These options are discussed in Subsection 3-8.3.

3-14 COMPONENTS AND ASSEMBLY OF A CM

3-14.1 Components

The components of a CM (as furnished to the Contractor for signature) consist of the following:

- Contract Modification Form (Amendment of Solicitation/Modification of Contract, Standard Form 30),
- Continuation Sheet , and
- Plan sheets, details, specifications, drawings or other data required to clearly state the work required by the CM and the resulting equitable adjustment.
- Certification for Cost or Pricing Data if required

In addition to the above, the project file for the CM should contain the following:

- Administration Control Sheet (Optional if the Division requires a structured means of tracking CM preparation and non-contractual approvals.
- Procurement Request (Required by Transportation Acquisition Regulation).
- IGE and contract time assessment.
- Contractor's price proposal (Cost or Pricing Data if required).
- Field Pricing Report(s) if required.
- Evaluation of the proposal.
- Prenegotiation objectives.
- Records of negotiations.
- Correspondence concerning CM.
- Records of any relevant discussions or field reviews.

3-14.2 CM Form (Amendment of Solicitation/Modification of Contract, SF 30)

The Amendment of Solicitation/Modification of Contract, SF 30 when completed is the actual CM. (See **Figure 3-14**) This form is used for both change orders and supplemental agreements.

Block 1 CONTRACT ID CODE. Leave blank.

PAGE OF PAGES - Include only pages to be sent to the Contractor.

Block 2 AMENDMENT/MODIFICATION NUMBER. Enter four digit consecutive number assigned to each supplemental agreement, change order, and amendment. (e.g., "CM No. 0004". The words "Supplemental Agreement" or "Change Order" can also be used in block 2 to more closely define the type of modification being issued.

Block 3 EFFECTIVE DATE. Normally enter , See Block 16C."

Block 4 Not applicable. Leave blank.

Block 5 PROJECT NO. Enter the Project Number, such as NTP 3X2, ID FH 23(1).

Block 6 ISSUED BY. Enter the name and address of the appropriate FLH Division.

Block 7 ADMINISTERED BY. Leave blank.

Block 8 NAME AND ADDRESS OF CONTRACTOR. Enter Contractor name and address as shown on the contract.

Blocks 9A & 9B Not applicable.

Block 10A MODIFICATION OF CONTRACT/ ORDER. Enter the DOT Contract Number such as DTFH70-95-C-0123.

Block 10B DATE. Enter the Contract date.

Block 11 Not applicable.

Block 12 Use appropriate account number and include the net amount of the changes.

Block 13A Mark this block for a unilateral change order. Reference the appropriate FAR clause. (In most cases this will be the Changes Clause, FAR 52.243-4).

Block 13B Mark this block for a unilateral CM issued for an administrative change that does not require an equitable adjustment, or the Contractor's agreement.

Block 13C Mark this block for a supplemental agreement. With this type of CM, both the Contractor and Government have agreed to modify the pricing of the CM. The FAR reference is usually the Changes Clause, however, there are situations where another Contract clause is appropriate.

Block 13D This block is normally not used. If using this block seems appropriate, it should be discussed with the COE.

Block 13E Mark the *is not* block for change orders as change orders do not require the contractor's signature. Mark the *is required to sign this document and return ___ copies to the issuing office.* block for supplemental agreements and indicate the number of copies the Contractor is to sign and return to the project or Division office.

Block 14 DESCRIPTION OF AMENDMENT/MODIFICATION. Give a concise description of the modification and the effect on Contract time. If there is no effect on Contract time, it should be so stated. A release statement is included in all supplemental agreements and should be worded as shown in FAR 43.204 or as provided by the COE. If the CM is a change order, a release statement is not included; however, state that the Contractor's signature in Block 15B acknowledges receipt of the order. Use a continuation sheet if necessary.

Block 15A NAME AND TITLE OF SIGNER. The name and title of the person authorized to sign or receive a CM for the Contractor should be typed or printed in this block. This block is usually filled in by the Contractor but can also be filled in by the CO's staff if the name and title are known at the time the CM is being prepared.

Block 15B CONTRACTOR/OFFEROR. The person named in block 15A, the authorized representative of the Contractor, signs in this block to indicate agreement to a supplemental agreement. Change orders (CM's which the Contractor is not in agreement with) should be acknowledged by the Contractor as being received, although in hostile situations this is not required as long as the Engineer documents the files that the CM was in fact, delivered to the Contractor.

Block 15C DATE SIGNED. The person signing in block 15B enters the date signed.

Block 16A NAME AND TITLE OF CONTRACTING OFFICER. Enter the name of the Contracting Officer.

Block 16B UNITED STATES OF AMERICA BY. Signed by the Contracting Officer with authority to sign the size and type of CM indicated.

Block 16C DATE SIGNED. Enter the date the CM is signed by the CO for unilateral CM's , or both parties for bilateral CM's.

3-14.3 Continuation Sheet (Tabulation of Contract Changes)

A continuation sheet is used to summarize the contract item and dollar amount changes due to the CM. This form or an equivalent is required for CM's which include new items, changes in quantities, or changes in unit prices. All the items of work involved or affected by the CM should be listed separately as follows:

- **Decreased items**.
- **Increased items**.

- **Deleted items.** It is preferable not to unnecessarily delete items, and replace them with new, slightly changed item. A new item reflecting only the change is preferred to avoid giving a misleading indication of the size of the CM.

- **New items.**

- **Changed items** (changes in unit price).

For each item list the following:

- **Item number** (e.g., 20401, 40101).

- **Item Name** (e.g. Roadway excavation; or Hot asphalt concrete pavement, class___, grading___, class___pavement smoothness)

- **Quantity.** (i.e., the quantity changed, created, or otherwise affected by the CM).

- **Unit** (square meter, metric ton, etc.)

- **Unit Price or Lump Sum** (i.e., the contract price, agreed or unilaterally established price for the item).

- **Dollar Amount** (i.e., the product of the quantity and the unit price). For decreased or deleted items, the amount will be a negative value. The algebraic total of the amounts is the *Estimated Net Change in Probable Contract Amount as a Result of this CM*.

3-14.4 Administrative Control Sheet

The Administrative Control Sheet is an internal document used to document the sequence of preparation of the CM, as well as technical, administrative, or cooperating agency concurrences not required contractually, but required by Division procedures. It is attached to the front of the CM from initial preparation through approval but is detached prior to sending the CM to the Contractor. The use of, and format for the Administrative Control Sheet is optional with each Division.

3-14.5 Contract Modification Checklist

The following is a suggested checklist which may be used by the Division for CM quality control. It may also be incorporated into the Administrative Control Sheet. The checklist should be completed by the Project Engineer and/or COE. The CM checklists address the availability or completeness of the following elements:

- **Procurement Request** including documentation of funds availability.

- **Independent Government Estimate** and contract time assessment.

- **Contractor's Proposal**.

- **SF 1411, Cost or Pricing Data and Certification of Cost or Pricing Data**, if required.

- **Evaluation of Proposal** (a price or cost analysis).

- **SF 30, Amendment of Solicitation/Modification of Contract**.

- **Continuation Sheet - Tabulation of Contract Changes**.

- **Records of discussions, objectives, negotiations**

3-15 CM REVIEW

The Government generally requires full and open competition, and although FAR 6.001 waives competition requirements for CM's, any modification to an ongoing contract (since it is non-competitive) is subject to review and scrutiny.

3-15.1 Reasons for Review

CM procedures are reviewed and monitored for the following reasons:

- To determine the adequacy of management and internal controls over CM's,
- To determine reasons for the CM and eliminate a need for the same CM on future projects, and
- To determine contract growth generators to refine monetary controls and for budget purposes.

3-15.2 Audits of CM's and CM Procedure

Audits or reviews of CM procedures are periodically done by organization outside FLH, such as, the Office of the Inspector General (OIG), the Office of the Secretary of Transportation or FHWA Office of Contracts and Procurement.

The objective of these CM reviews is usually to determine the adequacy of management and internal controls over CM's to help prevent fraud, waste, and abuse. These reviews normally evaluate how effective CM procedures are.

3-15.3 Contract Growth

Contract growth is a measure additional funds required to complete a contract (project). A microcomputer system to store, sort, identify and monitor contract growth using CM's and other growth generators has been developed for use in the FLH Program. A data base program to analyze CM's is available which contains sufficient details to determine the reasons for any contract growth.

The input data sheet (data base form) for this program allows over 70 selections in areas such as reason for change, initiated by, agreement type, areas of work affected, and contractual effects. (See **Data Base Report, Figure 3-15**) This input data results in 25 pieces of information (data fields) concerning each CM available that can be sorted or combined as desired with all other CM's. The program can also include other growth generators, such as overruns, incentives and contingent sums.

3-16 FEEDBACK

Feedback concerning the causes of CM's from the construction staff to the project designers and other appropriate personnel is encouraged, and is necessary to evaluate and improve the FLH design/construct process. The FLH, Project Development and Design Manual, Volume 1, Chapter 11 is devoted to feedback and should be reviewed for further information.

3-16.1 Forms of Feedback

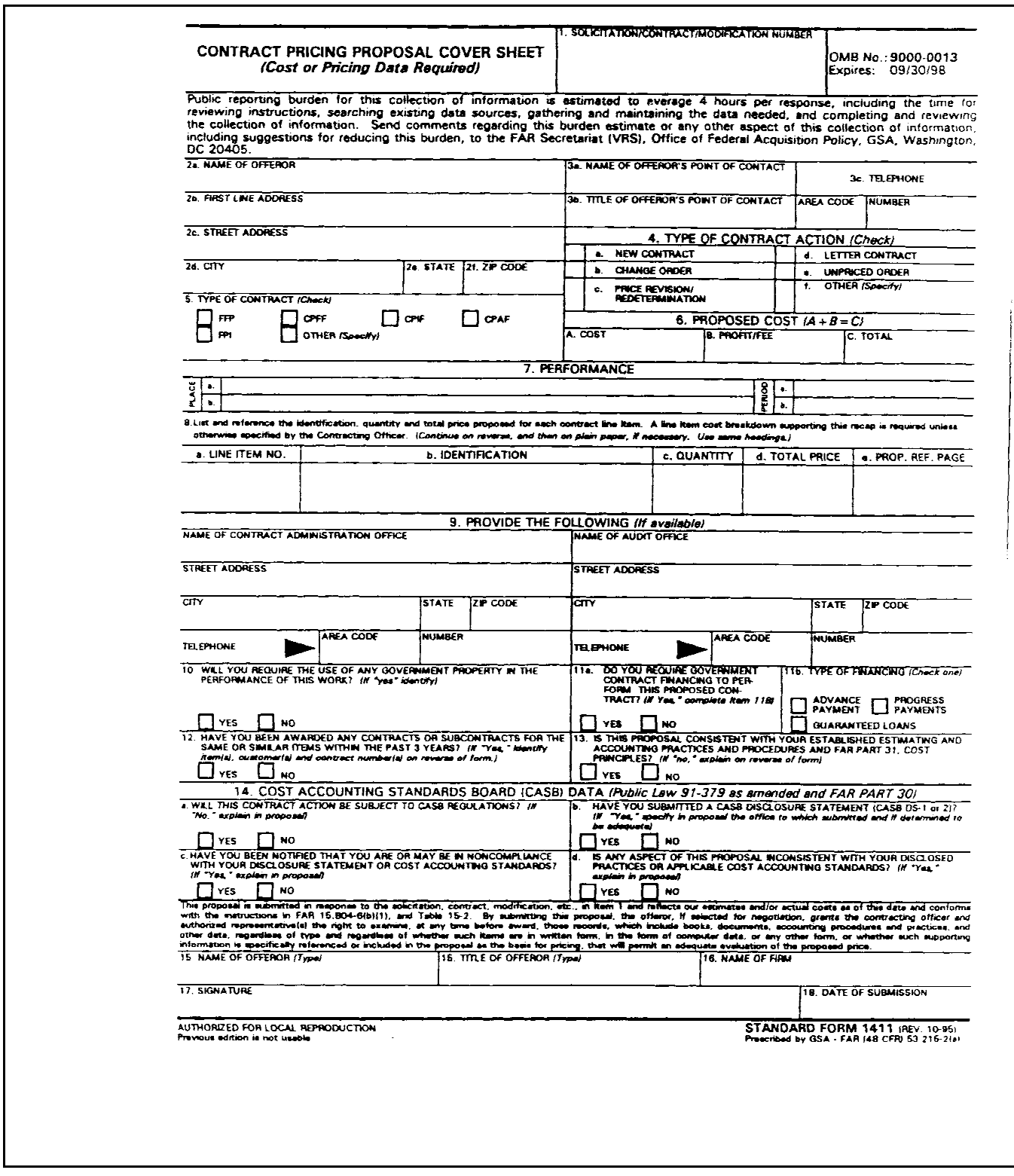
The feedback systems, in addition to the CM's themselves, range from informal communications, such as telephone calls, and *Minute Memos*, to field reviews and management reviews of CM procedures. Other feedback items are as follows:

- Trip reports from construction, materials, and design staff.
- Contractor claims and resulting evaluations and reports.
- Reviews of Contractor initiated Value Engineering Change Proposals (VECP's).
- Formal program management reviews or audits of CM's and CM procedures.
- Feedback form reports.
- Surveys and correspondence from owner or maintaining agencies, such as requests for modifications, post-construction problems, environmental concerns or commitments.

3-16.3 Feedback Report

At present, a feedback form is being used in the FLH Divisions. (**See Feedback Report, Figure 3-16**) Although the procedure might vary within the Divisions, the form is basically handled in the following manner:

1. The originator, usually the Project Engineer, states the problem with a recommended solution and sends the form to the COE.
2. The COE concurs and/comments on the proposal and forwards the form to the relevant offices. The form includes space for the appropriate offices to enter what process changes or other action was taken, or to add comments.
3. When the dissemination is complete, a copy of the completed form circulates back to the COE and the originator of the form.
4. The COE usually prepares a quarterly report of all feedback obtained and distributes it to the relevant offices, such as Materials or Project Development.



CONTRACT PRICING PROPOSAL COVER SHEET
(Cost or Pricing Data Required)

1. SOLICITATION/CONTRACT/MODIFICATION NUMBER

OMB No.: 9000-0013
Expires: 09/30/98

Public reporting burden for this collection of information is estimated to average 4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (VRS), Office of Federal Acquisition Policy, GSA, Washington, DC 20405.

2a. NAME OF OFFEROR
2b. FIRST LINE ADDRESS
2c. STREET ADDRESS
2d. CITY | 2e. STATE | 2f. ZIP CODE

3a. NAME OF OFFEROR'S POINT OF CONTACT
3b. TITLE OF OFFEROR'S POINT OF CONTACT
3c. TELEPHONE — AREA CODE | NUMBER

4. TYPE OF CONTRACT *(Check)*
- a. NEW CONTRACT
- b. CHANGE ORDER
- c. PRICE REVISION/ REDETERMINATION
- d. LETTER CONTRACT
- e. UNPRICED ORDER
- f. OTHER *(Specify)*

5. TYPE OF CONTRACT *(Check)*
- FFP
- FPI
- CPFF
- OTHER *(Specify)*
- CPIF
- CPAF

6. PROPOSED COST *(A + B = C)*

A. COST	B. PROFIT/FEE	C. TOTAL

7. PERFORMANCE

PLACE		PERIOD	
a.		a.	
b.		b.	

8. List and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this recap is required unless otherwise specified by the Contracting Officer. *(Continue on reverse, and then on plain paper, if necessary. Use same headings.)*

a. LINE ITEM NO.	b. IDENTIFICATION	c. QUANTITY	d. TOTAL PRICE	e. PROP. REF. PAGE

9. PROVIDE THE FOLLOWING *(If available)*

NAME OF CONTRACT ADMINISTRATION OFFICE
STREET ADDRESS
CITY | STATE | ZIP CODE
TELEPHONE — AREA CODE | NUMBER

NAME OF AUDIT OFFICE
STREET ADDRESS
CITY | STATE | ZIP CODE
TELEPHONE — AREA CODE | NUMBER

10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK? *(If "yes" identify)*
☐ YES ☐ NO

11a. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? *(If "Yes," complete Item 11b)*
☐ YES ☐ NO

11b. TYPE OF FINANCING *(Check one)*
☐ ADVANCE PAYMENT ☐ PROGRESS PAYMENTS
☐ GUARANTEED LOANS

12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? *(If "Yes," identify item(s), customer(s) and contract number(s) on reverse of form.)*
☐ YES ☐ NO

13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31, COST PRINCIPLES? *(If "no," explain on reverse of form)*
☐ YES ☐ NO

14. COST ACCOUNTING STANDARDS BOARD (CASB) DATA *(Public Law 91-379 as amended and FAR PART 30)*

a. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? *(If "No," explain in proposal)*
☐ YES ☐ NO

b. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1 or 2)? *(If "Yes," specify in proposal the office to which submitted and if determined to be adequate)*
☐ YES ☐ NO

c. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NONCOMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? *(If "Yes," explain in proposal)*
☐ YES ☐ NO

d. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSED PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? *(If "Yes," explain in proposal)*
☐ YES ☐ NO

This proposal is submitted in response to the solicitation, contract, modification, etc., in Item 1 and reflects our estimates and/or actual costs as of this date and conforms with the instructions in FAR 15.804-6(b)(1), and Table 15-2. By submitting this proposal, the offeror, if selected for negotiation, grants the contracting officer and authorized representative(s) the right to examine, at any time before award, those records, which include books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or any other form, or whether such supporting information is specifically referenced or included in the proposal as the basis for pricing, that will permit an adequate evaluation of the proposed price.

15. NAME OF OFFEROR *(Type)* | 16. TITLE OF OFFEROR *(Type)* | 16. NAME OF FIRM

17. SIGNATURE | 18. DATE OF SUBMISSION

AUTHORIZED FOR LOCAL REPRODUCTION
Previous edition is not usable

STANDARD FORM 1411 (REV. 10-95)
Prescribed by GSA - FAR (48 CFR) 53.215-2(e)

Figure 3-12

Certificate of Current Cost Or Pricing Data

This is to certify that, to the best of my knowledge and belief, the cost or pricing data (as defined in section 15.801 of the Federal Acquisition Regulation (FAR) and required under FAR subsection 15.804-2) submitted, either actually or by specific identification in writing, to the contracting officer or the contracting officer's representative in support of _____* are accurate, complete, and current as of _____**. This certification includes the cost or pricing data supporting any advance agreements and forward pricing rate agreements between the offerer and the Government that are part of the proposal.

Firm_____

Signature_____

Name_____

Title_____

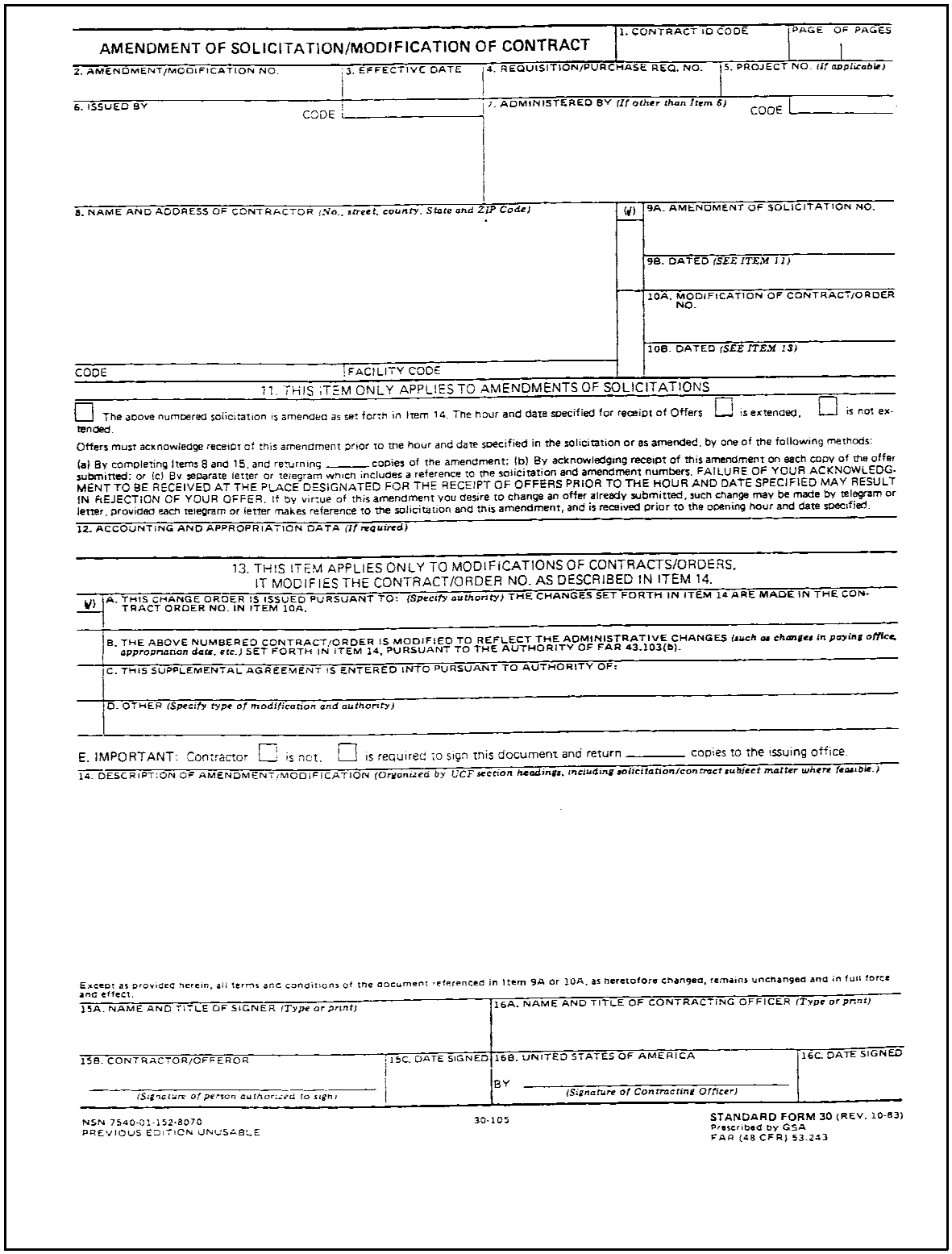
Date of Execution*** _____

* Identify the proposal, quotation, request for price adjustment, or other submission involved, giving the appropriate identifying number (e.g. RFP No.)

** Insert the day, month, and year when price negotiations were concluded and price agreement was reached or, if applicable, another date agreed upon between the parties that is as close as practicable to the date of agreement on price.

*** Insert the day, month, and year of signing, which should be as close as practicable to the date when the price negotiations were concluded and the contract price was agreed to.

Figure 3-13



AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE | PAGE OF PAGES

2. AMENDMENT/MODIFICATION NO. | 3. EFFECTIVE DATE | 4. REQUISITION/PURCHASE REQ. NO. | 5. PROJECT NO. (If applicable)

6. ISSUED BY CODE

7. ADMINISTERED BY (If other than Item 6) CODE

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

(X) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

10A. MODIFICATION OF CONTRACT/ORDER NO.

10B. DATED (SEE ITEM 13)

CODE FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(X) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

15B. CONTRACTOR/OFFEROR | 15C. DATE SIGNED | 16B. UNITED STATES OF AMERICA | 16C. DATE SIGNED

(Signature of person authorized to sign)

BY (Signature of Contracting Officer)

NSN 7540-01-152-8070
PREVIOUS EDITION UNUSABLE

30-105

STANDARD FORM 30 (REV. 10-83)
Prescribed by GSA
FAR (48 CFR) 53.243

Figure 3-14
Amendment of Solicitation/Modification of Contract

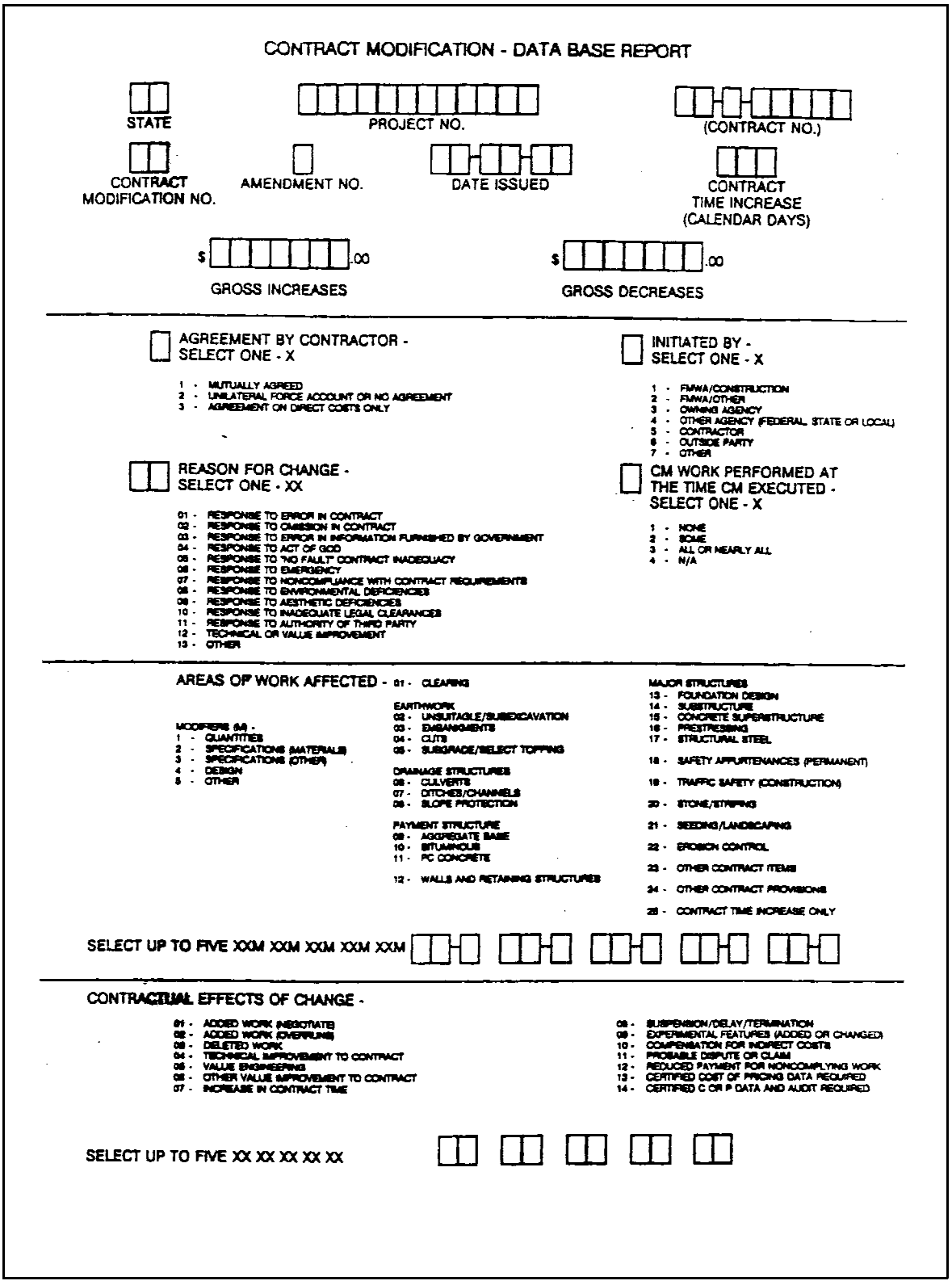


Figure 3-15
Contract Modification - Data Base Report

FEEDBACK REPORT

To: _____

From: _____

Date: _____

Instructions:

1. One problem per report.
2. May be completed in pencil or ink.
3. Forward original and 1 copy to Division office.
4. Retain a copy for your records.

Project Name: _____

Type of Contract: _____
(Grading, Base, Paving, Bridge, etc.)

List any problems encountered in the plans, specifications, or administration of your contract, any problem associated with Division support services, or any deficiencies where correction action or improvements can be incorporated into upcoming projects. Timely submission is essential for implementation of corrective actions.

Problem: _____

_____

_____

(attach additional pages if more space is needed)

Corrective Action Taken and Improvements Recommended for Future Projects:

_____

_____

_____

Division Staff Comments: _____

_____

_____

_____

Action Recommended and by Whom: _____

_____

Figure 3-16
Feedback Report

CHAPTER 4 - CONSTRUCTION SURVEYS AND WORKING DRAWINGS

CONTENTS

FIGURES

CONSTRUCTION SURVEYS AND WORKING DRAWINGS

4-1 WORKING DRAWINGS

See *FAR Clause 52.236-21 - Specifications and Drawings for Construction.*

The Contract states the time requirements for submission and approval of working drawings.

The Project Engineer should go over the Contractor's schedule for submissions at the preconstruction conference so that the Government can schedule its own resources. The Contractor should also be advised to promptly submit information on suppliers and subcontractors whose work will require Government inspection and testing, particularly offsite inspection.

4-1.1 Submittal and Approval Procedures for Working Drawings

Procedures for submittal and approval of working drawings will be in accordance with Division policy.

4-2 CONSTRUCTION STAKING

The Contract establishes specific staking responsibilities and requirements, including survey tolerances.

4-2.1 General

An FLH survey to obtain final design information and to set initial control for staking during construction is usually completed before the award of the construction contract. Practices vary among Divisions. Individual project situations may also vary. Some contracts will require more survey effort from the Contractor than others.

4-2.2 Staking Verification

The first step in verifying the accuracy of the survey control is taken before any work has been done by the Contractor. The Project Engineer is to receive copies of such documents as: an earthwork listing, cross sections, clearing book, slope stake book, coordinate listing, etc. A list of such documents is called out in the special contract requirements to be made available to the contractor. The Project Engineer needs to cross check this information with the plans to insure consistency. Sometimes the plans contain coordinates of control points. The Project Engineer should compare these coordinates with the data listing. The Project Engineer should calculate some coordinates of PC's, PT's, etc., using data from the plans. Then the Project Engineer should compare the calculated coordinates with the design listing. The Project Engineer should contact the Design Section for help, if discrepancies are found or if questions develop.

4-2.3 Government Field Control

The next phase of staking verification is in the field. Initial project surveys are done by the FLH or a consultant surveyor under a separate contract, before the award of the construction contract. Such surveys will provide control points to be used later by the Contractor.

The Project Engineer is responsible for verifying that the information in both the special contract requirements and the plans match what is in the field. The Project Engineer should walk the design line to make sure that enough reference points, control points, elevation benchmarks, etc., physically exist. It is not uncommon for some of these points to be destroyed or moved between the time of staking and the time of award of the construction contract. Some common causes of missing or damaged survey control are: nearness to a campground (stakes and hubs make good kindling), farming activities, road and ditch maintenance, or removal by vandals.

The Project Engineer should assume the quality of the Government control is adequate for the project, unless there is reason to believe it may have been disturbed, or unless the Contractor's beginning survey efforts lead to questions or allegations of errors. If errors are alleged or suspected for any reason, the Construction Operations Engineer is to be quickly consulted to arrange for or provide expert advice and/or assistance.

If so many Government control points have been lost or disturbed that replacement by available project staff is not feasible, the Project Engineer should contact the Construction Operations Engineer. Options available to reset the control points include:

- A contract modification to have the Contractor do the work
- Contracting with a local surveyor
- Bringing in a Government survey crew
- Temporary additional project staff

Any needed work relating to control points should be done as soon as possible to avoid delaying the Contractor's operations.

4-2.4 Establishing and Referencing Centerline and/or other Roadway Control

At some point during construction of the project, the centerline is established by the Contractor. Shoulder points are often set in the same operation. The degree of accuracy depends on the phase of construction taking place. Most staking tolerances are found in the specifications. When they are not, standard practice for the type of work will govern.

During initial grading, the inspector can check work by measuring from the slope stakes or the slope stake reference hubs. When doing this, the inspector should line up with the reference hub or the slope stake on the other side of the road. This insures that centerline is intercepted at the station listed on the stake. Use of a cloth tape and hand level should be adequate at this stage, so long as the Contractor's work is being found generally in compliance. Tools such as the Rhodes Arc or Easy Arc are convenient for steep terrain. If it appears there are serious or chronic errors, more accurate checking methods may be warranted.

When finishing subgrade, fine grade control stakes (*blue tops*) or stakes for string lining are usually set by the Contractor. Most of the time a Contractor sets the horizontal location of grade control stakes for about 1,000 meters of roadway, then comes back to set the proper elevations. To check the work at this stage, the inspector should have a theodolite and an electronic distance measuring device. Radial survey methods can then be used. By occupying a point of known coordinates and having a similar backsight, the Contractor's grade control stakes can be checked by comparison with points set at their coordinates.

An older method of checking the alignment and grade control is to occupy a centerline point, backsight a point with a known azimuth (or bearing), and run in the centerline by using deflection angles and distances. This is what could be termed the *classic* method of laying out a road. Most books on route surveying illustrate the procedure. After running in centerline, the inspector turns right angles off each centerline point to get the shoulder locations. This method can be rather time consuming and usually requires three people (minimum) to do it efficiently with a transit and steel tape. Using an electronic distance meter speeds the work. However, with that available, the *radial* method mentioned above is usually superior.

Regardless of the method chosen for checking, the Project Engineer should require as independent a check as is feasible. Occupying points different from those used by the Contractor, or using a different method, are approaches to that. The purpose of an independent check is to lessen the chance of duplicating any error. Points set for checking may not match the Contractor's points exactly, but they should fall within tolerances.

Referencing centerline, as used in this section, means to set additional control outside of the construction limits, and out of harm's way generally. These references are used to reestablish centerline or other control points. The control referenced may be any of PC's, PT's, P-line points, state coordinate points, etc.

A wide range of methods exist to reference centerline depending on the equipment available and the importance of the point. **Examples of Referencing Methods** are shown in **Figures 4-2.4a through 4-2.4e**. Regardless of how the Contractor references centerline, a record is to be given the Project Engineer, in an acceptable format. The Project Engineer should mathematically check a sampling of calculations, and should field-check some of the reference points in order to verify the competence of the Contractor's work. Field verification consists of making sure the references do exist, insuring that references are out of harm's way, and checking that the points match the data submitted by the Contractor. The Project Engineer should check enough points to feel satisfied that all are correct. The Contractor is to be notified of any discrepancies found and required to correct anything that will be left in place.

Where construction plans show equations in the stationing, these equations must be left in, and the station ahead must not be altered. The back station may be corrected if any error or distance is found when rerunning the line. This is necessary to preserve the relation of centerline to landmarks.

If the stationing at the crossing of property lines does not agree with the original plans (except minor differences in chainage), it will be necessary to equate to the original station ahead. The Project Engineer should coordinate with Project Development when any changes are necessary, which affect the right-of-way description.

The terminal stations of the project should be left as shown on the plans unless a change has been approved by Project Development through the COE. If errors, equations or centerline corrections cause a terminal station to be in a significantly different location relative to the geometrics of the road and physical features of the right-of-way, the Project Engineer should coordinate with the COE to see if an equation or a revision to the terminal station is appropriate. Such actions should be kept to a minimum.

4-2.5 Permanent Monuments

Permanent monuments such as United States Coast and Geodetic Survey (USCGS) monuments, Public Lands corners, State coordinate points, Corps of Engineers' monuments, or property corners might be in the way of the work. The Contract should provide for relocation of such monuments before construction, in accord with legal and/or agency requirements. If a monument is discovered that is not called out in the Contract, the Project Engineer should contact the owning agency as soon as possible for instructions.

4-2.6 Bridges

The Government provides initial control from which the Contractor can locate the bridge. The Contractor determines what additional control is needed for construction purposes and is responsible for staking it. The Contractor is required to submit this staking information to the Project Engineer. The Project Engineer should check its accuracy.

The Project Engineer must verify that Government field control matches the control listed in the Contract. If not, the field control will have to be reset. The Project Engineer should contact the Construction Operations Engineer to get input on the best method of accomplishing this. Various options are given in Section 4-2.4. If the control is good, the Project Engineer may want to set additional control for checking purposes outside the construction limits. Usually, points set at right angles and even distances are best. The points should be clearly marked, i.e. *"offset from bridge chord"*, *"end of bridge"*, etc. Vertical control should be set close to the bridge to reduce the number of turning points required. Complete level circuits should always be done. Refer to a book on surveying for technical information on staking.

Bridge tolerances are much tighter than roadway tolerances. The Project Engineer should allow enough time to do checking prior to scheduled concrete operations.

4-2.7 Retaining Walls

This section is written for cast-in-place concrete, cantilever retaining walls. The Project Engineer can apply most of the ideas presented here to other types of walls as well. However, each wall type (cast in place, reinforced earth, gabion, bin wall, keystone block, ...) has some things unique to it. For an unfamiliar wall type, the Project Engineer may contact the manufacturer to gain insight for laying it out. Actual layout is done by the Contractor.

Unlike bridges, locations of retaining walls may not be precisely established on the plans. In many situations, the Contract requires the Project Engineer to field check the beginning and ending station of the wall before the Contractor can

order materials or begin work.

A common method used to check the Contractor's staking involves setting an offset line parallel to the wall. The inspector measures from this line to check the wall. On walls, setting the radius points is sometimes more practical and useful. Once the footing for a wall is complete, the Contractor often places control on it. This is convenient to use. It is a good idea to check the location of the top of the form. This is to insure the proper batter is being obtained.

The Project Engineer might rely the Contractor's control after checking its accuracy. However, this is not an independent check.

4-2.8 Slope Stakes

This section assumes that project personnel have some experience with slope staking. If not, the Project Engineer should request or provide special training. Many survey books give only a brief description of the subject as compared to traversing, running levels, and other aspects of surveying which are well explained. When explanations are given, they are often of flat country work, not practical for most Federal Lands' projects. See **Figure 4-2.8** for an **Example Slope Stake and Reference Stake** markings and notes.

The Project Engineer should closely review the printed earthwork listings and the plotted cross-sections for knowledge of the overall earthwork and stakeout required. Close study of plotted cross-section data proves very helpful in understanding the intended template for the road. The Project Engineer should note anything appearing odd, or contrary to the plans or Contract, for later field checking.

The Project Engineer should review the earthwork and staking data with the Contractor and its staking crew before the contractor does any staking. The Project Engineer should discuss write-up and color coding of slope stakes and their reference stakes, and whether or not the cuts marked on the slope stakes are to ditch grade or shoulder grade. The Project Engineer should ask the Contractor and its staking crew to demonstrate how they will mark the catch and reference stakes. The Contractor also should explain where substantial differences between the data contained in the furnished field notes and actual ground shots will be recorded. The Project Engineer should point out that care must be taken to assure measuring is accurate, particularly when staking is done with a hand level, rod and cloth tape. The Contractor must submit accurate and timely staking notes throughout the life of a project. Failure to furnish staking notes on time prevents or delays review of that work, and causes delay to the total operation.

Once the Contractor has started placing slope stakes in the ground, the Project Engineer should look at the staked line to see if it flows smoothly with the terrain. If there is a slope stake out of line, the Project Engineer should check the plans to see if there is a reason for it. An inlet basin for a culvert may cause a station to appear out of line. If there is no apparent reason for the misalignment, the Project Engineer should check the slope stake book and compare it to the writing on the slope stake. The Project Engineer should check data recorded on slope stakes and R.P.'s for legibility, as well as for content.

The Project Engineer's method for review of the Contractor's staking depends on the equipment available. If a theodolite and electronic distance meter or a total-station theodolite are on the job, the Project Engineer can shoot catches (slope stake positions) in from a control point. These can be compared to slope stakes the contractor has set. Unless something was wrong with the original topographic data, the two should compare closely. The Project Engineer should check the Contractor's stakes to see that they meet the horizontal and vertical tolerances for the Contract.

Sampling is permissible for checking staking. Unless sample size is specified, the Project Engineer may select about 10% of the stakes in

any group being tested. The sample selection method must insure all stakes in the group have an equal selection chance. The average error in the sample is taken to represent the mean error in the work being checked. Vertical and horizontal errors are best considered separately.

If the mean error exceeds specification tolerances, or normal industry tolerances if none are specified, corrective action is warranted. Some time spent at that point to determine why the error is so large will likely be worthwhile. Check both parties equipment, methodology, and conventions such as measuring from and to the center of stakes or hubs. Government staff might work with the Contractor's crew for a time, or observe its work very closely. The Construction Operations Engineer might be asked to provide or arrange for help if necessary to find problems.

When re-checking a rejected unit of work, one should take a new sample and proceed as above.

4-2.9 Fine Grade Control Stakes

Fine grade control stakes (red tops, blue tops etc.) can initially be checked similarly to checking slope stakes. The eyeball method will usually show any large bust in the staking. The Project Engineer should require complete level circuits, always tying into a benchmark to close the circuit. To meet the horizontal tolerances, the grade control stakes must be set and checked, using a survey instrument of some type. Taping off slope stakes or slope stake reference hubs does not assure the required accuracy. Section 4-2.4 contains additional information on checking grade control stakes. Discussion of sampling in Section 4-2.8 may be applied to checking fine grading control points. The checking procedures are the same for all fine grading control points. Definition of various grade control stakes by color code is often in the special contract requirements.

In some situations, the grade control stakes have to be fine-tuned by the Project Engineer to get a smooth ride, and/or to insure proper drainage of the surface. In a very curvilinear alignment, the tangent runouts can get shortchanged. The Project Engineer may have to adjust the designed superelevation to soften dips or humps.

4-2.10 Sight Levels

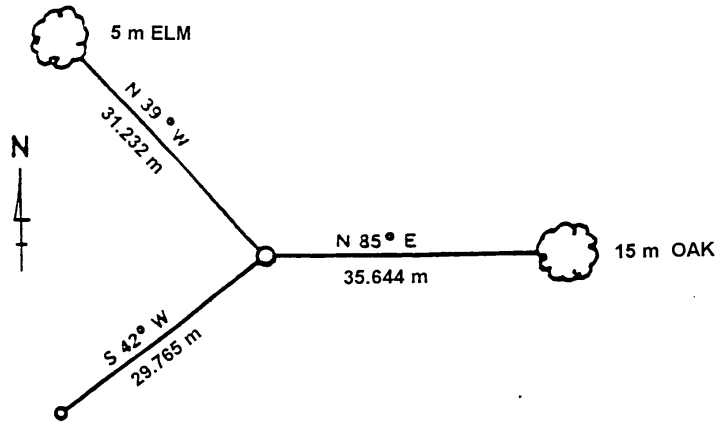
See **Figure 4-2.10**. These are tools with which one person can check the crown, superelevation or linear grade without a level and rod. These are three metal rods each welded to a small base to enable them to stand vertically unsupported. The main rod has a small *tee* section of tubing welded horizontally to the top that serves as a sight and target. To see if the three levels are all on the same plane, the inspector chooses any random cross-section of the roadway, places a level on the right shoulder, one on the center of the road, and the third on the left shoulder. The inspector then sights from one on either shoulder to the one on the other shoulder. The inspector measures the amount of crown by how far the top of the center level is above the line of sight on centerline. A string line will settle arguments. The levels are usually painted with alternating colored stripes at fixed increments.

To check a roadway section that has a turnout or passing lane, the inspector places one level on centerline and another on the shoulder. Then the third level is placed in between to see that the crown at centerline is carried over the entire length of the template.

The inspector may use this same method of placing three levels across the roadway at a cross-section to check the superelevation by sighting over the top of the handles. This method also works for checking the linear grade of the roadway between stations. The inspector places two levels on consecutive control stakes, and the third level in between and sights over the top to see if they line up.

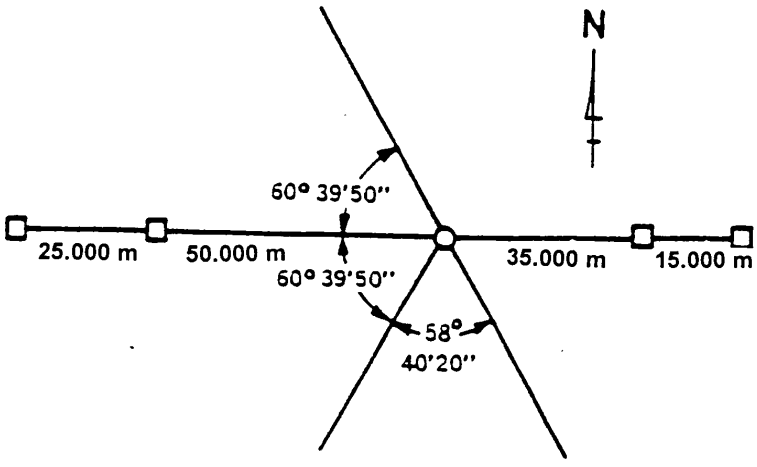
The levels give a quick check of uniformity and smoothness of the subgrade, base aggregate course, and later courses. Using levels on vertical curves, horizontal curve transitions and curvilinear alignment will not work as described.

The main use of levels is to rough check that the grade is conforming to the template shown in the Contract drawings.



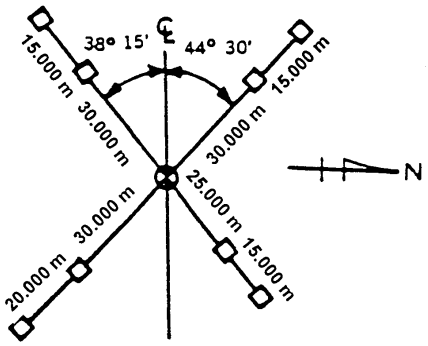
Application: Used on resurfacing projects, etc., where references will remain undisturbed and an offset line will not be needed.

Bearing/Distance Reference
Figure 4-2.4a



Application: The preferred method of referencing alignment points is by angle and distance to instrument point. Install tacked hubs set at convenient distances and in line with a prominent distant object when possible. The hubs, or more permanent points, should be set where they will not be disturbed during construction and are accessible enough for a transit to be set over them.

Angle/Distance Reference
Figure 4-2.4b



Application: Often used when referencing PI's. If the interior angle is bisected, the midpoint can easily be established. Another similar method has two sets of references (tacked hubs) at angles and distances from centerline. It is desirable to have the two lines approximately 90 degrees from one another.

Double Angle/Distance Reference

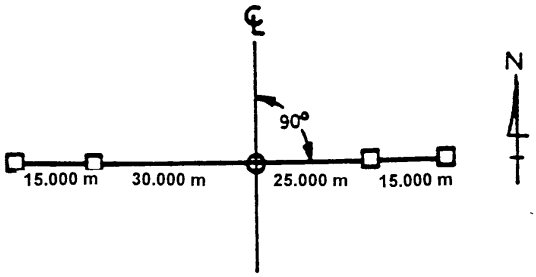
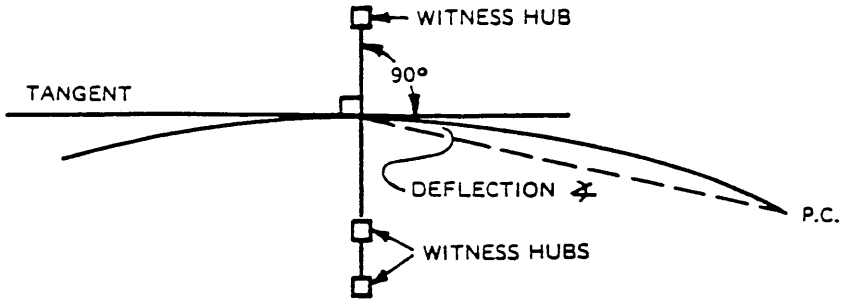


Figure 4-2.4c

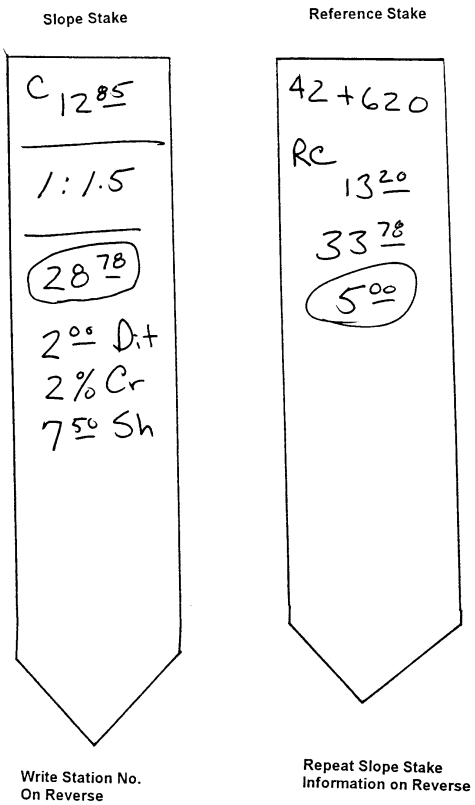
Application: Frequently used for section and quarter corners and control points that fall within an intersection. This is a very accurate method because two instruments can be used, thereby eliminating distance measurements. Another method also makes use of tacked hubs, but the witnesses are set 90 degrees to the construction centerline. This allows the survey crew to establish offset lines with minimal instrument setups.

Right Angle/Distance Reference
Figure 4-2.4d



Application: Commonly used on widening and relocation projects where normally, offset lines run parallel to construction centerline. When POC's on long curves are to be referenced, this method should be used. In order to witness a POC at right angles to the curve, the instrument is set on the station. After taking a backsight, the deflection angle for the instrument station is turned. Ni nety degrees are added or subtracted, depending on which way the references are to be established.

Right Angle/Distance Reference at P.T.
Figure 4-2.4e



Slope Stake

The intersection of the stake and ground is 12.85 meters above grade of ditch.

The cut slope ratio is 1 unit vertical to 1.5 units horizontal.

The stake is 28.78 meters from centerline. Some conventions show distance to bottom of slope.

(Optional) The template at this station has a 2.00 meters wide ditch. Ditch depth might be shown if it varies.

(Optional) The roadbed is crowned at 2% at this station.

(Optional) The subgrade shoulder break is 7.50 meters from centerline at this station.

Reference Stake

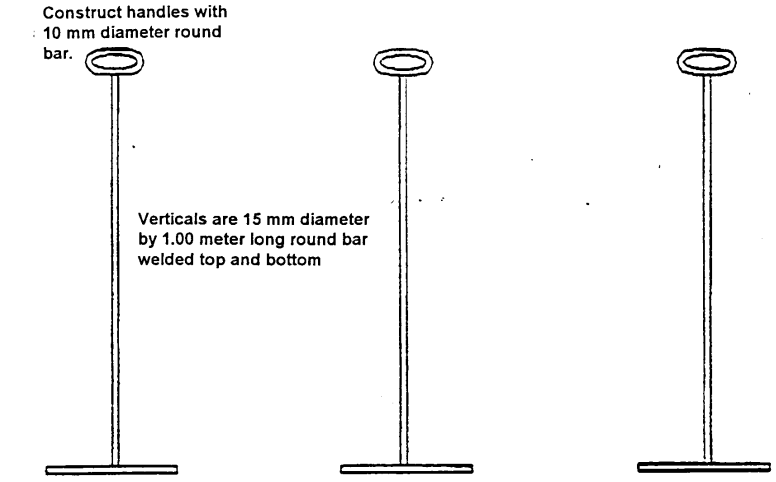
The stake is at Station 42+620

The stake is a reference cut (RC), 13.20 meters above the grade of the ditch.

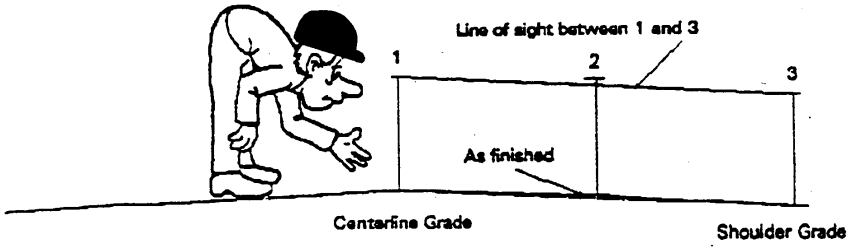
The stake is 33.78 meters from centerline.

The stake is 5.00 meters horizontally behind the slope stake.

Example Slope Stake and Reference Stake
Figure 4-2.8



USEAGE



Sight Level
Figure 4-2.10

CHAPTER 5

CONTROL OF MATERIALS

5-1 GENERAL

This chapter deals with the general requirements for materials inspection and control, including the inspection and control of the *installation* of those materials, i.e. the work itself.. Some additional information concerning inspection of materials for specific construction items is included in Chapter 9 of this manual. The *FLH Field Materials Manual* is the primary guide for sampling and testing materials.

Specific requirements for all materials are stated in the Standard Specifications, Special Contract Requirements and Plans.

Copies of all preliminary engineering materials and subsurface data; such as soil profiles, boring log data, materials sources, borrow area diagrams, options, use permits, and test reports should be on file at the project office. The Project Engineer should consult with the Construction Operations Engineer to insure that he/she has what is available.

The *FLH Field Materials Manual* explains verification of contractor testing as well as Independent Assurance sampling and testing, including required frequency thereof. The Project Engineer will need to monitor these functions or at least be aware of the requirements, and advise the Construction Operations Engineer and/or Materials Specialist of when construction operations require them to perform required functions.

Materials incorporated into highway work are of three basic types:

- Off-the-shelf commercial items, which are represented by the manufacturer as meeting a standard or industry specification. E.g. guardrail, traffic paint, culvert pipe.

- Commercial items manufactured specifically to meet the requirements of FLH, or which are of sufficient criticality to require inspection and quality assurance by FLH or an organization engaged by FLH. E.g. structural steel, precast structural elements.

- Items manufactured at or near the site of work by the Contractor, subcontractor or supplier, and which are subject to routine inspection, and quality assurance procedures by FLH. E.g. asphaltic concrete, aggregate base course.

Testing and inspection of commercial items, other than off-the-shelf items will generally be conducted at the site of manufacture by specialists engaged by FLH. Often State DOT personnel will be engaged to perform these Quality Assurance functions.

Tests for locally produced materials will be made by Contractor or FLH personnel as per the requirements of the Contract. Often the tests will be performed at commercial laboratories on samples submitted through the Project Engineer.

The Standard Specifications require the Contractor to notify the Engineer of all proposed sources of materials at the earliest date possible. These sources should be reported immediately to the Construction Operations Engineer in order that necessary arrangements may be made for the testing of materials. If, as for Contractor proposed sources of crushed aggregates, the Contractor is to do sampling and testing, the Construction Operations Engineer will make known any requirements relative to the size and numbers of samples, not explicit in the Contract.

Pursuant to FAR Clause 52.246-12, the Contractor will be required to maintain an adequate inspection system and perform such inspections as will ensure the work conforms to contract requirements. The Project Engineer should review all test reports for accuracy and completeness, whether the test was performed on the project, by designated laboratories, or other inspection agency. Commercially produced products that are shipped to the project, whether or not quality assurance documentation is required, should be physically inspected by the Contractor upon delivery. Spot checks by FLH personnel should verify that these inspections are effective.

The FLH Field Materials Manual provides details as to the nature of quality assurance documentation required for various type of materials.

The Contract provides that the Contractor shall, without charge, replace any material or correct any work found by the Government not to conform to the Contract requirements, unless in the public interest the Government consents to accept such material or work with an appropriate adjustment in Contract price.

With respect to acceptance, construction materials will fall into one of the following categories:

- Those found to exceed minimum specification requirements and are accepted at a pay factor exceeding 1.00 as per a statistically based acceptance plan in the contract.

- Those found to be in reasonably close conformity with the specifications; and are therefore accepted at full payment.

- Those not in reasonably close conformance but deemed technically serviceable and therefore accepted at reduced payment as provided by a contract acceptance plan or as mutually agreed if there is no acceptance plan.

- Those not in reasonably close conformance, and not deemed technically serviceable and therefore rejected, and require to be removed, replaced or acceptably corrected.

Care should be taken when evaluating materials after a Contractor's corrective efforts. One common misconception is that an individual sample and test result represents a discrete quantity of material. But often poor quality materials contain both passing and failing quantities. One test which passes may be due solely to chance.

In fact, any quantity of material is collectively represented by all the samples taken from it. If acceptance is based on the statistically based acceptance plan in the Contract, at least five tests are required for even a minimal assessment of the quality level. Any corrective effort should be applied to the whole of any material represented by a series of samples, unless additional testing convincingly isolates the defective areas. After corrective action, multiple tests must be used to verify that the corrective actions were effective.

Nonconforming material with a quality level within the range of the Contract acceptance plan is accepted in accordance with that plan, provided that the material is uniform in appearance and apparent quality. I.e. as long as there are no isolated areas of grossly defective materials. However, if the Contractor chooses to replace or correct the defective materials, that option should be permitted as long as the Government incurs no added expense or risk, and ultimately receives materials and related work which fully conform to the Contract requirements.

For nonconforming materials for which there is no applicable acceptance plan, the Contractor must either remove and replace, or correct the defects; or negotiate a pay reduction acceptable to the Government.

To accept nonconforming materials at reduced payment when there is no contract acceptance plan two things must happen:

- **The Government must make a determination that the materials will serve the purpose intended, and**

- **The Government must agree on the amount of the reduced payment.**

Generally the Contractor is told that the materials or work in question are rejected, that they must be replaced or corrected, and that any offer of acceptance at reduced payment must be generated by the Contractor, together with acceptable support documentation. If the Contractor indicates such an offer is forthcoming, there must be a determination by the Government that the defective materials will serve the intended purpose. If the

Government cannot make this determination, the default is to go back to remove & replace or correct. If the determination is affirmative, the appropriate amount of the pay reduction should be evaluated by the Government. Advice of the COE and materials specialists will be required. The appropriate amount of the adjustment will be based on engineering and contractual considerations, and the particular circumstances of each situation. In the end, the final amount of the price reduction must be negotiated and mutually agreed or else the default is back to the remove & replace or correct.

Once agreement on price is achieved, a contract modification is then required to effect the acceptance at a reduced price.

Refer to Chapter 3 for procedures to be followed in negotiating a Contract Modification for accepting nonconforming material.

5-2 SOURCES FOR AGGREGATES, SELECT BORROW, ETC.

The Standard Specifications usually provide that the Contractor may furnish materials from sources shown on the plans or described in the special provisions, or from Contractor furnished sources. In any case, the Contractor is to determine the amount of equipment and character of the processing required to produce specification materials.

The Contractor is required to submit certain information relative to any proposed materials source other than a source shown by the Government in the contract as acceptable. The COE will, with consultation with Materials, review the Contractor's test results and quantity data before approval and authorization of Contractor furnished sources.

The Construction Operations Engineer will usually require sufficient exploration and testing to be reasonably confident of the source. But for a Contractor selected source, the Contractor will always assume additional risk in that the Contractor, not the Government is responsible for the adequacy of the source.

