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Instructions:
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TECHNICAL MANUAL

Construction Manual

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July 2009

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Construction Office

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1-1 General Information

1-1.1 Purpose and Scope of Manual

This manual is published by the State Construction Office primarily as a resource for construction engineering personnel. It is intended as instruction for administering Washington State transportation projects. The manual recognizes established standards and describes accepted engineering practices. The instruction provided by this manual is intended to identify desired results, establish standardized requirements, and provide statewide uniformity in the administration and construction of transportation related contracts.

Construction engineering staff responsible for work on construction contracts will want to be familiar with the guidance and instructions included in this manual. The guidance presented by this manual is intended to complement the requirements of the *Standard Specifications* and the contract provisions and to promote uniformity of results among all Regions of the Washington State Department of Transportation (WSDOT).

Suggestions for corrections, additions, or improvements to this manual, and to the *Standard Specifications or General Special Provisions* are welcomed and encouraged. Any means of communication with the Construction Office will be accepted and reviewed promptly.

1-1.2 Definition of Terms

In using this manual, the interpretation of words or terms should be considered the same as set forth under "Definitions and Terms" in Section 1-01 of the *Standard Specifications*. If a conflict should occur between the guidance or instructions offered by this manual and the specifications or provisions identified in the contract, the latter should always prevail.

1-1.3 WSDOT State Construction Office

The State Construction Office strives for consistent, cost-effective, quality construction through direct support of WSDOT's Regional construction program. The Construction Office coordinates the development of policies and standards, provides training, guidance, oversight, technical expertise and advocacy, introduces innovation, and coordinates and shares information on construction issues.

1-1.3A State Construction Engineer

The State Construction Engineer reports to the Director of Environmental and Engineering Programs and is assigned the responsibility for all WSDOT contract construction projects, except those contracts executed by the Director of Washington State Ferries Division. The State Construction Engineer is responsible for all matters pertaining to contract administration and represents the Director in managing the performance of these contracts. In addition, the State Construction Engineer acts for the Director in approving increases or decreases of work, changes in the work, changes in materials incorporated into the work, authority to accomplish work by force account, extensions of time, and the assessment of any liquidated damages. The State Construction Engineer is responsible for providing guidance and direction to the Regions and State Construction Office personnel who are investigating construction claims and is responsible for the approval of all claim settlements. The State Construction Engineer establishes WSDOT policy relative to inspection and documentation and ensures uniform interpretation and enforcement of the *Standard Specifications* and contract provisions throughout the State. The State Construction Engineer is assisted by three principal assistants for construction as outlined in the Table of Organization shown in Figure 1-1.

1-1.3A(1) Administration

The Construction Engineer, Administration, acts for the State Construction Engineer in setting requirements for contracting, policy, and responding to questions from the regions on all issues pertaining to Division 1 of the *Standard Specifications* and Chapters 1 and 10 of the *Construction Manual*. These include, but are not limited to, time extensions, external civil rights contract changes, prevailing wage issues, documentation, and claims resolution. The Construction Engineer, Administration, also represents WSDOT on task forces with contractor organizations, other public agencies, and at the legislature regarding public contracting issues.

The Construction Engineer, Administration, is assisted by:

- The *Assistant Construction Engineer, Administration*, who reviews time extensions and liquidated damage assessments, represents the Construction Office on external civil rights issues, and the monitoring of the Apprentice Utilization program. The Assistant Construction Engineer for Administration also acts as liaison to various external stakeholders and suppliers.
- The *Documentation Engineer*, who provides guidance for contract documentation and contract payments, as well as providing support to Region Documentation Engineers. The Documentation Engineer resolves issues of material documentation deficiencies for all federal aid projects, is responsible for prevailing wage issues, and is also responsible for evaluating the contract for Acceptance.
- The *Specification Engineer*, who is responsible for maintaining the *Standard Specifications*, and *General Special Provisions*, and provides guidance and review in the writing of Special Provisions.
- The *Construction Administration Specialist, who is responsible for the Construction Manual*. The Construction Administration Specialist also supports the *Assistant Construction Engineer, Administration* in matters concerning goal setting.
- The *Construction Administration Support Engineer*, who is the CCIS System Manager, the Construction Office Liaison to MIS, supports the Region and Project Engineer offices by providing training in the use of CCIS, the CCIS Sequel Database, and the Construction Data Mart. This position also maintains the *Equipment Rental Rate Blue Book*.

1-1.3A(2) Roadway

The Construction Engineer, Roadway, acts for the State Construction Engineer in matters of highway construction such as:

Grading	Drainage	Surfacing
Paving	Gravity Walls	Structural Earth Walls
Geosynthetic Walls	Concrete Slope Protection	RoadsIde Restoration
Guardrail	Signing	Illumination
Traffic Signals	Intelligent Transportation Systems	3-Sided Culverts
Rest Areas	Traffic Control	Slope Stabilization

For the purpose of establishing uniformity between the Regions, the Construction Engineer, Roadway, is responsible for establishing accepted practices for construction, construction engineering, and contract administration for work performed within these fields. Some of these responsibilities include inspecting projects, evaluating reasons for contract changes, approving change orders, conducting or assisting in contract negotiations, investigating complaints and claims, and providing recommendations on major changes to the State Construction Engineer.

The Construction Engineer, Roadway, is assisted by three professional engineers.

1-1.3A(3) Bridges

The Construction Engineer, Bridges, acts for the State Construction Engineer in such matters as:

Fixed Span Bridges	Moveable Span Bridges	Standard Reinforced Concrete Walls
Non-Standard Reinforced Concrete Walls	Soldier Pile Walls	Tie-Back Walls
Soil Nail Walls	Slurry Walls	Cylinder Pile Walls
Noise Walls	Concrete Bridge Deck Overlays	Sign Structures
Signal Structures	Bridge Approach Slabs	Other Projects As Assigned

For the purpose of establishing uniformity between the Regions, the Construction Engineer, Bridges, is responsible for establishing accepted practices for construction, construction engineering, and contract administration of work performed in construction of bridges and other related structural construction. Some of these responsibilities include inspecting projects, evaluating reasons for contract changes, approving change orders, conducting or assisting in contract negotiations, acting as a resource to the Regions for resolving construction related problems, investigating complaints and claims, and providing recommendations on major changes to the State Construction Engineer.

The Construction Engineer, Bridges, is assisted by three professional engineers.

1-1.4 Materials

The Materials Engineer acts for the Director of Environmental and Engineering Programs by directing the materials testing, inspecting, and acceptance functions of WSDOT. Subject to the approval of the Director of Environmental and Engineering Programs, the Materials Engineer; formulates and recommends policies and procedures; directs operating methods to be followed in providing precontract soils, foundation, and materials analysis and testing; recommends and/or approves Pavement Designs; furnishes counsel and technical assistance to the Regional Construction Manager in conducting required materials tests and analysis and provides for periodic review of these test methods and procedures to ensure their conformance to established policies, procedures, and methods; and provides a program that verifies the uniformity of all testing and sampling procedures.

The Materials Engineer is assisted by a staff of professional engineers, administrative personnel, engineers, and technicians.

1-1.5 Region Organization

1-1.5A Regional Administrator

The Regional Administrator represents the Secretary in a geographic area, organizes and supervises a staff of personnel which perform administrative duties and supervise location, design, construction administration, and maintenance of the transportation system within the Region. For the purposes of this manual, the Administrator of the Urban Corridors Office is considered to be a Regional Administrator.

1-1.5B Regional Construction Manager

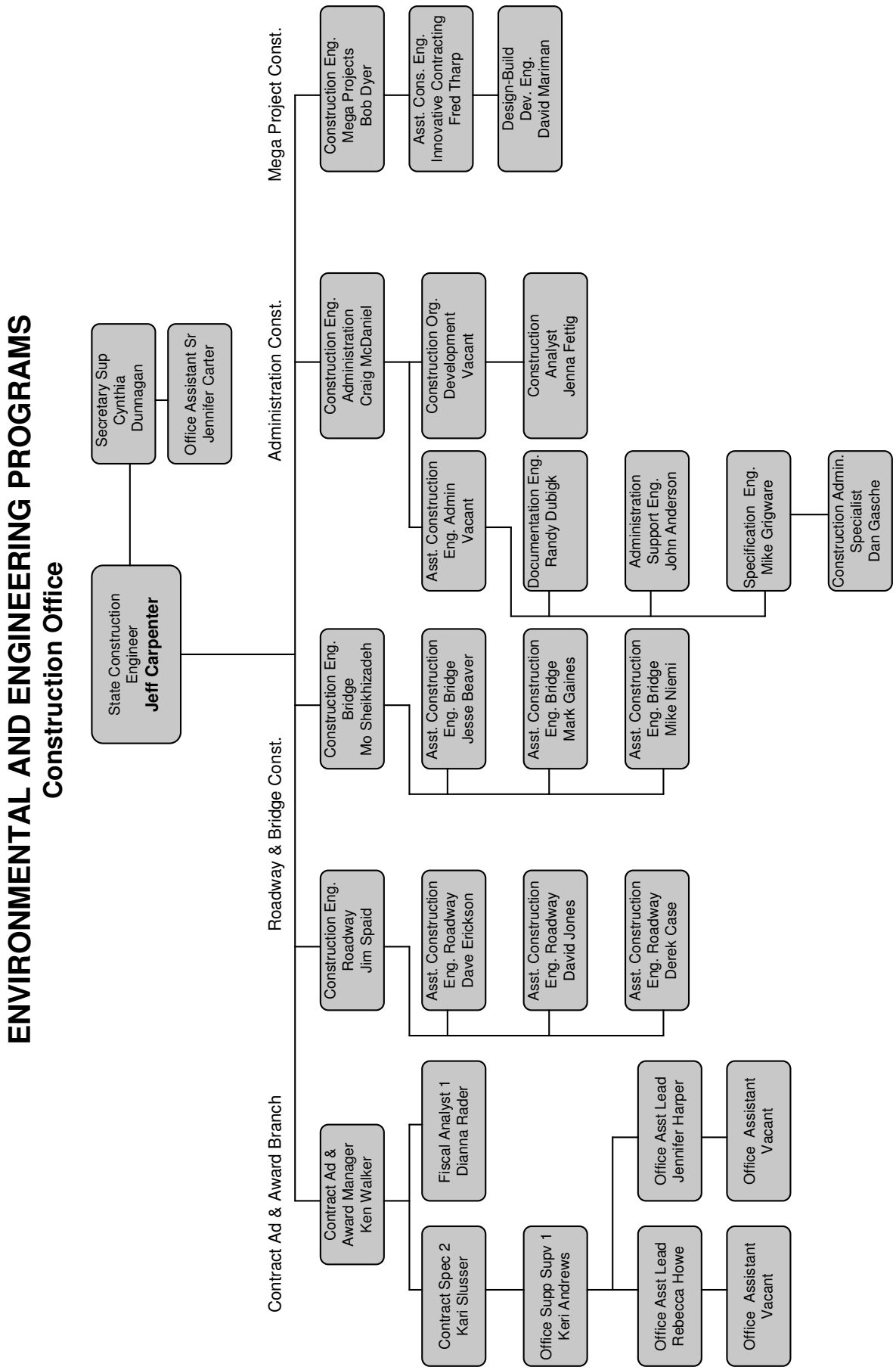
In supervision of construction, the Regional Administrator is assisted by a Regional Construction Manager. The Regional Construction Manager assigns Project Engineers with appropriate supporting personnel and provides training and guidance to the Project Engineers. It is the responsibility of the Regional Construction Manager to ensure that sufficient personnel are provided on all projects at all times to ensure adequate inspection, documentation, and quality controls. For the purposes of this manual, the Deputy Administrator of the Urban Corridors Office is considered to be a Regional Construction Manager.

1-1.6 Relationship With Other Agencies

1-1.6A Federal Highway Administration

The Federal Government provides transportation funding to Washington State through the Federal Highway Administration (FHWA), a division of the United States Department of Transportation. These funds are subject to applicable Federal law, Executive Orders, regulations, and agreements.

The WSDOT contact with FHWA for Construction Administration matters is the State Construction Office. In preparing and approving *Standard Specifications*, general special provisions, and this manual, the Construction Office seeks the review and approval of FHWA. Use of approved provisions and meeting the required outcomes described in the manual become the basis of federal reimbursement.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Contract Spec 2 Kari Slusser
Office Supp Supv 1 Keri Andrews
Office Asst Lead Jennifer Harper
Office Assistant Vacant
Office Asst Lead Rebecca Howe
Office Assistant Vacant

Figure 1-1

FHWA provides oversight of WSDOT work on some projects and has delegated that responsibility to WSDOT on others. A full discussion of WSDOT responsibilities under Stewardship is included in this Manual (Section 1-3.4).

1-1.6B Local Agencies

Cities, counties, and other municipalities within the state may also perform work funded with Federal dollars. When this happens, the money is passed through the Department of Transportation and we will have entered into agreements with the local agencies to provide services. For example, WSDOT will allow the use of testing facilities by a local agency.

1-1.6B(1) Project Engineer Administering Local Agency Project

Occasionally, a WSDOT Project Engineer may be assigned to provide engineering and inspection services on a local agency project. The duties of the Project Engineer will be determined by the actual contract provisions and by any specific agreement made between the Region administration and the local agency. The provisions of this manual may or may not apply, depending on the situation.

1-1.6B(2) Local Agency Administering Its Project on State Right of Way

In some cases, WSDOT may grant approval for a local agency to construct a facility on State Right of Way using local agency staff and contractors. (For example, a city funded overpass of an interstate). When this happens, a Project Engineer will be assigned to provide oversight of the local agency work. The Project Engineer is expected to assure that the local agency provides the same level of engineering and inspection that State employees would accomplish. While the Local Agency may have different administrative provisions with respect to risk-sharing and submittal requirements, all of the technical aspects of the *Standard Specifications* and this manual must be met.

1-1.6C Other Federal, State, and Local Agencies

The design and construction of transportation improvements often incorporates locations and features that fall within the jurisdiction of other agencies. It is the policy of WSDOT to cooperate with all agencies as partners in the completion of each project, recognizing and complying with each agency's legal requirements. The Project Engineer shall cooperate with local authorities to help ensure that the contractor complies with local laws, ordinances, and regulations. However, unless specifically allowed in the statutes and the contract documents, no WSDOT employee shall engage in any kind of enforcement of laws, rules, regulations, or ordinances which are the responsibility of other agencies. As WSDOT attempts to earn confidence and build trust with resource agencies and the public, it is critical that we take the proper actions when we are aware of an issue. When WSDOT employees observe something which is questionable or appears to not be in compliance with local laws, ordinances, and regulations, it shall be brought to the Project Engineer's attention. The Project Engineer is responsible for bringing it to the Contractor's attention for proper action. Rely on the Regional and Headquarters expertise and the appropriate agencies when dealing with complex issues such as environmental compliance, safety, or hazardous materials.

1-1.6C(1) Highways over National Forest Lands

WSDOT has entered into a Memorandum of Understanding (MOU) with the United States Forest Service (USFS) and the Project Engineer is required to do the following when performing work on National Forest Service Lands:

1. Represent the department in all matters pertaining to the project.

2. Confirm that the USFS has been notified of the project advertisement and award.

3. Notify and obtain approval from the USFS for any changes in the project that will affect National Forest System Lands, beyond that of the original contract.

4. Notify the USFS when the project nears completion, at which time the USFS will indicate if they choose to participate in the final review of the project.

1-1.7 Relating to the Public

Public confidence is enhanced by WSDOT personnel being responsive to reasonable requests for information, providing timely advanced notice of possible impacts, and reducing inconvenience to traffic while maintaining worker safety. When possible, the Project Engineer should rely on resources such as Regional Public Information Officers and the State Office of Communications and Public Involvement. If there is concern or reason to question the confidentiality or sensitivity of the information requested, consult with your supervisor or seek the advice of the Attorney General's office.

1-1.8 Safety

Safety is not optional in WSDOT. No employee will be permitted to disregard applicable safety and health standards of the State Department of Labor and Industries or other regulatory agencies.

The Secretary of Transportation's Executive Order E 1033.01 provides direction to all WSDOT employees to adhere to the following basic safety provisions in every work activity:

- Participate in your work group safety plan (or Safety Management System for WSDOT Ferries Division employees).
- Look for ways to prevent accidents.
- Immediately identify hazards and safety concerns.
- Always use personal protective equipment.
- Promptly report all injuries.

The Order also states that all employees at WSDOT Ferries Division are already covered and shall continue to be covered by the existing Ferries Division Safety Management System. Therefore:

- All Ferries Division employees will refresh their knowledge of existing Safety Management System procedures and shall follow them accordingly.

- A concerted effort will be made to address existing and new Safety Management System safety reports in a timely manner.
- All Ferries Division employees shall address issues of concern with existing safety procedures using the existing Safety Management System reporting program.

All other WSDOT employees are covered and continue to be covered by the policies and procedures in the *WSDOT Safety Procedures and Guidelines Manual* M 75-01, and other related policy documents. Therefore, a pre-activity safety plan is required prior to performing any new field work. Office staff will conduct a hazard assessment and mitigation plan for all office environments.

Since WSDOT employees on transportation construction projects are routinely exposed to a variety of hazards, they must take adequate safety precautions at all times. The following items represent common activities that workers or work crews may encounter, and should be addressed in pre-activity safety plans as needed.

- The employee shall ensure that an area is safe before entering it for the purpose of inspection. For example, a deep trench must be adequately shored and braced before entering it.
- Aggregate production and material processing plants should be inspected for safety hazards. Corrective measures should be called to the attention of the Contractor or producer. Corrections must be completed before WSDOT personnel will be permitted to proceed with entry or work upon the premises.
- The employee must, at all times, watch for backing trucks and not depend upon hearing alone for warning. The noise of plants and other equipment often make it impossible to hear trucks approaching and the truck driver's vision area is restricted when backing a truck.
- Parking WSDOT vehicles too close to the path of construction equipment, behind standing equipment, or in other hazardous locations is not permitted.
- Where traffic is maintained in work zones, care must be taken to avoid approaching traffic when it is necessary for inspectors and others to step onto or cross the traveled portion of the roadway. Whenever possible, work activities, ingress and egress, should be conducted within the relative safety of the work zone.
- WSDOT employees working on foot in the highway right of way and other areas exposed to vehicular traffic must comply with the high visibility clothing requirements of Section 4.2, Chapter 3, of the *Safety Procedures and Guidelines Manual* (M 75-01.10).
- Where the engineering crew is working adjacent to traffic, without positive barriers, the work area should be marked with proper signs and traffic control devices as shown on the appropriate Traffic Control Plan (TCP). The crew may be protected by a certified flagger or spotter as needed.
- When the engineering crew is working under the protection of the Contractor's flaggers and signs, other signs may not be needed, but a "STOP"/"SLOW" paddle should be available for use in special situations. Good communication with the Contractor and Flagger is needed to ensure that they are aware of crew activities within the work zone.
- A survey crew is typically exposed to traffic hazards and should conduct survey work under approved TCPs from the *Work Zone Traffic Control Guidelines* (M 54-44). The Region Traffic Office will assist survey crews with TCPs for situations not covered in this publication.
- During blasting operations, employees are instructed to seek cover at least 500 feet from the location of the blasting.

In addition to the above requirements for workers and work crews, supervisors also have the following responsibilities:

- Each supervisory employee is charged with the responsibility of providing safety leadership at all times and safety enforcement when necessary.
- Supervisors shall give thorough instructions to employees under their jurisdiction on the safe use of tools, materials, and equipment and the safe prosecution of work on construction projects.
- The Division of Occupational Safety and Health requires that every foreman, supervisor, or other person in charge of a crew have a valid first aid card.
- When employees are injured on the job to the extent that the services of a doctor are required, the Regional Safety Officer shall be notified immediately.
- When traffic control measures are necessary, approved Traffic Control Plans (TCPs) should be used in conformance with the *Manual on Uniform Traffic Control Devices,* as adopted by WSDOT. Supervisors should ensure that the appropriate TCP is used and that the necessary signs, devices and equipment are available.

1-1.9 Archaeological and Historical Objects

It is both National and State policy to preserve historical or prehistorical objects and ruins. These objects and ruins may include sites, buildings, artifacts, fossils, or other objects of antiquity that may have particular significance from a historical, cultural, or scientific standpoint.

If provisions for archaeological and historical salvage have not been made in the contract and it appears that significant historic or prehistoric objects or ruins have been or are about to be encountered, the Project Engineer should immediately take steps to preserve and protect the objects or ruins. Once the objects or ruins have been sufficiently protected, the Project Engineer should immediately notify the Region Construction Manager, who will provide any necessary initial assistance to the Project Engineer. Where the Region determines appropriate, the Project Engineer will contact and inform through existing Region environmental staff, the cultural resources consultant, the State Historic Preservation Officer (SHPO), FHWA, and affected tribes of the discovery. The Project Engineer will also help facilitate any on-site meetings for the appropriate parties should either FHWA, SHPO, or the cultural resources consultant believes it necessary.

1-1.10 Construction Work in International Boundary Strip

The International Boundary Commission of Washington, D.C., by treaty with Canada, has the exclusive jurisdiction of the 20-foot boundary strip, 10 feet on each side of the International Boundary. Any construction work within this strip must be with the exclusive permission of the International Boundary Commission (IBC). Boundary monuments are not to be moved or disturbed in any manner without the expressed approval of the IBC. It is expected that permission for all work within the boundary strip will be obtained from the IBC during the design stage of a project. However, it is the Project Engineer's responsibility to ascertain that permission has, in fact, been obtained from the IBC for all work performed within the boundary strip. The Region shall be immediately notified if, upon construction, it is found that permission has not been obtained to relocate boundary markers or perform construction work in the 20 foot boundary strip.

1-2 Contract Administration

1-2.1 Proposal and Award of Contract

1-2.1A Contract Proposal and Bids

When the design phase of a project is completed and funding has been secured, the public is then notified that WSDOT is ready to accept bids for completion of the work involved. This notice is accomplished by publishing an advertisement for the project, along with an invitation to bid the work, in the "*Daily Journal of Commerce*". The advertisement includes a specific date and time for the opening of bids along with the necessary information for obtaining plans, specifications, and bid documents. Once advertised, these plans and specifications are then made available to all contractors who wish to study the project. Contract proposal forms or bid documents are also furnished, but only to those prospective contractors who have been prequalified to bid on the types and quantities of work involved. Once bids have been opened, an announcement in the "*Daily Journal of Commerce*" will also be made identifying the "Apparent Low Bidder". Specific information regarding the advertisement phase and bidding procedures can be found in the *Ad & Award Manual,* M 27-02

If the Project Engineer determines that prospective bidders may have difficulty locating the project or determining the project limits, the Project Engineer may choose to post the project limits. If this is determined necessary, signs similar to those illustrated in Figure 1-3 should be used.

Section 1-02.4 of the *Standard Specifications* requires that all requests for explanation or interpretation of the contract documents be submitted in writing. Anytime the answer to a question from a prospective bidder would provide additional information that would not be available to all bidders, the Project Engineer should immediately contact the Region Construction Manager or Region Plans Office in order to facilitate the preparation of an Addendum. Answers to such questions must be provided to all bidders in the same manner. If the question has to do with generic issues such as office procedures (for example, methods of payment calculation or handling requests for information,) the answer may be provided directly to the questioning party without involving other bidders.

All questions from prospective bidders regarding an advertised project should be referred to the Project Engineer listed in the "Notice to All Planholders" for a complete response. The Project Engineer will coordinate the effort to determine if any requested information needs to be addressed by an addendum.

1-2.1B Award and Execution of Contract

Bids for the contract are opened at a public meeting where each prospective bidder's proposal is read and the Apparent Low Bidder is announced. Within 45 calendar days of bid opening, the proposals will be closely reviewed and the contract will be awarded to the lowest bidder deemed responsive. In accordance with Section 1-03 of the *Standard Specifications*, the successful bidder is then allowed 20 calendar days to return the signed documents that are necessary to enter into a contract with WSDOT. The Contract Administration and Payment System (CAPS) Unit of Accountability & Financial Services (AFS) sends the awarded contract to the Contractor for execution within 3 days of award. Additional copies go to the Region, State Construction Office, Bridge and Structures Office, other internal WSDOT divisions and railroads as needed.

After these documents are returned to WSDOT, the contract must be approved and executed. No proposal submitted by a Contractor is binding upon WSDOT prior to the date of execution by WSDOT. No work is to be performed within the project limits or WSDOT furnished sites prior to the execution of the contract by WSDOT. Any work that is performed by the Contractor outside of these areas, or any material that is ordered prior to WSDOT execution, is done so solely at the risk of the Contractor.

In order to ensure timely notification to the Contractor regarding execution of the contract and authority to proceed, the following procedure is used:

1. Immediately after execution of the contract documents by WSDOT, the CAPS Unit of AFS or (for Region Ad & Award projects) the Region Plans Office will e-mail notification to the office administering the contract (the Regional Construction Manager's Office, the Director of Terminal Engineering, or the Architecture Office). The CAPS Unit of AFS also notifies, by memorandum, the National Association of Credit Management, and internal interested parties that the contract has been executed and/or the work may proceed.

2. The Regional Construction Manager or a representative should contact the Project Engineer's office as soon as notification is received. The Project Engineer should then contact the Contractor and provide notification of the execution date. The date, time, and method of notification in all instances should be recorded in the project diary.

3. Following the initial contact, the CAPS Unit of AFS will return fully executed copies of the contract to the Contractor.

1-2.1C Preconstruction Meetings, Discussions

The Project Engineer is required to communicate with the Contractor for the purpose of discussing the project and exchanging a variety of information. Depending upon the complexity of the project, this information can be exchanged in any combination of the following methods:

- Information packets provided to the Contractor
- Letters transmitting information
- Informal meetings
- A single multipurpose formal meeting
- Several formal meetings with different purposes

If the Project Engineer decides that a formal meeting is necessary in order to successfully begin work on the project, a meeting should be arranged as soon as practical after the contract is awarded and the Contractor has organized for the work.

In the case of a project that includes utilities to be adjusted, relocated, replaced or constructed by a utility, or their contractor, during the performance of the contract, the Project Engineer shall facilitate a mandatory utility preconstruction meeting with the Contractor, all affected utility owners and their contractors prior to any on-site work. The Project Engineer should request assistance from the Region Utilities Engineer for help in getting utilities to attend this meeting. This meeting should include a discussion of all utility work schedules, in order to enable the utilities and the Contractor to coordinate their work, resolve schedule conflicts, and eliminate delays.

All information exchanged should be documented in the project records, by formal meeting minutes, by file copies of letters, or by diary entries.

The nature, amounts, and methods of communication with the Contractor are left to the Project Engineer. As a minimum, the following subject areas should be covered during the preconstruction time period:

- CONTRACTOR WSDOT RELATIONSHIPS

  The Project Engineer should begin to develop a positive and effective relationship with the Contractor as soon as the contract is awarded. This is also a good time to introduce the concept of "Partnering" if it has not already been introduced on the project. The Project Engineer should strive to create an environment that encourages a cooperative approach to completing the project. This can be helped by beginning the development of a team consisting of both the Contractor's and WSDOT's project people. The level of authority delegated to each member of the Project Engineer's staff should be discussed with the Contractor. The level of authority of each member of the Contractor's staff, in particular regarding change orders, should be discussed. In addition the methods of establishing the Contractor's Performance ratings can be reviewed (Manual M 41 40) (see Chapter 1-2.8F of this manual for additional information). The Contractor should also be informed that there is an opportunity to evaluate the WSDOT construction process as well.

- ENVIRONMENTAL COMMITMENTS

  If there are commitment files for the project, these should be made available and discussed with the Contractor. Any references in the *Standard Specifications* or the special provisions to environmental requirements or permits should be discussed. The Contractor's responsibility to obtain any local agency permits should also be discussed. If rock crushers are involved in the project, the State Department of Ecology registration requirements should be discussed (WAC 173-400). In addition, a written record of this discussion should be sent to the regional office of the State Department of Ecology so that they are aware of the timing and location of the rock crushing operation.

- ORDER of WORK AND TIME SCHEDULES

  In order for the Project Engineer to set up the required crews, arrange for any special inspections, provide timely reviews of submittals, etc., the project office must be made aware of the contractor's schedule of work. In addition the contract specifications may include specific requirements for sequencing or durations for some items of work. The contract requirements for progress schedule or time for completion in accordance with Section 1-08, or as amended by the special provisions, can also be discussed.

- SUBCONTRACTORS AND LOWER-TIER SUBCONTRACTORS

  In accordance with Section 1-08.1 of the *Standard Specifications*, the Project Engineer needs to become aware of the Contractor's plans to delegate portions of the work to subcontractors. These plans must conform to the condition of award, if any, related to disadvantaged business enterprise participation. The Project Engineer should explain the requirements and process involved for subcontractor and lower-tier subcontractor approval, including the prevailing wage rate requirements outlined in the contract documents (see Chapter 1-2.6 of this manual), the requirement to verify that each subcontractor meets the responsibility criteria outline in 39.04 RCW and possesses any license required by 19.28 RCW or 70.87 RCW. WSDOT/Contractor/Subcontractor relationships should also be discussed. The Project Engineer should remind the Contractor that there is no contractual relationship between WSDOT and the subcontractors. All subcontractor correspondence with WSDOT should pass through the Contractor for submittal to WSDOT or vice versa. Contractor representation should also be discussed. It will be necessary for the Contractor to be represented at the job site at all times, even when there is only subcontractor work in progress.

- UTILITIES, RAILROADS, AND OTHER THIRD PARTIES

  If the project affects or is affected by third party organizations, the Project Engineer must advise the Contractor about the relationships with the third parties and the expectations they hold regarding the actions of both WSDOT and the Contractor. The Project Engineer may wish to arrange face-to-face meetings with representatives of affected third parties. In the case of

Contract Number: _____ Project Engineer: _____

Contractor: _____

Subject	Communication Type (Letter, Min. of Mtg., Info. Packet, Diary) Completed (Date)	File Location
A. Contractor/WSDOT Relationship		
1. General Discussion		
2. Contractor Performance Rating		
3. C.O. signature authority (form)		
B. Environmental Commitments		
1. Commitment Files		
2. Contract Provisions		
3. Rock Crushers		
C. Order of Work and Schedules		
1. Discuss Plans for Prosecution		
2. Formal Schedule Requirements		
3. Completion Date		
D. Subcontractors and Lower Tier Subs		
1. General Discussion		
2. Condition of Award		
3. Paperwork Process		
4. 39.04 RCW, 19.28 RCW, 70.87 RCW		
5. WSDOT/Prime/Sub Relationship		
6. Correspondence through Prime		
7. Prime represented on site		
8. WSDOT will address sub concerns		
E. Utilities, Railroads, and Other Third Parties		
1. Existing Agreements described		
2. Commitments, Obligations, Notices		
3. Underground Locator Service		
4. Insurance Requirements		
5. Merchantable Timber (Dept. of Revenue)		
F. Safety and Traffic Control		
1. Discuss Contractor's Safety Program		
2. Traffic Control Requirements		
3. Police Relationship		
4. Job-Specific Safety Concerns		
5. Off-site Hauling Restrictions		
G. Control of Materials		
1. Material Approval Required		
2. Source Approval for Aggregates		
3. Acceptance Procedures		
4. Fabricated Items		
5. Installation without Certifications		
H. Other Submittals		
1. Job-Specific List and Discussion		
2. Delay of 1st Progress Payment		
I. Equal Employment Opportunity and Training		
1. Contract EEO Requirements		
2. Contract Training Requirements		
3. Training Plan/Trainee Appr. Process		
4. Monitoring and Reporting		
J. Wage Rate Administration		
1. Prevailing Wage Rates Required		
2. Payrolls, Wage Rate Interviews		
3. Davis-Bacon Investigations		
K. Forms		
1. Describe Required Forms		
2. Provide supply of forms		
L. Deferral of Payments (Std. Spec 1-06.3)		
1. Deferral Triggers		
2. Notification Method (of intent to defer)		

Preconstruction Communication Checklist

utilities, reference should be made to the underground locator services and the requirements to utilize them (see RCW 19.122). If WSDOT has agreed to notification time limits, these should be communicated to the Contractor. If special insurance is required by any agreements with third parties, then these requirements should be pointed out to the Contractor.

If utilities are to be adjusted, relocated, repaired or constructed by the utility during the performance of the contract, the Project Engineer shall facilitate a separate, mandatory, utility preconstruction meeting with the Contractor, the utility, and their contractors.

- SAFETY AND TRAFFIC CONTROL

  The Contractor's safety program should be discussed as outlined in Section 1-2.2I(3) of this manual. WSDOT has an interest in safe operations on the job and the Project Engineer should make clear that this interest will be protected. As part of a discussion of specific safety requirements of the particular work, safety considerations for workers and WSDOT personnel, such as safety zone requirements, vehicle intrusion protection, fall prevention, closed spaces, hazardous materials, work around heavy equipment, etc., should be addressed. The need for control of speed on all construction equipment should be emphasized.

  The Project Engineer should describe WSDOT's traffic requirements. The Contractor's Traffic Control Manager (TCM), Traffic Control Supervisor (TCS) and WSDOT's traffic control contact person should be identified and their responsibilities and authorities clearly stated. Any traffic control requirements that are unique or restrictive should be emphasized and addressed by the Contractor with respect to construction operations. Unacceptable delays to traffic should also be discussed.

  The *Manual on Uniform Traffic Control Devices*, as adopted by WSDOT, is the legal standard for all signing, traffic control devices and traffic control plan requirements on the project. These standards have been incorporated into the project Traffic Control Plans (TCPs.) If the Contractor chooses to use these TCPs, they must be formally adopted in writing as required in Section 1-10.2(2) of the *Standard Specifications*. If the Contractor wishes to use some other traffic control scheme, then that plan must be submitted and approved in advance.

  Flaggers and their intended locations must be included in the plans. When Flaggers are utilized, they must have a current flagging card and shall be equipped with hard hats, vests, and standard stop/slow paddles as required in Sections 1-07.8 and 1-10.3 of the *Standard Specifications*. Overuse of flaggers is not appropriate as "catch all" traffic control and should be discouraged. Safety of flaggers, through use of physical protection devices where practical, proper flagging methods and formulating an emergency escape plan, should be emphasized.

  The Contractor and the Project Engineer should establish communication with the Washington State Patrol (WSP) and local law enforcement agencies. Law enforcement advice about traffic control should be considered. Arrangements for all law enforcement agencies to notify the project office about accidents near, or in, the construction area should be established, if possible. If WSP traffic control assistance is to be used, a general discussion of strategy and responsibilities should be included.

  Off site hauling can pose a safety hazard to the public. WSDOT will cooperate with law enforcement agencies in the enforcement of legal load limit requirements and the covered load regulations. The Project Engineer should discuss this with the Contractor before any hauling begins.

- CONTROL of MATERIALS

  The Contractor should be reminded of Section 1-06.1 of the *Standard Specifications*, requiring the Engineer's approval of all materials prior to their use. In order to expedite these approvals, the Contractor should be encouraged to make these requests as early as possible. The Project Engineer should provide the Contractor with a current copy of the Record of Materials (ROM) for the project. The Project Engineer should discuss the ROM with the Contractor, covering the various requirements for sampling, catalog cuts, shop drawings, certification requirements, etc., which may be needed for approval of materials prior to their use. If the project includes Federal funds, the Project Engineer should discuss the requirements of "Buy America" and WSDOT Form 350-109 EF, *Certification of Materials Origin*. The requirements of Section 1-06.2 of the *Standard Specifications* for ongoing acceptance of approved materials prior to their being incorporated into the work, should also be discussed. If fabricated items will be needed, the inspection process for fabricated materials, including shop drawing approvals and notification requirements for fabrication inspectors, should also be outlined. The requirements of Section 1-06.3 of the *Standard Specifications* that require manufacturer certifications prior to use of the materials should also be reviewed.

  The Contractor should be reminded that, in order to avoid deferred progress payments for portions of work not completed, all necessary documentation for approval of materials and required certifications must be received and accepted prior to their use. A method of notification of intent to defer payment should be discussed with the Contractor, and an agreed upon method documented in the project files.

- OTHER SUBMITTALS

  Discuss any other submittals that may be needed during the course of the contract. This may include Falsework and Forming Plans, Traffic Control Plans, Temporary Water Pollution/Erosion Control Plans, Schedules, Installation or Operating Procedures, or other Contractor initiated items requiring WSDOT review and/or approval. There are requirements for a number of submittals which, if not satisfied in a timely manner, could delay the initial progress payment. These include

the Statement of Intent to Pay Prevailing Wages, the Progress Schedule, and the Training Plan. There may be others depending on the work to be done and as required by the contract provisions. The Project Engineer should identify and remind the Contractor of these requirements and the potential for deferred payments.

- DBE PARTICIPATION / EEO / TRAINING

  The Project Engineer should briefly discuss and answer any questions the contractor may have with regard to the efforts, reports, and monitoring necessary to ensure successful performance for DBE *Participation, EEO, & Training*. Chapter 1-2.7A provides a breakdown of these various programs and the general requirements each contains. However, the specific requirements and contractor performance information are included in the *Standard Specifications for Road and Bridge Construction*, the Amendments included in the contract, as well as the contract specific special provisions titled *Equal Employment Opportunity Responsibilities*. If additional assistance or information is necessary, the Project Engineer could also request assistance from the Region EEO Officer, the State Office of Equal Opportunity, or the State Construction Engineer's Office.

- WAGE RATE ADMINISTRATION

  Advise the Contractor of the requirement to pay prevailing wage rates as identified in the Contract. Advise the Contractor that it is their responsibility to work directly with Washington State Department of Labor and Industries (L&I) for approval of the Statement of Intent to Pay Prevailing Wages (SI) and Affidavit of Wages Paid (AWP) and that:

  - The SI and AWP will be on forms provided by L&I.
  - The forms will be obtained from L&I or can be filed electronically with L&I online at www.LNI.wa.gov/prevailingwage, if the contractor is registered by L & I to file electronically.
  - The contractors, subcontractors, lower-tier subcontractors, suppliers, manufacturers, and fabricators that are required to submit SI and AWP will pay the approval fee directly to L&I.
  - The Contractor will provide the Project Engineer a copy of the approved forms (SI, before any payment can be made for the work performed and all AWP, before any retained percentage can be released). If payrolls are required, establish submittal deadlines in accordance with Section 1-07.9(5) of the *Standard Specifications*. Describe the wage rate interview process. Describe the required job site posters and provide them to the Contractor (See Chapter 1-2.6 of this manual). On all Federal-Aid contracts, the Project Engineer must remind the Contractor that the work falls under the guidance of Davis-Bacon and Related Acts and the Contract Work Hours and Safety Standards Acts. As indicated in Chapter 1-2.6C of this manual, the U.S. Department of Labor may conduct investigations to ensure compliance with these Acts.

- FORMS

  The Project Engineer should provide the Contractor a description of all required forms, giving the Contractor an initial supply of each. Additional forms required by the Contractor over the course of the work should be provided by the Project Engineer upon request by the Contractor. Remind the Contractor that all form submittals, including those of subcontractors, lower-tier subcontractors, and suppliers, should be routed through the Prime Contractor for submittal to WSDOT.

- SUMMARY

  While these issues are to be discussed with the Contractor in some manner at the beginning of each contract, the Project Engineer is free to select the most effective method of doing so. A formal preconstruction conference may or may not be the best solution. Perhaps a single meeting is adequate or several meetings may be required. The entire preconstruction communication may also be covered in a short meeting between the Project Engineer and the Contractor. The Project Engineer is responsible to address these subjects, inform the Contractor in some manner and maintain a written summary of the preconstruction meetings or discussions for the contract files.

  The Contractor and Project Engineer may be knowledgeable about those normal requirements listed above. In this situation, some items need only be listed in a mailing as a convenience to the Contractor's staff. Unique features, constructability, and third party coordination should be focused on with as many of the interested parties as can be assembled.

  The key is effective communication, getting the right message to the necessary people. Additional meetings may be required as people change, as new facets of the work become imminent, or as the project goes into a second or third season. In order to assist this process, a checklist has been developed as a tool for the project office's use. It can be used to help identify the issues and track them for completion through the various preconstruction communications. See Figure 1-4.

1-2.2 Project Engineer's Relationship and Responsibilities

1-2.2A Assignment

The Region will appoint a Project Engineer to act as the authorized representative of the Secretary of Transportation for each contracted project. After the contract has been executed by WSDOT, the Region may provide the Contractor with written confirmation of the name and address of the Project Engineer assigned. (The Region may rely on the special provisions and forego this letter, unless a change is made.) If a letter is sent, the Contractor should be reminded to send all correspondence and forms regarding the project to the Project Engineer.

The Project Engineer is then responsible for enforcement of the contract specifications and provisions and the completion of all work according to the plans. The Project Engineer supervises the work of WSDOT personnel assigned to the project and ensures that they perform their

work in accordance with the Plans, specifications and all applicable WSDOT policies. The Project Engineer is responsible for keeping complete and accurate records of all construction data and work progress, preparing progress and final estimates, and preparing other records necessary for a complete documentation of the project, including a performance evaluation of the Contractor (see Chapter 1-2.8F).

Changes made to the project or substitutions for work detailed in the contract plans or specifications, must be made in accordance with the requirements of Section 1-04 of the *Standard Specifications* and the guidance provided by Chapter 1-2.4C of the *Construction Manual*. The Project Engineer should review the project on a regular basis with the Regional Maintenance personnel so they have an opportunity to present any maintenance problems that may arise.

The Project Engineer must, at all times, stay aware of the design implications of actions taken during construction. Change orders and undocumented field adjustments can affect the design standards utilized. If change orders or field adjustments affect the project design criteria, the changes must be documented, approved and incorporated into the Design Documentation Package. The Project Engineer shall contact the Region Project Development staff for guidance in documenting these design criteria changes.

1-2.2B Responsibility as a Public Official

The Project Engineer is responsible for a project that is affected by Federal, State, Tribal, and local laws, ordinances, and regulations. While no one could be familiar with every requirement, the Project Engineer should seek to understand as much as possible. Beyond that, the prudent Project Engineer will look for guidance and seek information related to whatever current issue is at hand. Legal requirements could affect State employees, those employed by the Contractor in performing the work, the materials to be incorporated, the equipment that is used on the project, or could otherwise affect the conduct of work.

If the Project Engineer discovers that any provision of the contract, plans, or specifications appears to be inconsistent with a law, ordinance, or regulation, the inconsistency should be investigated and, if appropriate, referred to the Region Construction Manager. The Project Engineer should, at all times, strive to comply with all laws, ordinances, and regulations.

1-2.2C Relationship With the Contractor

The Project Engineer must be familiar with the conditions of the contract, special provisions, and specifications for the work. The Project Engineer must attend to any reasonable request of the Contractor, i.e., furnishing grades, stakes, plans, etc., whenever necessary and within reason. In general, the Project Engineer should do all things necessary to enable the Contractor to work to advantage and without delay. The Project Engineer should not set any stakes or furnish to the Contractor any plans which are the responsibility of the Contractor to set or provide. The Project Engineer must ensure that the Contractor performs the work in accordance with the contract provisions, plans, and specifications.

Integrity on the part of all employees is essential. The attitude of the Project Engineer and staff toward the Contractor and the Contractor's personnel should be one of cooperation, consistent with the requirements of the specifications. It should be recognized that both the State and the Contractor have explicit rights under the contract and that both parties must respect those rights. The Contractor is generally trying to fulfill the contract honestly, and errors or difficulties, which may arise are usually due to a lack of information or a misunderstanding. If conflict should occur, the Project Engineer should make every effort to determine the cause of the conflict and make appropriate corrections.

1-2.2D Relationship With Other Government Agencies

Other agencies responsible for such things as flood control, land development, stream navigation, pollution, etc., may be affected by the work. The Project Engineer should attempt to determine that the Contractor has complied with all regulations known to be in effect. The Project Engineer is encouraged to obtain a copy of commitments from the project design file. This should be available from a region or project design office. This file should contain environmental permits, real estate commitments, utility commitments, design deviations, and other good important information. When the Contractor is specifically required by the contract to obtain an approval document from other agencies, the Project Engineer must confirm that the document was received. Other approvals required of the contractor, but not mentioned in the contract documents should be confirmed to the extent that the requirements are known and the confirmation is possible. If a representative of an agency visits the project, the Project Engineer or an inspector should accompany the representative on the visit.

In carrying out construction work in forested areas, the Project Engineer should encourage the Contractor to comply with all Federal and State forest rules and regulations governing the protection of forests and the prosecution of the work within both national and State forests. The Contractor must take all precautions necessary to prevent and suppress forest fires. The Project Engineer shall report to the nearest forest fire warden at the earliest possible moment, the location and extent of any fire and shall take immediate steps to control the fire if practicable.

Construction work in or near streams, rivers, or other bodies of water may require a permit from the State Department of Fish and Wildlife. In an agreement with the agency, for each project requiring a Hydraulics Project Approval (HPA) (RCW 75.20.100), the State Department of Fish and Wildlife will issue the permit to WSDOT only and not to its contractor. One representative of the State Department of Fish and Wildlife will be assigned to coordinate requirements with the Project Engineer. The permit is specific to the work provided for in the contract itself and will not cover other work in support of the project, such as operations in Contractor staging areas, material sources, or waste sites. When a Hydraulics Project Approval has been obtained for the project, and the permit has not been incorporated into the contract documents, the Project Engineer shall provide copies of the permit to the Contractor and ensure it is properly posted at the work site at all times work is in progress. The

Project Engineer should ensure that both the intent and the specific provisions of the permit are rigidly enforced. If the Contractor's method of operations, weather conditions, design changes, or other factors affect waters of the State in ways not anticipated or represented in the Hydraulic Project Approval, the Project Engineer will work with the assigned representative and the Contractor to modify the existing permit or obtain a new or revised one as appropriate.

The U.S. Department of Labor, Mine Safety and Health Administration, Metal and Non-Metal Mine Health and Safety Division, 3633 136th Place SE, Suite No. 206, Bellevue, Washington 98006, (206) 553-7037, must be notified at the beginning and closing of all mining operations. This includes surface mining, such as our normal pit site operations. Notification is required for all crusher operations and for all pits and quarries, including borrow pits, which are separated from the roadway under construction. The Project Engineer is responsible for this notification for WSDOT furnished pits and must submit the required report as soon as the date of opening or closing can reasonably be determined. The Contractor is responsible for notification for all pits and quarries not furnished by WSDOT. The Bureau of Mines reports are in addition to reports required by the Department of Natural Resources.

Whenever construction work is performed in navigable waterways, it is necessary to obtain a construction permit from the Coast Guard. One of the requirements of the construction permit is regular submission of Bridge Construction Progress Reports. Two copies of the report should be prepared by the Project Engineer sufficiently in advance of the first working day of the month and transmitted to the State Bridge and Structures Engineer. When a Coast Guard permit modification is proposed (by the Contractor or WSDOT), it shall be submitted to the Bridge and Structures Engineer for processing through the Coast Guard. The time required for approval/disapproval of the proposed permit modification is variable and depends on the nature and significance of the modification. Up to six months may be required. When all construction obstructions to navigation have been removed, the Project Engineer shall report that fact immediately to the Bridge and Structures Engineer indicating the date removal was completed. Upon completion of all permitted bridge work, a final report indicating the date of completion and certifying that the bridge has been constructed in compliance with the Coast Guard Bridge Permit shall be submitted by the Project Engineer to the State Bridge and Structures Engineer.

1-2.2E Relationship With Public and Private Utilities

In some cases, utility adjustments will be completed prior to contract work. In other cases, adjustments are to be made concurrently with the work. The Project Engineer and the Contractor should meet with the public utility companies, individuals, and others owning or maintaining utility features within the limits of the highway right of way and confirm the relationship, the terms of the relocation agreements, and the relocation work schedule. Where the feature will require adjustment during construction, notice should be provided far enough in advance to allow the utility to perform the adjustment without affecting the Contractor's work schedule.

Utilities should have been given prints of the preliminary plans, prior to awarding of the contract, showing grade lines and right of way to enable them to prepare plans and estimates for making the necessary changes to their facilities in as timely a manner as possible. The Project Engineer should determine that plans for the work have been made, that the relocated facilities will be clear of the construction, and that the utilities coordinate with the Contractor's operations to the fullest extent possible.

When utilities are known to exist within the limits of the project and are not planned for relocation but may be affected by the Contractor's construction activities, the Project Engineer and the Contractor should become familiar with the requirements of RCW 19.122, Underground Utilities. The Project Engineer may wish to obtain copies of the RCW for review at Preconstruction Meetings.

The approximate locations of most existing underground utilities are shown on the contract plans. However, the existence of some underground utilities may not have been known or detected during design. If a one number locator service is available, the Contractor must utilize it in an attempt to locate all affected utility features. If no one number locator service is available, notice shall be provided individually to those owners of underground facilities known to have or suspected of having underground facilities within the area of proposed excavation. Even areas covered by a one number service may contain utilities not included in the service. If the Contractor discovers underground facilities which are not identified, the Contractor shall cease excavating in the vicinity of the facility and immediately notify the owner or operator of such facilities, or the one number locator service.

1-2.2F Responsibility for Coordination of Railroad Agreements

When railroads are involved within the project limits, an agreement covering the work involved is usually entered into between WSDOT and the Railroad Company. Upon identifying that the contract involves work or involvement by a railroad, the Project Engineer should immediately obtain a copy of the Railroad Agreement or contact the Region Utilities Engineer to determine the status of the agreement and to make sure it contains all elements needed to accommodate the construction of the project. If an agreement has not been made with the railroad, the Project Engineer should coordinate and monitor the development and processing of the agreement through the Region Construction and Region Utilities Engineers. Where notices are required. The Project Engineer should ensure that proper notice is provided to the railroad company and that such notice is acknowledged by them. The Project Engineer should work with the Region Construction Manager and Utilities Engineer to resolve any conflicts with the Railroad Company and prevent delays to the Contractor's operations.

1-2.2G Responsibility for Railroad Encroachment Insurance

Projects which include work on railroad right of way generally require special insurance protection. Pay particular attention to the Contract Special Provisions for project requirements because they vary from project to project. It is the responsibility of the Project Engineer to enforce the provisions. The required insurance documents are to be furnished by the Contractor (usually through the Project Engineer) to the State Accounting Services Office who will (a) review the documents and (b) obtain approval of the insuring documents from the railroad company. Written notification of approval by the railroad company will be furnished to the Project Engineer by the State Accounting Services Office as soon as approval is obtained.

No work shall be started on railroad property until the necessary approvals have been obtained. The railroad insurance must be maintained until the date of physical completion of the project unless otherwise stated. However, the Contractor may make a written request to be relieved of the responsibility to continue all or part of the railroad protective liability insurance before the completion date under certain conditions. The details and conditions for this relief are specifically set forth in the special provisions of the contract. If the Contractor should make a request for relief, the Project Engineer should contact the Region Construction Manager and Utilities Engineer for guidance and assistance in coordinating this effort with the railroad.

1-2.2H Responsibility for Coordinating Work With Other Contracts

When two or more Contractors, including any utility or their contractor, are working in the same area, Section 1-05.14 of the *Standard Specifications* will apply. The Contractor shall not cause any unnecessary delay or hindrance to the other contractors on the work, but shall cooperate with other contractors to the fullest extent. Progress schedules and plans for all contractors involved should be reviewed by the Project Engineer to detect possible conflicts which might be resolved before a delay of work is experienced or extra costs are incurred as a result. If an adjacent project requiring coordination is known prior to holding a Pre-Construction meeting, it would be beneficial to invite principals from that project to the meeting.

1-2.2I Responsibility for Enforcement of Safety and Health Requirements

1-2.2I(1) General

All contractors doing work for WSDOT must provide safety controls for the protection of life and health of the Contractor's employees and other persons, for the prevention of property damage, and for the avoidance of interruptions in the performance of the work under the contract. As the owner contracting agency, WSDOT has the responsibility for enforcement of the provisions of the contract, however, provisions and regulations which are by law the fundamental responsibility of other agencies, both from the standpoint of interpretation and enforcement, should be monitored by WSDOT, but with full recognition as to the responsibilities and authorities of those agencies. The Project Engineer will cooperate fully with the responsible agency.

Any violations noticed by the Project Engineer will be brought to the attention of the Contractor for correction. The Project Engineer will also notify the responsible agency (if that action is deemed necessary by the Region Construction Manager) and utilize such sanctions as are consistent with contract terms in assisting the responsible agency in enforcing laws, rules, and regulations.

The Contractor is obligated by law to comply with both State and Federal safety regulations. State regulations are administered by the Washington State Department of Labor and Industries under the Washington Industrial Safety and Health Act (WISHA). Federal regulations are administered by the Occupational Safety and Health Administration (OSHA) and the Mine Safety and Health Administration (MSHA) of the U.S. Department of Labor, which has jurisdiction over Federal safety requirements for pit and quarry operations up to the point where materials leave the quarry area or go into a batch plant. Inspectors from any or all of these agencies may review the Contractor's operations at any time. (See Section 1-07.1 of the *Standard Specifications*.) in order to fulfill WSDOT obligations to monitor contract operations in accordance with the above, the following procedures should be followed on both Federal-aid and non Federal-aid contracts.

1-2.2I(2) Precontract Preparation

- The Project Engineer shall obtain the WISHA manuals, particularly Safety Standards for Construction Work WAC 296-155, General Safety and Health Standards WAC 296-24, and General Occupational Health Standards WAC 296-62, and shall review them with the key field WSDOT inspectors to ensure reasonable familiarity to the extent that they can recognize important requirements.
- The Contract Plans and contract provisions should be reviewed to identify those aspects of the work meriting special attention from the standpoint of potentially dangerous types of work and hazard elimination.
- The project site should be reviewed to identify those aspects of the location that present hazards such as limited sight distance, confined spaces, difficult terrain, extreme temperatures, illegal encampments, or exposure to biological and physical hazards associated with animals or humans.

1-2.2I(3) Preconstruction Duties

As part of the Preconstruction Meetings and Discussions (see Chapter 1-2.1C), the Contractor's safety program should be discussed. Some of the things that the Project Engineer may want to consider are:

- The contractual obligation of the Contractor for complying with State and Federal construction safety standards. (See Section 1-07.1 of the *Standard Specifications*.)
- The availability of the safety standards that apply to the contract.

- The accident prevention program of the Contractor — organization, staff, names of responsible individuals, meetings, training, reports, etc. A review of specific areas for which plans are required (especially those also affecting WSDOT personnel). These might include Fall Protection, Confined Spaces, Respirators, Hearing, and Hazardous Materials plans. Implementing a mechanism for employees to report "near misses" and/or work zone accidents.
- The Contractor's responsibility for seeing that subcontractors comply with safety regulations.
- The Contractor's plans for meeting specific safety requirements and for eliminating potentially critical hazards on the project for all Contractor employees, Contracting Agency employees, and the public.

1-2.2I(4) The P.E.'s Role in Safety on the Project

It is difficult to generalize about safety. It's a judgment call which is dependent on risk, knowledge, authority to direct corrections, etc. As people, professionals and representatives of the State, Project Engineers have an obligation to take action if they become aware of a situation that presents an immediate threat. Project Engineers should advise their employees on what the lines of communication are and what the procedures are for alerting the responsible agencies with regard to serious safety hazards.

Employees should be made aware that the Contractor is obligated to make the work-site safe, to their satisfaction, for inspection activities. Anyone who is uncomfortable with access for inspection should inform their supervisor of the situation and expect resolution. Project personnel should also be made aware of project specific hazards and be trained in specific areas as the project warrants. For example; fall protection, confined space requirements, respirator training, lead paint hazards, hazardous material training, and exposure to medical waste (sharps). It is suggested that the expertise of the Regional Safety Officers or Headquarters Safety Office be utilized as appropriate.

Be aware that the construction contract requires the contractor to perform any measures or actions the Engineer may deem necessary to protect the public, and that the Engineer may suspend work if the Contractor fails to correct unsafe conditions. Project staff should continuously monitor the Contractors' work activities for potential violations of legal safety requirements, and for any condition that poses an immediate threat to the health of any person. Immediately notify the Contractor upon becoming aware of any such condition.

Additional information, such as safety regulations and Department of Labor and Industry (L&I) contacts, are available on the Internet at www.wa.gov/lni/. Keep in mind that many WSDOT employees are not trained to interpret and apply safety regulations; however, employees need to have a reasonable understanding of what hazards may be encountered on a project. Many, but not all, of the requirements are listed under Chapter 296-155 WAC, "SAFETY STANDARDS FOR CONSTRUCTION WORK" under the various "Parts A through V".

State L&I offers consultation service (advise is given) and enforcement (assessment of a violation would result in a citation being issued). A listing of phone numbers for the various L&I field offices is as follows:

- REGION 1 Offices
  Bellingham Field Services Location 360 647-7300
  Everett Field Services Location 425 290-1300
  Mount Vernon Field Services Location 360 416-3000
- REGION 2 Offices
  Bellevue Field Services Location 425 990-1400
  Seattle Field Services Location 206 515-2800
  Tukwila Field Services Location 206 835-1000
- REGION 3 Offices
  Bremerton Field Services Location 360 415-4000
  Port Angeles Field Services Location 360 417-2700
  Tacoma Field Services Location 253 596-3800
- REGION 4 Offices
  Aberdeen Field Services Location 360 533-8200
  Longview Field Services Location 360 575-6900
  Tumwater Field Services Location 360 902-5799
  Vancouver Field Services Location 360 896-2300
- REGION 5 Offices
  East Wenatchee Field Services Location 509 886-6500
  Kennewick Field Services Location 509 735-0100
  Moses Lake Field Services Location 509 764-6900
  Yakima Field Services Location 509 454-3700
- REGION 6 Offices
  Colville Field Services Location 509 684-7417
  Pullman Field Services Location 509 334-5296
  Spokane Field Services Location 509 324-2600

1-2.2I(5) Pedestrian Safety

When the work area encroaches upon a sidewalk, crosswalk, or other areas that are near an area utilized by pedestrians or bicyclists, special consideration should be given to their accommodation and safety. Pedestrians are more susceptible to personal injury in work areas than are motorists. Visibility and recognition of hazards is an important requirement for the safety of pedestrians and bicyclists.

Protective barricades, fencing, handrails, and bridges, together with warning and guidance devices, should be used so that pathways for pedestrians, bicyclists, equestrians, and other non-motorists are safe and well defined. Where walks are closed by construction or maintenance, an alternate walkway should be provided where feasible. Where it is necessary to divert pedestrians into the parking lane of a street, barricades and delineation should be provided to separate the pedestrian walkway from the adjacent traffic lane. Pedestrians should not be diverted into a portion of the street used by vehicular traffic. At locations where adjacent alternate walkways cannot be provided, pedestrians can be diverted across the street by placing appropriate signs at the construction limits and at the nearest crosswalk or intersection. When hazardous work conditions exist overhead, it may be necessary to install a fixed pedestrian walkway of the fence or canopy type to protect and control pedestrians. In such cases, wood and chain link fencing can be used with warning lights and illumination to warn and guide both pedestrians and motorists. These accommodations for pedestrians and bicycles should be included in Traffic Control Plans.

Fences around a construction area are often necessary and may be a requirement of the local jurisdiction building code. They are often constructed in conjunction with a special pedestrian walkway or when there are deep excavations or when pedestrian access to the job site is not desirable. Installation of such fencing must take into account relocation of existing control devices and facilities such as traffic signals, pedestrian signals, traffic signs, and parking meters. The use of chain link fencing which can be seen through may be needed at intersections to provide adequate sight distance.

Relocating a walkway without unreasonable inconvenience to pedestrians, residents, or commercial interest, is the safest practice of all. Remember, however, that pedestrians like to "see what's going on". Simply denying them access does not, of itself, prevent their encroachment onto the worksite. Sometimes it is advisable to design and construct a pedestrian observation area for this purpose.

1-2.2I(6) Site Cleanup and Removal of Illegal Encampments

Site Cleanup

Some contracts contain specifications for site cleanup. This may include the removal of illegal encampments, unauthorized pedestrians, personal property, refuse, and other biological and physical hazards from the work area. The Contractor is required to perform all necessary work, and to take precautions to maintain the health and safety of all workers and the public, who may be in the work area. It is the responsibility of the Project Engineer to inspect the Contractor's work and ensure compliance with the contract requirements and with all applicable laws. Each Project Engineer should appoint a contact for encampment removal issues.

The Contractor is required to have a Health and Safety Plan, and to submit the plan to the Project Engineer prior to commencing any cleanup work. The Project Engineer should ensure that the plan is prepared in accordance with contract provisions.

The Contractor will furnish and install "No Trespassing" signs in all areas where pedestrians may be encountered, except where pedestrians are legally allowed. "No Trespassing" signs must be posted no less than 72 hours prior to beginning site cleanup work or any other potentially hazardous work. If the site contains encampments, the signs should be posted at each encampment. The Project Engineer should conduct a site visit in order to verify that the signs are posted correctly and meet the requirements of the contract.

At the time the signs are posted the Contractor should provide written notification to the Project Engineer and local jurisdictions. When the work includes removal of encampments the Contractor should also notify local advocacy groups that site cleanup and removal is scheduled.

After the initial removal of encampments, the Contractor should revisit the area at regular intervals, and if encampments persist, permanently post the area with "No Trespassing" signs and proceed with removal activities.

Immediately prior to commencing cleanup and removal, brush clearing, or other potentially hazardous work, and periodically throughout the day, the Contractor should visually inspect the area to ensure that no unauthorized pedestrians are present. The Project Engineer should verify that the site is cleared of pedestrians and that periodic area checks are being done. Special attention should be given to areas hidden from view, such as in dumpsters or equipment, or under blankets. The Project Engineer may consider the use of non-invasive detection aids, such as infrared detectors, to ensure that no unauthorized persons are present.

Removal, Storage, and Return of Personal Property

Personal property that is not refuse will be removed from the work area, by the Contractor. Items should be placed in large transparent plastic bags, labeled, and stored for return to the property owner. The Project Engineer should ensure that personal property is handled and stored in accordance with the requirements of the contract and all applicable laws.

1-2.2J Responsibility for Environmental Considerations

During the precontract period, the Project Engineer should obtain copies of the final Environmental Impact Statement and any special environmental studies related to the project. It is important that all key personnel become familiar with the environmental decisions considered during the design process. The contract documents should include necessary provisions for protection of the environment, including requirements that the Contractor secure permits from and abide by regulations of appropriate Federal, State, and local agencies. Any changes in contract work that may become necessary must also be reviewed to ensure conformance with the original intent, requirements, and commitments established during the environmental design of the project.

1-2.2J(1) Spill Prevention, Control, and Countermeasures (SPCC) Plans

Spill Prevention, Control, and Countermeasures plans are written by the Contractor to prevent, respond to, and report hazardous material spills in a safe and effective manner. All WSDOT projects should have a project specific SPCC Plan and the plan must be submitted to the Project Engineer prior to starting any on-site work. The plan should be reviewed by the Project Office for compliance with Chapter 6-3 of the *Highway Runoff Manual* (M31-16.01). WSDOT personnel who review SPCC plans are required to take the class – "Spill Plan Reviewer Training", (ATMS course code: BYZ).

SPCC Plans should include information regarding the project site and contractor activities as they relate to spill prevention, control, and response activities. Additionally, SPCC Plans should identify possible sources of hazardous materials, methods to prevent and control spills, and spill response procedures. Plans are written and maintained by the Contractor and are required on all WSDOT projects, regardless of the size or duration of construction activities.

SPCC Plans are applied to the life of a construction project and may need to be amended over time with changing conditions. Periodic inspections will ensure that the required preparation and preventative steps identified in the SPCC Plan have been taken to keep the site in compliance throughout the life of the project.

The *Standard Specifications* provide the complete list of required contents for the Contractors SPCC Plan in Section 1-07.15(1).

1-2.2K Responsibility for Environmental Compliance During Construction

The following procedure pertains to WSDOT personnel on all WSDOT contracts and contains duties and activities by persons other than the project staff, but all of which are related to construction contracts and affect the Project Engineer to one degree or another. The Project Engineer must stay aware of this procedure and follow it as written.

1-2.2K(1) Environmental Compliance Assurance Procedure

The purpose of the Environmental Compliance Assurance procedure is to recognize and eliminate environmental non-compliance events during the construction phase on Washington State Department of Transportation (WSDOT) construction sites, and to ensure prompt notification to WSDOT management and agencies. For purposes of this procedure, non-compliance events are defined as actions that are not in compliance with environmental standards, permits, or laws.

When any action (Notification Trigger) below occurs or if there are questions about compliance, the Project Engineer (PE) shall initiate this procedure to develop corrective actions to solve the identified problem. The Regional Environmental Manager (REM) will serve as a resource to the PE and give priority to addressing the actions, activities, or situations that stem from notification triggers. The PE and REM will work together on an appropriate response to the notification trigger to avoid or minimize environmental damage.

A. **Notification Triggers:** "Notification Triggers" (listed below) means an action, activity, or situation that requires the Project Engineer to implement the Environmental Compliance Assurance Procedure.

1. Notice from a resource agency that a violation has occurred;

2. Any action that, in the judgment of the REM, contractor or Project Engineer, may violate environmental permit conditions, agreements, or approvals for the project; or other environmental laws, ordinances, or regulations;

3. Any unauthorized work, activity, or fill in wetlands, shorelines, creek beds (including dry channels), other waters of the state, or critical habitat;

4. Any emergency protection activity that involves unauthorized placement of fill in wetlands, shorelines, creek beds (including dry channels) or waters of the state or for bank stabilization activities where fill or structures are placed on the bank;

5. Any action or project revision requested by an agency after a site inspection that may be in conflict with other permits;

6. Any spill, or release of hazardous materials, petroleum products, or chemicals to:

- water or areas that have the potential to enter waters of the state (i.e. stormwater conveyances, ditches, swales, ground water).
- land, when the spill or release is an immediate threat to human health or the environment (i.e. dangerously toxic, explosive or flammable situations that result in severe or substantial consequences, etc.).[1]

7. Any evidence of a release from a buried underground storage tank.

8. Any situation that results in a fish kill, or if dead or dying fish are discovered in the vicinity of the project;

9. Activities that monitoring shows are out of compliance.

B. **Notification and Resolution Process:** In the event of a notification trigger, the following steps shall be taken:

1. If a notification trigger is observed first by the contractor or REM, the contractor or REM shall immediately notify the Project Engineer.

2. The Project Engineer must:

Step 1. Immediately notify the Contractor of the situation, implement emergency response procedures including agency notification, and suspend all non-conforming work on the site.

Step 2. Immediately notify the Regional Environmental Manager (REM). Consultation with the REM must occur before any remediation actions are taken.

Step 3. In consultation with REM assemble the following information

a. The activities that triggered the notification and why they occurred.

b. Location of the work.

c. Potential solutions to the problem, or if additional investigation is needed, the agreed upon course of action.

d. Any related site constraints or safety issues.

e. Urgency of the issue

Step 4. Notify his or her immediate supervisor.

Step 5. *Notify the Regional Administrator.

Step 6. In consultation with the REM, determine the resource agencies having jurisdiction and who will notify them.

Step 7. Document all actions, conversations and activities.

[1] Note: All spills need to be contained and disposed of and reported properly. Follow the procedures outlined in the project specific Spill Prevention, Control and Countermeasures Plan (SPCC).

3. The Regional Environmental Manager must immediately:

Step 1 *Notify the Director of Environmental Services.

Step 2. Notify his or her immediate supervisor.

Step 3. Work with the Project Engineer to resolve the issue that caused the notification trigger.

Step 4. Identify and obtain appropriate permits or permit revisions with the aid of the Project Engineer.

Step 5. Document all actions, conversations, and activities. Communicate issues and send appropriate documentation to Regulatory and/or Resource Agencies.

4. *The Director of Environmental Services must immediately:

Step 1. Notify Compliance Branch Manager and any other ESO Program Managers associated with the resource issue.

Step 2. Notify Director of Environmental & Engineering Programs.

Step 3. Notify the Regional Environmental Manager that the Director of Environmental & Engineering Programs has been contacted. Regional Environmental Manager must then notify the Project Engineer that the reporting procedure has been completed.

5. *The Regional Administrator will:

Step 1. Coordinate with the Director of Environmental & Engineering Programs to contact the Assistant Secretary of Engineering and Regional Operations advising him or her of the situation, and provide updates as needed on the situation.

Step 2. Ensure that the Project Engineer and the Regional Environmental Manager have the necessary resources, authority and organizational support to successfully resolve the Non-complying activity.

C. **Timing:** Due to costs of project delays, or risk of not acting quickly during emergency situations, the REM shall provide a 24 hour contact person for environmental consultation.

D. Documentation:

1. The Project Engineer shall document the details of the notification and non-complying activity resolution in the contract records.

2. The Regional Environmental Manager shall maintain a record of all regional non-compliance events. REMs shall collect and maintain, at a minimum, the following data on all non-compliance events:

a. Project name and Location

b. PE and Prime Contractor

c. Incident Date

d. Incident Description

e. Permit/Regulation Violated

f. Resource Agency(s) notified and date of notification

g. Whether or not resource agency staff conducted site review in response to notification

h. Record of Notice Of Violation and/or penalties issued

The REM shall provide all regional non-compliance tracking data to ESO Compliance Branch Manager for the purposes of annual reporting and review of compliance performance.

3. The Project Engineer and the Regional Environmental Manager shall coordinate and prepare the appropriate response to the regulatory and/or resource agency. The response shall include documentation about the non-compliance event and how it was resolved, including any preliminary mitigation solutions.

E. Roles and Responsibilities:

1. "Project Engineer" is the person responsible for the project and administration of the construction contract. This responsibility may be delegated to a subordinate employee on site, but the ultimate responsibility for making sure these procedures are followed will be with the Project Engineer. The Project Engineer shall have a thorough knowledge of all of the environmental permit conditions and design requirements for the project, and have such certifications and other qualifications as may be required.

2. "Regional Environmental Manager" is the person responsible for administering the regional environmental program. This responsibility may be delegated to a subordinate employee with knowledge of environmental permitting and procedures, but the ultimate responsibility for setting and interpreting regional environmental policy will be with the Regional Environmental Manager.

3. "Contractor" is as defined in Section 1-01.3 of the *Standard Specifications* for Road, Bridge, and Municipal Construction.

**Denotes that the action is mandatory when the non-compliance event 1) results in agency enforcement staff coming on site to conduct enforcement review; and/or 2) there is a high likelihood the event will result in a Notice Of Violation or a monetary penalty.*

1-2.2L Responsibility for Posting Required FHWA and State Labor and Industries Job Site Posters

A combination of both State and Federal laws require that on all WSDOT administered contracts some or all of the posters listed below are to be posted at the place of employment such that all employees have ready and free access to inspect their contents. The Project Engineer must ensure that the Contractor complies with these requirements.

- FHWA 1495 and 1495A — Wage Rate Information
- FHWA 1022 — Fraud Notice Poster
- OFCCP-1420 — Equal Employment Opportunity is the Law
- WISHA F416-081-909 — Job Safety and Health Protection
- F242-191-909 — Notice to Employees (L&I)
- F700-074-909 — Your Rights as a Non-agricultural Worker
- EMS 9874 — Notice to Employees (Emp. Security)
- Copy of approved Statement of Intent to Pay Prevailing Wages
- Copy of prevailing wage rates from the contract provisions

If Federal funds are involved, all of these posters are required. If only State funds are involved, the first three do not apply. After contract execution and before work begins, the Contractor should be given a package containing the appropriate required job site posters. There are links to these posters on the State Construction Office website. This package should also be accompanied by either a written or verbal explanation of the contents and include notification that the Contractor, each subcontractor, and each lower-tier subcontractor will have to post a copy of the State L&I approved Statement of Intent to Pay Prevailing wages. This action shall be specifically noted in the project records.

1-2.2M Responsibilities When Working on Tribal Lands

Indian nations have the political distinction of being sovereign. This is different from being designated as having protected group status based on racial classifications. Being sovereign, tribes have the ability to create and enforce tribal ordinances such as Tribal Employment Rights Ordinances (TERO). These are legal requirements pertaining to work within the boundaries of the reservation which are enforced by the respective tribes. When a contract includes work on a reservation, the project should include a general special provision "Indian Preference and Tribal Ordinances" that alerts the contractor to the possibility that TERO requirements may apply and provides a contact person for the tribe. The provision also reminds the contractor to bid any costs associated with TERO compliance into associated items of work. TERO requirements may take a variety of forms, some of which are listed in the noted provision. The provision also notes that complying with TERO requirements shall not be a violation of the contract equal employment opportunity requirements. The end result is that the contractor is expected to comply with TERO requirements as they would any other legal obligations. The underlying intent is to reduce Indian unemployment and most tribes are willing to work with contractors to best meet this goal. We want to avoid creating any contractual requirements that interfere with their ability to do so. Our role is to assist in communication but not become involved in determining or paying the tax.

1-2.2N Responsibilities Following Unanticipated Discovery of Cultural Resources

Given the wealth of historical and archeological resources found in Washington, the Project Engineer should be familiar with the requirements of the National Historic Preservation Act (NHPA), *Standard Specification* 1-07.16(4), and any contract specifications regarding the discovery of cultural resources. The Project Engineer should discuss these requirements with the Contractor and WSDOT staff at the Pre-Construction Conference. These resources include, but are not limited to:

- Human skeletal remains,
- Anthropogenic soil horizons (areas showing the influence of humans on nature), occupational surfaces (areas showing evidence of human activity or habitation), midden (refuse heap), etc.,
- Areas of charcoal or charcoal-stained soil and stones,
- Stone tools or waste flakes (i.e. arrowheads or stone chips),
- Bones, burned rocks, or other food related materials in association with stone tools or flakes,
- Clusters of in cans or bottles,
- Logging or agricultural equipment more than 50 years old.

The Project Engineer will include a project-specific unanticipated discovery plan (UDP) in the project provisions for use by the Contractor. A sample of may be found at http//wwwi.wsdot.wa.gov/eesc/environmental/culres/default.htm. The Cultural Resources Office, at the Headquarters Environmental Services Office, will assist with completing the plan.

1-2.2N(1) Discovery of Human Skeletal Remains

The following guidance is given to assist the Project Engineer when construction activities cause disturbance to human skeletal remains. All human skeletal remains, which may be discovered, shall at all times be treated with dignity and respect.

Should any WSDOT employee, contractor, or subcontractor believe that he or she has discovered human skeletal remains; the following steps shall be initiated:

1. Ensure that all work adjacent to the discovery has ceased. The area of work stoppage shall be adequate to provide for the total security and protection of the integrity of the human skeletal remains.

2. The Project Engineer shall:

a. Notify the Region Construction Manager.

b. Immediately notify the local coroner and the local sheriff, or other appropriate law enforcement official, requesting that a person who is competent and qualified to identify human skeletal remains be present. Do not call 911 or the media.

i. No persons other than the coroner or proper law enforcement personnel, WSDOT Cultural Resources staff, SHPO (State Historical Preservation Officer), and DAHP (Department of Archeological and Historic Preservation) staff will be authorized direct access to the discovery location. This access must comply with all safety and security procedures.

ii. The coroner will make a determination as to whether the human skeletal remains are forensic (evidence of a possible crime) or non-forensic (historical). If the human skeletal remains are determined to be forensic, the coroner will retain control of the human skeletal remains and the discovery site will be treated as a crime scene. If the human skeletal remains are determined to be non-forensic, the coroner will notify DAHP.

iii. The DAHP state physical anthropologist will make the initial determination as to whether the human skeletal remains are of Native American ancestry. If the human skeletal remains are determined to be of Native American ancestry, DAHP will notify the affected tribe(s).

c. Notify the WSDOT Cultural Resource Manager at HQ Environmental Services, who will notify:

i. FHWA Area Engineer or Environmental Program Manager

ii. State Historic Preservation Officer (SHPO)

iii. WSDOT Tribal Liaison Office. The WSDOT Tribal Liaison Office will contact the affected tribe(s) and notify them of the unanticipated discovery.

iv. Region Environmental Manager

3. If the human skeletal remains are determine to be of Native American ancestry, tribal access will be allowed to the designated representative(s) of the affected tribe(s). WSDOT and FHWA will make a good faith effort to accommodate requests from affected tribe(s) to be present, prior to implementation of mitigation measures. The Project Engineer, WSDOT Cultural Resources, SHPO, and the affected tribe(s), in consultation, will determine what treatment is appropriate. If disinterment of Native American remains becomes necessary, FHWA, WSDOT, SHPO, and the affected tribe(s) will jointly determine the final custodian of the human skeletal remains for re-interment.

1-2.2N(2) Discovery of Other Cultural Resources

The following guidance is given to assist the Project Engineer when construction activities cause the disturbance of cultural resources, other than human skeletal remains.

Should any WSDOT employee, contractor, or subcontractor believe that he or she has uncovered a cultural resource, at any point in the project, the following steps should be initiated:

1. Ensure that all work adjacent to the discovery has ceased.

2. Immediately notify the Project Engineer. The Project Engineer shall immediately notify:

a. The Regional Construction Manager

b. The WSDOT Cultural Resource Manager at HQ Environmental Services who will notify:

i. FHWA Area Engineer or Environmental Program Manager

ii. State Historic Preservation Officer (SHPO)

iii. WSDOT Tribal Liaison Office.

iv. Region Environmental Manager

3. Ensure that the area of work stoppage is adequate to provide total security and protection of the integrity of the resource. Vehicles, equipment and unauthorized personnel will not be permitted to traverse the site, nor will work resume, until treatment of the cultural resource is completed.

4. All archeological deposits discovered during construction are to be treated as if they are eligible for inclusion in the NRHP (National Register of Historical Places). Intentional disturbance of archeological sites without a permit from DAHP is prohibited by RCW 27.35. Disturbance of Indian burials, cairns and glyphs is prohibited by RCW 27.44.

5. If cultural resources are discovered, but additional project effects to the resource are not anticipated, project construction may resume, away from the site of the discovery, while documentation and assessment of the resource proceeds.

1-2.3 Construction Traffic Control

1-2.3A Public Convenience and Safety

1-2.3A(1) General

Under the many special conditions encountered where traffic must be moved through or around construction operations, serious problems of traffic control can occur. Most conditions are temporary and are, therefore, dangerous and difficult to deal with because they are unexpected and not in accordance with the normal pattern of highway traffic. Section 1-07.23(1) of the *Standard Specifications* requires the Contractor to conduct all operations with the least possible obstruction and inconvenience to the public and

to provide adequate safeguards, safety devices, protective equipment, and any other needed actions to protect the life, health, safety, and property of the public. The responsibility to comply with these requirements is the Contractor's. It is the Project Engineer's responsibility to ensure that the Contractor complies.

1-2.3A(2) Work Zone Clear Zone (WZCZ)

When a project requires traffic control, a Work Zone Clear Zone (WZCZ) shall be established and will apply during both working and non-working hours. During non-working hours no equipment or materials shall be within the WZCZ, unless it is protected by permanent guardrail or temporary concrete barrier (location and installation to be approved by the Project Engineer). During working hours, unless protected as stated for non-working hours, only materials or equipment absolutely necessary to construction shall be allowed in the WZCZ or allowed to park on the shoulder of the roadway.

The minimum clear zone distance, measured from the edge of traveled way, shall be based on the posted speed as follows:

Posted Speed	Distance From Traveled Way
35 mph or less	10 Ft.
40 mph	15 Ft.
45 to 55 mph	20 Ft.
60 mph or greater	30 Ft.

Any deviation from these requirements shall only be allowed if the Contractor has requested the deviation in writing and the Engineer has provided written approval. The Region Traffic Office should be contacted to help evaluate the deviation and determine if the requested deviation is approvable.

1-2.3A(3) Temporary Breaks in Limited Access for Construction

The Federal Highway Administration (FHWA) cannot delegate its approval authority to add access points to existing limited access controlled Interstate facilities through the WSDOT-FHWA Stewardship Agreement. The FHWA has granted approval to break limited access in order to gain access to the worksite from adjacent properties. This approval was granted through the FHWA approval of Standard Specification Section 1-07.16. This approval does not extend to allowing the contractor to use this access to merge construction vehicles and equipment with public traffic in the traveled way, auxiliary lanes or shoulders. It is therefore necessary to seek approval from the FHWA when proposing to break limited access and merge construction vehicles with public traffic in the traveled way, auxiliary lanes, or shoulders.

Standard Specification Section 1-07.16 allows the contractor to access the worksite from adjacent properties but does not allow the contractor to merge construction vehicles or equipment (including contractor workforce vehicles of any type) from that access with public traffic. Standard Specification Section 1-07.23 allows the Interstate highway system to be accessed through existing facilities or through access points allowed within the contract only. These access points allowed in the contract will either be in the form of site specific traffic control plans or by contract provisions included in the contract documents.

A General Special Provision (GSP) to allow the contractor to merge construction vehicles with public traffic in the traveled way, auxiliary lanes or shoulders may be included in the contract provisions. Consultation with Region and Headquarters Design and approval by the FHWA must occur prior to deciding to include this GSP in a contract on Interstate facilities.

If the contractor proposes to merge construction vehicles with public traffic in the traveled way, auxiliary lanes or shoulders and the contract contains the GSP that allows this access, then the contractor shall submit a site-specific plan for traffic control in accordance with the MUTCD Part VI. The Region Traffic Engineer should review this plan and it should be submitted to FHWA.

During construction on Interstate projects the Project Engineer will notify the FHWA Area Engineer by sending them a copy of the approved vicinity map showing the location of the access break and site-specific traffic control plan. FHWA approval of a PS&E containing this GSP constitutes approval of access from adjacent properties to the traveled way, auxiliary lanes or shoulders.

While some contracts may not contain provisions for breaking limited access for construction and for merging of construction vehicles with mainline and/or interchange ramp traffic, the contractor may request one. If the Region agrees and the project is on limited access controlled Interstate, the FHWA Area Engineer shall be contacted for approval. The contractor shall submit a vicinity map showing the location of the access break, a site-specific plan for traffic control in accordance with the MUTCD Part VI, and the duration for which the accesses will be in operation. On non-interstate limited access controlled facilities, approval will be required by the Region. If approval is granted and the facility is a limited access facility, the GSP will be added to the contract by change order. On all other roadways the Project Engineer may approve the access with Region concurrence.

1-2.3B Public Information and Customer Focus

Most drivers still have the expectation of proceeding to their destination with little or no delay even though traffic conditions on many of our highways are deteriorating, primarily due to increased traffic volume. This increased volume may create congestion, delays, accidents and aggressive driving during normal daily operation. Highway construction will usually require a more restricted roadway to accommodate work zones and can further reduce traffic mobility and safety. Even some of our lower volume rural highways can present a challenge due to factors such as drivers not expecting construction work and seasonal/recreational traffic increases. Construction and user delays present significant costs in addition to costs associated with crashes and worker safety. These delays and costs can be minimized by implementing a traffic control strategy based on traffic conditions and construction requirements, and which includes public information and customer focus considerations.

Our goal on every highway construction project should be to provide the best overall balance of work zone safety and traffic mobility while constructing quality highway projects. Much of our effort is directed at engineering responses to safety and mobility issues and is generally included in the contract requirements. Recent customer focused highway construction studies have shown that accurate and timely project information is a valuable element in an overall traffic control strategy. Advance planning and coordination between the project engineer and contractor is necessary to ensure that there is an opportunity to provide public information for all phases of the project that impact traffic. Proper use of public information and customer focused techniques will provide safety and mobility benefits that would not otherwise be gained, as listed below:

- Alert drivers to potential delays by advance notice through project signing and the news media that would allow drivers to take alternate routes, adjust scheduled trips and have better awareness of traffic impacts and how to avoid them.
- Provide benefits to the Contractor from reduced traffic volume and better driver awareness through fewer crashes, less material delivery delay, better worker safety, fewer complaints and overall public acceptance of the project.
- Achieve better driver acceptance, reduced aggressive driving and improved work zone credibility by minimizing delays and providing accurate and timely information.
- Consider innovative construction techniques and shorter term intense work stages with more severe traffic restrictions, such as weekend closures, if possible.
- Closely monitor traffic conditions when traffic is restricted to determine the need for any traffic control or work hour adjustments that would improve traffic flow. Specified working hours and the accompanying traffic restrictions are critical elements of the project traffic control strategy and should not be adjusted without proper traffic analysis.
- Maintain ongoing communication during the life of the project with local law enforcement, emergency services, local agencies, transit groups, affected local businesses, etc.
- Continue use of innovative devices such as portable, changeable message signs, project information signs with information phone number and highway advisory radio systems.

The Regional Construction Manager, Traffic Engineer, and Public Information Officer should be involved in the project traffic control strategy and may be able to offer assistance.

1-2.3C Work Zone Traffic Control

1-2.3C(1) General

The primary function of work zone traffic control is to move vehicles and pedestrians safely through or around work zones while protecting on-site workers and accommodating the contractor's construction operations.

All work is to be performed by the contractor under the contractor's control and supervision. All resources are to be provided by the contractor unless the Special Provisions of the contract specifically states that the department will provide some resource(s), what those resources will be and how they are to be utilized. Such provided resources will be placed in the contractor's control to be used in the contractor's operation. Any additional resources provided to the contractor during the project should be accompanied by a change order to the contract and, where appropriate, a price reduction.

The "General" requirements for traffic control (Section 1-10.1) address the responsibility to provide adequate traffic control measures at work zones as follows:

- No work shall be done until all necessary signs and traffic control devices are in place and/or conflicting and confusing signs are covered.
- If the Contractor does not provide necessary traffic control, WSDOT may do it and deduct the cost from the Contractor's payments.
- The Contractor is responsible regardless of whether or not WSDOT orders, furnishes, or pays for necessary traffic control.

It is important for the Project Engineer to ensure that the Contractor has an approved traffic control plan in place and implemented providing all necessary signs and other traffic control devices so that the traveling public is aware of all deviations from the normal traffic conditions and is furnished adequate direction and guidance to permit safe travel through the construction area.

WASHINGTON STATE PATROL (WSP) TRAFFIC CONTROL ASSISTANCE

Washington State Patrol (WSP) troopers may fulfill two roles on a construction project. In the first case, troopers may be dispatched to participate in the Contractor's traffic control activity, perhaps as Flaggers or Spotters, perhaps to operate a vehicle during one-way piloted operations or rolling slowdowns. The WSP role will be defined in the contract provisions.

WSDOT has an agreement, GC9131, with the Washington State Patrol (WSP) for that agency to provide troopers and vehicles to help with traffic control on construction projects. WSP traffic control assistance is considered an enhancement to the required work zone traffic control and should be reserved for those work zones that have unusual hazards or a high degree of worker exposure to traffic, which cannot be addressed by traditional traffic control means.

The Project Engineer should ensure that good communication is maintained with WSP troopers assigned to the project and that the appropriate traffic control strategy is applied. On each shift of WSP traffic control assistance, Form 421-045, WSP Field Check List, shall be filled out. WSDOT will fill out the top portion of the form and give it to the WSP trooper on the project to complete. At the end of the officer's shift, the completed form shall be returned to WSDOT.

The Contractor shall direct the activities of the WSP troopers assigned as a labor resource provided by the State.

Instructions for WSP assistance are in Instructional Letter "IL 4008.00" and the *Traffic Manual* M 51-02.

The second case of WSP involvement is in the area of enforcement. In this case, the troopers are not considered to be a State-provided resource and do not participate in the Contractor's traffic control work. When this situation occurs, WSP is present (at WSDOT expense) to provide enhanced, increased and visible enforcement of all traffic regulations, including those installed by the Contractor in the course of the work.

Enforcement officers are simply doing more of what they usually do. Their presence or lack of presence is due to administrative decisions by the department and WSP that are completely independent of the contract. They are not to be considered a provided resource, there shall be no entitlement to their services and neither the Contractor nor the Project Engineer shall direct their activities.

As stated above, a mid-project decision to provide troopers would be a change order. To be fair to unsuccessful bidders, such a change would need a price adjustment if nothing else had changed.

1-2.3C(2) Traffic Control Management

GENERAL

"Traffic Control Management" (Section 1-10.2) addresses the requirements and duties of the Contractor's management personnel responsible for traffic and the Traffic Control Supervisor (TCS). The Contractor has the responsibility for managing traffic control and providing safe traffic control measures that are appropriate for the type of work and consistent with the requirements of the contract plans and specifications. The Contractor's traffic control work is a contract activity. Just like other contract activities, it is associated with pay items. The activity must be inspected for adequacy and conformance with the contract. Once it is performed and inspected, associated contract items must be measured and paid. Traffic management actions affect not only the Contractor's work operations, but also those of subcontractors. The process for coordinating and approving those actions must be well defined and consistent with the contract requirements.

Contractor management and the TCS work together with the Project Engineer and WSDOT's traffic control contact person to address traffic control issues as the work progresses. Planning and coordination of the Contractor's work efforts with appropriate traffic control measures are the primary responsibilities of contractor management. It is also the responsibility of management to ensure that any adopted State-provided or approved Contractor-proposed Traffic Control Plans (TCPs) needed to implement the contract work operations are provided to the TCS and that any necessary resources to implement the TCP are available.

TRAFFIC CONTROL SUPERVISOR

The TCS ensures that the traffic control measures shown on the approved traffic control plans (TCPs) are properly implemented, operating, and documented on the project. The Contractor's TCS may not be required full time on the project, but is required to perform all the duties required by the specifications. When the Contractor is working multiple shifts, it may be necessary to have more than one person assigned to the role.

In addition to the Contractor's responsibility to designate a Traffic Control Supervisor, WSDOT may designate a DOT employee who is qualified, but not necessarily certified, to serve as the State's traffic control contact. It is intended to have qualified, trained representatives from both the Contractor and WSDOT work together to achieve safe traffic control operations on the project.

Among the duties of the Project Engineer in the area of Traffic Control are the following:

- **Communication:** About the planned work, traffic control needed and adjustments to the approved Traffic Control Plan. During the work, to stay aware of changes, events and issues.
- **Monitoring:** The activities of the Contractor TCS and traffic control workers. The status of signs and control devices. Conformance with specifications and requirements.
- **Documentation:** Obtaining and reviewing daily reports. Handling Traffic Control Plans and their approvals.
- **Coordination:** With adjacent projects, with DOT Traffic offices, notices to the media.

The Project Engineer may assign these duties in any manner. It would make sense to include the State's traffic representative in these activities.

When reference is made to the "Traffic Control Supervisor (TCS) in these provisions or in the *Standard Specifications*, it shall mean the Contractor's Traffic Control Supervisor unless stated otherwise.

TRAFFIC CONTROL PLANS

"Traffic Control Plans" (Section 1-10.2(2)) addresses the requirements of Traffic Control Plans (TCPs). The Contractor must either adopt the TCPs appearing in the contract or propose modified TCPs to be used for the project. The Contractor must submit proposed modifications to plan TCPs or alternate plans at least ten calendar days in advance of the time the traffic control will be required. Approval of these plans must be obtained before the work can begin.

The possibility of alternate plans is covered by the contract. No change order will be needed because of that reason. However, if a price adjustment is needed then a change order will be necessary to accomplish that. We would allow additional payment, either through added units or revised lump sums, only if the original contract TCP was shown to be inadequate or in the case of traffic control needed for another change in the work. If the proposal is only for contractor convenience or preference, then a discussion of no pay for added traffic control or a credit for less traffic control

would be appropriate. If the contractor should balk at this, the response could be "build according to plan."

Minor modifications to the TCP may be made by the Traffic Control Supervisor to accommodate site conditions. Modifications or adjustments to the plan must maintain the original intent of the plan. When there is a change in the intent and/or substantial revisions are needed, a revised TCP shall be submitted for approval through the TCM to the Project Engineer. The Regional Traffic Office should be consulted when this situation occurs. Again, changes may call for a formal change order.

Traffic Control Plans should not only address all work zones and standard devices and signs but should also address issues such as:

- Conflicting or temporary pavement markings
- Maintaining existing operational signs and covering conflicting signs
- Staging requirements
- Temporary vertical or lateral clearance restrictions
- Temporary work zone illumination
- Consistency with any existing work hour restrictions
- Position of positive barriers for traffic hazards or worker protection
- Vertical drop-offs
- Work zone access
- Intersection or access control (traffic signals, road approaches)
- Pedestrians and bicycles
- Work zone capacity and related mobility impacts

If the Contractor's method of operation or the work area conditions require other than minor modification of the specific TCP appearing in the contract or any of the TCP's previously designated and adopted by the Contractor, the Contractor shall submit a proposed modification of the TCP for approval. If the Contractor's proposed modifications comply with the MUTCD requirements and are consistent with contract requirements as well as State and Region policy, the Project Engineer may approve these proposed modifications (perhaps utilizing a change order, if appropriate.) If the Contractor's proposed modifications do not comply with the MUTCD requirements, the Project Engineer should consult with the Region Traffic Engineer.

Any Contractor proposed TCP or modifications to an existing TCP should be evaluated for their affects on work zone safety and mobility. The Project Engineer should refer to the guidance in the *Design Manual* Chapter 810 Work Zone Safety and Mobility when evaluating how the new TCP works within the projects overall Transportation Management Plan (TMP).

If there is any doubt that the proposed TCP complies with the MUTCD or provides for the safe movement of traffic, the Project Engineer shall consult with the Region Traffic Engineer or the Region Construction Manager.

CONFORMANCE TO ESTABLISHED STANDARDS

"Conformance to Established Standards" (Section 1-10.2(3)) addresses the requirements for standards and condition of flagging, signs, and all other traffic control devices. In addition to standards establish

ed in the latest adopted edition of the *"Manual on Uniform Traffic Control Devices"* (MUTCD) and/or as specified in the contract plans, the "National Cooperative Highway Research Project, 350" (NCHRP 350) has developed requirements for safety of four categories of traffic control devices. Category 1 devices consist of small lightweight devices that generally do not present a hazard. Typical Category 1 devices are cones, tubular markers, and plastic drums with no attachments. Conformance to NCHRP 350 for Category 1 is described in Section 1-10.2(3). The Contractor is required to keep the manufacturer's certification document on file and available for inspection if needed. Inspection of certification documents by WSDOT is not routinely required but should be considered if operational or safety issues are observed.

Category 2 contains devices that are more hazardous due to their rigid construction, such as barricades, portable sign stands, intrusion alarms, and drums with lights. The collision test certification rules apply to all new Category 2 devices. The Inspector should verify, and document, that all portable sign stands have an identifying label affixed. The label will display the FHWA approval letter designation and will appear similar to the image below.

Category 3 devices are fixed or substantial in mass and could cause significant damage to a vehicle or its occupants. Devices such as barriers, fixed sign supports, and TMAs are included in this category. WSDOT approved devices in this category currently meet NCHRP 350 standards.

Category 4 devices are typically trailer or truck mounted and could cause significant damage if impacted by an errant vehicle. Devices such as arrow boards, PCMS, portable signals, and portable lighting units are included in this category. Crash testing is not required for these devices.

1-2.3C(3) Traffic Control Labor, Procedures and Devices

1. TRAFFIC CONTROL LABOR

All traffic control labor must be trained with a video about safety in the work zone. Flaggers and spotters have additional requirements concerning flagging cards and apparel.

All flaggers and spotters working on WSDOT construction projects must have a valid State of Washington flagging card or a flagging card issued by the states of Oregon, Montana, or Idaho. Flaggers, spotters, and all other personnel performing the Work described in Section 1-10 of the *Standard Specifications*, are required to wear high visibility clothing as specified in Section 1-07.8 of the *Standard Specifications*. Other workers may certainly use this type of clothing, but doing so is not a contract requirement, unless they are performing work on foot within the work zone of a Federal-Aid highway.

Flaggers used as spotters to protect an exposed work crew may be considered appropriate if other worker safety measures are not feasible. Before the Project Engineer approves the use of a spotter not shown on a contract plan, careful evaluation of the hazards involved should indicate that the spotter could actually provide a safety benefit to the work crew without undue risk to the spotter.

FLAGGERS AND SPOTTERS

Typically, flaggers have the highest exposure to traffic hazards and are more frequently injured or killed than other workers. Flaggers should only be used when all other forms of traffic control are inadequate to control traffic. When flaggers are used, flagging stations must be shown on the TCP along with the required illumination, warning signs and devices. Flagger stations should be protected with a positive barrier, if possible. The flagger should also have in mind an "escape plan" to avoid errant vehicles. It is not recommended to use flaggers at locations, such as freeways, where their primary function of warning or directing traffic is ineffective or not intended. Use of flaggers to exclusively display the "SLOW" message is also not recommended and is, in fact, not required by the contract. The provisions call for a flagger with intermittent responsibilities to direct traffic to step back from the flagging station between tasks. Additional guidance on the use of flaggers is located in the *"Traffic Manual"* and the *"Work Zone Traffic Control Guidelines Book."*

OTHER TRAFFIC CONTROL LABOR

For some projects, labor in addition to the assigned Flaggers and Spotters is needed for a variety of traffic-related tasks. Some of these tasks are listed in the provisions. Hours for this item are measured only for work on certain defined tasks (see Section 1-10.4(2)).

2. **TRAFFIC CONTROL PROCEDURES**

ONE-WAY TRAFFIC CONTROL

The major points to note in Section 1-10.3(2)A are:

- The provision does not limit one-way traffic control to treated bases, surface treatments, and pavements. This type of configuration can be used in other operations, such as grading, when appropriate.
- Line of sight is important in coordination of side roads and approaches with the limits of the one-way operation.
- When the contract does not stipulate a pilot car operation (i.e., bid proposal does not include such an item,) a new item can be established by change order if the Engineer deems that method of traffic control to be most appropriate; and
    - Contractor vehicles and equipment may utilize the closed lane in any manner. The one-way controlled open lane is for public traffic and, should the contractor use that lane, all rules and procedures applicable to public traffic will apply to the contractor. There will be no "wrong-way" travel in the open lane, no heavy equipment will join the public traffic and any additional traffic control will be performed according to approved plans only.
    - The contractor is required to plan and conduct operations so that the roadway can be reopened to two-way traffic at the end of the shift. If the nature of the work prevents this, or if the work area is left in a condition unsafe for public two-way traffic, then the contractor must continue the one-way operation throughout the off-shift hours.

ROLLING SLOWDOWN

This can be a useful method of creating gaps in traffic for very short-term activities. The key is planning and communication. If all goes well, the gap will arrive at the site and be of long enough duration that the activity can be completed. If this breaks down, the contractor must undertake the most expeditious method of restoring the open roadway. If demobilizing and pulling off is faster than finishing the task, then demobilizing is the path that will be followed, without regard to cost, efficiency or schedule.

LANE CLOSURE SETUP/TAKEDOWN

The use of truck-mounted attenuators with arrow boards is required by the provisions. This combination is to be used during the transition from open lane to closed lane. Once a lane is closed, the TMA may be removed, leaving the arrow board alone.

MOBILE OPERATIONS

The key to this operation is to keep the traffic control equipment effectively close to the work and moving to match the work operation. Two traffic protection devices are used. One is a TMA/Arrow Board combination upstream of the work. The primary purpose of this device is to protect the errant vehicle from fixed object collisions. The second device is immediately adjacent to the work area. Its purpose is to protect the workers from the errant vehicle.

PATROL & MAINTAIN TRAFFIC CONTROL MEASURES

This activity is to observe, repair and maintain traffic control devices and layout. The provisions require an hourly visit to each device and layout. Depending on the extent of the control measures, more than one patroller may be required.

3. **TRAFFIC CONTROL DEVICES**

CONSTRUCTION SIGNS

The standard of these provisions is that the contractor provides all signs, posts and supports. If the special provisions do not promise that some or all of these will be furnished by the State, then the contract requires the contractor to do it all.

"Do Not Pass" and "Pass With Care" signs are the responsibility of the Contractor. The provisions explain how to determine the number of these and that determination is to be made by the Contractor as well.

Construction Signs (Section 1-10.3(3)) divides construction signs into two categories, Class A and Class B, and lists the work required for the Contractor.

At no time should signs be left in traffic control position during periods when they are not necessary to traffic safety. Indiscriminate use of traffic control signs soon destroys public confidence and respect for the signs. Unnecessary traffic restriction and inconvenience tends to reduce the effectiveness of all signing and causes difficulty in enforcement by authorities. The Project Engineer should ensure that signs are removed or completely covered with metal or plywood during the hours they are not needed, either before or after working hours and on nonworking holidays or nonworking weekends.

Signing for nighttime traffic is more difficult than that required for daylight hours. A review of the project signing should be made and recorded during the hours of darkness.

Signs and other traffic control devices should be shown on the traffic control plan (either State-provided or contractor-submitted) approved and in use and should be installed with adjustments for work zone and traffic conditions. The Contractor and WSDOT should ensure proper use and placement of signs and devices. For situations not addressed by the TCPs, the Project Engineer will determine who is responsible for preparing a revised TCP. Refer to the Work Zone Traffic Control Guidelines Book, MUTCD, or seek assistance from the Region Traffic Engineer for appropriate TCP revisions. A modified or new TCP may be needed if adjustments to signs and devices do not adequately address existing hazards or resolve observed traffic problems or accidents.

Judgment will be required when a traffic control plan is changed. The project engineer must determine if the change has arisen because of a flaw in the original plans or because of the contractor's activities or preferences. In the first case, a change order, perhaps with compensation, may well be needed.

The remaining devices listed in the provisions are the following:

SEQUENTIAL ARROW SIGNS

PORTABLE CHANGEABLE MESSAGE SIGN

BARRICADES

TRAFFIC SAFETY DRUMS

BARRIER DRUMS

TRAFFIC CONES

TUBULAR MARKERS

WARNING LIGHTS & FLASHERS

TRUCK-MOUNTED ATTENUATOR

The specifications for these devices should be sufficient to explain their use and requirements.

1-2.3C(4) Measurement

Measurement is the key element of the new provisions, which now contain lump sum bid items. The provisions will define one of several pay item strategies, which will determine the measurements to be made.

First, the "normal" project with these provisions will contain items. The items are different from previous contracts and are non-standard, although several have very similar item names. Each of these is described below.

Instead of items, the project may be designated as a "Total Project Lump Sum." This will be the case if the item "Project Temporary Traffic Control, Lump Sum" is included in the proposal. If this is the strategy of the project, then all measurement and payment provisions for all other pay items are deleted from the contract. When this occurs, then all temporary traffic control costs of whatever nature (everything defined in Section 1-10) are included in the lump sum.

The project may be a lump sum hybrid. In this case, the Total Project Lump Sum item will be present, but the provisions will reinstate one or more of the deleted standard items. If that happens, the measurement and payment of the reinstated item(s) will be separate from and not included in the lump sum.

These are the items and a discussion of the features of the measurement spec for each:

Traffic Control Supervisor (lump sum). Previously paid by the hour, this item is now a fixed cost. Overtime is not considered, a second TCS for a night shift makes no difference. This lump sum status will likely cause TCS to become a part of change order negotiations. If the change does, in fact, require additional TCS work, then there would be entitlement. This will also apply to extended contract duration, as the TCS can be considered part of on-site overhead.

Flaggers and Spotters, (per Hour). This contract activity is separated from other kinds of traffic control labor. It is measured according to the hours that an approved flagging station is manned. We will not count minutes and seconds; time will be rounded up to the half hour as specified in Section 1-09.1. If a station is manned, but full-time presence of the flagger is not necessary (trucks entering roadway, equipment crossing) then the flagger is expected to step back out of harm's way until the next event. No deduction will be made for this stepping back, provided the flagger can not be assigned to other duties while waiting. In measuring flagging,

disregard overtime, split shifts, union rules for show-up time, the trade classification of the flagger and any other payroll issues. The flagging is a service that is provided and paid by the hour. It is only peripherally related to the flagger's paycheck.

Spotters may be used and are encouraged. Spotter stations must be shown on the TCP and approved. Once approved, the item will be measured when the approved station is manned. The same rules apply to the non-relationship between Spotter payment and the paycheck of the spotter employee.

Other Traffic Control Labor (per Hour). There are other duties for traffic control labor besides flagging and spotting. Some of them are included in this item for separate measurement. If one of the activities listed in the provision is provided, then measurement of that activity is appropriate. Only the hours that the activity is performed will be measured. Again, this is not a payroll measurement.

Note the limit under patrolling and maintaining. No matter how many people are involved in this activity, measure only one hour for each hour that each approved route is operated.

Another little feature shows up under the last bullet (Installing and removing devices). Time spent ahead of the setup marking layout points on the shoulder or getting signs ready in the yard will be measured under this item.

Do not succumb to pressures to add other hours to this item. As the payment spec for "Other Temporary Traffic Control" states, all costs not compensated by other items are covered there.

Construction Signs, Class A (per sq. ft.) to qualify for payment under this item, the sign must be designated as Class A on an approved TCP or be directed installed by the Engineer and designated as Class A at the time of direction. After-the-fact re-designations of signs that have been originally thought to be Class B should not be considered.

Other Unit Price Items. The new traffic control provisions limit unit items to major devices. These include Sequential Arrows, Changeable Message Signs and Truck Mounted Attenuators. The measurement and payment requirements for these are similar or identical to those which have been in use for some time and are relatively straightforward.

One point to make is with the force account item for "Repair Truck-Mounted Attenuator. Because this is a temporary installation and not a part of the permanent work, the Third Party Damage item does not apply and that is why a separate force account is established. If the damage was caused by a third party, the department may well be able to recover the costs paid to the Contractor under this item. The Project Engineer should take steps to protect the department's interest and involve the Maintenance, Accounting and Risk Management offices to initiate the efforts to recover costs.

1-2.3C(5) Payment

The payment provisions of the new specifications are intended to provide a mechanism that accounts for all of the Contractor's costs for temporary traffic control. The total project lump sum item is self-explanatory. There is no additional payment unless there is a change order.

If the job contains items, the pay definition for each describes the limited portion of the Contractor's costs that are covered by each item. The summary lump sum item (Other Temporary Traffic Control) is written to be a catchall cleanup that lets nothing escape for "additional compensation" discussions.

Watch out for change orders. A principal concern over lump sum items is that work will be added that is not required by the original contract and no mechanism exists to increase traffic control payment. This can be straightforward in identified changes, merely becoming an additional aspect of the negotiation. More troubling are constructive changes, which are not written, but which do end up in negotiation. An "overrun" of asphalt pavement to add a few driveways may be a convenient way to do field decisions, but may also create a dispute over the related traffic control costs (not to mention the dispute about the changed nature of the paving.).

1-2.3C(6) Construction and Maintenance of Detours

Construction zone detours will normally be detailed in the plans. When detours not shown in the plans are required, the design will likely be done by the construction office under the direction of the Project Engineer and requirements of the MUTCD. If the detour is a full-fledged roadway, design and traffic reviewers should check the design. Short-term minor detours may be installed and operated without formal review, but the Project Engineer must be satisfied that the facility is suitable and safe for traffic use.

Existing pavement markings on asphalt pavement should never be merely blacked out with oil or paint. Rather, the striped and adjacent areas should be sandblasted or ground in a pattern different from the original marking until the marking is no longer visible. This change in pattern minimizes the possibility that the original marking will still be visible to drivers, especially at night or in rainy weather when covered-over stripes have a tendency to shine in contrast to the pavement. Temporary pavement marking tape, either for temporary lane marking or masking of existing markings may offer another option.

Barricades and barriers are inherently fixed object hazards. Therefore, they should not be used unless the combined hazard for the motorist and the workers of operating without barriers is greater than the hazard of striking the barriers themselves. They should not be used as primary delineation to guide traffic. Delineation devices must be maintained, and kept clean. When delineators become covered with grime or are damaged, they become ineffective. The condition and positioning of these devices should be checked daily.

1-2.3C(7) Road/Ramp Closures

When it is necessary to close a road, street, or ramp, the Project Engineer shall submit a request that includes the appropriate closure/detour plan to the Region Traffic Engineer in advance of the need. Per RCW 47.48.010, the Regional Administrator may close a road, street, or ramp.

With proper planning and implementation, road/ramp closures can be an effective and safe method of traffic control. As required by RCW, notice of the closure shall be

published in one issue of a newspaper in the area in which the closure is to take place. Signs indicating dates and times of the closure shall be placed at each end of the section to be closed on or before publishing the notice in the newspaper. Publishing the notice and placing of the signs shall be a minimum of three days in advance of the closure. Advance notice using local radio, portable changeable message signs or HAR may be effective in diverting traffic from the closed or impacted locations.

Coordinate with the Region Public Information Officer for assistance with public notification.

In cases of emergency, or closures of 12 hours or less, the road, street, or ramp may be closed without prior notice to the public. If possible, a notice should be posted one working day in advance of the closure.

1-2.3D Speed Reductions

If speed reductions are considered, the Project Engineer shall consult with the Regional Traffic Engineer in advance of the need. Per RCW 47.48.010 and Directive D55-20, the Regional Administrator may post advisory speeds and/or establish a reduced regulatory speed limit. Speed reductions must be determined in accordance with standard traffic engineering practice by the Regional Traffic Engineer.

- ADVISORY SPEED

  Within a construction area, there may be short sections of roadway, such as curves or rough roadway, which may not be safely negotiated at the established speed limit. For these areas, an advisory speed sign should be used in conjunction with proper warning signs. The speed shown on the sign is not intended as an enforceable limit but should show, in multiples of 5 miles per hour, a safe speed for normal conditions of weather and lighting. Advisory speed signs should only be used in conjunction with appropriate warning signs.

- REGULATORY SPEED LIMITS

  Traffic controls that are designed and implemented for site specific work zone conditions, including actual traffic speed, are generally more effective than a speed limit reduction. Speed limit reductions should be considered at work zones where conditions reduce operational safety to a point where other traffic control measures are not effective.