If the Contractor attempts, using reasonable and accepted industry processing practices, to produce specification material from a Government source, and is unable to do so, the Contractor may be eligible for a equitable adjustment for increased costs incurred in producing material from a new source. This additional compensation may include the costs of equipment moves and setup, additional haul, and additional costs, if any, of producing the material. Again a Contract Modification is indicated, and the COE and appropriate specialists will have to evaluate the situation and agree that the Government source is not acceptable.

The Contractor is responsible for producing a material which meets gradation and plasticity requirements by appropriate crushing, screening and even reasonable wastage. On the other hand, processing cannot change such characteristics as soundness, abrasion, or stripping resistance of the aggregate, nor the quantity of material in the deposit. Therefore, the Government assumes these responsibilities when proposing sources.

Care should be taken to insure that all reasonably available material is secured from a source before the Contractor is authorized to move to a new source. Different formations in sources and other factors affecting production should not be used as reason for abandonment, when acceptable material can be reasonably produced.

Extraction methods, land use, and quantities of material located on U.S. Government property should be discussed with a representative of the land managing agency if one is present during the preconstruction meeting, or in any event before any work on the deposit is started by the Contractor.

5-3 SAMPLES AND TESTS

5-3.1 Sampling and Testing

Sampling and testing requirements are contained in the specifications. Detailed instructions are in the *FLH Field Materials Manual*.

5-3.2 Records and Reports of Materials

On assignment to a construction project, the Project Engineer should obtain copies of test results, soil profiles, pit diagrams, materials source options or use permits, and all other applicable preliminary materials data for the project.

It is the responsibility of the Project Engineer to maintain a file at the project office of all tests made, both in the field or elsewhere, to indicate the quality of all materials delivered to the project and used in the construction. All test reports should show the source of the samples, the quantity represented, and where, when and by whom the sampling and testing was done. The record should also show whether the material so represented is accepted or rejected.

Copies of test reports are to be furnished to the Contractor.

Forms for recording of field testing operations are described in the *FLH Field Materials Manual.*

5-3.3 Size of Samples and Schedule for Sampling and Testing

Frequencies at which quality control, verification and independent assurance samples are to be taken should conform to the Contract requirements; otherwise guidance in the *FLH Field Materials Manual* should be used. Sample sizes to be submitted for testing should conform to the requirements of the contract as detailed in the Contract or the *FLH Field Materials Manual*.

5-4 STORAGE AND HANDLING OF MATERIALS

The Contractor is responsible for the handling and storage of materials to insure the preservation of their quality and fitness for the work. If the Project Engineer comes to believe the Contractor's handling and storage operations will be detrimental to quality, and the belief continues after consultation with and/or suggestions to the Contractor, the Project Engineer should consult the Construction Operations Engineer relative to directed operations and/or payment for preliminary work. The Government always has the right to retest materials to verify they have not been degraded by Contract operations or the lack of adequate protection. The Government can declined to make advance payment for materials which are not be stored and protected from degradation.

CHAPTER 6 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

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FIGURES

LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

6-1 LAWS TO BE OBSERVED

The Standard Specifications require the Contractor to keep fully informed of, and at all times observe and comply with, all laws pertinent to the work. From a contractual standpoint, FLH has the right to monitor apparent compliance with these laws, and to invoke contract sanctions if there are violations. However, except for the specific actions enumerated in this Manual, in the Contract, and in the FAR, general compliance reviews and enforcement of these laws is the responsibility of specific Federal, State or local agencies, i.e. OSHA, EPA or the Department of Labor.

6-2 PERMITS AND RESPONSIBILITIES

6-2.1 Materials Sources and Easements

Often, sources of materials and easements for access and staging areas are provided in the Contract. In general, the Engineer should have documentation on file covering designated materials sources or use of designated land outside the construction limits, including privately owned property on which FLH holds options.

Occasionally, the Contractor may request permission to use other sources or request additional easements to expedite the work. If FLH is requested to become a party to such a request, it may be necessary for the Engineer to make a judgement as to FLH's proper role. If it is in the Government's interest to expedite special requests for access and other purposes, the Project Engineer should furnish assistance and liaison with the permitting agency. However, if the request is solely for the Contractor's convenience or savings, action by FLH may not be appropriate. This is especially true if the quality of the proposed source is less certain than the source designated in the Contract. Permits requested by a Contractor within public lands are often issued to FLH rather than the Contractor. This implies a responsibility of FLH to monitor the terms of the permits, i.e. safety, reclamation, erosion control, etc.

FLH will obtain required railroad crossing permits, and permits for construction over or adjacent to navigable waters as shown on the plans. If the Contractor elects to use railroad crossing or waterway privileges other than those shown on the plans, required permits or other arrangements will usually be the Contractor's responsibility.

6-2.2 Load Limits

The specifications usually require the Contractor to comply with load limits on public roads in the vicinity of the project. As a practical matter, this is difficult to enforce except where materials are being delivered by the ton with weigh tickets. The Project Engineer should, however, be particularly sensitive to this problem when there are complaints from local officials, and during periods of wet/thawing subgrade. FLH should cooperate with these officials in their reasonable attempts to protect their roads, even when our contractor may be inconvenienced.

In terms of FLH's contract liability, it is preferable to have a legal order from the local official, or a strongly worded demand, that says, hauling be temporarily discontinued or loads restricted, than for FLH to take actions based on verbal or other poorly documented requests. Actions which may be perceived as unilateral on the part of FLH, could be considered a change, and subject the Government to liability for the Contractor's increased costs. The Project Engineer should contact the COE for advice when in doubt.

On the project itself, overloads are not normally a problem through construction of the untreated base layers of the pavement structure. However, once construction of asphaltic concrete or treated layers begins, they must be protected from damage.

Although the Contractor is required to repair damage caused by overloads, there may be times when it is appropriate to prohibit heavy loads (even loads less than the legal maximum) in certain circumstances when the probability of damage is present. Again, the COE should be solicited for advice.

6-2.3 Bulletin Board

The Contractor is required to maintain a weatherproof bulletin board, accessible to all employees at the site. The following items are contractually required to be posted on the bulletin board. FLH should furnish items 1 and 2.

1. Davis-Bacon wage decision - Remove pages from Contract booklet.

2. EEO Poster.

3. Contractor's EEO policy.

The following items may not be contractually

required but may be required by regulation. FLH should furnish items 1, and 2. FLH may furnish item 3 if such resources are maintained by the cooperating agency, e.g. inside certain large National Parks..

1. Notice to Employees working on Federally Financed Construction Projects, Form WH 1321 - To be displayed with Davis-Bacon rates.

2. Job Safety and Health Protection poster.

3. Telephone numbers of physicians, hospitals or ambulances.

4. Blasting signals, if applicable.

5. Crane hoisting signals, if applicable.

6-2.4 NPDES Permits

The Clean Water Act of 1987 required the Environmental Protection Agency (EPA) to implement a program to regulate the quality of discharges and runoff from industrial and construction sites. This program, known as the National Pollution Discharge Elimination System (NPDES), went into effect in October 1992.

NPDES and equivalent [or more stringent] State regulations are applicable to essentially every project FLH constructs. However, these impacts differ, depending mostly on the State and local regulations in the State where the project is. In no State does the EPA itself actively monitor and enforce the NPDES process. In many States, monitoring and enforcement by State personnel is active and aggressive. Failure to comply with the requirements of the permit may result in shutdowns, injunctions, lawsuits and other adverse actions against FLH and/or the Contractor.

The Project Engineer should be familiar with the permit and other regulatory requirements in the State where the project is. These requirements are generally spelled out in the permit package or other documentation included in the PS&E package, or otherwise furnished by Project Development to Construction at the time of award.

In some cases permits will be issued for a specific project; in others, FLH will operate under a blanket permit.

In some cases the anticipated construction schedule and erosion control plan will have been submitted as a part of the permitting process; in others the permit simply obligates FLH and the Contractor to have a plan and to follow best erosion control practices. If the plan is filed with a State or local agency, it is important to know whether changes and enhancements to that plan have to also be filed or if they simply have to be documented in the project records.

In some cases FLH is the permittee [official holder of the permit]; in other cases the Contractor is designated as a co-permittee, or occasionally, the sole permittee. If permittee responsibility is transferred to, or shared by the Contractor, the Project Engineer needs to know if specific paperwork must be executed and filed to document that transfer.

Generally inspections of erosion control devices must be made periodically [usually weekly except in arid areas] and after heavy rains. It is important to know who the permit and the Contract require to make these inspections. It may be FLH; it may be the Contractor; but usually it will be a joint responsibility. There will also be specific requirements as to the format of the inspection report, who is required to sign the inspection report, and whether it is sent to the responsible State agency. It will usually be required to simply be filed in the project files.

The permittee is always responsible for making enhancements to the erosion control plan if the construction operations and/or original plan are resulting in unacceptable levels of sediment runoff. However, the Project Engineer should be very wary of eliminating specific features of the original plan even if they appear to be unnecessary. Such actions should be taken only after discussions with the COE or environmental resource personnel in the FLH Division.

In many States, inspections by State personnel responsible for administering NPDES are common. These personnel should be treated with

respect and cooperation to the extent that is possible. They will often request to see the permit, the erosion control plan, inspection reports and related documentation. The files on this subject should be kept up to date and easily accessible. Do not tell these personnel that they have to go through FOIA to see FLH files. If State inspectors issue instructions or make demands that seem to go beyond the requirements of the Contract and existing permits, discuss the issue with the COE before implementing these actions - especially if the actions may result in unforeseen expenses or liability to the Government.

Whether or not the Contractor is designated as the permittee, the Contract usually gives control over erosion control items and quantities to FLH and the Project Engineer. It is important therefore to cooperate with the Contractor and State authorities to assure that there are no deficiencies in NPDES requirements due to disputes over the payment for additional quantities and devices. If additional funding is required for these quantities, the issue should be discussed with the COE.

If deficiencies are due to poorly scheduled construction operations, or the lack of tenacity and perseverance in maintaining the erosion control measures and completing work as scheduled, then the Project Engineer must be assertive in requiring the Contractor to resolve these problems.

6-3 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE

6-3.1 General

The Contractor is responsible for the protection of all public and private properties adjacent to the construction insofar as they are endangered by the construction operations. This responsibility also extends to designated materials sources and property adjacent to haul roads. If the Contractor fails to take proper precautions or persists in performing the work in a manner which causes damage to such property, the matter should be called to its attention in writing. The Contractor is obligated to repair, rebuild, or otherwise restore such damaged property, or make good such damage or injury.

Occasionally there are claims against the Contractor related to damage to its own (nondesignated) materials sources or to property not directly related to the Contract. FLH should try not to become involved in such disputes. However, there are times when, for political or public relations reasons, our involvement is necessary. There are also certain environmental protection laws which make the Government partially responsible even for private sites, which are related to the construction project. The Project Engineer should discuss such cases with the COE prior to taking action.

Since landscape degradation often cannot be completely restored, emphasis should be placed on prevention of damage. In cases of damage, the Project Engineer should contact the appropriate representative of the agency concerned and discuss the extent of repairs that the Contractor must make. Request a written description of the repairs so that the Contractor may be given a copy. As long as the requested repairs are reasonable, the Contractor should be given a written directive to complete them at no cost to the Government. If the requested repairs seem unreasonable or excessive, discuss the situation with the COE. If FLH orders corrective action under the Contract, which is later deemed excessive, we may ultimately be liable for the excess costs.

6-3.2 Trespassing

FLH should do no staking on private property without written permission from the owner. If the Contractor performs any construction operations outside the limits of the acquired right-of-way, or permits employees to trespass on private property, the Project Engineer should notify the Contractor of its liability for damages to such property. If for any reason additional easements or right-of-way should be necessary, the Project Engineer should notify the COE well in advance of the time when access will be required and secure proper written permission for right of entry.

6-3.3 Forest, Park, and Public Lands Protection

The specifications usually provide that when working within or adjacent to State or National Forests, Parks, or other public lands, the Contractor shall comply with all regulations of the authority having jurisdiction over such lands.

The governing rule concerning sanitary facilities on Public Lands specifically requires the Contractor to obtain permits for latrine construction from the public agency having jurisdiction. It has been found that some district officers of public agencies do not allow open pit toilets (chemical toilets, minimum), while others do. This matter should be cleared before the start of construction, preferably at the preconstruction conference.

6-3.4 Fire Prevention and Control

Employees of FLH and the Contractor must comply with the rules and regulations of the Forest Service, Park Service, State, or other public agency having jurisdiction governing fire prevention and control. If they are incorporated into the Contract specifically or by reference, the Project Engineer is responsible for enforcing the rules and regulations governing fire prevention and control, and therefore should obtain copies of manuals of instructions and fire plans of the agency having jurisdiction. Forest Service fire control plans are sometimes included in the special provisions of the contract.

Employees of FLH are required to take appropriate action to suppress unauthorized or accidental fires on public lands; and they shall immediately report fires to the nearest responsible official. Employees of FLH may also be called upon by officials to help in suppressing fires, regardless of their origin or location. In such instances, assistance should be given promptly by all willing, able-bodied employees, and should continue until other forces are available.

If FLH employees are called upon to help extinguish fires, the Project Engineer should immediately forward this information to the COE, giving the names of the project personnel involved in fire fighting and other pertinent information. The COE should be asked for instructions regarding payment by other agencies for labor and other costs incurred.

Fire prevention is an item that should be discussed at the preconstruction conference. If Forest or Park officials are not present at the conference, the Project Engineer should arrange a meeting with them and the Contractor to discuss the subject.

The specifications impose a very strict obligation on the Contractor for any fires in the vicinity of the project caused by Contractor personnel. The Project Engineer should direct the attention of the Contractor to the contract requirements before work on the contract starts, and again when permitted burning operations begin.

When burning is permitted, the Engineer should determine that the Contractor has secured written permission from the Forest Service, National Park Service, or the local fire control authority, or any other agency having jurisdiction over the area. The special provisions may require the Contractor to furnish a fireguard, either as a subsidiary obligation or with the method of payment specified. When a fireguard is not required by the special provisions but is requested by the agency having jurisdiction over the area because of special conditions, the Project Engineer must take appropriate action to provide such a guard. The Contractor may be ordered to furnish a fireguard by contract modification if necessary and not provided in the contract.

The specifications usually provide that the Contractor, when requested by the Federal agency having local authority, make its forces temporarily available for fighting fires that occur in the vicinity of the project but are not caused by the Contractor. Although payment for such services is the obligation of the requesting agency, the Project Engineer should make appropriate entries in the project diary concerning the fire and the extent of the services provided by the Contractor.

6-3.5 Pits and Quarries

The specifications usually require the Contractor to strip the overburden from all Government owned or designated material pits and quarries, and stockpile this overburden for later use in reclamation of the sites.

After a pit has served its purpose, waste material stored outside the pit or quarry area should be moved back into the pit. The pit then should be neatly sloped and trimmed, and the side slopes flattened to the maximum extent possible to conform to the natural ground surface. The stockpiled overburden should then be uniformly spread over the sides and bottom of the pit or quarry. No direct payment will be made for this work unless otherwise provided

The restoration requirements for private/contractor furnished pits and quarries is generally a matter between the Contractor and the owner. However, some States have special environmental or mining requirements which may apply, and which may necessitate FLH involvement in restoration activities.

6-4 OPENING OF SECTIONS OF PROJECT TO TRAFFIC

There are two contractual situations where the Contractor may be required to open a partially completed portion of the project to public traffic.

If the opening is a part of an overall stage construction scheme which is a part of the Contract requirements, no special written order or directive is required. However, it may be prudent to go over the incomplete work involved and agree with the Contractor on the work remaining, and the Contractor's plan to protect and maintain the completed work. Generally the Contractor is responsible for such maintenance including vandalism and private vehicular accidents.

If the opening is unplanned, i.e. not a requirement of the Contract, the Government has a right under the Contract (FAR Clause 52.236-11) to order an opening, but may incur some liability for doing so. This situation should be discussed with the COE. The liability may include, but not be limited to increased construction costs to complete under traffic, and increased maintenance and possible vandalism costs. If the Government decides to open in spite of this liability, a written direction signed by a Contracting Officer is required.

In neither of these two cases is the Government accepting the partially complete work and the Contractor should be clearly advised of that and its continuing responsibility for completion and maintenance as appropriate.

6-5 CONTRACTOR'S RESPONSIBILITY FOR WORK

The contract provides that the Contractor is not responsible for damages due to cataclysmic phenomena of nature, acts of the public enemy, or acts of Government authorities. The Contractor is responsible for other kinds of damage to the work, even damages which are not the result of the fault or negligence of the Contractor. See FAR Clause 52.236-7, Permits and Responsibilities.

When damages occur, and the responsibility for those damages is in doubt, the Project Engineer should discuss the issues with the COE; and if immediate action is necessary, direct the Contractor to take necessary steps to repair the work. If a Contract Modification and compensation is in order, the CM should be processed through normal channels. The Project Engineer will keep exact accounts of work performed, so that payment can be made on a actual cost basis if necessary.

The payment to be made to the Contractor under the foregoing conditions should be full reimbursement for restoring the work to the condition at the time of the damage, less any salvage value of removed material.

6-6 UTILITIES

Utility relocation and adjustments are to be made by the utility company unless otherwise provided in the Contract. The specifications usually provide that the Government is responsible for coordinating with the utility and endeavoring to have all necessary adjustments made as soon as practicable, and that no additional compensation will be allowed the Contractor for any delays, inconvenience, or damage sustained due to any interference from the utility appurtenances or the operation of moving them. However, if such delays are unforeseeable and beyond the control of the Contractor, an adjustment in contract time may be justified. Also, if the utility fails to assume their responsibility for the adjustments in a reasonably expeditious manner, the Contractor may be entitled to a price adjustment in accordance with the Changes clause.

The specifications also usually provide that the Contractor shall not start work in areas where damage to utilities might result in considerable expenses, loss, or inconvenience, until after all arrangements necessary for the protection of the utilities have been made. The Contractor also must cooperate with the utility owners in their removal and rearrangement operations.

6-6.1 Government-Owned Utilities

Special procedures for removal and/or reconstruction of Government-owned telephone lines and other utilities have been agreed upon between FLH and some of the Regions of the Forest Service, but such procedures usually vary in minor details in the different Forest Regions. In general, all repair, reconstruction, and other telephone work should be handled by the Forest Supervisor or authorized representative. Park Service utility lines should be handled in a similar manner.

6-6.2 Privately-Owned Utilities

In most cases, the work by utility companies must precede work by the Contractor in the affected area. The Project Engineer should request the COE to verify that such work has been arranged. When possible, the Project Engineer should make diary entries to document the operations of the utility companies as the work of adjustment or relocation progresses. Such data as the date of beginning of the work, the number of personnel working each day, the equipment and materials used, disposal of any salvaged material, and the date of completion of the work are particularly important.

When it is necessary to change the planned relocation from that shown on the plans accompanying the utility agreement, or when a significant increase in the estimated relocation costs is apparent, the COE must be immediately notified so that arrangements can be made for financing and modification of the agreement.

When costs of utility adjustments are to be reimbursed by the Government under a utility agreement, FLH records are important to allow reasonable verification of the utility company billing. Utility adjustments are normally one of three types with respect to payment:

- **Actual Cost** - The operation should ideally be observed daily, and diary entries made. It is not necessary that someone be assigned full time to this work, but it is desirable that diary entries be made not less than once a day.

- **Lump Sum** - The operation should be observed occasionally. Diary entries should be made for - when work starts, number of personnel, equipment, progress, shutdowns and reason (if available), and date work was completed.

- **No cost** - In some cases the utility must absorb its own costs for relocation, because that is a condition of its sharing the right-of-way. The same record as for **Lump Sum** should be kept except where the road Contractor might be delayed. When the utility adjustment is delayed or delaying the road Contractor, the Project Engineer should arrange for the same records as outlined under **Actual Cost** above.

When utility adjustment is delayed, and the Contractor proceeds to work in the affected area

or is hindered by such delay, the Project Engineer must keep adequate records in the project diary, and support them with appropriate photographs whenever practical. This information is of value in the event a claim is filed by the Contractor.

The Project Engineer may deal directly with the State or County right-of-way officials, and with public utilities on matters arising during construction. It is expected that the Project Engineer will obtain the appropriate account number in order to make proper charges for any services or costs involved, and that he/she will keep the COE informed of any information furnished, services performed, changes or problems. The COE will provide additional assistance and instructions when needed.

When field conditions require significant changes from plans or agreements, the Project Engineer should request the COE to arrange for a meeting with representatives from the utility company to reach a final decision on the change. Agreement modifications will be processed, funded, and approved by Division staff, based on data and estimates obtained at the above described joint meeting.

6-7 ENCROACHMENTS ON HIGHWAY RIGHT-OF-WAY

Where the right-of-way lies through privately owned land, the Project Engineer may become aware of the encroachment of buildings, fences, fixtures, or advertising signs on the right-of-way. The Project Engineer must ascertain from the plans or from the right-of-way agreement, whether the removal of such items is to be by the owner or the Contractor, and if by the Contractor, whether any salvage right has been retained by the owner or the Government. Any new encroachments, after construction has begun, must be reported to the COE who will follow up with instructions on the proper course of action.

6-8 CONSTRUCTION SAFETY

6-8.1 General

Federal law requires all FLH contracts to contain *FAR Clause 52.236-13, Accident Prevention*. This clause requires the work to be performed in accordance with the *Safety and Health Regulations for Construction (OSHA Part 1926)* published by the U. S. Department of Labor. Each Project office should have a copy of these regulations. The clause also obligates the contractor, without separate or additional payment, to safeguard the public, Government employees and Government property exposed to the construction. This obligation gives the Government the discretion to order correction of hazards *whether or not a specific hazard is specifically covered by the OSHA regulations*. The following procedures are to be followed to monitor and assure that contractor's safety program meets the requirements of the contract.

Contracts which are exceptional in terms of the duration or severity of hazards may contain a supplement to the FAR clause which requires the Contractor to submit a proposed safety plan to FLH prior to beginning construction. **Figure 6-8.1** is a **Suggested Outline for a Contractor's Safety Plan**. It should be provided to the Contractor at or before the Preconstruction Conference so that they know what we expect for a safety program. Even for contracts which do not have the FAR Clause supplement, the outline should be provided to the Contractor for information.

6-8.2 FLH Safety Responsibilities Prior to Start of Construction

1. At the Preconstruction Conference, emphasize the Contractor's safety responsibilities under FAR Clause 52.236-13, Section 100 of the FP and Contract provisions dealing with specific subjects such as work zone traffic control and explosives.

2. Approve or otherwise respond to the Contractor's Safety Plan submittal for contracts which include that provision. **Figure 6-8.2** is an **Example Approval Letter**.

3. For other contracts, some of the provisions of the plan may be applicable, and require emphasis at the Preconstruction Conference. For example:

   - Names of contractor employees with overall responsibility for safety management and supervision.

   - Posting of emergency procedures. Posting of appropriate telephone numbers, and locations of doctor, emergency services and hospitals.

4. Emphasize that the Contractor, not the Project Engineer is obligated to:

   - Perform routine safety inspections and otherwise monitor project safety.

   - Immediately correct or otherwise determine an appropriate response to complaints of safety deficiencies whether those complaints come from Contractor employees, the Government or the public.

   - Provide the required safety expertise to fulfill these obligations. It should not be assumed that FLH has, or will provide such expertise.

5. Advise the Contractor that the Contract requires that FLH notify the Contractor in writing of alleged safety deficiencies, and that the FLH Division will notify the State or Federal OSHA office responsible for construction safety monitoring if deficiencies are chronic or unresolved.

6. Advise the Contractor that if it fails to immediately correct safety deficiencies, especially high risk deficiencies, the Project Engineer is empowered to stop work on the affected operations until the deficiencies are corrected.

7. Advise the Contractor that the safety of public traffic and pedestrians in the vicinity

of the project is of paramount concern; and that all accommodation of the public will be in strict accordance with the Contract or subject to the direction and approval of the Project Engineer.

8. Advise the Contractor that inspectors, testers, and other Government employees and contractors working at the site are not obligated to work under unnecessary or unreasonable risks; and that the inspection and acceptance of the work may require accommodations to protect those personnel.

9. Advise the Contractor that it will be required to provide copies of all accident reports prepared for Government agencies or insurance carriers, to the Project Engineer.

6-8.3 FLH Safety Responsibilities During Construction Operations

1. FLH will not normally perform periodic, comprehensive project safety inspections or safety inspections of Contractor equipment, tools or workplace. However, if during the course of their other duties, FLH employees become aware of hazardous conditions which result from the Contractor's known or possible violation of either OSHA regulations, or reasonable standards of construction safety practice, as determined by the Project Engineer, the Contractor shall be notified immediately with a written follow up. See **Figure 6-8.3a** for an **Example Notification of a Safety Deficiency**.

2. Allegations of safety deficiencies may come from sources outside FLH and its onsite inspection staff. Client agency employees, contractor employees, others working at the site, or sometimes just private citizens passing through the site may point out what they think are safety violations. These allegations should be conveyed to the contractor in writing. The contractor shall be instructed to correct the deficiency if the Project Engineer is convinced that there is a deficiency. The contractor shall be asked to investigate the deficiency and take appropriate corrective action if there is doubt as to whether a deficiency exists.

3. All safety deficiencies identified whether serious or minor, singular or repeated, should be considered failures of the Contractor's Safety Program, and the Contractor should be advised of the necessity not only to correct the deficiency, but to review and modify the program to prevent repeat occurrences.

4. When the Contractor has repeated minor deficiencies or avoidable accidents (more than three in any three month period), any serious or life threatening deficiencies, or any deficiencies which the Contractor failed to immediately correct, a copy of the written notification to the Contractor shall be provided to the State or Federal agency responsible for OSHA enforcement at the Project. See **Figure 6-8.3b** for an **Example Notification of Chronic Deficiencies**, requiring a copy to a State OSHA office. The COE should be advised prior to copying the State or Federal OSHA office. This level of safety deficiencies may also be a basis to request that the Division safety resource person assist in an overall inspection and evaluation of the Contractor's safety program. On National Park Service projects, NPS safety specialists may be invited to participate in such evaluations on a consultive basis. Such an inspection and evaluation would be especially appropriate if the response of the State OSHA office is inadequate to resolve the problem.

   Once safety specialists have concurred in the Project Engineer's determination of chronic or unresolved deficiencies, appropriate actions under the terms of the Contract, such as issuance of a stop work order, may be warranted. Except for life threatening situation discussed below, the COE should be advised of, and concur in such actions.

5. When any FLH employee observes a life threatening condition resulting from the Contractor's operations, the Contractor shall be ordered to immediately correct the situation. In addition, that portion of the

work should be stopped until the hazard is corrected.

When in doubt the Project Engineer may elect to discuss the situation with the COE before taking action. However, it is generally better to err on the conservative side than to not take action when appropriate.

6. FLH onsite personnel are generally not trained as safety specialists, and should not directly or indirectly assume control, direction or responsibility for the Contractor's safety program. In advising the Contractor of apparent deficiencies, FLH personnel should not prescribe the corrective measures or procedures to be taken by the Contractor. In many cases, the Project Engineer may not know for sure that there is an OSHA violation. For example whether a given piece of equipment is required to have a ROPS (Roll Over Protection System) or other features. Upon notification, it is up to the Contractor to provide the expertise to determine if there is a violation, and to correct it if necessary, or respond to the Project Engineer in some credible manner if there is no deficiency.

7. In addition to its contractual responsibilities, FLH has a responsibility to ensure a safe working environment for its employees, other Government employees working in the vicinity and its other contractors (e.g. contract inspectors). None of these personnel should be required to perform inspection or other duties in an unsafe environment. If the unsafe environment is under the control of the Contractor, the superintendent should be advised that the work requiring inspection cannot be accepted until the unsafe condition is corrected. For example rolling operations may have to be suspended during testing if the compaction tester perceives a hazard associated with that equipment. If verbal notice proves ineffective, written notice to this effect should be provided.

6-8.4 High Risk Situations

There are certain high risk categories of safety hazards which are statistically of paramount importance and deserve special attention during administration of construction contracts.

1. **Construction Vehicle Accidents** - This category receives little mention in the OSHA regulations because it is so difficult to write general standards when every situation is different. However it is a leading cause of construction accidents and fatalities. If the Project Engineer perceives that deficiencies or unnecessary risks are present with respect to the use of construction vehicles, the Contractor should be advised whether or not a specific OSHA violation has occurred. Some of the deficiencies associated with vehicular accidents are:

   - Failure to separate pedestrian workers from heavy equipment and other construction vehicles.
   - Failure to provide working backup alarms or clearly identified signal persons in lieu of backup alarms.
   - Failure to adequately plan and manage the movement of vehicles in congested or low visibility conditions.
   - Failure to maintain brakes, ROPS and other safety equipment adequately.
   - Failure to operate vehicles using due care and caution.
   - Altering "as designed" configuration or safety features of equipment.

2. **Interaction with Public Traffic** - This is an increasingly serious category due to the percentage of highway construction projects being performed under traffic. See Sections 156 and 635 of the Contract, as well as corresponding sections of this Manual for additional guidance.

3. **Trenching and Excavation** - This is a

leading cause of construction accidents and fatalities, mostly due to the sudden and unexpected nature of such accidents when required precautions are not taken. In 1989 OSHA substantially revised the safety standards associated with trenching and excavation. See CFR 1926, Subpart P. **Figure 6-8.4** is a **Summary of OSHA Trenching and Excavation Requirements**. The actual regulations should be reviewed for exceptions and more detailed information. It is the contractor's obligation to have personnel who are trained in, or otherwise competent to implement the new regulations. FLH should not be put in the position of providing that competence, training the contractor or approving each trenching operation.

4. **Falls** - Scaffolding, rails, stairs & ladders meeting OSHA standards are the primary requirement. If that is impractical then safety belts and lifelines are required. If both are impractical then safety nets shall be provided at heights exceeding 7.6 meters. Vertically protruding reinforcing steel below walkways or persons working must be protected.

5. **Explosives** - Accidents often result from failure to have competent personnel in charge of blasting or failure to develop and follow a valid blasting plan. CFR 1926, Subpart U, and the Contract provisions contain the pertinent requirements.

Suggested Outline for Contractor's Safety Plan

A. **Overall Responsibility -** Who will be responsible for the on site safety program? What are the credentials (training & experience) of that person? Will they have direct authority or will their authority be through the superintendent? Who will be responsible for reporting accidents and maintaining the accident log required by OSHA?

B. Subcontractors -Will subcontractors be under prime's program or will they have their own program? If they have their own program, separate plans are required.

C. Safety Policy - How will new employees be oriented and their responsibilities explained? How will all employees be oriented to specific project hazards or the hazards of new operations? How will drug & alcohol policy be conveyed to employees?

D. Personal Protection -What conditions/operations will require personal protection equipment? Hardhats, ear plugs, steel toed boots, respirators, etc? Who will decide when protection is needed? Who will monitor its use?

E. Safety Meetings - Who will conduct meetings? What will frequency be? Who will attend? How will subjects be selected?

F. Emergency Medical Care - Telephone Nos. (Ambulance, Fire, Rescue). Directions. Prearrangements made - insurance, workmen's comp?

G. First Aid - Names of trained employees. Names of CPR trained employees

H. Trenching and Excavating - Who will be responsible for selecting slopes, shoring and protection systems during trenching operations? Is the person trained and competent in the revised (1989) OSHA regulations?

I. Hazard Recognition, Reporting and Abatement - To whom will employees report perceived hazards? How will these reports be handled? Who will correct hazards?

J. Equipment Inspection - Who will inspect construction and hauling equipment? Will it be inspected before shipment to project, or after? How will suppliers equipment be inspected(e.g. asphalt hauling trucks)?

K. Separating Pedestrians from Construction Vehicles and Public Traffic - Are there hazards associated with pedestrians (contractor or public) moving amidst equipment and public traffic? How will these hazards be abated?

L. Jobsite Inspections - Who will perform jobsite inspections? What will the frequency be? Will a report be generated? How will deficiencies be corrected? Immediate order or report back to superintendent?

M. Hazardous Materials -Will hazardous materials be generated? Asphalt products, solvents, chemicals? What are special procedures for handling, disposing?

N. Explosives - See Section 205 for special requirements. What are provisions for storage and inventory control of explosives?

O. Fire Fighting and Emergencies - What are fire hazards requiring special attention? What resources are available for fire emergencies?

Figure 6-8.1

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

Construction Inc.
Myrtlesville Drive
Oak River, CA 94601

November 12, 1992

Re: CA Forest Highway Project - PFH 168-3(2)
Winding River Road

Gentlemen:

This acknowledges our review of your project Safety Plan submitted at the Preconstruction Conference on October 16, 1992. The plan is approved with the following comments, and work may proceed on the basis on this approval.

1. The plan states that all work will comply with current OSHA standards. However, FAR Clause 52.236-13 does not limit your obligation to OSHA standard but provides that CO may order corrected any situation which poses a safety hazard, especially hazards to the public and Government employees. You should expect that periodically the Project Engineer will identify such situations.

2. The plan states that supplier's trucks will have backup alarms, or that an observer will signal when backing is safe. When these operations occur, and if some of the hauling units do not have backup alarms, you are requested to specifically identify to the Government's onsite inspector, who the observer is.

3. The plan states that jobsite safety inspections will be performed as necessary by the Project Superintendent. You are requested to establish a specific frequency for such inspections and so advise the Project Engineer of that frequency and the results of each inspection as it is performed.

If Project Engineer and onsite Government inspectors observe chronic or repeated deficiencies in you safety program, this approval may be rescinded and you will be requested to take immediate action to preclude recurrences of the deficiencies.

Sincerely yours,

J. Doe
Project Engineer

Example Approval Letter
Figure 6-8.2

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

Construction Inc.
Myrtlesville Drive
Oak River, CA 94601

May 11, 1993

Re: CA Forest Highway Project - PFH 168-3(2)
Winding River Road

Gentlemen:

On May 10, 1993 FLH inspectors observed an employee of your testing subcontractor attempting to take a compaction test in the vicinity Sta. 112. Visibility was poor due to dust from the scrapers. The tester had no safety vest. He was not shielded by a vehicle. Scrapers and other equipment seemed oblivious to his presence as they passed by at speed less than 3 meters away.

You are directed to review your overall safety plan for adequacy in this area, specifically how pedestrian workers are effectively protected when working in the vicinity of heavy equipment. Please advise the Project Engineer of actions you are taking to minimize this problem and similar situations in the future.

Sincerely yours,

J. Doe

J. Doe
Project Engineer

Example Notification of Safety Deficiency
Figure 6-8.3a

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

Construction Inc.
Myrtlesville Drive
Oak River, CA 94601

June 4, 1993

Re: CA Forest Highway Project - PFH 168-3(2)
Winding River Road

Gentlemen:

This letter summarizes a number of safety problems which have occurred at the jobsite in the last several months. The frequency and/or seriousness of at least some of the problems suggest that your overall safety program is inadequate; or that to be effective, it should be implemented more assertively.

-In March, a crane outrigger foundation failed causing the crane's load to swing and damage some concrete formwork.

-Also in March, we advised you of concrete finishers working on planks approximately 5 meters above the ground, without adequate safety belts.

-In May we advised you that your compaction tester was observed working immediately adjacent to compaction and hauling equipment during periods of poor visibility and without adequate isolation of the test site from the construction operations.

-On May 26, 1993 several form bolts fell off the top of scaffolding at Pier No. 4 narrowly missing a workman.

You are hereby directed to review your overall safety program and to provide the enhancements necessary to prevent, in the future, these kinds of deficiencies and accidents, any one of which could have resulted in a fatality or serious injury. Please respond to this office in writing by July 1, 1993, detailing the actions you have taken or are taking to enhance your program. If the Government believes your safety program continues to be inadequate, FAR Clause 52.236-13 permit the suspension of all or part of the work pending corrections to the program. We will be compelled to consider such an action if the frequency of accidents and safety deficiencies does not diminish.

Sincerely yours,

J. Doe

J. Doe
Project Engineer

Example Notification of Chronic Deficiencies
Figure 6-8.3b

Summary[1] of OSHA Trenching and Excavation Requirements

Soil Classification

Classification	Description
Stable Rock	Solid rock which can be excavated with vertical sides which remain intact while exposed.
Type A Soil	Cohesive soil, caliche or hardpan that is not fissured, subject to vibration or other factors which would require it to be classified as a less stable material; and which has an unconfined compressive strength of at least 150 kilopascals.
Type B Soil	Cohesive soil that is fissured, subject to vibration or other factors which would require it to be classified less than Type A, but not Type C and which has an unconfined compressive strength between 50 and 150 kilopascals; granular cohesionless soils including silt, silty loam, sandy loam; angular gravel or crushed rock; previously disturbed soil.
Type C Soil	Cohesive soil with an unconfined compressive strength of less than 50 kilopascals; cohesionless soils including rounded rock, sand; submerged or saturated soil, submerged rock that is not stable; layered systems which dip into the excavation at a slope of 1:4 or steeper.

Maximum Slope and Trenching Depth
Unsupported Trenches

Soil Type	Maximum Slope	Maximum Depth[2]
Stable Rock	Vertical	6.0 meters
Type A, B or C	Vertical	1.5 meters
Type A Soil	1.3:1	6.0 meters
Type A Soil (Alternate)	Vertical and 1.3:1[3]	1.1 meters 2.5 meters[4]
Type A Soil (Alternate)	Vertical and 1:1[3]	1.1 meters 3.6 meters[4]
Type A Soil (Short Term)[5]	2:1	3.6 meters
Type B Soil	1:1	6.0 meters
Type C Soil	1:1.5	6.0 meters

Notes:

1 - This material is a summary of OSHA regulations published in CFR 1926, Subpart P, Appendix A and B. The regulations themselves are not written in SI units, and are more detailed than the summary presented here; and therefore should be used to resolve actual job site questions and interpretations.

2 - Support systems for trenches over 6.0 meters deep must be designed by a registered Professional Engineer.

3 - Maximum slope above vertical portion of trench.

4 - Maximum total depth including vertical portion of trench.

5 - Short term means 24 hours or less.

6 - All soil must assumed to be Type C, unless a competent person, provided by the Contractor, following the procedures in CFR 1926, Subpart P, Appendix A, determines that it is Type A or Type B.

7 - See CFR 1926, Subpart P, Appendix B for details regarding compound slopes, stepped slopes and permitted use of shoring and support systems.

8 - Design of shoring and support systems must comply with CFR 1926, Subpart P, Appendix C or D; be a commercial system used in accordance with manufacturers recommendations; or be designed by a registered Professional Engineer.

Summary of OSHA Trenching and Excavation Requirements
Figure 6-8.4

CHAPTER 7 - PROSECUTION AND PROGRESS

CONTENTS

FIGURES

7-1 SUBCONTRACTING

7-1.1 General

The Standard Specifications permit subcontracting a portion of the work. The FAR specifically encourages subcontracting to small, small disadvantaged, and women owned small businesses. However, the Contractor is usually required to perform, with its own organization, work amounting to not less than 50 percent of the original Contract amount. This requirement is contained in FAR Clause 52.236-1. In some contracts an alternate percentage may be inserted. Contracts which are Small Business Set Asides contain FAR Clause 52.219-14, which permits a far higher percentage of the work to be subcontracted (85% less materials). For most FLH contracts written consent to subcontract is not required. However, contracts and subcontractors may be required to furnish certain regulatory and administrative items prior to beginning work on a subcontract. These items are as follows:

SF 1413 (Figure 7-1.1a) - Statement and Acknowledgement - A standard form in which the prime and the sub certify that the standard labor provisions are included in the subcontract. This form is required for all subcontracts involving onsite (Davis-Bacon) labor. It must be submitted to the Government within 14 days of award of the prime contract or 14 of the award of any applicable subcontract.

FHWA 1775 (Figure 7-1.1b) - Notice of Subcontract Award - Supplemental Information - This form is designed to solicit certain data on the size and socio-economic status of the subcontractor in order to report such data accurately to the Small Business Administration. The form also provides for documentation of the amount subcontracted to date. Prices shown should be based on the actual prices in the subcontract, regardless of the bid prices.* This form should be obtained from all subcontractors, including supply subcontracts, whether they involve onsite labor or not.

For those subcontracts for which the Contractor claims entitlement under the DBE/WBE Subcontract Compensation Clause, the contractor is required to furnish a written request for compensation and a variety of additional documentation including a copy of the subcontract itself, certification of amounts paid, proposed incentive computation, copies of current DBE/WBE certification or documentation which would support an ad hoc certification.

* *Significant differences between the subcontracted prices and the bid prices should be reviewed with respect to the prime's entitlement to full progress payments. For example if the prime bid $250,000 for clearing, but subcontracted the work for $25,000, the bid item may be an improper augmentation to the mobilization item and should be questioned. The Contractor would be entitled to any amount bid, but the Government may take the position that these excess amounts cannot be paid early in the Contract because they represent payment for underbid work to be completed later in the Contract. Instead the payments should be prorated on a reasonable schedule, through the remaining Contract. Situations such as this must be discussed with the COE, who will probably seek legal advice, before proceeding.*

Contracts which are awarded to large business concerns and which exceed $1,000,000 (original contract amount) contain a Subcontracting Plan submitted by the Contractor immediately after award. The goals contained in the Subcontracting Plan are contractually binding and must be monitored by the Project Engineer to verify that they are met. Failure to comply with these goals may result in liquidated damages being assessed in accordance with *FAR*

Clause 52.219-16, Liquidated Damages - Small Business Subcontracting Plan. A contractor who is operating under a Subcontracting Plan is required to submit periodic documentation to the Small Business Administration through the Contracting Officer, FLHO and DOT.

Figure 7-1.1c, SF-294, Subcontracting Report for Individual Contracts is required to be submitted semiannually on April 30 and October 30 each covering the semiannual periods ending March 31 and September 30.

Figure 7-1.1(d), SF-295, Summary Subcontract Report is required to be submitted annually on October 30 covering the fiscal year ending September 30.

The Construction Operations Engineer should be advised when the Contractor fails to submit required documentation, when there is apparent noncompliance with the subcontracting plan or when the invoking of such damages is apparently warranted.

During the preconstruction conference the Contractor should be apprised in detail of the subcontracting requirements and the required certification forms should be discussed and made available at that time. It should be made clear to the Contractor that, insofar as the Government is concerned, the prime Contractor is responsible for all work subcontracted and resubcontracted, and that all subcontracts must include the appropriate provisions of the original Contract.

7-1.2 Percent Subcontracted

In order to verify compliance with *FAR Clause 52.236-1, Performance of Work by the Contractor*, it is necessary, with each subcontract, to recompute the amount of the original contract which the prime Contractor is performing with its own forces (labor). **Figure 7-1.2(a), Subcontracting Guidelines**, provides guidance for computing the percent subcontracted, as well as whether specific kinds of subcontracts counts toward the DBE/WBE threshold or for compensation under the DBE/WBE SCC. **Figure 7-1.2b, Example Contract**, contains numerous first, second and third tier subcontracts. **Figure 7-1.2c, Example Computations, Part A**, is an example computation of the percentage which the prime is performing with its own forces. Only onsite subcontracts which include Davis-Bacon labor are counted as work not performed by the prime. Subcontracts which involve onsite services such as testing, surveying and inspection are not counted unless they include at least some Davis-Bacon labor. Whether they include Davis-Bacon labor or not varies from State to State. Supply type subcontracts do not count; nor do hauling subcontracts unless they are subject to Davis-Bacon.

FAR Clause 52.219-14, Limitations on Subcontracting, applies only to Small Business Set Asides. It permits the prime to perform as little as 15 percent of the amount of the original contract (exclusive of materials). Generally this percentage is so low, that as long as the prime has some presence on the site, including the submission of payrolls, no further documentation is necessary to verify the 15 percent requirement. If documentation is generated, the full amounts of all materials supply subcontracts (at any tier) must be deducted from the original Contract amount, and from the amounts of all subcontracts prior to computing the amount subcontracted.

7-1.3 Materials Supply Subcontracts

For purposes of computing the percent subcontracted and for administration of the DBE/WBE Subcontract Compensation Clause it is important to define a materials supply subcontract.

- Such subcontracts provide for the furnishing of materials which are to be incorporated in the work, such as concrete, steel and asphalt. Other materials such as form lumber, explosives or fuel do not count as materials supply subcontracts.

- Such subcontracts must be in writing prior to the delivery of the material, and both parties (the Contractor and the supplier) must have mutually enforceable obligations under the subcontract. Usually the prime agrees to purchase certain quantities of materials, the supplier agrees to a specific price for the materials. Simple price quotes or the purchase of occasional concrete from a local supplier to build headwalls would usually not count as materials supply subcontracts.

Traditionally, in accordance with the Labor Department regulations, materials supply subcontractors were simply called "suppliers" rather than subcontractors. That remains true in all DOL laws and regulations. However the FAR defines suppliers as a form of subcontractor, not a separate entity. This is important when applying DBE, Prompt Payment and other non-Labor provisions in the Contract.

7-1.4 Small and Small Disadvantaged Business Concerns

The FAR encourages small business and small disadvantaged business subcontracting. In order to be a disadvantaged business or a woman owned business as defined by the FAR, the company must also be a small business. Whether a company is a small business is determined by standards set by the Small Business Administration (SBA) and published in Part 19 of the FAR. A company's status also depends on the nature of the work it is doing. A company might be a large business as a general highway contractor, but a small business as an asphalt supplier. Also the Federal Aid regulations put additional limitations on the definition of "small business" that do not apply to Federal contractors. These additional definitions are such that a company could be excluded from small business programs (like DBE subcontracting) on Federal Aid projects, but still be eligible on FLH projects. Therefore, the lack of a State certification may not give an accurate indication respect to eligibility under Federal contracting (FAR) rules. FHWA 1775 asks for information on the subcontractor's small business and socio-economic status. This is done to be sure the subcontractors responses are consistent with the regulatory requirements and definitions. The information furnished should be checked by a designated specialist in the Division office. Among the information requested is the Standard Industrial Classification (SIC) code which is used by SBA to define small businesses. Most businesses should know their SIC code and be able to complete the form. **Figure 7-1.4, SIC Codes and Size Limitations for Typical Highway Contractors**, is edited from the FAR and may be used to verify or detect inconsistencies in information provided by the contractor.

7-1.5 DBE/WBE Subcontract Compensation Clause

The FLH DBE/WBE SCC is intended to be compatible with Federal Aid DBE Subcontracting regulations which are used by State Highway agencies. However, some key differences should be noted and reflected in our administration of the clause.

-Federal Aid regulations define women-owned businesses (WBE's) as a form of disadvantaged business (DBE). In Federal (FAR) procurement WBE's are a separate category and must not be reported as DBE's unless they also meet that criterion.

-Federal Aid regulations put certain size limitations on DBE/WBE's that are more restrictive than Federal regulations. This means that certain subcontractors, especially materials supply subcontractors may not be considered "small businesses" by Federal Aid regulations, but may be considered as such by Federal regulation and therefore eligible to participate in the DBE/WBE SCC.

We cannot always rely on DBE/WBE's being certified by a State DOT or being 8(a) certified by the Small Business Administration. Therefore, FLH has an *ad hoc*, or *for this contract only* means of certifying DBE/WBE's who believe they are eligible to participate in our program, but

do not have a State certification. **Figure 7-1.5a, Ad Hoc Certification Application**, is a tabulation of the information necessary to process an ad hoc certification. In addition to the information requested, contact with the certification department of the State DOT where the subcontractor has its home office is recommended. For consistency it is recommended that ad hoc certifications be processed through the Construction Operations Engineer by a designated specialist in the Division office.

Figure 7-1.5b, Example Computations, Parts B & C, show an example of how to determine the achievement of the minimum threshold for participation in the DBE/WBE SCC; and compute the actual incentive payment. Bear in mind, these computations come only after validation of the subcontractor's status as a DBE or WBE - either through State certification or an FLH ad hoc certification. It addition the subcontractor must perform a *commercially useful function* in order for the prime to qualify for the incentive. For example subcontractors which simply *pass through* the cost of supplies to the prime, or which furnish labor to be reimbursed by the prime are probably not performing a commercially useful function. Any contractual arrangement which is not normal in the industry and appears contrived to precipitate (or increase) eligibility for the incentive should be considered suspect.

Compensation under the DBE/WBE SCC is based on the net amounts paid by the prime to the DBE/WBE. *Net* means any deductions the prime makes for work, services or penalties are deducted from the amount of the subcontract before computing payment. E.g. if the DBE/WBE doesn't have a backhoe and the prime rents it one to complete the work and charges $2000 for the rental, the $2000 is in effect, a reduction in the subcontract amount, even if it is paid to the prime separately by check. In the absence of evidence to the contrary, it is acceptable to rely on the contractor's certification as to the net amount paid to the DBE/WBE.

Figure 7-1.5b, Example Computations, Part D, shows computation of a contract time extension on a completion date contract. This type of extension is applicable unless that provision is omitted from a particular contract.

7-1.6 Miller Act

Occasionally, subcontractors or even individuals may contact the Project Engineer about unpaid bills for labor, materials or services furnished to the project and request help in collecting payment from the Contractor or subcontractors. Sometimes the Project Engineer is asked to enforce payment or to withhold funds from the Contractor to make up the nonpayment. There is no specific authority in law for FHWA to take either of these actions under normal circumstances. However, see Section 8-3 dealing with Prompt Payment and false certifications. The only direct assistance FHWA can provide is to bring the reported nonpayments to the attention of the prime Contractor and its bonding company. The Payment Bond, required by the Miller Act, protects most persons furnishing labor, materials or services, just as a mechanics lien protects companies in the private sector. These companies cannot put a lien on parts of the project, or repossess items. Items which are *repossessed* after they have been wholly or partially paid for on progress payments are of particular concern because they are then Government property. If the prime does not immediately resolve such problems they should be reported to the Construction Operation Engineer.

Figure 7-1.6a, Example Miller Act Letter, is an example of a letter to a complaining subcontractor or supplier which advises them of their rights under the Miller Act. **Figure 7-1.6b**, **Miller Act Provisions**, is a copy of the pertinent parts of the law itself, which should be furnished to complaining subcontractors and suppliers.

7-2 NOTICE TO PROCEED

The Notice to Proceed will be issued by, or with the concurrence of, the Construction Engineer (CE).

SF 1442, Solicitation, Offer, and Award, and *FAR Clause 52.211-10, Commencement, Prosecution, and Completion of the Work*, establish the contract completion date for each project. The Contract may also provide a specific number of calendar days (i.e., after the bid opening or receipt of acceptable bonds), or a specific date, by which time the Notice to Proceed (NTP) must be issued. In the event the NTP is not issued within the specified time period, for reasons not the fault of the contractor, the Government is obligated to extend the fixed completion date accordingly. The NTP should be sent certified mail, return receipt requested.

Inordinate delays in issuing the NTP may warrant more than just a day-for-day extension if the project completion date has been pushed into the next construction season. In addition, the Contractor may be due compensation for additional costs such as remobilization for the extra season. Such eventualities should be treated as a Contract Modification requiring cost data, negotiations, etc., in accordance with Chapter 3 of this Construction Manual.

FAR 52.211-10 requires the Contractor to commence work within a specified period of time after receipt of the NTP. To allow the Contractor to coordinate operations and mobilization, the date for issuing the NTP should be discussed with the Contractor when possible. However, it is important that the Project Engineer (PE) and Construction Operations Engineer (COE) remain aware of the status of project award and establish a NTP date that falls within the time period specified in the Contract, unless the delay is due to the fault or negligence of the Contractor, e.g. by failing to submit acceptable bonds; or unless the Contractor and FLH have mutually agreed to delay the NTP in which case a CM signed by both parties should be executed.

Construction should provide input at the time of PS&E approval for an anticipated date by which the NTP will be issued. This is particularly important for contracts awarded in the fourth quarter when weather conditions may be unfavorable for work to commence immediately after award. When this is anticipated to occur, it may be best to provide a date the following spring when conditions are expected to be suitable for work. Failure to do this may result in the need to issue the NTP at a time when it is impossible for the Contractor to begin work in the specified period or delaying the NTP until conditions are suitable for work. If the Contractor requests and FLH agrees to a delay in the NTP, FLH has no obligation to extend the completion date unless that is a part of the overall agreement.

7-3 CONSTRUCTION SCHEDULES

7-3.1 General Requirements

FAR Clause 52.236-15, Schedules for Construction Contracts, and Section 155 of the Standard Specifications (FP) require the Contractor to submit a construction schedule. This construction schedule is to represent the sequence in which the Contractor plans to perform the contract work, showing start and end dates for each work activity including material ordering and delivery.

7-3.2 Limitations on Completing Work

The time allowed for completion of a contract is the ultimate limitation or constraint on the construction activities required for the project. Numerous activities can be planned, supplied and constructed within the contract time by recognizing the limitations on the work and the interdependence between activities of work.

Most activities are resource dependent, i.e., they rely on resources such as equipment and manpower. Other activities of work are independent and can be carried out simultaneously if sufficient resources are available such as constructing a bridge while earthwork or paving are being completed.
Some activities, however, are completely dependent on the completion of another activity such as the sequence of excavation to embankment construction, then fine-grading, followed by placement of any base courses, and finally the asphalt paving.

Other activities, such as concrete curing or form removal, are restraints since they cannot be completed before a minimum amount of time has elapsed, i.e., seven days is required for curing and a percentage of the 28-day strength must be achieved before the forms can be removed. Other possible restraints are shop drawing approvals, traffic lane closure restrictions, limited work hours and climatic conditions. To properly manage a construction project, all of these activities, constraints, and limitations must be logically organized and developed into a construction schedule.

7-3.3 Construction Schedule Format

The general format for the construction schedule includes a graphic representation of the sequencing of work activities and the time to complete each of these activities, and a written narrative supporting the Contractor's logic in the development of the graphic representation. The FP requires the Contractor to use one of two standard formats, the Bar Chart Method or the Critical Path Method. The Special Contract Requirements (SCR) may limit the choice to only one of these specific formats, otherwise it is the Contractor's option.

1. Bar Chart Method (BCM)

The BCM format consists of a progress bar chart and a written narrative. The FP outlines the information to be included on the bar chart and in the written narrative. The bar chart typically is comprised of a horizontal time scale and a vertical listing of project work activities. Bars are drawn to graphically represent the span of time necessary to accomplish each activity. See **Figure 7-3.3a, Example Bar Chart Schedule**.

Bar charts are the least sophisticated of scheduling methods because they do not show the relationships and dependencies of different work activities; do not tie the work to resource utilization; do not show float time; and are not effective in determining overall impact (cause-effect) on time resulting from a change or disruption. As such, delay analysis is impossible to perform accurately.

Bar charts are appealing to operations personnel because they identify the general course of the work in an uncomplicated fashion and they are easy to use in routinely monitoring the Contractor's progress. The development of a BCM schedule requires substantially less resources as compared to a CPM schedule.

Most non-complex projects do not warrant the resource investment required for a CPM schedule.

The narrative requirement for the BCM method of scheduling should result in more useful bar charts than received in the past. The Contractor is now required to identify anticipated resources and production rates. If during construction, the scheduled resources are not used on the project, or if the production rates are not achieved for unchanged work, it is possible to prove the Contractor's original schedule was defective. However, when the Government is responsible for a delay, using the BCM, it remains a difficult, if not impossible, job to evaluate the impact of each delay or inefficiency encountered through the course of the project and quantify the true delay for which the Government is liable.

2. Critical Path Method (CPM)

The CPM format consists of a diagram, a tabulated schedule, and a written narrative. The FP outlines the information required for each of these submittals. The CPM is the more sophisticated and useful format and will normally be required on complex or large contracts. It represents the sequence and interdependence of work activities and time, factors in any constraints and restrictions, and clearly defines the critical activities of work. Through this maze of activities, constraints and restrictions, lies a *critical path* sequence that cannot be altered without affecting the overall completion date. **See Figure 7-3.3b, Example CPM Schedule**.

a. The Critical Path

The critical path is the longest chain of dependent activities. These dependent activities are critical activities, also described as controlling activities of work. The critical path is of obvious importance when considering the impact of a CM on the completion date. If a CM affects a critical activity, a time extension should be considered. An event that causes a delay to part of the project may not increase the time required to perform the entire project unless it delays a critical activity on the critical path.

On many FLH highway contracts the critical activities are fairly obvious such that the Project Engineer and the Contractor are aware of what activities are controlling the completion of the contract. Computer software to complete CPM's (network analysis) or other resources (production rates, current bar chart, equipment lists, etc.) should be available to check the Contractor's schedule, determine the critical work activities, and document the reasons for granting or denying a time extension.

b. Float Time

For work activities not on the critical path, the Contractor has some leeway as to when these non-critical work activities are started. This leeway is called float time. Float time is the amount of time an activity can be delayed without affecting the completion date of the contract. Float time can also be defined as the amount of time between the earliest start date and the latest start date, or between the earliest finish date and the latest finish date. When the float time for an activity is exceeded, it becomes a controlling activity of work, moves onto the critical path, and affects the contract completion date. Activities on the critical path have no float time.

c. No Float and Multiple Critical Path CPM's

It is important that the Contractor assign a reasonable amount of time to all work activities and identify any float time in the schedule. With any delay, an activity with little float time can become a controlling activity of work.

A schedule with little float time for most of the work activities often puts the Government at a disadvantage, since any delay will soon affect completion and could result in a delay claim.

CPM's with multiple critical paths should also be closely reviewed, since seldom is there more than one truly critical path. If a schedule with

multiple critical paths is accepted, the Government is at a disadvantage because any delay will probably impact one of the paths. Multiple critical paths are usually created by assuming low production rates and eliminating float on noncritical activities so that the activities appear critical.

If the Government can show that actual production and activity durations were consistently better than those assumed on the original schedule, that evidence can be used to question whether those durations were *realistic*, and whether the activities were therefore *critical*. A new schedule can be requested on this basis. It is best to make such observations prior to a change or differing site condition which may impact time.

7-3.4 Submittal Requirements and Review

The FP requires that three copies of a preliminary construction schedule (PCS) be submitted at least 7 days before the preconstruction conference. The PCS is a written narrative detailing the Contractor's contract activities for the first 45 calendar days after the NTP is issued. Seven calendar days after the preconstruction conference, the PCS must be accepted or rejected and returned for revisions. The Contractor should not be permitted to start any work, except mobilization and traffic control, i.e., erection of construction signs, until the PCS is approved.

The PCS should be reviewed to determine if it generally represents those activities that logically should occur in the beginning of the specific type of contract. This could involve all traffic control as on an urban road rehabilitation project; erection of an onsite batch plant for a remote paving or concrete project; or only time for material ordering and delivery for a pre-manufactured installation, i.e., precast guardwalls. The Project Engineer's review must consider the type of project and need not be overly critical. The PCS should also be used to plan and schedule the Government's initial onsite personnel and equipment needs.

The FP requires that three copies of the initial or "as bid" construction schedule for the total contract work be submitted within 30 calendar days after the NTP is issued. This initial schedule must be accepted, or rejected and returned for revisions within 14 calendar days after receipt by the Government. This initial construction schedule, whether in the BCM or CPM format, is of particular importance. The Contractor's initial construction schedule should show how he plans to begin, sequence, and complete the principal phases of work within the time allotted by the Contract.

It is the Contractor's initial construction schedule that normally warrants the most thorough, in-depth review by the Government. Once accepted, this initial schedule will establish the basis against which all future schedule changes or updates and claims will be compared and justified. The Government's review should carefully consider each work activity on the schedule and the time proposed for its completion. Any unrealistic production rates based on proposed crew size or number of equipment should be questioned. Any impractical sequencing of work activities either for contractual reasons, e.g., impermissibly staged or phased construction, physical constraints such as assuming access where there is none, or for improper workmanship or aesthetic, e.g., placing final asphalt surface before construction of adjacent curb, should be questioned. Also, any actions involving the Government such as shop drawing approvals or time allotted for testing should be carefully reviewed. All reservations should be documented in writing and returned for resolution before final acceptance of the schedule. If it is determined that there are no contractual or supportable operational reasons for rejecting an optimistic schedule, all reservations should still be included in the acceptance letter. By accepting an unrealistic schedule from the Contractor, the Government could be at a distinct disadvantage when defending against any future delay or impact claims.

The FAR permits the withholding of progress

payments if the Contractor fails to submit his schedule within the time prescribed. Progress payments should be withheld until receipt and acceptance of the Contractor's initial construction schedule. Progress payments may be withheld, whole or in part, if schedule updates are not submitted as required. Prudent judgment should be used in withholding payment due to disagreements with the Contractor concerning his submitted schedule. Generally if the required initial schedule has been submitted in good faith, but is not acceptable for clear, objective reasons, or if the approved schedule has proven obsolete and the Contractor has failed to submit a requested update, the maximum ten percent retent provision contained in *FAR Clause 52.232-5, Payments Under Fixed-Price Construction Contracts* is usually more appropriate than total withholding of payments. Minor problems do not normally justify the withholding of progress payments.

7-3.5 Schedule Updates

FAR Clause 52.236-15 and the FP both require the Contractor to document actual progress on the approved construction schedule. Three copies of an updated construction schedule must be submitted at least every 8 weeks or when any delay or change occurs as outlined in the FP. The SCR may specify a different submittal frequency.

Construction schedules, especially those in the CPM format, should be updated frequently because any change in production or other events that impact time can make the schedules obsolete, may alter the critical path, and therefore change the controlling activities of work. Schedules reconstructed *after the fact* can be biased so that the true picture of the past work is not shown.

If the Contractor's progress is not satisfactory - usually defined as when the progress falls 10 percent behind the current schedule - an updated schedule should be requested, in writing. The request should ask the Contractor to identify any Government caused delays. It should also notify the Contractor of any intent to withhold retent due to unsatisfactory progress, or the assessment of liquidated damages if the Contract time is about to elapse. It is also prudent to request an updated schedule when issuing a major CM, time extension, or a directed acceleration.

All updated construction schedules should be reviewed, accepted, or rejected and returned for revisions. The review can focus on the areas of the updated schedule which have been significantly changed from the previously accepted schedule. The Contractor should identify these changes in the narrative submittal. Any reservations should be documented in the acceptance letter.

7-4 LIMITATION OF OPERATIONS

Most FLH projects are constructed under traffic. The Contractor is required to conduct the work at all times, in such a manner and in such sequence as will assure the least interference with public traffic. The Contract may include specific constraints such as when closures may occur, how long they may last and when one-way operations may take place. The Contract may also include one or more interim completion dates or phases which specify that certain portion of the project must be complete and open to the public before others are started.

If the Contractor is prosecuting the work in a manner which results in sections of the project being unnecessarily closed when little work is in progress, which results in substandard accommodation of traffic, or when temporary traffic control costs to the Government are unnecessarily high due to the inefficiency of the Contractor, the Project Engineer may require the Contractor to modify its operations to correct these problems. Since such orders are likely to result in a dispute, they should be discussed with the COE prior to issuance.

However, the Project Engineer and COE should have an understanding when situations are causing unsafe conditions or severe backups, the Project Engineer should be authorized to immediately order appropriate actions to alleviate the problem, rather than delay pending discussions with the COE. Such situations may be the result of the Contractor's operations, or they may relate to the need to modify or augment the specified Traffic Control Plan.

In accordance with *FAR Clause 52.236-11 Use and Possession Prior to Completion*, the Government has the right to order portions of the project open prior to completion of the entire contract. This clause in applicable only to a situation where the Contract provides for the closure of such portions until completion of the entire contract, but the Government elects to change the conditions of the Contract and order the portions opened. Such a decision may make the Government liable for an equitable adjustment, and therefore must be considered a change ordered in accordance with Chapter 3.

7-5 CHARACTER OF WORKERS AND ADEQUACY OF EQUIPMENT

The Contract, *FAR Clause 52.236-5, Material and Workmanship,* requires the Contractor to perform work in a skillful and workmanlike manner. The Government may order any Contractor employee removed, who is incompetent, careless or other wise objectionable. This is a serious action which may subject the Government to liability if the removal is later deemed by a court to be arbitrary or in bad faith. Normally the COE or higher Contracting Officer must sign such an order.

The same clause permits, unless otherwise specified, that when equipment, materials or processes are specified by catalog number, make, or other proprietary description, the Contractor may propose an alternate to that specified in the Contract as long as the Contracting Officer determines the equipment, material or process to be equal to that specified. Since FLH seldom specifies proprietary equipment, materials or processes, this issue does not often arise. When it does, approval or disapproval should be made in good faith, as a Contract Modification.

FAR Clause 52.236-6, Superintendence by the Contractor, requires the Contractor to assign to the work, a superintendent satisfactory to the Contracting Officer. If a superintendent is deemed to be unsatisfactory and removal is contemplated, the action should be taken be the COE or higher as delegated. This is a serious action which may subject the Government to liability if the removal is later deemed by a court to be arbitrary or in bad faith.

FAR Clause 52.246-12, Inspection of Construction, as well as the Contract Specifications, require the Contract to maintain an inspection system which ensures that the work complies with the Contract requirements. The inspection system should not be dependent on the presence of Government inspectors or the performance of Government testing. The work should comply with the Contract, whether or not a Government inspector is present, or whether or not Government testing has been performed. Failure to maintain an adequate inspection system subjects the Contractor to suspension and/or ordered correction of not just the work in question, but the inspection system itself. It also subjects the Contractor to an unsatisfactory performance rating which may be used to deny the company future Contracts.

The Project Engineer should keep the COE fully informed of any failure on the part of the Contractor to furnish suitable personnel and equipment, and actions taken or recommended.

The Project Engineer should maintain sufficient records on the Contractor's personnel and equipment to support actions and recommendations, and to document the facts in case a claim should arise or the Contractor should dispute any contract action.

7-6 CONTRACT TIME

The time allowed for completion of the work will be based on a specified completion date as stated in FAR 52.211-10. All work on the project is to be completed no later than on the date specified in the Contract, as adjusted under the Contract provisions.

7-6.1 Failure to Complete Work Within the Time Allowed

If the Contractor fails to complete the work by the close of business on the specified completion date (as adjusted), the charge of contract time and the attendant liquidated damages will include each calendar day between the specified completion date and the actual date of substantial completion.

Substantial completion is defined in Subsection 101.04 of FP-92 as: *The point at which the project is complete such that it can be safely and effectively used by the public without further delays, disruption, or other impediments. For conventional bridge and highway work, the point at which all bridge deck, parapet, pavement structure, shoulder, permanent signing and markings, traffic barrier, and safety appurtenance work is complete.*

Liquidated damages at a reduced rate will then be charged beginning with the day after substantial completion and ending with the date of final completion and acceptance (See FP-96 Subsection 108.04).

7-6.2 Methods of Adjusting Time Allowance

Adjustments in contract time are permitted under the following clauses:

-FAR 52.211-10, Commencement, Prosecution, and Completion of Work
-FAR 52.211-18, Variation in Estimated Quantity
-FAR 52.242-14, Suspension of Work
-FAR 52.236-2, Differing Site Conditions
-FAR 52.243-4, Changes
-FAR 52.249-10, Default (Fixed Price-Construction)

In addition to these standard FAR clauses, most FLH contracts contain provisions under Section 108 for a time extension as an incentive under the DBE Subcontract Compensation Clause.

General information regarding time extensions is included in *FP Subsection 108.03, Determination and Extension of Contract Time*.

Increases in contract time may be authorized as follows:

- By supplemental agreement which includes a revised fixed completion date.

- By change order providing a unilateral revised fixed completion date for performing work for which there has been no agreement.

- By supplemental agreement issued in settlement of a claim.

- By Contracting Officer's decision in accordance with *FAR Clause 52.249-10, Default, and FAR Clause 52.233.1, Disputes*.

7-6.3 Consideration of Time Adjustments

When contract modifications are issued, consideration must be given to the modification's effect on overall contract time. Failure to grant a time extension for increased work or changed work with a definite bearing on time for performance may result in an acceleration claim. If it is critical that the original contract completion date be maintained, it may be in the Government's interest to compensate the Contractor for accelerating the work to meet the original completion date. Generally, time adjustments will not be made unless the modification or change in work is on the critical path items.

When an adjustment in contract time is negotiated, it must be ensured that the proposed adjustment is in accordance with the Contract

provisions and is fair to both the Contractor and the Government. The actual time allowed should be tailored to the particular *change* situation along with consideration of the *effect on non-changed work* as to total Contract performance time. Consider the time of performance of the changed work and the need to acquire and mobilize/demobilize equipment to perform the work.

Unusual weather patterns impacting the work should be considered as appropriate. The Project Engineer should obtain rainfall information from local weather data centers for the past 10 year period to provide a base for any adjustments. Rainfall and other weather conditions should be documented throughout the life of the project.

Ideally, contract time should be determined by the effect of the change on the construction schedule which is current at the time of the change. Each modification should be clear and specific as to its effect on contract time such that all parties recognize and agree to the impact of the changed work.

A reduction in performance time to less than the original number of days allowed in the contract is rarely necessary, but is provided for under the Contract where early delivery of the facility is in the public interest. When a decrease in performance time is contemplated, the contract modification should be negotiated (a unilateral order is inappropriate) and an equitable adjustment is normally required.

The Contract permits the Contractor to request a time extension if it is impossible, for reasons beyond its control, to complete the work on time. Such a request should be made prior to the expiration of the contract time. The request must be made in writing and it must outline the reasons and justification for the time extension, citing the contract clause(s) which provides the basis for granting the extension. The Project Engineer should evaluate such a request and forward it, along with his/her recommendation, to the COE for a determination. Any resultant change in contract time shall be made by contract modification.

7-7 WORK SUSPENSIONS AND STOP ORDERS

7-7.1 Definitions

Note that the word *suspension* is commonly used in the FAR as meaning a suspension for the convenience of the Government pursuant to *FAR Clause 52.242-14, Suspension of Work*, i.e. a suspension which implies liability or potential liability to the Government. In Federal Lands, on the other hand, the word *suspension* has been most often used to describe directives to suspend due to unsuitable weather or failure of the Contractor to comply with contract requirements, neither of which implies liability to the Government. To resolve this inconsistency the following terms are defined to distinguish between these conditions.

Suspension: An interruption, delay, or halting of all or any part of the work by, and for the convenience of the Government, or resulting from an act (or failure to act) of the Contracting Officer. (See FAR 52.242-14, Suspension of Work).

Stop Order: An interruption, delay, or halting by the Government, of all or any part of the work resulting from unsuitable weather or soil conditions, an act of the Contractor, or the failure of the Contractor to act. (See FP Subsection 108.05)

7-7.2 Suspension of Contractor Operations

FAR 52.242-14 permits work to be suspended for the convenience of the Government. If a suspension is for longer than a *reasonable* time the Contractor may be entitled to an equitable adjustment. What is *reasonable* depends on the circumstances, and the liability of the Government for not suspending should be considered.

For example if the Contractor begins excavating from a Government designated borrow source, and it becomes apparent that the material may be unsuitable for its intended use, a suspension for one day to decide if it is in fact unsuitable would probably be reasonable. If the Government decided after one day that the source was acceptable, it could argue that no liability was incurred.

Authority to issue emergency or urgent suspensions within the window of *reasonableness* may be delegated to the Project Engineer. Once it is recognized that the suspension will result in liability to the Government, the letter or notice ordering the suspension of work, or documenting the suspension after the fact, shall be issued by the COE or the Construction Engineer depending on Division delegations.

Constructive suspensions of work can occur by failure of the Government to act. For example:

- Failure to approve shop drawings or mix designs within the time period specified in the Contract, or within a reasonable time if not specified
- Failure to perform timely inspections
- Delays due to defective specifications

7-7.3 Stoppage of Contractor Operations

The Standard Specifications permit the Contracting Officer to stop the work wholly or in part due to the following:

1. Weather or soil conditions considered unsuitable for prosecution of the work;

When the Contractor fails to act responsibly by voluntarily stopping operations when weather or soil conditions are unsuitable, the Project Engineer may issue a letter ordering work to stop. Normally this would be done only if the Contractor's continued work was causing damage to previously completed work, adjacent public or private property, or otherwise causing a potential liability to the Government.

In the letter, describe the problem which makes conditions unsuitable for work and the condition(s) which must exist before work can be resumed.

No order is required when the Contractor elects to stop work because of unsuitable conditions, which are usually of short duration and expected during the project duration. However, the project records should document and indicate such periods of no work.

For completion date contracts, there is no *counting* of contract time; therefore, normal unsuitable weather or soil conditions have no effect on the completion date. However, a time extension and new completion date may be established if the Contractor can demonstrate the amount of unsuitable weather is extraordinary or unusually severe. Such a demonstration will require careful review and documentation of weather history in the project area. In the event the Government agrees the weather is unusually severe, the completion date may be adjusted by contract modification. Such an adjustment is not dependent on a stop order having been issued by the Government, but only on the weather being demonstrated as unusually severe, and adversely impacting the Contractor's progress.

2. Failure of the Contractor to:

(a) Correct conditions unsafe for the workers or the general public.

(b) Carry out orders given by the Contracting Officer.

(c) Perform any provision of the contract.

In cases where these conditions exist, the Project Engineer should issue the Contractor a written notice covering the deficiencies that require correction. The notice should include a statement that failure to immediately take corrective action may result in the issuance of a stop order covering the work in question. At the same time, the Project Engineer should notify the COE by telephone and request instructions.

If the Contractor refuses or fails to correct the identified deficiencies, the Project Engineer may issue a stop order for periods of short duration due to reasons **1.** and **2.(a)** above. Stop orders for long durations or those due to reasons **2.(b)** or **2.(c)** shall be issued by, or have the concurrence of, the COE or the Construction Engineer.

Stop orders should cover only those items of work which are deficient. Stopping other work may be construed as punitive; stop orders or suspensions are not to be punitive.

7-7.4 Content of Suspensions and Stop Orders

Use a letter format for suspensions and stop orders, and include the following information:

1. Date, Contractor's name and address, contract number, and project designation.

2. Reason for suspension or stop order and whether the order pertains to all work underway or only part of the work. If the suspension or stop order affects only part of the work, describe that work which is affected.

   For stop orders covered by Subsection 108.05 of the FP, cite that provision.

   For suspensions of work for the convenience of the Government, cite *FAR Clause 52.242-14, Suspension of Work.*

3. Effective date of suspension or stop order.

4. Statement that work will not be resumed until directed in writing. For work stopped under Section 108.05, include a description of what conditions must exist before the Contractor can resume work.

5. A statement regarding the effect of the suspension or stop order on the contract time

and amount. If an unusually severe weather related delay is recognized by the Government, note that a contract modification may be requested adjusting contract time.

For other stop orders covered by Subsection 108.05 include a statement which says there will be no change in contract completion date or contract amount.

For suspensions of work for the convenience of the Government, state that any adjustment(s) to the contract completion date or amount as a result of the suspension will be made by contract modification.

The Contractor should be requested to acknowledge receipt of all suspensions and stop orders. If the Contractor's superintendent is absent, or due to strained relations, refuses to acknowledge the letter, its delivery should be noted in the diary and a copy sent to the Contractor's main office.

Examples of suspensions and stop orders are included in Figures 7-7.4a through 7-7.4c.

7-7.5 Content of Resumption Orders

After the reasons for a suspension or stop order have been resolved, FLH should provide a written resumption order to the Contractor to rescind the suspension or stop order. The resumption order should be signed by, or have the concurrence of the the official who signed the suspension or stop order. The order should include the following:

1. Date, Contractor's name and address, contract number, and project designation.

2. Reference the suspension or stop order, and identification of the item(s) of work affected by the resumption.

3. Effective date of resumption.

4. A statement regarding the effect of the suspension or stop order on the Contract time and amount (See 7-7.4 above).

Resumption orders after periods of short duration, may be made effective immediately if conditions permit normal resumption of the work. After long suspension periods, resumption orders should be issued sufficiently in advance of the effective date to permit the Contractor to coordinate the start-up of work. The Contractor should be requested to acknowledge receipt of all letters to resume work.

STATEMENT AND ACKNOWLEDGMENT

FORM APPROVED OMB NO. 9000-0014

Public reporting burden for this collection of information is estimated to average .15 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (VRS), Office of Federal Acquisition and Regulatory Policy, GSA, Washington, D.C. 20405; and to the Office of Management and Budget, Paperwork Reduction Project (9000-0014), Washington, D.C. 20503.

PART I – STATEMENT OF PRIME CONTRACTOR

1. PRIME CONTRACT NO.	2. DATE SUBCONTRACT AWARDED	3. SUBCONTRACT NUMBER

4. PRIME CONTRACTOR (Name, address and ZIP code)	5. SUBCONTRACTOR (Name, address and ZIP code)

6. The prime contractor states that under the contract shown in item 1, a subcontract was awarded on date shown in item 2 by (Name of Awarding Firm) _____

_____

to the subcontractor identified in item 5, for the following work:

7. PROJECT	8. LOCATION

9. NAME AND TITLE OF PERSON SIGNING	10. BY (Signature)	11. DATE SIGNED

PART II – ACKNOWLEDGMENT OF SUBCONTRACTOR

12. The subcontractor acknowledges that the following clauses of the contract shown in item 1 are included in this subcontract:

Contract Work Hours and Safety Standards Act – Overtime Compensation – Construction	Davis-Bacon Act
	Apprentices and Trainees
	Compliance with Copeland Regulations
Payrolls and Basic Records	Subcontracts
Withholding of Funds	Contract Termination-Debarment
Disputes Concerning Labor Standards	Certification of Eligibility

13. NAME(S) OF ANY INTERMEDIATE SUBCONTRACTORS, IF ANY

14. NAME AND TITLE OF PERSON SIGNING	15. BY (Signature)	16. DATE SIGNED

NSN 7540-01-151-4297 Previous edition is usable — EXPIRATION DATE: 3-31-92 — 1413-102 — **STANDARD FORM 1413** (REV. 6-89) Prescribed by GSA - FAR (48 CFR) 53.228(e)

SF 1413 Statement and Acknowledgement
Figure 7-1.1a

NOTICE OF SUBCONTRACT AWARD - SUPPLEMENTAL INFORMATION
(Attach to SF 1413)

PART I - STATEMENT OF PRIME CONTRACTOR

A. PRIME CONTRACT NO.	B. DATE SUBCONTRACT AWARDED	C. PROJECT NAME AND NUMBER

D. PRIME CONTRACTOR (Name, address and ZIP code)	E. SUBCONTRACTOR (Name, address and ZIP code)

F. PERCENT SUBCONTRACTED - APPLICABLE ONLY TO FIRST TIER SUBCONTRACTS PERFORMED WHOLLY OR PARTLY ONSITE AND INCLUDING DAVIS-BACON LABOR

TOTAL DOLLAR AMOUNT OF ALL ONSITE SUBCONTRACTS PREVIOUSLY AWARDED - $_____

ESTIMATED DOLLAR AMOUNT OF THIS SUBCONTRACT - $_____

TOTAL DOLLAR AMOUNT OF ALL ONSITE SUBCONTRACTS AWARDED TO DATE - $_____

ORIGINAL CONTRACT AMOUNT - $_____

PERCENT OF ORIGINAL CONTRACT AMOUNT SUBCONTRACTED - _____%

G. NAME AND TITLE OF PERSON SIGNING	H. BY (Signature)	J. DATE SIGNED

PART II - ACKNOWLEDGMENT OF SUBCONTRACTOR

A. The subcontractor acknowledges that it ☐is ☐is not a Small Business Concern as defined by Contract Clause 52.219-8. Check applicable blocks if the subcontractor is a Small Business Concern.

Average Number of Employees	Average Annual Gross Receipts (Last Three Years)	
☐ Less than 100	☐ Less than $2.5 Million	☐ $7.0 to $12.5 Million
☐ 100 to 500	☐ $2.5 to $3.5 Million	☐ $12.5 to $17.0 Million
☐ More than 500	☐ $3.5 to $7.0 Million	☐ More than $17.0 Million

B.Standard Industrial Classification (SIC) code and description which best describes this subcontract. Example: SIC 1741 Masonry, Stone Setting and Other Stonework.

SIC_____ Description_____

C. [Answer only if subcontractor is a Small Business Concern] The subcontractor acknowledges that it ☐is ☐is not a Small Disadvantaged Business Concern as defined by Contract Clause 52.219-8. If subcontractor is a disadvantaged business concern check one or more of the following as applicable:

☐ Small Business Act Section 8(a) Certified	☐ Black American	☐ Hispanic American
☐ Asian-Pacific American	☐ Subcontinent Asian American	☐ Native American

D. [Answer only if subcontractor is a Small Business Concern] The subcontractor acknowledges that it ☐is ☐is not a Woman Owned Small Business Concern as defined by Contract Clause 52.219-13.

E. NAME AND TITLE OF PERSON SIGNING	F. BY (Signature)	G. DATE SIGNED

FHWA 1775 (4/93)

Notice of Subcontract Award - Supplemental Information
Figure 7-1.1b

SUBCONTRACTING REPORT FOR INDIVIDUAL CONTRACTS
(Whole dollar amounts should be indicated. See instructions on reverse)

FORM APPROVED OMB NUMBER 9000-0006

Public reporting burden for this collection of information is estimated to average 5.73 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (VRS), Office of Federal Acquisition and Regulatory Policy, GSA, Washington, D.C. 20405; and to the Office of Management and Budget, Paperwork Reduction Project (9000-0006), Washington, D.C. 20503.

IMPORTANT: DOD contractors--complete all items. Civilian contractors--do not complete shaded items unless required by the agency.	1. REPORTING PERIOD: ☐ OCT 1 - MAR 31 ☐ APR 1 - SEP 30 FY _____	2. TYPE OF REPORT ☐ REGULAR ☐ FINAL ☐ REVISED	3. DATE SUBMITTED / 4. REPORT NO.
5. REPORT SUBMITTED AS: ☐ PRIME CONTRACTOR ☐ SUBCONTRACTOR	6. AGENCY OR CONTRACTOR AWARDING CONTRACT (Name, address and ZIP Code)	7. REPORTING CONTRACTOR (Name, address, and ZIP Code)	

8. DATES OF CONTRACT PERIOD OF PERFORMANCE (MM/DD/YY) FROM: TO:	12A. EST. AMT. OF SUBCONTRACT AWDS. UNDER ORIG. CONTRACT $	12B. REV. AMT. OF SUBCONTRACT AWDS. UNDER MOD. CONTRACT (If applicable) $
9. PRIME CONTRACT AND SUBCONTRACT NO. (If applicable)		
10. ADMINISTERING AGENCY (If other than Awarding Agency)		
11A. ORIGINAL CONTRACT AMOUNT $ / 11B. REVISED CONTRACT AMOUNT (If applicable) $		

13A. ORIGINAL GOALS	DOLLARS	PERCENT
1. SMALL BUSINESS CONCERNS		
2. SMALL DISADV. BUSINESS CONCERNS		
13B. REVISED GOALS (If applicable)		
1. SMALL BUSINESS CONCERNS		
2. SMALL DISADV. BUSINESS CONCERNS		

14. GOAL AMOUNTS IN 13A. AND 13B. ☐ DO INCLUDE INDIRECT COSTS ☐ DO NOT INCLUDE INDIRECT COSTS

SUBCONTRACT AWARDS

DIRECT SUBCONTRACT AWARDS	THIS REPORTING PERIOD DOLLARS	THIS REPORTING PERIOD PERCENT	CUMULATIVE (From beginning of Subcontract Plan) DOLLARS	CUMULATIVE (From beginning of Subcontract Plan) PERCENT
15A. SMALL BUSINESS CONCERNS (Include Disadv.) ($ amt. and % of 15C.)				
15B. LARGE BUSINESS CONCERNS ($ amt. and % of 15C.)				
15C. TOTAL (Sum of 15A. and 15B.)		100		100
16. SMALL DISADVANTAGED BUSINESS CONCERNS ($ amt. and % of 15C.)				

INDIRECT SUBCONTRACT AWARDS	DOLLARS: THIS REPORTING PERIOD	DOLLARS: CUMULATIVE (From beginning of Subcontract Plan)
17A. SMALL BUSINESS CONCERNS (Not Disadvantaged)		
17B. LARGE BUSINESS CONCERNS		
17C. SMALL DISADVANTAGED BUSINESS CONCERNS		

18. REMARKS (Enter a short narrative explanation if: (a) Small Business or Small Disadvantaged Business accomplishments fall below that which would be expected using a straight line projection of goals through the period of contract performances or (b) either goal is not met if this is the final report.)

19. TYPED NAME AND TITLE OF INDIVIDUAL ADMINISTERING SUBCONTRACTING PLAN	SIGNATURE	TELEPHONE NO. ( )
20. TYPED NAME AND TITLE OF APPROVING OFFICER	SIGNATURE	DATE

NSN 7540-01-152-8078 EXPIRATION DATE: 8-31-92 294-103 STANDARD FORM 294 (REV. 1-90)
Previous edition is not usable Prescribed by GSA - FAR (48 CFR) 53.219(a)

SF 294 Subcontracting Report for Individual Contracts
Figure 7-1.1c

SUMMARY SUBCONTRACT REPORT
(See instructions on reverse)

FORM APPROVED OMB NUMBER 9000-0007

Public reporting burden for this collection of information is estimated to average 16.21 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (VRS), Office of Federal Acquisition and Regulatory Policy, GSA, Washington, D.C. 20405; and to the Office of Management and Budget, Paperwork Reduction Project (9000-0007), Washington, D.C. 20503.

IMPORTANT: DOD contractors—complete all items. Civilian contractors—do not complete shaded items unless required by the agency.

1. REPORTING PERIOD (check one):
- A. DOD FEDERAL FY 19___ QUARTER ENDING: ☐ DEC 31 ☐ JUN 30 ☐ MAR 31 ☐ SEP 30
- B. CIVILIAN FEDERAL FY 19___ ☐ ANNUAL (OCT 1 - SEP 30) (except commercial product)
- C. DOD & CIVILIAN FEDERAL FY 19___ ☐ ANNUAL (OCT 1 - SEP 30) (commercial product)

2. TYPE OF REPORT: ☐ REGULAR ☐ FINAL ☐ REVISED

3. CONTRACTING AGENCY

4. ADMINISTERING AGENCY (If different from Item 3)

5. DATE OF LAST GOV. REVIEW

6. REVIEWING AGENCY

7. CONTRACTOR ESTABLISHMENT CODE (If available)

8. REPORT SUBMITTED AS: ☐ PRIME CONTRACTOR ☐ SUBCONTRACTOR ☐ BOTH

9. CORPORATION, COMPANY OR SUBDIVISION COVERED (Name, address, ZIP Code)

10. MAJOR PRODUCTS OR SERVICE LINES

CUMULATIVE FISCAL YEAR SUBCONTRACT AWARDS
(Report in whole dollars)

SUBCONTRACT AWARDS	CURRENT FY (Through Reporting Qtr.) DOLLARS	CURRENT FY (Through Reporting Qtr.) PERCENT	SAME PERIOD LAST YEAR DOLLARS	SAME PERIOD LAST YEAR PERCENT
11A. SMALL BUSINESS CONCERNS (Include Disadv.) ($ amt. and % of 11C.)				
11B. LARGE BUSINESS CONCERNS ($ amt. and % of 11C.)				
11C. TOTAL (Sum of 11A. and 11B.)		100		100
12. SMALL DISADVANTAGED BUSINESS CONCERNS ($ amt. and % of 11C.)				
13. WOMEN-OWNED SMALL BUSINESS CONCERNS				
14. LABOR SURPLUS AREA CONCERNS ($ amt. and % of 11C.)				
15. HIST. BLACK COLLEGES & UNIV/MINORITY INST.				

16. REMARKS (Enter a short narrative explanation if: (a) zero is entered in Blocks 11A or 12 for the current fiscal year, (b) the percent entry in Block 11A for current fiscal year is more than 5 percentage points below the percent reported for the same period last year, or (c) the percent entry in Block 12 for the current fiscal year is lower than the percent reported for the same period last year.)

SUBCONTRACT GOAL ACHIEVEMENT
(Report in whole dollars)

CONTRACTS			NO. OF CONTRACTS WITH GOALS	TOTAL $ VALUE OF SUBCONTRACTS AWARDED	$ VALUE OF SUBCONTRACT GOALS	ACTUAL GOAL ACHIEVEMENT DOLLARS	ACTUAL GOAL ACHIEVEMENT PERCENT
17. CONTRACTS WITH SMALL BUSINESS SUBCONTRACT GOALS	A. ACTIVE CONTRACTS						
	B. CONTRACTS COMPLETED THIS QTR.	(1) WHICH MET GOALS					
		(2) NOT MEETING GOALS					
18. CONTRACTS WITH SMALL DISADV. BUSINESS SUB-CONTRACT GOALS	A. ACTIVE CONTRACTS						
	B. CONTRACTS COMPLETED THIS QTR.	(1) WHICH MET GOALS					
		(2) NOT MEETING GOALS					

19. NAME AND TITLE OF LIAISON OFFICER | SIGNATURE | DATE | TELEPHONE NO. ( )

20. NAME AND TITLE OF THE APPROVING OFFICER | SIGNATURE | DATE

AUTHORIZED FOR LOCAL REPRODUCTION
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EXPIRATION DATE: 9-30-92

295-102

STANDARD FORM 295 (REV. 1-90)
Prescribed by GSA - FAR (48 CFR) 53.219(b)

SF 295 Summary Subcontracting Report
Figure 7-1.1d

Subcontracting Guidelines
Computing Percent Subcontracted, DBE/WBE Threshold & DBE/WBE Compensation

If the first tier subcontractor is a:	Counts For? % Subcontracted	DBE/WBE Threshold	DBE/WBE Compensation
A. Non DBE/WBE who is doing:			
1. Onsite work and the..	Yes	No	No
Second tier subcontractor is a:			
a. Non DBE/WBE who is doing:			
i. Onsite Work	Yes(1)	No	No
ii. Offsite, Supplier or Equipment Rental	Yes(1)	No	No
iii. Onsite or Offsite Hauling	Yes(1)	No	No
b. DBE/WBE who is doing:			
i. Onsite Work	Yes(1)	Yes	No(2)
ii. Offsite, Supplier or Equipment Rental	Yes(1)	Yes	No
iii. Onsite or Offsite Hauling	Yes(1)	Yes	No
2. Offsite, Supplier or Equipment Rental	No	No	No
B. DBE/WBE who is doing:			
1. Onsite work and the..	Yes	Yes	Yes
Second tier subcontractor is a:			
a. Non DBE/WBE who is doing:			
i. Onsite Work	Yes(1)	Yes(4)	No(3)
ii. Materials Supply	Yes(1)	Yes(1)	No(3)
iii. Equipment Rental	Yes(1)	Yes(1)	Yes(1)
iv. Offsite Hauling	Yes(1)	Yes(1)	Yes(1)
v. Owner-Operator Hauling	Yes(1)	Yes(1)	Yes(5)
b. DBE/WBE who is doing:			
i. Onsite Work	Yes(1)	Yes(6)	Yes(1)
ii. Materials Supply	Yes(1)	Yes(6)	Yes(1)
iii. Equipment Rental	Yes(1)	Yes(6)	Yes(1)
iv. Offsite Hauling	Yes(1)	Yes(6)	Yes(1)
2. Offsite, Supplier or Equipment Rental	No	Yes	No

Notes:
(1) No Deduction
(2) No compensation since payment to second tier subcontractor would not be made by prime.
(3) Deduct from higher tier subcontract
(4) Deduct amounts exceeding 50% of higher tier subcontract.
(5) No deduction unless the owner-operator is in effect a subcontractor getting paid by the amount hauled.
(6) Included in higher tier subcontract and counted again for this subcontract.

Figure 7-1.2a

EXAMPLE CONTRACT

Prime Contractor - ACE Construction, $2,000,000 - Grade, drainage, base, pave and one prestressed concrete girder bridge.

Subcontract (1st tier) - Malibu Culvert, $55,000, Corrugated culvert supply. Non DBE/WBE

Subcontract #2 (1st tier) - Richardson Drainage Contracting, $ 50,000, Installation of culverts. Certified DBE

Subcontract #3 (1st tier) - Quality Testing, $20,000, Quality control and testing, Certified DBE

Subcontract #4 (1st tier) - Williams Bridge Construction, $480,000, One prestressed concrete girder bridge. Non DBE/WBE

Subcontract #4A (2nd tier) - Maypole Piling - $90,000, Furnish and drive steel piling. Certified WBE

Subcontract #4Aa (3rd tier) - Bingo Steel - $36,000, Furnish steel piling, Non DBE/WBE

Subcontract #4B (2nd tier) - Bartlett Resteel - $75,000, Resteel supply. Non DBE/WBE

Subcontract #4C (2nd tier) - Altlen Resteel - $50,000, Resteel installation, Certified DBE

Subcontract #4D (2nd tier) - Burt's Ready Mix - $110,000, Concrete Supply. Non DBE/WBE

Subcontract #4E (2nd tier) - Millville Prestress - $82,000, Furnish & deliver prestressed girders, Non DBE/WBE

Subcontract #4F (2nd tier) - Central Equipment - $16,000, Crane Rental, Certified DBE

Subcontract #5 (1st tier) - Allan Aggregates - $91,000, Furnish and deliver base course materials, Certified WBE

Subcontract #6 (1st tier) - Quality Paving, Inc., $180,000, Furnish and place paving materials, Non DBE/WBE

Subcontract #6A (2nd tier) - Gotham Asphalt - $61,000, Furnish asphalt cement, Non DBE/WBE

Subcontract #6B (2nd tier) - Allan Aggregates - $82,000, Furnish asphaltic concrete aggregates, Certified WBE

Subcontract #6C (2nd tier) - Packer Hauling - $26,000, Hauling asphaltic concrete from commercial plant, Certified DBE

Subcontract #7 (1st tier) - Centerline, Inc. - $28,000, Striping, Certified DBE

Subcontract #7A (2nd tier) - 3M Company - $10,000, Thermoplastic materials, Non DBE/WBE

Subcontract #8 (1st tier) - Greenthumb Landscaping - $31,000, Seeding and mulching, Certified DBE

Subcontract #9 (1st tier) - Central Equipment - $71,000, Equipment rental, Certified DBE

Figure 1.2b

Typical Standard Industrial Classification (SIC) Codes

for Highway Construction

Code	Description	Maximum Size*
1611	Highway & Street Construction**	$17.0 Million
1622	Bridge, Tunnel and Elevated Highway Construction	$17.0 Million
1741	Masonry, Stone Setting & Other Stonework	$ 7.0 Million
1771	Concrete Work***	$ 7.0 Million
1791	Structural Steel Erection	$ 7.0 Million
2951	Paving Mixtures & Blocks	500 Employees
3272	Concrete Products, Except Block & Brick	500 Employees
3273	Ready Mixed Concrete	500 Employees
3441	Fabricated Structural Metal	500 Employees
4212	Local Trucking, Without Storage	$12.5 Million
8713	Surveying Services	$2.5 Million
8711	Other Engineering Services	$2.5 Million
8734	Testing Laboratories	$3.5 Million

* Maximum size to qualify as a Small Business Concern, Disadvantaged Business Enterprise or Woman Owned Business Enterprise. Where the standard is expressed in dollars, that is the maximum average gross receipts over the last three years. When it is expressed in numbers of employees, it is the maximum average (including temporary and part time employees over the preceding 12 months.

** Includes concrete work, guardrail, and signing associated with highway and street construction.

*** Is generally limited to private sector work. Public sector concrete work is classified under SIC 1611 or 1622

Figure 7-1.4

Disadvantaged Business Enterprise (DBE)
Women Owned Business Enterprise (WBE)
AD HOC CERTIFICATION APPLICATION

Application is hereby made by the individual (organization) identified below for certification as disadvantaged business enterprise (DBE), or a Women Owned Business Enterprise (WBE) under the Federal Lands Highway Program's administration of the requirements of Federal Acquisition Regulation (FAR) Clauses 52.219-8 and 52.219-13 as well as the Subcontract Compensation Clause contained in Section 108 of the Contract. This application must be completed by any individual (organization) which is (1) not certified as a DBE or WBE by a State or local agency using criteria equivalent to the above referenced FAR criteria; and (2) desires to participate in the Subcontract Compensation Clause with respect to establishing eligibility for compensation (questions 1 through 14 only), or computing compensation (all questions).

Firms claiming DBE status must be owned (51% minimum) and controlled by one or more socially and economically disadvantaged persons. Members of the following groups are presumed to be socially and economically disadvantaged:

	DBE Code
Black American	B
Hispanic American	H
Native American	NA
Asian-Pacific American	AP
Subcontinent-Asian American	AS
Other Approved by SBA	SBA

A copy of one of the following documents must be submitted to prove membership in the ethnic group claimed:

- Membership letter or certificate of ethnic organization
- Tribal Certificate or Bureau of Indian Affairs Card
- Birth Certificate/Record (Including those of natural parents)
- U. S. Passport
- Armed Services Discharge Papers
- Alien Registration Number
- Other document providing evidence of ethnicity

Firms claiming WBE status must be owned (51% minimum) and controlled by one or more women.

Applications for Ad Hoc Certifications must address each of the following items as applicable. Attach additional sheets as needed.

1. Name and Address of Organization
2. Mailing Address (If Different)
3. Contract Person and Title
4. Telephone No.
5. Federal Identification Number
6. Other Identification Number Used

Figure 7-1.5a

7. Has this organization be certified under Section 8(a) by the Small Business Administration? Yes/No If certified, attach a copy of the certification.

8. Nature of the organization's business. Identify only those areas for which you can provide a commercially useful function and still be competitive with other firms in those areas. You may be requested to provide evidence of your firm's experience or ability to perform in these areas.

___Construction ___Supplier ___Manufacturer ___Professional/Technical Service

9. Standard Industrial Classification (SIC) Code, description, applicable size standard and actual size of the organization with respect to that code; for each code applicable to the organization. (Refer to the small business size standard at 13 CFR 121)

Example:	SIC 2951
Description	Paving Mixtures and Blocks
Size Standard	500 Employees
Actual Size	31 Employees

10. List States in which the organization is authorized to do business.

11. Licenses required to conduct business. Attach copies of any required local, county or State active business licenses and permits, i.e. contractor, PUC, A&E registration, etc. For each license/permit indicate:

Name of licensee
Name of qualifying individual
Type of license
Expiration Date
DBE Code
Gender (M/F)

If the qualifying individual is not one of the DBE or women owners listed below, please explain.

12. Ownership information

___Sole Proprietor ___Partnership ___Corporation ___Joint Venture*

Date established/incorporated_____State_____

*For joint ventures, complete this application for each party to the venture and attach a copy of the joint venture agreement.

13. List owners/investors who have a 5% or more interest:

Name
DBE Code
Gender (M/F)
Date of Ownership
Number of Shares
Voting %
U.S. Citizen? (Y/N)

14. Board of Directors (in the last three years). For each:

Name
Title
DBE Code
Gender (M/F)
Expiration of Term (Date)

Figure 7-1.5a (Continued)

For offsite, supply and other DBE/WBE subcontracts which will be used only to establish compliance with the threshold requirement, but not to compute entitlement, no further questions need be completed except the affidavit at the end of this form. The remaining questions must be completed by any onsite subcontractor when any or all of the amount of the subcontract will be used by the prime to compute entitlement under the Subcontract Compensation Clause.

15. Firms with less than 100% DBE/WBE ownership, list the contribution of money, equipment, real estate, or expertise of each of the owners/investors. Attach a tabulation of the initial investment in the firm (dollars, real estate, equipment, etc.) on behalf of each owner.

16. Management. List organization officials by name and title primarily responsible for the management areas listed below. For each individual show the organization official to which the individual reports and the individual's DBE code and/or gender.

Preparation and presentation of estimates and bids
Hiring and firing management personnel
Final determination of what jobs the company will undertake
Control of day to day operations
Negotiations and approval of contracts
Overall administration of organization contracts
Overall supervision of marketing and sales activities
Negotiating and signing for surety bonds
Overall supervision of field operations
Approving payroll and signing checks
Approving major purchases

17. Identify any owner or management official of the firm who is, or has been, an employee of another firm that has an ownership interest in, or a present business relationship with the organization. Provide details of the arrangement and relationship. Present business relationships include shared space, equipment, financing or employees, as well as both firms having the same owners. This response should include any person who is currently working for any other business which has a relationship with the organization, whether on a full time or part time basis as an owner, partner, shareholder, advisor, consultant, or employee.

18. List the three largest projects performed by the company in the last 3 years. Briefly describe the project, the dollar amount of the DBE/WBE's portion of the work, status or date completed, and a contact person associated with the owner. If performed as a subcontractor, indicate the name of the prime contractor in addition to a contact person.

19. Tabulate the firm's gross receipts for each of the last three tax years.

20. Name of surety company, bonding limit, agent, and agent's telephone number.

21. Tabulate all money and equipment loaned to the company, include name of the lender, amount or value, date of loan and terms.

22. Workforce information

Total personnel in the past calendar year:

___Highest weekly total ___Lowest weekly total ___Average

Figure 7-1.5a (Continued)

22. Workforce Information (Continued)

Tabulate numbers of part-time, full-time and total personnel currently on payroll in each of the following categories.

Administrative
Clerical
Supervisory
Skilled Hourly
Laborer or Unskilled Hourly

To your knowledge are any of the personnel on another firm's payroll? (Y/N) If yes, identify the firm and number of employees.

23. Provide a listing of owned equipment. Do not include leases. If ownership is in the name of an individual or business other than the DBE/WBE organization, indicate the owner and explain relationship to DBE/WBE.

24. Indicate if the organization or other organization with any of the same officers has previously received or has been denied certification to participate as a DBE, MBE or WBE and describe the circumstances. Indicate the name of the certifying authority and the date of such certification or denial.

25. Provide copies of the following:

Resumés of principals of organization showing education, training and employment with dates
Article of incorporation including date approved by State (Corporations only)
Corporate bylaws (Corporations only)
Copies of third-party agreements, such as rental or management service agreements
Lease/rental agreement for business site
Partnership agreement, buy-out rights agreement and profit sharing agreement (Partnerships only)
Brochure or descriptive information on firm

AFFIDAVIT

The Undersigned swears that the foregoing statements are true, correct and complete; and include all material information necessary to be responsive to each of items listed. Further, the undersigned agrees to provide any additional information requested by FHWA to clarify any item, and if requested by FHWA to permit an onsite review of the organizations operation as well as the audit examination of books, records and files of the organization. Further the undersigned agrees to immediately notify FHWA if there are changes in the information provided which might alter the organization's status as a DBE or WBE. Any material misrepresentation will be grounds for terminating eligibility, and for initiating action under Federal law concerning false statements.

_____

Name of Organization

_____

Name Title

_____

Signature Date

Figure 7-1.5a (Continued)

DBE/WBE SCC EXAMPLE COMPUTATIONS

Refer to Figure 7-1.2a for basic contracting and subcontracting data.

Part A. What is the percentage of work which the prime contractor is performing with its own forces in response to FAR Clause 52.236-1*

Prime Contract -	$2,000,000
Onsite Davis-Bacon Subcontracts -	
Richardson Drainage Contracting -	($ 50,000)
Williams Bridge Construction -	($480,000)
Quality Paving, Inc. -	($180,000)
Centerline, Inc. -	($ 28,000)
Greenthumb Landscaping -	($ 31,000)
Net -	$1,231,000
Percentage -	61.6%

Part B. What is the percentage of work subcontracted to DBE/WBE's for the purpose of determining entitlement (threshold) under the Subcontract Compensation Clause.

Prime Contract -	$2,000,000	
DBE/WBE Subcontracts -		
Richardson Drainage Contracting -		50,000
Quality Testing -	20,000	
Maypole Piling -	90,000	
Altlen Resteel -	50,000	
Central Equipment -	16,000	
Allan Aggregates -		91,000
Allan Aggregates -		82,000
Packer Hauling -	26,000	
Greenthumb Landscaping -		31,000
Central Equipment -		71,000
Total DBE/WBE Subcontracts -	$ 527,000	
Percent -	26.4%	

Threshold Requirement is Satisfied - Assuming the standard 10% minimum is used in the contract.

Figure 7-1.5b

Part C. What is the estimated* amount of entitlement under the DBE/WBE Subcontract Compensation Clause?

Qualifying Subcontracts -		
Richardson Drainage Contracting -	$ 50,000	
Quality Testing -	20,000	
Centerline, Inc.-	28,000	
Thermoplastic Materials	(10,000)	
Greenthumb Landscaping -	31,000	
Total Qualifying Amounts -		$ 119,000
Approximate* Incentive Payment -		$ 11,900

* Subject to final certification of amounts paid.

Part D. What is the amount of the time extension associated with the DBE/WBE subcontracting?

Original Contract Amount -	$2,000,000
Date of Notice to Proceed -	April 1, 1991
Contract Completion Date -	September 30, 1992
Qualifying DBE/WBE Amounts -	$119,000
Convert contract time to days -	547
Maximum contract time increase (10%) =	55 days
Percentage increase = 119,000/2,000,000 =	5.95%
Contract time increase -	33 days
Revised completion date -	November 2, 1992

Figure 7-1.5b (Continued)

U.S. Department
of Transportation

Federal Highway Administration

Richbourg's Sales and Rentals
1500 W. Lucas St.
Florence, SC 29501

August 24, 1992

Dear Sirs:

This is to acknowledge your notice of nonpayment related to materials provided on Project OCMU 14(1), Ocmulgee National Monument (Contract DTFH71-91-C-0002) which is being administered by this office of the Federal Highway Administration.

In accordance with the Miller Act (Title 40, United States Code, Section 270), the prime contractor, Randolph Construction, submitted a payment bond, under which it bound itself through its bonding company (surety) to pay all legitimate claims of its subcontractors and suppliers under the contract. A copy of the pertinent sections of the Act [and the Payment Bond for the contract*] are enclosed. [You may wish to contact the surety to requested intervention in your nonpayment dispute.*]

*[Providing a copy of the bond is optional. Division policy may provide that the complainant make this request directly to the Division office, or it may provide that a copy of the bond or the name and address of the bonding company and/or agent be furnished by the Project Engineer.]

If you do not have a direct contractual relationship with the prime contractor, you must notify the prime contractor in writing of your request for payment within ninety days of the last day you performed the labor or furnished the supplies. You have the right, after failing to receive a response to your request for payment from the prime contractor, to file a claim under the Miller Act. [This paragraph may be omitted if the complainant obviously does have a contractual relationship with the prime.]

In addition, this contract is subject to the terms of the Prompt Payment Act. This law obligates the contractor to make payment on any work performed by subcontractors and which it invoices to, and is paid by the Government. If you provide this office with a detailed accounting of the work you have performed on the contracts, and the date/amounts you have been paid for the work, we will evaluate if there has been an apparent violation of the Prompt Payment Act.

If you choose to file a claim under the Miller Act, please contact [FLH Division, P&C], and a certified copy of the Bond will be provided to you for this purpose. Please note that neither the Miller Act, the contract, nor any other Federal or State laws or regulations creates any right for you to bring this type of claim directly against the Federal Highway Administration, or the United States Government; or permits payment by the Government directly to you. Your exclusive recourse under the law is against the prime contractor and its surety. If you have any further questions on this matter please contact this office.

Sincerely,

Wyland Rimrock, Jr.
Project Engineer

Enclosures

Example Miller Act Letter

Figure 1.6a

§ 270b. Rights of persons furnishing labor or material

(a) Every person who has furnished labor or material in the prosecution of the work provided for in such contract, in respect of which a payment bond is furnished under sections 270a to 270d of this title and who has not been paid in full therefor before the expiration of a period of ninety days after the day on which the last of the labor was done or performed by him or material was furnished or supplied by him for which such claim is made, shall have the right to sue on such payment bond for the amount, or the balance thereof, unpaid at the time of institution of such suit and to prosecute said action to final execution and judgment for the sum or sums justly due him: *Provided, however,* That any person having direct contractual relationship with a subcontractor but no contractual relationship express or implied with the contractor furnishing said payment bond shall have a right of action upon the said payment bond upon giving written notice to said contractor within ninety days from the date on which such person did or performed the last of the labor or furnished or supplied the last of the material for which such claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the material was furnished or supplied or for whom the labor was done or performed. Such notice shall be served by mailing the same by registered mail, postage prepaid, in an envelop addressed to the contractor at any place he maintains an office or conducts his business, or his residence, or in any manner in which the United States marshal of the district in which the public improvement is situated is authorized by law to serve summons.

(b) Every suit instituted under this section shall be brought in the name of the United States for the use of the person suing, in the United States District Court for any district in which the contract was to be performed and executed and not elsewhere, irrespective of the amount in controversy in such suit, but no such suit shall be commenced after the expiration of one year after the day on which the last of the labor was performed or material was supplied by him. The United States shall not be liable for the payment of any costs or expenses of any such suit.

(Aug. 24, 1935, ch. 642, § 2, 49 Stat. 794; Aug. 4, 1959, Pub. L. 86-135, § 1, 73 Stat. 279.)

AMENDMENTS

1959—Subsec. (b). Pub. L. 86-135 substituted "day on which the last of the labor was performed or material was supplied by him" for "date of final settlement of such contract".

EFFECTIVE DATE

Section effective upon the expiration of sixty days after Aug. 24, 1935, but shall not apply to any contract awarded pursuant to any invitation for bids issued on or before the date it takes effect, or to any persons or bonds in respect of any such contract, see section 5 of act Aug. 24, 1935, set out as a note under section 270a of this title.

RETROACTIVE EFFECT

Section 3 of Pub. L. 86-135 provided that: "The rights of laborers and material men under contracts entered into before the effective date [Aug. 4, 1959] of this amendment [amending subsec. (b) of this section and section 270c of this title] shall not be affected."

FEDERAL RULES OF CIVIL PROCEDURE

Parties, see rule 17, Title 28, Appendix, Judiciary and Judicial Procedure.

SECTION REFERRED TO IN OTHER SECTIONS

This section is referred to in sections 270d, 270e, 270f of this title; title 15 section 636; title 25 sections 47a, 450j, 1656; title 31 sections 3905, 9303; title 39 section 410; title 42 section 11705.

§ 270c. Right of person furnishing labor or material to copy of bond

The department secretary or agency head of the contracting agency is authorized and directed to furnish, to any person making application therefor who submits an affidavit that he has supplied labor or materials for such work and payment therefor has not been made or that he is being sued on any such bond, a certified copy of such bond and the contract for which it was given, which copy shall be prima facie evidence of the contents, execution, and delivery of the original. Applicants shall pay for such certified copies such fees as the department secretary or agency head of the contracting agency fixes to cover the cost of preparation thereof.

(Aug. 24, 1935, ch. 642, § 3, 49 Stat. 794; Aug. 4, 1959, Pub. L. 86-135, § 2, 73 Stat. 279; Apr. 18, 1984, Pub. L. 98-269, 98 Stat. 156.)

AMENDMENTS

1984—Pub. L. 98-269 substituted "department secretary or agency head of the contracting agency" for "Comptroller General" in two places.

1959—Pub. L. 86-135 struck out ", and, in case final settlement of such contract, has been made, a certified statement of the date of such settlement, which shall be conclusive as to such date upon the parties" and "and certified statements" after "original" and "certified copies", respectively.

EFFECTIVE DATE

Section effective upon the expiration of sixty days after Aug. 24, 1935, but shall not apply to any contract awarded pursuant to any invitation for bids issued on or before the date it takes effect, or to any persons or bonds in respect of any such contract, see section 5 of act Aug. 24, 1935, set out as a note under section 270a of this title.

RETROACTIVE EFFECT

Rights of laborers and material men under contracts entered into before Aug. 4, 1959, unaffected, see section 3 of Pub. L. 86-135, set out as a note under section 270b of this title.

FEDERAL RULES OF CIVIL PROCEDURE

Proof of official records, see rule 44, Title 28, Appendix, Judiciary and Judicial Procedure.

Effect of rule 44 on this section, see note by Advisory Committee under that rule.

SECTION REFERRED TO IN OTHER SECTIONS

This section is referred to in sections 270b, 270d, 270e, 270f of this title; title 15 section 636; title 25 sections 47a, 450j, 1656; title 31 section 9303; title 39 section 410; title 42 section 11705.

Miller Act Provisions

Figure 7-1.6b

PROGRESS SCHEDULE AND RECORD

PROJECT Arizona FH 89-1(2), Blue Mountain Pass — CONTRACT NO. DTFH68-85-C-00000

CONTRACT AMOUNT $4,440,505.00 — DATE OF CONTRACT 7/5/84 — TIME 270 Calendar Days

AWARDED 3/5/84 — NOTICE TO PROCEED EFFECTIVE 4/15/84 — LIQUIDATED DAMAGES $700/Day

CONTRACTOR ABC Construction Co. — ADDRESS P.O. Box 1234, Anywhere, USA 13579

SIGNED: _____ CONTRACTOR — DATE _____

APPROVED: _____ PROJECT ENGINEER — DATE _____

MONTH		MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER					
WORK / DAYS		S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S					
CLEARING	PLANNED	$7,600 = 10%	0	60	80	100						201(1), 201(6), 202(1)				$30,000
	ACTUAL															
DRAINAGE	PLANNED	$14,400 = 33%	0	20	40	60	80	100				602(27E), 604, 605(7)				$376,630
	ACTUAL															
GRADING	PLANNED	$22,000 = 5%	0	20	40	60	80	100				203(1), 206(6), 209(1)				$666,740
	ACTUAL															
BASE	PLANNED	$50,000 = 25%	0	10	20	30	40	50	60	70	80	90	100	304(1), 306(6), 401(1)				$4,272,600
	ACTUAL															
PAVING	PLANNED	$8,400 = 10%									0	50	100	401(6), 401(2), 644				$1,210,740
	ACTUAL															
MISC.	PLANNED	$14,250 = 3%	0	10	20	30	40	50	60	70	80	90	100	911, 912, 913				$123,829
	ACTUAL															
% OF TIME ELAPSED		15 days = 7.5%	0	11	22	33	44	55	66	77	88	100						
% OF VALUE SCHEDULED			0	1	13	29	39	50	59	77	89	100						
TOTAL MATERIALS DELIVERED TO																		
TOTAL CONSTRUCTION PLACED TO																		
GROSS OF CURRENT VOUCHERS TO																		

Example Bar Chart Schedule
Figure 7-3.3

Example Critical Path Method (CPM) Schedule

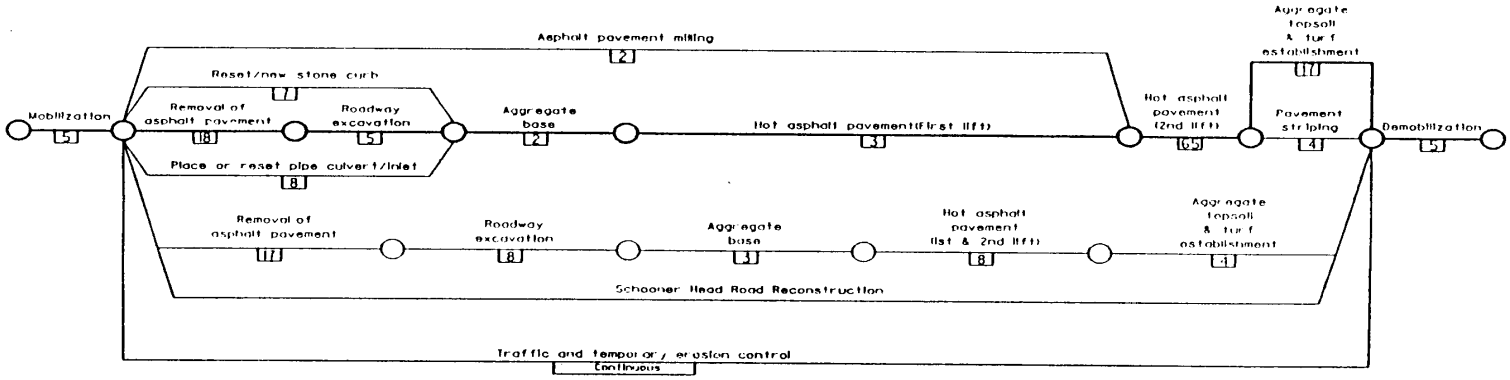
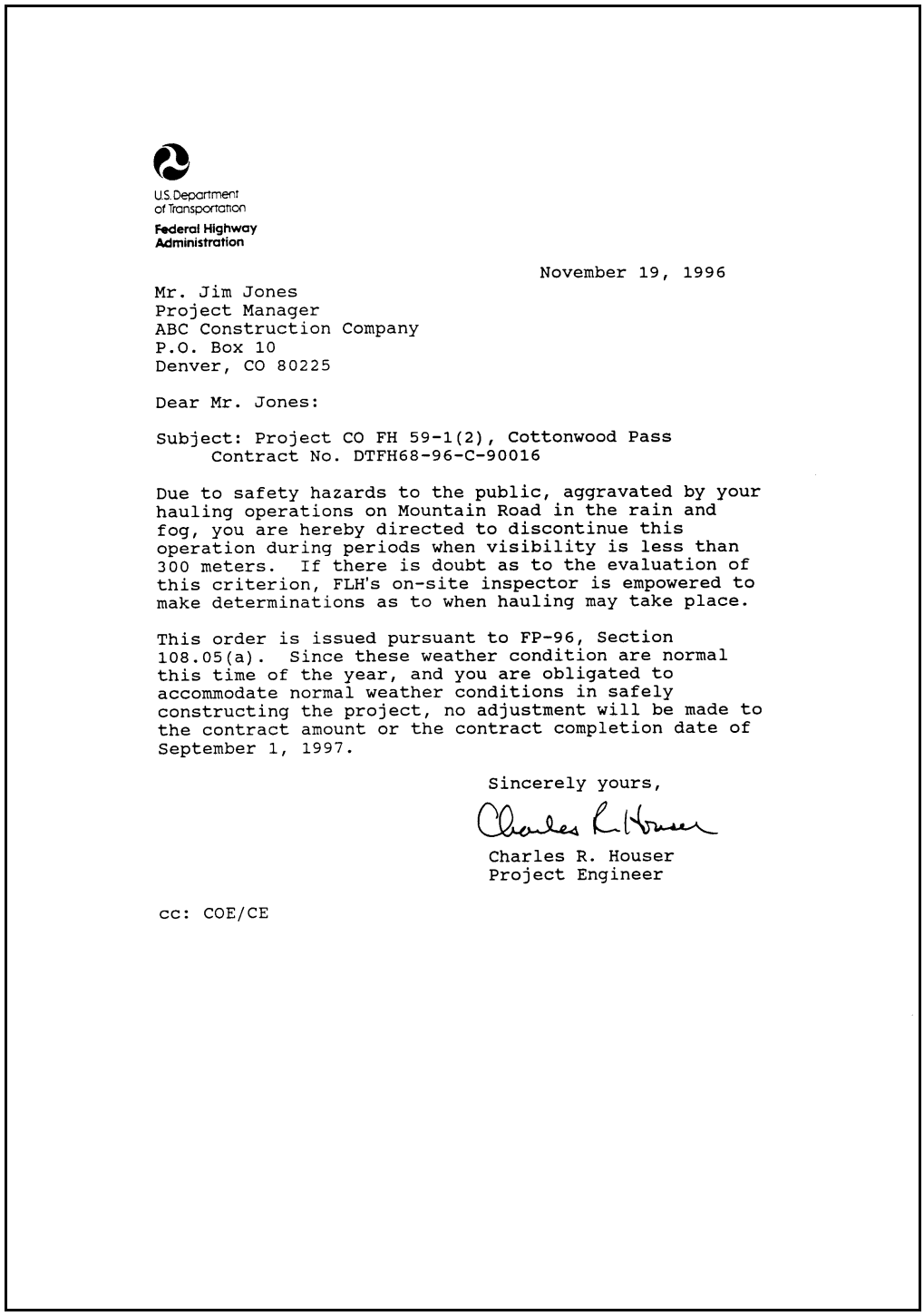


Figure 7-3.4



U.S. Department
of Transportation
Federal Highway Administration

November 19, 1996

Mr. Jim Jones
Project Manager
ABC Construction Company
P.O. Box 10
Denver, CO 80225

Dear Mr. Jones:

Subject: Project CO FH 59-1(2), Cottonwood Pass
Contract No. DTFH68-96-C-90016

Due to safety hazards to the public, aggravated by your hauling operations on Mountain Road in the rain and fog, you are hereby directed to discontinue this operation during periods when visibility is less than 300 meters. If there is doubt as to the evaluation of this criterion, FLH's on-site inspector is empowered to make determinations as to when hauling may take place.