  Directive D55-20 describes the appropriate conditions and requirements to implement advisory speeds and reduced regulatory speed limits.

1-2.3E Records of Construction Signing, Collisions, and Surveillance

Due to the increased damages being awarded by the courts for improper signing, it has become more important that detailed records of signing and delineation be continuously maintained on every project on sections of highway within the construction limits under traffic. The following are recommended procedures and methods of recording the signing on the project:

- Use extensive photographic, digital or videotape records.
- The Contractor's signing must adhere to the TCP, and the records must confirm that the sign installation is checked against that plan. The Regional Traffic Engineer should only be involved in significant changes to TCPs and need not be involved in minor adjustments.
- Documentation of the Contractor's activity for traffic control, including signing, should be completed by the Contractor's Traffic Control Supervisor (TCS). In accordance with the *Standard Specifications*, the TCS must maintain a daily project traffic control diary. DOT Forms 421-040A, "Contractor's Daily Report of Traffic Control- Summary", and 421-040B, "Contractor's Daily Report of Traffic Control Traffic Control Log," are provided to the Contractor for this purpose.

  The Summary report will typically contain a brief description of the daily activities of the TCS with expanded details of any important happening such as traffic collisions, meetings, decisions, or rapidly deteriorating conditions of traffic or weather. The Summary report is usually sufficient to verify the location and status of Class A signs once they are installed.
- The Traffic Control Log report is used to specifically identify all details of each Class B work zone setup. This includes identification of specific signs used, location of the signs, location of flaggers, location of the work zone, the time it was set up, and the time it was removed. Additional information includes cone layout, if used, comments about piloted traffic, and comments about the relationship of the setup to an approved traffic control plan.

The Project Engineer should make an effort to become aware of any traffic collisions that occurs within the project area. Where possible, thorough records should be maintained about the collision, including site conditions and the status of signing and other traffic control measures. In case of an incident investigated by the WSP, do not move signs until released to do so by the trooper. When inspections are made of the work zone, either by project or region personnel, the documentation of these inspections should be maintained in the project files. The 1997 report on Highway Work Zone Reviews contains recommendations for review procedures and reporting format. The report emphasizes the following points:

- Each Region should designate an office or individual responsible for oversight of traffic control issues.
- Regions should conduct regular reviews of traffic control with management involvement and document results.
- Expand discussion of work zone traffic control within the Region.
- Regions will take the lead in scheduling statewide annual traffic control reviews.
- State Traffic Office will prepare an annual summary of the statewide traffic control reviews.

1-2.3E(1) Work Zone Safety and Mobility

In keeping with the above recommendations, the Project Engineer should utilize the information obtained from traffic control reports, collision reports, and other field observation in order to better manage Work Zone impacts. This will allow the Project Engineer to implement any necessary changes to traffic control in order to increase safety and to enhance mobility through the work zone.

At the completion of each project, the Project Engineer should review the traffic control used on the project in order to identify trends, etc. that may be used to improve Work Zone practices or strategies. This information should be summarized and provided to the Region Traffic Office for inclusion in annual reports.

1-2.3F Resources for Traffic Control and Work Zone Safety

The following information may provide additional guidance and more specific detail. Also, this list includes the staff, reference documents and manuals mentioned throughout Section 1-2.3 of this manual.

- *Work Zone Traffic Control Guidelines*, M 54-44
- *Traffic Manual,* Chapter 5, M 51-02
- MUTCD Part VI
- Work Zone Safety Task Force Recommendations
- Quality Standards for Work Zone Traffic Control Devices (ATSSA)
- Work Zone Traffic Control Supervisor's Notebook
- Highway Work Zone Reviews, 1997 (Work Zone Safety Task Force)
- Planning and Scheduling Work Zone Traffic Control (FHWA-IP-81-6)
- Directive D 55-20, Reduced Speed in Maintenance and Construction Zones
- Instructional Letter IL 4008.00, "WSP Traffic Control Assistance in Work Zones"
- Traffic Control Supervisor Evaluation - Final Report
- Region Construction or Traffic Office and Public Information Officer(Traffic Engineer or Work Zone Traffic Control Specialist)
- State Traffic Office (Traffic Specialist or Traffic Control Engineer)

1-2.4 Application of Contract Provisions, Plans, and Specifications

1-2.4A Construction Contracts Information System (CCIS)

The CCIS system is a mainframe application designed to track contract information and generate reports for all WSDOT administered construction projects. The initial setup of contract information into CCIS is done automatically by using information in the CAPS system. However, after the initial setup, the project offices must enter the majority of the contract information into the CCIS system. The data entered is then maintained and stored on the mainframe.

Among other things, CCIS generates the Weekly Statement of Working Days and Change Orders, and tracks this information. The system creates the forms for these reports so a preprinted form is not needed. Following is a list of data that needs to be entered into the CCIS database over the life of the project:

A. *Contract Information*

This part of CCIS will contain general contract information.

Region administering contract

Region the contract is located in

Regional Administrator

Operations Engineer

Project Engineer/PE Org code

Begin and End mile post

County

Prime Contractor's local address, if applicable

Prime Contractor contact person

Prime Contractor D/M/WBE type if applicable

Prime Contractor ethnic code if applicable

Date of Statement of Intent to Pay Wages - Prime

Date of Contractor and Subcontractor/Agent Cert. for F.A. Projects

Date of Affidavit of Wages Paid - Prime

Date of Preconstruction Meeting Minutes

Date time started

Date work started

Date Orig. Progress Schedule approved

Date Last Supplemental Progress Schedule approved (if applicable)

Date of Substantial Completion (if no Substantial Completion granted, use Physical Completion date)

Date of Physical Completion

Final Estimate to Contractor

Date of Completion

Final Estimate to Headquarters (filled in by Region office)

Contract time – Original Authorized Working Days

B. Contractor Information

This part of CCIS tracks information about Request to Sublet and Affidavits of Amounts Paid.

Request to Sublet

Affidavit of Amounts Paid

C. ECR Tracking

This part of CCIS tracks the Contractor's training program, trainees, and MWDBE reviews

Training Program

Apprentice/Trainee Approval Request

DMWBE and EEO reviews

D. *Change Orders*

Change orders are created, printed and tracked in this part of CCIS. It is very important to keep the information current to facilitate correct tracking and reporting.

Approval (to proceed when granted)

CRIP Amount (if the change order is a CRIP)

A brief description of the change order (if the change order is a CRIP)

Date sent to Contractor

Date received from Contractor

Is there Surety consent

Date of Surety consent

Dates of approval and execution *Note: Line 4 "Date Executed" should only be used by Region or HQ.*

Change Order Voided (if applicable)

E. *Weekly Statement of Working Days*

The "*Weekly Statement of Working Days*" is a report generated by CCIS, based on information entered into the system by the project office. This report details the number of workable/unworkable days charged to a project, the reason a day is charged as unworkable, daily weather codes, the current status of contract days, and a summary or the week's construction activity. The Project Engineer must ensure that the appropriate information is entered into CCIS on a weekly basis, a "*Weekly Statement of Working Days*" is generated, and a copy of the report is sent to the Contractor. Weekly statements shall cease when physical completion is granted, or when substantial completion is granted and all working days are expended.

Refer to the *CCIS Manual* for details on using the system.

1-2.4B Order Lists

Contract language requiring an order list can be found in Section 6-05.3(2), which addresses piling other than cast in place concrete and steel piles, and in Section 8-21.3(1), which addresses the determination of lengths of wood and steel sign posts. In other types of work, such as drainage, guardrail, etc., the actual layout will often result in quantities and lengths that vary from the plan estimates. A project engineer could choose to communicate this information in several ways, one of which could be the development of a formal order list. If an order list is used, extra care should be taken to ensure its accuracy. An alternate method of notice could also be a walk through with the contractor representative after staking.

1-2.4C Changes in the Work

- INTRODUCTION

  WSDOT reserves the right, under *Standard Specifications* 1-04.4, to make changes to the work, work methods, working days, or quantities, as necessary to satisfactorily complete the project as originally intended.

  Adding work beyond the original scope is, in essence, entering into a contract to perform work without the benefit of a competitive bid. There is a statutory (RCW 47.28.050) exception from the competitive bid requirement for work up to a value of $7,500. If the value of the work is in excess of $7,500 it is necessary to go through the competitive bidding process.

  Change order work may impact the design criteria used to develop the project. The Project Engineer must be alert to this, and ensure that the Design Documentation Package is revised to reflect any such changes. The Project Engineer must contact the Region Project Development staff to obtain approval for the change, and for guidance in documenting and incorporating the change into the Design Documentation Package.

1-2.4C(1) Types of Changes

There are several categories of changes that may occur during the course of the work. A change may warrant additional payment to the contractor or a credit for the contracting agency. A change may also warrant an increase or decrease in the working days. Every situation is different. The *Standard Specifications* are very specific on what additional costs are eligible for adjustment. The balance of this discussion of types of changes is intended to help describe and explain the various categories of changes.

(I) VARIATIONS FROM ORIGINAL BID QUANTITIES

Contracts are set up with estimated quantities. Contractors provide unit prices and actual measured quantities are paid using those unit prices. What happens when the actual measured quantity varies from the estimated proposal quantity? The WSDOT *Standard Specifications* (Section 1-04.6) require that variations of less than 25% be performed without changes in the bid price, but that variations greater than 25% may qualify for a payment adjustment of the contract bid. This distribution of estimating risk is a policy of WSDOT and is also a Federal requirement for any project with Federal funds.

Variations may occur because field conditions cause a different quantity for the planned work than was envisioned during the estimating. Other variations may occur when work is added or deleted by change order and original contract unit items are included as the method of pricing the change order. Finally, quantity variations occur when work is added, deleted or revised without a formal change order (constructive change) and units with unit prices are the only measure of the revision. The work represented by a constructive change order is in fact work not anticipated at the time the contract was bid and executed, and as such would be outside of the requirements of *Standard Specifications* Section 1-04.6. In other words, you cannot deny a payment adjustment based solely on the fact that the accepted quantity of a bid item is within 25% of the original proposal quantity.

As discussed below, quantities included in formal change orders are excluded from consideration of quantity variations. The project engineer who allows constructive changes without formal documentation may find an additional negotiation waiting when final adjusted quantities are calculated and compared with the original proposal quantity.

A unit bid price consists of four different parts. First, and most obvious, are the costs of labor, equipment, materials and services needed to accomplish the work. These are the "direct costs" involved and they vary directly with the amount of work. Second are the variable overhead costs, such as field supervision, field support items (phones, computer rental, payroll clerks, sanicans, etc) whose amounts will vary along with the direct costs. Third, and more difficult to assess, are unavoidable, distributed, fixed overhead costs. These are typically long term and exist whether the quantity varies or not. They include things like home office costs, field trailer setup, long term equipment rentals and other fixed costs. These are typically distributed to the project by allocating them to the plan quantity. Fourth, and finally, the unit price will include some amount for profit.

[1] Section 1-04.6

The standard contract provision calls for the calculation of an adjusted final quantity. This is the method of revising the final measured quantity to allow for proposal item quantities included in agreed change orders. Unit prices as originally bid will be utilized if the adjusted final quantity is more than 75% of the original proposal quantity and not more than 25% greater than the original proposal quantity.

If the final adjusted quantity is outside these limits, then either party to the contract may initiate a renegotiation. If neither party does so, then unit prices will apply to the entire measured quantity of the item. Neither of these actions would be a change to the contract, as the provisions already allow a price change. A formal change order document might well be initiated to show the agreement, however, and would be the mechanism to create new prices.

If a negotiation is initiated, the provision calls for a new price for the quantity in excess of the 25% overrun or a contract price adjustment to compensate for costs and losses associated with an excessive underrun. The renegotiated price for the overrun portion is not an equitable adjustment and this is an important distinction. The new price is based upon actual costs experienced and is completely unrelated to the old bid price. The typical discussion about "what's different from the bid work and what number should be used to modify the bid price?" does not apply in this type of negotiation. The underrun compensation is an equitable adjustment, however, and much of the negotiation is related to the bid price and discussions of the actual work costs as opposed to the planned costs.

Other features of the provision include an exclusion of force account items and other items where an amount has been entered solely to provide a common proposal for the bidders. Consequential damages and lost profits are specifically excluded. The effect of any unbalanced allocation of overhead costs is also excluded from compensation under the provision.

Force accounts and calculated quantities are already taking actual costs into account for overruns. Because of the nature of these items, contractors are unable to allocate unavoidable fixed costs to them except as a share of the allowed markup. The contractor is aware of this provision at the time of bid and knows that this item will not be eligible for renegotiation in the case of an underrun.

Consequential damages are those which are separated from the project and which might be presented as part of a negotiation. "Because of your overrun, I was unable to start work on my other project and had to do that other work in the wintertime." This *consequence* of the quantity variation is not compensable because of the wording of the provision. Similarly, the profit that the contractor might have made on some other work but for the need to perform the extra work in an overrun is also not compensable.

Unbalanced bidding might result in a significantly higher or lower price for an item than normal. It means that too much or too little of allocated overhead or other costs is assigned to the item. This is not a problem in a low bid situation when all items come in at plan quantity. The problem would arise if an unbalanced item were to be involved in an excessive underrun. This provision allows the project engineer to evaluate this possibility during an underrun negotiation (remember that the overrun pricing takes care of the problem automatically by assessing cost and ignoring the bid price.)

Contract time may be affected by the first unit of overrun or underrun. It may be appropriate to add or delete working days; depending on how the quantity variation affects critical activities, as shown on the Contractor's approved progress schedule.

[2] Negotiation Guidelines

{a} Adjusted Final Quantity the Standard Specification language is quite clear on this subject. Start with the final measured quantity, the number that would be included in the final estimate for the item. Review all change orders that have been approved and have been accepted by the Contractor (see Section 1-04.5 for a definition of contractor acceptance of change orders.) Identify change order increases in the item and subtract these from the final measured quantity. Identify change order decreases in the item and add these to the result of the previous subtraction. The result of these calculations is defined as the Adjusted Final Quantity.

Compare the Adjusted Final Quantity to the original proposal quantity. If the Adjusted Final Quantity is greater than 1.25 times the original proposal quantity, then the item is eligible for an overrun renegotiation. If the Adjusted Final Quantity is less than 0.75 times the original proposal quantity, then the item is eligible for negotiation of an equitable adjustment due to underrun.

{b} Renegotiation for Overruns the first analysis should be to determine, if possible, where and when the overrun took place. This is not necessarily the work done after the quantity of 1.25 times proposal was reached. In many cases, a review of the work will disclose which part of the project actually experienced the low estimate and the resulting extra quantity. This is more common in physical items that are visible and can be measured by weight or physical dimensions (Roadway Excavation, Culvert Pipe, Select Borrow, etc.) These are often detailed in the plans to the extent that actual work can be compared with the relevant portion of the proposal quantity. When actual overrun work can be identified and when records exist showing the resources utilized for that work, then those records

can form the basis for the revised payment amount. In other cases, the item is a support function, often measured by time, where the plan segments cannot be separated for analysis. This is common in Flagging, Pollution Control items, etc. To analyze these, the only choice is often to look at the actual work that occurred after the threshold was reached and price it. A third method, where records are adequate, is to evaluate the actual costs for the entire item, and apply those only to the overrun units.

Regardless of method of determining direct cost, markups will be allowed. A good place to start would be the force account percentages described in Section 1-09.6. If the contractor is providing other records for overhead and profit, these can be used, if they are reasonable. Any overhead items that are unavoidable, distributed fixed costs should be excluded. Remember that the Contractor has already been compensated for these one and a quarter times over.

The revised price will apply only to the units measured in excess of 1.25 times the original proposal quantity. The overrun units between the proposal quantity and the threshold will be paid, according to the terms of the contract, at the bid price.

{c} Equitable Adjustment for Underruns the adjustment for an underrun is limited by the contract terms to three factors. The first of these is an adjustment for any increase or decrease in direct costs that result solely from the reduction in quantity. The most common example of this type of cost is the learning curve. "By the time my crew learned how to do this work at this site with these specifications, we were done. They should have been able to apply these skills to an additional 30, 40 or 50 percent of the plan quantity. I experienced the least efficient units and missed out on the most efficient." in negotiation, this might be demonstrated by production rates, by inspectors' reports or by the agreed judgment of the negotiators. If such a condition did exist, then an agreed amount for inefficiency during the learning curve could be included in the adjustment.

The second factor has to do with the nature of the work actually done, when compared with the work shown in the plans. The most common manifestation of this is "You deleted the easiest units and left me with the most difficult," or "You added units that were much more difficult than those shown in the plan." Compensable, if true. Logic dictates that, if all of the work shown in the plans was performed and, if no work was added except by formal change order, then this factor can have no value. The work that was performed was what was shown in the plans and was what the Contractor bid. If, on the other hand, the project engineer has allowed constructive changes without formal documentation, then this factor could well come into play.

Finally, the negotiation should include a look at reallocation of undistributed unavoidable fixed overhead costs. The contractor has allocated these to 100% of the proposal amount. The bid price is firm as long as 75% of the units are measured and paid. If the final adjusted quantity is less than 75%, then the anticipated contribution of the units not performed (up to 75%) can be identified, negotiated and included in the equitable adjustment.

One final aspect of underruns: There is a reality that, if more units were paid up to the 75% threshold, then there would be no eligibility for negotiation. Because of this, there is a limit to the equitable adjustment. The total paid for the item, including units actually performed and the equitable adjustment cannot exceed 75% of the original proposal quantity, multiplied by the unit bid price.

(II) DELETION OF ITEMS

[1] AUTHORITY to DELETE As provided in Sections 1-04.4 and 1-08.10(2) of the *Standard Specifications*, WSDOT may cancel all or portions of work included in a contract. When deleting work that is condition of award (COA), be sure to also delete that work from the COA requirements by completing the condition of award portion of the change order in CCIS. An adjustment in working days may also be appropriate.

[2] PAYMENT FOR REMAINING WORK There are some limitations to payment that should be noted under *Standard Specification* 1-09.5. When work is decreased or deleted by the contracting agency, payment will only be for the costs actually incurred for partially completed work. No profit will be allowed for work that was not completed. Consequential damages are also not allowed. Consequential damages may include such things as: loss of credit, loss of bonding capacity, loss of other jobs, loss of business reputation, loss of job opportunities, etc. In the case of a portion of a lump sum item or partially completed unit items, the value of this work will need to be determined. It may also be necessary to negotiate a price adjustment for the work that was performed and paid using a contract unit price if there is a material difference in the nature of the accomplished work when compared to the nature of the overall planned work. Under certain circumstances when the contractor says "you eliminated all the easy work and left the difficult," there may be entitlement to an adjustment.

In the event that the deletion impacts the critical path for the project, an adjustment in working days may also be appropriate.

[3] PAYMENT FOR MATERIALS When work is deleted from the project and the contractor has already ordered acceptable materials for such work, Section 1-09.5 of the *Standard Specifications* controls.

{a} contractor restocks the first and best method for disposing of the materials is to request that the contractor attempt to return the materials to the supplier at cost or subject to a reasonable restocking charge. If the materials are restocked then, in accordance with Section 1-09 of the *Standard Specifications*, the contractor's actual costs incurred in handling the materials may be paid.

{b} contractor purchases If WSDOT cannot utilize the materials, the contractor may elect to retain them for other work. Once again, in accordance

with Section 1-09 of the *Standard Specifications*, the contractor's actual costs incurred to handle the materials may be paid.

{c} state purchases and disposes As a last resort, if the materials can not be disposed of at a reasonable cost to WSDOT, the Department may choose to purchase the materials from the contractor. There are some limitations that come with the use of federal funds that may require that the materials be purchased with state funds depending on the situation. The State construction office may be contacted for advice. If possible, such materials may be provided to a future contractor (work with Design) or to Maintenance (work with the Regional Maintenance Office). If the materials cannot be used, they shall be disposed of as described in the manual for *Disposal of Personal Property* (M 72-91). Once again, in accordance with Section 1-09 of the *Standard Specifications*, the contractor's actual costs incurred in handling the materials may be paid.

(III) CONTRACT MODIFICATIONS

Changes in Materials, Work Method, or Work Sequence may or may not be a change to the contract. The determining factor is if the change is a modification of a specific contract requirement. If the contract includes language such as "recommends", "suggested", or "approved equal" associated with the item or allows the engineer to approve changes, then a change order is probably not required. In essence, this would not be a violation of the contract and therefore, does not require a change to the contract. A common situation is when the contractor proposes a change to a submitted manufacturer's recommendation, drawing or plan such as a falsework drawing or erection plan. Changes to those drawings/plans may be made by the same authority that approved them the first time. Once again, it is not a change to the contract.

(IV) COST REDUCTION INCENTIVE PROPOSAL (CRIP)

It is the policy of WSDOT to encourage our contractors to be innovative in planning and performing the work when a cost savings can be realized. When a contractor identifies such a savings and provides a significant portion of the efforts needed to develop the proposal, then WSDOT will share the resulting savings with the contractor. This policy is carried out through change orders containing Cost Reduction Incentive Payments. The Project Engineer should encourage CRIPs and seriously consider the mutual benefits of these proposals brought forth by the contractor as a partner in the contract.

[1] IS IT A CHANGE/CRIP? A proposal may include material and/or product substitutions, work method changes, work sequencing changes, etc., that normally take place during the construction of a project. Contractor proposals do not require change orders nor qualify as CRIPs when the change does not require modification of the contract. See the previous section "contract modifications".

[2] AGENCY CREDIT OR NO COST CHANGES (NOT A CRIP) the contracting agency is not obligated to accept a proposal which is not equivalent or superior to what is required by contract. However, if a contractor proposed change is acceptable and desirable to WSDOT, but is not equivalent or superior to what is specified by contract, then a credit should be considered as part of the change order. This type of change would not be considered a CRIP. The credit required would normally be 100 percent of the cost or time savings. If it is determined that contract time is not affected and that the cost differential is negligible or to the state's advantage, then the change might require a "no cost" change order. If, in the opinion of the evaluator, the State is not harmed and there is no windfall savings for the contractor, then a no-cost change would be appropriate.

[3] IDENTIFYING A TRUE CRIP

A CRIP might exist if:

- the change is the contractor's idea
- it offers, in effect, the same end result as what is specified in the contract
- savings will be achieved in dollars or time by its implementation

Qualifying actions by the contractor:

- accepts design risk of temporary features
- accepts risk of constructability
- makes a significant effort to develop the proposal
- employs an engineer to assist in development (indicator, but not required)
- prepares all documentation, presentations, and plans
- invests an appreciable amount of time

[4] DEVELOPMENT OF CRIPS Once a CRIP is identified and developed to the point of conceptual approval, it is treated in nearly the same manner as any other change order. There are some differences, such as the contractor's responsibility for preparing the documents, and there is a special method of calculating the incentive payment amount. In the interest of uniformity, the following guidelines are to be used for the evaluation of CRIPs submitted by the contractor:

General Requirements and Principles Applying to CRIPs:

- The proposed change must alter a contract requirement.
- The proposed change must result in a product that meets the intent of the original design.
- In the judgment of the evaluator, the ultimate life cycle costs to WSDOT shall not be unduly increased.
- The contractor agrees to substitute for deleted condition of award COA work.

Additional Requirements for Time Reduction CRIPs:

- The time saving is a direct result of an actual change in the design or method of work (simply adding more crews would not qualify as a CRIP).
- The original time for completion was realistic (an early finish of a job with an unnecessarily long time for completion would not be a CRIP).

- The project does not already have an incentive/ disincentive clause (in that case, the cost of accelerating the completion is assumed to be included in the bid and a CRIP sharing of the cost is inappropriate).
- Liquidated damages penalties are not used to calculate savings
- Administrative/overhead cost savings enjoyed by either party as a result of a contract time reduction accrue to each party and are not used to calculate savings. (these savings can be recognized as an indirect benefit of the CRIP, as discussed later).

{a} **Step 1:** *concept approval* the first effort in development of a CRIP shall be to achieve concept approval. To this end, the contractor shall submit a written proposal to the Engineer for consideration. The proposal shall contain the following information:

- An explanation outlining the purpose of the change(s).
- A narrative description of the proposed change(s). If applicable, the discussion shall include a demonstration of functional equivalency or a description of how the proposal meets the original intent of the design.
- A cost discussion estimating any net savings. Savings estimates will generally follow the outline below under "Calculating the Incentive Payment".
- A statement providing WSDOT with the right to use all or any part of the proposal on future projects without further obligation or compensation.
- A statement acknowledging and agreeing that the Engineer's decision to accept or reject all or part of the proposal is final and not subject to arbitration under the arbitration clause or otherwise be subject to claims or disputes.
- A statement giving the dates the Engineer must make a decision to accept or reject the conceptual proposal, the date that approval to proceed must be received, and the date the work must begin in order to not delay the contract.

A separate copy may be sent to the Headquarters Construction Office to initiate tracking of the progress of the proposal. After review of the proposal, the Engineer will respond in writing with acceptance or rejection of the concept. This acceptance shall not be construed as authority to proceed with any changed contract work. Depending on the nature of the proposal, the review could include Region and Headquarters designers and, possibly, outside consultants. The completeness and quality of the proposal will have an effect on the time needed for the review. WSDOT will make every effort to expedite the review.

{b} **Step 2:** *formal approval* Concept approval allows the contractor to proceed with the work needed to develop the final plans and other information to support the ultimate preparation of a change order. To qualify for an incentive payment, the contractor will normally take the lead in the development effort. The Project Engineer is encouraged to provide whatever assistance is needed. The development of a CRIP is an example of partnering at work in a contract. The contractor's submittal shall provide the Project Engineer with the following:

- Deleted Work — Calculated quantities of unit price work to be deleted. Proposed partial prices for portions of lump sum work to be deleted. Time and material estimates for deleted work in force account items.
- Added Work — Calculated quantities of unit price work to be added, either by original unit contract prices or by new, negotiated unit prices. Proposed prices for all new items to be negotiated.
- Contractor's Engineering — Costs of engineering to develop the proposal shall be submitted. Costs of employees utilized in contract operations on a regular basis will not be included.
- Schedule Analysis — If the CRIP is related to time savings, a partial progress schedule showing the changed work. A discussion comparing this schedule with the approved progress schedule for the project.
- Plans and Working Drawings — All drawings and supporting calculations necessary to accomplish the work. Those drawings which include engineering calculations and features shall be prepared by a professional engineer licensed in the State of Washington and shall bear the professional engineer's signature and seal.

{c} Step 3; Preparing and approving The change order the change order itself shall be prepared and processed in the same manner as any other change order. Accordingly, the change order must incorporate the terms of the agreement into the contract. Along with all of the components of a change, all CRIP change orders shall include the following:

- A statement that the Contractor accepts design risk of temporary features of the changed work.
- A statement that the Contractor accepts risk of constructability of the changed work.
- A statement providing WSDOT with the right to use all or any part of the proposal on future projects without further obligation or compensation.

Calculating the Incentive Payment in the interest of uniformity, all CRIP change orders shall include separate payment items as follows:

- Any deleted work, whether at contract prices or at agreed prices.
- Any added work, whether at contract prices or at agreed prices.
- The contractor's engineering costs, reimbursed at 100 percent of the contractor's cost.*
- The incentive payment to the contractor.*

*Where added work exceeds deleted work, but time savings make a viable proposal, these two items would be replaced by:

- WSDOT's share of added cost to achieve time savings.
- The contractor's share of savings from deleted work.

The final sum of these shall ordinarily be the savings to WSDOT. However, in some cases, savings may be offset by any increased inspection and administration costs, or augmented by intangible benefits, such as user benefits, or by indirect benefits, such as overhead and engineering savings in time reductions, or by theoretical savings, such as a CRIP that eliminates a large anticipated overrun in plan quantity. In these cases, the benefits would not be expressly reflected in the change document, but should be discussed in the justification letter.

Proposal Savings: The incentive payment shall be one-half of the net savings of the proposal calculated as follows:

(gross cost of deleted work) - (gross cost of added work) = (gross savings)

(gross savings) - (contractor's engineering costs) - (WSDOT's engineering costs) = (net savings)

(net savings)/2 = (incentive pay)

WSDOT's engineering cost shall be actual consultant costs billed to WSDOT and extraordinary in-house personnel labor costs. Project personnel assigned to the field office or who work on the project on a regular basis shall not be included.

Cost to Achieve Time Savings:

(cost of added work) + (contractor's engineering costs) = (cost to achieve time savings)

(cost to achieve time savings)/2 = (WSDOT's Share of Added Cost)

If the timesaving proposal also involves deleting some work and, as a result, creates a savings for WSDOT, then the contractor would also receive one-half of the savings realized through the deletion.

{d} Authority to Proceed with Changed Work the need may arise to proceed with changed work before the change order is executed. WSDOT is willing to provide an approval, allowing the work to proceed, if the following criteria has been met:

- Concept approval has been granted.
- The necessary design reviews and approvals have been completed, including plans and specifications.
- The contractor has guaranteed, in writing, the minimum savings to WSDOT.

Such advance approval, if given, shall be in writing and shall constitute commitment by WSDOT to ultimate formal approval of the proposal. Where appropriate, the advance approval may contain a narrative formula of the elements to be utilized in the final cost negotiations. When work has begun under such an approval, detailed records shall be kept of the labor, equipment, and materials utilized and, if ultimate approval is not gained soon enough to provide prompt payment for the work, then an interim change shall be executed to allow partial payments.

{e} Problems Arising After the Agreement the contractor assumes the risk of constructability. However, there will occasionally be problems that arise while the work of the CRIP is being performed. These will be evaluated on a case-by-case basis. The controlling philosophy will be that we entered the CRIP as a team with the contractor and we will approach problems in a similar vein. If the problem is something that could not reasonably have been anticipated in the design work of the CRIP, then the risk shall be shared as will the cost of the solution.

{f} Proposed CRIP is not accepted If the evaluator decides to reject a CRIP proposal, the contractor will be notified in writing with an explanation. Copies of this notice, with an attached analysis of evaluation costs and any other factors, shall be provided to the Region Construction Manager and the Headquarters Construction Office.

(V) TERMINATION FOR PUBLIC CONVENIENCE

[1] AUTHORITY to TERMINATE: As provided in Section 1-08.10(2) of the Standard Specifications, WSDOT may cancel all or portions of the Work included in a contract. If the project is to be terminated in whole and contains Federal funds, FHWA must be notified and a discussion of Federal participation eligibility should take place prior to the decision to terminate is finalized. The authority to terminate a contract resides in the same position that is authorized to execute the project. Change order approvals, per the Change Order Checklist, are required for termination change orders.

[2] COST ASSOCIATED WITH DELETED WORK: The Contractor must submit a request for payment of costs associated with termination of the contract no later than 90-calendar days from the effective date of the termination. There are some limitations to payment that should be noted under Section 1-09.5 of the Standard Specification. When Work is deleted by the termination of a contract by the contracting agency, payment will only be for the costs actually associated with the termination. No profit will be allowed for Work that was not completed. Consequential damages are also not allowed. Consequential damages may include such things as loss of credit, loss of bonding capacity, loss of other jobs, loss of business reputation, loss of job opportunities, etc.

[3] PAYMENT for MATERIALS: When Work is deleted from the project by termination and the contractor has already ordered acceptable materials for such Work, payment for these materials may be negotiated in accordance with Section 1-09.5 of the Standard Specifications.

[4] DELETION of CONTRACT ITEMS: Since a termination change order is deleting work from the contract, uncompleted and unused contract items, if they are to remain uncompleted, must be deleted from the contract by the change order. "Zeroing out" these items assists in releasing funding from the project. When terminating a contract that contains work that is condition of award (COA), be sure to delete that work from the COA requirements by completing the condition of award portion of the change order in CCIS. Due to limited character space in CCIS, it may be necessary to create more than one change order to complete the termination change order. Be sure these multiple change orders are concurrent.

[5] PHYSICAL COMPLETION: If the Contractor is not required to complete any contract Work after execution of the change order, the execution date of the change order should be established by the Project Engineer, and entered into CCIS, as the Physical Completion date for the contract. If the Contractor must complete some items of the Work, Physical Completion will be granted by the Project Engineer upon satisfactory completion of the Work (Standard Specification Division 1-03). This date assists the CAPS unit of AFS to know if insurance must be maintained on the project.

[6] TIME: The change order should contain a time statement, just like any other change order.

[7] WAIVER: The change order should contain waiver language similar to that found in Chapter 1-3.3A(2) of the Construction Manual.

1-2.4C(2) Equitable Adjustment

(I) PRICING

Section 1-04.4 of the *Standard Specifications* specifies that an equitable adjustment (EA) in accordance with Section 1-09.4 will be made when changes cause an increase or decrease in the cost of performing work on the contract. The basic theory of an EA is to leave the parties to the contract in the same position cost wise and profit wise as they would have been without the change, preserving to each as nearly as possible the advantages and disadvantages of their agreement. Although the contractor is entitled to profit on the changed work, the profit (or loss) on the unchanged work should remain unaffected by the equitable adjustment.

- This is an important point, *for unchanged work*, the contractor is entitled to the profit bid or a windfall, if the work turns out to be easier than expected.
- On the other hand, *for unchanged work*, the contracting agency is not obligated to make the contractor well for an under bid item.

Consequential damages are never allowed as part of a negotiated equitable adjustment. Consequential damages may include such things as: loss of credit, loss of bonding capacity, loss of other jobs, loss of business reputation, loss of job opportunities, impacts to another project, etc.

[1] UNIT PRICES An appropriate price may be

established using average unit bid prices, citing similar unit bid prices, a determination of market value, by estimating the cost to perform the work, or a combination of these methods. Unit bid price is one indication of an equitable price, however the contracting agency should be prepared to support the price by other means.

[2] FORCE ACCOUNT When added work is paid by force account, a change order shall be prepared detailing the added work to be performed and the estimated cost. Standard Item Number 7715 is to be used for all force account items that do not have an assigned standard item number. Force account should be a last resort used only if the work can't be clearly defined.

[3] OVERHEAD There are two basic types of overhead as follows:

- **DISTRIBUTED FIXED COSTS:** Offsite "home office overhead" is the cost of running a company. These costs are assumed to be distributed among all the projects performed by the company. Onsite overhead is incurred as a function of time needed to accomplish the project. Onsite costs are assumed to be evenly distributed among contract items. This category of overhead is eligible under an equitable adjustment if working days are added to the contract as part of the adjustment.
- **VARIABLE FIXED COSTS:** these costs are directly associated with performing an item of work on the project and therefore vary with the quantity, the contractor is entitled to recover these costs as a part of an equitable adjustment.

(II) FORWARD PRICING AND RISK

The first and best option for an equitable adjustment is agreement in advance between the contractor and WSDOT on the increased or decreased cost and time for performance of the changed work. The Project Engineer should expend every effort possible to obtain a satisfactory negotiated equitable adjustment prior to submitting the change order to the contractor for endorsement. The Project Engineer must remember that the contractor is a full participant in the contract and retains all the rights and privileges during a negotiation. When bidding a job, the contractor must be optimistic and take appropriate risks. When negotiating, it is understandable and acceptable for the contractor to be pessimistic and avoid risk, unless compensated. Some key points to remember are:

CHANGE ORDER — CHECKLIST			
Cont. #: _____ **Cont. Title:** _____ **Change Order #:** _____ **C.O. Title:** _____			**If Yes, State Construction Office Approval Required**
I. Executed by the State Construction Office	**Yes**	**No**	
1. A cost or credit equal to or exceeding $500,000.*1	☐	☐	X
2. A change in the contract documents beyond the scope, intent, or termini of the original contract.*2	☐	☐	X
3. Any proposed revision or deletion of work that affects the condition of award requirements.	☐	☐	X
II. Executed by the Region			
4. A cost or credit greater than $100,000 but less than $500,000. *1	☐	☐	
5. A change in contract time greater than 10 and less than or equal to 30 working days must be related to changes implemented by change order.	☐	☐	
6. A change in contract time greater than 30 working days or a change in contract time unrelated to any change order.	☐	☐	X
III. Executed by the PE			
7. A determination of impacts and/or overhead.	☐	☐	X
8. Specification change, involving Headquarters generated specifications. (Includes Region Generated specification requiring State Construction Office Approval)	☐	☐	X
9. Specification change, involving Region generated specifications.	☐	☐	
10. Material or product substitution.	☐	☐	X
11. A structural design change in the roadway section. (Requires State Materials Lab approval)	☐	☐	
12. A determination of changed condition. (Section 1-04.7 of the *Standard Specifications*)	☐	☐	X
13. Settlement of a claim submitted(Section 1-09.11(2) of the *Standard Specifications*)	☐	☐	X
14. Repair of damage regarding “acts of God” or “acts of the public enemy or of government authorities”. (Section 1-07.13 of the *Standard Specifications)*	☐	☐	X
15. A structural change for structures (see BTA authority as shown in the Construction Manual).	☐	☐	X

Approvals Obtained:

Project Engineer (Required): _____ Date: _____

Region (Required if yes marked): _____ Date: _____

State Construction Office: _____ Date: _____

State Materials Lab: _____ Date: _____

Other (Local Agency, FHWA, Surety, etc.): _____ Date: _____

To be completed by Project Engineer:

CO Reason (s) (see CCIS “Browse Reasons” or HQ Const. SharePoint): _____

Change order prepared by: _____ Date: _____

Has change been entered in lessons learned? Yes ___ No ___ Has design documentation been updated: Yes ___ No ___

Is this project under full FHWA stewardship oversight? *1 Yes ___ No ___

To be completed by Region:

Is the change eligible for Federal participation where applicable? Yes ___ No ___

Change order reviewed by: _____ Date: _____

*1 Change (Cost or Credit) greater than $200,000 or greater than 30 days on Full Federal Stewardship Oversight requires FHWA approval (see Ch. 1-2.4C(3), Ch. 1-3.4 and http://www.wsdot.wa.gov/biz/construction/Stewardship/Stewardship.xls).

*2 Per RCW 47.28.050, any change beyond $7,500 that is beyond the original scope shall go through the competitive bidding process.

This form represents the minimum information required by State Construction. If you wish to supplement this information, you may do so on a separate sheet of paper.

Figure 1-5

- A negotiated price will likely be higher than a competitive bid price.
- A proposal which assigns extensive risk to the contractor will likely be more costly yet.
- The contractor may be willing to take on this risk if the price is a bit higher
- The significant advantage of reaching a price agreement before the work is started (forward pricing) is that the contractor assumes the risk of the accuracy of the pricing assumptions and predicted duration for performing the work.
- (when forward pricing) the Project Engineer may utilize the high end of the estimating range in justification.
- (when forward pricing) an audited overhead rate may be substituted for the markups described in Section 1-09.6. Contractors can usually provide an estimated home office overhead rate which may be checked by an annual audit, if warranted.

(III) PRICING AFTER FACT

When establishing prices after the work has been performed, actual costs should be used to the extent they are available. The following are key points to keep in mind:

- Costs for equipment cannot exceed the rates established by the AGC/WSDOT *Equipment Rental Agreement* for an equitable adjustment.
- When pricing after the fact, the markups described in Section 1-09.6 are appropriate for measuring time and materials because there is no risk involved in after the fact pricing.

(IV) UNILATERAL PRICING

In the interest of being timely, the change order should be a tool to document agreement and not a negotiation tool back and forth. Ideally we will have agreement with the contractor when pricing the work. On occasion, however, due to time constraints and difference of opinion, we can't always come to agreement. The difference of opinion may be for only a small portion of the work. *Standard Specification* 1-09.4 (2) provides, "If the parties can not agree, the price will be determined by the Engineer using unit prices, or other means to establish costs". This is not to say that the contractor is obligated to honor unit bid prices for work that qualifies for an equitable adjustment. This allows us to proceed with changed work prior to reaching an agreement on the price. In the interest of being timely, and provided the Project Engineer is comfortable that the included price can be supported, there's nothing wrong with issuing a change order to the contractor unilaterally. This orders the work to proceed, establishes the State's position on cost, and puts the decision to continue negotiations in the contractor's hands as detailed under 1-04.5. The contractor is obligated to endorse, write a separate acceptance, or protest as described in the specification and a timeline is provided for these actions.

(V) TIME

The completed equitable adjustment should include provisions for any increases or decreases in contract time based on impacts to overall contract duration. The decision on time should be supported by an analysis of the project schedule. Analyzing time in advance encourages communication between the parties allowing the contracting agency to make an informed decision on the true costs. It also enables the contracting agency to mitigate time impacts if that is in the agency's best interest.

1-2.4C(3) Approval of Changes/Checklist

In addition to noting who can execute a change order, the checklist (see Figure 1-5) further indicates who must approve the change prior to execution. The completed checklist shall accompany the change order when it is transmitted to Headquarters, and represents the minimum information required to process the change order, If the Region wishes to supplement the checklist, they may do so on a separate sheet. Written approval constitutes agreeing with the general nature of the change and can be granted by memorandum or e-mail. The checklist works as follows: for any item marked "yes", approval from the State Construction Office must be obtained if indicated by the column with the "Xs". The Project Engineer and the Region Construction Office have the authority to decide not to proceed with the change. This approval does not constitute authority to proceed with the work. That authority must come from the person who will execute the change order (*see* prior *approval*) in an emergency; the Region Construction Manager may authorize work to begin on any change order if the State Construction Office cannot be contacted for the required approvals within a reasonable amount of time.

(I) STATE CONSTRUCTION OFFICE

[1] FHWA APPROVAL - On a project with federal funding and for which the stewardship responsibility has not been delegated (full FHWA oversight), written FHWA approval, or other less formal prior approval if the public interest is served by the more timely action, is required prior to beginning work on change orders that will:

- involve new construction on the Interstate
- alter the termini, character, or scope of work
- increase or decrease the project cost by more than $200,000 (except for changes prepared in accordance with *Standard Specification* Section 1-04.6)
- add more than 30 days to contract time

  {a} who does what? The State Construction Office will formally submit this type of change order to FHWA for approval.

  Projects with full FHWA oversight are listed on the State Construction Office web site at: http://www.wsdot.wa.gov/biz/construction/Stewardship/Stewardship.xls.

[2] CONSTRUCTION ENGINEER, ADMINISTRATION

{a} areas of responsibility Contract Payments and Withholding of Payments; Contractor Assignment of Payments; Contractor Default; Time Extensions; Assessment of Liquidated Damages; Contract D/M/WBE, EEO, and Training Programs (i.e., Division 1 of the *Standard Specifications*).

[3] CONSTRUCTION ENGINEER, BRIDGE

{a} areas of responsibility: Division 6 of the *Standard Specifications* (See Chapter 1-1.3A(3))

[4] CONSTRUCTION ENGINEER, ROADWAY

{a} areas of responsibility: Divisions 2, 3, 4, 5, 7, and 8 of the *Standard Specifications* (See Chapter 1-1.3A(2)).

[5] STATE MATERIALS LAB

{a} areas of responsibility: Division 9 of the *Standard Specifications* (See Chapter 1-1.4) The State Materials Laboratory also advises the State Construction Office and Regions regarding an alternate material's capability to perform the same function as a required material. However, the State Construction Office makes the final approval based on application of the material, maintenance concerns, etc., as to whether an alternate material is capable of performing. As you will notice from the checklist, the State Materials Laboratory plays a major role- in:

CHECKLIST ITEM #11 the State Materials Lab is the design approval authority for a structural change with regard to roadway sections. Once design approval is obtained, the Region may approve the change order.

[6] BRIDGE TECHNICAL ADVISOR (BTA)

{a} areas of responsibility: the BTA is on call to the Project Engineer during active contract work. BTA's are responsible for questions relating to structures design, plan inconsistencies, and "minor" structural changes to support construction contracts.

{b} assignment of *BT*A: after the contract has been awarded, the Project Engineer may send a written request to the Bridge Construction Engineer in the State Construction Office for the assignment of a BTA. The State Construction Office will evaluate the request with the Region to determine if BTA assignment is appropriate or necessary for the specific contract under discussion..

{c} delegation of executing authority if BTA is assigned: when a BTA has been assigned to the project, the Region may execute minor structural change orders provided: 1) there is written structural concurrence and a recommendation from the BTA; and 2) the magnitude of the change is within the Region's authority to execute. A copy of all correspondence between the BTA and the Region shall be concurrently sent to the State Construction Office. All other requirements of the change order checklist apply with the exception that when structural changes, under item #15, are deemed to be "minor" the BTA's written structural concurrence and recommendation may substitute for the State Construction Office approval.

{d} minor structural changes: a "minor" structural change is not easy to identify, therefore, when in doubt, contact the State Construction Office for advice. Changes involving specifications, materials, work method changes, repairs, major design changes, and CRIPs should be referred to the State Construction Office. The BTA would never become involved in contract administration issues such as payment, determining the existence of a change to the contract, or directing the contractor. These would be construction issues. Structural questions which require support analysis exceeding field capabilities or questions regarding geotechnical or hydraulics issues should be referred to the State Construction Office. Any redesign of significance will be managed through the State Construction Office.

{e} BTA guidelines:

- Develop the most economical solutions with consideration to the Contractor's means and methods.
- Structural concurrence and recommendations for "minor" structural changes should be made in writing to the Project Engineer and the State Construction Office and should include:
  - A cost estimate of the change work and written documentation to support the recommendation for changes.
- Keep a project diary of all activities and recommendations.
- Refer contract administration issues to the Project Engineer and the State Construction Office.
- Conform to the field safety requirements of the Region and the Contractor.
- Give the project priority but be prudent in the use of time and expense charges.

The above guidelines are generally representative of the scope of services to be provided by the BTA. The BTA's immediate administrative support on-site will be provided by the Project Engineer. The BTA's technical responsibility will be to the BTA's supervisor in the Bridge and Structures Office. Overall determination and monitoring of the assignments will be made by the State Bridge and Structures Engineer.

{f} BTA summary: Bridge Technical Advisors advise the Project Engineer in their area of expertise, which is structural design. The Project Engineer has the responsibility and authority to administer all aspects of the contract. Therefore, when it comes to contract issues of payment, work methods, material substitution, etc., it will be the Project Engineer's responsibility to get the proper approval of those aspects of structural changes

1-2.4C(4) Delegation of Execution Authority

(I) HIGHWAY CONSTRUCTION

The Change Order Checklist (Figure 1-5), in addition to describing the approval requirements previously described, also outlines who has authority to execute a change order.

The State Construction Engineer (or designee) executes the change order:

- if any one of 1, 2, or 3 is true (checklist item # 1, 2, or 3 is yes)

The Region (Regional Administrator or designee) may execute a change order provided:

- 1, 2 and 3 are not true of the change (checklist item # 1, 2, and 3 are no)

The Regional Administrator's authority to execute change orders may be:

- delegated to the Regional Construction Manager
- further delegated to the assistant to the Regional Construction Manager

The Region's (Regional Administrator or designee) authority to execute a change order may be delegated to the Project Engineer provided:

- items 1 through 6 are not true of the change (boxes 1 through 6 are marked no)

In the absence of the Project Engineer, the Project Engineer execution authority may be further subdelegated to the Assistant Project Engineer.

(A) LIMITS OF EXECUTION AUTHORITY

Executing Authority	Dollar Limit	Time Limit
State Construction Engineer	Greater than $1,000,000	Greater than 60 days
Construction Engineers	not to exceed $1,000,000	not to exceed 60 Days
Assistant Construction Engineers	not to exceed $750,000	not to exceed 45 Days
Region Administrator or Designee	not to exceed $500,000	not to exceed 30 days

(II) WASHINGTON STATE FERRIES

The Director and CEO of WSDOT Division of Washington State Ferries is authorized to approve all changes for terminal construction projects and may consult the State Construction Office for advice. This authority to execute change orders may be:

- Delegated to the Director of Terminal Engineering provided the change does not include a cost or credit exceeding $500,000 nor does it change the condition of award requirements.
- Authority may be further delegated to the Manager of Terminal Maintenance and Construction provided the change does not exceed $100,000 and does not include a time extension exceeding 10 days.
- In the absence of the Manager of Terminal Maintenance and Construction, that Manager's execution authority may be further subdelegated to the Assistant.

(III) LOCAL AGENCY PROJECTS

When the project being administered includes local agency participation, the project engineer should coordinate with the Regional Local Programs Engineer and the local agency to establish an approval process acceptable to all the parties. Any funding constraints and timelines for reviews and approvals should be established and specified in the contract, if appropriate.

1-2.4C(5) Prior Approval

The best business practice is to have a signed change order in place prior to proceeding with the work. Prior approvals should be the exception. A prior approval might be warranted if it will provide a cost/time benefit to WSDOT or minimize a cost/time disadvantage to the contractor. In the event that the Project Engineer determines that it is in the State's best interest to proceed with the work prior to having a signed change order, the permission "prior approval" of the executing authority to proceed with the change under these circumstances must be documented in the file. The executing authority is the person who will ultimately execute the change order. The project engineer must have either an executed change order or a prior approval in place prior to proceeding with the work

1-2.4C(6) Documentation

(I) STATE CONSTRUCTION OFFICE ROLE

The State Construction Office will review Region executed change orders and provide appropriate feedback. Four main areas the Construction Office will review are:

- whether the change is appropriate and there is entitlement
- determine compliance with the change order checklist
- check for existence of supporting documentation
- determine if eligibility for federal-aid participation has been addressed

(II) PROJECT FILES

[1] CCIS INPUT The Project Engineer shall ensure that the following information is input into CCIS accurately and in a timely manner:

- Page 1
  - Contract No.: (in 6-digit format)
  - Proposed By: C(Contractor), E(Engineer), or B(Both)
  - Order Date: Date change order entered into CCIS
  - Unilateral Change: Y/N
  - PE Stamp required: Y/N
  - Short Description: Descriptive title for change order
  - Is this a MINOR CHANGE? :Y/N
- Page 2 – (Use only if approval to proceed is requested)
  - Approval Date: The date approval given
  - Estimated Amount:
  - Requested By: Who requested approval
  - Approved By: Who gave approval

  - Estimated Amount: The estimated dollar amount of the change order
  - Narrative: Description of why approval is needed
- Page 3 – (Use only if this change order is a CRIP)
  - CRIP Amount
  - Commentary on CRIP
- Page 4
  - Sent To Contr: The date the change order was sent to the contractor for signature/concurrence
  - Rec'd From Contr: The date the change order was returned from the contractor
  - Surety Consent: Was surety consent obtained
  - Surety Date: Date Surety consent obtained
  - PE Recom: Is PE recommending approval by Region or HQ
  - Exec: Initials of PE if executing change order
  - Date: Date that PE executed or recommended execution (Note: the date field on line 4 is for Region or HQ use only)
  - By Whom: Who voided change order (if applicable)
  - Date: Date change order was voided (if applicable)
- Page 5
  - Phase: Contract phase affected by change order (if days added/deleted)
  - Description: Phase description (if days added/deleted)
  - Net Change: Number of days added/deleted by change order
- Page 6
  - What Section of contract changed?
  - Describe the Detail Change:
  - What created the need or caused the change?
  - What is the purpose of this change order?
- Page 7
  - Description: Change order text (uploaded from MS Word)

If new items are created, contract items modified, or Condition of Award is modified by the change order, this information must be input into CCIS as well.

It is important that CCIS input be accurate and timely. CCIS is used by internal and external customers to monitor project changes and costs. Information on change orders (*including minor changes*) is readily accessible through a numbering process and must be adequate so that everyone involved will understand the need for the change. Some key items to remember are as follows:

- Is there a clear description of the work?
- Is the origin and purpose of the change being entered using at least two of the reasons listed in the system?
- Was there an order, other than a signed change order, by the engineer for the contractor to proceed?
- Is there a reference to any key documents in the change order file?
- Are any increases or decreases in contract time associated with the change order entered in the appropriate field enabling the *Weekly Statement of Working Days* to be automatically updated?
- For condition of award change orders, are the appropriate fields filled in to generate the change order and automatically update the condition of award items?
- Are any disclaimers included in the change order and are any agreed upon disclaimers included in the text?
- Are all the appropriate dates entered?

[2] Memorandum: The memorandum transmitting the change order and attachments should include an explanation in sufficient detail so that everyone involved will understand the need for the change, will see that the price is appropriate and that appropriate checks and consultations have been made. The following is a list of items to consider for inclusion in the transmittal when putting together a change order:

{a} describe the change

- what is required by contract?
- what is the change?
- how does it solve the problem?
- reason for entitlement/why is this not paid under the contract?
- is there time associated with the change?
- did the contractor concur/if not why?
- is FHWA participation appropriate?
- does the change affect COA?

{b} evolution of the change

- how did the change evolve?
- discussions with associated offices (maintenance, utilities, environmental, budget, design, etc.)
- alternatives considered
- BTA involvement
- design approval necessary
- COA substitutions authorized by State Construction Office
- approvals in accordance with the checklist/date

{c} payment

- any increase or decrease in cost
- how it was established (see equitable adjustment)
- force account must include estimate

{d} time

- does the change impact the critical path?
- how was any change in working days established?
- note if a change in contract time affects the amount of liquidated damages

{e} prior approval

- was the change order executed by the appropriate WSDOT authority prior to proceeding with the work?
- if not, prior approval by whom and when

{f} attachments

- checklist
- documentation of approval to proceed
- any supporting documentation needed for understanding

[3] DISTRIBUTION

{a} Region-executed When the Region (PE or Region Construction Office) has executed a change, then copies should be sent to the Contractor and the CAPS Unit of Accountability & Financial Services, (if necessary, the CAPS Unit of Accountability & Financial Services creates and coordinates new groups in "CAPS" and "TRAINS"). The original signed change order, the original memorandum and any other pertinent documentation, along with one copy of the change order and one copy of the memorandum should be sent to the State Construction Office. If the change order requires FHWA approval per Chapter 1-2.4C(3), the Assistant Construction Engineer will route a copy of the change order package to the responsible FHWA representative upon receipt. If the change order utilizes the "Minor Change" process, then the two page document substitute for the transmittal and CCIS change order print out. The original two page "Minor Change" document should be sent to the State Construction Office,

{b} Headquarters-executed If the change is executed at the State Construction Office, copies will be sent to the contractor, the Region, the CAPS Unit of Accountability & Financial Services, (if necessary, the CAPS Unit of Accountability & Financial Services creates new groups and/or items) and, if appropriate, to the State Bridge Office, Design and the Materials Lab. If the change order requires FHWA approval per Chapter 1-2.4C(3), the Assistant Construction Engineer will route a copy of the change order package to the responsible FHWA representative upon execution.

{c} protecting the *interest* of *the surety* One area for the Project Engineer to watch is the interests of the bonding company. Consent of Surety should be required on any change order that expands the scope of the contract. It is also appropriate on any change of large value or risk. Failure to obtain consent of surety could weaken the State's protection under the bond.

{d} Requiring FHWA approval Upon receipt of the signature page signed by the FHWA representative, the State Documentation Engineer will route a copy to the Headquarters files and the change order final records file.

1-2.4C(7) Minor Changes

(I) OVERVIEW

All contracts will have a standard item for "Minor Changes". This item will be established in every group as a calculated lump sum. Credits, debits, changes in working days and no cost changes may all be processed under the minor change method subject to the listed criteria.

(II) CRITERIA FOR USE

Keep in mind that although the change meets the criteria for using the minor change process, the Project Engineer may decide that this process is not appropriate. The use of this item is at the Region's and the Project Engineer's discretion. Also keep in mind that the limitations and approvals required by the change order checklist still apply as well as all other change order criteria not modified by this *Minor Changes* section. The Minor Changes process is limited to changes that satisfy both of the following criteria:

- the value of the change (credit or debit) is estimated at $15,000 or less and,
- any change in working days not greater than ten days.

(III) ENDORSEMENT

In the interest of being timely, the change order should be a tool to document agreement and not a negotiation tool back and forth. The contractor's authorized signature on the change order is desirable but not mandatory. A phone call or a verbal agreement with the project superintendent may be appropriate if payment is to be made by "Minor Changes". This may be a good discussion item at preconstruction meetings. The Project Engineer should determine when the Contractor's signature is required based on when it is in the State's best interest to document agreement prior to proceeding with a change order. Some situations that may warrant the Contractor's signature are as follows:

- The contract includes substantial incentives.
- There are mutual benefits associated with the change.
- The change might include impacts to time or other work.
- The change is proposed by the contractor.
- The change is a claim settlement.

In any case, a copy of the Minor Change must be sent to the contractor. If the contractor does not agree with the terms or conditions of any change order and has not endorsed the change, then the contractor is required to follow the procedure outlined in Section 1-04.5 of the *Standard Specifications*. This orders the work to proceed and puts the decision to continue negotiations in the contractor's hands as detailed in that section. The contractor is obligated to endorse, write a separate acceptance or protest as described in the specification, and a timeline is provided for these actions.

(IV) EXECUTION

Due to the criteria for the application of minor changes, the Project Engineer has the authority to execute these change orders.

(V) PAYMENT BY LUMP SUM

The negotiation of prices for payment under "Minor Changes" is intended to be the same as any other change order. The focus, as always, should be forward pricing such that the contractor controls the work and assumes the risk. However, situations occur where it makes sense to measure portions of the work in a variety of ways such as units, force account and/or lump sum. The method for establishing, measuring and monitoring the total may be by any combination of methods however, the payment will only be by a lump sum under the item "Minor Changes".

(VI) PROJECT FILES

[1] CCIS INPUT: "Minor Change" change orders must be entered into CCIS, however the required input is slightly abbreviated. Since a formal change order document as described in Chapter 1-2.4C(6) is not processed, the *Work Description* section in CCIS requiring a detailed upload of text is not required. However, the *Short Description* is required and should provide enough detail to identify the content of the "Minor Change" change order. All other information requested by CCIS, including changes to working days, is required.

[2] TRANSMITTAL: under the Minor Change process, the "*Change Order - Minor Changes* form # 421-005A EF" substitutes for the transmittal included in the more formal process described above. The information on the Minor Changes form should at a minimum briefly document three key items:

- A description of the change
- Reason for entitlement/why is this not paid by bid items.
- Any increase or decrease in cost and time and briefly how it was established.

[3] distribution: when utilizing the "Minor Change" process, the minor change form is substituted for the change order document and the transmittal. The original, signed, "Minor Change" form and the Change Order Checklist shall be submitted to HQ. In the case of the "Minor Change" process, it is not necessary to route other backup documentation nor a CCIS print out, as part of the distribution. A copy of the form may be used to document the payment.

1-2.4D Force Account

1-2.4D(1) General

When it is difficult to provide adequate measurement or to estimate the cost for certain items of work, force account may be used in order to pay the Contractor for performing the work. Some contract items may be set up to be paid by force account. Some change orders may require payment by force account. Section 1-09.6 of the *Standard Specifications* describes the boundaries for payment of work performed by the force account method. In any case, the purpose of force account is to fully reimburse the Contractor for costs incurred on the work. These costs may also include indirect segments, such as travel, per diem, safety training, industrial safety measures, overhead, profit and other hidden costs. The objective is to minimize the inclusion of any "contingencies" included in the contract bid in anticipation of costs that may be incurred during force account work and not reimbursed.

When work is added to the contract and is to be paid by force account, a change order will have been prepared describing the added work to be performed. The change order package will also contain an independent estimate of the cost to perform the added work. All non-standard force account items are assigned the Standard Item Number 7715.

Force account payments are typically not authorized for employees engaged in management or general supervisory work. The cost for this type of activity is presumed to be included in the Contractor's markups for overhead and profit. However a foreman or, in some cases, a dedicated superintendent devoting full time to the force account work is eligible for payment on the force account.

On projects that require the Contractor to employ trainees, these employees may be utilized in force account work.

In the case of some Emergency Contracts (see *Emergency Relief Procedures Manual* M3014.01) which will be measured and paid by Force Account, it is appropriate for the Engineer to consider payment for mobilization of equipment to the site of the emergency, including all staff time employed to procure and coordinate the mobilization. It may also be appropriate to include the labor payment for a dedicated superintendent and foremen employed solely to oversee the emergency work. On emergency contracts the mark ups may not be enough to cover the cost of performance bonds; the Project Engineer may consider payment for performance bond costs when making payment under emergency force account contracts.

The Project Engineer should consider a decision to direct force account work with the same degree of caution that would be applied to directing any other work on the contract. The Contractor should have the expertise to schedule the work and determine what equipment is required. In most cases, it is best that we allow the Contractor to propose the method and approach to the work. Our most effective role would be to concur or approve of the Contractor's proposal or suggest modifications to it. Before any work is performed by the Contractor on a force account basis, the inspectors should review and agree with the Contractor upon:

1. **Labor.** The classification and approximate number of workers to be used, the wage rate to be paid those workers, whether or not travel allowance and subsistence is applicable to those workers, and what foreman, if any, will be paid for by force account. This agreement will be closely tied to the development of the Labor List.

2. **Materials.** The material to be used, including the cost and any freight charges whether the material is purchased specifically for the project or comes from the Contractor's own supply. For materials representing a significant cost, or where the industry experiences fluctuations in price, the contract allows for shopping and the Contractor may be directed to obtain quotations. If time permits and the situation seems appropriate, the Project Engineer may want to do this.

3. **Equipment.** The equipment to be used including the size, rating, capacity, or any other information to indicate the equipment is proper for the work to be performed whether the equipment to be used is owned by the Contractor or is to be rented. The cost per hour for the equipment to be used. In the case of rented equipment, the Engineer may ask for competitive quotations, provided the request is made in advance and there is time to obtain them.

Payment for force account work should be made on the same timely basis as any other item of work. When money is being withheld from a progress estimate, the criteria for withholding should apply equally to all items of work, not just to force account work, because of its method of payment.

The procedure for record keeping and payment of force account work on change orders shall be the same as for contract items to be paid by force account. Separate records are to be kept for each force account whether it is an item in the original contract or established as a result of a change order.

1-2.4D(2) Payment Procedures for Force Account Work

1. **Labor.** The specifications require the Contractor to prepare and submit a "Labor List" in advance of force account work. Once approved by the Project Engineer, this list provides the hourly rate for force account calculations until a new list is approved. New lists will not be approved retroactively and calculations previously made from an approved list will not be changed when a new list is approved. If the Contractor fails to submit a list before the first force account calculations are made, then the Project Engineer will determine the rates from the best data available (payrolls on this job, payrolls on other jobs, prevailing wage requirements, union information, etc). Labor list rates will include all the pieces of wage expense — base rates, benefits, assessments, travel, with allocations shown where necessary. Examples of Labor List entries might be:

Generic Laborer (Straight Time)		John Doe, Teamster (Overtime)	
Basic Wage/hr	$21.36	Basic OT Wage/hr	$32.81
FICA (7.65%)		FICA (7.65%)	
FUTA (0.80%)		FUTA (0.80%)	
SUTA (5.42%) Total =	2.96	SUTA (5.42%) Total =	4.55
Indust Ins $1.01/hr	1.01	Indust Ins $1.01/hr	1.01
Benefits/Hr $30.78/hr	5.45	Benefits/Hr $46.37/hr	8.00
Travel Expense		Travel Expense	
$250/40 hrs	6.25/hr	$250/40 hrs	$52.62/hr
Total	$37.03/hr	Total	$52.62/hr
Use	$37per hr	Use	$53per hr

These examples show the rate rounded to the nearest dollar, which is permissible. If either party would prefer to use the unrounded amount, that is also acceptable. When deciding how many hours require compensation, the specification allows all hours that are a contractual obligation or are customary payments made to all employees. This means that, if a labor contract calls for 4 hours of pay for any call out, then that is a contractual obligation and the 4 hours would be eligible for reimbursement. (As always, the Contractor is expected to reassign the employees, if possible, to avoid the penalty.). In the same vein, a non-Union contractor, who has made call out payments to all employees for years, would be eligible for reimbursement for similar payments in a force account.

2. **Materials.** Materials also work from a list, but the list is generated in a different fashion. The Project Engineer provides the basic list of materials observed by the inspector. This is done in a timely manner (daily, unless the Contractor agrees otherwise). The Contractor adds prices to the list and attaches invoices or affidavits to support the prices. Once the list is returned and checked, payment can be made.

If a shipment of material is only partially consumed during the force account reporting period, the inspector may choose to include the entire amount in the first report or to estimate the amount consumed during each reporting period. The decision should be based upon the amount of the shipment, the nature and cost of the shipment and the security of the stockpile. A case of empty sandbags to be utilized throughout the winter for pollution control would adapt well to a single report, while a stockpile of galvanized conduit should probably be reported piecemeal as it is used in the work. The Contractor may use copies of the original invoice when the material is reported incrementally. If the Contractor has to restock unused material, restock charges can be reimbursed if the original order was reasonable for the work planned.

Along with supplying prices and invoices, the Contractor may suggest additions or corrections to the Materials List. These suggestions will be reviewed by the Project Engineer and, if appropriate, added before payment is made.

If the Contractor does not have an invoice, as in the case of stockpiles or some warehouse stock, then an affidavit will suffice. The Engineer may review the affidavit and, if it is an unreasonable price that cannot be supported, the Engineer may substitute another price, utilizing the best data available. The reasonableness of the price must consider the circumstances of the purchase and all costs associated with obtaining material from another source.

The specifications allow the Engineer to require competitive quotations, if this is done before the work is started and sufficient time is available. If the Contractor has to divert an employee to obtain the quotations, then that employee may be included in the labor reimbursement for the force account.

3. **Equipment.** The Project Engineer should review and comply with the rules governing payment for equipment as outlined in the most current AGC/WSDOT Equipment Rental Agreement. This agreement was developed as a supplement of the specifications and is relatively self explanatory.

There are three methods of acquiring equipment for use on a force account. "Owned" means that the Contractor controls and operates the equipment. A long term lease arrangement would be the same as ownership. Owned equipment is priced according to the Blue Book. "Rented to Operate" means that the Contractor has obtained a piece of equipment through a short term rental and will operate that equipment with its own employees. Rented to Operate equipment is priced according to the invoice from the rental agency. "Rented Operated" means that the Contractor has obtained a service from an individual or a company to provide a piece of equipment with an operator. An operated rental is not paid as equipment, but rather as a Service. In some cases, the Service will be reclassified as an entity performing in the manner of a subcontractor (see below).

Damage waivers are compensable. The Engineer has the discretion to reimburse for a damage waiver when it makes good business sense. Upon request, the Contractor should be able to demonstrate that the purchase of the damage waiver is consistent with their standard business practice. Consideration should be given to the potential risk of damage to the equipment versus the cost of paying for the damage waiver. In most cases, the cost of the waiver is minimal. The damage waiver does not cover damage caused by operator negligence, nor should the Department reimburse the Contractor for repair of any damage caused by operator negligence.

Normal wear and tear on equipment is included in the Blue Book rental rates. The ownership rates include major overhaul of the equipment. The Blue Book defines major overhaul as the periodic rebuilding of the engine, transmission, undercarriage, and other major equipment components. The operating rates include the cost of daily servicing of the equipment, including the replacement of small components such as pumps, carburetors, injectors, filters, belts, gaskets and worn lines. The operating rates also include the cost of expendables such as fuel, lubricants, filters, tires, and ground engaging components, such as pads, blades bucket teeth, etc.

The costs of extraordinary operating expendables are not covered in the operating rates due to their highly variable wear patterns. These extraordinary operating expendables may include certain ground engaging components, such as hammer and drill bits, drill steel, augers, saw blades, and tooth-bits. The cost for these items will normally be recovered separately, based upon invoices for their cost.

Repair of damage is considered a risk of providing equipment. The cost of this risk is assumed to be in the markup for overhead and profit. Costs for repair of damage should not be included in the force account direct charges. A common event is the offer of a Damage Claim Waiver by a renting agency. If such a charge appears on an invoice, it may be considered for inclusion when payment is calculated.

As with Materials, the Engineer may require competitive bids for equipment rentals. Normally, this requirement must be made in advance, before the work is started. However, if the rental is not made in an "arm's length" transaction, for example when the contractor rents the equipment to himself through some sort of business structure, then after the fact quotations may be obtained from independent rental agencies and the lowest such quotation may be used in place of the rental invoice.

Finally, as a special insertion into this Manual, there is a separate method of paying for Pavement Routers for Crack Sealing. WSDOT has agreed to set aside the Blue Book rate for this equipment and to pay $20 per hour for the operated router.

4. **Services.** Services billed by invoice will be compensated according to the invoice if that is the typical method in standard industry practice. Typical industry practice might include specialized technical services, such as Testing Labs and Environmental Cleanup firms. Also included might be unit price invoices, such as Sweeping per mile or Concrete Pumping per cubic yard, or lump sum quotation invoices, such as Remove Danger Tree or Pump Septic Tanks.

The markup for services depends on the nature of the firm's activities on the project. If the firm is clearly an uninvolved supplier, then the Service markup will apply. If the firm is acting as a subcontractor, then the markup will be made under the subcontractor provisions described below, with the underlying (subcontractor's) overhead and profit assumed to be embedded in the invoice.

It should be noted that payment of force account work through an invoice does not excuse the Contractor from other requirements of the contract. Wage rate rules, subcontractor approvals and other provisions are still contract requirements and must be enforced. Such enforcement, however, is independent of the administration of force accounts and force account payment will not ordinarily be withheld to aid in the enforcement. Note that the statutes associated with some provision requirements do involve the withholding of payment for associated work.

As with materials and equipment rentals, the Engineer may require competitive bids for invoiced services. Normally, this requirement must be made in advance, before the work is started. However, if the service is not obtained in an "arm's length" transaction, for example when the invoice comes from a subcontractor without sufficient effort to find competitive prices, then after the fact quotations may be obtained from independent service providers and the lowest such quotation may be used in place of the service invoice.

5. **Mobilization.** Mobilization and demobilization are reimbursable expenses for assembling equipment, materials, supplies and tools for any force account item and then returning those items to the previous location when the work is finished. Demobilization can include restocking costs for materials not utilized. Force account mobilization applies to original bid item force accounts as well as force accounts added through change orders. The standard bid item "Mobilization" is assumed to not include mobilization activities for force account work.

Mobilization may occur within the project limits if special efforts are required to assemble needed items to the force account location. For example, if a lowboy is required to move a bulldozer from one end of a project to the other, then that mobilization effort would be reimbursed.

If off site preparation work is needed, the Contractor must notify the Engineer in a timely enough manner that the work can be observed, if that is desired. Without such notice, that preparation work will not be reimbursed.

The AGC Agreement allows for pro-rating mobilization costs for equipment that will be used in both force account and bid item work. This will be done by negotiation and agreement. For example, if the Project Engineer and Superintendent agree that a mobilized backhoe will be used three hours on regular work for each hour on force account, then 25 percent of the mobilization costs would be paid on the force account.

All mobilization activities can be categorized as Labor, Equipment, Materials, or Services and will be listed under those categories for payment.

6. **Other Payments**

Permits or Fees

When a force account requires the Contractor to pay for permits or fees (hazardous waste dumping, etc.) that would fall outside the scope of overhead, these costs are reimbursable and may be included in the "Services" section of the force account payment.

Sales Tax

How retail sales tax is handled on the overall project depends on the ownership of the property upon which it rests. Keep in mind that a project may span more than one type of ownership.

STATE AND PRIVATELY OWNED LANDS

Work performed on state or privately owned land falls under Section 1-07.2(2) of the *Standard Specifications* and Department of Revenue Rule 170. Retail sales tax **is required** on the total contract amount. The Contracting Agency provides this payment to the Contractor to be passed through to the Department of Revenue. This is the tax noted in the summation of contract payments.

The Department of Revenue considers materials incorporated into the final work (such as concrete, signs, aggregates) to be an integral part of the completed improvement. These materials are purchased for "resale". **No tax is required** when purchasing these materials, therefore, no tax is paid as part of force account payments or as part of pricing change order work. The contractor purchases these materials as tax exempt and, in turn, sells them to the State as a part of the total project and the only tax collected is on the total contract as described previously.

There may be items that the contractor **is required** to pay sales tax on at the point of purchase. The Department of Revenue considers supplies consumed (such as concrete forms, fuel or tools, equipment purchased or rented) during the performance of the contract to be "consumables", a part of the overall cost of doing business. The contractor is required to pay retail sales tax at the point of purchase/rental for these items. These costs are bid as a part of the associated bid items.

When calculating or estimating the cost of force account or change order work, sales tax should be included in the individual invoices for "consumable" items. It's a fine line; for example, permanent striping is considered "resale" (tax exempt), temporary striping is a "consumable" (taxed). The fact that taxes are shown or not shown on invoices is not a reliable indication of what the contractor is obligated to pay. The contractor may receive reimbursement later or be required to pay additional taxes when the contract is complete. The contractor's books are audited by the Department of Revenue upon completion of each project to ensure compliance. The Project Engineer must apply these guidelines as closely as possible. Note that, in some cases, it is possible and necessary to pay a tax on a tax.

CITY, COUNTY, AND FEDERALLY OWNED LAND

Work performed on city, county or federally owned lands falls under Section 1-7.2(1) of the *Standard Specifications* and Department of Revenue rule 171. Retail sales tax **is not required** on the total contract amount.

The Contractor **is required** to pay retail sales tax on all purchases regardless of use ("consumable" or not). For contract work, this expense is incidental and therefore included in the individual contract items as a part of the bid amount.

When calculating or estimating the cost of force account or change order work, sales tax should be included on all invoices. As stated previously, the fact that taxes are shown or not shown on invoices is not a reliable indication of what the contractor is obligated to pay. The contractor may receive reimbursement later or be required to pay additional taxes when the contract is complete. The contractor's books are audited by the Department of Revenue upon completion of each project to ensure compliance.

Exceptions

Construction of the following facilities has been specifically exempted from Department of Revenue rule 171. Work on these facilities falls under Department of Revenue rule 170 even if they are on non state owned land:

- Water mains
- Sanitary sewers, if they are not a part of the road drainage system
- Telephone and telegraph lines
- Electrical power, if such power does not become a part of a street or road lighting system
- Other conduits or lines

Conclusion

Most of the time, retail sales tax on invoices is required. In turn, we need to reimburse the contractor for the tax (paid or deferred) on force account invoices and include the costs when estimating the value of change order work.

The one exception is "resale" items if the contract falls under Department of Revenue rule 170. "Resale" items under this rule do not require that retail sales tax be paid at the point of purchase.

These rules should be adhered to regardless of whether retail sales tax is shown on the invoice.

Subcontractor Markup

If work is being performed by a subcontractor (or by a service supplier acting in the manner of a subcontractor), then a supplemental markup will be added. This supplement will be added one time for each payment, even if a lower-tier subcontractor is doing the work. The markup is a graduated step down rate, which gets smaller for each force account item as the amount of work increases.

The amounts on which the rate is determined will be tracked separately for each subcontractor on each force account item included in the original contract or added by change order. If two subcontractors work on the same force account, then the accumulated total will be tracked for each, and markup for work done by each will be according to the respective total. If a single subcontractor works on two force accounts, then there will be a running total of work done by that subcontractor on each account and the markup rate for the same sub on different force accounts could be different.

1-2.4D(3) Records and Source Documents

Accurate daily time records should always be kept when performing force account work. Form 422-008, "Daily Report of Force Account Worked", is provided for the Project Engineer's use to help facilitate timely, accurate, and complete records of the daily force account activities. Whatever method of record keeping is used, it is recommended that the document be signed by both the Inspector and a representative of the Contractor agreeing on the materials used and the hours noted for labor and equipment. A copy of the daily report must be provided to the Contractor. When the work is performed by a subcontractor, a copy should also be provided to the subcontractor.

The costs for force account work should be determined and entered into the CAPS system in as timely a manner as possible.

All calculations for determining force account costs should be checked, initialed, and dated. After the cost of the work has been computed in the office, a copy of calculations shall be furnished to the Contractor.

1-2.4D(4) Summary

To summarize, the purpose of force account is to fully reimburse the Contractor for costs incurred on the work. The objective of force account administration is to minimize the inclusion of any "contingencies" included in the contract bid in anticipation of costs that may be incurred during force account work and not reimbursed.

Items which are bid or negotiated with a unit price or a lump sum agreement will not be converted to force account unless a change (as defined in Section 1-04.4 of the *Standard Specifications*) has occurred. On the other hand, any work to be done or the remaining portion of work underway on a force account basis may be converted to unit prices or a lump sum at any time the parties can reach an agreement. Such a conversion is highly desirable and should always be a goal of the Project Engineer.

1-2.4E Differing Site Conditions (Changed Conditions)

There are two types of changed conditions. The first (Type I) is a hidden condition that is different from that indicated by the contract (the borings do not show this rock). The second (Type II) is a hidden condition that is not shown differently in the contract, but is unusual and different from what a reasonably prudent contractor would expect (I've never seen this before and nobody else has ever seen it, either). In either case, to qualify for renegotiation, the condition must have a "material" affect on the cost of doing work. In other words, there must be a definable difference in the way the work will now be done and that difference must be significant.

The contractual rules included in Section 1-04.7 are related to fair notice and to giving the State an opportunity to examine the condition and, perhaps, order a different approach to the work. If the contractor takes away this opportunity, then there may be grounds for denying compensation for the different approach to the work. In some cases, the changed situation is not recognized until much or all of the work has been done. In that case, the determining factor for notice is the time when the Contractor knew or should have known of the condition. Whenever notice is served, it must be written.

In a perfect world, a changed condition will be recognized, notice will be given and work will be stopped until all the interested parties can reach agreement on how to proceed. In the real world, we are often faced with traffic closures and safety issues. Contractors work on tight schedules with one activity interdependent on others and it is not in the public interest to stop work while a changed condition discussion takes place. As soon as possible, to the extent possible, and in any manner which accomplishes the intent, the Project Engineer is expected to consult with the Region Construction Manager and the State Construction Office to obtain the approval before agreeing that a changed condition exists or before entering negotiations for price adjustments.

The Department response to a contractor's assertion of changed conditions, whether agreement or denial, must be written. The Project Engineer must keep accurate time and material records whether the response was negative or positive.

1-2.4F Termination of Contract

Contract termination is divided into two major categories, termination for default and termination for public convenience. Section 1-08.10(1) of the *Standard Specifications* defines the situations when a contract may be terminated for default (doesn't happen very often.) Section 1-08.10(2) of the *Standard Specifications* defines the situations when a contract may be terminated for public convenience.

Keep in mind that the conditions of the termination may be negotiated in the event that the termination is in the best interest of both parties. An example would be if a major change is beyond the abilities of the contractor. Negotiations with regard to conditions of the termination may include pricing partially completed items, mobilization payment, or the State taking possession of fabricated/purchased materials.

In both categories, if federal funds are involved, FHWA needs to be notified and informed of the situation early in the process. Specifically, Federal participation eligibility should be discussed prior to making a decision on termination. Formal notification and discussion should use normal channels through the Region to the State Construction Office. Authority to terminate a contract rests with the same position that had authority to execute the contract.

1-2.4G Subletting Portions of the Contract

Requests by the Contractor for subletting are submitted on Form 421-012 EF (Request to Sublet) and are to be approved by the Regional construction manager or designee. The request must be approved prior to the performance of any work on the project by either the subcontractor or a lower-tier sub. A copy of the Statement of Intent to Pay Prevailing Wages, executed by the subcontractor or lower-tier sub and approved by Washington State L&I, must be provided to the Project Engineer by the Contractor prior to payment for any work performed by that subcontractor or lower-tier sub. In addition, for Federal-aid projects, Form 420-004 EF (Contractor and Subcontractor or Lower-Tier Subcontractor Certification for Federal-aid Projects), must be submitted with the Request to Sublet.

Section 1-08.1 of the *Standard Specifications* defines what is not considered to be subcontracting. By default, any entity performing bid item work on the project is a subcontractor, unless: (1) they are the Prime Contractor, (2) an Owner furnished resource (such as WSP, utility owner or its contractor or consultant), or (3) they are specifically excluded from consideration as a subcontractor in Section 1-08.1. Do not be confused by the distinction between Professional Services and Subcontractors in the markups for force account work described in Section 1-09.6. Those provisions apply only to how the markup for overhead and profit is applied to force account work, and they have no relationship to the requirement for a Request to Sublet.

If a subcontractor wishes to further sublet a portion of its work to a lower-tier firm, the Contractor must submit the name of the lower-tier firm along with the request to sublet the work to the subcontractor. If more than one subcontractor on a project wants to utilize the same firm as a lower-tier subcontractor, separate requests are required. Section 1-08.1 of the *Standard Specifications* sets limitations on the amount of work a lower-tier sub may perform for each subcontractor. Section 1-08.1 of the *Standard Specifications* also sets forth the procedure for subletting portions of the project, and the percentage of the contract which may be sublet. The dollar value to be used for determining the amount of work that must be performed by the Prime Contractor is the total original contract amount less the amount of any specialty items which have been subcontracted. In order to ensure proper tracking and reporting of sublet information, the Project Office shall enter data from each request to sublet into the CCIS database. When the Project Office is in a situation where the CCIS database is not utilized during the administration of a project (i.e. Emergency Contracts, State Aid Contracts, etc.), and requires the "hand calculation" of the percentage of amount sublet, the percentage will be calculated for all items except specialty items, using the amount shown on the Request to Sublet or the bid amount whichever is smaller.

When Condition of Award items are sublet, ensure that the total amount is equal to or greater than the amount in the Condition of Award letter and that the Condition of Award items will be sublet to the proper Condition of Award subcontractor. If a bid item shown on the Condition of Award letter is not sublet to the proper D/M/WBE, then the request cannot be approved until the contract is changed.

1-2.4H Contractors' Shop Plans and Working Drawings

In general, all shop drawings and supplemental details submitted by the Contractor should be checked, in detail, for conformance to all contract requirements before forwarding on for approval or further actions by others. A Change Order is required for any deviation from the contract plans. Any conflicts with the contract plans that have been detected or revisions that may be desired by the Project Engineer should be noted on one copy of the drawings being forwarded to Headquarters for approval. If Change Orders to cover any deviations from the contract plans have been issued, or are being processed, those changes should also be noted.

Figure 1-6 is a list of many of the most common shop plans and drawings, and includes references to the specifications that require them and the section of this manual that covers the procedures for processing them. Use Form 410-025 to transmit all listed bridge and structure plans to the Bridge and Structures Engineer.

The Project Engineer should maintain a log of all shop plans or other drawings received for each contract.

Shop plans for items that conform to the contract plans or a standard plan, except those listed in Figure 1-6, should be checked and approved by the Project Engineer.

1-2.4I Relief of Responsibility for Completed Work and Relief of Responsibility for Damage by Public Traffic

Section 1-07.13(1) specifically designates the Contractor as being solely responsible for the completed work or material until the entire improvement has been completed. All work and material, including change order work, is at the sole risk of the contractor and when damaged must be rebuilt, repaired, or restored. When these damages occur to either the permanent or temporary work, and have occurred prior to the contract Completion Date, the costs for these repairs shall be entirely at the Contractor's expense. However, the specification does provide the contractor exceptions for causes that are generally beyond the contractor's control.

While the Contractor is fully responsible for the work and materials, the section does provide the contractor some options for relief. Relief is broken into 2 categories. The first category being relief of maintenance and protection for portions of works that have been completed. The second category is for relief of damage caused by the public when it is necessary that the public use the facility during construction. Both options for relief have specific criteria in order to exercise them. While a brief explanation of each option is provided, the Project Engineer should review the entire Section 1-07.13 of the *Standard Specifications* to ensure that the extent of responsibilities are understood and that any relief from responsibility is granted in accordance with those provisions.

Section 1-07.13(2) provides relief to the Contractor from maintaining and protecting specific portions of contract work as they are completed. The Contractor must submit a written request for relief to the Project Engineer. Before granting any relief, the Project Engineer will review the request to ensure

that the items of work noted conform to the requirements and limitations outlined in Section 1-07.13(2) of the *Standard Specifications* and have been fully completed in all respects of the contract. The Regional Construction Manager or designee may approve these requests for relief. Relief may be granted for several specific items, for example: "Item 17, Beam Guardrail, Type l; Item 18, Beam Guardrail Anchor Type l; etc." Relief may also be granted for all work except certain items, for example: "All work except Item 38, Electrical." the approval of the Contractor's request must be in writing.

When it is necessary for public traffic to utilize a highway facility during construction, Section 1-07.13(3) of the *Standard Specifications* provides relief of responsibility to the Contractor for damage caused to the permanent work by the public traffic. When the conditions specified in this section are met, the Contractor is automatically relieved of this responsibility. However, this section does not provide relief for damage caused by vandalism or other causes. The Contractor will resume full responsibility for both temporary and permanent work if traffic is relocated to another section of roadway. This responsibility will again continue until contract completion unless the section is reopened to public traffic or the Contractor is granted relief under 1-07.13(2).

The first paragraph of Section 1-07.13(3) refers to damage to "permanent work". This refers to work included in the contract that is being constructed in accordance with the requirements noted in the plans and specifications and is damaged. The intent is to exclude equipment, temporary facilities and temporary materials such as formwork and falsework. Contract features such as "Temporary Traffic Barrier," are included if they have been constructed according to plan and are damaged by public traffic using an approved traffic plan.

1-2.4J Protested Work

Occasions may arise where the contract may not have fully or clearly defined a work activity or financial responsibility. In these cases, the Project Engineer may determine that, in order to avoid delay of other critical work, protect the traveling public, or other critical circumstances, it may be necessary to direct the Contractor to proceed immediately to complete the work. In some instances, this order may be against the Contractor's wishes. While acknowledging the Contractor's verbal protest, the Project Engineer should again direct the contractor to proceed with the work in accordance with Section 1-04.5 of the *Standard Specifications*. The Contractor should also be advised that, as a separate action, they should follow the guidance in this same section for protest and protest resolution. While these provisions require the Contractor to keep accurate records for completing the protested work, it is not advisable for the Project Engineer to rely on these records to determine what may have taken place when trying to verify costs for protested work many months later. In order to help document the Contractor's work, the form "Report of Protested Work" (DOT Form 422-007) was developed as a tool for the Project Engineer's use.

1-2.4K Metric Designed Projects Administered with English *Standard Specifications*

Some recent projects, whose plans were developed using Metric dimensions, are being administered utilizing the English version of the *Standard Specifications*. Any dimensions in the *Standard Specifications*, Amendments, or Special Provisions that are expressed in English terms are to be converted, utilizing a precise arithmetical "hard" conversion method, to equivalent Metric units, when necessary, to be compared to the contract documents, field conditions or Contractor's equipment or operations.

The Department still has some Metric projects "on the shelf". There are also Metric jobs being developed for other agencies, such as Sound Transit. Since there is no current Metric Standard Specification Book, those jobs will be administered using the English book. Several General Special Provisions will be included to accomplish this. These provisions require that, whenever an English dimension or value in the specifications needs to be compared with a contract plan or provision, a field condition or measurement or with the Contractor's equipment or operation, the necessary conversion will be made utilizing a precise arithmetical "hard" conversion method.

To accomplish the conversion to English specifications, a series of General Special Provisions have been developed to replace those Metric specifications that contain soft conversions. In all cases, the English specifications have been left intact so that, if items must be added through change order, English units may be utilized with the reference to the *Standard Specifications* without including all the Metric specs in the change order.

The old Metric books contained provisions for "soft" or approximate conversions for a number of elements (bolts, re-steel, etc.). These have been converted to General Special Provisions which will be included with all Metric plan sets. This will allow these exceptions to the "hard" conversion rule noted above. Metric plan sets will have Metric pay units. Change orders on Metric plan set jobs will automatically reference the English specifications and will require English units.

When making payment to the contractor, the project office should measure and pay for the bid item, either Metric or English, indicated as the unit of measure in the contract plan or change order. For example, if the contract calls for "Clearing and Grubbing" to be paid for by the hectare, then the engineer should instruct his crew to measure and pay for the work performed in metric units. The opposite would apply if a change order was written for the project utilizing the English specifications for clearing and grubbing. In that case, the bid item would be measured and paid for in English units (by the acre).

If a situation arises when a conversion is required from English to Metric for an interpretation, a measurement or a payment, the conversion should be made utilizing a "hard" conversion factor. In the case of a payment, the level of precision of the factor will be such that the resulting payment will not vary from the true calculated value by more than one dollar.

1-2.4L Emergency Work Performed Under the Contract

When a natural disaster impacting a wide area strikes, WSDOT may utilize an existing construction Contract in order to restore essential travel, minimize damage or protect remaining facilities. RCW 47.28.170(2) allows WSDOT to contract this work on a negotiated basis provided (a) the cost does not exceed force account rates for the work performed and (b) the contract does not to exceed thirty working days. There must be an emergency declaration by the appropriate authority, the Project Engineer must complete a Detailed Damage Inspection Report (DDIR) and the Project Engineer must contact the Regional Program Manager, since this work will initially be funded by state funds. The Project Engineer should follow the guidance provided in the *Emergency Relief Procedures Manual*, M 3014.01.

Emergency repair work, when performed by the Contractor under an existing Federal-Aid Contract, may be eligible for Emergency Relief funding. In order to qualify for Emergency Relief funding, the repair work must be the result of a natural disaster over a wide area, such as a flood, an unusually severe storm or a landslide. The work must be demonstrated to be beyond the Contractor's responsibility and not work that has already been scheduled for repair or replacement of deficient structures. Only the work required to protect and open the roadway is eligible for Emergency Relief funding.

Adding emergency work to a State funded contract would require the addition of all Federal-Aid specifications, and is not practicable. It is however acceptable to hire the existing contractor to perform emergency work at the same location under a separate emergency force account contract which would include all the Federal requirements.

1-2.5 Contract Time

1-2.5A General

The contract duration specified for physically completing the contract is stated in the contract provisions normally under the general special provision "Time For Completion." Although there are exceptions, the guidance in this chapter pertains to contracts in which time is accounted for in terms of working days.

The Contractor may begin work as soon as the contract is executed and shall prosecute the work diligently until physical completion has been reached.

The Region will be notified by telephone on the day the contract is executed by WSDOT. Because it can take several days for the executed contract to reach the Contractor, the Region should immediately provide the Contractor with verbal notification of the date of execution so that the Contractor may order materials and prepare to mobilize onto the project and begin work. The date the contractor actually begins work on the project is to be noted and entered into CCIS.

Between the execution of the contract and the acceptance by the State Construction Engineer, the Project Engineer will likely encounter time-related issues. These will be documented through Weekly Statements of Working Days (Section 1-08.5), Suspensions of Work (1-08.6), Protested Work (Section 1-04.5), and Time Extensions (Section 1-08.8).

Contract Completion Milestones

There are two milestones that establish the end of contract time. They are defined in Section 1-01.3 of the *Standard Specifications* as Substantial Completion and Physical Completion. These two milestones are discussed in greater detail later in this chapter.

1-2.5A(1) Progress Schedules

The requirements for progress schedules are specified in Section 1-08.3 of the *Standard Specifications*. A copy of the specified reference, *Construction Planning and Scheduling, Second Edition*, published by the Associated General Contractors of America, has been sent to each Project Office and each Region Construction Office. One of three progress schedules will be specified in the contract. Two types of progress schedules are identified in the *Standard Specifications*, Type A and Type B. A third type may be inserted in the contract as a General Special Provision specifying a Type C Progress Schedule. The three types of progress schedules represent levels of job complexity. Type A being the simplest and easiest to produce and Type C being the most complex. Application is such that the complexity of the project (whether it be timing, coordination or the work itself) will be reflected in the complexity of the schedule.

In addition, a preliminary schedule is required on contracts requiring Type B or C Progress Schedules. Preliminary progress schedules show the work to be accomplished within the first 60 working days. As always the contract provisions may contain requirements that add to, or supersede, all or parts of Section 1-08.3 to allow for special circumstances.

There are four basic reasons that we ask for a schedule:

- To better understand the contractor's plan to deliver the project within the time allowed
- To plan our work force and other resource requirements
- To advise the public and executive staff of major milestones
- And to enable us to actively manage impacts to the contract

Progress schedules should have sufficient detail such that the progress of the work can be evaluated accurately at any time during the performance of the contract. The owner is obligated by contract to return the schedule for correction or approve it within 15 calendar days of receipt. Approval requires that the schedule complies not only with Section 1-08.3 but it demonstrates compliance with other contract requirements such as interim completions, staged work, order of work, etc. Periodically as warranted by progress, delays or changes, the Project Engineer should review the schedule for accuracy and progress of work. If it is determined that the current schedule does not provide the required information or is no longer accurate, a Type B supplemental schedule update may be requested from the Contractor. Monthly updates are required when Type C progress schedules are specified, and the cost of the updates is included in the Lump Sum price of the bid item.

The cost of Type B schedule updates is not included in the Lump Sum price of the bid item. When work is added to the project or the work method is changed at the request of the contracting agency, the respective cost to update the Type B progress schedule should be included in the change order. Type B schedule updates driven by the contractor's actions shall be provided to the contracting agency and are considered incidental to other work. No payment is made for Type A Progress Schedules or Type A schedule updates. Type B and C Progress Schedules are paid as a lump sum. Eighty percent of the lump sum payment is paid upon approval of the initial schedule. The remaining portion is paid when eighty percent of the original work is completed, provided updates have been provided as requested. Weekly look-ahead schedules are considered incidental to other items of work in the contract and therefore are not paid for separately.

When the Contractor has failed to provide a required schedule, the Engineer may:

- Withhold payment for the Type B or Type C schedule if it is not received (but not for other conforming work).
- Withhold all progress payments for failure to comply with the terms of the contract as specified in Section 1-09.9 (this should be a rare event).
- Suspend work and continue to charge each day as workable (this should only be implemented when the Agency is harmed by lack of knowledge of the contractor's intended approach to the work).

In extreme cases, the Agency may determine that the Contractor is in breach of contract according to Section 1-08.10 (usually accompanied by other serious breaches).

When lacking a progress schedule, the Engineer must base progress on the information available and their best judgment. According to Section 1-08.5, the Contractor may protest working day charges, but must support the protest in sufficient detail to enable the Engineer to ascertain the basis and amount of time disputed. This provides another opportunity for the PE to communicate our need for a progress schedule.

1-2.5A(1) Review and Approval of Progress Schedules

It is the responsibility of the Project Engineer to insure that the Contractor submits a correct and complete progress schedule in the time specified. Progress schedules must meet the general as well as type specific criteria. Once it is determined that the progress schedule submitted is of the type specified by the contract, the Project Engineer should evaluate the schedule to determine if it meets the requirements of Section 1-08.3 of the *Standard Specifications*, the Special Provisions and the Contract.

(I) GENERAL REQUIREMENTS

- The progress schedule must include all activities necessary to physically complete the project. By definition, activities consume time and usually consume resources. Activities like concrete curing time and slope staking earthwork may be rolled-up into the overall duration of the activity.
- The progress schedule must show the planned order of work in logical sequence, and in compliance with any requirements of the contract. The reviewer should remember that some work is sequenced by factors inherent in the work, but the Contractor may sequence the work by their preference as long as the project is completed within the authorized time and in conformance to the contract.
- The progress schedule must show durations of work activities in working days. Except for defining nonworking days, the calendar has no relationship to administering contract time. An activity may be stalled by unsuitable weather for days or weeks and remain "on schedule".
- The progress schedule must show activities in durations that are reasonable for the intended work. Since durations of work are a function of resource allocation, the Project Engineer may be required to estimate production rates using estimating manuals, experience or other resources, or to ask the Contractor to explain their planned resource allocation to support the duration.
- The progress schedule must define activities in sufficient detail that progress of individual activities may be evaluated on a daily basis. The reviewer should keep in mind that the level of detail required in a progress schedule is driven by the amount of precision required to perform and monitor the work. For example a single activity that represents several miles of grading may not provide adequate detail, and may need to be subdivided into smaller activities described by station limits.
- The progress schedule must show the physical completion of all contract work within the authorized contract time.

WSDOT may accept a Progress Schedule indicating and early physical completion date but cannot guarantee that WSDOT's resources will be available to meet an accelerated schedule.

If the progress schedule does not provide the required information, it should be returned to the Contractor for correction and resubmittal. Because the *Standard Specifications* do not specify timelines for resubmittal, the Engineer should provide a reasonable amount of time for the Contractor to revise and resubmit the schedule, and advise the Contractor of the expected date of resubmittal.

(II) TYPE A PROGRESS SCHEDULE

Type A Progress Schedules are required for any projects that do not include the bid item for Type B Progress Schedule or Type C Progress Schedule. The Contractor is required to submit five copies of Type A Progress Schedules to the Engineer no later than the first working day of the project. This may be a critical path method (CPM) schedule, a bar chart, or other standard schedule format, such as fenced bar charts, linear schedules, PERT networks and others. These scheduling methods are described in detail in the benchmark document "Construction Planning and Scheduling, Second Edition", a copy of which has been provided to each Project Office and each Region Construction Office. The Contractor is required to identify the critical path of the project, because a bar chart schedule does not rely on network calculations to determine the critical path.

The Engineer will evaluate this schedule and approve or return it for correction within 15 calendar days of receiving the submittal.

(III) TYPE B PROGRESS SCHEDULE

Type B Progress Schedules are required for all projects containing the bid item for Type B Progress Schedule.

The Contractor is required to submit a preliminary schedule to the Engineer no later than five calendar days after the date the contract is executed. Preliminary schedules must meet all requirements of a Type B Progress Schedule except that they may be limited to activities occurring in the first 60 days of the project.

The Contractor is required to submit five copies of the Type B Progress Schedule to the Engineer no later than 30 calendar days from the date that the contract is executed. This schedule must be a critical path method (CPM) schedule developed by the Precedence Diagramming Method and may employ restrains provided the restraints do not alter the network logic or critical path. As a minimum the Type B Progress Schedule must show:

- The Contract Number and Title
- Construction Start Date
- Critical Path
- Activity Description
- Milestone Description
- Activity Duration
- Predecessor Activities
- Successors Activities
- Early Start and Early Finish for each activity
- Late Start and Late Finish for each activity
- Total Float and Free Float for each activity
- Physical Completion Date
- Data Date

(Many of these terms are defined in "Construction Planning and Scheduling.)

The reviewer should watch for fixed date constraints that override network logic and force activities to become critical. Specific work windows or "open to traffic" milestones may legitimately influence sequence and duration of related activities. Resource constraints (such as availability of a large crane) may be preferential and may be explained by the Contractor if necessary. Fixed completion milestones for work that is susceptible to unsuitable weather are inappropriate because completion may be extended by the determination of unworkable days.

It is not unusual to see dual critical paths on a CPM schedule, nor is it prohibited. Multiple critical paths are generally very short in duration. Lengthy occurrences of parallel critical activities should be cause for careful scrutiny of activity durations and sequencing.

The Engineer will evaluate this schedule to insure that all required information is included in the schedule, check the network calculations, and approve or return it for correction within 15 calendar days of receiving the submittal.

(IV) TYPE C PROGRESS SCHEDULE

Type C Progress Schedules are required for all projects that include the bid item for Type C Progress Schedule. The Contractor is required five copies of a preliminary Type C Progress Schedule to the Engineer no later than the first working day (as defined in Section 1-08.5 of the Standard Specification). The preliminary schedule must meet all requirements of a Type C Progress Schedule and of Section 1-08.3(1) except that it may be limited to activities occurring within the first 60 working days.

The Contractor is required to submit five printed copies of a Type C Progress Schedule no later than 60 calendar days after the contract is executed. If the Contractor can demonstrate that they are unable to determine resource availability, and that this lack of information prevents them from preparing a reasonable schedule, the Engineer may allow and additional 30 calendar day for schedule submittal.

Each time that a preliminary schedule, Progress Schedule, or Schedule Update is submitted, the Contractor is required to provide the Engineer with an electronic copy of that schedule, on CD-ROM in Primavera Project Planer Enterprise Version, P3e/c or P3 format.

Type C Progress Schedules must contain all of the information required of a Type B schedule, and the following additional information:

- A timed scale logic diagram.
- Activities for traffic detours and closures.
- Milestones for required delivery of State furnished materials (if any)
- Activities for State furnished traffic controller resources (if any).
- Activities for fabrication of materials with longer than 120 calendar days lead time.
- Fixed constraints shall be identified on the activity listing and be supplemented with a written narrative describing why the constraint exists.
- Monthly schedule updates.

If requested by the Engineer, the Contractor shall provide a written narrative describing assumed production rates and planned resource allocation to support activity durations.

(V) WEEKLY LOOK-AHEAD SCHEDULE

Weekly Look-Ahead Schedules are required for all projects. The Contractor is required to submit a Weekly Look-Ahead Schedule, for each week that work is to be performed on the project, showing Contractor and all subcontractor activities for the next two weeks. The Weekly Look-Ahead Schedule must show:

- Description of the work
- Duration of the work.
- Sequence of the work.
- Planned hours of work.

The specification requires that Look-Ahead Schedules show the contractor's planned hours of work. This information is necessary to evaluate the results of unsuitable weather on the critical path and to assess working days charges correctly.

This schedule is to be submitted by mid-week of the week preceding the scheduled work, or other mutually agreed upon submittal time.

(VI) SCHEDULE UPDATE

Schedule Updates are required for all projects. The Engineer may request schedule updates when any of the following events occur:

- A change that affects the critical path.
- The sequence of work is changed from that in the approved schedule.
- The project is significantly delayed (10 days or 10 percent of the original contract time, whichever is greater).
- An extension of contract time is requested.

It is important to note that schedule updates are only required when they are requested by the Project Engineer, when a contractor submits a request for a time extension, or monthly in the case of a Type C Progress Schedule. The Project Engineer may request an update when any of the triggers occurs, but may choose to forego the update if the impacts to the schedule are readily evident.

The Contractor is required to submit five copies of the Schedule Update for approval within 15 calendar days of a written request, or when an update is required by contract provisions.

In addition to all other requirements, a Schedule Update must show:

- Actual duration and sequence of as-constructed work activities, including changed work.
- Approved time extensions.
- Construction delays or other conditions that affect the progress of work.
- Modifications to sequence or duration of remaining work.
- Physical completion of all remaining work within the remaining time authorized.

It is important to know the difference between an as-planned schedule and an as-constructed schedule. All updates must show the as-constructed sequence and actual durations of all activities prior to the status date.

When the need for a schedule update is triggered by an event that is the contractor's doing, they are responsible for the cost. When WSDOT causes an event or requests an update for their need, payment will be made as part of an equitable adjustment. When WSDOT is adding work or time by means of a change order, the price of the schedule update can be included as part of the work.

Any unresolved request for time extension must be shown by assuming that no time extension will be granted, and by showing the effects to follow-on activities necessary to physically complete the project within the currently authorized time for completion.

Working Drawing, Shop Plan or Submittal Type	Const Manual References	Standard Spec or Other References	Number of Paper Copies (Contact Bridge & Structures to discuss the option of electronic Submittals)	Reviewer Prior to Approval	Approving Authority	PE Distribution of approved drawings (surplus copies stay @ PE)	Notes
Supplemental Drawings (Shop Plans for Contract or Standard Plan Item)	1-2.4H	1-01.3	6 sets to Project Engineer		Project Engineer	2 sets to Contractor 1 set to Fabrication Inspector	
Calculations for Overload of Structure	None	1-07.7(2) 6-01.6 6-01.9	3 set to Project Engineer	Bridge & Structures Engineer	Bridge & Structures Engineer	2 sets to Contractor	PE Stamp required.
Mfg. Specification for Portable Temporary Traffic Control Signal	None	1-10.3(3)K	3 set to Project Engineer		Project Engineer	2 sets to Contractor	
Prefabricated Vertical Drainage Wick Submittals	None	2-03.3(14)H	3 set to Project Engineer		Project Engineer	2 sets to Contractor	
Calculation for Backfilling Abutment Prior to Superstructure Placement	None	2-03.3(14)I	3 set to Project Engineer	Bridge & Structures Engineer & Geotechnical Engineer	Bridge & Structures Engineer	2 sets to Contractor	PE Stamp Required
Blasting Plan	None	2-03.3(2)	3 set to Project Engineer		Project Engineer	2 sets to Contractor	
Excavation Slope Working Drawings and Calculations	None	2-09.3(3)B	3 set to Project Engineer	Geotechnical Engineer	Project Engineer	2 sets to Contractor	PE Stamp Required for Temporary Slopes Greater than 20 Feet in Height
Cofferdams, Shoring, Cribs, and Trench Boxes	6-1.5	2-09.3(3)D 2-09.3(4) 6-01.9 6-02.3(16)	6 sets to Bridge & Structures 2 sets to Project Engineer TRENCH BOXES 3 sets to Project Engineer	Bridge & Structures Engineer & Geotechnical Engineer	Bridge & Structures Engineer	2 sets to Contractor 1 set to Region Const	PE Stamp is Required. 4 additional sets to Bridge if RR is involved (per RR) 6 additional if US Bureau of Reclamation is involved
Falsework, Forming, and Bracing Plans (including design calculations)	6-1.5	6-02.3(16) 6-02.3(17)F	6 sets to Bridge & Structures 2 sets to Project Engineer FOR PREAPPROVAL 1 set Plans & 2 sets design calculations to Bridge & Structures 1 set Plans & 1 set design calculations to Project Engineer	Bridge & Structures Engineer	Bridge & Structures Engineer	2 sets to Contractor 1 set to Region Const	PE Stamp is Required. 4 additional sets to Bridge if RR is involved (per RR) 6 additional if US Bureau of Reclamation is involved
Girder Erection Plans (Including falsework and stress calculations)	None	6-02.3(16) and 6-02.3(25)N 6-03.3(7)A	6 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer	Bridge & Structures Engineer	2 sets to Contractor 1 set to Region Const	PE Stamp is Required. 4 additional sets to Bridge if RR is involved. (per RR)

Shop Plans & Working Drawings
Figure 1-6

Working Drawing, Shop Plan or Submittal Type	Const Manual References	Standard Spec or Other References	Number of Paper Copies (Contact Bridge & Structures to discuss the option of electronic Submittals)	Reviewer Prior to Approval	Approving Authority	PE Distribution of approved drawings (surplus copies stay @ PE)	Notes
Welding Reinforcing Steel	6-2.6D	6-02.3(24)E	5 welding procedures to Bridge & Structures 2 welding procedures to Project Engineer	Bridge & Structures Engineer	Bridge & Structures Engineer	2 sets to Contractor 2 sets to Fabrication Inspector	No mention in spec of Bridge & Structures or number of drawings
Shop Detail Plans of Prestressed Concrete Girders, Prestressed Structures, Prestressed & Precast Conc Piles	6-2.7A	6-02.3(25)A None for Piles	5 sets to Bridge & Structures 2 sets to Project Engineer SPLICED GIRDERS 7 sets to Bridge & Structures 1 set to Project Engineer	Bridge & Structures Engineer	PE approval standard series I girders and concrete piling on standard plans E-4 & E-4a - all other prestressed concrete products and precast piles to Bridge & Structures for approval	1 set to Contractor 2 sets to Fabrication Inspector	6-02.3(16)B is for the formwork plans for preapproval
Post-Tension Shop Drawings	6-2.8	6-02.3(26)A	7 sets to Bridge & Structures 2 set to State Bridge Const. Engineer 2 sets to Project Engineer	State Bridge Const. Engineer & Bridge & Structures Engineer	Bridge & Structures Engineer	1 set to State Const. 2 sets to Contractor 1 set to Region Const.	
Precast Concrete Panels	None	6-02.3(28)A 6-12.3(1)	7 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer	Bridge & Structures Engineer	1 set to State Const. Engr. 2 sets to Contractor 1 set to Fabrication Inspector	Additional sets for RR not mentioned in spec.
Welding Structural Steel (Submitted with Shop Drawings)	6-3.6C	6-03.3(25)	8 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer	Bridge & Structures Engineer	1 Set to Region Const. 2 sets to State Materials Lab 2 sets to Contractor	4 additional sets to Bridge if RR is involved. (per RR)
Shop Plans for Structural Steel for Bridges (Expansion Joints, Metal Bridge Rails, Bridge Drains, Etc.)	6-3.1	6-03.3(7) 6-06.3(2) Special Provisions	8 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer	Bridge & Structures Engineer	1 set to Region Const. 2 sets to State Mat'ls Lab 2 sets to Contractor	4 additional sets to Bridge if RR is involved. (per RR)
Treated Timber Structures	6-4.1	6-04.3(3)	6 sets to Bridge & Structures 1 set to Project Engineer	Bridge & Structures Engineer	Bridge & Structures Engineer	2 sets to Contractor 1 set to Fabrication Inspector	
Welding Steel Piling	6-5.6	6-05.3(6) 6-03.3(25)	8 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer	Bridge & Structures Engineer	2 sets to Contractor 2 sets to Fabrication Inspector	Weld splices of steel casing for cast-in-place conc. Piles shall be the Contractor's responsibility 4 additional sets to Bridge if RR is involved. (per RR
Pile Driving Equipment Adequacy Submittals		6-05.3(9)	3 sets to Geotechnical Engineer 2 sets to State Bridge Const Engineer 2 sets to Project Engineer	Geotech. Engr. State Construction Engr. (Bridge)	Geotech. Engr.	2 sets to Contractor	

Shop Plans & Working Drawings (continued)
Figure 1-6

Working Drawing, Shop Plan or Submittal Type	Const Manual References	Standard Spec or Other References	Number of Paper Copies (Contact Bridge & Structures to discuss the option of electronic Submittals)	Reviewer Prior to Approval	Approving Authority	PE Distribution of approved drawings (surplus copies stay @ PE)	Notes
Painting Plan	None	6-07.3(2)	3 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer, State Construction Engr. (Bridge),	Bridge & Structures Engineer	2 sets to Contractor	
Modified Concrete Overlays (Mix Design, Equipment Specifications and Procedures)	None	6-09.3(2)	3 sets to State Bridge Const. Engineer 2 sets to Project Engineer	State Bridge Const. Engr.	State Bridge Construction Engr.	2 sets to Contractor	
Shaft Installation Plan for Noise Walls, Soldier Pile Walls, and Luminaire Bases	6-2.3E	6-12.3(1) 6-16.3(2)	4 sets to Bridge & Structures 1 set to Project Engineer	Bridge & Structures Engineer, State Construction Engineer (Bridge), & Geotech. Engr.	Bridge & Structures Engineer	2 Sets to Contractor	
Structural Earth Wall Submittals	None	6-13.3(2)	3 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer, & Geotech. Engr.	Bridge & Structures Engineer	2 sets to Contractor	PE Stamp Required
Geosynthetic Retaining Wall Plans	None	6-14.3(2)	3 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer, & Geotech. Engr.	Bridge & Structures Engineer	2 sets to Contractor	
Soil Nail Walls	None	6-15.3(3)	3 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer, & Geotech. Engr.	Bridge & Structures Engineer	2 sets to Contractor	Include State Bridge Const. Engr. if shotcrete facing is permanent (6-18.3(1))
Soldier Pile Walls	None	6-16.3(2)	3 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer, & Geotech. Engr.	Bridge & Structures Engineer	2 sets to Contractor	PE Stamp Required
Permanent Ground Anchor Submittals	None	6-17.3(3)	3 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer, & Geotech. Engr.	Bridge & Structures Engineer	2 sets to Contractor	PE Stamp Required
Roadside Plant/Weed & Pest Control Plan	None	8-02.3(2)	4 sets to Project Engineer		Project Engineer	2 sets to Contractor 1 set to Region Const.	Signed by Licensed Chemical Pest Control Consultant
Shop Plans for Light Standard and Traffic Signal Standards	8-20.2B	8-20.2(1)	6 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer	Bridge & Structures for light standards and Types II, III, IV, V and SD signal standards. Project Engr for Types PPB, PS, & I signal standards shown on Standard Plan J-7a.	2 sets to Contractor 2 sets to Fabrication Inspector	Shop drawings are required for all signal standards and for those light standards without pre-approved plans. (per Std. Spec)

Shop Plans & Working Drawings (continued)
Figure 1-6

Working Drawing, Shop Plan or Submittal Type	Const Manual References	Standard Spec or Other References	Number of Paper Copies (Contact Bridge & Structures to discuss the option of electronic Submittals)	Reviewer Prior to Approval	Approving Authority	PE Distribution of approved drawings (surplus copies stay @ PE)	Notes
Shop Plans for Sign Structures	8-21.3	8-21.3(9) A refers to Section 6-03.	8 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer	Project Engineer for Standard Plans G2 through G9a Bridge & Structures for special design sign structures or sign fittings	2 sets to Contractor 2 sets to Fabrication Inspector	4 additional sets to Bridge if RR is involved. (per RR)
Column Jacket Shop Drawings & Installation Plans	None	See BSP 02300403. GB6 02300404. GB6	8 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer, & Geotech. Engr.	Bridge & Structures Engineer	2 sets to Contractor 1 set to Fabrication Inspector	PE Stamp required.
Form Liners (Various patterns per GSP)	None	See GSP 0231405.GB6	2 sets to Bridge & Structures Architect 2 sets to Project Engineer	Bridge & Structures Architect	Bridge & Structures Architect	1 Set to Region Const 2 sets to Contractor	Include 2ft X 2'ft sample with drawing to Bridge & Struct. Architect
3-Sided Structures	None	See GSP 023281.GR6	8 sets to Bridge & Structures 2 sets to Project Engineer 2 sets design calculations to Bridge & Structures	Bridge & Structures Engineer, & Geotech. Engr.	Bridge & Structures Engineer	2 sets to Contractor 1 set to Fabrication Inspector	PE Stamp required.
Project Specific Powder Coating Plan and Materials Submittals	None	See Special Provision	3 Sets to Bridge & Structures. 1 Set to Project Engineer	State Materials Engineer (Fabrication Inspection), Bridge & Structures Engineer	Bridge & Structures Engineer	2 Sets to Contractor 1 set to Fabrication Inspector	
Bridge Demolition Plans	None	See Special Provisions	6 sets to Bridge & Structures 1 set to Project Engineer	Bridge & Structures Engineer	Bridge & Structures Engineer	2 sets to Contractor 1 set to Region Const	PE Stamp is Required.
Shaft Installation Plan and Construction Experience for Bridges and Permanent Signing Structures	None	See Special Provisions	3 sets to Bridge & Structures 1 set to Project Engineer	Bridge & Structures Engineer, & Geotech. Engr. & State Construction Engr. (Bridge).	Bridge & Structures Engineer	2 Sets to Contractor	Construction Manual does not mention approval – only mentions meeting of all parties.
Precast Vaults	None	See Special Provisions	3 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer, & Geotech. Engr.	Bridge & Structures Engineer	2 sets to Contractor 1 set to Fabrication Inspector	
Pipe Jacking Plans	None	See Special Provisions	3 sets to Bridge & Structures 2 sets to Project Engineer	Bridge & Structures Engineer, & Geotech. Engr.	Bridge & Structures Engineer	2 sets to Contractor	

Shop Plans & Working Drawings (continued)

Figure 1-6

1-2.5B Working Day Charges

The first working day will be established in accordance with Section 1-08.4 of the *Standard Specifications* or such other date as prescribed by the contract provisions. Section 1-08.4 indicates that time may start at a time different from that specified if "otherwise approved in writing". Such other approval is intended only for very unusual circumstances, usually associated with mis-handling of contract documents. It will only be granted in consultation with Headquarters Construction. Time associated with each phase of work established in the contract is to be shown on the Weekly Statement of Working Days. The Project Engineer is to furnish a weekly statement advising the Contractor of the current status of working day charges against the contract. Weekly Statements are generated by the CCIS computer system. This statement is to be issued in accordance with Section 1-08.5 of the *Standard Specifications*. The purpose of this statement is to advise the Contractor about the Project Engineer's decision for each passing day. The questions to be answered when determining if a day is chargeable are; is it a nonworking day (holiday or a day the contract does not allow critical work to advance)? was it a chargeable working day (critical work progressed uninhibited)? or was it an unworkable day (critical work delayed by weather or conditions caused by the weather)? in evaluating each day, the Project Engineer should take into consideration the following conditions:

1. The effect of inclement weather on critical activities.

2. The effect of conditions caused by inclement weather on critical activities.

3. Critical work restrictions imposed by the contract or the Project Engineer.

If any of the above conditions prevent work or reduce the Contractor's efficiency on critical activities on the project, working day charges shall be adjusted accordingly. If the Contractor is able to continue work on critical activities but the efficiency is significantly reduced, a half day may be charged. When determining unworkable days the Project Engineer shall take into consideration the prolonged effects of weather events. If the contractor is required to divert resources from working on critical path activities due to the lasting effects of a weather event the Project Engineer may determine a half day, the whole day or several days as unworkable.