This order is issued pursuant to FP-96, Section 108.05(a). Since these weather condition are normal this time of the year, and you are obligated to accommodate normal weather conditions in safely constructing the project, no adjustment will be made to the contract amount or the contract completion date of September 1, 1997.

Sincerely yours,

Charles R. Houser
Project Engineer

cc: COE/CE

Example Stop Order

Figure 7-7.4a

U.S. Department
of Transportation
Federal Highway Administration

SEP 9 1993

Mr. Jim Jones
Project Manager
ABC Contracting Company
P.O. Box 10
Denver, CO 80225

Dear Mr. Jones:

Subject: Project CO FH 59-1(2), Cottonwood Pass
Contract No. DTFH68-89-C-90016

This confirms the September 1 telephone conversation in which you were verbally ordered to cease grading operations between Stations 115+00 and 130+00 because of the anticipated repair of a main gas line adjacent to the project by CP&L Gas Company. This suspension is for the convenience of the Government, FAR Clause 52.212-12.

You may resume work in the above vicinity effective September 10, 1993.

Since Item 102(1), Unclassified Excavation, is a critical path item, the contract completion date will be extended by 8 days. A contract modification will be prepared and issued reflecting this adjustment. If you believe that you incurred an increased in the cost of performance of the Contract as a result of this suspension, you may submit a cost proposal for the consideration of the Government.

Sincerely yours,

Jane Clem
Construction Operations Engineer

cc: Project Engineer
Construction Engineer

Example Suspension

Figure 7-7.4b

U.S. Department
of Transportation
Federal Highway Administration

SEP 14 1993

Mr. Jim Jones
Project Manager
ABC Contracting Company
P.O. Box 10
Denver, CO 80225

Dear Mr. Jones:

Subject: Project CO FH 59-1(2), Cottonwood Pass
Contract No. DTFH68-89-C-90016

By letter dated September 1, you were instructed to clear Stations 210+00 to 215+00 of remaining timber slash and vegetation in accordance with Subsection 204.04, of the Contract, prior to initiating excavation in this area. Your forces have started excavating cut material in this area several times over the last two weeks. However, as we have discussed on several occasions, the clearing and grubbing has not been completed.

Since you have failed to perform the work require by the Contract, stop all excavation operations within the above noted limits effective September 15. This stop order is issued is in accordance with Subsection 108.05(b) of the FP-92.

Work may resume at such time the area is cleared of all slash, debris, and vegetation.

No adjustments to the contract completion date or the contract amount will be made as a result of this order.

Sincerely yours,

Charles R. Houser

Charles R. Houser
Project Engineer

cc: COE/CE

Example Stop Order

Figure 7-7.4c

CHAPTER 8 - MEASUREMENT AND PAYMENT

CONTENTS

FIGURES

8-1 MEASUREMENT OF QUANTITIES

8-1.1 General

The Standard Specifications prescribe methods of measuring quantities but are not intended to be all-inclusive. Refer to the plans, special contract requirements, and to Chapter 9 of this manual for measurement details.

Each *Construction Requirements* section of the Standard Specifications contains a subsection entitled *Measurement*, stating what is to be measured and how it is to be measured. Further, the *Payment* subsection of each section states what work is covered by the payment. Work that is not specifically identified for payment is assumed to be a subsidiary obligation and no payment is required.

Occasionally, plans and special contract requirements will change the standard methods of measurement and payment, or include provisions for measurement and payment for items not in the Standard Specifications.

Before making any measurements on a project, the Project Engineer should study the plans, specifications, and special contract requirements to determine first, what is to be measured, and second, how it is to be measured.

There are three basic methods of measuring contract items. The first is *contract quantity* (or lump sum). For these items the work authorized by the contract is verified and paid for. No detailed remeasurement is required. Changes or correction of errors must be documented by a Contract Modification. Examples of contract quantity would be mobilization and structural concrete (usually).

The second method is *staked or ordered quantity*. That is, when work is staked out or ordered by the Engineer, before the work is performed, the quantity is defined, and that is what is paid for. Again, although verification that the work is done is necessary, no detailed remeasurement is required. Examples of this method would be culverts, curbing and earthwork (usually).

The third method is *as constructed* quantity. The performance of work is authorized by the contract or the Engineer, and, subject to FLH inspection, it is performed, measured, computed [if necessary] and paid for. Examples of this method would be paving items paid by the ton, subexcavation of soft spots, and watering.

Figure 8-1.1a, Daily Record of Miscellaneous Items, may be used for documenting many bid items in the third category such as flagging, water, rolling hours, etc. The original ticket remains in the ticket book, or is otherwise filed in the project files; and the duplicate is issued to the Contractor after acknowledgment (signature or initials) by the Contractor or its representative and by the Project Engineer or his/her representative. The use of only one bid item per ticket book is desirable for miscellaneous items. See also **Figure 8-1.1b, Materials Receipt Form**, used for items paid by weight.

All bid items supported with tickets will be totaled on an adding machine or spreadsheet and entered in the Summary Book under the appropriate bid item. It is not necessary to enter daily totals in the Summary Book each day for miscellaneous items, but the total units for each book or the entire progress estimate period may be entered as a single entry.

Contract Quantity items will be supported by a signed and dated note preferably in a field book, stating the item of work has been completed satisfactorily and is in substantial conformity with the plans and specifications.

8-1.2 Quantity Significant Figures

The minimum number of significant decimal places to which quantities should be measured, computed and reported is generally dependant on the value or bid price of an individual unit; and with the degree of precision with which it is practical to measure the item.

FLH computer programs for the receiving report (progress or final estimate) generally allow up to

four figures to the right of the decimal point. However, usually not all of these figures are required to be significant.

For progress estimates the methods used to measure quantities may sometimes be faster but less accurate than methods used for final payment. For this reason progress payment quantities may be (but are not required to be) less precise than final quantities. For progress estimates the minimum reported precision for any contract item should be the quantity that has a value between $10 and $100. For final payment the minimum reported precision for contract item should be the quantity that has a value between $1 and $10.

Quantities should generally be computed to at least one significant figure more than the minimum required for reporting.

If the measurement and computational methods used yield significant figures beyond the minimum required, it is at the discretion of the Project Engineer whether or not to round the total to the minimum precision indicated. Once quantities are computed and reported on progress estimates, it is not recommended that they later be rounded arbitrarily to a lesser number of significant figures, especially for items that have been completed and subcontractors paid.

Items specified as contract quantity items should always be reported for final payment with the same precision implied in the contract.

Items measured by weigh tickets should be reported to the same precision as the ticket for both progress and final payment.

Examples:

(1) Item 20101 Clearing and grubbing is bid at $3,500 per hectare. One hundredth (.01) hectare is valued at $35. Therefore report clearing and grubbing quantities for progress payments to a precision of not less than 0.01 hectare. Report the final quantity to a precision of not less than 0.001 hectare.

(2) Item 60103 Concrete is bid at $18,500 lump sum. One thousandth (.001) of one percent is valued at $18.50. Therefore report this lump sum item to a precision of not less than 0.001 percent for progress payments.

(3) Item 25303 Gabions is bid at $167.00 per cubic meter. One tenth (0.1) of a cubic meter is valued at $16.70. Therefore report gabion quantities for progress payments to a precision of not less than 0 .1 cubic meter. Report final payment to a precision of not less than 0.01 cubic meter.

(4) Item 62902 Roving is bid at $0.85 per square meter. One hundred (100) square meters has a value of $85.00. Therefore report roving quantities for progress payments to a precision of at least 100 square meters Report the final quantity to a precision of at least 10 square meters.

8-1.3 Computation of Earthwork Quantities

Electronic computation of earthwork quantities is standard procedure. It may be necessary or desirable, however, to make supplementary earthwork quantity computations on the project in connection with minor alignment, grade, or slope changes, or for other reasons. These supplementary computations may be performed on computer based software, or by manual calculations if necessary. The relationship to the main design computations should be clearly documented and checkable by others.

The Summary Book should list all of the current documentation used to pay for earthwork; i.e., the master quantity printout along with each supplement or correction to those quantities. Date or otherwise identify each document referenced. Do not leave stacks of obsolete or superseded computations mixed with current documentation.

Unless otherwise provided in the special contract requirements or otherwise approved by the Project Engineer as providing equivalent accuracy, excavation quantities for payment are

to be computed by the average end area method, with no correction for curvature. In this method, the average area of end sections (taken at right angles to the centerline) and the centerline distances between end sections are used.

In order to avoid distorted balancing of earthwork quantities in areas of sinuous alignment through heavy sidehill construction, correction for curvature may be necessary. Such correction will be for the purpose of balance only, and payment will be made for uncorrected excavation quantities unless otherwise provided in the special contract requirements. In the case of Contract Modification work, the difference between actual vs. computed excavation should be discussed with the Contractor during negotiation since this difference may impact costs and quoted prices.

The cross-section areas generally are obtained either by direct computation from slope stake notes or by plotting and computing the section. Direct computation of areas from slope stakes is preferable because it is usually less time consuming. Planimetering of plotted sections is sometimes used for design, but is not acceptable for documentation of payment because it is less accurate and cannot be checked except by repeating the process.

A number of commercial earthwork software packages are available which compute quantities using cross sections and end areas, or equivalent techniques. If commercial earthwork software is not available, there are several acceptable methods of manually computing cross-section areas.

Cross-section notes will be entered directly in a preformatted slope stake field book. Electronic data collectors may also be used if the Division procedures support them. Field books for slope staking may be duplicate (no carbon required) type. If used, the original must be retained in the book to serve as the permanent record. The second copy may be detached to facilitate computing. This permits mailing data to the Division without exposing the original to loss. Likewise, if electronic data is collected, a copy should be retained prior to sending the diskette to the Division.

The maximum interval for cross-sectioning should usually be 20 meters with intermediate sections taken as necessary to catch all breaks in terrain. For pay purposes, the volumes must be computed and checked mathematically and all computations should be documented in field books, on computer printouts or on cross section rolls. Each document should be uniquely identified and referenced in the Summary Book. The Summary Book should contain a tabulation of the following: station to station; prism excavation and/or embankment volume; and any other quantities involved such as subexcavation, waste, channel changes, etc. Grouping may be between balance point stations, or for example, every 500 meters when balances are infrequent. Plan quantities may be entered in the Summary Book originally, whether or not they are a specified basis for payment. Measured quantities may be added to or substituted for the plan quantities after computation and checking. Whenever changes or new sections are substituted, the referencing should be clear. The old sections should be discarded or identified as "superseded".

The taking of cross-sections after completion of the grading is not normally required. Ordinarily, cross-sections will not be necessary except in areas where there is a controversy with the Contractor, where slides are involved, or in rock cuts involving overbreak or underbreak. In rock excavation where it is necessary to determine the allowable overbreak, plotting of the cross-sections may be necessary. When borrow is paid for in its original location (borrow pit), the use of unclassified excavation must be carefully monitored to be sure unnecessary waste does not occur, which would increase the need (and payment) for borrow. Typical waste problems might be fill slopes too wide, not breaking down and incorporating rock into fills, not conserving potential topping material, and wasting acceptable quality material just because it is too wet, or haul distance is excessive.

8-1.4 Measurement of Materials (Weight Basis)

For materials paid for on a weight basis, a daily summary of all weighed and accepted loads should be generated. Either custom software or a spreadsheet is acceptable for this summary. The summary should be filed with the tickets indicating certified weight and acceptance which remain the original or source document. Separate ticket books and summary reports are best used for each contract item when more than one item is being produced at once.

When standard tickets are used, the weigher should fill them in completely, except for the station of placement, and shall deliver the original and duplicate to the truck driver, and retain the triplicate. If an original is lost or missing at the end of the shift and delivery on the road was accomplished, the triplicate may be used to verify the quantity provided it can be confirmed that the material was delivered.

When approved recording scales are used, the detail of checking and delivering material will vary according to the form of the tickets, but must be arranged so as to furnish both the weigher and checker with a record of each load and the Contractor with a ticket issued as each load is weighed. When the recording scales accommodate tickets in duplicate only, it will be necessary for the weigher to keep a complete tabulation showing ticket number, tare, total weight, and pay weight. Both tickets will then be given to the truck driver. The checker on the road will fill in the station of placement, initial both copies, return the duplicate to the truck driver, and retain the original.

Weighing by an accredited public weighmaster is acceptable, provided the same basic procedures described above are used.

Tare weights of each empty truck are to be determined at least twice daily and at such other times as the Project Engineer directs. It is important that tare weights be determined at random times during the day, and that the random selection process not be controlled by the truck driver or biased toward weighing when the fuel tanks are empty. The tare weights (and the date and time determined) should be recorded.

Where direct reading platform scales (those on which tares may be set on one beam and weight of load read directly on the other) are used the tare weight should be recorded (automatically or manually) on each ticket to give additional assurance that the correct tare weight was in fact set on the scale prior to reading the net weight. When belt scales, batch scales or other devices weigh the net weight of material without depending on gross truck weight, the ticket will be considered satisfactory when only net weight is shown. If scales of these types are used, a notation of scale type should be made in the diary.

Unless otherwise specified in the special contract requirements, no deduction will be made from aggregate weights for moisture content. When such deduction is specified, its method of determination should be specified. If a correction is required but no method specified, a deduction based on the daily average moisture content determined by heat drying no less than three representative samples taken at random intervals from each 8-hour production should suffice. Depending on contract requirements, the actual deduction will probably be for *excess* moisture, i.e., the difference between actual and optimum moisture.

The Standard Specifications provide that weighing devices shall be accurate within 0.5 percent throughout the range of use, and shall be inspected, tested, and sealed as often as the Engineer may deem necessary to assure continued accuracy. For noncommercial scales, the Engineer should request a copy of the inspection documentation for the project files. For commercial scales, the documentation may be requested if deemed necessary.

Before starting each day's weighing operations, and several times during the day, zero balancing

of the scales must be carefully checked. This consists of setting the scale indicators at zero when the scale is unloaded and checking the beam. The beam should swing freely and evenly, equidistance from the top and bottom of the trig loop. For multiple-beam scales, each beam should be balanced individually and then collectively. Any beam not actually used should be securely fastened into zero position so it cannot be mistakenly used with other beams.

Adjustments and repairs of weighing devices are the responsibility of the Contractor. FLH personnel may adjust the balance bar but must not perform other adjustments or repairs.

If the Project Engineer has reason to doubt the accuracy of a weighing device at any time, the Contractor should be required to stop weighing operations and have the weighing device tested and sealed.

The National Institute of Standards and Technology (NIST), Handbook 44 is the standard by which scales are tested and sealed. FLH Divisions will provide applicable parts of this document, and appropriate training, when its operating procedures include the routine involvement of field personnel in detailed scale inspections. Otherwise, problems which are not resolved by the Contractor to the satisfaction of the Engineer, should be referred to the COE who may engage a technical consultant.

8-2 ACTUAL COST WORK

8-2.1 General

The Standard Specifications provide for the performance of Contract Modification work on an actual cost basis when it is not possible to define the quantity of work and negotiate a price prior to the performance of the work being accomplished. Actual cost pricing should be used only when it is not practically possible to establish fixed unit prices or lump sum prices.

When actual cost work is agreed to, or when work is commenced on an actual cost basis pending negotiation of unit or lump sum prices, the Engineer or FLH inspector monitoring the work should agree with the Contractor on the exact hours for labor and equipment (as well as materials) associated with the work each shift. A preprinted form on which to tabulate such hours and costs is recommended. The form should allow signature or initials for both the Contractor and the Engineer.

See Chapter 3 for more discussion of pricing Contract Modifications **for which payment can not be agreed upon. Actual Cost work involved in the performance of contingent sum items will be ordered by the issuance of contract modifications.**

Payment for actual cost work will be in accordance with the Standard Specifications. Strict adherence to the requirement that the cost records be maintained and signed daily as the work progresses is essential.

8-2.2 Daily Records of Actual Cost Work

When actual cost work is being performed, daily records should be prepared on Form FHWA-1478A, Daily Record of Actual Cost Labor and Equipment (Figure 8-2.2a), or Form FHWA 1478B, Daily Record of Actual Cost Materials (Figure 8-2.2b). The minimum entry requirements for labor, equipment, and materials are as follows:

- **Labor - The name and complete minimum wage schedule description, i.e., laborer unskilled; or operator, asphalt milling machine. The Project Engineer must ascertain that the daily records of hours worked do not exceed the hours shown on the Contractor's payrolls. When fringe benefits are expressed as a percent, they should be applied to the gross payroll (i.e., straight-time wages plus overtime wages).**

- **Equipment - Complete Corps of Engineers ownership and operating rate information, e.g., Dozer, Caterpillar, D-8L, 250 kW; and the Corps unit number if available, e.g., #T15CA015.**

- **Material - A description of the material and source together with certification or test data and invoices or other cost information.**

The original of Form FHWA-1478A or 1478B will be retained in the project files and a copy given to the Contractor. It is important that the daily sheets be made out and agreed to as soon as possible so that any differences may be resolved at the time the work is performed. The original copies of the signed daily sheets and the materials invoices are the minimum documentation required for actual cost work. If an inspector keeps notes on the actual cost work, these notes should be made a part of the files.

8-2.3 Summary of Actual Cost Work

Monthly summaries of actual cost work should be prepared in the Project Summary Book. Separate summaries should be kept for each actual cost contract modification, and all subtotals and totals should be entered in the Summary Book. Computations supporting the subtotals and totals should be attached to the daily sheets for the period covered in the Project Summary Book. This can be done by the use of a copy of the adding machine tape or computer spread sheet, which will also facilitate checking.

Actual costs of materials may be included in the monthly progress payments if the Contractor has

provided the Project Engineer with a copy of acceptable invoices and quality data for the material. This documentation should be attached to the daily work sheets.

8-3 PROGRESS PAYMENTS

8-3.1 General Requirements

The processing of progress payments became a substantially more complex process with the *Prompt Payment Act of 1982*, including amendments to the Act in 1988 and additional administrative requirements by OMB in 1989. These requirements are included in *FAR Clause 52.232-5, Payments Under Fixed Price Construction Contracts, FAR Clause 52.232-27, Prompt Payment for Construction Contracts*, and Subsection 109.08, Progress Payments of the FP. These clauses appear in each contract and should be reviewed in detail. The following guidance addresses the highlights and common problems.

8-3.2 Prompt Payment

Some of the basic requirements of the Prompt Payment Act are:

- The Government is required to make payment to the Contractor within 14 days after a valid invoice is received at the designated billing office from the Contractor.
- The Government must advise the Contractor in writing within 7 days if the invoice is defective.
- The Government is obligated to pay the Contractor interest if payment is not made in a timely manner.
- The Contractor may invoice only subcontractor's work for which it is committed to paying the subcontractor within 7 days of payment by the Government.
- The Contractor may be obligated to pay interest to the Government and an interest penalty to the subcontractor on any amounts for subcontractor work it invoices, and is paid by the Government; and fails to pay the subcontractor within 7 days.
- The Government is not to become involved in disputes between subcontractors and contractors.

8-3.3 Preconstruction Conference

The payment and invoice process as well as the Contractor's obligations in this process should be emphasized at the preconstruction conference. In particular the Contractor should understand that failure to provide required materials documentation, test reports and certifications will result in nonpayment for the work in question.

Subcontractor complaints are a particular problem. While the Project Engineer should avoid getting involved in disputes between the prime and subcontractors, the interest on amounts due subcontractors sometimes makes the Government have a *stake* in the dispute. This means the Contractor should be requested to resolve such disputes and advise the Project Engineer of how they are resolved - at least to the extent we are satisfied that there were no violations of Prompt Payment. It should be made clear to the Contractor that FLH is not a policing or audit agency; and if disputes linger on, or appear to indicate improper actions of the Contractor prejudicial to the Government, we will have no choice but to request intervention of an appropriate legal authority such as the DOT Office of the Inspector General.

8-3.4 Government's Receiving Report (Project Engineer's Progress Estimate)

Prior to the Prompt Payment Act, the Project Engineer's Progress Estimate was the sole document used to initiate progress payments. Under the Prompt Payment Act and ensuing regulations, the Government's estimate (printout from the *Progress Estimate Program*) is defined as the *receiving report*. Its purpose is to validate the accuracy of the Contractor's invoice. See Figure 8-3.4 for an Example Project Engineer's Receiving Report. Together these items initiate payment. While it is possible to combine the Government's receiving

report and the Contractor's invoice in a single printout or document, that is generally discouraged since it undermines the Contractor's accountability and obligation to prepare the invoice.

In order for payment to be made, the Contractor's invoiced quantity and unit price for any item must not exceed the receiving report quantity and unit price for that item. Therefore, the Contractor must have access to measurement, quantity, and pay factor information that only the Project Engineer may have, at the time the receiving report is prepared. For example: allowances for partially completed work or computation of quantities based on survey notes which only the Government has access to. The Project Engineer must provide or concur in, all measurement, quantity, and pay factor information on the receiving report, in writing or in a meeting with the Contractor's representative at a mutually agreeable time within 7 days after the estimate *cutoff* date. While the Project Engineer should be reasonable in resolving disputes or differences with the Contractor on what the receiving report should include, the Project Engineer has the final say [within the terms of the Contract], and *agreement* on the content of the receiving report is not required.

The Project Engineer should not include work on the receiving report for which the Contractor has not provided the required documentation, test results or certifications.

All quantities shown on the receiving report must be documented in the summary book and cross referenced to an appropriate field book or file. The basis of percentage payments, and temporary items like stockpiled materials should be documented in a separate estimate book or file. Any material pay factor adjustment to Contract unit prices should be documented with a QL-Pay printout or manual computations.

All contract items and probable quantities should be shown on the receiving report so that the status of the probable contract amount can be monitored easily. Probable quantities are normally not provided to the Contractor unless they are requested, or unless the Contractor needs to know, e.g., to order materials. This information may sometimes precipitate a request for a contract modification; but it is generally better to be forthright with the Contractor, than to obscure information. All quantities and pay items associated with Contract Modifications should be listed separately and identified as to the number of the Contract Modification. When a unit price is adjusted based on a material pay factor or other specific contract provisions, neither a new item nor a contract modification is necessary, but the pay factor should be identified as *interim* on the receiving report, if it is subject to further adjustment.

Proposed adjustments to the Contractor's invoice (see Subsection 8-3.8 below) may be shown on the receiving report; however, if their approval is not delegated to the Project Engineer, they are considered tentative until approval of the estimate payment in the Division office.

8-3.5 Contractor Invoices

The Contractor's invoice package must contain the items listed in Section 109 of the FP. See Figure 8-3.5 for an Example Contractor's Invoice. The Contract specifies where the invoice must be sent or delivered in order for the 14-day *clock* to start. This may be either the FLH Division, or the Project Office. It is important to stamp or note on the invoice when it was received. It is also important to know the maximum time it may be retained during processing by the billing office, and still be within the 14-day limit for payment. There are generally three major components of a Contractor invoice:

- Tabulation of quantities and unit prices. No quantity for an individual item should exceed the quantity for that item on the Government's receiving report. However, quantities for certain items may be less - for example if a subcontract provided that certain work not be paid for until complete (see below). Payment would then be based on the lower (contractor's) quantity.

- Accounting of subcontractors, with the total amounts, amounts previously paid, and amounts to be paid from this estimate.

- Signed certification conforming to FAR Clause 52.232-5(c)

FAR Clause 52.232-27 requires *interest penalties* and similar adjustments to also be included in the invoice. I.e., if the Contractor previously invoiced the Government for work that it then withheld from a subcontractor, it is required to show the interest penalty (credit to the Government) on the invoice. We expect this sort of adjustment to be very infrequent. However, if the occasion arises, and the Contractor needs the correct current interest rate, the information should be obtained from the COE.

8-3.6 Subcontractor Work and Payments

The term *subcontractor* as used in the payment clauses means not just onsite subcontractors, but supply, equipment rental and service subcontractors as well. There is no prohibition against a Contractor withholding payment from a subcontractor for cause - such as producing defective work (whether or not the Government considers it defective), or not completing its work on time. However, the Contractor cannot invoice the Government for work for which it is *temporarily* withholding payment from the subcontractor. *Temporarily* means the Contractor recognizes an obligation to pay the subcontractor as soon as the problem which precipitated the withholding is corrected.

If the Contractor does invoice the Government for work performed by a subcontractor it must pay the subcontractor within 7 days of receiving payment from the Government. Failure to make payment results in an interest penalty due from the Contractor to the Government. Interest continues as long as the Contractor has received payment from the Government, but failed to pay the subcontractor. If the Contractor has violated the terms of the subcontract by failure to make payment, it may owe a second interest penalty to the subcontractor. Generally, the Government is not a party to the latter obligation, and the Project Engineer should not attempt to monitor or enforce subcontract provisions.

If the withholding from the subcontractor is permanent, that is considered a defacto reduction in the amount of the subcontract and should be reported in the invoice documentation as such. For example: A subcontractor building a box culvert is unable to obtain credit to buy ready mix concrete. The prime purchases the concrete and deducts payment from the subcontractor's payments. This transaction reduces the amount of the subcontract. The prime may invoice the Government for the full amount of the completed work, and is not obligated to pay interest to the subcontractor or to the Government.

The Prompt Payment Act takes precedence over the terms of the Contract. For example, the Contract may provide that temporary traffic control devices are paid at 50% on delivery to the site. However, the Contractor may have a subcontract which provides payment at 5% per month for the first 20 months of the Contract. In this case the Contractor may invoice the Government only for the amounts it will pay the subcontractor, plus a proportionate share of any overhead and profit markup if applicable. The Project Engineer will often not have enough information to know if there is a significant difference in subcontract payment terms and those in the contract. A comparison of the tabulation of the status of all subcontract payments required by Section 109.08 of the Contract, with the Project Engineer's knowledge of how much subcontracted work has been paid for under the Contract, will often give indications of problems which should be questioned.

Complaints from subcontractors who say they have not been paid have two implications under the Contract. The first is a possible Miller Act

claim by the subcontractor against the Contractor's surety. The second is a possible violation of the Prompt Payment Act, if the payment in question was invoiced the Government and paid to the Contractor, but not passed on to the subcontractor.

See Subsection 7-1.6 for a discussion of the Miller Act, and Figure 7-1.6, Example Miller Act - Prompt Payment Letter to a Subcontractor. Copies of such letters should be normally provided to the Contractor. However, you should discuss unusual situations, such as allegations of fraud or other criminal activity, with the COE prior to initiating correspondence.

If there is an apparent violation of the Prompt Payment Act, FLH should write to the Contractor detailing the allegations and facts as we know them, and request a written explanation from the Contractor. See Figure 8-3.6a for an Example Prompt Payment Letter. Note that the Government's only interest in underpayments to subcontractors is possible violations of the Prompt Payment Act and the interest that might therefore be due the Government. The Government should avoid becoming involved in disputes between the Contractor and its subs; and especially avoid ordering the Contractor to pay subs. Our position is simply that if the Contractor is not paying the subs, it cannot invoice the Government for the subs' work.

Figure 8-3.6b is a table with summarized Guidelines for Handling Subcontractor/Supplier Complaints of Nonpayment.

8-3.7 Preparatory Work and Stockpiled Materials

General mobilization and preparatory work for starting construction is included in the Mobilization pay item. See Section 151 of the Standard Specifications. Preparatory work, or the beginning stages of work on a particular item should be included in the Contractor's invoice and paid as an agreed percentage of that item. While it is possible to pay preparatory work on an actual expenses basis, this is not recommended because it entails additional bookkeeping and control to prevent overpayment. See Figure 8-3.7 for Guidelines for Percentage Payments for Partially Complete Work.

Stockpiled materials may be included in the Contractor's invoice and paid for as one or more separate (temporary) line items, provided:

- The materials are stored onsite or otherwise under the control of the Contractor. If materials are stored offsite the Contractor must provide documentation that it has acquired title to the materials. A paid invoice from the supplier to the contractor is normally adequate. However, *title* does not necessarily mean the Contractor has paid for the materials. Under prompt payment, the obligation to pay for them does not begin until payment is received from the Government.

- The materials are designated for incorporation into the work. E.g., form lumber, explosives and diesel fuel cannot be paid as stockpiled materials. They should be included in the mobilization item.

- There are test reports, certifications or other reasonable documentation that the materials comply with Contract requirements, or that the item into which they will be incorporated will comply with those requirements.

Payment for stockpiled materials is intended to allow the Contractor to order materials sufficiently in advance of the work to avoid delivery delays. Payment does not constitute *acceptance* of the material, although the Government may argue that it legally *owns* the materials in the event of a default. It is also not intended as a means of providing advance payments. Payments must represent the reasonable value of the materials as compared to the bid prices for the work into which they will be

incorporated. Whenever there is payment for stockpiled materials, such payment is covered by the conditions of the Prompt Payment Act. I.e., the Contractor is required to make payment to the subcontractor (supplier) within 7 days of receiving payment from the Government.

As the materials previously paid for are incorporated into the work and paid under Contract items, the temporary line item created to pay for them must be reduced or *zeroed out* accordingly.

8-3.8 Adjustments to Contractor's Invoice

Generally any change which the Government makes to the Contractor's invoice invalidates the certification accompanying the invoice and should therefore be avoided. The principal exception to this guidance is, if an error in the Contractor's invoice is based on erroneous information which the Government provided or failed to provide at the onsite meeting before the invoice was submitted, we should try to reconcile the error administratively rather than declare the invoice to be defective. Such reconciliations or corrections can be handled by phone, with a followup confirmation in writing to the Contractor.

Certain additions or adjustments discussed in Section 109 of the Standard Specifications may be made to the Contractor's invoice. These adjustments may be documented on the receiving report or generated separately. The adjustments generally relate to retent, liquidated damages, or other liabilities to the Government, which are handled outside the normal contract items. Some of these items, like liquidated damages may be in dispute. It is awkward to ask a Contractor to certify to the correctness of liquidated damages at the same time they are being contested. It is therefore acceptable for the Government to make such adjustments administratively after the invoice is received. These adjustments do not make the certification invalid.

Any adjustments to the Contractor's invoice which are an adverse action (i.e., retent, liquidated damages, or other liabilities to the Government) should be documented by written notice to the Contractor explaining the reason for the adjustment, and if temporary, the conditions which would cause the adjustment to be rescinded. The Division should have procedures to assign responsibility for initiating this notice.

8-3.9 Retainage and Liquidated Damages for Poor Progress

Retainage or retent is money withheld from progress payments. FAR Clause 52.232-5(e) permits the retent of 10 percent of any progress payment when progress is unsatisfactory. See Section 7-6 for a discussion of administration of contract time. Unsatisfactory progress means one of the following:

- Contractor is significantly behind the approved construction schedule.
- Contractor is following a construction schedule which shows completion beyond the Contract completion date [or time].
- Contractor does not have an approved construction schedule, or the originally approved schedule has been rendered obsolete and invalid, thereby making it impossible to determine if progress is satisfactory.

Retent is not applied to the entire amount of payments to date, but only to those payments earned since progress became unsatisfactory. Withholding of additional retent is discontinued as soon as progress and the approved schedule are demonstrated to be consistent. However, previously withheld retent will continue to be withheld until the Contractor demonstrates an ability to complete the project by the contract completion date [as modified by any CM's or incentives].

Once the Contract completion date has passed without completion, the Government is to withhold liquidated damages for each day of delay, in

accordance with Subsection 108.04 of the FP. Whereas retent is a *discretionary* condition of the Contract, liquidated damages are mandatory unless there is a CM modifying or waiving them. If substantial retent *and* liquidated damages are being withheld, it is reasonable to estimate what the final amount of liquidated damages will be, and to assess a combined amount of retent and current liquidated damages not to exceed this amount. This is done by reducing the retent to some number less than 10 percent. This situation should be discussed with the COE.

When contract time is in dispute, or when there is recognized entitlement to additional time which has not yet been quantified, the CO may modify the Government's assessment of retent and liquidated damages pending the resolution of the Contract time issue. If this occurs, the COE should be involved in any decision, and the Contractor should be advised in writing as to the conditions of any such arrangement.

8.3.10 Pre-Final Payment

The provisions of the Prompt Payment Act apply to final payments as well as progress payments, except that final payment is required in 30 days rather than 14. Pending final payment, the Government is permitted to withhold a reasonable sum pending the checking of final quantity records. Since the Contractor cannot sign an accurate final invoice/voucher or claims release until this checking process is complete, an attempt should be made to minimize retainage due solely to the checking. It is recommended that not more than one percent of the contract amount be withheld pending the checking of final quantities. If additional amounts are outstanding after the work is complete, a pre-final or additional progress payment is recommended to reduce the amount being withheld solely to protect the Government during the checking process. This does not include retainage for cause, such as liquidated damages or failure to provide certifications and other required documentation. If extenuating circumstances suggest that larger amounts be withheld to protect the Government, this should be discussed with the COE.

8-4 FINAL PAYMENT

8-4.1 General

As soon as the project is accepted and all quantities are checked, the COE or designee depending on Division procedures must prepare a final receiving report together with a final voucher and claims release for the Contractor's signature. The final voucher should cover all known and acknowledged remaining payments under the contract. If there are disputes which are not resolvable at the time the final voucher is prepared, a second (or possible third) final voucher may be required at sometime in the future. Unlike progress payments, no separate invoice from the contractor is required for final payment. The SF-1034 is the final invoice as soon as it is signed by the contractor. The Prompt Payment Act requires payment within 30 days of the signed final voucher and claims release being received by the paying office. FLH procedures require that the signed final voucher be included in the final voucher assembly prior to being submitted to the Contracting Officer for approval.

8-4.2 Final Payment Designations

There are two basic types of final payment. The final voucher should clearly identify which type is being processed.

> FINAL PAYMENT (FINAL SETTLEMENT) - This designation applies to contracts where there are no unresolved disputes or claims and where the payment indicated will release both parties (the Government and the Contractor) from further contractual obligations and liabilities. If there have been previous claims or disputes which are being resolved by this final payment this designation should also be used.
>
> FINAL PAYMENT (EXCEPTION) - This designation applies to contracts where there are unresolved disputes or claims, or where the contract is to be kept open for a contractually valid reason - for example, if a plant establishment warranty must elapse prior to final acceptance. The claims release must specifically list the exception(s) and the exception(s) must be summarized on the face of the voucher. The purpose of the final voucher is then to close all issues other than the one(s) for which exceptions are identified.

Note that the last progress payment could be followed by a Final Payment (Exception) designating a claim. If a Contracting Officer's decision subsequently acknowledges partial liability for the claim, but the Contractor still refuses to agree that the issue is resolved, then the payment resulting from the CO's decision should be processed as another Progress Payment. Then if settlement of the claim is ultimately negotiated, final settlement could be processed.

Two copies of the final voucher and claims release should be sent to the Contractor with instructions that one signed copy of each must be returned.

If a Final Payment (Final Settlement) voucher is not returned by the Contractor within 90 days the Division may process it as a final settlement in order to close the account. In that case, the words "Not signed/returned" should be typed in the Contractor's signature block. Legal advice should then be sought if events suggest that the Contractor subsequently wants to reopen the contract.

All payment vouchers, progress and final, should be numbered sequentially regardless of their designation. The corresponding receiving report must have the same number.

8-4.3 Final Receiving Report

This document is prepared after the Division has checked all notes, quantities, and the Summary Book. It is given a sequential number following the last receiving report supporting a progress (or prefinal payment), with the word "(Final)" in parentheses after the number. Example: "Receiving Report No. 21 (Final).

After the final receiving report is prepared, the Project Engineer should contact the Contractor to find out if the Superintendent wants to go over the quantities and other issues like contract time before being sent the voucher. In addition, the Project Engineer or COE should verbally confirm that the claims release and release language on the voucher will say, to be sure they are acceptable to the Contractor.

8-4.4 Final Voucher

Standard Form 1034 (Public Voucher for Purchases and Services Other Than Personal) is required for any final payment. See Figure 8-4.4a through 8-4.4e.

For an exception final voucher, pending claims or disputes must be listed on the face of the final voucher and a corresponding statement must contain a statement matching or concisely summarizing the statement on the Contractor's Release. See Subsection 8-4.5 below. If there are no claims or disputes the release language shown on Figure 8-4.4a, Final Voucher (No Exceptions) should be used. If there are claims or disputes the language shown on Figure 8-4.4b, Final Voucher (With Exception for Pending Dispute) is typical. The dollar amount of the proposed final payment must match the dollar amount indicated on the corresponding final Receiving Report. The Contractor's designated representative is required to sign the voucher and Contractor's Release, show his/her title, and enter the date of signing. All copies of the voucher and Contractor's Release shall be conformed to agree with the original.

When plant establishment warranties or similar obligations go beyond the completion of all work, a final voucher with exception should be processed to document that there are no outstanding issues, other than the warranty in question. See Figure 8-4.4d, Final Voucher (With Exception for Plant Establishment).

8-4.5 Contractor's [Claims] Release

Form DOT F 4220.4 Contractor's Release is required to be executed by the Contractor as a condition of processing any final payment. See Figure 8-4.4c. It should be completed by the COE through Item No. 1 and sent to the Contractor with the final receiving report and final voucher.

If there are no claims or outstanding disputes, simply type the word, "None" in Item No. 1. This applies also if there has been a previous claim or dispute and it is being resolved by the final payment. If there are claims or disputes they should be summarized, including dollar amount and reference to the Contractor's request letter or claim, in Item No. 1. Figure 8-4.4c, Contractor's Release (With Pending Dispute), illustrates a typical claims release with a pending dispute. Note that although the word "claim" appears on the form, any dispute should be listed if the Contractor insists that it is an impediment to final settlement.

8-4.6 Letters of Acceptance by Cooperating Agencies. Written acceptance by cooperating agencies (State, County, Forest Service, National Park Service, etc.) is desirable prior to the acceptance of the project by FLH. Obtaining acceptance may be by letter to the cooperating agency requesting acceptance by endorsement of the letter. A recommended format for such a letter is shown in Figure 8-4.6, Example Letter Requesting Acceptance by Cooperating Agency.

For contracts with a landscaping or similar warranty clause, there should be an acceptance at the conclusion of construction of all work except the warranted work; and then a second acceptance of only the warranted work at the conclusion of the warranty period.

8-4.7 Letter of Acceptance by FLH. The Contractor should be notified of the cessation of contract time charges promptly after completion of the work. A letter of final acceptance [or limited acceptance in the case of warranted work] should be issued to the Contractor as soon as concurrence in final acceptance is received from the cooperating agencies. See Figure 8-4.7, Example Letter of Final Acceptance.

If there are disputes pending, it may be appropriate to write a more somber acceptance letter, stating that, "You will have the opportunity to reserve the right to pursue specific claims and disputes by listing a brief reference to, and the associated dollar amount of each.".

8-4.8 Final Inspection Report. The Final Inspection Report will normally be documented on Form FHWA 1446A. It will document the physical inspection of the work near the time of completion. It will also typically list all *punch list* or cleanup items remaining before acceptance by the Government. The Final Inspection should be attended by all interested cooperating agency representatives to assure that the punch list is complete.

8-4.9 Final Voucher Assembly

When the signed final voucher and claims release are returned, the COE must prepare a final voucher assembly based on Division management and fiscal needs. The assembly is submitted for signature of the Contracting Officer and [funds] certifying officer in accordance with Division procedures. As a minimum the final voucher assembly includes the following:

- Final Voucher (SF 1034) signed by the Contractor.
- Contractor's Release (DOT F 4220.4) signed by the Contractor.
- Final Receiving Report
- Copy of letter of acceptance by FLH to the Contractor
- Letters of acceptance by cooperating agencies
- Final inspection report.

This list is in reverse chronological order, i.e., the Final Inspection Report is the first to be prepared, and the voucher and release are the last. In addition to the listed items, Division procedures may require one or more of the items detailed in Section 2-14, Final Construction Report.

8-4.10 Payment of Claims

Standard Form 1034 will be used for payment of any monies awarded to a Contractor in settlement of a claim after completion of the project, and as illustrated in Figure 8-4.4e, Example Final Voucher (Claim Settlement - No Exceptions). Acceptance of this voucher by the Contractor, and payment thereof, constitutes final and complete settlement of the contract.

Vouchers covering this type of payment will be accompanied by copies of all Contracting Officer's Decisions, justifications and other pertinent documents in support of the payment. The documents accompanying the voucher to the Division Office must include a revised final receiving report supporting the revised final contract amount.

If there is a Contracting Officer's Decision acknowledging entitlement, but the issue remains outstanding as a claim, the amounts acknowledged should be paid as a progress payment, with the claim referenced as the invoice. See Subsection 8-4.2 above.

FORM FHWA9-482
(Rev. 4-76)

No. 8 – 14316

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration
Region Eight – Denver, Colorado

DAILY RECORD OF MISCELLANEOUS ITEMS

Project_____ Date_____

Item No._____

DESCRIPTION, LOCATION, ETC.	QUANTITY
TOTAL ▶	

I certify that the above quantity was performed and/or used in the construction of this project.

Contractor _____ Project Engineer _____

ORIGINAL TO PROJECT ENGINEER

☆ GPO 1981 - 780-491

FORM FHWA9-482
(Rev. 4-76)

No. 8 – 14316

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration
Region Eight – Denver, Colorado

DAILY RECORD OF MISCELLANEOUS ITEMS

Project_____ Date_____

Item No._____

DESCRIPTION, LOCATION, ETC.	QUANTITY
TOTAL ▶	

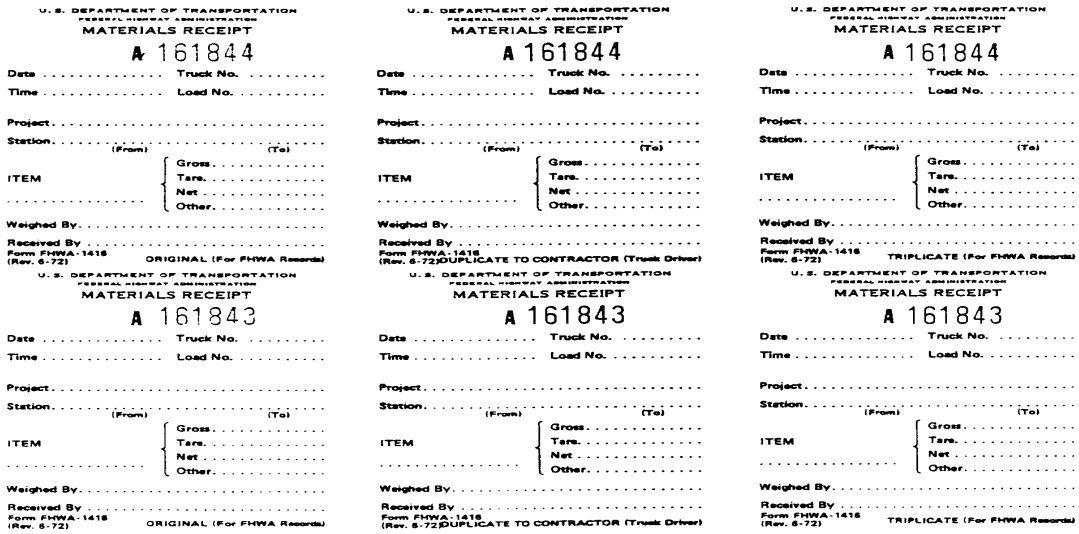
I certify that the above quantity was performed and/or used in the construction of this project.

Contractor _____ Project Engineer _____

DUPLICATE TO CONTRACTOR

☆ GPO: 1981 - 780-491

Daily Record of Miscellaneous Items
Figure 8-1.1a



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
MATERIALS RECEIPT
A 161844
Date ..... Truck No. .....
Time ..... Load No. .....
Project .....
Station ..... (From) (To)
ITEM { Gross ..... Tare ..... Net ..... Other .....
Weighed By .....
Received By .....
Form FHWA-1416 (Rev. 6-72) ORIGINAL (For FHWA Records)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
MATERIALS RECEIPT
A 161843
Date ..... Truck No. .....
Time ..... Load No. .....
Project .....
Station ..... (From) (To)
ITEM { Gross ..... Tare ..... Net ..... Other .....
Weighed By .....
Received By .....
Form FHWA-1416 (Rev. 6-72) ORIGINAL (For FHWA Records)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
MATERIALS RECEIPT
A 161844
Date ..... Truck No. .....
Time ..... Load No. .....
Project .....
Station ..... (From) (To)
ITEM { Gross ..... Tare ..... Net ..... Other .....
Weighed By .....
Received By .....
Form FHWA-1416 (Rev. 6-72) DUPLICATE TO CONTRACTOR (Truck Driver)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
MATERIALS RECEIPT
A 161843
Date ..... Truck No. .....
Time ..... Load No. .....
Project .....
Station ..... (From) (To)
ITEM { Gross ..... Tare ..... Net ..... Other .....
Weighed By .....
Received By .....
Form FHWA-1416 (Rev. 6-72) DUPLICATE TO CONTRACTOR (Truck Driver)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
MATERIALS RECEIPT
A 161844
Date ..... Truck No. .....
Time ..... Load No. .....
Project .....
Station ..... (From) (To)
ITEM { Gross ..... Tare ..... Net ..... Other .....
Weighed By .....
Received By .....
Form FHWA-1416 (Rev. 6-72) TRIPLICATE (For FHWA Records)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
MATERIALS RECEIPT
A 161843
Date ..... Truck No. .....
Time ..... Load No. .....
Project .....
Station ..... (From) (To)
ITEM { Gross ..... Tare ..... Net ..... Other .....
Weighed By .....
Received By .....
Form FHWA-1416 (Rev. 6-72) TRIPLICATE (For FHWA Records)

Materials Receipt Form
Figure 8-1.1b

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

DAILY RECORD OF ACTUAL COST LABOR AND EQUIPMENT

Project_____ Date: _____ Contract Modification No.: _____Contractor/Subcontractor _____

Work Description: _____

_____ Station: _____ Sheet ____of ____

Line No.	LABOR (Classification, Code No., Group No.)	HOURS		RATES($)				TOTAL AMOUNT($)		
		S.T.	O.T.	S.T.	O.T.	F.B.	TRVL/SUB	WAGES	F.B.	TRVL/SUB
1										
2										
3										
4										
5										
6										
7										
8										
9										
							TOTAL DIRECT LABOR			
							LABOR BURDEN			
	LABOR BURDEN RATE ____% APPLY TO TOTAL WAGES						TOTAL LABOR			

Line No.	EQUIPMENT (Description)	CODE NO.	HOURS		RATES			TOTAL AMOUNT($)
			OPER.	S.B.	A/S*	OPR.	S.B.	
10								
11								
12								
13								
14								
* A = Average, S = Severe		TOTAL EQUIPMENT						

It is agreed that the above listed labor and equipment costs were expended in the preformance of the work indicated.

Int. Date

Comp. By _____ ____

Checked By _____ ____

Ent. Summ. Bk. _____ ____

_____ Project Engineer

_____ Contractor

Form FHWA 1478A (7-96)

Daily Record of Actual Cost Labor and Equipment
Figure 8-2.2a

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

DAILY RECORD OF ACTUAL COST MATERIALS

Project_____ Date: _____ Contract Modification No.: _____Contractor/Subcontractor _____
Work Description: _____
_____ Station: _____ Sheet ____ of ____

Line No.	DESCRIPTION OF MATERIAL	QUANTIITY	UNIT	UNIT PRICE	AMOUNT	SALES TAX	FREIGHT	TOTAL AMOUNT
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
						TOTAL MATERIALS		

It is agreed that the above Imaterials wre used in the preformance of the work indicated.

Int. Date
Comp. By _____ _____
Checked By _____ _____
Ent. Summ. Bk. _____ _____

_____ Project Engineer

_____ Contractor

Form FHWA 1478B (7-96)

Daily Record of Actual Cost Materials
Figure 8-2.2b

Project:
NE PLH 34-1(4)
Prairie Road
Contract No. DTFH68-91-C-00053

Sheet 1 of 2

Contractor:
Malcom Contracting, Inc.
661 Fourth St.
North Platte, NE 67901

Project Engineer's
Receiving Report
No. 11
July 25, 1992

Amount Previously Earned	$ 1,547,969.10
Aount Earned this Report	108,908.76
Amount Earned to Date	1,656,877.86
Recommended Adjustments	
10% Retent Reports No. 10 & No. 11	(26,751.26)
Not Invoiced by Contractor	(5,000.00)
Subtotal Payments to Date	1,625,126.60
Previous Payments	(1,532,108.80)
Net Recommended Payment	$ 93,017.88

Recommended:

Wyland R. Rimrock, Jr., Project Engineer — Date 7/27/92

Concurred:

Ralph Jumpers, COE — Date 7/30/92

Approved:

B. C. Wadsworth, Construction Engineer — Date 8/2/92

Example Project Engineer's Receiving Report
Figure 8-3.4

bject Engineer's Receiving Report No. 11 Closing Date: July 25, 1992 Project: NE PLH 34-1(4), Prairie Road
eet 2 of 2 Contractor: Malcom Contracting, Inc.; 661 Fourth St,; North Platte, NE 67901

m No	Item	Con Unit Pr	Con Quan	Unit	Pay Fac	Adj Unit Pr	Prev Quan	Curr Quan	Quan to Date	Prev Earn	Curr Earn	Earn to Date	Prob Quant	Prob Earn
ntract Items														
6101	Mobilization	$89,000.00	1.00	LS	1.00	$89,000.00	1.00	0.00	1.00	$89,000.00	$0.00	$89,000.00	1.00	$89,000.
6201	Constr survey and staking	$24,000.00	1.00	LS	1.00	$24,000.00	0.90	0.05	0.95	$21,600.00	$1,200.00	$22,800.00	1.00	$24,000.
6401	Contractor testing	$36,000.00	1.00	LS	1.00	$36,000.00	0.90	0.05	0.95	$32,400.00	$1,800.00	$34,200.00	1.00	$36,000.
6703	Silt fence	$6.00	2,400.00	m	1.00	$6.00	2,341.10	768.20	3,109.30	$14,046.60	$4,609.20	$18,655.80	3,109.30	$18,655.
6711	Sediment traps	$350.00	6.00	EA	1.00	$350.00	5.00	0.00	5.00	$1,750.00	$0.00	$1,750.00	5.00	$1,750.
6716	Equip for eros control	$41.50	250.00	HR	1.00	$41.50	138.00	17.00	155.00	$5,727.00	$705.50	$6,432.50	175.00	$7,262.
0101	Clearing & grubbing	$10,800.00	17.40	ha	1.00	$10,800.00	17.40	0.00	17.40	$187,920.00	$0.00	$187,920.00	17.40	$187,920.
0204	Rem of indiv trees	$10.50	200.00	m2	1.00	$10.50	181.20	0.00	181.20	$1,902.60	$0.00	$1,902.60	181.20	$1,902.
0401	Roadway excavation	$3.10	182,000.00	m3	1.00	$3.10	191,000.30	384.90	191,385.20	$592,100.93	$1,193.19	$593,294.12	192,000.00	$595,200.
0101	Agg base, grdng C	$7.50	38,000.00	t	0.99	$7.43	37,456.90	871.20	38,328.10	$278,117.48	$6,468.66	$284,586.14	38,400.00	$285,120.
0101	Hot AC pav, cl B, grdg D	$27.50	17,500.00	t	0.95	$26.13 *	9,456.32	3,265.10	12,721.42	$247,046.36	$85,300.74	$332,347.10	17,500.00	$457,187.
1102	Prime ct, grd MC-70	$1.55	480.00	l	1.00	$1.55	320.20	81.40	401.60	$496.31	$126.17	$622.48	480.00	$744.
0201	600 mm pipe culvert	$7.50	1,240.00	m	1.00	$7.50	1,180.00	0.00	1,180.00	$8,850.00	$0.00	$8,850.00	1,180.00	$8,850.
0206	End section for 600 mm cul	$57.75	8.00	EA	1.00	$57.75	8.00	0.00	8.00	$462.00	$0.00	$462.00	8.00	$462.
0901	PCC crb & gttr, 400 mm	$12.50	860.00	m	1.00	$12.50	Deleted by CM #3		0.00	$0.00	$0.00	$0.00	0.00	$0.
1701	Grdrl G4, type II, cl B	$9.80	2,200.00	m	1.00	$9.80	1,080.40	422.50	1,502.90	$10,587.92	$4,140.50	$14,728.42	2,200.00	$21,560.
1702	Term section, typ A	$248.00	6.00	EA	1.00	$248.00	2.00	1.00	3.00	$496.00	$248.00	$744.00	6.00	$1,488.
2406	Placing con topsoil	$2.50	2,500.00	m3	1.00	$2.50	2,684.00	0.00	2,684.00	$6,710.00	$0.00	$6,710.00	2,684.00	$6,710.
2501	Seeding, hyd meth	$300.00	18.00	ha	1.00	$300.00	6.60	0.00	6.60	$1,980.00	$0.00	$1,980.00	18.00	$5,400.
6507	Constr sign	$40.00	280.00	m2	1.00	$40.00	244.00	43.00	287.00	$9,760.00	$1,720.00	$11,480.00	287.00	$11,480.
6508	Drum	$65.00	50.00	EA	1.00	$65.00	40.00	0.00	40.00	$2,600.00	$0.00	$2,600.00	40.00	$2,600.
6509	Flagger	$28.00	580.00	HR	1.00	$28.00	310.00	168.00	478.00	$8,680.00	$4,704.00	$13,384.00	580.00	$16,240.
ntract Modifications														
0801	CM #1, DBE/WBE incentive	$12,500.00	1.00	LS	1.00	$12,500.00	0.50	0.00	0.50	$6,250.00	$0.00	$6,250.00	1.00	$12,500.
401A	CM #2, Rdwy excavation	$3.50	900.00	m3	1.00	$3.50	887.40	0.00	887.40	$3,105.90	$0.00	$3,105.90	887.40	$3,105.
901A	CM #3, PCC crb & gttr, 400 mm	$10.00	860.00	m	1.00	$10.00	780.00	0.00	780.00	$7,800.00	$0.00	$7,800.00	780.00	$7,800.
mporary Items														
201T	Stkpld 600 mm culvert	$4.25	1,180.00	m	1.00	$4.25	0.00	0.00	0.00	$0.00	$0.00	$0.00	0.00	$0.
701A	Stkpld grdrl, G4	$7.80	2,140.00	m	1.00	$7.80	1,100.00	(424.00)	676.00	$8,580.00	($3,307.20)	$5,272.80	0.00	$0.
Interim pay factor, subject to further adjustment.						Totals				$1,547,969.10	$108,908.76	$1,656,877.86		$1,802,938.

Example Project Engineer's Receiving Report (Continued)
Figure 8-3.4

Malcom Contracting, Inc.
661 Fourth Street
North Platte, NE 67901

Mr. Wyland R. Rimrock, Project Engineer
P. O. Box 735
Winsome, NE 67747

Dear Mr. Rimrock:

I. Invoice Quantities

The following is our invoice for NE PLH 34-1(4), Prairie Road, Contract No. DTFH68-91-00053. The items listed are those on which there was work or changes during this invoice period.

Item	Description	Unit Price	Quantity to Date	Note
15201	Construction survey & staking	$24,000.00	0.85	(1)
15401	Contractor testing	36,000.00	0.95	
15703	Silt fence	6.00	3,109.30	
15716	Equip for eros control	41.50	155.00	
20401	Roadway excavation	3.10	191,385.20	
30101	Agg base, grdg C	7.43	38,328.10	(2)
40101	Hot AC pav, cl B, grdg D	26.13	12,721.42	(3)
41102	Prime ct, grd MC-70	1.55	401.60	
61701	Grdrl G4, type II, cl B	9.80	1,502.90	
61702	Term section, type A	248.00	3.00	
63507	Construction sign	40.00	287.00	
63509	Flagger	28.00	478.00	
61701A	Stockpiled grdrl, G4	7.80	676.00	

Notes:

(1) Quantity reflects 10% ($2,400) being withheld from subcontractor as a condition of subcontract.
(2) Unit price reflects reduced pay factor (0.99) per Subsection 106.05.
(3) Unit price reflects reduced pay factor (0.95) per Subsection 106.05.

II. Status of Subcontractors

Name	Total	Previous	This Period	Note
1. A-1 Testing Service	$ 24,000	$ 20,400	$ 1,200	(1)
2. Blacktop Paving, Inc.	$450,000	247,542.67	85,426.91	(2), (3)
3. Quality Guardrail	$ 23,048	11,083.92	4,388.50	(3)

Notes:

(1) Condition of subcontract is 10 retent until acceptance by Government of all work.
(2) Subcontract amount has been reduced to reflect reduced pay factor in accordance with Subsection 106.05.
(3) Payment will be reduced to reflect subcontractors share of any retent assessed by the Government.

III. Certification (FAR Clause 52.232-5)

I certify, to the best of my knowledge and belief, that -

(1) The amounts requested are only for performance in accordance with specification, terms, and conditions of the contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements and the requirements of chapter 39 of Title 31, United States Code; and

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract.

A. L. Malcom

Arnold L. Malcom
Vice President
Malcom Contracting

Example Contractor's Invoice
Figure 8-3.5

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Program

Big Shovel Construction Co.
4153 West Apple Way
North Fork, VA 22567

January 16, 1994

Re: VA Tobacco Road Parkway, TOBA 17-1(4)

Gentlemen:

We have been advised by your subcontractor Acme Steel Supply, that payment for structural steel furnished on the above referenced project is past due. According to Acme, $25,000 on the $219,000 subcontract was paid on October 14, 1993, and no further payments have been received. Your invoice dated December 1, 1993 billed the Government for 90% ($315,000) of the $350,000 bid for Item 55501. The Government paid you this amount on December 12, 1993.

Acme has been advised of their rights under the Miller Act. In addition, Acme's allegation indicates a possible violation of the Prompt Payment Act, which obligates the prime contractor to pay subcontractor's within 7 days of receipt of payment by the Government, any amounts, associated with the subcontractor's work, which have been invoiced by the contractor and paid by the Government. You are therefore requested to provide within 30 days, a written response to Acme's allegation.

If Acme has been underpaid as indicated by the allegations you must make payment in full, including any interest due the subcontractor, prior to your next invoice to the Government, and provide the Government with documentation to that effect. If you choose not to make payment to Acme, the amounts of all overpayments by the Government must be rescinded and credited to the Government on your next invoice.

In addition, if Acme's allegation is valid, you are obligated to credit the Government with interest on the amount of all overpayments for the period of time from when they were due to be paid the subcontractor (December 19), until they were paid, or until they were rescinded and credited to the Government. The Treasury Department interest rate for the six months ending December 31, 1993 was 6.52%, and the rate for the first six months of 1994 is 6.34%.

Your failure to resolve this apparent violation of the Prompt Payment by the due date of your next invoice and progress payment may result in the invoice being deemed defective and returned to you for correction. If the Government cannot determine from your response, whether a violation of the Prompt Payment Act has occurred, the issue may be referred to the Department of Transportation, Office of Inspector General for investigation.

R. McEntyre
Project Engineer

Example Prompt Payment Letter
Figure 8-3.6a

Guidelines for Handling Subcontractor/Supplier Complaints of Nonpayment

Action	FLH Response
Verbal complaint from subcontractor or supplier of nonpayment.	Verbally advise subcontractor/supplier that no action can be taken unless a written complaint is provided.
	Verbally advise subcontractor/supplier that in order to ascertain a violation of the Prompt Payment Act, the Government needs a detailed statement of payments under the subcontract, dates payments made, and amounts subcontractor/supplier believes were due on those dates.
	Verbally advise contractor superintendent of complaint and remind him/her of Prompt Payment Act requirements.
	Document all exchanges in diary. No further action in absence of written statement/complaint.
Written complaint from subcontractor/supplier of nonpayment, but without detailed accounting of amounts paid and dates.	Furnish copy of bond and Miller Act information to subcontractor/supplier. See Section 7-1.6.
	Request a statement of payments under the subcontract, dates payments made, and amounts subcontractor/supplier believes were due on those dates.
	No further action unless statement of payments is provided.
Written complaint from subcontractor/supplier of nonpayment, including detailed accounting of amounts paid and dates.	Furnish copy of bond and Miller Act information to subcontractor/supplier. See Section 7-1.6.
	Compare subcontractor/supplier's detailed statement of payments, Contractor accounting of subcontractor payments, and Government's payments for contract items known to be part of the subcontract.
Subcontractor statement of payments generally agrees with Contractor's accounting and amounts paid by Government for subcontracted work.	No further action. Subcontractor may have recourse under Miller Act, but no apparent Prompt Payment Act violation.
Subcontractor statement indicates payments less than corresponding invoiced percentages of contract items associated with the subcontract.	Write letter to Contractor requesting resolution of payment discrepancies. See Section 8-3.6.
Contractor fails to respond to letter requesting resolution of alleged underpayment.	Notify Contractor in writing that without an adequate response to nonpayment allegations, further invoices including the payment in question must be presumed to be defective.
	Refer file to Regional Counsel for possible referral to DOT Office of Inspector General as false claim.
Contractor responds that payment information provided by subcontractor/supplier is in error and that all payments have been made in accordance with the Prompt Payment Act, but does not provide credible evidence that this is the case.	Refer file to Regional Counsel for advice on possible nonpayment of invoices and referral to DOT Office of Inspector General as false claim.
Contractor responds in a way that confirms that payments made to subcontractor/supplier have been less than those invoiced the Government for the contract items associated with the subcontract.	On next invoice, require Contractor to debit appropriate interest from next progress payment. Require debit of overpayment unless Contractor pays subcontractor/supplier by then.

Figure 8-3.6b

Guidelines for Percentage Payments for Partially Complete Work

Description	Allowance (Cumulative)
Clearing and Grubbing	
Felled and slashed	35
Bucked and piled (slashings, brush and logs)	60
Grubbed	75
Burned or chipped and removed	98
Substantially complete including cleanup	100
Excavation and Embankment	
Pioneered	5
Drilled	20
Blasted	35
Roughed out to grade	85
Roadbed finished to grade	90
Slopes seeded	98
Substantially complete including cleanup	100
Structural Excavation	
Excavation complete	85
Backfill complete	98
Substantially complete including cleanup	100
Aggregate Courses	
Crushed and stockpiled onsite	50
Placed on roadway	80
Spread, compacted and tested	98
Substantially complete including cleanup	100
Asphalt Pavements	
Aggregates crushed and stockpiled onsite	50
Placed, compacted and tested	98
Substantially complete including cleanup	100
PCC Pavement	
Forms set	35
Concrete in place	90
Forms removed and testing complete	98
Substantially complete including cleanup	100

Figure 8-3.7

Guidelines for Percentage
Payments for Partially Complete Work

Description	Allowance (Cumulative)
Concrete Structures	
Falsework erected	10
Forming complete	20
Concrete in place	80
Forms removed	90
Concrete tested and finished	98
Substantially complete including cleanup	100
Steel Structures	
Falsework erected	10
Steel in place	80
Bolting and welding complete	90
Painting complete	98
Substantially complete including cleanup	100

Notes:

(1) These percentages are typical. They may be adjusted based on a detailed analysis of circumstances on a given project.

(2) Whenever partially complete work entails continuing maintenance, an appropriate percentage should be retained to cover those costs.

Figure 8-3.7 (Continued)

Standard Form 1034
Revised October 1987
Department of the Treasury
I TFM 4-2000
1034-122

PUBLIC VOUCHER FOR PURCHASES AND SERVICES OTHER THAN PERSONAL

VOUCHER NO.

U.S. DEPARTMENT, BUREAU, OR ESTABLISHMENT AND LOCATION

U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
555 Zang Street
Lakewood, CO 80228

DATE VOUCHER PREPARED: September 12, 1985

CONTRACT NUMBER AND DATE: DTFH68-83-C-90004 1/6/83

REQUISITION NUMBER AND DATE:

SCHEDULE NO.

PAID BY

PAYEE'S NAME AND ADDRESS: Crystal Creek Construction, Inc.
P.O. Box 3699
Redding, CA 96049

DATE INVOICE RECEIVED

DISCOUNT TERMS

PAYEE'S ACCOUNT NUMBER

SHIPPED FROM | TO | WEIGHT

GOVERNMENT B/L NUMBER

NUMBER AND DATE OF ORDER	DATE OF DELIVERY OR SERVICE	ARTICLES OR SERVICES (Enter description, item number of contract or Federal supply schedule, and other information deemed necessary)	QUANTITY	UNIT PRICE COST	UNIT PRICE PER	AMOUNT
	COMPLETED 8/13/85	PAYMENT No. 10 -- FINAL PAYMENT (FINAL SETTLEMENT) In final settlement, for construction of California Forest Highway Project 111-1(1), Ridge Road. Payment of the amount provided herein is specifically conditioned upon the execution of the Contractor's Release attached hereto and incorporated herein. Agreed: [signature] Title: Vice Pres. Date: 8/16/85				

(Use continuation sheet(s) if necessary) (Payee must NOT use the space below) TOTAL $47,921.79*

PAYMENT:
- ☐ PROVISIONAL
- ☐ COMPLETE
- ☐ PARTIAL
- ☐ FINAL
- ☐ PROGRESS
- ☐ ADVANCE

APPROVED FOR = $

EXCHANGE RATE =$1.00

DIFFERENCES

BY [2]

TITLE Construction Engineer

Amount verified; correct for

(Signature or initials)

Pursuant to authority vested in me, I certify that this voucher is correct and proper for payment.

(Date) (Authorized Certifying Officer) [2] (Title)

ACCOUNTING CLASSIFICATION

*Amount from attached receiving report. 19A-16-06-54-1111-001

PAID BY

CHECK NUMBER | ON ACCOUNT OF U.S. TREASURY | CHECK NUMBER | ON (Name of bank)

CASH $ | DATE | PAYEE [3]

[1] When stated in foreign currency, insert name of currency.
[2] If the ability to certify and authority to approve are combined in one person, one signature only is necessary; otherwise the approving officer will sign in the space provided, over his official title.
[3] When a voucher is receipted in the name of a company or corporation, the name of the person writing the company or corporate name, as well as the capacity in which he signs, must appear. For example: "John Doe Company, per John Smith, Secretary", or "Treasurer", as the case may be.

PER

TITLE

Previous edition usable

PRIVACY ACT STATEMENT
The information requested on this form is required under the provisions of 31 U.S.C. 82b and 82c, for the purpose of disbursing Federal money. The information requested is to identify the particular creditor and the amounts to be paid. Failure to furnish this information will hinder discharge of the payment obligation.

Example Final Voucher (No Exceptions)
Figure 8-4.4a

Standard Form 1034
Revised October 1987
Department of the Treasury
I TFM 4-2000
1034-122

PUBLIC VOUCHER FOR PURCHASES AND SERVICES OTHER THAN PERSONAL

VOUCHER NO.

U.S. DEPARTMENT, BUREAU, OR ESTABLISHMENT AND LOCATION
U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
555 Zang Street
Lakewood, CO 80228

DATE VOUCHER PREPARED: October 12, 1985

SCHEDULE NO.

CONTRACT NUMBER AND DATE: DTFH68-83-C-90004 1/6/83

REQUISITION NUMBER AND DATE

PAID BY

PAYEE'S NAME AND ADDRESS
Crystal Creek Construction, Inc.
P.O. Box 3699
Redding, CA 96049

DATE INVOICE RECEIVED

DISCOUNT TERMS

PAYEE'S ACCOUNT NUMBER

SHIPPED FROM | TO | WEIGHT | GOVERNMENT B/L NUMBER

NUMBER AND DATE OF ORDER	DATE OF DELIVERY OR SERVICE	ARTICLES OR SERVICES (Enter description, item number of contract or Federal supply schedule, and other information deemed necessary)	QUANTITY	UNIT PRICE COST	UNIT PRICE PER	AMOUNT
	COMPLETED 8/13/85	PAYMENT No. 10 -- FINAL PAYMENT (EXCEPTION) For construction of California Forest Highway Project 111-1(1), Ridge Road. Payment of the amount provided herein will completely discharge all obligations of the Government under the contract with the following exception: Request for equitable adjustment of $17,095.42 and 28 days of additional contract time as set forth in the Contractor's letter dated September 29, 1985. Agreed: [signature] Title: V. Pres Date: 8/16/85				

(Use continuation sheet(s) if necessary) (Payee must NOT use the space below) TOTAL $47,921.79*

PAYMENT:
- ☐ PROVISIONAL
- ☐ COMPLETE
- ☐ PARTIAL
- ☐ FINAL
- ☐ PROGRESS
- ☐ ADVANCE

APPROVED FOR = $

EXCHANGE RATE =$1.00

DIFFERENCES

BY [2]

Amount verified; correct for

(Signature or initials)

TITLE Construction Engineer

Pursuant to authority vested in me, I certify that this voucher is correct and proper for payment.

(Date) (Authorized Certifying Officer) [2] (Title)

ACCOUNTING CLASSIFICATION

*Amount from attached receiving report. 19A-16-06-54-1111-001

PAID BY

CHECK NUMBER	ON ACCOUNT OF U.S. TREASURY	CHECK NUMBER	ON (Name of bank)
CASH $	DATE	PAYEE [3]	

[1] When stated in foreign currency, insert name of currency.
[2] If the ability to certify and authority to approve are combined in one person, one signature only is necessary; otherwise the approving officer will sign in the space provided, over his official title.
[3] When a voucher is receipted in the name of a company or corporation, the name of the person writing the company or corporate name, as well as the capacity in which he signs, must appear. For example: "John Doe Company, per John Smith, Secretary", or "Treasurer", as the case may be.

PER

TITLE

Previous edition usable

PRIVACY ACT STATEMENT
The information requested on this form is required under the provisions of 31 U.S.C. 82b and 82c, for the purpose of disbursing Federal money. The information requested is to identify the particular creditor and the amounts to be paid. Failure to furnish this information will hinder discharge of the payment obligation.

Example Final Voucher (With Exception for Pending Dispute)
Figure 8-4.4b

DEPARTMENT OF TRANSPORTATION CONTRACTOR'S RELEASE	CONTRACT NO. DTFH68-83-C-90004
CONTRACTOR *(Name and address)* Crystal Creek Construction, Inc. P.O. Box 3699 Redding, CA 96049	SUM OF Forty seven thousand, nine hundred twenty one dollars and seventy-nine cents DOLLARS ($ 47,921.79

In consideration of the sum stated above, which has been paid or is to be paid to the Contractor, or his assignees, the Contractor, upon payment of the said sum by the UNITED STATES OF AMERICA (hereinafter called the Government), does remise, release, and discharge the Government, its officers, agents, and employees, of and from all liabilities, obligations, claims, and demands whatsoever under or arising from the said contract, except:

1. Specified claims in stated amounts or in estimated amounts where the amounts are not susceptible of exact statement by the Contractor, as follows:

Request for equitable adjustment of $17,095.42 and 28 days of additional contract time as set forth in Contractor's letter dated September 29, 1985

2. Claims, together with reasonable expenses incidental thereto, based upon the liabilities of the Contractor to third parties arising out of the performance of this contract, which are not known to the Contractor on the date of the execution of this release and of which the Contractor gives notice in writing to the Contracting Officer within the period specified in the said contract; and

3. Claims for reimbursement of costs (other than expenses of the Contractor by reason of his indemnification of the Government against patent liability), including reasonable expenses incidental thereto, incurred by the Contractor under any provisions of the said contract relating to patents.

The Contractor agrees, in connection with patent matters and with claims which are not released as set forth above, that he will comply with all provisions of the said contract, including without limitation those provisions relating to notification to the Contracting Officer and relating to the defense or prosecution of litigation.

IN WITNESS WHEREOF, this release has been executed this 21st day of October, 19 85.

WITNESSES

_____

_____

Crystal Creek Construction, Inc.
(Contractor)

BY Myron Whipple

TITLE Vice President

NOTE: *In the case of a corporation, witnesses are not required, but the certification below must be completed.*

CERTIFICATE

I, Leon Sniggle, certify that I am the official secretary of the corporation named as Contractor in the foregoing release; that Myron Whipple who signed said release on behalf of the Contractor was then Vice President of said corporation; that said release was duly signed for and in behalf of said corporation by authority of its governing body and is within the scope of its corporate powers.

(CORPORATE SEAL)

Leon Sniggle

Form DOT F 4220.4 (2-71)

Example Contractor's Release (With Pending Dispute)
Figure 8-4.4c

Standard Form 1034
Revised October 1987
Department of the Treasury
1 TFM 4-2000
1034-122

PUBLIC VOUCHER FOR PURCHASES AND SERVICES OTHER THAN PERSONAL

VOUCHER NO.

U.S. DEPARTMENT, BUREAU, OR ESTABLISHMENT AND LOCATION

U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
555 Zang Street
Lakewood, CO 80228

DATE VOUCHER PREPARED: October 12, 1985

CONTRACT NUMBER AND DATE: DTFH68-83-C-90004 1/6/83

REQUISITION NUMBER AND DATE:

SCHEDULE NO.

PAID BY

PAYEE'S NAME AND ADDRESS

Crystal Creek Construction, Inc.
P.O. Box 3699
Redding, CA 96049

DATE INVOICE RECEIVED

DISCOUNT TERMS

PAYEE'S ACCOUNT NUMBER

SHIPPED FROM | TO | WEIGHT | GOVERNMENT B/L NUMBER

NUMBER AND DATE OF ORDER	DATE OF DELIVERY OR SERVICE	ARTICLES OR SERVICES (Enter description, item number of contract or Federal supply schedule, and other information deemed necessary)	QUANTITY	UNIT PRICE COST	UNIT PRICE PER	AMOUNT
	COMPLETED 8/13/85	PAYMENT No. 10 -- FINAL PAYMENT (EXCEPTION) For construction of California Forest Highway Project 111-1(1), Ridge Road. Payment of the amount provided herein will completely discharge all obligations of the Government under the contract with the following exception: In accordance with Subsection 626.16 payment of $3,240.70 is withheld pending completion of the plant establishment period. This payment and any other issues related to the plant establishment period will be addressed at final settlement. Agreed: [signature] Title: V. Pres Date: 8/16/85				

(Use continuation sheet(s) if necessary) **(Payee must NOT use the space below)** TOTAL $47,921.79*

PAYMENT:
- ☐ PROVISIONAL
- ☐ COMPLETE
- ☐ PARTIAL
- ☐ FINAL
- ☐ PROGRESS
- ☐ ADVANCE

APPROVED FOR = $

EXCHANGE RATE =$1.00

DIFFERENCES

BY [2]

Amount verified; correct for

TITLE: Construction Engineer

(Signature or initials)

Pursuant to authority vested in me, I certify that this voucher is correct and proper for payment.

(Date) (Authorized Certifying Officer) [2] (Title)

ACCOUNTING CLASSIFICATION

*Amount from attached receiving report. 19A-16-06-54-1111-001

PAID BY

CHECK NUMBER | ON ACCOUNT OF U.S. TREASURY | CHECK NUMBER | ON (Name of bank)

CASH $ | DATE | PAYEE [3]

[1] When stated in foreign currency, insert name of currency.
[2] If the ability to certify and authority to approve are combined in one person, one signature only is necessary; otherwise the approving officer will sign in the space provided, over his official title.
[3] When a voucher is receipted in the name of a company or corporation, the name of the person writing the company or corporate name, as well as the capacity in which he signs, must appear. For example "John Doe Company, per John Smith, Secretary", or "Treasurer", as the case may be.

PER

TITLE

Previous edition usable

PRIVACY ACT STATEMENT

The information requested on this form is required under the provisions of 31 U.S.C. 82b and 82c, for the purpose of disbursing Federal money. The information requested is to identify the particular creditor and the amounts to be paid. Failure to furnish this information will hinder discharge of the payment obligation.

Example Final Voucher (With Exception for Plant Establishment)
Figure 8-4.4d

Standard Form 1034
Revised October 1987
Department of the Treasury
I TFM 4-2000
1034-122

PUBLIC VOUCHER FOR PURCHASES AND SERVICES OTHER THAN PERSONAL

VOUCHER NO.

U.S. DEPARTMENT, BUREAU, OR ESTABLISHMENT AND LOCATION
U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
555 Zang Street
Lakewood, CO 80228

DATE VOUCHER PREPARED: October 12, 1986
CONTRACT NUMBER AND DATE: DTFH68-83-C-90004 1/6/83
REQUISITION NUMBER AND DATE:

SCHEDULE NO.
PAID BY

PAYEE'S NAME AND ADDRESS
Crystal Creek Construction, Inc.
P.O. Box 3699
Redding, CA 96049

DATE INVOICE RECEIVED
DISCOUNT TERMS
PAYEE'S ACCOUNT NUMBER
GOVERNMENT B/L NUMBER

SHIPPED FROM | TO | WEIGHT

NUMBER AND DATE OF ORDER	DATE OF DELIVERY OR SERVICE	ARTICLES OR SERVICES (Enter description, item number of contract or Federal supply schedule, and other information deemed necessary)	QUANTITY	UNIT PRICE COST	UNIT PRICE PER	AMOUNT
	COMPLETED 8/13/85	PAYMENT No. 11 -- FINAL PAYMENT (FINAL SETTLEMENT) In final settlement for construction of California Forest Highway Project 111-1(1), Ridge Road. Agreement to the amount provided also indicates agreement to consideration provided by Contract Modification No.23 [attached] in settement of Contractor's claim dated February 14, 1986. Payment of the amount provided herein is specifically conditioned upon execution of the attached Contractor's Release and will completely discharge all obligations of the Government under the contract. Agreed: Myron Whipple Title: V. Pres Date: 8/16/85				

(Use continuation sheet(s) if necessary) (Payee must NOT use the space below) TOTAL $47,921.79*

PAYMENT:
- ☐ PROVISIONAL
- ☐ COMPLETE
- ☐ PARTIAL
- ☐ FINAL
- ☐ PROGRESS
- ☐ ADVANCE

APPROVED FOR = $
EXCHANGE RATE =$1.00
DIFFERENCES
BY [2]
Amount verified; correct for
TITLE Construction Engineer
(Signature or initials)

Pursuant to authority vested in me, I certify that this voucher is correct and proper for payment.

(Date) (Authorized Certifying Officer) [2] (Title)

ACCOUNTING CLASSIFICATION

*Amount from attached receiving report. 19A-16-06-54-1111-001

PAID BY

CHECK NUMBER	ON ACCOUNT OF U.S. TREASURY	CHECK NUMBER	ON (Name of bank)
CASH $	DATE	PAYEE [3]	

[1] When stated in foreign currency, insert name of currency.
[2] If the ability to certify and authority to approve are combined in one person, one signature only is necessary; otherwise the approving officer will sign in the space provided, over his official title.
[3] When a voucher is receipted in the name of a company or corporation, the name of the person writing the company or corporate name, as well as the capacity in which he signs, must appear. For example: "John Doe Company, per John Smith, Secretary", or "Treasurer", as the case may be.

PER
TITLE

Previous edition usable

PRIVACY ACT STATEMENT
The information requested on this form is required under the provisions of 31 U.S.C. 82b and 82c, for the purpose of disbursing Federal money. The information requested is to identify the particular creditor and the amounts to be paid. Failure to furnish this information will hinder discharge of the payment obligation.

Example Final Voucher (Claim Settlement - No Exceptions)
Figure 8-4.4e

U.S. Department of Transportation
Federal Highway Administration

July 12, 1985

Humbolt County Commission
2386 Utopia Street
Mountain View, CA 97854

Gentlemen:

On July 10, 1985, the final inspection of California Forest Highway Project 111-1(1), Ridge Road, was made with Mr. R.L. Lattimore of your organization in attendance. Several minor punchlist items were identified at the inspection. All work including the punchlist work was completed on July 11, 1985.

Final acceptance of the project is contingent upon the concurrence of the maintaining agency, Humbolt County California. Please indicate your approval and acceptance of the project by signing and returning the orginal of this letter. Your prompt attention to this matter will facilitate final payment and closeout of this contract.

Sincerely yours,

S. Twain
Project Engineer

Project Accepted:

Humbolt County California

By:_____

Title:_____

Date:_____

Example Letter Requesting Final Acceptance by Cooperating Agency
Figure 8-4.6

U.S. Department
of Transportation

Federal Highway Administration

July 22, 1985

Crystal Lake Construction, Inc.
P.O. Box 3699
Redding, CA 96049

Gentlemen:

We are pleased to advise you that the work performed on California Forest Highway Project 111-1(1), Ridge Road, has been satisfactorily completed in substantial confornity with plans and specfications. Final acceptance is effective on July 11, 1985; and as of that date you are relieved of further maintenance obligations.

The final payment voucher in final settlement of the contract will be forwarded to you as soon as final quantities are verified.

Sincerely yours,

C. X. Homer

Charles X. Homer
Construction Engineer

cc: Humbolt County Commission

Example Letter of Final Acceptance
Figure 8-4.7

CHAPTER 9 - CONSTRUCTION DETAILS

CONTENTS

9-1 INTRODUCTION

Chapter 9 consists of discussion of construction activities. The chapter is divided into sections for each of the major categories of work. The sections are further subdivided to provide discussion of each individual item or type of work. These subsections each contain instructions, illustrations, suggestions, or references concerning the following:

1. Preliminary Review and Approval

2. Construction Inspection

3. Measurement

4. Documentation

5. Reference Materials (if appropriate)

The materials should not be considered all-encompassing and, in fact, will not be appropriate in all situations. It does not offer cookbook solutions to problems, but rather suggestions to help try to avoid problems and ideas to aid in the development of solutions.

Much of the material deals with construction processes, procedures and equipment. It is intended that the contractor provide a sufficient level of expertise to properly calibrate and use its equipment. If that is not happening, the problem should be addressed as a management problem on the part of the contractor. It is not intended that this manual provide a level of expertise to the Project Engineer such that he/she can actually intervene to compensate for ineptitude on the part of the contractor. This information can give an indication as to when construction processes and procedures are inconsistent with appropriate quality standards.

SECTION 9-2 - CLEARING AND EARTHWORK

9-2 CLEARING AND EARTHWORK

9-2.1 Clearing and Grubbing

1. Preliminary Review and Approval

The vegetation and debris to be cleared, grubbed, removed, and disposed of under this section, includes all surface objects, trees, stumps, roots, and other protruding obstructions within the designated limits except such objects as are designated to remain in place or are to be removed under other contract items.

Before clearing and grubbing operations begin, the Project Engineer should address the following matters:

- Have the limits of all areas in which the Contractor will be required to perform work clearly marked. It should be made clear to the Contractor what access has been provided for the Contractor and for those property owners adjacent to the project.

- Go over the job with the Contractor and discuss the work to be done and any special details. Such details should include trees to be saved, stakes and survey control points to be preserved, and all known utilities that could be damaged during clearing operations. The general clearing procedure and disposal of materials should also be discussed.

- Have all trees, shrubs, survey or historical markers, objects of historical or archeological value, etc., that are to be preserved or remain in place, clearly marked and make the Contractor aware of their location.

- Go over erosion control requirements. See Subsection 9-2.4.

2. Construction Inspection

Inspection is usually a matter of intermittent checks, once the Contractor's supervision and understanding of requirements has been verified. Special circumstances such as a high degree of environmental sensitivity in some National Parks may dictate more frequent reviews. The inspector will usually be concerned with the following:

A. Equipment and Methods

The choice of equipment and methods used for this work is usually left to the Contractor, so long as the work is performed in a satisfactory manner. However, there may be limitations to the Contractor's choice as dictated by the specifications or common sense, (i.e., specific control of the use of explosives in congested areas).

B. Removal of Trees, Undergrowth, Stumps and Roots

Trees, stumps, and large roots should be removed from excavation areas to a depth sufficient to prevent such objectionable material from becoming mixed with the material being incorporated in the embankment. These areas to be excavated will normally require grubbing to remove small bushes, vegetation, rubbish and other objectionable material.

C. Removal of Material Outside Clearing Limits

It may be desirable to remove downed timber, etc., outside the originally established limits for clearing and grubbing. When there is no item for *Individual Removal of Trees*, or when these situations are not covered in the special contract requirements, they should be considered for a contract modification.

D. Preservation of Objects Designated to Remain

Precautionary measures must be taken to protect objects designated to remain in place, from damage during clearing and grubbing and other construction operations. These objects may

include trees, shrubs, survey or historical markers, objects of historical or archaeological value, and others. Clearly marking such objects and making the Contractor aware of their location will help insure their preservation.

Trees close to the top of high cut slopes should not be designated for preservation as they may become a traffic hazard or threaten the stability of the slopes.

Trees at the bottom of fill slopes should be removed beyond the slope limits, including rounding, unless tree wells or similar provisions for protecting them are included in the contract.

E. Timber to be Saved

When merchantable timber is to be saved, it must be trimmed, sawed, and stockpiled ln accordance with the special contract requirements. When there is no suitable place along the highway to stockpile timber to be saved, it may be necessary to clear an additional area for stockpiling. The length of haul of this timber to stockpile areas should be kept to a minimum. The areas of such additional clearing should be included in the measurement for payment, and approved by the Project Engineer in cooperation with land owning agency.

F. Rehandling

Contractor is entitled to no additional payment in the event of any rehandling of refuse caused by an order from the Forest Service or other legal authority, to delay burning. Such orders should be requested in writing and should be conveyed to the Contractor in a manner which makes it clear they have not been initiated by Federal Lands as a contractual action.

G. Hazards

Clearing and grubbing operations, particularly in dense, tall timber regions, can be very dangerous. Federal Lands personnel should make certain that the Contractor's operation does not endanger them, result in potential hazards to the traveling public, or create damage to existing facilities in or adjacent to the right-of-way.

3. Measurement

Methods of measurement must be consistent with Contract. Specifications should be reviewed closely for any exceptions to the general practice of including all area designated for clearing in the measured quantity, whether some parts require physical clearing effort or not. For example, the area of existing roads lying within the area staked for clearing are not deducted from the area otherwise measured unless the contract specifically provides for such deduction.

4. Documentation

The Project Engineer is responsible for documentation of the required compliance with specifications, and for the field measurement notes and computations for pay quantities. Compliance is usually documented by IDR or diary entries, and photographs. Original (authorized) quantities are generated with earthwork quantities. Adjustments and additions may be in a field book. Quantities are summarized in the Progress Estimate Book with indications as to when each section is complete or partially complete noted and reflected in the computations. Whether field measurements and/or computations are made by Contractor or Government crews, the Project Engineer must arrange for reasonable verification processes.

9-2.2 Removal of Structures and Obstructions

1. Preliminary Review and Approval

Before operations begin, the Project Engineer should go over the project with the Contractor and clearly identify any structures and obstructions to be removed. When the bid schedule does not contain a bid item for removal of structures and obstructions, removal within the designated construction limits should be considered a subsidiary obligation of the Contractor. However if the obstruction was not apparent during the bidding, and so unusual that it could not reasonably have been anticipated, the Contractor may make a case that it is compensable as a differing site condition. There may also be instances when it is desirable to remove structures that are not within these limits. In such cases, if the removal of such structures is not covered in the special contract requirements, they should be considered for a contract modification.

2. Construction Inspection

As with clearing operations, precautionary measures must be taken to protect objects designated to remain in place from damage during these operations. Clearly marking such objects in the company of the Contractor will help insure their preservation.

3. Measurement

The method of measurement must be consistent with the Contract. Usually removal items are measured by *each* or *lump sum*.

4. Documentation

The Project Engineer is responsible for documentation of the required compliance with specifications and for the field measurement notes and any computations for pay quantities. A separate field book may be appropriate, especially if the work is extensive. Otherwise, the book used for clearing or for miscellaneous items, can be used. Each structure or obstruction to be removed should be identified by location, measured, if appropriate, date of removal documented as well as place of disposal (if known). The summary book should include reference to the primary record.

9-2.3 Excavation and Embankment

1. Preliminary Review and Approval

The specifications provide that all suitable excavated material shall be used in the formation of embankment, subgrade, shoulders, slopes, bedding and backfill of structures, and for other purposes shown on the plans or as directed. The specifications also provide authority for making changes in the plans and specifications during the course of construction to adjust them to field conditions. Changes which affect the Contractor's unit costs or time of performance may warrant an equitable adjustment.

If the Contract requires the Contractor to furnish embankment material from sources of its own choosing, and if excavation from the roadway prism is incidental to an embankment pay item, the Project Engineer is usually concerned only with material quality, compaction, and geometrics.

Likewise if the Contract indicates that borrow may be necessary but no pay item for borrow is provided, the Project Engineer should prudently *monitor* quantities and how they are used, but normally is not required to actively *manage* these quantities.

Other contracts will require embankments to be constructed, or constructed in part, from materials to be excavated, and excavation will be a pay item. This is the predominant design scheme in many areas of Federal Lands work, particularly for projects in rugged terrain. The intent (which is also a condition of the Contract) is for the grading work to *balance*. That is, the cuts are to provide adequate material to make the fills. If that is not possible then a borrow item, and often a source for that borrow is provided. The designer must estimate how much the excavated material will shrink, or swell as it is placed and compacted in the embankments. Soil is usually expected to shrink, while shot rock will swell. Usual materials are a mixture. The Project Engineer should attempt to monitor the early grading work for verification of the designer's adjustment factors. This will sometimes provide lead time to correct for errors, perhaps by adjusting slopes in areas not worked, or by adjusting grades or alignment, or by finding waste or borrow areas. Failure to make the earthwork balance when the Contract indicates that it does, may result in a dispute over disposal of excess excavation or the importation of necessary borrow.

It is the responsibility of the Engineer to recommend or make changes found necessary to meet field conditions encountered during the progress of the work. It may be necessary to flatten slopes for stability or revegetation. Where more rock is encountered than anticipated, economy will dictate the steepening of slopes. Changes in grade, alignment, and/or slopes may be necessary to balance quantities, avoid wasting materials, and minimize overruns in excavation quantities. Redesign of the thickness of topping, subbase or base course may be dictated by variations in the quality of subgrade materials. In making or recommending changes, the Project Engineer should be guided by Chapter 3 of this manual and instructions from the Construction Operations Engineer. Insofar as possible, the need for contract modifications should be anticipated and issued before the Contractor starts grading operations in the areas involved. However, it should be kept in mind that changes which increase the Contractor's cost or time of performance can have an additional effect on cost of the remaining work.

Periodic inspection of the construction of side slopes and drainage ditches is necessary. If the Contractor excavates outside the slope stakes, or below subgrade except as required, gouges or undercuts the slopes, or causes significant overbreak, the Project Engineer should immediately advise the Contractor, in writing, that the specifications do not permit payment for such material. Before the work is accepted, the roadway shall be reasonably close to the required alignment, grade, and cross section.

The Project Engineer should discuss with the Contractor, the importance of exercising care in blasting operations to ensure landscape preservation in National Forests and National

Parks, and protection of abutting privately-owned property where such property is involved. The Project Engineer should ensure that the Contractor's Blasting Plan reflects this level of concern prior to approving it.

The Project Engineer should observe the Contractor's methods of drilling, blasting, and other grading operations for compliance with the protection and restoration of property provisions of the Contract. The Standard Specifications provide for restoration (at the expense of the Contractor) of any landscape features damaged by Contractor operations. However, the objective should be, to avoid such damage in the first place.

If blasting causes a scattering of material beyond construction limits, the land owner or agency be consulted, in the presence of the Contractor, to determine an acceptable method of removing the material without further damage to the property. In the event that damage results to privately-owned property, and repairs are not promptly made by the Contractor, the Construction Operations Engineer should be consulted and appropriate action taken.

2. Construction Inspection

Inspection at random intervals will usually be adequate, if decisive corrective action is ordered relative to any deficiencies found.

A. Materials

Preliminary sampling and testing of excavation, borrow, and subgrade materials normally will have been performed for design purposes prior to award of the contract. The preliminary design data furnished to the Project Engineer may include classification, moisture-density relationship, and color and texture of the soils sampled during the preliminary soil survey.

It is the responsibility of the Project Engineer to see that sufficient supplementary samples are taken and tested during construction, to verify classification, moisture-density relationships and other assumptions made during the design are consistent with the actual constructed conditions.

If the Contract makes specific quality requirements for the subgrade or other portions of the embankment, then verification of those quality requirements is a part of the Project Engineer's responsibility. If there are no specific requirements, then the Project Engineer can request certain better materials be conserved for, say subgrade. But if the Contractor's operations make it uneconomical to do that, the Government may consider a Contract Modification, or it may have to reevaluate its pavement structure design in areas where the below average materials are used. In the latter case, it becomes particularly important to compare the design assumptions with actual conditions.

The Project Engineer should request the soils and/or pavement design report. The report may provide the most significant factors considered in design, including traffic loading, soil support values, and climatic and environmental conditions. It will aid in making an assessment as to whether conditions encountered differ from design assumptions.

Additional information on sampling and testing is contained in Chapter 5 of this manual.

B. Borrow

When borrow excavation is included in the bid schedule, the Contractor is required to furnish necessary material from sources designated in the Contract, or from sources the Contractor provides. In either case, the material must meet the gradation and quality requirements of the Contract. The standard specifications provide that borrow used when roadway excavation material would have been available, will be deducted from the borrow volume (not paid for). It is intended that borrow material not be placed until after all reasonably accessible roadway excavation has been used, or will be used. Contractors who, for reasons of efficiency want to bring in borrow before all excavation has been performed, should

be advised that they run the risk of having borrow quantities reduced if excavated material is left over.

Another method is often used for projects requiring a significant quantity of material hauled in for embankment construction. This is to simply specify and pay for embankment material from the Contractor's selected sources. The Contractor is paid for the quantity of embankment rather than excavation or borrow. Any excavation required on the project is considered incidental to the embankment pay item, or will be called out as a separate pay item.

Selected borrow for topping is often specified on grading projects where soil conditions are poor. This material is obtained from sources as above, and will usually have more stringent gradation and quality limits specified than borrow for embankment construction.

The selected borrow for topping item may be reduced (or eliminated) if a suitable substitute is found in the excavation or borrow operations. Unless the Contract specifically requires such materials to be identified and used in the subgrade, the change would require a Contract Modification.

Even if better materials are ordered conserved for subgrade use, it is generally not economically practical that such materials be excavated and stockpiled, and later used in the work. Conservation for topping should be accomplished by leaving the material in its original position, whenever practical.

When a source of borrow material proposed by a Contractor for use has not been previously tested and approved, it is the responsibility of the Contractor to submit records of exploration and testing to support a request for approval. If the source is not an open commercial source, environmental and archeological clearances may also be required. Approval of the source should be made to apply only to those portions from which acceptable material can be obtained.

Borrow pits, other than those contemplated in the design, may be required to provide material of the quality and quantity necessary to complete the project. When additional borrow pits are necessary and it is determined the Government will provide them, concurrence of the Construction Operations Engineer should be obtained and approval by the local Forest or Park Service officials secured (where such jurisdictions are involved) before pits are staked. If the pits are on private lands, right-of-way agreements shall be executed and any question of royalty settled before they are staked. It is very unusual for Federal Lands to attempt to negotiate a borrow pit on private land, especially in the midst of an ongoing contract.

If additional right-of-way or an easement is required to expand a designated pit, the Project Engineer should obtain necessary property descriptions and forward them to the Construction Operations Engineer for appropriate action. The Construction Operations Engineer should also be consulted relative to any permits likely to be required. These might relate to State mining laws, laws governing wetlands, etc.

Whenever practicable, borrow pits should be located outside the limits of view of the project. In timbered country they should be located a minimum of 100 meters from the roadway, in open country a minimum of 300 meters.

It is sometimes faster and no more expensive to assign responsibility for the source of any required borrow material to the Contractor, and structure the contract or contract modification on that basis.

C. Topsoil

When the plans or specifications provide for removal and storage of suitable topsoil, only soil which can sustain a growth of vegetation should be conserved. Most soil will sustain growth, if given the fertilization. If the Project Engineer has doubts, the Federal land management agency associated with the project may be able to help. That is, the Forest Service or National Park Service may employ specialists locally who can be consulted.

D. Presplitting Rock Cuts and Blasting Plans

Before starting drilling operations for presplitting rock cuts as specified in the specifications, the Contractor is required to furnish a drilling and blasting plan. The drilling and blasting plan is to document that the Contractor has a plan for accomplishing the work. Its approval or acceptance by Federal Lands does not absolve the Contractor of responsibility for using proper drilling and blasting methods to achieve the required results. The Project Engineer should evaluate the plan, and bring to the attention of the Contractor any apparent weaknesses or proposed procedures which are contrary to the Contract. The Project Engineer should closely inspect initial operations, methods being used and the results obtained. When satisfactory results are not obtained, the Project Engineer should order a revised plan.

Critical factors in successful presplitting are hole diameter and spacing, hole deviation, charge distribution, and confinement. Test blasts, as required by the Standard Specifications, will help to determine the optimum drill pattern for each job. In practice it has been found that the denser, less fractured, and more homogenous the material is, the larger the hole diameter can be, the less explosives will be required, the greater the distance between holes, and the better results will be obtained.

Successful presplitting operations indicate a spacing of 0.4 to 0.75 meters, center to center, and a hole diameter of 50 to 100 millimeters. Charges taped at 0.3 to 1.0 intervals to a down line of detonating cord with heavier loads placed at the bottom of the hole have been used; however, lighter loads are required in weak rock masses. Explosives packaged in long narrow cardboard tubes that can be coupled into a continuous column as they are placed in the hole can be used in place of the taped loads. These have proven to be effective.

Hole depth in presplitting is limited by the difficulty in drilling accurately aligned holes. This is dependent on the quality of the rock mass. Deviation of greater than 150 millimeters from the desired plane of shear will give inferior results. Generally, 15 meters is the maximum depth that can be used without significant deviations of alignment unless unusually large diameter holes are permitted.

Presplitting can be accomplished in conjunction with the primary blast by delaying the primary holes so that the presplitting holes will fire ahead of them. Shooting far in advance of primary excavation can be troublesome if the rock characteristics change and the load causes excessive shatter in weaker areas. By carrying the presplitting only one-half shot in advance of the primary blasting, the knowledge gained from the primary blasts regarding the rock can be applied to subsequent presplitting shots. In this manner, the loads can be modified if necessary, and less risk is involved as compared to presplitting the full length of the neat excavation line before starting the primary blasts.

The above considerations are typical of the issues addressed by the Contractor in the Blasting Plan. It is not Federal Lands' intent to order methods and procedures beyond those in the Contract. Certainly if the Contractor has difficulty achieving required results, these and other issues should be discussed with the Contractor and with trained blasting specialists if the Project Engineers is uncertain of his/her own ability to deal with the technical issues.

Although not normally required, some contracts may, for aesthetic reasons, require the removal or obliteration of remaining drill holes in cut faces.

E. Prewatering Excavation Areas

In some areas, prewatering of excavation areas by sprinkling, flooding, or irrigation provides more uniform distribution of moisture with less water than truck watering in the embankments. This will also reduce the need for manipulation of the soil on the roadbed. When prewatering is used and water is specified as a pay item, the Project Engineer must closely observe and

evaluate the prewatering operations to avoid payment for wasted water. The special contract requirements may limit the pay quantity to the amount required to provide the proper moisture content for compaction to specified densities.

F. Slope Rounding and Warping

Slopes are to be rounded as indicated on the plans. The method of measurement and basis for payment is specified in the Contract.

The Project Engineer should encourage the Contractor to perform the slope rounding as a part of rough grading operations, rather than doing it as a special operation after slopes are otherwise finished. This will usually minimize the work involved and improve its overall quality.

In order to obtain reasonably smooth and uniform surfaces required by the specifications, slopes should be warped and adjusted to harmonize with existing landscape features. The Project Engineer can help assure the desired results by carefully reviewing the slope stakes on the ground and ordering appropriate adjustments before grading work begins.

G. Waterways and Ditches

Satisfactory drainage often is difficult to secure, particularly in flat country. Except when ponds are specified, waterways should drain quickly and efficiently away from the highway. Cut ditches should be flared out away from the roadbed at the end of the cuts and extended on the natural ground to a point where water will not discharge along the junction of the fill slope and the natural ground. Abrupt changes in these outlet ditch grades should be avoided to prevent erosion or silting. If possible, the flow line slope of waterways should not exceed that which is proper for the material. Where that slope is exceeded on steep grades, the Project Engineer should consult with the Construction Operations Engineer to determine the need for additional cross drains, paving of waterways, or other corrective measures to prevent scour. Extra wide sections require special consideration, especially when super elevation may increase scour or erosion potential.

Where considerable surface drainage over the top of a high cut appears likely, the Project Engineer should consult the Construction Operations Engineer regarding measures to be taken. One method of correction would be the construction of ditches above the cut to intercept and lead the flow to natural drainage courses. Such ditches should be far enough away from the edge of the cut to prevent seepage sufficient to cause sliding, and should not be so steep as to cause erosion. Unless shown on the plans, construction of such ditches in sensitive areas, such as on Park or Parkway projects, should not be undertaken without the agreement of appropriate Park Service officials. Right-of-way for such ditches may be a consideration for some projects.

H. Subdrainage

Thorough attention to subdrainage is essential to the life of the road and will result in reduced maintenance costs. Should the Project Engineer suspect the presence of subsurface water in such quantity as to affect the stability of the roadbed, and if corrective measures have not been provided in the plans and specifications, appropriate action should be taken to correct the problem. Stabilization may be accomplished by the simple installation of underdrains under certain conditions. Other conditions may require special investigation and more involved designs using geotextiles. The Project Engineer should consult with the Construction Operations Engineer or FLH specialists when simple underdrains are deemed inadequate for the field conditions.

Section 9-6 of this manual contains information on the construction of underdrains.

I. Embankment Foundation Preparation

The quality of embankment construction depends on the proper preparation of the foundation. The presence of subsurface slippage planes, soft or saturated material, and springs or seepage are some of the conditions which may cause

embankment failures. These require careful attention.

The plans and/or special contract requirements will usually provide corrective measures for unstable foundation conditions known to the designer. Some may not have been known. Clearing and grubbing may expose them. Before embankment construction begins all embankment areas should be examined to determine any need for corrective treatment. Some areas of questionable support may only require subgrading. Others will require extensive systems of underdrains, filter blankets, rock trenches, or rock embankment.

During the construction of embankments on hillsides, particular attention should be given to obtaining the best possible interlock between sloping original ground surfaces and the new embankment. Sufficient benches should be excavated to assure a firm bearing on solid material. Payment for the benching will depend on how the specifications are written. If not addressed in the specifications, a contract modification may be required.

One of the most frequent points of embankment failure is the area where the roadway changes from excavation to embankment. It is advisable to explore these areas for possible need of underdrains to remove seepage water. The benching operation described above should be very carefully followed in these transition areas.

For any embankment area where the foundation treatment and/or Contract items provided in the Contract seems inadequate for the actual field conditions, advice of the Construction Operations Engineer should be sought.

J. Embankment Failures -- Causes and Corrective Measures

Embankment failures or displacements are due mainly to improper design or construction, or both. Four major causes of embankment failures are discussed below. The design should be based on a thorough exploration of foundation conditions and available embankment materials. Serious failures occurring or expected during project construction should be corrected on the basis of subsurface investigation and analysis. The Project Engineer should consult the Construction Operations Engineer to arrange this.

(1). Failure due to weight of the embankment displacing soft foundation material. This failure is usually characterized by an en masse drop and lateral movement of a portion of the fill. To provide a satisfactory embankment over a soft foundation, three approaches may be taken:

- **Removal and replacement of soft soil with suitable material.** This may be the most economical method to depths of about 3 meters.

- **Reduction of applied shearing forces**. This can be accomplished by reducing the height of the embankment, using light-weight material in the embankment, and by either flattening the side slopes or by using toe berms.

- **Strengthening of the soft foundation soil.** This can often be accomplished through consolidation. Drainage ditches may be used to lower the water table and consolidate the foundation soil under its own weight. Foundation strength may be allowed to keep pace with increase in load by providing adequate time for foundation consolidation. A sand blanket placed directly on the soft foundation soil, or vertical sand drains in combination with a sand blanket, will increase the allowable rate of consolidation. This rate must be controlled by field measurements during construction.

  Pavement failures due to excessive consolidation of the soft foundation soil may be reduced by removing the soft material,

providing sufficient time for consolidation before paving, or by accelerating the consolidation by the use of a temporary surcharge and one of the drainage methods noted above.

(2). Failure due to loss of stability of embankment through impounding of hillside seepage water causing saturation.

This type of failure is usually identified by characteristic sloughing of part or all of the fill. When opened up, the impounded water will usually gush out until the hydrostatic pressure is relieved. Prevention of such failures usually lies in providing for escape of seepage water by means of subdrains or placement of very porous material in the lower part of the fill.

(3). Failure due to the weight of embankment causing movement on a well defined slippage plane in the underlying foundation.

This type of embankment failure is generally characterized by bodily movement of the fill, without sloughing. The usual correction is to intercept and remove the subsurface water by trenching or placing subdrains above the fill

(**4). Failure due to horizontal stresses produced by the weight of the fill being greater than the corresponding shearing resistance.**

This condition occurs when the slopes are too steep for the height of the fill and the type of the material, or when the material is insufficiently compacted. Proper compaction and correct slope design are both essential for permanent fill stability.

K. Embankment Compaction

The need for adequate compaction of embankments should be strongly emphasized. Compaction of the lower portions is necessary to prevent settlement and provide stable slopes. It is important in the upper portions and subbases to provide bearing capacity, control volume change, and provide uniformity.

All embankments are to be compacted in accordance with the Contract specifications. The specifications normally do not prescribe the type of compaction equipment to be used. Unless otherwise specified in the special contract requirements, the Contractor is free to use equipment of its own choice, provided it will compact the embankment in accordance with the Contract requirements.

The Contractor is required to bring the embankment material to a uniform moisture content suitable for compaction and to compact the embankment until it consistently meets the Contract requirements.

It is the responsibility of the Project Engineer to verify that the moisture-density relationship of each type soil to be used in embankments is determined in accordance with the test methods specified. In most contracts the actual sampling testing and documentation will be the responsibility of the Contractor. As discussed in Section 9-2.3 of this manual, this will require use of preliminary soil data and supplementary sampling and testing of any soils encountered during construction which are different from those sampled during the preliminary soil survey.

The specifications usually require density tests of compacted embankment material to be made in accordance with AASHTO T 238, or other approved methods. In place moisture is determined by AASHTO T 239. The Project Engineer should make observations and reviews of density tests to insure that prescribed procedures are being used, required density is being attained, and adequate documentation is being maintained.

If more than one type of soil is being compacted into embankments, the selection of the proper moisture-density curve becomes as important as the density test itself. It may be necessary to use a family of curves (AASHTO T272) in combination with a one point proctor in order to select the proper curve.

In gravelly or rocky soils a coarse particle correction (AASHTO T224) or a family of curves may be necessary to correct for differing percentages of coarse particles in the field as compared to the original proctor. This is especially true when a nuclear gauge is used in gravelly soils. A sample may be required in order to compute a coarse particle correction each time a density test is taken.

During construction, a record of all relative density tests should be maintained on a chart drawn to convenient scale. This may be done on a roll of cross-section paper with both plan and profile plotted as horizontal lines. Depth and location tests and retests can thus be easily shown in relation to grade and centerline station.

The success of compaction operations is dependent to a large extent on proper moisture control. If the proper amount of moisture is uniformly distributed throughout the embankment layer, rarely will there be any difficulty in obtaining satisfactory compaction, provided the thickness of the layer does not exceed the capabilities of the roller being used. The common tendency to construct earth embankments at moisture contents on the dry side of *optimum* makes the task of securing uniform moisture distribution and satisfactory compaction more difficult. Usually, it is better to begin compaction with the moisture content slightly high; however, in humid areas it may be better to begin with the moisture content near optimum.

The mixing and blending of soils and water should be thorough. Large clods and lumps must be broken down to insure a uniformly moist condition. Whenever it is necessary to blend moisture into very plastic clays, heavy plowing and turning of the soil will usually do the job satisfactorily; however, in certain extreme cases some type of mechanical mixer may be needed.

When adding water to a layer of material, care must be taken to avoid overlapping or gapping between successive passes of the water distribution equipment. Wet or dry streaks are undesirable and should be avoided. Application of water should begin on one side of the embankment and progress across to the other side to avoid having wet or dry streaks in the center of the embankment. It is better to make several light applications rather than one heavy application of water.

In lieu of applying water to material in the embankment to attain the proper moisture content for compaction, the excavation or borrow areas may be prewatered as discussed in e. of this subsection.

In using density tests to determine the adequacy of compaction, recognition should be given to causes of variations in test results which are to be expected in using this method of compaction control. Exact representative samples are seldom possible. When it is not possible to properly perform meaningful tests due to high rock content or for other reasons, explanation as to why the tests were not made should be entered on the form provided for recording the test results

L. Disposal of Surplus Material (when off-site disposal is not a Contractor responsibility)

Unavoidable waste or surplus from roadway and structure excavation is to be utilized, to the maximum extent practical, to widen embankments, flatten slopes, and provide parking areas. Proper distribution is necessary to secure uniform appearance of the finished roadway. Boulders or rocks brought to the surface by scarifying generally are to be covered in embankments or disposed of as authorized by the Contract.

The necessity for widening of embankments should ideally be determined early enough that such widening may be incorporated in the originally planned embankment. If surplus material is developed after the nearby embankments have been completed, it should be used to fill pockets on the uphill side of embankments, or hauled and wasted in other suitable disposal areas.

Proposed disposal sites for any significant quantity of unanticipated surplus material should be discussed with the Construction Operations Engineer and representatives of cooperating agencies. There may be need for permit consideration in accordance with State or Federal regulations.

M. Finishing Earthwork

Before the finishing operations begin, the Project Engineer should carefully check the roadway to see that the earthwork is in reasonably close conformity with the staked lines, grades and cross sections. The Standard Specifications require the roadway to be finished to reasonably smooth and uniform surfaces. Refer to Chapter 1 for a discussion of tolerances not explicitly specified.

3. Measurement

Refer to Subsection 8-1.3, of this manual, and to the appropriate measurement sections in the Contract. The Standard Specifications detail what is and is not to be included as excavation and embankment.

Most excavation and embankment items are paid as staked quantities, i.e. the computer generated quantities based on field cross section and slope stakes. Often secondary measurements are taken to modify the original quantities, e.g. when a slope is laid back.

Adjustments to authorized quantities may also be appropriate, if for example the Contractor wastes material which could be used, or uses excavation for rip-rap which necessitates it being replaced by borrow or expanded excavation.

Some quantities are measured in place. For example subexcavation is often inspected as it is excavated and the limits of the excavation determined at that time.

4. Documentation

Refer to Subsection 8-1.3, of this Manual

Generally basic documentation will consist of the computer generated quantities. The computer run should be dated and cross referenced to the Summary Book. Obsolete versions of computer runs should be destroyed or clearly marked as “superseded”. Adjustments to the computerized quantities should be in field books or supplementary computer runs and also cross referenced to the Estimate Book. It should be possible at any time for someone unfamiliar with the project to pick up the Estimate Book and to follow the cross references back to the detailed quantities authorized and accomplished.

9-2.4 Soil Erosion Control

1. Preliminary Review and Approval

Construction activities that are subject to high erosion risk include clearing and grubbing, earthwork, ditch construction, haul roads, culvert installation, channel changes, pier or abutment work in streams, temporary stream crossings, borrow pit operation, and hydraulic or mechanical dredging.

The Contract will contain an erosion control plan that reflects special concerns, measures to protect resources, and permit requirements. The Contractor may submit an alternate plan for approval, but the alternate plan must comply with Contract requirements, constraints and permits. No work on any segment of the project may begin until the required erosion control devices associated with that segment are installed.

Approval of alternate plans should be based on compliance with the requirements and constraints in the Contract, and, if applicable, requirements and constraints in the permit, and in the regulatory requirements of local water quality agency. If the Project Engineer encounters approval/disapproval issues which are not addressed by these documents, the subject should be discussed with the COE.

It is required that the Contractor incorporate all permanent erosion control features into the project at the earliest practicable time. This commitment should be reflected in the proposed progress schedule. If the Contractor subsequently fails to adhere to the schedule and is forced to install additional temporary devices or seeding because the site is not ready for permanent devices or seeding, FLH may take the position that the cost of the additional devices are not compensable under the Contract.

The effectiveness of erosion control should be reviewed and updated prior to any winter shut down or expected erosion potential. Sediment traps, settling basins, stage seeding, mulching, temporary slope drains, special berms, terraces, ditches and/or dikes, temporary seeding, sodding, contouring, benching, serrated slopes, and erosion control mesh may be placed in the construction contract to control soil erosion and stream pollution.

2. Construction Inspection

Prior to beginning each major construction operation phase, the Project Engineer should make a detailed inspection of the project with the Contractor's representative to verify that the approved schedule remains adequate and to go over details not covered in that schedule. Once the devices are installed, additional inspections should also be made periodically to verify the adequacy of the plan.

NPDES permits require inspections at least once per week and after rainfall greater than 10 millimeters. These inspections must be documented and maintained in a separate file. The Contract may require the Contractor to conduct, participate in, and/or document these inspections. Otherwise the Project Engineer is responsible for them.