If the contract does not specifically define a working day, a working day will be considered a 24 hour period. The contractor establishes the hours of work in the Weekly-Look Ahead Schedule and the start of the day should be by mutual agreement. The contractor shall be charged for one day during the defined 24 hour period regardless of how many shifts are worked.

Section 1-08.5 grants the Contractor the right to protest working day determinations and working day charges determined by the Engineer. In the event the Contractor submits the required written protest within 10 calendar days following the date of the statement, the Project Engineer will analyze the information provided, and respond to the Contractor by either denying the protest or revising the Weekly Statement of Working Days.

The Project Engineer will complete Weekly Statements of Working Days throughout the course of the project, showing workable , nonworking and unworkable days as they occur. These statements will continue to be completed until the project has reached Substantial Completion and the Working Days assigned to the contract have been exhausted. Following are the three possible scenarios:

- The working days are exhausted prior to reaching Substantial Completion. Weekly Statements of Working Days continue until Substantial Completion.
- The working days are exhausted on the day Substantial Completion is achieved. Weekly Statements of Working Days cease upon Substantial Completion.
- The working days are not exhausted upon reaching Substantial Completion. Weekly Statements of Working Days continue until the working days are exhausted or until physical completion.

Upon Substantial Completion the Project Engineer will ensure that the date is entered into CCIS and is noted in the remaining Weekly Statements of Working Days. After Weekly Statements have stopped, comments concerning weather and other events beyond the Contractor's control should be entered into the project diary. The effect of these conditions on remaining work and on the scheduled completion should also be noted.

If contract time is expressed in calendar days, then Section 1-08.5 becomes difficult to interpret and the contract special provisions will provide guidance for the charging of contract time.

1-2.5C Suspension of Work

When, in the judgment of the Project Engineer, inclement weather, or conditions caused by inclement weather, make it impracticable to achieve satisfactory results on a critical item of work, an order should be issued to suspend the affected portions of the contract work or the entire project. If at all possible, suspensions for weather should be made with the concurrence of the Contractor. If the Contractor does not agree to a weather suspension, the Project Engineer should consult with the Region Construction Manager before issuing a unilateral suspension.

In addition, subject to the agreement of the Contractor and the approval of the Regional construction manager, delays caused by other conditions beyond the control of the Contractor may also warrant an order to suspend work.

During suspensions of long duration, for example a winter shutdown, the publication of Weekly Statements may be suspended. Notices to suspend or resume work should be written. Forms 421-006 and 421-007 have been developed for this purpose. A letter may accomplish the same purpose. If it is determined that some items of noncritical work on the project could be continued unaffected by weather conditions, then those items may be excluded from the order to suspend work. The prime consideration for unworkable days or suspensions is always the ability to work on critical items.

In the event that a suspension of work for weather or for other reasons beyond the control of the contractor is necessary for an extended period of time, the Project

Engineer may recommend that the Contractor be relieved of routine maintenance during the period of suspension. Before WSDOT will assume the responsibility for maintenance, the Contractor must have taken all necessary actions to control erosion, pollution, and runoff prior to, and during, the shutdown period. The extent of the project area that will be maintained by WSDOT is the subject for a three party negotiation and agreement among the Project Engineer, the Maintenance Superintendent and the Contractor.

The suspensions described above are related to weather or other causes beyond the control of the Contractor. They apply only to critical work items and, therefore, always result in a determination of an unworkable day. If the Engineer and the Contractor agree to stop working on a noncritical item for one of these causes but to continue critical work, then the agreement should be noted in the records and weekly statements should be issued in the normal fashion.

The contract also gives the Engineer the right to suspend work on any part of the project when the Contractor is not complying with the contract's terms or the orders of the Engineer. This would be a significant action and, except in an emergency situation, should not be undertaken without the full and informed consent of the Region Construction Manager and the State Construction Office. If work is suspended under this contract provision, then weekly statements and the charging of workable days will continue in the normal fashion.

1-2.5D Extension of Time

In general time extensions are appropriate whenever the critical work is delayed due to an action or inaction of the contracting agency, or by a cause that is not the responsibility of the Contractor. Section 1-08.8 of the *Standard Specifications* includes a list of reasons that entitle the Contractor to a time extension, and a list of reasons for which no time extension will be granted. In all cases, the change or delay must delay critical work or an extension is not appropriate.

The contract requires the Contractor to identify a delay within 10 working days. If a delay is readily identifiable, the Project Engineer should enforce this provision. If the delay is not immediately apparent the time extension discussion should take place as soon as the delay is recognized. Before discussing a potential delay for which adequate notice was not given, the Project Engineer should discuss the situation with the Region Construction Manager to seek guidance. The Contractor should be encouraged to identify delays and bring them to the State's attention at the earliest opportunity. This allows the contracting agency to mitigate the delay by adding time, modifying the work or recovering the schedule. In the interest of actively managing a delay the project engineer may act unilaterally to address time if the contractor avoids the discussion.

If possible, all time associated with work added by change order should be addressed as part of the change order. If you are unable to come to agreement on the number of working days to add, the Region Construction Manager should be consulted concerning the need to unilaterally add time to the contract. Deferring the discussion of time in a change order to a later date should be a last resort. If the contractor is not granted time for an item, they are required to complete the contract in the number of working days that remain. This may require that the contractor to accelerate their efforts, by adding additional crews, equipment or working longer hours or extra days. If these actions are taken as a result of the contracting agency not granting time extensions when the contractor is entitled to them, the cost for these items would be paid by the contracting agency. If you do choose to defer the time discussion to later, set a time frame during in which the decision will be made.

The State has a responsibility to inform the Contractor's surety whenever increased time is being considered and the current extension, combined with previous extensions, would exceed 20% of the original allotted time in the contract. This information could be represented by the Surety's signature on the change order that adds time, by a separate letter from the Surety, or by a notice letter direct to the Surety office. Such notice and surety consent is a legal requirement and will help maintain the State's rights to be protected by the performance bond.

Section 1-08.6 of the *Standard Specifications* provides under what circumstances the Contractor may be entitled to compensation. Anytime that a project is delayed for any cause, the Project Engineer and the Contractor should consider methods of mitigating the delay damage. A common approach is to pursue schedule recovery by allocating additional resources to the work to get the project back on schedule. When the Project Engineer suspects that the State may be responsible for the delay, then compensation for the mitigation efforts may be proposed.

Any time extension will be documented either in a change order with approval levels defined in Section 1-2.4C of this Manual or in a letter to the Contractor from the State Construction Office.

1-2.5E Substantial Completion

Substantial Completion may be granted when only minor, incidental items of work, replacement of temporary facilities or correction remain in order to physically complete the contract. In determining Substantial Completion, the Project Engineer should consider whether or not:

- The public has full use and benefit of the facility.
- Major safety features are installed and functional, including guardrail, striping, and delineation.
- Illumination, if required, is installed or a temporary system with equal functional capabilities is operating.
- Signals, if required, are installed or a temporary system with equal functional capabilities is operating.
- The need for temporary traffic control on a regular basis has ceased. Only minor traffic restrictions will be needed for the remaining work.
- The traffic is operating in its permanent configuration.

The Project Engineer is responsible for determining the Substantial Completion date. When this has been done, the Contractor will be notified by letter, specifically noting the date on which Substantial Completion was achieved. The Contract Administration and Payment System (CAPS) Unit of Accountability and Financial Service (AFS) should be

notified of substantial completion (e-mail to: caps@wsdot.wa.gov). In order to be in concurrence with Section (9-1.5) - Compliance Review for Materials Certification Process, the project engineer will also provide notification of Substantial Completion to the Headquarters Materials Laboratory Documentation Section.

1-2.5F Date of Physical Completion

The date on which the Project Engineer determines that all physical work has been completed is noted and then established as the date of Physical Completion. The Project Engineer will immediately notify the Contractor by letter of the date determined for Physical Completion. Copies of the letter will be sent to:

- The Railroad companies, if applicable.
- The Contract Administration and Payment System (CAPS) Unit of Accountability & Financial Services (AFS).
- The Regional Local Programs Engineer on all city and county projects.
- The State Roadway Data Office, MS 47380.
- Any other distribution that the Region deems appropriate.

Actions the Project Engineer should consider taking once Physical Completion has occurred include:

- Initiate a discussion of contract time.
- Identify any unresolved disputes and initiate discussions.
- Initiate a full review of item quantities, seeking contractor concurrence.
- Initiate a final review of materials documentation.
- On Federal-aid projects, initiate a Stewardship Final Inspection and Acceptance.

1-2.5G Liquidated Damages

Liquidated Damages must be resolved before the final estimate can be completed and processed. Guidance for assessing Liquidated Damages can be found in Section 1-08 of the *Standard Specifications,* and in some cases, in the contract provisions.

Any withholding or assessment made against the Contractor's payments, is to be preceded by a fair notice written communication to the contractor. For those issues that could be remedied with actions taken or initiated by the Contractor, this notice should also include a reasonable period of time that will allow the contractor to take action to mitigate or completely avoid the withholding or assessment.

The term "withhold" refers to a temporary deduction shown on a progress estimate. The term "assess" refers to a permanent deduction that could be shown on a progress estimate, but will be shown on the final estimate. Liquidated damages fall into two categories — one deals with contract time and the other deals with miscellaneous provisions such as ramp or lane closures. These two categories are described below.

1-2.5G(1) Contract Time Liquidated Damages

Section 1-08.9 of the *Standard Specifications* (and, at times, the contract provisions) establishes the amount of Liquidated Damages to be assessed the Contractor for overruns in contract time. These assessments are either: (1) the formula calculated liquidated damages, or the liquidated damages prescribed by the contract provisions; or (2) the direct engineering and related costs. All temporary withholding or final assessment of these Liquidated Damages are to be shown as a below the line "Liquidated Damages" deduction on progress estimates and the final estimate.

The State Construction Engineer has not subdelegated to the Region the authority to assess time related damages on progress estimates or the final estimate. However, the authority to withhold below the line "Liquidated Damages" on progress estimates has been subdelegated to the Regions, and may be further subdelegated to the Project Engineer. Liquidated Damages should be addressed whenever it is apparent that the number of working days provided in the contract will be used before Substantial Completion. It is emphasized once again that fair notice and communication is necessary as a legal requirement.

In some cases, there are legitimate reasons for time extensions which would preclude withholding liquidated damages on progress estimates. If the Project Engineer is aware of or anticipates a possible time extension that would preclude withholding liquidated damages on progress estimates, the Region and/or the State Construction Office should be consulted for guidance. If the Project Engineer determines that withholding of liquidated damages on progress estimates would not be appropriate, the reasons for not withholding are to be documented by a memorandum to the files. The following describes the procedures for addressing contract time related liquidated damages in the various stages or phases of the project:

- Phases (Interim Physical Completion Dates). Liquidated damages for phases will be shown in the special provisions. When the contract includes additional phases, and the time for physical completion of a phase has overrun, the overrun should be resolved as it occurs. This involves the Contractor either being granted an extension of time or being assessed liquidated damages by the State Construction Office.
- After Substantial Completion Date of the Contract. If substantial completion is granted after the expiration of contract time the formula for liquidated damages in Section 1-08.9 of the *Standard Specifications* will be assessed for that period of time between the expiration of contract time and the substantial completion date. Liquidated damages assessed after the date of substantial completion will be only those costs identified as Direct Engineering and related costs that have been incurred by WSDOT. The direct engineering and related costs are defined as field engineering and inspection time charges plus any vehicle, travel pay, per diem, or other charges connected with the delayed contract physical completion. Engineering costs such as computing grades, quantities, etc. which would have been incurred by WSDOT under normal conditions should not be included in the determination of direct

engineering and related costs. If substantial completion is granted on or prior to the expiration of contract time, direct engineering costs will only be assessed for that period of time between the date contract time expired and the physical completion date.

- Before Physical Completion. If Substantial Completion has not been established, the formula for Liquidated Damages in accordance with Section 1-08.9 of the *Standard Specifications*, will be assessed for that period of time between the expiration of contract time and the Physical Completion date.

Working days added to the contract by time extensions when time has overrun shall only apply to the days on which Liquidated Damages or Direct Engineering have been charged, such as:

- If Substantial Completion has been granted prior to all of the authorized working days being used, then the number of days in the time extension will eliminate an equal number of days on which Direct Engineering charges have accrued.
- If the Substantial completion date is established after all of the authorized working days have been used, then the number of days in the time extension will eliminate an equal number of days on which Liquidated Damages or Direct Engineering charges have accrued.

1-2.5G(2) Miscellaneous Liquidated Damages

The contract provisions may provide for assessment of other liquidated damages, such as failure to open traffic lanes within the prescribed time or failure to open ramps within the prescribed time. Any temporary withholding or final assessment of these liquidated damages shall be shown as a below the line "miscellaneous" deduction on progress estimates and the final estimates. The State Construction Office has subdelegated the authority to the Regions to withhold and assess these types of liquidated damages on progress estimates and the final estimate. The Project Engineer shall notify the Contractor in writing when these types of liquidated damages are to be assessed.

1-2.5H Completion Date

Immediately after the Physical Completion date has been established, the Project Engineer is to notify the Contractor of all outstanding documents that are required in order to establish a project Completion Date. Once all the obligations of the contract have been performed by the Contractor, the Project Engineer will provide the Contractor written notice of project completion, identifying the Completion Date established for the contract.

In order for the project Completion Date to be established, all the physical work on the project must be completed, and the Contractor must have furnished all documentation required by the contract, contract provisions, and the *Standard Specifications*. This includes the signed Final Contract Voucher Certification. (Note: Establish the Completion Date as soon as the last item of paper work is received. The final estimate does not have to be processed in order to establish the Completion Date.) the notice to the Contractor should be prepared and mailed on the same day that is designated as the completion date. A copy of the completion letter must be e-mailed to: caps@wsdot.wa.gov, or faxed to the contract payments section of the WSDOT Accountability and Financial Services Office, (fax number (360)705-6804) on the day the letter is written.

If the Contractor refuses, or is unable to return, a signed FCVC or any of the required documents, the Project Engineer, the Region and the State Construction Office can work together to move the project towards closure by establishing a unilateral completion date allowing WSDOT Acceptance of the contract. See Chapter 1-3.1D for Unilateral Acceptance procedures.

1-2.6 Enforcement of Wage Rate Requirements

1-2.6A General Instructions

Section 1-07.9 of the *Standard Specifications* outlines prevailing wage responsibilities for the Contractor, subcontractors, lower-tier subcontractors, agents or any other persons performing work under the contract. Additionally, contracts financed in whole or in part with federal funds have the *Required Contract Provisions for Federal-aid Construction Contracts* (FHWA-1273) included in the contract documents. These provisions identify additional federal wage requirements.

Contracts that are financed by either state or federal funds, or both, will include specific Hourly Minimum Wage Rates and Fringe Benefit schedules from either or both the Washington State Department of Labor and Industries (State L&I) and the United States Department of Labor (USDOL). When both state and federal funds are involved and there is a difference between the two prevailing wage determinations, the Contractor, subcontractors, and lower-tier subcontractors must pay a wage of not less than the higher of the two in order to remain in compliance with both prevailing wage laws. Comparisons that are made between state and federal wage rates must include their corresponding fringe benefits as identified in their respective state or federal wage determinations.

1-2.6B Monitoring of State Requirements

The requirements for the Contractor's compliance with State prevailing wages are noted in Section 1-07.9 of the *Standard Specifications*. Specific wage rate determinations for State prevailing wages are noted in the contract itself. Though certified payrolls can be requested regardless of the contract's source of funds, these are a specific requirement for enforcement of federal wage laws only and are not routinely used for monitoring of State prevailing wage issues.

Requirements for State prevailing wages include:

- Section 1-07.9 requires that the Contractor submit a *Statement of Intent to Pay Prevailing Wages* (SI) prepared on the State L&I form and approved by that agency. Statements are required for the Contractor and for each subcontractor, agent and lower-tier subcontractor. The specification requires that no progress payments be released to the Contractor for work completed by the Contractor, or for portions of work completed by subcontractors, agents or lower-tier

subcontractors prior to the Project Engineer's receipt of the approved statement for the entity performing the work. State L&I will approve the statements and further certify that the documents meet the requirements of State laws.

- After the project has been accepted by WSDOT, the Contractor, all subcontractors, and all lower-tier subcontractors must submit an *Affidavit of Wages Paid* (AWP) prepared on the State L&I form and approved by that agency. (The form may be submitted earlier by a subcontractor or lower-tier subcontractor should that firm's work be completed prior to acceptance.) It is the Contractor's responsibility to obtain and provide all AWP to the Project Engineer for all subcontractor and lower-tier subcontractors performing work on the project. In the event a subcontractor or lower-tier subcontractor cannot or will not provide a completed AWP form, the Contractor should consult or seek guidance from State L&I. Failure to provide all required AWP for all contractors who worked on the project will result in continued withholding of the prime Contractor's retained percentage.
- A contractor or subcontractor may enter into an agreement with his or her employees to work 10 hours per day without having to pay overtime. This is provided that no employee work more than 4 calendar days a week.
- State L&I has also defined "Contractor" to include some fabricators or manufacturers who produce nonstandard items specifically for use on the public works project. Additionally some companies who may contract with the Contractor, subcontractors, or lower-tier subcontractors for the production and/or delivery of gravel, concrete, asphalt, or similar materials may perform activities that cause employees of these firms to be covered by state prevailing wage laws.

  Specific circumstances that may cause employees of theses firms to be covered by State prevailing wage laws are described in State L&I publications. These publications are included in the provisions of each contract adjacent to the State Prevailing Wage listings. Where these firms are covered by State prevailing wage laws, an approved *Statement of Intent to Pay Prevailing Wages* and *Affidavit of Wages Paid* must be submitted to the Project Engineer on State L&I forms.

The Project Engineer should monitor the Contractor's efforts in regards to state prevailing wages by:

- Monitoring to ensure an approved Statement of Intent is received prior to releasing any progress payments for work completed by the Contractor, subcontractor or lower-tier subcontractors as well as any fabricators or suppliers of materials whom L&I may also determine as being covered.
- Monitoring to ensure that Affidavits of Wages Paid have been received for the Contractor as well as each subcontractor or lower-tier subcontractor who performed work on the contract. In addition, AWP are also required of each fabricator or supplier who was also covered by state prevailing wages. Ensure that the company name on the Affidavit of Wages Paid matches the company name on the Statement of Intent to Pay Prevailing Wages. If this is not the case, the Affidavit is not acceptable; unless the Contractor or subcontractor can supply a copy of their business license showing both names (i.e. Company Name and Trade Name).
- Monitoring by observing concerns of employees of the Contractor, subcontractors, or lower-tier subcontractors. In particular, the Project Engineer should note any employee complaints regarding specific state prevailing wage violations by the employer.

In the event the Project Engineer identifies or receives a complaint from any employee of the Contractor regarding improper application or nonpayment of state prevailing wages, or improper application of overtime pay, the Project Engineer should immediately notify the Contractor requesting prompt corrective action. All issues of noncompliance involving either the Contractor, subcontractor, and any lower-tier subcontractors are to be addressed through the Prime Contractor for resolution.

Once the Contractor has been informed that an apparent violation of state prevailing wages has occurred, it is expected that a satisfactory correction or explanation will be made within a reasonable period of time. If this does not happen, the Project Engineer should inform the Contractor that the matter may be referred to the Washington State Department of Labor and Industries (L&I) for further action. If the failure to act continues, the Project Engineer should refer the issue to the Region Construction Manager.

Except as noted for missing Statements of Intent, routine monthly progress payments made to the Contractor for work completed should not be deferred for enforcement of state prevailing wage laws. The State Construction Office will refer the matter to State L&I for further investigation that may be appropriate. Should State L&I choose to investigate, L&I will establish the amount of any unpaid wages due employees of the contractor. In order to recover these wages for employees, L&I may choose to file a claim against the Contractor's retainage held under the contract. State L&I may also choose to recover unpaid wages by requesting that the Project Engineer withhold funds from monthly progress estimates for work completed by the Contractor.

1-2.6C Enforcement of Federal Prevailing Wage Provisions

In addition to the requirements of Section 1-07.9 of the *Standard Specifications,* all contracts financed with Federal-aid funds include the *Required Contract Provisions for Federal-aid Construction Contracts* (FHWA-1273). These provisions identify federal wage requirements. The federal prevailing wage requirements included in these provisions are also commonly referred to as Davis Bacon and Related Acts (DBRA). It is the responsibility of the Project Engineer to both monitor and enforce these provisions to the degree necessary to ensure full compliance. In order to comply with these requirements, the Contractor must:

- Submit weekly certified payrolls to the Project Engineer for themselves, each subcontractor, and each agent or lower-tier subcontractor. These consist of copies of weekly payrolls along with a signed Statement of Compliance.

- Post wage rate posters.
- Post the wage determinations of the United States Secretary of Labor. These determinations consist of the listing of Federal Wages that are included in the provisions of each contract.
- Allow interviews of employees during working hours by authorized representatives of WSDOT, the Federal Highway Administration, and the U.S. Department of Labor.

The prime Contractor is ultimately responsible for all subcontractor, agent, or lower-tier subcontractor compliance with the requirements for federal prevailing wages.

1-2.6C(1) Federal Prevailing Wage Rates

The Contractor must post the federal wage determination, consisting of the wage listing included in the contract provisions, in a prominent place where it can easily be seen by workers. Standard posters (forms FHWA 1495 and FHWA 1495A) are also to be posted and are available to the Region from the Support Services Supervisor, FHWA, Olympia, Washington. Form FHWA 1495A is printed in Spanish and is to be posted when the project is in an area where there is a possibility that some workers may speak only Spanish.

1-2.6C(2) Certified Payroll Inspection

The "Contract Provisions for Federal-Aid Construction Contracts" (FHWA-1273) require the Contractor, subcontractors, agents or lower-tier subcontractors to submit certified payrolls. These are to be checked by the Project Engineer to ensure the required information has been included and is correct. The Project Engineer should accomplish this by making a complete check of the first payroll submitted on the project by the Contractor, each subcontractor, and each lower-tier subcontractor. Once satisfied that these first payrolls are correctly prepared, subsequent payrolls for that project may be accepted by a random spot checking of approximately 10 percent of the payrolls submitted. If errors are found during any spot-checking of the payrolls, a more complete or thorough check should occur until the Project Engineer has determined that the errors detected have been corrected and monitoring can be returned to a spot checking basis. The *Contract Provisions for Federal-Aid Construction Contracts* (FHWA-1273) identify the required items to be included in certified payrolls. A complete payroll inspection by the Project Engineer should confirm that the following items are present:

- The contract number and contract name noted on the payroll form, together with the payroll number and payroll period. The name of the employer, identifying the Contractor, subcontractor, or lower-tier subcontractor, must be shown.
- A specific minimum wage rate is to be identified for each worker. The *Standard Specifications* require the Contractor to use word descriptions for the labor classifications that are included in the contract provisions identifying federal wage rates, and are to be used on all payrolls. Section 1-07.9 of the *Standard Specifications* permits the Contractor to use an alternative method to identify or correlate the labor descriptions used in order that they may be compared to the contract provisions.
- Each employee's unique identification number (i.e., last four digits of the employee's Social Security number). The payroll shall not include the full Social Security number or home address of the employee; however the contractor or subcontractor shall maintain this information on file and provide this information upon request by the Agency.
- Payroll deductions must conform to the "Anti-Kickback" Act noted in the *Required Contract Provisions for Federal-aid Construction Contracts* (FHWA-1273). If payroll deductions are questionable, contact the State Construction Office for assistance.
- Every laborer or mechanic working on the contract must be classified for the proper minimum prevailing wage in accordance with the designated wage determination. If a classification of worker is used that does not appear in the contract special provisions, Section 1 07.9 of the *Standard Specifications* makes it the Contractor's responsibility to contact the U.S. Department of Labor for a determination of the proper wage rate. The *Required Contract Provisions for Federal-aid Construction Contracts* (FHWA-1273) provides a method for resolving this.
- All payrolls must have a statement of compliance signed and in the form prescribed by Section V of the *Required Contract Provisions Federal-aid Construction Contracts* (FHWA-1273).
- The Contractor, subcontractor, or lower-tier subcontractor, in accordance with the requirements of DBRA, must certify all payrolls. This certification contains four elements:
  - That the payroll copy furnished is a true copy;
  - That the payroll is correct and complete;
  - That the wage rates contained therein are not less than those determined by the Secretary of Labor, and that the classification set forth for each laborer or mechanic conforms with the work being performed; and
  - That the appropriate fringe benefits due each employee have been paid in full.

Subcontractors and lower-tier subcontractors are required to submit payrolls through the Prime Contractor to the Project Engineer. Any payrolls which do not comply fully with the requirements outlined above must be corrected by a supplemental payroll.

1-2.6C(3) Employee Interviews

The Project Engineer must conduct periodic employee interviews. The purpose of these spot interviews is to establish, with reasonable certainty, that the provisions for federal prevailing minimum wages are being complied with and that there is no misclassification of workers or disproportionate employment of laborers, helpers, or apprentices. The occupation description must be shown on the form used for the employee interview noted under current duties. The occupation description is noted in the wage listing included in the contract provisions.

Some employees may refuse to reveal their rate of pay. This is acceptable and should be noted in the remarks column. Many employees do not know or may guess at the rate. If possible, a determination of the accuracy of the stated rate should be made, and any uncertainty noted in the remarks column to reduce the need for follow up interviews. If either the stated rate (from the employee) or the record rate (from the certified payroll) is below the minimum rate (from the contract wage listing), an investigation by the Project Engineer must be conducted. The investigation may be as simple as a follow up interview with the employee or a more in depth investigation may result in a requirement for a supplemental payroll. In any event, the matter must be resolved so that the employee interview report describes what corrective action was taken to ensure that the employee has been paid the minimum prevailing wage rate. This corrective action is to be reported under remarks on the form or by attached memo if more space is needed. All discrepancies found must be resolved.

The frequency and extent of these interviews should be sufficient to ensure a representative sampling has been made for all classes of workers employed on the contract. A minimum sampling should include employees of the Contractor and all major (30 percent or more of the contract dollars) subcontractors. The interviews should be made with such frequency as may be necessary to ensure compliance. Employee Interview Report, Form 424-003, is used to record and report interviews.

1-2.6C(4) Complaints

Any complaints regarding violations of minimum wage rate regulations that are referred to the Project Engineer by employees of the Contractor, subcontractor, or lower-tier subcontractors should be treated as confidential, and should be promptly investigated by the Project Engineer. If there are questions regarding complaints and the application or interpretation of the federal prevailing wage provisions, the Project Engineer should consider referring the issue to the Region Construction Manager or contacting the State Construction Office for further assistance.

1-2.6C(5) Federal Prevailing Wage Violations

In the event the Project Engineer identifies or receives a complaint from any employee of the Contractor regarding improper application or nonpayment of federal prevailing wages, improper application of overtime pay, or any other requirement noted in the *Required Contract Provisions for Federal-aid Construction Contracts* (FHWA-1273), the Project Engineer should immediately notify the Contractor requesting prompt corrective action. All issues of noncompliance involving either the Contractor, subcontractor, and any lower-tier subcontractors are to be addressed through the prime contractor for resolution.

If the Project Engineer determines the Contractor is in violation of the provision noted in the FHWA 1273 or Section 1-07.9 of the *Standard Specifications*, the Contractor should be immediately informed and requested to make the necessary corrective actions. Once the Contractor has been informed that an apparent violation has occurred, it is expected that a satisfactory correction or explanation will be made within a reasonable period of time. If this does not happen, the Project Engineer should withhold an appropriate portion of payment (see 1-3.1B(9)). If the failure to act continues, the Project Engineer should refer the issue to the Region Construction Manager.

1-2.6C(6) Department of Labor Investigation

The U.S. Department of Labor may investigate compliance with the DBRA and the Contract Work Hours and Safety Standard Act (CWHSSA) when conducting any investigations relative to compliance with the Fair Labor Standards Act or any other acts under its enforcement authority. Investigative action taken by the U.S. Department of Labor with respect to DBRA and CWHSSA do not, in any way, change the degree of authority or responsibility of WSDOT for enforcement of these Acts. Any actions taken by the U.S. Department of Labor should be considered as services we may use to assist us in our enforcement activities but, should not be considered to relieve us of our basic responsibility to investigate fully all potential violations and to apply such sanctions as are deemed applicable under our enforcement authority to ensure compliance.

1-2.6C(7) Fraud Notice Poster

Fraud Notice, FHWA 1022, Title 18 USC 1020, must be displayed on all Federal-aid projects during the course of the work. This notice points out the consequences of any impropriety on the part of any contractor or WSDOT employee working on the project.

1-2.6C(8) Request For Authorization of Additional Classification and Rate

The U.S. Department of Labor (DOL) issues wage determinations under the Davis-Bacon Act (DBA) using available statistical data on prevailing wages and benefits paid in a specific locality. On occasion, the data does not contain sufficient information to issue rates for a particular classification of worker needed in the performance of the contract. Because of this, DBA provisions contain a conformance procedure for the purpose of establishing an enforceable wage and benefit rate for the missing classification (reference Standard Specification 1-07.9(1) and FHWA 1273).

Contractors are responsible for determining the appropriate staffing necessary to perform the contract work. Contractors are also responsible for complying with the minimum wage and benefits requirements for each classification performing work on the contract. If a classification considered necessary by the contractor for performance of the work is not listed on the applicable wage determination, the contractor must initiate a request for approval of an additional classification along with the proposed wage and benefit rates for that classification.

The Contractor initiates the request by preparing form SF1444, Request for Authorization of Additional Classification and Rate, at the time of employment of the unlisted classification. (Reference FAR 22.406-3 and 52.222-6(b), and Title 29 CFR Part 5, Section 5.5(a)). The Contractor completes blocks 2 through 15 on the form. Standard Form 1444 is readily available via the internet

and is accessibleaccessible by going to http://www.gsa.gov/Portal/gsa/ep/formslibrary.do?formType=SF, and searching by the form number.

The Contractor submits the request to the State Construction Office via the Project Engineer's office. The Project Engineer's office will need to review the request and if applicable, provide backup data showing that the requested classification(s) have been prevailed in other counties within the state. The project office will also need to describe the work being performed and verify that the duties performed, as described in the request, are not covered by any other classification(s). This documentation, along with the request, will be forwarded under cover letter from the Project Engineer's office, through the Region Documentation office, to the State Construction Office.

The State Construction Office reviews the request for completeness and signs the form designating the contracting agency's concurrence or disagreement with the Contractor's proposal. If the Project Engineer or the State Construction Office indicates disagreement with the Contractor's proposal, a statement must be attached supporting a recommendation for different rates. The State Construction Office then submits the proposal with all attachments to DOL for approval. The Contractor is obligated to pay the proposed wage and benefit rates during the request for determination and pending a formal response from DOL.

When a determination has been received from DOL, the Contractor is obligated to pay that determined wage and benefits. If the Contractor has underpaid the employee(s), they are required to make back payment and re-submit corrected certified payrolls.

1-2.7 EEO, D/M/WBE and Training

1-2.7A Overview

Differences between State and Federal laws require a variety of guiding requirements. As a result individual contracts may have different guiding requirements depending on what laws were in place at the time the contract was executed and how the project is funded. The special provisions, *Standard Specifications*, and amendments determine the specific requirements for each project. The *Construction Manual* is one of many resources available for general information on the obligations and policy of WSDOT with regard to external civil rights. Other resources include:

1. Office of Equal Opportunity (OEO): OEO monitors, maintains, and updates WSDOT Equal Employment Opportunity (EEO) policies and commitments to FHWA. As part of that effort they maintain the following documents which are available through the OEO homepage:

- Equal Employment Opportunity Compliance Program (EEO and on the Job Training)
- Disadvantaged Business Enterprise Participation Plan (contract goals, if included in a project, will be mandatory)
- Title VI Plan (nondiscrimination)

2. *Standard Specifications*, as follows, apply to all projects:

- 1-07.11 Requirements for Nondiscrimination
- 1-08.1 Subcontract Completion and Return of Retainage Withheld

3. General Special Provisions as may be included in the contract include:

- Minority and Women's Business Enterprise (MWBE) Participation (included in projects financed with only State funds)
- Requirement for Affirmative Action to Ensure Equal Employment Opportunity (included in projects with FHWA participation)
- Disadvantaged Business Enterprise Participation (included in projects with FHWA participation)
- Special Training Provisions (included in projects with FHWA participation and only if the contract is selected for training)
- Indian Preference and Tribal Ordinances (TEROs) (only if the project includes work on the reservation and only if the ordinances exist)

While some requirements and provisions apply to all projects, others apply to projects with State funds only and others yet apply to projects that are partially or fully financed with Federal funding.

1-2.7B EEO (Federally Funded Projects)

WSDOT has committed to FHWA to perform comprehensive construction compliance reviews to ensure that the requirements of Section 1-07.11 have been adhered to. This review is performed by the WSDOT Office of Equal Opportunity (OEO) on a selected number of FHWA funded projects and may take place at any point during the life of the project or after the project has been completed. A Contractor that is found in violation of the contractually required affirmative action good faith efforts will be invited to a compliance conference to develop a corrective action plan. Failure to accept and comply with a corrective action plan may result in sanctions. The records that have been maintained at the Contractor's office will be utilized for these reviews. The FHWA also retains the authority to review the Contractor's records for EEO compliance. These reviews do not normally involve the project office other than notification of their occurrence and the resulting findings.

Contract compliance reviews include an on-site review, and interviews of contractor employees, while the contractor is actively engaged in performing work associated with the contract. If interviews cannot be conducted during the site review, such interviews may be conducted off-site, at other locations, or at a later time. The WSDOT Office of Equal Opportunity (OEO) may also interview WSDOT personnel associated with the project. FHWA has established narrow time frames during the execution of the project that maximize the potential for obtaining the information required for an on-site review. OEO will contact the Region EEO Officer or project staff to facilitate the timing of the review. Federal regulations for projects having federal-aid dollars as part of their funding source require the full cooperation of any contractor who performs work on the project.

1-2.7B(1) Prompt Return of Retainage to All Subcontractors

As a condition of receiving Federal funding, WSDOT is required to ensure prompt payment to all subcontractors on all contracts regardless of funding. State Statutes (Revised Code of Washington, RCW) pertaining to prompt pay require that the contracting agency make prompt payment to the prime contractor and that the prime contractor, in turn, pass these payments on to subcontractors in a timely manner.

Return of the subcontractor's retainage held by the prime contractor is required by the *Standard Specifications*. This is a race neutral effort intended to support all small businesses in their efforts to participate in WSDOT contracts. Therefore, in accordance with the contract provisions, the prime contractor is required to release any and all retainage to the subcontractor within a designated time period after subcontract completion. The Project Engineer has no role in this process other than to respond to allegations of non-compliance with this contract requirement as with any other. We need to keep in mind that our contract is with the prime contractor, and we are not a party to the prime contractor's subcontract documents. We should avoid becoming involved in a prime's relationship with their subcontractors.

In the prime contractor's effort to determine completion of subcontract work, as required by the contract provisions, the Project Engineer may be asked to determine completion of a portion of the work. While we need to work with the Contractor to comply with the requirements of the specification, we should also take specific care to not issue partial punch lists or to place ourselves in a position of "accepting" portions of the work. In some cases we may provide the Contractor relief under certain conditions as described in Section 1-07.13 of the *Standard Specifications*, "Contractor's Responsibility for the Work."

1-2.7C EEO (State Funded Projects)

The Contractor is required to comply with the EEO requirements detailed in the *Standard Specifications* Section 1-07.11, Requirements for Nondiscrimination. In general, these requirements include having an EEO Officer, developing, maintaining, making known, and utilizing an EEO program. The Project Engineer should be alert for and respond to any indications or accusations of discrimination. If the Project Engineer, or any other WSDOT personnel, becomes aware of any indications or accusations of discrimination, they should immediately notify the Region EEO Officer, who will in turn immediately notify WSDOT OEO. WSDOT OEO will handle any investigation that is warranted. The Office of Equal Opportunity and your regional OEO staff are available for guidance and assistance in these types of situations.

1-2.7D EEO (Federally Assisted Projects)

The requirements for EEO and nondiscrimination for federally assisted contracts are similar to those required for State funded projects. However, additional monitoring, reporting, and authority are mandated by Federal laws as noted in the Federal contract requirements known as the "FHWA 1273." The "FHWA 1273" is included in every Federally assisted contract. These requirements are reiterated in the *Standard Specifications* Section 1-07.11, Requirements for Nondiscrimination.

Reporting

- Federal-Aid Highway Construction Contractors Annual EEO Report, Form FHWA - 1391 — This form is required for all Federally assisted projects provided the prime contract is equal to or greater than $10,000 and for every associated subcontract equal to or greater than $10,000. Each contract requires separate reports be filed for the prime contractor and each subcontractor (subject to the above noted criteria.) These forms are to be submitted to the Project Engineer, and are due by August 25th each year in which work was performed in the month of July.

  The payroll period to be reflected in the report is the last payroll period in July in which work was performed. A contractor who works on more than one Federally assisted contract in July is required to file a separate report for each of those contracts. For multi year projects, a report is required to be submitted each year work was performed during the month of July throughout the duration of the contract. A responsible official of the company must sign the completed report.

  Upon receipt, the Project Engineer will forward the annual report to the Region's EEO Officer by September 5th. The Region EEO staff at the direction of the OEO will compile and report the information noted on the forms. The figures reported must reflect the number of employees, not hours, in each category, with subtotals broken out for women and minorities and grand totals for the category. Tables A through E reflect both apprentices and on the job trainees that were also utilized within each trade. The form must also include the corresponding subtotals in each category, A through E, broken out by both women and ethnicity.
- Summary of Employment Data Report, Form FHWA - 1392 — As a part of the WSDOT OEO Equal Employment Opportunity Contractor Compliance Program, WSDOT is required to submit a summary of employment data to FHWA for each Federal fiscal year. This Summary of Employment Data Report, FHWA-1392, is prepared from forms FHWA-1391 (project specific annual reports) that have been submitted to the Region by the Project Engineer's offices. This summary is prepared by the Region EEO lead or other Region designee for each Federally assisted project. This report also includes Local Agency projects administered through the Region's Highways and Local Programs offices. The completed FHWA-1392 summary reports, including all forms FHWA-1391, are then submitted by the Region EEO lead to the WSDOT Office of Equal Opportunity by September 15th each year.
- Monthly Employment Utilization Reports, WSDOT Form - 820-010 — This form, or approved substitute, is required for all federally assisted projects if the prime contract is equal to or greater than $10,000 and for every associated subcontract equal to or greater than $10,000. This report includes the total work hours for

each employee classification as well as the total number of employees, broken out by ethnicity, in each trade, for each WSDOT project. Instructions for completing the form can be found on the back of the form itself. These monthly reports are to be maintained by the Contractor in the respective prime or subcontractor's records for a period of three years from acceptance of the contract, and available to WSDOT and/or Federal reviewers upon request.

The information required by WSDOT Form 820-010 may be accepted in an alternate format provided that format contains all of the data required by and is completed in accordance with the instructions for WSDOT Form 820-010. The Region EEO staff should be consulted regarding the acceptability of any alternate format proposed by the Contractor.

Records Retention and Reviews

The Contractor is required to maintain all project records, including the aforementioned EEO records, for three years following completion of the contract.

1-2.7E Minority and Women Owned Business Enterprise (MBE, WBE)

MBE, WBE is the designation for holding State certification as a minority or women owned business enterprise. The State Office of Minority and Women's Owned Business Enterprises (OMWBE) certifies businesses as either a minority owned business (MBE), a women owned business (WBE), or a combination of both (M/WBE). On projects funded in whole or in part with State funds, the contract provisions will include a MBE, WBE special provision. This provision requires that the Prime Contractor submit an M/WBE Participation Plan and may specify voluntary goals for the Contractor's utilization of M/WBE. The provision also includes suggested methods for encouraging M/WBE participation. As noted, these requirements are indeed voluntary and there are neither preferences for accomplishment nor sanctions for noncompliance. When the Project Engineer's Office receives the Prime Contractor's M/WBE Participation Plan, it should be transmitted to the WSDOT Office of Equal Opportunity for review and comment.

MBE/WBE Reporting

- Annual Report of Amounts Paid MBE/WBE Participants (Form 421-023). In accordance with Section 1-08.1 of the *Standard Specifications*, an Annual Report of Amounts Paid MBE/WBE Participants (Form 421-023) is required from the prime contractor for all projects funded entirely by State funds. When a project contains Federal assistance, the Federal quarterly reporting requirements for DBE utilization override the States requirements, eliminating the need for the State's annual report of amounts paid.

  The Annual Report of Amounts Paid MBE/WBE Participants reflects the State fiscal year, July 1 through June 30, and is to be submitted to the Contracting Agency by the 20th of July each year and/or upon physical completion of the contract. The dollar amounts shown in the report are those amounts paid to the MBE/WBE firms during the reporting period. The final report is to show only the dollar amounts paid since July 1st through the Physical Completion date. The Region is responsible for entering this data into CCIS. The Region Documentation/Equal Employment Opportunity (EEO) Officer needs to verify the information has been entered and validate the information. The completed form is maintained as a part of the project records and becomes a part of the temporary final records upon completion.

1-2.7F Disadvantaged Business Enterprise (DBE)

DBE is the designation for holding Federal certification as a Disadvantaged Business Enterprise. On Federally funded projects there will normally be a DBE requirement of some sort specified by the contract special provisions. This special provision will be one of two types:

1-2.7F(1) GSP Includes No Goal

When *No Goal* is specified, the contractor is encouraged to take actions that promote DBE participation. The goal is intended to draw the attention of bidders to the opportunity to subcontract with DBE's. However, these requirements are indeed voluntary and there are neither preferences for accomplishment nor sanctions for non-compliance. They do contribute to the overall goal established by the Department. It is therefore important that the Department capture the work that is being performed. This can be done through "Quarterly Report of Amounts Credited as DBE Participation".

1-2.7F(2) GSP Includes Condition of Award (COA) Goal

When *a Condition of Award Goal* (COA) is specified, the Contractor is required to employ DBE participation to at least the extent identified in the contract special provisions. This is a condition of awarding the contract to the Contractor and a project can not be considered successful unless the Contractor meets the COA DBE participation goal, or the Contractor demonstrates that a good faith effort was made to deliver on the Condition of Award. These specifications are placed in contracts as a condition of continued Federal Funding for the Department.

- As a *Condition of Award*, the Contractor must commit to, and follow through on, subcontracting at least the work and the amount identified by the COA to certified DBE firms or make a good faith effort to do so.
- Measurement of attainment is not simply the payments made to the DBE. Attainment is measured in accordance with the provisions of the "DBE Participation" section of the contract special provisions.
- Changes to the amounts specified for COA must be made in accordance with the procedures outlined in this section.

1-2.7F(3) Additional Execution Documents

Successful bidders will be required to provide a "Bidders List" to the Department. This list is to include the names and addresses of every firm that submitted a bid or quotation to the Prime, whether or not that bid was used as part of

the overall proposal. The Contractor is directed to send this list directly to the WSDOT Office of Equal Opportunity in Olympia and normally the Project Engineer will have no involvement.

1-2.7F(4) DBE Reporting

The contract special provisions require the Contractor to submit to the Project Engineer a "Quarterly Report of Amounts Credited as DBE Participation" for each quarter and upon completion of the project. Again, the measurement is not simply the payments made to the DBEs, rather it is in accordance with the "DBE Participation" section of the contract special provisions. This report should contain all DBEs utilized on the contract not just the COA DBEs. The information is used to track the Departments attainment of our overall goal and it is important to insure that they are received and processed in a timely manner. The Region Documentation/EEO Officers shall track and verify that the affidavits are being received and entered for all applicable contracts. The Region Documentation/EEO Officers shall also compare the affidavits with the Condition of Award requirements.

1-2.7F(5) On Site Reviews

On-site reviews shall be conducted on all Federal-aid contracts where there is DBE participation (with or without Condition of Award (COA) goals). On-site reviews shall be conducted at periodic intervals – when the DBE begins work, during the peak period of the DBE's work, and any time there is a change in the nature or methods of the DBE's work. An on-site review must also be conducted when there is a change in the DBE performing the work (substitution of a DBE firm). An on-site review is a "snapshot in time" and should record personal observations, documentation reviews and personnel interviews, as applicable. A copy of the completed on-site review (WSDOT Form 272-051 EF) should be forwarded to WSDOT's Office of Equal Opportunity (OEO).

One of the requirements of the overall DBE Program is that all DBE firms working on Federal-aid project are in control of their specific items of work and are performing a "Commercially Useful Function" (CUF), as described by the specification. An on-site review may lead to a more in-depth CUF review, conducted by the OEO. These in-depth CUF reviews may be a result of concerns identified during the initial on-site review, or the OEO may select DBE firms on a periodic basis for a more in-depth review. The OEO uses these in-depth reviews to stay abreast of the DBE firm's capabilities. The OEO will contact the Project Office directly to schedule these reviews. The fact that the OEO is going to conduct a review shall be kept in confidence in order to ensure that the review truly reflects a sampling of the typical work of the DBE firm. The CUF review will include observations of the work, as well as interviews with key staff of all parties on the contract, in addition to the DBE firm.

On those projects containing a COA goal, the COA letter requires that the identified DBE firms perform specific items of work for the estimated dollar amounts included in the proposal. The COA letter also identifies whether the DBE firm will be performing as a "subcontractor", "manufacturer", or "regular dealer (supplier)". Any issues regarding DBE compliance should be brought to the attention of the OEO and the State Construction Office.

In order for WSDOT to take credit for DBE participation (as reflected by the quarterly reports), WSDOT must ensure that all DBE firms perform a "Commercially Useful Function". Determination of whether or not a firm is performing a "Commercially Useful Function" requires on-site monitoring. The Project Office plays a key role in this monitoring by acting as the Departments "eyes and ears" in the field.

1-2.7F(6) Changes to the Condition of Award (COA)

The Contractor is required to utilize the COA subcontractors, manufacturers, etc., to perform the work as listed in the COA letter. Substitution of another DBE is allowed if:

- A COA DBE firm becomes decertified, or
- The Contractor proposes a change to the contract, that is subsequently approved by WSDOT, which reduces DBE COA participation, or
- The prime contractor provides documentation that a DBE firm is unwilling or unable to perform the work.

Exceptions to the substitution requirement may be allowed under any of the following circumstances:

- WSDOT deletes the COA firm's intended work.
- The COA work accomplished under runs the original planed quantity.
- The Contractor can show substantial financial loss if a substitution is required.
- The work has progressed to the point where no other work remains to be subcontracted.
- The DBE subcontractor has taken the positive step of graduating from the DBE program.

The State Construction Office must approve any substitution with concurrence from the Office of Equal Opportunity.

1-2.7F(7) Substitution

Substitutions must meet the following requirements:

- The new firm must do an equal dollar value of work on the contract.
- The change order does not increase the dollar amount of the original goal.

1-2.7F(8) Condition of Award (COA) Change Orders

Changes to the contract COA amounts must be made through a change order executed by the Headquarters Construction Office. Approval is granted after consultation with the Office of Equal Opportunity. This approval shall be obtained and documented prior to the changed work, and any related work, being performed. The amounts shown in the COA change order should be limited to the credit necessary to accomplish the original contract goal amount. The request for approval and the change order as well as the change order package needs to contain the following information:

- An explanation of why the change is necessary.
- Identification of both the deleted work and the added work.
- Revised subtotals for all COA DBE firms. The change order only needs to address each affected DBE firm, not all COA DBE firms.
- Revised total attainment for DBE participation.
- Documentation of a good faith effort to substitute should go in the change order file, (if required, see 1-2.7F(6)).

1-2.7F(9) Consulting with the Office of Equal Opportunity

The Department's DBE program is managed by the External Civil Rights Branch of the Office of Equal Opportunity (OEO) at Headquarters. The Project Engineer must communicate extensively and continuously with that office about any aspect of the DBE activities on the project. Any questions received from the Contractor or subcontractor about DBE provisions or enforcement should be answered only with full knowledge of the opinions and directions of the OEO. The OEO phone number at Headquarters is 360-705-7085.

The Office of Equal Opportunity is also required to approve DBE firms that are manufacturers and regular dealers (suppliers).

The State Construction Office must execute any change orders that revise the COA commitment. When preparing the change order in CCIS pending CO's menu use option 3, "Condition of Award Items." Include the first three items listed above in the change order document. When submitting the change order to the Contractor for signature, the Project Engineer should also send copies to the affected DBE firms and should advise the Contractor that this has been done.

1-2.7G On-the-Job Training (OJT)

1-2.7G(1) On-the-Job Training Special Provisions — General

The requirements for training are made a part of the contract by the special provision, Special Training Provisions. The amount of training is set by the WSDOT Office of Equal Opportunity based on the opportunities presented by the work and the needs in the geographical area involved. The requirements for trainee, training plan approval, and trainee payment are all specified in the contract special provisions.

1-2.7G(2) OJT Required Reports

The contract provisions allow the Contractor to accomplish training as part of their work activities, or through the activities of their subcontractors or lower-tier subcontractors. However the prime contractor is designated as being solely responsible for the completion of the training requirements as they are outlined in the contract provisions.

- Form DOT 272-049 Training Program — A training program is to be completed by the Contractor. The program must be submitted to the Engineer for approval prior to commencing contract work. The Project Engineer's office may approve Office of Apprenticeship, Training, Employer and Labor Services (OATELS) or Washington the State Apprentice and Training Council (WSATC) programs provided they meet the requirements specified in the contract provisions. The Region will review any non-OATELS/WATC training plans submitted under section III of the form for compliance. If the plan appears to be in compliance, the Region will sign it, check "Approval Recommended", and submit it to the WSDOT Office of Equal Opportunity (OEO) for concurrence. If concurrence is granted, OEO will note this on the plan and will submit the plan to FHWA for approval.
- Form 272-050 Apprentice/Trainee Approval Request — Approval of an individual trainee cannot be authorized until an approved Training Program is filed with the Region. This form is to be submitted by the Contractor for each trainee to be trained on the project. When an OATELS/WSATC apprentice/trainee is first enrolled, a copy of the apprentice/trainee's certificate showing apprenticeship/training registration must accompany the Trainee Approval Request. Trainees are approved by the Project Engineer's office based on the criteria in the special provisions. If the contractor submits a request for approval of trainee who is neither female, nor a minority, the region must obtain concurrence from the WSDOT Region EEO Officer or the WSDOT Office of Equal Opportunity prior to approval of the requested trainee.
- Form 226-012 EF Trainee Interview Questionnaire — One trainee interview is to be conducted for each craft designated on an approved training program for contracts which have 600 or more training hours or on projects otherwise designated by the Region EEO. The Region EEO shall designate additional contracts on which trainee interviews are to be completed in conjunction with those that meet the criteria above to insure that trainee interviews are conducted on at least one fourth of all the contracts that have training hours established for any given construction season. The intent of these training interviews is to document that the trainees are working and receiving proper training consistent with their approved programs. DOT form 226-012EF should be used to document these spot checks.
- Form DOT 272-060 Federal-aid Highway Construction Annual Training Report — This report is to be completed annually by the Project Engineer summarizing the training accomplished by the individual trainees during the reporting period beginning January 1 and ending December 31 of the calendar year. This report is due at the Regional EEO Office by December 20th of the same calendar year as the reporting period. The "gap" between the reporting deadline (December 20) and the end of the reporting period (December 31) is not significant enough to adversely affect the data, and should not be a source of concern for the project staff.

1-2.7G(3) Payment for "Training"

At progress estimate cutoff time, the Contractor shall submit a certified invoice requesting payment for training. The invoice must provide the following information for each trainee:

- The related weekly payroll number
- Name of trainee
- Total hours trained under the program
- Previously paid hours under the contract
- Hours due for current estimate
- Dollar amount due for current updated estimate

Retroactive payment may be allowed provided:

- The Training Program is approved
- There are no outstanding issues or circumstances that would have prevented approval of the apprentice/trainee

Increases in training hours are allowable and may be approved on a case by case basis by the Project Engineer in consultation with the Regional EEO Officer.

1-2.7H Apprentice Participation

1-2.7H(1) Apprentice Participation Special Provision – General

The requirements for apprentice utilization are made a part of the contract by the special provision *"Apprentice Utilization"*. The use of this provision, and the percentage of required apprentice participation, will be determined by meeting the date and dollar thresholds as follows:

- 10% On contracts advertised on or after July 1, 2007 but before July 1, 2008 and estimated to cost five million dollars or greater.
- 12% On contracts advertised on or after July 1, 2008 but before July 1, 2009 and estimated to cost three million dollars or greater.
- 15% On contracts advertised on or after July 1, 2009 and estimated to cost two million dollars or greater.

Only apprentices enrolled in and apprenticeship program approved by the Washington State Apprenticeship Council may be counted toward attainment of the apprentice utilization requirement. The Contractor may attain the apprentice utilization goal as part of their work activities, or through the work activities of subcontractors or lower-tier subcontractors. Attainment of the requirement will be calculated by comparing the total labor hours worked by all the enrolled apprentices performing work for the Contractor and any subcontractors, in all trades, with the total labor hours performed on the project, in all trades.

It is important to note that the Apprentice Utilization Requirement is a separate program from the Federal Training requirements included in all contracts which contain federal monies. The two programs are not mutually exclusive. The intent of the federal program is to increase the availability of women and minorities within the construction trades; where as the Apprentice Utilization Requirement (state program) is promoting the use of apprentices in general. The state program will generally be much larger the federal training program. Federal training goals are set on approximately 25% of all federally funded contracts and the state program will be required on all contracts estimated to cost two million dollars or greater. The state program will ultimately require that 15% of all labor hours on a project be performed by enrolled apprentices; this could range from 700 to 10,000 hours. Training hours on federal contracts range as high as 3,000 hours for a similar sized contract.

1-2.7H(2) Apprentice Utilization Plan

The Contractor is required to submit an apprentice utilization plan, on WSDOT Form No. 422-115 EF, to the Project Engineer within 30 days of execution of the contract. This plan is not submitted for approval; but to inform the Project Office as to how the Contractor will attain the utilization goal. The intent of the plan is to provide the Project Engineer with enough information to track the Contractor's progress in the utilization requirements. If the plan does not indicate that the Contractor will attain the goal, a revised plan should be requested and/or the Contractor should be notified that "Good Faith" documentation will be required, as specified.

1-2.7H(3) Reporting

For each contract with an apprentice utilization requirement, the Contractor is required to submit a monthly ***Statement of Apprentice/Journey Participation*** (WSDOT Form No. 422-110 EF) to the Project Office. This report shall be a consolidated report, and include data from the Contractor's work activities, as well as from the work activities of all subcontractors. This report will include the total hours and number of apprentices and journeymen working on the contract during the reporting period. The report will list the apprentices by name, registration number, and craft or trade; as well as the name of the Contractor or subcontractor for whom the apprentice is working. The Project Office should verify that each apprentice listed is enrolled in a State approved apprenticeship training program and that the report is reasonable and complete; however, do not confuse apprenticeship reporting with Federal Wage Administration or the Special Training Provisions. The reporting period starts on the first day of the month and runs through the last day of the month, and will be reported on the last working day of the following month. The Project Office should use this report and the apprentice utilization plan to measure the Contractor's progress toward attainment of the utilization goal. If apprentices are not being reported on the project when the plan shows that they should be working, the Project Office should contact the Contractor and request a revised plan. The Project Office should forward copies of all apprentice utilization plans to the Headquarters Construction Office, and the Region. The original apprentice utilization plan should be kept in the project file. A copy of all reports, and any "Good Faith" documentation submitted, should also be submitted to the Headquarters Construction Office, and the Region.

1-2.7H(4) "Good Faith" Procedures

"Good Faith" is the action taken by the Contractor to meet the Apprentice Utilization requirement. Documentation of the Contractor's "Good Faith" efforts is only required if the Contractor fails to attain the goal. "Good Faith" documentation may arrive with the monthly report or at

the completion of the contract. The need to provide "Good Faith" documentation should be stressed if it is determined that the monthly reports show a level of attainment that significantly differs from that in the Apprentice Utilization Plan. If this should occur, the Project Office should request a revised Apprentice Utilization Plan and/or "Good Faith" documentation from the Contractor. "Good Faith" documentation is basically written correspondence form approved program sponsors indicating that apprentices are not available to the Contractor. All apprentice programs must be approved by the Washington State Apprenticeship Council. A listing of approved programs can be found at the Department of Labor and Industries web page.

1-2.7I American Recovery and Reinvestment Act (ARRA) Projects

Projects that are funded in whole or in part by the American Recovery and Reinvestment Act (ARRA) are subject to the same requirements that apply to other federally funded projects. ARRA funded projects also have specified employment reporting requirements that are in addition to the reporting required on all Federal Aid projects.

ARRA Employment Reports shall be submitted by the Contractor to the Project Engineer on Form FHWA 1589. The report shall be completed according to the specifications and coding instructions provided with the report form, and shall contain project specific information as to the numbers, hours worked, and wages paid by the Contractor and all subcontractors for all of their employees. This report shall include all those employees of the Prime Contractor and of all subcontractors working on the ARRA project at the jobsite, in the project office, in the home office, or teleworking from home or an alternative office; and all engineering personnel, inspectors, sampling and testing technicians, and lab technicians who are actively performing work directly in support of the ARRA project.

Within 30-days of execution of the contract, the Contractor shall submit to the Project Engineer an initial report for each ARRA project awarded to the Contractor. Each month thereafter, the Contractor shall submit a monthly report for each ARRA project, submitted no later than the 10th day of each month, reporting employment information for the previous month. In those cases where there is no active work on the project for a specific month, the report will be submitted with "zeros" reported for number of employees, hours and wages.

Do not confuse Employment Reporting with Federal Wage Administration, as they are not the same. WSDOT is not provided with data that would allow for verification, nor is WSDOT required to verify employment data. Because certified payrolls are not required to include the salaried employees, owner-operators, or professional services that are required to be included in the employment report, there is no way to verify the employment data through comparison with certified payrolls. Because employment reports are required to include contractors' home-office and telework employees, there is no way to verify employment data through field observations. Accordingly, ARRA Employment Reports should be checked only to verify that they are reasonably complete (all subs observed to be active on the project are reported).

Failure on the part of the Contractor to submit these reports by the due date may result in the withholding of all progress payments to the Contractor until reports are received, as provided in Section 1-09.9 of the *Standard Specifications*. If the report is not received by the due date, the Project Engineer shall notify the Contractor of intent to defer payment within eight (8) calendar days of the report due date. When payments must be withheld, the Project Engineer must ensure that the Region Construction Manager/Construction Engineer and the State Construction Office are notified.

The original initial report and subsequent monthly reports should be placed in the project file and maintained with the temporary final records for the project. The Project Office will submit copies of the ARRA reports to the Region Construction Office and to the State Construction Office, and must be received by the 15th day of each month. The Project Office may utilize the HQ Construction Sharepoint site for purposes of submitting the monthly Contractor reports to the State Construction Office. The State Construction Office will submit this information to the FHWA Division Office and to FHWA headquarters.

WSDOT is required to report on WSDOT employees, hours and wages for each ARRA funded project. This will be handled at Headquarters by means of our existing systems. The Project Office is not required to submit this information. In addition WSDOT is required to report on amounts paid to DBE subcontractors for each ARRA funded project. This reporting will be handled by means of Form 422-102 EF "Quarterly Report of Amounts Credited as DBE Participation". This report, which is already required on Fed-Aid projects, must be submitted by the Contractor in a timely manner and submitted to the State Construction Office as soon as it is received by the Project Office.

1-2.8 Control of Work

1-2.8A Authority of the Project Engineer

The Project Engineer is given considerable authority to enforce the provisions of the contract under Section 1-05.1 of the *Standard Specifications*. This authority is tempered by WSDOT's policies and delegation of authority from the Engineer to the Project Engineer. Accordingly, considerable care and professional judgment must be exercised by the Project Engineer in order to avoid exceeding the authority as delegated and to avoid decisions or actions that may be contrary to WSDOT policy. Should there be any doubts as to the limits of authority, the Project Engineer should consult the Regional Construction Manager.

Standard Specifications Section 1-07.16(1) *Private/Public Property* restricts the contractor from using Contracting Agency owned or controlled property other than property directly affected by the contract work without the approval of the Engineer. The Engineer has the authority to allow the use of Contracting Agency owned or controlled property within the project limits and any other property specifically listed for use in the contract. The use of any other Contracting Agency owned or controlled property would require a lease agreement as detailed in Chapter 11 of the WSDOT *Right of Way Manual*, M26-01.

In many cases, the courts have held that where the Project Engineer has exceeded the authority provided in the plans and specifications or the authority delegated by the Engineer, the actions of the Project Engineer are binding upon WSDOT. Because of this, it is important that the Project Engineer make no instructions, verbally or by written memoranda, that are outside the scope of the plans, specifications, contract provisions, or the authority delegated by the Engineer.

In advance of or during the course of the project, in the interest of economy and efficiency, noncritical items of work may be identified for which the Project Engineer may choose to modify the normal inspection or testing procedures. In taking these actions, the Project Engineer is acting under the professional responsibility inherent in all actions as a representative of the Department and a Licensed Professional Engineer. Full accountability of such incidents is expected. The scope of such actions should not exceed $10,000 for a single bid item, nor exceed $25,000 for an entire project.

The nature of the work to be accepted in this manner will generally be limited to minor and isolated items. Acceptance would typically involve dimensional conformance to the plans and a visual determination that the materials are suitable, however, the Project Engineer may require some testing or other means to support a decision. In such action, the Project Engineer should be guided by the principle of achieving the intent of the contract, attaining reasonable expectations of service life proportional to cost, and protection of public safety. Typically, changes in acceptance procedures will only be made to work outside of vertical lines through the horizontal limits of the traveled way. Consideration should be given to the consequences of subsequent failure, ease of replacement, whether or not there is a high variability in the quality of similar work, or any other pertinent facts. Actions taken in accepting such materials should be identified in the project records with acknowledgment by signature of the Project Engineer. Materials accepted in accordance with this guidance should be identified in the Project Engineer's preparation of the Certification of Materials under Chapter 9-1.5 of this manual.

The use of this process is not intended to retroactively justify deficiencies discovered after the completion of work.

1-2.8B Contractor's Equipment, Personnel, and Operations

The Contractor is required to furnish adequate equipment for the intended use. The Contractor's equipment must also be maintained in good working condition. Prior to the start of work, the Project Engineer should ensure, by inspection, that the Contractor's plant, equipment, and tools comply with the specifications.

Whenever the specifications contain specific equipment requirements, the Project Engineer should verify that the equipment provided meets these specifications. This should be documented in project records such as the Inspector's Daily Report. The Contractor is required to furnish, upon request, any manuals, data, or specialized tools necessary to check the equipment.

It is most important that the operation of automatically controlled equipment be checked carefully and that the Contractor be advised immediately whenever the equipment is not performing properly.

The Contractor's supervisory personnel must be experienced, and able to properly execute the work at hand. If, in the Project Engineer's opinion, the Contractor's supervisory personnel are not fully competent, the Project Engineer should immediately notify the Regional Construction Manager of the facts in the matter, seeking assistance and advice.

It is expected that, consistent with WSDOT's policies and delegated authority, the Project Engineer will assist the Contractor in every way possible to accomplish the work under the contract. However, the Project Engineer must not undertake, in any way, to direct the method or manner of performing the work. Contrary to popular legend, this statement is true of force account work as well. Should the Contractor select a method of operation that results in substandard quality of work, non-specification results, a rate of progress insufficient to meet the contract schedule, or that otherwise violates the contract specifications or provisions, the Contractor should be ordered to discontinue that method or make changes in order to comply with the contract requirements. Where cooperation cannot be achieved, the Project Engineer should notify the Regional Construction Manager of the facts in the matter, seeking assistance and advice.

1-2.8C Defective or Unauthorized Materials or Work

Contract Final Acceptance for all work completed on a project is made solely by the Secretary of Transportation acting through the State Construction Engineer. However, the Engineer relies heavily on the actions and professional opinions of others, involved throughout the course of work, in determining acceptability. Because of this, it is expected that the Project Engineer, working with the assistance of the Regional Construction Manager, as well as making full use of the many resources available at both the Regional level and Headquarters, particularly the office of the State Construction Engineer, will ensure that sufficient inspection is conducted in order to determine that the work performed or the materials utilized to construct the project comply with the requirements included in the contract plans and specifications. When inspections or tests are performed that indicate substandard work or materials, the Project Engineer should immediately notify the Contractor, rejecting the unsatisfactory work or material. When a review of the Contractor's work or materials used indicate questionable acceptability with regard to the specifications, the Contractor should be notified as quickly as possible so that changes in materials or work methods can be made in order to avoid materials or work being rejected.

1-2.8C(1) Defective Materials

The contract plans and specifications for construction of a project require that specific materials and/or work practices be utilized in completing the work. The Project Engineer may reject any materials not conforming to the requirements of the specifications. The rejected materials, whether in place or not, are to be immediately removed from the site of the work unless the following guidelines for acceptance of non-specification materials are followed:

Material Not in Place

1. Nonconforming materials that are within the defined tolerance limits noted in Chapter 9-5.6 of this manual may be accepted for use on the project in accordance with the guidance in Chapter 9-5.4.

2. There may be situations where WSDOT determines the use of nonconforming materials is acceptable. This requires prior approval of the State Construction Engineer and a change order modifying the project specifications.

Except for 1 and 2 above, materials that are known in advance as failing to comply with the Specifications are not to be incorporated into the work.

Material in Place

1. Price adjustments have been developed and are referenced in the contract for acceptance of certain materials whose properties cannot be determined until they are in place. Items this policy applies to include: concrete compressive strength, Portland cement concrete pavement thickness, hot mix asphalt mixture and density, and pavement smoothness.

2. Material incorporated into the work that is subsequently found to be in nonconformance with the specifications and for which price adjustments for acceptance are not included in the contract, must be reviewed to determine acceptability. The determination of acceptability should be made only when, in the Project Engineer's judgment, there is a possible service or benefit to be obtained from its use. If it is determined that no benefit or service is obtained from the material's use, the Project Engineer may direct that the material be immediately removed and replaced at no cost to WSDOT.

The Project Engineer may consult the State Construction Office, State Materials Laboratory, the State Bridge and Structures Office, or other design organizations for assistance in determining the usefulness of the nonconforming material. If consulted, these offices will offer technical advice to the extent that information is available. It is not intended to enter into extensive research to assess material which could be removed and replaced under the contract terms.

If the material is acceptable for continued use, a determination shall by made by the Project Engineer of the possible reduced service life caused by the material substitution and the resulting credit assessed by change order. This determination of acceptability and the resulting credit must meet with the Region Construction Manager's approval for execution of the change order. In addition, prior review and approval must be obtained from the State Construction Engineer with a recommendation from the State Materials Engineer for the intended application of the material. With this determination for acceptance of non-specification material, discussions should be initiated with the Contractor and a change order completed.

If it is determined that the specification violation will not compromise the performance of the material and the nature of the violation is considered to be more of a technical infraction of the specification, the material may be accepted with a change order, possibly including a price reduction. If there is sufficient data and if the nature of the material makes analysis feasible, a pay factor may be determined using QC/QA methods similar to those described in the *Standard Specifications*, Section 1-06.2(2). If QC/QA can not be applied, the Project Engineer may determine an adjustment subjectively, using whatever information is available. This assessment or price adjustment is typically based on the unit bid price and may vary from no price adjustment up to the total contract unit bid price for the item involved. If it is determined that the violation is serious enough that the material can not be accepted for use on the project, the Project Engineer may direct its complete removal and replacement at no cost to WSDOT.

All change orders for acceptance of nonconforming materials are Contractor proposed and WSDOT is under no obligation to accept or approve any of them.

1-2.8C(2) Defective or Unauthorized Work

The following types of activities will be considered unauthorized work and will be completed solely at the risk and expense of the Contractor:

- Work performed contrary to, or regardless of, the instructions of the Project Engineer.
- Work and materials that do not conform to the contract requirements.
- Work done beyond the lines and grades set by the plans or the Engineer.
- Any deviation made from the plans and specifications without written authority of the Project Engineer.

Until all issues of material acceptance and conformity to the contract plans and specifications can be resolved, unauthorized work will not be measured and paid for by WSDOT. The Project Engineer may direct that all unauthorized or defective work be immediately remedied, removed, replaced, or disposed of. In correcting unauthorized or defective work, the Contractor will be responsible to bear all costs in order to comply with the Engineer's order.

For additional guidance, see Section 1-05.7 of the *Standard Specifications*. If the Contractor fails or refuses to carry out the orders of the Engineer or to perform work in accordance with the contract requirements, the Project Engineer should immediately notify the Regional Construction Manager of the facts in the matter, seeking assistance and advice.

1-2.8C(3) Material Acceptance by Manufacturer's Certificate

All material is to be accepted for use on the project based on satisfactory test results that demonstrate compliance with the contract plans and specifications. All work demonstrating compliance is to be completed prior to the material's incorporation into the work. In many cases, this testing has already been completed in advance by the manufacturer. A Manufacturer's Certificate of Compliance is a means to utilize this work in lieu of job testing performed prior to each use of the product. While this provides for a timely use of the material upon arrival to the job site without having delay in waiting for the return of test results, it creates potential difficulties in obtaining and assessing the adequacy of a certificate.

Section 1-06.3 of the *Standard Specifications* describes the procedures for acceptance of materials based upon the Manufacturer's Certificate of Compliance. Division 9 of the *Standard Specifications* describes those materials that may be accepted on the basis of these certificates. Since a certificate is a substitute for prior testing, it is intended that all certificates be furnished to the Project Engineer prior to use or installation of the material.

However, there are some circumstances where the Contractor may request, in writing, the Project Engineer's approval to install materials prior to receipt and submittal of the required certificate. The Project Engineer's approval of this request must be conditioned upon withholding payment for the entire item of work until an acceptable Manufacturer's Certificate of Compliance is received. Examples of materials that *shall not* be approved by the Project Engineer for installation prior to the Contractor's submittal of an acceptable certificate are: materials encased in concrete (i.e., rebar, bridge drains, etc.); materials under succeeding items where the later work cannot be reasonably removed (i.e., culvert under a ramp to be opened to traffic); etc. The Project Engineer's approval or denial shall be in writing to the Contractor, stating the circumstances that determined the decision. If the requirements of this provision are followed, including the written request by the Contractor and the written approval by the Project Engineer, then the remedy for failure to provide the Certificate is the withholding of 100% of the cost of the material and the cost of the work associated with the installation of the material.

At the conclusion of the contract, there may still be some items that are lacking the required certificates. These items must be assessed as to their usefulness for the installation, prior to payment of the Final Estimate and subsequent Materials Certification of the contract. The review of these items may include:

- Comparison with the suitability of other shipments to the project or other current projects.
- If possible, sampling and testing of the items involved or residual material from the particular lot or shipment.
- Independent inspection on site of the completed installation.

If it is determined that the uncertified material is not usable or is inappropriate for the completed work that incorporates the material, the Contractor should be directed to immediately remove the material, replacing it with other certified materials. If the material is found to be usable and is not detrimental to the installation it was incorporated into, it may be left in place but, if the provisions of Section 1-06.3 were followed, with a reduction to no pay. The reduction in pay will be the entire cost of the work (i.e., unit contract price, portion of lump sum, etc.) rather than only the material cost. The Contractor should continue to have the option of removing and replacing the uncertified material in order to regain contract payment for the installation. If the provisions of Section 1-06.3 were not followed, then there can be no withholding beyond the value of the missing work itself (the preparation and submittal of the Certificate.)

1-2.8D Contractor Submittals

Missing submittals is a principal source of delays in closing out the project and processing the final estimate. As the project proceeds toward completion, the Project Engineer and the Contractor should attempt to obtain all submittals as the need arises. These might include such things as materials certificates, certified payrolls, extension of time requests, or any other item or document that might delay processing the final estimate. Attention is needed to assure the receipt of these items from subcontractors as they complete their work.

1-2.8E Guarantees/Warranties

As specified in Section 1-05.10 and 1-06.5 of the *Standard Specifications*, the Contractor shall provide to the Project Engineer all guarantees, warranties, or manuals furnished as a customary trade practice, for material or equipment incorporated into the project. The Project Engineer should transmit the originals of any such guarantees / warranties or manuals to the organization that will be maintaining the items covered by the guarantee/warranty or manuals. The Project office should maintain a copy of the guarantee/ warranty, and a letter of transmittal for manuals, with the materials documentation file for the project.

1-2.8F Contractor's Performance Reports

The procedures for completing and submitting the Prime Contractor's Performance Report are included with the report, Form 421-010, and the *Prime Contractor's Performance Report Manual,* M 41-40. The requirement for this report and other direction can also be found in WAC 468-16-150 and WAC 468-16-160.

Should the Contractor's typical performance on a contract become below standard, the Project Engineer should immediately notify the Regional Construction Manager of the facts in the matter, seeking assistance and advice.

1-3 Estimates and Records

1-3.1 Estimates

1-3.1A General

Payment for work performed by the Contractor and for materials on hand must be made in accordance with Section 1-09 of the *Standard Specifications*. To facilitate payments to the Contractor and ensure proper documentation, WSDOT utilizes an automated computer system to record project progress in terms of bid item quantity accomplishment. This is then used to pay the Contractor for actual work performed during each designated pay period or for materials on hand. The automated system that completes this task is called the Contract Administration and Payment System (CAPS). CAPS utilizes an electronic tie between each project office's computer system and the mainframe computer. This system provides access to a large volume of corporate data and facilitates the maintenance of this data by different groups in different locations. Some of these different activities include:

- Contract Initiation — A Headquarters action whereby new contracts are created and stored in a computer file. The information consists of the names of the Contractor and the Project Engineer, project descriptive data, accounting identifier numbers, preliminary estimate, proposal date, bid opening date, award date, execution date, accounting groups and distributions, and an electronic ledger.
- Project Ledger — An updating process by the Project Office which keeps track of work performed on the contract as it is completed.
- Estimate Payments — A Project Office action whereby progress estimates and Regional final estimates are processed directly from the Project Office. The Headquarters Final Estimate process activates the Region Final when all the required paperwork is in place. Supplemental final estimates are processed by Headquarters only. Complete instructions for use of the CAPS computer system are included in the manual titled *Contract Administration and Payment System* (M 13-01).

1-3.1B Progress Estimates

Progress estimates are normally processed on the 5th of the month for odd numbered contracts and on the 20th of the month for even numbered contracts. Where the Project Engineer deems it appropriate, estimates may also be run on other dates.

Estimates may also be run on other dates if the progress estimate or parts of the progress estimate were withheld to encourage compliance with some provision of the contract and the Contractor resolves the issue that caused the withholding. These estimates should be paid immediately upon resolution by the Contractor.

Within the CAPS system, the basis for making any estimate payment is information from the project ledger. Every entry in the ledger is marked by the computer as either paid, deferred, or eligible for payment. Before an estimate can be paid, a Ledger Pre-Estimate Report (RAKD300C-PE) must be produced. In constructing this report, the CAPS system gathers all the ledger entries that are identified as eligible for payment, prints them on the report summarized by item, and shows the total amount completed to date for that item but not yet paid for by progress estimate. The report also shows any deferred entries or exceptions if they exist and includes a signature block for the Project Engineer's approval.

If there are errors or omissions in this report, the ledger must be changed to reflect the correct data. After corrections are made, the Ledger Pre-Estimate Report must be run again in order to get the corrections into the report and made available for payment by progress estimate. Once the Ledger Pre-Estimate Report is correct, an actual estimate can be paid. The report containing the Project Engineer's signature should be retained in the project files.

The estimate process is then accomplished with a few keystrokes in option 2, estimate payments, in the CAPS main menu. At this point, the CAPS system will automatically calculate mobilization, retainage, and the sales tax. The warrant will be produced, signed, and sent to the Contractor along with the Contract Estimate Payment Advice Report and two different sales tax summary reports. Copies of these reports will also be sent to the Project Office. When the Project Office receives their copy of the Contract Estimate Payment Advice Report, the total amount paid for contract items should be checked against the Pre-Estimate Report. This helps to verify that the amount paid was what the Project Engineer intended to pay. In addition, the ledger records that produced the estimate will now be marked by the CAPS system as being paid.

Up to the point of actually producing the warrant, the entire process for making a progress estimate payment is initiated and controlled by the Project Office.

Particular attention should be given to the comparison of the plan quantities and the estimate quantities for the various groups on the project as shown on the Ledger Pre-Estimate Report. Overpayments on intermediate progress estimates are sometimes difficult to resolve with the Contractor at the conclusion of the project.

New groups which do not change the termini of the original contract or changes in groups should be accomplished by memorandum from the Region to the State Accounting Services Office.

An additional estimate may be prepared if considerable work has been done between the date of the last progress estimate and the date of physical completion when the Engineer anticipates delays in preparing the final estimate. Should this circumstance occur, the additional estimate should show the work done to date no later than the day before the date of physical completion.

1-3.1B(1) Payment for Lump Sum Items

The Contractor is required to submit a detailed Lump Sum price breakdown for those items specified as Lump Sum for which there is no specified payment described in the payment clause of the applicable specification. Estimate payments for items specified as Lump Sum will be a percentage of the price in the Proposal, based on the Project Engineer's determination of the amount of work performed. Consideration will be given to, but payment will not be

based solely on, the Contractor's Lump Sum breakdown. The Project Engineer should verify that the price breakdown is based upon a reasonable proportioning of the work, and detailed enough to allow a determination of the work performed on a monthly basis.

Payment of the first 80 percent of the Lump Sum price for Type B Progress Schedules will be made on the next progress estimate following the submittal and approval of the Type B Progress Schedule. The payment will be increased to 100 percent of the Lump Sum price when the Contractor has attained 80 percent of the Original Contract Award amount, as shown on the CAPS Pre-Estimate Report (inclusive of payments made for Material on Hand).

On WSDOT contracts for which payment is made through CAPS (Contract Administration and Payment System), payment for mobilization is calculated and paid automatically by the system. On contracts that do not use CAPS, the Project Office must calculate, and make payment for, the Contract item "Mobilization". Payment will be made in accordance with *Standard Specification 1-09.7 - Mobilization*. Based on the lump sum Contract price for "Mobilization", partial payment will be made as follows:

1. When 5-percent of the original Contract amount has been earned from other Contract items, excluding any amounts paid for materials on hand, the Contractor is also entitled to a partial payment of the Bid item "Mobilization". This payment, which is in addition to payment for contract work performed, will be calculated as 50-percent of the amount bid for "Mobilization" or 5-percent of the original Contract amount, whichever is the least.

2. When 10-percent of the original Contract amount has been earned from other Contract items, excluding any amounts paid for materials on hand, the Contractor will be paid 100-percent of the amount bid for "Mobilization" or 10-percent of the original Contract amount, whichever is the least. This payment is in addition to payment for contract work performed.

3. When the Substantial Completion date has been established for the project, payment of any remaining portion of the lump sum item "Mobilization" will be made.

1-3.1B(2) Payment for Material on Hand

Payment for material on hand (MOH) may be considered for materials intended to be incorporated into the permanent work. The requirements for payment of MOH are noted in Section 1-09.8 of the *Standard Specifications*. Payments for MOH are made under the 900 series of item numbers as ledger entries and need to be backed out as items are utilized such that 900 series entries are zeroed at close out of the contract. Therefore logically payment for MOH shall not exceed the value of the corresponding bid item. It is the responsibility of the project engineer to devise procedures that assure this is done correctly.

Payments may be made provided the contractor submits documentation verifying the amounts requested, the materials meet the requirements of the contract and the materials are delivered to a specified storage site or stored at the suppliers/fabricators as approved by the project engineer. Materials shall be segregated, identified and reserved for use on a specific contract or project. Payments commensurate with the percentage of completion may be paid for partially fabricated items.

All materials paid for as MOH must be readily available for inspection by the owner. Steel materials must be available for inspection but this availability need not be immediate. Reasonable notice should be given to allow the contractor to locate and make the material available for inspection. The project engineer may accept a higher level of risk that steel material may not be reserved for our use. The contractor's obligation to perform the work and the surety's guarantee of this obligation serve to offset the risk that reserved materials are diverted to other projects.

When materials paid for as MOH are stored in areas outside the general area the region shall make arrangements for inspection as deemed necessary prior to making payment. The region may utilize other regions or the State Materials Laboratory in doing so.

When contracts are estimated to cost more than $2 million and require more than 120 working days to complete, a General Special Provision (GSP) will be included in the contract provisions, requiring documentation from the contractor as the basis for MOH payments and deductions. When this GSP is included in the contract provisions, the following procedure is used to determine how much of the MOH payment should be deducted from an estimate:

- Each month, no later than the estimate due date, the contractor will submit a document and the necessary backup to the Project Engineer that clearly states:
  - The dollar amount previously paid for MOH,
  - The dollar amount of the previously paid MOH incorporated into the various work items during the month, and
  - The dollar amount that should continue to be retained in MOH items.

  If work is performed on the items and the contractor does not submit a document, all previous associated MOH payments may be deducted on the next progress estimate.

1-3.1B(3) Payment for Falsework

On those projects which include a lump sum item for bridge superstructure, payment may be made on request by the Contractor for falsework as a prorated percentage of the lump sum item as the work is accomplished. The Project Engineer may require the Contractor to furnish a breakdown of the costs to substantiate falsework costs. For any given payment request, the Contractor may be required to furnish invoices for materials used and substantiation for equipment and labor costs.

1-3.1B(4) Payment for Shoring or Extra Excavation

When Shoring or Extra Excavation Class A is included as a bid item, payment must be made as the work under the bid item is accomplished, the same as for any other lump sum bid item. When Shoring or Extra Excavation Class B is included as a bid item, measurement and payment shall be made in accordance with Sections 2-09.4 and 2-09.5 of the

Standard Specifications. RCW 39.04 provides that the costs of trench safety systems shall not be considered as incidental to any other contract item, and any attempt to include the trench safety systems as an incidental cost is prohibited. Accordingly, when no bid item is provided for either Shoring or Extra Excavation Class A or Shoring or Extra Excavation Class B and the Engineer deems that work to be necessary, payment will be made in accordance with Section 1-04.4 of the *Standard Specifications*.

1-3.1B(5) Payment for Asphalt, CRS-2P, Steel, and Fuel Cost Adjustment

Some projects may include the specifications for Asphalt Cost Adjustment, CRS-2P Cost Adjustment, Steel Cost Adjustment, or Fuel Cost Adjustment (one or more) as a General Special Provision. Not all projects will contain these provisions, since their use depends on the type of work, the duration of the contract, and Region preference. For those contracts containing one or more of the cost adjustment bid items, an adjustment (payment or credit) will be calculated monthly for qualifying changes in the index price of the commodity. No adjustment (payment or credit) shall be made if the 'Current Reference Cost' is within the percentage of the 'Base Cost' specified in the contract, and only those items that are included in the provision are eligible for adjustment. Worksheets are available, in the "Shared Documents" folder of the "HQ Construction" Sharepoint site (http://sharepoint/HQConstruct/default.aspx), to assist the Project office in computing these price adjustments.

It is important to understand that the adjustments provided by these provisions are not a guarantee of full compensation for changes in the contractors cost, and that they are intended only to absorb some of the risk of severe cost escalation during contract performance. Because of this, the method of computing the adjustment has been simplified to eliminate tedious considerations that would otherwise be required to provide precise reimbursement of actual costs.

Payment for "Asphalt Cost Price Adjustment," "CRS-2P Cost Adjustment," and "Fuel Cost Adjustment" is based on quantities of the eligible material(s) incorporated during the period covered, as demonstrated by pay notes for those items. Payment for "Steel Cost Adjustment" is based on the quantity of eligible steel items incorporated or paid as Materials on Hand for the period covered. The Contractor is required to provide documentation of the quantities and the date shipped from the producing mill to the manufacturer. If the Contractor fails to provide the required documentation, any adjustment credit will be unilaterally computed by the Project Office using a shipment date determined by the Engineer. If the Contractor wishes to protest this adjustment, it must be done in accordance with Section 1-04.5 of the *Standard Specification*.

The provisions for these items are prescriptive, and should result in the correct adjustment if they are followed to the letter. Regardless of whether the estimate cutoff is the 5th of the month or the 20th of the month, any adjustment will apply the most current reference cost to the entire current quantity of each eligible item paid (or deferred) in the current estimate. When a portion of the payment for an eligible item is deferred, a similar portion of the price adjustment for that item should be deferred.

The provisions for these cost adjustments are silent in regard to changed work because there are other contract clauses that address how the Department will pay for changed work. Should changes occur in bid items that are eligible for adjustment, equitable adjustments should adhere to the guidance provided in Chapter 1-2.4C of this Manual. Under no circumstances should eligible items that were not included in the specifications at the time of bid be added by change order after award and execution of the contract. Likewise, these provisions should not be added by change order. FHWA will not participate in the cost of retroactive price adjustments.

1-3.1B(6) Payment for Surplus Processed Material

When excess aggregate is produced by the Contractor from a WSDOT furnished source, the Contractor will be reimbursed actual production costs if the excess materials meet the requirements of Section 1-09.10 of the *Standard Specifications*. If more than one type of aggregate is involved, the provisions of Section 1-09.10 apply to each type.

If WSDOT has a need for the excess aggregate for either maintenance or future construction contracts, the material may be purchased into the appropriate inventory account. The Project Engineer should contact Region Maintenance and Accounting for guidance. If aggregates are to be disposed of as surplus, the Project Engineer should contact the State Administrative Services Office, Purchasing and Inventory Section, for additional assistance.

1-3.1B(7) Liquidated Damages

Liquidated Damages and Direct Engineering, or other related charges, are to be addressed as described in the contract specifications, Section 1-08.9 of the *Standard Specifications,* and Chapter 1-2.5G of this manual. Direct Engineering charges are a form of Liquidated Damages and must be listed on the monthly progress estimates on the line for Liquidated Damages. Traffic related damages as described in Chapter 1-2.5G(2) of this manual are to be listed under Miscellaneous Deductions. The Project Engineer must evaluate potential Liquidated Damages that have accrued as a result of the expiration of contract time before the damages are withheld from moneys due the Contractor. The work and circumstances that have occurred over the course of the project should be reviewed to determine if there is potential entitlement for granting additional contract time. Liquidated Damages that have accrued should be adjusted for this evaluation. Liquidated Damages deemed chargeable should then be withheld from moneys due the Contractor each monthly progress estimate as Liquidated Damages accrue. While the Project Engineer takes the action to withhold damages as the work progresses, only the State Construction Office may actually assess those damages.

1-3.1B(8) Credits

Dollar amounts may be deducted as a "Below the Line Miscellaneous Deduction" from progress or final estimates when WSDOT is due a credit from the Contractor. Routine credits from the Contractor to WSDOT include, but are not limited to, the following items:

- Engineering labor costs when due to Contractor error or negligence, additional engineering time is required to correct a problem. This includes the costs of any necessary replacement of stakes and marks which are carelessly or willfully destroyed or damaged by the Contractor's operation.
- Lost and/or damaged construction signs furnished to the Contractor by WSDOT. The Contractor should be given the opportunity to return the signs or replace them in kind prior to making the deductions.
- Assessment to WSDOT from a third party that is the result of the Contractor's operations causing damage to a third party, for example, damage to a city fire plug. Actual costs will be deducted from the estimate.
- Other work by WSDOT forces or WSDOT materials when the Contractor cannot or will not repair damages that are the responsibility of the Contractor under the contract.
- Liquidated damages not associated with contract time, i.e., ramp closures, lane closures (see Chapter 1-2.5G).
- As provided for in the specifications, specific costs or credits owed WSDOT for unsuccessful contractor challenged samples and testing.

The authority to withhold and assess routine "Below the Line Miscellaneous Deduction" on progress and final estimates has been delegated to the Regional Construction Manager, and may be further subdelegated to the Project Engineer. The Project Engineer must give written documentation to the Contractor describing the deduction and provide sufficient notice of the impending assessment.

Credit items which are specifically provided for by the *Standard Specifications* or contract provisions, such as non-specification density, non-specification materials, etc. may be taken through the contract items established for those purposes. A change order is required for credit items which are not specifically provided for by the contract provisions.

Occasionally a Contractor will send a check directly to a Project Office for payment of money due WSDOT. (The Project Office should not request payment.) Whenever a Project Office or WSDOT employee receives a check or cash directly from a Contractor, it is very important that the guidance found in the *Accounting Manual* (M 13-82), Chapter 2-1, Control of Cash Receipts, be followed.

1-3.1B(9) Railroad Flagging

All dollar amounts actually incurred by the Railroad Company for railroad flagging, under the terms of the typical railroad agreement, will be paid by WSDOT. The Contractor will incur no costs for railroad flagging unless the flagging is for the Contractor's benefit and convenience. In this case, the Project Engineer will deduct this cost on monthly progress estimates as a below the line item in the Contract Administration and Payment System.

1-3.1B(10) Payment for Third Party Damages

Section 1-2.4I of this manual details when WSDOT assumes responsibility and pays for third party damages. The *Risk Management Manual, M 72 01*, provides detailed guidance on procedures, including lines of communication. Payment should be made under the item "Reimbursement for Third Party Damages". This item is only intended to be used for costs that are the responsibility of the contracting agency. If this item was not included in the contract, it may be added by change order using a separate group for each Control Section in which an incident occurs. On some items such as "Repair Impact Attenuator" there has been a conscious decision by the contracting agency during design to assume a risk which is otherwise the contractor's. It would not be appropriate to assume this risk for other items of work by adding a similar pay item through a change order.

The next step is for the Project Engineer to determine if an incident warrants an attempt to recover costs based on cost effectiveness. If so, a memo is necessary to provide notice and information to the risk management office. Basically, they need the information necessary to investigate the incident, find the responsible party, determine the amount of the damages and obtain reimbursement for the State. The risk management office needs the following information:

- Contract Number, Project Description
- Names of Witnesses
- Documentation Related to the Damage
  - Change Order Number
  - Field Notes
  - Police Reports
  - Work Order Coding
- Summary of Repair Costs

1-3.1B(11) Withholding of Payments

Withholding payments for work the Contractor has performed and completed in accordance with the contract should not be done casually. There must be clear contract language supporting the action. The authority to withhold progress payments is subdelegated to the Regions. Further delegation to the Project Engineers is at the discretion of each Region.

There are very few occasions when it would be appropriate to withhold the total amount of a payment for completed work. If a minor amount of cleanup remains, if a portion of the associated paperwork has not been submitted, or if minor corrective measures are needed, then the correct action is to pay for the work and defer an amount commensurate with the needed remaining effort.

The concept of "allowing the Contractor to proceed at his own risk" and then withholding payment is not often supported by the contract. There is a contractual obligation to finish the work correctly, there would certainly be a "moral obligation" on the part of the Contractor to live up to the bargain, but there is no contract language that allows such an action. Specific exceptions to this rule are listed below.

Once a decision to withhold any part of the monthly payment has been reached, then it is imperative that the Contractor receive fair notice of this action. The method of this notice can be negotiated with the Contractor and could be a listing at the time of estimate cutoff, a copy of the pre-estimate report or other mechanism. Once notice has been provided, then it is also necessary to allow a reasonable time for corrections to be made.

No Payment for the Work

Standard Specification 1-06.3, "Manufacturer's Certificate of Compliance" is unique in that this is a situation, specified as part of the contract, where the contractor may request permission to assume the risk for no certificate and end up never being paid for the related work.

Progress Payment Deferral

In the following situations, the contract specifies that the contracting agency has the authority to defer the entire progress payment:

- The contracting agency may not make any payments for work performed by a Prime/Subcontractor until the contractor performing the work has submitted a Statement of Intent to Pay Prevailing Wages approved by Labor and Industries (RCW 39.12.040)
- Failure to submit the "*required reports"* by their due dates (*Standard Specification* 1-07.11(10)B)

Wage Administration in General

The administration of wages and payment for the work are separate issues. Holding a force account payment for certified payrolls is not appropriate. Withholding payments on the contract is suggested as a method to achieve compliance under the *Standard Specifications* pertaining to wages (1-07.9(1)). This remedy should not be used without approval of the Headquarters Construction Office. Routine enforcement of wage requirements should be done on their own merits utilizing the sanctions specified as follows:

State Wage Administration

Labor and Industries is the enforcement agency for state prevailing wage administration. The State (WSDOT) is protected under the contract from wage claims by reserving 5 percent of the moneys earned as retained percentage. This 5 percent is made available for unpaid or underpaid wages liens among other claims. Contract payments should not be deferred due to a contractor's failure to pay the State minimum prevailing wage.

Federal Wage Administration

FHWA 1273 specifies that the State Highway Administration (SHA) is in the enforcement role for federal prevailing wage administration. Under Section IV "*Payment of Predetermined Minimum Wage*" subsection 6., "*Withholding,*" the State Highway Administration (contracting agency) is authorized to withhold an amount deemed necessary to make up any shortfalls in meeting Davis Bacon prevailing wage requirements. It goes on to authorize the deferral of all payments, under certain conditions, until such violations have ceased. This is only for federal wage requirements and the amount "deemed necessary" must be based on the amount of the underpayment.

Application of the *Standard Specifications*

Under 1-05.1 Authority of the Engineer reads in part as follows: "If the Contractor fails to respond promptly to the requirements of the contract or orders from the Engineer:…. 2. The Contracting Agency will not be obligated to pay the Contractor, and …….."

Under Section 1-09.9 Payments reads in part as follows: "Failure to perform any of the obligations under the contract by the Contractor may be decreed by the Contracting Agency to be adequate reason for withholding any payments until compliance is achieved".

Sounds good and we can do so, but withholding of payments owed the contractor must not be done on an arbitrary basis. Other than the previously noted exceptions, money is normally withheld because work/work methods are not in accordance with contract specifications. Also, the amount withheld must have a logical basis. We cannot penalize the contractor by withholding more than the out of compliance work is worth.

Withholding payments should not be used routinely as a tool for forcing compliance on general contract administration requirements. The State is protected against nonperformance by requiring a performance bond. In the event that lack of contract compliance puts the State at substantial risk monetarily or safety wise, it may be appropriate to inform the contractor of the compliance problem and suspend work under *Standard Specification* 1-05.1 "*Authority of the Engineer*" until corrections are made.

When withholding money, remember that delaying the contractor's cash flow may damage the contractor's ability to perform work. Before doing so, the State should be able to demonstrate:

- specifically what was not in accordance with the contract and where the requirement is specified in the documents
- that the amount withheld is commensurate with the amount of the unauthorized, uncompleted or defective work
- that the contractor was notified in a timely manner (within 8 days per prompt pay laws) and given a chance to make corrections
- that the State has worked with the contractor to mitigate corrections to non-specification work in order to minimize the cost

The State is required to pay the contractor in a prompt manner within 30 days after receipt of the work or after recognition of entitlement to additional compensation. The Project Engineer must keep an eye on the calendar when scheduling monthly estimate payments.

Regions are not authorized to withhold amounts that are greater than the estimated cost of the missing or incorrect portion of the work. Any such excess withholding must be approved by the Headquarters Construction Office.

1-3.1C Final Estimates — Regions

The final estimate for a project is processed in the same manner as a routine monthly progress estimate. The *Work Done to Date* entry on a final estimate is the physical completion date. When the Region final estimate is completed and is run in CAPS at the Region, it will not generate a warrant for the Contractor. Instead, the Region final estimate will produce several reports: a final Comparison of Quantities; the Contract Estimate Payment Advice; the Contract Estimate Payment Total; and the Sales Tax Summary.

These reports should be carefully checked to verify the accuracy of items, quantities posted, and the costs that have accumulated through various progress estimates during the life of the contract. Where necessary, corrections can be made to the ledger and the Region final estimate rerun as many times as it takes to make it correct before proceeding with the final estimate process.

If the final estimate shows an overpayment has been made to the Contractor, the estimate should still be processed in the same manner as a normal final estimate. If this occurs, the Contract Estimate Payment Totals report will show a minus amount due the Contractor. When the State Accounting Services Office receives the accepted final estimate package, that office will request any reimbursement due from the Contractor. The Project Engineer should not request reimbursement from the Contractor.

Once the Project Engineer has validated the final estimate amounts, a copy of the Comparison of Quantities Report, the Contract Estimate Payment Advice Report, and the Contract Estimate Payment Totals Report should be forwarded to the Contractor along with the Final Contract Voucher Certification. The Project Engineer might remind the Contractor that the person signing the Final Contact Voucher Certification must be authorized to do so. Authorized signatures are submitted by the contractor at the beginning of each contract.

Once the project has been physically completed, the final estimate package described above should be submitted to the Contractor for signature as soon as is reasonably possible. The final estimate package and request for the Contractor's signature should be transmitted to the Contractor formally. The effort to prepare the final estimate package will vary in nature and magnitude, depending on the project. In some cases, this work will conflict with field work on other projects. It is expected that final estimate preparation will be scheduled and accomplished as soon as possible, but not later than six months after physical completion.

Once the signatures and all necessary documents have been obtained, the final estimate package should be assembled by the Region and submitted to the State Construction Office. If any needed recommendations for assessment of liquidated damages associated with contract time have not already been submitted, this submittal should include them. The State Construction Office must resolve all issues of liquidated damages before the final estimate can be accepted and submitted to the State Accounting Services Office.

1-3.1D Final Estimates — Headquarters

The final estimate package submitted to the State Construction Office consists of the following:

- Project Status Report — the Project Status Report should address contract time and recommendations for liquidated damages related to contract time, amount of railroad flagging used if any, Miscellaneous Deductions identified, etc. In addition, the report should indicate whether or not all Affidavits of Wages Paid have been received for the Contractor, and all subcontractors, agents or lower-tier subcontractors.
- Final Contract Voucher Certification — Form 134-146, original only.
- If an assessment of liquidated damages has been made previously, include a copy of the letter from the State Construction Engineer to the Contractor assessing these.
- If an assessment of miscellaneous damages or liquidated damages resulting from causes other than time, include copies of letters from the Region to the Contractor for assessment of these.
- Contract Estimate Payment Totals — RAKC300F-EA.

The final estimate package is reviewed by the State Construction Office and submitted to the State Construction Engineer for acceptance of the contract. The date on which the State Construction Engineer signs the Final Contract Voucher Certification becomes the final acceptance date for the contract itself. The final estimate package is then submitted to the State Accounting Services Office.

1-3.1D(1) Final Estimate Claim Reservations

Should the Contractor indicate a claim reservation on the Final Contract Voucher Certification, it must be accompanied by all of the requirements of Section 1-09.11(2) of the *Standard Specifications* (provided these have not been met in a previous claim submittal). The Project Engineer must assure that the requirements have been met prior to submitting the final estimate package to the State Construction Office. If the claim package is incomplete, return the voucher to the Contractor with notice of the missing parts.

1-3.1D(2) Unilateral Acceptance of Final Estimates

The Project Engineer cannot establish a completion date for the contract if the Contractor is unwilling or unable to submit one or more of the required documents noted in Section 1-08.5 of *Standard Specifications*. However, the Region can request that the State Construction Engineer accept the contract by signing the Final Contract Voucher Certification (FCVC) in spite of the missing documents.

If the Contractor has not signed the FCVC, the Region can request that the State Construction Engineer accept the contract without the Contractor's signature. The Region is responsible for notifying the Contractor before such a request is made. The State Construction Office will generate the certified letter notice mentioned in the *Standard Specifications*, Section 1-09.9. The date of the State Construction Engineer's signature of the FCVC becomes both the acceptance date and the completion date of the contract, both established unilaterally.

1-3.1E Supplemental Final Estimates

A Supplemental Final Estimate is a payment adjustment made to a contract after the Final Estimate has been processed and the project has been accepted by the State Construction Engineer. A Supplemental Final Estimate may be necessary to correct an inadvertent under payment or where a claim settlement may require additional payment be made to the Contractor. In order to complete a Supplemental Final Estimate, the Project Engineer should complete and assemble the following items, routing them through the Region to the State Construction Office for review and further processing:

1. Complete any corrections or additional postings necessary in CAPS, including any postings to change order items added to CAPS for the settlement of a claim. (Please note, where additional CAPS postings are necessary after the Physical Completion date has been established, the *"Work Done To"* date in CAPS must be entered as the Physical Completion date or prior.)

2. Complete a Pre-Estimate report including the Project Engineer's recommendation for payment.

3. Assemble the backup information supporting the necessity and substantiating the cost of the changes to be made.

4. Complete a supplemental Final Contract Voucher Certification (WSDOT Form 134-146 EF) reflecting the changes made and showing the new total *"Final Amount"*.

After review, the Pre-Estimate report will be signed by the State Construction Engineer authorizing payment to proceed.

While postings and corrections to CAPS may continue, once the Completion date has been established for a contract, CAPS will no longer allow the Project Engineer or the Region to process further payments to the Contractor. As a result, payment of the Supplemental Final Estimate will need to be completed for the Project Engineer by the WSDOT HQ Accountability and Financial Services Office.

If this process requires a more timely response, the above documentation may be scanned and e-mailed to the State Construction Office and CAPS; and the contract payments section can be requested to print out the pre-estimate report to be taken to the State Construction Engineer for signature prior to processing the supplemental final estimate. Once the supplemental payment is completed, the signed and executed Pre-Estimate report will be returned to the Project Engineer where it can be maintained as a part of the project payment files and made a part of the Region Temporary Final Records.

While a new Final Contract Voucher Certification is completed as a part of the Supplemental Final Estimate, the Acceptance date will remain the same as established by the State Construction Engineer's signature on the original Final Contract Voucher Certification.

The above process may not be used when there has been an inadvertent over payment to the Contractor, the Final Estimate has been processed, and the project has been accepted by the State Construction Engineer. In this case, the Project Engineer must work with the Region, the contract payments section of the WSDOT Accountability and Financial Services Office, and the State Construction Office to make the correction. All dates in the system will be deleted, the correction made, and the Final Estimate process will begin again with the Region Final Estimate (see Chapter 1-3.1C of this manual).

1-3.1F Retained Percentage

Retained percentage withholding is based upon RCW 60.28, which provides that:

- A sum not to exceed 5 percent of the money earned by the Contractor on estimates be retained by the Contracting Agency.
- The Contractor may submit a bond for all or any portion of the amount of funds retained by WSDOT.

  When a contract is awarded, the Division of Accountability and Financial Services (AFS) / Contract Administration and Payments System (CAPS) unit or the Region Plans Office sends a package of contract documents to the Contractor.

  This package of contract documents also includes the necessary instructions for the Contractor to make application for a bond to replace all or any portion of the retainage. The bond form will be processed by AFS/CAPS without involvement from Project Engineer's Office, although the payment system will not allow them to process a payment until some form of retainage is in place.