3. Measurement

Measurement for erosion control devices normally starts with the quantities authorized in the Contract which are based on the specified Erosion Control Plan. If the plan is modified or quantities are adjusted, written authorization for the modifications is required. Once the devices are installed there should be documentation in the IDR's or a field book that each of the authorized installations has been accomplished. If additional quantities, beyond those authorized in the Contract are required, a contract modification may be necessary.

4. Documentation

Basic documentation for erosion control items consists of the following:

- The Contract or alternate approved plan for erosion control devices.

- Documentation/authorization for quantities in excess of those provided in the Contract..

- Inspection documentation that the required devices have been installed and maintained for the duration of need.

The Estimate Book documentation should be cross referenced to these items.

9-2.5 Structural Excavation

1. Preliminary Review and Approval

Excavation for structures is usually bid at prices considerably higher than unclassified excavation. This is largely due to the smaller quantities, difficult access and special foundation preparation and backfill requirements which are included in the bid price for structural excavation. It is the latter requirement which require the most inspection and approval efforts.

2. Construction Inspection

Inspection is required after excavation and foundation preparation has occurred to verify that the foundation materials and their compaction meet the Contract requirements. During backfill, verify that the backfill materials meet contract requirements and that compaction also meets those standards.

Inspection frequency should be random until it is verified that the Contractor is doing a good job controlling the quality process. Inspection frequencies can then be reduced further. Major, critical structures should receive more inspection, especially the approval of the foundation prior to placement of forms for footings.

When backfilling structures, particular attention should be paid to drainage behind such structures. The plan usually require weepholes. The material adjacent to weepholes should be permeable but not erodible. The Contract may require filter fabric to assure separation of coarse rock immediately adjacent to the hole, from finer erodible materials further away.

3. Measurement

Structural excavation is often not included as a bid item and no measurement is performed. When it is included, measurement is usually *as staked*. That is, quantities are computed based on the dimensional limits in the Contract including the elevations of footings regardless of the quantities actually excavated. Sometimes additional excavation is ordered because the foundation does not meet design expectation. These quantities may be ordered to a specific depth - say 200 millimeters, or excavation may be performed under inspection and measured after a suitable foundation is exposed.

If there is no item for structural excavation, then measurement is not an issue. When structural excavation is a pay item, measurement is usually a staked quantity controlled by ground elevation [after unclassified excavation is removed], and vertical planes 450 millimeters from the structure. There is no remeasure of quantities outside those vertical planes, nor is there remeasure of quantities inside the planes not excavated [e.g. adjacent to a footing].

4. Documentation

If structural excavation is a pay item, documentation requirements include original ground elevation, or computed elevations after unclassified excavation is removed if that is appropriate.

Actual computations of structural excavation should be the theoretical volumes below the natural ground or unclassified excavation. These quantities should be verified in the field after being performed. Volumes not excavated should not be paid for, e.g. if the Contractor excavated against natural ground instead of forming. Additional quantities should not be paid for unless the Engineer ordered a footing lowered or expanded.

9-2.5 Watering

See 9-2.3 for a discussion concerning watering for embankment construction.

Unless otherwise provided in special contract requirements, only that water necessary for dust control is measured for payment. Documentation may be a tally of loads of haul vehicles. This may be maintained by the Contractor, so long as the Project Engineer performs verification at checks at reasonable intervals. The tally of loads should include the time of complete discharge of each load to discourage accidental double counting. The determination of haul vehicle capacity should be witnessed by an FLH inspector. Determination should preferably be by weight if scales are available, or otherwise by meter, or computed volume (least preferred).

9-2.7 Finishing Roadbed

1. Preliminary Review and Approval

On new grading construction, finishing of the roadbed is usually a subsidiary obligation of the Contractor under other items of the Contract. Similarly, on projects providing for a base or surface course on a previously constructed roadbed, the *finishing* or preparation, of the previously constructed roadbed is usually a subsidiary obligation.

When a project includes a section of new grading, plus construction of a base or surface course on a previously graded section as well as on the new work, it is common though not universal practice to include a bid item for *finishing previously constructed roadbed*. This is done for the primary purpose of permitting a Contractor to bid the surfacing items without the necessity of prorating the costs of preparation of the old roadbed. In such cases, payment will be limited to the length of the old roadbed. If no such item is provided, the work is a subsidiary obligation.

2. Construction Inspection

The work required to be performed in accordance with specifications, whether there is a pay item, or the work is subsidiary to other items. Inspection should include surface tolerances, compaction, a visual inspection for soft spots and unsuitable materials.

3. Measurement

Unless there is a pay item for this work, there is no measurement for payment.

4. Documentation

Documentation should verify that each section of roadbed has been inspected, tested if necessary, measured if necessary and accepted prior to construction of subsequent layers.

SECTION 9-3 - AGGREGATE BASE AND SUBBASE COURSES

9-3.1 AGGREGATE BASE AND SUBBASE COURSES

1. Preliminary Review and Approval

A. General

Prior to placing base or subbase materials the subgrade must meet grade and template requirements. This can usually be checked well enough with sight levels (see Section 4-2). Sight levels are especially useful when fine grading stakes have been knocked out. And, they are useful for checking *quarter crown* and critical superelevation transition sections, whether or not stakes remain.

The subgrade should also be checked for large rocks (over 150 millimeters) in the surface. These will *shine* or reflect through subsequent aggregate and paving courses placed over them.

The thickness of bases, as shown on the typical sections of the plans, is based on the type of subgrade soil, amount of subgrade stabilization, climatic conditions, traffic, and other factors. Base courses should be placed to the thickness shown on the plans unless subsequent determination indicates a different thickness is required, as might be the case if subgrade material proved significantly different than design expectation. Documentation provided with the design package should indicate the assumption made by the pavement designer. Discuss with the COE. when in doubt as to subgrade adequacy.

The Contractor's QC personnel should develop a spread rate for the aggregate course prior to starting the spreading operation. The spread rate converts the tonnage of each truck to the number of meters along centerline which that tonnage should cover. These computations should be checked by the Engineer. The spread rate should be based on the wet density at two percent or so above minimum density.

Example:

Maximum Density (Dry) - 2160 kg/m^3
Optimum Moisture - 8.0%
Maximum Density (Wet) - 2333 kg/m^3
Target Density (97%) - 2263 kg/m^3
Spread Depth - 150 mm
Bottom Width - 9.2 m
Top Width - 8.0 m
Area - 1.29 m^2
Spread Factor - 2263 × 1.29 = 2919 kg/m

So a truck with a 30,000 kg net load would cover a spread of 10.28 meters.

Once laydown has started, the Contractor should perform depth checks and width measurements in order to verify the computed spread rate. When the operation is fine tuned to the point that plan dimensions are being achieved, the Project Engineer must consider *yield*. It is necessary to calculate as early as possible how well the yield, in say stations per metric ton, will match the contract quantity for the item, if the entire course is completed at the same rate. This information will bear on questions of project funding adequacy, materials source capacity, and any necessity to negotiate relative to significant variation from plan quantity.

B. Materials.

It is the responsibility of the Project Engineer to see that required samples are taken and tested in accordance with the specifications. This applies whether the sampling and testing is to be performed by the Government or the Contractor.

(1). Preliminary Sampling and Testing

Laboratory tests for a source approval determination of quality will be made before base or surface course material is produced or shipped. Where the source proposed for use has not been previously explored, tested, and approved, it is the responsibility of the Project Engineer to coordinate the approval process. The Construction Operations Engineer, as well as Division materials specialists, etc. will usually be involved in the approval decision. If the source has been proposed by the Contractor, the specifications may require submission of

exploration and test data. The Construction Operations Engineer will advise the Project Engineer on the status of the Contractor's submission, and how any approval letter is to be written when the decision is made.

(2). Sampling and Testing by the Contractor.

Whether or not contractor testing is specified, it is the responsibility of the Contractor to effectively control the quality and contract compliance of the material being produced. The specifications include requirements for a contractor inspection system, pursuant to Federal Acquisition Regulations.

It is to the mutual advantage of the Contractor and the Government that the product comply with the specifications at the time of production. However, in the event of deficiencies, blending of filler and other adjustments by the Contractor prior to final mixing and blending may correct those deficiencies. Conversely, material which is found to comply with specifications at the time of sampling at the crusher may be degraded during further handling so that it fails when tested for acceptance.

While base and subbase specifications are for the most part *end result* type, the Contract will often specify proper handling and storage of materials. Therefore, if the Project Engineer comes to believe a Contractor's handling and storage processes will result in quality problems, there is contractual basis for requiring process improvements. The Construction Operations Engineer should be consulted if there is disagreement with the Contractor.

(3). Sampling and Testing for Acceptance

Gradation, liquid limit, plastic limit, plasticity index, moisture and density, and other job control sampling and testing required by the specifications will typically be performed in the field. The Contractor is usually responsible for establishing specification target values. For stockpiled materials, the computed composite gradation is most often proposed as the target.

There are at least three methods of adding water and mixing aggregate materials. Regardless of the method used the aggregates will be tested for acceptance based on samples taken from the windrow or roadway after final blending and prior to compaction. The frequency of samples and tests can be determined from the Contract specifications and/or the FLH Field Materials Manual.

2. Construction Inspection

A. Inspection Intensity

The inspection of a high production base or subbase operation will usually require the full attention of one competent inspector even if personnel furnished by the Contractor are testing, weighing, and recording the receipt of materials on the grade. This inspector will be busy verifying the work of the Contractor personnel, designating and monitoring samples and inspecting subgrade ahead, in addition to verifying dimensions of materials placed, keeping complete records of Contractor equipment and personnel usage, and consulting with the Contractor and Project Engineer.

If Government personnel are testing compaction, or are receiving materials, these personnel will be able to relieve the inspector of part of the duties described above, perhaps to the point the inspector can monitor some other project operation also.

B. Mixing with Water

The Contractor may mix the base course by the stationary plant method, the travel plant method, or the road mix method. When the Contractor elects to use the road mix method, special attention should be given to the following:

- That excess water is not added in such a manner that the subgrade bearing capacity is

detrimentally affected.

- That water is added uniformly and not in a manner which might promote segregation.

If the Contractor uses a stationary pugmill plant and storage hopper, it may be necessary to baffle the flow into the hopper to reduce segregation of the aggregates.

C. Compacting

The moisture density relationship for base and subbase materials is commonly determined in a central laboratory but a field laboratory can usually perform the tests if time is short.. The laboratory requires a sample of the aggregate, and knowledge of the Contractor's target values. The laboratory usually requires some time for the determination. Aggregates with moisture in the range indicated below can usually be compacted with usual effort.

The Project Engineer should require sufficient moisture determinations of the base course material to assure proper compaction. With the typical material, this moisture content will be between 5 and 8 percent at the time of compaction. The amount necessary will vary with the specific gravity, surface texture, and grading of the aggregate. Preliminary tests made in the Division or other designated laboratory will show the percentage of moisture necessary for proper compaction and maximum dry density. It is essential that the proper amount of water be uniformly mixed with the aggregate before spreading and compaction is started. Base course must be rolled sufficiently and with such weight and type of roller as will assure specified compaction. Excess water will cause flushing of fines to the surface under compaction. Rolling should be stopped in such cases until the excess water is removed, or allowed to run off and evaporate. Water draining from haul vehicles is usually a sign of excessive water in the mixture.

D. Stockpiling Aggregates.

The Contractor may elect to stockpile base course aggregate prior to placement. However since testing for acceptance does not take place until placement, this is frequently a situation where a Contractor may initially test the material and document compliance but is later unable to meet gradation requirements.

With or without observing proper stockpiling techniques, the Contractor is responsible for providing aggregate which meets the specified grading requirements upon incorporation into the project. However, compliance with specified handling and storage requirements might mean an overall pay factor of l.0, as opposed to say 0.75 if proper procedures are not followed. .

3. Measurement

The method of measurement will be in accordance with the Contract. If the measurement is by the metric ton, the scales must meet the requirements of the specifications. Project Engineers should not confuse checks of *contractor weighing*, with checking the scales. One is a personal integrity issue, the other relates to equipment.

4. Documentation

The area of documentation is one which is closely scrutinized by internal and external reviews, and deserves the Project Engineer's careful attention.

Delivery records should be checked against weigh records to verify that material weighed was incorporated into the project. As a minimum the number of loads invoiced should be checked against the number of loads delivered every day. Spot checks of actual tickets against the invoice summary should also be performed routinely.

Weight and delivery records, as described for bituminous mixes in Section 9-4.1a., are also suitable for this work. When the specifications stipulate Contractor weighing, the Project Engineer should periodically verify weights recorded. For platform scales, this is

accomplished by taking a truck weighed under normal circumstances and circulating that truck back across the scales and reweighing the vehicle in the presence of an FLH inspector.

This verification process is to be documented in the permanent weigh records. Verification loads are to be selected so as to preclude knowledge or anticipation by Contractor personnel. The Project Engineer and Contractor should have a documented understanding of acceptable tolerances, and what is to be done if they are exceeded. The recommended tolerance for a single check is 50 kg, but the average of several checks should be 15 kg or less. If there is evidence of biased or erratic weighing, the COE should be consulted. The Government may want to considered requiring the removal of the weigh person, and/or applying a correction factor to all invoiced weights.

For belt-scale weighing, a previously weighed truck should also be periodically directed to a properly certified platform scale. This verification should be documented in the permanent scale records. In rural areas this may require a long trip to find such a scale.

In all cases if the Contractor has an English unit scale which otherwise meets Contract requirements, there is no requirement to provide a metric scale if invoices and other documentation are submitted in metric units.

Occasionally it may be necessary to haul material by the cubic meter when measurement is specified by the metric ton. The Project Engineer should keep this type of variation from the specified measurement to a minimum. Where such variation is approved, the Contractor should be required to establish the metric ton per cubic meter ratio by weighing a load of known volume on certified scales. This documentation along with truck volume measurements should become a part of the permanent record.

When the specifications stipulate volumetric measurement in the hauling vehicle, the Project Engineer should verify the measurement of the volume to be hauled by each hauling vehicle. In certain instances, it may be necessary to haul less than the capacity of the truck. When this occurs, the volume being hauled and documented should be accompanied by a written agreement between the Government and Contractor as to the volume to be paid per hauling vehicle.

9-3.2 DUST PALLIATIVES

1. Preliminary Review and Approval

Review the Contractor's plan for controlling traffic during application and curing. Review supplier certifications to insure that the specified palliative is being provided.

2. Construction Inspection

The roadbed to be treated should be brought to the proper template and compacted. Just prior to treatment, the surface should be dampened. Application rates should be determined and equipment calibrated as in Section 9-4.10.2. Runoff is to be avoided, particularly in the vicinity of lakes and streams.

3. Measurement

Dust palliative materials are paid by the metric ton. If materials are not used the Contractor should be requested to document the quantities involved and to remove them from the project without payment. However, if the Contractor makes a convincing argument that such materials are not returnable and have no further value, the Project Engineer may have to consider paying for all or part of the leftover quantities and ordering them removed under a Contract Modification. For this reason it is important to plan quantities carefully and communicate with the Contractor as to what will be needed and what will happen to leftovers.

Application of dust palliatives will be paid separately by the square meter, or by the station. The Project Engineer or Inspector should reach agreement with the Contractor on the quantities involved in each application.

4.Documentation

Required documentation includes certifications or other acceptable quality documentation.

Invoices or weigh ticket should be submitted to document quantity of materials. Daily records of applications should be included in a field book to document that item.

SECTION 9-4 - ASPHALT CONSTRUCTION

9-4.1 HOT ASPHALT CONCRETE PAVEMENT

1. Preliminary Review and Approval

The contract defines the Contractor's responsibility with respect to the production and placement of asphalt mixes. It behooves the Project Engineer to also be prepared with knowledge of proper construction procedures.

As a part of the Quality Control Plan approval process the Contractor's process control procedures should be reviewed both from a procedural standpoint and from a quantitative view. Equipment, screens, scales etc., should be inspected and the test methods examined. Care must be taken to insure that the Contractor testing personnel do not construe the approval of QC equipment and methods as acceptance of the material produced.

The Project Engineer should insure that the mix design samples are adequate in size, representative of the material being produced, and that they are submitted as soon as reasonably possible. The shipment of the asphalt and antistrip agent samples should be coordinated through the suppliers, and the central laboratory notified of their impending arrival.

After the mix design is completed, the Project Engineer should review and compare it with the design criteria to understand the approval process/criteria. The Project Engineer should make certain that the Contractor understands that the asphalt cement content used in FLH mixes is a percentage of the total mix, not a percentage of the dry aggregate.

Before production of the mix begins, the statistical evaluation procedures should be thoroughly discussed with the plant personnel and any problems or questions concerning the procedures resolved before conflicts arise.

Prior to the commencement of paving operations, it is desirable for the Project Engineer and the Contractor to get together for a pre-paving conference. This is an opportunity for both parties to familiarize themselves with the contract requirements and share their plans for proceeding with paving operations. This goes a long way toward minimizing surprises during paving and promotes good working relations.

2. Construction Inspection

A. Plant Operations

(1) General. There are, in general, two types of plant operations: (1) the permanently located commercial plant with multiple production operations; and (2) the portable plant, erected on or near the project to produce solely for the project.

The inspection and quality control of asphalt plant operations is typically a Contractor or producer responsibility and covered in the Contractor QC plan. The Project Engineer may ask for documentation and verification that this QC process is effective and may perform verification inspections. Generally FLH oversight of Contractor QC is less necessary at commercial plants.

At the commercial plant site, or as soon as the portable plant is set up and ready to operate, the Contractor QC specialist should make a thorough examination of the plant layout, including storage areas and component parts of the equipment. If the storage areas or any part of the equipment fails to comply with the requirements, corrective measures must be taken before operations begin.

There are two general types of asphalt concrete mixing plants: the batch plant and the continuous mixing plant. Continuous mixing plants include pugmill mixing plants (very rare) and dryer drum plants. In the batch plant, the aggregates are proportioned by weight and the bituminous material proportioned by weight or volume. In the continuous plants, the aggregates and bituminous materials are proportioned by volume based correlated to weight; or in the

case of the dryer drum plant, provided with positive weight measurement (belt scales) to allow regulation of the feed gates and permit automatic correction for variations in load.

(2). Inspection of Plant Equipment

(a). Pugmill Mixer. In order to properly understand the asphalt plant, it is necessary to become thoroughly familiar with the specification requirements and with the particular type of equipment being used. The components of a batch plant and continuous mix plant utilizing a pugmill for mixing are essentially the same. The main difference is the method used to proportion the components into the pugmill mixer. The dryer drum mixer uses an entirely different concept for mixing the aggregates and bitumen and will be discussed separately. As an additional aid for plant inspections, the functions of the most important components of the batch and continuous bituminous plants and some of the factors to be considered during the inspection are discussed below.

- **Bituminous Storage Tanks**. Storage tanks must be of sufficient capacity to maintain continuous operation while allowing for delay in asphalt shipments. They must be equipped with heating devices and must be able to hold the material at the required temperatures.

  Storage tanks must be inspected by Contractor or producer QC personnel to see that they are free of foreign material and any bituminous material other than that to be used in the mix. They must also not admit water, fuel oil or other foreign substances. Steam coils used for heating should be checked for leaks before any asphalt is unloaded and again when the material is first heated. The asphalt cement lines and fittings must be adequate to provide proper circulation between the storage tanks and the plant. All pipes and fittings should be steam or oil-jacketed or otherwise insulated to prevent heat loss.

- **Cold Aggregate Feeder**. The cold aggregate feeder used with a portable plant is generally equipped with four bins, adjustable gates, reciprocating feeders and an endless belt to carry the proportioned aggregate to the dryer elevator. A commercial plant is generally equipped with separate bins, adjustable gates and a tunnel and conveyor system. In either system, the gates must be adjusted so that the aggregates, in the proper amount and size, are delivered to the plant to maintain uniform production.

- **Dryer**. From the cold feeder the aggregate is elevated to the dryer where it is heated and dried to the required temperature and moisture content. The component parts of the dryer are: (1) a revolving cylinder, usually from 1 to 3 meters in diameter, and from 6 to 12 meters long; (2) a burner which is either gas or oil fired; and (3) a fan which may be considered part of the dust collector system, but its primary function is to provide the draft air for combustion in the cylinder. The cylinder is equipped with longitudinal cups or channels, called *lifting flights* which lift the aggregate and drop it in veils through the burner flame and hot gases. The slope of the cylinder, its speed of rotation, diameter, length, and the number of flights, control the length of time required for the aggregate to pass through the dryer.

  The aggregate passes from the dryer to the hot elevator through a discharge chute near the burner end of the dryer. The sensing element of a thermometric instrument should be located in this discharge chute to record or indicate the temperature of the aggregate as it passes from the dryer.

  Dryers must heat the aggregate

uniformly. To prevent coating the aggregate with fuel oil, the burners and draft must be adequate for total combustion of the fuel. Because of possible damage to the bituminous materials, the heating system should be checked to make certain that overheating of the aggregates is avoided.

- **Dust Collector**. All plants are required to be equipped with dust collectors. This is necessary to reduce air pollution and to return dust to the hot elevator when needed to meet aggregate grading requirements.

  In operation, a fan exhausts the draft air from the upper end of the dryer into the dust collector system. This draft air, containing dust particles, vapor, and gases enters the dust collector at the upper periphery and goes upward. The heavier dust particles are separated by centrifugal force into the collector shell and fall to the bottom. The heavier dust will be reintroduced into the flow of aggregate or wasted as required by the specifications or grading requirements.

  To comply with established air pollution limitations, the use of a scrubber or other suitable device to practically eliminate dust particles from the exhaust air of bituminous plants is sometimes required. The Contractor is to comply with all Federal, State, and local laws and ordinances. The more stringent rules normally apply.

- **Hot Elevators**. Hot elevators must be protected so as to prevent chilling of the aggregate or the blowing away of fines.

- **Screening Unit**. The heated aggregates are elevated, usually by a bucket elevator, to a screening unit, which separates the aggregate into the required number of size fractions and deposits the various sizes into the graded aggregate bins. The screening unit on most plants is the flat table vibrating type, usually equipped with four decks. The size of the screens on the decks varies with the type of bituminous mixture to be produced. The top deck is covered with a scalping screen which removes all oversize material and discharges this material into a reject chute.

  Screens should be examined and a record made of their dimensions, length, size, and rotation or vibrating speed. They should not clog nor overflow during normal operations. Holes or breaks in a screen should be repaired promptly.

- **Hot Aggregate Bins**. These bins hold the heated and screened aggregates in various size fractions required for the type of mixture being produced. The bottom of each bin is fitted with a discharge gate which can be operated manually or automatically. Each bin must be equipped with an adequate overflow pipe.

  Inspection of the bins should include an examination of the partitions to see that they are tight, free of holes, and of sufficient height to prevent the intermingling of aggregate sizes. The closure of discharge gates must be positive enough to prevent leakage into the weigh box. Other leakage from bins and the accumulation of aggregates in the corners or elsewhere is to be avoided.

- **Scales (Batch Plants).** On batch plants, a weigh hopper for the aggregates is located directly under the graded aggregate bins. The weigh hopper is suspended on the weighing mechanism, generally equipped with a springless dial. scale on which the weight of aggregate from each bin is marked accumulatively so that the last mark will read the total amount of aggregate in each batch. The hopper must be large

enough to hold the batch of dry aggregate without overflowing or reaching the bin gates.

The bituminous material can be weighed in a special bucket or can be measured by a meter for each batch.

The scales are required to be inspected and sealed. When the plant is ready to operate, the scales should be cleaned and each part carefully checked. It is imperative that the bitumen scales and the aggregate scales be checked daily. The indicating heads must be functioning properly, that is, balanced with the dial at zero. The scale levers and knife edges must move freely. If the weigh hopper is rubbing against some part of the plant or is being supported by one of the structural members, the indicated weight of the material in that hopper will be incorrect.

- **Graded Aggregate Bin Control Gates (continuous plants)**.Up to the point of discharge from the graded aggregate bins, the function of the continuous mix plant and the batch plant are essentially the same. In continuous mixing plants, the proportioning of the separate sizes of aggregate is accomplished through the adjustable gates on the feeder of the gradation unit which deposits the aggregates onto the elevator to be delivered to the pugmill. The asphalt cement is delivered to the pugmill through a calibrated metering pump. The aggregate feeder and the asphalt cement pump are generally geared to a common power source to assure that proportions of aggregate and the bituminous material remain constant, regardless of variations in the power supply. Before production begins, calibration of the flow of aggregates from each feeder gate must be made.

- **Pugmill Mixer**. After proportioning, the aggregate and the asphalt cement are introduced into the pugmill for mixing. The asphalt plant is equipped with a pugmill mixer, which consists of twin shafts equipped with paddles for mixing the ingredients into a homogeneous mass. Efficient mixing is dependent upon the number and shape of the paddle tips, speed of the mixing shafts, length of mixing time, temperature of the materials, quantity of materials in the mixer, and the clearance between the paddle tips and the liner plates. The mixers of batch mix plants and continuous plants are essentially of the same design, except for the variation in arranging the paddle tips.

  In the batch plant mixer the materials are dumped into the center of the mixer and paddle tips are arranged to give an end to center mixing or a run-around (figure eight) mixing pattern. The material is held in the mixer for the required mixing time and then discharged through the discharge gate into the transporting vehicles or storage hopper. The mixer must be equipped with an automatic timing device to automatically regulate the dry-mixing and wet-mixing periods, and a batch counter to accurately record the number of batches produced.

  In a continuous mix pugmill the materials are introduced in one end of the mixer and the paddle tips are set to transport the materials to the discharge end as the mixing is accomplished. The mixing pressure varies with the height or weight of material in the pugmill, which can be controlled by: (1) raising the dam on the discharge end of the mixer to hold the material in the mixing unit for a longer period of time at a depth that will intensify the mixing action; and (2) adjusting or reversing the pitch of the paddles to retard movement of material through the pugmill.

Linings, sides, bottoms, and gates of the mixer should be inspected to see that there are no leaks. Paddle tips and/or liner plates must be replaced or adjusted when they show excessive wear or when clearance exceeds the specified amount.

(b). Dryer Drum Mixers

In dryer drum mixers the aggregate is coated with the asphalt by spraying asphalt into the veil of aggregate during the drying process as opposed to the mechanical mixing of a pugmill in the batch plant. The most important components of the dryer drum plants and some of the factors to be considered during the inspection are discussed below.

- **Cold Aggregate Feeder**. The cold aggregate feeder is basically the same as that used with a batch type plant discussed above with the exception that the main belt feeding the dryer is equipped with a weigh bridge, which is used to monitor the amount of aggregate being fed into the plant at any given time. This weigh bridge is interconnected with the asphalt pump so that the required amount of asphalt is added for the mix. Weights obtained from the weigh bridge include moisture in the aggregates which must be taken into account to arrive at the dry weight of aggregate. Since dryer drum plants do not have screening units and hot aggregate bins, it is very important that the stockpiled aggregates be of the proper grading, are not segregated, and that the gate openings on the cold feeders are properly calibrated for the mix design.

- **Dryer.** The dryer in this type plant not only heats and dries the aggregate, but is also the mixing chamber for the asphalt and aggregate. The aggregate enters the drum at the burner end and is lifted by the flights and veiled through, and in front of the flame, thus protecting the asphalt from direct flame contact. Newer dryer drum plants are equipped with a flame shield to protect the asphalt from the flame, but even with these plants good veiling of the aggregate is also necessary. In order to assure a good veil of aggregate, the plant must be operated within the capacity range recommended by the manufacturer. The asphalt is introduced into the middle one-third of the drum through a spray pipe. Moisture being driven off the aggregate reacts with the asphalt, causing it to foam and thus facilitates the coating of the aggregate.

- **Dust Collector**. Dust collectors on a dryer drum plant are the same as for batch plants as discussed above.

- **Storage Silo**. Since a dryer drum is a continuous operation, the asphalt mixture is transported from the drum by a hot elevator to a storage silo. The silo should be of sufficient size to allow continuous operation of the plant and should be insulated to prevent temperature drop in the mix during storage. Silos should be designed so that segregation of the mixture will be minimized during charging. This is accomplished by using a rotating chute, batcher, or ladder.

- **Controls.** Modern plants are fully automated with control panels that can furnish a variety of data pertaining to the plant operation. The inspector should become familiar with the data output available for the plant to be used.

(3) Calibration of Plants. It is not intended that FLH personnel take the lead in the calibration of plants. Commercial plants approved by a State highway agency should not have to be recalibrated for FLH mixes provided documentation of their calibration and accuracy is available. For portable plants, calibration should be a part of the Contractor's QC Plan and subject to the review of the Project Engineer.

The scales (both aggregate and asphalt on batch plants, and the apron feeders and asphalt on continuous plants) should be calibrated before production is started. General information and/or suggestions for consideration by the Engineer are as follows:

(a). Batch Plants. The specifications require that noncommercial (project) plant scales be inspected, tested, and sealed after relocation but not less than once per year. Commercial plant scales must be sealed in accordance with acceptable local/industry practice. However, portable plants may be used for a reasonable period of time prior to sealing, providing field testing indicates compliance with the accuracy specified.

For batch plant scales, field testing may be performed as follows: Asphalt and aggregate hoppers should first be balanced with the dial or beam reading zero, making sure that all weighing equipment operates freely. Accuracy of the scales should then be checked at various points within the anticipated operating range, using standard weights required to be furnished by the Contractor. Since it is not required that the Contractor have sufficient standard weights to reach full capacity of the aggregate hopper, the maximum number of weights available should first be placed in the hopper and the weigh beam balanced or the dial read. The weights should then be removed and aggregate dumped in the hopper to bring the beam back to balance or to give the same reading on the dial. The standard weights should again be placed in the hopper and a new balancing or reading obtained. The operation of adding weights, balancing, and replacing weights by an equivalent amount of aggregate is then repeated until the full capacity of the hopper is reached.

(b). Continuous Plants. Continuous plants use a positive displacement asphalt pump. Discharge is measured through a meter similar in operation to the ordinary water meter. Rate of discharge is varied either by an adjustment on the pump or by changing the sprocket drive combination. The pump may be calibrated at different rates of discharge by taking initial and final meter readings for a measured length of time. This should be done with the specified grade of asphalt brought to the required temperature and after the pump has been run long enough to eliminate all air from the lines and for the pump to reach operating temperature.

The asphalt meter may be checked from time to time by comparing the difference in meter readings with the known amounts of asphalt that have been run through the plant. These known amounts may be obtained from the weights of asphalt delivered to the job or by asphalt storage tank measurements using the appropriate calibration curves.

Proportioning of aggregates in a continuous plant is by volume rather than by weight as in the batch plant. Calibration involves converting these volumes to weights. Discharge from the different bins is obtained by varying the rate of discharge by adjustments of a gate over an apron feeder. Continuous plants are normally equipped with gates for simultaneously diverting the discharge from its normal path to the pugmill to sampling cans - one can for each bin. The amount of aggregate discharged into each can for a given number of shaft revolutions and at various gate openings is weighed. From this data, calibration charts can be prepared which will show the proportionate rate of discharge for each particular type and grading of aggregate used in the calibration. The aggregate for calibration should be dried and screened in the same manner as will be used during construction. In other words, a "dry run" will be made with aggregate fed to the dryer, with dryer screens operated the same manner as for actual plant-mix production. Calibration will normally start with the gate openings set at about 50 millimeters and then graduated to openings corresponding with the maximum capacity of the plant.

To facilitate calibration, the Contractor should have available a copy of the manufacturer's operating instructions, which will show the operating speed of the feeder and the asphalt pump delivery rate for the various sprocket sizes. The sprocket size for the asphalt pump must be checked, for the delivery rate required, by weighing the amount of material pumped into a container over a carefully timed interval.

(c). Dryer Drum Plant. Calibration of a dryer drum plant consists of setting the cold feeder gates for each aggregate size and setting the asphalt pump for the proper asphalt content. The pump should be set for the desired percent asphalt based on rate of the aggregate feed as determined from the cold feed weigh bridge, remembering that the percent moisture in the aggregate must be deducted from the cold feed weight.

(4).Inspection of Plant Operations.

(a). General. With today's fully automated hot plants, it is not often that the plant is found to be the cause for construction of poor quality hot asphalt concrete pavements. The plant QC specialist should be familiar with the operation of the plant, and be able to monitor gate openings, scale settings, timer settings and temperature controls. Such things as screening units, bins, mixers and overflow vents should be checked to assure they are functioning properly.

End result specifications place the responsibility for quality control with the Contractor. The Project Engineer should be familiar with the Contractor's quality control plan and monitor the results for any indication of change which could be expected to affect the quality of the work being produced. It is important that FLH personnel and the Contractor cooperate fully in order to produce a high quality, acceptable paving material.

During production, the QC specialist should make periodic checks of:

- Cold feeder gates and overflow vents for any overflow of the graded aggregate bins
- Temperature of aggregates, bituminous material, and mixture
- Proper dryer operation
- Weighing and mixing operations; and
- Mixture in trucks for uniformity in appearance.

The Project Engineer should see that the haul tickets are properly made out and issued for each truckload of mixture delivered, and must see that the daily totals are promptly obtained, checked, entered on the daily report, and made a part of the permanent project records.

(b). Operation of Cold Feeders. The first and most important aggregate proportioning is done at the cold feeders. To provide the proper flow of the right sizes of aggregates, the proper sizes of aggregate must be in the stockpiles and kept from segregating and intermixing, and the feeder gates must be kept adjusted and free from obstruction. Enough material must be maintained in all bins to provide a positive and uniform flow.

Plant QC should include observation of the equipment feeding the plant from the stockpiles and be sure that the material is uniform when it is fed to the dryer unit. Segregated aggregates fed through the dryer will result in uneven drying and heating which, in turn, result in nonuniform screening and ultimately in a nonuniform mix.

The specifications will normally require that the materials be separated into a minimum of two stockpiles. One pile will normally contain that fraction retained on a 4.75 mm sieve, and that the other fraction passes the 4.75 mm sieve. The cold feed bin must be so constructed so that there is no intermingling of the two sizes of material.

(c). Screens and Bins. The size and relative amount of fine aggregate controls the voids in the mix, which in turn controls the proper proportion of asphalt in the mix. Every effort should be made to hold the grading uniform. Segregation occurring in the fine-aggregate bin can be corrected by properly placed combining chutes and baffles.

The coarse aggregate bin should be inspected occasionally for a carryover of the fine material. Carryover can be corrected by installing a section of larger-opening screen, reducing the rate at which the material passes over the screen, or changing the length, diameter, pitch or speed of the screen. The presence of more than 5 percent of smaller sized material in any bin, is an indication that excessive carryover is occurring and screens are either clogged or overloaded.

Sampling of aggregates prior to mixing with bituminous material may most conveniently be made of the dried and screened aggregates in the different bins. Most plants, either of the batch or continuous types, are equipped with sampling trays that make sampling from each bin quite easy.

(d). Checking of Asphalt Content. Probably the most common cause of failure in asphalt paving mixtures is the incorrect asphalt content. Incorrect asphalt content can be caused by inaccurate scales (asphalt and/or aggregate), variation in aggregate grading, absorptive qualities of aggregates used, or poor interpretation of preliminary test results. Attention must be paid to the lever systems of the scales on the mixing plant to be sure they are functioning properly.

(e). Mixing. The method of charging the mixer, which gives a homogeneous mixture in the least possible time, is the desired method to adopt for the job. The most commonly used method of charging is by dropping the weighed batch into the mixer and thoroughly mixing dry for a period of a few seconds before adding the asphalt.

The mixer should produce a uniform distribution of asphalt throughout its length. The introduction of the asphalt by means of a spray bar over the entire length of the mixer aids in obtaining uniform distribution.

Temperature of the aggregate has a marked effect on the mixture. If the aggregate is too cold, a nonuniform distribution of asphalt through the mixture will result. If too hot, the aggregate will cause excessive hardening of the asphalt and will result in a too thin coating on the coarse aggregate with a corresponding excess of asphalt in the fine aggregate portion.

The requirements for limiting the temperature of the aggregates are in the specifications. The temperature can be measured most conveniently on the mixture immediately after discharge from the plant.

During the actual mixing process the QC process should include frequent observation of the operations from the mixing platform with notation of the care used by the operator in weighing each size of aggregate and the asphalt; the time interval for mixing the dry aggregate; whether or not the asphalt bucket is well drained; and the time of mixing the asphalt and aggregate. The inspector should also note the action of the mixture in the mixer box to determine uniformity of mixing and the tendency toward segregation. The movement of the mixture is controlled by the position of the mixer blades. Variations in uniformity can usually be eliminated by changing the position of the blades. This must be done by trial. When the blades are satisfactorily set, they seldom need further attention.

Attention should also be given to the mixer-box to see (1) that the liners and blades are so set that all of the material will be incorporated into the mixture and that none lies in the bottom of the box to be dropped out

eventually as an unmixed or partially mixed combination, and (2) that the discharge gate of the mixer box is neither unduly worn nor improperly seated. Its condition can usually be determined by observing the bottom of the box from the time the dry aggregate is introduced until the completed mixture is dropped. If a thin stream of dust and fine aggregate sifts from the gate during the dry-mix period, or a rich mixture of asphalt and fine aggregate seeps through during the wetmix period, this indicates that the gate does not fit tightly. If, as the gate opens to discharge the mixture, a stream of dry, uncoated aggregate appears first, there is indication that the gate lining is worn, or the mixer blades are not picking up the aggregate. In either case, the Contractor should take the necessary action to eliminate the problem. No useful purpose is served by accurately preparing and weighing the components of the mixture if they are not combined properly. A satisfactory mix is of uniform coating and appearance, free from segregated areas or heavy smoking. No more mixing should be employed than is necessary to completely and uniformly coat the coarse aggregate. The manufacturer's rated capacity should not be exceeded, nor should the minimum specified mixing time be underrun.

Mixers should be cleaned daily with hot dry aggregate and with hand tools if necessary. The cleaning should not be so thorough, however, as to polish the mixer sides. This may occur with the hot dry aggregate cleaning. Cleaning with oil should not be permitted.

Where continuous mixers with volumetric proportioning devices are used, the QC process should include a check of the accuracy of the proportioning devices and require any necessary adjustments before production of the mixture is begun. The Contractor should have available descriptive literature and instructions published by the plant manufacturer for the particular plant being used in order to facilitate the checking of adjustments of the equipment.

During the operation of drum mixer plants, the inspector should review and observe operating data of the control panel and should inspect the stockpiles and cold feed for segregation and quality. Aggregate, mixture and asphalt temperatures should be checked periodically. Any deficiencies found should be pointed out to the Contractor and corrective measures taken.

B. Road Operations

(1) General. It is the responsibility of the Project Engineer or the paving inspector to verify that the paving operations are performed in accordance with the contract. They must be thoroughly familiar with the plans and specifications, the Contractor's plan of operations, necessary traffic control procedures, and construction equipment to be used.

Prior to paving operations, the paving inspector should thoroughly check the surface on which the pavement is to be placed.. The surface should be checked for correct grade and template and all damaged areas, depressions or potholes repaired to give a firm and unyielding paving base. If the surface is a base or subgrade, a prime coat is often required. If so, it must be thoroughly cured. When an existing pavement is to be resurfaced, the surface must be cleaned of dirt and other extraneous matter and all weak areas repaired. If a leveling course is to be applied, the existing surface should be checked and the roughest areas marked to received that course. A tack coat, when required, should be applied to paved surfaces. The tack coat should be applied to the width and length required for not more than the day's operation.

For prime and tack coats Contractor QC personnel should document that equipment including meters is in proper repair and the coverage rates are properly calculated and applied.

The pavement edges should be marked by

stringline or paving guideline sufficiently in advance to assure continuity in the paving. These should be set and nailed to the surface at intervals that will permit the line to be held taut, and checked to be sure that the required pavement width is secured. When necessary, an electronic sensor line is set rigidly supported to the required grade.

(2) Inspection of Paving Equipment The paving inspector should make an inspection of the Contractor's paving equipment, checking the condition and adjustment of the component parts of the laydown machine and rollers. This equipment should have already been subject to the Contractor's QC process. Therefore if deficiencies are noted the Contractor should be advised to modify that process. By making this inspection prior to beginning paving operations, obvious deficiencies in the condition of the equipment may be discovered and corrected, thus avoiding delays once the work is underway and assuring that the best possible surface is obtained.

Listed below are some of the more important details the inspector should check during the inspection of the paving equipment.

(**a) Paving Machines**. The inspector should become familiar with the mechanical features of the paver to be used on the project, so that an intelligent appraisal of the condition and adjustment of the machine may be made. Operating details and instructions for adjustments are contained in the manufacturers' handbooks. These handbooks should be available to Contractor QC personnel as well as the Engineer and inspectors. The Contractor QC person should check the general features listed below before starting paving operations:

- On all paving machines the operating motor should be checked for proper governor operation and vibration at operating speeds.
- On track mounted machines, track linkage must be correctly adjusted and checked for excessive wear.
- On pneumatic-tired machines, all tires should be inflated to the recommended pressures, and the drive chains checked for correct adjustment and for excessive wear.
- The screed should be free from excessive play, and have the correct adjustment for crown and tilt.
- Check screed plates for excessive wear, and screed heating burner's operating efficiency. Screed extensions must be in the same true plane and flush with the screed bottom. Check vibrators on the vibrating screed for proper operation.
- Automatic grade or thickness control, should be checked for proper operation with ski or other device(s) as required.

(b) Rollers. Check steel-wheel rollers to see that the wheels are capable of rolling in a true plane and are free from flat spots or ridges. The steering and driving mechanism must be free of excessive play or backlash; and the motor and driving transmission free of oil leaks. The rollers must have scrapers for keeping the rollers clean and wetting pads to keep the rollers wet so they do not pick up asphalt during the rolling operation. Water and a wetting agent should be used, not a petroleum based product.

With the widespread use of vibratory rollers for compaction at asphalt mixtures, the laydown inspector should become familiar with their operation. A variety of information is available covering the use of vibratory rollers and the effects of vibratory compaction variables such as frequency, amplitude, mixture and construction parameters such as

gradation, aggregate characteristics, type and amount of asphalt, environmental conditions, lift thickness and type of base. The inspector should become familiar with the rollers to be used and the adjustments that can be made to control frequency and amplitude. The adjustment of these two variables can have a marked effect on the compaction of the mixture. Roller operators have a tendency to "set it and forget it," so the QC process should require frequent verification that settings are correct..

(3) Spreading and Finishing. The specifications require the use of a asphalt paver for spreading and finishing the mixture. In irregular areas the mixture may be spread and finished by other suitable tools or equipment.

The paving inspector's routine duties are to collect load tickets from the Contractor's laydown foreman, and to verify that they are complete and that depths and spread distances are being controlled effectively. At the end of the day the inspector must sign a daily weight record attesting to the acceptance of the total weight. The inspector's principal duty is to assure construction of a pavement to the correct grade and template as set forth in the plans, and with a surface texture and riding surface as required by the Contract.

To achieve these results, the inspector must monitor the Contractor's QC process and periodically check the surface to be paved, the mixture in the trucks, surface texture behind the machine, rolling operations, and paved surface with a straight-edge or string line for the proper crown and smoothness.

When ready to start paving operations, the screed should be heated to the proper temperature and the grade controls set to construct the transverse joint. This must be carefully checked to insure good riding qualities and conformity with the tolerance requirements before the paver is allowed to proceed. Particular care should be exercised in setting the thickness control device to assure attainment of the spread and crown desired. When matching the edge of a previously laid section of pavement, the paver screed should overlap the existing edge from 25 to 50 millimeters and the thickness controls should be adjusted to leave the material slightly higher than the previously laid section of pavement. Overlapping this edge will force enough material into this area to insure that the joint is completely filled and moisture proof. The height of the material above the previously laid edge should adjusted so that when the longitudinal joint is properly compacted, the pavement will be uniform in cross section and within the tolerances specified.

The use of any hauling unit with a frame that comes into contact with the paving machine or which bears down on the machine while dumping, should not be permitted. The result either or both of these conditions will be a rough surface.

As the paving proceeds, the grade or thickness control devices must be adjusted to give the spread as required by the plans. As continuity of operations is essential to secure a good pavement surface, the speed of the paver should be regulated to avoid stopping and starting.

By observing the surface texture behind the machine, and checking the surface with a straightedge, a malfunction in the paver or segregation of mixture may be detected. The inspector should insist on prompt action to locate and correct any trouble that occurs. Some of the most common difficulties encountered are listed below with the possible cause:

- **Wavy Surface (short choppy waves)**. Worn or poorly adjusted tracks or drive chains; truck driver setting brakes too tightly; excessive paving machine speed.

- **Wavy Surface (long waves)**. Excessive variation in the amount of mix carried in the auger box; rolling too early; roller operating too fast; over controlling the screed.

- **Excessively Open Surface Texture**. Improper adjustment of the tamper bar; improper speed of tamper bar; screed plate rough or galled; excessive machine speed.

- **Varying Surface Texture**. Insufficient mixing; over mixing; overheating of the mixture; dry mixing period too long; segregation of mix in trucks; worn or damaged screed plate.

- **Bleeding Patches on Surface**. Asphalt not uniformly mixed; excessive moisture in mix; excessive prime or tack coat..

- **Irregular Rough Spots in Pavement**. Roller standing on fresh surface; abrupt reversing of roller; trucks backing into machine; poor workmanship on transverse joints.

All pavers are required to be equipped with automatically controlled screeds. Automatic control of transverse slope as well as proper elevation must be maintained to obtain the required surface. When this unit malfunctions, it tends to compound its errors; therefore, the paver must be stopped immediately, the pavement corrected, and the malfunction located and corrected before preceding with the operations. Essentially, the automatic grade control unit divorces the screed from the upward and downward movement of the floating arms which attach the screed to the machine, and transfers this control to the unit equipped with a sensor element which travels on a rigidly set or traveling guideline.

When the pavement is constructed in more than one course, the longitudinal joint should be offset from each preceding course with the surface course joint being in the center of the pavement. The screed should overlap the previously laid lane from 25 to 50 millimeters to insure that enough material is available to completely fill the joint.

(4) Compaction. The Contractor is required to furnish the rollers and establish the rolling pattern required to arrive at the density necessary to meet the specifications. The compactive effort should be completed at the highest temperature possible within the mix design limits. The relationship between rolling and temperature must be maintained consistently in order to get consistent compaction results. It is recommended that the breakdown rolling be completed at temperatures above 95°C and that pneumatic rollers be included in the compaction process.

(5) Smoothness. Most paving or overlay projects include a profilograph smoothness specification with incentives and disincentives. Refer to the FLH Field Materials Manual for test methods and data compilation guidelines. Generally the Contractor will run the profilograph under the supervision of FLH personnel. The trace or printout will then be turned over to FLH for analysis.

Bumps or rejected areas are required to be corrected before the final profilograph and pay factor are determined, but the method of correction is subject to approval of the Government. Often grinding or grinding with an emulsion flush is not an acceptable correction because the appearance and physical characteristics of the surface are even less desirable than the rough payment.

3. Measurement

Payment is normally made on a metric tonnage basis for all material delivered, incorporated in the work and accepted. The appropriate specification should be reviewed concerning the testing and inspection of the scales. It should be understood that payment is to be made for the weight of the complete mixture with no deductions for any

required additives, and the measurements should be made on this basis. See Chapter 8 for details of weight measurement.

Asphalt cement, when paid for separately, may be measured in one of two ways. The preferred method, and used if the project is the sole user of the plant, measurement is made using the suppliers weigh tickets, with any asphalt not utilized (waste or returned) being deducted from the total.

For commercial plants when asphalt used for the project is not isolated from other production, the asphalt usage should be determined by averaging the asphalt content test results.

4. Documentation

The requirements for documentation fall into two categories quality and quantity.

The quality of asphalt cement will be documented using the certificate of compliance that accompanies each shipment and the test results of the samples taken at the hot plant.

The quality of the mix is documented with the gradation and asphalt content test results and the verification or independent assurance tests performed in a separate laboratory. All tests should be noted on control charts or other production records so that when result are available there is a clear visual representation as to when problem occurred and where the material is on the project.

Quantity documentation for asphalt cement consists of the suppliers weigh tickets or quantity computations based on asphalt content tests.

The weigh tickets for the loads of mixture with the signature of both the weigh person and the spread person will serve as documentation of quantities involved in the project. These tickets should show the project number, the item number, the date delivered, and the truck number. A record of the empty truck weights is also necessary. Two weighings per shift of the empty trucks is required - at least one with the fuel tank full or nearly so. An adding machine tape or computer printout, with the item number, date and project indicated will serve as documentation for each days production. It should also indicate the persons who computed and checked the quantity.

A copy of the QL-Pay printout should be included in the project documents for each estimate and for final payment.

For final payment a copy of the smoothness data summary and computation worksheet is necessary. Paving quantities to which smoothness pay adjustments are made are determined in accordance with the Contract.

When estimates are paid, quantities should not include tonnage for which Contractor test results are delinquent.

5. References

The following are suggested source and/or reference materials for Engineers and inspectors on Hot Asphalt paving projects.

National Asphalt Pavement Association

TAS-15 *Rolling and Compaction of Asphalt Pavement*

Asphalt Institute

MS-4 *Asphalt Handbook*
MS-6 *Asphalt Pocketbook of Useful Information*
ES-9 *Factors Affecting Compaction*

Federal Highway Administration

ED-88-028 Hot Mix Bituminous Paving Manual

Center for Transportation Research, Bureau of Engineering Research, the University of Texas at Austin

Compaction of Asphalt Mixtures and the Use

9-4.2 OPEN-GRADED ASPHALT FRICTION COURSE

1. Preliminary Review and Approval

See Section 9-4.1.1.

2. Construction Inspection

The guidelines given in Section 9-4.1.2. should be followed in the inspection of the plant and laydown equipment. Because of the characteristics of the mix, some points will merit special emphasis.

Normally the depth of the course will be only slightly thicker than the size of the largest aggregate, so the elimination of all over size aggregate is a must. The nature of the mix makes repair work behind the screed almost impossible, so it is imperative that control of the mixing and laydown operations is such that problems are corrected before the mix reaches the screed.

Necessary consolidation will be normally attained with one pass of a nonvibrating steel roller. Care must be exercised to avoid over rolling of the mix. Traffic, especially hauling units, must be kept off the newly placed mat until it has completely hardened or shoving and/or rutting will occur.

The temperature constraints given in the specifications should be strictly observed. Experience has shown that the quality of the completed mat is directly related to the weather conditions at laydown the warmer the better.

3. Measurement

The same steps outlined in the asphaltic concrete sections are required for this item.

4. Documentation

See 9-4.1.4.

9-4.3 OPEN-GRADED EMULSIFIED ASPHALT PAVEMENT (OGEAP)

1. Preliminary Review and Approval

A. General

The Project Engineer may obtain from the Federal Lands Division an excellent reference publication entitled, *A Basic Asphalt Emulsion Manual*, coded FHWA-lP-79-1 (Two volumes). Volume 1, entitled *Understanding and Using Emulsions* should be of particular interest to project personnel. Volume 2, *Mix Design Methods* may also be of value.

Many of the practices used for hot asphalt concrete pavement are also applicable to open-graded emulsion cold mixes. Only significant differences will be discussed in this section. The reader should therefore consult Part 9-4.1 in conjunction with this section.

The major difference is that an open-graded emulsion cold mix has few fines and requires no heat for mixing and placing. Mixture handling characteristics of hot mixes are controlled by the temperature of the material. The thickness of the emulsified asphalt coating controls these characteristics in the cold mix. As the emulsion *breaks*, the mixture viscosity increases rapidly, thereby making these mixes less forgiving than hot mixes during construction. They do, however, produce a very flexible pavement when properly placed.

Both aggregate gradation and moisture content can affect the behavior of the emulsion as it is mixed into the aggregate. These will also affect the behavior of the mixed material as it is transported to the grade and placed through the paving machine.

Emulsified asphalt is composed of finely chopped particles of asphalt cement suspended in a solution of water, emulsifying agent, and oil distillate. Emulsified asphalt specifications place a minimum limit on the percent of asphalt cement residue; a minimum and maximum limit on the percent of oil distillate and the penetration of the asphalt cement residue; and a minimum limit on the ductility of the asphalt cement residue. Other values are also specified for particle charge, coating ability and water resistance. All of these characteristics of the emulsified asphalt affect the behavior of the emulsion during the handling, mixing and laydown operations when producing an open-graded emulsified asphalt pavement. The effects of these emulsified asphalt properties are not all the same.

The stability of the emulsified asphalt prior to incorporation into the aggregate will be determined primarily by the type and amount of emulsifying agent. The stability referred to is the ability of the emulsified material to remain an emulsion. In other words, the emulsion's resistance to the coagulation of the asphalt particles to form the residual asphalt cement. This coagulation is generally called "breaking". Primary factors influencing the behavior of the mixed emulsified asphalt and aggregate are:

- The type and amount of emulsifying agent;
- The amount of moisture in the aggregate;
- The gradation of the aggregate and,
- The amount of manipulation the mixture is subjected to between introduction of the emulsion and placement through the paver.

These factors, along with the influence of the other emulsified asphalt properties, will generally be reflected in the performance of the completed pavement.

Controlling the moisture in the aggregates is area of critical concern. Excellent results have been obtained when dryers were used to dry wet aggregates. However, for economic reasons, drying is usually not specified. A uniform, low aggregate moisture content is necessary to use the specified amount of emulsified asphalt in the mix. As in all asphaltic mixes it is important to have a positive interlock between aggregate and asphalt feed systems.

The adherence to aggregate gradation specifications is also extremely important, more so than for standard hot mixed asphaltic concrete. A fractional percent more than the specified amount of minus 75 μm material can greatly increase mixture viscosities in the mixing chamber and/or paver. These increased mixture viscosities are sufficient to cause operational difficulties which result in rough riding pavements. Because its viscosity changes with temperature, it is advisable to maintain uniform emulsified asphalt temperatures. A 10°C change in emulsified asphalt temperature will produce a noticeable viscosity change. Higher emulsified asphalt viscosities will permit the aggregate to hold more asphalt. The temperature of the aggregate should also be kept uniform and compatible with the asphalt temperature. Changes in either temperature will affect uniformity of the pavement.

B. Source Approval

The requirement for a very clean, surface dry aggregate at the time of mixing with emulsified asphalt should be kept in mind when reviewing Contractor proposed material sources. This requirement should be particularly stressed when writing source approval letters to the Contractor. This is especially so if the proposed source will require special handling to produce aggregates which are both clean and surface dry. Refer to more detailed discussion of source approval elsewhere in this manual.

C. Mix Design

The mix design is a process to determine how much emulsion the proposed aggregate can hold and to determine the compatibility of aggregate and emulsion (electrostatic charge). Visual observations are made on the mixing characteristics in the laboratory. These tests generally are simple processes. There should be no delay in furnishing materials to the FLH laboratory which is doing, or reviewing, the design. Emulsions may react negatively to certain aggregates due to their chemical composition; therefore, the aggregate or the emulsion may need changing. Maximum possible time for adjustments should be provided by early submission of materials for mix design or mix design review.

D. Pre-Operations Conference

The Project Engineer should confer with the Contractor prior to laydown operations. In addition to the usual topics of a prepaving conference, there is need to insure adequate sand or other suitable blotter material is available, as well as proper application equipment. This is necessary both to apply material to the surface of the newly placed mix, as is usually specified; and to quickly cover any problem area to facilitate traffic and/or environmental protection. The potential traffic need would include any roads used to haul from the plant to the project, because leakage from the haul vehicles can be expected to occur.

2. Construction Inspection

A. General

It is desirable to have a materials specialist available from the Division to assist the Project Engineer during the initial paving start-up, through field testing of the design.

The Project Engineer should plan for at least as large an inspection force as for a hot mix operation, and to spend much personal time at inspection. This is due to the sensitivity of the material to minor changes in mix composition and in changes in the weather. It also relates to the extreme difficulty that might occur as a result of such sensitivity.

B. Plant Operations

The comparatively simple plant usually used for OGEAP is one of its strong points. The inspector needs to be concerned mainly with feed operations to the pugmill. These include the usual concerns for any uncontrolled mixing of separate piles of aggregate through stockpile overlap or misfeeding of separate cold feed

bins. Aggregate moisture content also needs to be watched closely. Small changes in aggregate gradation or moisture content can be very critical with these mixes. For example, when working from a stockpile having wet and dry areas, a careless loader operator can vary the moisture content of the aggregate entering the pugmill. The non-uniform moisture content will vary the asphalt content of the mix because it is controlled by the aggregate belt scale feeding the pugmill. An increase in aggregate moisture content over that established during plant calibration will increase the percent of emulsified asphalt to the aggregate. The more free moisture, the less emulsion the mix will hold. Too much water on the aggregate will therefore mean excessive dripping from the trucks and less asphalt for binder in the mix.

If the loader operator were to load aggregate with too many fines, a different problem might result. With finer aggregate in the mix, the emulsion might break too early. If it breaks in the pugmill, the Contractor might be delayed while cleaning up the mess. If it breaks in the paver or prior to raking, some very rough pavement might be laid because of the severe handling problems.

The point of introduction of emulsion into the pugmill is important. This is one adjustment to be considered when the emulsion is breaking either too early or too late, or if the aggregates are not being properly coated.

C. Roadway Operations

Vertical joints at connections to existing pavement must be square cut since the comparatively coarse aggregate will not accommodate "feathering". It is, however, sometimes possible to make special mixes using 9.5 mm or 6.3 mm minus dense graded aggregates for preleveling or for making approaches where feathering is necessary. These mixes will probably require a different type emulsion than that used for the mainline paving. Otherwise, these preleveling and feathering operations might best be done with a dense graded hot mix if it is available. In either case, a contract modification should be considered unless this was covered in the specifications.

Ideally, the OGEAP should begin to change from a brownish color to black, within about 30 meters of the paver. This color change signals the emulsion *breaking*. That is, the separation of the asphalt and the water. If this is not occurring in that distance, there are several adjustments which can be made. Probably the most important consideration is whether or not the emulsion will have broken sufficiently to withstand rainfall within four hours after placement. A check for this condition is pouring water from a gallon jug onto the completed pavement. One should look for the water to flow out from the pavement edge where it contacts the lower non-porus layer. When the water runs out, a paper towel is placed in it to determine if asphalt is being carried out of the pavement with the water. It is difficult to tell if the water contains asphalt because it may be discolored by the emulsifiers. After the paper towel has dried, it is possible to see any asphalt. It is not uncommon for some emulsion and/or emulsifier to discolor water for several days after laydown. Actions must then be taken to prevent damage to the environment, especially waterways.