  The Contractor, at any time during the life of the contract, may make a request to the Project Engineer for the release of all or any portion of the amount of funds retained. This request does not need consent of surety since the retainage bond form, for this purpose, requires their consent. The Region must forward this request by transmittal letter to AFS/CAPS, which will furnish the appropriate bond form to the Contractor for execution. The Contractor may return the executed bond form directly to AFS/CAPS for final approval and signature by WSDOT.
- For projects that include landscaping work the Contractor may request that, 30 days after completion of all contract work other than landscaping work, WSDOT release and pay in full the amount of funds retained during the life of the contract for all work except landscaping. In order to initiate this release of funds, Form 421-009 EF should be completed by the Contractor and submitted to the Project Engineer. In signing the request, the Project Engineer will confirm that all work, except landscaping work, is in fact physically completed. For any landscaping work that may have been completed, the Project Engineer will designate the amount of landscaping moneys, if any, that have been earned to date by the contractor. In the space designated for remarks the Project Engineer will identify the landscaping or plant establishment work that remains to be completed and its approximate value. Except for landscaping work, the Project Engineer will determine if all Statements of Intent and Affidavit of Wages Paid have been received for the work that has been physically completed. WSDOT will continue to

withhold a 5 percent retainage of any moneys earned for landscaping work that may have been completed to date and will continue to retain 5 percent of the moneys that are to be earned for landscaping that is yet to be completed. A bond is not required

The completed request along with the Project Engineer's cover memo confirming receipt of Statement of Intent and Affidavit of Wages Paid for the Contractor, subcontractor, and any lower-tier subcontractors who were involved in the completed work, is then forwarded to the State Construction Office, through the Region Construction Office, for approval. Once approved, the Construction office will submit the request to AFS/CAPS for further processing. If there are no claims against the retainage still in place and releases have been received from Revenue and Employment Security within the designated 60 day period, AFS/CAPS will release the appropriate portion of retainage to the Contractor.

1-3.2 Final Records for Projects Constructed by Contract

The Project Engineer is responsible for preparing all necessary records in order to document the work performed on the contract. Detailed instructions on the records required and methods of preparing them are covered in Chapter 10 of this manual.

1-3.3 Disputes and Claims

1-3.3A Claims By the Contractor

1-3.3A(1) Disagreement, Dispute, Protest

During the course of a contract, differences of opinion may arise over decisions and plan interpretations that benefit one party at the expense of the other. It is the policy of WSDOT to pursue resolution of these differences at the earliest possible time and to fully recognize all of the contractual rights of the Contractor during the resolution process.

Disagreements, disputes and protests are the responsibility of the Project Engineer until a formal claim is filed in accordance with Section 1-09.11(2). Contact the Headquarters Construction Office for concurrence before taking any issue to a Disputes Review Board. The Project Engineer may employ a variety of techniques and procedures to pursue resolution of these issues. With the high potential for cost impact, it is strongly recommended that all disagreements be identified and tracked.

When a protest occurs during a contract, the Contractor shall pursue resolution through the Project Engineer as outlined in Section 1-04.5 of the *Standard Specifications*. The Specification contains specific requirements which, if not followed, may result in a waiver of the Contractor's claim. The Project Engineer should monitor whether the Contractor is meeting these requirements. If all of the requirements have been met, the Project Engineer shall evaluate the merits of the protest and take whatever appropriate action is needed to resolve the issue. If it appears that the Contractor has failed to meet any of the requirements set forth in 1-04.5, the Project Engineer should advise the State Construction Office and request guidance. Pending such guidance, the Project Engineer may continue to discuss the protest with the Contractor with the qualification that no final evaluation of the protest will be made until permission is received from the State Construction Office.

1-3.3A(2) Claims

If the Contractor has pursued and exhausted all the means provided in Section 1-04.5 to resolve a dispute, the Contractor may file a formal claim. A formal claim, filed in accordance with Section 1-09.11(2), is a much more structured device and demands a high level of conformance with the contract requirements. The objective is to utilize the rights that WSDOT has under the contract to identify the issues, obtain a sufficient level of information from the Contractor and limit the discussion to a defined subject matter. To accomplish this, and to maintain the Department's rights in a situation that may lead to court action and expensive lawsuits, the Project Engineer must insist on rigid conformance with the requirements of the provision. In fact, the first evaluation must not be of the claim's merit, but rather of the claim's structure and content. If the package fails the specification requirements in any way, it should be returned to the Contractor immediately with a written explanation. Conversely, if the package meets the contract requirements, then the Project Engineer must comply with the demands for WSDOT actions that are included in the same specification.

The existence of a formal claim does not diminish the responsibility of the Project Engineer to pursue resolution. The only difference is that Headquarters final approval of a proposed settlement is required. The change order settling a formal claim must include waiver language similar to the following:

> "The Contractor, (company name), by the signing of this change order agrees and certifies that:
>
> Upon payment of this change order in the amount of $_____, any and all claims set forth in the letter(s) to the Department of Transportation, dated _____ and signed by _____ of (company name) in the approximate amount of $_____, have been satisfied in full and the State of Washington is released and discharged from any such claims or extra compensation".

If the settlement is intended to close out all dispute discussions for the contract, use language similar to:

> "The Contractor, (company name), by the signing of this change order agrees and certifies that:
>
> Upon payment of this change order in the amount of $_____, any and all claims in any manner arising out of, or pertaining to, Contract No. _____, (including but not limited to those certain claims set forth in the letter(s) to the Department of
>
> Transportation, dated _____and signed by _____ of (company name) in the approximate amount of $_____, have been satisfied in full and the State of Washington is released and discharged from any such claims or extra compensation in any manner arising out of Contract No. _____".

1-3.3A(3) Legal Filing

Once the Contractor has submitted a formal claim in acceptable form and the State has either denied the claim or failed to respond in the time allowed, the Contractor is free to seek judicial action by filing a lawsuit or, in some cases, demanding binding arbitration. Note that the Contractor must fully comply with the provisions of Section 1-09.11 before it can seek judicial relief. Once any legal action has been started, the Project Engineer may only continue with settlement efforts if the Attorney General's office has given specific permission to do so. Such permission may be sought through the State Construction Office. Settlements of claims which have resulted in a judicial filing need review and approval by the Attorney General's office and different waiver language similar to the following:

> "The Contractor, (company name), by the signing of this change order agrees and certifies that:
>
> Upon payment of this change order in the amount of $_____, any and all claims in any manner arising out of, or pertaining to, Contract No. _____, (including but not limited to those certain claims set forth in the complaint filed under Thurston County Cause No._____ (Contractor's name) vs. State of Washington), have been satisfied in full and the State of Washington is released and discharged from any such claims or extra compensation in any manner arising out of Contract No. _____ ".

1-3.3A(4) Final Contract Voucher Certification

In some cases, of course, the Contractor will not have been so cooperative as to participate in resolution efforts. After a protest has been disallowed, there may have been no formal claim filed and the Project Engineer really doesn't know if there is a continuing problem. The way to resolve this after the project is physically complete is to assemble the final estimate and send it to the Contractor with a Final Contract Voucher Certification (FCVC). The FCVC is the Contractor's last chance to formally file a claim. If there is no exception above the Contractor's signature on the FCVC, there is no claim. The contract will be over as soon as the State Construction Engineer accepts it. If the Contractor does not return the FCVC in a reasonable time, WSDOT may unilaterally set the completion date and process the final estimate without the Contractor's signature. Proposals to unilaterally accept a contract should be discussed with Region managers before any action is initiated.

1-3.3B Claims Against the Contractor — Damage

The Department has a claims office, now known as the Washington State Department of Transportation Risk Management Office (RMO). All receptionist job descriptions, all Region operations manuals, and all telephone training is set up to refer citizens with damage claims related to construction to the RMO and to provide the toll free number (1-800-737-0615). The RMO will react to the call, issuing claims forms, contacting the contractor, and following up on the actions taken.

The Project Engineer's role is to appropriately advise the RMO, if needed. There may be confusion about which contract is involved. Field office knowledge about the incident and the surrounding circumstances may be solicited. The contractor's insurance and the insurance provided by the Contractor for the State may be involved and information about the policy will, most likely, be requested.

If, in spite of the Department process, the claimant contacts the field office directly, the Project Engineer should refer the claimant to the State Risk Management Office (1-800-737-0615).

1-3.3C Claims Against the Contractor — Money

Claims received by the Region for money owed by the Contractor should be referred to the Contractor. A claimant should be advised of the legal right to file a lien against the retained percentage for claims involving labor, equipment, or materials used on the project and be referred to the State Accounting Services Office for obtaining the necessary lien forms.

1-3.3D Claims Against Officials and Employees

The statutes provide that claims may be filed against the State of Washington, State officers and employees, for damages resulting from their conduct and prescribes the manner in which the action must be taken. Whenever this occurs, the state will furnish the legal defense and pay any judgments if the act which caused the alleged damage was within the scope of the person's duties, was in good faith, and without negligence.

1-3.4 Stewardship

Webster defines "steward" as "one who acts as a supervisor or administrator, as of finances and property, for another or others." the designated steward of all federal highway funds is the United States Department of Transportation, acting through the Federal Highway Administration. In Washington State, FHWA is represented by its Washington Division. Washington Division has delegated a portion of its stewardship responsibility (and the corresponding authority) to the Washington State Department of Transportation through the Federal-Aid Highway Program Stewardship and Oversight Agreement, signed on February 19, 2008.

This section describes further agreement between FHWA and WSDOT concerning the details of the part of the stewardship agreement that applies to construction (Section V c. Construction and Contract Administration and VII Appendix B Construction Monitoring Plan). The subject matter of this sub-agreement is monitoring of construction performed on behalf of WSDOT by independent contractors.

Scope of Construction Monitoring Plan

This plan deals specifically with federally-financed construction performed under contracts with WSDOT and administered through the WSDOT State Construction Office. It is not intended to be all-encompassing. WSDOT Ferries Division contracts for construction of vessels and facilities are not included. Contracts for work through local agencies

are not included. Federally-financed utility agreements are not included. Emergency Relief work performed by contractors and administered by WSDOT Maintenance is not included.

Project Responsibility

FHWA, Washington Division, has delegated to WSDOT (and through the WSDOT delegation of authority to the State Construction Office) stewardship responsibility and authority for all federally-funded construction except new construction and re-construction on the Interstate system and certain specially-selected areas of high interest. The special selections are made by FHWA and include significant demonstration projects, special funding agreements and projects of very high national interest. Projects with full FHWA oversight are listed on the State Construction Office web site at: http://www.wsdot.wa.gov/biz/construction/Stewardship/Stewardship.xls.

The Construction Office has further delegated the stewardship reporting responsibility for projects with a contract value less than $6.0 Million to the various WSDOT Regions. The delegation of stewardship authority from Headquarters to the Regions is through the *Construction Manual*.

FHWA has also delegated to WSDOT the authority to accept projects on the Interstate system that are not new construction or re-construction. This authority has been further sub-delegated to the Regions for projects with a contract value less than $6.0 Million.

FHWA Review/Approval Actions & Related Processes

With the pre-approval of specifications and processes and the extensive delegation of stewardship authority, there are relatively few approval actions needed from FHWA during actual construction.

For new construction and re-construction on the Interstate system, FHWA has retained the oversight role of interim, or project, inspections, final inspections and acceptance, and the approval of certain high-value change orders.

The following processes will apply:

For project inspections, the WSDOT Project Engineer and the FHWA Area Engineer shall agree on the timing of such inspections. Typically, project inspections will take place quarterly, however, the Area Engineer may select other frequencies. The Project Engineer will advise the Area Engineer when agreed milestones or completion stages have been accomplished and the Area Engineer will schedule the review and prepare the report. (A similar process will be followed between the Project Engineer and the Headquarters Construction representative for delegated projects when the delegation has been retained at Headquarters. Regions will develop processes for those jobs delegated to them.)

For final inspections and acceptance, the review will be conducted in two parts. The first part will be a field review of the work and will be conducted at about the time of physical completion, when the contractor is still available to make corrections or changes identified during the review. The second part of the process will be the final acceptance review. This will be conducted after WSDOT has accepted the contract and has assembled all cost and materials documents. The second part of the review (acceptance) may be conducted with an exchange of documents and without a physical visit to the site. The Project Engineer will notify the Area Engineer when these times have arrived and the Area Engineer will schedule the reviews and will prepare one final report summarizing both reviews. (A similar process will be followed between the Project Engineer and the Headquarters Construction representative for delegated projects when the delegation has been retained at Headquarters. Regions will develop processes for those jobs delegated to them.)

Change orders on FHWA stewardship projects (for which FHWA has not delegated stewardship responsibility to WSDOT) may be approved by WSDOT unless they alter the termini, character or scope of work of the contract they have a net value of more than $200,000, or they change contract time by more than 30 days. Note: Changes that adjust quantities without changing the work may be approved by WSDOT regardless of value. FHWA approval will normally be a written formal response, but may be verbal if the public interest is served by the more timely action. In all cases, the FHWA approval of a change order shall be obtained through the State Construction Office.

The FHWA Area Engineer may also choose to accompany the WSDOT reviewer during the review of any federal-aid project. Such participation will be random and will be initiated by the Area Engineer. This participation by the FHWA will not change any delegation of oversight responsibility or authority in any way. When the Area Engineer has participated in a review, a copy of the summary report will be provided directly to the Area Engineer.

Stewardship Summary Reports

It is important to note the difference between a steward and a stewardship reviewer/reporter. Stewardship on WSDOT federal-aid projects is provided by a wide cross-section of employees who make stewardship decisions according to the requirements of the *Construction Manual* and their own delegated responsibilities and authorities. From the field inspector who observes contract work and prepares pay instructions, to the Project Engineer who reviews and approves a monthly progress payment, to the Region Construction Manager who executes a change order, to the State Construction Engineer who negotiates and approves a claim settlement, all are acting as stewards in their own job descriptions and assignments.

The stewardship reviewer/reporter, on the other hand, is acting as an overseer, observing and collecting information about all of the stewardship activities, evaluating that information, making recommendations concerning the qualification of the covered work for federal funding and preparing reports to summarize the activities. Reviewers may be FHWA Area Engineers, State Construction Engineers, Region Managers or subordinate Region specialists in documentation or contract administration. For the reports that it prepares, WSDOT may assign any person of the classification of Transportation Engineer 3 or above to this duty. The only restrictions are that the reviewer must not have been involved in the project-level administration and the report must be signed by someone with supervisory authority over the Project Engineer or management responsibility over the contract itself.

- Types of Reports

  Interim Reports (also known as Project Reports) are intermediate summaries of stewardship activities on an uncompleted project. These will be performed on multi-season jobs at least annually. Interim reports may be submitted at a greater frequency or for a special purpose at any time, at the discretion of the stewardship reviewer. Interim reports may be submitted on single-season projects for special purposes, again at the discretion of the reviewer.

  Abbreviated Final Inspection/Acceptance Reports are single page closeout reports for projects between $1.00 and $500,000 that summarizes the project in more of a checklist format with opportunity for comments. It will still be necessary for the Stewardship reviewer to evaluate the project documentation and procedures, but the reporting will not be to the same level of detail as a Final Inspection and Acceptance of Federal Aid Project for a project over $500,001. Final Inspection/Acceptance Reports are single close-out reports that summarize the results of reviews conducted in two parts at the completion of all projects. The first part is a review of the field work conducted at a time when the contractor is still available to perform additional work or corrective work. The second part is after acceptance, when the final cost figures are known and the materials certification is available. For FHWA-retained projects, the final inspection and acceptance will be conducted by the FHWA Area Engineer. For delegated projects with a greater value than $6.0 Million, the final inspection and acceptance will be conducted by a representative of the State Construction Office. For projects further delegated to a Region, the final inspection and acceptance will be conducted by a Region representative. The final acceptance portion of the final review may be done without a site visit, working from documents and computer data only.

- Timing of Reports

  At least once per year, Headquarters Construction will publish a list of all projects that have been started and not closed out for federal funding. The list will be divided to show the responsibility for stewardship reporting for each project. In the past a Final Inspection and Acceptance of federal-aid project report was required for each project financed in part or in whole with federal dollars. In an effort to expedite contract closure and move unused obligated funds back into the various highway programs sooner, stewardship reporting will take the following course:

  - For projects with values between $1 and $500,000: 25% of the projects will be selected from each project office from each Region and an abbreviated Final Inspection and Acceptance of Federal-Aid Project will be required.
  - For projects with values between $500,001 and $6,000,000: 50% of the projects will be selected from each project office from each Region and a Final Inspection and Acceptance for Federal-Aid Project (WSDOT Form No. 421-101 EF) will be required.
  - For projects with values greater than $6,000,000: 50% of the projects will require a Final Inspection and Acceptance of Federal-Aid Project form.

  Interim reports will be performed at times that are appropriate for the nature and progress of the work and the seasonality of the project. These times will be determined through the judgment of the reviewer. The objective for all reviewers will be to prepare and submit interim reports within 30 calendar days after the field review.

  For Abbreviated Final Inspection/Acceptance Reports, final inspection will be conducted around the time of physical completion, while the contractor is still mobilized and able to perform corrective or added tasks. Final acceptance review of the project will be conducted after the State Construction Engineer's final acceptance of the contract itself and after receipt of the Region's Materials Certification. The objective for all reviewers will be to prepare and submit the Abbreviated Inspection/Acceptance Report within 30 calendar days after project final acceptance. Final inspections for projects over $500,001 will be conducted around the time of physical completion, while the contractor is still mobilized and able to perform corrective or added tasks. The Project Engineer is in the best position to identify this time and shall advise the reviewer that a final inspection is needed. Final acceptance reviews will be conducted after the State Construction Engineer's final acceptance of the contract itself and after receipt of the Region's Materials Certification. The objective for all reviewers will be to prepare and submit the final inspection/acceptance report within 60 calendar days after project final acceptance.

  Copies of reports prepared by FHWA will be sent to the State Construction Office. Copies of reports prepared by any WSDOT reviewer will be collected by the State Construction Office and forwarded to FHWA.

- Content of Reports:

  Stewardship reports provide a high-level overview for those who may not know the project intimately, but may need to be aware of the more significant details of the contract. Communicating those details in a concise and comprehensive manner is a critical aspect of the report. Any individual reading the report should be able to have a reasonable idea of how the project proceeded.

  In addition to providing an objective view of the project, a stewardship report should clearly identify what is unique to that project and what circumstances made it unique. Most of our projects are routine and the stewardship reports will reflect that. However, when a project has conditions that are out of the ordinary, the stewardship report should explain what occurred on the project to make those conditions significant.

  The ability to write a practical report in a clear and concise manner is a mark of a good engineer.

  Job Description: A description of the major elements of the work. Include a narrative about the job. Include the contractor's name, the award date and the amount of the bid.

Time and Damages: On an interim report, discuss the present status of time and its relationship to the completion status. If behind, describe what is being done to catch up. Describe any suspensions or time extensions. On a final report, discuss the final time result. If overrun, discuss liquidated damages. Subjectively, comment on the amount of time set up. If working days are extended by 10% of the original contract amount, describe the cause(s) that warranted the increase.

Change Orders: Confirm that each change was approved according to the checklist before the work started. Evaluate the preparation of the change order and the justification. For all changes, include a statement of federal participation eligibility. Include more detailed discussions of major or significant changes (e.g. Scope Change, Claim Settlements, Significant Actions, and Changes over $100,000).

Cost: List the final payment, the original amount, the net effect of change orders and the mathematical calculation of net overruns/underruns. Obtain and include a general explanation of the overs and unders.

Materials: On an interim report, review a process in progress by checking for submittals and approvals of RAMs, any drawing or catalog submittals, the testing method and frequency, adjustments to the ROM, observe field tests and include a summary report. Comment on the overall status of materials testing, documentation and adequacy. On a final report, review the Region Materials Certification, comment on any missing items and mention the resolution of the certification for participation purposes. If material deficiencies warrant withholding of Federal participation, define the deficiencies and the amount of Federal participation being withheld. Refer to the following section, "Quality Improvement and Accountability," in the Stewardship and Oversight Agreement, for a discussion on selection of processes for review.

Disputes, Claims: On an interim report, note any claims or major disputes presently underway. Note how previous issues have been resolved. On a final report, note any exceptions to the final voucher certification and describe the issue.

Traffic Control: Comment on the adequacy of the traffic control plans. Discuss the project's use of flagging, devices, pilot cars, etc. and any unusual events during the project.

Training: On an interim report, determine that a plan has been submitted and approved. Also, note the comparison between accomplished training and the completion status. Report any efforts to recover if behind. On the final report, list the amount of training originally included, any changes made to this requirement and the total amount of training accomplished.

Subcontracting: Discuss the level and nature of subcontracted work. Note any DBE requirements and any change orders modifying these requirements by deleting, adding or substituting DBE commitments. Make reference to any Condition of Award requirements. Assure that mandatory DBE contracting did happen and that the DBEs performed a commercially useful function (review the On-Site reports). Review on-site reports for any DBE firm utilized, whether or not its utilization was mandatory.

Other: Talk to the Project Engineer. Look for special notes. If there was an experimental specification or process, discuss it. If there was an unusual event or happenstance, discuss that. Describe the overall impression of the contractual relationship. Describe any evidence of successful collaboration between the parties. Include any other information of interest.

Note: As a significant part of any review, the reviewer must visit the jobsite and confirm that a project of approximately the nature and magnitude of that shown on the plans actually does exist. This is true for all stewardship reporting.

Communication

Much of the day-to-day communication between WSDOT and FHWA is informal in nature. Verbal discussions, telephone consultations and e-mail notices (including digital photos when needed for clarity) are used extensively. Except where formal written notices are specifically required, staff from both agencies will attempt to utilize the simplest form of communication that accomplishes the needed communication in the least time. All reports and correspondence related to a project shall bear both the WSDOT contract number and the FHWA project number as identifiers.

1-4 Utility and Railroad Relocation

1-4.1 Work Performed Under Utility Agreements

Utility agreement work associated with a contract exists in two categories. The first is work done for a utility by WSDOT that is included in the contract and performed by the WSDOT contractor. The second is work done, either by the utility or the utility's contractor, that is associated with and done near the WSDOT project.

If the utility work is included in the contract, the plans will show the work and will include pay items exactly as if the work was part of the transportation improvement. The responsibility of the Project Engineer is to treat this work the same way that "normal" work is handled. There will be a necessity for communication with the utility itself, inviting comments and joint reviews and inspection of the work. In many cases, the utility will provide materials or equipment to be incorporated into the work. The utility will also provide certification that provided material meets the requirements of the contract. If problems arise and changes are considered, there are additional paperwork demands. The Project Engineer should consult with the Utility and the Region Utility Engineer.

If the work is associated with the project, or if unrelated work is being done nearby, and the utility or its contractor is performing the work, the Project Engineer should treat the neighboring work in the same manner that adjacent WSDOT work would be treated. (See *Standard Specifications*, Section 1-05.14 and Section 1-2.2H of this manual.)

1-4.2 Work Performed Under Railroad Agreements

Railroad work associated with a contract exists in three categories. The first is work done for a railroad by WSDOT that is included in the contract and performed by the WSDOT contractor. The second is work done, either by the railroad or the railroad's contractor, that is associated with and done near the WSDOT project. The third category is railroad protective services. Protective services, such as flagging, are typically provided by the railroad.

If the railroad work is included in the contract, the plans will show the work and will include pay items exactly as if the work was part of the transportation improvement. The responsibility of the Project Engineer is to treat this work the same way that "normal" work is handled. There will be a necessity for communication with the railroad itself, inviting comments and joint reviews and inspection of the work. In many cases, the railroad will provide materials or equipment to be incorporated into the work. The railroad will also provide certification that provided material meets the requirements of the contract. If problems arise and changes are considered, there are additional paperwork demands. The Project Engineer should consult with the Railroad Company and the Region Utility Engineer.

If the work is associated with the project, or if unrelated work is being done nearby, and the railroad or its contractor is performing the work, the Project Engineer should treat the neighboring work in the same manner that adjacent WSDOT work would be treated. (See *Standard Specifications*, Section 1-05.14 and Section 1-2.2H of this manual.)

Protective services may be called for when the Contractor is performing work on railroad facilities (first category above) or when the Contractor's work is conflicting or adjacent to a railroad facility that is not being changed. Typically, the railroad will determine the need for service, provide the protective services, and send the bill to WSDOT. There may be an agreement in place, or the railroad's actions may be unilateral. On all projects including railroad flagging, the Project Engineer will notify the Railroad Company when all work involving the railroad is physically complete.

The addition or revision of agreements with the railroad can be lengthy processes. The Project Engineer should stay alert for possible changes and the need for revisions to the agreement. When these arise, the Railroad Company and the Region Utility Engineer should be contacted early and often.

1-5 Surveying

1-5.1 Site Surveying

1-5.1A Permanent Monuments

Most permanent monuments which are in the construction zone are relocated by the establishing agency. Normally these monuments are relocated prior to beginning of construction, but if monuments are found within the construction zone, they must be preserved until they can be moved. If the urgency of construction does not allow time for the relocation of the monument, it must be properly referenced so it may be reset or relocated at a later time. When a monument is found within the construction area, the proper agency shall be notified promptly and requested to relocate the monument.

1-5.1B Property Corner Monuments and Markers

It is imperative that land plats and property corners be preserved. The 1973 Legislature enacted a Survey Recording Act, RCW 58.09, to provide a method for preserving evidence of land surveys by establishing standards and procedures for monuments and for recording surveys as a public record. When a general land office corner, plat survey corner, or property line corner exists in the construction zone, it is necessary to properly reference it and reset it after the construction work has been done. RCW 58.09.040 requires that, for all monuments that are set or reset, a record of the monument be filed on a Monumentation Map with the County Engineer in the county in which the corner exists and the original sent to the State Right of Way Plans Branch. Headquarters will forward a copy to DNR for their records.

1-5.1C Alignment Monumentation

During construction, alignment monumentation may be altered to fit field conditions. Such changes may include:

- Normally all PCs and PTs are to be monumented. Additional point on tangent (POT) monuments are necessary where line of sight is, or may in the future be obstructed by the horizontal or vertical alignment, buildings, or other barriers.
- When the right of way and the construction alignment do not coincide, the monumentation shall be such that the exact right of way as acquired can be positioned in the field. This will generally require, as a minimum, that the right of way alignment be monumented.
- When safety of the survey crew or survival of the monuments is an issue, monuments may be offset from the true alignment. An extra effort in accuracy must be made when setting offset monuments to ensure an accurate reestablishment of the true alignment. The monumentation, including monument locations, reference distances, stations, and bearings, is to be shown on the as built plans.

1-5.2 Construction Surveying

1-5.2A Surveying Provided by the State

Unless the contract states otherwise, the Project Engineer is responsible for providing all surveying needed to locate and define the contract work. The staking done in construction surveying must assure that the work will conform to the plans and must also conform to the Contractor's approach to the work. There are numerous survey techniques that will accomplish these objectives. Prior to each phase of the work, the Project Engineer must reach agreement with the Contractor concerning the method, location, and timing of construction staking. Once this agreement is reached, it must be shared with all WSDOT, Contractor, and subcontractor personnel who place or use construction stakes.

1-5.2B Contractor Surveying

If the contract requires the Contractor to provide some or all of the construction surveying, the Project Engineer is required to provide only the primary control points staked, marked, and verified in the field and the coordinate information for the main alignment points in the plans. The plan alignment and the field control points must be referenced to the same grid coordinate system.

The provisions for contractor surveying are intended to provide the stakes needed to inspect the work, as well as the primary function of locating and defining the work. If the survey stakes required by the contract do not provide the reference data needed for inspection, then the Project Engineer will have to provide additional survey work that is needed. As an alternative, a change could be negotiated with the Contractor to perform the added work.

The Contractor's survey work is a contract item, just like all other contract items. It must be inspected for adequacy and conformance with the contract. Once it is performed and inspected, it must be paid for.

The wise Project Engineer will inspect the survey efforts and check as much of the contractor's work as is practical. Any errors should be brought to the Contractor's attention for corrective action. The inclusion of contractor surveying in a project transfers the risk of survey errors to the Contractor. The Project Engineer must assure that the survey work of the Contracting Agency does not relieve the Contractor of that risk.

1-5.2C Grade Control

1-5.2C(1) Subgrade Tolerance

The finish required on roadway subgrades shall ensure a final grade in as close conformity to the planned grade and cross-section as is practicable, consistent with the type of material being placed. Subgrade blue tops shall be set 0.05 foot below subgrade elevation and be accurate to + or – 0.01 foot. The finished subgrade surface shall not deviate from the plan subgrade elevation by more than +0.00 to -0.05 foot. Where excessively rocky materials are being placed, deviations in excess of the above may be accepted where, in the opinion of the Engineer, closer conformance cannot be achieved by normal procedures and with a reasonable amount of effort and care on the part of the Contractor. Conformance to grade shall be checked by rod and level, straight-edging, or other appropriate engineering method as selected by the Engineer.

1-5.2C(2) Surfacing Tolerance

Red and Yellow tops for surfacing materials shall be set accurate to + or -0.01 foot. The finish of the compacted materials shall conform to the grade established by the blue tops as closely as is practicable and in general, should not deviate from the established grade in excess of the following: ballast and base course, + or – 0.05 foot; top course for bituminous surface treatment, + or – 0.03 foot; top course for asphalt concrete, + or – 0.02 foot; surfacing under treated base course, + or – 0.03 foot; treated base under Portland cement concrete pavement, + 0.00 to – 0/02 foot.

Conformance should be checked by use of rod and levels from blue tops and/or by string-line or straight edge methods as determined appropriate by the Engineer. The above schedule refers to conformance both longitudinally and transversely to the traveled way. The outer shoulder line finished grades shall not exceed double the deviations outlined for the traveled way.

In the event that additional blue tops are not set for setting grade of surfacing courses, the grade of the surfacing shall be referenced to the earthwork subgrade blue tops and adequate controls shall be used to ensure the placement of the required thickness of surfacing and a final surface meeting the requirements outlined above.

1-6 Inspection of Course Thicknesses

Tabulated below are the permissible deviations in measured thickness for specified depths of surfacing and paving. While these are the maximum deviations that can be allowed, the Project Engineer may impose tighter requirements for conforming to the plan dimensions where there is a reason to do so.

Material	Specified Depth	Max. Allowable Deviation at Any One Point	Average Depth Deviation for Entire Project
Untreated Surfacing	0 – 0.25′	-0.05′	-0.025′
and ATB	0.26 – 0.50′	-0.06′	-0.03′
	0.51 – 0.75′	-0.07′	-0.035′
	0.76 – 1.0′	-0.08′	-0.04′
	Over 1.0′	-8%	-4%
Hot Mix Asphalt (HMA)			
(single-lift)	0.08 – 0.15′	-0.045′	-0.015′
(multi-lift)	0.00 – 0.25′	-0.03′	-0.01′
	0.26 – 0.50′	-0.045′	-0.015′
	0.51 – 0.75′	-0.06′	-0.02′
	Over 0.75′	-0.075′	-0.025′

For HMA overlays with a specified depth of less than 0.08 foot, it will be the responsibility of the Project Engineer to ascertain the adequacy of the overlay depth in conformance to the plan.

2-3.5C Use of Photogrammetry Service

The photogrammetry service may be used to create a 3D Digital Terrain Model (DTM) files for use with the department's current design software in order to produce cross sections, contours, and quantity information. Photogrammetry can also provide Digital Ortho Photos as a by product instead of the DTM files. The Ortho Photo has the same accuracy characteristics as a map but without the elevation data. The type and size of the project and the amount of time that can be saved will be considerations in the selection of the method of obtaining the ground line cross-sections. The Project Engineer must also ascertain that the work schedule of the Photogrammetry Section will permit them to provide the DTM files and Digital Ortho Photos by the time they are required. If proper ground control was established on the project during the design stage, considerable savings in time may be realized by using this service.

It is recommended that the State Photogrammetry Office be contacted at the earliest possible date when it is determined that this service may be needed, since the process requires significant time and the weather and position of the sun (angle of the sun's rays) in Washington can affect Photogrammetric mapping schedules by weeks or even months.

The 3D DTM files and Ortho Photos are obtained from aerial photographs and will show the ground as it existed at the time the photographs were taken. This data is measured in the Stereo plotter and transferred to computer files. The State Photogrammetry Office will design each photo mission and mapping process to best fit the needs of the project as defined by the Project Engineer. The State Photogrammetry Office maintains an active archive of each new project's files and all DTM data produced since 1989. It is easily accessible via WSDOT LAN on a file server type computer. Contact the State Photogrammetry Office for specific information on past projects and archived data.

2-4 Haul

2-4.1 General Instructions

Haul is the transportation of excavated material. Measurement and payment for haul is made on material hauled.

The measurement of haul is expressed as a unit of one hundred cubic yards hauled 100 feet.

Haul quantities can be computed using the PC and associated programs on all earthwork projects and the limits of each segment of haul and the "Haul" units can be identified.

Haul shall be calculated and included in the section from which the material is hauled. Haul on roadway quantities, including borrow obtained by the widening of cuts and including waste deposited along roadway embankment slopes, will be computed on the basis of transporting material along the centerline or base line of the highway.

2-4.2 Vacant

2-4.3 Haul on Borrow or Waste

Quantities of material hauled from a borrow site to the roadway or from the roadway to a waste site are computed normal to the long axis of the borrow or waste site. When computing the amount of haul, determination of the direction of movement of the mass and the distance it is transported requires good, practical judgment by the Engineer. The size and shape of a borrow pit and egress from the pit to the highway improvement must be considered in the proper determination of the amount of haul. The same conditions are true in the case of waste sites. Instructions herein for computing haul from borrow pits shall be applicable to computing haul to waste sites.

The long axis of the borrow pit should be used for the base line of the cross-section which, theoretically, would pass through the centers of gravity of the sections; however, the base line may approximate the centers of gravity of the sections. Borrow pits which are provided by widening of the roadway cuts would be an exception to this since the *Standard Specifications* define them as "Roadway Excavation" and not "Borrow."

The measurement of the distance from the pit to the center line of the roadway should originate at the center of mass as measured in the pit and be computed via the most direct and feasible route to the nearest practical point on the center line of the roadway.

The route of haul will be indicated on the plans, and, where possible, will be via existing roads. If no road exists, provision will be made in the plans for constructing a haul road and for rights therefor.

If the Contractor chooses to haul over a route shorter than the computed or designated route, payment for haul will be based on the length of the actual haul route. If the Contractor chooses to haul over a longer route than the computed or designated route, payment for haul will be based on the length of the computed or designated route.

2-5 Slope Treatment

2-5.1 General Instructions

Earth cuts, soft or decomposed rock cuts, and overburden in all rock cuts shall have the tops of the slope rounded in accordance with *Standard Plan* H-8 to produce an aesthetic and pleasing appearance. The slope treatment shall be constructed at the time of excavation so the material resulting from the rounding of the slopes may be disposed of along with the excavation from the cut.

The Project Engineer should go over the slope treatment procedure with the Contractor at the beginning of the excavation operation to ascertain that proper rounding is being constructed and reduce extensive reworking.

2-5.2 Measurement and Payment

Slope treatment shall be measured and paid for in accordance with Section 2-03.3(5) of the *Standard Specifications.*

2-6 Subgrade Preparation

2-6.1 General Instructions

The subgrade shall be constructed in accordance with the lines, grades, and typical sections shown on the plans or as established by the Engineer and the *Standard Specifications*.

The entire subgrade should be uniformly compacted to the density specified. The subgrade shall meet the tolerance in Chapter 1-6 of this manual. On some separate grading projects where the surfacing Contractor will be required to or elects to trim the subgrade with an automatically controlled mechanical trimmer, the tolerances for the subgrade must be changed to provide material for the subgrade trimmer to trim, but the trimmed subgrade must meet the tolerance stated above.

After the subgrade is prepared, the Contractor shall maintain it in the required condition until the next course of work is performed.

2-6.2 Measurement and Payment

The quantities of work involved in constructing and maintaining the subgrade shall be measured and paid for in accordance with the provisions of Section 2-06.5 of the *Standard Specifications.*

2-7 Watering

2-7.1 General Instructions

Water shall be applied as ordered by the Engineer, in accordance with the specifications, uniformly to the material so that all of the material will have approximately the same moisture content. It is more economical and effective to apply water at night or in the early morning hours when loss from evaporation is lower. In many instances, this is the only time that it is possible to increase the moisture content to that required.

The Inspector should be alert to see that the subgrade is not damaged from too much water being applied or that more water is being applied than is necessary. Usually light applications applied more frequently are more advantageous than heavy applications. The water should not be applied on surfacing materials with such force that it will wash the fine particles off the coarser ones causing segregation.

If water is a pay item, the Project Engineer shall verify the size of the water truck by measuring or weighing and if gauges are used, he should also verify the accuracy of the gauge. A record of measurements or weights, and calculations must be made for future references.

A Daily Delivery Record, Form 422-024, showing the time of each load and where it was placed should be maintained on the project. The Inspector will issue a ticket for the amount of water used.

2-7.2 Measurement and Payment

Water shall be measured and paid for in accordance with the provisions of Sections 2-07.4 and 2-07.5 of the *Standard Specifications*.

2-8 Vacant

2-9 Structure Excavation

2-9.1 General Instructions

Before starting structure excavation, stakes should be set to locate the structure and cross-sections should be taken to determine the quantities of material involved.

During the progress of excavation, the character of material being removed and exposed should be examined to determine if it is suitable for use as backfill and to ensure that acceptable foundation conditions exist. This should be done especially on streams subject to high velocity flood water and which carry drift. Open pit excavation or “glory holes” are not allowed without permission. This specification is of special importance in application to the construction of foundations in or adjacent to running streams, where the approval of the State Construction Office should be secured.

Material obtained from structure excavation may be used for backfilling over and around the structures, for building embankments, or it may be wasted. When this material is stockpiled for backfilling, the Contractor is required to protect it from contamination and the elements. If not properly protected, the Contractor must replace the lost material with acceptable backfill material at no expense to WSDOT. The backfilling of openings made for structures must be made with acceptable material from the excavation, other acceptable backfill materials indicated in the plans and special provisions, or as specified in Section 2-09.3(1)E of the *Standard Specifications*.

When specified in the Contract or approved by the Engineer, acceptable material may include Controlled Density Fill (CDF) – also known as Controlled Low-Strength Material (CLSM).

Before the CDF is placed, the Contractor is required to develop a mix design in accordance with Standard Specification Section 2-09.3(1)E and to submit the CDF mix design in writing to the Project Engineer on WSDOT Form 350-040. Section 2-09.3(1)E requires the Contractor to utilize ACI 229 and testing methods ASTM D 4832, ASTM D 6023 and WSDOT FOP for AASHTO T 119 in developing the CDF mix design. The ASTM and AASHTO tests required in Section 2-09.3(1)E are for use by the Contractor in developing the CDF mix design, and with the exception of providing the 28 day compressive strength test results on WSDOT Form 350-040, the test results are not required as part of the CDF mix design submittal. The Project Engineer must review the mix design before placement of the CDF will be allowed.

The Inspector should verify and document that each truckload of CDF is accompanied by the producer supplied Certificate of Compliance, meeting the requirements of Standard Specification Section 6-02.3(5)B. The Inspector

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5-1 Cement Concrete Pavement Rehabilitation

5-1.1 General Instructions

Rehabilitation of Portland Cement Concrete Pavement is undertaken in order to repair damage to the roadway, extend the life of the pavement, prevent further damage to the pavement, and to provide a smoother ride to the traveling public. The various types of rehabilitation each have specific methods and requirements for performing the work. The Project Engineer and the inspection team must be familiar with the specifications, contract requirements, and techniques to be employed to accomplish the work. In addition, all personnel must be familiar with and adhere to the traffic control plans.

Prior to beginning work, the Project Engineer must ensure that the project personnel are properly qualified in the test procedures to be employed and familiar with the testing requirements; and that the equipment is calibrated and available.

When saw cutting or diamond grinding is required, pay special attention to environmental requirements for the removal and disposal of concrete slurry.

In addition to the requirements of Section 5-05.3(3) of the *Standard Specifications*, equipment used in PCCP rehabilitation must meet the requirements of Section 5-01.3(1)B of the Standard Specifications.

5-1.2 Replacement of Portland Cement Concrete Panels

When a PCCP panel is damage too severely, the only repair possible is replacement of all or a portion of the panel. This is accomplished by saw cutting and removing the PCCP panel and placing new PCCP, dowel bars and tie bars.

The Inspector must ensure that panels to be removed are laid out according to the plan or as designated by the Engineer. All saw cuts must be full depth. In order to prevent damage to adjacent slabs that are to remain, a second full depth relief cut is required 12 to 18 inches inside the panel in both the transverse and longitudinal directions. If these full depth relief cuts are not made the energy imparted lifting out and or break up the panel may be transmitted to the adjacent panels that are to remain and cause damage.

Once the panel has been removed, the Inspector should inspect the subgrade material and the adjacent panels for any damage.. The subgrade should be compacted to grade prior to placement of new concrete. Crushed surface base course or hot mix asphalt may be needed to provide a level and firm surface. This is already included in the standard bid price of the work. If the material is not compactable remove it, place a geotextile and place crushed surfacing base course as detailed in *Standard Specifications* section 5-01.3(4). Should the material need to be removed, this work, as detailed in items 1 through 5 of the Standard Specification, is to be paid by force account.

If new concrete pavement is to be placed against existing concrete pavement, epoxy-coated dowel bars and tie bars shall be drilled and grouted into the existing concrete pavement. The Inspector should verify that placement and tolerances of dowel bars and tie bars are in accordance with Section 5-01.3(4) of the *Standard Specifications*.

Note: *Placement of bond breaking material such as polyethylene film, roofing paper or other material approved by the Engineer between the replacement panel and adjacent concrete and under the panel will reduce the likelihood that cracks will form in the replacement panels. The bond breaking material under the panel is only required when placed over a treated base (Cement Treated, Asphalt Treated, etc.). Bond breading material will not be required between crushed surfacing and a new panel.*

Materials

Portland Cement Concrete mixes used in concrete panel replacement have to meet the following additional requirements:

- The mix design must have been designed to have an average flexural strength of 650 psi at 14 days and,
- The concrete must have obtained a compressive strength of 2,500 psi before the panel can be opened to traffic.

The Inspector should ensure that the mix design has been approved prior to use. Acceptance of the mix is verified on the grade by testing the air content and taking 28-day compressive strength cylinders for testing. Acceptance testing for air content and compressive strength should be performed once per shift.

Ensure that dowel bars and tie bars are placed in accordance with the plan, and meet the requirements of Sections 9-07.5 and 9-07.6 of the *Standard Specifications*. The Inspector should collect Manufacturer's Certificate of Compliance documentation (and Certificates of Materials Origin on federally funded projects) for all dowel bars and tie bars prior to use on the project.

Equipment

The Inspector should verify that all equipment used is in good working order and can produce a panel to the correct grade and in compliance with the Contract specifications.

5.1-3 Partial Depth Spall Repair

This work consists of removing and replacing a relatively small portion of a concrete panel.

The Inspector must ensure that removal of existing pavement does not cause damage to any pavement that is to remain. Make sure that a saw cut to a minimum depth of 2-inches is made around the area to be removed. The pavement shall be removed to a depth of 2-inches or to sound concrete as determined by the Engineer.

Materials
The Contractor shall use concrete patching materials meeting the requirements of Section 9-20 of the *Standard Specifications*. The Inspector should inspect and document all prepackaged cementitious materials to ensure that they are properly labeled and that the Contractor mixes them to the correct proportions, as specified by the manufacturer.

Equipment
The Inspector should verify that all equipment used is in good working order, and meets the requirements of the contract. The Inspector should verify that jackhammers weigh no more than 30-pounds and chipping hammers weigh no more than 15-pounds.

5-1.4 Dowel Bar Retrofits

Dowel bar retrofitting is employed in insure the transfer of loads between adjacent roadway panels and is combined with pavement grinding to extent the service life of the pavement. This increases the stability of the roadway by restricting differential movement of the panels and reducing vertical movement. Dowel bar retrofits are accomplished by cutting slots in the pavement, placing dowel bars, and filling with concrete patching material.

The Inspector should verify that the slots are located per the plan and cut parallel to the centerline of the roadway and to each other, and that they are centered over the transverse joint. All exposed surfaces and cracks in the slot must be sand blasted to a clean concrete surface. All grout residue and debris must be removed form the slot, using either an air compressor or, if approved, a high pressure water blast.

The Inspector should ensure that dowel bars are as specified and are placed per plan. Foam core inserts shall be placed at the middle of the dowel, in line with the transverse joint, and must fit tightly to the sides and bottom of the slot.

Concrete patching material shall be placed in the slots in a manner that does not disturb the dowel bar and to a level slightly above the level of the surrounding roadway.

Within 10 working days of placement of the concrete patching material, diamond grinding of the roadway surface should be done in order to provide a smooth surface.

Materials
The Contractor shall use concrete patching materials meeting the requirements of Section 9-20 of the *Standard Specifications*. The Inspector should inspect and document all prepackaged cementitious materials to ensure that they are properly labeled and that the Contractor mixes them to the correct proportions, and follows any placement restrictions, listed on the packages.

Ensure that dowel bars and tie bars are placed in accordance with the plan, and meet the requirements of Sections 9-07.5 and 9-07.6 of the *Standard Specifications*. The Inspector should collect Manufacturer's Certificate of Compliance documentation (and Certificates of Materials Origin on federally funded projects) for all dowel bars and tie bars prior to use on the project.

Equipment
The Inspector should verify that all equipment used is in good working order, and meets the requirements of the contract. Ensure that air compressors are of sufficient size and capacity to perform the work.

5-1.5 Sealing Existing Random Cracks, Transverse Joints, and Longitudinal Joints

Sealing existing random cracks, transverse joints, and longitudinal joints in a PCCP panel helps restrict the infiltration of water into the subgrade beneath the panel.

Random cracks are sealed by routing, cleaning, and filling with an approved joint sealant material.

Transverse and longitudinal joints are sealed by removing all old sealant material with a diamond blade saw, cleaning the joint and sealing with an approved joint sealant material.

Prior to commencing sealing of random cracks, the Engineer must indicate which cracks are to be sealed. The Inspector must ensure that random cracks are routed to the proper width and depth prior to sealing, and that the top of the sealant material is placed ¼–inch below the surface of the roadway. If the material is not placed at least a ¼-inch below the surface, traffic passing over the joint will remove the sealant.

When sealing transverse and longitudinal joints, the Inspector must verify that the proper depth of the old sealant has been removed from the joint. Immediately prior to sealing, all joints shall be blown clean with dry oil-free compressed air. Sealant materials shall be placed in conformance with the manufacturer's recommendations and in accordance with Section 5-05.3(8)B of the *Standard Specifications*.

Materials
Joint sealant shall meet the requirements of Section 9-04.2 of the *Standard Specifications*.

Equipment
The Inspector should verify that all equipment used is in good working order, and meets the requirements of the contract. Ensure that air compressors are of sufficient size and capacity to perform the work.

5-1.6 PCCP Grinding

Diamond grinding of PCCP panels is employed to increase ride smoothness and to reduce bumps following dowel bar retrofitting and will increase the PCCP pavements life.

The Inspector should ensure that grinding begins within 10-working days of dowel bar placement and once begun is a continuous operation until completed. Pavement shall be ground in a longitudinal direction, with a minimum overlap of 2-inches, removing a minimum of ⅛-inch from 95-percent of the surface to be ground.

Equipment
The Inspector should verify that all equipment used is in good working order, and meet the requirements of the contract. Ensure that only diamond grinders of sufficient size and capacity are used to perform the work.

5-2 Bituminous Surface Treatment

5-2.1 General Instructions

Refer to Chapter 5-4.1 for a general discussion of responsibilities and attitude of the Inspector on bituminous paving work.

It is very important that the Inspector on construction of a Bituminous Surface Treatment be entirely familiar with the specifications and methods applicable to the work, as construction of these types of surfaces proceeds very rapidly. If the work is begun without proper preparation and planning, it is entirely possible that a major portion of the job will be completed before correction of any improper methods or procedures can be made. Project inspectors should thoroughly review Section 5-02 of the *Standard Specifications*, the contract plans and the contract special provisions well in advance of Bituminous Surface Treatment construction.

Careful review of Section 5-02.3(10) of the *Standard Specifications* concerning unfavorable weather and calendar cutoff dates should be made well in advance of any bituminous paving work. In no case should bituminous surface treatments be placed before May 1 or after August 31 of any year except upon written order of the Project Engineer.

To correct the volume of the material to 60° F, the Inspector may use 240 gallon per ton @ 60 F for all grades of emulsified asphalts.

When payment for asphaltic materials is by the ton, they should be measured by weighing. When it is impractical to weigh the materials, the quantity of asphaltic material used may be measured by the gallon and the number of gallons converted to tons with the appropriate temperature volume correction.

5-2.2 Duties Before Construction

See Chapter 5-4 for preliminary duties of the Inspector.

Traffic Control
Refer to Chapters 1-2.3 and 5-4 of this manual for instructions concerning preliminary arrangements to be made for control of traffic.

Inspection Tools and Equipment
Before construction begins, the Inspector shall secure from the Project Engineer all equipment necessary to carry out the inspection duties. This equipment shall include air and asphalt thermometers, a device to measure surface temperature, wind gage, sieves and scale, tapes and rules, canvas sample sacks, containers for sampling asphalt, notebooks, ticket books and diary book.

Inspection of Contractor's Equipment
Prior to construction of the bituminous surface, the Inspector shall make an inspection of the Contractor's equipment. The Inspector shall check to see that all required equipment is available, in good condition, and is properly adjusted.

A careful check of the asphalt distributor shall be made to ensure that it meets the requirements of the specifications. The Inspector shall verify the capacity of the distributor, and ensure that the volume gauge is calibrated to correctly indicate quantities in the tank.

Special attention should be given to the condition and adjustment of the asphalt pump, spray bar and spray nozzles. The nozzles should be set uniformly at the proper angle from the axis of the spray bar, normally 15 to 30 degrees, to eliminate interference of the sprayed material from one nozzle with that from an adjoining nozzle. Each nozzle should be set at the same angle. The height of the spray bar must be checked to see that the correct overlap of the spray from each nozzle is obtained. This can be accomplished by plugging alternate nozzles and adjusting the height of the spray bar until the edges of the spray fans from the unplugged nozzles just meet at the roadway surface. When all nozzles are spraying, an exact coverage of asphalt will be obtained, resulting in an application of asphalt free from longitudinal streaking.

The asphalt pump must be checked to ensure that the manufacturer's required pressure can be maintained uniformly.

The Inspector must check the motor patrol graders, rollers, spreader boxes, etc., to ensure that they are in good operating condition. The Inspector should see that the motor patrols are equipped with the required moldboard brooms. The capacity of hauling trucks and water tanks must be determined, by the Inspector, from measurement obtained on the job, the results being recorded for future reference.

5-2.3 Inspection of Bituminous Surface Treatment on New Construction

Preparation of Roadway
The roadway surface shall be shaped and compacted to a smooth, uniform grade and cross-section before application of the asphalt. No traffic will be allowed on the prepared surface until the prime coat of asphalt emulsion and aggregate is applied. It is essential that the grading of the surfacing material be uniform over the area to be treated to allow uniform penetration of the asphalt. This is different work than that associated with shaping and compacting of crushed surfacing as required in Section 4-04.3(5) of the Standard Specifications. The quality and smoothness of the finished roadway depends to a great extent on the quality of the work done in preparing the roadway. Careful inspection during this operation will lay the groundwork for a smooth riding and uniform appearing finished project.

In many instances, the surfacing course upon which the bituminous surface treatment is to be placed will be segregated, rutted and pot-holed by traffic using the roadway prior to oiling. Such a surface must be completely processed to the depth of the ruts or potholes, and re-laid. Do not allow the Contractor to merely lightly blade the surfacing course, filling the holes with loose, segregated material. Such procedures are sure to result in a rough uneven pavement, due to differential compaction and penetration.

The surfacing must be damp, bladed, and thoroughly rolled to obtain a dense, unyielding base for the bituminous surface treatment. If additional water is required, it shall be applied in the amount and at the locations designated by the Project Inspector. The final coverage must be with a steel-wheeled roller to produce a smooth surface upon which to apply the prime coat.The blading and rolling of the surfacing shall be coordinated so the asphalt will be applied while the surfacing

material is still damp. If the surfacing material compacts to a very tight surface, the asphalt material will not penetrate as much as if the material is more open. If this is the case, the inspector should be careful to not apply too heavy a coat of asphalt.

Application of Asphalt and Aggregate

When beginning a BST section, the Inspector shall require that the Contractor provide a minimum 1,000-foot test strip. This test strip will be used to verify that the Contractor's equipment is functioning according to specification.

Building paper shall be placed at the joint, each time the distributor starts, in a manner that assures a uniform asphalt spread across the area of the joint.

During the application of the asphalt, the Inspector shall maintain a close inspection of the roadway to see that the asphalt is applied in a uniform manner. Longitudinal joints will be allowed only at the centerline of the roadway, the center of the driving lanes, or the edge of the driving lanes. If any evidence of improper application is apparent, the operation must be stopped at once and required corrections be made to eliminate the trouble. The Inspector must check to see that the asphalt pump pressure and the speed of the distributor are maintained at uniform rates to ensure even application of the asphalt. A record shall be made of each distributor load applied, showing area treated, gallons spread, temperature of asphalt, etc. The Inspector should compute the yield of each spread in gallons per square yard depending on diluted or undiluted emulsion.

Part of the prime shot asphalt applied to the surfacing penetrates the material and the rest remains on the surface and surrounds the aggregate, usually ½ inch screenings. Constant checking is necessary to ensure that enough asphalt product is being applied to fill the voids and stick the aggregate. This may change during the day because of weather or the preparation crew's efforts to stay ahead of the oiling crew. Some bleed can be tolerated on the prime shot as it can be corrected on the second (seal coat) shot if uniform in nature. The final mat will be thicker and better if the maximum amount of asphalt possible, without excessive bleed, is shot on the first (prime) shot. Succeeding shots are placed as seal coats described in Chapter 5-2.4 of this manual.

Stockpiled aggregate shall be inspected to ensure that the grading of the material meets specification, and to see that it is damp at the time of loading onto trucks for hauling to the roadway. If dry or dusty, the material in the stockpile must be watered to produce a surface damp condition. The asphalt does not readily coat a dry dusty surface. During good warm weather, the moisture on the surface of the aggregate will quickly evaporate after the aggregate is spread the asphalt applied to the roadway.

The Inspector must frequently check the truckloads of aggregate at the point of delivery, to see that the trucks are completely loaded and that the material is damp. Tickets shall be issued for each load of material received or a receiving report record made as the loads of material are received. A record shall be made of the quantities of material used on each section.

Following the application of asphalt, the Inspector is responsible for ensuring that the aggregate is applied in accordance with the specifications, watching especially that the aggregate is applied at the correct rate within the time limit allowed. The roadway shall be inspected for signs of skips or omissions in the application of the cover stone. Any omissions shall be immediately covered by re-spreading with the chip spreader or by hand-spotting methods. The Inspector must not allow excessive amounts of aggregate to be applied, as this will result in waste of the material and require harmful excessive brooming.

Careful inspection and control of the rolling operation must be made to ensure that the requirements of the specifications are met. It is important that rolling be conducted as soon as possible following application of the aggregate in order to properly imbed the aggregate in the asphalt.

Chips are broomed the day following the shot because loose chips are of no value in protecting the mat and any loose aggregate on the roadway promotes wheel tracking. Areas of severe bleed will need to be blotted with ¼-inch material during the cure period. Cutback asphalts are curing as long as you can smell the volatiles on a warm day. Emulsions do not really cure except to shed water when they break. Either asphalt will be tender for awhile, although probably ready for the next construction step.

When the asphalt has started to cure and the chances of it bleeding are remote, the excess aggregate on the edge of the roadway should be broomed off as it is a hazard to traffic and reduces the usable width of the roadway.

5-2.4 Inspection of Bituminous Surface Treatment Seal Coats

Preparation of Roadway

Prior to the application of the seal coat, the Inspector shall ensure that the existing surface is broomed clean and that holes and breaks are patched as required. The Inspector should inspect the existing surface carefully over the length of the job, noting the surface characteristics of the roadway, so that the rate of application of asphalt best suited to the conditions can be determined. The Inspector should make note of varying conditions and plan to vary the application of asphalt accordingly.

Any areas of the roadway showing failure caused by soft subbase or poor drainage must be removed and the cause of the failure corrected.

If any open or porous surfaces, particularly on recently constructed bituminous pavements, are found in the area to be treated, the Inspector shall require the application of a "fog seal" to be applied before construction of the seal coat. If this fog seal is not shown on the plans, the Inspector will inform the Project Engineer of the situation, so that a supplemental agreement may be reached with the Contractor.

The Inspector is responsible to see that a newly constructed bituminous surface be allowed the required time for curing before allowing construction of the seal coat over the affected area.

Construction of Seal Coat
Refer to Chapter 5-2.3 for instructions covering inspection duties during application of asphalt and screenings or cover stone.

In the construction of a seal coat the quantity of asphalt spread is very critical, due to the thinness of the layer of aggregate placed on the asphalt. Constant checking is required to ensure that embedment of the major stone in the asphalt is 50 to 70 percent. Where ½-inch or ⅝ to No. 4 chips are used on routes with moderate traffic volumes, choke stone may be used either ahead of or immediately behind the main rollers. Some bleed is inevitable at intersections, on steep hills, and at severe horizontal or vertical curves. This is less objectionable than losing rock on long sections in between, due to insufficient asphalt.

The Inspector must maintain continual inspection of the aggregate application on the freshly spread asphalt, to see that the material is placed within the allowable time. The Inspector must make certain that the spread of asphalt is not extended beyond the area which the Contractor is capable of covering.

Omissions or skips in the spreading of aggregates must be immediately covered by re-spreading with the chip spreader or by the hand spotting crew.

The best seal coats are obtained on those jobs where the time elapsed between spreading of asphalt and application of aggregates is held to the shortest possible time within the allowed time.

The Inspector must see that the rolling operation is not allowed to lag far behind the spreading of aggregates. It is important that the particles of aggregate be rolled into the asphalt film as soon as possible following application.

Spreading Fine Screenings
When constructing Bituminous Surface Treatment Seal Coats, the specifications may require application of choke stone follow the spreading and rolling of the coarse aggregates. The Inspector must exercise judgment in determining the time for applying the choke stone. When using emulsions, the choke stone should be applied immediately, sometimes even before initial rolling

Fine screenings, applied at the proper time, will key the gaps between the particles of coarse aggregate and provide a smoother riding surface, as well as absorb any free asphalt which might "bleed" to the surface of the coarse particles.

By observing conditions and results carefully, the experienced inspector will determine the procedure which produces the best results under any particular condition.

If the sealed roadway is rained on before the asphalt has cured and the asphalt starts to emulsify under the traffic, the roadway can usually be saved from damage by applying fine screenings on the roadway to prevent the traffic from picking up the asphalt. The spill prevention control and countermeasures plan (SPCC plan) should be referred to for guidance on using Best Management Practices (BMPs) to protect the environment.

5-2.5 Inspection and Sampling of Materials

Asphalt
Each shipment of asphalt arriving on the job by tank truck shall be inspected by the Inspector. Each shipment must be accompanied by a weigh bill and shipper's certificate. The tank must be inspected after it is unloaded to see that no asphalt remains in the tank.

The Inspector must check and record the temperature of each load of asphalt as it is delivered to the roadway for spreading.

Samples of the asphalt shall be taken as required in Chapter 9-4.2 of this manual, and shall be submitted to the State Materials Laboratory for Testing.

Aggregates
No aggregate shall be used without the approval of the State Materials Laboratory. If any question arises concerning quality of the material, a sample shall be sent to the State Materials Laboratory for testing before use and preferably during plan preparation.

5-2.6 Miscellaneous Inspection Duties

Protection of Structures
When spreading asphalt or aggregate near curbs, bridge rails, drainage inlets, monument covers or other structures, adequate protection must be provided to prevent damage to the structures. The Inspector shall see that any asphalt sprayed, or aggregate spread, on or in a structure is satisfactorily removed by the Contractor.

Control of Traffic
Frequent checks should be made of traffic control operations to see that traffic is being conducted through the job in a safe, orderly manner. When spreading asphalt, traffic should not be allowed to travel past the distributor. Control of the speed of traffic is very important, especially during the early curing stage of the asphalt, so that the aggregate covering the asphalt is disturbed as little as possible. Control of traffic must be maintained as long as required to prevent excessive loss of the aggregate. The Inspector must ensure that all warning signs are properly in place throughout construction. See Chapter 1-2.3 of this manual for further instructions on construction signing.

Maintenance and Finishing Roadway
The Inspector shall see that the newly completed roadway is properly maintained until brooming is completed. The Contractor shall be required to keep sufficient equipment on the job to adequately handle any situation that may develop, including application of a fog seal if a fog seal is deemed necessary by the Engineer. Before the work is accepted, the Contractor shall be required to finish the roadway and clean up any debris resulting from their operations, as required in the *Standard Specifications*.

Measurement of Stockpiles
Before construction begins, the stockpiles from which materials are to be removed shall be measured and quantities computed. Upon completion of the work, the Contractor shall be required to leave the remaining materials in neat, presentable stockpiles. The stockpiles shall again be measured and quantities determined. The difference in quantities obtained by this procedure will aid in checking

pay quantities determined by truck volumes. It will also serve as an accurate basis for reporting quantities withdrawn from stockpiles. Measurement of stockpiles will not be necessary on projects where the aggregate is furnished by the contractor.

Notice to Maintenance Superintendent
The Project Engineer should keep the area Maintenance Superintendent informed of the Contractor's proposed progress schedule so that maintenance operations can be coordinated to accommodate the construction work. The Project Engineer must also notify the Maintenance Superintendent of the date when the Contractor's maintenance period will expire so that maintenance of the roadway may be taken over by WSDOT and maintained without interruption. These notices should be given sufficiently in advance to enable the Maintenance Superintendent to provide equipment and organize the work.

5-2.7 Reports and Records

A Daily Report of BST Operations, Form 422-644 EF, shall be made at the end of each day's work, showing type of work, areas treated, quantities used, etc. This report shall be submitted in duplicate for the Project Engineer and Region.

Records of quantities of asphalt and aggregate used shall be kept in the Inspector's Daily Report, and shall be checked daily against quantities shown on tickets issued to the Contractor. Accurate, neat records are invaluable to the Project Engineer in preparing estimates and final records. See Chapter 10-2 of this manual for instructions concerning quality control procedures.

The Inspector shall enter in the Inspector's Daily Report all pertinent information concerning each day's work.

5-3 Vacant

5-4 Hot Mix Asphalt

5-4.1 General Instructions

The technology of asphalt materials and mixes is continuously changing. It is imperative to study contract documents and specifications prior to the start of any paving contract. There also are many excellent handbooks that can be obtained to assist paving inspectors and testers. It is recommended that the Project Engineer obtain copies of these handbooks as a resource for their office. Recommended books include "Hot Mix Asphalt Materials, Mixture Design and Construction" by the National Center for Asphalt Technology and "Hot-Mix Asphalt Paving Handbook" by the US Army Corps of Engineers.

Good work and a successfully completed job depend on good equipment, skillful operation of the equipment, competent, knowledgeable supervision and inspection, and open lines of communications. Maintaining open lines of communication through informal daily meetings between the project inspector and contractor, can greatly improve the success of any job. Hot mix asphalt (HMA) projects, are not always built as originally scheduled. Changes may occur because of material supply, equipment breakdown, contractor and subcontractor schedules, and weather conditions. Informal meetings on a regular basis provide a forum for the exchange of information and discussion of problems. To begin the communication process a prepaving meeting is recommended. The Project Engineer, paving inspectors and testers together with Contractor superintendents, foremen, screed operators, rakers, roller operators and plant operators should be present to go over all activities and plan the entire operation. It is also advisable to include traffic control personnel. The following check list may be used as an outline for the prepaving meeting:

Prepaving Check List

1. Review the HMA contract requirements with the Contractor. This will include the class of HMA, grade of asphalt binder, evaluation and acceptance procedures, mix design verification and test section requirements (both HMA mixture and compaction).

2. Go over procedures in *Standard Specification* 5-04.3(7)A for modifying the job mix formula.

3. Discuss construction of test sections, both mixture (Section 5-04.3(8)A item 3E) and compaction (Section 5-04.3(10)B item 2) where required. Review what is needed for the test section to be acceptable.

4. Go over the procedure and timing in obtaining density gauge correlation factors.

5. Discuss the communication procedure to be used for weather shut downs, use of mix in trucks and silos, and other potential construction problems.

6. If material transfer equipment (vehicle or device) is required by a special provision what type does the contractor plan on using and does it meet the requirements of the special provision?

7. Discussion of what to do if segregation of the mix is occurring.

8. Discuss the preparation of the existing surface (Section 5-04.3(5)A) including cleaning the pavement, application oftack, pickup problems and weather limitations (Section 5-04.3(16).

9. Go over asphalt densities: Who, When, and How, notification of results, request for cores, and utilization of core results.

10. Mix sample and testing: Who, When, and How, notification of results, composite pay factors (CPF), and Contractor's use of challenge test specifications. If the paving contractor is a subcontractor, the CPF should also be provided directly to the paving contractor.

11. Obtain a copy of the temperature-viscosity curve and the maximum recommended heating and discharge temperatures (Sections 5-04.3(6) and 5-04.3(8) respectively) for the type(s) of asphalt binder being used on the project. The Contractor will supply the information from the manufacturer of the asphalt binder.

12. Traffic control procedures and lines of communication including allowable times for lane closures.

13. Other factors specific to Contract or of concern by those attending.

In the construction of HMA, it is extremely important that the material meets all requirements of the specifications. It should be remembered that specifications are not arbitrarily arrived at, but have evolved through the years as a result of experience and research.

Experience has shown that pavements that do not meet all specifications will not perform satisfactorily, resulting in high maintenance costs. The responsibility for obtaining a mixture in close conformance with the project mix design and meeting the specification requirements rests with the Contractor. The importance of this cannot be overemphasized, since the best possible construction at the lowest cost to WSDOT cannot be obtained unless the mixture produced at the plant is uniform and of good quality. The key word used to describe quality production of HMA is UNIFORMITY.

- The aggregate in the stockpile must be of UNIFORM quality and gradation;
- Aggregate must be fed into the plant in a UNIFORM, controlled manner;
- The heating and drying of the aggregate must be UNIFORM;
- The separation of the aggregate in the bins must be UNIFORMLY controlled;
- The aggregates and asphalt must be combined and mixed in a UNIFORM, consistent manner.

In order to achieve this uniformity of quality, it is necessary that the entire operation be conducted so that each phase of the production operation is in balance with all other phases. To accomplish this most Contractors have a Quality Control (QC) program.

With the advent of Quality Assurance (QA) specifications and statistical evaluation of HMA, the role of inspection has evolved from one that was highly involved in the operation of the asphalt plant to one that is involved in verification that the material the Contractor produces is in conformance with the job mix formula and in accord with the specifications.

Various testing procedures are available to ensure that the component materials and the completed mixture meet the requirements of the specifications. However, since only relatively small samples of each day's production can be tested, inspection duties and responsibilities involve more than merely performing the required tests. Inspectors and testers must be familiar with the working of the asphalt plant and be observant during the production of the HMA for any changes that may occur in the Contractor's production of HMA. The Contractor is responsible for the uniform production of HMA so that the end product is of uniform quality. Only when the product is uniform can samples be considered representative of the material produced. The Inspector, through communications and observations of plant operation, can work with the Contractor to assure that the mix is being produced uniformly. If problems are observed, the plant foreman should be notified as the foreman is responsible for making the necessary corrections. If violations or misunderstanding of the specifications arise that cannot be promptly settled, the Project Engineer must be notified immediately.

Instructions in all cases shall be issued to the Contractor's designated representative rather than the workers. A diary must be kept, showing all instructions received from the Project Engineer and instructions issued to the Contractor.

Careful review of Section 5-04.3(16) of the *Standard Specifications* concerning weather limitations and calendar cutoff dates should be made in advance of any HMA paving work so that paving can be planned and completed prior to any unfavorable weather. Pavement performance is highly dependent on the weather conditions in the first weeks and months following paving. Invariably, when these specifications are not closely adhered to, early pavement performance problems occur. Therefore, between October 1 and April 1, no wearing course is to be placed without written approval of the Project Engineer. The Project Engineer will review this decision with the Region Headquarters prior to approving any paving outside these dates.

In addition, use of a pneumatic tired roller is required from October 1 to April 1. It has been shown that during warmer weather, traffic will knead the HMA providing a more durable pavement. To duplicate this benefit for late season paving, use of pneumatic tired rollers is part of the specifications. Placement of dense graded mixes of 0.10 foot or less is not recommended between September 1 and April 1. Heat loss in thin lifts is very quick and in most cases inadequate time is available for placement or to achieve needed compaction.

5-4.2 Inspector Roles and Responsibilities

Testing Equipment

Before production commences, the Inspector needs to ensure that all of the necessary equipment that will be needed to accomplish all of the test procedures has been obtained. In addition, chapter 9-8 lists the equipment that needs to be calibrated or verified. The Inspector needs to make sure that this equipment is in good working order and has a current calibrated or verified sticker on it.

The Inspector is charged with responsibility for care and safekeeping of all testing equipment that is issued. The equipment must be maintained in a clean and proper operating condition to ensure accuracy of test results. Special care must be exercised in the use and maintenance of sieves to see that they do not become clogged or damaged. Thermometers must be handled carefully to avoid breakage.

Electronic scales are expensive, desirable, and delicate equipment. Particular care should be taken to protect them from theft or voltage spikes.

The ignition furnace is a high temperature oven, care must be exercised in its operation and testers must be qualified in its use.

Given reasonable care, HMA testing equipment will give long and satisfactory service.

Required Tests
The Project Inspector is responsible to the Project Engineer for the required field tests as well as for submission of required samples to the State Materials Laboratory for testing. Testers must be qualified in the "Asphalt Module" or for the particular method of sampling and testing they will be performing. It is the intent of QA specifications that the Contractor is made totally responsible for the maintenance and operation of equipment and the production of the HMA. It is the Inspector's role to sample and test the material to assure that WSDOT is getting a uniform and specification product. However, it is not possible or desirable for the WSDOT Inspector to take a "hands off" approach to the production of HMA. If the Inspector notices anything at all that affects the quality of the HMA, this information should be brought to the Contractor's attention in a cooperative manner so that the situation can be corrected.

5-4.2A Hot Plant Inspection

Plant Inspector's Check List

Some of the most important details of inspection on asphalt plants are listed below:

1. See that testing tools, equipment, and samples are on hand at the plant site and in good condition. Make sure you understand all tests.

2. Inspect all components of the asphalt plant; make sure all deficiencies are corrected *before* production is begun.

3. Verify that the truck scales are currently certified in accordance with Section 1-09 of the *Standard Specifications*.

4. Post mix designs, including all revisions to the job mix formula.

7. Watch for evidence (dark smoke from plant exhaust and oily coating of aggregate) of incomplete combustion of burner fuel.

8. Check frequently the temperature of the asphalt and volume accumulation from flow meter.

9. Observe plant operator occasionally to see that correct weights and proportions are obtained, including asphalt content.

10. Make frequent visual inspections of mix leaving plant for evidence of non-uniformity or incomplete mixing.

11. Check temperature of mix frequently.

12. Inspect truck beds before loading; see that bed is free of congealed chunks of mix and excess bed release agent.

13. Check frequently with Street Inspector concerning workability and uniformity of mix at the paving machine and density test results.

14. Take samples of mix for field tests and submission to laboratory.

15. Make accurate, complete record of all test results, asphalt used, and other pertinent data.

16. Have copies of all test reports available for review.

17. Fill out the required daily reports.

18. Keep in constant communication with the plant foreman and the street inspector and give immediate notification regarding any problems.

Field Tests
On all projects involving HMA, job site samples shall be obtained, tested, and recorded in accordance with the *Standard Specifications*, the contract special provisions, and Chapters 9 and 10-3.5 of this manual. A split of the field sample will be retained by the field tester for further testing if necessary. This sample may be used when test results are challenged by the Contractor per *Standard Specification* 5-04.3(8)A. Asphalt content of the mix shall be determined by use of the Ignition Furnace in accordance with AASHTO T308, and gradation determined in accordance with WAQTC FOP for AASHTO T30.

Samples Required by Materials Laboratory
When taking a sample of the mixture for mix design conformation, a sufficient quantity of the mix should be obtained so that a portion of the same sample may be submitted to the State Materials Laboratory for testing. Samples shall be taken as provided in Chapter 9 of this manual and forwarded to the State Materials Laboratory in the amounts and at intervals therein specified.

Sampling Methods
Samples of the complete asphalt mixture should be taken from the hauling conveyance in accordance with the current test method and quartered down to the desired size for testing. Remember that the value of material quality testing is dependent on exact parallel tests of identical splits from representative samples.

Verification of the Ignition Furnace Calibration Factor
The Project Engineer shall verify that the "Ignition Furnace Calibration Factor" shown on the asphalt mix design is valid. The verification of the "Ignition Furnace Calibration Factor" shall be determined in accordance with current test methods and should be done prior to beginning the production of any paving mixture using initial mix design. The verification shall be done using the furnace that will be used for acceptance testing. In some circumstances it may be necessary to use production data to verify acceptance results but should be only utilized when all verification procedures have been used and validated.

5-4.2A(1) Inspection of Mixing Plant

Project Inspectors should familiarize themselves with plant operations prior to beginning of paving. A visit to the plant will do this and additionally provide an opportunity to inspect the plant for conformance to WSDOT specifications. Specification violations should be brought to the attention of Contractor so they may be corrected prior to beginning paving.

When doing plant inspection, particular attention should be given to examination of gates, feeders, drier and dust collector, screens and bins, pugmill, and all thermometers, pyrometers, and weighing scales. To assist in this inspection, one of the previously recommended hot mix asphalt paving

handbooks will provide excellent guidance. In addition, the manual from the WSDOT Asphalt Concrete Testing Procedures training class provides an excellent resource.

With the increased emphasis on aggregate structure and void content, it may be necessary for the Contractor to use multiple stockpiles.

Allowable methods of heating the asphalt are stated very clearly in the specifications, and the limits of the range of application temperatures are also specified. An asphalt thermometer is required to be installed in the asphalt line. This thermometer should be checked for accuracy before work starts. Close control of variations in temperature of the asphalt binder is very important, as overheating of asphalt oils will cause hardening and may cause substantial decrease in pavement life. When using modified Performance Graded (PG) asphalt, the asphalt manufacturer may recommend a higher mixing temperature. The Project Engineer may approve of increasing the mixing temperature, in accordance with the manufacturer's recommendation, as allowed in the *Standard Specifications*.

Section 5-04.3(1)A of the *Standard Specifications* requires that a valve be placed in either the asphalt supply line to the mixer or the storage tank for sampling the asphalt. This valve should provide a safe method of obtaining samples of the asphalt material that are representative of the material being incorporated in the mixture. All samples must be taken in the Inspector's presence. If for any reason the asphalt oil is suspected to have become mixed or contaminated in the storage tank, additional samples from the asphalt supply line should be taken and noted on sample submittals.

During the preliminary inspection of the asphalt mixing plant, the Inspector should note any violation of safety rules concerning machinery safeguards, such as lack of guards on belts, sprockets and the like. The Inspector should call to the attention of the Contractor any such violations and request that corrections be made. If the violations directly affect the functions of the engineers and inspectors, the Project Engineer should refuse to allow mixing to begin until conditions are safe for sampling, inspecting, etc. Section 1-05.6 of the *Standard Specifications* requires the Contractor to provide safe facilities for inspection of the plant and the work.

5-4.2A(2) Inspection During Mixing Operations

After the mixing begins, and throughout the day, the Project Inspector working with the qualified tester shall make the required tests of the mixture. It is very important, however, that the Project Inspectors and testers spend some of the time observing the operation of the plant and the condition of the mixture being produced. Changes in the mixture can quickly be detected by observing changes in appearance or color of the mixture.

Periodic checks of the temperature of the liquid asphalt, as well as the mixture produced must be made to ensure that maximum allowable temperatures are not exceeded and a uniform material production is being produced. The Contractor will choose the desired temperature of the mixture within specification limits, depending on weather conditions, length of haul, and other factors. Project inspectors should watch for excessive variation in temperatures, and notify the contractor of any variation that occurs. Variable temperatures of the mix may cause compaction and segregation problems and close monitoring of temperatures is an essential part of HMA paving.

When stockpiled, aggregates may contain a high percentage of moisture. With moisture in the aggregate difficulty may be encountered in heating the material to the proper temperature. In some cases, the contractor may try to correct this condition by increasing the amount of fuel oil fed to the burner. This can be done satisfactorily until incomplete combustion of the fuel oil occurs. Black smoke coming from the exhaust stack is an indication that incomplete combustion is occurring. Black smoke is also a sure sign that air quality standards are being violated. The Inspector should watch for this condition, as the unburned fuel will deposit a sooty, oily film on the aggregate particles that is detrimental to proper coating of the material with the asphalt film. A reduction in the amount of aggregate fed to the drier will usually correct the situation and allow proper heating and drying of the material.

Frequent inspections of the condition of the mixture leaving the plant should be made, noting the consistency of the mix, the distribution of asphalt and aggregate throughout the mixture, and the temperature of the mixture. Trucks should be loaded by multiple dumps of three or more as recommended by the National Asphalt Pavement Association (NAPA). If the quality of the mixture varies from truck to truck, an immediate check should be made to locate the source of trouble. Uniform distribution of the asphalt throughout the mix is extremely important. If portions of each truckload vary from rich to lean, the Inspector shall advise the Contractor to correct the problem. It may be necessary to increase the mixing time to correct this situation. By examining the mixture in bright light, the experienced Inspector can quickly detect non-uniformity in the mixture.

5-4.2A(3) Miscellaneous Duties of the Plant Inspector

One of the duties of the Plant Inspector may be to oversee the work of the scale person on truck weighing scales at the plant, and see that the required tests of the scales are performed. The Inspector must see that tickets are properly made out and issued for each truckload of mixture delivered, and shall also see that daily totals are promptly obtained and entered on the daily report.

Before trucks are allowed to be loaded at the plant, a check shall be made to see that the truck beds are properly lubricated as required in the specifications. No pools of bed release agent shall be allowed to remain in the truck bed following this operation. The truck bed should be raised to allow any excess material to be drained off.

When the Contractor is using a site furnished by WSDOT, the inspector should see that the Contractor shapes up any remaining aggregate into neat stockpiles, and removes all debris from the plant site when the project is complete.

5-4.2B Street Inspection

General
In the construction of HMA pavements, it is the responsibility of the Street Inspector to see that construction methods and equipment used, as well as the finished pavement, meet the requirements of the specifications. In order that the Inspector may properly discharge this responsibility, it is necessary that the Inspector thoroughly understand the *Standard Specifications*, the special provisions of the contract, and the instructions set forth herein. The Inspector must also have a good working knowledge of methods and equipment involved in the construction.

A means of communication between the Street Inspector and the Plant Inspector must be established, and the Street Inspector shall keep the Plant Inspector informed of any difficulties encountered in the laying of the mixture or of any faulty mixture received at the paving site.

Street Inspector's Check List
Some of the most important details of inspection on HMA paving are listed below:

1. Check condition and adjustment of paving machines and rollers.

2. Has width of spread in successive layers been determined?

3. See that traffic control is organized and functioning properly; make sure required signs are in place and document it.

4. Check application of tack coat; do not allow tacking of more base than will be paved each day. Be sure that the pavement is swept and clean ahead of the tack application (Section 5-04.3(5)A).

5. Examine pavement base, see that required patching and/or pre-leveling is done. Do not be afraid to get the front of your shirt dirty; do a lot of "belly-grading." Make a check of surfacing depths before paving begins.

6. See that paver guidelines are set and adhered to (Section 5-04.3(3)).

7. Check transverse joint for smoothness and appearance a straightedge should be used.

8. Watch trucks dumping into paver hopper for adverse effect on paver operation. Pay particular attention to constant uniform paver speed and minimum operation of the hopper wings.

9. Check temperature of HMA occasionally and watch for evidence of incomplete mixing.

10. Maintain constant inspection of mat behind paver for signs of roughness or non-uniformity of mixture.

11. See that longitudinal joint is raked and compacted properly.

12. Make frequent checks of yield and depth.

13. Watch rolling operation and verify that the rollers are operated in accordance with the manufacturers recommendations (Section 5-04.3(4)). See that nuclear density readings are maintained. Check internal temperature of mix to verify that vibratory rolling is not used below 175° F.

14. Keep record of truckloads used each day; check with Plant Inspector concerning masses.

15. Make sure the job is in good shape before you leave at the end of the day, that the transverse night joint is properly constructed (Section 5-04.3(11)) and see that any excess paper is trimmed from the transverse night joint.

5-4.2B(1) Duties Before Paving Begins

The Street Inspector is a key participant in the prepaving meeting and typically oversees all aspects of the operation at the jobsite. The street inspector should be knowledgeable as to the project limits, hours of operations, the direction in which paving is to proceed, methods of performing any unusual features of work peculiar to the project, proposed traffic control methods, etc. The plan of operation agreed upon at the prepaving meeting should be followed faithfully whenever possible.

Traffic Control
The Contractor shall conform to the requirements of Section 1-07.23 of the *Standard Specifications*. The Project Engineer and the responsible inspector must work closely with the Regional Traffic Engineer and the Contractor to ensure that the proper signs are placed in the best possible manner. All applicable signs shall be installed on the job before paving begins. Chapter 1-2.3 of this manual includes additional sign installation details.

Inspection Tools
Before paving work begins, the Street Inspector must see that all tools and equipment necessary for the inspection work are available. These would include such things as surface and probe thermometers, tape measure, depth gauge, tire pressure gauge, 10 foot straightedge, notebooks, diary, report forms, etc.

Inspection of Paving Equipment
It is the duty of the Street Inspector to inspect the Contractor's paving equipment to verify the equipment meets the contract specifications. In order that the best possible surface finish will be obtained, it is essential that all machines are in good condition and all parts are in proper adjustment. All equipment, including trucks, should be observed for hydraulic and fuel leaks when systems are under pressure.

Listed below are some of the most important details the Inspector should check during the inspection of paving equipment:

(a) Paving machines. Several types and makes of paving machines are in use in this State, all of which are capable of producing satisfactory surface finishes. The differences between types of paving machines are primarily in the methods used in striking off, compacting, and smoothing the mixture. The Inspector should be familiar with the mechanical features of the type of paver to be used on each job.. Handbooks of operating instructions are available from each manufacturer, in which the various adjustments and operating details are shown. The Inspector should

obtain copies of these instructions from the Contractor or the manufacturer. The requirements for paving machines are in Section 5-04.3(3) of the *Standard Specifications*. The inspector must be familiar with the specifications

Extensions may be added to the paving machine to allow the Contractor to pave a wider section. When the extensions are used in the traveled way they are required to have augers and screeds that vibrate and are heated. Most newer paving machines will be equipped with automatic screed extensions.

On all track paving machines, correct adjustment of the track linkage is essential for smooth operation. A poorly adjusted track, or a badly worn one, can produce an uneven, lurching movement in the travel of the machine which will be reflected in an uneven, "choppy" pavement surface. Observation of the machine in motion will usually show up any defects in the track or drive mechanisms.

Some pavers are suspended on rubber-tired wheels. For proper operation of this type of paving machines all tires must be inflated to the correct pressure and the drive system must not have any slack.

(b) Rollers. The proper operation of the roller is a key factor in quality pavement. When done properly the HMA will be compacted to a dense uniform mat free of defects. Improper operation produces a poor quality mat that may include tears, roughness and low or uneven compaction. All of these will result in a reduced life of the HMA and increased cost.

Steel-wheeled rollers must be inspected to determine that the wheels are capable of rolling a true plane and are in good condition. The Inspector should be especially watchful for flat spots on the wheels. The steering and driving mechanisms must be free of excessive play or backlash. Observation of the roller in motion and reversing direction will disclose any deficiencies in the drive and clutch mechanisms. The manufacturer of the roller provides the maximum rate of travel.

Pneumatic-tired rollers, to function properly, must have tires of equal size and in good condition. All tires must be equally inflated, so that all exert equal unit pressure on the pavement. Tire pressures may be varied to suit conditions on the job, but, in general, should be such that ground contact pressures range between 40 and 80 psi. The Inspector should observe the roller in motion to see that all wheels are rolling true, without wobble or creep. Pneumatic tired rollers should have full skirts as the tires must be warm to prevent "picking." (When the cool tires roll over the hot HMA mix, the mix tends to stick to the tires, and is "picked" up from the mat onto the tires.)

(c) Other items. The Inspector should be satisfied that the Contractor is properly equipped with portable barricades, cones, or other means of protecting the freshly laid pavement from damage by traffic.

Upon completion of the check of the paving equipment, the Street Inspector should call any deficiencies of equipment to the attention of the Contractor, so that correction can be made.

Preleveling

The Engineer must give careful consideration to the use of a preleveling course over areas of unusual roughness, wheel ruts, or sags in the profile of the pavement base. The Contractor should be given as much advance notice as is possible of the intent to place a preleveling course. The areas that need prelevel should be marked out and reviewed with the contractor prior to the pre-pave meeting. The extent of prelevel and the methods to be used should be discussed at the pre-pave meeting.

There are several methods the contractor is allowed to use for preleveling. One method used for preleveling may be using a motor patrol grader. A paving machine may be used when the Engineer has determined that better results can be obtained by this method and particularly where long undulations occur. When conditions warrant, a reference line may be erected for preleveling and a long multi-footed ski-type reference should be used for placement of subsequent pavement courses. Ruts can be economically preleveled by dragging a paver screed. Because of the possible detrimental effect on the equipment, it should only be done with the consent of the Contractor or if required by the plans. In order to outline areas and amount of preleveling, the Contractor should be encouraged to erect a single reference line along the crown point for the first pass. The practice of directly marking depths and limits of preleveling required on the pavement surface is considered beneficial. When the area is small or irregular the Contractor may choose to use hand methods to prelevel.

The nominal compacted depth of any layer of any course, including preleveling lifts, shall not exceed the depths outlined in the *Standard Specifications* for the class of mix being used. The purpose of this requirement is to reduce the differential compaction that takes place and to ensure adequate compaction of thick lifts between two humps. Compaction should be accomplished with a pneumatic roller.

To produce a satisfactory riding surface, preleveling, in theory, should continue regardless of quantities until a uniform lift of HMA can be placed by paving machines with the multi-footed ski-type reference. If it appears that the plan quantity of prelevel must be exceeded due to the condition of the existing pavement, the situation should be immediately brought to the attention of the Project Engineer, and the Region Construction staff. The Engineer must take care to clearly distinguish between preleveling operations and paving operations, especially leveling courses.

Preparation of Untreated Roadway

Section 5-04.3(5)B of the *Standard Specifications* covers the work of preparing the untreated roadway quite thoroughly. When the roadway is carrying traffic, public or construction, it may be necessary to construct the prime coat treatment to maintain the roadway to the desired line, grade and cross-section until the first course of pavement is constructed. When a prime coat is required it will be designated in the plans. If there is no traffic problem, it may be desirable to eliminate the construction of the prime coat treatment.

Weather conditions must be satisfactory for construction of the prime coat treatment and the prime coat must be allowed to cure for a minimum of 5 days before proceeding with paving. When the weather limitations cannot be met or the minimum curing period would present a hardship and it is desirable to pave the roadway, elimination of the prime coat should be considered.

5-4.2B(2) Duties During Paving Operations

Prior to beginning of paving work each day the Inspector shall see that guidelines are set for the day's work, that the base is properly prepared, and that the tack coat has been applied through the area to be paved during the day. It is not a good practice to apply the tack coat over more area than can be paved in a day or an hour or two if the weather appears to be questionable. Traffic conditions may also dictate how far the tack coat should be placed ahead of the paving operation.

The specifications require an application of tack coat that is uniform and free of streaks and bare spots. The application rate will depend on several factors and include the condition of the existing pavement, the Contractor's equipment, the type of asphalt used, if it has been diluted with water and the application temperature. Tack coat is always applied prior to the placement of HMA including projects that have multiple lifts of HMA. For many pavements an application rate of approximately 0.05 gallons per square yard of residual asphalt is adequate. When paving a second lift of HMA a lower application rate is typically applied. Thin lifts of pavement require heavier applications of tack coat to prevent raveling, spalling, and delamination. As a guide, existing surfaces that are coarse, dry or milled require a higher application rate of tack coat than surfaces that appear rich or bleeding.

Joints

The *Standard Specifications* provide that butt joints be constructed. The use of heavy paper is recommended to form the butt joint at the end of the day's work, with a temporary ramp laid on the paper beyond the joint to assist traffic over the change in elevation. Paper protruding above the pavement shall be carefully trimmed flush with the pavement so that there will not be an illusion of a hazard at night. When the ramp and paper are removed prior to beginning the succeeding day's paving, a well-constructed joint will require a minimum of cutting back to form the required butt joint. When hand raking is performed on a joint, all segregated coarse aggregate shall be removed, to avoid a coarse, porous surface at the joint.

If the roadway is open to traffic, the transverse joint must be feathered to provide a smooth transition for the traveling public and joints between successive lifts in each lane should not be less than 100 feet apart. The higher the speed on the roadway, the longer the taper on the joint must be to provide an acceptable transition. The required slope ratios is 1 vertical to 50 horizontal or flatter.

This slope will usually require use of more than one width of paper. Sufficient material must be temporarily placed in front of the paver to prevent a deformation from occurring in the permanent ACP behind the joint. Care should be taken to construct a straight line taper without humping.

The open longitudinal joint resulting from any day's operation should be abutted by paving the adjacent lane on the next day.

At the beginning of the day's work, special care must be exercised in the construction of the transverse joint joining the freshly laid mixture with the previous day's work. The paver should be allowed to proceed at a low rate of speed (creep) ahead of the joint, until hand finishing of the joint is completed. The paver should not come to a full stop or the screed may settle and cause a dip at that point. The Inspector should check this work closely, using the 10-foot straightedge to see that the requirement for surface smoothness is met.

Spreading and Finishing

In the construction of HMA pavements, it is extremely important that the paving machine be in good adjustment and that the machine and screed operators be experienced and capable. The Inspector should be quick to note operational practices that have an adverse effect on the work, and *request* the Contractor to make immediate corrections.

Compaction procedures will be as specified in Section 5-04.3(10) of the *Standard Specifications*.

During the paving operation, constant inspection must be maintained to see that the machine is producing a smooth pavement having the required characteristics of texture and uniformity. The Inspector must require immediate action be taken to correct any trouble that may develop and should attempt to assist the Contractor in locating the source of the trouble.

Listed below are some common difficulties encountered on HMA paving work, together with the most common causes of the difficulty:

- *Wavy surface (short, choppy waves):* Worn or poorly adjusted tracks or drive train; truck driver setting brakes too tightly; excessive paving machine speed.
- *Wavy surface (long waves):* Excessive variation in amount of mix carried in auger box ahead of screed; over-controlling screed; roller operating too fast.
- *Excessively open surface texture:* Improper adjustment of strike off; screed plate rough or galled; excessive paving machine speed.
- *Varying surface texture:* Insufficient mixing; trucks being loaded improperly at the plant; segregation of mix in trucks; poor gradation control at mixer; screed not uniform across paving machine.
- *Streaked surface texture:* Insufficient mixing; segregation of mix in trucks; worn or damaged screed plate.
- *Bleeding patches on surface:* HMA not uniformly mixed; excessive moisture in mix.
- *Irregular rough spots on pavement:* Roller standing on fresh surface; abrupt reversing of roller; trucks backing into paver; poor workmanship at transverse joints.

- *Cyclic open texture, that usually matches up with the distance that each truck load of material covers:* This may be caused by a couple of problems. One is the result of thermal segregation. In this case the differential temperatures in the HMA result in inconsistent compaction and a cyclic open texture. The use of a mass transfer vehicle (MTV) or mass transfer device (MTD) will reduce or eliminate thermal segregation. Secondly, the machine operator may be allowing the head of material to fall below the top of the augers or by dumping the wings of the paver when the hopper is low on material. Hopper wings should be operated only occasionally and then with some load in the hopper.
- *Crooked or irregular longitudinal joint lines:* Careless machine operation or no guide string placed for the machine operator to follow.

Some paving machine operators have a tendency to operate the paver at speeds in excess of that required to handle the quantity being produced at the plant, resulting in a jerky, stop and go operation. *This must not be allowed.* Generally, when the paver is operated consistent with plant production and roller capacity, the finished surface will be smoother. The ideal speed of the paver will be that which will result in a smooth, nearly continuous process with a minimum of stops required in waiting for trucks and/or the compaction equipment. If the production rate of the mixing plant is very high, requiring excessive speed of the paver, the Contractor will be required to correct the situation by slowing his production or using additional paving machines and generally, additional compaction equipment. Delivery must be adjusted to match production and uniform lay down. A formula is provided in Section 5-4.2(C) to help determine the approximate paver speed for continuous operation.

The Inspector should periodically check for difficulties while dumping truckloads of mixture into the hopper of the paving machine. Trucks must not be allowed to back into the paver in such a manner that they bump the paver, nor shall trucks that bear against any part of the machine other than the pushing rollers be permitted to dump into the paver. Any mix spilled onto the pavement in front of the paving machine must be shoveled into the hopper of the machine or back into the truck before paving is resumed. The Inspector should be especially watchful to see that mix spilled in the paths of the tracks or wheels of the machine is removed.

Checks should be made of the crown adjustment of the screed, to ensure that the finished surface will conform to the required section.

Particular attention must be given to the construction of the longitudinal joint when paving adjacent to a previously laid lane. The Inspector must insist that hand raking be held to a minimum, by adjusting the screed so that the freshly laid pavement is of the proper depth, allowing for compaction, to meet the grade of the previously laid lane. The uncompacted mixture immediately adjacent to the joint should be left slightly high so that the roller can compact the mixture thoroughly at this point. The rakers must not be permitted to cast excess mixture over the uncompacted, freshly spread lane. The Inspector must insist that segregated coarse particles of mix remaining after making the joint be removed and wasted, to avoid construction of a coarse, porous joint.

Surface Smoothness

When a leveling course is being constructed, an attempt must be made to remove all depressions and sags in the grade line by adjusting the depth of the course. The Inspector should work closely with the screed operator to accomplish this result by pointing out irregularities in the base far enough ahead of the machine to allow proper adjustment of the screed to eliminate the irregularity. The objective to be attained during construction of the leveling course is the complete elimination of all irregularities, so that the placing of the wearing course can be accomplished with a minimum of screed adjustments. If the base is excessively rough, pre-leveling should be done prior to construction of the leveling course.

Section 5-04.3(3) of the *Standard Specifications* require the use of automatic screed controls on the paver. It must be remembered that as the equipment becomes more sophisticated, it also becomes more necessary that it be properly adjusted and operated or satisfactory results will not be achieved. With proper operation, this equipment will give excellent performance.

When reference lines are required, or the Contractor elects to use reference lines, particular attention must be given to see that the line is properly set and tensioned. If the line is offset too far from the paving machine, vibrations of the machine may affect the operation of the automatic controls, which in turn affect the smoothness of the pavement. The reference line for asphalt paving machines normally will not be used when the roadway is under traffic. The specifications provide that if the course that the pavement is to be placed on is superior to established smoothness requirements, the paver may operate from a mat referencing device such as a “multi footed ski” instead of the wire. The inspector must ascertain that smoothness of the pavement continues to be superior to the requirements of the specifications.

Normally, when the surface for paving is properly constructed using a reference line, or the first course of pavement is constructed using a reference line, subsequent courses of pavement may be constructed using a mat referencing device with continued improvement in the surface smoothness.

Manual operation of the screed controls will be permitted in the construction of irregular shaped and minor areas, such as gore areas, road approaches, left turn channelization, and tapers.

Surface smoothness and good riding qualities of a pavement are secured only by hard work and strict attention to small details. The Inspector should continually study the conditions peculiar to the job, and strive to obtain the smoothest surface possible. A smooth riding pavement costs no more than an unsightly, poor surface, but it does require constant, careful inspection of all details of construction to obtain the desired results.

Section 5-04.3(13) of the *Standard Specifications* outlines the smoothness requirements using a 10 foot straight edge oriented in both the longitudinal and transverse directions. Smoothness checks should be made at the starting point of paving, at transverse “night joints”, whenever the paver is stopped for any length of time, or where ever the inspector suspects a smoothness problem.

5-4.2B(3) Compaction

General

Compaction of the HMA is very important in the construction of a durable pavement. When good compaction is coupled with the proper mix design, extended service life of the pavement can reasonably be expected.

The importance of thorough, compaction of HMA cannot be over stressed. Two major factors are working simultaneously in a well-designed mixture to resist good compaction - (A) the stability of the mix in place increases with each pass of the roller, and (B) the viscosity of the asphalt increases as the temperature drops. A temperature-viscosity curve for the type of asphalt used in the mix is a useful tool in determining the ideal compaction temperature of the mix.

Although densities for some HMA may be increased at temperatures below 175° F, vibratory rollers may damage the mat internally in ways that cannot be seen at the time of compaction. To prevent this damage, compaction with vibratory rollers is not allowed below the minimum specification of 175° F. When paving in air temperatures over 90° F, some or all of the compactive effort may have to be delayed, but in no case should it be delayed below 175° F mat temperature.

The desirable end point of a properly compacted HMA is a dense and nearly impermeable mat. Acceptable densities can be obtained if the mix proportions are proper. If not, no reasonable amount of compaction can produce acceptable density. Without proper density, the HMA will be subject to early distress and failure. Some mixes may be difficult to compact because they will move under the roller instead of compact. This is referred to as a tender mix and may result from several causes including gradation, fracture and asphalt binder properties. Mixes that have a gradation that crosses the max density line in the restricted zone or have excessive natural sand are more likely to be tender. Having available the 0.45 power plot of the design and production mixes will help the Inspector know what to expect in terms of compaction difficulty.

The asphalt binder content in a mix is based on several factors including traffic levels, aggregate structure and asphalt binder properties. The contractor develops the mix design to meet specific volumetric properties. Changes in the mix design asphalt content should only be allowed after careful consideration of all of the impacts. The Region Materials Laboratory is a good resource to contact when considering changes in the asphalt binder content.. Increasing the asphalt binder content on high traffic volume routes carries more long term performance risk than on low volume roads.

The use of thicker lifts of pavement permits more time for compacting and will increase the effectiveness of the equipment. With careful organization and planning, the production of over 400 tons per hour may be compacted by as few as three rollers on deeper lifts. It is also apparent that high production rates with thin lifts might require twice as many rollers or more. It is the Contractor's responsibility to determine how many rollers are needed to match the asphalt plants production rate.

Usually the Contractor has a companion group of rollers, pavers, and production equipment that is used together on paving projects and have proven to be compatible. By consulting with the Region Staff, it may be determined if the full complement is present or just what past experience has been. Before production begins, the Regional Materials Engineer should be notified to arrange for the coring of the pavement to correlate nuclear densities to core densities for calculation of a gauge correlation factor.

In general, compacting should begin on the outer edge of the course and progress toward the center of the pavement except on superelevated sections where the initial effort shall be on the lower side with the progressive compaction toward the higher side.

The type of rollers and their relative position in the compaction sequence shall generally be at the Contractor's option provided specification densities are attained and it's not specified otherwise in the contract provisions. An exception is that the pneumatic tired roller is required between October 1 and April 1. On wearing course, coverage with the vibratory or steel roller may precede pneumatic tired rolling. The maximum speed of rollers shall not exceed the recommendations of the manufacturer of the roller for the compaction of HMA. When requested by the Project Engineer the Contractor is required to provide a copy of the manufacturer's recommendations. When the roller reverses direction the vibrators turned off momentarily.

The vibratory roller is generally used for the primary compaction on ACP mixes and sometimes for finish rolling in a static mode. Two terms frequently used with vibratory rollers are frequency and amplitude. Frequency is how often the impacts are applied and is normally stated in cycles per second. Amplitude is the greatest vertical movement, up or down, of the drum during a cycle.

Vibratory rollers achieve their compaction effect from the kinetic energy produced by the vibrating components of the roller. Vibratory rollers usually work best when operated with high frequency and low amplitude on dense graded leveling and wearing courses. On hills, it usually works best to operate the vibrators only while traveling uphill. Over vibrating can cause decompaction. Operated in the static mode, despite their apparent bulk, they are less effective than even intermediate size conventional steel wheel rollers due to their lower mass.

Vibratory rollers may not be practical in areas where there are mortar joint concrete or certain other vintage pipe used for utilities or irrigation. Compaction can be achieved with pneumatic rolling if the mix is good. Elimination of vibratory rolling is not consistent with the *Standard Specifications*, and will generally require a special provision or change order before an alternate method of compaction is considered for use.

With pneumatic roller breakdown it will be necessary to hold in about 6 inches from unsupported edges to avoid lateral displacement. Keep the tires dry and the roller within 200 feet of the paver and in constant motion. A narrow overlap of successive trips is desirable. During the initial compaction, the rollers direction should be such that the

powered wheel passes over the uncompacted mix first. Breakdown tiller wheels will be turned the least possible amount in the uncompacted area and thereby avoid pushing and shoving the hot mat in a local area. Avoid stopping the roller in the same place. Continue pneumatic breakdown rolling until deep tire tracks are ironed out as much as possible and the roller walks out to the top of the mat, and then move ahead. The most desirable arrangement is to have two similar pneumatic rollers about 6 feet wide with the "air-on-the-run" feature and posi-traction type differential followed by a tandem steel wheel roller. The steel wheel roller should follow closely behind the pneumatic roller to compact the centerline joint and the edge of the pavement as well as iron out the pneumatic tire marks. The steel wheel roller will exert extra pressure on the uncompacted edge and should have no difficulty in properly compacting this edge if the roller is close behind the pneumatic rollers. Cold rubber tires usually "pick" the mat. Every effort should be made to warm the tires before compacting the mat. Sending the rollers for a drive before the work is fully organized prior to paving will help with the tires.

The axles of the roller are weighted by the use of iron pigs, chain, rivets or other concentrated loading in addition to the usual water and aggregate tank loading to control the total roller weight. Ground contact pressure is determined by the tire inflation pressure, a ground contact pressure of 70 psi is a reasonable pressure to start with. Variation in the mixture and tire pressures will soon determine the most desirable combination of mixture, temperature, contact pressures and number of applications.

Steel wheel rolling is generally used for finish rolling; however, it is sometimes used for breakdown and primary compaction. It is important that vibratory roller operation on pavement with temperatures below 175° F not be permitted. Over-rolling by the steel wheel roller may damage the pavement more than under-rolling.

Preferably, rolling equipment should be wide enough so that a uniform application of compactive effort can be distributed over the entire course without creating hard streaks or leaving narrow porous strips. Breakdown and intermediate rolling should be completed while the mixture is above 185° F with the finish rolling completed above 150° F. With lower temperature mixes and thin lift applications it becomes obvious that the rollers must be kept up close to the paver.

Compaction Test Sections

Compaction of HMA is an important part of paving and the construction of a compaction test section can be a key component in achieving the proper density.

For HMA requiring a specified level of relative density a compaction test section may be constructed prior to production paving at the Contractor's option. If the contractor elects to not construct a test section for compactibility of the mix, the mix is considered compactible. Equally important for a Contractor to construct a test section(s) is to determine what rolling pattern with his compaction train will give best results. Test sections are financially important to both WSDOT and the contractor and therefore need careful attention. Although it is the responsibility of the contractor to show that a mix is compactible and determine the rolling patterns, it is to WSDOT's best interest to assist in construction of test sections.

When the compacted course thickness of HMA is 0.10 foot or less for any mix in the traffic lanes, or when paving shoulders and other nontraffic lane areas, regardless of course thickness, a test section will be constructed to establish a rolling pattern. The test section shall be constructed in accordance with the following instructions (Steps 1 through 6) except that the proposed rolling pattern and equipment shall be used. The number and timing of passes with an approved compaction train that will yield the maximum density as determined in the test section, is the determining factor that adequate density is being achieved.

When paving with prelevel a test section will not be required. The test section(s) provide for varying compactive efforts. If the compaction equipment and compaction conditions are right, values should increase with increasing number of roller passes. Ideally, the values should rise until a maximum compacted mat has been reached and then flatten out as compactive effort increases. An exception to this can occur when the vibratory roller is used as it can pull the mat apart and lower the density if operated after the temperature cools to below 175° F. If the mat does not react to the compactive procedures described, then the Inspector should review the directions for test procedures to ascertain what corrective action to take.

The procedures for a test section are as follows:

1. Select a test section on a reasonably level portion of the project providing a consistent paving depth and uniform underlying conditions.

2. Compaction equipment used in the test section should be the most effective units. Pneumatic tired rollers and/or vibratory equipment in the vibrating mode are normally the most effective units.

3. Select a section approximately 200 feet long of course thickness depth.

4. Select a test spot within the section near the center of the traveled lane and near the middle of a truckload discharged to the paver. Avoid longitudinal ruts or nonrepresentative locations (severely alligatored, patched pothole).

5. After each roller pass, a density reading is taken with the nuclear gauge at the test spot.

6. After finish rolling, densities are then to be determined at two additional locations, 15 to 25 feet each side of the test spot and in line longitudinal with the direction of paving. Evaluation of the compactibility of the mix shall be made on the average of the three densities.

7. If the average test spot density is greater than 92 percent, but less than 96 percent of Rice density for wearing courses or less than 98 percent of Rice density for base and leveling courses, a satisfactory test section has been completed. If the test section values are beyond these limits, the mix design should be changed. The State Materials Laboratory can provide assistance as needed.

The test section should be repeated when:

1. The results of previous tests are not considered by the Engineer to be reliable.

2. The Engineer directs a change in mix composition. Note that slight adjustments in bin masses are not considered a change in mix composition.

3. Routine control tests indicate changes from results found in previous qualifying test sections. (In this instance, the Inspector should check the contractor's rolling pattern for changes and check plant test results for mix changes. Any changes should be noted on the compaction report.)

Compaction Control

Compaction is controlled by testing with the nuclear density gauge for all classes of HMA where the paving is in the traffic lanes and compacted course thickness is greater than 0.10 foot. The nuclear gauge testing shall be conducted in accordance with current test methods. The specification requirements shall be a quality level of 1.00 or greater referenced to a minimum density of 91 percent of the maximum density (Rice density) as determined by WSDOT FOP for AASHTO T 209.

Cores of the finished pavement may be substituted for nuclear gauge readings to determine densities, provided they are requested by the Contractor by noon of the next day after paving. If this alternate is done at the request of the Contractor, and the cores show the materials to be outside specification limits, WSDOT shall be reimbursed for the coring expenses at the rate of $125 per core. If the cores show the materials to be within specification limits, then there will be no charge for the cores.

Control lots not meeting the prescribed minimum density standard of 0.75 CPF need to be evaluated for removal and replacement with satisfactory material. At the Engineer's option, control lots with a CPF between 0.75 and 1.00 may be accepted at a reduced price in accordance with current policies.

For preleveling mix, the compaction control shall be to the satisfaction of the Engineer.

Compaction control for longitudinal joints is controlled by testing with the nuclear density gauge in accordance with WSDOT SOP 735. The specification requirements shall be a minimum density of 90.0 percent of the maximum density as determined by WSDOT FOP for AASHTO T 209.

At the request of the Contractor, cores of the finished joint may be substituted for nuclear gauge readings to determine densities. WSDOT will accept test results for cores taken and tested by an independent AASHTO R18 accredited testing laboratory. If this alternate is used, the Contractor shall bear all expense including coring, traffic control, and testing.

For all other conditions, the Contractor shall construct a test section in accordance with instructions from the Engineer. The number and timing of passes with an approved compaction train that will yield maximum density with the nuclear gauge in the test section shall be used on all succeeding paving. The Inspector should make sure the Contractor is making the required number of passes and reconstruct a test section if conditions change.

5-4.2B(4) Miscellaneous Duties of the Street Inspector

When constructing plant-mixed pavement adjoining gutters, curbs, cold pavement joints, manhole castings, etc., the Inspector shall see that all contact surfaces are painted with an approved asphalt material before placing the adjoining pavement.

A detailed Inspector's Daily Report (Forms 422-004, 422-004A, and 422-004B) shall be kept by the Inspector, noting all unusual occurrences, orders received from the Project Engineer, orders issued to the Contractor, and other pertinent information.

The Asphalt Concrete Pavement Compaction Report, Form 350-092, shall be prepared by the Density Inspector and distributed as shown on the form.

5-4.2B(5) Multiple Asphalt Plants

When two or more asphalt plants are used on one project, the mix from each plant must be placed with separate paving machines and compaction equipment. This is necessary because of the required adjustments on each paving operation to accommodate the different mixes and the various rolling patterns that may be necessary. Otherwise the test sections would not reflect true data for compaction controls due to different characteristics for the different aggregates or asphalt plants.

5-4.2B(6) Weed Control Under Asphalt Pavement

Weeds cause considerable damage to thin asphalt pavements such as sidewalks, shoulder overlays, and asphalt lined ditches. It is typically recommended that chemical weed control be used under all asphalt pavements less than 0.35 foot in depth unless a full depth base preparation was included in the construction. Check the contract requirements to see if soil residual herbicide is required.

5-4.2C How to ...

Calculate Approximate Paver Speed for Continuous Operation

To assist in working with the Contractor to determine paver speeds, the following formula can be used to calculate approximate speeds required to handle various production rates at varying depths. Section 5-04.3(3) of the *Standard Specifications* requires the paving machine to be operated at a uniform speed consistent with the plant production rate and compaction train capacity, which will allow a smooth, *continuous* paving operation.

$$S = [(T \div 0.076) \div (W * D)] \div 60$$

where:
- T = Tons per hour
- W = Width in feet
- D = Depth in feet
- S = Paver speed in feet per minute

Based on 2.052 tons per c.y. = 0.076 tons per c.f.