If it is determined from the above test that the break is too slow, the mixing time should be increased slightly. The additional shearing action on the emulsified asphalt in the mix, as it is mixed more, will accelerate the break. This can be accomplished by:

- Introducing the emulsion into the pugmill nearer to the aggregate entrance, and/or
- Placing a dam at the output of the pugmill.

If the break is still too slow in occurring, the next step would normally be to change the emulsion formula slightly. The Project Engineer cannot make this change nor can the Contractor. For this reason it is advisable for the Contractor to have a representative from the emulsion supplier on the project until the operation is

running smoothly. A final *last resort* adjustment is to add portland cement to the aggregate prior to the introduction of the emulsified asphalt. A very small amount, usually not more than 0.3 percent by weight of the dry aggregate, is normally sufficient to dehydrate the aggregate enough to permit continued operation. The portland cement is usually added to the aggregate feed belt by a screw auger feeding from a small hopper. The screw auger should be interlocked with the aggregate feed belt in the same manner as the asphalt supply pump.

It is okay if the emulsion turns black during the transport or laydown operation, provided it passes through the paver and can be laid without causing irregularities in the pavement surface. These irregularities usually will take the form of the mat tearing under or behind the paver screed. Occasionally, it may be difficult to maintain proper lift thickness because of the harshness of the mix. When these conditions occur, the emulsion is breaking too soon and mixing time should be reduced. This can also be done by introducing the emulsion more toward the output end of the pugmill. If the pugmill has a dam installed in the output, it should be removed. If these adjustments do not provide the necessary increase in break time, other places in the process should be considered where a reduction can be made in the physical manipulation of the mix prior to its passing under the paver screed. When all of these measures have been implemented and the emulsion is still breaking too early, a change in the emulsion formula will usually be required to correct the condition. Again, this change will require the assistance of the emulsion supplier's representative and will result in a loss of time.

Traffic can usually be accommodated immediately after the addition of the blotter or choker aggregates following the initial rolling. The pavement should soon develop enough stability to support even heavily laden logging trucks, provided the aggregate particles have the specified fracture percent. The load carrying capability of the pavement is determined by the interlock of aggregate particles, not by the type and/or amount of asphaltic binder. The asphaltic binder serves only to keep the aggregate particles in place in the pavement. The type and amount of asphaltic binder determines how well and how long these particles will remain in place. The stability of the placed and compacted mix should continue to increase with time as the asphaltic binder stiffens with age.

The pavement can be expected to remain much more flexible than a hot mix for a comparatively long time. Problems may occur with turning, stopping, and any other traffic pattern exerting extreme stress on the mat. For example, a truck with a locking brake might gouge the pavement seriously, several hours after placement. For this reason, traffic control should be established which will minimize the occurrence of these stresses. Reshaping and compaction is sometimes possible while the mix is in this state. However, the results are never as good as prevention would have been. If cement has been added, the set will be quicker and harder and it will be more difficult to correct rough areas.

3. Measurement

OGEAP will be measured by the metric ton of total mix, with the emulsion and mineral filler [portland cement] also paid separately by the ton. If emulsion is invoiced or metered by the liter it is converted to metric tons at the rate of 1000 liters per metric ton. Refer to Part 9-4.1 for additional measurement instruction.

4. Documentation

See above. Refer to Subsection 9-4.1 for documentation instructions.

9-4.4 DENSE-GRADED EMULSIFIED ASPHALT PAVEMENT

1. Preliminary Review and Approval

Dense-graded emulsified asphalt concrete is a mixture similar to hot asphalt concrete except that the bituminous material and additives, when required, are of such a nature that the mixture may be transported, stockpiled, and placed cold. The contract specifications designate the types of materials to be used in the mix. The special contract requirements will provide the combinations of materials, based on local conditions. There are some special kinds of dense-graded emulsified asphalt concrete which are patented and hence their use is subject to approval of the patent owner and to the payment of a royalty.

The controls expressed in Section 9-4.1.1. also apply to this section with the following additions and/or exceptions:

Mixing Temperature. Control of the temperature will be in accordance with the contract requirements.

2. Construction Inspection

See Section 9-4.1.2.

3. Measurement

See Section 9-4.1.3.

4. Documentation

See Section 9-4.1.4.

9-4.5 ASPHALT TREATMENTS

Asphalt treatments include the use of asphalts as a prime coat, a tack coat, a single course surface treatment [chip seal] or a multi-course surface treatment. Because the methods used are the same for all treatments, when the application of asphalt is discussed, the information is valid for all usages.

1. Preliminary Review and Approval

For a chip seal or multi-layered treatment, if required by the Contract involved, a representative sample of this aggregate and asphalt should be sent to the Division laboratory for a mix design, i.e. application rate of asphalt and aggregate. This design should be reviewed to insure that the application rates are sufficient to produce enough residual asphalt to provide proper imbedding of the aggregate.

A good rule of thumb is that 40 percent of the most prevalent size aggregate will be embedded in the residual asphalt. It is important to remember when using emulsified asphalt, that it is normally shipped at a 70/30 ratio of asphalt to water, with the water being only a carrier and has no effect on the holding of the aggregate. A chip seal with insufficient asphalt applied has little or no chance of success.

The traffic control plan should be discussed thoroughly prior to the start of the work, since keeping the traffic off the newly worked area is important to both the success of the treatment and to public relations. An asphalt splattered car or a broken windshield is no laughing matter.

2. Construction Inspection

Prior to commencing operations, it is imperative that the distributor and aggregate spreader, are inspected, so that the material can be uniformly applied throughout the project. Areas of particular interest include the following:

A. Asphalt Distributor

(1). Spray Bar -
All nozzles same size
All nozzles at same angle - (15° to 30° - as recommended by manufacturer)
Bar height constant regardless of load
Proper height for coverage required double or triple coverage

(2). Bitumeter
No build up on wheel
Dial easily readable

(3). Pumps and Circulation System
Instantaneous shut off
Pressure variations with relative ease

B. Aggregate Spreader

(1). Storage Bin
Truck hook functioning properly
Feeder belts operating

(2). Spreader Box
Gates spreadable
Spreader wheel operable
Speedometer or tachometer functioning
Oversize or scalping screens in place

C. Application Rates

When the Inspector/Project Engineer is satisfied that the equipment is functional, the calculations necessary to obtain the desired rate of application can be made. The variables in the application rates of asphalts from a distributer are: vehicle speed, spray bar width, and the pump discharge rate. Normally the spray bar width is held constant throughout the passes. Often the alignment and grade of the roadway will limit the speed of the vehicle. For a typical prime coat application, the sequence could be as shown below.

(1). Establish bar width: 10.5 meter roadway plus widening--use three passes at 3.5 meters each.

(2) Establish practical vehicle speed: For this example, use 8 kph. 8 kph/60 min per hour = 133 m/min.

(3). Asphalt characteristics: Desired application 1.6 L/m^2 of CRS-2 at 15°C. Asphalt as delivered = CRS-2 with specific gravity of 0.966 at a temperature of 80°C.

(4). Correct asphalt for temperature: 1.6 ÷ 0.971 (factor from Asphalt Institute Pocketbook) = 1.65 liters at 80°C.

(5). Calculate pump discharge rate required:

(1.65 L/m^2) x (133 m/min) x (3.5 m^2/m) = 768 L/min

(6). Shoot test section: ~30 m. Observe coverage and penetration, adjust rate if needed, note liters used and distance covered. Complete distributer load.

(7). Check applied rate:

(___L)÷(___m x 3.5 m) = ___ L/m^2

If the existing roadway is paved, brooming will be required prior to the application of a tack or seal coat. The broom should be checked for uneven wear, and observed during operation to insure that no ridges of dirt are left on the roadway. The brooming should start at centerline and proceed toward the shoulder.

When the construction requires the spreading of aggregates over the freshly sprayed asphalt, the specifications will usually require a self-propelled, two-axle, pneumatic-tired spreader. The application rate is controlled by the speed of the spreader. Trial and error is the only available method of establishing the desired rate. Placing a container of known area (e.g. 1 m^2), and weighing the stone deposited will give the Project Engineer a starting place. Adjust the speed until desired rate is attained. When placing aggregates on the freshly applied asphalt, it is imperative that the spreader be as close to the asphalt distributor as possible. At no time should more than 1 minute elapse between the asphalt spray and the chip spread. The rolling should take place using rubber-tired rollers, treadless tires only, as close to the spreader as possible. All rolling must be completed before the asphalt has set. Over rolling or late rolling can break the bond between the stones and asphalt. If the application rate of asphalt and aggregate is rapid, more than one roller will be required.

The application of chips should be a single layer of stones, with small separation between stones. Avoid over-application of aggregate; this will result in none of the stones being correctly embedded. After the chips have been applied, brooming with light, even pressure may be required to remove the excess aggregate.

Application of a chip seal should never be attempted under adverse weather conditions. The stones should be as free of dust as possible and dry or only slightly damp. There are many factors that will effect the success or failure of a chip seal. Any combination of them can cause a less than satisfactory result. Things to look out for are:

- **Cool weather.** Slow setting or "break" of the asphalt bonding action interrupted by cold nights are a particular hazard.
- **Dirty aggregate.** Fine particles soaking up too much asphalt with remainder insufficient for proper embedding.
- **Insufficient asphalt.**
- **Excessive asphalt.** Bleeding, slick areas, loss of friction.
- **Excessive aggregate.** Too much competition for asphalt.
- **Over-diluted emulsion.** Same as insufficient asphalt.
- **Dust, dirt, moisture on roadway.** Bond between roadway and chips prevented.

3. Measurement

If payment for asphalt is by the metric ton, measurement can be made by weighing or by using weights from the suppliers weigh tickets. If

payment is by the liter, measurement can be made either by converting the weight to liters at 15°C or by measuring the liquid in the tanks or hauling units and converting to liters at 15°C. For emulsions no correction for temperature is required. The factor of 1000 liters per metric ton is always used. In any event, there must be a deduction for unused or wasted material.

Aggregates, if paid for by the cubic meter, are to be measured in the hauling units or by converting weights to cubic meters. If payment is by the metric ton, material must be weighed in accordance with the procedures in Chapter 8.

4. Documentation

Documentation requirements are similar to those in Section 9-4.1.4. In addition, if aggregates are measured in hauling units, a system for documenting measurement and delivery must be devised to fit the circumstances involved.

During the course of the work there should be periodic comparisons of the materials spread on the road vs. those invoiced for payment. If, due to the difficulty in controlling storage tank quantities, wasted materials and those not used, the Project Engineer decides the weight based invoices are unreliable, the use of daily spread computations/tabulations may be directed to be used for payment instead.

5. References

Useful reference materials for asphalt treatments.

Asphalt Institute

ES-ll *Asphalt Surface Treatments*
ES-12 *Asphalt Surface Treatments Construction Techniques*
MS-6 *Asphalt Pocket Book of Useful Information*
MS-19 *A Basic Asphalt Emulsion Manual*

9-4.6 MINOR ASPHALT CONCRETE

This item is to provide materials from local or commercial sources where the use or quantity involved does not justify the use of more comprehensive FLH materials specified in Subsection 9-4.1.

1. Preliminary Review and Approval

The contract requirements define the required certifications and documentation to be submitted by the Contractor prior to the supplying of the mixture. These should be reviewed and approved if the proposed mix meets contract requirements. If the mixture is designed to meet a local agency specifications, contact should be made with the agency and the adequacy of the mix for the purposes intended verified. If serious doubts as to the quality of the product arise, an alternate submittal should be requested, or mix design and quality tests should be taken per Subsection 9-4.1.

2. Construction Inspection

See Subsection 9-4.1.

3. Measurement

Weigh tickets from the material producer can be used as measurement of the amount delivered.

4. Documentation

Copies of the producer's certifications for the asphalt and the mixture will serve to document the quality of the product. Signed weight tickets will document the quantity delivered.

SECTION 9-5 - CONCRETE AND STRUCTURES

FIGURES

9-5.1 PORTLAND CEMENT CONCRETE

1. Preliminary Review and Approval

A. Mix Design.

Responsibility for concrete mix design is normally assigned to the Contractor. Documentation is submitted by the Contractor to FLH. The mix design data is approved, rejected or conditionally approved by Project Engineer (if so delegated) or the COE, after concurrence of materials specialists. Normally, FLH will not do verification testing of the mix. However, if the FLH elects to do verification testing, the Contractor should be so advised and samples requested as early as possible. The procedure may be appropriate when the following occurs:

- The specified concrete is required to have unusually high strength or other characteristics for which the producer has no historic records or data.
- The concrete is composed of components from sources not previously used for structural concrete by FLH or another organization.
- The concrete contains an admixture or additive; e.g. super water reducer or fly ash for which the producer has no experience or production data.

In any case, it is the FLH's prerogative whether or not to do mix design testing.

Approval is based on the quality and other specification requirements of the component materials; and whether the mix will comply with the strength, air and water/cement ratio requirements during production. As a minimum the proposed mix design should include cylinder strengths at least from 7-day cylinders which indicate that the 28-day strength will not be a problem. If strengths are marginal, and especially if air and water are on the low side of the specifications, the Contractor should be advised of the potential risks of nonspecification concrete. Regardless of air, water and strength indicators under laboratory conditions, the Contractor remains obligated to comply with these specifications during production.

B. Batching Procedures.

The Contractor is generally assigned responsibility for batch plant procedures. The Project Engineer may elect to perform occasional batch plant inspections prior to the start of production or at other times during production. The FLH will not normally perform full time plant inspection during every batching operation. The Contractor's/supplier's QC plan should address batch plant quality control.

Batch Plant Inspection Checklist:

- Storage, uniformity and identification of aggregates, cement and admixtures.
- Quality Control tests and their documentation.
- Facilities to weigh or otherwise measure components.
- Batch ticket documentation procedures.
- Facilities to measure, control and adjust for aggregate moisture.
- Facilities to heat or cool concrete during adverse weather operations.
- Facilities to mix and deliver concrete.
- Truck cleanout facilities and procedures.

C. Volumetric Batching

Volumetric batching, where aggregates, cement, water and admixtures are metered and mixed continuously is permitted by the specifications. Since volumetric batching eliminate most variability in batching and mixing time it can result in more consistent mixes, especially when high range water reducers are used. Detailed requirements for volumetric batching are contained in AASHTO M 241. Some of the pertinent sections

of AASHTO M 241 are reproduced here for information:

- **Control Devices**. If volume proportioning is employed, devices such as counters, calibrated gate openings, or flowmeters must be available for controlling and determining the quantities of the ingredients discharged. In operation, the entire measuring and dispensing mechanism must produce the specified proportions of each ingredient.

- **Manufacturer's Recommendations**. The recommendations of the equipment manufacturer in the operation of the equipment and in calibrating and using the various gauges, revolution counters, speed indicators, or other control devices should be followed.

- **Visibility and Access**. All indicating devices that bear on the accuracy of proportioning and mixing of concrete shall be in full view and near enough to be read by the operator while concrete is being produced. The operator shall have convenient access to all controls.

- **Checking.** The proportioning and indicating devices shall be individually checked by following the equipment manufacturer's recommendations as related to each individual concrete batching and mixing unit.

- **Accuracy**. Adequate standard volume measures, scales, and weights shall be made available for checking the accuracy of the proportioning mechanism. The device for the measurement of the added water shall be capable of delivering to the batch the required quantity within the accuracy of +l percent; the device shall be so arranged that the measurements will not be affected by variable pressures in the water supply line.

- **Yield Check** - Essentially, the volume of concrete discharged from the mixer is checked by first weighing the amount of concrete discharged during some number of revolutions, or as determined by some other output indicator. This is followed immediately by a determination of the mass of concrete per cubic meter. The mass of concrete discharged divided by the mass per cubic meter is equal to the number of cubic meters mixed and discharged during the chosen interval. The accuracy of the output indicator is thus checked by this expedient.

- **Yield Sample**. It is recommended that about 0.07 to 0.09 cubic meters be discharged for this purpose. This amount of concrete will weigh from 170 to 220 kilograms and can be discharged into, and contained in a small steel drum or other suitable container which in turn can be placed on a scale of adequate capacity. The output of a batcher-mixer unit may be indicated by the number of revolutions, travel of a belt, or changes in gauge readings; if so, these figures should be used as a measure of output.

- **Proportioning Check** - Whenever the sources or characteristics of the ingredients are changed, or the characteristics of the mixture are noted to have changed, the Engineer may require a check of the fine aggregate content and the coarse aggregate content by use of the washout test. Essentially, in the washout test, 0.025 cubic meter of concrete is washed through a 4.75 mm sieve and 150 μm sieve; that retained on the 4.75 mm sieve is normally considered coarse aggregate, and that passing the 4.75 mm and retained on the 150 μm sieve is considered fine aggregate. The mass of the retained aggregates should then be compared to theoretical masses computed from the mix design data. Significant differences suggest that the design mix is no longer being produced..

- **Water**. The rate of water supplied the continuous mixer shall be measured by a calibrated flowmeter coordinated with the cement and aggregate feeding mechanism, and with the mixer. The rate shall be capable of being adjusted in order to control slump at the desired levels and to determine that the maximum water/cement ratio is being met.

- **Admixtures.** Liquid admixtures shall be dispensed through a controlled flowmeter.

2. Construction Inspection

See Sections 9-5.2, 9-5.3 and 9-5.4 for procedures relative to falsework, forms, reinforcing steel and other incidentals.

During concrete placement inspection operations, the Project Engineer or Inspector is normally concentrating on the placement at the structure while the Contractor's QC personnel should assume responsibility for completion of the batch ticket, quality control of discharge operations and all required tests. During the first one or two placement operations, extra attention by the Project Engineer may be needed to assure that the Contractor properly assumes this responsibility. The Contractor, however, should not be permitted to rely indefinitely on FLH for quality control. After the first few placement operations, intermittent monitoring of concrete inspection should be sufficient.

Concrete Discharge Inspection Checklist:

- Completion and receipt of batch ticket.

- Control of additional water or admixtures.

- Control of time of mixing and discharge.

- Temperature and slump of mix.

- Control of air content.

- Quality assurance tests to document acceptance.

3. Measurement

Concrete is normally included in the contract item in which it is incorporated. When concrete is paid as structural concrete, it is complete and in place in the structure. Quantities are usually determined by the theoretical dimensions of the structure and paid as a contract quantity or lump sum. The Project Engineer should have access to design computations, and should not have to recompute concrete quantities in the absence of evidence that they are in error.

4. Documentation

See FLH Field Materials Manual for guidelines for materials related documentation.

5. References

Design and Control of Concrete Mixtures, Portland Cement Association.

ACI Manual of Concrete Inspection. American Concrete Institute.

CRSI Manual of Standard Practice, Concrete Reinforcing Steel Institute

9-5.2 CONCRETE STRUCTURES

1. Preliminary Review and Approval

The following items normally require attention before concrete placement.

A. Contract Requirements.

The Project Engineer and inspectors should have reviewed in detail all requirements of the contract. Any questions should be resolved with the Construction Operations Engineer, in consultation with Bridge Engineer as may be necessary.

B. Submittals.

The Contract will normally require a number of submittals for approval prior to certain work commencing. It is important that the Contractor and the Project Engineer communicate as to the schedule for these submittals, the estimated time it will take to review and approve them, and what the criteria for approval will be. Sometimes these approvals go beyond the stated requirements in the Contract, and are required to be based on industry standards or even regulatory requirements.

At the same time the Project Engineer and the COE must be in agreement on the issue of submittals. Specifically which ones will be approved by the COE or Bridge Engineer and which ones the Project Engineer will approve. .

The COE or Division policy may require the Project Engineer to review submittals for completeness prior to transmitting to the Division. Be sure to keep the Contractor advised of the status of submittals. If the Engineer knows there are serious problems with a submittal, but the Bridge Engineer hasn't officially disapproved it yet, the Contractor should be told verbally so that plans and schedules can be adjusted.

C. Falsework and Forms.

(1) Falsework Design. Contractor's submittal should include:

- All loads (such as finishing machine), location of loads, and loadings assumption, e.g. associated with rate of concrete placement for vertical members.
- Species and grade of lumber, all dimensions (span, width, thickness) of members and forms, allowable stresses used, calculated deflections, type and size of bracing.
- Type, size and capacity of connections (bolts, hangers, spikes, nails etc.).
- Manufacturer's recommendation or tests for manufactured assemblies.
- Bearing value of supporting materials, wind and other external load assumptions.

If the drawings are not complete, they should be returned to the Contractor to be completed before forwarding to the Bridge Engineer. Unless the special contract requirements waive the standard requirement, the drawings must be prepared and sealed by a licensed registered professional Engineer.

(2) Contractor's Schedule and Equipment.
The Contractor's intentions for scheduling, rate of placement, equipment to be used, curing material, etc., should be discussed in order to adequately plan inspection and testing and to be sure the Contractor has adequately planned the placement operation.

(3) Foundation Bearing Capacity. The bearing capacity of foundation material is required to be determined by the Contractor and reflected in the design assumptions of the falsework. The determinations may be based on standard tables, or in cases of marginal material or disputed assumptions, the Engineer may insist on actual tests. **Figures 9-5.2a, Allowable Bearing on Sandy Soils; and Figure 9-5.2b, Allowable Bearing on Clayey Soils,** may be used by the Engineer to confirm Contractor assumptions.

Tests and assumptions must be based on a *worst case* condition. I.e. if the foundation may become saturated during construction, the design must be based on that condition. Alternatively the Contractor should include a drainage plan in the falsework drawings submitted for approval. The plan must provide an effective means of draining the area around the falsework for the duration of its use.

When tests are required, they may be simple static load vs. settlement tests, or more in-depth tests as may be suggested by the Contractor, and concurred in by the Engineer. The Engineer should be confident that the test reflects the capacity of the foundation, and not just a layer of good material overlaying poorer material. Steel scaffolding type falsework is particularly vulnerable to foundation problems because of its sensitivity to differential settlement/loading.

(4) Used Materials. When used materials are anticipated for the falsework design, it is the Contractor's responsibility to identify and reflect appropriate reductions in sections or maximum working loads. The documentation should be a part of the falsework submittal. When the materials are finally incorporated into the falsework structure, it must be verified that the assumptions on which the design was based, are consistent with the apparent condition of those materials. If the Engineer has a basis to question any of these materials, they should be rejected unless the Contractor conducts tests or otherwise clearly demonstrates their validity.

D. Stakeout.

The Government should furnish the Contractor data on the permanent or semipermanent control points by which the structure is to be staked and constructed. If the initial control points will not be usable for checking during construction, then the Project Engineer should set and check additional control points o reference lines for checking. The Contractor should be held responsible for all control points, reference lines and other surveying for the proper layout of the structure.

E. Quality Control Plan

See Subsection 9-5.1 for concrete requirements.

The Quality Control Plan should have been submitted and approved prior to concrete placement. The QC plan should address the duties, responsibilities and authority of all management and QC personnel. The plan should adequately address the responsibility of supplier QC personnel.

2. Construction Inspection

A. Excavation

The excavation and foundation for both the structure and the falsework must conform to the contract requirements or design assumptions and must be excavated to the required elevation. The excavation for footings must be dewatered prior to concrete placement unless underwater placement is approved.

B. Falsework

(1) Consistency with Approved Design. The Contractor is required to arrange for inspection of the falsework prior to concrete placement by a licensed professional engineer; and to certify in writing that the installation conforms to the approved design, contract requirements and acceptable engineering practice. The Engineer should coordinate with the Contractor to participate in this inspection. **Figure 9-5.2d, Checklist For Falsework Inspection**, is a good outline for the inspection of falsework prior to concrete placement. Deviations from the approved drawings must be approved and concisely documented in the files with a copy to the Bridge Engineer, through the COE. Any changes to the materials, type of manufactured assembly, connections, footings or dimensional configurations of the various components of the falsework must also be approved and documented.

(2). Changes. Requests for approval of all changes will normally be through the COE to the Bridge Engineer. When the Project Engineer has

substantial experience and structural knowledge, the COE may delegate the authority to approve minor deviations to suit field conditions or the availability of materials, if it is evident by inspection that the deviation neither increases the stress in, nor the deflection of any falsework member beyond the maximum value allowed by the specifications; and does not reduce the load-resisting ability of the falsework system as a whole. Substantial (other than minor) changes may not be informally field approved. The following are examples of substantial changes which would entail a formal request and submittal from the Contractor with all supporting calculations and literature:

- A change in the size, spacing or placement of any primary load carrying member.
- A change in the method of providing lateral or longitudinal stability.
- Any change, however minor, which affects the falsework to be constructed over or adjacent to traffic opening.
- A revised concrete placing sequence, if it materially affects the stresses in load-carrying members.

All changes must be formally documented. The internal form, **Report of Field Changes to Falsework/Formwork, (Figure 9-5.2c)**, is provided as the mechanism to accomplish this documentation or initiate approval.

(3). Piling. Piles driven for falsework should be inspected for bearing capacity and alignment. The procedures in Section 551 of the Standard Specifications should be used to estimate bearing capacity.

(4). Timber Members. Timber members should be checked to verify that they are the proper grade (if a grade is required or assumed) and dimension, and are not damaged or defective. The dimensions in question should be actual dimensions, not the nominal dimensions, unless the design is based on nominal dimensions.

Required blocking should be included in the design submittal. Additional blocking, shimming and wedging should be kept to a minimum; and should be used primarily to assure full bearing and to make fine adjustments in elevation.

(5). Steel Members. Steel members must be inspected carefully for loss of section due to welding, holes or web openings. Welded splices, should be inspected visually for obvious defects: however, radiographic inspection or other methods of nondestructive testing are not required unless the Engineer's visual inspection suggests the welds are defective. If the falsework design is based on steel other than AASHTO M 183M [A36M] grade, the Contractor must produce a certification or other evidence that actual steel furnished is the required grade.

Field welds designed up to 150 Newtons per millimeter of 3 millimeter fillet weld may be accepted based on visual inspection. If higher values are required, welding and inspection must be in accordance with AWS D1.1.

(6). Manufactured Assemblies. Steel shoring components should be inspected before assembly to verify that all components are a part of the approved system. Components should also be inspected for dents, bent members, cracked welds, rewelding and corrosion. Such members must be rejected. After erection, the systems must be plumb, jacks installed at the top and bottom and in firm contact, all connections fitted together evenly, and locking devices in good working order. Screw jacks must not be extended beyond the manufacturer's recommendations, and must be fitted with the proper hardware to be compatible with the frame legs and held firmly in line with the axis of the leg. Other manufactured assemblies should similarly be inspected and verified as being used consistently with the approved drawings and the manufacturer's recommendations.

(7). Exterior Bracing. Exterior bracing must be included in the falsework design when multi-tiered structures, wind loading or other factors cause concern with respect to lateral loads and

stability. Exterior bracing should be checked for adequate sizes and for adequacy of connections. Cable connections must be tight and secure.

(8). Traffic Openings. Openings through falsework for public traffic requires enhanced design standards in the vicinity of the opening to minimize the risk of damage due to errant vehicles. Falsework members installed adjacent to, or over traffic openings must be immediately temporarily braced until the entire system is in place and permanent restraints in place. Minimum vertical and horizontal clearance should be provided at all times and verified immediately upon erection.

(9). During Concrete Placement.

(a) Tell Tales. Prior to concrete placement, the Contractor should install tell-tales under the structure. A tell-tale is a rigid strip of vertical wood, metal or fiberglass (25 mm by 50 mm lumber is common) reaching from the underside of the formwork to a pin or stake driven firmly into the ground. The end of the pin is free, and is marked before concrete placement so that during placement settlement can be monitored. Tell-tales should be installed near the vertical supports for the falsework, but sufficiently away from falsework foundations which may settle.

(b) Incipient Failure. As concrete is being placed, the falsework and tell-tales should be inspected at frequent intervals. The following items, in particular, are indications of incipient failure, where immediate response is required.

- Excessive compression at the tops and bottoms of posts and under the ends of stringers.
- Pulling of nails in lateral bracing; movement or deflection of braces.
- Excessive deflections of stringers; tilting or rotation of joists or stringers.
- Excessive settlement of tell-tales (10 mm more than the anticipated settlement).
- Posts or towers that are moving out of plumb.
- The sound of falling concrete, cracking timbers or popping welds.

Any response to these problems should address safety issues first, including the possible evacuation of the site.. The safety of workers and the public is more important than technical issues.

C. Form Layout

Contractor's surveyors should have checked all forms as to exact location and elevation. The Project Engineer or Inspector may review this process or make spot checks. After initial process check type reviews, comprehensive checking by FLH should not be necessary,

D. Reinforcing Steel.

See Section 9-5.4

E. Deck Forms.

The Contractor is responsible for setting deck forms and reinforcing steel and screed rails to grade. If all of these items are not set properly, they will not relate properly and the deck will be too thick, too thin, or the steel will not have sufficient cover.

After the screed rails are set, the entire deck placement plan should be checked in the presence of the Project Engineer or Inspector. Note that when the screed is supported by the deck overhang rather than by girders, these supports must be firm enough so there is no significant variability or *bounce* in the screed elevation. The deck should be checked on a 3 to 5 meter grid over the entire deck surface. The Contractor should check the thickness of the deck (from the screed to the deck form) at each grid point as well

as the reinforcing steel cover. Minor adjustments should be made by raising or lowering the deck forms (assuming the screed rails and settings have previously been verified as good).

If the adjustments are of such number and magnitude as to indicate the deck is not ready to be checked, the Inspector should arrange with the Contractor to come back at a later time or day when the Contractor believes the deck will be ready. It is inappropriate for the Engineer or FLH inspector to be a part of the routine deck grade setting process.

F. Cleanup.

All debris, water, ice, etc. should be removed from the forms before concrete placement is authorized.

G. Concrete Placement

The Contractor is responsible for quality control during concrete placement. FHL's role should be one of overview and verification. If the Contractor is not properly assuming the quality control responsibility, the problem should be addressed in specific terms. See the contract clauses relative to inspection of construction and material and workmanship.

Normally, small and medium sized placement operations should require only one FLH Inspector once initial starting problems are worked out. The inspector should not be reluctant to request Contractor assistance whenever necessary.

The following items require attention during concrete placement.

(1). Concrete Discharge.

See Section 9-5.1.

(2). Placement and Vibration.

Concrete should be placed near its final location by pump, bucket, buggy or chute. Vibration is essential to avoid air pockets under re-steel and in corners.

(3). Form Alignment.

Tall or slender forms such as those for columns should be monitored for alignment as the placement progresses.

(4). Deck Surfaces.

The Contractor should be making spot checks with a 3 meter straight edge to assure proper surface tolerances. Particular attention must be paid to surfaces beyond the limits of the finishing machine.

(5). Scheduling of Concrete Delivery.

Occasionally, due to poor scheduling of trucks or equipment breakdowns, the delivery of concrete may not be continuous as is required by the specifications. If this happens, it is important that the Contractor take all appropriate action to minimize damage due to *cold joints*. Such action may consist of the following:

- Shading and/or fogging exposed concrete faces to prevent drying.

- Using a vibrator to keep the exposed concrete face plastic. This can be done for 2 hours or more if the concrete is cool (less than 20 °C).

It is emphasized that these are emergency actions of limited useful duration. More drastic action, such as constructing an emergency construction joint or a total washout of a partial concrete placement operation, should be required whenever the structure may have been weakened.

When the Contractor's scheduling problems are chronic and avoidable, the Project Engineer should communicate the deficiencies in writing and direct the Contractor to take corrective action such as furnishing standby equipment.

H. Curing and Protection

Curing materials and water must be available to begin curing as soon as initial set has taken place and the water sheen has disappeared.

In cold weather, the equipment required by the Contractor's approved cold weather concreting plan must be available and ready to install.

Curing compound, mats, water, etc. must be applied as soon as possible. The Contractor should not wait until a large deck pour is completely finished before starting to apply these materials.

When forms are stripped before the curing period is over, curing materials must be applied immediately.

When a curing compound is used there should be periodic verification that it is being applied full strength at the required rate.

Particular attention must be given to sidewalk and curb construction joints that are obstructed by steel during the deck placement. A curing compound is normally not usable in these areas. Wet burlap or other acceptable procedures must be used to ensure that these areas are kept moist during placement and continuously during the curing period.

I. Hot Weather Concreting.

Before concreting in hot weather, the Contractor should be required to compare the proposed procedures with the requirements of the Contract to determine if procedures are adequate. The following factors affect the evaporation rate of surface moisture from concrete:

- **Air Temperature -** If anticipated daytime air temperature is too high, night time (lighted) operations may be the only alternative.

- **Wind Speed -** Wind screens may be necessary to insure relatively calm conditions and reduce evaporation.

- **Humidity -** In dry areas, fogging equipment may be used up wind from the placement operations to raise the humidity.

- **Concrete Temperature -** Through the use of ice as part of the mixing water, or other means, the concrete temperature should be held low enough to conform to anticipated conditions.

Figure 9-5.2e, Evaporation Rates in Hot Weather, shows the relationship among these factors.

J. Cold Weather Concreting.

Before concrete placement, when air temperatures might be less than 2°C during the curing period, the Contractor must have an approved plan for maintaining the minimum temperature. This plan should address the following:

- **Concrete Temperature -** Provisions may be required at the plant to heat mixing water or aggregates in order to achieve minimum temperature.

- **Forms and Insulation -** Depending on circumstances, forms may have to be designed with insulation, or similar precautions such as flooding of footings or layers of straw may be used to avoid freezing.

- **Heat -** If artificial heat is required, the Contractor should have a comprehensive system of monitoring and maintaining. There should also be special precautions to be sure that moisture is maintained for curing during the heating process.

- **Thermometer -** Depending on contract requirements, either the Contractor or the Government is required to furnish a thermometer to monitor temperature during curing.

K. Removal of Forms and Falsework.

Falsework must not be removed so as to produce excess stresses in the concrete. The contract may

require minimum percentages of 28-day strength be reached prior to form removal. It is permissible to use statistically based prediction techniques to determine if the minimum strengths have been achieved.

The specifications may contain specific requirements regarding the removal of falsework, or a removal plan may be required as a part of the falsework submittal. Whether or not an approved removal plan is required, to prevent damage to the completed structure, and to maintain the safety of the public and onsite personnel, the Contractor's removal plan should be discussed with the Engineer ahead of time. This is particularly important with respect to removal operations adjacent to, or over traffic openings. If temporary bracing was required during installation, then it is also required during removal unless another method of maintaining stability is provided.

Waterproof (metal, sealed etc.) forms which are part of the curing process may not be removed during the curing period unless provisions are made for continuing that process during stripping and finishing. These provisions may include curing compound, water spray, and wet burlap, or combinations thereof.

3. Measurement

A. Contract Quantities.

Structural concrete is normally paid as a part of a lump sum item or on the basis of quantities computed by the designer and specified in the plans. It should not be necessary to recompute or verify these quantities unless discrepancies are brought to the attention of the Project Engineer. If discrepancies are alleged, the Project Engineer may elect to check only the parts of the structure in question, or all concrete may be recomputed. The designer may be asked for assistance if checking becomes necessary.

B. Staked or Ordered Quantities.

When final quantities are not specified in the plans, or when these quantities are adjusted or corrected, payment is normally on a staked or ordered quantity basis. The Engineer should determine in the field the required minimum dimensions of the structural element involved (e.g., a subfooting), and provide the Contractor with these authorized dimensions. These dimensions become the basis of the computed quantity. Upon completion, the inspection verifies that the structural element has be constructed within acceptable tolerances, but no detailed remeasurement is required.. If the Contractor elects to construct slightly greater dimensions, no additional payment is necessary.

C. Measured Quantities

Occasionally the contract may authorize payment on a measured quantity basis. This method implies a higher level of control during construction, since the Government is going to pay for all concrete placed. This method is usually used when concrete is authorized to fill a void of unknown or odd dimensions. Measurement may be simply based on the quantity of concrete batched and placed if dimensions are inaccessible.

4. Documentation

The following is a list of minimum requirements for documentation of construction of concrete structures:

A. Falsework

All changes to actual falsework as compared to the approved design should be documented on the form, **Report of Field Change to Falsework/Formwork (Figure 9-5.2c).**

The **Checklist for Falsework Installation (Figure 9-5.2d)**, is an outline of what the Contractor's QC and inspection personnel should be checking to document compliance with FAR Clause 52.246-12, with Section 552 of the Contract, and with OSHA Regulations, Sections 1926.700, 1926.701 and 1926.702. This checklist is provided to assist the inspector in documenting

an independent check of the Contractor's procedures and the ultimate conformity of the falsework to the approved drawings. If the Contractor is not competently performing these functions, a Directive ordering corrective action must be issued. At that point, if the Engineer thinks it would be helpful to provide the Contractor with a copy of the checklist for guidance, that is permissible. However, the Engineer should be wary of moving toward a situation where the Contractor's inspection/quality control responsibilities are usurped by comprehensive FLH inspection procedures.

Prior to the beginning of concrete placement the Contractor is required to provide a certification by a licensed Professional Engineer that the installation has been inspected and conforms to the approved design.

B. Forms and Steel.

A notation is appropriate in IDR. in field book or placement records that falsework, forms and steel have been checked for compliance with the contract.

C. Quantities.

If payment is by contract or plan quantity, that quantity should be referenced in the estimate book. If payment is by ordered (computed) quantity, complete documentation of these computations is required.

If payment is by measured quantities, batched quantity with deduction for estimated non-usage, should be documented. Except if the contract provides that payment be made for all quantities which the Government orders, wastage will not be deducted.

Approximations are adequate for progress payments if plan quantities are used for final payment. Usually approximations are based on an approximate breakdown of the plan quantities. Use of batched quantities for approximation is discourage since errors may accumulate over several placement operations.

D. Placement Record.

The placement record should detail the structural component placed, conditions, problems, time, etc. This information should be filed with or cross referenced to load tickets and test reports.

E. Curing and Heating.

Diary entries or supplemental records must document inspection during curing/heating periods to verify temperatures and presence of moisture.

5. References

Same as Section 9-5.1, plus:

Form Work for Concrete, American Concrete Institute

9-5.3 PRESTRESSED CONCRETE

1. Preliminary Review and Approval

A. Shop Drawings.

All prestressed components must have shop drawings approved by the Bridge Engineer prior to fabrication.

B. Equipment and Facilities.

Equipment and facilities, especially in the case of temporary fabrication sites, must be approved. Facilities for curing require special attention. See below relative to remote sites.

C. Inspection and Testing..

For remote fabrication sites inspection and testing may be arranged commercially or through a State highway department. The Materials Engineer will arrange this when requested.

D. Moving, Transporting and Stressing.

It will be necessary to have an approved procedure for evaluating concrete strength in preparation for transporting or stressing the elements. A statistically based early strength prediction procedure is acceptable for this purpose.

2. Construction Inspection

Intermittent inspection is required at each stage of the operation. Comprehensive inspection is usually necessary during concrete placement and tensioning of steel.

A. Beds and Forms.

Forms should be inspected for dimensions and stability. Anchorage tie downs should be available as required.

B. Reinforcing Steel and Inserts.

See Section 9-5.4. Ducts and inserts for voids must be located accurately and tied down to counteract buoyancy.

C. Pretensioning.

Strands must be clean and acceptably free of corrosion immediately prior to concrete placement. Tensioning systems must be supported by approved calculations and verification after tensioning. Thermal effects, slippage and elongation must be considered.

D. Concrete Placement.

See Section 9-5.2. High frequency internal and/or external vibrators are often necessary to consolidate low slump concrete in congested forms for prestressed elements. High slump concrete utilizing a high-range water reducer is sometimes appropriate if requested by the fabricator and approved in accordance with the Contract.

E. Post Tensioning.

Tensioning should comply with the approved shop drawings. Ten to twenty percent of ultimate load should be applied to take up slack before measurement of elongation. Anchorage and tensioning devices must perform without apparent defects.

F. Grouting.

A guide to good practice is that grouting should be performed within 5 days of tensioning unless special anticorrosion precautions are taken. Ducts should be flushed and blown out with compressed air before grouting. Components of the grout shall have been previously approved prior to use. Pumps and gauges must be in proper working order with backups available.

3. Measurement

Prestressed elements are normally paid as a lump sum or plan quantity item. No additional measurement is required. If post tensioning is paid separately, the Contractor may be requested to

furnish a breakdown for progress payment purposes. Even if it is not paid separately, the value of the post tensioning should not be paid in progress payments until the work is actually done.

4. Documentation

In addition to normal concrete and reinforcing steel documentation required by Subsections 9-5.1.4. and 9-5.4.4., the following items should be addressed:

A. Materials Records and Certifications.

Documentation should include prestressing wire and grout components.

B. Tensioning Records.

Identification of member and prestressing wire used, jacking equipment, elongation calculations, gauge readings or other verification computations showing assumed slippage, compression, etc.

C. Stress Transfer.

Concrete records should indicate that the required concrete strength has been achieved prior to stress transfer.

D. Equipment.

Calibration records should be available and checked for all jacking equipment used in the operation.

5. References

Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products, Prestressed Concrete Institute.

Post-Tensioning Manual, Post-Tensioning Institute.

9-5.4 REINFORCING STEEL

1. Preliminary Review and Approval

The Contractor should submit shop drawings or *cut sheets* for all reinforcing steel prior to fabrication. It is normally not necessary to submit routine cut sheets to the Bridge Designer for approval. They should be fully reviewed and approved or noted differences marked and returned to the Contractor by the Project Engineer.

If the plans include a design reinforcing steel detail, these sheets may be used to compare to and approve the cut sheets. However, the fabricator may make minor changes in bar lengths to account for shortening at bends, etc.

The epoxy coating process should be subject to independent inspection arranged by the Materials Engineer. This inspection may be by FLH specialists, State inspectors or a commercial testing firm.

Upon delivery of the steel, the Project Engineer should be furnished certifications and mill test reports for all reinforcing steel. The documentation must be provided before the steel is paid for. Bars must be identified by markings as to grade, mill, size, and type of steel. **Figure 9-5.4(a), Identification Marks - ASTM Standard Bars,** may be used to verify that the bars and certification grades indicated are the same.

It is not necessary for the Project Engineer to check dimensions of all steel upon delivery, as it is often difficult until it is placed in the forms. A cursory check should be made to verify the entire shipment has been received as represented by the documentation.

2. Construction Inspection

Except for epoxy coated bars, reinforcing steel requires only intermittent inspection until a portion of a structure is complete and ready for concrete placement. Inspection should then be comprehensive in conjunction with approval to proceed with the placement. Upon delivery, epoxy coated bars should be checked for cracks, pinholes, and coating thickness. Special equipment may be obtained for checking the thickness and completeness of coating.

A. Storage and Handling.

Reinforcing steel must be stored where it will be protected from dirt and grease. Minor rust is not normally a problem for non-coated steel, but it should be protected when stored in marine environments where major rust and scaling is likely.

B. Placing and Tying.

Bars must be supported and tied so as not to deflect significantly under construction and concrete placement conditions. Refer to CRSI guidelines for specifics. Deck steel should not be used to support buggy ramps or other heavy equipment. CRSI and ACI contain tolerances for minimum cover, vertical and lateral placement, as well as minimum frequency of ties.

Proper placement of deck steel is particularly important. The procedure described in Subsection 9-5.2.E. should be used to verify proper placement and cover for deck reinforcing steel.

C. Placement of Concrete.

Prior to concrete placement, steel must be cleaned of form release agents or any other detrimental substances. In hot weather it may be necessary to shade reinforcing steel and/or spray with fresh water to cool it to less than 32 °C.

After concrete placement, splice bars and other protruding bars must be cleaned of concrete splatter.

3. Measurement

Reinforcing steel is normally paid on a plan quantity basis. No remeasurement or computational checks are necessary. However, if changes are ordered by the Government or significant errors are discovered in the plans, the

quantities should be adjusted to provide for these changes or errors. Minor adjustments in bar lengths to conform to fabrication standards are not considered significant.

Figure 9-5.4(b), ASTM Standard Reinforcing Bars, may be used to compute quantity changes in reinforcing steel.

4. Documentation

The following are minimum documentation requirements for reinforcing steel.

- Certification and mill test reports must be on file covering all reinforcing steel.
- For epoxy coated reinforcing steel inspection reports covering the coating process, as well as inspection reports on condition after delivery should be on file.
- Prior to each concrete placement, diary entries or a placement report must document that all steel to be incorporated in that placement has been checked as to size, location, cover, etc.
- All changes in contract quantities must be documented by detailed computations.

5. References

Placing Reinforcing Bars, Concrete Reinforcing Steel Institute (CRSI).

Manual of Standard Practice, CRSI

9-5.5 PILING

1. Preliminary Review and Approval

A. Test Piles.

Test piles are several ordinary piles driven in advance of ordering the remainder of the piles, in order to better estimate the order length of the remainder and to minimize cutoffs and splices. Test piles are normally *tested* only by their driving characteristics. If test piles are required, it must be determined if the test pile lengths are specified or if they must be ordered. If the latter is the case, the Project Engineer should consult with the Construction Operations Engineer to agree on the order lengths.

B. Load Tests.

Load tests are when a previously driven pile is tested by loading to its design load, or to failure to determine if driving characteristics give an accurate estimate of actual capacity. Load tests are very expensive and not normally performed in highway structure construction, except for experimental work and under unusual [usually friction pile] situations..

If one or more load tests are required, all equipment as well as the layout of the tests must be approved by FLH prior to the test.

C. Pile Lengths.

Some contracts may specify the order lengths of piles, or minimum tip elevations, but normally the Project Engineer must furnish order lengths based on the test piles (dynamic formula or wave equation analysis) and/or load tests. The determination of pile length often involves economic decisions. For example, if the cost of splices is considerable, it may be wise to order slightly excess lengths to minimize splices. Some contracts require the Contractor to determine lengths but provide payment only for the piles actually driven.

D. Piling Hammers and Equipment.

Proposed pile hammers and equipment must be submitted to FLH for approval prior to driving. Geotechnical personnel should be available to assist in evaluating equipment. Hammers must be large enough to assure some penetration (usually at least 3 mm per blow) at the design bearing; however, too large a hammer can damage some piles, or may not be able to reach full energy at the pile capacity. **Figure 9-5.5b, Pile Driving Equipment Data Sheet**, shows the information required to approve pile driving equipment.

2. Construction Inspection

Pile driving requires essentially continuous inspection in order to verify bearing.

A. Equipment.

Check hammer weight, cushion, leads and pile alignment.

B. Preparation.

Have the Contractor mark piles and provide a stationary scale on the leads in order to monitor penetration. The inspector should have computed or otherwise know the minimum blows per 25 mm necessary for design bearing.

C. Driving.

The hammer must operate at full stroke in order to attain the specified energy. This is important when determining the blow per 25 mm from which bearing capacity is determined. Low pile resistance may initially cause the hammer to function at less than full energy. **Figure 9-5.5a, Pile Driving Record** is a convenient form for recording pile driving information.

Once a pile has reached design tip elevation and the specified bearing has not been reached, it may be prudent to wait a period of time and try driving again. Often, in granular soils, consolidation will have taken place and bearing will have been achieved.

D. Splicing.

Splicing procedures must be approved and splicing must be performed in a skillful manner. Welding, in particular, must be performed under controlled conditions by a certified welder..

E. Drilled Piles.

Some piles must be drilled or augered. Examples are concrete piles that are cast in place, and some steel and concrete piles that are predrilled to a specified tip elevation, or installed in a newly constructed embankment.

If the specifications require drill holes and casings to be inspected, the Contractor's QC plan should cover most of this effort. Minimum embedment in rock may be a specified criterion. Periodically the inspector should make verification inspection and the Contractor should be asked to furnish assistance.

Often, cast-in-place piles must be cast in a dry casing or hole. This can require difficult sealing and dewatering.

3. Measurement

Measurement requirements depend on how pile related contract items are structured. The specifications must be read carefully before setting up a documentation system. Generally, all piles ordered by the Government must be paid for, but if the Contractor is required to determine order lengths only pile lengths driven are paid for.

Often splices are paid for, but not always. Usually splices in piles less than the order length are not paid for.

4. Documentation

Comprehensive documentation is necessary for all pile driving operations. Following are minimum requirements:

- Pile layout, structure and numbering system
- Type of hammer and other equipment
- Material certifications for piling
- Driving log for each pile
  - Penetration/blow counts
  - Pile lengths
  - Splices
  - Computed tip elevation
  - Computed Bearing
  - Summary of Pay Items

5. References

Design and Installation of Driven Pile Foundations, by Hal W. Hunt, Associated Pile and Fitting Corporation.

Inspectors Manual for Pile Foundations, Deep Foundations Institute, P.O. Box 359, Springfield, New Jersey 07081.

Design and Construction of Pile Driven Foundations, FHWA, Demonstration Projects Division.

A Pile Inspector's Guide to Hammers, Deep Foundations Institute, as above.

9-5.6 STEEL STRUCTURES

1. Preliminary Review and Approval

A. Shop Drawings.

All shop drawings for major steel structures should be submitted for approval to the Bridge Engineer.

B. Fabrication.

The Materials Engineer or Bridge Engineer will arrange for inspection of fabrication.

C. Falsework.

Falsework for steel structures must be approved as required by Section 9-5.2.

D. Welding.

If field welding is required, the Bridge Engineer should evaluate the need for specialized field inspection or testing if appropriate.

E. Bolts.

If a calibrated torque wrench is necessary for inspection of high strength bolts, the Project Engineer should arrange for the required calibration equipment.

F. Certifications.

All materials must be accompanied by certifications. Structural plate and associated welds should be documented by mill test results and other required tests.

2. Construction Inspection

Intermittent inspection of all operations is normally adequate except for welding and bolt tightening which require comprehensive inspection.

A. Delivered Steel.

Upon delivery, steel should be checked for proper documentation including mill test reports, certifications, and inspection reports.

Any significant damage may require repairs. The Bridge Engineer should be consulted if this is the case. Steel should be stored to be protected from the weather. This is especially true if it is to be stored for a long duration. If at the time of erection, excessive mill scale and rust has built up on unpainted bearing surfaces, these surfaces may require sandblasting prior to assembly.

B. Falsework and Erection Equipment.

Facilities for erection must be installed to conform to the approved working drawings and erection plan.

C. Erection

All bearing plates and rockers must be placed within acceptable tolerances. Bearing surfaces must match or be ground smooth. Required gaps in expansion joints should be checked prior to securing the fixed end of spans..

D. Bolted Splices.

If splice plates are temporarily removed, match marking should be checked to insure proper replacement.

When heavy hexagon bolts and heavy semifinished hexagon nuts are used, a hardened washer must be installed under the bolt head or nut, whichever is the element being turned. Heavy hexagon bolts can be identified by three radial lines, the legend A-325, and the manufacturer's mark on the top of the head. Heavy semifinished hexagon nuts can be identified by three circumferential marks, or by the number "2" and the manufacturer's mark on at least one face. The bolts and nuts may be washer faced but these faces do not take the place of a hardened washer.

See **Figure 9-5.6(a), ASTM Standard Structural Bolts**, for standard markings of A-325 bolts. Washer dimensions can be found in the Standard Specifications.

Calibrated torque wrenches must be used to check all tightening operations. When impact wrenches are used, a constant check should be maintained on the initial phase of the work to ascertain that the bolt tensioning is slightly in excess of the minimum value given in the table on bolt tension and torque values in the Standard Specifications. Once the procedure is satisfactorily established, less frequent checks should may performed if permitted by the Project Engineer.

AASHTO M 164M bolts, nuts, and washers are used with AASHTO M 183M steel and other steels which are to be painted. AASHTO M 253M bolts, nuts, and washers are to be used with AASHTO M 222M steels. M 253M bolts are manufactured of steel, which is more corrosion resistant than M 164M.

The Contractor is required to conduct quality assurance checking the torque of bolts in each connection. Generally, not less than 10 percent or two bolts per connection should be checked. Quality assurance checking must be in the presence of the Engineer.

E. Welding.

All field welding must be performed by welders certified for the specific types of welds to be performed. The Project Engineer may request documentation of welder certification.

F. Painting.

See Section 9-5.7

3. Measurement

Structural steel is always paid by lump sum or plan quantity. No remeasurement or computations are necessary. If an error is discovered or change is made, weights specified in the *AISC Manual of Steel Construction*, may be used to compute changes. However, it is likely some additional cost data may be necessary to more accurately assess the increase or decrease in the Contractor's costs.

4. Documentation

Mill test reports, certifications and shop inspection reports are required for all structural steel. Diary entries made during erection of steel should indicate all problem areas and solutions.

The systematic means of checking bolt tightening should be documented.

5. Reference

Steel Construction Manual, American Institute of Steel Construction (AISC)

9-5.7 PAINTING OF STRUCTURES

1. Preliminary Review and Approval

Paint certifications must be provided prior to beginning painting.

If color samples and approval of color are required, this must be coordinated with the Contractor and the approving official.

Environmental concerns may have to be addressed, especially if there is nearby private property, traffic, or if lead or other highly toxic paints are used. In any case, the Contractor should be asked how any problems or potential problems will be mitigated.

If removal of old paint is a part of the Contract, the Contractor may be required to test, and if necessary dispose of the debris as hazardous waste. Laws and regulations may
put constraints on how such debris is collected and stored prior to disposal. Negative pressure enclosures may also be required. In enclosure workers, and FLH inspectors may have to take special health precautions to address the presence of lead and other toxins.

2. Construction Inspection.

Inspection is normally intermittent at each stage of construction.

A. Surface Preparation.

The specifications should contain specific requirements as to surface preparation. Mill scale, dirt, and loose paint must always be removed. Sandblasting of deteriorated areas and perhaps the entire structure may be required. The specific requirements must be reviewed with the Contractor to be sure they are understood. In the event that Steel Structures Painting Council's (SSPC) sandblasting standards are specified, these standards should be obtained for reference. The presence of oil or grease may necessitate a solvent cleaning.

For some paints and conditions, neither surface preparation nor actual painting can be done outside certain ranges of air temperature, humidity, and dew point. For marginal cases the necessary equipment and expertise should be obtained. Generally, final surface preparation and coating application should not proceed unless the surface temperature is at least 3°C higher than the dew point. Or, if a spot on the steel is moistened with a damp cloth, it should dry within 15 minutes if the dew point is low enough to paint.

When there are airborne pollutants in the area (steam, dust, chemicals), additional precautions may be necessary.

B. Equipment.

The equipment selected by the Contractor should comply with the specifications, be clean, and in good working order. The equipment used to measure film thickness is usually furnished by the Government. The procedure for determining thickness should be discussed with the Contractor. Initial readings should be taken on bare surfaces and the prime coat to use as a base for measuring subsequent coats.

C. Paint.

Mixing of paint together with all specified additives is the single most important operation prior to application. Paint must be mixed until it becomes smooth, homogeneous, and free of surface "swirls" or pigment lumps. All settlement in the bottom of cans must be thoroughly mixed with the liquid.

It is often useful to tint second coats of prime or other intermediate coats in order for the painter to monitor coverage.

D. Paint Application.

Paint must be applied in a uniform and consistent manner. Special attention to coverage is necessary in corners, behind stiffeners and bolts. Brush application may be necessary in these areas.

E. Film Thickness.

Wet film thickness gauges may be used by the Contractor for process control. Dry film thickness gauges are used by the Inspector for acceptance. Chalk is useful to mark deficient areas. If deficient areas are numerous, the Contractor should be advised that the job is deficient, and ordered to check and correct it; i.e., the Inspector is not obligated to spend many hours identifying deficiencies if it is clear that the job is not ready for acceptance. Remember that the thickness gauge measures total thickness, so it is necessary to establish average readings for the prime coat(s) in order to calculate the thickness of the finish coat.

F. Multiple Coats.

When more than one coat is to be applied and dust and pollution are in the air, it may be necessary to clean the surface before each coat is applied.

G. Special Tests.

In addition to dry film thickness readings, some projects may require special tests such as pinhole/holiday detection, or adhesive testing (ASTM D-3359). The ASTM test may be obtained from the Materials Engineer. The pinhole/holiday detection test requires special equipment.

H. Samples.

Although paint is normally accepted by certification, FLH may, at its discretion, take samples and have them tested (usually commercially).

3. Measurement

Painting is normally a subsidiary obligation or paid as a lump sum. That being the case, no measurement of quantities is necessary. Changes or added quantities may be negotiated based on changes in areas painted.

4. Documentation

Certifications are required for all paint. Certifications and paint containers should be marked as to lot number and date of manufacture. The contract may require specific test data supporting the certifications.

For surface preparation, the IDR's should document inspection results and approvals. Photograph of passing and failing surfaces are helpful. Photographs of corners, splices, bolts and other hard to clean areas are more so.

The Project Engineer should maintain documentation of the intermittent inspections leading up to the dry film thickness measurements after each coat. The results of dry thickness readings should be documented as well as retesting (if necessary) and final acceptance.

5. References

Steel Structures Painting Manual, Volume 1, Good Painting Practice, Steel Structures Painting Council (SSPC)

Steel Structures Painting Manual, Volume 2, Systems and Specifications, Steel Structures Painting Council (SSPC)

9-5.8 REHABILITATION OF CONCRETE STRUCTURES

1. Preliminary Review and Approval

Rehabilitation specifications are normally detailed and method oriented. The Project Engineer should go over them in detail with the Contractor to establish necessary controls at each phase. There are normally areas shown on the plans designated for removal or corrective action. The Project Engineer must ascertain if these are ”estimated" areas requiring extensive rechecking prior to authorizing the Contractor to proceed with the work, or if they have already been checked and it is acceptable to begin work.

All materials and equipment used by the Contractor are usually subject to approval prior to commencement. Traffic control procedures must also be reviewed in detail to determine if all potential problems have been properly anticipated. Equipment approval is particularly important because if such equipment is too heavy or too large it may damage additional portions of the structure as defective areas are removed.

When the specifications say ”all unsound concrete is to be removed", it is important to reach an understanding with the Contractor as to who has the authority to designate this concrete. If the Contractor can perform responsibly, there is nothing wrong with giving Contractor QC personnel limited authority to expand designated areas if they are defective, with the understanding that such areas will be added to pay quantities. If, however, the Government wants to retain complete control of the removal process; it will be necessary to assign Inspectors to the operation nearly full time to approve removal or to expand areas as necessary.

In any case, it is important to discuss these problems and reach at least tentative understandings before work begins.

2. Construction Inspection

Inspection required for rehabilitation work is nearly continuous. Problems, changes, and the frequent necessity to approve each stage of the work necessitate this.

A. Bridge Decks.

Removal operations, using approved equipment, must remove all defective concrete without significant damage to the structure. Milling must be deep enough to accommodate the overlay. Defective areas must be identified by sounding or more sophisticated procedures. Usually two stages are necessary: one to identify initial removal areas and one to check/or identify additional areas.