Compute Yield
During the paving operation, a careful record shall be kept, showing truckloads, the weight of each truck and other pertinent data. Periodically, the Inspector shall compute the quantity of mix placed per square yard, and shall compare the yield against the proposed quantities. Overruns or underruns in quantities may be avoided by making a constant check of quantities placed.

HMA pavements are designed on a weight-volume relationship of 137 pounds for one square yard of pavement of a compacted depth of 0.10 foot. It is the intention in the construction of the pavement to spread the mixture according to an average yield in pounds per square yard.

Remember that the minimum compacted depth of pavement must also be met. If the aggregates are heavier than anticipated when the quantities were computed, or if the surface that the pavement is being constructed on is not true, the average yield can be attained without meeting the minimum thickness requirement.

Weigh tickets shall be collected and a daily total weight of mixture received shall be obtained and entered on the daily report for submission to the Project Engineer. To eliminate possible errors, totals as recorded by the Plant Inspector shall be compared against the total obtained by the Street Inspector. Careful attention given to those details may save argument with the Contractor concerning pay quantities.

Determining Minimum Lift Thickness
On occasion, the thickness of an individual lift of HMA is not specifically indicated on the roadway sections, or a contractor requests permission to place the HMA in more than one lift. Although maximum lift thickness is specified in the *Standard Specifications*, there is no guidance as to the minimum.

Lift thickness is governed by aggregate size. Adequate lift thickness ensures proper aggregate alignment during compaction, so that density and an impermeable mat can be achieved. Lifts placed too thin can lead to aggregate segregation, tearing, more rapid cooling and it is generally more difficult to achieve proper density and pavement smoothness. As a guide, the following table may be used to determine the minimum lift thickness for the various classes of mix.

HMA Class	Minimum Lift Thickness (feet)
Superpave ⅜”	0.08
Superpave ½”	0.12
Superpave ¾”	0.20
Superpave 1”	0.25

5-4.3 Mix Design

Establishing Mix Proportions
The Contractor is required develop a mix design for each of the classes of HMA in the contract. When the contractor has completed a mix design it is submitted to the Project Engineer along with representative samples of the mineral materials that will be used for HMA production. The mix design and samples are shipped to the State Materials Laboratory in Tumwater for verification of the mix design.

During production it may be necessary to make adjustments in aggregate gradation and asphalt content on the job to fit field requirements such as workability, compactibility, and volumetric properties (Va, VMA and VFA). Section 9-03.8(6)A of the *Standard Specifications* provides the limits of change, both for the aggregate and the asphalt binder content, that can be approved by the Project Engineer. These changes can be made at the request of the contractor provided the change will produce material of equal or better quality. The Project Engineer may order a change in the asphalt binder content.

Adjustments for asphalt binder content greater than ± 0.3 percent may be approved by the State Materials Laboratory or the State Construction Office. Based on past experience in the Region, the Regional Administrator or the Regional Construction Engineer may wish to change the asphalt content beyond the ± 0.3%. To accomplish this, the Region may direct the Project Engineer to increase or decrease the asphalt content by notifying the Project Engineer in writing, or by e-mail, and sending a copy of this direction to the State Materials Laboratory. It is intended that this action include consultation with the State Materials Laboratory or the State Construction Office to provide the best asphalt paving material possible.

During construction, guidance for adjustments is provided through the use and interpretation of the compaction test sections and compaction control testing results.

The Contractor’s plant operator shall be advised of all results of sampling and testing performed so that the proper gate settings may be established at the cold aggregate feeders.

5-5 Cement Concrete Pavement

5-5.1 General Instructions

Concrete paving is a highly complex, mechanized operation and proper organization and planning of the work is essential on the part of both Contractors and WSDOT. Cement concrete pavement has a relatively high initial cost and WSDOT expects many years of satisfactory service from this type of pavement. It is imperative that the Project Engineer and Inspectors are thoroughly familiar with the specifications and techniques applying to the work, if this objective is to be attained.

Before construction begins, the Project Engineer should review all phases of the work, and see that all members of the crew are familiar with the duties to which they are to be assigned. Advance planning and organization of the engineering and inspection teams will do much to eliminate the confusion and improper construction sometimes found during the first day’s work. All inspection equipment and testing tools should be on hand, and properly calibrated or certified, in advance of beginning of paving, and WSDOT materials testers properly qualified to perform the necessary concrete testing.

The Project Engineer should make certain that all Inspectors are instructed in the proper methods of keeping notes, records and diaries. Accurate records of construction progress and test results are absolutely essential in evaluating pavement performance through the years.

5-5.2 Pre-Pave

5-5.2A Subgrade Preparation

The subgrade should be shaped and thoroughly compacted. Special attention should be directed to see that all parts of the subgrade are firm and unyielding. Soft spots should be removed and backfilled with suitable material. *Standard Specifications*, Section 5-05.3(6) requires that the subgrade be prepared and compacted a minimum of 3 feet beyond each edge of the area to receive the concrete pavement in order to accommodate the width of the slip form paving equipment. The 3 foot extensions on each side of the subgrade are tracklines that the slip form paving machines tracks will follow, and the smoothness of the tracklines directly affects the smoothness of the concrete pavement.

The subgrade must be trimmed to the proper subgrade elevation and shape. After trimming, the subgrade shall be thoroughly wetted and compacted to achieve a dense unyielding surface. The subgrade must be kept in this condition until the concrete is placed.

The elevation of the subgrade should be checked either by stretching a stringline between the control wires and measuring down to the surface or by another method that provides for a satisfactory check. Extra checks should be made through crown and super transitions to be sure proper adjustments were made in the machine through this area and that no high spots exist.

5-5.2B Controls

If control stakes have not been set for previous operations, they need to be installed at this time. If the control stakes have previously been set, the installation of the wire shall be checked to verify that it is set to the proper line and grade. This is especially important if the wire is offset from its original position.

5-5.2C Equipment

Batch Trucks
Nonagitating trucks are permitted to haul plant mixed concrete provided the concrete is delivered and discharged within 45 minutes after the introduction of mixing water to cement and aggregates, and the concrete is in a workable condition when placed Paver.

The slip form paving equipment must be self-propelled and capable of placing, spreading, consolidating, screeding, and finishing the freshly placed concrete to the proper pavement elevation and cross-section within the specified tolerances. Sliding forms on the paver must be rigid to prevent spreading of the forms. The paving equipment must finish the surface in a manner which will minimize hand finishing.

Slip form pavers contain various combinations of all or some of the following components: auger spreader, spud vibrators, oscillating screeds, tamping bars, and pan floats. The equipment should be checked for calibration and satisfactory operation in accordance with the manufacturer's manual before paving is allowed to proceed.

If it is necessary to stop the forward movement of the paver, the vibratory and tamping elements should also be immediately stopped. No tractive force should be applied to the machine except that which is controlled from the machine.

5-5.3 Paving

5-5.3A Preparation

Ahead of the paving operation, the subgrade must be properly prepared with some type of "fixed" control template to accommodate the width of the paver. The subgrade must be properly dampened so as to have no water demand from the mix, but, also, the concrete must not be placed on subgrade on which pools of water have formed. If concrete is delivered by trucks on the grade, subgrade disturbance should be kept at a minimum.

A very important factor in obtaining a superior product with slip form paving is uniformity of operation. The Engineer should ensure that the plant, mixing facilities and hauling units are in quality and quantity balance to supply the paver with an adequate quantity of concrete for continuous operation at the recommended speed, without sacrificing uniform slump. Considerable pavement roughness can be attributed to spasmodic operation, and this should be held to a minimum.

It is very important that uniform consistency of the concrete be maintained with the water/cementitious ratio not exceeding 0.44 and the edge slump not exceeding ¼-inch. The *Standard Specifications* requirements for the water/cementitious ration is in Section 5-05.3(2) and the edge slump requirement is in Section 5-05.3(11). The current requirements for water/cementitious ratio and edge slump are intended to control consistency.

5-5.3B Placing

As paving progresses, the Inspector should be alert to the wire position just ahead of the machine, since the most precisely set control can be disturbed by workers or equipment hitting it. If you notice anyone or anything bumping, touching, leaning on or otherwise in contact with the control wire, notify the Contractor immediately. It is much easier to correct a misaligned control wire than repair the pavement after it has been placed.

The unconsolidated concrete in front of the paver should be kept well distributed by spreading or by dumping. As the truck or mixer discharges the mix onto the grade in front of the paver, the forces delivered to the machine should be held to a minimum, with all systems functioning as designed. If the paver is not moving, the vibration should be off. When vibration is in progress, it is important that the concrete becomes uniformly plastic for the full slab width as it passes through the vibration area. A lack of consolidation at one position on the machine could cause a potential fracture line parallel to the direction of movement and also a rough and uneven finished surface. The head of material in front of the paving machine should always be in accordance with the manufacturer's recommendation.

It is possible that experimentation may be necessary at the beginning of paving. To start, no trailing forms should be used on the machine and all finishing equipment should be engaged. This could then be modified if problems occur. One of the prime contributors to edge slump is high slump concrete. This should not be tolerated. Another is tie bar insertion for abutting lanes, which should be installed ahead of the final finishing.

Edge slump of the unsupported sides behind the paver is one of the major problems to be combated on slip form paving. The surface should be immediately straight edged by the Contractor and methods corrected to deliver a consistently true edge. Trailing forms can be used to give support beyond the length of the paver, but this may not be the answer. It is possible that more damage than good is done by trailing forms in some cases, by drag resistance pulling down the edge, or by mechanical vibration transmitted through the paver linkage to the form. This comment is also applicable to a trailing finisher. Remember that the concrete is between the moving forms only a few minutes and does not take its initial set until long after the forms leave it.

If water is added to the surface from a spray bar at the rear of the machine it should be in the form of a fine fog spray to avoid washing of the surface and extreme care must be exercised to see that the amount of water added is held to a bare minimum. Addition of excessive amounts of water during finishing will weaken the surface of the concrete and may result in hair checking or scaling of the pavement surface at an early date. If a considerable amount of water is continually required to finish the concrete, it may be better to add more water to the concrete mix to reduce the need for spraying water on the surface. Rain on a green unformed slab can cause disastrous edge slump and erosion. The Contractor should be encouraged to halt operations previous to this circumstance, and should be prepared to protect the pavement at all times.

Soon after the paving starts, and periodically thereafter, the slab template should be checked to insure that the "dry" template has not changed. This is done by stretching a line over the transverse wires and measuring down. This check should also be made through curves and transitions to ensure that the proper section adjustments are being made.

The slip form paver behaves similarly to an asphalt paver with the front probe approximately $^{3}/_{16}$-inch higher than the rear. This will probably vary with the machine, due to mass distribution, etc.

Slope of less than this produces an unstable characteristic and an undulating profile, slopes in excess of the correct one cause the machine to repeatedly build up and then slump down. If the symptoms occur, this is one place to check. The machine also has about ¾-inch convergence in the sides, to encourage stability. Hand finishing, water adding, and other surface manipulation should be kept at a minimum.

5-5.3C Installing Tie/Dowel Bars

Tie/dowel bars must be installed where specified in the *Standard Plans (See Standard Plan Series A-40 and A-60)*. Tie bars must be placed so that equal lengths of the bars project into the two lanes of adjoining pavement. When paving two or more lanes at a time, the tie bars are placed at the juncture of the lanes by mechanical means. The Inspector must be alert to see that the bars are set at the proper spacing and depth and are properly centered between the two lanes.

When placing tie/dowel bars in the edge of a slab, the ends of the bars projecting from the forms should be protected against disturbance that might destroy the bond between the concrete and steel. The bars already in place shall be bent to lie close to the slab to permit preparation of the subgrade of the adjoining lane, and carefully straightened to their proper position before placement of concrete.

5-5.3D Finishing

After the concrete has been given the preliminary finish by the paving machine, minimal hand finishing may be required before the Contractor checks the surface with a straightedge device not less than 10 feet in length. High and low areas indicated by the straightedge shall be corrected. The requirements of checking the surface with the straightedge may be waived if it is demonstrated that other means will consistently produce a surface that meets the requirements for surface smoothness.

The pavement shall be given a final finish by texturing with a comb perpendicular to the center line of the pavement. The comb shall produce striations approximately ⅛-inch to $^{3}/_{16}$-inch in depth in the fresh concrete with random spacing of the striations from ½-inch to 1¼-inch. It is important that the comb be used when the concrete is at the proper consistency. If the concrete is too soft, it will not retain the proper texture obtained by the comb, and if the concrete is too hard, the proper texture will not be achieved. The comb should be set up and ready to use well in advance of the time it will be required.

5-5.3E Curing

Immediately following final finishing of the concrete or after free water leaves the surfaces, the curing compound should be applied. The purpose of curing, whatever method is used, is to prevent the loss of moisture required to hydrate the cement so that the concrete will gain its proper strength and durability. It is essential that a complete coverage of curing compound be applied to seal the exposed surface of the pavement.

On most paving work, specifications will call for machine application of the curing compound. It should be seen that the spray nozzle is adequately protected from the wind by shielding so that the compound is not blown off the pavement surface. The Inspector shall check to see that the specified rate of coverage is obtained.

The efficiency of the curing compound in preventing escape of moisture from the concrete is dependent upon the thickness of the membrane. For this reason, it is essential that the compound be evenly applied over the exposed surface at a rate of 1 gallon to not more than 150 square feet. Refer to *Standard Specification*, Section 5-05.3(13) for additional requirements for curing.

The curing membrane must be protected from damage by foot traffic or equipment. There is a certain amount of foot traffic required in sawing joints, operating the profiler and other operations. This traffic should be held to a minimum, and if damage from undue scuffing or other causes does occur, the area shall be re-sprayed with the required amount of curing compound. Care must be exercised so that curing compound is not sprayed into saw cuts, as the joint sealing compound will not adhere to the concrete in the joints if the curing compound is present.

When pavement is being constructed in early spring or late fall, the Engineer must be alert to predictions of freezing weather, and see that the Contractor is prepared to protect the fresh concrete from freezing, as required in Section 5-05.3(14) of the *Standard Specifications*.

When special protection against freezing is required, the protective earth or straw covering must be placed against the sides of steel forms, if used, as well as on the surface of the pavement, since steel offers poor insulation to the change in temperature.

5-5.3F Joints

Contraction Joints

As concrete cures and hardens, a change in volume occurs due to loss of moisture and cooling. This shrinkage results in tensile stresses being set up in the pavement, causing cracks to develop. History has shown that transverse cracks will develop at about 15 foot intervals along the length of a slab, and that a slab wider than 15 feet may crack longitudinally. The spacing for transverse contraction joints is a maximum of 15 feet; see *Standard Plan A-40.10-00* for more information on spacing of transverse joints.

The purpose of contraction joints is to control the cracking of the concrete, thereby preventing ragged random cracks that spall and require expensive maintenance. Good construction of these joints is of the utmost importance, and inspection of this work is one of the most important phases of the Engineer's duties.

Contraction joints are weakened planes that collect the cracking into a controlled joint. These joints are made by sawing and pouring a hot or cold filler into the joint. The purpose is to create a maintainable joint in the slab and cause the crack to form along the plane of the joint.

This type of joint is constructed by sawing a groove in the hardened concrete to create a plane of weakness along which the crack will form. The saw cuts are made with the circular saw blades edged with diamonds. On full width construction, a gang sawing machine using several blades simultaneously is generally used to saw the transverse joints. When the gang sawing machine is used, the Inspector must see that the individual blades are properly aligned and set to cut the required depth.

It is necessary to control the time of sawing transverse joints very carefully, so that sawing may be done when concrete has hardened as much as possible without delaying so long as to allow development of random cracks. It is impossible to state a sawing schedule that will be ideal for every job, since curing conditions vary a great deal from job to job. Some generalizations can be made concerning sawing, but the Contractor on each job must determine from experience the most suitable schedule for that job.

It is desirable to delay sawing as long as possible to allow the concrete to gain enough strength to resist raveling adjacent to the saw cut. Sawing green concrete produces excessive wear on the saw blades, and causes washing, raveling, and other structural damages to the concrete near the joint. However, it may be necessary to make some early cuts to control cracking.

In general, a program of sawing control joints should be followed, sawing every fifth joint, not to exceed 64 feet, as soon as the concrete hardens sufficiently to resist excessive raveling. The beginning of sawing may vary depending on the type of base, concrete mix characteristics and weather. Sawing of the intermediate joints should follow the sawing of the control joints. It will usually be found possible to delay sawing the rest of the joints until the day following placement of the concrete (see *Standard Plan A-40.10-00* for more information).

By observing the frequency of cracking and opening of joints the next day, it will be possible to lay out a sawing schedule that will give best results. If only the control joints are cracked, the sawing of the intermediate joints can be delayed further, given fairly constant weather conditions.

The Contractor should mark off the locations of the transverse joints and the inspector should check the spacing and frequently check to see that the specified depth of cut is sawed. The locations of the dowel bar baskets need to be marked on the grade prior to the dowel bar baskets being covered by the concrete pavement in order to correctly locate the transverse joint saw cut in the middle of the dowel bars. Since much of the sawing will be done at night, the Inspector should be equipped with a good flashlight to properly examine the condition of saw cuts and to watch for random cracks.

When paving a lane adjacent to a previously paved slab, an early morning examination of joints in the existing lane will show the joints that are open and working. These locations should be marked for sawing control joints in the second lane. Friction at the construction joint and the tie bars will transmit stresses to the new slab and may cause random cracking to occur. For the same reason, uncontrolled cracks in the first lane should be matched with a control joint in the second. In addition, when cement concrete pavement is placed adjacent to existing cement concrete pavement, the vertical face of all existing working joints shall be covered with a bond breaker, such as polyethylene film, roofing paper or other material as approved by the Engineer to prevent uncontrolled migration of the crack into the adjacent slab (See *Standard Specifications*, Section 5-05.3(8)A for more information). If the Contractor proposes to use material other than polyethylene film or roofing paper as a bond breaker, the Project Engineer shall consult with the State

Construction Office on the suitability of the proposed bond breaking material.

Isolation Joints
Drainage features and manholes placed within the concrete pavement are likely to cause a crack to develop in the concrete and need to be isolated from the rest of the concrete pavement by some type of premolded joint filler. Consult the contract plans and or Standard Plans for details. If no details are found contact the State Construction Office for guidance.

Construction Joints
A construction joint shall be made at the end of each day's paving by placing a header board transversely across the pavement. Uncapped dowel bars should be installed in the joint, seeing that the dowels are parallel with the centerline and profile of the pavement. The ends of the dowels projecting from the header should be protected so that they will not be disturbed or moved from their correct positions.

Prior to beginning paving the following day, any broken curing seal on the end of the previous day's work must be re-sprayed with curing compound, and exposed dowel bars shall be coated with a parting compound, such as curing compound or grease to allow for future slab movement.

5-5.3G Smoothness

In general, the paving contractor is responsible only for the pavement placed by them. This includes the smoothness of the pavement on both sides of any and all joints constructed. On the other hand, the Contractor would not be responsible for pavement placed by another contractor or if the work abuts a bridge or approach slab constructed on a separate contract. When leaving or approaching such joints, the center of the profiler will be started or stopped on the pavement to be profiled at a point approximately 15 feet from the joint. The remaining areas that are unprofiled would be checked for smoothness with the 10 foot straightedge in accordance with current practices used on bridge decks.

Since the primary goal is to obtain a smooth pavement, it would be advisable to run the profiler over the joints at the beginning and end of the project, as well as any intermediate joints as described above, and exclude these readings from the profile index. Should these areas meet straightedge tolerances, but not that for the profiler, consideration should be given to grinding which would be performed at WSDOT's expense.

Section 5-05.3(12) of the *Standard Specifications* requires that the pavement smoothness be checked with equipment furnished and operated by the contractor, in the presence of the Engineer, within 48 hours following placement of the concrete to determine whether the equipment and methods used by the contractor are producing a pavement meeting the smoothness required by the specifications. A computerized recording profiler meeting the requirements of Section 5-05.3(3)E of the *Standard Specification*s, is required to be used. For the purposes of determining the "daily profile index", two or more profiles may be averaged together (see example in WSDOT Test Method 807). The "daily profile index" may also be used to identify those areas having high points in excess of 0.3 inches which must be reduced by abrasive means until reruns of the profiler indicate the area does not exceed the allowable deviation. The longitudinal "profile index" of the pavement is based on the elevation of any point on the pavement relative to the elevation of points 12.5 feet ahead of and behind the point. This is measured by a 12 wheeled vehicle having a 25 foot wheelbase and a reference wheel, free to move in a vertical direction, suspended midway between the outer wheels. The vehicle is calibrated to record longitudinal travel and vertical variations in elevation on a continuous strip chart as it traverses a section of pavement. The "profile index", which is determined from the recorded chart of each 0.1 mile section, is defined as the cumulative total of recorded elevation extremes above or below a standard variation of ±0.1 inch.

For example, if the chart for a 0.1 mile section showed all elevation extremes to be within the +0.1 inch standard, except for 2 points which measured +0.2 inch and +0.3 inch respectively, the "profile index" would be 0.3 inch per 0.1 mile, or 3 inches per mile.

The "daily profile index" may be used for acceptance purposes should the various individual indexes used to determine the "daily profile index" not exceed 0.7 inches per any 0.1 mile section or 7 inches per mile.

Grinding depths should be limited to ⅜ inch. If the specifications cannot be met with this, the section should be removed. Low areas which grinding cannot feasibly remedy shall be sandblasted, filled with epoxy bonded mortar and textured by grinding. The epoxy bonding agent shall meet *Standard Specification* Section 9-26.1(1)B for Type II epoxy. Areas which exhibit improperly finished surfaces and would require extensive patching should be removed at the Engineer's discretion.

5-5.4 Post Paving

5-5.4A Repair of Defective Pavement Slabs

Broken slabs, slabs with random cracks, nonworking joints near cracks, edge slumping and spalls along joints and cracks must be replaced or repaired prior to completion of joint sealing. Areas of concrete pavement that are identified as needing replacement or repair need to be reviewed by the Project Engineer to determine if a repair or replacement of the concrete is most appropriate in accordance with Section 5-05.3(22) of the *Standard Specifications*. There are times that small defects or spalls in the concrete should not be repaired as the repair is worse than leaving small defects or spall alone. The Project Engineer shall consult with the State Construction Office in making the determination on which areas should be repaired, replaced or leaving small spalls or defects alone.

5-5.4B Sealing Sawed Contraction Joints

Prior to opening of the pavement to traffic, sawed joints must be sealed with an approved type of filler material. Before application of the filler material, the joints must be thoroughly clean and dry. The saw shall be free of dirt and dust and may be cleaned with a jet of compressed air. It is important that the saw cut be completely filled to within ¼ inch to ⅝ inch below the top of the concrete surface with the joint filler material. The Inspector can check this by probing the joint after sealing with a stiff wire and watching for sagging of the filler below the top of the joint.

5-5.4C Thickness

Section 5-05.5(1) of the *Standard Specifications* outlines procedures for thickness determinations and provides penalties when prescribed tolerances are exceeded. Before final payment, the pavement thickness will have to be determined in order to calculate the quantities.

5-5.4D Opening to Traffic

Standard Specifications Section 5-05.3(17) covers the requirements for opening cement concrete pavement to traffic. During the curing period designated for the concrete mix, the pavement must be properly barricaded to close it to all traffic. If necessary, the Contractor may be required to furnish a person to prevent traffic from using the pavement.

When the pavement has developed a compressive strength of 2500 psi, as determined from cylinders made at the time of placement, it may be opened to traffic. The pavement should be cleaned either by brooming or a pickup sweeper prior to opening.

5-5.5 Stationary Side Forms

5-5.5A Forms

Metal side forms or other forms approved by the Engineer, conforming to the requirements of Section 5-05.3(7)B of the *Standard Specifications,* shall be used for the construction of cement concrete pavement when a slipform paving machine is not used unless the Contractor requests to use an approved slip form machine.

It is essential that the base of the forms used have full, equal bearing upon the subgrade throughout their length and width. The forms should be set true to alignment and grade and firmly staked with steel pins to avoid movement. The forms must never be set on blocks or pedestals. After the forms are firmly staked in place, a final inspection of line and grade should be made by sighting along the tops of the forms. Minor adjustments in grade can be accomplished by tamping additional subgrade material under the form base by an approved mechanical form tamper or by inserting small leveling wedges under the forms. It is important that the leveling wedges do not protrude into the cement concrete pavement so as to prevent uncontrolled cracking in the concrete pavement at the locations of the wedges. A small amount of concrete may seep under the forms and this concrete needs to be removed flush with the vertical face of the existing concrete pavement prior to placing new cement concrete pavement next to existing concrete pavement.

If major changes in alignment or grade are required, the forms should be removed and the subgrade reshaped to the proper elevation and recompacted before resetting the forms.

5-5.5B Joints

Longitudinal and transverse contraction joints will be provided by saw cutting the surface in accordance with Standard Specifications Section 5-05.3(8) to the depth specified in *Standard Plan A-40.10-00*. The joints shall match transverse joints on adjacent concrete pavement and be at 15 foot intervals transversely on other areas.

5-5.6 Testing Equipment/Reports

5-5.6A Testing Equipment

Specified screens, sieves, and scales

Air meter

Straightedges and stringlines

Thermometers

Cylinder molds for casting concrete test specimens

Stop watch

Flashlights

5-5.6B Records

The Project Engineer is responsible for the keeping of proper records that must include the following information:

Record of cement received and used

Screen analysis of aggregates (see Chapter 9)

Air-entraining agent used, and air meter test results

Rate of application of curing compound

Inspector's diaries

5-5.7 Check Lists

For the convenience of the Inspector, some of the most important inspection duties on concrete paving work are listed below:

Pre-Pave

1. Review contract requirements (plans, standard specifications, amendment to the standard specifications, and special provisions)

2. See that all testing tools and equipment are on hand and in good condition. Working with the Contractor, determine location(s) for the Contractor provided curing box(es) used for initially curing concrete test cylinders (See *Standard Specifications* Section 5-05.3(4)A).

3. Check preparation of subgrade; watch for soft spots. Check subgrade elevations to ensure there are no high or low spots, Section 5-05.3(6). If HMA pavement placed on subgrade prior to PCCP, refer to Section 5-04 for HMA requirements.

4. Check that forms are in good condition and are set securely, true to line and grade, Section 5-05.3(7)B. If a slip form paver is used, check position of wire, string line across the wire and check the depth to subgrade or HMA pavement in at least three locations across the proposed paving area at each pin location.

5. Check that subgrade or HMA is moist before the concrete is placed, Section 5-05.3(6).

Paving

6. Watch for variations in slump of mixed concrete batches, Section 5-05.3(2). In the case of slip-form paving, make frequent checks of the condition of the wire and edge slump, Section 5-05.3(11).

7. Make tests of air content, temperature, compressive test cylinders, and make complete, accurate records of test results and computations, Section 5-05.3(4)A, 5-05.3(5)A and Chapter 9. If maturity meters are used, document locations and periodically check output against maturity curve

8. Check tie bars and dowel bars for rust and defects, that they are installed properly, and secured to the grade if placed in baskets. Ensure that dowel bars receive a bond breaker if they are not precoated, Section 5-05.3(10).

9. Watch for excessive movement of forms under weight of concrete paving equipment.

10. Check frequently to see that vibrators are operating properly, Section 5-05.3(7). If a dowel bar inserter is used, check spacing and alignment of dowel bars. Ensure that PCCP is consolidated after the bar is inserted and that slurry does not fill the insertion point.

11. Watch finishing operations to make sure excessive amount of water is not added to surface; allow fine spray only to be used, Chapter 5-5.3B

12. Check the surface texturing operation to see that proper, uniformly textured surface is obtained, Section 5-05.3(11).

13. See that curing compound is placed uniformly, at the required rate, and at the proper time. The curing compound needs to completely coat the surface of the concrete, Section 5-05.3(13)A. Note other curing methods are allowed in *Standard Specifications*.

14. See that concrete is consolidated properly at night headers, Section 5-05.3(8)C.

Post Pave

15. Inspect joint sawing operation to see that required depth is cut, and that the best possible saw cuts are obtained, Section 5-05.3(8)A.

16. Watch removal of forms; see that damage to pavement does not occur; require curing compound to be applied on edge of slab immediately following form removal, Section 5-05.3(7)B.

17. See that additional curing compound is applied over areas scuffed by foot traffic.

18. Check that pavement is protected from traffic with necessary barricades, lights, etc, Section 5-05.3(16).

19. Check that sawed contraction joints are sealed properly with joint sealant filler. Fill to between ¼-inch and 5/8-inch below the surface of the concrete and minimize any overflow, Section 5-05.3(8)B.

20. Review surface smoothness tests each day, Section 5-05.3(12).

Note: *"Section" references are to the Standard Specifications and "Chapter" references are to the Construction Manual.*

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6-1 Structures, General Requirements

6-1.1 Bridge Construction De-Briefing Session

In an attempt to continually improve the quality of bridge contract plans, specifications and estimates and to obtain feedback on engineering and construction practices, the Bridge and Structures Office is available to assist in conducting post construction De-Briefing Sessions for "Capturing Lessons Learned". The purpose of these De-Briefing Sessions is to provide designers with feedback on positive things that worked well and things that could be improved.

The Project Engineer, Bridge Technical Advisor, or Bridge Design Unit Manager should consider initiating a De-Briefing Session on those projects where they feel feedback to the designers would benefit the quality of future construction plans. Suggested projects include Bridge Rehabilitation Projects, Bridges with complex staging, substructure conditions, or new material applications. Suggested attendees at these sessions should include Region Project Office Staff, Headquarters Construction, Bridge and Structures Office, Design Consultants, and the Contractor involved in the structural work.

The Bridge and Structures Office will assist the Project Engineer in organizing and facilitating the De-Briefing Session once it is agreed to go forward with a De-Briefing Session. The Project Engineer will be responsible for making all contacts with Contractor personnel.

The Project Engineer should determine the timing of the De-Brief session with respect to the contract work. Scheduling the session too long after the contract work is complete may diminish the Contractor's willingness to participate or recall of the issues for discussion. Scheduling a session too soon before completion of all contract related activities may cloud issues currently under discussion. The Project Engineer should exercise caution in selecting the proper timeframe for this session.

More information on these sessions, including De-Brief Meeting guidelines, typical agenda, and De-Brief report outline, are available on the Bridge and Structures Office's homepage at http://www.wsdot.wa.gov/eesc/bridge/cecw/index.cfm.

6-1.1A General Inspection Procedures

Because of the wide variety of types and designs of structures, the Inspector should be thoroughly familiar with all of the contract documents as they provide the specific materials requirements, dimensions, and other details that make each structure unique. The Inspector should examine the contract documents extensively by:

Thoroughly reviewing *all* contract documents, including:

- The plans and special provisions for the project.
- The appropriate *Standard Specifications*, supplemental specifications, and standard drawings that apply.
- Any contractor-provided documents, such as traffic control plans, falsework and forming plans, shoring plans, and shop drawings for prefabricated items.
- Check with the Region's Environmental Section to verify that all necessary environmental documentation has been obtained for the project and is current.
- Special care needs to be taken over streams that are subject to the Endangered Species Act (ESA) as the requirements and the regulations are constantly changing and may change during the life of the contract.

Checking and verifying all:

- Plan dimensions,
- Elevations, and
- Materials quantities.

List any discrepancies that are discovered and report them to a supervisor (along with any items that may require clarification).

Set up part of the inspection documentation records in advance so that the actual dates, dimensions, quantities, and other values can be more easily filled in as the work progresses.

When inspectors cannot participate directly in a preconstruction meeting, they should check with the Project Engineer after the meeting to identify any areas of special concern.

6-1.1B Inspection Guide for Construction of Bridges and Structures

The intent of the contracting agency inspection is to provide Quality Assurance (Q/A) for the work performed. Often times this task creeps into the Quality Control (Q/C) function which is the contractor's responsibility. There is usually no need for an inspector to observe the entire construction operation unless identified in the table below or there are other compelling reasons. The following Q/A inspection shall be performed by one inspector representing the contracting agency:

Structural Component	When to Inspect *
Demolition and Removal of Structures	
Foundations, Bridges, etc.	Entire operation
Demolition of Structures	Entire operation, if adjacent to traffic
Structure Excavation	
Excavation	Final
Shoring	Entire task
Foundations	
Compacted Soil	Test and view
Spread Footings, pile caps, shaft caps	After rebar and form completion; before concrete placement
Drilled Shafts	The entire operation
Pile Installation	The entire driving task; cage and concrete placement
Temporary Work	
Falsework	Initial, intermediate, and final during erection
Formwork (incl. deck soffits)	After completion
Substructure & Walls	
Columns	Before concrete placement in footing; before form placement
Abutments	Before form placement; form cleanliness, correct rebar numbers, and location
Crossbeams	Before concrete placement; form cleanliness, correct rebar numbers, and location
Retaining & Noise Walls	Before form placement; form cleanliness, correct rebar numbers, and location
Soldier Pile Walls & PGA/	The entire operation
Soil Nail Walls	The entire operation
Superstructure	
Bearings	Before installation, inspected by the fabrication inspectors
Girder Erection	The entire operation
Post Tensioning	After duct placement; after strand installation; all stressing operations
Deck Rebars (layout & epoxy)	Before the finishing machine dry run

Superstructure (continued)	
Deck Finishing Machine Dry Run	Before concrete placement
Deck Concreting, Finishing, Curing regime	The entire operation
Expansion Joints	Check for proper gap, and after completion
Deck Overlays	Identify further deck repair, and the entire placement
Concrete Barrier	Before concrete placement
Other Structures	
Cantilever Signs	The entire erection
Sign Bridges	The entire erection
Approach Slabs	Assure compaction, before concrete placement
Other Tasks	
Concrete/Grout placement	Entire task plus 1 inspector for QA testing
Shotcrete placement	Qualification testing; after completion
Concrete cure	Initial set-up; check daily (wetness, runoff)
Painting	Check materials/equipment, hold points (containment, surface prep, each coat)
Welding	UT testing after completed
Bolting	Completed holes; materials; all installation
Structure Repairs	Completed initial preparation
Mechanical Rebar Couplers	Ensure compliance with the manufacturer's installation method
Resin Bonded Anchors	Verify random hole depths, certified resins
Grout Pads	During mixing

* For all items, the inspector should be familiar with the current contract documents that specify the work (plans, provisions, and standard specifications) and internal policies for quality assurance (construction manual and materials manual). Additionally, the inspector should have an approved submittal onsite during all inspection activities and shall have documented approval of all materials prior to installation. Time should be allotted to allow this review of the contract documents before each stage of work.

6-1.2 Foundations

Elevations of bottoms of footings, as shown in the plans are determined from information secured from test holes or borings or other sources. The Project Engineer shall observe the character of the materials removed to confirm the material is similar to that identified in the test borings. If the material is similar, they shall note the elevation of such material and approve the footing elevation. If the material differs from the test borings, the State Construction Office shall be consulted for an evaluation. Except in solid rock foundations, it is necessary to carry all footings well below any possible line of scour. Footings in streams are often carried to greater depths in hard material than they would be in the same material where danger of scour does not exist. Footings on solid rock shall be well keyed into the rock to prevent sliding of the structure. Keys should not be less than 1 foot (300 millimeters) deep and the rock surface should be rough so it has more value as a key. Arch abutments may be designed with bottoms on an inclined plane. Care must be taken that the rock or other material is cut as nearly as possible to the plane shown. If this cannot be done, the material should be removed to a satisfactory foundation, cross-sections taken and the State Construction Office should be advised and requested to secure a new design of the abutment. Material at the heel, or back of the abutment, shall be carefully removed and all loose material removed. In placing concrete in arch abutments, the concrete is placed directly against the undisturbed foundation material at the back of the abutment for the reason that an arch abutment is subject to very high vertical and horizontal loads. Footings in hard material are sometimes sloped or stepped. Steps must be carefully made and if the material is not hard enough to stand vertically the steps shall be inclined or beveled. The slope shall not be steeper than the angle of repose. Backfilling to level up foundations or to fill holes will not be allowed except by permission of the State Construction Office. Under certain conditions, permission will be granted to fill a hole with a lean concrete mix. If the design soil pressure is low, unsuitable material may be replaced by granular material compacted to 95 percent density. If there is no contract unit price for the replacement material, an agreed unit price must be secured. Just prior to placing concrete, all loose material shall be removed and, if in the dry, shall be well sprinkled with water before concrete is placed.

The following are the approximate bearing values (in tons per square foot) of various materials encountered in foundation excavations:

Alluvial Soil	½ to 1 ton	50 to 100 kPa
Ordinary clay	1 to 2 tons	100 to 190 kPa
Dry, stiff clay	2½ to 3 tons	240 to 290 kPa
Confined sand	3 to 4 tons	290 to 380 kPa
Ordinary sand and gravel	2 to 3 tons	190 to 290 kPa
Cemented sand and gravel	5 to 10 tons	480 to 960 kPa
Solid rock	5 or more tons	480 or more kPa

6-1.3 Clearing the Site

The Contractor shall clear the site of the proposed structure of all trees, brush, stumps and debris for the full width as required and in the manner specified in Section 2-01 of the *Standard Specifications*. Existing bridges, buildings or obstructions shall be removed as provided in the contract or the *Standard Specifications*.

Payment for clearing and grubbing and removing structures and obstructions shall be as provided in the contract. If no specific payment is provided, this work is considered to be incidental to the construction.

The removal or relocation of public or private utilities encountered on the site will be as provided for under the terms of Section 1-07.16 of the *Standard Specifications*.

The Project Engineer shall make a thorough study of the various public utilities involved with respect to the construction of the new work, noting the clearances required for all power and telephone lines and poles, sewer and water lines; tracks, trolley lines, ditches, signals, etc., on railroad grade separations; and possible interference with or inconvenience to adjoining property. The Project Engineer shall ascertain from the Regional Utilities Engineer if notification has been given to utilities for required movement of lines so that the construction is not delayed.

6-1.4 Alignment and Grade of Railings

Bridge traffic barriers, curbs, bridge railings and rail bases shall be carefully aligned to give a pleasing appearance. See Chapter 6-6 of this manual for further instructions.

6-1.5 Working Drawings

The Contractor is required to submit for approval detailed plans for falsework, concrete forms, cofferdams, shoring, and cribbing. These plans must comply with the requirements of the contract plans and specifications and shall be designed under the supervision of or by a Washington State licensed professional engineer and shall bear their seal and signature.

If appropriate, the plans should include:

1. Ground line at time of construction when falsework, shoring, and cribbing are involved.

2. Horizontal clearances to adjacent roadways, existing structures, and railroads when shoring and cribbing are involved.

A change order is required for any deviation from the contract. Deviation from an approved working drawing requires Headquarter's approval. The Project Engineer must receive approval of these plans before the Contractor is permitted to start construction of the structure.

If a project has a large number of working drawings associated with it the Project Engineer should talk to the contractor about prioritizing his submittals. The project engineer should share this information with the State Bridge and Structures Engineer so that the review process can be accomplished in the most efficient manner for the contractor.

The Contractor shall submit six complete sets of plans directly to the State Bridge and Structures Engineer (or Terminal Design Engineer — Ferries Division) for review and approval, and two complete sets to the Project Engineer for information. If a railroad is involved, four additional sets shall be submitted to the State Bridge and Structures Engineer (or Terminal Design Engineer) for each railroad company involved. See the Shop Plans and Working Drawings Table in Chapter 1-2.4H of this manual.

The Project Engineer will review the plans to see that they comply with the requirements of the contract and send any comments to the State Bridge and Structures Engineer (or Terminal Design Engineer) about any field conditions or contract deficiencies that would affect the checking of the plans.

When preapproved formwork plans are used, the Contractor shall submit two sets of the plans to the Project Engineer. The Project Engineer must then advise the Contractor that construction may proceed unless a field condition needs to be resolved before doing so. If a railroad is involved, four additional sets shall be submitted to the State Bridge and Structures Engineer for each railroad involved. The State Bridge and Structures Engineer (or Terminal Design Engineer) will return two copies to the Project Engineer with the notations made by the railroad. The Project Engineer will then advise the Contractor that construction may proceed utilizing any notations given by the railroad.

The Contractor must allow sufficient time for review and approval of the working drawings. It usually takes two to four weeks for review and approval and if a railroad is involved, this time is increased to four to eight weeks. The Project Engineer should alert the Contractor to this time requirement and urge them to submit their plans sufficiently in advance of their need. If the plans are incomplete or unsatisfactory, the time required to get final approval is increased.

Falsework shall be supported on piling unless the State Bridge and Structures Engineer (or Terminal Design Engineer) approves the use of mudsills in lieu of piling. When mudsills are proposed and indicated by the Contractor on the falsework plans, the Project Engineer must provide the State Bridge and Structures Engineer (or Terminal Design Engineer) with information regarding the soil conditions and allowable soil pressures. Soil condition information and allowable bearing values shall be obtained from the State Materials Engineer if unavailable in the contract plans.

When mudsills are approved, they shall be placed on undisturbed firm soil or on fill compacted to 95 percent density. The loose upper layer of soil shall be removed and the firm soil below shall be fine-graded to provide firm, even bearing over the entire area of the mudsill. If placed on sand, gravel or other material which can be displaced sideways, the bottom of the mudsill shall be set about 6 inches (150 millimeters) below the normal surface of the surrounding area. Posts should be centered on the mudsills. Mudsills shall be constructed to distribute the load from the post to the soil with very little deflection or settlement.

Falsework piling shall be driven in accordance with the specifications for permanent piles of the same material unless alternate criteria is shown on the Contractor's falsework plans. The falsework piling shall be driven to develop a bearing value as shown on the approved falsework plans. Allowance for settlement must be made for all spans, as the amount varies, depending on the character of foundations and the number of joints of timber. Piles and timbers should be carefully cut to fit, thereby reducing settlement of the falsework.

Forms for concrete deck on steel or prestressed concrete girder spans shall be fully supported on the girders. They shall in no case extend to the ground unless the steel girders are also supported on piles or posts.

The Project Engineer shall see that the falsework and forms are constructed in accordance with the approved plans. If it becomes necessary, or the Contractor desires to deviate from the approved plans, a revised plan for approval shall be submitted and the Contractor shall not start construction in accordance with the revised plan until receiving approval of the revision. All revisions to the approved plan shall be reviewed by the State Bridge and Structures Engineer (or Terminal Design Engineer) to ensure the structural integrity of the falsework and formwork.

6-1.6 Approval of Materials

The Project Engineer shall notify the Contractor that approval of all materials used in permanent structures is required. Contractors frequently list only the local suppliers and not the material. This should be discussed with the Contractor at a preconstruction meeting. Particular care should be used to see that this requirement is met in regard to minor parts and materials such as drains, bearings, expansion dams, bolts, pins, and paints. It should also be impressed on the Contractor that inspection of all materials is required before they are used and that the best time for inspection is generally before the materials are shipped. Contact the State Materials Lab for inspection services.

Prefabricated materials, such as structural steel and cast steel, are fabricated in accordance with approved shop plans, submitted by the Contractor, and approved by the Bridge and Structures Engineer. Erection of unapproved prefabricated materials shall not be allowed.

6-1.7 Safety Nets and Staging

Fall arrest and protection shall be provided. Reference WAC 296-155-24510, Fall Restraint Systems, and WAC 296-155-24510, Fall Arrest Systems. A Fall Protection Work Plan shall be on site.

Section 1-05.6 of the *Standard Specifications* requires the Contractor to furnish sufficient, safe and proper facilities such as walkways, railings, ladders, and platforms for inspection of the work. The Project Engineer should insist that the Contractor provide safe facilities and should not permit WSDOT personnel on the project when it is not safe for them.

Concrete Placement Checklist

Location _____
(span, pier, station)

Part of structure being cast _____
(seal, footing, deck, etc.)

Concrete scheduled for _____ (a.m.) (p.m.) on _____
(time) (day of week and date)

Contract No. _____

Structure _____

Inspector _____

Date _____

Weather forecast is _____

1. Foundation:

A. Spread Footing:
- ___ cross-sections recorded prior to excavation
- ___ excavated to plan elevation
- ___ foundation approved by the Project Engineer (if foundation material differs from the test borings, consult Olympia Service Center Construction Office)

B. Pile Supported Footing:
- ___ excavated to plan elevation
- ___ pile order length given to contractor (if required)
- ___ pile driving completed and accepted
- ___ pile cutoff elevations checked
- ___ pile cutoff treated (timber)

2. Falsework:
- ___ constructed per approved F/W drawings
- ___ tattletails set and checked after first placement
- ___ foundations (mudsills or piling) constructed per specifications and falsework drawings

3. Forms:

A. Approved Form Drawings:
- ___ dimensions verified
- ___ elevations checked
- ___ longitudinal and transverse form alignment checked
- ___ studs and walers in accordance with approved drawing
- ___ plumb and/or batter checked
- ___ form material of proper thickness, grade and grain orientation, facing, and in satisfactory condition
- ___ form liner approved
- ___ kickers and braces in accordance with approved drawing
- ___ ties, bolts, nails, etc., in accordance with approved drawing
- ___ forms coated with a release agent

Concrete Placement Rate: _____ m/hr. at _____ °C

B. Construction Joints:
- ___ location checked
- ___ construction joint properly formed, braced, and aligned
- ___ shear keys fabricated to proper size and correctly placed
- ___ construction joint elevation checked
- ___ existing concrete at the construction joint is cleaned, roughened, and wetted
- ___ open or dummy joints formed and located in accordance to the plans
- ___ premolded joint filler secured

4. Reinforcing Steel:
- ___ cut sheets reviewed
- ___ mill certificates received
- ___ bar sizes, number, and spacing checked
- ___ bottom and top concrete cover and side clearances checked
- ___ bar ties and supports in accordance with contract
- ___ splice locations and lengths checked (welded or mechanical splice approved)
- ___ alignment and length of bars extending into future work checked

5. Post-Tensioning:
- ___ approved shop drawing received
- ___ trumpet, distribution plate, and reinforcement correctly located and secured
- ___ duct sizes, material, and wall thickness checked
- ___ ducts installed per approved profile and alignment
- ___ ducts securely tied
- ___ ducts free of holes and dents
- ___ duct joints sealed
- ___ ducts clear and unobstructed
- ___ inlets, outlets, vents, and drains properly installed
- ___ contractor prepared to clear all ducts immediately after concrete placement

6. Method of Concrete Placement:
- ___ pump
- ___ pump backup system available
- ___ bucket
- ___ chute
- ___ tremie
- ___ other list: _____

7. Concrete:
- ___ Concrete Class _____
- ___ 28 day strength _____ MPa
- ___ specified slump _____ mm (max.)
- ___ specified air entrainment _____%
- ___ flyash
- ___ air-entraining admixture, Brand _____
- ___ water-reducing admixture, Brand _____
- ___ retardant admixture, Brand _____

Estimated Concrete Quantity: _____ cubic meters

Inspector: _____

Date: _____

Figure 6-1

6-1.8 Working in Water

When working in water, the Project Engineer shall see that the Contractor complies with the requirements of the specifications and the various agencies for pollution control and navigation. If the contract requires the Contractor to obtain special permits, the permits shall be obtained before the work covered by them is begun. In the event of a fuel or oil spill, the Contractor is required to notify the Coast Guard immediately, regardless of the amount of the spill or the efforts for containment.

Whenever construction work is performed in navigable waterways, it is necessary to obtain a construction permit from the Coast Guard. One of the requirements of the construction permit is regular submission of Bridge Construction Progress Reports. Two copies of the report should be prepared by the Project Engineer sufficiently in advance of the first working day of the month and transmitted to the State Bridge and Structures Engineer. One additional copy of each report must be forwarded by the Project Engineer to the State Construction Engineer.

The Bridge Construction Progress reports shall be made in the form of a print of the Coast Guard Bridge Permit exhibit sheet. The print shall be marked in green to show construction progress of permanent work, in red to show work scheduled for completion in the next month, and blue to show current location of falsework supports and other temporary obstructions to navigation, such as anchor lines, or moored barges. Supplemental sketches may be required for clarity. The memo forwarded to the State Bridge and Structures Engineer should include information about any activities planned for the next month that could affect waterway users.

When a Coast Guard permit modification is proposed (by the Contractor or WSDOT), it shall be submitted to the Bridge and Structures Engineer for processing through the Coast Guard. The time required for approval/disapproval of the proposed permit modification is variable and depends on the nature and significance of the modification. Up to six months may be required.

When all construction obstructions to navigation have been removed, the Project Engineer shall report that fact immediately to the State Bridge and Structures Engineer indicating the date removal was completed.

Upon completion of all permitted bridge work, a final report indicating the date of completion and certifying that the bridge has been constructed in compliance with the Coast Guard Bridge Permit shall be submitted by the Project Engineer to the State Bridge and Structures Engineer.

6-1.9 Final Cleanup

When the structure is completed, the Contractor shall clean up the site and remove all materials and debris. The decks of the structures shall be swept and washed clean. The Contractor shall level off and fine grade all excavated material not used for backfill, and fine grade around all piers, bents, abutments, and on slopes so that the entire site and structure is left in a clean and presentable condition.

Upon completion of the work, all falsework piling, cofferdams, shoring, curbs, and test piles shall be removed to a minimum of 2 feet (0.6 meter) below the finished ground line. Removal limits within a stream or channel are described in Section 2-09.3(3)D of the *Standard Specifications*.

6-1.10 Concrete Placement Checklist

The Concrete Placement Checklist was developed as an inspection aid. See Figure 6-1. The use of this checklist is encouraged.

6-1.11 Inventory Inspection

After a permanent or temporary bridge or a bridge modification is complete and preferably before opened to traffic, the State Bridge and Structures Office's Bridge Preservation Section needs to perform an inventory inspection. The purpose of this inspection is to field verify certain contract plan details, to provide a base-line condition assessment of the bridge, and to identify any potential problem features.

When the bridge is nearing completion, two to four weeks before completion, the Project Engineer should notify the State Bridge Preservation Engineer of the anticipated completion date. The Bridge Preservation Engineer will make arrangements with the Project Engineer for an inventory inspection.

When load or width restrictions are in force on a temporary structure, immediate notification should be provided when service is discontinued on the temporary structure and traffic is rerouted to the permanent structure.

6-1.12 Falsework

Falsework construction is a critical part of the bridge construction process. Generally, the factor of safety used for design of falsework is less than that of permanent construction. Therefore, it is extremely important that the falsework is constructed in accordance with the approved falsework drawings. Any changes to the approved falsework drawings must be approved by the Bridge and Structures Office.

6-2 Concrete Structures

6-2.1 Proportioning and Mixing Concrete

Mix design, proportioning, and mixing concrete is the responsibility of the Contractor. General information regarding proportioning and mixing concrete is provided in Appendix A at the end of this chapter to provide a better understanding of the variables involved.

6-2.1A Mix Designs

The *Standard Specifications* require the Contractor to provide a mix design for all classes of concrete specified in the Plans except for those accepted based on a Certificate of Compliance. The mix design should be submitted on Form 350-040 Proposed Mix Design. The Project Engineer should review all Contractor proposed mix designs for conformance to the contract. Specific items to look for are:

1. There is at least the minimum cement content specified in Section 6-02.

2. The minimum amount of fly ash (if called for).

3. The amount of fly ash (if used) does not exceed 35 percent.

4. The amount of ground granulated blast furnace slag (if used) does not exceed 25 percent, or the combination of slag and fly ash does not exceed 35 percent.

5. The aggregate conforms to Section 9-03.

6. Air entrainment is included if required.

6-2.2 Inspection of Concrete Production Facilities

6-2.2A Prequalification Inspection

All concrete production facilities which produce concrete other than commercial or lean will be prequalified. Commercial concrete and lean concrete may be batched in production facilities which are not prequalified.

The concrete production facility prequalification shall be accomplished by one of the following methods.

1. Certification by the National Ready Mix Concrete Association (NRMCA). Information concerning NRMCA certification may be obtained from the NRMCA at 900 Spring Street, Silver Springs, MD 20910 or online at www.nrmca.org. The NRMCA certification shall be good for a two year period.

2. Independent evaluation certified by a Professional Engineer using NRMCA checklist. The Professional Engineer shall be licensed under title 18 RCW, state of Washington, qualified in civil engineering. The independent certification using the NRMCA checklist shall be good for a two year period.

3. Inspection conducted by the Plant Manager, defined as the person directly responsible for the daily plant operation, using the NRMCA Plant Certification checklist. The Plant Manager certification shall be done prior to the start of a project, and every six months throughout the life of the project.

The Contractor is required to submit Form 350-071, Request for Approval of Materials Source, listing the name and location of the plant which will supply the concrete and also the source of the cement, aggregates, and admixtures that will be used in the concrete. Concrete from the plant shall not be used until the plant has been approved. The Project Engineer shall take approval action based upon the batch plant prequalification submittal meeting the requirements of the Standard Specifications, Sections 6-02,3(4)A and the Approved Source of Material Listing. If the batch plant prequalification submittal indicates that the scale certification has expired the Project Engineer shall confirm that the scales have been recertified or the source will not be approved.

6-2.2B On-Site Inspection of Trucks

Whenever ready mix concrete is used on the project, the Inspector shall be alert to the condition of the trucks being used for delivery. All trucks used for delivery of concrete (other than commercial concrete or lean concrete) must be preapproved prior to use on the project. Preapproval of delivery trucks is a part of the plant approval process described in Chapter 6-2.2(A) of this manual. Approved trucks will be identified on an NRMCA truck list for plant manager inspected facilities. Approved trucks will be identified by an NRMCA sticker (for the years of approval) for NRMCA approved facilities. In some cases an approved truck may not have yet received an NRMCA sticker. In these cases, the ready-mix producer shall notify the Project Engineer in writing that the truck has passed NRMCA inspection, and is approved for use. The Inspector should verify that all delivery trucks meet the requirements of Standard Specification 6-02.3(4)A. All delivery trucks must have operational revolution counters and a device to measure the amount of water added at the site. All trucks are required to be operated within the rated capacity stated on the manufacturer's data plate. The Inspector needs to check the concrete as it is being discharged down the chute to ensure that the concrete is uniformly mixed. If the concrete does not appear uniformly mixed, the Inspector can request that the concrete producer re-inspect the truck. If the concrete delivery truck cannot deliver uniformly mixed concrete, the delivery truck needs to be rejected.

6-2.2C Verification Inspection

When necessary, the Project Office shall make an inspection of the batch plant to confirm: the accuracy of the batching process; that the scales have current certifications; the accuracy of the water metering devices; and to sample the coarse aggregate and fine aggregate.

6-2.3 Concrete

6-2.3A General

Type III portland cement shall not be allowed in any concrete structure unless called for in the plans or specifically approved by the State Construction Office. The use of Type III cement in structures is not desired because it is believed to reduce the resistance of the finished surface to weathering, particularly to freezing and thawing cycles and is more subject to plastic and shrinkage cracking. If it is necessary or desirable to place structural concrete in service prior to the time stated in the *Standard Specifications*, authority must be obtained from the State Construction Office. In such cases, test cylinders from each pour are taken and tested by the Contractor to determine the early break strength.

All sawdust, nails, dirt, and other foreign material, including ponded water, must be removed from within the forms and the forms shall be inspected and approved before placing any concrete.

The bottom of footings and forms must be thoroughly soaked with water prior to placing the concrete so they do not absorb water from the concrete mix. Care must be taken to be sure there is no ponded water when placing the concrete.

Vibrators are usually specified to be used when placing concrete. Their use is important for the purpose of consolidating the concrete in the forms, thus producing a dense uniform concrete.

Adequate vibration is necessary for placing concrete in difficult places, such as under and around closely spaced reinforcement. When steel forms are used for curbs, traffic barriers, or rail bases, external vibration may be required to eliminate voids at the surface caused by entrapped air. It is desirable to have the Contractor designate one person to operate the vibrator. This person could then be instructed in its use and an effort could be made to have that person kept on the same work whenever it is required.

The quantity of mixing water to be used shall be the minimum amount possible to produce the required workability. Vibrators shall be used only in freshly placed concrete. As soon as the concrete is dumped it should be spread out and vibrated by inserting the vibrator torpedo directly into the fresh concrete. However, it should be kept in one place only long enough to make the concrete uniformly plastic. Dependence should not be placed on the vibrator to work the concrete into corners and along the faces of the forms. Metal or wooden spades should be used to whatever extent is necessary in places where the vibrator cannot be satisfactorily employed, however, spades should be used only to accomplish complete filling of the forms and not for the purpose of puddling the concrete.

In regard to the desired consistency of concrete and the use of vibrators, the *Standard Specifications* should be carefully studied and followed. Every effort should be made to see that the specifications are followed.

Air-entrained concrete is required in all structural concrete above ground. The use of air entrained concrete below the finished ground line is optional with the Contractor.

The specifications require that construction joints shall be located and constructed as shown in the plans. Approval to add, move, or delete construction joints must be obtained from the State Construction Office. Section 6-02.3(12) of the *Standard Specifications* requires that shear keys shall be provided at all construction joints unless a roughened surface is shown in the plans, and where the size of keys is not shown in the plans, they shall be approximately one-third of the area of the joint and approximately 1½ inches (40 millimeters) deep.

Construction joints are to be either vertical or horizontal. Wire mesh, wire lath, and other similar items can be used for a roughened surface construction joint but shall be removed and the joint cleaned before making the adjacent pour. Construction joints in roadway slabs and approach slabs must be formed vertical and in true alignment. An edger shall not be used on the joint but lips and edgings must be removed before making the adjacent pour. If the joint is properly formed, a good straight edge will be obtained with a minimum amount of lips and edgings to be removed.

Shear keys in construction joints shall be formed with 1½-inch (40 millimeter) thick lumber and shall be constructed the full size shown in the plans. For box girder webs, these shear keys are normally shown in the plans to be full width between stirrups. The specifications require shear key forms to be left in place at least 12 hours after the concrete has been placed. The plans will indicate certain joints to have a roughened surface. These joints shall be finished and prepared for the next pour in accordance with the instructions given in the specifications or as shown in the plans.

Expansion dams or the expansion dam blockout shall be carefully placed before concreting the roadway decks. They shall also be carefully aligned for crown and grade.

Blockouts for expansion joint seals must be carefully formed to the dimensions shown in the plans for proper placement and operation. Be sure to check that the rebar in the blockout does not conflict with the expansion joint anchors. The joint seal must be placed using a lubricant adhesive.

Concrete shall be placed in accordance with the requirements of Section 6-02.3(6) of the *Standard Specifications*. The Inspector should be alert to see that any method of placing concrete that causes segregation of the concrete mix be discontinued. Some of the conveyor belt systems tend to cause segregation of the mix after several exchanges from one belt to another. The Inspector shall see that the length of conveyor belt is limited so segregation does not occur. Aluminum pipe or sheeting shall not be used in contact with fresh concrete.

In heavily reinforced sections, the maximum concrete slump may be increased 2 inches (50 millimeters) with the use of a high range water reducer, as discussed in Section 6-02.3(4) C of the *Standard Specifications*. It is anticipated that possible candidates for this increase of concrete slump may be columns, cross-beams, and post-tensioned box girder web walls and other heavily reinforced members.

6-2.3A(1) Weather and Temperature Limits

Concrete may **not** be placed when rain is hard enough to:

- Cause a muddy foundation.
- Wash or flow the concrete.

The temperature of the concrete for cast-in-place concrete must be between 55 F (13°C) and 90 F (32°C) during placement. The temperature for precast concrete that is heat cured must be between 50 F (10°C) and 90 F (32°C).

The air temperature must be at least 35 F (2°C) during and for seven days after placement (unless the contractor has an approved cold weather plan).

The temperature measuring device shall be capable of measuring the temperature of freshly mixed concrete to ±1 F (±1°C) with a range of 0 F to 130 F (-18°C to 54°C).

Hot Weather Placement (Air Temperature Above 90 F (32°C))

- Cool the component materials of the mix, transport and placement equipment, and the contact surfaces at the site.
- Methods shall be preapproved by the Engineer.

Cold Weather Placement

- Concrete shall not be placed against any frozen or ice-coated foundation, forms, or reinforcement.
- A preapproved plan for cold weather placement and curing is required, if temperatures are below 35 F (2°C) or anticipated to be below 35 F (2°C) in the next seven days.
- Heat aggregate and/or water to maintain mix temperatures above 55 F (13°C).
- Control temperature and humidity after placement by:
  - Enclosing concrete.
  - Heating to 50 F to 90 F (10°C to 32°C) for seven days.
  - Add moisture for six days (discontinue 24 hours before heat is stopped).
  - An accurate recording thermometer is required.
  - Corners and edges require special attention to prevent freezing.

When heating water and aggregates, the approximate resulting temperature for a batch of concrete can be estimated from the following formula:

$$X = \frac{Wt + 0.22W't'}{W + 0.22W'}$$

Where

X = temperature of the batch
W = weight (mass) of the water
W′ = weight (mass) of the aggregates and cement
t = temperature of the water in degrees F
t′ = temperature of the aggregates and cement

6-2.3A(2) Acceptance of Concrete

The Contractor is required to provide a certificate of compliance for each load of concrete delivered to the job. Based on who is supplying the mix, the format of the certification may vary. All certifications must contain the information required by the *Standard Specifications*. If a Contractor Certification sheet is not provided by the Contractor, the form provided by WSDOT may be used.

Example forms are available as follows:

1. Manufacturer's Certificate of Compliance for Ready Mix Concrete (Form 450-001)

2. Batching Process Verification for Ready Mix Concrete (Form 350-012)

3. Proposed Mix Design (Form 350-040)

A Certificate of Compliance is all that will be required for acceptance of commercial and lean concrete. It is advised that as inspectors are collecting the Certificate of Compliance (batch ticket), they do a visual inspection of the concrete. Visual inspection should verify that the items listed on the batch ticket are included in the mix. If the concrete does not appear satisfactory for its intended use, it should be rejected.

Prior to Placement

It is the responsibility of the Inspector to compare the actual batch weights (masses) on the concrete delivery ticket to the proposed mix design weights (masses). The cement, coarse and fine aggregate weights (masses) are required to meet the following tolerances:

Concrete batch volumes less than or equal to 4 cubic yards:

Cement	+5% and -1%
Aggregate	+10% and -2%

Concrete batch volumes greater than 4 cubic yards:

Cement	+5% and -1%
Aggregate	+2% and -2%

If the total cementitious material weight is made up of different components, the component weights shall be within the following tolerances of the amount specified in the mix design:

Portland cement weight	+5% and -1%,
Fly ash weight	+5% and -5%
Microsilica weight	+10% and -10%.

For all mix designs the water weight (mass) shall not exceed the maximum water specified in the mix design. These batching tolerances apply to all mixes.

Acceptance testing will be performed by WSDOT in accordance with WSDOT standard test methods and Field Operating Procedures. Lean concrete and commercial concrete will be accepted based on a Certificate of Compliance, provided by the supplier as described in Section 6-02.3(5)B of the *Standard Specifications*. All other concrete will be accepted based on conformance to the requirements for temperature, slump, air content for concrete placed above finished ground line, and the specified compressive strength at 28 days.

The Inspector must be familiar with the type of concrete mix and who is responsible for the mix. The Contractor is responsible for the mix design and is responsible for 28-day strength.

The Inspector must be prepared to test materials for conformance. The Inspector must also be prepared to deal with nonconformance.

Preparation as a concrete testing inspector requires knowledge of concrete properties and construction procedures. Knowledge of how to use testing equipment and understanding the reliability of testing is also important. A continual evaluation of the testing equipment is needed to be sure it is operating and performing as required. Care and caution are recommended when transporting testing equipment and handling test materials, i.e., cylinders, molds, fresh concrete cylinders, and other samples).

Slump Acceptance

The maximum slump for vibrated and nonvibrated concrete is listed in Section 6-02.3(4)C of the *Standard Specifications*.

When a high range water reducer (super plasticizer) is used, the maximum slump limit may be increased an additional 2 inches (50 millimeters) while the concrete is affected by the admixture.

Air Content Acceptance

All cast-in-place concrete above the finished ground line shall be air entrained. The air content shall be a minimum of 4.5 percent and a maximum of 7.5 percent, unless otherwise specified.

When commercial concrete is placed in sidewalks, curbs, and gutters, air content is very important. It is recommended that the inspector perform air content testing sufficient to ensure that the concrete has between 4.5 and 7.5 percent air entrainment.

The Contractor may elect to use air entrained concrete below finished ground line. If so, the 28-day compressive strength shall meet the requirements for the class of concrete specified.

Placement Time

It is the Inspector's job to ensure that:

- The concrete is placed in the forms as soon as possible after mixing, but no later than 1½ hours after cement is added to the mix.
- The concrete is always plastic and workable while being placed.
- The concrete is placed continuously with interruptions no longer than 30 minutes.
- Each layer of concrete is placed and consolidated before the preceding layer takes initial set. Initial set has begun if the vibrator will not penetrate the preceding layer under its own weight while being operated.

The discharge time may be extended to 1¾ hours if the temperature of the concrete being placed is less than 75°F (24°C). With the approval of the Project Engineer, this may be extended to two hours, if the temperature of the concrete being placed is less than 75°F (24°C). If it is apparent that the 30-minute time limit will be exceeded for a continuous pour, a construction joint should be established. The State Construction Office shall be contacted when this occurs. A vibrator can be used to determine if initial set has taken place when evaluating the need for a construction joint as described previously.

In certain instances, it may be difficult to meet the above criteria due to long transit times. The *Standard Specifications* allow the Contractor the option of requesting in writing to extend the time for discharge. The extension of time will be considered on a case by case basis and requires the use of specific retardation admixtures and coordination with the State Construction Office.

Point of Acceptance

Acceptance tests for specification compliance are to be determined from samples taken at the discharge of the placement system for bridge decks, overlays, bridge approach slabs, and barriers, and at the truck discharge for all other placement. For bridge decks, overlays, bridge roadway slabs, bridge approach slabs, and barriers, acceptance samples should be taken as close to the point of deposition as possible. (e.g., taking a sample from the end of a pump down below the bridge instead of up on the deck is not acceptable as it may have substantially different characteristics.)

If a pump is used as a placement system, the initial acceptance test must be delayed until the pump has been cleared of all initial priming slurry. Do not allow placement of pump slurry in the forms.

The Inspector should arrive in advance of the concrete placement and prepare the testing location. It is the Contractor's responsibility to provide adequate and representative samples of the fresh concrete to a location designated by the Engineer. Above all, the equipment must be in good working condition with records of the last calibrations for the air meter and scales. The Inspector should have all the information, including the mix design, and all the forms needed for documentation of the placement operation.

Retesting Concrete

Once the Contractor has turned over the concrete for acceptance testing, no more mix adjustment will be allowed. The concrete will either be accepted or rejected.

Multiple Placements from One Concrete Truck

Only one set of acceptance tests are required per concrete truck.

6-2.3B Bridge Deck Construction

Bridge deck construction is critical because this part of the structure receives the most abuse from traffic and the environment. Construction of maintenance-free bridge decks requires close attention to details. One or two weeks before placing the concrete in the deck, a placement conference should be held to go over the procedures to be used and to emphasize the critical areas of construction. As a minimum, this should include a discussion of the rate of placement, personnel and equipment and backup equipment to be used, type of finish, and curing details. The rate of placement should normally provide for at least 20 feet (6 meters) of finished deck per hour.

The position of the reinforcing steel is very important because of the thin concrete section. Adequate blocking and ties are necessary to hold the steel in place. If foot traffic on the reinforcing steel causes it to deflect, the spacing of the chair supports is not adequate. A pre-check of the screed setting for proper elevations and clearances to the reinforcing steel is essential prior to any concrete placement. The finishing machine should be run the full length of the placement after the screed is adjusted to check deck thickness and cover of the reinforcing steel, this check

should also continue over all bulkheads and expansion joints to verify their clearances. The finishing machine should not be adjusted while it is finishing concrete to clear bulkheads and expansion joints. These adjustments must be made prior to the concrete placement. During the placement, frequent checks should be made of the actual cover obtained directly behind the finishing machine and recorded in the Inspector's Daily Report.

Quality concrete is required, particularly in the bridge deck. Uniform consistency of the concrete should be maintained throughout the placement. The water-cement ratio is very important. It should be the minimum possible to produce the required workability and not exceed the specification limit. To keep the water-cement ratio as low as possible, the specifications require the use of a water reducing additive for all bridge deck concrete. Frequent checks of the free water contained in the aggregates is necessary to determine the amount of water actually contained in the concrete mix.

6-2.3B(1) Placing Concrete in Hot Weather

When the concrete is being placed in the bridge deck during hot weather, additional precautions must be taken in order to prevent surface evaporation. See 6-02.3(6)A for estimated evaporation rates.

The temperature of the concrete at the time it is placed in the forms must be kept under 90 F (32°C). Concrete with high temperature looses slump rapidly and is difficult to place and finish. This temperature can be controlled by shading the concrete trucks while loading and unloading and shading the conveyors or pump lines used in placing the concrete. The forms and reinforcing steel should be cooled prior to placing the concrete. This can be done by covering them with damp burlap and then spraying them with cool water immediately prior to placing the concrete. Care must be taken to see there is no standing water in the forms when the concrete is placed.

Water reducing retarder admixture should be used in the concrete so the water-cement ratio and slump of the concrete can be maintained within the specification limits. The mixing time of the concrete should be held to the minimum. The concrete must be placed and finished as soon as possible. If there is a delay in applying the curing compound after the concrete has been finished, a fog spray should be applied to reduce the moisture loss due to evaporation. If plastic cracks form and the concrete is still in a plastic state, they can be eliminated by revibrating the concrete and refinishing. Care must be taken to not revibrate the concrete after initial set has been obtained.

The requirements for curing the concrete shall be enforced. As soon as the visible bleed water has evaporated from the finished deck, the curing compound should be applied. The curing compound should be applied in two applications to ensure full coverage of the concrete. The second coat should be applied in a direction perpendicular to that of the first application. The amount of curing compound applied in the two applications should meet the minimum amount specified. Immediately after application of the curing compound and initial set, the concrete deck should be covered in accordance with Section 6-02.3(11) of the *Standard Specifications*.

In summary, the difficulties arising from hot weather concreting may usually be minimized by:

1. Using cool mixing water.
2. Keeping the aggregate temperature as low as is economically feasible.
3. Reducing the length of mixing time.
4. Placing the concrete as soon as possible after mixing and with a minimum of handling.
5. Keeping the surfaces shaded during placing.
6. Placing curing compound as soon as possible.

6-2.3B(2) Placing Concrete in Cold Weather

Several precautions must be taken when placing concrete in cold weather. If temperatures below 35 F (2°C) are anticipated within seven days following placing the concrete, the Contractor will normally be required to enclose the structure and provide heat and moisture so the concrete will obtain its initial strength without freezing. The addition of moisture should be discontinued 24 hours before discontinuing the heat so there will not be an excess of moisture on the surface of the concrete to form ice in case of cold weather following the seven-day protection. If the temperature is below 35 F (2°C) when placing the concrete, the concrete must be heated to at least 60 F (16°C) by heating the aggregate and/or water in accordance with the *Standard Specifications*. The temperature of the concrete, as well as the slump, must be consistent from batch to batch.

When heating water and aggregates, the resulting temperature for a batch of concrete can be computed from the formula in Chapter 6-2.3A(1) of this manual.

6-2.3C Use of Epoxy Resins

Quite frequently, the use of epoxy resin systems on our projects is considered; either at the design stage or during the progress of a contract. Generally this use is in connection with repair of distressed concrete or in setting rebar.

Epoxy resins are quite versatile materials and are capable of providing the answer to numerous bonding or grouting problems. However, like a number of products, there is a tendency to treat them as a universal cure-all and they occasionally are applied without proper consideration of inherent limitations.

Epoxy systems are capable of providing many different properties through the formulation of their various components. To a certain extent, the systems can be tailored to fit the particular need and conditions of time, temperature, humidity, etc., that will prevail. Use of a material under conditions beyond those for which it was formulated can result in considerable trouble rather than benefit. Probably the greatest potential for trouble exists in the use of epoxies at temperatures below which a normal reaction can occur. Generally speaking, unless a specially formulated epoxy is being used, trouble can occur when application is attempted below 50 F (10°C).

The State Materials Engineer is available as a technical resource on the use of such systems, in the resolution of pertinent problems should they occur during preliminary design considerations, or as a result of problems during construction. It is strongly recommended that any contemplated use of epoxy resin systems at application temperatures below 50 F (10°C) be checked with the State Chemical Materials Engineer to forestall potential difficulties.

If epoxy resin is used, the following elements need to be carefully checked by the Inspector:

- Proper mixing and curing of the epoxy resin.
- Temperature and/or moisture limitations of the epoxy being used.
- That the areas are clean and prepared in accordance with the manufacturers recommendations.
- That the epoxy covers the entire repair area.
- That the epoxy fills the entire space between bar and the hole (if bars are being set with epoxy resin).
- That the epoxy is still tacky (not set) when it is being used to bond two structural elements together (just before elements are put together).

For setting rebar or anchors, it is best to determine the volume required to be filled by the epoxy and measure the epoxy being used. A method of measurement should be agreed to with the Contractor for inspection purposes. Also, occasional samples should be taken of the epoxy resin being placed to be sure it is setting up properly. If there is any question of filling the void or adequacy of the epoxy resin, the Inspector shall advise the Contractor, document the discussion, and report it to the Project Engineer.

6-2.3D Finishing Structures

6-2.3D(1) General

As soon as possible after the forms are stripped, the concrete surfaces shall be examined and all lips or edgings where form boards have met, shall be removed with a stone or sharp tool. Bolt holes and rock pockets shall be filled with cement mortar and floated to a smooth finish. The mortar patch shall be the same color as the adjoining concrete surfaces. Finishing of concrete surfaces shall be done in accordance with the provisions of the *Standard Specifications* and Special Provisions.

The amount of work necessary to complete the finishing satisfactorily, depends entirely on the quality of the original concrete work. If the forms have been poorly constructed and the concrete surfaces are rough and uneven, it will be necessary for the Contractor to do sufficient rubbing and finishing after the forms are removed to secure a satisfactory job. Grinding leaves a surface that is off color and should be kept to a minimum.

6-2.3D(2) Formed Surfaces

The primary purposes of finishing formed surfaces are:

- To seal the surface from water and other elements that can rust or corrode metal ties and reinforcement within the concrete.
- To provide a uniform, pleasing appearance for surfaces that will remain visible to the public.

There are two different classes of finish. They are:

Class 1

- All rail bases, curbs, traffic barriers, pedestrian barriers, and ornamental concrete members.
- As designated in the Plans and in accordance with Section 6-02.3(14).

Class 2

- Required for all other surfaces.

See the *Standard Specifications* for additional requirements.

6-2.3D(3) Roadway Slabs and Bridge Approach Slabs

Finishing of roadway slab and bridge approach slab surfaces shall be as outlined in Section 6-02.3(10) of the *Standard Specifications*. The principal objectives to be attained are a good wearing surface and a smooth riding roadway. The Engineer should ensure that adequate preparation has been made to do a good job in accordance with the specifications.

The Engineer should insist that a float be available. When a good strike-off and finish has been obtained by a finishing machine, floating may be, and should be, kept to a minimum because excess floating can be detrimental. A light aluminum float carefully and sparingly used will not harm a well finished deck, but will expose poor adjustment and misuse of a good machine. It will also smooth out mortar ridges left by the finishing machine and seal the surface. **The Contractor is required to check the deck with a 10-foot (3-meter) straightedge immediately after it is floated.**

Low and high spots can possibly be corrected by operating the finishing machine over the area (if the concrete is still plastic).

The Engineer should be cautioned that hard floating of the concrete surface with aluminum floats may cause a chemical reaction between the aluminum and the fresh concrete which could decrease the strength of the concrete at the surface of the concrete. Excessive wear or pitting of the aluminum float could be an indication that chemical reaction is taking place between the float and the concrete.

It is important that the texturing comb be used when the concrete is at the proper consistency. If the concrete is too soft, it will not retain the proper texture obtained by the comb and, if the concrete is too hard, the proper texture will not be achieved. The comb should be set up and ready to use well in advance of the time it will be required. Surface texturing is normally done with a comb except when an overlay is required.

The finished and cured deck slabs must be checked with a 10-foot (3-meter) straightedge and corrected by cutting down the high spots and building up low spots until the entire surface comes within the specified tolerance.

Sidewalks shall be finished smooth with a wood float and then brushed with a fine bristle brush. Use an edger tool at all joints and edges. Block lines on sidewalk surfaces are not desired on structures.

6-2.3E Drilled Shaft Foundations

Drilled shaft foundation construction is often very technical and is always critical because the shafts are supporting the structure. Any shaft foundation malfunction will be devastating both economically and safety wise. Construction of maintenance free bridges requires close attention to details during the construction of drilled shaft foundations.

Training on shaft construction is available through the State Construction Office. The training covers specifications, equipment, site geological conditions, and general questions.

At least one week before any drilled shaft foundation work is done, a conference should be held to go over the procedures and equipment to be used and to emphasize the critical areas of construction. As a minimum, this meeting should include a discussion of the contractor's shaft installation plan and order of work. In addition to this discussion, both WSDOT personnel and the Contractor's personnel should discuss specifics of the project; such as, site subsurface conditions, site access, traffic control, staging areas, excavation disposal, protection of the environment, etc.

Meeting attendees should include key personnel from WSDOT, the Prime Contractor, and the shaft drilling Contractor. The WSDOT personnel should include the Project Engineer representatives, a Geotechnical Engineer from the State Materials Laboratory, and a representative of the State Construction Office.

6-2.3F Curing Concrete

Proper curing of concrete is important to securing strong, good wearing concrete and in reducing cracking. Curing periods and methods specified should be strictly observed.

The last step in ensuring a good concrete job is to provide proper curing. Concrete begins to cure from the time cement and water are added in the mixing chamber and continues for many years after. Concrete is very susceptible to damage during initial curing, if proper steps are not taken. Three of the most important factors are:

1. Surface drying (evaporation).

2. Rapid temperature changes between segments of the concrete as it is curing.

3. Stresses or loads applied before the concrete has reached adequate strength.

All of the specifications regarding curing, form removal, hot and cold weather concreting, etc., are designed to provide protection for the concrete during this critical stage.

For example: If the surface begins to dry, the surface will begin to shrink and cracking can occur. To prevent this, the Inspector should be aware that fog misting, curing compounds, wet blankets, plastic sheeting, etc., are designed to be applied **before** surface drying begins to prevent loss of surface moisture. Some concrete mixes such as microsilica and latex are very susceptible to surface drying and require closer attention due to the effects of thin lift application.

Note: Curing compounds are not chemicals that cure concrete. They prevent water loss by forming a waterproof membrane.

Like most materials, concrete expands when heated and contracts when cooled. Therefore, the concrete should not be subjected to extreme temperature changes as hardening takes place.

Hardening of concrete is also slowed down by cooler weather. Concrete must not be exposed to freezing conditions to avoid permanent damage.

Concrete (as it hardens) contains a high percentage of moisture and could crack if the water in the mix freezes and expands. Air entrainment will not protect the concrete from damage during the initial curing period.

Summary

1. Prevent surface moisture loss.

2. Maintain constant temperature (no freezing).

3. Prevent stress loads.

6-2.3G Test Cylinders

Concrete test cylinders shall be molded in forms conforming to the requirements for single use molds as detailed in ASTM M 205. Cardboard test cylinder molds shall not be used.

See Chapter 9 of this manual for instructions for making, curing, and shipping concrete test cylinders and for the number of test cylinders to be made.

Extra cylinders that are tested for early removal of forms and falsework shall be the responsibility of the Contractor. Early cylinders are cylinders tested in advance of the design age of 28 days. Their purpose is to determine the in place strength of concrete in a structure prior to applying loads or stresses. The Contractor shall retain an independent testing laboratory to perform this work. This lab shall be approved by the Engineer.

The cylinders shall be cured in accordance with WSDOT FOP for AASHTO T23. Special cure boxes to enhance cylinder strength will not be allowed. The number of early cylinder breaks shall be in accordance with the Contractors need and as approved by the Engineer.

Prior to the removal of any forms, the Contractor is required to furnish the Engineer with all test results. Forms shall not be removed without approval of the Engineer.

If set retarders are used in a mix, the State Materials Lab should be consulted for curing, handling, and storage instructions prior to use.

6-2.4 Concrete Seals and Cofferdams

When constructing foundations in streams and other locations below water, it is usually necessary to place a concrete seal in the cofferdam so that the cofferdams may be dewatered. The weight of the concrete seal resists the buoyant force on the cofferdam when it is dewatered. Seal concrete is placed underwater by means of a tremie. Concrete pumps may be used.

Handling of the tremie requires the use of a crane to raise and lower it into place. Hand winches are sometimes used in small seals but they must be equipped with a brake and drum for quick release and stop.

The tremie pipe shall be at least 10 inches (250 millimeters) in diameter, made of heavy steel pipe, with flange or sleeve connections. Sleeve connections are preferable for seals placed in pile foundations. Flanges sometimes hang up on tops of piles and the concrete charge is lost. The tremie pipe must be absolutely water tight, at the joints as well as at the connections to the hopper. The hopper should be of at least, one-half cubic yard (one-half cubic meter) capacity.

Before any concrete is placed, the bottom of the tremie pipe shall be sealed with a plug. A satisfactory plug can be made with a 2-inch (50-millimeter) board slightly larger in diameter than the tremie pipe; on top of this board fasten a ¾-inch (19-millimeter) round piece cut to the neat size of the inside of the pipe. Place a piece of cloth or burlap over the end of the pipe and drive the plug in place. Lower the tremie until the plug rests on the bottom, then fill the tremie pipe with concrete. When the tremie is raised the weight (mass) of the concrete will push out the plug. The plug can be salvaged by fastening a piece of wire to it before it is lowered into the water.

Further details for handling a tremie are found in Section 6-02.3(6)B of the *Standard Specifications*.

The thickness of seals without piling are generally not less than 0.43 times the height of high water above the bottom of seal. Seals in footing with piling require special design. The thickness of the seal is computed for the water elevation shown in the plans. The cofferdams must be designed and vented for this elevation. The design and vent elevations are noted in the plans. If concrete is placed in the seal during a period of high water, the dewatering of the cofferdam will have to be delayed until the water level drops to the vented elevation. No change in the vent elevation shown in the plans shall be allowed without approval from the State Construction Office. Such approval should be obtained before the cofferdam is designed. All cofferdams must be vented at the elevation used for computing the seal thickness in order to prevent an unsafe hydrostatic pressure on the seal. Cofferdams shall not be dewatered before the concrete has been placed and cured.

The vertical sheathing of the cofferdam or shoring shall extend below the bottom of the excavation in accordance with the approved working drawings. Sheet piles in cofferdams shall be placed tightly together so that there will be no flow of water through the cofferdams while seal concrete is being placed.

The tops of seals should slope slightly toward one end. At that end, provision shall be made for a sump for the pump intake. Cofferdams should be tightly constructed so that a minimum of pumping is required after the cofferdam has been dewatered. Space for water courses shall be provided on top of the seal and around the footing block, between the footing block and the walls of the cofferdam.

Before starting to place seal concrete, all equipment should be checked to see that it is in good working order. It is necessary that concrete in a seal be placed continuously until completion, with the end of the tremie always extending into the fresh concrete.

It is not desirable to leave cofferdam struts and waling in the seal concrete but it is sometimes necessary to do so, especially in soft foundation material, when a set of struts and waling is required near the bottom of the cofferdam. The concrete displaced by such struts and waling is not deducted from the Contractor's pay items.

After the cofferdam is dewatered, a film of scum or laitance will usually be found on top of the seal. This must be cleaned off before the footing concrete is placed. If the seal is designed as a footing, the laitance will have to be removed only from the areas that will support pier shafts, columns, or walls.

6-2.5 Pier, Column, and Wall Concrete

Concrete in all reinforced footings shall be placed in the dry. All reinforcing, including vertical wall or shaft bars and dowels, shall be securely fastened in place before placing of concrete begins. Driving of dowel bars into concrete must not be permitted, except in seal concrete when the seal is also the footing block, but they must be placed immediately after the concrete is placed. The placing and spacing of footing reinforcing steel is as important as in any other part of the structure.

Care must be exercised in placing reinforcing steel in the columns where it splices with the dowel bars into the footings. In many instances, if the dowel bars and column bars are not carefully placed, there is not enough space between the steel bars for proper placement of concrete. Considerable care must be taken in placing and vibrating the concrete in the columns so that no rock pockets are formed. Column details must be strictly adhered to since they are critical to the earthquake resistance of the bridge.

Care must be taken in placing and vibrating the concrete of sloping walls or columns to get proper consolidation and to avoid rock pockets.

Concrete shall be placed in one continuous operation from top of footing to bottom of pier cap or crossbeam unless construction joints are shown in the plans or preapproved by the State Construction Office. Concrete shall be placed at the rate for which the formwork is designed. This rate, in feet of height (meters of height) per hour along with the concrete temperature, should be stated on the approved falsework plans. Spacing of studs, wales and form ties shall be as shown on the approved falsework plans. Rails, barriers, and parapets on retaining walls shall not be placed until all backfilling is completed. Vibrators shall be used at all times when placing concrete, unless otherwise specified.

6-2.6 Concrete Structures

6-2.6A Forms and Falsework

The forms for the structure shall be constructed in accordance with the approved falsework and form plans and the requirements of Section 6-02.3(17) of the *Standard Specifications*. In general, the forms used for all concrete surfaces which will be exposed, shall be faced with plywood. All plywood used shall be exterior type except where CDX is allowed by the specifications. All forms have to be strong enough to hold the plastic concrete in place until it has hardened. Forms should be designed to permit easy removal without damage to the concrete. Forms are a critical part of the concrete bridge construction process. Generally, the factor of safety used for design of forms is less than that of permanent construction. Therefore, it is extremely important that the forms are constructed in accordance with the approved form drawings. Any changes to the approved form drawings shall be reviewed and approved by the State Bridge and Structures Office.

The Contractor is responsible for designing and constructing the forms and falsework for fixed-form concrete. The Contractor must submit detailed plans (refer to Chapter 6-1.5 of this manual):

- For departmental approval;
- Except for footings and retaining walls less than 8 feet (2.4 meters) in height. See Section 6-02.3(16) of the *Standard Specifications*.

Prior to placing concrete, the Inspector should verify that all forms:

- Provide forming faces that are:
  - Smooth and firm;
  - Clean of dirt, laitance, oil, or any other material that would contaminate or discolor the concrete;
  - Treated with an approved form-release agent;
- Are mortar tight to avoid any leakage (including tape or caulking if needed for surfaces that will require Class 2 finish);
- Are constructed in accordance with the approved forming plans;
- Are adequately rigid and well supported to hold and retain the concrete without distortion or displacement;
- Are set at the locations, dimensions, lines, and grades as specified in the plans.

If wood forms are used, see that plywood is used for the form faces with:

- The joints and grain generally in line with the line of the structure.
- The face grain of the plywood running perpendicular to the supports.
- No offsets or projections that would leave an impression in the concrete surface.

Also verify that:

- Uniform chamfer strips are set at the correct line and grade as required for filleted edges.
- Adequate tie rods, snap-ties, hairpins, studs, walers, and braces are securely placed as needed support.

If metal or fiberglass forms are used, the same basic requirements apply, but particularly check for:

- Any dents or other defects that would harm the uniformity of the concrete surface.
- Any rust or other foreign material that would discolor the concrete surface.
- Countersunk bolts and rivet heads.
- Adequate support clamps, rods, and pins.

Prior to placing any reinforcing or concrete loads on the falsework, verify that:

- The bottom of the falsework is set on a solid foundation, with mudsills, minimum pile diameter, etc., all constructed per approved plans.
- The upper portion provides firm, uniform support.
- Devices such as screw-jacks and wedges are used to hold the forms at the correct elevation, and that they are free from defects, and undamaged or not bent.
- When wedges are used, they are placed in pairs to provide uniform bearing.
- The falsework construction is in accordance with the approved falsework plans and the *Standard Specifications*.

Major failures with loss of life have occurred as a result of poor falsework and formwork construction. It is critical that the Inspector check these temporary structural elements very carefully. Any deficiencies must be corrected before construction loads are applied. If there is a question, the State Bridge and Structures, Construction Support Engineer, or the State Construction Office should be contacted.

Suggested acceptance tolerances are as follows:

1. Bridges and similar structures:

   a. Variation from the plumb or the specified batter in the lines and surfaces of columns, piers, walls and abutments

Exposed, in 10 ft. (3 m)	½ in. (13 mm)
Backfilled, in 10 ft. (3 m)	1 in. (25 mm)

   b. Variation from the level or from the grades indicated on the drawings in slabs, beams, horizontal grooves, and railing offsets

Exposed, in 10 ft. (3 m)	½ in. (13 mm)
Backfilled, in 10 ft. (3 m)	1 in. (25 mm)

   c. Variation in cross-sectional dimensions of columns, piers, slabs, walls, beams, and similar parts

Minus	¼ in. (6 mm)
Plus	½ in. (13 mm)

   d. Variation in thickness of bridge slabs

Minus	⅛ in. (3 mm)
Plus	¼ in. (6 mm)

   e. Footings: Variation in dimensions in plan

Minus	½ in. (13 mm)
Plus	2 in. (50 mm)

   f. Misplacement or eccentricity

2 percent of the footing width in the direction of misplacement but not more than	2 in. (50 mm)

   g. Reduction in thickness

Minus	5 percent of specified thickness

   h. Variation in the sizes and locations of slab and wall openings ½ in. (13 mm)

Forms for concrete surfaces which will be exposed shall be treated with a parting compound consisting of a chemical release agent. Form oil or other oils shall not be used. The parting compound shall be applied before the reinforcing steel is placed. The forms shall be thoroughly wetted on both sides in advance of placing the concrete.

The basic requirements for the removal of any forms and falsework are that:

- The curing temperature was above 50 F (10°C) during the cure period and that strength is adequate.
- No forms or falsework may be removed until authorized by the Engineer.
- All forms and falsework must be removed unless there is no access for removal (i.e., inside a box girder bridge).
- All forms and falsework must be removed in a manner that will not damage the structure.

Timing is a key consideration in the removal of forms and falsework. In terms of curing, the concrete, forms, and falsework must remain until the concrete has sufficient strength to support itself. For finishing purposes, it is generally better to remove the forms as early as possible to finish the surface while it is still green. Therefore, the timing of falsework and form removal depends largely on the type of structure as well as how it is cured and finished.

For example:

- Side forms — not load bearing — at least 24 hours for:
  - Footings, if curing compound applied to complete cure;
  - Steel or dense plywood if: (1) water reducer in mix; (2) low-slump mix, (3) 1,400 psi (9650 kPa) compressive strength, and (4) wet cure for balance of three days;
  - Otherwise three days minimum.
- Release of falsework — supporting weight (mass) of concrete (see *Standard Specifications*).

6-2.6B Traffic Barrier, Pedestrian Barrier, and Rail Bases

On some projects, the Contractor has the option of using slipform techniques in addition to the usual fixed forms as specified in Sections 6-02.3(6), 6-02.3(11)A, 6-02.3(24)C, 6-10.3(2), and 9-03.1(2)B of the *Standard Specifications*.

In either method, barriers and rail bases should be carefully aligned both horizontally and vertically to give a pleasing appearance; refer to Section 6-01.4 of the *Standard Specifications*. The vertical adjustment for the pleasing appearance is intended for localized camber and deck profile variables. This **adjustment is not intended to eliminate grade breaks, such as vertical curves and superelevation transitions**. The Project Engineer should plot to a large scale the profiles of the roadway grades at the curb lines. From these profiles, the grades for the tops of traffic barriers, pedestrian barriers, and rail bases can be properly determined. A slight hump in the barriers or rail base over the whole bridge is not usually objectionable.

On the safety-shape traffic barriers, some of the height variation may be accommodated in the vertical face at the base. Any height variation shall maintain the 2-foot 8-inch (815-millimeter) total height. The vertical toe face at the base is usually 3 inches (75-millimeters) unless the structure is receiving an immediate overlay. To accommodate the overlay, the vertical face at the base is increased to 3 inches (75-millimeters) plus overlay thickness. The front face geometry of the safety-shape traffic barrier is critical and should not be varied except as noted herein. Ideally, all height adjustment required to provide a pleasing appearance should be accomplished by modifying the total height of the traffic barrier by varying the vertical toe face at the base, i.e., 2-inch (50-millimeter) minimum. The front and back faces of the traffic barrier are parallel on the upper part to accommodate all height adjustment necessary. The 7-inch (175-millimeter) height of the intermediate sloping face shall be maintained. To ensure proper alignment, carefully check the top of forms or the Contractor's control wire prior to placing concrete.

On slipformed traffic barriers and pedestrian barriers, the same cross-section as shown for fixed-form construction shall be used, except the top chamfer may be shaped to a ¾-inch (20-millimeter) radius. Although slipforming may be allowed in the contract, the reinforcing steel bars may not be sufficient to resist the forces during the concrete placement operations. The contractor should evaluate the stiffness of the reinforcing and, if necessary, provide additional reinforcing steel crossbracing, both longitudinally and transversely. Slipformed concrete is usually placed with a slump of 1¼ inches (30-millimeters) plus or minus ¼ inch (6-millimeters). This slump is critical and should be carefully controlled by the Contractor. It is not unusual to encounter conditions which produce sections of unsatisfactory barrier or rail base due to slump, finish, alignment or other problems. When this occurs, do not hesitate to have the unsatisfactory sections removed. Occasional removal is inherent in slipform construction.

Placement of the reinforcing steel bar cage to ensure adequate concrete cover and proper reinforcing bar location is very important and difficult to check for slipformed traffic barrier, pedestrian barrier, and rail bases. When fixed forms are used, final adjustment of the reinforcing steel bar cage can be accomplished after the forms are set prior to concrete placement. The slipform method does not present this opportunity. For that reason, Section 6-02.3(24)C of the *Standard Specifications* requires that the Contractor check reinforcing steel bar clearances and placement prior to slipform concrete placement. This check can be accomplished by either the use of an approved template or by operating the slipform machine over the entire length of the barrier. The final grade control must be set prior to the check. All reinforcing steel deficiencies must be corrected by the Contractor. Once the deficiencies are corrected, the Contractor may begin slipform concrete placement after he has the Project Engineer's approval.

6-2.6C Reinforcing Steel

For most concrete structures, some type of reinforcement is required to resist high tension stresses. Reinforcing materials include:

- Uncoated deformed steel bars, which are most commonly used.
- Other types, such as welded wire mesh, epoxy-coated bars, wire, prestressing cable.

(**Note:** Epoxy-coated bars require special handling to prevent damage to the coating.)

- Wire ties and other devices to securely hold the reinforcement in place.

The Contractor is responsible for determining and ordering quantities from the plans.

As reinforcing steel is delivered and stored at the project site, the Inspector should verify that:

- All positioning, spacing, sizes, lengths, shapes, and splice locations conform with the plans.
- Any field bending is done as specified and any cracked or split bars are rejected. If in doubt, reject the bar in question.

The Inspector should verify that the reinforcing placed is:

- Tied at all intersections if bar spacing is 1 foot (300-millimeters) ormore.
- Tied at alternate intersections if spacing is less than 1 foot (300-millimeters).
- Supported in accordance with the *Standard Specifications*.
- **Tack welding is not allowed. It can severely damage the reinforcing steel.**
- Check that clearances between the forms and the reinforcement are within ¼ inch (6-millimeters) of those specified in the plans.
- Check that splices are located and constructed only as shown in the plans using either:
  - Lap splicing:
    - Not permitted for No. 14 or No. 18 bars.
  - Welded splices:
    - Special inspection is required (steel fabrication inspector).
    - Advance approval of welding procedures.
    - By certified welders (test welds).
  - Mechanical splicing (if allowed in the plans):
    - This type of splice must be approved by the State Materials Lab before use.
- Check that reinforcement is securely supported and held in place as follows:
  - By preapproved metal or plastic chairs, hangers, support wires, or mortar blocks that are at least as strong as the structure (mortar blocks require manufacturer certification or cubes for compressive strength testing).
  - With such supports having the correct dimensions to provide the required clearances.
- Check that all damaged epoxy-coated rebar is repaired in accordance with the *Standard Specifications*.

See the *Bar Identification Guide* (Figure 6-2) for proper identification of rebar at the job site.

The ASTM specifications for billet-steel, rail-steel, axle-steel, and low-alloy steel reinforcing bars (A 615M, A 616M, A 617M, and A 706M respectively) require identification marks to be rolled into the surface of one side of the bar to denote the producer's mill designation, bar size, type of steel and minimum yield designation. See Figure 6-2. Grade 60 (400) bars show these marks in the following order:

1st — Producing Mill (usually a letter)

2nd — Bar Size Number (#3 through #18)

3rd — Type Steel:

S for Billet meeting Supplemental Requirements S1 (A 615M)

N for New Billet (A 615M)

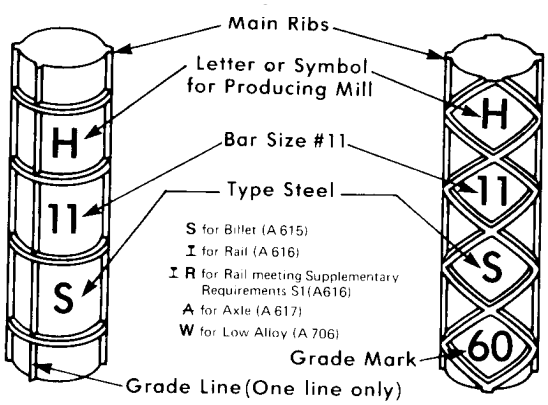
R for Rail meeting ASTM A 617M, Grade 60 bend test requirement (A 616M) [per ACI 318-83]

I for Rail (A 616M)

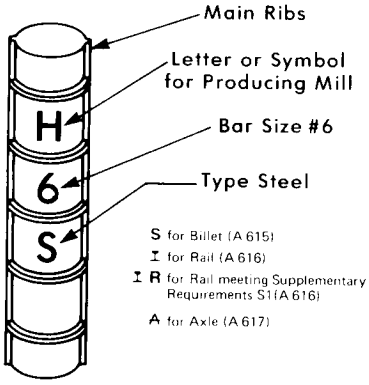
A for Axle (A 617M)

W for Low-Alloy (A 706M)

4th — Minimum Yield Designation



GRADE 60 (400)



GRADE 40 (300) AND 50 (350)

Figure 6-2

Minimum yield designation is used for Grade 60 (400) bars only and can either be one (1) single longitudinal line (grade line) or the number 60 (grade mark).

A grade line is smaller and between the two main ribs which are on opposite sides of all U.S. made bars. A grade line must be continued at least 5 deformation spaces. A grade mark is the 4th mark on a bar.

Grade 40 (300) and 50 (350) bars are required to have only the first three identification marks (no minimum yield designation).

Bar identification marks may be oriented as illustrated or rotated 90 degrees. Grade mark numbers may be placed within separate consecutive deformation spaces. Grade line may be placed on the side opposite the bar marks.

Reinforcing steel shall be placed in position as shown on the plans and held securely during the placement of the concrete. The strength of a reinforced concrete structure depends not only upon the amount of steel placed but also on its proper location. Improper location of the steel can impair the strength of the structure.

In instances where reinforcing steel is shown in detail in specific relationship to other material and details such as inserts, openings, etc., the Inspector should make sure that this relationship exists when inspecting the placement of the reinforcing steel. If the shown relationship is impossible to maintain or results in a conflict with other details, the State Construction Office shall be consulted to obtain clarification of the details.

The reinforcing steel shall be securely blocked from the forms by means of small mortar blocks, with a groove or tie wire embedded, not more than 2 inches (50-millimeters) square, or by other approved devices. If metal chair supports are used as supports for steel reinforcing bars, all surfaces of the chair supports not covered by at least ½-inch (13-millimeters) of concrete shall be treated in accordance with the requirements of Section 6-02.3(24)C of the *Standard Specifications*.

Runways for wheelbarrows or concrete buggies used in placing concrete shall not be supported on the steel reinforcing bars.

Steel delivered to the job far in advance of its use should be stored under cover to prevent rust. Mill scale is sometimes present on the reinforcing steel to such an extent that it must be removed. This is especially true with the larger bars. Removal can usually be accomplished by the use of wire brushes or by tapping the bars with hammers. Hardened concrete mortar must be removed from the reinforcing steel before placing the concrete. All reinforcing steel shall be in its proper place before concrete is placed. Driving of dowels, rail bars, etc., into concrete (wet setting) shall not be permitted. See the *Standard Specifications* for further details.

Before concrete is placed, the reinforcing steel shall be inspected to see that it conforms to the plans and that the steel is properly fastened in position. The amount of cover of concrete over the reinforcing steel in bridge roadway slabs and bridge approach slabs is critical. The Inspector must verify compliance with plan dimensions in the slabs by an adequate number of measurements of the steel reinforcing bar locations in the forms before and immediately after placing concrete. These measurements can be taken at the same time checks on the depth of the concrete in the slabs are taken. These measurements shall be recorded as to depth and location and made a part of the project construction documents.

When steel reinforcing bars protruding from columns or walls are exposed to weather for several months, they rust and exposed surfaces below become stained with rust. To prevent this, the bars should be protected to prevent rust. Coatings used for this purpose may prevent adequate bonding of concrete to the steel bars and should be removed from the bars before concrete is placed, except as allowed by the *Standard Specifications*.

6-2.6D Welding Reinforcing Steel

Reinforcing bars shall not be welded unless welding is indicated in the plans or special provisions. If welding is specified, the WSDOT welding inspector must be contacted for purposes of certifying welders and procedures. Reinforcing bars which are to be welded must be furnished of steel which is suitable for welding as specified.

Only operators qualified as specified in Section 6-02.3(24)E of the *Standard Specifications* shall be allowed to weld reinforcing steel.

AWS specifications require that Low Hydrogen type electrode (welding rod) be used for welding reinforcing steel. Generally, grade E7018 electrodes shall be used for grade 40 (300) reinforcing bars and grade E8018 electrodes shall be used for grade 60 (400) reinforcing bars. If semiautomatic welders are used equivalent grade electrodes shall be used. It is important that moisture be eliminated from the electrode and the steel reinforcing bars. The electrode must be prepared as called for in Section 6-03.3(25) of the *Standard Specifications*. To do this, a drying oven is essential and must be available and used at the site where welding is done.

The recommended procedure for welding steel reinforcing bars is given in Section 6-02.3(24)E of the *Standard Specifications*. The Contractor shall submit a welding procedure to the Engineer for approval. The Project Engineer shall transmit the Contractor's welding procedure to the State Bridge and Structures, Construction Support Engineer for review.

6-2.7 Prestressed Concrete Girders and Piles

Shop inspection of the manufacturing process of prestressed concrete products will be done by an inspector working under the direction of the State Materials Engineer. The State Materials Laboratory has instituted a procedure of inspecting each prestressed concrete plant in the State on an annual basis. During this inspection, the State Materials Laboratory obtains a list of the sources of the component parts to be used in manufacture of the prestressed concrete members. When the Contractor submits a request for approval of source of prestressed products, the complete member and the prestress plant which will manufacture it need only be listed.

The Inspector prepares a weekly Fabrication Progress Report and Inspectors Daily Report, and submits them to the Project Engineer for information and records. When the prestressed unit is completed, including finishing, the Inspector will attach an Approved for Shipment tag, and/or the girder will be stamped with an "approved for shipment" and a lab I.D. number. The Approved for Shipment tag properly signed and dated or the "approved for shipment" and a lab I.D. number will be the Project Engineer's basis for accepting the product at the job site. The Project Engineer will be required to inspect the item only for any damage which may occur during shipment or after the item arrives at the job site.

Finishing of concrete surfaces of prestressed units shall be in accordance with Sections 6-02.3(14) and 6-02.3(25)H of the *Standard Specifications* unless specifically changed by the special provisions. The Shop Inspector shall require that the finishing done in the shop is in accordance with the specifications.

Prestressed concrete girders shall be maintained in a plumb, upright position at all times and shall be lifted by means of the lifting strands provided at the ends of the girders. All prestressed girders have been designed for a vertical pickup at the ends as indicated in the contract plans, and any other method will induce stresses which could cause failure of

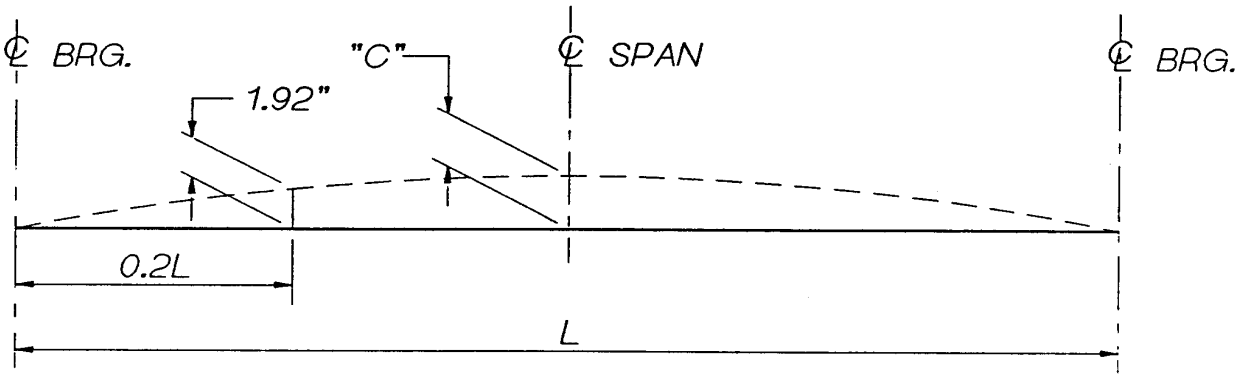


Figure 6-4

the girder during pickup. Some deviation from the vertical is safe for some girders. If the Contractor wishes to deviate from the vertical pickup, they shall have the proposed method analyzed by their engineers and shall submit the method, with supporting calculations, for review. The Project Engineer submits the calculations to the State Construction Office for review. If the girders are broken or damaged during handling or erection, they will have to be replaced at the Contractor's expense.

The girders shall not be placed on the finished piers or abutments until the concrete in the piers or abutments has obtained at least 80 percent of its design strength. If grout pads are required, they shall be constructed and cured as required by the plans and specifications before placing the girders. If elastomeric bearing pads are required, the lower contact surface of the pads must be bonded to the structure with an approved rubber cement to hold them in the position shown in the plans.

The girders must meet the dimensional tolerances listed in Section 6-02.3(25)I of the *Standard Specifications*.

6-2.7A Shop Inspection of Prestressed Concrete Products

The Contractor is required to submit five sets of the shop detail plans to the Project Engineer for approval. The Project Engineer shall check these plans for compliance with the contract plans and specifications. The Project Engineer shall only approve the shop plans for standard series "I" girders and for the concrete piling shown in Standard Plan E-4 or E-4a. No deviations shall be approved without written approval of the State Bridge and Structures Engineer (or Terminal Design Engineer for Ferries Division projects). The shop drawings for all other precast piles or prestressed concrete products shall be approved by the State Bridge and Structures Engineer (or Terminal Design Engineer for Ferries Division projects).

The approved shop detail plans shall be distributed as follows:

A. Project Engineer (or Terminal Design Engineer) Approved:

2 sets retained by the Project Engineer (or Terminal Design Engineer)

1 set to the Contractor

2 sets, along with the contract plans and special provisions, to the State Materials Engineer

B. Bridge and Structures Engineer (or Terminal Design Engineer) Approved:

1 set retained by the Bridge and Structures Engineer (or Terminal Design Engineer)

4 sets to the Project Engineer, who will forward one set to the Contractor, and two sets to the State Materials Engineer who will forward the shop drawings and a set of contract plans and special provisions to the Prestressed Plant Inspector

Manufacture of these members shall not begin until the Contractor has received approval of the method, materials, and equipment they propose to use in the prestressing operations. Deviations from the approved shop drawings shall not be permitted unless approved in writing in advance of use.

Welding of the reinforcing bars will not be permitted unless shown in the contract plans.

The State Materials Lab has published a manual entitled "Inspectors Guide for Prestressed Plant Inspection and Quality Control" which contains more detailed instructions for this work.

6.2.7B Prestressed Girder Camber

Precast prestressed girders start creeping up immediately after prestressing strands are released in the casting bed. Over time, creeping or girder deflection upward continues. Bridge plans estimate the expected creep at 120 days, from prestress release to deck placement, and designate the letter "D" for this deflection. Theoretical girder camber at mid span vs. actual girder camber measured in field, after girder erection, should be compared for compliance with *Standard Specification* 6-02.3(25)k.

The camber diagram is a parabolic curve. In order to have a smooth vertical profile the pad dimension on top of girder flange varies through the length of span (see Figure 6-3). This dimension is usually least (depending on the vertical profile curve) at center span and maximum at center line of bearings which bridge plans refer to as "A" dimension. The designation "C" is the amount of camber added to the deck grade elevations to account for the anticipated downward girder deflection due to all superimposed loads (slab, overlay, sidewalks, utilities and traffic barriers).

Finished roadway grade elevations should be calculated along the center line of the prestressed girders at a minimum of every 10 feet for each span. Camber values at these locations need to be added to the finished roadway grade elevations to compensate for the girder deflection due to superimposed loads. Equation 6-1 calculates the camber at any point along the span.

$$\mathbf{Y = C - 4C\,(M - 0.5)^2} \quad \text{(Equation 6-1)}$$

Y = camber at any point along the span length in inches (mm)

C = deflection due to superimposed dead load at span mid point in inches (mm)

M = location of span in decimal percent

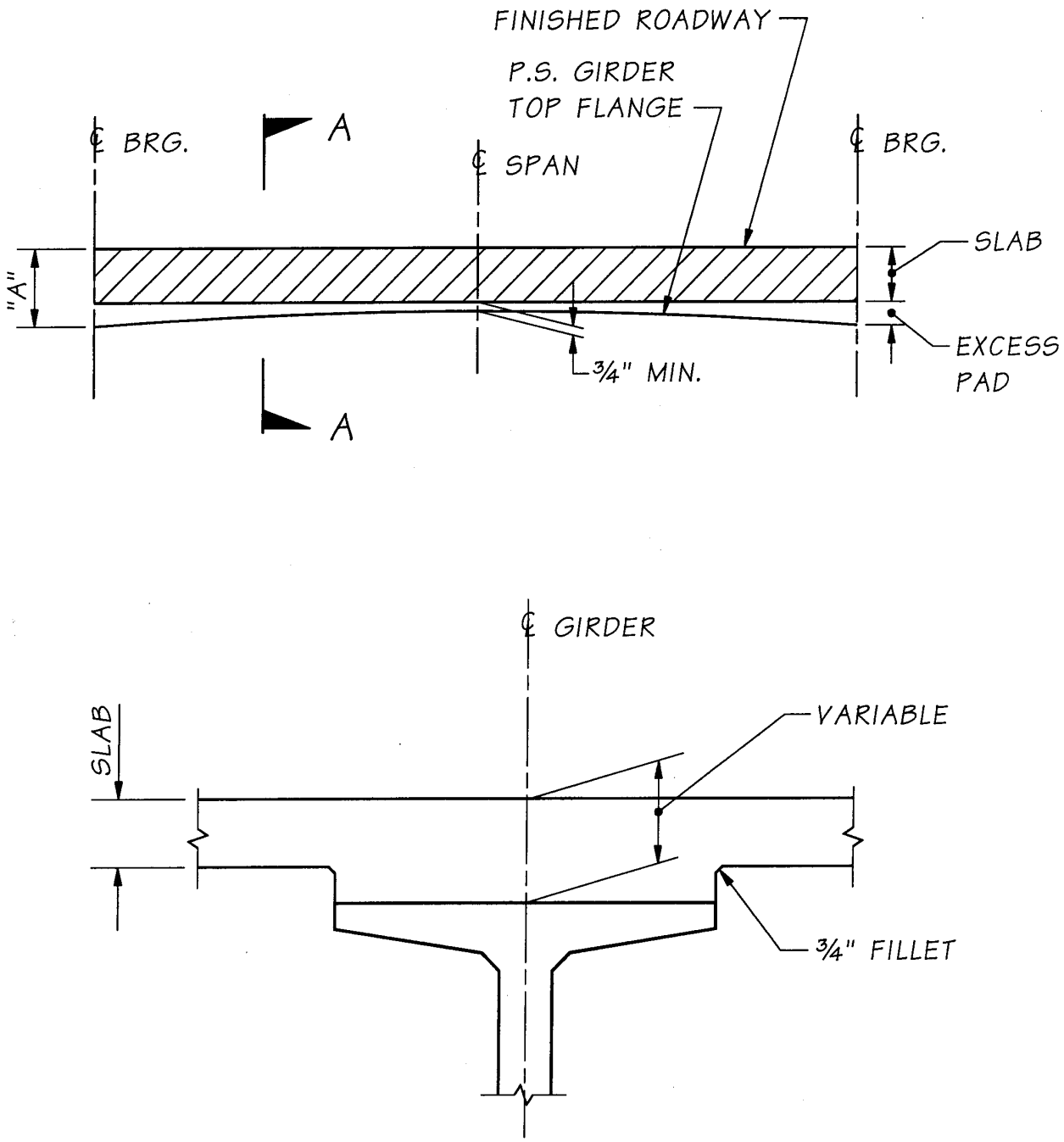
The following example shows how tenth point span camber can be calculated.

Example:

Calculate camber at 0.20 point span for a prestress girder when girder length (ctr. - ctr. bearing) is 174.2 feet (53.085 m) and "C" dimension at mid span given as 3 inches (75 mm) (see Figure 6-4).

$$Y = 3 - 4(3)\,(0.20 - 0.5)^2$$

$$Y = 1.92 \text{ inches (48 mm)}$$



Section A-A
Figure 6-3

Once the girders are set in place and before any load is added to the girders, elevations are taken at the tenth point locations (or minimum spacing of 10 feet as determined by the span length) to be used to determine an adjusted "A" dimension. The adjusted "A" dimension is determined by subtracting the as built elevations from the calculated finished roadway grade elevations plus camber to determine the new adjusted "A" dimension at each location. The adjusted "A" dimension is used to string line between two adjacent points to determine soffit location.

6-2.8 Post-Tensioned Bridges

The construction of cast-in-place post-tensioned bridges requires considerable attention to details of construction by the Contractor and Inspectors. **The State Construction Office is available to present job-specific training on post-tensioned bridges**. They should be contacted after the post-tensioning shop drawings have been approved and before post-tensioning ducts and anchors are to be placed.

In addition to the falsework and form plans for the structure being approved by the Bridge and Structures Engineer, post-tension detail plans shall be submitted for approval as shown in the Shop Plans and Working Drawings Table in Chapter 1-2.4H of this manual. Included in these details will be the anchoring details, jacking forces, lift off forces, tendon profile, elongation of the tendons, and the tendon stressing sequence. In many structures, the dead load of the structure is increased at the jacking ends during the jacking operation. In these cases, the falsework at the jacking ends must be designed to carry the additional dead load.

The installation of the post-tension system begins with the placing of assemblies consisting of bearing plate, transition cone or trumpet and grout inlet. Duct sections consisting of rigid conduit are assembled with couplers and are tied to the stirrups. Anchorages and bearing plates are securely fastened to the forms to prevent movement and loss of mortar during concreting. Connections between trumpets and ducts, ducts and couplers, and ducts and vent saddles are taped with a durable and waterproof tape to prevent intrusion of mortar.

It is necessary that the ducts be located in the position shown in the approved post-tension details in order for the structure to function as designed. A misaligned duct will cause increased friction and localized stress which can result in failure of the member during the stressing operation. The Inspector must check to see that the ducts are properly located and securely fastened in place to prevent movement during concreting.

On continuous structures, vents must be placed at the high and low points of the tendon and grout inlets at the ends of the tendon.

At the completion of the duct installation and prior to placement of concrete in the top slab, a device of slightly smaller diameter than the inside diameter of the duct shall be blown through the ducts to ensure no undetected damage or blockage has occurred (see *Standard Specifications* Section 6-02.3(26)E.

The prestressing reinforcement strand is delivered to the site in sealed reel-less packs or reels containing desiccant to prevent corrosion. It is necessary that the prestressing reinforcement is free of rust and kept clean while it is assembled, stressed, and grouted. Normally, the grouting shall take place within 10 days of the time the strand is removed from the packs to prevent the accumulation of rust. The Inspector should check the reels of strand intended for use and reject those which show damage to the strand or visible rust. See Section 6-02.3(26)F of the *Standard Specifications* for further requirements.

Some projects may be designed for the use of high strength steel rods instead of the strand. These rods come in various sizes to give the required steel area for the tendon in one bar instead of bundling several strands in the tendon.

Jacking operations shall not be started until the concrete in the structure has cured for the specified time or reached the specified strength. Jacking shall be carried out in the sequence shown on the approved post tension details to minimize the amount of eccentric loading on the structure. **During the jacking operations, no person should be directly behind either end of the tendon.** Occasionally a tendon will let go, resulting in a very dangerous situation.

Each jack used to stress tendons shall be equipped with either a pressure gauge or a load cell along with certified calibration charts for determining the jacking force.

Gauging devices should be re-calibrated at intervals of not more than 180 days; however, if during the progress of the work, any gauging system appears to be giving erratic results, or if gauge readings and elongation measurements indicate materially different stresses, the jack and the gauges shall be re-calibrated.

A starting load, usually 20 percent of the jacking load, as shown in the approved post tensioning schedule, is applied to the tendon. The purpose of this starting load is to take up the slack in the tendon so that an accurate elongation measurement may be made. This load is applied by hydraulic jacks and measured by the jack gauges. During the stressing operation, the tendons shall be jacked to the specified load and the jacking load and elongation shall be recorded. Also the elongation after seating must be measured and recorded (see Figure 6-5).

In the event of discrepancies between measured elongations and calculated elongations (see Stress Acceptance Criteria), the entire operation should be carefully checked and the source of error determined and corrected before proceeding further. A discrepancy between the elongation and the jacking force usually indicates that the gauge on the jack is not correctly calibrated, there is undue friction between the duct and the tendon, or the tendons are not properly anchored.

Stress Acceptance Criteria

Strand Tendon (lengths 50 feet (15 meters) and less):

1. The tendon may be accepted provided: The measured elongation is equal to or exceeds 93 percent of the approved calculated elongation, and

2. A force verification lift-off is performed: The verification lift-off force is between -5 percent and +5 percent of the approved calculated force.

Strand Tendon (lengths greater than 50 feet (15 meters) and less than 150 feet (45 meters)):

1. If the measured elongation is between -7 percent and +7 percent of the approved calculated elongation, the tendon can be accepted.

2. If the measured elongation exceeds 107 percent of the approved calculated elongation, confirm the jack/gauge calibration, and then perform a force verification lift-off:

a. If a force verification lift-off is performed on one end of the tendon only and the lift-off force is between -1 percent and +5 percent of the approved calculated force, the tendon can be accepted.

b. If a force verification lift-off is performed on both ends of the tendon (jacking end and anchor end) and the lift-off forces are between -5 percent and +5 percent of the approved calculated force, the tendon can be accepted.

Strand Tendon (lengths 150 feet (45 meters) and greater):

1. If the measured elongation is between -7 percent and +7 percent of the approved calculated elongation, the tendon can be accepted.

2. If the measured elongation exceeds 107 percent of the approved calculated elongation, confirm the jack/gauge calibration, and then perform a force verification lift-off.

a. If a force verification lift-off is performed on one end of the tendon only and the lift-off force is not less than 99 percent of the approved calculated force nor more than 0.7 f's As, the tendon can be accepted.

b. If a force verification lift-off is performed on both ends of the tendon (jacking end and anchor end) and the lift-off forces are not less than 95 percent of the approved calculated force nor more than 0.7 f's As, the tendon can be accepted.

Singularly Jacked Four-Strand Transverse Deck Tendon:

The tendon may be accepted provided:

1. The measured elongation of an individual strand is between -10 percent and +10 percent of the approved calculated elongations, and

2. The average of all four individual strand percent elongations is between -7 percent and +7 percent of the calculated elongation.

Bar Tendon:

1. The tendon may be accepted provided: The measured elongation is equal to or exceeds 93 percent of the approved calculated elongation, and

2. Perform a force verification lift-off: The verification lift-off force is between -5 percent and +5 percent of the approved calculated force.

If acceptance tolerances are exceeded, notify the State Construction Office.

f's = specified minimum ultimate tensile strength of prestressing steel (270 ksi (1862 Mpa) for strands and 150 ksi (1034 Mpa) for bars.)

As = cross-section area of the tendon (0.153 square inches (99 square millimeters) for ½-inch (13-mm) diameter strand, 0.217 square inches (140 square millimeters) for 0.6-inch (15-mm) diameter strand.)

The grout used is fluid and quite different from the mortar we usually associate with the term grout. The component materials of the approved grout mix must be accurately measured. **The maximum amount of water specified must not be exceeded.** The grout should be screened after it has been mixed and before it is added to the grout equipment to remove lumps which might cause clogging of the ducts.

Immediately, prior to grouting, the ducts shall be blown out with oil free compressed air. Grout is applied continuously by pumping under moderate pressure at the lower end of the duct toward an open vent at the upper end until all entrapped air is forced out the open vents. The open vents are closed under pressure of issuing grout after a steady solid stream of grout is discharging. The grouting pressure is gradually increased to a minimum of 100 psi (690 kPa) and 200 psi (1380 kPa) maximum and held at this pressure for a minimum of 10 seconds. The grouting entrance is then closed.

After grouting of the tendons, the recesses for the anchorages are cast solid with concrete.

A complete record must be kept of the stressing operations.

An example of the Post-Tensioning Record (Form 450-005) is shown in Figure 6-5 the following explanation to help in completing the record.

A. Required jacking force for the tendon is obtained from the approved post-tensioning details.

B. Gauge pressure is obtained from the certified calibration chart for the jack to obtain the required jacking force listed in "A" above.

C. Gauge pressure for the initial force to take up the slack in the tendon and is usually 20 percent of the force obtained in "B" above.

D. The designed elongation is obtained from the approved post-tensioning details, however the stress strain curves prepared by the steel manufacturer shall be used to determine the modulus of elasticity for adjusting the designed elongation based on the average value of all strands to be incorporated in the tendon.

E. This required seating take up is obtained from the approved post-tensioning details. This is usually ¼ inch (6 millimeters) to ⅜ inch (10 millimeters).

F. & G. The elongation must be measured at the initial force of 20 percent of the required jacking force, at the specified jacking force, and again at the 20 percent loading.

H. The difference in the elongation measured at full force and the elongation measured at the initial force of 20 percent (minus any dead end slip). This elongation should be reasonably close (see Stress Acceptance Criteria) to the required elongation in "D" above.

I. Seating take-up is the difference in the elongation measured at full force and the elongation measured after the tendon has been seated and the jacking force reduced to the initial force of 20 percent of full force. However, since the elongations are measured at the end of the jack, the elongation of the tendon from the wedges to the measuring point must be accounted for to obtain the true seating take-up. After finding the difference between the full jacking force elongation and the 20 percent of full jacking force, (I1) the elongation of the tendon inside the jack must be subtracted from the difference to obtain the true seating take-up. (I2) The elongation of the tendon inside the jack is approximately $^{1}/_{16}$ inch per foot (5 millimeters per meter). This seating take-up should be the same as the required take-up in "E" above. It is important that the specified seating take-up be obtained as it has an appreciable effect on the stress in the tendon.

J. Percent elongation per tendon is a comparison of the calculated elongation and the measured elongation. If the elongation obtained at full jacking force is not reasonably close to the required elongation, the following conditions are usually indicated:

1. There is more (or less) friction in the tendon than was anticipated in the calculations of the post-tension details.
2. The gauging devices on the jack are not properly calibrated.
3. The strands of a tendon are not properly anchored.

If tendon stressing is performed at an air temperature below 60 F (16°C), the Contractor should not be allowed to use jack pressure gauges that utilize oil or glycerin. This will ensure accurate jack pressure readings. The reason for this is that these gauges tend to react slowly at lower temperatures. What can happen with these gauges is the jack operator will bring jack up to the required gauge pressure and shut the jack off. Since the gauge is slow in reacting, it will continue to rise until it "catches" up, resulting in over stressing the tendon. Once this occurs, the tendon will usually need to be replaced.

6-2.9 Measurement and Payment

Measurement and payment instructions are covered in Sections 6-02.4 and 6-02.5 of the *Standard Specifications*.

6-3 Steel Structures

6-3.1 General

The Contractor shall submit shop plans of all steel fabrication for approval. Fabrication of the steel shall not be started until the shop plans have been approved by the Bridge and Structures Engineer (or Terminal Design Engineer for the Ferries Division projects) and the materials source and fabricator have been given approval by the State Materials Engineer. The State Materials Engineer shall advise the State Bridge and Structures Engineer (or Terminal Design Engineer) when the materials source or fabricator has been approved. The plans will not be returned to either the Contractor or the fabricator by the Project Engineer until the approval of source has been given by the State Materials Engineer. WSDOT approves the shop plans for sufficiency of the materials and connections and not for the correctness of dimensions. Some details of the design drawings may, with the approval of the State Bridge and Structures Engineer (or Terminal Design Engineer), be changed to suit the erection methods the Contractor desires to use. These revisions may require a change order.

The Contractor shall submit eight sets of all shop detail plans required for fabrication of the steel directly to the State Bridge and Structures Engineer and two sets to the Project Engineer. For the Ferries Division projects, all ten sets shall be submitted to the Terminal Design Engineer. If a railroad is involved, four additional sets are required for each railroad involved. See the shop plans and working drawings table in Chapter 1-2.4H. The Project Engineer should advise the State Bridge and Structures Engineer of any conditions that would affect the checking and approval of the drawings. These comments should be shown with a green color marker on the Project Engineer's copy.

Shop inspection is performed either by inspectors or representatives of the State Materials Laboratory. Material Acceptance Reports are obtained by these inspectors and provided to the Project Engineer upon completion of the shop fabrication. Erection plan sheets generally accompany the shop plans.

Falsework and erection plans for structural steel structures shall be submitted for approval in the same manner as for concrete structures.

Camber diagrams are normally shown in the contract plans. It is the Fabricator's responsibility to fabricate the members to the prescribed camber shown in the plans. The Fabrication Inspector should verify that the members are fabricated in accordance with the approved shop drawings.

The use of heavy equipment for erection purposes requires the approval of the State Bridge and Structures Engineer. See *Standard Specifications* Section 6-01.6.

Prior to completion of the project, the Contractor is required to furnish shop drawings on mylar or equivalent, which will be sent to the State Bridge and Structures Office for their permanent file. These drawings must be suitable for reproducing by microfilming.

6-3.2 Layout

Laying out work for structural steel spans requires greater accuracy than for other structures. Use precise instruments, standardized tapes, scales and thermometer when making layout. Spacing of piers, bents, and anchor bolts shall be as shown in the plans, providing the span after fabrication in the shop is the correct length.

The fabrication shop is required to furnish a sketch showing the length of span and amounts of camber measured in the shop at the time the spans are assembled. The Project Engineer should have a copy of this sketch before erection

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Post-Tensioning Record

Date	Gir. No.	Tendon No.	Jack No.	Jack Location	Req 'd. Jacking Force Per Tendon (kN)	Strands Per Tendon	Gauge @ 20% Jacking Force (MPa)	Gauge @ Req'd. Jacking Force (MPa)	Gauge @ Actual Jacking Force (MPa)	Actual Elong. (mm)	(A) 100% Actual Elong. -20% Actual Elong. (mm)	(B) Calc. 80% Elong. (mm)	% Elong. Per Tendon	100% Actual Elong. -Seated Elong. (mm) = (c)	(c) -Jack Elong. = Seating Take-up (mm)	Req'd. Seating Take-up (mm)
1-2-96	A	1	6	Pier 1	1655	12	9.65	48.26	9.65	108						
									48.26	597	489	486				
									9.65	582				15	10	10
							Dead	End	Slip		(-) 3					
											486			15-5		
														1 m jack x 5 mm/m		
1-2-96	A	1	6	Pier 3	1655	12	9.65	48.26	9.65	0						
									48.26	44	44	50				
									9.65	30				14	9	10
											530	536	99			
					A		C	B	F	G	H	D	J	I_1	I_2	E

DOT Form 450-005X Met
Revised 1/97

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Olympia Service Center Construction

Note: % Elong. = The sum of columns "A" for both ends of the tendon divided by the sum of columns "B" for both ends of the tendon X 100.
% Elong. shall be between 93% minimum and 107% maximum.

Figure 6-5

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PROJECT ENGINEER	INSPECTOR

Post-Tensioning Record

Date	Gir. No.	Tendon No.	Jack No.	Jack Location	Req'd. Jacking Force Per Tendon (Kips)	Strands Per Tendon	Gauge @ 20% Jacking Force (p.s.i.)	Gauge @ Req'd. Jacking Force (p.s.i.)	Gauge @ Actual Jacking Force (p.s.i.)	Actual Elong. (in.)	(A) 100% Actual Elong. -20% Actual Elong. (in.)	(B) Calc. 80% Elong. (in.)	% Elong. Per Tendon	100% Actual Elong. - Seated Elong. (in.) = (c)	(c) - Jack Elong. = Seating Take-up (in.)	Req'd. Seating Take-up (in.)
1-2-96	A	1	6	Pier 1	372	12	1400	7000	1400	4 1/4						
									7000	23 1/2	19 1/4	19 1/8				
									1400	22 7/8				5/8	7/16	3/8
							Dead	End	Slip		6) 1/8					
											19 1/8			5/8 - 3/16		
														3 foot Jack x 1/16 in/ft.		
1-2-96	A	1	6	Pier 3	372	12	1400	7000	1400	0						
									7000	1 3/4	1 3/4	2				
									1400	1 1/4				1/2	5/16	3/8
											20 7/8	21 1/8	99			
					A		C	B	F	G	H	D	J	I_1	I_2	E

DOT Form 450-005X
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Olympia Service Center Construction

Note: % Elong. = The sum of columns "A" for both ends of the tendon divided by the sum of columns "B" for both ends of the tendon X 100.
% Elong. shall be between 93% minimum and 107% maximum.

Figure 6-5

is begun. The lengths as measured in the shop seldom vary more than ¼ inch (6 mm) to ⅜ inch (10 mm) from the design drawings, and there is sufficient play in the anchor bolt sleeves for this tolerance.

Allowance will be made on the design drawings for stretch of the span due to loss of camber. The Project Engineer shall compute camber elevations from the shop camber measurements taken by the shop. Elevations shall be set above the falsework at each panel point for the camber blocking. Most erectors set the camber blocks high to allow for settlement of the falsework. The amount of allowance for settlement should be decided by the erector. The Project Engineer shall give the exact elevations for the finished camber. Elevations shall be given and carefully checked as an error means that an unnecessary amount of jacking and adjusting may be required.

The adjustment of spans is often a source of argument between erectors and engineers. Accurate work on the part of the Engineer will do much to avoid such arguments. Elevations set on the falsework before the load is applied may not be correct after the load is applied. It is the responsibility of the Contractor to determine the allowance that may be necessary to compensate for settlement in the falsework. It is easier to lower the span than to raise it.

6-3.3 Handling and Storing Material

Structural steel members shall be handled carefully to prevent twisting, bending, or scraping the member. The material shall be supported on suitable skids or platforms to keep it off the ground or out of water and it shall be protected from deterioration by rust.

Structural steel members should not be unloaded and stored on adjoining concrete approach spans. If the Contractor proposes to use the concrete approach spans to support the structural steel members, the proposal must be submitted in writing to the Bridge and Structures Office for review and approval. This proposal shall include drawings describing the support locations, loads, and supporting stress calculations. The structural steel members shall be placed on timber blocking, spaced so that the weight (mass) will be carried on the girders (load carrying members) and not on the comparatively thin concrete deck slab. Bridge decks are designed for carrying traffic and not as storage or dock space. This is especially true for concrete sidewalk slabs. Sidewalk concrete slabs shall not be overloaded by loads such as building material, tool sheds, or paint sheds.

6-3.4 Straightening Bent Material

Methods for straightening of plates, angles, other shapes, and built-up members shall not produce fracture or other injury to the metal, and shall be approved by the State Construction Office. Distorted members shall be straightened by mechanical means or by the carefully planned and supervised application of a limited amount of localized heat. The temperature of the heated area shall not exceed 1,100 F (593°C) (a dull red) and shall be controlled by temperature indicating crayons, liquids or bimetal thermometers.

Following the straightening of a bend or buckle, the surface of the metal shall be tested for evidence of fracture.

6-3.5 Setting Anchor Bolts and Masonry Plates

Anchor bolts are usually plain round bolts with the head and plate washer on the lower end and the thread and nut at the top end. These bolts are set in pipe sleeves to allow room for adjustment of the span. Location of anchor bolt sleeves is very critical and must be verified by the inspector. Also, the exposed length of anchor bolts should be checked to ensure enough thread is exposed out of the pier cap to tie down the lower bearing assembly.

Anchor bolt sleeves, when anchor bolts will not be grouted until after freezing weather, must be protected against damage from expanded ice by filling the sleeves with an approved nonevaporating antifreeze solution. Without exception, when piers and superstructures are constructed under separate contracts, the anchor bolt sleeves shall be filled with an approved nonevaporating antifreeze solution by the substructure Contractor. Before the bolts are grouted, the antifreeze solution shall be removed, the space well cleaned and the holes then filled with grout. The antifreeze solution shall be diluted with water and completely removed from the sleeves or it will have a detrimental effect on the filler grout. See Section 6-02.3(18) of the *Standard Specifications*.

It is important to set bearings level on all piers. Bridge plan bearing details usually show a leveling method. Bearings shall be set so that they are at zero movement at 64 F (18°C) after the total load is applied and the span is released. The amount of offset varies with the length of the span and the temperature at time of erection.

Anchor bolt holes and the void underneath masonry plates shall be grouted, after all structural steel is erected and adjusted for length and camber, and at least seven days before the deck concrete is placed. Portland cement shall be used for grouting and the procedure should be as outlined in Section 6-03.3(36) of the *Standard Specifications*.

Do not grout underneath masonry plates with dry mortar unless specifically shown in the plans. The Contractor shall build forms around the masonry plate about 4 inches (100 millimeters) high and pour grout in the form from one side until the whole area is well filled. Use a wire or steel band to keep the grout flowing. After the grout has taken its initial set, remove the form and cut the edges of the grout with a trowel to about a 45 degree bevel from the bottom of the shoe to top of the pier. Do not allow the finished grout to extend above the bottom of the masonry plate.

6-3.6 Erection of Steel

6-3.6A Assembling

Before erection of the steel is commenced, the structural steel members shall be inspected for damage during shipping and handling. Any members that have been damaged must be repaired or replaced before being erected.

All members should have been match-marked and shall be assembled in accordance with the erection drawings from the Contractor. As the erection progresses, the Inspector should compare assembled members against the erection plans to see that proper members are in correct positions.

If during assembling, it is discovered that various members do not fit together, do not allow undue force to be applied to make them fit. The application of such a force can introduce stresses in several components of the structure. These stresses can be of a magnitude high enough to cause serious structural problems. The structure has not been designed to take these stresses. In such cases, the Assistant State Construction Engineer, Bridges, shall be informed.

Structural steel members that are improperly fabricated, or do not fit, shall be rejected and either repaired or replaced with new. If the Contractor elects to repair the structural member, the proposed repair procedure shall be reviewed and approved by the Assistant State Construction Engineer, Bridges, prior to any repair work.

Unless otherwise shown or specified, structural steel connections shall be bolted. Simple truss spans shall be completely erected with all field-bolted connections and/or splices held in place with the minimum number of drift pins and bolts as specified in Section 6-03.3(32) of the *Standard Specifications*. Once the minimum number of drift pins and bolts are installed in all the connections, final adjustments for span length and camber shall be made prior to completion of bolting and release of falsework. The assembly and bolting sequence for all structural steel structures shall strictly follow the approved erection plan. Erection and bolting sequences, especially cantilever and arch spans, are usually detailed in the contract documents.

Field connections shall be pinned and bolted in accordance with the requirements of Section 6-03.3(32) of the *Standard Specifications*. This section applies to connections and splices made in the field. Connections are when one structural steel member is bolted directly to another structural steel member; such as, cross-members and braces. Splices utilize structural steel plates to connect two structural steel members; such as, a plate girder. It also requires all connections and splices be securely drift-pinned and bolted before the weight of the member can be released or the next member is added. The field erection drawings must specify pinning and bolting requirements. Section 6-03.3(32) then specifies the required minimum number of pins and bolts for field connections and splices.

All bolted connections are designed by WSDOT to be friction connections. A friction connection transfers the stress by friction between surfaces in contact and does not depend on shear or bearing between members and bolts. The friction is provided when the connection or splice members are compressed through tension on the bolts (measured by turn-of-nut or direct-tension-indicator method). To develop design contact surface friction, all bolts in a bolted connection must be properly tightened to the minimum specified tension. The *Standard Specifications* recognize that final design loads are not present during erection of the structural steel members. Therefore, during erection, all the bolts are not needed in order to develop the friction necessary in the connection or splice for erection loads. The *Standard Specifications* recognize this and require a minimum percentage of the holes to be filled during erection; for instance, 50 percent for normal structures and 75 percent for cantilevered structures. These holes are filled with a combination of drift pins and bolts. Drift pins are required to properly align the members since bolts are usually smaller in diameter than the holes. Bolts are required to develop the minimum friction required to transfer erection loading. The minimum friction or load-carrying capacity is not developed until the bolts are tightened to the specified minimum tension.

Once the member is released from its support (support falsework or crane), the *Standard Specifications* specify the procedure required to complete bolting of each connection.

Sometimes fabricators will temporarily bolt-splice plates to the appropriate member. The fabricator will usually use the minimal number of bolts to secure the splice plate during shipping and handling. These temporary bolts shall be removed and replaced with approved high-strength bolts.

6-3.6B High-Strength Bolts

Structural steel field connections are made with high tensile strength bolts conforming to the requirements of Section 9-06.5(3) of the *Standard Specifications* and Special Provisions. A special heat treatment gives these bolts a high tensile strength.

WSDOT designed bolted connections generally operate by a transfer of stresses by friction between surfaces in contact and do not depend on shear or bearing between the members and the bolts. Therefore, it is imperative that the contact surfaces of the metal shall be properly cleaned and the required minimum tension be obtained in the bolts.

The required tension in the bolts may be obtained by using either the Turn-of-Nut method or the Direct Tension Indicator (DTI) Method unless the specifications for the project state otherwise. If required because of bolt-entering and wrench-operation, tightening by either procedure may be done by turning the bolt while the nut is prevented from rotating. Section 6-03.3(33) requires a hardened washer under the turned element. Therefore, if the bolt is turned, a hardened washer is required under the bolt head. A hardened washer is also required with the DTI Method.

Bolted parts shall fit solidly together when assembled. Where an outer face of the bolted parts has a slope greater than 1:20, with respect to a plane normal to the bolt axis, a beveled washer shall be used to compensate for the lack of parallelism. See Figure 6-6. Bolts shall be tightened beginning from the center of each connection towards the edges of the connection. All joint surfaces, including those adjacent to the bolt heads, nuts or washers, shall be free of scale, except tight mill scale, and shall also be free of burrs, dirt, and other foreign material that would prevent solid seating of the parts.

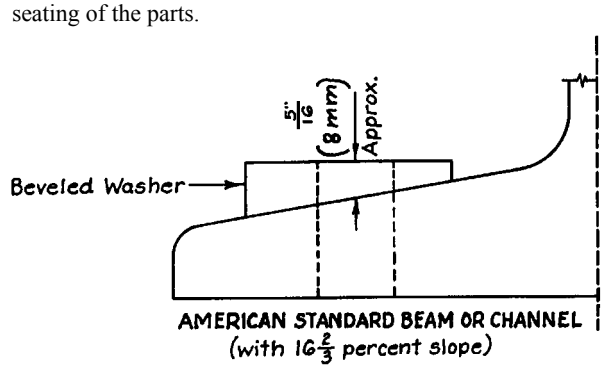


Figure 6-6

AASHTO specifications require that bolts bear specific identification marks. The following identification is marked on the top of the bolt heads:

	AASHTO M 164	AASHTO M 253
Type 1	A 325	A 490
	8S	10S
Type 2	A 325	A 490
	8S	10S
Type 3*	A 325	A 490
	8S3	10S3

*At the manufacturer's option, Type 3 bolts may have additional distinguishing marks to indicate the bolt is atmospheric corrosion resistant and of weathering type.

Nuts of all classes, in nominal diameter M5 and larger, shall be marked with the property class designation (5, 9, 10, 12, 8S, 10S, 8S3, 10S3) on the top or bearing surface, on the top of flange, or on one of the wrenching flats. Additionally, nuts of Classes 10, 12, 8S, 8S3, 10S, and 10S3 shall be marked with a symbol to identify themanufacturer. For Classes 8S3 and 10S3 nuts, the manufacturer may add other distinguishing marks to indicate the nut is atmospheric corrosion resistant and of a weathering grade of steel.

Type 3 bolts must be used when the structure is not being painted (WSDOT rarely utilizes unpainted structural steel for new structures). Nuts and washers used with Type 3 bolts must also have weathering characteristics.

Each fastener shall be tightened to provide, when all fasteners in the joint are tight, at least the minimum tension shown in the *Standard Specifications* for the size and grade of fastener used.

Turn-of-Nut Method

When the turn-of-nut method is used to provide the specified bolt tension, all of the required minimum number of bolts within a bolted connection or splice shall be brought to a "snug tight" condition. The bolts shall be tightened to "snug tight" in a systematical order to ensure that all parts of the joint are brought into full contact with each other. This usually requires that the bolts located near the center of the connection or splice be tightened first. Then all remaining bolts shall be tightened from the center progressing toward the outer edges. "Snug tight" is defined as the tightness attained by (1) a few blows from an impact wrench, or (2) the full effort of a man using an ordinary spud wrench. The "snug tight" requirement also establishes the starting point for full tensioning by the turn-of-nut method.

Once the bolts are snug tight, the outer face of the nut and protruding part of each bolt shall be match-marked with crayon or paint. The match-marking provides the control to both ensure the bolt does not rotate during tightening and measure the nut rotation. The required minimum nut rotation is listed in Table 4 of Section 6-03.3(33) of the *Standard Specification*s. During this tightening operation, there shall be no rotation of the part not turned by the wrench.

Contractors often suggest a tightening method that eliminates marking the bolt as required in the turn-of-nut method. This suggested method requires calibration of the air impact wrench(es) and the inspection torque wrench. After calibration, the Contractor wants to snug tighten each bolt, then tighten to minimum tension using the air impact wrench without marking the nut and bolt. This method is heavily dependent upon the torque wrench test and is not accepted by WSDOT.

Direct Tension Indicator Method (DTI)

When the direct tension indicator method is used to provide the specified bolt tension, all of the required minimum number of bolts within a bolted connection or splice shall be brought to a "snug tight" condition. The bolts shall be tightened to "snug tight" in a systematic order to ensure that all parts of the joint are brought into full contact with each other. This usually requires that the bolts located near the center of the connection or splice be tightened first. Then all remaining bolts shall be tightened from the center progressing toward the outer edges. "Snug tight" is defined as the tightness attained by (1) a few blows from an impact wrench, or (2) the full effort of a man using an ordinary spud wrench.

This method uses a direct-tension-indicator washer that has formed protrusions on one face, leaving a gap. As the bolt is tensioned, the formed gap is reduced. The measurement of this gap verifies the bolt tension. Section 6-03.3(33) of the *Standard Specifications* addresses the maximum gap opening for direct tension indicators.

WSDOT has two concerns associated with the use of direct-tension-indicator washers. These concerns are (1) potential corrosion within the washer gap and (2) undetected bolt loosening as bolt tightening of a connection or splice proceeds. Following is a brief discussion of each item:

(1) Potential Corrosion: The *Specifications* address this potential corrosion problem by limiting the maximum gap opening for painted and unpainted structures. These gap opening limits are governed by both tension requirement and required corrosion protection. The direct tension indicator manufacturers address only the minimum bolt tension requirement. It is, therefore, very important that the Inspector be aware of this additional concern of potential corrosion.

(2) Undetected Bolt Loosening: The manufacturers of the direct-tension-indicator washers emphasize the ease and reliability of their product. They claim, and it is true, that if the gap is reduced to the specified maximum opening, the respective bolt is properly tensioned. The concern we have is that through the process of tightening all the bolts in a connection or splice, a warped plate may be progressively flattened, potentially loosening the initially tightened bolts. If this happens, the indicator washer still indicates the bolt(s) are fully tensioned. For this reason, WSDOT requires that bolt tension inspection, usually with a calibrated torque wrench, be performed. The Inspector should be aware of this potential problem and observe the tightening procedure with this in mind.

Inspection

The Inspector shall determine that the requirements of the *Standard Specifications* are met in the work. The Inspector shall observe the installation and tightening of bolts to determine that the selected tightening procedure is properly used and shall determine that all bolts are tightened and, in the case of the direct-tension-indicator method, that the correct indication of tension (gap) has been achieved. Bolts may reach tensions substantially higher than the value in Table 3 of the *Standard Specifications*, Section 6-03.3(33), but this is not cause for rejection.

The condition of the bolts is critical to the bolt-up operation and inspection. Bolts to be installed in the structure shall be lubricated in accordance with the *Standard Specifications*. A good check is a nut that is easily turned on the entire threaded portion of the bolt.

The following inspection procedure shall be observed for:

1. Bolts tightened using the turn-of-nut method: The Contractor, in the presence of the Engineer, shall use an inspection wrench which may be a torque wrench. Calibration of the inspection torque wrench is explained in a following section.

Bolts that have been tightened using the turn-of-nut method shall be inspected by applying, in the tightening direction, the inspecting wrench and its job-inspecting torque to 10 percent of the bolts, but not less than two bolts, selected at random in each connection. If no nut or bolt head is turned by this application of the job inspection torque, the connection hall be accepted as properly tightened. If any nut or bolt head is turned by the application of the job inspecting orque, this torque shall be applied to all bolts in the connection, and all bolts whose nut or head is turned by the job inspecting torque shall be tightened and reinspected. As an alternate, the Contractor may retighten all of the bolts in the connection, and then resubmit the connection for the specified inspection.

2. Bolts tightened using the direct-tension-indicator method: The Contractor, in the presence of the Engineer, shall use a feeler gauge to verify that each bolt has been properly tensioned to the maximum specified gap.

If a bolt that has had its direct-tension-indicator washer brought to full load loosens during the course of bolting the connection, the bolt shall have a new direct-tension-indicator washer installed and be retensioned. Reuse of the bolt and nut are subject to the provisions in the *Standard Specifications*.

Calibration of Inspection Torque Wrench

Five bolts of the same grade, size, and condition as those under inspection shall be placed individually in a calibration device capable of indicating bolt tension at least once each working day. There shall be a washer under the part turned in tightening each bolt. Each bolt shall be tightened in the calibration device by any convenient means to the specified minimum tension. The inspecting wrench then shall be applied to the tightened bolt and the torque necessary to turn the nut or head 5 degrees (approximately 1 inch (25 millimeters) at a 12-inch (300 millimeter) radius) in the tightening direction shall be determined. The job-inspection torque shall be taken as the average of three values, thus determined after rejecting the high and low values.

If the bolts to be installed are not long enough to fit in the state-furnished tension calibrator, five bolts of the same grade, size, and condition as those under inspection shall be tested using Direct-Tension-Indicator (DTI) to measure bolt tension. This tension measurement test shall be done at least once each inspection day. The DTI shall be placed under the bolt head. A washer shall be placed under the nut, which shall be the element turned during the performance of this tension measurement test. Each bolt shall be tightened by any convenient means to the specified minimum tension as indicated by the DTI. The inspecting wrench shall then be applied to the tightened bolt and the torque necessary to turn the nut 5 degrees (approximately 1 inch (25 millimeters) at a 12-inch (300 millimeter) radius) in the tightening direction shall be determined. The job-inspection torque shall be taken as the average of three values, thus determined after rejecting the high and low values.

Figure 6-7 shows the operator calibrating a hand-indicator torque wrench. The bolt is brought to the proper tension by either method described above. The dial on the wrench was set at “zero” and sufficient torque applied to rotate the nut 5 degrees in the tightening direction. At this point, the wrench dial shows the kips (kilonewtons) required to further rotate the nut or bolt head. The torque wrenches used by inspectors of both the Contractor and WSDOT should be tested and compared at the same time for purposes of uniformity.

6-3.6C Welding

Welding of structural steel shall be in accordance with the requirements in Section 6-03.3(25) of the *Standard Specifications*. Welding will not be accepted as a substitute for bolting and should be done only where indicated in the plans. Adding even small welds not shown in the plans can induce high stresses in the members. This could seriously impair the strength and structural capability of the structure involved. The structure has been designed assuming that no additional welding will be done. The approval of the Assistant State Construction Engineer, Bridges, is required before doing any welding not shown in the plans.

Good workmanship and proper materials are essential. Welding operators should be qualified for the type of welding they are required to do. Welding procedures shall be approved by the Bridge Engineer before starting to weld on the structure.

Welding defects should be corrected as indicated in the *Standard Specifications*.

Low hydrogen type electrodes must be dry when used. The care and use of these electrodes as given in the *Standard Specifications* should be completely observed. No relaxation of these requirements can be tolerated.

6-3.7 Placing Concrete Roadway Slab

As required in Section 6-03.3(39) of the *Standard Specifications*, the masonry plates shall be grouted and steel work, except railing, completely bolted and released from the falsework before forming for the roadway slab begins. Expansion dams shall not be bolted down until after the span is released from the falsework.

The camber diagram shown in the plans, especially for welded steel plate girders, quantifies the calculated deflection of the steel girder weight and the deflection of the girders due to the concrete slab weight (mass). The camber diagram for the weight (mass) of the steel girders only is utilized by the girder fabricator.

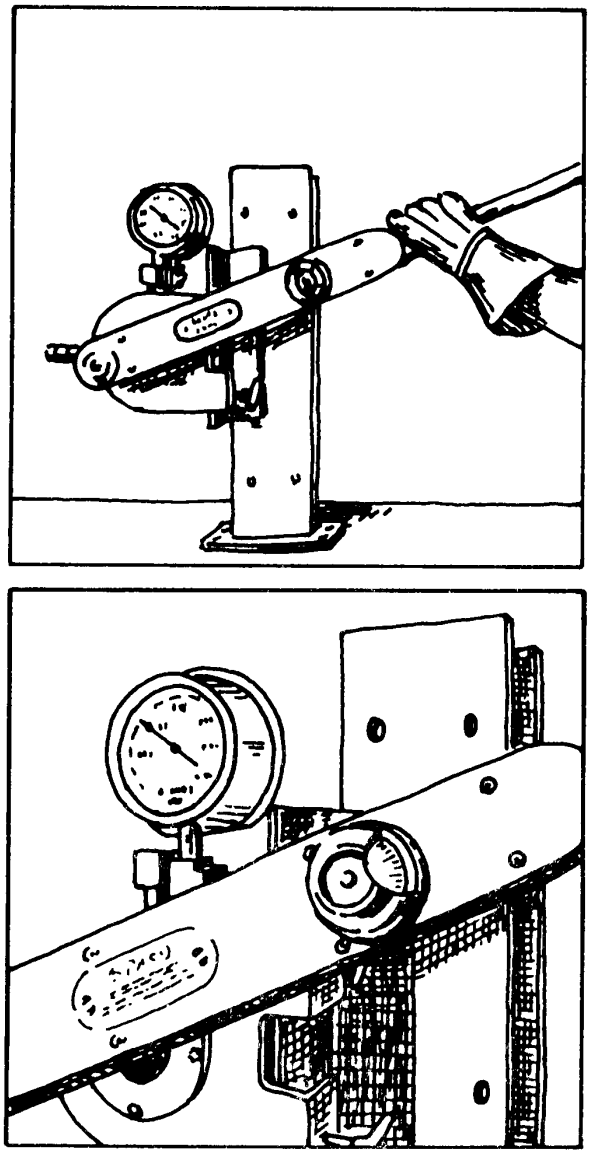


Figure 6-7

Once all the temporary girder supports are removed, it is important that elevation control points on the top of the flanges of the girders or floor beams be established and permanently marked before any external load, such as form lumber, reinforcing steel, etc., is applied. These control points should be located at proper intervals to establish elevations for formwork and finished roadway slab grades. These control points should be at the span tenth points or at cross-frame locations (panel points).

Once these control point elevations are established, fills at each of these control points shall be calculated utilizing the camber diagram for the weight (mass) of the roadway slab and the profile grade. These control point fill values shall be used from that point on because it is extremely difficult, if not impossible, to calculate the deflection of the girders as formwork and reinforcing steel are added. These control point fill values will be used for the final adjustment of the roadway slab finish machine.

A pouring sequence for the roadway slab may be shown in the plans to reduce the size of the concrete pours, control deflection, and minimize tension cracking of the concrete slab during construction. Placing and finishing the concrete in the roadway slab shall be the same as for Concrete Structures covered in Chapter 6-2 of this manual.

6-3.8 Railings

Steel railings may be erected in place at the same time the trusses are erected but they shall not be finally aligned or bolted until after the concrete deck is placed. Railings shall be true to line, and for single spans shall show the camber of the span. For two or more spans the railing shall show a uniform camber over all of the spans; that is, the individual camber of each span shall not be carried in the railing.

6-3.9 Painting

Steel structures shall be painted in accordance with the requirements in Section 6-07 of the *Standard Specifications*.

6-3.10 Measurement and Payment

Measurement and payment instructions are covered in Sections 6-03.4 and 6-03.5 of the *Standard Specifications*.

6-4 Timber Structures

6-4.1 General

Framing plans and details for treated timber structures shall be furnished by the Contractor and approved by the Project Engineer. Upon approval of the framing details, one set shall be returned to the Contractor and one set furnished the shop inspector. Inspection of shop framing and treating of timber is performed by shop inspectors of the Materials Lab. Inspection reports showing details of treatment and lists of materials shipped will be mailed to the Project Engineer. Representative pieces of each shipment will be stamped by the shop inspector.

Untreated timber may be accepted on the basis of an inspection certificate in accordance with Section 9-09.2(3) of the *Standard Specifications*.

6-4.2 Storage and Handling

Timber and lumber shall be stored off the ground and piled to shed water and prevent warping. Treated timber shall be handled carefully to prevent breaking of the outer fibers and rope or chain slings shall be used. Pike poles and peaveys are not to be used in handling treated timber.

6-4.3 Framing

All cutting, framing and boring of treated timbers shall be done before treatment insofar as is practicable. Framing shall be done in accordance with the requirements of Section 6-04.3 of the *Standard Specifications*.

6-4.4 Field Treatment of Timber

When field framing cannot be avoided, the cuts and holes shall be treated as required in the *Standard Specifications*. Timber for field treatment must be dry before applying the required treatment. Holes shall be bored for all bolts, drift bolts, boat spikes, dowels and truss rods using augers of the size specified in Section 6-04.3(5) of the *Standard Specifications*.

After removal of temporary scaffolding and formwork, the nail and bolt holes in treated timber shall be repaired in accordance with the *Standard Specifications*.

Field treatment for structures of untreated timber shall be in accordance with the requirements in Section 6-04.3(4) of the *Standard Specifications*.

6-4.5 Painting

Painting of timber structures shall be in accordance with the requirements in Section 6-07 of the *Standard Specifications*.

6-4.6 Measurement and Payment

Measurement and payment instructions are covered in Sections 6-04.4 and 6-04.5 of the *Standard Specifications*.

6-5 Piling

6-5.1 General

Piling shall conform to the requirements of Section 9-10 of the *Standard Specifications*. When piling is received on the project, it shall be inspected and a notation made in the section of Miscellaneous Notes in the Pile Record book. Untreated timber piles will be inspected in the field and accepted for use there. All other piling, except concrete piles cast on the job, will be inspected by Fabrication Inspectors before delivery.

6-5.2 Treated Timber Piling

Chain slings will be permitted in handling treated timber piles. Treated timber piling shall be furnished and driven full length, i.e., without splices. The entire length shall be pressure treated. Therefore, the pile tip shall not be cut after treatment. If splices become necessary and the order length furnished by the Engineer is insufficient, the State Construction Office should be contacted for direction. However a splice probably will not be considered if it cannot be located below the permanent water table elevation.

6-5.3 Precast Concrete Piling

Curing beds for steam cured concrete piles shall not rest directly on the floor but shall be elevated enough to permit the complete circulation of steam around the piles.

Lifting loops shall be removed to ½ inch (15 millimeters) below the surface of the concrete and the hole filled with mortar.

Concrete piles shall be handled as described in the *Standard Specifications,* the *Standard Plans,* or as shown in the plans in order to avoid excessive deflections and strains.

6-5.4 Cast-in-Place Concrete Piling

The casings for piles cast in place shall be carefully checked after driving, for water tightness and deformation of the casing due to the driving of adjacent piles. A mirror for reflecting light into the casing is the most common method for this check. On cloudy days, a flashlight may be lowered into the casing.

Immediately after driving, the pile casing shall be covered to prevent dirt and water falling into it. All debris and water shall be removed from the casing prior to placing the reinforcing steel cage. No water will be permitted in the casing when concrete is placed.

Due to the ever increasing loading from earthquake activity, most cast in place piling require reinforcement for the full depth of the pile. This full depth reinforcement presents extreme difficulty in placing concrete with a rigid conduit the full depth, especially if the pile is battered. For this reason, Class 4000P (28P) concrete is required. This class of concrete has small aggregate and fly ash making the mix rather sticky and cohesive, which reduces the likelihood of segregation during placement. This concrete shall be placed continuously through at 5-foot (1.5-meter) rigid conduit directing the concrete down the center of the pile casing, ensuring that every part of the pile is filled and the concrete is worked around the reinforcement. The top 5 feet (1.5 meters) of concrete shall be placed with the tip of the conduit below the top of fresh concrete. The Contractor shall vibrate, as a minimum, the top 10 feet (3 meters) of concrete. In all cases, the concrete shall be vibrated to a point at least 5 feet (1.5 meters) below the original ground line.

No Engineer's order list will be given for cast-in-place concrete piling.

6-5.5 Vacant

6-5.6 Steel Piling

Steel piling shall be handled in such manner as to prevent bending of the flanges, and when stacked they shall be supported in such a manner that the piles will not bend. When steel piles must be spliced and splicing details are not shown in the plans, the splice should be made with a single V-butt weld over the whole cross-sectional area of the pile. Welding shall be done with specified welding rod and suitable equipment in accordance with American Welding Society Specifications and good industry practice. A qualified welder is required. See Section 6-05.3(6) of the *Standard Specifications*.

No Engineer's order list will be given for steel piling.

6-5.7 Pile Driving

6-5.7A General

It is suggested that the State Construction Office be contacted before any piling are driven.

Piling shall be driven to develop the bearing value as shown in the plans or in the *Standard Specifications*. The penetration of the piles under the last few blows must be carefully gauged and the bearing value computed by use of the formula shown in the *Standard Specifications*. Pile driving specifications should be administered with a great deal of common sense. There is no substitute for experience and good judgment.

Often the foundation reports contain two pile tip elevations, "estimated tip" and "minimum tip" elevations. The estimated tip elevation is simply the elevation that the tip is estimated to be driven to and is utilized to determine driving length quantities in the bid item for furnishing piling. Minimum tip elevations are often specified in the contract plans. These are usually to ensure that piles do not hang up on logs, a thin hard soil layer and other obstructions, or to achieve a minimum pile penetration (e.g., uplift and/or lateral load capacity). Minimum tip elevations are also specified where resistance to uplift is taken into consideration in the design of the foundation seal thickness. The minimum tip elevations should be higher than the estimated tip elevations. The Project Engineer should always review the tip elevations in the plans and compare them to the foundation report recommendations. Any discrepancies should be reported to the State Construction Office.

The minimum tip elevations is a design parameter that may come from the geotechnical design or the structural design. A pile tip elevation that is less than minimum cannot be accepted in the field, it must be reviewed by the State Bridge and Structures Office, the State Bridge Construction Office, and the State Geotechnical Engineer. If, during the initial pile driving operations, minimum tip is not being achieved, no additional piling should be driven until concurrence is obtained to change the minimum tip elevation, or the contractor will have to change his method of installation so that the minimum tip elevation can be achieved.

Where the specified minimum tip elevations cannot be reached the State Construction Office shall be notified.

Foundation piles must be driven true to line and in their proper position so that full bearing and lateral support is secured for each pile. Each pile has been definitively positioned in the design, and piles should be driven as nearly as practicable to the position shown. Any variation of 6 inches (150 millimeters) or more from the plan shall be reported to the State Construction Office before accepting the pile. The tolerance for all types of battered piles is ¼ inch in 12 inches (20 millimeters in 1 meter). Any deviation exceeding this tolerance shall be reported to the State Construction Office for evaluation.

Pile driving leads shall be fixed at the top and bottom as discussed in Section 6-05.3(9)C of the *Standard Specifications*, to ensure that the piling can be accurately driven both as to position and batter.

The type and size of hammers to be used to drive piling are specified in Section 6-05.3(9)B of the *Standard Specifications*. The Project Engineer shall require the Contractor to furnish full information on any hammer proposed for use so it can be determined whether or not the hammer meets the requirements of the specifications and that the bearing capacity of driven piles may be computed. It is very important to verify that the drop of the ram is in accordance with the submitted data. Otherwise, the pile bearing calculations will not be correct. A useful formula to determine the drop of a single acting diesel hammer determined from measuring the blows per minute is:

Stroke Formula (ft. of drop)=$(4.01((60/BPM)^2)-0.3)$

Stroke Formula (meter of drop)=$((4.01(60/BPM)^2)-3)*.3048$

Where BPM is the blows per minute of the hammer.

This drop can then be used in the bearing equation shown in Section 6-05.3(12) of the *Standard Specifications* to determine the bearing of the piling.

This formula calculates the drop from the rate of blows per minute that the hammer is hitting at and makes it no longer necessary to watch the top of the hammer and estimate the distance that hammer is coming out of the casing. Since the rate the hammer runs at is dependent on the drop of the hammer, and this hammer drop is accelerated at a constant by gravity, the distance the ram travels can be determined from the formula.

The *Standard Specifications*, Section 6-05.3(9)B, and Special Provisions, govern the hammer size by specifying the minimum ram weight (mass) and the minimum energy required for each type of pile, required bearing, and hammer. The most commonly used hammers are air, hydraulic, or diesel activated. The hammer energy output is simply the weight (mass) of the ram times the distance the ram falls. This energy determination is a simple matter with a drop, hydraulic, or air/steam activated hammer. The measurement of the energy output of a diesel activated hammer is more complex. The minimum energy required by the specifications is the energy output of the hammer at the point of impact at the required pile bearing. The hammer needs to operate at or above the required minimum energy level in order to achieve the specified pile bearing capacity.

The Project Engineer may approve the Contractor's proposed hammer if it meets the criteria of the *Standard Specifications* and the special provisions. During field operations, the pile driving hammer must be capable of delivering at least the required minimum energy at the required pile bearing value. The State Construction Office should be consulted for any other hammer submittals or insufficient performance in the field.

Drop hammers, which are rarely used, must be weighed, in accordance with Section 6-05.3(9)B of the *Standard Specifications*, before any piles are driven. The drop hammer stroke should be carefully measured. This can be done by taping a piece of rope or rag around the hammer line at the height above the hammer for the drop desired. The hammer operator can then gauge the drop with reasonable accuracy. The stroke (drop) of the hammer ram must be consistent with the required minimum energy.

Air or steam activated hammers lift the ram by either air or steam pressure to a predetermined distance and release the ram. The energy is produced by the falling ram. These hammers usually operate at 50 to 60 blows per minute depending on the hammer manufacturer. A count of the actual blows per minute will provide verification that the hammer is operating properly. If the blows per minute exceed the published manufacturer's data sheet for the specified minimum energy, and the Contractor is not able to find and rectify the problem, the State Construction Office shall be notified. No additional piling are to be driven until the problem is resolved.

Hydraulic activated hammers lift the ram by hydraulic fluid pressure to a predetermined distance and then release the ram. The energy is produced by the falling ram. There are two types of hydraulic activated hammers, single and double acting. The hydraulic activating systems for both of these types of hammers are totally enclosed using a vegetable oil medium, rendering them environmentally friendly. The method for measuring the energy output is different for each type of hydraulic activated hammer. The energy output for each type can be varied by using simple adjustment procedures. Again, the respective hammer must be operating at or above the specific minimum energy when the required pile bearing capacity is reached.

Diesel activated hammers lift the ram by energy produced when diesel fuel is ignited. The energy produced is a combination of the fuel explosion and the drop of the ram. There are two types of diesel activated hammers, single and double acting. The method for measuring the energy output is different for each type of diesel activated hammer. Diesel hammers produce a variable energy. The variable energy output of a diesel hammer is dependent on a number of factors, which include fuel quality, fuel setting, soil conditions, and resistance from the pile being driven. As the pile resistance increases, the energy output of a diesel hammer usually increases. The manufacturer's maximum energy value for each diesel hammer is measured in the laboratory using a hammer in tip top shape. For this reason, it is a good idea to have a hammer on the project with a maximum rated energy higher than the contract minimum required energy. A good rule of thumb when selecting a diesel hammer is that, if 80 percent of the maximum energy of a hammer equals the contract minimum required energy, the diesel hammer will produce sufficient energy to meet the contract energy requirements.

A single acting diesel activated hammer is open at the top, and at the top of the ram stroke a portion of the ram is usually visible. The bearing value of the pile being driven is determined by the number of blows per foot (300 millimeters) at a blows per minute rate. The energy output of a single acting diesel hammer is determined by the blows per minute of the running hammer. The manufacturer is required to submit this energy data. The rate (blows per minute) is dependent on how high the ram raises up (stroke) due to the diesel fuel combustion. Thus, the longer the stroke, the greater the energy and the longer it takes. In other words, as the rate (blows per minute) decreases, the energy output increases.

A double acting diesel activated hammer is closed at the top. This closed top acts as a pressure chamber driving the ram back down where the diesel fuel explosion occurs. The bearing value of the pile being driven is determined by the number of blows per foot (300 millimeters) at a measured pressure within the top bounce chamber. The energy output of a double acting diesel hammer is determined by the measured bounce chamber pressure while the hammer is operating. The manufacturer is required to submit this energy data. Each double acting diesel hammer comes with a hose running from the bounce chamber to a box containing a pressure gauge. There is usually a button on this pressure gauge box. When the button is depressed the gauge is activated with the bounce chamber pressure. If this button is depressed continuously, the hammer efficiency decreases because of the pressure bleed off created by the pressure gauge operation. The button should only be depressed periodically when an energy reading is required. The pressure reading and corresponding energy shall meet the minimum energy at the required pile bearing value.

On some projects, pile driving vibrations will be monitored for potential damage to adjacent structures or buildings. When that monitoring indicates a potential for damage, the Project Engineer should ensure that the minimum size hammer specified for the piling being driven is actually being used. If so, and vibrations are still potentially damaging, the State Construction Office should be notified to determine if preboring or jetting should be used to reduce vibrations. Should preboring or jetting, or other methods be determined necessary, such work shall be considered a change in accordance with Section 1-04.4 of the *Standard Specifications*.

The contract allows the use of vibratory hammers to initially set piles. As of yet, there is no reliable means of determining the actual bearing capacity of a pile driven by a vibratory hammer. Often, the contractor wants to initially set piles with vibratory hammers if the soils and/or limited access are such that impact hammer operation would be difficult. The contract allows this but requires that an impact hammer be used to acquire the bearing capacity. Since static friction is usually much higher than dynamic friction, the actual bearing capacity is determined while the pile is in motion. This requirement is governed by the contract requirement that the pile must be driven at least an additional 2 feet (0.6 meters) using an impact hammer with the blow count (blows per inch (25 millimeters)) constant or increasing. If the contractor uses a vibratory hammer to initially set the piles, there must be a comprehensive procedure to ensure proper location an plumbness of each pile. This is usually accomplished by providing a rigid steel template and using good conscientious control while setting and initially driving each pile.

The use of water jets may be required for driving piles, especially for concrete piles. The piles must be driven at least 6 inches (150 millimeters) after the jet is removed, or to the required bearing. Do not allow the nozzle of the jet to penetrate below the tip of piling previously driven. Mark the jet pipe in such manner that the operator and Inspector can determine the depth required. The State Construction Office should be notified if water jets are proposed for use.

Preboring may also be used to secure the minimum specified penetration. Usually the prebored hole should be slightly smaller in diameter than the pile and the depth of preboring should be less than the minimum specified penetration. However, conditions may exist which make it necessary that a larger hole be prebored and the space around the pile be filled with sand while the pile is being driven to the specified bearing. Unless water-jetting, preboring, or other means of securing minimum penetration is specified and payment is provided for in the contract provisions, this work will be at the Contractor's choice and expense. However, the procedure used must be approved by the Engineer and shall result in a satisfactory pile and will not damage the integrity of the structure, roadway, adjacent structures, or utilities. Any damage done must be repaired to the satisfaction of the Engineer at the Contractor's expense.

The lengths of piling required are determined by driving test piles or by other information which may be available. The Project Engineer provides the Contractor with an order list for timber and precast concrete piles. This list must show the length of piles required below cutoff (the top of the pile within the footing). The Contractor should be informed that the lengths shown on the order list should be increased, at their expense, the necessary amount to provide for fresh heading and to reach from the cutoff elevation up to the position of the driving equipment. Payment for piling will be made for the number of feet shown on the order lists except that if greater lengths are driven, with the approval of the Project Engineer, payment will be made for the lengths actually driven below cutoff. Itemized lists for cast-in-place piles or steel piles will not be furnished by the Engineer.

Rejected piles shall be removed or cut off 2 feet (0.6 meter) below the bottom of the footing. Rejected casings for cast in place piles that are left in place shall be filled with sand.

The handling and driving of treated piling require special care. Heads of piles should always be freshly cut, and rings or wire mesh screens placed on top during driving. In wet weather the final cutoff should be at least 1 foot (0.3 meter) long and the creosote, pitch and fabric cover placed immediately after the pile is cut. Do not make a cutoff and then wait until the next day to place the cover. Fabric covers should be well tacked to the pile and neatly trimmed to within 3 inches (75 millimeters) of the top of the pile so that the fabric will not have ragged edges. A follower driving cap should be used on treated piles. This is to help hold the pile in line to minimize the use of chocks in the leads during driving. Timber piles must be strapped in accordance with the requirements of Section 9-10.1 of the *Standard Specifications* before they are driven.

Precast concrete piles require special care in storage and handling, especially when raising them into the leads. The general method of attaching slings for handling is described in the *Standard Specifications*. Long piles must be supported at the ends and at intermediate points to prevent undue bending and cracking of the concrete. In special cases the plans may show the method for lifting long piles. Some pile driving crews lack experience with concrete piles and handle them as they are accustomed to doing with timber piles. Such handling will probably result in damage to the concrete piles and must not be allowed.

In driving precast concrete piles, several layers of plywood or a 3½-inch (90 millimeter) wood block should be placed between the top of the pile and the steel driving head of the hammer. Care should be taken to prevent crushing of the pile head before the desired penetration is reached. Where crushing occurs, the top of the pile should be checked to determine if the end is square with the body of the pile; also, the hammer should be checked to determine if a fairly flat blow is being delivered to the pile. In driving concrete piles, it may be advisable, in order to prevent crushing of the head and to obtain the required penetration, to operate a hammer at less than full throttle until just before completing the driving, after which the throttle should be fully opened in order to obtain the true bearing value of the pile.

Large diameter prestressed concrete cylinder piles are not completely covered in the *Standard Specifications*. The requirements of the special provisions must be observed. Accuracy of placing and driving is most important. Every effort should be made to prevent these piles from drifting out of line or out of plumb during driving, but care must be taken to avoid applying excessive lateral force which may crack the pile. These piles do not have to be very far out of plumb before excessive overstress occurs. When a driven pile is found to be cracked or is out of plumb, it should be referred to the State Construction Office for a decision regarding corrective action to be taken.

Care shall be taken in driving steel H piles to ensure that the driven pile is oriented as close as possible to that shown in the plans. Pile design usually involves horizontal forces due to temperature, concrete shrinkage, earthquake, and wind as well as axial forces, and if a driven pile is not aligned as shown in the plans, the pile may become overstressed due to excessive bending stresses. Any deviation of more than 20 degrees from the pile axis or more than 6 inches (150 millimeters) from the position shown in the plans shall be reported to the State Construction Office for evaluation and acceptance.

6-5.7B Test Piles

A careful study should be made of the foundation exploration data shown in the plans and/or included in the Geotechnical Report before driving any test piles. Care should be taken that the test piles are not stopped on a relatively thin hard layer overlaying softer material. After the test piles have been driven, an effort should be made to correlate the results with the foundation data before ordering the permanent piles. The results from diving the test piles should be discussed with the Regional Operations/Construction Engineer if they do not correlate with the foundation data.

Test piles shall be driven to at least 15 percent more than the ultimate bearing capacity required for the permanent piles, except where pile driving criteria is determined by the wave equation. When pile driving criteria is specified to be determined by the wave equation, the test piles shall be driven to the same ultimate bearing capacity as the production piles. Test piles shall penetrate at least to any minimum tip elevation specified in the Contract. If no minimum tip elevation is specified, test piles shall extend at least 10 feet (3 meters) below the bottom of the concrete footing or groundline, and 16 feet (5 meters) below the bottom of the concrete seal.

Preboring, jetting, or other approved means may be used to secure minimum penetration with the test pile if such means is necessary and will be used for the permanent piles. The reason for driving the test pile is to obtain information for ordering the permanent piles, and to obtain additional information relative to driving the permanent piles.

It is the responsibility of the Contractor to supply test piles of sufficient lengths to provide for variation in soil conditions. If the piles furnished are not long enough, or are unsuitable in other ways, it will be necessary for the Contractor to supply acceptable piles. Followers will not be permitted in driving test piles. A follower is a member interposed between a pile hammer and a pile to transmit blows while pile head is below the reach of the hammer (pile head below the bottom of leads).

The State Construction Office should be notified of the date test piles will be driven.

6-5.7C Pile Driving Records

Pile driving records are to be kept in the Pile Driving Record Book, Form 450-004, which becomes part of the project final records. This book has sufficient room for a condensed pile driving history, pile layout, and miscellaneous notes in addition to the driving log for each pile. Number the piles on the sketch in the pile layout and use these for the Pile No. on the pile driving log.

The pile driving record book contains instructions for completing the driving log. In order for this log to furnish complete information on the pile driving work, it is imperative that it be filled out completely in accordance with the instructions in the book. If more space is necessary, use more than one page for the pile. Items in the heading which are the same for several piling, may be marked "Same as Pile No. ___."

The piling should be marked every foot (300 millimeters) of their lengths with crayon or paint unless there is some other method of determining when each foot (300 millimeters) of the pile has been driven. Count and record the number of blows per foot (300 millimeters) and hammer energy as the pile approaches bearing.

Test piles shall also be recorded in the pile driving record book. In addition, following the driving of each test pile, the Test Pile Record form shall be completed and sent to the appropriate offices the following day. This form should be filled in completely, including the rate/pressure of the hammer. Record the bearing value of the test pile for each foot (300 millimeters) as it is driven.

6-5.8 Measurement and Payment

Measurement and payment instructions are covered in Sections 6-05.4 and 6-05.5 of the *Standard Specifications*.

6-6 Bridge Railings

6-6.1 General

Railings shall be carefully aligned, both horizontally and vertically, to give a pleasing appearance. On multiple span bridges, the rail and wheel guard or curb heights at the ends of each span should be varied a sufficient amount to produce a uniform camber or grade from end to end of the bridge.

At the beginning and ends of horizontal curves and through vertical curves, the height of curbs may need to be varied so that the rail heights will be uniform above the curb. On any structure on which occurs a break in grade, horizontal curve with superelevation, vertical curve, or a combination of the three, the Project Engineer should plot to a large scale, the profiles of the roadway grades at the curb lines. From these profiles the grades for the tops of the curbs and railings can be properly determined. A slight hump in the rail over the whole structure is usually not objectionable, but a hump and then a sag is not permissible.

6-6.2 Measurement and Payment

Measurement and payment instructions are covered in Sections 6-06.4 and 6-06.5 of the *Standard Specifications*.

6-7 Painting

6-7.1 General

When inspecting bridge painting for steel structures, the Inspector should prepare a plan for the structure they will be inspecting. This plan will enable the Inspector to locate sections of the structure where painting activities occurred.

An Inspector's Daily Report should be filled out after every work day with the activities performed and related to the Inspector's bridge plan. In the daily report, the Inspector should identify the activities such as cleaning, blasting, and applying the base, intermediate, and finish coats. These daily reports should accurately represent the work accomplished and any noted deficiencies.

The Inspector should become familiar with the latest safety requirements. Contract environmental requirements should be reviewed as well.

Manufacture and shop mixing of paint materials are controlled from the State Materials Laboratory. Each container in each shipment of paint should bear a lot number, date of manufacture, type of paint and manufacturer's name.

When quantities of paint required for a particular job are 20 gallons (75 liters) or less, they may be manufactured and shipped without inspection and testing by the laboratory. A certificate of compliance with specifications signed by the manufacturer shall be presented to the Project Engineer by the Contractor at the time the paint is brought to the project site.

All paint shall be thoroughly mixed before using. Paint may be mixed by stirring with hand paddles or by using power stirrers.

All paints bearing dates of manufacture over one year old should be sampled on the basis of one sample per batch. Paint showing appreciable deviation from normal should be sampled and set aside until checked and released by the State Materials Laboratory.

The paint should be capable of application at the required thickness without any sags or runs. If it is not possible to do this, the State Materials Laboratory should be contacted for necessary steps to be taken.

6-7.2 Cleaning Metal

Cleaning for removal of rust or corrosion spots in repainting and cleaning of new steel shall mean "commercial" abrasive blasting as defined in the *Standard Specifications* or the Special Provisions.

Wire brushing and scraping shall normally be limited to removal of dirt and loose paint where corrosion is not involved.

All rust which cannot be removed by abrasive blasting shall be removed with chisels, hammers or other effective means as directed by the Engineer.

When called for in the *Standard Specifications* or Special Provisions, the entire structure shall be pressure flushed with water from the top down before other cleaning or painting is started. The nozzle should not be more than 9 inches (230 millimeters) from the surface being cleaned. A biodegradable detergent may be added to the water jet to remove oil and grease. Biodegradable detergents shall be approved by the State Materials Laboratory and precautions taken to avoid harmful residue on the steel.

In addition to the initial pressure flushing, all abrasive blasting residue must be removed after blasting and spotting and before application of additional paint. Pressure flushing may be required for this purpose if the Project Engineer deems it necessary.

New steel, shop coated before erection, shall have all erection and transportation scars, rivet heads, and welds cleaned and spot coated. If a dirt film has accumulated on the steel during the erection period this must be removed by flushing. All concrete residue must be removed from the floor system after the deck pour is completed. Generally, this may be accomplished by flushing before the residue has set up and while the pour is in progress.

On repainting projects, the Engineer or Inspector should observe and report to the State Bridge and Structures Engineer any spot or area where corrosion or other deficiencies are of such extent as to threaten the strength of the steel member. They should also observe areas where water becomes trapped to ultimately endanger the steel through corrosive action, and advise the Regional Operations/Construction Engineer, so the condition may be corrected.

Many bridges that are being repainted have been previously painted with lead based paint. When this is the case, the Contractor must submit a "Lead Health Protection Program". WAC 296-155-176. The waste generated from cleaning the bridge (bird guano, paint chips, etc.) must be tested as outlined in the contract provisions. Handling and disposal of this wasted must be as prescribed by current state law. Contact your Regional Environmental Office regarding disposal of lead paint waste.

Containment systems are required by the Contract. Containment systems are required during the cleaning and painting of the bridge. These systems are necessary to prevent contaminants from entering state waters.

6-7.3 Applying Paint

All coatings shall be applied per the manufacturers recommendations.

Brushes and spray equipment should be in good condition. An intermediate stripe coat should be applied to the metal edges, inside angles, welds, bolt heads, nuts and rivets prior to the application of the full intermediate coat of paint. The use of inspection mirrors is required for reflecting light into the interior of boxed sections or members for locating painting defects.

The Inspector must check to see that the proper film thickness of paint is applied. Wet film thickness is to be measured immediately after the paint is applied and the dry film thickness is to be measured after the paint has become thoroughly dry and hard. It is difficult to measure the dry film thickness of paint on galvanized metal so it is necessary to measure the wet film thickness for each coat of paint as it is applied.

When an Inspector finds an area where the painting does not meet the specifications, they should mark the area with contrasting brightly colored alkyd paint from an aerosol can. A light coat of this spray paint will not adversely affect the paint job and it will effectively mark the area to tell whether correction work was performed on the area. Marking the area with spray paint provides the Inspector with an easy method of marking deficient areas and provides the Contractor a ready method of locating the areas that require additional work. This will also free the Inspector to concentrate on areas of serious deficiencies without losing control over those requiring minor corrections. When marking the final coat, be careful to mark only the area to be reworked.

The protection of the structure, traffic, and property from splatters and airborne paint spray is the responsibility of the Contractor. Since WSDOT may be criticized because of damage from paint, the Engineer must enforce the provisions of the contract to ensure protection therefrom.

Adequate staging, scaffolding, ladders, and fall protection are required to be provided by the Contractor to ensure safety to workmen, room for good workmanship, and adequate facilities for proper inspection.

Technical assistance and equipment are available at the State Materials Lab, and on request can be provided at the job site to ensure a good paint job.

During the preparation and painting of steel bridges, it is very important that the Inspector be aware of the potential impact to the surrounding environment. The air, water, and land quality are of major concern. WSDOT and environmental agencies are working together to establish guidelines for bridge painting. Policies and procedures involving environmental concerns will be addressed in the contract. Compliance to these specifications should be closely monitored.

6-8 Waterproofing

The instructions for this work are quite complete in Section 6-08 of the *Standard Specifications*.

Appendix A Concrete Mix Proportioning

The *Standard Specifications* previously had concrete mix designs that WSDOT would provide. The Contractor had the choice of using WSDOT's provided recipe or using a different mix. If the Contractor chose to provide a WSDOT mix, then WSDOT would be responsible for the performance of the mix provided it was produced within our specifications.

The proportions for mixes that used to be given in the *Standard Specifications* where in the nature of basic mixes which would need adjustment for the factors listed below as applicable to the job conditions. The following information is provided to give an understanding on how mix designs can be adjusted without substantially changing the mix characteristics.

Adjustments for cement content and workability cannot be applied until after batches have been mixed. The adjustment factors listed below are in the order in which they are to be applied.

Adjusting Mix Proportions

Adjustments to the proportions for WSDOT Provided Mixes that used to be shown in the *Standard Specifications* were to be made in the following order:

1. Bulk specific gravity
2. Crushed rock used as coarse aggregate
3. Substandard gradings
4. Free water in aggregates
5. Cement content**
6. Workability**

**The adjustments for either cement content or workability can only be made after testing has been completed from concrete batched with adjustments made for items 1 through 4.

Example:

Assume the following conditions for Class 3000 (20) Concrete without Air:

Coarse aggregate is crushed rock.

Bulk specific gravity, coarse aggregate is 2.76.

Bulk specific gravity, sand is 2.62.

Grading of coarse aggregate OK.

Grading of fine aggregate — finer than fine limits of specification by 25 percentage points. (Under Section 9-03 of the *Standard Specifications*, aggregate finer than the specifications may be used provided the cement content is increased.)

Concrete is non-air entrained.

Proportioning for Bulk Specific Gravity

The masses of aggregates that used to be given in the *Standard Specifications* were for a bulk gravity of 2.67. These values must be corrected for the actual bulk specific gravity (G) of the materials used. The adjusted batch mass to be used is:

$$\text{Adjusted Batch mass} = \text{Batch mass} \times \frac{G}{2.67}$$

Metric

Example:

The mix proportions for Class 20 concrete are as follows in kg/m^3.

Current batch masses:

Cement	320 kg
Fine Aggregate	775 kg
No. 2 Coarse Aggregates	1155 kg
Water	160 kg
	2410 kg

W/C (160/320) = 0.50

Batch masses corrected for bulk specific gravity:
(Aggregate masses rouned to nearest 5 kg.)

Cement		320 kg
Fine Aggregate	775 x (2.62/2.67) =	760 kg
No. 2 Coarse Aggregates	1155 x (2.76/2.67) =	1195 kg
Water		160 kg
		2435 kg

W/C (160/320) = 0.50

English

Example:

The mix proportions for Class 3000 concrete are as follows in pounds per cubic yard.

Current batch weights:

Cement	540 lbs.
Fine Aggregate	1,315 lbs.
No. 2 Coarse Aggregates	1,950 lbs.
Water	270 lbs.
	4,075 lbs.

W/C (270/540) = 0.50

Batch weights corrected for bulk specific gravity:
(Aggregate weights rounded to nearest 10 lbs.)

Cement		540 lbs.
Fine Aggregate	1,315 x (2.62/2.67) =	1,290 lbs.
No. 2 Coarse Aggregates	1,950 x (2.76/2.67) =	2,020 lbs.
Water		270 lbs.
		4,120 lbs.

W/C (270/540) = 0.50

Proportioning for Crushed Rock

Crushed rock is angular in shape and contains more voids than gravel. Unless a greater proportion of mortar is provided to fill the excess voids, the concrete will be harsh as compared to that made with gravel.

Example:

As a starting mix, the weight (mass) of crushed rock should be reduced by 8 percent of the weight (mass) of the coarse aggregate shown, corrected for bulk specific gravity. At the same time the weight (mass) of fine aggregate should be increased the same number of pounds (kilograms) that coarse aggregate was decreased.

In general, no additional changes in the starting mix would be needed because of the presence of crushed oversize gravel in coarse aggregate. In the absence of contrary instructions from the State Materials Lab, no changes in cement per cubic yard (meter) would be necessary on account of the use of crushed rock in place of gravel as coarse aggregate. Decrease gravel 0.08 x 2020 = 162 (0.08 x 1155 kg = 93 kg); add same amount to fine aggregate.

Metric

Batch masses corrected for crushed rock: *(Aggregate masses rounded to nearest 5 kg.)*

Cement		320 kg
Fine Aggregate	(760 + 92) =	850 kg
No. 2 Coarse Aggregate	(1195 – 92) =	1105 kg
Water		160 kg
		2435 kg

W/C (160/320) = 0.50

English

Batch weights corrected for crushed rock:
(Aggregate weights rounded to nearest 10 lbs.)

Cement		540 lbs.
Fine Aggregate	(1,290 + 162) =	1,450 lbs.
No. 2 Coarse Aggregate	(2,020 – 162) =	1,860 lbs.
Water		270 lbs.
		4,120 lbs.

W/C (270/540) = 0.50

Proportioning for Substandard Gradings

The *Standard Specifications* permit the use, within certain limits, of aggregate graded finer than the fine limits as specified, provided cement is added. A reduction of 1 percent in weight (mass) of aggregate per cubic yard (meter) of concrete will result in an increase of approximately 1 percent in cement content.

The use of finer gravel with extra cement ordinarily will not cause changes in workability sufficient to warrant revising relative proportions of sand and coarse aggregate in the starting mix.

When finer sand (fine aggregate) is used with extra cement, however, the mix is almost certain to be oversanded, dependent on the amount of excess fineness of the fine aggregate. The starting mix should, therefore, be revised in accordance with the following rule:

After reducing weights (masses) of both fine aggregate and coarse aggregate proportionally to result in the required change in cement content, further reduce the weight (mass) of fine aggregate at the rate of ⅔ pound per 100 pounds (0.67 kg per 100 kg) of cement for each 1 percent the fine aggregate passing each sieve is in excess of the maximums. Increase the coarse aggregate by the same number of kilograms (pounds) that the fine aggregate has been reduced to control over-sanding.

Metric

Example:

Consider a fine aggregate having a gradation as follows:

Screen Size mm	Percent Passing: Gradations Sample	Percent Passing: Allowable* Specifications	Percent Passing: Excess Maximum	Fineness
4.75	100	95-100		
3.35	97	82-98		
2.36	93	68-86	95	7
1.18	75	47-65	80	10
0.60	50	27-42	60	8
0.30	19	9.0-20.0	20	
0.15	6	0.0-7.0		
0.075	2.0	0.0-2.5	2.5	
				25%

*As designated in the *Standard Specifications*.

The 25 percent of excess fineness of fine aggregate requires an increase of 8 percent cement, calculated on the basis of ⅓ percent for each percent of excess fineness (25 ∞ ⅓ = 8). The desired cement content will be (320 ∞ 1.08) = 346 kg per cubic meter.

The fine aggregate should next be decreased by (⅔ ∞ .25 ∞ 346) = 57.7 kg to avoid over sanding. The coarse aggregate should be increased a like amount.

Batch masses corrected for substandard gradings:
(Aggregate masses rounded to nearest 5 kg.)

Cement		346 kg
Fine Aggregate	(850 – 58) =	790 kg
No. 2 Coarse Aggregate	(1105 + 58) =	1165 kg
Water		160 kg
		2461 kg

W/C (160/346) = 0.46

English

Example:

Consider a fine aggregate having a gradation as follows:

Percent Passing

Screen Size	Gradations Sample	Allowable* Specifications	Excess Maximum	Fineness
4	100	95-100		
6	97	82-98		
8	93	68-86	95	7
16	75	47-65	80	10
30	50	27-42	60	8
50	19	9.0-20.0	20	
100	6	0.0-7.0		
200	2.0	0.0-2.5	2.5	
				25%

*As designated in the *Standard Specifications*.

The 25 percent of excess fineness of fine aggregate requires an increase of 8 percent cement, calculated on the basis of ⅓ percent for each percent of excess fineness (25 x ⅓ = 8). The desired cement content will be (540 x 1.08) = 583 pounds per cubic yard.

The fine aggregate should next be decreased by (⅔ x .25 x 583) = 97 pounds to avoid over sanding. The coarse aggregate should be increased a like amount.

Batch weights corrected for s ubstandard gradings:
(Aggregate weights rounded to nearest 10 lbs.)

Cement		583 lbs.
Fine Aggregate	(1,450 – 97) =	1,350 lbs.
No. 2 Coarse Aggregate	(1,860 + 97) =	1,960 lbs.
Water		270 lbs.
		4,163 lbs.

W/C (270/583) = 0.46

Proportioning for Free Water in Aggregates

Free water is the water available in the aggregates that will combine with the cement during the mixing process in addition to the mix water added and if not accounted for will reduce the strength of the concrete. The planed mixing water is reduced by an amount of free water present in the aggregates in order to ensure the maximum water/cement ratio is not exceed or water/cementitious ratio where fly ash is used.

The free water is defined as the amount of water present in the aggregates above the amount of absorbed water. Absorbed water will not be released by the aggregates during mixing of the concrete. The absorbed water is reported on the Pit Report and is expressed as a percentage of the weight (mass) of the aggregates.

The Moisture content of the aggregates is the total water in the aggregates expressed as a percentage of the dry weight (mass) of the aggregates. The free water can be determined by subtracting the amount absorbed water (absorbed content ∞ dry weight (mass) of the aggregates) from the total water in the aggregates (moisture content ∞ dry weight (mass) of the aggregates).

Metric

Example:

The total amount of water permitted in the mix includes both the free water in the aggregates and the total mixing water (added at the plant and any water added in route to or on the project). For example, consider a Class 20 mix which has been determined to have a maximum water content of 160 kg per cubic meter.

Batch masses corrected for substandard gradings:
(Aggregate masses rounded to nearest 5 kg.)

Cement	346 kg
Fine Aggregate	790 kg
Coarse Aggregates	1165 kg
Water	160 kg
	2461 kg

W/C (160 kg of water/346 kg of cement) = 0.46

Current tests of the aggregate stockpiles shows the moisture content as follows:

Fine Aggregates 4.0 percent

Coarse Aggregates 1.2 percent

The Pit Report from the State Materials Laboratory shows the amount of absorption as follows:

Fine Aggregates 1.5 percent

Coarse Aggregates 1.0 percent

Total Water in Aggregates:

Fine Aggregates 790 kg ∞ 0.04 = 32 kg

Coarse Aggregates 1165 kg ∞ 0.012 = 14 kg

Absorbed Water in Aggregates:

Fine Aggregates 790 kg ∞ 0.015 = 12 kg

Coarse Aggregates 1165 kg ∞ 0.010 = 12 kg

Free Water in Aggregates:

Fine Aggregates 32 kg of total water – 12 kg of absorbed water = 20 kg of free water

Coarse Aggregates 14 kg of total water – 12 kg of absorbed water = -2 kg of free water

Total Free Water in Aggregates: 20 kg from Fine Aggregates + 2 kg from Coarse Aggregates = 22 kg

Deducting free water gives 138 kg of allowable mixing water.

(160 kg – 22 kg) = 138 kg of allowable mixing water

The aggregate masses should be increased to reflect the free water and the amount of water added should be decreased to maintain the maximum water/cement ratio.

Batch masses corrected for free water in aggregates:
(Aggregate masses rounded to nearest 5 kg.)

Cement		346 kg
Fine Aggregates	790 + 32 kg =	820 kg
No. 2 Coarse Aggregates	1165 kg + 14 kg =	1180 kg
Water		139 kg
		2485 kg

W/C (160 kg of water/346 kg of cement) = 0.46

English

Example:

The total amount of water permitted in the mix includes both the free water in the aggregates and the total mixing water (added at the plant and any water added in route to or on the project). For example, consider a Class 3000 mix which has been determined to have a maximum water content of 270 pounds per cubic yard. This is calculated to be 270 lbs./8.34 lbs./gallon = 32.4 gallons.

Batch weights corrected for substandard gradings:
(Aggregate weights rounded to nearest 10 lbs.)

Cement	583 lbs.
Fine Aggregate	1,350 lbs.
Coarse Aggregates	1,960 lbs.
Water	270 lbs.
	4,163 lbs.

W/C (270 lbs. of water/583 lbs. of cement) = 0.46

Current tests of the aggregate stockpiles shows the moisture content as follows:

Fine Aggregates 4.0 percent

Coarse Aggregates 1.2 percent

The Pit Report from State Materials Laboratory shows the amount of absorption as follows:

Fine Aggregates 1.5 percent

Coarse Aggregates 1.0 percent

Total Water in Aggregates:

Fine Aggregates 1,350 lbs. x 0.04 = 54 lbs.

Coarse Aggregates 1,960 lbs. x 0.012 = 24 lbs.

Absorbed Water in Aggregates:

Fine Aggregates 1,350 lbs. x 0.015 = 20 lbs.

Coarse Aggregates 1,960 lbs. x 0.010 = 20 lbs.

Free Water in Aggregates:

Fine Aggregates 54 lbs. of total water – 20 lbs. of absorbed water = 34 lbs. of free water

Coarse Aggregates 24 lbs. of total water – 20 lbs. of absorbed water = 4 lbs. of free water

Total Free Water in Aggregates: 34 lbs. from Fine Aggregates + 4 lbs. from Coarse Aggregates = 38 lbs.

Deducting free water gives 232 lbs. of allowable mixing water.

(270 lbs. – 38 lbs.) = 232 lbs. of allowable mixing water

The aggregate weights should be increased to reflect the free water and the amount of water added should be decreased to maintain the maximum water/cement ratio.

Batch weights corrected for free water in aggregates:
(Aggregate weights rounded to nearest 10 lbs.)

Cement		583 lbs.
Fine Aggregates	1,350 lbs. + 54 lbs. =	1,400 lbs.
No. 2 Coarse Aggregates	1,980 lbs. + 24 lbs. =	1,960 lbs.
Water		232 lbs.
		4,195 lbs.

W/C (270 lbs. of water/583 lbs. of cement) = 0.46

Correction for Cement Content

Determine the unit weight (mass) of the concrete, using ASSHTO Test Method T 121, of the first two trucks that meet all applicable acceptance test requirements. Using the unit weight (mass), calculate the yield and cement content, adjusting the calculations for a design air content of 6 percent if the mix is entrained. Average the two cement contents and compare the averaged cement content to the minimum cement content specified.

If the averaged calculated cement content is 10 pounds per cubic yard (5 kg per cubic meter) less than the minimum cement content specified, an adjustment is required. If a mix proportion adjustment is necessary, the adjustment shall be accomplished by adjusting the aggregate only. The fine to coarse aggregate ratio shall be maintained when the concrete mix is adjusted. The yield and cement content calculations should be provided to the contractor.

Metric

Example:

The cement content is determined to be 340 kg per cubic meter whereas the minimum cement content of 346 kg per cubic meter was specified. This amount is 6 kg per cubic meter less, so an adjustment is required. The aggregate masses should be decreased. The batch masses should be corrected as follows:

Fine Aggregates 820 kg x 340/346 = 805
rounded to nearest 5 kg 15 kg decrease

Coarse Aggregates 1180 kg x 340/346 = 1160 kg
rounded to nearest 5 kg 20 kg decrease

Batch masses corrected for cement content: *(Aggregate masses rounded to nearest 5 kg.)*

Cement	346 kg.
Fine Aggregates	805 kg
Coarse Aggregates	1160 kg
Water	139 kg
	2450 kg

W/C (160 kg of water/346 kg of cement) = 0.46

English

Example:

The cement content is determined to be 568 pounds per cubic yard whereas the minimum cement content of 583 pounds was specified. This amount is 15 pounds per cubic yard less, so an adjustment is required. The aggregate weights should be increased. The batch weight should be corrected as follows:

Fine Aggregates	1,400 lbs. x 568/583 = 1,360 lbs. rounded to nearest 10 lbs. 40 lb. decrease
Coarse Aggregates	1,980 lbs. x 568/583 = 1,930 lbs. rounded to nearest 10 lbs. 50 lb. decrease

Batch weights corrected for cement factor: *(Aggregate weights rounded to nearest 10 lbs.)*

Cement	583 lbs.
Fine Aggregates	1,360 lbs.
Coarse Aggregates	1,930 lbs.
Water	232 lbs.
	4,105 lbs.

W/C (270 lbs. of water/583 lbs. of cement) = 0.46

Revision for Workability (Example)

During the placing of the first truck, some difficulty was found in the region of a group of closely spaced reinforcing bars. The same situation will exist on the next pour. It is decided to increase the fine aggregate content somewhat and the entire 90-pound (35 kg) decrease (as calculated previously) for cement content is deducted from the coarse aggregate. The new batch masses are as follows:

Metric

Batch masses corrected for workability: *(Aggregate masses rounded to nearest 3 kg.)*

Cement		346 kg
Fine Aggregate		820 kg
No. 2 Coarse Aggregate	(1180 – 35)	1145 kg
Water		139 kg
		2450 kg

W/C (160/346) = 0.46

English

Cement		583 lbs.
Fine Aggregate		1,400 lbs.
No. 2 Coarse Aggregate	(1,980 – 90)	1,890 lbs.
Water		232 lbs.
		4,105 lbs.

W/C (270/583) = 0.46

The goal should be to use the lowest percentage of fine aggregate that is consistent with job conditions and will permit placing the concrete without voids and finishing it to a satisfactory surface. If the mix is undersanded, however, the tendency will be to make up for a lack of inherent workability by using an excessive amount of mixing water. Such concrete tends to segregate in handling and placing and is to be avoided. The sand content of the mix, however, should not be increased merely to relieve the Contractor of the work of vibrating that is required to be performed under the specifications.

A grossly oversanded mix will be recognized by the apparent shortage of coarse aggregate and by its “sticky” character. Those particles of coarse aggregate that are readily visible will appear to be floating independently in a matrix of mortar. In a badly undersanded mix, the coarse aggregate will be very conspicuous, the concrete will be hard to handle with a shovel regardless of its wetness and there will be a marked tendency for separation of the mortar from the coarse aggregate. Between these extreme limits, the best mix must be determined by experience and careful study of the results obtained during placing of the concrete and upon removal of the forms.

If the fine aggregate is graded near the coarse limits of the specifications and the coarse aggregate is near the fine limit, the concrete is apt to be harsh. Increasing the fine aggregate content in such cases probably will not result in much improvement. The grading of the fine aggregate and the coarse aggregate should be improved. The *Standard Specifications* require rejection or alteration of the aggregates when the resulting concrete is too harsh.

Generally speaking, a reduction or increase of 20 pounds (20 kg) of fine aggregate per 100 pounds (100kg) of cement will make a pronounced change in the appearance and workability of the concrete. The Project Engineer should work within these limits (after revising proportions of the starting mix as outlined in Chapter 6-2 of this manual) to secure the best results possible. Changes should be made only after consultation with the State Materials Laboratory.

The following flow charts are intended to provide a guide to the Project Engineer for the bridge electrical/mechanical contracts.

Mechanical/Electrical Request-For-Information Process

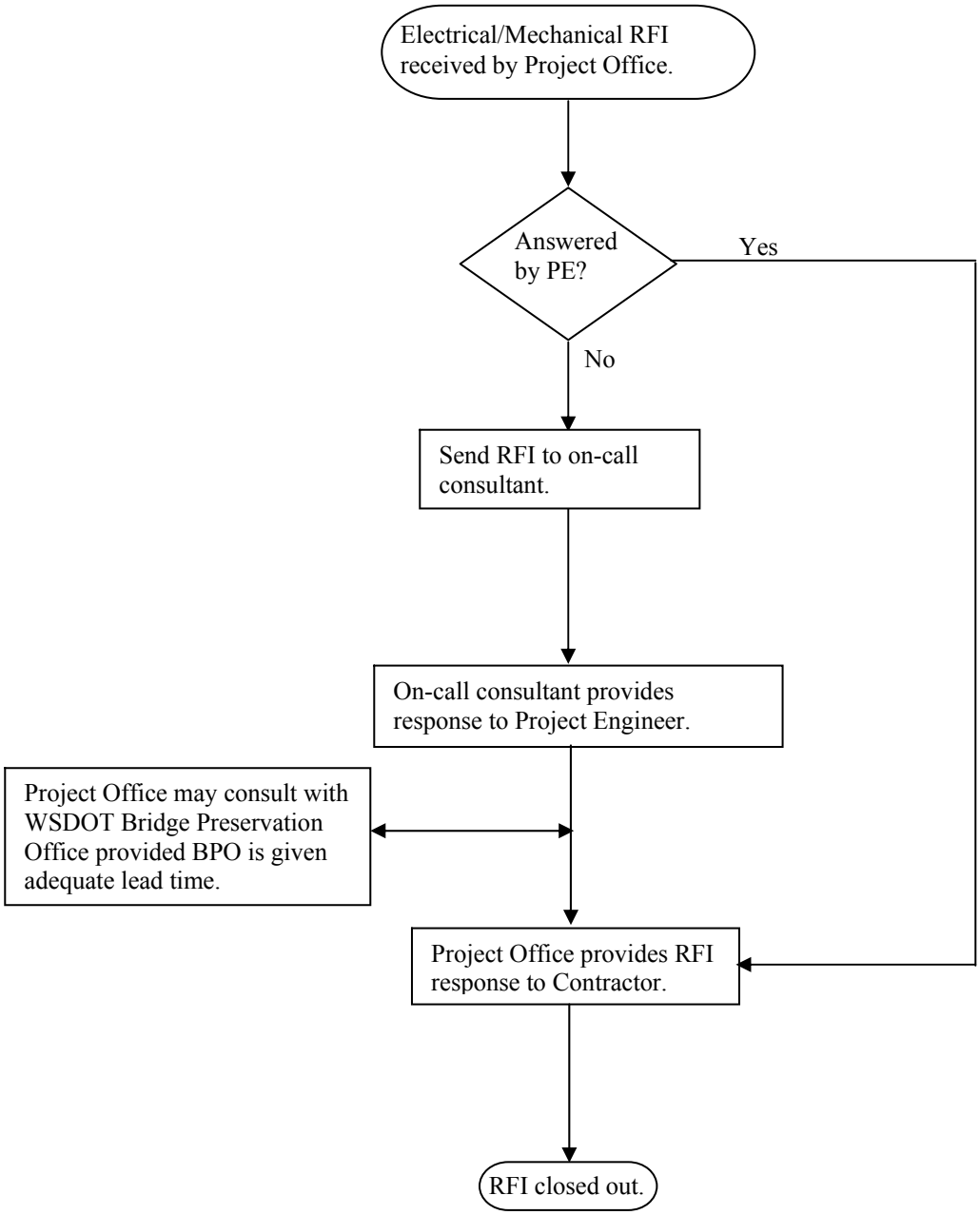


Figure 6-9

Electrical/Mechanical/Structural Request-For-Change Process

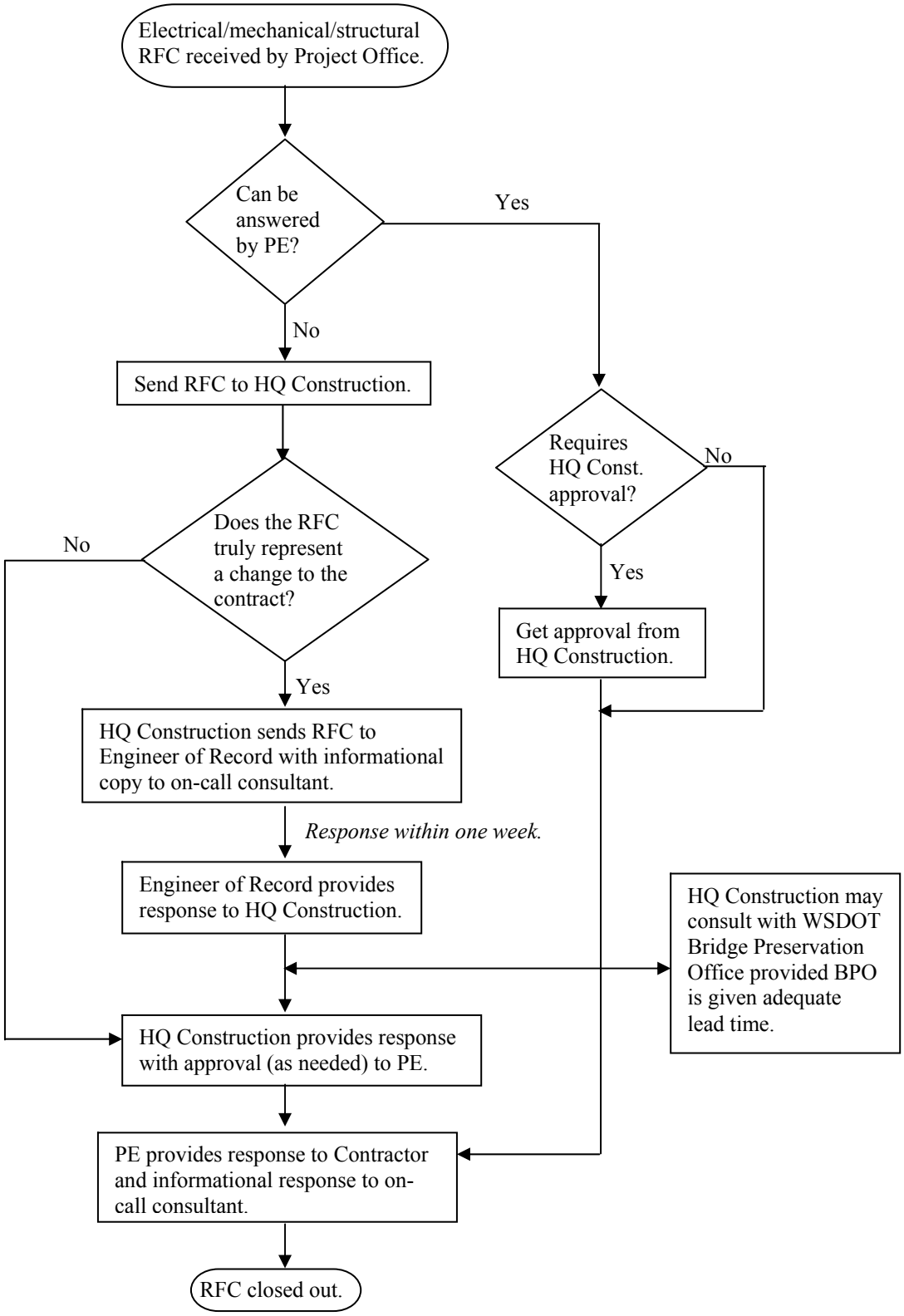
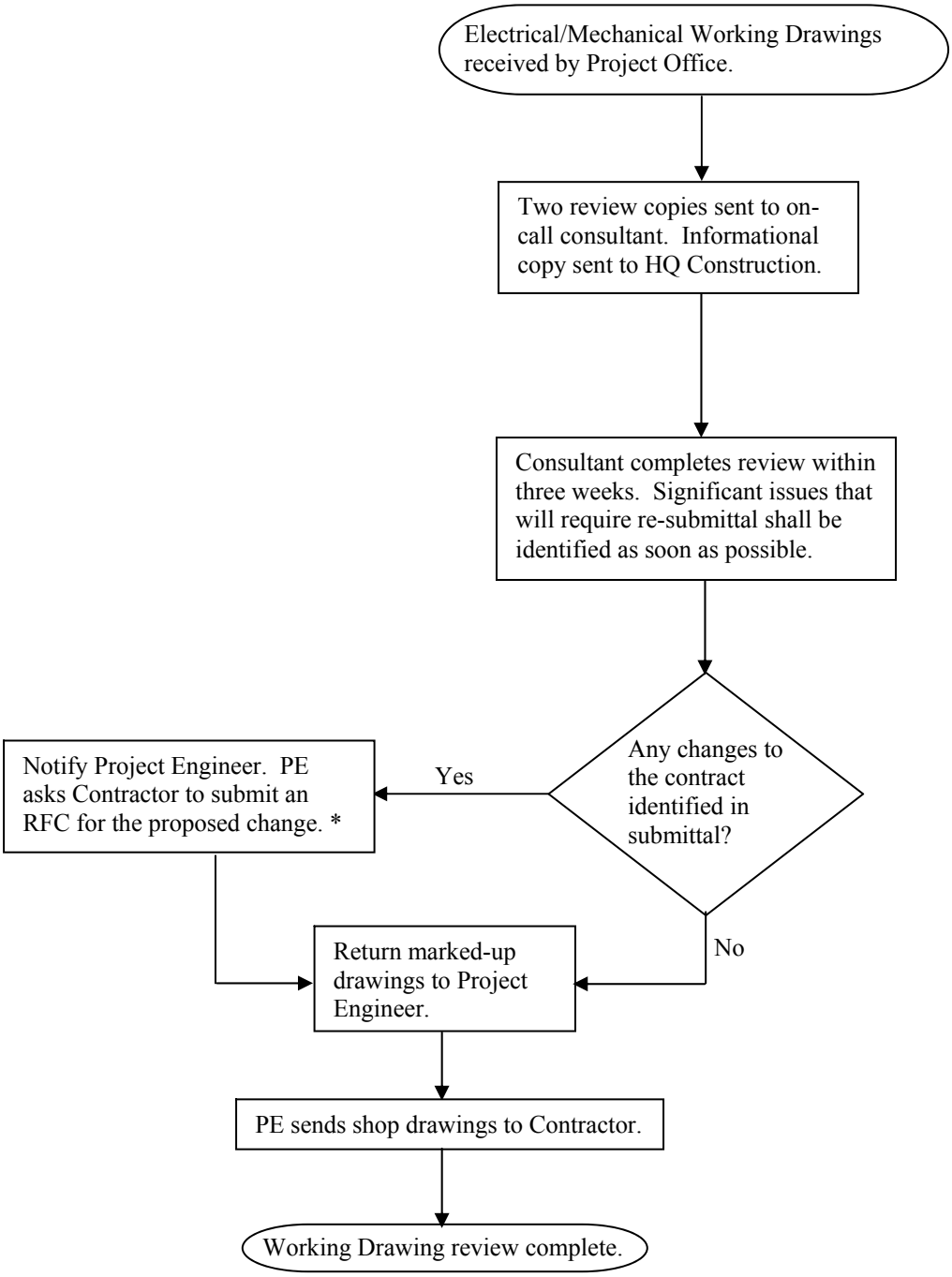


Figure 6-9 (continued)

Electrical/Mechanical Working Drawing Review Process



** -- Refer to Electrical/Mechanical/Structural Request-For-Change Process.*

Figure 6-9 (continued)

Today's destination sign has increased in size to the extent that it is no longer a minor installation and the amount of time required to install an average freeway sign project has been extended to the point that close cooperation between all forces on highway construction projects is vital so that the facility is signed properly when opened to traffic.

Any sign that is erected on a section of roadway carrying traffic ahead of the time the message on the sign will be applicable to the traffic shall be covered in accordance with Section 8-21.3(3) of the *Standard Specifications* until the appropriate time for uncovering it. It is essential that signs with conflicting messages not be displayed.

8-21.2 Sign Location

Since it is impossible to visualize the actual physical features of final grade elevations, vertical curves, trees, and other factors that affect proper sign placement in the initial sign plan stage, it becomes necessary to make adjustments in sign location just prior to installation. The Project Engineer and Regional Traffic Engineer should coordinate a study of each location to determine that each sign will be in the most efficient location for visibility and nighttime reflectivity. Advance Destination signs may be moved up to 500 feet (150 meters) in either direction if severe ground or slope conditions are encountered. If the sign must be moved more than 500 feet (150 meters), consideration should be given to revising the distance on the sign. All sign locations shall be staked by the Engineer prior to installation by the Contractor.

Following staking of the signs, the Project Engineer should furnish the Contractor with the list of post lengths for steel posts. For wooden posts, the Contractor should be able to order posts in commercial lengths from the approximate lengths shown in the plans. Final lengths of timber posts will be determined or verified by the Engineer at the request of the Contractor prior to fabrication.

Anytime an existing bridge mounted sign bracket, cantilever sign structure, or sign bridge structure is removed from service, the Contractor shall remove any existing sign structure identification plate and give it to the Project Engineer. The Project Engineer will return the identification plate to the State Bridge Preservation Office so the sign structure can be removed from the inventory.

8-21.3 Approval of Materials

All materials for installation on permanent signing projects should be selected off the *Qualified Products List* (QPL) or listed on the Request for Approval of Materials (RAM). Materials listed on RAM not listed on the QPL shall be submitted to the State Materials Laboratory for appropriate action as soon as possible. Shop drawings of sign structures shall be reviewed by the Project Engineer for conformance with the *Standard Plans* Section G. The Project Engineer approves plans in conformance with the standard plans. Any request to deviate from standard plans should be reviewed by the State Bridge and Structures Office.

The eight sets of shop drawings of special design sign structures and/or special sign fittings shall be submitted to the State Bridge and Structures office, which will coordinate approval with the State Materials Laboratory. After approval, the State Bridge and Structures office will retain one set and forward two sets to the State Materials Engineer and send three sets to the Project Engineer. One of the State Materials Engineer's sets will be forwarded to the Fabrication Inspector. The Project Engineer will send two sets to the Contractor, who will forward one set to the Fabricator.

If a structural review is not required by the State Bridge and Structures office, the Project Engineer shall mark all changes in red on all eight copies and distribute per the Shop Plans and Working Drawings Table in Chapter 1-2.4H of this manual.

All drawings shall be clearly marked ("Approved as Noted", "Returned for Correction", or "Approved") before returned to the Contractor, whether reviewed and checked by the Project Engineer or the State Bridge and Structures Office.

The special provisions of the contract deal to a great extent with the proper fabrication of the signs to be installed and the manufacturing process requiring the use of approved application equipment. It is necessary, therefore, that the firm who actually makes the signs be approved as a source of supply. Such approval is made by the State Materials Laboratory.

8-21.4 Inspection

A "fabrication approval" decal dated and signed by the Sign Fabrication Inspector shall appear on the back of all permanent signs that are received on the project. Signs without such indicated approval shall not be permitted on the project. Damaged signs shall be rejected at the project site.

At the completion of a sign installation, the Project Engineer shall request the Regional Traffic Engineer to assist in making a final inspection.

8-21.5 Bolting Base Connections

It is important to ensure the proper torque is applied to bolts connecting the bases when installing *Standard Plan* G-24.10.00 through G-24.60.00 Sign Structures. Procedures for assembling and inspecting high strength bolts are covered in Chapter 6-3.6B of this manual. All base assemblies shall be checked with a torque wrench. This can be accomplished either by observing the Contractor's torquing or by the Inspector utilizing the Region's torque wrench. Documentation of the torquing method used should be accomplished by proper entries in the Inspector's Daily Reports.

8-21.6 Measurement and Payment

Measurement and Payment instructions are covered in Sections 8-21.4 and 8-21.5 of the *Standard Specifications*.

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Chapter 9 Materials

9-1 General

9-1.1 Introduction

The quality of material used on the project will be evaluated and accepted in various ways, whether by testing of samples, visual inspection, or certification of compliance. This chapter details the manner in which these materials can be accepted.

9-1.2 Requirements

Requirements for materials are described in Section 1-06 and Division 9 of the *Standard Specifications for Road, Bridge and Municipal Construction* (M 41-10). Tolerance limits and a procedure for acceptance of certain materials are given in Chapters 9-5.4 and 9-5.6. For inspection of course thickness, the maximum deviations for measured thickness of surfacing and paving see Chapter 1-6 of this manual.

9-1.3 Sample and Test Numbering

A separate series of numbers, starting with No. 1 in each instance, shall be used for acceptance, independent assurance, and verification samples for each type of material for which there is a separate bid item. Verification samples shall be referenced to the corresponding Manufacturer's Certificate of Compliance.

9-1.3A Preliminary Samples and Tests

Preliminary samples are intended to show the general character of the materials available or proposed for use. The sample may be taken from a natural deposit, the general stock of a dealer, or elsewhere. The material sampled may require further treatment before it will meet the specification requirements. Preliminary samples are a basis for approving which aggregate site or brand of material will be considered for use. Deliveries cannot be accepted on the basis of preliminary samples unless the samples represent an identified lot of materials.

Unless specified for a particular purpose, preliminary sampling and testing of materials from a potential source are not mandatory functions. It is to be performed when requested by the Project Engineer, Region Materials Engineer or the State Materials Laboratory on the Request for Approval of Material (DOT Form 350-071).

For aggregate sources that have been identified as having variable quality, contact the Regional Materials Engineer prior to use. It has been demonstrated that some of these sources can provide quality material through diligent production and stockpile management. The Regional Materials Engineer may approve these aggregate sources by the stockpile(s) or on a project-by-project basis. To determine aggregate approval status, consult the 'Aggregate Source Approval Report' generated from the ASA database prior to use.

In order to insure consistency in sampling of aggregate sources for preliminary testing, the sampling must be witnessed or taken by a designated representative of the Regional Materials Engineer.