The Construction Operations Engineer and the Bridge Engineer (designer) should be apprised if the conditions during removal are drastically different from conditions depicted in the contract.

Joints, reinforcing steel, and miscellaneous hardware often require repair, and the actual conditions are often not as depicted in the plans.

Replacement concrete should be inspected as required by Subsections 9-5.1 and 9-5.2 as modified by any additional requirements in the contract.

B. Concrete Pavement.

The contract normally has specific requirements as to slab removal, replacement, and sealing. As with bridge decks, it is necessary to respond to conditions as they actually exist if those conditions are different than those depicted in the plans.

Repair of expansion joints in concrete pavement is particularly important. Dowels which are out of line or installed improperly will defeat the purpose of the repair work.

3. Measurement

The contract will normally have a wide variety of pay items for rehabilitation work. The most important consideration is the determination of how additional quantities will be measured; i.e.,

will the Contractor have authority to perform numerous quantities of additional work and expect that work to be measured for payment. Or will only the Engineer have authority to authorize additional work. The answers are different for different situations, but understandings should be reached before work is started.

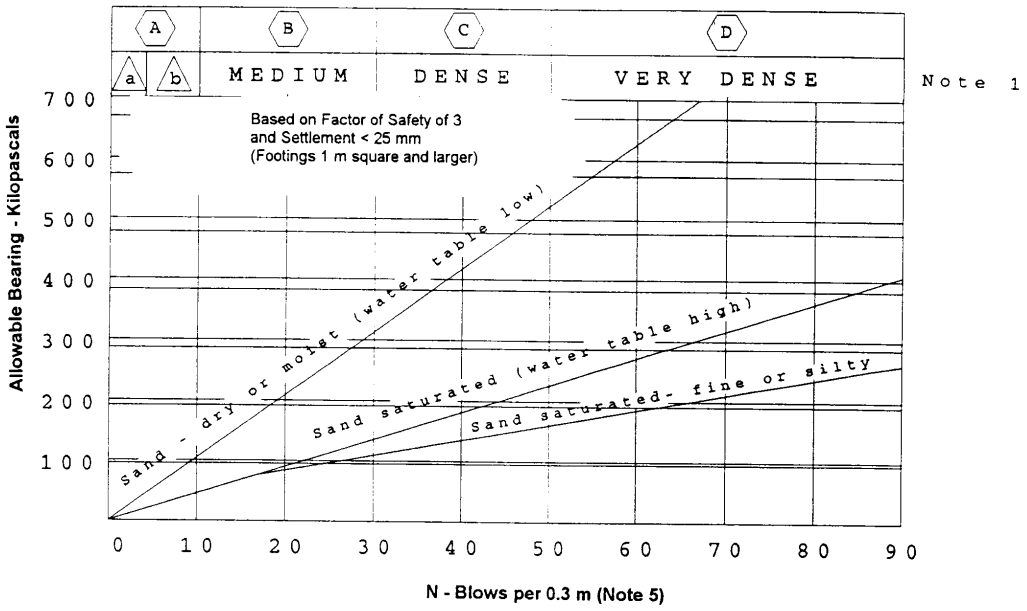
4. Documentation

Complex documentation is required for rehabilitation work. Removal, replacement, and repair items must be documented in detail, usually with drawings or sketches.

All material must be documented with certifications or test and inspection results.

Photographs are particularly important for rehabilitation work because they provide good feedback so that future designs can be improved.

Allowable Bearing on Sandy Soils



a Very Loose

b Loose

A Easily penetrated with 12 mm rod pushed by hand

B Easily penetrated with 12 mm rod driven with a 2 kg hammer

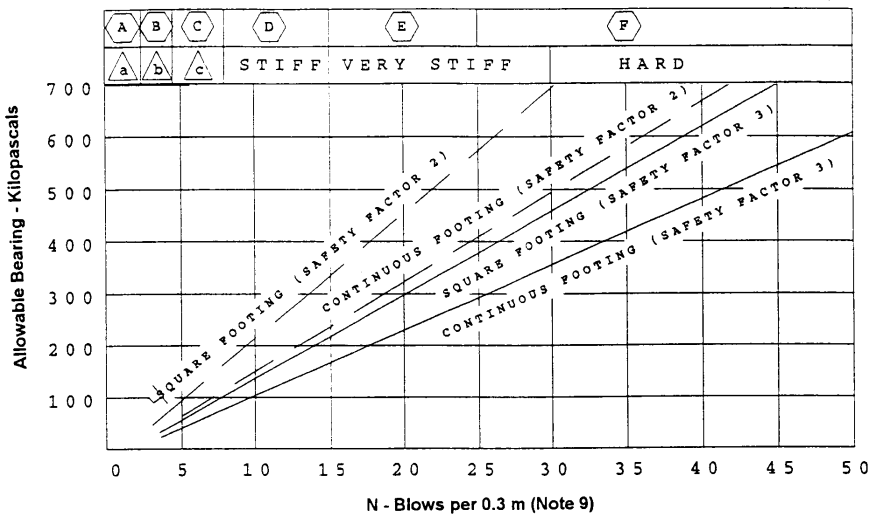
C Penetrated 0.3 m with 12 mm rod driven with 2 kg hammer

D Penetrated 0.1 m with 12 mm rod driven with 2 kg hammer

Notes
1) Terzaghi & Peck Classification
3) Settlement governs over bearing capacity when footing least dimension exceeds about 1 m.
4) An average or representative blow count over a depth below footing equal to the least width of the footing should be used.
5) N represents the blows per 0.3 m to drive a 35 mm diameter (ID) sampler using a 63.5 kg hammer freely falling 0.76 m.

Allowable Bearing on Sandy Soils
Figure 9-5.2a

Allowable Bearing on Clayey Soils



a VERY SOFT

b SOFT

c MEDIUM

A Squeezes between fingers when fist is closed

B Easily moulded by fingers

C Moulded by strong pressure of fingers

D Dented by strong finger pressure Penetrated by thumb only with great effort

E Readily indented by thumbnail. Dented slightly by strong finger pressure

F Dented only slightly by pencil point

See Notes Next Page

Allowable Bearing on Clayey Soil
Figure 9-5.2b

Notes 1) Terzaghi & Peck Classification

3) Weak strata at some distance below footings may in cases cause more settlement than soil layers immediately below the footings.

4) Desiccation of clay near the surface will result in higher blow counts. An average or representative blow count over a depth below footing equal to the least width of the footing should be used.

5) For same unit pressure, large footings settle most. This is particularly so where clay strata are involved.

6) Greatest settlements may generally be expected at centers of loaded areas.

7) Consolidation and settlement tend to increase with the following:

- Softness of the clayey material.
- Thickness of the compressible strata.
- Closeness of clay stratum to ground surface.
- Amount proposed loading exceeds past loading.
- Width of footing or loaded area.
- Height of water table.
- Liquid limit.
- Time.

8) Shear failures are most apt to occur when:

- Footings are small.
- Settlements are large.

9) N represents the blows per 0.3 m to drive a 35 mm diameter (ID) sampler using a 63.5 kg hammer freely falling 0.76 m.

Allowable Bearing on Clayey Soils (Continued)
Figure 9-5.2b

REPORT OF FIELD CHANGE TO FALSEWORK/FORMWORK

Project: _____ Date: _____

Portion of Structure: _____

Description of Change: _____

_____

_____

_____

_____

_____

_____

Action Taken:_____

_____

_____

_____

_____

_____

Change: _____ Approved By____ Discussed With _____ Date _____

_____ Waiting Approval _____ Contractor Proceeding ____ Work on This Item Suspended

_____ Need Decision By _____(Date) _____ See Drawings or Attachments

_____ Other Comment: _____

_____

_____

_____

_____

Distribution: Construction Operations Engineer, Bridge Engineer, Project Files

Figure 9-5.2c

CHECKLIST FOR FALSEWORK INSPECTION

Project:_____ Portion of Structure: _____

Partial:_____ Final: _____ Date:_____

A. All Falsework

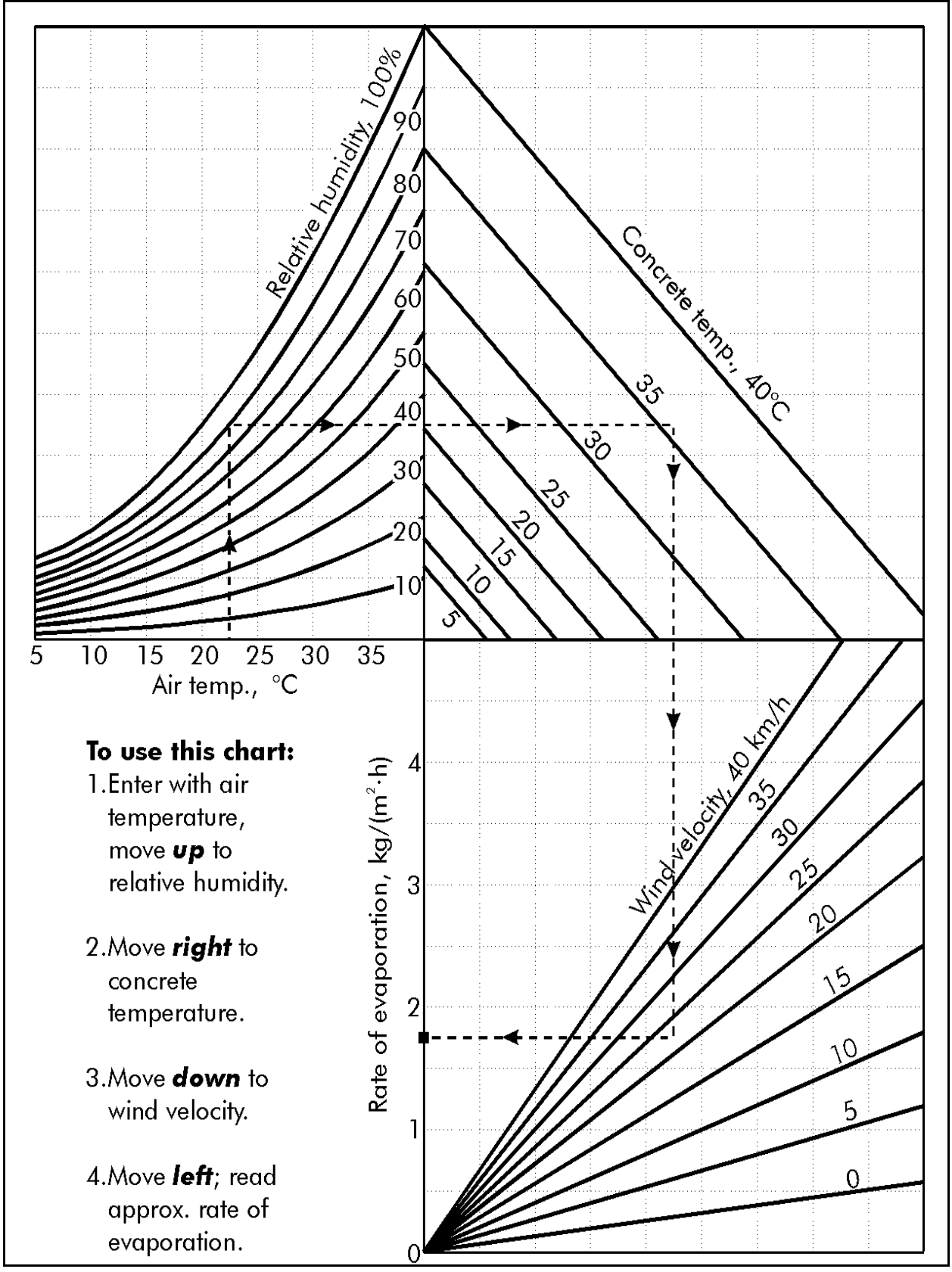
Item	Insp	Date
1. Approved shop drawings with all appendices and attachments available onsite.		
2. All components identified as consistent with approved drawings. Identification should be by dimensional checks and/or manufacturers model numbers when available. Special grade lumber should be verified by markings. No significant damage (repairs, welds, holes cut, etc.) to any component unless the damage is considered in the design computations		
3. Bearing capacity of footing foundations checked and confirmed consistent with design assumptions.		
4. No standing water or washouts in vicinity of foundations which may have reduced their bearing capacity.		
5. Footings, beams and leveling blocks dimensionally correct and in firm contact.		
6. Elevation adjustments made with full contact shims or paired/properly sized wedges.		
7. Columns, towers and vertical members checked for maximum spacing and plumbness in both directions. Plumbness should be within 3.5 millimeters in one meter.		
8. Lateral and diagonal bracing in place and attached per approved drawings.		
9. All components protected from adjacent traffic and construction vehicles.		
10. Tell-tales in place and checked.		

Checklist for Falsework Inspection
Figure 9-5.2d

B. Steel Tower/Screw Jack Falsework

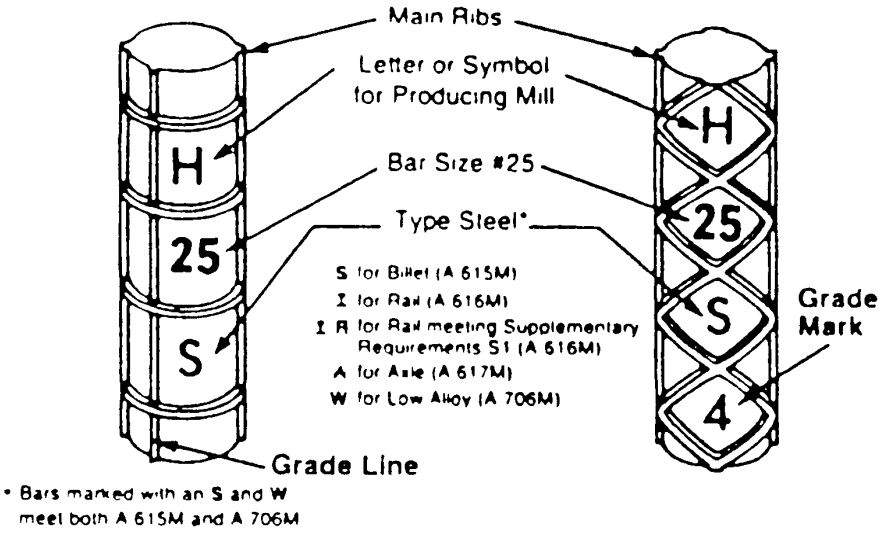
Item	Insp	Date
1. All steel support frames, jacks and assembly parts are in accordance with manufacturer's model numbers and as approved in the falsework drawings. All components are free of dents, bends, cracked welds and corrosion.		
2. Base plates in firm contact with footing or sill, and with decking support system. Plates should be attached if required by the approved drawings.		
3. Adjustment screws snug against frame legs. Alignment devices in place inside legs to prevent rotation. Screws not over extended.		
4. No gaps between adjacent tiers of frame legs. If gaps cannot be closed by adjustment screws without putting the frame out of plumb, the frame may be out of square and should be replaced.		
5. Each tier of frames must have cross bracing or diagonal bracing.		
6. Locking devices on bracing are properly closed and tight, and not damaged.		
7. If exterior bracing for lateral stability is required, the devices which fasten this bracing to the frame system must be securely attached in accordance with manufacturer's recommended standards and as required by the approved falsework drawings. Check cable clamps, tubing clamps and timber to steel connections.		

Checklist for Falsework Inspection (Continued)
Figure 9-5.2d



Note: Example shown by dashed lines is for an air temperature of 22.5°C, relative humidity of 90 percent, concrete temperature of 36°C, and a wind velocity of 22.5 kilometers per hour. This results in a rate of evaporation of 1.75 kilograms per square meter per hour.

Evaporation Rate in Hot Weather
Figure 9-5.2e



Grade 400 and above

Standard Bar Markings
Figure 9-5.4a

MINIMUM YIELD STRENGTH OR GRADE (f_y)		GRADE MARK
English (ksi)	Metric(MPa)	
40.0		None
43.5	300	None
50.0		None
50.8	350	None
58.0	400	4 or one line
60.0		60 or one line
60.9	420	4 or one line
72.5	500	5 or two lines
75.4	520	5 or two lines

Standard Grade Marks
Figure 9-5.4b

BAR SIZE MARK			NOMINAL DIAMETER (mm)	NOMINAL AREA (mm²)	NOMINAL MASS (kg/m)
US (Standard) AASHTO M 31, M42 or M53	US (Metric) ASTM A 615M-96a	Canadian (Metric) AASHTO M31M, M42M or M53M			
3	10		9.5	71	0.560
		10	11.3	100	0.785
4	13		12.7	129	0.994
5	16		15.9	199	1.552
		15	16.0	200	1.570
6	19		19.1	284	2.235
		20	19.5	300	2.355
7	22		22.2	387	3.042
		25	25.2	500	3.925
8	25		25.4	510	3.973
9	29		28.7	645	5.060
		30	29.9	700	5.495
10	32		32.3	819	6.404
		35	35.7	1000	7.850
11	36		35.8	1006	7.907
14	43		43.0	1452	11.38
		45	43.7	1500	11.76
		55	56.4	2500	19.61
18	57		57.3	2581	20.24

Standard Bar Sizes
Figure 9-5.4b

Pile Driving Record

PROJECT:		DATE:	
CONTRACTOR:		INSPECTOR:	
STRUCTURE:		PILE LOCATION:	
SAXIMETER NO.:	TIME: START	STOP	
PILE NO.:	PILE TYPE / SIZE:	LENGTH (m):	BATTER:
GROUND ELEV.:	PILE TIP ELEV.:	CUTOFF ELEV.:	
HAMMER MAKE/MODEL:			
THROTTLE SETTING:	ENERGY/BLOW:	BLOWS/MIN.:	
HAMMER CUSHION TYPE/THICKNESS:			
PILE CUSHION TYPE/THICKNESS:			

DEPTH (0.25m)	BLOWS (/ 0.25m)	STROKE / PRESSURE	DEPTH (0.25m)	BLOWS (/ 0.25m)	STROKE / PRESSURE	DEPTH (0.25m)	BLOWS (/ 0.25m)	STROKE / PRESSURE	DEPTH (0.25m)	BLOWS (/ 0.25m)	STROKE / PRESSURE
0.25m											
1.00m			8.00m			15.00m			22.00m		
2.00m			9.00m			16.00m			23.00m		
3.00m			10.00m			17.00m			24.00m		
4.00m			11.00m			18.00m			25.00m		
5.00m			12.00m			19.00m			26.00m		
6.00m			13.00m			20.00m			27.00m		
7.00m			14.00m			21.00m			28.00m		

REMARKS:

Pile Driving Record
Figure 9-5.5a

Pile Driving Equipment Data Sheet

Contract No.: _____ Structure Name and/or No.: _____

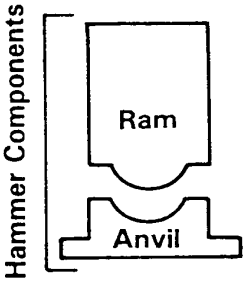
Project: _____

Pile Driving Contractor or Subcontractor: _____

County: _____

(Piles driven by)

Hammer Components



Hammer

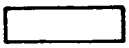
Manufacturer: _____ Model: _____

Type: _____ Serial No.: _____

Rated Energy: _____ at _____ Length of Stroke

Modifications: _____

Capblock (Hammer Cushion)



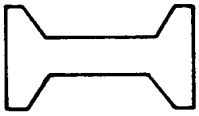
Material: _____

Thickness _____ Area: _____

Modulus of Elasticity – E _____

Coefficient of Restitution-e _____

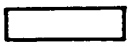
Pile Cap



Helmet
Bonnet
Anvil Block
Drivehead

– Weight: _____

Pile Cushion



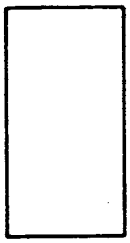
Cushion Material: _____

Thickness: _____ Area: _____

Modulus of Elasticity – E _____

Coefficient of Restitution _____

Pile



Pile Type: _____

Length (in Leads) – _____

Weight/meter _____

Wall Thickness: _____ Taper: _____

Cross Sectional Area _____

Design Pile Capacity: _____ (Tons)

Description of Splice: _____

Tip Treatment Description: _____

Note: If mandrel is used to drive the pile, attach separate manufacturer's detail sheet(s) including weight and dimensions.

Submitted By: _____ Date: _____

Pile Driving Equipment Data Sheet
Figure 9-5.5b

SECTION 9-6 - MISCELLANEOUS CONSTRUCTION

Figure

9-6 MISCELLANEOUS CONSTRUCTION

9-6.1 Drainage Structures

1. Preliminary Review and Approval

A. Pipe Culverts and Storm Drains

After the project has been slopestaked, it will be necessary for the Project Engineer to analyze the approximate design of drainage culverts as shown on the plans, and if required, to make or recommend adjustments or redesign to meet field conditions.

The contract may require that the Contractor perform this analysis and submit proposed adjustments to the Engineer for approval; or it may be silent on this issue which means the Engineer must perform the analysis and make the adjustments prior to authorizing the Contractor to order materials and install the culvert.

The analysis will usually require that stakeout data at the culvert installation be taken and plotted in order to verify the design.

Careful consideration should be given to the following pertinent factors:

(1). Location of Structure.

The alignment and grade of the channel adjacent to the inlet and outlet of the proposed structure should be carefully studied to assure efficient operation. If the location for any structure as indicated on the plans appears incorrect, the Project Engineer must take the necessary action to properly correct the situation, contacting the Construction Operations Engineer if there are technical or procedural questions.

(2). Type and Size of Structure.

Based on actual field conditions, the Project Engineer may come to question the type of a structure, arch vs. round culvert perhaps, or the size. The Project Engineer should review design information in these situations, and should consult the Construction Operations Engineer if the question persists.

Prior to establishing the lengths of manufactured culverts, the Engineer should review with the Contractor how culvert length are cut or manufactured. If culverts only come in say 0.25 meter or 1.0 meter increments, they should be ordered that way if possible. However, if this would involve technical compromises or waste, the culvert should be staked as necessary and the Contractor should deal with the odd length, and cutting problem.

(3). Limiting Heights of Fill.

The Project Engineer must see that the design gauge or strength of culvert pipes meets the prescribed design criteria for the heights of fill to be placed over them, if either the fill or culvert vary from what was anticipated by the designer. The design criteria are normally shown on the plans. If not, this information will be furnished by the Construction Operations Engineer.

Past culvert design methods increased metal thickness to control pipe deflection. The present emphasis is for the use of proper bedding and backfill as the best method for controlling pipe deflection. This method has produced fill height tables with less pipe thickness for corresponding maximum fill heights. It has also, of course, increased the need for care in inspecting bedding and backfill.

B. Underdrains

Adequate design of underdrains at the time of preliminary engineering and preparation of plans is often difficult or impossible due to scant information and time. The Engineer must therefore carefully evaluate the conditions on the project as the work progresses, and provide underdrains as conditions warrant.

The location and depth of underdrains are governed by the characteristics of the particular soil involved, the location of the water to be intercepted, and the terrain. Numerous alternate perforated pipe materials are acceptable and have been approved for use. Prior to installation, it should be determined which material the Contractor intends to furnish from the list of specified alternates. Then their properties should

be reviewed for compliance with specifications.

All available alternate pipe materials are not approved for installation beneath the traveled way. The Project Engineer must check to insure any proposed pipe materials different from those designated on the plans are acceptable. This information can be obtained from the Construction Operations Engineer.

When geotextile fabric is used, the certified physical properties as well as the performance tests require review prior to installation, to insure specification compliance. Division procedures may require samples for additional testing.

Granular backfill material is a vital component to the complete system. The Project Engineer is responsible for arranging evaluation of the location and volume of underground water to be carried and the permeability of the intended granular backfill material when there is any doubt the true situation was known to the designer. A change in the design of the system may be required. Assistance should certainly be requested when failure of an expensive or environmentally sensitive portion of a project seems possible. Assistance from Geotechnical, hydraulics and other design personnel, may be arranged through the Construction Operations Engineer.

2. Construction Inspection

Once the Project Engineer and/or Inspector have reached an understanding with the Contractor on proper installation, inspection of routine installations should be an occasional, as opposed to a constant task. Underdrains may require closer attention. If the *design* is being done as excavation proceeds, this is a frequent occurrence.

A. Pipe Culverts and Storm Drains

The Project Engineer is responsible to insure a stable foundation is being prepared for all structures. Stable foundation, rock foundation, and yielding foundation all require different methods of bedding. Construction requirements and instructions will usually be found in the specifications and project plans. Information on good practice may be obtained from any of several publications available to the Project Engineer.

Silting around an inlet or outlet is caused by retarding the velocity of the stream just above or below the culvert. If sedimentation is anticipated, erosive velocities should be reduced by means of a broken grade line, stilling basins, or spillways. In unusual situations, the matter should be referred to the Construction Operations Engineer for special consideration. For pipe installation and construction procedures, reference should be made to the AISC publication, *Handbook of Steel Drainage & Highway Construction Products.*

B. Underdrains

In general, the underdrain gradient should be not less than 2 percent, and stringline or grade points set by instrument should be used to eliminate pockets.

Installation for underdrain systems often reveal sources of underground water adjacent to the excavated trench and the inspector should be alert to the need for branch connections.

Outlets to underdrain pipes should be located so as not to interfere with future maintenance, be subject to damage or blockage, and not cause erosion problems.

3. Measurement

Methods of measurement are described under the appropriate section of the Standard Specifications, Special Contract Requirements, and/or Project Plans. They should be reviewed with the Contractor in the early stages of the project, to avoid arguments later when the Contractor compares invoice length to pay length. Any confusion should be resolved early, before a significant quantity of pipe is buried, making resolution awkward.

4. Documentation

The Project Engineer should insure there is a record of the field check for compliance of materials to specifications, normally by signed and dated notes and copies of invoices or certifications.

Field measurement records are required along with records of computation of all pay quantities. Special sheets or books are usually available for records of these items (Culvert Books). As a minimum, the record should show installation dates, survey records for excavation volumes, and names of FLH personnel making the records.

9-6.2 Guardrail and Concrete Barriers

1. Preliminary Review and Approval

Field conditions unknown to the designer and/or changes in the design may result in changes in guardrail needs for the project. The Project Engineer must carefully evaluate all field situations to determine if guardrail can be eliminated or if guardrail should be installed in areas where changes have occurred.

Field changes that affect drainage or slope flattening should be consistent with the 404 Permit, or an amended permit secured. The Project Engineer should notify the Construction Operations Engineer as soon as any permit deficiencies are known or suspected. The permit process can be a long time, so early review is best.

The AASHTO publication *Roadside Design Guide*, is the guide for the Project Engineer when evaluating changes.

2. Construction Inspection

Once the Project Engineer has approved the location, length and termini of all installations, inspection should be intermittent.

Culverts and structures near guardrail areas should be checked to prevent damage during guardrail post or anchor installation.

Wooden guardrail post installation should be monitored to discourage installers shortening post lengths upon encountering impenetrable objects. Look for saw dust or cut off ends. Also areas with extra length posts specified will require extra monitoring. If problems are encountered, they should be dealt with as violations of the Contractor's QC management responsibilities.

In areas of contorted geometrics and unusual superelevation configurations, rail must be checked to insure design height above ultimate finished grade.

3. Measurement

Methods of measurement must be done in accordance with instructions found in specifications.

9-6.3 Fence

1. Preliminary Review and Approval

The right-of-way line is nominally the fence line, however, unless otherwise directed, the fence will be located 0.3 meter inside the right-of-way line. The purpose for installing fence is usually to keep livestock off of the highway. For the fence to be most effective, the wire and the livestock should be on the same side of the post. One exception to this rule is when placing fence on sharp curves the wire must be on the outside of the curve. Another exception is when the cooperating agency wants the fence on the road side for aesthetic reasons.

2. Construction Inspection

Fence inspection requires the Engineer to assure that the fence is properly installed. He/she is responsible for checking post and wire spacing and gate, cattleguard, and brace panel locations. He/she must verify that the Contractor has a QC system to check all fence materials delivered to the project for compliance with specifications. Wood posts need to be checked for soundness, quality, straightness and physical dimensions. Wire certifications must be checked to assure it is of the proper gauge and that it meets contract requirements. Steel posts and certifications must be checked to assure the posts have the proper weight, length, cross section and finish. Cattleguard materials must be checked to assure they comply with contract requirements.

It is usually necessary to grade the fence line before installing fence, particularly if woven wire is being installed. The amount of grading to be done depends on the terrain and cover and should be held to a minimum. The unnecessary removal of native vegetation encourages weed growth and erosion. The Contractor will probably be inclined to do too much grading rather than too little, particularly if equipment such as a motor patrol is used. To prevent unnecessary disturbance, it may be necessary to require grading be accomplished by hand tool methods. Care must be taken to preserve stakes, reference points, bench marks, etc.

It is the Contractor's responsibility to establish post locations, and the inspector is responsible for checking to see that the spacing is correct. When checking post location and spacing, it is advisable to keep in mind that the brace panels are the "anchors" for runs of fence and strong vertical post installation is necessary to provide an adequate anchorage. Line posts should be checked to make sure they are on line and plumb. Vertical alignment can be checked quickly with a makeshift plumb bob, and occasional post holes should be checked for proper depth

Posts should be set vertical, tightly tamped or set in concrete. Those set in concrete should be properly cured for 7 days before having wire stretched to them. The top of the concrete should be crowned to provide drainage away from the post.

When stretching and fastening wire to the posts, several things must be remembered. Wire should be stretched from panel to panel and not between single posts. The top wire should be stretched first, wrapped around the post, and fastened back on itself. Removal of enough barbs or stays to allow for wrapping the wire around the post and back on itself will make for a nice tight wrap splice. Stretching the top wire first places the maximum pull on the post and the lower wires can then be added without loosening the first wires. Stapling should begin in the middle of the runs and progress to the ends to assure a uniformly tight fence. Staples should be driven at about a 45° angle to the centerline of the post to minimize splitting. Staples should be driven slightly downward on level runs and over hills and slightly upward into the post in draws or depressions where the wire has a tendency to lift. Staples should not be driven over barbs and not driven deep enough to pinch the wire. This allows the wire to move freely through the staple to allow for expansion and contraction.

When crossing ditches or gullies, *deadmen* should be installed to keep the fence in position. This helps keep the wire from pulling posts out of the ground and plugs holes that livestock might otherwise use to go through the fence.

Wire spacing should be checked periodically. The use of a notched lath or stick can be used to

simplify this procedure.

Appearance of a fence is very important. A sound fence can be an attractive fence, but a fence that does not provide a pleasing appearance is a detriment to the project whether or not it is structurally sound.

3. Measurement

Fence is usually measured by the meter along the top wire from outside to outside of end post for each run of fence. Gates are usually measured by the each for the type and size specified in the contract. Cattleguards are usually measured by the each for the type and size specified in the contract.

Unless the plans and specifications indicate otherwise, any related work necessary to construct fence, gates, and cattleguards is not paid for separately but is considered to be included in the price paid for these items. Examples of work for which the Contractor may feel he/she is entitled to extra pay might be the installation of *deadmen* and any clearing and grubbing necessary to construct the fence.

4. Documentation

Clear, concise records must be kept of each type of fence, gate, and cattleguard installed. Information to be kept should include location, installation date, type, size, or length installed as well as any special details of construction. This might include the removal and disposal of existing facilities, any changes in type or locations, labor and equipment used, or any other information that may be considered pertinent. Certifications of compliance for manufactured materials incorporated in the work must also be included.

9-6.4 Curb, Gutter, Waterways and Sidewalk

1. Preliminary Review and Approval

Curbs primarily contain, control, and direct surface runoff to inlets, catch basins, outlet ditches, and other drainage control features, but they also serve to define the limits of the roadway and help confine vehicular traffic to the traveled way. They are a part of the roadway that is most visible to the public and as such, finished appearance is of utmost importance.

The inspector should begin by becoming familiar with the layout details shown on the plans. Curb and gutter profile should be closely checked to minimize constructing *birdbaths*. The location of curb and gutter must be closely coordinated with other drainage features to assure construction of an efficient functioning drainage control system.

2. Construction Inspection

A. Preparation

It is the Contractor's responsibility to set stakes for these items, but it is the inspector's responsibility to check the accuracy of those stakes. Particular care must be taken on checking the profile grade when roadway grades are relatively flat. Steeper grades tend to minimize the potential for *birdbaths*, but grades are still important from the standpoint of appearance. Steeper grades tend to magnify irregularities in profile grade. Horizontal alignment is primarily important from the standpoint of appearance. Existing edges of pavements or sidewalks cannot be depended on for accurate line and grade and often, the final alignment must be an *eyeball* adjustment.

Waterways will often have to be slightly deeper where steep downhill slopes transition to flatter slopes. Waterways may also need special treatment on the outside of horizontal curves where water may have a tendency to overflow.

The typical curb and gutter cross section will normally show a gutter cross slope intended to keep the water in the gutter and away from the roadway. With gutter installations on the high side of a superelevation the design should provide for an inlet or ditch to get rid of the water before it crosses the road. Then the slope on the gutter should be transitioned to match the superelevation of the roadway.

Curb, gutter, and sidewalk is normally placed on a foundation of compacted crushed aggregate base course. Before placing this crushed aggregate, the existing soil must be brought to the proper grade and compacted. Any soft, muddy or unstable material must be removed, replaced, and compacted with good stable material. Nonuniform or inadequate compaction of the crushed aggregate or underlying soil will result in settlement of the curb, gutter, and sidewalk creating drainage problems and increased maintenance costs.

When waterways and similar structures are placed on very steep slopes, the use of highly permeable foundation material should be avoided; otherwise piping under the structure can undermine destroy large sections.

B. Concrete Placement and Finishing.

Concrete design, production, placement, and testing is to be performed in accordance with the appropriate sections of the specifications as indicated on the plans.

Immediately prior to placing concrete, the forms and compacted base course should be moistened with water. It is desirable for the material with which the plastic concrete comes into contact to be damp, but standing water (puddles) should not be allowed. For proper curing of the concrete to occur, the mixing water in the concrete must be retained. This is achieved through prewetting and proper curing procedures.

Proper consolidation of the concrete is important and often neglected. Proper vibration of such a small (shallow) mass of concrete is not easily accomplished and often not attempted.

The reason for consolidating (compacting) the concrete is to mold it in and around the forms and imbedded parts such as reinforcement, and to eliminate rock pockets and entrapped air.

Placement is more easily accomplished if the slump is to the high side of the specification range but finishing and forms stripping may be delayed. Concrete should be placed in the forms as close as possible to its final position. Any vibration or manipulation of the mixture should be only that necessary to form a dense, consolidated mass.

Strikeoff or screeding is the process of striking off excess concrete to bring the top surface to the proper grade. In manual methods, the device used is called a straightedge, however, in some instances it may be curved to achieve the desired template. It may be desirable, for instance, for a sidewalk to have a slightly curved surface to facilitate drainage. The screed, or straightedge, is moved across the concrete in a sawing motion as it progresses with a slight surplus of concrete ahead of it to fill the low areas as it passes.

Edging, jointing, and floating all must take place somewhat simultaneously. Edging densifies and compacts the concrete slab next to the form where floating and troweling are less effective, making it more durable and less vulnerable to spalling and chipping. Jointing, when properly done, can control unsightly random cracking. Contraction joints can be formed with the use of a jointing tool or form material and should be approximately 3 mm wide. Expansion joints are normally 20 mm and formed with some type of preformed joint material. Spacing should be as indicated on the plans.

Floating accomplishes several things. It imbeds the aggregate particles just beneath the surface; it removes imperfections in the surface and it keeps the surface open so excess moisture can escape. Floating produces a relatively even texture that has good slip resistance and is a good finish for sidewalks. In some cases it may be necessary to lightly roughen the surface with a broom to achieve a good nonskid surface. Overworking of the surface during finishing should be avoided, as this will bring an excess of water and fine material to the surface and defects can result. Floating, or finishing, should not commence until the plastic concrete has lost its initial sheen of moisture. No water should be added to the surface during the finishing. The tendency is to float the surface too soon while the concrete is too soft.

If slip form installation is used, the Contractor QC plan should address significant quality issues, particularly grade control, foundation preparation and density. Sometimes slipform crews have a tendency to overtake the grading crews.

C. Final Finishing and Curing

Forms should be removed as soon as the concrete has taken its initial set. This will permit the timely repair of minor defects in the surface with mortar (1 part cement/2 parts sand). The curbs should be inspected for irregularities in line and grade. Since the concrete is still plastic, minor adjustments in alignment can be made by placing a long board against the curb and striking it with a sledge hammer.

After final finishing and while the concrete is still moist, it should be cured in accordance with specification requirements. If curing is accomplished with the use of some form of covering to retain the moisture (moist burlap or mats), they must be checked periodically to assure the concrete remains moist for the required curing period (usually 3 days). If curing compounds or seals are used, care must be taken to assure it is sprayed uniformly over the entire exposed surface area of the concrete. The purpose is to seal in the moisture in the concrete so care must be taken to achieve this result. During the curing period, the concrete must also be protected from damage by people and vehicles. Sidewalks being cured with clear or lightly pigmented curing compound are particularly susceptible to pedestrian traffic because to some, it may not appear to be fresh concrete. Clear curing compound normally has a slight pigment that aids in monitoring proper coverage but will dissipate soon after application.

D. Asphalt Installations

Asphalt curbs and waterways usually require an experienced crew and special equipment. Increase asphalt content is necessary since compaction will not be as high as with paving mixes. However, the Contractor should have a mean to get reasonably good compaction and a tight surface texture.

3. Measurement

Concrete curb and curb and gutter combination is usually paid for by the meter measured along the front face of the curb at finished grade elevation. While, in theory measurement should be on an *as staked* or *as ordered* basis, in reality it is easier to measure after construction. However lengths and areas clearly not authorized by the Engineer, should not be paid for.

Measurement is normally continuous through drainage structures and curb cuts (driveways). Sidewalks are usually measured and paid for by the square meter of finished surface. Items often found in a sidewalk such as junction boxes, valve boxes, etc. are normally not deducted from the measured quantity for sidewalk as long as these individual appurtenances have a surface area of one square meter or less. It is always advisable to check the method of measurement for these particular items in the specifications to determine how they should be measured.

4. Documentation

Records should show the date the forms were ready, dates concrete was placed, type of curing utilized, weather conditions, name of inspector and description of work inspected, quantities placed, and any corrective actions that may be taken. A brief narrative of the concrete placement operations becomes invaluable in the event it is necessary to retrace events should some type of failure occur.

Concrete quality records should be kept to reflect the specification requirements in the contract. Should the specifications permit certification acceptance, the certification should be checked to assure specification requirements are met.

9-6.5 Signing, Delineators, And Striping

1. Preliminary Review and Approval

A. Signing.

The Engineer should, when possible, review the plans and specifications applicable to the permanent signing well in advance of the actual placement. The following areas should be reviewed:

- Inspect sign location for possible obstructions to visibility, and possible right-of-way problems.
- Inspect for effectiveness of locations.
- Check to see if sign message is appropriate for situation.
- Check to see if additional signs may be needed to adequately convey guidance, regulation or needed information to the traveling public.

If there are any changes considered to be necessary for complete and accurate signing, the Engineer should coordinate these matters with the appropriate Designer and Construction Operations Engineer.

B. Delineators.

Although delineators are one of the last items to be constructed, it is important to generally review the standards and specifications early on with the Contractor so it is known exactly what hardware is needed from the supplier. The Contractor should also be made aware of its responsibilities related to staking and placing the delineators.

C. Striping.

Although striping is one of the last items to be constructed, it is important to generally review the applicable standards and specifications early on with the Contractor so he/she is aware of the material and equipment needs.

The plans should contain a striping location plan. If not, the Engineer should consult with the Designer for help in arriving at a suitable plan. In some situations the applicable State Highway agency will perform the necessary layout when requested.

If the striping location plan does not provide detailed information concerning location for no-passing zones, the Engineer should not *eyeball* such. *The Manual On Uniform Traffic Control Devices* is very specific concerning layouts for no-passing zones. Special equipment and know how is required to determine where the no-passing zones should be located. Again, consult with the Central Designer or possibly the State Traffic Engineer for help.

2. Construction Inspection.

A. Signing.

The construction inspection should generally consist of the following:

(1). Specifications. Check the sign hardware for conformance with the applicable standard plan and specifications.

(2). Layout & Legend.. Check the sign locations and applicability of sign legends as per the approved plans.

(3). Alignment. Check the sign panel alignment as per applicable standard plan and/or the *Manual On Uniform Traffic Control Devices.*

(4). Night Check. When permanent signing is complete, drive the project at night as a final check as to the clarity and visibility of the signing network.

B. Delineators.

Prior to actual placement of the delineators, the Engineer should discuss with the Contractor the appropriate horizontal spacing and lateral offset for the delineators. Usually the actual staking of the delineators will be done by the Contractor using the spacing guide provided in the plans.

The Engineer should be assured during the course

of delineator placement that the placement locations are adequate. In the absence of a Standard Plan for delineator placement, the Engineer should use the *Manual On Uniform Traffic Control Devices* for delineator placement criteria.

The Engineer should take the necessary precautions to insure that the delineator posts are materially acceptable.

C. Striping.

Prior to actual placement of pavement markings, the Engineer should discuss with the Contractor the general process that will be required to develop a specification product. This discussion should include the following:

(1). Equipment. The requirements for the paint application machine.

(2). Geometrics. The geometrics of the paint stripe, including the stripe width and skip pattern.

(3). Application Rates. The application rates for the paint and beads.

(4). Temperature. The application temperatures.

(5). Preparation. Necessary preparatory work prior to striping.

During the actual placement of paint stripes, the Engineer should randomly check the application rates for the stripes and beads. This check should be recorded appropriately.

3. Measurement

Signs and delineators are usually paid for by each; therefore, no physical measurement is required for pay quantities.

When payment is by the square meter, computations should be based on the dimensions shown in the plans, after occasional verification.

Striping materials are normally paid by the meter for each type of striping. Measurement of broken lines includes gaps. Measurement based on centerline stationing is adequate for conventional roadways.

When paint for striping is paid for by the liter, measurement should be based on the quantity used after a yield check to verify coverage in an acceptable range (plus or minus 10 percent recommended). Wastage or quantities outside the acceptable range should be deducted.

4. Documentation

Adequate recorded notes in a field book bearing a validated acceptance statement for each sign installation along with appropriate certification for sign face material is acceptable as a source document for payment justification. The source document should be referenced in the progress estimate journal when payment is made.

The installed delineators should be physically counted and the actual number recorded in a field book. The field book entry should contain a validated acceptance statement which will be used as the source document for payment justification. The source document should be referenced in the progress estimate journal when payment is made.

The record should also include documentation concerning FLH's physical evaluation of the weight and cross-section properties of the delineator posts. This does not have to be part of the source document.

Documentation should include certifications for beads and paint based on AASHTO standards.

The Contractor should furnish the Engineer with correspondence documenting the total liters of paint used. The Engineer should check the application rate with a yield analysis. The actual quantity for payment along with the yield analysis should be documented in a field book. This and the certifications as discussed above will be source documents for payment justification.

The source documents should be referenced in the Project Summary Book when payment is made.

9-6,6 Slope Protection

1. Preliminary Review and Approval

Section 404 of the Clean Water Act requires permits for the alteration of banks within waters or wetlands. The Project Engineer must be aware of conditions that require a permit and verify that the 404 permit was obtained. Stipulated conditions contained in the permit should be reflected in the plans, and in any event should be adhered to during construction.

Riprap is discussed in the specifications and will generally call for a certain gradation and quality requirements and will probably be paid for under a riprap item. Slope protection may be used to accomplish the same intent but will more than likely be produced from unclassified excavation and may be specially sorted or preserved material paid for as a normal unclassified excavation or embankment item. It will probably not have a specified gradation or quality requirement. References to riprap that follow will also generally pertain to slope protection.

Field conditions unknown to the designer and/or changes in the design may result in change of beginning and ending points for riprap. The area where riprap is to be placed should be reviewed after field staking to be sure intended bank stabilization or erosion prevention will be accomplished. Field changes should fit the 404 Permit, or an amended permit secured. The Project Engineer should notify the Construction Operations Engineer as soon as any permit deficiencies are known or suspected. The permit process can take a long time, so early review is best.

Sources proposed by Contractors for rock riprap should be considered as described in Chapter 5 herein, and the project specifications.

2. Construction Inspection

Foundation trenches, when required, must be constructed and measured for payment as detailed on the project plans prior to placement of riprap. Filter blankets and/or filter fabric, when required, must be placed on the prepared slope prior to placement of riprap. Except as inspector presence is required for these purposes, or to make or review riprap quantity records depending on basis of payment, slope riprap need only be inspected at critical points.

3.Measurement

Method of measurement must be in accordance with instructions found in the specifications. Riprap may be measured in place, weighed, or perhaps be incidental to the excavation item.

4. Documentation

The Project Engineer is responsible for arranging documentation of the required compliance with specifications and for the field measurement notes and computation for all pay quantities. This is often done in a specially designated field book. However, if payment is incidental to another item(s), diary records may well be adequate. If measured in the haul vehicle, ticket books or weighing and receiving ledgers are appropriate. Photographs are particularly helpful after a flood in documenting that subsequently covered riprap was placed.

The source documents should be referenced in the Project Summary Book when payment is made.

9-6.7 Landscaping

1. Preliminary Review and Approval

Commercially produced landscaping materials including seed, fertilizer, mulch and irrigation hardware are normally accepted by certification. Topsoil, sod, and plants may be inspected and accepted on delivery or agreement may be reached with the Contractor for inspection and preliminary approval of the source. The Project Engineer may request assistance from the Construction Operations Engineer if the source is a long way away or if more expertise is needed.

It is important to meet and reach agreement with the landscaping Contractor prior to beginning work. Such agreement should include:

- Use of previously approved or certified materials only.
- Final layout or staking of limits of the work.
- Level of inspection and notice to the Government when work is to be done.
- Limitations of planting seasons.
- Groupings of plant areas for purpose of acceptance and/or beginning of plant establishment period.

If there is a separate landscaping contract related to a construction contract, it is important that the construction contractor be advised of the landscaper's schedule and intentions in order to prepare all areas for planting in a timely manner. Although the two contractors are obligated to cooperate, the Government is obligated to provide reasonable site availability to the separate landscape contractor.

2. Construction Inspection

Landscaping requires intermittent inspection at the completion of various phases. Comprehensive inspection is normally required at the beginning of seeding operations and perhaps for the duration of such operations if the Contractor seems incapable of functioning responsibly without inspection.

A. Seeding and Sod.

The limits of the work must clearly be communicated to the Contractor by stakes or by the continuous direction of the Inspector.

Quantities for seeding should have already been computed by the Inspector so that yield and quantity checks of seed, fertilizer, mulch, etc. can be made.

B. Plants.

The Engineer may locate and stake each individual plant or group of plants, or the Contractor may simply be advised to rely on the plans if the plans are detailed enough to use without staking.

Holes for plants must be prepared in accordance with the plans and specifications including all topsoil, mulch, and fertilizer as required.

Plants that are significantly damaged through mishandling, drying or freezing must be rejected even if they were previously accepted.

C. Establishment Periods.

The beginning and end of establishment periods for each plant or group of plants should be clearly understood by the Contractor and so documented. On large, complex projects, acceptance by large groupings is recommended to avoid the necessity of keeping track of individual plants. Normally, replacement of dead plants is required only at the end of the establishment period, and there is only one establishment period; i.e., a new establishment period is not started if a dead plant is replaced. However, all plants must be simultaneously alive at final acceptance.

D. Watering and Maintenance.

Normally, if there is an establishment period, the Contractor is responsible for watering and maintenance during that period without additional compensation. If payment is provided for watering, the Inspector must exercise some control over when it is needed and how much is needed.

3. Measurement

Items paid by the square meter or area measurement are measured parallel to the ground surface. Measurement should be made prior to installation of the work and copies of computation furnished to the Contractor for use in settlement with its subcontractor.

Plants are normally paid by the unit of each. Payment may be made for planting except that if there is an establishment period, the contract may authorize a retent until the end of the establishment period. A 25 percent retent is suggested if none is specified.

If watering is measured for payment, the Contractor may be requested to keep a daily log of quantities and placement locations. Occasional checks on the adequacy of this log will usually suffice unless there is reason to suspect it is not being properly kept.

4. Documentation

Certifications or inspection reports are required for all materials. Quantity computations for items paid by area may be in field books or computerized computations may be used.

Plants require documentation as to:

- When planted
- Scheduled end of establishment period
- Condition at end of establishment period
- When replaced (if so ordered)

For water, the log completed by the Engineer, or the Contractor if authorized, should show each load, quantity, time, and where placed. If the Contractor is keeping the log, it should be collected and reviewed daily.

9-6.8 Maintenance of Traffic

1. Preliminary Review and Approval

At the time of the Preconstruction Conference, the Contract Traffic Control Plan should be reviewed with the Contractor. Modifications within the latitude of the contract will be made depending on the Contractor's plan of operations and existing field conditions. The Project Engineer will then direct the Contractor in writing, to furnish the required devices.

Prior to beginning construction, the Engineer will reach an understanding with the Contractor relative to the following items:

- The identity of Contractor personnel directly responsible for traffic control and maintenance of devices.
- Procedures for anticipating the need for, and ordering, of signs and traffic control devices. In situations where there is high attrition or substantial lead time in ordering replacements, spare signs and replacements should be ordered and stockpiled.
- Procedures for setting up and removing groups of devices.
- Procedures for inspecting, cleaning and maintaining devices.
- Procedures for off-duty hours inspections.
- Procedures for covering or removal of unnecessary signs.
- Training and procedures to be followed by flaggers.
- Training and instruction of other Contractor personnel.
- Procedures for movement of Contractor equipment through the project.
- Facilities for employee parking.
- Emergency (accident) procedures.
- Storage of equipment and materials.

Substantive points deriving from these discussions should be documented in the project files.

The continuing effectiveness of the Contractor's traffic control procedures will require monitoring by the Project Engineer. This monitoring will be systematic and thorough until it is determined that the Contractor's procedures are adequate. At that point, the Project Engineer's efforts can be reduced to periodic monitoring. Monitoring efforts will include after hours, nighttime, and nonworkday situations.

A dialog should be established between FLH personnel and the local policing authority which will result in feedback on the effectiveness of the traffic control schemes, warnings of potential deficiencies, and advice on possible improvement. The police will be supplied with emergency telephone numbers of the Contractor and FLH personnel who can take action to restore major traffic control devices that are destroyed or damaged.

As a part of normal field reviews, Construction Operations Engineers and other FLH personnel will review the adequacy of the traffic control procedures, discuss findings, and insure necessary corrective actions are taken by the Contractor.

2. Construction Inspection

A. General

All FLH project staff should be cognizant of the quality and effectiveness of the Contractor's traffic control. On complex projects with high exposure, an experienced inspector should be assigned to have primary responsibility for monitoring the Contractor's traffic control. The Contractor however, should not be allowed to let FLH assume responsibility for the traffic control. If this seems to be happening due to lack of commitment by the Contractor, written notice should be provided. The following are guidelines for evaluation of construction traffic control.

Work sites should never present a surprise to the

motorist. Thus, frequent or abrupt changes in geometrics should be avoided. Well-delineated transitions, long enough to accommodate driving conditions and the speeds vehicles are realistically expected to travel, should be provided at lane drops, reductions in roadway or lane width, detours, etc.

The roadway should be kept clear of obstacles as much as possible. Flaggers, other workers, and objects such as traffic-control devices and construction equipment should not be permitted in the roadway except when their useful presence clearly outweighs the hazards they present.

Obsolete pavement markings should be removed in such a manner as to eliminate any misleading cues to drivers under all conditions of light and weather. Where temporary pavement markings are required, consideration should be given to use of highly visible markings that can be easily placed and removed, such as raised reflective markers. On very short-term maintenance projects, removing existing markings for the projects' duration may be more hazardous to both workers and motorists than leaving the markings in place. If so, special attention must be paid to providing additional guidance by other traffic control measures to overcome the misleading effect of the markings left in place. Special treatment should be given to areas where a joint between pavements of different colors or textures may create a misleading cue.

All devices used in the traffic-control setup should be clearly visible to motorists at all times. This means they must be adequately reflectorized or illuminated, as appropriate, and kept clean and in good repair. All devices should be removed immediately when no longer needed. Signs that do not apply to the existing conditions should be removed, completely covered, or turned so as not to be read by passing motorists.

Areas outside the traveled way should be designed to accommodate errant vehicles. Equipment, materials, and debris should be located as far from the roadway as possible, and protected by effective, safe barriers when within 10 meters of the roadway. Barriers are warranted at work site locations where the severity of a collision with a roadside feature would be greater than with the barrier or where encroaching traffic may threaten workers safety.

All vehicles, including workers' and Contractor's, should be prohibited from parking adjacent to the traffic lanes. Special parking areas, well out of the recovery area, should be designated.

Provisions should be made for disabled vehicles or other emergency situations on all but the shortest projects. If it is impossible to provide a continuous, substantial shoulder throughout the project, other alternatives should be provided, such as periodic turn-outs or heavy patrolling of the project.

When a firm schedule and final traffic control plan have been decided on, a public information campaign should be conducted to alert motorists. Often the local government or cooperating agency will assist in such efforts. The amount and type of effort will depend on the type of control (short time, off-peak periods, etc). In addition, cooperation of the responsible enforcement agencies should be enlisted.

Work sites should be carefully monitored under varying conditions of traffic volume, light, weather, etc., to ensure that traffic-control measures are operating effectively.

Figure 9-6.8 is a **Basic Checklist for Construction Traffic Control**, usable by inspectors and Contractor personnel in the monitoring of work zones. Consult the project plans, specifications and design narrative for additional requirements.

Adverse answers to any of these questions should result in action to eliminate or minimize the problem.

B. Analysis of Accident Data

On all projects, and in particular complex projects with high exposure, the Protect Engineer should analyze the circumstances of accidents occurring in and around the work zone.

- This procedure should involve contacts with

the policing agency including a request to obtain copies of accident reports.

- Analysis should be critical of the Contractor's traffic control; i.e., even if an accident was caused by driver error, a better traffic control scheme may have prevented it.

- There should be periodic feedback to Project Development as to the effectiveness of standards for construction traffic control.

C. Detours

For the protection of the public, or for the protection of the highway from damage during storms or particular construction operations, the Contractor may find it advisable to bypass traffic over detours in lieu of maintaining traffic along the improvement as provided by the contract documents. Such a change will require the issuance of a contract modification. The detour may be opened to traffic after the general plan has been approved by proper authority and the contract modification approved. In order that the State or County may be advised, and the public in turn notified several days in advance of the opening, the Project Engineer should notify the COE of the exact date that the highway will be closed and the detour put into use. The same procedure of notification will be followed in the case of special detours shown on the plans. This procedure need not be followed when traffic is bypassed around a structure, or other work, for comparatively short distances and for short periods of time. This type of bypass will generally be considered as maintaining traffic along the traveled way.

Under emergency conditions the Project Engineer may close a highway to traffic for the protection of life and property without prior approval, but the Construction Operations Engineer should be notified as soon as possible. Should such circumstances arise, the Project Engineer must immediately notify the local authority having jurisdiction over the road.

If a highway is closed without prior warning to the public, the Contractor should be required to station flaggers at each barricade to advise the public that the road is closed, why it has been closed, what detours can be used to best reach desired destinations, and the approximate length of time the highway will be closed.

Detours and temporary roads must be adequate to accommodate the volume and type of traffic using them. Unless otherwise proved in the plans, they should be two-way roads of sufficiently high standard that traffic may be maintained with safety and without undue inconvenience to the traveling public. The Contractor cannot be expected to improve the standards or raise the surface of an existing road used as a detour, without compensation. Whenever a detour is to be discontinued and the highway opened to traffic, the Engineer must so notify the jurisdictional authority.

The permission to close or not close a public road to traffic is considered a condition of the Contract and therefore, the Contractor should not be permitted to close a road solely for convenience unless:

(1) The Construction Operations Engineer obtains approval

(2) The cooperating agency concurs and

(3) An equitable price reduction or determination that the closure is in the Government's interest is made.

D. Nonconstruction Traffic Control

No FLH survey or other activities should be attempted on or adjacent to a traveled roadway without traffic warning/control procedures conforming to Part VI of the *Manual on Uniform Traffic Control Devices* and other FLH standards. When such activities are performed adjacent to a construction project the Contractor may be ordered (and paid) to provide proper signing and control. Otherwise the party chief or team leader should arrange for such signs and devices prior to embarking on the assigned task.

3. Measurement

At the beginning of the project the Engineer

should direct the Contractor in writing to order all necessary traffic control devices. Upon delivery of the devices, this document becomes the basis of measurement of quantities. If payment is provided on a lump sum basis, the Engineer should still issue the directive telling the Contractor specifically what is required.

Orders for traffic devices should include replacement or standby devices if high attrition is expected and delays in ordering replacements are anticipated. Once ordered, the Contractor is responsible for reordering and replacing devices at no additional cost.

If the Contractor's maintenance of traffic control devices is deemed unsatisfactory, the Government may withhold payment for such devices and ultimately may make permanent deductions in accordance with FAR Clause 52.246-l2(f). If this is done, there must be written notice of the deficiency giving the Contractor the opportunity to take corrective action.

4. Documentation

Primary documentation includes the directives ordering all traffic control devices and documentation of delivery and acceptance of the devices.

Inspections and deficiencies should be documented in the project diaries or IDR's along with corrective action ordered and accomplished.

Basic Checklist
for
Construction Traffic Control

Advance Signing

1. Are signs clean, visible, and well maintained?

2. Are inappropriate signs removed or completely covered?

3. Do the signs concisely tell the driver exactly what to do (preferred) or what to expect?

4. Is delineation and channelization adequate if the driver fails to heed the advance signing?

Hazards

1. Are hazards in the construction zone delineated properly?

2. Is it clear how pedestrians, bicycles as well as cars are to pass through the construction zone safely?

3. Are there hazardous conflicts with construction traffic?

4. Is opposing traffic clearly and effectively separated?

5. Are "blind" or unexpected hazards given special attention?

6. Is the roadway surface being properly maintained?

Delineation

1. Is the path through the construction zone clearly delineated with drums or other suitable devices.?

2. Is delineation adequate in nighttime or bad weather conditions?

Flaggers

1. Are flaggers clearly visible with advance signing?

2. Are flaggers effectively in control of traffic?

Basic Checklist for Construction Traffic Control
Figure 9-6.8