Before sampling, check to see if the source that is proposed is currently approved for the intended use. If current preliminary test reports are available and confirm that the material meets the contract requirements, additional tests may not be needed. If in doubt, contact the State Materials Laboratory for assistance.

9-1.3B Acceptance Samples and Tests

Acceptance samples and tests are defined as those samples tested for determining the quality, acceptability, and workmanship of the materials prior to incorporating the materials into the project. The results of these tests are used to determine conformance to the contract documents. The minimum frequency for sampling and testing of acceptance samples is detailed in Chapter 9-5.7 of this manual.

9-1.3C Vacant

9-1.3D Verification Samples and Tests

Verification samples and tests are used for making checks on the reliability of a manufacturers test results when acceptance of the material is based upon a Manufacturer's Certificate of Compliance.

9-1.4 Form Letters

A number of form letters have been prepared as an aid to the Project Engineer in transmitting information to the laboratory. In order to minimize delays to completion of material testing, transmittal letters should include all the information that is pertinent to the sample in question. In order to assist the laboratory, copies of the transmittal letters should be retained in the Project Engineers Office. The following is a list of the forms that may be used for transmittal of samples and/or information to the materials laboratory:

350-009 EF	Concrete Test Cylinder Transmittal
350-016	Asphalt Sample Label
350-026 EF	Preliminary Sample Transmittal
350-040 EF	Concrete Mix Design
350-041 EF	Request for Reference HMA Mix Design
350-042 EF	HMA Mix Design Submittal
350-056 EF	Sample Transmittal
350-067 EF	Thickness Measurement and Core Transmittal
350-071 EF	Request for Approval of Material
350-073 EF	Hot Mix Asphalt Test Section Report
350-074 EF	Field Density Test
350-074A EF	Field Dry Density Test
350-092 EF	Hot Mix Asphalt Compaction Report
350-114 EF	Summary Report of Acceptance Sampling and Testing
350-115 EF	Contract Materials Checklist
351-015 EF	Daily Compaction Test Report
410-025 EF	Project Engineer Transmittal

9-1.5 Project Material Certification

The Project Engineer is responsible for obtaining all required materials documentation or otherwise ensuring that all required materials testing is completed, all with satisfactory results, prior to the materials being incorporated into the project. The Project Engineer is also responsible for maintaining a successful accounting for the materials incorporated into the project in order to support the Region's Certification of Materials. Management and accounting for materials used in the construction of a project are to be administered in the same manner regardless of its funding source; Federal, State, or a combination of both.

The Region is responsible for periodic reviews of each project's materials documentation at the Project Engineer's office. Upon completion of the project the Region will prepare a Region Materials Certification letter listing all variances that were identified and their resolution. On projects that involve Federal participation where material deficiencies are documented, these deficiencies must be resolved with the State Construction Office through the Region before the Region Certification of Materials can be completed. On projects that involve State Funds only, documented deficiencies must be resolved with the Region prior to the Region Certification of Materials. The Regional Administrator or their designee is responsible for signing and distributing the certification letter.

The State Materials Laboratory will also perform compliance reviews on a sampling of completed projects statewide where the materials have been certified.

Definitions

Certification: A Region Materials Certification based on a documented evaluation of the project's materials inspection, sampling, testing, and other materials acceptance activities for their conformance to the contract documents, *Standard Specifications* and this manual. The certification reflects the project's conformance with the Record of Materials as adjusted by the Project Engineer for:

1. Actual project quantities utilized,
2. Acceptance practices as provided for in this manual, including Chapters 1-2.8 and 9-5.2, and Non-critical items,
3. Adjusted sampling/testing frequencies as provided for in Chapter in 9-5.2, and
4. Work added by Change Order.

Variance: An identified difference between the materials acceptance requirements noted in this manual, the contract documents, the *Standard Specifications*, and a review of the completed projects Record of Materials. All variances must be noted. Such notations will need to include the basis by which the material was accepted and how the requirements for that material were met. Any variance between the recognized acceptance requirements and the Project Engineer's use of the material must be resolved with either the Region, State Construction Office, and/or State Materials Laboratory, as appropriate.

Project Material Certification Process

Environmental and Engineering Programs Division (EEPD)

1. State Materials Laboratory (Documentation Section)

   a. Prepare the initial Record of Material for all major items of materials listed in the contract.

   b. Provide technical support, certification guidelines, format, and suggested documents. See Figure 9-1 for Project Materials Checklist (DOT Form 350-115, latest version). See Figure 9-2 for examples of the Region Materials Certification letter and its distribution.

   c. Conduct Compliance Reviews on a sampling of completed projects statewide where the Region has certified the materials.

2. The State Construction Office

   a. Receives variances for federal aid projects identified during the Region's materials certification review.

   b. Coordinates FHWA and Region to determine funding eligibility for variances.

   c. Prepares response to Region identifying degree of participation (Letter of Resolution).

3. Accounting Office

   a. The federal aid section will make the appropriate transaction as necessary upon receipt of the Letter of Resolution.

   b. Voucher a federal project only after receiving a copy of the Project Materials Certification, the Letter of Resolution and assure that the appropriate credit has been made to FHWA.

   c. Attach a copy of the Letter of Resolution to the Journal Voucher sent to FHWA.

Region

1. Project Engineer

   a. Sets up and maintains a materials documentation system.

   b. Maintains and monitors a current Record of Material ensuring materials certification throughout the course of the project.

   c. Identify, document, and justify all materials variances including determination and acceptance of noncritical items in accordance with Chapter 1-2.8 of this manual. Justification may be any of the following:

      1. Follow requirements of Section 1-2.8C(3) if the deficiency is a lack of manufacturer's certification.

      2. Satisfy the deficiency through additional testing or documentation.

      3. Demonstration that the existing documentation is adequate (for example, 19 out of 20 test were taken).

Washington State Department of Transportation

Contract Materials Checklist

Contract Number	Sign Route	Federal Aid Number(s)
Project Title		

	Yes	No*	N/A	Item No(s).
1. All materials/products used in the construction of this project, including items added by Change Order, have been approved & are listed on the Record of Materials.		**		
2. The actual materials/products used along with the actual basis for acceptance of those materials and products has been documented.		**		
3. All uses of proprietary items, including those listed in the Special Provisions and/or contractor provided QPL items, are documented.				
4. When required, change of material/product letters and a revised RAM were initiated by the contractor.				
5. A Change Order has been completed for all materials accepted and incorporated into the project, but which failed to meet the required specifications when tested.		**		
6. An appropriate credit has been received for all non-specification materials used.		**		
7. Modifications to testing/inspection procedures, including CM 1-2.8A, have been explained and documented by the Project Engineer prior to construction of the item.				
8. Acceptance based on Sampling and Testing for Small Quantities has been documented. CM Chapter 9-5.2C.				
9. Where Manufacturers Certifications were not provided prior to material or product installation, the Project Engineer has provided specific prior approval for the work to continue in accordance with 1-06.3 of the Standard Specifications.				
10. All required acceptance actions and documentation were completed and satisfactory test results demonstrated before payment was made on each item.				
11. Acceptance sampling & testing frequencies for each item accepted is adequate for the total quantities of those items incorporated into the project.		**		
12. All Acceptance Sampling and Testing completed by the Project Engineer utilized Qualified Testers and Certified Testing Equipment in accordance with the Qualified Tester program.				
13. All fabrication inspected items have been accepted in accordance with CM 9-1.5D		**		
14. The contractor has submitted all required Manufacturer Certifications and Mill Certifications, the Certifications represent the specification requirements noted in the contract, and quantities represented by the certifications match or exceed the final quantities used.		**		
15. All required catalog cuts have been approved and are on file.		**		
16. All required Certificates of Materials Origin have been received and are on file. (Fed Aid projects only)		**		

* Checklist items marked "No" constitute a Materials Certification deficiency. Each "No" requires the contract item number for the affected item to be shown along with an attachment to the Materials Checklist detailing the circumstances of use, the method used for acceptance of the material, the Project Engineer's evaluation of the material, suitability for it's application, and determination as to whether or not it may have met the specification in spite of the materials documentation oversight. If the project is Federally funded, the Project Engineer should also include a recommendation for Federal participation in light of the use of undocumented materials.

** These specific materials deficiencies on Federal Aid projects must be resolved through State Construction Office and may result in the loss of Federal participation.

Project Engineer — Date

Region Construction Engineer/Operations Engineer/Area Engineering Manager — Date

DOT Form 350-115 EF
Revised 3/2002

Figure 9-1

Washington State
Department of Transportation
Paula J. Hammond, P.E.
Secretary of Transportation

Transportation Building
310 Maple Park Avenue S.E.
P.O. Box 47300
Olympia, WA 98504-7300

360-705-7000
TTY: 1-800-833-6388
www.wsdot.wa.gov

Date:

Jeff Carpenter, P.E.
State Construction Engineer
P.O. Box 47354
Olympia, WA 98504-7354
MS: 47354

Cont. No.: SR-
F.A. No:
Section:

Completion Date: (may be substantial, physical, or completion date)

Dear Jeff:

This is to certify that:

The results of acceptance sampling and testing completed for the project referenced above, confirm that the materials incorporated into the project were found to have met the requirements as outlined in the contract plans, provisions, and Standard Specifications.

There were no exceptions

OR:

This is to certify that:

The results of the tests on acceptance samples indicate that the material incorporated in the construction operations controlled by sampling and testing were in conformance with the approved plans and specifications.

Exceptions to the plan and specifications are explained on the attached sheet(s).

Very truly yours,

Regional Administrator or designee

XX:xx
Attachment

cc: FHWA, 40943 (F.A. Projects Only)
State Materials Engineer, 47365
Regional Oper./Const. Engineer
Project Engineer

Figure 9-2

4. Demonstration that the cost of obtaining the missing documentation will not be justified by the benefits received.

d. Identify and document the determination and acceptance of all non-critical items in accordance with Section 1.2-8A of this Manual.

e. Prepares the Region Materials Certification package, which includes the Region Materials Certification letter, identified variances, Letters of Resolution for all identified variances on federal aid projects and resolution actions taken. This package also includes a completed Contract Materials Checklist (DOT Form 350-115). The certification package is submitted to the Region Construction Manager for review. The certification letter is to be addressed to the State Construction Engineer.

2. Regional Operations/Construction Office

a. The Region shall review projects according to Chapter 10-5 of this manual for documentation requirements including materials.

b. Resolve materials variances identified by the Project Engineer and the Region's review of materials documentation at the Region level for State funds only projects. Resolve materials variances on Federal aid projects through contact with the State Construction Office.

c. Review certification package for completeness.

d. Submit certification letter to Regional Administrator for signature.

e. Distribute signed Region Materials Certification letter. The original is submitted to the State Construction Engineer, with copies sent to FHWA (for F.A. Projects) and the State Materials Engineer. A copy of the Letter of Resolution shall be attached if there are any variances.

3. Regional Administrator, or designee

a. Signs the certification letter.

4. State Construction Administration and Support Accounting Office

a. Completes the necessary paperwork.

Compliance Review for Materials Certification Process

Compliance reviews will be performed by the State Materials Laboratory to document how well project records conform to materials certification standards.

The compliance review will normally be conducted at the Project Engineer Office unless arrangements are made for it to be conducted elsewhere.

The goal is to perform a compliance review on at least one project per Project Engineer Office every two years. Compliance reviews may be conducted more frequently as appropriate. Projects will be selected with consideration given to project size and complexity.

Reviews may be performed either prior to or after receipt of the Region Certification of Materials letter. If the review is performed prior to receipt of the Region Certification letter, the review will occur after Substantial Completion. Compliance reviews are performed in order to assist the Project Engineer Office in verifying that all required materials documentation and testing has been completed in accordance with established requirements and standards. If the review is to be performed at the receipt of the Region Materials Certification Letter, the State Materials Laboratory will notify the Region within 60 days of intent to perform a compliance review on that project. Compliance reviews performed prior to receipt of the Region Materials Certification Letter will occur at any time after Substantial Completion.

The goal is to perform a compliance review on at least one project per project office every two years. Compliance reviews may be conducted more frequently as appropriate. Projects will be selected with consideration given to project size and complexity.

The records maintained and developed by the Project Engineer for approval, acceptance and, field verification of the materials placed and paid for on the contract and the identification of variances will be reviewed.

Upon completion of the review, the findings will be discussed with the Project Engineer and/or their representative. A draft report of the findings will be prepared and sent to the Project Engineer after the review. The Project Engineer Office will be given time to rectify any possible deficiencies before the final report is written. A copy of the final report will be sent to the Regional Documentation Engineer, Construction Manager, State Construction Office, and the FHWA Division Office.

In addition to addressing material documentation deficiencies, the Project Engineer/Construction Manager will correct any such discrepancy in the Project Engineer Office material documentation process noted during the Compliance review.

The following items of documentation must be made available for the review:

1. Record of Materials, as revised and amended by the Project Engineer Office (ref. 9-1.5A)

2. Approval Documents:

a. Request for Approval of Material (ref. 9-1.5B)

b. Qualified Products List pages (ref. 9-1.5B)

3. Acceptance Documents:

a. Test Results

1. Acceptance Test Reports

2. Assurance Test Reports (where applicable)

3. Independent Assurance Test Reports (where applicable)

4. Verification Test Reports (Cement and Liquid Asphalt)

b. Manufacturer's Certificate of Compliance (ref. 9-1.5E)

1. Concrete Pipe Acceptance Report (ref. 9-1.5F)

2. Lumber Grading Certificate

3. Certification of Cement Shipment

4. Notice of Asphalt Shipment or Certified Bill of Lading

5. Any other certificates required by the contract documents

c. WSDOT Fabrications Inspected Items (ref. 9-1.5D)

d. Catalog Cuts (ref. 9-1.5H)

e. Proprietary or Agency Supplied Items (ref. 9-1.5B)

f. Visual Inspection Items (ref. 9-1.5C)

g. Small Quantity Acceptance Documentation

h. Reduced Frequency Testing Documentation

4. Field Verification Documentation (ref. 9-1.5C)

a. Inspectors Daily Reports

b. Field Acceptance Reports

c. Field Note Records (individual materials information initialed and dated by the inspector in the field)

5. Inspectors Daily Reports

6. Field Note Records

7. Comparison/Summary of Quantities

8. List of Change Orders

9. Project Engineer Office Signature/Initial List

9-1.5A Record of Materials (ROM)

A Record of Materials (ROM) listing of all major construction items is provided by the State Materials Laboratory for each project. For these major construction items, the ROM identifies the kinds and quantities for all materials deemed to require quality control testing. It further identifies the minimum number of acceptance and verification samples that would be required for acceptance of those materials. The minimum number of acceptance tests is based on the planned quantities for the project and should be adjusted for the actual quantities used. Also listed are those materials requiring other actions, such as fabrication inspection, Manufacturer's Certificate of Compliance, shop drawings, or catalog cuts.

The acceptance action and/or numbers of samples listed are the minimum requirements for the Project Engineer's acceptance of those materials and the minimum requirements necessary for the Region's certification for the materials used on that project. The State Materials Laboratory will forward the Record of Materials electronically to the Regional Materials Engineer, and Project Engineer shortly after the contract is awarded. The copy submitted to the Project Engineer is intended as a tool to assist the project office in tracking the samples approved, samples tested, Manufacturer's Certificate of Compliance, shop drawings, catalog cuts received, and other pertinent data necessary for the Project Engineers and the Regions certification of materials.

The acceptance requirements shown on the Record of Material may be modified by the Contractors specific Requests for Approval of Material. In addition the ROM is based on the State Material Laboratory's review of the major items of construction identified by the contract Summary of Quantities. Reviewing the contract plans and provisions may also identify additional materials documentation requirements as well as major construction items that require additional materials not accounted for in the State Material Laboratory's initial review of the project. These additional materials documentation requirements should be added to the ROM and tracked for completion throughout the course of the project work.

The accuracy of the ROM and Certification of Materials is largely the responsibility of the Project Engineer.

Where the ROM is not clear or there appear to be opportunities to adjust the acceptance requirements that have been identified, the Project Engineer is encouraged to contact the Region Materials Engineer or the State Materials Laboratory for assistance.

In order to ensure clarity upon completion of the work and to allow for easy certification of the project by both the Project Engineer and the Region, it is important that the project ROM be accurate and actively maintained throughout the course of the project. Any changes to the acceptance requirements, additional materials used, or any additional materials added to the project by change order should be accurately documented and tracked in the project Record of Materials.

9-1.5B Approval of Materials

To fulfill the requirements of *Standard Specifications* Section 1-06.1, the Contractor must notify the Engineer of all proposed permanently incorporated materials prior to use. Some temporary items may require approval if required by the Contract Documents. This may be accomplished by a Qualified Product List (QPL) submittal or by submitting a Request for Approval of Material (RAM) (DOT Form 350-071).

When the materials are approved, it does not necessarily constitute acceptance of the materials for incorporating them into the work. Additional acceptance actions, as noted by the code on the RAM or QPL must be completed prior to the materials being used in the work.

Qualified Products List — Submittals

Products listed in the QPL have been found capable of meeting the requirements of the *Standard Specification*, General Special Provision, Bridge Special Provision and Standard Plans under which they are listed and, therefore, have been "Approved." These products may be "Accepted" by fulfilling the requirements of the Acceptance Code and any notes that apply to the product. During the life of the contract, acceptance criteria for materials in the QPL may change, becoming more stringent or less stringent. The

acceptance criteria detailed on the originally submitted QPL page will continue to be the acceptance criteria for the life of the contract, unless the Contractor submits a new QPL page for the material. This is the case regardless of whether the criteria become more stringent or less stringent. Instructions are given in the QPL for processing QPL submittals. It is encouraged that Contractors and Project Engineer Offices use the QPL database for submittals. The QPL database is constantly updated with additions and/or deletions and can be accessed @ www.wsdot.wa.gov/biz/mats/QPL/QPL.cfm.

The Engineer shall review the submittal of the material for consistency with the Bid Item and shall promptly notify the Contractor of any concerns, working toward resolving these with the Contractor. QPL submittals inconsistent with the intended use for the Bid Item should be marked "unacceptable for intended use" and returned to the Contractor. Copies of QPL pages for materials that are to carry a WSDOT Fabrication Inspection 'Stamp/Tag' or Sign Inspection 'Decal' shall be forwarded to the WSDOT Headquarters Fabrication Inspection Office.

Request for Approval of Material — Submittals

The Contractor shall submit all Request for Approval of Materials (RAM) to the Project Engineer Office using RAM for DOT 350-071 EF.

If a RAM is submitted with a material that is found on the QPL, the Project Engineers office may code the RAM as defined below.

If a RAM is submitted with a material not identified under the 'Project Engineer's Office Approval Coding' area, the Project Engineer's Office shall submit the RAM to the State Materials Laboratory Documentation Section for coding.

The coding of the RAM is to determine if the proposed material on the RAM is capable of meeting the established standards and defining the acceptance criteria. Acceptance determines if the material being placed on the contract does meet the established standards.

When unable to approve a RAM as outlined below, the Project Engineer's office will sign, date, and code the items with a "7" –'Approval Pending' and forward it to the State Materials Laboratory Documentation Section. If the RAM is not filled out correctly it will be returned to the Project Engineer's Office prior to any action being taken. It is recommended that the RAM submittal should be submitted in a timely manner. The RAM may be forwarded by mailing, electronically transferring or faxing. A copy should also be returned to the Contractor at this point to inform them that the RAM has been sent to the State Materials Laboratory for approval. Submit any additional documentation, including appropriate transmittals, that may assist the RAM Engineer in approving the proposed material; such as Test Reports, Catalog Cuts, Manufacturer's Certificate of Compliance, etc. The page number of the Special Provision or Plan Sheet will also aid in expediting the approval process.

The State Materials Laboratory Documentation Section may elect to delegate approval of some specialty items.

All RAMs shall be signed and dated by the Engineer. All copies of the RAM's processed through the Project Engineers Office shall be sent to the State Materials Laboratory Documentation Section. Copies shall be distributed as indicated at the bottom of the RAM form. Acceptance requirements should be noted on the maintained ROM and/or Materials Tracking Program (MTP). This is especially important since the maintained ROM and/or MTP will be used for auditing purposes.

Project Engineer's Office Approval Coding

- QPL Reference Materials:

  The Engineer may code the RAM if the product listed on the RAM is identified in the QPL by make, model, batch, color, size, part no., etc. The product must also be listed in the QPL under the appropriate *Standard Specification* for the intended use as indicated by the Bid Item and Specification Reference shown on the RAM. The RAM should be coded with the 4-digit QPL acceptance code and any notes and/or restrictions restated as "Remarks" on the RAM.

- Aggregates:

  Aggregate Sources will be approved by consulting the Aggregate Source Approval database for the use intended. The RAM should be coded when there is a sampling frequency in Section 9-5.7 of this Manual with a "1" – "Conditionally Approved: Acceptance based upon Satisfactory Test Report". Aggregates that do not have sampling frequency should be coded per requirements of the ASA database. Print the ASA Report and attach it to the approved RAM.

- Proprietary Materials:

  Where the Contract Documents state "shall be…" and list products by specific name and model, the Contractor needs only to complete the RAM indicating to the Engineer the intended choice. The Engineer shall approve the RAM, coding with an"8" – "Source Approved" and note the page number where it is listed in the Contract Documents as a proprietary product. Occasionally some proprietary materials will have additional acceptance criteria and these criteria need to be noted on the RAM. On occasion the Subject Matter Expert for the material being placed may ask for additional documentation.

- Agency Supplied Materials:

  An approved RAM is not required for Agency Supplied Materials. If a RAM is submitted to the PEO, then the Engineer shall approve the RAM, coding with an "8" – "Source Approved" and note the page number where it is listed in the Contract Documents as an Agency Supplied Material. Addition acceptance criteria may be required if listed in the Contract Special Provisions or Plans.

- Concrete and Asphalt Batch Plants

  For Concrete Batch Plants, the Project Engineer Office shall ensure submittals and requirements of 6-02.3(4) of the *Standard Specification are met* prior to approving the RAM.

For Asphalt Mixing Plants, the Project Engineer Office shall ensure requirement of Section 5-04.3(1) of the *Standard Specification* are met. There is no approval of Asphalt Mixing Plants required, however coding the RAM with an "8" – "Source Approved" would be appropriate.

Low Risk Materials

There are low risk materials that may be used in the project without contractor identification per Section 1-06 of the *Standard Specifications* or any other documentation unless stipulated in the Contract Documents. Please note however, that if the project is federally funded, the requirements of the "Buy America" provisions apply. The following is a listing of these materials. Other items can be considered for addition to this list. Suggestions are encouraged and may be made to the State Construction Office or the State Materials Laboratory.

- Asphaltic felt for bridge approach slabs
- Coloidal copper compound
- Duct tape for bridge approach slab anchors
- Electrical pull string
- Electrical tape
- Friction tape, and moisture proof varnish for friction tape
- Expanded polystyrene for bridge approach slab anchors
- Galvanized wire mesh and hardware for screens on sign bridges and cantilever sign structure bases
- Grout for cosmetic purposes
- Locknuts for terminating conduit
- Nails
- Pea gravel for decorative purposes
- Pipe wrap and spacers for electrical conduit
- Polypropylene rope for induction loop centralizers
- Premolded joint filler for expansion joints in sidewalks
- PVC pipe for bridge approach slab anchors
- PVC solvent cement
- Rebar tie wire (plain and epoxy-coated)
- Silicone sealant for electrical service cabinets
- Spacers for electrical conduit duct bank
- Spacers for rebar columns
- Straw bales not used as mulch

9-1.5C Field Verification of Materials

All materials permanently incorporated into a contract shall be field verified and documented by the inspector. The field verification or visual inspection shall occur prior to or during placement of materials by means of a note in the Inspector's Daily Report (IDR), a note added to the Field Note Record, a completed Field Acceptance Report, by completing the QPL page, or notes kept in a pocket notebook or other form developed by the PE office. Field verification documentation should contain sufficient information to identify what was used including manufacturer and/or source, product identity, quantities, Fabrication Inspection information and retainage of additional documentation if required per the contract documents. The field verification documentation needs to be initialed or signed and dated by the inspector at the time of verification. The field verification information should be the link between what was placed and paid for to what was approved on the RAM or QPL and its proper acceptance criteria.

Material that has acceptance criteria of 'visual inspection' only requires that the field inspector sign and date the Field Note Record representing each pay quantity identified. When the project inspector signs/initials the FNR for payment, they are also affirming that items requiring visual inspection have been checked and have been found to be acceptable. All other forms of acceptance criteria require normal Field Verification documentation per this section.

If the Field Note Record is used for field verification, the materials documentation on the record has to be adequate to verify what was used and approved. For lump sum or large items of work, it may necessitate the field inspector to 'field verify', sign, and date the Field Note Record more than once over the duration of the work on the bid item. This would show that each 'component' of the bid item was verified prior to or during the time it was placed.

For DOT fabrication inspected items, the field verification required is the quantity, the Tag/Stamp ID number, and Materials Origin, Foreign or Domestic (F or D) designation.

For signs, the field verification shall document the quantity, and a notation that all signs had the WSDOT inspected decal. The field inspector will need to document that the sign mounting hardware package supplied by the sign fabrication facility bears a "WSDOT INSPECTED" stamp, is 'sealed' and the contains either a Materials Origin F or D.

Field Verification for Traffic Control Cabinet will be by a passing test report and the documentation of the date and name of the region electrical inspector approving the cabinet for turn on. Field Verification for Electrical Service Cabinet will be the documentation of the date and name of the region electrical inspector approving the "turn on".

9-1.5D Materials Fabrication Inspection Office — Inspected Items Acceptance

Items that are inspected and found to meet contract documents by the Materials Fabrication Inspection Office are identified by a tag or stamp. This type of inspection is generally performed at the manufacturing or fabrication plants. There are various types of stamps or tags used for acceptance of inspected items, which attest that the item was in full conformance with the specifications at the time of inspection. The inspected items along with the type of stamp designation is covered under Section 9-1.5D(1) of this manual.

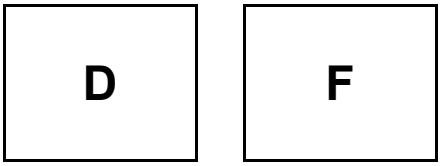
The following is the process for the acceptance of inspected items.

1. The manufacturing or fabrication plant must be approved via the "Request for Approval of Material," (RAM) or the *Qualified Products List* (QPL)

2. The Materials Fabrication Inspection Office Inspector, who will obtain the necessary mill tests or other documentation from the manufacturer and reference them to the stamp or tag shown in Figures 9-3 through 9-7, must inspect the item of work. This number can be used for tracking of the item.

Steel and iron items containing Foreign steel will be stamped with an “F” identifier, and steel and iron items that do not contain foreign steel will be stamped with a “D” identifier. See figure 3A and 3B. This stamp is in addition to the appropriate acceptance tag or stamp in figures 9-3, 9-4, 9-5, and 9-7. The “F” or “D” identifier will be stamped next to the acceptance stamp. For those items with an acceptance tag, the “F” or “D” stamp will be stamped on the back of the tag.

In all cases, the project office will be responsible for securing the Certificate of Material Origin and tracking the quantities.



Domestic or Foreign Identifier Stamp
Figure 3A and 3B

3. Once the fabricated item arrives on the job, check for approval stamp or tag.

   a. If there is an approval stamp or tag, record the type of tag or stamp along with the ID number when applicable, quantity, and brief description of the item for project records. The Project Engineer’s representative should note in a report that the material was in satisfactory visual condition when installed and forward all information to the project office. In case of questions concerning an inspected item, contact the appropriate Materials Fabrication Inspection Office. The offices are:

      State Materials Laboratory, Tumwater, Mail Stop 47365

      Seattle Inspection Office, Mail Stop NB-82, Northwest, MS-501

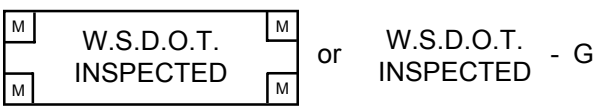
      Spokane Inspection Office, Mail Stop Eastern, Materials Lab

      Vancouver Inspection Office, Mail Stop Southwest S-15, Materials Lab

   b. If there are no stamps or tags, inform the Contractor that the item may not be acceptable, and contact the Materials Fabrication Inspection Office to determine the status of the inspection. Items lacking tags or stamps or damaged during shipping should be rejected and tagged or marked appropriately.

9-1.5D(1) Inspected Items, Stamps and Tagging Identification

The following are examples of the types of stamps and tags used by the Materials Fabrication Inspection Office. The letter on the stamp or tag represents the inspector who performed the inspection.



Stamps
Figure 9-3

The stamps shown in Figure 9-3 identifies inspection and the inspector of the following items:

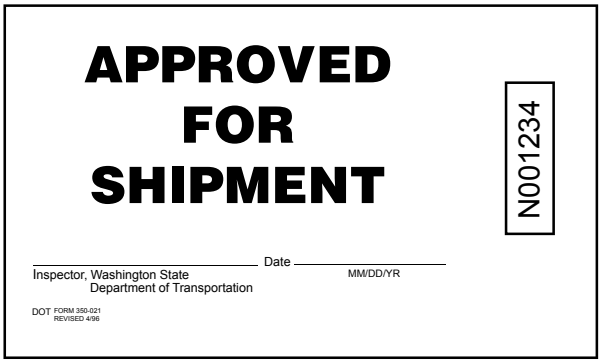
1. Precast Concrete Barrier
2. Precast Concrete Catch Basins, Manholes and Inlets. This includes all sections and risers 6 inch and above.
3. Concrete Utility Vaults
4. Concrete Junction Boxes
5. Galvanized Steel

All Documentation associated with these stamps in Figure 9-3 will be reviewed and approved by the Materials FabricationInspection Office and kept at the point of Manufacture, with the exception that they will not track the quantities of foreign materials used on the project. Steel items containing foreign steel will be stamped with an “F” identifier in addition to the appropriate stamp. Steel items that do not contain foreign steel will be stamped with a “D” identifier in addition to the appropriate stamp.

APPROVED
FOR SHIPMENT
WASH. DEPT. TRANSP.

N001234

Stamp
Figure 9-4



Tag
Figure 9-5

The stamp shown in Figure 9-4 or tag shown in Figure 9-5 identifies inspection and the inspector of the following items:

1. Concrete Wall Panels — Stamped or tagged
2. Three Sided Structures — Stamped or tagged
3. Prestressed Concrete Products — Stamped or tagged
4. Steel for Bridges — Stamped or tagged
5. Signal, Luminaire, ITS and Strain Poles — Stamped or tagged
6. Miscellaneous Welded Shop Items (see RAM or QPL for special items) — Stamped or tagged
7. Sign Structures and associated hardware — Stamped or tagged

8. Anchor Bolts for Luminaires, Signal Poles and Sign Structures –A representative number of bolts shall be stamped with the inspector's I.D. # and the shipment will be accompanied by an "Approved for Shipment Tag".

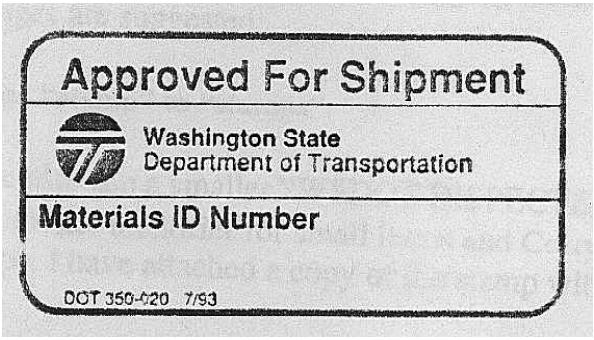
9. Epoxy Coated Reinforcing Steel Bars for Concrete — Representative bundles of rebar shall be tagged per shipment to the project

10. Metal Bridge Rail — Each bundle of rail shall be tagged

11. Concrete Culvert, Sewer Pipe (30 inches and above) — Stamped

13. Sign Mounting Hardware – stamp

All Documentation associated with the stamp in Figure 9-4 or the tag in Figure 9-5 will be reviewed and approved by the Materials Fabrication Inspection Office and kept at the Materials Fabrication Inspection Office, with the exception that they will not track the quantities of foreign materials used on the project. Steel items containing foreign steel will be stamped with an "F" identifier in addition to the appropriate stamp. Steel items that do not contain foreign steel will be stamped with a "D" identifier in addition to the appropriate stamp.



Tag
Figure 9-6

The tag in Figure 9-6 identifies inspection and inspector of Treated Timber, Piling and Poles

1. Bundles of treated timber may be randomly tagged "Approved for Shipment" referencing the inspector's identification number.

2. Treated Piling and Poles shall be individually tagged "Approved for Shipment" referencing the inspector's identification number.

All Documentation associated with the tag in Figure 9-6 will be reviewed and approved by the Materials Fabrication Inspection Office and kept at the Materials Fabrication Inspection Office.

WSDOT-A

Stamp
Figure 9-7

The stamp shown in Figure 9-7 identifies inspection and inspector of the following items:

(This stamp is impressed on the casting and will be circled with spray paint for ease of visibility of the stamp.)

1. Gray-Iron Castings, Steel Castings, Ductile-Iron Castings — Stamped

2. Rectangular Frames and Grates — Each set shall be stamped aligning the adjacent mating surfaces to each other. This alignment is critical as the leveling pads are ground to prevent rocking of the grates in the frames.

All Documentation associated with the stamp in Figure 9-7 will be reviewed and approved by the Materials Fabrication Inspection Office and kept at the Materials Fabrication Inspection Office, with the exception that they will not track the quantities of foreign materials used on the project. Steel and Iron items containing foreign steel will be stamped with an "F" identifier in addition to the appropriate tag or stamp. Steel and Iron items made entirely of domestic steel and iron will be stamped with a "D".

9-1.5E Manufacturer's Certificate of Compliance

As designated by the specifications and contract special provisions, certain materials may be accepted on the basis of a Manufacturer's Certificate of Compliance. This acceptance is an alternate to job site sampling and testing. The submitted Qualified Products List page or approved Request for Approval of Material shall stipulate the items for which a compliance certification is an acceptable basis of acceptance. The Manufacturer's Certificate of Compliance is required prior to installation of the material. See Section 1-2.8C(3) of this manual for guidance on allowing material to be placed without certification.

Acceptance by Manufacturer's Certificate of Compliance will be permitted where designated by the contract documents. The original Record of Material will provide a summary of requirements combining the special as well as general requirements of the contract.

The form of the Manufacturer's Certificate of Compliance will vary considerably based on both the material and the origin and may take the form of standard state certificate forms, individual letters from manufacturers, or overstamps on bills of lading. Certain information is required and is designated by the specifications. This information includes the identity of the manufacturer, the type and quantity of material being certified, the applicable specifications being affirmed, and the signature of a responsible representative of the manufacturer. Supporting mill tests or documents may also be required. A Manufacturer's Certificate of Compliance is required for each delivery of material to the project and the lot number, where lot numbers apply, of material being certified shall be identified.

Upon receipt of the Manufacturer's Certificate of Compliance at the project office, it shall be reviewed for compliance with the specifications requirements using the preceding guidelines and the checklist for Transmittal of Manufacturer's Certificate of Compliance Check List – DOT Form 350-572. The manufacturer of the material must make

the certification. A supplier certificate is not acceptable except as evidence for lot number and quantity shipped and can only be accepted when accompanied by a certificate from the manufacturer, which meets the requirements of Section 1-06.3 of the *Standard Specifications*. The Project Engineer's Office is required to retain the signed and dated Manufacturer's Certificate of Compliance Check List Form for each submittal.

9-1.5E(1) Certification of Materials Origin

On projects that include FHWA Federal funding, the requirements of "Buy America" (23 CFR 635.410, 23 U.S.C. 313) apply. This provision, incorporated into the contract by General Special Provision, applies to all manufactured products containing steel or iron permanently incorporated into the project. The Contractor may choose to utilize minor quantities of foreign steel or iron, as described in the General Special Provision.

In all cases the Contractor is required to provide a copy of WSDOT Form 350-109 EF, Certification of Materials Origin, prior to incorporation of the steel or iron materials into the project. It is the responsibility of the Project Office to ensure that the Certification of Materials Origin is on file prior to placing or paying for steel or iron materials.

9-1.5F Concrete Pipe Acceptance Report

Fabrication inspection is periodically performed at approved sources of concrete pipe. During this inspection, samples of each type, size, and class of pipe are inspected and tested to verify compliance with the *Standard Specifications*. For a 90-day period of manufacture from the date of inspection, concrete pipe less than 30 inches diameter may be shipped and accepted based on "Concrete Pipe Acceptance Reports." This report is prepared by the Fabrication Inspector and copies are thereafter supplied by the fabricator to accompany each shipment of pipe.

The Acceptance Report will indicate the date and original test results as performed by the Fabrication Inspector and will bear appropriate certification from the fabricator. Verify the conformance of the shipment with the contract requirements and examine the manufacture and shipping dates of the pipe for conformance with specifications and with the Acceptance Report.

9-1.5G Sign Fabrication Inspection

The Sign Fabricator Inspector is to verify that signs for an individual contract were inspected and approved for shipment to the project by having a **"FABRICATION APPROVED"** decal, see Figure 9-8.

Figure 9-8

Pre-approval of the Sign Fabricator is required by Traffic Operations and /or the Materials Fabrication Office. The Sign Fabricator is approved via the Request for Approval of Material (DOT Form 350-071).

Sign Fabrication Inspectors

Seattle, Yakima, Tacoma, and other Western Washington area — Contact the State Materials Lab- Seattle Inspection Office, Mail Stop NB82-501, (206) 464-7770.

Vancouver-Portland area — Contact Vancouver Inspection Office, Mail Stop S15, (360) 905-2193.

Spokane-Eastern Washington area — Contact the Eastern Region Materials Lab, Spokane, (509) 324-6169

Sign Inspection documentation requirements:

1. **Sign blanks or panels:** Manufacturer's Certificate of Compliance with accompanying mill certifications will be kept at the Sign Fabrication facility.

2. **Reflective Sheeting and Cutout Legend:** Manufacturer's Certificate of Compliance, this certificate will verify that the product(s) meets all the requirements of *Standard Specification* 9-28.12. The Manufacturer's Certificate of Compliance will be kept at the Sign Fabrication facility.

3. When sign mounting hardware is supplied by Sign Fabrication Facility, a Manufacturer's Certificate of Compliance is required to verify that the product(s) meet all the requirements of *Standard Specification* 9-28.11. The Manufacturer's Certificate of Compliance will be kept at the Sign Fabrication facility. For high strength sign mounting hardware supplied by the contractor, a certification will be required that shows the hardware meets *Standard Specification* 9-28. A 307 bolts, where allowed, will not require certification.

4. The Project Engineer Representative will accept for installation and payment only those signs which have a "FABRICATION APPROVED" decal affixed. The representative will also verify the sign mounting hardware package supplied by the sign fabrication facility bears a "WSDOT INSPECTED" stamp or that contractor supplied high strength mounting hardware for overhead and large multiple post roadside signs are certified to meet the requirements of *Standard Specification* 9-28.11. In the event there is no "FABRICATION APPROVED" decal on the signs, or if the hardware does not have "WSDOT INSPECTED" stamp or Manufacturer's Certificate of Compliance as described in section 3 above, they may be rejected. Contact the appropriate Sign Fabricator Inspector for status, or have the Contractor ship the signs back to Sign Fabricator, if this does not delay the project.

Double-faced signs, which do not receive decals, will be approved on visual inspection at the fabricator's facility and in the field.

A list/invoice of all inspected and accepted signs will kept in the Sign Fabricator Inspector's files.

9-1.5H Catalog Cuts

As designated by the contract documents, certain materials may require the acceptance criteria be based on a Catalog Cut. A Catalog Cut may also be required in support of approving a Request for Approval of Materials (RAM) per 9-1.5B. The approved Catalog Cut is required prior to installation of the material.

Upon receipt of the Catalog Cut information at the project office, an initial review for compliance with the established specifications and contract documents should be performed. All information shall be accompanied by the 'Transmittal of Catalog Cuts' form generated with the Record of Materials. The project office shall follow the directions on the 'Transmittal of Catalog Cuts' form and submit the package to the State Materials Lab Documentation Section for approval, or as per the original Record of Material. The 'Transmittal of Catalog Cuts' form and catalog cuts for those materials listed in Section 9-14 and 9-15 of the *Standard Specifications*, and accepted based on approved catalog cuts, should be submitted to the Region Landscape Architect or to the Landscape Liaison for approval.

The Catalog Cut may be forwarded by mailing, electronically transferring or faxing.

9-1.6 Control of Materials

The succeeding parts of this chapter on materials outline the detailed method to be used in the control of materials. The expenditure made for materials is a large item in construction costs. If faulty materials are permitted to be incorporated into the project, the cost of replacement may exceed the original cost.

Chapter 9-4, Specific Requirements for each type of material, includes the following information:

1. Approval of Material
2. Preliminary Samples
3. Acceptance Samples
4. Field Inspection
5. Specification Requirements

Chapter 9-5, Guidelines for Job Site Control of Materials, provides the Engineer with additional information to assist in determination of the point of acceptance for materials from WSDOT and Contractor sources, the basis of acceptance, verification sampling and testing, tolerance limits, and the sampling and testing frequency guide.

Chapter 9-6, Radioactive Testing Devices, explains policy on the administration of radioactive testing devices.

Chapter 9-8, WSDOT Test Methods/Field Operating Procedures, are the testing procedures that are used in the field.

9-2 Vacant

9-3 Vacant

9-4 Specific Requirements for Each Material

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9-4.1 Portland Cement or Blended Hydraulic Cement

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, product is listed under appropriate specification.

2. **Preliminary Samples:** Preliminary samples will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance/Verification

   a. Acceptance

      (1) **Bulk Cement:** Bulk cement will be accepted upon receipt of a Manufacturer's Mill Test Report Number, which shall be reported on each certified concrete delivery ticket.

      (2) **Bagged Cement:** If the quantity of bagged cement exceeds 400 bags, then it will be accepted by "SATISFACTORY" test reports from the State Materials Laboratory. If a sample is needed, acquire a 10-pound sample from one of every 400 bags and ship to the State Materials Laboratory for testing. Allow a minimum of 14 days from receipt of the sample at the Laboratory for testing.

DO NOT permit the use of bagged cement until a "SATISFACTORY" test report has been received from the State Materials Laboratory.

b. **Verification:** Manufacturing mills will provide samples directly to the State Materials Laboratory on a quarterly basis to compare with the manufacturing mill test report. The Engineer may take samples for testing as described in *Standard Specification* Section 9-01.3.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual.

5. **Specification Requirements:** See *Standard Specification* Section 9-01. Review contract documents to determine if supplemental specifications apply.

9-4.2 Bituminous Materials

1. **Approval of Material:** Approval of the materials are required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071 EF). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071 EF). A preliminary sample consists of two 1-quart cans.

3. Acceptance/Verification

a. **Acceptance:** Bituminous materials may be used after receipt by the Engineer of Asphalt Supplier's Certification of Compliance incorporated in their Bill of Lading with the information required by the *Standard Specification 9-02*. Examine these certificates to make sure the material is of the grade required and that it comes from the approved supplier and point of shipment.

b. **Verification:** Samples for verification conformance will be taken based on the frequencies as stated in Chapter 9.5-7 of this manual. Because the entire sample may be used in testing, it is necessary to take a backup for each sample. The samples shall be taken and labeled in duplicate by the Engineer with both samples forwarded promptly to the State Materials Laboratory. Asphalt Binder's (PG, AR, etc.) shall be taken at a frequency corresponding to every other HMA acceptance sample. The first, third, fifth, and every fifth sample thereafter will be tested. Emulsions and cutbacks (such as MC and RC grades) shall be sampled from every other shipment. Emulsion used exclusively for tack coat (such as STE-1 and CSS-1) do not require sampling.

Consult the FOP for AASHTO T40 for detailed sampling procedures. Samples shall be taken as close as possible to the point where the material is to be used; i.e., pug mill, distributor, etc. In the case of cutback asphalt's, sampling may be from the distributor itself, by opening a valve or one of the nozzles. If a hand nozzle is available, the sample may be drawn off there. Asphalt binder for use in a plant should be sampled by drawing from either the supply line between the storage tank and the mixer or the storage tank. Specifications require the Contractor to install a valve for this purpose.

If samples cannot be taken from the distributor, as outlined above, they may be taken from the storage tank. Samples taken directly from storage tanks must be taken with a "thief," so that they do not include surface material and are from near the middle of the asphalt in storage. They may be taken by the grab method — that is, the full amount of the sample will be taken at one time or at one spot in the car.

Samples of emulsified asphalt shall be taken as close as possible to the location the materials are used, but they must be taken before any dilution of the material takes place.

The containers for all liquid asphalt products except emulsions will be approximately 1-quart cans with 1¾-inch screw caps. Containers for emulsions shall be 1-quart plastic. Always use new, clean containers that are free of rust, dents, or other weaknesses that may cause leaking or contamination. Containers previously used for any other purpose will not be satisfactory regardless of how well cleaned they are considered to be. The outside of the containers must not be cleaned by immersion in kerosene or other solvent because of the danger of contaminating the sample. Containers must not be cooled by immersion in water or other liquid as contraction may draw contaminants into sample. Enter complete data on gummed label DOT Form 350-016 and attach to each of the two cans. Complete a Sample Transmittal (DOT Form 350-056 EF) and attach it, in its envelope, to the container. If tape is used to attach envelope to container, or the containers together, be sure the tape is not contacting the label(s).

4. **Field Inspection:** Check the "Bill of Lading" that the liquid asphalt delivered complies with the requirements of the approved mix design. Check temperature to which material is heated to make sure specified limits are not exceeded, see *Standard Specification* 9-02.3.

5. **Specification Requirements:** See *Standard Specifications* Section 9-02. Review contract documents to determine if supplemental specifications apply. In addition, refer to project mix design.

9-4.3 Hot Melt Traffic Button Adhesive

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071). Submit Manufacturers Certificate of Compliance meeting the requirements of *Standard Specifications* Section 1-06.3, including supporting tests reports to State Materials Laboratory for evaluation.

3. Acceptance/Verification

a. **Acceptance:** Field Verify per Section 9-1.5C of this manual.

b. **Verification:** Submit a sample of each lot of material to the State Materials Laboratory for testing.

4. **Field Inspection:** Field Verify per Section 9-1.5C of this manual. Verify correct heating of product per manufacturers recommendations.

5. **Specification Requirements:** See *Standard Specifications* Section 9-02.1(8). Review contract documents to determine if supplemental specifications apply.

9-4.4 Concrete Aggregates

1. **Approval of Material:** Consult the Aggregate Sources Approval (ASA) database for approval of material for each source prior to use.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on the Request for Approval of Material (DOT Form 350-071) or if the ASA database indicated that the aggregate source has expired. Contact the Regional Materials Office if preliminary samples are required. Preliminary samples for Concrete Aggregate shall be made up of 50-100 pounds of clean, washed coarse aggregate and 30-40 pounds of clean washed fine aggregate. The sample is to be shipped in increments, using satisfactory containers, not exceeding 30 pounds.

3. **Acceptance:** After the source has been approved, concrete aggregates may be accepted upon satisfactory field tests for grading, cleanliness and free from excessive organic matter, silt, and soft or foreign pieces. Acceptance samples shall be obtained, tested, and recorded in accordance with the *Standard Specifications* Section 9-03.1, the contract special provisions, and Chapters 9-5 of this manual.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for uniformity of plants within each lot and for representative sample lost based on the following:

5. **Specification Requirements:** See *Standard Specifications* Section 3-02 and 9-03.1. Review contract documents to determine if supplemental specifications apply.

9-4.5 Surfacing Aggregates (Crushed Screening, Crushed Cover Stone, Ballast, Shoulder Ballast, Crushed Surfacing Base and Top Course)

1. **Approval of Material:** Consult the Aggregate Sources Approval (ASA) database for approval of material for each source prior to use.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on the Request for Approval of Material (DOT Form 350-071) or if the ASA database indicated that the aggregate source has expired. Contact the Regional Materials Office if preliminary samples are required. Preliminary samples for Surfacing Aggregate made up of 80-120 pounds are required to perform the qualifying tests. The sample is to be shipped in increments, using satisfactory containers, not exceeding 30 pounds.

3. **Acceptance:** After the source has been approved, surfacing aggregates may be accepted upon satisfactory field tests. Acceptance samples shall be obtained, tested, and recorded in accordance with the contract special provisions, and Chapters 9-5 and 9-8 of this manual.

4. **Field Inspection:** See Chapters 9-8 for Sampling Methods and Testing Procedures. Discuss test results with the Contractor's representative. Enforce provisions of the *Standard Specifications* regarding stockpiling.

5. **Specification Requirements:** See *Standard Specifications* Sections 3-02, 9-03.4, and 9-03.9. Review contract documents to determine if supplemental specifications apply.

9-4.6 Aggregates for Hot Mix Asphalt (HMA) and Asphalt Treated Base

1. **Approval of Material:** Consult the Aggregate Sources Approval (ASA) database for approval of material for each source prior to use.

2. Preliminary Samples

a. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on the Request for Approval of Material (DOT Form 350-071) or if the ASA database indicated that the aggregate source has expired. Contact the Regional Materials Office if preliminary samples are required. Preliminary samples for the aggregate shall be made up of 80-120 pounds as required to perform the quality tests. The sample is to be shipped in increments, using satisfactory containers, not exceeding 30 pounds.

b. **Preliminary Mix Design Samples:** These samples are used to determine if the aggregate source is capable of meeting the mix design specification requirements. Preliminary samples shall be made up of 200 pounds of rock or pit run gravel and 25 pounds of blend sand if utilized. Contact the Regional Materials Office if preliminary samples are required. Give full details of type of construction proposed. The sample is to be shipped in increments, using satisfactory containers, not exceeding 30 pounds.

3. **Acceptance:** After the source has been approved, the aggregates may be accepted upon satisfactory field tests. Acceptance samples shall be obtained, tested, and recorded in accordance with the *Standard Specifications*, the contract special provisions, and Chapters 9-5 and 9-8 of this manual. Aggregates produced for use on the current contract shall be sampled and tested for fracture and sand equivalent as the material is placed into stockpile. When material is used from a stockpile that has not been tested as provided above, the requirements for fracture, sand equivalent, flat and elongated, and uncompacted void content of fine aggregate shall apply at the time of its introduction to the cold feed of the mixing plant. Acceptance of the aggregate for gradation shall be based on samples taken from the Hot Mix Asphalt.

If the aggregates are being produced for use on a future contract, they shall be sampled and tested for gradation as well as fracture, sand equivalent, flat and elongated, and uncompacted void content of fine aggregate at the time the material is placed in stockpile.

4. **Field Inspection:** See Chapter 9-8 for Sampling Methods and Testing Procedures. Discuss test results with the Contractor's representative. Enforce provisions of the *Standard Specifications* regarding stockpiling.

5. **Specification Requirements:** See *Standard Specifications* Sections 3-02, 9-03.6 and 9-03.8. Review contract documents to determine if supplemental specifications apply.

9-4.7 Hot Mix Asphalt (HMA) and Asphalt Treated Base

1. **Approval of Material:** Approval of the materials for Hot Mix Asphalt (HMA) and asphalt treated base are required prior to use.

A current approved mix design is required for each contract. An approved mix design is only valid for a single construction season.

a. **Job Mix Design:** Send a total of 600 pounds of aggregate proportion as the Contractors' proposal to the State Materials Laboratory for testing. For example, the Contractors' proposal consists of five stockpiles with following blending ratio.

Material	Ratio
¾" - No. 4	20%
½" – No. 8	30%
⅜ – No. 16	30%
No. 4 – 0	15%
Blend Sand	5%

Calculate the amount of aggregate needed from each stockpile in the following manner.

Material		Pounds of aggregate needed per stockpile
¾" – No. 4	600 pounds x 0.20	120 pounds
½" – No. 8	600 pounds x 0.30	180 pounds
⅜" – No. 16	600 pounds x 0.30	180 pounds
No. 4 – 0	600 pounds x 0.15	90 pounds
Blend Sand	600 pounds x 0.05	30 pounds

The sample is to be shipped in increments, using satisfactory containers, not exceeding 30 pounds.

The aggregate samples must be accompanied by completed sample transmittals from the Project Engineer and the contractor's proposal containing the following data: individual stockpile average gradations, proposed combining ratios of aggregate stockpiles, which when calculated will reflect the proposed gradation of the completed mix. Also include the asphalt supplier(s) and grade of the asphalt binder.

b. **Reference Mix Design:** A reference mix design can be used if there is a current valid mix design previously developed using the same materials and JMF as the one proposed. Contact the State Materials Laboratory, Bituminous Section for availability.

2. **Preliminary Samples:** Not required.

3. **Acceptance:** After the sources have been approved, the aggregates may be accepted upon satisfactory field tests, for gradation and asphalt binder content. Acceptance samples shall be obtained, tested, and recorded in accordance with the *Standard Specifications*, the contract special provisions, and Chapters 9-5 and 9-8 of this manual. The sampling will be on a random basis using the procedures shown in WSDOT Test Method 716. The sampling and testing frequency for each lot is indicated in Chapter 9-5.7.

4. **Field Inspection:** The Engineer should perform a plant inspection prior to production. Contact the Regional Materials Office for assistance with this inspection. See Chapters 9-8 for Sampling Methods and Testing Procedures. Discuss test results with the Contractor's representative.

5. **Specification Requirements:** See *Standard Specifications* Sections 5-04, 9-03.6, and 9-03.8. Review contract documents to determine if supplemental specifications apply.

9-4.8 Mineral Filler

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Sample:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071). Ship 3 pounds in polyethylene bag.

3. **Acceptance:** Acceptance of mineral filler (commercial stone dust) shall be based on "SATISFACTORY" laboratory tests only for each lot of 50 tons or less. Portland cement may be accepted without test if it is furnished in original factory sacks and is not lumpy.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. See that the mineral filler does not contain foreign material or lumps.

5. **Specification Requirements:** See *Standard Specifications* Section 9-03.8(5). Review contract documents to determine if supplemental specifications apply.

9-4.9 Gravel Base and Bank Run Gravel for Trench Backfill

1. **Approval of Material:** Consult the Aggregate Sources Approval (ASA) database for approval of material for each source prior to use.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on the Request for Approval of Material (DOT Form 350-071) or if the ASA database indicated that the aggregate source has expired.

Contact the Regional Materials Office if preliminary samples are required. Preliminary samples for the aggregate shall be made up of 50-100 pounds are required to perform the quality tests. The sample is to be shipped in increments, using satisfactory containers, not exceeding 30 pounds.

3. **Acceptance:** After the source has been approved, the aggregates may be accepted upon satisfactory field tests. Acceptance samples shall be obtained, tested, and recorded in accordance with the *Standard Specifications*, the contract special provisions, and Chapters 9-5 and 9-8 of this manual.

4. **Field Inspection:** See Chapter 9-8 for Sampling Methods and Testing Procedures. Discuss test results with the Contractor's representative. Enforce provisions of the *Standard Specifications* regarding stockpiling.

5. **Specification Requirements:** See *Standard Specifications* Section 3-02, 9-03. Review contract documents to determine if supplemental specifications apply.

9-4.10 Pit Run Aggregates (Gravel Backfill for Foundation CL. B, Walls, Pipe Zone Bedding, Drains and Drywells; Backfill for Sand Drains, Sand Drainage Blanket, Bedding Material for Rigid Pipe, Thermoplastic Pipe; Foundation Material Class A, B, and C, Gravel Borrow, Common Borrow, Select Borrow)

1. **Approval of Material:** Consult the Aggregate Sources Approval (ASA) database for approval of material for each source prior to use. For Borrow sources, approval of source can be performed in the field by conforming that the gradation and SE meets the requirements as defined in Section 9-03 of the *Standard Specifications*.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on the Request for Approval of Material (DOT Form 350-071) or if the ASA database indicated that the aggregate source has expired. Contact the Regional Materials Office if preliminary samples are required. Preliminary samples for the aggregate shall be made up of 80-120 pounds are required to perform the quality tests. The sample is to be shipped in increments, using satisfactory containers, not exceeding 30 pounds.

3. **Acceptance:** After the source has been approved, and prior to use, the gradation and SE tests shall be performed to determine if the material does in fact meet specifications for intended use. The aggregates may be accepted upon satisfactory field tests. Acceptance samples shall be obtained, tested, and recorded in accordance with the *Standard Specifications*, the contract special provisions, and Chapters 9-5 and 9-8 of this manual.

4. **Field Inspection:** See Chapter 9-8 for Sampling Methods and Testing Procedures. Discuss test results with the Contractor's representative. Enforce provisions of the *Standard Specifications* regarding stockpiling.

5. **Specification Requirements:** See *Standard Specifications* Section 3-02, 9-03. Review contract documents to determine if supplemental specifications apply.

9-4.11 Vacant

9-4.12 Premolded Joint Filler for Expansion Joints

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification. See Section 9-1.5B for Low Risk Materials when premolded joint filler for expansion joints is used for sidewalks.

2. **Preliminary Samples:** When a preliminary sample is required, it shall consist of a 1 square foot section from each lot of material used. Submit sample to the State Materials laboratory for testing.

3. **Acceptance:** Materials shall be accepted on receipt of "SATISFACTORY" test reports from the State Materials Laboratory. If the lot can be identified and proven to have prior satisfactory acceptance test results, it may be used without testing on current projects per Section 9-5.2D of this manual.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for accuracy in cutting, stapling, and care in handling.

5. **Specification Requirements:** See *Standard Specifications* Section 9-04.1. Review contract documents to determine if supplemental specifications apply.

9-4.13 Elastomeric Expansion Joint Seals

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** When a preliminary sample is required, it shall consist of a 2 feet section from each lot of material used. Submit sample to the State Materials laboratory for testing.

3. **Acceptance:** The material/product may be accepted on a "SATISFACTORY" test report from the State Materials Laboratory. If the lot can be identified and proven to have prior satisfactory acceptance test results, it may be used without testing on current projects per Section 9-5.2D of this manual.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual.

5. **Specification Requirements:** See *Standard Specifications* Section 9-04.1. Review contract documents to determine if supplemental specifications apply.

9-4.14 Two Component Poured Rubber Joint Sealer

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** When a preliminary sample is required, it shall consist of an unopened container of each component from each lot of material used unless specifically exempted by the State Materials Laboratory. Submit sample to the State Materials Laboratory for testing.

3. **Acceptance:** Material shall be accepted on "Satisfactory" test report or lot approval by the State Materials Laboratory. If the lot can be identified and proven to have prior satisfactory acceptance test results, it may be used without testing on current projects per Section 9-5.2D of this manual.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Make certain that application is in accordance with requirements of *Standard Specifications* and manufacturer's written recommendations. In order to obtain satisfactory adhesion of the sealer, joints must be thoroughly cleaned before the sealer is applied.

5. **Specification Requirements:** See *Standard Specifications* Section 9-04.2(2). Review contract documents to determine if supplemental specifications apply.

9-4.15 Hot Poured Joint Sealant

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, product is listed under appropriate specification, and a "SATISFACTORY" test report from the State Materials Laboratory prior to use.

2. **Preliminary Samples:** When a preliminary sample is required, submit one box sample to the State Materials Laboratory for testing.

3. **Acceptance:** The material/product shall be accepted on a "SATISFACTORY" test report from the State Materials Laboratory. If the lot can be identified and proven to have prior satisfactory acceptance test results, it may be used without testing on current projects per Section 9-5.2D of this manual.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Ensure that application is in accordance with requirements of the *Standard Specifications* Section 5-04.3(5C), 5-05.3(8)B and the manufacturer's recommendation.

5. **Specification Requirements:** See *Standard Specifications* Section 9-04.2(1). Review contract documents to determine if supplemental specifications apply.

9-4.16 Concrete Drain, Perforated Underdrain, Culvert and Storm Sewer Pipe

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). Notify Materials Fabrication Inspection Office of need to provide Inspection Services. An on-site inspection of the manufacturing facilities prior to approval will be required only if requested on Request for Approval of Material (DOT Form 350-071). When approved, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance:

   a. Concrete pipe less than 30 inches in diameter will be accepted based on "Concrete Pipe Acceptance Reports" which shall accompany the pipe to the job. Individual pipes are not stamped.

   b. Concrete pipe 30 inches in diameter and larger are individually inspected at the plant prior to shipment. Accepted pipe will be stamped "APPROVED FOR SHIPMENT" with ID number (Figure 9-5) on each piece of pipe, numbers repeated per inspection visit, number will differ for different diameters. An "F" or "D" will be stamped to indicate whether the steel or iron is of foreign or domestic origin.

4. Field Inspection:

   a. Concrete pipe less than 30 inches in diameter:

      (1) Verify that the "Concrete Pipe Acceptance Report" is current and covers the diameter, quantity and class of pipe delivered.

      (2) Inspect the manufacture date marked in each pipe to verify that it was made within the period covered by the "Concrete Pipe Acceptance Report". Also verify that shipment was made after the required retention time. *Standard Specifications* require 28 days for pipe using Type II cement and seven days for pipe using Type III cement. If tested and accepted at an earlier age these requirements may be modified.

      (3) Verify that the pipe is free from damage from handling and shipping.

      (4) Concrete sewer pipe requires testing after installation in conformance with the *Standard Specifications* Section 7-04.3.

      (5) Complete the upper portion of the "Concrete Pipe Acceptance Report" and forward to the contract files.

b. Concrete pipe 30 inches in diameter and larger:

(1) Verify that each pipe in the shipment is stamped "APPROVED FOR SHIPMENT." Only properly stamped pipe may be accepted.

(2) Check for the Inspector's approved stamp (Figure 9-5) and the "F" or "D" indicator for foreign or domestic steel and document it. Only properly stamped pipe may be accepted.

(3) Verify that pipe is free from damage from shipping and handling.

(4) Concrete sewer pipe requires testing after installation in conformance with the *Standard Specifications* Section 7-04.

5. **Specification Requirements:** See *Standard Specifications* Section 9-05. Review contract documents to determine if supplemental specifications apply.

9-4.17 Corrugated Galvanized Steel, Aluminized Steel, Aluminum: Drain, Perforated Underdrain, Culvert Pipe Arch, and Storm Sewer Pipe

1. **Approval of Material:** Approval of material and fabrication facility is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). Notify Materials Fabrication Inspection Office if protective treatment is specified. Approval of fabrication facility as well as the base metal must be obtained. An on-site inspection of the fabricating facilities prior to approval will be required only if requested on Request for Approval of Material (DOT Form 350-071). When approved, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance:

a. Treated:

1) The Materials Fabrication Inspection Office will inspect all asphalt or polymer treated metal culvert and sewer pipe at the point of fabrication. A representative number of pipes in each shipment will display "WSDOT INSPECTED" stamp (Figure 9-3). If none of the treated pipe bears the "WSDOT INSPECTED" stamp, contact the Fabrication Inspection Office to arrange for an on-site inspection prior to installation.

b. Untreated:

1) **QPL Acceptance:** Untreated pipe may be accepted at the job site by Visual Inspection per 9-1.5 of this manual provided they are manufactured by a facility listed in the QPL.

2) **Non-QPL Acceptance:** Untreated metal culvert and drain pipe may be accepted at the job site by obtaining a Manufacturer's Certificate of Compliance with supporting Mill Test Reports prior to use.

Verify that the appropriate AASHTO specification for the steel sheet, gauge thickness, and heat number is stamped on the pipe. Pipe not bearing this stamp shall not be installed. Any pipe, which is damaged in any way from shipping or handling, should not be accepted. If the manufacturer of the pipe delivered to the job site can not be identified, a Bill of Lading showing the manufacturer should be requested prior to accepting or installing the pipe.

It is the responsibility of the project office to obtain a Certificate of Materials Origin, which is required prior to incorporating the steel pipe and pipe arch into the project.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check each delivery for fabrication details and quality of workmanship. Check for shipping damage and ensure that the spelter coating is intact. Check treated pipe for damage to coating. Obtain documentation for all pipes not accepted under provisions established in the QPL. Contact the Materials Fabrication Inspection Office for assistance.

5. **Specification Requirements:** See *Standard Specifications* Section 9-05. Review contract documents to determine if supplemental specifications apply.

9-4.18 Polyvynl Chloride (PVC) and Corrugated Polyethylene (PE) Drain, Perforated Underdrain, Culvert, and Storm Sewer Pipe

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). When the RAM process is being used, attach Catalog Cuts and/or other appropriate documents to the proper transmittal and submit to the RAM Engineer, to assist in the approval process. When approved, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Pipe may be accepted on Manufacturer's Certificate of Compliance and field inspection.

a. Drain Pipe, Perforated Underdrain Pipe, Solid Wall PVC Culvert and Storm Sewer Pipe – Visual inspection per section 9-1.5 of this manual.

b. Profile Wall PVC Culvert and Storm Sewer Pipe, Corrugated PE Culvert and Storm Sewer Pipe - Manufacturer's Certificate of Compliance shall accompany materials delivered to the project and shall include production lots for all materials represented.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for compliance with specifications, and for shipment and handling damage.

5. **Specification Requirements:** See *Standard Specifications* Section 9-05. Review contract documents to determine if supplemental specifications apply.

9-4.19 Structural Plate Pipe, Pipe Arch, Arch, and Underpass

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). When approved, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Acceptance may be on the basis of Manufacturer's Certificate of Compliance, with accompanying mill test reports. The mass of zinc coating for each heat number in the shipment must be present on the "Manufacturer's Certificate of Compliance". The mill test report will contain both chemical and physical analysis of the base metal.

All suppliers of structural plate pipe, arches and underpass are to transmit four copies of the certification to the Project Engineer. At least one copy must accompany the shipment; the others may be forwarded through the Contractor. Two copies of the certification are to be retained in the Project Engineer's files.

It is the responsibility of the project office to obtain a Certificate of Materials Origin prior to incorporating the plate pipe, pipe arch, arch or underpass into the project.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for breaks in zinc or asphalt coating and for damage from shipment. Material in the shipment must be properly identified as to heat number.

5. **Specification Requirements:** See *Standard Specifications* Section 9-05.6. Review contract documents to determine if supplemental specifications apply.

9-4.20 Steel Castings, Gray-Iron Castings, Ductile-Iron Castings: Manhole Rings and Covers, Catch Basin and Inlet Frames, Grates, Covers, Monument Cases and Covers

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). Notify Materials Fabrication Inspection Office of need to provide Inspection Services. An on-site inspection of the manufacturing facilities prior to approval will be required only if requested on Request for Approval Material (DOT Form 350-071). When approved, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Acceptance will be based on WSDOT-A (Figure 9-7) impressed stamped into all castings. In Figure 9-7, the "A" is an inspector identifier, and will be different for each individual inspector. An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. Only properly stamped castings may be accepted.

It is the responsibility of the project office to obtain a "Certificate of Materials Origin" prior to incorporating the material into the project.

a. For Rectangular Frames and Grates, the frame and grate will each be stamped in such a fashion as to align adjacent mating surfaces to each other. This alignment is critical as the leveling pads are ground to prevent rocking of the grates in the frames.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual Check for defects listed in the Standard Specifications. See 6-03.3(43). Check for the Inspector's approved stamp (Figure 9-7) and the "F" or "D" indicator for foreign or domestic steel and document it. Check for shipping and handling damage.

5. **Specification Requirements:** See *Standard Specifications* Sections 9-05.15, and 9-22.1. Review contract documents to determine if supplemental specifications apply.

9-4.21 Sanitary Sewers

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). Notify Materials Fabrication Inspection Office of need to provide Inspection Service. An on-site inspection of the manufacturing facilities prior to approval will be required only if requested on Request for Approval of Material (DOT Form 350-071). When approved, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Material may be accepted upon receipt of an "Approved" document in lieu of sampling as shown below:

(1) Plain Concrete Storm Sewer Pipe and Reinforced Concrete Storm Sewer Pipe — Concrete Pipe Acceptance Report (see section 9-4.16 of this manual)

(2) Vitrified Clay Sewer Pipe and Ductile Iron Sewer Pipe — Manufacturer's Certificate of Compliance

(3) PVC Sewer Pipe and ABS Composite Sewer Pipe — Visual Inspection per section 9-1.5 of this manual.

It is the responsibility of the project office to obtain a "Certificate of Material Origin" for all steel or iron products prior to incorporating the material into the project.

4. **Field Inspection:**

a. Non-Concrete Pipe

1. Field verify per Section 9-1.5C of this manual. Check material delivered to the project for damage, and conformance to the contract documents.

b. Concrete pipe less than 30 inches in diameter:

1.) Verify that the "Concrete Pipe Acceptance Report" is current and covers the diameter, quantity, and class of pipe delivered.

2.) Inspect the manufacure date marked in each pipe to verify that it was made within the period covered by the "Concrete Pipe Acceptance Report". Also verify that shipment was made after the required retion time. Standard Specifications require 28 days for pipe using Type II cement and seven days for pipe using Type III cement. If tested and accepted at an earlier age, these requirements may be modified.

3.) Verify that the pipe is free of damage from shipping and handling.

4.) Concrete sewer pipe requires testing after installation in conformance with Standard Specification section 7-04.3.

5.) Complete the upper portion of the "Concrete Pipe Acceptance Report" and retain in the project files.

c. Concrete pipe 30 inches in diameter and larger:

1) Verify that each pipe in the shipment is stamped "APPROVED FOR SHIPMENT". Only properly stamped pipe may be accepted.

2) Check for the Inspector's approved stamp (Figure 9-5) and the "F" or "D" indicator for foreign or domestic steel and document it. Only properly stamped pipe may be accepted.

3) Verify that the pipe is free of damage from shipping and handling.

4) Concrete Sewer pipe requires testing after installation in conformance with Standard Specification 7-04.3.

5. **Specification Requirements:** See *Standard Specifications* Section 7-17. Review contract documents to determine if supplemental specifications apply.

9-4.22 Steel for Bridges

1. **Approval of Material:** Approval of the fabricator is required prior to use. Upon receipt of the "Request for Approval of Material," the Materials Fabrication Inspection Office will inspect the fabrication shop to ensure it meets all contract requirements. A copy of the Request for Approval of Material will be sent to the Materials Fabrication Inspection Office. Approval of Fabrication Facility will include approval of steel sources used by the facility.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Materials and fabrication will be accepted on Approved for Shipment stamps or tags (Figure 9-4 or 9-5) except in the case of minor parts. An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. As soon as the fabricator receives the materials, the Materials Fabrication Inspection Office Inspector will check the accompanying mill test certificates to ensure the materials meet contract requirements. Project offices will not be required to maintain Manufacturer's Certificates of Compliance for items from approved fabricators that have the "APPROVED FOR SHIPMENT' tag or stamp. Certificates of Material Origin will be maintained by the project office. The Materials Fabrication Inspection Office Inspector will also provide weekly written shop inspection reports to the Project Engineer while major steel structures are being fabricated.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for "APPROVED FOR SHIPMENT" tags or stamps (Figure 9-4 or 9-5) and the "F" or "D" indicator for foreign or domestic steel and document it. Check for shipping and handling damage.

5. **Specification Requirements:** See *Standard Specifications* Sections 6-03 and 9-06. Review contract documents to determine if supplemental specifications apply.

9-4.23 Unfinished Bolts (Ordinary Machine Bolts), Nuts, and Washers

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Unfinished bolts, nuts, and washers may be accepted on receipt of Manufacturer's Certificate of Compliance. If using the QPL, be sure to verify appropriate means of acceptance, see applicable Acceptance Code within the QPL.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual check each lot of material delivered to the project for damage, and that accompanying Manufacturer's Certificate of Compliance is present.

5. **Specification Requirements:** See *Standard Specifications* Section 9-06.5(1). Review contract documents to determine if supplemental specifications apply.

9-4.24 High Strength Bolts, Nuts and Washers

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Materials may be accepted on receipt of "SATISFACTORY" test reports from the State Materials Laboratory. When the materials are received on the job site, sample each shipment of the bolts, nuts, and washers in accordance with the table in Section 9-06.5(3) of the *Standard Specifications*. A separate transmittal and materials certification shall accompany each sample of bolts, each sample of washers, and each sample of nuts.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual Make certain that material being used is from a lot represented by "SATISFACTORY" test report.

5. **Specification Requirements:** See *Standard Specifications* Section 9-06.5(3). Review contract documents to determine if supplemental specifications apply.

9-4.25 Anchor Bolts

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification. Notify the Materials Fabrication Inspection Office of need to provide Inspection Services.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Acceptance may be based on "Approved for Shipment" tags and/or stamp (Figure 9-4 or 9-5). An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. Certificate of Material Origin will be the responsibility of the project office.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for "APPROVED FOR SHIPMENT" tags and/or stamp (Figure 9-4 or 9-5) and the "F" or "D" indicator for foreign or domestic steel and document it. Check for damage due to shipping and handling.

5. **Specification Requirements:** See *Standard Specifications* Section 9-06.5(4). Review contract documents to determine if supplemental specifications apply.

9-4.26 Reinforcing Bars for Concrete

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071).

2. **Preliminary Samples:** May be required if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Acceptance will be by the Fabricators Certification of Compliance and Certified Mill Test Reports that will accompany each shipment.

Note: If Mill Test reports are not available, do not incorporate steel into the project and contact the State Materials Laboratory, General Materials Engineer for guidance.

Representative of the Materials Fabrication Inspection Office may take random samples at the point of fabrication.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for Certification of Compliance and Certified Mill Test Reports for sizes and heats of rebar. Remove excess rust and mill scale before using. Check steel fabrication and bends for compliance with contract documents.

5. **Specification Requirements:** See *Standard Specifications* Section 9-07. Review contract documents to determine if supplemental specifications apply.

9-4.27 Epoxy Coated Reinforcing Steel Bars for Concrete

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071). Notify Materials Fabrication Inspection Office of need to provide Inspection Services.

3. **Acceptance:** Material may be accepted on "APPROVED FOR SHIPMENT" stamp or tag (Figure 9-4 or 9-5). An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. Certificate of Material Origin will be the responsibility of the project office.

Note: If bar is not tagged "APPROVED FOR SHIPMENT" do not incorporate steel into the project and contact the Materials Fabrication Inspection Office for guidance.

Representatives of the Materials Fabrication Inspection Office may take random samples at the point of fabrication and at the coating facility. The Fabricator shall provide the Mill Certificates to the Materials Fabrication Inspection Office Inspector.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check shipment for "APPROVED FOR SHIPMENT" stamp or tag (Figure 9-4 or 9-5) and the "F" or "D" indicator for foreign or domestic steel and document it. Check coating for shipping damage, check steel fabrication and bends for compliance with contract documents.

5. **Specification Requirements:** See *Standard Specifications* Section 9-07. Review contract document to determine if supplemental specifications apply.

9-4.28 Mechanical Splices

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Sample:** A preliminary sample for qualifying the rebar coupling system, will be required only if requested on Request for Approval of Material (DOT Form 350-071). The sample to include a made up splice for each size bar to be used and include the manufacturers product information. The overall length of spliced rebars should be approximately 5 to 6 feet.

3. **Acceptance:** Material may be accepted on receipt of a "SATISFACTORY" Test Report from the State Materials Laboratory from contractors assembled samples (see Note) taken from the project. A Manufacturer's Certificate of Compliance and other technical data MUST be submitted with the samples. The overall length of spliced rebars should be at least 5 feet.

Note: This is a test of the Contractors ability to properly assemble the splice as much as it is a test of the quality of the materials. For this reason the spliced bars must be assembled by the contractors personnel, witnessed by the inspector and transmitted intact to the State Material Lab for testing.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual and that the material has "Satisfactory" test results.

5. **Specification Requirements:** See *Standard Specifications* Section 6-02.3(24)F and G. Review contract documents to determine if supplemental specifications apply.

9-4.29 Rebar Chairs, Dobies, and Spacers

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Sample:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance:

   a. **Dobie Blocks:** Material may be accepted on receipt of Manufacturer's Certificate of Compliance with supporting test reports. See *Standard Specifications* Section 6-02.3(24)C.

   b. **Rebar Chairs and Spacers:** May be accepted based upon inclusion in the QPL as an "Approved" product.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual.

5. **Specification Requirements:** See *Standard Specifications* Section 6-02.3(24)C. Review contract documents to determine if supplemental specifications apply.

9-4.30 Dowels and Tiebars for Concrete Pavement, incl. Epoxy Coated

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Sample:** A preliminary sample of two dowels will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Acceptance may be on Manufacturer's Certificate of Compliance with accompanying Mill Test Reports for both steel and coating process.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for dimensional conformance and if proper mill test certificates have been provided. Check epoxy coating for damage and uniformity

5. **Specification Requirements:** See *Standard Specifications* Section 9-07.5 and 9-07.6. Review contract documents to determine if supplemental specifications apply.

9-4.31 Wire Reinforcement for Concrete

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** May be required if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Acceptance will be by the Manufacturer's Certificate of Compliance and Certified Mill Test Reports that accompany each shipment.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for excessive rust on wire, and check the spacing of the wires and weight per square yard.

5. **Specification Requirements:** See *Standard Specifications* Section 9-07.7, 9-07.8, and 9-07.9. Review contract documents to determine if supplemental specifications apply.

9-4.32 Bridge Approach Slab Anchors

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Sample:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance:

   a. **Anchors Type A:** These anchors may be accepted on a Manufacturers Certificate of Compliance for the Steel Rod and Plate.

   b. **Anchors Type B:** These anchors may be accepted on a Manufacturers Certificate of Compliance for the Threaded Steel Rod and Steel Plate and Manufacturers Product Information on inch stop coupling.

   c. **Other Anchor Rod materials:** Such as plastic pipe, polystyrene, and duct tape may be accepted on visual inspection.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check material delivered to the project for conformance with the contract plan and specifications.

5. **Specification Requirements:** See *Standard Plans* A2 and *Standard Specifications* Section 6-02.3(10). Review contract documents to determine if supplemental specifications apply.

9-4.33 Prestressing/Post Tensioning Reinforcement — Strand

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance /Verification:**

   a. Acceptance: The strand may be accepted upon receipt of a Manufacturer's Certificate of Compliance, a mill certificate, supporting test report and the stress/strain curve

   b. Verification: The strand shall be tested for verification prior to placement. Samples for verification of conformance will be taken from each reel furnished to the project site or the fabrication facility. The samples shall not be less than 5 feet in length. All samples must include the Manufacturer's Certificate of Compliance, a mill certificate with supporting test report, and the stress/strain curve.

   Submit 1 sample for each 5 reels to the State Materials Laboratory for testing. A copy of the Manufacturer's Certificate of Compliance, a mill certificate with supporting test report, and the stress/strain curve MUST accompany each sample submitted for testing. Upon receipt of a passing test report, the other 4 retained samples may be discarded. If the submitted sample fails the testing, submit the 4 retained samples taken before and the 4 retained samples taken after the failing sample for additional testing.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check the strand for dirt, grease or rust.

5. **Specification Requirements:** See *Standard Specifications* Section 9-07.10. Review contract documents to determine if supplemental specifications apply.

9-4.34 Prestressing/Post Tensioning Reinforcement — Bar

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Acceptance will be on "SATISFACTORY" laboratory test report only. Send two samples from each heat. If supplemental requirements apply, send additional samples of two bars from each heat. See contract documents. The samples must be a minimum of 5 feet in length. A copy of the Manufacturer's Certificate of Compliance shall accompany each heat of reinforcing bar.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check material delivered to the project for damage.

5. **Specification Requirements:** Review contract documents to determine specification requirements.

9-4.35 Paints for Structures

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** Preliminary Samples will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Paint will be sampled at the point of manufacture by the manufacturer, supplied to WSDOT Fabrication Inspection Office, Seattle, WA (206) 464-7770 and tested by the State Materials Laboratory prior to its receipt on the project. The lot number on the containers must be checked against the Laboratory test reports. Except as indicated, paint which has not been tested and accepted by the Laboratory will **not** be used. When less than 20 gallons of one kind of paint are involved, its use without laboratory tests may be approved upon the Manufacturer's Certificate of Compliance that the material meets the specification. The certificate shall include a list of materials and the quantities used. One copy of the certificate shall be submitted to the State Materials Laboratory for approval.

4. **Field Inspection:** No field samples are required. Material shall be accepted on satisfactory test report or lot approval by the State Materials Laboratory. Field verify per Section 9-1.5C of this manual. To verify approved lot numbers contact The State Materials Lab, Chemical Section (360) 709-5431.

See that paint is not caked in the container, that it is free from skins and is well stirred before withdrawing portions for use.

After application the paint should dry to a uniform film without running, streaking or sagging.

5. **Specification Requirements:** See *Standard Specifications* Section 9-08. Review contract documents to determine if supplemental specifications apply.

9-4.36 Timber and Lumber — Untreated

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance:

a. Timber and Lumber require a Grading Certificate conforming to the requirements of the *Standard Specifications*. The Grading Certificate will be issued by the grading bureau whose authorized stamp is being used, or by the mill grading the timber or lumber under the supervision of one of the following lumber grading agencies: West Coast Lumber Inspection Bureau (WCLIB), Western Wood Products Association (WWPA), or the Pacific Lumber Inspection Bureau (PLIB). Typical lumber grade stamps, as used by the various inspection agencies are shown below and in the QPL, Appendix B:

b. Sign posts, mileposts, sawed fence posts, and mailbox posts will be accepted by visual determination in the field that materials delivered to the job site bears the appropriate lumber grading stamp. The PLIB graded lumber will be graded under the grading rules of one of the other two listed agencies and will be grade stamped accordingly. All timber and lumber is subject to re-inspection upon delivery to the project.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check that all lumber and timber has the proper lumber grade stamps.

5. **Specification Requirements:** See *Standard Specifications* Section 9-09. Review contract documents to determine if supplemental specifications apply.

9-4.37 Treated Timber and Piling

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance:

a. Structural Timber and Lumber , sign posts 6 inches x 6 inches and larger. Check for "APPROVED FOR SHIPMENT" tag (Figure 9-6). Approved for shipment tags will be stapled to the ends of the pilings or timber. All piling will be stamped or tagged on the butt end. Only about one-third of the approved timber pieces will be stamped or tagged for acceptance.

b. Sign posts less than 6 inches x 6 inches, mileposts, sawed fence posts, and mailbox posts shall be accepted as listed under 9-4.36.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check primarily for damage caused by handling. Check pieces for "APPROVED FOR SHIPMENT" stamp or tag (Figure 9-6).

5. **Specification Requirements:** See *Standard Specifications* Sections 9-09 and 9-10. Review contract documents to determine if supplemental specifications apply.

9-4.38 Timber Piling — Untreated

1. **Approval of Material:** Approval of material is not required prior to use for temporary structures.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Field inspection for compliance with contract requirements.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for compliance with specifications.

5. **Specification Requirements:** See *Standard Specifications* Section 9-10.1(1). Review contract documents to determine if supplemental specifications apply.

9-4.39 Steel Piling All Types

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** Samples are not required unless requested on Request for Approval of Material (DOT Form 350-071). Submit a 1-foot section of the piling if requested.

3. **Acceptance:** Material may be accepted on satisfactory Manufacturer's Certificate of Compliance including mill certificates showing heat number, physical properties and chemical composition. Certificate of Material Origin is the responsibility of the Project Engineer's Office.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check material in each shipment against heat numbers shown on Mill Test Certificates. Check for damage due to shipping and handling.

5. **Specification Requirements:** See *Standard Specifications* Section 9-10.5. Review contract documents to determine if supplemental specifications apply.

9-4.40 Coated Steel Piling

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Sample:** Samples are not required unless requested on Request for Approval of Material (DOT Form 350-071). Submit a 1-square foot section of the piling if requested.

3. **Acceptance:** Coated piling will be inspected prior to coating at the facility applying the coating. Piling will be stamped or tagged "Approved for Shipment" when coating requirements have been met. An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. Manufacturer's Certificate of Compliance will be checked and maintained by Fabrication Inspection Office. Certificate of Material Origin will be the responsibility of the Project Engineer's Office.

4. **Field Inspection:** Filed verify per Section 9-1.5C if this manual. Check shipment for "APPROVED FOR SHIPMENT" stamp or tag (Figure 9-4 or 9-5) and the "F" or "D" indicator for foreign or domestic steel and document it. Check coating for shipping damage.

5. **Specification Requirements:** See *Standard Specifications* Section 9-10.5 and 6-07.3(1)A. Review contract documents to determine if supplemental specifications apply.

9-4.41 Precast Concrete Manholes, Catch Basins, Inlets, and Drywells

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Request for Approval of Material (DOT Form 350-071). Notify Materials Fabrication Inspection Office of need to provide Inspection Services. An on-site inspection of the manufacturing facilities prior to approval will be required only if requested on Request for Approval of Material (DOT Form 350-071). When approved, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Acceptance will be based on "WSDOT Inspected" stamp (Figure 9-3) provided by the Materials Fabrication Inspection Office Inspector. An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. It is the responsibility of the project office to obtain a "Certificate of Material Origin" prior to incorporating the material into the project.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check shipment "WSDOT Inspected" stamp (Figure 9-3) and the "F" or "D" indicator for foreign or domestic steel and document it. Check for shipping and handling damage. Only properly stamped manholes, catch basins, inlet, or drywells may be accepted.

5. **Specification Requirements:** See *Standard Specifications* Section 9-12. Review contract documents to determine if supplemental specifications apply.

9-4.42 Riprap, Quarry Spalls, Slope Protection, and Rock for Rock Wall

1. **Approval of Material:** Consult the Aggregate Source Approval Report generated from the ASA database for approved materials for each source prior to use. The Regional Materials Engineer may approve a source for non-structural applications.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on the Request for Approval of Material (DOT Form 350-071) or if the Aggregate Source Approval Report indicates that the aggregate source is not approved for the intended application. Contact the Regional Materials Office if preliminary samples are required. Preliminary samples shall be made up of 50 to 80 pounds of material sampled in a manner consistent with this manual. The sample is to be shipped in satisfactory containers, not exceeding 30 pounds in weight.

When the usage is for non-structural applications, the Region Materials Engineer may waive the requirement for preliminary samples.

3. Acceptance:

a. When project quantities are less than or equal to 150 cubic yards the Project Engineer may accept the material by visual inspection.

b. When project quantities exceed 150 cubic yards, the Project Engineer shall determine that the grading is in conformance with the *Standard Specifications* and contract special provisions.

c. When usage is for non-structural applications the Project Engineer may accept the material by visual inspection.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. See that the gradation remains constant.

5. **Specification Requirements:** See *Standard Specifications* Section 9-13 or Section 9-27. Review contract documents to determine if supplemental specifications apply.

9-4.43 Semi-Open Slope Protection

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Material may be accepted on receipt of Manufacturer's Certificate of Compliance.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check material delivered to the project for conformance with the contract plan and specifications. Also check for shipping damage.

5. **Specification Requirements:** See *Standard Specifications* Section 9-13.5. See Standard Plans. Review contract documents to determine if supplemental specifications apply.

9-4.44 Plant Material

1. **Approval of Material:** Approval of material is required prior to use. This approval will be submitted to the field office by listing the nursery to supply the plant material on a Request for Approval of Material (DOT Form 350-071).

2. Preliminary Site Inspection, when requested on the RAM, will be performed by the Region Landscape Architect or the State Horticulturalist.

3. **Acceptance:** After the approval of the material, the plants will be accepted based on field inspection on the job site. Sample lots as provided in (4), Field Inspection will be the inspection of samples delivered to the site. Acceptable samples will be incorporated into the project.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for uniformity of plants within each lot and for representative sample lot based on the following:

(N = total number of plants in lot) (n = number of plants in sample lot)

Total Number of Plants (N)	Minimum No. of Plants Required to Make Sample Lot (n)
0 - 500	All plants
501 - 1,000	500
1,001 - 5,000	600
5,001 - 30,000	850
Over 30,000	1000

Should 5 percent or less of the sample lot fail, the entire lot may be accepted. Should over 5 percent of the acceptance sample lot fail to meet nominal specification requirements, the entire lot shall be rejected and removed from the job. The Engineer may accept the plants if there is a large percentage of plants that appears to be exceptionally hearty and vigorous after sorting by the Contractor. If done immediately, the Contractor shall be allowed to sort and remove the substandard portion of the plants.

After the contractor has completed sorting, a new sample lot based on the above schedule of the remaining stock will again be selected and inspected. Should 5 percent or less of this sample lot fail, the sorted lot may be accepted.

5. **Specification Requirements:** See *Standard Specifications* Section 9-14.6. Review contract documents to determine if supplemental specifications apply.

9-4.45 Topsoil Type A

1. **Approval of Material:** Approval of Topsoil Type A prior to use is required by a Request for Approval of Material (DOT Form 350-071).

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071). Samples of 5 to 10 pounds are required to perform the qualifying tests.

3. **Acceptance:** Material may be accepted upon receipt of a Manufacturer's Certificate of Compliance with accompanying test reports verifying conformance with the Contract Specifications.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. The material shall be inspected for roots, weeds, subsoil, rocks, and other debris.

5. **Specification Requirements:** See *Standard Specifications* Section 9-14.1. Review contract documents to determine if supplemental specifications apply.

9-4.46 Seed

1. **Approval of Material:** Approval of materials is required prior to use. This approval will be by Request for Approval of Material (DOT Form 350-071). If there is a question on the intended use of the seed, contact the State Horticulturist.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Material may be accepted on analysis shown on the label.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Each individual sack of seed must contain a label (tag) as to the contents, which must meet all requirements specified in the special provisions for each component of the seed mix and be unopened prior to use on the project. At least one label should be retained in the project records in the event that subsequent questions or claims may arise.

5. **Specification Requirements:** See *Standard Specifications* Section 9-14.2. Review contract documents to determine if supplemental specifications apply.

9-4.47 Fertilizer

1. **Approval of Material:** Fertilizer will be approved prior use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If there is a question on the intended use of the fertilizer, contact the State Horticulturist or the Region Landscape office.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance:

   a. Fertilizer for General Use. Fertilizer may be accepted based on approval of material and chemical content shown on container labels meeting contract requirement. No fertilizer shall be used from unidentified or unlabeled containers.

   b. Fertilizer for Erosion Control. For Erosion Control on projects with total quantities less than 5 acres, acceptance of fertilizer may be made by verification of the components based on stamped or printed bag analysis. Projects involving 5 acres or more shall require a certified analysis of each component furnished meeting the requirements of a Manufacturer's Certificate of Compliance (Section 1-06.3 of the *Standard Specifications*).

   c. Fertilizer for Landscaping. Fertilizer for landscaping projects may be accepted on the basis of examination of the labeled contents for conformance to the project specifications.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Each individual sack must be labeled as to its contents, which must meet the requirements specified in the special provisions. All bags must be unopened prior to use on the project. Most fertilizers specified contain ureaform (38-0-0) which is blue-green in color, which makes that component's presence easy to identify. Retain label showing analysis for contract records.

5. **Specification Requirements:** See *Standard Specifications* Section 9-14.3. Review contract documents to determine if supplemental specifications apply.

9-4.48 Mulch

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Material may be accepted as described below for the different types of mulch:

   a. Straw — Visual inspection

   b. Wood Cellulose Fiber — Manufacturer's Certificate of Compliance

   c. Bark or wood chips— Field gradation test (WSDOT Test Method 123)

   d. Bonded Fiber Matrix - Catalog Cut

   e. Mechanically Bonded Fiber Matrix – Catalog Cut

   f. Tackifier — Catalog Cut

   g. Compost — Satisfactory test report from an independent STA program certified laboratory, documentation stating that the compost facility is STA certified, waste handling permit, etc. see contract provisions. To purchase Solvita Compost Maturity Test Kits for field office use contact: Woods End Research Laboratory, Inc. Box 297, Mount Vernon, Maine 04352 (207)-293-2457 E-mail: info@woodsend.org

   h. Wood Strand Mulch – Manufacturer's Certificate of Compliance

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. A visual inspection shall be made to ensure uniformity of the mulch. Also check for detrimental contamination.

5. **Specification Requirements:** See *Standard Specifications* Section 9-14.4. Review contract documents to determine if supplemental specifications apply.

9-4.49 Irrigation System

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval action is being requested via the RAM process, attach Catalog Cuts or other appropriate documents, using proper transmittal, to assist in the approval process. All Irrigation System materials being requested via RAM process will be sent to the Region Landscape Architect or the Region Liaison Landscape Architect, except for Electrical Wire and Splices, which

will be sent to the State Materials Laboratory. Atmospheric vacuum breaker assemblies (AVBA), pressure vacuum breaker assemblies (PVBA), double check valve assemblies (DCVA) and reduced pressure backflow devices (RBFD) shall be of a manufacturer and model approved for use by the Washington State Department of Health. When approved, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Material may be accepted upon receipt of and "Approved" document in lieu of sampling as shown below:

a. QPL Acceptance

1. PVC Pipe and Fittings, Automatic Controllers, Spray Heads, Valve Boxes and Protective Sleeves, Automatic Control Valves with Pressure Regulator, Quick Coupling Equipment, Electrical Wire and Splices – Visual Inspection per Section 9-1.5 of this manual.

2. Cross-Connection Control Devices – Document that the model number of the device is from the current Washington State Department of Health (WSDOH) listing and Visual Inspection per Section 9-1.5 of this manual.

b. Non-QPL Acceptance:

1. PVC Pipe, Polyethylene Pipe, and Detectable Marking Tape – Visual Inspection per section 9-1.5 of this manual.

2. Galvanized Iron Pipe – Manufacturer's Certificate of Compliance

3. PVC Pipe Fittings, Drip Tubing, Automatic Controllers, Spray Heads, Valve Boxes and Protective Sleeves, Gate Valves, Manual Control Valves, Automatic Control Valves, Automatic Control Valves with Pressure Regulator, Quick Coupling Equipment, Drain Valves, Hose Bibs, Check Valves, Pressure Regulating Valves, Three-Way Valves, Flow Control Valves, Air Relief Valves, Electrical Wire and Splices, Wye Strainers – Catalog Cuts per section 9-1.5H of this manual.

4. Cross Connection Control Devices – Manufacturer's Certificate of Compliance indicating device is approved by WSDOH and Catalog Cut per section 9-1.5H of this manual.

It is the responsibility of the project office to obtain a "Certificate of Material Origin" for all steel or iron products prior to incorporating the material into the project.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for damage to the galvanized coatings in shipping and handling. See that damaged areas and field cut threads are protected with an approved galvanized repair paint formula, standard formula A-9-73.

5. **Specification Requirements:** See *Standard Specifications* Section 9-15. Review contract documents to determine if supplemental specifications apply.

9-4.50 Fencing & Gates

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** The following items will be accepted on receipt of "SATISFACTORY" test report from the State or Regional Materials Laboratory. Send acceptance samples as follows:

a. Chain Link Fabric — One sample consisting of three wires across full width of fabric from one roll for each 50 rolls.

b. Wire Mesh — One 12-inch sample across full width of roll, from one roll for each 50 rolls.

c. Tension and Barbed Wire — One 3-foot piece from one roll for each 50 spools.

d. Grade 1Post Material

- Rails and Grade 1 Posts for Chain Link Fence — Sample to consist of one post and 12" sample from each end of the rail, where appropriate, for each 500 post or rails or fraction thereof.
- Corner Post or brace posts —One complete post assembly per 10 corner or brace posts.

e. Wire Fence Line Posts — One complete post with plate for each 500 posts or fraction thereof.

f. Misc. Fence Hardware — These materials includes such items as tie wire, hog rings, galvanized bolts and nuts, fence clips, stays, post caps, tension band and bars, rail end caps, etc. The Engineer shall visually inspect and approve for use.

g. Grade 2 Post Material will be accepted with a Manufacturer's Certificate of Compliance adhering to Section 9-16.1 of the *Standard Specifications*.

h. Gates will be accepted based upon a Shop Drawing showing conformance to the Contract documents. Shop Drawings will list component specifications required per 9-16.2(1) and 9-16.2(1)I of the *Standard Specifications*. Submit shop drawings to the State Materials Laboratory for approval.

Above samples are to be taken from properly identified lots of material stored at job site. Be sure samples are numbered and properly identified as to Lot, if applicable, when sent to the Laboratory. If first sample fails, two additional samples are to be submitted from same lot. Resamples are to be properly identified as to Lot and referenced to previous Lab No. for first sample.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for damage to zinc or other coating on posts, rails, hardware, etc.

5. **Specification Requirements:** See *Standard Specifications* Section 9-16. Review contract documents to determine if supplemental specifications apply.

9-4.51 Beam Guardrail, Guardrail Anchors, and Glare Screen

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Materials listed on the Qualified Products List may be accepted as outlined on the QPL or by Manufacturers Certificate of Compliance meeting the requirements of *Standard Specifications* Section 1-06.3 including supporting test reports. A307 bolts will be accepted by field verification and documentation that bolt heads are stamped 307A.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check material delivered to the project for damage to galvanizing.

5. **Specification Requirements:** See *Standard Specifications* Section 9-16.3.

9-4.52 Guardrail Posts and Blocks

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on the Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Materials listed on the Qualified Products List may be accepted as outlined on the QPL. Materials not listed on the QPL will be accepted by receipt of an acceptable certificate of treatment and by visual determination in the filed that materials delivered to the job site bears the appropriate lumber grading stamp.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check material delivered to the project for conformance with the contract plan and specifications.

5. **Specification Requirements:** See *Standard Plans*.

9-4.53 Miscellaneous Precast Concrete Products (Block Traffic Curb, Precast Traffic Curb)

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** In general, the Materials Fabrication Inspection Office will not, undertake inspection of these products. When large quantities are involved, the Regional Administrator should arrange for inspection during manufacturer, including the sampling of materials and the making of test cylinders.

   a. **Precast Traffic Curb:** Acceptance on field inspection. Unless the curb sections have been inspected prior to shipping they are to be carefully inspected upon arrival on the project site. Check for surface color and damage, such as cracks, broken corner or edges, contour and alignment. Surface color and texture should match advanced sample provide by the manufacturer. See *Standard Plans* for details.

   b. **Block Traffic Curb:** Acceptance on visual inspection. Check exposed faces of curb sections for damage such as chips, cracks, and air holes. See *Standard Specifications* Section 9-18.3 for details. Compressive strength may be determined in accordance with the FOP for ASTM C 805.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for damage due to shipping and handling.

5. **Specification Requirements:** See *Standard Specifications* Sections 9-18. Review contract documents to determine if supplemental specifications apply.

9-4.54 Prestressed Concrete Products

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071. Notify Materials Fabrication Inspection Office of need to provide Inspection Services, or to verify that the precast plant's annual review and approval are current.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Acceptance will be based on "APPROVED FOR SHIPMENT" stamp or tags (Figure 9-4 or 9-5) from Materials Fabrication Inspection Office inspection and on field inspection for damage due to shipping and handling. An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. Certificate of Material Origin will be the responsibility of the project office.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for damage due to shipping and handling. Check and record "APPROVED FOR SHIPMENT" stamp or tag (Figure 9-4 or 9-5) and the "F" or "D" indicator for foreign or domestic steel and document it.

5. **Specification Requirements:** See *Standard Specifications* Section 6-02.3(25), 6-02.3(26), 6-02.3(28), and Section 9-19. Review contract documents to determine if supplemental specifications apply.

9-4.55 Raised Pavement Markers, Types 1, 2, and 3

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance:

   a. Type 1 Markers.

   Plastic Markers: Shall be from tested and approved lots. Testing shall be performed at the State Materials Lab prior to use of any lot. Allow a minimum of 10 working days for testing to avoid project delays. After use, all emptied, boxes shall be destroyed.

   Thermoplastic Markers: Markers listed on the QPL may be accepted based on visual inspection as to brand and model listed. Verification samples of Type 1 thermoplastic markers are required for each lot used on a project. A sample shall consist of three markers per job lot (from different boxes) for each color.

   b. **Type 2 Markers:** Only markers listed on the QPL may be accepted, visually inspect markers as to brand and model listed.

   c. **Type 3 Markers:** Only markers listed on the QPL may be accepted, visually inspect markers as to brand and model listed.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. A visual inspection shall be made to ensure that cracked or damaged lane markers are not incorporated in the work.

5. **Specification Requirements:** See *Standard Specifications* Section 9-21. Review contract documents to determine if supplemental specifications apply.

9-4.56 Signing Materials

1. **Approval of Material:** Approval of the sign fabricator as well as the manufacturer of the sign blanks, panels and the reflective sheeting is required prior to use. Approval of the sign fabricator will be by a Request for Approval of Material (DOT Form 350-071). A RAM will not be required for sign mounting hardware provided by the sign fabricator. Mounting hardware from a source other than the sign fabrication facility will require approval by the or an approved Request for Approval of Material (DOT Form 350-071. Approval of the sign blanks, panels and the reflective sheeting may be by the Qualified Products List or by an approved Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that product is in fact qualified for its intended use; product is listed under appropriate specification. The fabrication facility will notify Sign Fabrication Inspector of need to provide Inspection Services.

2. **Preliminary Samples:** A preliminary sample of the material may be requested on the Request for Approval of Material (DOT Form 350-071), or as requested by the Sign Fabricator Inspector.

3. **Acceptance:** Materials and fabrication will be accepted on "FABRICATION APPROVED" decal (Figure 9-8).

   a. **Sign Blanks:** As soon as the fabricator receives the materials, the Sign Fabricator Inspector will check the accompanying mill test certificates to ensure the materials meet contract requirements. These documents will be kept at the fabrication facility.

   b. **Reflective Sheeting:** The Sign Fabricator Inspector will check the Manufacturer's Certificate of Compliance for the reflective sheeting and the cutout legend to ensure the materials meet contract requirements. These will be kept at the sign fabrication facility.

   c. Sign Mounting Hardware supplied by the Sign Fabricator will have the mounting hardware certifications verified at the sign fabricator's facility by the Fabrication Inspector to ensure the materials meet the contract requirements. These records will be kept at the sign fabrication facility. Fabrication inspectors will verify sign mounting hardware as it is packaged for shipment and attach a "WSDOT INSPECTED" Tag to the sealed package.

   Contractor's who purchase sign mounting hardware separately from a source other than a WSDOT approved sign fabrication facility will be required to supply proper Manufacturer's Certificates of Compliance and it will be the responsibility of the contractor to supply the certifications to the Project Engineer's Office prior to use.

   Where *Standard Specifications* 9-28.11 allows use of A307 bolts for roadside wood posts, field verify A307 lag bolts were used, no further certification will be required for A307 bolts.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for a "FABRICATION APPROVED" decal (Figure 9-8) on the back of the sign and document Inspector's Daily Report. Check for a "WSDOT INSPECTED" stamp on sign mounting hardware and document. Check that all overhead signs are mounted with stainless steel bolts, u-bolts, washers, nuts, locknuts, mounting brackets and straps. Mounting hardware shall include bolts, nuts, washers, locknuts, rivets, post clips, windbeams, angles, "Z" bar, straps and mounting brackets. Check for damage due to shipping, handling, and installation.

5. **Specification Requirements:** See *Standard Specifications* Section 9-28, and Section 9-1.5G of this manual. Review contract documents to determine if supplemental specifications apply.

9-4.57 Concrete Curing Compounds

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Material will be accepted based on "SATISFACTORY" test results from the State Materials. No curing compound shall be used on WSDOT work prior to testing of each lot. If the lot can be identified and proven to have prior satisfactory acceptance test results in the same calendar year in which it is to be used, it may be used without testing per Chapter 9-5.2 of this manual. Submit a one-quart sample taken by, or in the presence of, an agency representative for each lot. Samples must be submitted for testing 10 days prior to use of curing compound.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check that the lots being used have "Satisfactory" test reports from the State Materials Laboratory.

5. **Specification Requirements:** See *Standard Specifications* Sections 9-23. Review contract documents to determine if supplemental specifications apply.

9-4.58 Admixtures for Concrete

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Acceptance will be on the basis of Certified Concrete Delivery Ticket, *Standard Specifications* Section 6-02.3(5)B, indicating the brand/product and dosage of the admixture as shown on the concrete mix design.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check Concrete Delivery Ticket for proper admixture usage.

5. **Specification Requirements:** See *Standard Specifications* Section 6-02.3(5) B and 9-23. Review contract documents to determine if supplemental specifications apply.

9-4.59 Plastic Waterstop

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Material may be accepted on basis of Manufacturer's Certificate of Compliance.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for uniformity of product in lot, and for damage in shipment or handling.

5. **Specification Requirements:** See *Standard Specifications* Section 9-24. Review contract documents to determine if supplemental specifications apply.

9-4.60 Epoxy Systems

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance/Verification

   a. **Acceptance:** Material may be accepted for use on receipt of a passing test report from the State Materials Laboratory. For epoxy bonding agents, submit mix ratios, intended use and a representative sample of each component for each batch or lot number. A representative sample may consist of 1 pint of each component for bulk lots or a pre-packaged kit. Containers shall be identified as "Component A" (contains the Epoxy Resin) and "Component B" (contains the Curing Agent) and shall be marked with the name of the manufacturer, the date of manufacture and the lot number. If the material is to be used as an epoxy grout, mortar or concrete, include a 5-pound representative sample of aggregate. Samples shall be submitted to the State Materials Laboratory. Epoxy Adhesive for Lane Markers does not require field sampling, but does require a Manufacturer's Certificate of Compliance. A period of 15 working days should be allowed for testing.

b. **Verification:** Proper proportioning of Epoxy Adhesive for Lane Markers can be verified at the State Materials Laboratory if desired. Submit a 1 pint sample of the field mixed epoxy in question and a 1 pint sample of each component as is detailed under "Acceptance" above.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for uniformity of color and conformance to required mix proportions. Streaking is an indication of inadequate mixing. Check for set and hardness with your thumbnail. You should not be able to dent the properly mixed and cured material. Epoxies shall be mixed and applied in conformance to manufacturer's written instructions unless otherwise modified in writing by the manufacturer's agent.

5. **Specification Requirements:** See *Standard Specifications* Section 9-26. Review contract documents to determine if supplemental specifications apply.

9-4.61 Resin Bonded Anchors

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance:

a. **Qualified Product Listed Product:** If Product is listed on QPL, the acceptance of the resin adhesive shall be by field acceptance procedures documenting that brand and model of the resin system. Threaded rod, nut and washer or other inserts shall be accepted on the basis of a Manufacturer's Certificate of Compliance with supporting Mill Test Reports indicating they meet the contract requirements.

b. **Non-qualified Product Listed Product:** Submit independent test lab data indicating resin system meets specifications when tested in accordance with ASTM E 488, and threaded rod, nut and washer or other inserts shall be accepted on the basis of a Manufacturer's Certificate of Compliance with supporting Mill Test Reports indicating they meet the contract requirements.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for proper embedment depths. Check that holes are properly cleaned. Check that the installation is in accordance with the manufacturers written instructions.

5. **Specification Requirements:** Review contract documents to determine if supplemental specifications apply.

9-4.62 Gabion Baskets

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071). The sample shall consist of the following:

a. One square yard of mesh including selvage and body wire.

b. Three feet of tie wire.

c. Three feet of lacing wire.

d. Six each wire clips, fasteners.

3. **Acceptance:** Acceptance is based on receipt of a Manufacturer's Certificate of Compliance with accompanying Mill Test Report.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for damage.

5. **Specification Requirements:** See *Standard Specifications* Section 9-27.3. Review control documents to determine if supplemental specifications apply.

9-4.63 Sign Structures

1. **Approval of Material:** Approval of the fabricator is required prior to use. Upon receipt of the "Request for Approval of Material," the Materials Fabrication Inspection Office will inspect the fabrication shop to ensure it meets all contract requirements. A copy of the Request for Approval of Material will be sent to the Materials Fabrication Inspection Office.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** The fabricated sign structure and associated hardware will be accepted on the basis of an "APPROVED FOR SHIPMENT" stamp (Figure 9-8) An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. When the structures are fabricated out-of-state and are shipped directly to the job site, arrangements must be made with the Materials Fabrication Inspection Office to have the structures and hardware inspected prior to erection. Manufacturer's Certificates of Compliance will be required to be delivered with the sign structures from out-of-state fabrication facilities.

Certificates of Material Origin will be the responsibility of the project office.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for "APPROVED FOR SHIPMENT" stamp (Figure 9-8) on the sign structure and associated hardware. Check for and the "F" or "D" indicator for foreign or domestic steel and document it. Check for damage due to shipping, handling and erection.

5. **Specification Requirements:** See design standards and *Standard Specifications* Section 9-28.15. Review contract documents to determine if supplemental specifications apply.

9-4.64 Conduit

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). Be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification. If approval action is being requested via the RAM process, attach Catalog Cuts or other appropriate documents along with the proper transmittal form (WSDOT Form 350-071 EF) to assist the RAM Engineer in the approval process.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Materials may be accepted as identified below in lieu of sampling:

a. QPL Acceptance: Rigid Galvanized Steel, Aluminum, PVC, PE, HDPE, Fiberglass Conduit and appurtenances (fittings, couplings, spacers, adapters, split internal expansion plugs, duct plugs, connectors, clamps, conduit bodies, and conduit supports), and Expansion Fittings, Deflection Fittings, Combination Deflection and Expansion Fittings – Visual Inspection per section 9-15C of this manual.

b. Non-QPL Acceptance: Expansion Fittings, Deflection Fittings, Combined Deflection and Expansion Fittings, Rigid Galvanized Steel, Aluminum, PVC, PE, HDPE, Fiberglass Conduit and appurtenances – Catalog Cuts per Section 9-1.5H and visual inspection per 9-1.5C of this manual.

The project office shall obtain a "Certificate of Material Origin" for all steel or iron products prior to incorporation of the material into the project.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for Underwriters Laboratories (UL) or Canadian Standards Association (CSA) approval labels. Check for damage to coatings in shipping and handling, and see that damaged areas and field cut threads are protected with an approved coating.

5. **Specification Requirements:** See *Standard Specifications* Section 9-29.1. Review contract documents to determine if supplemental specifications apply.

9-4.65 Electrical Conductors

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071). A sample shall consist of 15 feet.

3. **Acceptance:** Conductors shall be accepted upon receipt of "Satisfactory" Test Report from State Materials Laboratory.

a. **Single Conductors:** If using the QPL, be sure to verify appropriate means of acceptance, see applicable Acceptance Code within the QPL. For wire manufacturers not listed in the QPL, submit a sample. A sample shall be a length of wire that shall include the complete printed/stamped designation: manufacturer, size, and insulation type.

b. **Multiple Conductors:** If using the QPL, be sure to verify appropriate means of acceptance, see applicable Acceptance Code within the QPL. For wire/cable manufacturers not listed in the QPL, submit a sample. A sample shall be a length of wire that shall include the complete printed/stamped designation: manufacturer, size, and insulation type.

c. Fiber Optic Cable. A sample of the Fiber Optic cables shall be a minimum 2 feet long.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. A visual inspection shall be made to ensure that no conductors with damaged insulation are incorporated into the project.

5. **Specification Requirements:** See *Standard Specifications* Section 9-29.3. Review Contract Documents to determine if supplemental requirements apply.

9-4.66 Signal, Luminaire, ITS, and Strain Poles

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification. Notify Materials Fabrication Inspection Office of need to provide Inspection Services.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** The fabricated poles and associated hardware will be accepted on the basis on an "Approved for Shipment" tag or stamp (figure 9-8). If poles were inspected prior to shipment to job site, they will be stamped "APPROVED FOR SHIPMENT" (Figure 9-4) An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. Certificate of Material Origin will be the responsibility of the project office. Poles not inspected prior to shipment must be inspected and approved at the job site by the Materials Fabrication Inspection Office prior to installation. Acceptance will be based on approved shop drawings per Chapter 8-20.2B of this manual and Mill Test Certificates supplied by the manufacturer.

Certificates of Material Origin will be the responsibility of the project office.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for "APPROVED FOR SHIPMENT" stamp (Figure 9-4) and the "F" or "D" indicator for foreign or domestic steel and document it. Check for damage due to shipping, handling and erection. Arrange for inspection if not tagged.

5. **Specification Requirements:** See *Standard Specifications* Section 9-29.6. Review contract documents to determine if supplemental specifications apply.

9-4.67 Anchor Bolts for Luminaire, Signal Poles, and Sign Structures

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification. Notify Materials Fabrication Inspection Office of need to provide Inspection Services.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071)

3. **Acceptance:** Acceptance may be based on "APPROVED FOR SHIPMENT" tag and/or stamp (Figure 9-4 or 9-5). An "F" or "D" will be stamped to indicate if the steel or iron is of foreign or domestic origin. Certificate of material origin will be the responsibility of the project office.

The ID number on the tags that is attached to the bundles of anchor bolts will be stamped on a representative number of anchor bolts.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check and record the "APPROVED FOR SHIPMENT" tag and/or stamp (Figure 9-4 or 9-5) and the "F" or "D" indicator for foreign or domestic steel and document it. Check for damage due to shipping and handling.

Note: Special attention shall be placed on the proper installation of bolts. No adjustments (bending) of bolts will be allowed after placement in concrete.

5. **Specification Requirements:** See *Standard Specifications* Section 9-29.6(5). Review contract documents to determine if supplemental specifications apply.

9-4.68 Luminaires and Lamps

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification

2. **Preliminary Samples:** Preliminary samples will be required only if requested on Request for Approval of Material (DOT Form 350-071). Submit Manufacturers Certificate of Compliance and catalog cut to the State Materials Laboratory for evaluation if requested.

3. **Acceptance:** Verify the materials received on the job site, is in fact the same make, model, lot, batch, size, color, blend, etc. as approved for use, be it by QPL or via the Request for Approval of Material (DOT Form 350-071).

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual.

a. **Luminaires:** A visual inspection shall be made to ensure damaged equipment is not installed and that luminaires are mounted level. Confirm the socket position is the same as that noted on the catalog cut.

b. **Lamps for Luminaires and Signal Heads:** Check that all lamps are of the proper wattage, see contract documents.

5. **Specification Requirements:** See *Standard Specifications* Section 9-29.10. Review contract documents to determine if supplemental specifications apply.

9-4.69 Water Distribution System

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval action is being request via the RAM process, attach Catalog Cuts or other appropriate documents, using proper transmittal, to assist the RAM Engineer in the approval process.

When approved, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Material may be accepted upon receipt of an "Approved" document in lieu of sampling as shown below:

a. QPL Acceptance

1) Ductile Iron Pipe and Fittings, PVC Pipe and Fittings, Restrained Joints, Restrained Flexible Couplings, Gate Valves (3-inches to 16-inches), Butterfly Valves, Saddles, Corporation Stops – Visual Inspection per section 9-1.5 of this manual

2) Copper Tubing and Polyethylene Tubing – Manufacturer's Certificate of Compliance

b. Non-QPL Acceptance

1) Ductile Iron Pipe, Steel Pipe, Polyvinyl Chloride (PVC) Pipe, Polyethylene (PE) Pressure Pipe, Polyethylene Encasement – Manufacturer's Certificate of Compliance

2) Fittings for Ductile Iron, Steel, PVC, and PE Pipe. Restrained Joints, Bolted Sleeve-type Couplings for Plain End Pipe, Restrained Flexible Couplings, Grooved and Shoulder Joints, Fabricated Mechanical Slip-type Expansion Joints, Gate Valves (3-inches to 16-inches), Butterfly Valves, Valve Stem Extensions, Combination Air Release/Vacuum Valves, Tapping Sleeve and Valve Assemblies, Hydrants, End Connections, Hydrant Extensions, Hydrant Restraints, Traffic Flanges, Saddles, Corporation Stops, Copper Tubing, Polyethylene Tubing, Service Fittings, Mter Setters, Bronze Nipples and Fittings, and Meter Boxes – Catalog Cut per Section 9-1.5H of this manual.

3) Valve Boxes, Valve Marker Posts, and Guard Posts – Visual Inspection per Section 9-1.5 of this manual.

It is the responsibility of the project office to obtain a "Certificate of materials Origin" for all steel or iron products prior to incorporation of the material into the project.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check material delivered to the project for damage to the galvanized coatings in shipping and handling and conformance to the contract documents. See that damaged areas and field cut threads are protected with an approved galvanized repair paint formula, standard formula A-9-73. Water distribution pipe requires testing after installation in conformance with the *Standard Specifications* Section 7-11.3.

5. **Specification Requirements:** See *Standard Specifications* Section 9-30. Review contract documents to determine if supplemental specifications apply.

9-4.70 Elastomeric Bearing Pads

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071).

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Material may be accepted on a Manufacturer's Certificate of Compliance accompanied by a certified test report identifying the specific batch of material and conforming to AASHTO M251.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Make certain that material to be used is from the certified batch.

5. **Specification Requirements:** See *Standard Specifications* Section 9-31. Review contract documents to determine if supplemental specifications apply.

9-4.71 Fabric Bearing Pad

1. **Approval of Material:** Approval is required for the fabricator of the bearings prior to the start of fabrication. For approved plants in Washington State, or the need for inspection, contact the Materials Fabrication Inspection Office.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** All Fabric Bearing Pads need to be inspected at the point of manufacture prior to shipping.

Documentation will be checked and accepted by WSDOT Fabrication Inspection at the point of manufacture. Certification will be maintained by Fabrication Inspection office. An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin.

Certificate of Material Origin will be the responsibility of the project office.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check and record the "APPROVED FOR SHIPMENT" tag and/or stamp (Figure 9-4 or 9-5) and the "F" or "D" indicator for foreign or domestic steel and document it. Check for damage caused by shipping and handling.

5. **Specification Requirements:** Review the contract documents to determine the specification requirements.

9-4.72 Precast Concrete Barrier and Wall Panels

1. **Approval of Material:** Approval of fabricator is required prior to the start of fabrication. Materials will be approved by the Request for Approval of Material (DOT Form 350-071). Notify Fabrication Office of need to provide Inspection Services, or to verify that the precast plants annual review and approval is current for wall panels only.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Accept only barrier sections that are stamped "WSDOT INSPECTED" (Figure 9-3). Accept only wall panels, which are stamped "APPROVED FOR SHIPMENT" (Figure 9-4). An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. Certificate of Material Origin will be the responsibility of the project office. The "WSDOT INSPECTED" stamp on barrier will include the connecting pins, which will be inspected at the barrier fabricator's facility.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for shipping and handling damage. Check for "APPROVED FOR SHIPMENT" stamp or "WSDOT INSPECTED" stamp and the "F" or "D" indicator for foreign or domestic steel and document it.

5. **Specification Requirements:** See *Standard Specifications* Section 6-10, 6-02.3(25), and 6-02.3(28). Review contract documents to determine if supplemental specifications apply.

9-4.73 Safety Bars, Cattle Guards, Sign Mounting Brackets, Steel and Special Guardrail Posts, Steel Sign Posts

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071. If fabrication or welding of the item is needed, contact the Materials Fabrication Inspection Office for disposition and possible inspection.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Materials may be accepted on receipt of Manufacturer's Certificate of Compliance for the base metal including Mill Test Certificates.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual Check each lot of material delivered to the project for damage, and that accompanying Manufacturer's Certificate of Compliance is present. Check galvanizing using procedures stated in FOP for ASTM D 1186. Identify lots with test reports. Check for handling or shipping damage.

5. **Specification Requirements:** See *Standard Specifications* Section 9-05.18, 9-16.3(2), 9-28.14(2) and *Standard Plans*. Review contract documents to determine if supplemental specifications apply.

9-4.74 Metal Bridge Rail

1. **Approval of Material:** Approval of fabricator is required prior to the start of fabrication. Materials will be approved by the Request for Approval of Material (DOT Form 350-071). Notify Fabrication Office of need to provide Inspection Services.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** If rails were inspected prior to shipment to job site, they will be stamped or tagged "APPROVED FOR SHIPMENT" (Figure 9-4 or 9-5). An "F" or "D" will be stamped to indicate the steel or iron is of foreign or domestic origin. Certificate of Material Origin will be the responsibility of the project office. If not, rails must be inspected on job site by the Materials Fabrication Inspection Office prior to installation. Acceptance will be based on approved shop drawings per Chapter 8-20.2B of this manual, Mill Test Certificates supplied by the manufacturer.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for "APPROVED FOR SHIPMENT" tags or stamp and the "F" or "D" indicator for foreign or domestic steel and document it. Check for damage caused by shipping and handling. Unless aluminum parts have been adequately wrapped, there may be damage to anodic and lacquer coating. Damaged parts shall be rejected.

5. **Specification Requirements:** See *Standard Specifications* Section 6-06.3(2). Review contract documents to determine if supplemental specifications apply.

9-4.75 Construction Geotextiles

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. Acceptance:

   a. Satisfactory test reports from the State Materials Laboratory when quantities exceed the limits stated in *Standard Specifications* Section 9-33.4(4). Sample per WSDOT Test Method 914. A Manufacturer's Certificate of Compliance MUST accompany all samples submitted for testing.

   b. Acceptance may be on Manufacturer's Certificate of Compliance when quantities are within the limits stated in *Standard Specification* Section 9-33.4(4).

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check each roll of geotextile fabric for proper identification as shown on either the Manufacturer's Certificate of Compliance or on the State Materials Laboratory test report.

5. **Specification Requirements:** See *Standard Specifications* Sections 9-33. Review contract documents to determine if supplemental specifications apply.

9-4.76 Concrete

1. **Approval of Material:** Approval of all materials is required prior to use.

Cement – see Section 9-4.1

Fine Aggregate (sand) – see Section 9-4.4

Coarse Aggregate – see Section 9-4.4

Admixtures for Concrete – see Section 9-4.58

Water – see Section 9-4.77

Contractor must submit a concrete mix design on DOT Form 350-040. All concrete except commercial and Lean Concrete must come from a pre-qualified Batch Plant. Contact the Regional Materials Engineer to determine if plant is pre-qualified.

For mix designs proposed for cement concrete pavement the contractor is required to submit flexural and compressive strength test results in accordance with Section 5-05 of the *Standard Specifications* as part of the concrete mix design.

Note: If the Aggregate Sources Tacking System requires Alkali Silica Reaction (ASR) mitigation the concrete mix design submittal may include the use of either a low alkali cement per Section 9-01.3(3), or fly ash per 9-23.9, as

approved by the Engineer. The contractor shall provide test results for ASTM C 1260 or AASHTO T 303 showing the mitigating measures are effective (see Section 9-03 of the *Standard Specifications*). Contact the General Materials Engineer of the State Materials Laboratory or the State Bridge Construction Engineer if the contractor is proposing to use other mitigating measures.

2. **Preliminary Samples:** Not Required

3. Acceptance:

a. **Commercial and Lean Concrete:** Is accepted based on a Certificate of Compliance to be provided by the supplier as described in Section 6-02.3(5) B of the *Standard Specifications*.

b. **Cement Concrete Pavement:** Is accepted based on satisfactory field tests for air content and compressive strength (see Section 9-5 of this manual for testing frequency).

c. **Structural Concrete:** Is accepted based on tests for Slump, Air Content, Compressive Strength, and Temperature (see *Standard Specifications* Section 6-02.3(5)G for testing frequency).

4. **Field Inspection:** The concrete mix provided shall match the mix the contractor submitted for review. The Mix design submittal shall include the Aggregate Correction Factor to be used in determining the Air Content, if the contractor fails to provide this information on DOT form 350-040 do not apply an aggregate correction factor.

5. **Specification Requirements:** See *Standard Specifications* Section 9-03.1, 5-05 and 6-02.

9-4.77 Water for Concrete

1. **Approval of Material:** Not required.

2. **Preliminary Samples:** Not required.

3. **Acceptance:** Is based on test results provided by the contractor. If the Contractor is using potable water that is clear and apparently clean, then no testing is required.

a. **Physical Requirements:** conducted on a weekly interval for the first four weeks and thereafter on monthly interval.

b. **Chemical Requirements:** conducted on a monthly interval.

4. **Field Inspection:** See Section 9-4.75 concrete.

5. **Specification Requirements:** See *Standard Specifications* Section 9-25.1.

9-4.78 Expansion Joints

1. **Approval of Material:** Approval is required for the fabricator and all material components of the expansion joints prior to the start of fabrication. Materials will be approved by the Request for Approval of Materials (DOT Form 350-071).

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Expansion joint systems containing steel will be inspected by Fabrication Inspection at the jobsite.

All gland material will be accepted based on Manufacturer's Certificate of Compliance. Manufacturer's Certificates of Compliance for steel as well as the gland material will be approved and maintained by the project office. Certificates of Material Origin will be the responsibility of the project office. Expansion joints acceptable to the Fabrication Inspector will be stamped "WSDOT INSPECTED".

The Project Engineer shall collect all of the documentation from the fabricator for the various material items used in the Manufacturing of the expansion joints as listed below.

a. Gland Strip — Manufacturer's Certificate of Compliance

b. Steel Plates and shapes including — Manufacturer's Certificate of Compliance and Certificate of Material Origin.

c. Coatings for steel parts — Manufacturer's Certificate of Compliance

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Check for damage caused by shipping and handling.

5. **Specification Requirements:** Review contract documents to determine if supplemental specifications apply.

9-4.79 Controller Cabinet Assembly

1. **Approval of Material:** Approval of all components in the Controller Cabinet Assembly are required. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the individual components will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Final acceptance is based on a satisfactory test report. A satisfactory test report is defined as acceptable performance in the following tests:

WSDOT Test Method 421, Traffic Controller Inspection and Test Procedure

WSDOT Test Method 422, Transient Voltage Test (Spike Test) Procedure

WSDOT Test Method 423, Conflict Monitor Testing

WSDOT Test Method 424, Power Interruption Test Procedure

WSDOT Test Method 425, Environmental Chamber Test

WSDOT SOP 429, Method for Determining the Acceptability of Traffic Signal Controller Assembly

WSDOT Test Method T427, Loop Amplifier Test

WSDOT Test Method T428, Compliance Inspection and Test Procedure

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. Verify the controller cabinet assembly received on the job site, has satisfactory test reports if required. Check for damage due to shipping and handling.

5. **Specification Requirements:** See *Standard Specifications* Section 9-29.13. Review contract documents to determine if supplemental specifications apply.

9-4.80 Miscellaneous Temporary Erosion and Sediment Control Items

1. **Approval of Material:** Approval of materials is required prior to use. Materials will be approved by the Qualified Products List or Request for Approval of Material (DOT Form 350-071). If approval is by QPL, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on Request for Approval of Material (DOT Form 350-071).

3. **Acceptance:** Material will be accepted by visual inspection. The exception to this will be Geotextile for Silt Fence, which will be accepted on basis of Manufacturer's Certificate of Compliance.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual.

5. **Specification Requirements:** See *Standard Specifications* Sections 8-01, 9-14, and 9-33.

9-4.81 Concrete Patching Material

1. **Approval of Material:** Approval of materials is required prior to use. This approval may either be by virtue of the inclusion of this material/product on the Qualified Products List or by approval of a Request for Approval of Material (DOT Form 350-071). If approval is by means of QPL, be certain to verify that product is in fact qualified for its intended use, and the product is listed under the appropriate specification. If the product is not listed on the QPL, submit test data from an accredited independent laboratory confirming that the concrete patching material meets specifications of Section 9-20.

2. **Preliminary Samples:**

   A. **Prepackaged Concrete Patching Material:** If the concrete patching material is not on the QPL, submit test data from an accredited independent laboratory confirming that the concrete patching material meets the requirements of *Standard Specification* Section 9-01.2.

   B. **Aggregate for Extension:** A preliminary sample of the material will be required only if requested on the Request for Approval of Material (DOT Form 350-071) or if the ASA database indicates that the aggregate source approval has expired. Contact the State Materials Office if preliminary samples are required. Preliminary samples for Concrete Aggregate shall be made up of 50-100 pounds of clean, washed coarse aggregate and 20-25 pounds of clean washed fine aggregate. The samples are to be shipped in increments, using satisfactory containers, not exceeding 30 pounds.

3. **Acceptance:**

   A. The Contractor must submit a mix design meeting the requirements of *Standard Specification* 9-20 for the concrete patching material.

   B. Acceptance for the aggregate extender shall be based on the material coming from an approved source, and a satisfactory gradation report supplied with the mix design.

4. **Field Inspection:** Field Verify the prepackaged patching material received on the job site is in fact the same as approved for use, be it by QPL or via the Request for Approval of Material (DOT Form 350-071). Verify that the amount of added water and aggregate extender complies with the contractors mix design.

5. **Specification Requirements:** See *Standard Specifications* Section 9-20. Review contract documents to determine if supplemental specifications apply.

9-4.82 Streambed Aggregates

1. **Approval of Material:** Consult Aggregate Source Approval (ASA) database for approval of materials for each source.

2. **Preliminary Samples:** A preliminary sample of the material will be required only if requested on the Request for Approval of Material (DOT Form 350-071) or if the Aggregate Source Approval Report indicates that aggregate source is not approved for the intended application. Contact Regional Materials Office if preliminary samples are required. Preliminary samples shall be made up of 80 to 120 pounds of material sampled in a manner consistent with this manual. The sample is to be shipped in satisfactory containers, not exceeding 30 pounds in weight.

3. **Acceptance:**

   a. **Streambed Sediment:** After the source has been approved, and prior to use, the gradation test shall be performed to determine if the material does in fact meet specifications for the intended use. The sediment may be accepted upon satisfactory field tests. Acceptance samples shall be obtained, tested, and recorded in accordance with the Standard Specifications, the contract provisions, and Chapters 9-5 and 9-8 of this manual.

   b. **Streambed Cobbles:** After the source has been approved, the Project Engineer may accept the materials by Visual Inspection per 9-1.5 of this manual or determine the grading per Section 9-03.11(2) of the *Standard Specifications*.

   c. **Streambed Boulders and Habitat Boulders:** After the source has been approved, the Project Engineer may accept the material by Visual Inspection per 9-1.5 of this manual or determine approximately size per Sections 9-03.11(3) or 9-03.11(4) of the *Standard Specifications*.

4. **Field Inspection:** Field verify per Section 9-1.5C of this manual. See that the gradation (streambed sediment only) remains constant.

5. **Specification Requirements:** See Standard Specification Section 9-03.11. Review contract documents to determine if supplemental specifications apply.

9-4.83 Temporary Traffic Control Materials

1. **Approval of Materials and Systems:** Approval of materials is required prior to use and when applicable, shall be one or more of those listed in the current Qualified Products List (QPL). When approved, be certain to verify that the product is in fact qualified for its intended use, and the product is listed under the appropriate specification.

Prior approval is not required for:

- Stop/Slow Paddles
- Construction Signs
- Wood Sign Posts
- Sequential Arrow Signs
- Portable Changeable Message Signs
- Barricades
- Traffic Safety Drums
- Barrier Drums
- Traffic Cones
- Tubular Markers
- Warning Lights and Flashers
- Portable Temporary Traffic Control Signal
- Tall Channelizing Devices

2. **Preliminary Samples:** No preliminary sample required.

3. **Acceptance:**

a. **Stop/Slow Paddles, Wood Sign Supports** – Visually inspect to ensure good condition and conformance to the appropriate WSDOT Standard Specification.

b. **Construction Signs, Sequential Arrow Signs, Portable Changeable Message Signs, Barricades, Traffic Safety Drums, Barrier Drums, Traffic Cones, Tubular Markers, Warning Lights and Flashers, Tall Channelizing Devices –** Visually inspect per Section 9-1.5C of this manual to ensure the signs and traffic control devices are acceptable or marginal as defined in the book Quality Guidelines for Temporary Traffic Control Device and conform to the appropriate WSDOT Standard Specifications.

c. **Portable Temporary Traffic Control Signal –** All Portable Temporary Traffic Control Signals must be accepted prior to use. Inspect all Portable Temporary Traffic Control Signals to ensure good condition, functionality and conformance to the appropriate WSDOT Standard Specification.

d. **Truck-Mounted Attenuator (TMA):**

1. Acceptance – All Truck-Mounted Attenuators shall be selected from the approved manufacturers and models listed in the QPL.

2. Visually inspect per Section 9-1.5C of this manual prior to use for condition, reflectivity and conformance to the appropriate WSDOT Standard Specification.

4. **Field Inspection:** Field verify all temporary traffic controls devices to ensure good working order, cleanliness, and appropriate reflectivity.

5. **Specification Requirements:** See Standard Specification Section 1-10 and 9-35. Review contract documents to determine if supplemental specifications apply.

9-5 Guidelines for Job Site Control of Materials

9-5.1 General

When in doubt as to sampling requirements, refer to Record of Materials, (ROM), Request for Approval of Material, (RAM), and Chapter 9-4 of this manual. All items for acceptance, except for sampling and testing PCC cores, testing concrete cylinder and cement and as shown in Chapter 9-5.7 of this manual will be sampled and tested by the Project Engineers representative.

In some instances, certain items usually sampled by Project Engineers representative may be sampled and tested by representatives of the State Materials Laboratory or other representatives. Such items as shown in Chapter 9-1 of this manual, when properly identified with an “Approved for Shipment” tag, may be accepted for use by the Project Engineer without any further sampling or testing.

9-5.2 Sampling and Testing Schedule

9-5.2A General

The intent of sampling and testing is to ensure that the material provided to the project conforms to the specifications. The frequency schedule in Chapter 9-5.7 of this manual covers the minimum requirements for sampling and testing at the project level. The Project Engineer is responsible for obtaining the number of samples necessary to ensure adequate control of the material being produced under the circumstances and conditions involved with the particular project. In some instances, good construction practice will necessitate more frequent tests to ensure adequate control of the quality of production. This will be the case where production is just getting under way, where source material is variable or marginal in quality. Also operations from commercial sources when small lots of material are being sampled (as for barge loads of aggregate) or when stockpiles are built and depleted may require more frequent sampling and testing.

The instructions listed in Chapter 9-5.7 of this manual, will be followed in the production of those surfacing materials covered therein. A minimum of one acceptance test is required except for small quantities as shown in Chapter 9-5.2C of this manual.

9-5.2B Reducing Frequency of Testing

In instances of uniform production where the material is running well within specification limits, the Project Engineer may initiate deviations from the schedule. Deviations exceeding a 10 percent reduction will require approval from the Construction Materials Engineer at the State Materials Laboratory and must be documented in the project records, and fully explained by the Project Engineer. Lack of personnel, equipment, and facilities will not be considered sufficient reasons for such deviation.

Authority for approval of frequency reduction may be delegated to the Regional Materials Engineer upon request. This authority may permit overall reduction of sampling frequency or selective relief of selected test properties. Examples of selective relief would be reduction/elimination of fracture determinations for production from quarry sources or reduction of frequency for sand equivalent determination. As a general principle, frequency reduction may be considered whenever five consecutive samples taken at the normal frequency indicate full conformance with the specifications.

9-5.2C Sampling and Testing for Small Quantities of Materials

The Project Engineer may elect to accept small quantities of materials without meeting minimum sampling and testing frequencies using the following criteria.

An item can be accepted as a small quantity if the proposed quantity for a specific material is less than the minimum required frequency. For mainline paving, less than one-half the required frequency as defined in Chapter 9-5.7 of this manual.

Materials that will not be considered under the small quantity definition are:

- Concrete with a 28 day compressive strength of 4000 psi or greater

Some issues that the Project Engineer may consider prior to use of small quantity acceptance are:

- Has the material been previously approved?
- Is the material certified?
- Do we have a mix design or reference mix design?
- Has it been recently tested with satisfactory results?
- Is the material structurally significant?

Small quantity acceptance could be visual, by certification, or other methods. Acceptance of small quantities of materials by these methods must be documented. Documentation of materials under these methods must be documented in the project records prior to placement and must include the signature of the Project Engineer acknowledging approval of use. For visual documentation, an entry should be made in the project records as to the basis of acceptance of the material, and the approximate quantity involved.

The small quantity acceptance may be used for any quantity of the following uses:

- Curbs and Sidewalks,
- Driveways, Road approaches,
- Paved ditches and slopes

Where jobsite mixing of concrete occurs in accordance with *Standard Specification* Section 6-02.3(4)B, Jobsite Mixing, small quantity acceptance can be used for acceptance of packaged concrete meeting the requirements of ASTM C 387. The packaged concrete bag will state that the concrete meets the requirements of ASTM C 387.

9-5.2D Reference Test Report

When a Satisfactory Test Report is required, a Referenced Test Report may be used if allowed in Section 9-4 for a specific material. A Reference Test Report as listed below will not be allowed for HMA Mix Designs, or other materials unless allowed per Section 9-4.

A Reference Test Report may consist of one of the following:

- A copy of a previous WSDOT Satisfactory Test Report generated under another contract number as long as the manufacturer and lot number of the material to be used are the same as the material the test report represents.
- A printed copy of the electronic QPL database page showing ‘referenced’ lots previously tested. The lot number in the QPL must match the lot number of the material used. The information will be listed in the ‘description’ field for specific materials in the QPL.

All Referenced Test Reports must reflect the same specification as the material to be used and be received prior to installation of the intended material. A Reference Test Report for material can only be used in the same calendar year for when the material was incorporated into the contract.

9-5.3 Point of Acceptance

State Owned Source: Material produced from State owned source may be accepted either as it is placed into stockpile or as it is placed in hauling vehicles for delivery to the roadway. The sampling and testing frequency during stockpiling shall be in conformance with Chapter 9-5.7 of this manual.

In the event sample testing during stockpiling shows the material to be marginal (i.e., within tolerance limits) in any specification requirement, acceptance at this point shall be conditional and dependent on adherence to specifications at the time of removal from stockpile.

Contractor’s Source: If stockpiled material is set aside exclusively for use on WSDOT projects it may be accepted the same as that for a state-owned source. If stockpiles are constructed for general use, then materials for WSDOT projects shall be tested for acceptance from samples taken by the Project Engineer representative in accordance with WSDOT FOP for AASHTO T 2. The Engineer will determine the exact point of acceptance. If an existing stockpile was built without acceptance testing during material production, and later set aside exclusively for use on state projects, the material may be accepted with appropriate test results from samples taken by the Project Engineer representative in accordance with WSDOT FOP for AASHTO T 2. The sampling and testing frequency shall conform to Chapter 9-5.7 of this manual.

9-5.4 Basis for Acceptance

The basis of acceptance of Hot Mix Asphalt and aggregates may be either by statistical evaluation or non-statistical evaluation methods. The method to be used is specified in *Standard Specifications* or Contract Documents.

The testing tolerances shown in Chapter 9-5.6 of this manual apply exclusively to the appropriate specifications as listed in the *Standard Specifications*. These tolerances do not apply to those "special" materials having requirements differing from those listed in the *Standard Specifications*. For these "special", materials usually described in the contract documents, tolerances will be provided by the State Materials Laboratory upon request from the Regional Construction Manager.

Material that has been produced prior to rejection (i.e., HMA in storage silo, crushed materials hauled to the job site) may be incorporated into the project provided the Contractor is made fully aware that the material may be subject to a price adjustment or, in extreme cases, to total removal. Every effort shall be made to place this material in structurally noncritical areas such as shoulders or gore areas.

All material produced between the time of rejection and the time an acceptable material is produced, as defined by WSDOT adopted testing procedures, shall not be incorporated in the work in any manner until it meets specifications.

9-5.4A Basis for Acceptance — Statistical Evaluation

For materials being accepted using statistical evaluation procedures, random samples will be evaluated to determine quality level within a defined tolerance band. Acceptance, bonus, and disincentive procedures are defined in the contract documents.

Test results with acknowledged errors or equipment deficiencies are to be immediately discarded without recourse and another sample run.

Test results for Hot Mix Asphalt may be challenged by the Contractor, as defined in the *Standard Specifications* Section 5-04.3(8)A. These specifications allow the Contractor to challenge results of any individual acceptance sample test in writing and within seven calendar days from receipt of the specified test results.

When the Contractor challenges a test, a split of the original field sample must be tested by different equipment and a different qualified tester. It therefore is necessary that a split of every field sample (i.e., opposite quarter from acceptance test) be saved in a secure area, accurately marked, and be available for challenge sample testing. The specifications require that the challenge sample testing be done in the Regional Materials Laboratory or the State Materials Laboratory. When the Contractor makes a challenge it is expected that the split sample be sent and tested as quickly as possible. This will require that testing of these samples be prioritized. By expediting the challenge sample testing, problems that may exist in testing or with the material being produced can be identified and corrected lessening the impact to both the Contractor and WSDOT.

9-5.4B Basis for Acceptance — Non-Statistical Evaluation

If statistical acceptance procedures are not specified nonstatistical acceptance method will be used.

Individual samples taken for acceptance by this method may be subject to certain tolerances allowed outside the established value stated in the *Standard Specifications*. The tolerance acceptance procedures shall be followed in these cases. Test results with acknowledged errors or equipment deficiencies are to be immediately discarded without recourse and another sample run.

When the test results for Hot Mix Asphalt fall outside the control points the material will be evaluated according to the *Standard Specifications* Section 5-04.5(1)A.

9-5.4C Basis for Acceptance — Asphalt Binder

The basis for acceptance of asphalt binder is compliance with existing specifications as modified to include the tolerance as follows:

1. If a binder sample fails to meet the required specifications, the binder samples prior and subsequent to the failed sample will be tested. Samples of asphalt binder will continue to be tested until samples taken both prior and subsequent to the failing samples meet the specifications. The quantity of out of specification HMA is determined from the tons of HMA represented by each of the asphalt binder samples that failed to meet the specifications.

2. If a binder sample does not meet the specifications but is not more than 10 percent outside the specification limits and the binder sample prior and subsequent to the out of specification binder both meet the specifications, there will be no price adjustment.

3. If the binder sample is more than 10 percent out of specification or if the binder sample is less than 10 percent out of specification and either the binder sample prior or subsequent to does not meet the specifications, the HMA will be rejected.

9-5.4D Basis for Acceptance — Other Aggregate Properties

The basis for acceptance of aggregates prior to completion of the placement of the material is compliance with existing specifications as modified to include tolerances Established in Chapter 9-5.6 of this manual. The application of these tolerances shall be as follows:

1. Take the following actions any time a sample falls outside the specification limits, but within tolerance bands:

   a. Immediately take two separate additional samples representing current production in accordance with Chapter 9-4 of this manual. The contractor has the option of making plant adjustments prior to taking these samples.

   b. Production will be accepted until the second sample is checked for properties that were out of specification in the first sample.

c. Do not accept any additional material if the second sample is also out of specification.

d. If the second sample is within specification, immediately check the third sample. Do not accept any additional material if the third sample is out of specification.

e. No further material will be accepted after the time of rejection until corrections are made in the operations. This will be confirmed by new tests within specification limits.

f. Basis for acceptance after this correction will be in conformity with the procedure outlined above. All tests of material outside the specification limits must be listed and justified on the materials certification as required by Chapter 9-1.5 of this manual.

2. The acceptance of material shall cease with one or more of the following conditions:

a. When a sample falls outside of the applicable tolerance bands.

b. When any two out of three consecutive samples are within tolerance bands, but outside specification limits.

c. When any sample has a gradation that falls within both the high and low tolerance bands.

d. Any sample where the material is outside the specification limits, but within the tolerance bands, in any two of the following properties:

- Gradation
- Fracture
- Sand Equivalent
- Flat and Elongated
- Uncompacted Void Content of Fine Aggregate (Fine Aggregate Angularity)

The basis for acceptance of aggregate when all of the material has been placed on the project prior to completion of the testing is compliance with the existing specifications (no tolerances). Materials that are not in compliance with the specification will be evaluated as defined in 1-2.8C(1) Defective Materials for Material in Place.

9-5.5 Testing Staff Qualifications and Independent Assurance Program

9-5.5A Testing Staff Qualification

9-5.5A(1) General

WSDOT personnel assigned with testing construction materials will be enrolled in the Construction Tester Qualification Program. The details of this program are contained in this section. This program establishes uniform testing procedures, insures that testing staff is qualified in performing the testing procedures, and provides a regular review. The review process, through inspection by the Region Independent Assurance Inspector (IAI) evaluates the performance of all testing staff, recognizes proficient performance, and improves substandard performance by recommending corrective action. The qualification program extends the State Materials Laboratory accreditation principles. This includes the assignment, management, and review of project level testing using elements of the State Materials Laboratory accreditation program to accommodate an interface with region and, project level materials testing operations and the use and understanding of national standard test procedures such as AASHTO and ASTM, and other test procedures such as WAQTC and WSDOT.

9-5.5A(2) Construction Tester Qualification Rules

1. **Responsibility:** The construction tester qualification program requires detailed and specific attention to be paid to the testing procedures involved: The State Materials Engineer will address and resolve policy issues related to the qualification program.

2. **Qualification Modules:** The construction tester qualification modules have been set up in 5 areas of testing that represent most of the acceptance tests performed. The project acceptance testers will be evaluated for their proficiency in one or more of the construction tester qualification modules. Each module has a defined list of test procedures in which proficiency is evaluated, see Section 9-8 of this manual. The modules are listed as follows:

- Aggregates
- Hot Mix Asphalt
- Structural Concrete
- Embankment and Base Density
- Hot Mix Asphalt Density

3. **Qualification Categories:** The tester can be qualified in one or more of three categories. The qualification categories are:

a. **Module Qualified Tester:** Fully proficient in a testing module, normally works independently with only general supervision and is responsible for determining material compliance.

b. **Individual Method Qualified Tester:** Has proficiency in one or more test procedures which may partially encompass methods in the qualification modules, but also extends to other infrequent acceptance procedures performed at the project level, and includes tests performed at the Regional or State Materials Laboratories.

c. **Interim Qualified Tester:** Basically proficient in one or more tests but limited to an interim period of in training work. Works under the close supervision of a module or individual method qualified tester, refer to Paragraph 5 below.

Testing personnel at the Region may be either Module Qualified, Individual Method Qualified, or Interim Qualified Testers. Per the AASHTO accreditation, the State Materials Laboratory personnel are Individual Method Qualified Testers.

4. Attaining Qualification:

a. **Module Qualified Testers:** To become a Module Qualified Tester the tester shall satisfactorily complete the required written tests and proficiency evaluations by the IAI, the Region Construction Trainer, or materials staff under the direction of the Materials Engineer in a field or region laboratory for one or more modules in the construction tester qualification program.

b. **Individual Method Qualified Testers:** To become a Individual Method Qualified Tester the tester shall satisfactorily complete the proficiency evaluation by the IAI, the Region Construction Trainer, or materials staff under the direction of the Materials Engineer. This can be accomplished in a field or region laboratory or State Materials Laboratory. Their qualification records reflect proficiency in the specific individual test methods.

c. **Interim Qualified Testers:** To become an Interim Qualified Tester, the following conditions have to be met:

(1) Individual study of the written test method(s) for a complete module,

(2) Test demonstration by a proficient tester,

(3) Allowance for practice or trial tests,

(4) Successful completion conforming to testing checklist(s) without coaching, and

(5) The Interim Qualified Tester works under close supervision by a Module or Individual Method Qualified Tester who is qualified in the same tests.

The conditions as described above, leading to interim qualification, may be conducted by another tester currently qualified in the module or test concerned. Based on evaluation of prior experience by the supervisor, with concurrence of the region IAI or Region Construction Trainer, a non-qualified tester may be considered to have the equivalent of conditions 1 through 3 above. An individual will be considered an interim qualified tester when successful testing performance conforming to the checklists has been completed in the presence of another qualified tester.

5. **Supervision of Interim Qualified Testers:** An Interim Qualified Tester works under the close supervision of a Module or Individual Method Qualified Tester that is qualified in the same test or module containing the test. Close supervision means that the Module or Individual Method Qualified Tester is physically present when the Interim Tester performs the test. The Module or Individual Method Qualified Tester must review and endorse all test results and determinations of material conformance.

6. **Criteria for Evaluating Performance:** Satisfactory performance constitutes performance conforming to the method checklist or with limited deviations corrected on the spot. Unsatisfactory performance consists of repeated infractions from previous evaluations, or incorrect performance of individual critical items on the checklist. Unsatisfactory evaluations shall be subject to region review.

7. **Qualification of Evaluating Staff:** Staff participating in evaluation of testers for qualification operate under the professional responsibility of the Regional Materials Engineer, and are not themselves required to be qualified testers.

8. **Frequency of Equipment Verification:** Regional laboratory and field laboratory test equipment will be verified annually, usually during the first quarter of the year, utilizing State Materials Laboratory equipment verification criteria. A tag bearing the year the verification expires will identify verified equipment.

9. Test procedures that are not included in the testing modules, shall be considered infrequently performed test procedures and shall be individual method qualified. For those procedures the Regional Material's Engineer, or his designated representative, will insure that the following process is employed in carrying out the procedure:

a. The employee responsible for performing the test will study the test method, after first determining that the procedure is the applicable current version.

b. The necessary test equipment will be assembled and confirmed as to its suitability and verification if required.

c. The employee will review how to conduct of the test with the supervisor and clarify any questions.

d. The test procedure will be performed in duplicate, using split portions of the test sample if possible. If not, a blank of other similar material will be run in duplicate prior to testing.

e. The results of the duplicate determination will be compared with the expected precision and bias determinations, if any, from the test procedure.

f. Lacking any defined basis of comparison, the results will be reported as the average of the two determinations with both the individual values and the average shown on the test report.

9-5.5A(3) Personnel Qualification Policy

1. All personnel performing acceptance testing will be either Module Qualified, Individual Method Qualified, or Interim Qualified Testers.

2. Module or Individual Method Qualified Tester designated as responsible for the performance of an Interim Qualified Tester must be in close contact, which means that the Module or Individual Method Qualified Tester is physically present when the Interim Tester performs the test. The Module or Individual Method Qualified Tester must review and endorse all test results and determinations of material conformance.

3. The Tester Qualification Tracking System will identify each tester, their specialty, level of qualification, and the results of ongoing evaluations. The IAI shall be the responsible person within the region for the accuracy of the information contained in the Tester Qualification Tracking System.

4. On-the-job performance will be evaluated by the IAI, the Region Construction Trainer, or materials staff under the direction of the Materials Engineer using the qualification checklists. Noted deficiencies will be reported in writing to the tester and his/her supervisor.

5. Supervisor action is required for notations of unsatisfactory performance.

6. The region tester performance review Chapter 9-5.5A(9) will consider continued qualification of individuals noted as deficient in performance. The supervisor shall submit to the Regional Materials Engineer the corrective action taken for unsatisfactory performance.

9-5.5A(4) Laboratory Qualifications Policy

A region or other subordinate laboratory to be considered qualified shall meet the following conditions:

1. Identify all test methods performed on a regular basis. Methods must conform to those established by WSDOT for materials acceptance.

2. Annually, verify laboratory and field test equipment, using State Materials Laboratory equipment verification criteria. An attached tag will identify the verified equipment.

3. Maintain staff qualification for all methods performed in the laboratory. Qualification shall be either by Module Qualified Tester or Individual Method Qualified tester.

4. Respond to the findings of the review program by the State Materials Laboratory staff, modeled on AASHTO Materials Reference Laboratory (AMRL) inspection program. Such reviews shall be conducted at least biennially.

5. With approval of the State Materials Engineer, a non-WSDOT contracting laboratories having an equipment calibration/verification policy, and a technician training and evaluation process meeting the requirements of AASHTO R-18 may be used to conduct acceptance testing. Documentation of equipment calibration/verification and tester qualification shall be maintained and available for review by the Contracting Agency upon request. The Contracting Agency may conduct an on site review of the laboratory facilities, witness the tester performing the tests, verify the testing equipment, and review records when deemed necessary.

9-5.5A(5) Construction Tester Qualification Program

1. Qualifications:

   a. **Module Qualified Tester:** Qualification in a module will require satisfactory completion of a written exam, followed by hands-on performance of testing procedures. Written examinations require an overall score of 70 percent, with not less than 60 percent on each method for satisfactory completion. Performance examination requires satisfactory performance in the presence of the Independent Assurance Inspectors, the Construction Trainers, or materials staff of all checklist steps, in sequential order, in each required method.

   b. **Individual Method Qualified Tester:** Qualification in an individual method requires satisfactory completion of hands on performance of the testing procedures in the presence of the Independent Assurance Inspectors, the Construction Trainers, or materials staff. Performance examination requires satisfactory performance of all checklist steps, in sequential order.

   c. **Interim Qualified Tester:** Qualification as an Interim Qualified Tester requires satisfactory completion of hands-on performance of the testing procedures in the presence of a qualified tester that is qualified in the same test or module containing the test. Performance examination requires satisfactory performance of all checklist steps, in sequential order.

2. Equivalent programs, i.e., American Concrete Institute (ACI) Certification, may be accepted for qualification where feasible. The State Materials Engineer will determine acceptance of alternate programs.

3. Qualification examinations will be administered by Region IAI supported by Regional Construction Trainers and Regional laboratory supervisors.

4. Performance qualification will be determined from correct performance of all steps, in sequence, based on testing checklists derived from WSDOT adopted test methods as listed in the Materials Manual

5. Failure of a qualification examination will allow for reexamination after a 3-day minimum period of preparation for retest.

6. Repeated failures will be referred to the candidate's supervisor for regional performance review.

7. Tester will continue to be qualified under the following conditions:

   a. All unsatisfactory evaluations are resolved within 30 days.

   b. The IAI evaluates the Tester any time during the next calendar year (January to December).

   c. Testers that missed an annual demonstration of proficiency may be allowed to do acceptance testing for a 30-day period, if requested by the Project Engineer and approved by the IAI. An evaluation and checklist review by the IAI, the Region Construction Trainer, or materials staff under the direction of the Materials Engineer must be conducted within this 30-day period.

   d. Any tester missing two consecutive yearly annual evaluations will be required to retake the written test and achieve a satisfactory IAI performance evaluation.

9-5.5A(6) Regional Materials Laboratory Responsibilities

The Regional Materials laboratories will:

1. Examine and qualify testers using the Independent Assurance Inspectors, the Region Construction Trainers, or regional materials staff as a primary resource.

2. Annually, verify regional laboratory and field laboratory test equipment, using State Materials Laboratory equipment verification criteria. A tag will identify the verified equipment.

3. Maintain staff qualification for all methods performed in the Regional Materials Laboratory. Qualification shall be either by Module Qualified or Individual Method Qualified

4. Insure that the IAI will be the responsible person within the region for the accuracy of the information contained in the Tester Qualification Tracking System.

5. Respond to the findings of the review program by the State Materials Laboratory Staff.

6. Perform testing of independent assurance samples and comparison samples using qualified staff and verified equipment, if the region has a qualified laboratory.

7. Support the Construction Tester Training Program for their region or in cooperation with other regions by providing training facilities.

8. **Support of construction program testing including:** density cores, nuclear gauge correlation and management, concrete 28-day cylinders (acceptance), density standards (Proctor and maximum density), and as needed, hot mix asphalt ignition furnace calibration.

9-5.5A(7) Project Engineer Responsibilities

The Project Engineer will:

1. Ensure that all personnel assigned the responsibility for testing materials are Module Qualified Testers, Individual Method Qualified Tester, or Interim Qualified Testers who work under close supervision of a Qualified Tester.

2. Provide an opportunity for on-the-job training, and/ or mentoring of Interim Qualified Testers prior to assigning testing responsibilities.

3. Take corrective actions for unsatisfactory evaluations of Qualified Testers.

4. Advise the Regional Independent Assurance Inspector of changes in assigned testers, new testers needing qualification testing, and of follow up corrective actions.

9-5.5A(8) The State Materials Laboratory Responsibilities

The State Materials Laboratory will:

1. Attain and maintain AASHTO Accreditation of the Materials Quality System responding to the AASHTO Accreditation Program. The Materials Quality System shall include all test methods performed at the State Materials Laboratory.

2. Assist the Regional Materials Laboratories by providing standards and procedures derived from the Materials Quality System Manual for direct application to corresponding procedures in the Regional Laboratories.

3. Maintain testing standards and procedures in conformance with WSDOT, AASHTO, ASTM, and WAQTC.

4. As the departmental laboratory qualification authority, periodically review the performance and records of region and other subordinate laboratories for consistent practices in testing, equipment verification, and staff qualification.

5. Maintain examinations and checklists used to qualify all WSDOT testing personnel.

6. Provide oversight and coordination for establishment and revision of the qualification programs. Creation and revision of qualification program modules will be by a cross-functional work group.

7. Maintain Tester Qualification Tracking System computer program.

8. Provide guidance and prepare summary for annual report of Independent Assurance (IA) System performance.

9-5.5A(9) Tester Performance Review

1. The IAI, the Region Construction Trainer, or materials staff under the direction of the Materials Engineer reviews performance of all Module qualified, Individual Method Qualified, and interim qualified testers as provided under the IA process.

2. Such reviews are documented in the form of checklists reflecting the degree of conformance to the test procedure. Copies of the review are provided to the tester and to the tester's supervisor (normally the Project Engineer) at the conclusion of the review.

3. Remarks may be included to reflect commendable performance, attention to detail, cooperative attitude, or other performance beyond the expected norm. Satisfactory reports affirm tester proficiency and attest to proper operation of the materials acceptance process.

4. Expected satisfactory performance is that all steps of the checklist be performed correctly. However, incidences of single to several errors as isolated, first-time occurrences, which are acknowledged and corrected by on the spot, discussion with the IAI, also constitute satisfactory performance. (***Note:*** Some procedures may have single steps of such criticality that their omission reflects unsatisfactory performance.)

5. Unsatisfactory performance constitutes repeated occurrences of previous on-the-spot corrections, incorrect performance of critical steps. IAIs may also assign unsatisfactory performance based on observed falsification of test reports, violations of safety, hazardous materials or nuclear materials security standards, or failure to provide proper care of equipment. The Regional Materials Engineer shall promptly review all unsatisfactory performance reports.

6. Reports alleging improper performance of test procedures may be originated by other parties to a construction contract such as contractors, subcontractors or suppliers. Such allegations must he submitted in writing, to the Project Engineer for review. Allegations must identify the specific test procedure and alleged omissions or commissions and contain the name and signature of the individual making the allegation. These reports will be investigated.

9-5.5A(10) Review Actions for Unsatisfactory Performance

1. The tester's supervisor is expected to review and act on all unsatisfactory performance reports.

2. For unsatisfactory performance, the Regional Materials Engineer will work with the Project Engineer for proposed corrective action. Mutual agreement on corrective action shall be documented by attachment to the performance report.

3. Unresolved reports shall be referred to the Regional Construction Manager.

4. Review of substandard performance shall afford the tester involved the opportunity for a personal appearance. In the case of written allegations of misconduct, the individual making the allegation shall also have the opportunity to appear. The Regional Construction Manager shall review recommendation for corrective action. All findings related to allegations of misconduct shall be made in writing by the Regional Construction Manager.

9-5.5B Independent Assurance (IA) Program

9-5.5B(1) General

The IA Program, through a combination of sampling and observation, is intended to determine the conformance of sampling and testing to the defined procedures. The Independent Assurance process is intended to verify procedures, confirm equipment verification, and, in some instances, obtain split samples (Independent Assurance Samples) for independent testing. These samples do not reflect on the specification conformance of the materials involved. IA evaluation will be on a system basis, focused on individuals testing activity rather than being project based on a sample frequency and materials quantity basis.

9-5.5B(2) Independent Assurance Inspector (IAI)

The Regional Construction Manager should assign a sufficient number of persons in each region to handle the program for independent assurance sampling, testing, and annual tester evaluation reviews. These IAIs should be under the direction of the Regional Materials Engineer and should be well trained and experienced in all phases of the work.

It will be the duty of the IAI to conduct the IA Program in accordance with the requirements of WSDOT. The IA program requires the evaluation of all materials testers, observation of the techniques used to run the field tests, determination of the verification status and condition of testing equipment in use, and procurement of appropriate Independent Assurance Samples. The IAI's should exercise tact and good judgment in securing maximum cooperation on the part of the testers and other project personnel. IAI's will conduct the examination process under the Construction Tester Qualification Program.

The Tester Qualification Tracking System will identify each tester, their specialty, level of qualification, and the results of ongoing evaluations. The IAI shall be the responsible person within the region for the accuracy of the information contained in the Tester Qualification Tracking System.

The IAI may normally have other materials related functions to perform in addition to the IA functions. Typically, these may include:

1. Conducting initial training to establish interim qualification.

2. Mentoring interim or newly qualified testers to enhance efficiency and confidence.

3. Assisting in or conducting testing and inspection training in concert with the Regional Construction Trainer.

4. Reviewing materials, test-related records, and forms.

5. Radiation Safety Officer

6. Inspection and Certification of Concrete production facilities.

9-5.5B(3) Independent Assurance Evaluations

It is essential that the IAI evaluate all project and region materials testers, observe the techniques of running the field tests, ascertain the verification status of testing equipment in use, and obtain the appropriate Independent Assurance Samples.

The frequency of Independent Assurance Inspections is managed by the IAI's. On-site evaluation by the IAI will be conducted at least once per calendar year, per module or test. The on-site evaluation will accrue the calendar year following qualification or requalification. The on-site evaluation shall include evaluation in all test methods in the applicable qualification module, or the individual method qualified tests. Tests included in a module but not evaluated on a project may be evaluated off-site, such as at the region laboratory. Additional visits are recommended based on the activity level of the individual tester. Further, additional evaluations may be required for follow up of deficient performance or for monitoring activities of Interim Qualified Testers.

Observations of performance and split sampling will be performed for hot mix asphalt and aggregate testing. Only observations of performance are required for testing of Portland cement concrete and for density testing.

Independent Assurance observations and evaluations will follow the Tester Qualification Checklists for the procedures involved. A copy of these checklists and observations will be provided to the Project Engineer upon request. Each observation will be cataloged to the tester that is observed, to maintain an ongoing account of his/her performance. A complete record should be made of the evaluation and sampling performed during this inspection, the personnel contacted, the testing equipment observed, and the suggestions or on the-spot corrections that were left with job personnel. Observations other than test performance related to checklists are not normally considered in the evaluation of the individual tester, but may require action by management involved.

At the time of the Independent Assurance Inspection, where samples are required, the IAI will observe the initial sampling and participate in the sample splitting activity to ensure that an accurate split is obtained. The field split will then be tested, under observation. The split portion will be returned to the Regional Materials Laboratory and tested for comparison of results.

Additional separate comparison samples may be split by the field tester and forwarded to the Regional Materials Laboratory as initiated by the field tester or when directed by the IAI as follow up for observed deficient performance. This sample will be carefully split, identified as "Comparison Sample," show the tester's identity, and be forwarded to the Regional Materials Laboratory accompanied by the field test results.

All testing equipment involved will be examined for the presence of the required Region verification tags current for the present calendar year. In addition, evaluation of the condition of the equipment items is advised for determination of in service wear or damage.

9-5.5B(4) Evaluation of Independent Assurance Samples Testing

The companion tests of Independent Assurance Samples will be performed employing another qualified operator and set of verified testing equipment than that used for the field (acceptance) test results. When acceptance testing is performed at the Regional Materials Laboratory, the operators should be under the same degree of Independent Assurance oversight as for acceptance sampling performed in the field.

9-5.5B(5) Comparison of Independent Assurance and Acceptance Test Results

Independent Assurance results or comparison results will be compared with the acceptance results. Reports of the comparison of results will be provided to the Project Engineer and the Region IAI. Comments reflecting the degree of conformance will be entered in the remarks section of the report by the Regional Materials Engineer. The degree of conformance will be determined according to the deviation ranges noted below. Gradation test results will be compared only on specification screens.

Test	Normal Range of Deviation	Maximum Range of Deviation
Sand Equivalent	± 8 points	± 15 points
Fracture	± 5 percent	± 10 percent
Asphalt Binder Content (HMA&ATB)	± 0.3 percent	± 0.6 percent
Sieve Analysis — All Items: No. 4 sieve and larger	± 5 percent	± 8 percent
No. 6 sieve to No. 80 sieve	± 3 percent	± 6 percent
No. 100 sieve to No. 200 sieve	± 2 percent	± 4 percent

In the table above, "Normal Range" indicates an acceptable range of variation between test results and no action is required. Test results that fall in this category will be so indicated by the wording *"normal deviation*" on the independent assurance test reports.

Test results falling outside of the "Normal Range" but within the "Maximum Range," will be indicated by the wording *"questionable deviation*" on the independent assurance test reports. For deviations falling into this category, the Project Engineer or a representative shall review the original test report form, advise the responsible test operator of the deviation, and review the test procedure at the next opportunity. The IAI will take the same actions relative to the test operator in the region laboratory.

Test results exceeding the maximum range will be indicated by the wording *"excessive deviation."* For deviations falling in the excessive category, the Project Engineer or a representative will notify the IAI and/or Region Construction Trainer for their services in corrective action. Corrective action involving both the field tester and the region laboratory tester will include review of sampling procedures, sample splitting procedures, testing procedures, and testing equipment.

The Project Engineer will document actions and results of these investigations by a notation or attachment to the independent assurance sample test report. The Independent Assurance Inspector shall document the actions and results of these investigations on the individual's checklist evaluation with notations as to his/her findings in reviewing region lab procedures. Lacking any other actions, these results shall be considered in scheduling repeat evaluations of a tester and entered into the individual's qualification record. These may include comments or findings by the Region Construction Trainer.

The focus of Independent Assurance sampling is based on individual tester's activity and is not intended to provide independent assurance sample reports on all projects or on all materials on any particular project.

9-5.6 Tolerance Limits

Crushed Screenings ¾″ — ½″ for B.S.T.	Specification Limits	Tolerance Limits
% Passing 1″	100	95-100
% Passing ¾″	95-100	90-100
% Passing ½″	0-20	0-25
% Passing ⅜″	0-5	0-10
% Passing No. 200	0-1.5	0-2.0
Fracture	90% Min.	85% Min.

Crushed Screenings ⅝″ — No. 4 for B.S.T.	Specification Limits	Tolerance Limits
% Passing ¾″	100	95-100
% Passing ⅝″	95-100	90-100
% Passing No. 4	0-10	0-15
% Passing No. 10	0-3	0-7
% Passing No. 200	0-1.5	0-2.0
Fracture	90% Min.	85% min.

Crushed Screenings ½″ — No. 4 for B.S.T.	Specification Limits	Tolerance Limits
% Passing ⅝″	100	95-100
% Passing ½″	97-100	92-100
% Passing 1/4″	0-15	0-20
% Passing No. 4	0-5	0-10
% Passing No. 10	0-2	0-6
% Passing No. 200	0-1.5	0-2.0
Fracture	90% Min.	85% Min

Crushed Screenings 3/8″ — US No. 4	Specification Limits	Tolerance Limits
% Passing ½″	100	95-100
% Passing 3/8″	70-90	65-95
% Passing No. 4	0-5	0-10
% Passing No. 8	0-3	0-7
% Passing No. 200	0-1.5	0-2.0
Fracture	90% Min.	85% Min

Crushed Screening ⅜″ — No. 10	Specification Limits	Tolerance Limits
% Passing ½″	100	95-100
% Passing ⅜″	95-100	90-100
% Passing No. 4	0-35	0-40
% Passing No. 10	0-10	0-12
% Passing No. 200	0-1.5	0-2.0
Fracture	90% Min.	85% Min.

Crushed Screenings No. 4 — 0″ for B.S.T.	Specification Limits	Tolerance Limits
% Passing ⅜″	100	95-100
% Passing No. 4	76-100	71-100
% Passing No. 10	30-60	26-64
% Passing No. 200	0-10.0	0-11.0
Fracture	90% Min.	85% Min.

Ballast	Specification Limits	Tolerance Limits
% Passing 2½″	100	95-100
% Passing 2″	65-100	60-100
% Passing 1″	50-85	45-90
% Passing No. 4	26-44	21-49
% Passing No. 40	16 Max.	20 Max.
% Passing No. 200	9.0 Max.	10.0 Max.
Sand Equivalent	35 Min.	30 Min.
Dust Ratio		⅔ Max.

Shoulder Ballast	Specification Limits	Tolerance Limits
% Passing 2½″	100	95-100
% Passing 2″	65-100	60-100
% Passing ¾″	40-80	35-85
% Passing No. 4	0-5	0-6
% Passing No. 100	0-2.0	0-2.9
Fracture	75% Min.	70% Min.

Crushed Surfacing Base Course	Specification Limits	Tolerance Limits
% Passing 1¼″	100	95-100
% Passing 1″	80-100	75-100
% Passing ⅝″	50-80	45-85
% Passing No. 4	25-45	20-50
% Passing No. 40	3-18	3-20
% Passing No. 200	7.5 Max.	9.0 Max.
Sand Equivalent	40 Min.	35 Min.
Fracture	75% Min.	70% Min.

Streambed Sediment	*Specification Limits*	*Tolerance Limits*
% Passing 2½″	100	95-100
% Passing 2″	65-95	60-100
% Passing 1″	50-85	45-85
% Passing No. 4	26-44	11-48
% Passing No. 40	16 max.	18 max.
% Passing No. 200	5.0-9.0	3.0-10.0.

Crushed Surfacing Top Course	Specification Limits	Tolerance Limits
% Passing ¾′′	100	95-100
% Passing ½′′	80-100	75-100
% Passing No. 4	46-66	41-71
% Passing No. 40	8-24	5-27
% Passing No. 200	10.0 Max.	11.0 Max.
Sand Equivalent	40 Min.	35 Min.
Fracture	75% Min.	70% Min.

Maintenance Rock	Specification Limits	Tolerance Limits
% Passing ⅝″	100	95-100
% Passing ½″	90-100	85-100
% Passing No. 4	45-66	40-71
% Passing No. 40	10-25	8-30
% Passing No. 200	7.0 Max.	8.0 Max.
Sand Equivalent	40 Min.	35 Min.
Fracture	75% Min.	70% Min.

Gravel Base	Specification Limits	Tolerance Limits
% Passing 2″	75-100	70-100
% Passing No. 4	22-100	17-100
% Passing No. 200	10.0 Max.	11.0 Max.
Sand Equivalent	30 Min.	35 Min.
Dust Ratio	⅔ Max.	

Gravel Backfill for Walls	Specification Limits	Tolerance Limits
% Passing 4″	100	100
% Passing 2″	75-100	70-100
% Passing No. 4	22-66	17-71
% Passing No. 200	5.0 Max.	6.0 Max.
Sand Equivalent	60 Min.	55 Min.
Dust Ratio	⅔ Max.	

Gravel Backfill for Pipe Zone Bedding	Specification Limits	Tolerance Limits
% Passing 1½″	100	100
% Passing 1″	75-100	70-100
% Passing ⅝″	50-100	45-100
%Passing No. 4	20-80	15-85
% Passing No. 40	3-24	2-29
% Passing No. 200	10.0 Max.	11.0 Max.
Sand Equivalent	35 Min.	30 Min.

Gravel Backfill for Drains	Specification Limits	Tolerance Limits
% Passing 1″	100	95-100
% Passing ¾″	80-100	75-100
% Passing ⅜″	0-40	0-45
% Passing No. 4	0-4	0-5
% Passing No. 200	0-2	0-2.5

Gravel Backfill for Drywells	Specification Limits	Tolerance Limits
% Passing 1½″	100	95-100
% Passing 1″	50-100	45-100
% Passing ¾″	0-20	0-25
% Passing ⅜″	0-2	0-3
% Passing No. 200	0-1.5	0-2.0

Backfill for Sand Drains	Specification Limits	Tolerance Limits
% Passing ½″	90-100	85-100
% Passing No. 4	57-100	52-100
% Passing No. 10	40-100	35-100
% Passing No. 50	3-30	2-35
% Passing No. 100	0-4	0-5
% Passing No. 200	0-3.0	0-3.9

Sand Drainage Blanket	Specification Limits	Tolerance Limits
% Passing 2½″	90-100	85-100
% Passing No. 4	24-100	18-100
% Passing No. 10	14-100	9-100
% Passing No. 50	0-30	0-35
% Passing No. 100	0-7	0-8
% Passing No. 200	0-3.0	0-3.9

Gravel Borrow	Specification Limits	Tolerance Limits
% Passing 4″	100	95-100
% Passing 2″	75-100	70-100
% Passing No. 4	50-80	45-85
% Passing No. 40	30 Max.	33 Max.
% Passing No. 200	7.0 Max.	9.0 Max.
Sand Equivalent	50 Min.	45 Min.

Select Borrow	Specification Limits	Tolerance Limits
% Passing 6″	100	95-100
% Passing 3″	75-100	70-100
% Passing No. 40	50 Max.	55 Max.
% Passing No. 200	10.0 Max.	12.0 Max.
Sand Equivalent	30 Min.	25 Min.

Foundation Material Class A	Specification Limits	Tolerance Limits
% Passing 2½″	98-100	93-100
% Passing 2″	92-100	87-100
% Passing 1½″	72-87	67-92
% Passing ¾″	27-47	22-52
% Passing ⅜″	3-14	2-16
% Passing No. 4	0-5	0-6

Foundation Material Class B	Specification Limits	Tolerance Limits
% Passing 2½″	95-100	90-100
% Passing 2″	75-100	70-100
% Passing 1½″	30-60	25-65
% Passing ¾″	0-5	0-6

Hot Mix Asphalt	Specification Limits	Tolerance Limits
Asphalt Binder-Performance Grade (PG)	AASHTO M320	±10% of spec
Fracture	90% min.	85% min.
Uncompacted Void Content of Fine Aggregate < 3 million ESAL's ≥ 3 million ESAL's	 40% min 44% min	 35% min 39% min
Sand Equivalent	45 min.	40 min.

9-5.7 Acceptance Sampling and Testing Frequency Guide

Item	Test	Acceptance Sample
Gravel Borrow	Grading & SE	1 – 4000 Ton
Select Borrow	Grading & SE	1 – 4000 Ton
Sand Drainage Blanket	Grading	1 – 4000 Ton
Gravel Base	Grading, SE & Dust Ratio	1 – 4000 Ton
CSTC	Grading, SE & Fracture	1 – 2000 Ton
CSBC	Grading, SE & Fracture	1 – 2000 Ton
Streambed Sediment	Grading	1 – 500 tons
Maintenance Rock	Grading, SE & Fracture	1 – 2000 Ton
Ballast	Grading, SE & Dust Ratio	1 – 2000 Ton
Shoulder Ballast	Grading & Fracture	1 – 2000 Ton
Backfill for Sand Drains	Grading	1 – 2000 Ton
Crushed Coverstone	Grading, SE & Fracture	1 – 1000 Ton
Crushed Screening		
⅝ – No. 4	Grading & Fracture	1 – 1000 Ton
½ – No. 4	Grading & Fracture	1 – 1000 Ton
No. 4 – 0	Grading & Fracture	1 – 1000 Ton
Gravel Backfill For		
Foundations	Grading & SE	1 – 1000 Ton
Walls	Grading, SE & Dust Ratio	1 – 1000 Ton
Pipe Zone Bedding	Grading & SE	1 – 1000 Ton
Drains	Grading	1 – 100 Ton
Dry Wells	Grading	1 – 100 Ton
PCC Paving		
Coarse Aggregate See Note 7	Grading	1 – 2000 CY
Fine Aggregate See Note 7	Grading	1 – 2000 CY
Combined Aggregate See Note 7	Grading	1 – 2000 CY
Air Content	Air	1 – 500 CY
Cylinders (28-day)	Compressive Strength	1 – 500 CY
Core	Density	1 – 500 CY
	Thickness	1 – 500 CY
Cement	Chemical & Physical Certification	
See Note 5		
PCC Structures		
Coarse Aggregate See Note 7	Grading	1 – 1000 CY
Fine Aggregate See Note 7	Grading	1 – 1000 CY
Combined Aggregate See Note 7	Grading	1 – 1000 CY
Consistency	Slump	1 for every 5 trucks, See Note 8
Air Content	Air	1 for every 5 trucks, See Note 8
Cylinders (28-day)	Compressive Strength	1 for every 5 trucks, See Note 8
Cement	Chemical & Physical Certification	
Grouts	Compressive Strength	1 set per day
See Note 5		
Hot Mix Asphalt		
Completed Mix, See Note 3 and 4		
	Grading & Asphalt Content	1 – 800 Ton
	Compaction	5 – 400 Ton

Hot Mix Asphalt		
Completed Mix, See Note 3 and 4		
	Grading & Asphalt Content	1 – 800 Ton
	Compaction	5 – 400 Ton
Open Graded, See Note 3 Class D and D Mod.	Grading (Agg. from cold feed)	1-800 Ton

Hot Mix Asphalt Aggregate		
Aggregate	SE, Fracture, Uncompacted Void Content of Fine Aggregate, See Note 3	1 – 1600 Ton
Blend Sand See Note 1	SE	1 – Project
Mineral Filler	Sp. G & PI	Certificate

Asphalt Treated Base		
Aggregate	Grading See Note 1 & SE	1 – 1000 Ton
Completed Mix		
See Note 4	Grading & Asphalt	1 – 1000 Ton
	Compaction, See Note 2	5 – Control Lot

Asphalt Materials		Certification	
Binder Asphalt (AR, PG, Etc.)	Verification:	2-1 quart	every other mix acceptance sample, see Note 6
liquid Asphalt (Cutback, Emulsion)	Verification:	2-1 quart	every other shipment
Emulsion for ACP Tack Coat	Verification:	None required	
Rubberized Asphalt	Verification:	2-1 quart	every other mix acceptance sample

Compaction See Note 9	
Embankment	1 – 2500 CY
Cut Section	1 – 500 LF
Surfacing	1 – 1,000 LF (per layer)
Backfill	1 – 500 CY

Note 1 Tests for grading will be performed only when aggregates are being produced and stockpiled for use on a future project.

Note 2 A control lot shall be a normal days production.

Note 3 For projects under statistical acceptance, the sampling shall be performed on a random basis and the sublot size shall be determined to provide not less than three uniform-sized sublots with a maximum sublot size of 800 tons. Should a lot contain less than three sublots, acceptance will be in accordance with nonstatistical evaluation. For projects under nonstatistical acceptance, sample frequency shall be one sample per sublot, and the sublots shall be approximately uniform in size with a maximum sublot size of 800 tons.

Note 4 Mix design conformation samples shall be submitted to the State Materials Laboratory Bituminous Concrete Section. For all projects, submit one sample per day from the first five days of production for each plant and one sample every fifth day of production thereafter. The conformation samples should be taken in conjunction with and be a representative quarter, of the acceptance samples taken for the project as described in WSDOT Test Method 712. If no acceptance sample is required for any day of production no conformation sample will be required either.

Note 5 Cement may be accepted by the Engineer based on the Manufacturer's Mill Test Report number indicating full conformance to the Specifications. The Engineer has the option of taking samples at the job site for submission to the State Materials Laboratory for testing.

Note 6 The first sample of asphalt binder will be taken with the second Hot Mix Asphalt (HMA) mix sample. For nonstatistical HMA, take one sample for every 1,600 tons of mixture.

Note 7 The frequency for fine, course, and combined concrete aggregate samples for PCC Paving and PCC Structures shall be based on the cubic yard (CY) of concrete.

Note 8 Sample the first truck, and each load until two successive loads meet specifications, and then randomly test one load for every five loads. If at any time one load fails to meet specifications, continue testing every load until two successive loads meet specifications, and then randomly test one load for every five loads.

Note 9 For materials placed in a non-structural application outside the roadway prism such as slope flattening or shoulder dressing, acceptance for compaction may be based on visual inspection to the satisfaction of the engineer.

9-6 Radioactive Testing Devices

9-6.1 Administration and Safety

The purpose of this chapter is to provide a guide for personnel using, and administering the use of, nuclear density gauges. The instructions included in this Chapter will be used throughout the Washington State Department of Transportation for the express purpose of regulating the use of a nuclear density gauge containing radioactive materials.

Each Region shall have a Regional Radiation Administration Officer (RAO) and a Regional Radiation Safety Officer (RSO) whose duties are described in Chapter 9-6.2 and 9-6.3. All Regional RAO and RSO personnel must have radiation safety training. Only personnel who have successfully completed the WSDOT "Nuclear Gauge Safety and Operations" course are authorized to use or transport the nuclear density gauge. Personnel transporting gauges through a common carrier are required to have training that satisfies USDOT training requirements of 49 CFR 172, subpart H (HAZMAT). Recurrent training is required every 3 years (every 2 years if gauges are to be shipped by air). To perform acceptance testing with the nuclear density gauge all personnel must become a qualified or interim tester in either TM-8, In-Place Density of Bituminous Mixtures Using the Nuclear Moisture Gauge, and or, T-310, In-Place Density and Moisture Content of Soils and Soil-Aggregate by Nuclear Method. The operator's responsibilities for safety and security of the gauges are described in Chapter 9-6.4.

All personnel using or responsible for the nuclear density gauge shall be:

1. Thoroughly familiar with the safe handling techniques for using radioactive materials.

2. Fully informed of the hazards to health that exists near radioactive materials.

3. Completely familiar and in compliance with the following rules and regulations:

   a. Rules and Regulations for Radiation Protection by the State Department of Health, Division of Radiation Protection, Title 246, WAC.

   b. Radiation Emergency Handbook by the State Department of Health.

Copies of the above publications will be kept by the Region Radiation Safety Officer and at the storage location of the gauge. A copy of the *Radiation Emergency Handbook* will also be supplied with each nuclear density gauge. Authorized Operator(s) will read this handbook before using the radioactive testing device for testing.

If an emergency as outlined in the *Radiation Emergency Handbook* occurs, the following people or agencies should be notified by the individual in charge of the nuclear density gauge:

1. Radiation Safety Officer.

2. Radiation Administration Officer

The RSO or the RAO will notify, the following people or agencies:

1. Radiation Control Program; Health Services Division; State Department of Health; Olympia, Washington 98504 (Phone 206/NUCLEAR).

2. Washington State Patrol, if a public hazard exists.

3. State Radiation Administration Officer or Radiation Safety Officer, at the Materials Laboratory.

The telephone numbers of these agencies or individuals will be posted at all storage sites and a copy of these numbers shall be kept with each nuclear density gauge.

It is paramount to the Department that it's employees work in a healthy and safe environment. To this end each employee that works around or with nuclear gauges needs to know the potential hazards of working with nuclear gauges and their individual rights. Each office that uses or stores nuclear gauges shall have a copy of the latest "Sealed Source Edition Rules & Regulations for Radiation Protection" published by the Department of Health. Every employee that uses or works near the storage location of the nuclear gauges must sign the "Acknowledgment of the Hazards of Working with Radiation Sources" form after being instructed to review the applicable Chapters 246-220 Radiation - General Provisions; 246-221 Radiation Protection Standards; 246-222 Radiation Protection - Worker Rights. This form is available through the Radiation Safety Officer.

Personal monitoring of radiation received from the nuclear density gauge is one of the major items in the Health Safety Program. Any individual using radioactive sources or receiving on the job training with radioactive sources must wear a radiation exposure badge, which records any exposure that the body may receive. Radiation exposure badges are assigned to individuals. They are not to be used by any other person. Attention is to be made to the conditions outlined in WAC 246-221-010 and WAC 246-221-055 regarding the radiation exposure during pregnancy and dose limits to the embryo/fetus. Personnel with valid safety or health concerns may be released from the operation of nuclear gauges without prejudice to their career opportunities with the Department.

The acquisition of radiation exposure badges as needed by each Region shall be the responsibility of the Regional Radiation Safety Officer or a designated individual with radiation safety training. These badges can be obtained from U.S. Dosimeter Technology Inc., 660-A George Washington Way, Richland, Washington 99352, Telephone (509) 946-8738, or from a firm recognized by the Department of Health to perform this service. Three-month TLD (Thermal Luminescent Dosimeter) badges indicating exposure to gamma, beta, x-ray, and neutron radiation will be used as a minimum.

Each nuclear density gauge will be supplied in the manufacture's shipping container with an adequate latch. While transporting and when storing the nuclear density gauge, it must be secured with a minimum of 3 levels of security using locks:

1. Security level one is considered to be a combination of a lock on the handle of the nuclear density gauge, and a lock on the manufacture's shipping container.

2. Security level two is considered to be the chain and lock combination, or other locking mechanism, used to secure the manufacturers shipping container to the vehicle or toolbox.

3. Security level three is considered to be:

   a. If a passenger vehicle is used for transporting, the manufacturers shipping container containing the nuclear density gauge, which is secured and locked in the trunk.

   b. If a station wagon, van, or panel truck is used, the manufacturers shipping container containing the nuclear density gauge, which is secured and locked in the back of the vehicle in such a manner as to prevent it from moving during transport. Note, if the manufacture's shipping container can be seen through a window or other opening it must be covered.

   c. If a six-passenger pickup with a utility box is used, the manufacturers shipping container containing the nuclear density gauge, which is secured in the utility box with the storage lid locked. The nuclear density gauge shall not be transported in the cab of the truck.

   d. If a pickup is used, the manufacturer's shipping container containing the nuclear density gauge, which is secured to the inside of a suitable utility box. The utility box must be secured to the bed of the pickup and locked to prevent theft.

At all times, the key(s) for the security locks will be in the possession of the individual responsible for the nuclear density gauge.

Every effort shall be made to store and transport nuclear density gauges in an effort to minimize its view from the general public.

When the nuclear density gauges are not in use or in transit, they must be stored with three levels of security in licensed storage locations, or temporary storage facilities approved by the Regional RSO.

Performance audits shall be conducted randomly by the Region Radiation Safety Officer or designee to ensure that each gauge user;

1) Understands the security and transportation requirements described above.

2) Has the necessary means available to use three levels of security in each of their transport vehicles.

3) Is actively employing the three levels of security while gauges are out of a licensed storage area.

The Region Radiation Safety Officer shall retain records of performance audits.

9-6.2 Radiation Administration Officer (Region Materials Engineer)

The Radiation Administration Officer (RAO) will be responsible for administering the use of radioactive material within the Region.

The RAO will obtain, revise, and renew the Region's Radioactive Material License issued by the Washington State Department of Health. A license indicates the strength and type of sources that a Region may possess.

Licenses are issued subject to all the requirements of the Washington Rules and Regulations for Radiation Protection and to the conditions specified in the license. Licenses are also subject to any additional requirements of the Department of Health as stated in letters issued by DOH. Where a letter containing a license condition requirement differs from the Regulations, the letter will supersede the regulations insofar as the license is concerned.

When a change occurs in the radiation program, which would make untrue a statement in the current Radioactive Material License, the Licensee (RSO) will notify the Department of Health and request an appropriate amendment.

The Radiation Safety Officer must be listed on the license. Individual operators are not required to be on the license, but the Radiation Administration Officer or RSO must maintain a list of authorized operators. This list of authorized operators should include the operator's name, type of training, final test score, and a copy of the training certificate. The RAO or RSO will be responsible for the storage of the nuclear density gauge when not in field use, and the assignment of nuclear density gauge to the individual project offices. The RAO or RSO will be responsible for maintaining the following records:

1. List of qualified operators within the Region.

2. Radioactive testing device location records.

3. Radioactive testing device shipping records.

Prior to shipping or transferring the nuclear density gauge from one licensed organization to another, the shipper shall check, and be assured, that the receiver has a valid license; and that the shipped or transferred sources do not exceed the limitations of the receiver's license. Shipment to authorized personnel within the Region is covered by the Region's license. The State Materials Laboratory shall be notified of any repairs or calibration that is needed to the nuclear density gauge. When the nuclear density gauges are not in field use, the normal storage will be at the Region office. This should be an area designated for this purpose with the following information posted on the walls of the room to notify personnel of the existence of radiation:

1. "CAUTION — RADIOACTIVE MATERIALS" sign.

2. DOH Form RHF-3 "Notice to Employees."

3. WAC Chapters 246-220, 246-221, and 246-222 of the Rules and Regulations for Radiation Protection.

4. DOH Form "Notification of a Radiation Emergency."

9-6.3 Radiation Safety Officer

The Radiation Safety Officer (RSO) will have the responsibility for the Regional radiation protection program. The RSO will be responsible for maintaining the following records:

1. Leak test records.
2. Medical records.
3. Radiation Exposure Report.
4. Minor testing device maintenance as outlined in the Radioactive Materials License.
5. The Acknowledgment of the Hazards of Working with Radiation Sources form.

Leak testing is required by law and is simply a swabbing of the sealed source to ascertain that no radioactive contamination has occurred from the nuclear source. The Regional RSO shall be responsible for having each source wiped every six months. The analysis of leak tests shall be done by a commercial firm licensed to do this work.

The service contract will be obtained by individual regions. Records of leak test results shall be kept in units of micro-curies and maintained for inspection. Any leak test revealing the presence of 1850 Bq or more of removable radioactive material shall be reported to the Department of Health, Division of Radiation Protection, P.O. Box 47827, Olympia, WA 98504-7827, within five days of the test. This report should include a description of the defective source or device, the results of the test, and the corrective action taken.

Leak test kits can be obtained from Troxler Electronic Laboratory, Inc. When returning the sample for testing, place the sample in a plastic envelope. Place the plastic envelope(s) in another envelope and write your regions name, address, and other pertinent details on the outside. This envelope must be marked "RADIOACTIVE MATERIALS — NO LABEL REQUIRED."

Place this envelope into another envelope addressed to the approved facility for processing. Prior to being mailed, the contents and packing must be checked with a survey instrument and the radiation at any point on the surface must not exceed a dose rate greater than 0.005 mSv per hour in order to comply with U.S. Postal Regulations.

The RSO will be responsible for radiation exposure reports for their personnel in that Region. Exposure records shall be kept on Department of Health Form RFH-5 or in a manner, which includes all information, required on said form. Each entry shall be for a period of time not exceeding one calendar quarter.

9-6.4 Authorized Operators

The Authorized Operators will be directly responsible to the RAO for the use and storage of the nuclear density gauge in the field and to the RSO for all safety in regard to the nuclear density gauge.

The Authorized Operators shall be responsible for posting the following information at all field storage areas:

1. "CAUTION — RADIOACTIVE MATERIALS" Sign.
2. DOH Form RHF-3 "Notice to Employees."
3. WAC Chapters 246-220, 246-221, and 246-222 of the Rules and Regulations for Radiation Protection.
4. DOH Form "Notification of a Radiation Emergency."

The Authorized Operator must keep the RAO or RSO informed of the location of the nuclear density gauge at all times. (The State Radiation Control Unit inspectors will want the sources produced or the exact locations given during their periodic inspections.) If the exact location where the nuclear density gauge will be used is known in advance, it should be noted before leaving the Region office, and if unknown, shall be forwarded to the RAO or RSO as soon as it is known.

The operation of the shutter-operating device should be continuously checked and any malfunction reported to the RAO or RSO immediately. When not in use, the source index handle will be locked and the nuclear density gauge locked in an adequate storage facility. When operating the nuclear gauge (i.e., when the handle is in the "USE" position), unauthorized personnel are not to be within 15 feet (5 meters) of the gauge.

9-7 Vacant

9-8 WSDOT Testing Methods

9-8.1 Calibrated/Verified Equipment for Testing

The following listed equipment used in the Region Laboratory and in the Field Laboratory for acceptance testing is required to be verified and/or calibrated annually, and shall bear a tag indicating when the calibration or verification will expire. It is the responsibility of the testing personnel (i.e., Module Qualified Testers, Method Qualified Testers, or Interim Qualified Testers and Independent Assurance Inspectors) to check all equipment for serviceability and conformance to the requirements of the test procedure. No equipment with an expired calibration or verification shall be used for testing.

Aggregate Testing

Drying Ovens (AASHTO T-255, 265)

General Purpose Balances, Scales and Weights (AASHTO M-231)

Mechanical Sieve Shaker (AASHTO T-27)

Sand Equivalent Shaker (AASHTO T-176)

Sand Equivalent Weighted Foot Assembly (AASHTO T-176)

Sand Equivalent Irrigation Tube (AASHTO T-176)

Sieves (AASHTO M-92)

Thermometers

Timing Devices (AASHTO T-176)

Fine Aggregate Apparatus (AASHTO T-304)

Flat and Elongated Particle Shape Apparatus (ASTM D-4791)

Hot Mix Asphalt Testing

Drying Ovens (AASHTO T-255, 265, and WAQTC TM-6)

General Purpose Balances, Scales and Weights (AASHTO M-231)

Ignition Furnace (AASHTO T-308)

Mechanical Sieve Shaker (AASHTO T-30)

Sieves (AASHTO M-92)

Thermometer - ASTM 17C or 17F (AASHTO T-209)

Thermometer – drying temperature

Timing Devices

Vacuum System (AASHTO T-209)

Water Bath - if used (AASHTO T-209)

Pycnometer (AASHTO T-209)

Gyratory Compactor (AASHTO T-312)

Weighting Bath (AASHTO T-166)

Concrete Testing

Concrete Air Meters - Pressure gauge (AASHTO T-152)

Concrete Air Meters - Volumetric gauge (AASHTO- T152)

Cube Molds and Tamper (AASHTO T106 and WSDOT T-813) (no tag on tamper required)

General Purpose Balances, Scales and Weights (AASHTO M-231)

Rebound Hammer Type N (ASTM C-805)

Single Use Molds (AASHTO M-205) (no tag required)

Slump Cone and Rod (AASHTO T-119) (no tag on rod required)

Thermometer (AASHTO T-309)

Compression Testing Devise and associated equipment (AASHTO T-22, WSDOT T-802)

Beam Molds (WSDOT T-808)

Embankment and Base Density Testing

Drying Ovens (AASHTO T-255, 265)

General Purpose Balances, Scales and Weights (AASHTO M-231)

Manual Hammer (AASHTO T-99)

Mechanical Sieve Shaker (AASHTO T-27)

Maximum Density Devise (WSDOT T-606)

Nuclear Density Gauge (AASHTO T-310)

Sieves (AASHTO M-92)

Speedy Moisture Meter (AASHTO T-217)

Soil Mold (AASHTO T-99 and WSDOT T-606)

Straight Edge (AASHTO T-99)

Hot Mix Asphalt Density Testing

Nuclear Density Gauge (WAQTC TM-8)

Thermometer

9-8.2 Field Test Methods for Materials

The test method as specified by WSDOT Materials Manual will be used to perform the testing. All testing will be performed by Module Qualified Testers, Individual Method Qualified Testers, or Interim Qualified Testers as defined in Chapter 9-5 of this manual. The tester can be qualified in a testing module, or by individual test methods. Section 9-8.2A is the list of the tests that are included in each of the modules. A tester can be Individual Method Qualified in any test that are included in the modules or from the list of individual tests in Section 9-8.2B, however the tester is not limited to just these tests. All of the test methods listed in each of the testing modules can be found in the blue pages following this section, see Section 9-8.2C for the Contents. In addition the WSDOT and WAQTC test methods that are performed in the field and that are listed in Section 9-8.2B are included.

9-8.2A Testing Modules

Testing Modules Procedures

Aggregate Module

Procedure Number	Test Method
AASHTO T-2	**WSDOT FOP for AASHTO for** the Sampling of Aggregates
AASHTO T-27/T11	**WSDOT FOP for WAQTC/AASHTO for the Sieve Analysis of Fine & Coarse Aggregates**
AASHTO T-176	**WSDOT FOP for AASHTO for** Determining the Plastic Fines in Graded Aggregate by Use of the Sand Equivalent Test
AASHTO T-248	**WSDOT FOP for AASHTO for** Reducing Field Samples of Aggregates to Testing Size
AASHTO T-255	**WSDOT FOP for AASHTO for** Determining the Total Moisture Content of Aggregate by Drying
AASHTO TP 61	**WSDOT FOP for AASHTO for** Determining the Percentage of Fracture in Coarse Aggregate
Asphalt Module	
AASHTO T-168	**FOP for WAQTC/AASHTO for** the Sampling Bituminous Paving Mixtures
AASHTO T-209	**WSDOT FOP for AASHTO for** Determining the Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
AASHTO T-27/T11	**WSDOT FOP for WAQTC/AASHTO for** the Sieve Analysis of Fine & Coarse Aggregates
AASHTO T-40	**WSDOT FOP for WAQTC/AASHTO for** Sampling Bituminous Materials
AASHTO T-308	**WSDOT FOP for AASHTO for** Determining Asphalt Content of Hot Mix Asphalt (HMA) by the Ignition Method
AASHTO T-329	**WSDOT FOP for AASHTO for** Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
WSDOT 712	Standard Method of Reducing Bituminous Paving Mixtures
WSDOT 716	Method of Random Sampling for Location of Testing and Sampling Sites
Concrete Module	
AASHTO T-23	**WSDOT FOP for AASHTO for** Making and Curing Concrete test Specimens in the Field
AASHTO T-119	**WSDOT FOP for AASHTO for** Determining the Slump of Hydraulic Cement Concrete
AASHTO T-152	**WSDOT FOP for WAQTC/AASHTO for** Determining the Air Content of Freshly Mixed Concrete by the Pressure Method
WAQTC TM-2	Sampling Freshly Mixed Concrete
AASHTO T-309	**WSDOT FOP for AASHTO for** Determining the Temperature of Freshly Mixed Portland Cement Concrete
WSDOT 716	Method of Random Sampling for Location of Testing and Sampling Sites
Embankment and Base Density Module	
AASHTO T-310	**WSDOT FOP for AASHTO for** In-Place Density and Moisture Content of Soil and Soil Aggregate by Nuclear Method
WSDOT SOP 615	Determination of the % Compaction for Embankment & Untreated Surfacing Materials Using the Nuclear Moisture-Density Gauge
Hot Mix Asphalt Density Module	
WAQTC TM-8	**WSDOT FOP for WAQTC for** In Place Density of Bituminous Mixtures Using the Nuclear Moisture Gauge
WSDOT 716	Method of Random Sampling for Location of Testing and Sampling Sites

9-8.2B Individual Tests Method

Procedure Number	Owner	Test Method
T 19	AASHTO	Unit Weight and Voids in Aggregates
T 21	AASHTO	Organic Impurities in Fine Aggregates for Concrete
T 22	WSDOT	FOP for AASHTO for Compressive Strength of Cylindrical Concrete Specimens
T 23	WSDOT	FOP for AASHTO for Making and Curing Concrete Test Specimens in the Field
T 27/T 11	WAQTC	FOP for WAQTC/AASHTO for the Sieve Analysis of Fine & Coarse Aggregates
T 65	AASHTO	Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
T 88	AASHTO	Particle Size Analysis of Soils
T 99	WSDOT	FOP for AASHTO for Moisture-Density Relations of Soils Using a 5.5-lb Rammer and a 12-in. Drop
T 106	WSDOT	FOP for AASHTO for Compressive Strength of Mortars (Using 2-in.) Cube Specimens
T 121	AASHTO	Weight per Cubic Foot, Yield, and Air Content of Concrete
T 123	WSDOT	Method of Test for Bark Mulch
T 166	WSDOT	FOP for AASHTO for Bulk Specific Gravity of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens
T 196	AASHTO	Air Content of Freshly Mixed Concrete by the Volumetric Method
T 217	WSDOT	**FOP for AASHTO for** Determination of Moisture in Soils by Means of a Calcium Carbide Gas Pressure Moisture Tester
T 231	WSDOT	FOP for AASHTO for Capping Cylindrical Concrete Specimens
T 244	AASHTO	Mechanical Testing of Steel Products
T 272	WSDOT	**FOP for AASHTO for Family** of Curves-One Point Method
T 304	WSDOT	FOP for AASHTO for Standard Method of Test for Uncompacted Void Content of Fine Aggregate
T 312	WSDOT	FOP for AASHTO for Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
T 417	WSDOT	Method of Test for Determining Minimum Resistively and pH of Soil and Water
T 606	WSDOT	Method of Test for Compaction Control of Granular Materials
T 720	WSDOT	Method of Test for Thickness Measurement of Asphalt Concrete Cores
T 724	WSDOT	Method for Preparation of Aggregate for HMA Job Mix Design
T 726	WSDOT	Method of Test for Mixing Procedure for Binder and Aggregate
T 802	WSDOT	Flexural Strength of Concrete [Using Simple Beam with Center-Point Loading Breaking)
C 805	WSDOT	FOP for ASTM for Test Method for Rebound Number of Hardened Concrete
T 810	WSDOT	Method of Test for Determination of the Density of Portland Cement Concrete Pavement Cores
T 812	WSDOT	Measuring Length of Drilled Concrete Cores
T 914	WSDOT	Practice for Sampling of Geotextiles for Testing
C 939	WSDOT	FOP for ASTM for Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
D 1186	WSDOT	**FOP for ASTM for** Nondestructive Measurement of Thickness of Nonmagnetic Coating on a Ferrous Base
D 4791	WSDOT	FOP for ASTM for Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

9-8.2C Contents for Test Procedures in This Manual

Procedure Number	Owner	Test Method
T 2	WSDOT	**FOP for AASHTO for** Sampling of Aggregate
TM 2	WAQTC	FOP for WAQTC for Sampling Freshly Mixed Concrete
TM 8	WAQTC	**FOP for WAQTC for** In-Place Density of Bituminous Mixes Using the nuclear Moisture-Density Gauge
T 23	WSDOT	**FOP for AASHTO for** Making and Curing Concrete test Specimens in the Field
T 27/11	WAQTC	**FOP for WAQTC/AASHTO for** Sieve Analysis of Fine and Coarse Aggregates
T 40	WAQTC	**FOP for WAQTC/AASHTO for** Sampling Bituminous Materials
TP 61	WSDOT	**FOP for AASHTO** for Determining the Percentage of Fracture in Coarse Aggregate
T 99	WSDOT	**FOP for AASHTO for** Moisture-Density Relations of Soils Using a 5.5-lb Rammer and a 12-in. rop
T 119	WSDOT	**FOP for AASHTO for** Standard Test Method for Slump of Hydraulic-Cement Concrete
T 123	WSDOT	Method of Test for Bark Mulch
T 152	WAQTC	**FOP for WAQTC/AASHTO for** Air Content of Freshly Mixed Concrete by the Pressure Method
T 166	WSDOT	**FOP for AASHTO for** Bulk Specific Gravities of Compacted Asphalt Mixtures Using Saturated Surface Dry Specimens
T 168	WAQTC	**FOP for WAQTC/AASHTO for** Sampling Bituminous Paving Mixtures
T 176	WSDOT	**FOP for AASHTO for** Plastic Fines in Grade Aggregate by Use of the Sand Equivalent Test
T 209	WSDOT	**FOP for AASHTO for** Method of Test for Maximum Specific Gravity of Bituminous Paving Mixtures — “Rice Density”
T 217	WSDOT	**FOP for AASHTO for** Determination of Moisture in Soils by means of a Calcium Carbide Gas Pressure Moisture Tester
T 248	WSDOT	**FOP for AASHTO for** Reducing Samples of Aggregate to Testing Size
T 255	WSDOT	**FOP for AASHTO for** Total Moisture Content of Aggregate by Drying
T 272	WSDOT	**FOP for AASHTO for** Family of Curves — One Point Method
T 304	WSDOT	**FOP for AASHTO for** Uncompacted Void Content of Fine Aggregate
T 308	WSDOT	**FOP for AASHTO for** Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
T 309	WSDOT	**FOP for AASHTO for** Method for Determination of the Temperature of Freshly Mixed Concrete
T 310	WSDOT	**FOP for AASHTO for** In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
T 312	WSDOT	**FOP for AASHTO for** Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
T 329	WSDOT	FOP for AASHTO Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
T 420	WSDOT	**FOP for AASHTO for** Determining the Maturity of Compost (Solvita Test)
SOP 615	WSDOT	Determination of the % Compaction for Embankment & Untreated Surfacing Materials using the Nuclear Moisture-Density Gauge
T 712	WSDOT	Standard Method of Reducing Bituminous Paving Mixtures
T 716	WSDOT	Method of Random Sampling for Location of Testing and Sampling Sites
T 724	WSDOT	Method for Preparation of Aggregate for ACP Job Mix Design
T 726	WSDOT	Method of Test for Mixing Procedure for Binder and Aggregate

SOP 728	WSDOT	Standard Operating Procedure for Determining the Ignition Furnace Calibration Factor (IFCF) for Hot Mix Asphalt (HMA)
SOP 729	WSDOT	In Place Density of Bituminous Mixes Using the Nuclear Moisture-Density Gauge FOP for WAQTC TM 8
SOP 730	WSDOT	Standard Operating Procedure for Correlation of Nuclear Gauge Determined Density with Hot Mix Asphalt Cores
SOP 731	WSDOT	Standard Operating Procedure for Method for Determining Volumetric Properties of Hot Mix Asphalt
SOP 733	WSDOT	Standard Operating Procedure for Determination of Pavement Density Differentials Using the Nuclear Density Gauge
SOP 734	WSDOT	Standard Operating Procedure for Sampling Hot Mix Asphalt (HMA) after Compaction (Obtaining Cores)
SOP 735	WSDOT	Standard Operating Procedure for Longitudinal Joint Density
C 805	WSDOT	Rebound Hammer Determination of Compressive Strength of Hardened Concrete
T 813	WSDOT	Field Method of Fabrication of 2-in. Cube Specimens for Compressive Strength Testing of Grouts and Mortars
T 914	WSDOT	Practice for Sampling of Geotextiles for Testing
C 939	WSDOT	**FOP for ASTM for** Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
D 1186	WSDOT	Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base
C 1611	WSDOT	FOP for ASTM for Slump Flow of Self-Consolidating Concrete
C 1621	WSDOT	FOP for ASTM for Passing Ability of Self-Consolidating Concrete by J-Ring
D 4791	WSDOT	FOP for ASTM for Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

- Traffic Control Reports – Book Number 4 Contractors Daily Report of Traffic Control and Traffic Surveillance
- Pile Driving Records – Book Number 5
- Post Tensioning Records – Book Number 6
- Contaminated Material Disposal Bills – Book Number 7
- Miscellaneous Records – Book Number 8
- As Built Plans and Completed Contractor Provided Shop Drawings

10-3.1B Temporary Final Records

All records designated as *Temporary Final Records* are to be retained within the Region for a period of three years after which they may be destroyed. If a claim, lawsuit, or other circumstance is found to be pending at the end of this three year period, the Region should further retain those pertinent records until the issues have been resolved. The Region should ensure that those records designated as *Temporary Final Records* are also assembled as a portion of the overall project final records. The date for the beginning of this three year retention period for State-funded projects is the Acceptance Date; the date the State Construction Engineer signs the Final Contract Voucher Certification accepting the project. If Federal funds are involved in the project, the date for the beginning of this three-year retention period is the date that FHWA accepts the final payment voucher. The Headquarters Records Services will send a copy of Retention of Records on Federal Aid Projects (DOT Form 133-072) to the Region that specifically indicates the starting and ending dates for this period.

The following list contains some of the items that may be kept as *Temporary Final Records*. This listing is not a complete listing of all the possible items that could be grouped into this category. In short, *Temporary Final Records* consist of all project records that are not kept as *Permanent Final Records*. If *Temporary Final Records* are kept in numbered books then, in order to eliminate confusion with *Permanent Final Records*, these books are to be numbered consecutively beginning with Book Number 8. Examples of *Temporary Final Records* include:

- Item Quantity Tickets
- Project Engineer's Copy of Estimates
- Project Correspondence
- Inspector's Record of Field Tests
- Scaleman's Diary and Scale Checks
- Scale Test Reports
- Concrete Pour Records
- Record of Field Audits
- Approval of Source of Materials
- Quantity Computation Sheets
- Surfacing Depth Check Records
- Prints of Shop Drawings
- Contractor's Payrolls (Federal Aid Projects)
- FHWA Form 1589 (ARRA Projects)
- Source document files
- Alignment (Transit) Book
- Grade Book
- Cross-Section Notes
- Drainage Notes
- Photographs
- Mass Diagrams
- Computer Summary Sheets
- Computer Listings
- Falsework and Form Plans
- Daily Report of Force Account Worked
- Quarterly Report of Amounts Credited DBE Participation
- Annual Report of Amounts Paid as MBE/WBE Participation
- Washington State Patrol Field Check list

10-3.1C Electronic Documents Filed with Temporary/Permanent Records

Documents created electronically that do not require an original signature may be kept in an electronic file cabinet during the life of the contract, and if they are not part of the permanent records, they may be placed on a CD and included in the temporary files. No hard copies are necessary.

Documents created electronically that require an original signature and which are to be included in the permanent final records package may be kept in an electronic file cabinet during the life of the contract; however, original hard copies must be provided as part of the permanent records package. CDs are not acceptable.

Documents created electronically that require an original signature and which are not part of the permanent final records package may be kept in an electronic file cabinet during the life of the contract, placed on a CD for the temporary files and the original hard copies destroyed at contract Acceptance or at the end of the three-year retention period

10-3.2 Contracts

The original signed contract documents are maintained in the Contract Processing Section of the State Accounting Services Office during the active stage of a contract. After final payment has been made, Accounting sends these documents to Records Services for permanent filing.

10-3.3 Change Orders

Approved change orders are a legal part of the contract documents and are treated just like the original contract documents. For a complete discussion of change orders, see Chapter 1-2.4C.

10-3.4 Contract Estimate Payments

Documentation of contract estimate payments is facilitated by use of the electronic Contract Administration and Payment System (CAPS) which includes both the monthly progress estimates and the final estimate. For a complete discussion of the contract estimate process, see Chapter 1-3.1. Specific information on the final estimate package is found in Chapter 1-3.1D. After final payment has been made, Accounting sends these documents to Records Services for permanent filing.

10-3.5 Final Record Book No. 1

Final Record Book No. 1 is the first book of the *Permanent Final Records* for a construction contract. It contains indices to the records that have been compiled for both *Permanent and Temporary Final Records*. It also identifies the people who worked on the project and provides specific summary information. Final Record Book No. 1 is to be signed by the Regional Administrator or designee. Final Record Book No. 1 should contain a title sheet, Form 422 009 EF, and should be assembled with a semi rigid, water resistant cover.

The following records are to be incorporated into Final Record Book No. 1 in the order as arranged below. No other material is to be included in this book.

1. *Index*. There are two indices referred to within Final Record Book No. 1. The first is an index or detailed listing showing the various sections of Final Record Book No. 1 itself. An example of an index for Final Record Book No. 1 can be found in Figure 10-2. The second index is actually the first section of the book. It provides a detailed listing of all records that have been kept and assembled for the project, including both *Permanent Records* and *Temporary Records*. An example of this listing or index for Section 1 can be found in Figure 10-3.

2. *WSDOT Personnel List*. Section 2 of Final Record Book No. 1 contains a listing of all WSDOT personnel assigned to the project and their classifications. Each person noted should place their identifying signature and initials after their name on the listing in the same manner as it appears in other final record documents. The project office may use WSDOT Form 422-001 EF Project Personnel Signature Listing for this purpose.

3. *Comparison of Quantities*. Section 3 of Final Record Book No. 1 contains this CAPS report prepared from the Final Estimate.

4. *Final Estimate Sheets*. Section 4 of Final Record Book No. 1 contains a copy of the Final Contract Voucher Certification.

5. *Contract Estimate Payment Totals*. Section 5 of Final Record Book No.1 contains a copy of this report obtained from the final estimate.

6. *Affidavit of Wages Paid*. Section 6 of Final Records Book No. 1 contains all Affidavit of Wages Paid received from the Contractor, subcontractors, lower tier subcontractors or suppliers performing work or providing certain products to the project.

7. *Change Orders*. Section 7 of Final Records Book No. 1 contains a listing of all Change Orders prepared for the completed project.

8. *Record of Construction Materials*. Section 8 of Final Records Book No. 1 contains a tabulation showing the source of all construction materials. If material of a certain type was obtained from two or more sources, the station limits or parts of a structure relative to each source should be shown. Depending on the size of project and the method used to record this activity, a copy of the completed Record of Materials (ROM) or a summary from the contract's ROM database may satisfy this requirement. This is an acceptable method as opposed to preparing a separate or duplicate listing.

When preparing the individual Final Record Books, other than Book No. 1, it is not necessary to label pages within each book. Where it is appropriate, a table of contents may be added to identify sections within a particular book.

10-3.6 Diary Records

Diary records consist of both the Project Diary(s) and the Inspector's Daily Report (IDR). Together they should provide a complete narrative picture of the project, covering both the normal work processes and anything unusual that might have occurred on the project. Diary records are to be included in the project's *Permanent Final Records*.

10-3.6A Project Engineer's Diary

A complete, well-kept Project Diary is a valuable administrative tool. It is a collection point for many of the project's pertinent facts arranged in any chronological order. It may show how questions were answered, how problems were solved, progress of the work, and unusual conditions pertaining to working days charged. It can provide data for analysis of both claims and requests for extensions of contract time. It is also available for reference long after the work is completed.

The Project Engineer should ensure that a Project Diary is kept current for every construction contract. It is recommended that the Project Diary be maintained primarily by the Project Engineer. However this responsibility may be delegated to the Assistant Project Engineer or to the Chief Field Inspector. At a minimum, one Construction Project Diary is required for each project. The Project Diary should be used to record all matters of importance which are not covered by other routine reports or may contain a record of routine matters if the circumstances are unusual, conferences with the Contractor or the Contractor's field representative, agreements made, special notes regarding equipment or organization, labor conditions, weather or other causes for delays if of any consequence, and any other matters that might have a bearing on the completion of the project. To avoid keeping separate diaries and to avoid duplication, the Project Engineer and the principal assistant(s) may make entries in the same diary. Each diary entry should include the date of the entry and be followed by a signature or initials on the line immediately under the entry to identify the writer. The Project Engineer is responsible for ensuring the existence of a Construction Project Diary for each project.

Washington State Department of Transportation

Item Quantity Ticket

Date *	Location	Group
Remarks		

Time Received	◯ AM ◯ PM	Time Weighed	◯ AM ◯ PM
Received By *		Weighed By	
Pit Number		Truck Number *	
Check One * ◯ Tons ◯ Hours ◯ Cu. Yds. ◯ M. Gal. ◯ LBS. ◯ Each ◯ Days		Legal Gross Weight	
		Gross *	
		Tare *	
		Net *	
Other Unit of Measure		This Load	Total

Item Identification	
Contract Number *	Item Number *
Item Description	
Subcontractor	
Contractor	
*** Required Information**	Ticket Number

DOT Form 422-021
Revised 4/00

Figure 10-1

Contract #6767
Johnson Creek Bridge 112/38
Columbia Basin Region
Final Records Book Number 1

Item	Section
Listing of All Final Records Books	1
Listing of State Personnel	2
Comparison of Quantities	3
Final Contract Voucher	4
Contract Estimate Payment Totals	5
Affidavit of Wages Paid	6
Change Orders	7
Record of Construction Materials	8

Figure 10-2

Contract #6767
Johnson Creek Bridge 112/38
Columbia Basin Region

Permanent Final Records
(Retained at Headquarters Records Services)

Book Description	Book No.
Final Records Book No. 1	1
Project Engineer's Diary	2
Inspector's Daily Report	3
Traffic Control Reports	4
Pile Driving Records	5
Post Tensioning Records (Not used for this project)	-
Contaminated Material Disposal Bills	7
Miscellaneous Records	8
As Built Plans (submitted under Separate cover dated 8/10/00)	

Temporary Final Records
(Retained Within the Region)

Description
Item Quantity Tickets
Project Engineer's Copy of Estimates
Inspector's Record of Field Tests
Scaleman's Diary and Scale Checks
Scale Test Reports
Concrete Pour Records
Record of Field Audits
Surfacing Depth Check Records
Approval of Source of Materials
Quantity Computation Sheets
Source document files
Drainage Notes
Contractor's Payrolls (Federal Aid Projects)
FHWA Form 1589 (ARRA Projects)
Prints of Shop Drawings
Alignment (Transit) Book
Grade Book
Cross-Section Notes
Photographs
Mass Diagrams
Computer Summary Sheets
Computer Listings
Falsework and Form Plans
Daily Report of Force Account Worked

Figure 10-3

Washington State Department of Transportation

Field Note Record

Contract No.	Station	Line	C/S
4747	SEE DETAIL	L-LINE	2316

Staked By	Date	Work Started	Work Completed
Y. Lewis	2-12-98	2-5-98	2-9-98

Calculated By	Date	Checked By	Date	Inspector's Signature	Date
Y.L.	2-14-98	CB	2-15-98	John Smith	2-9-98

CREW: LEWIS M, BARNES, TOMS
WEATHER: CLEAR, COOL

CLEARING & GRUBBING

GROUP 1 TOTAL 21172 M^2 FROM REVERSE SIDE
= 2.12 HECTARES

GROUP 2 TOTAL 14609 FROM PAGE 4
= 1.46 HECTARES

PROJECT TOTAL = 3.58 HECTARES

Item No.	Material	Manufacturer	Brand Name Model/Type	RAMS/QPL Ref. No.	Appr/Accept Code	Basis of Acceptance

Item No.	Item Description	Group	Date Work Completed	Unit	Quantity	CAPS Entry No.	Posted By Initials	Posted By Date	Checked By Initials	Checked By Date	Est. No.
2	CLEARING & GRUBBING	1	2-9-98	HECTARE	2.12	7	AS	4/16	CR	4/20	1
2	" "	2	2-9-98	HECTARE	1.46	8	AS	4/16	CR	4/20	1

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Revised 3/98

Page No. _____

Figure 10-4

Book No. _____ Page No. _____

Structure Excavation (Pipe Structure Excavation Width = 1 M)

Station	Flow Line Grade	Original Ground	Sub-Grade	Centerline Cut		PK 1.8 M Rt. Offset Hub	Offset Cut F.L.	Remarks
				Flow Line	Bottom Ditch			
CB 9-18								
0+000	122.28	123.02		C-0.74		122.97	C-0.69	
0+000.7	122.29	123.02		C-0.73				BEGIN STR. EXC.
0+010	122.53	122.96		C-0.43				
0+020	122.80	123.14		C-0.34		123.51	C-0.71	
0+030	123.00	123.38		C-0.38				
0+040	123.33	123.60		C-0.27		124.05	C-0.72	
0+049.3	123.38	123.81		C-0.43				END STR. EXC.
0+050	123.40	123.81		C-0.41		124.21	C-0.81	
CB 9-15								

Remarks STR. EXC.

0.05 M ADDED FOR PIPE THICKNESS

GR 4

0+000.7	C - 0.74	0.64	x	9.3 x 1	=	5.95	
0+010	C - 0.43	0.48	x	1.5 x 1	=	0.72	
0+011.5	C - 0.42	0.43	x	8.5 x 1	=	3.66	6.7 GR 4

GR 2

0+020	C - 0.34	0.41	x	10 x 1	=	4.10	
0+030	C - 0.38	0.38	x	10 x 1	=	3.80	
0+040	C - 0.27	0.40	x	9.3 x 1	=	3.72	
0+049.3	C - 0.43					15.3	GR 2

CB 0.85 x 0.91 x 0.61
1.46 x 1.52 x 1.04 = 2.3 M^3

PAY 6.7 M^3 GR 4
17.6 M^3 GR 2

6.7
15.3
2.3
24.3 M^3 TOTAL STR. EXC.

DOT Form 422-637 EF
Revised 9/97

Figure 10-7

Washington State Department of Transportation

Field Note Record

Contract No.	Station	Mile/Line:	C/S
C7616	Project Limits	SR 26	0134 - G1/ 3830 - G2

Staked by	Date	Work Started Date	Work Completed	Date
Jason Lefler	3/23/2009	4/27/2009	4/27/2009	

Calculated by	Date	Checked by	Date	Inspector	Date
Jason Lefler	4/27/2009	Sean Carpenter	5/6/2009	Jason Lefler	4/27/09

One Type B Guardrail Connection installed at each bridge corner; 4 total.

Group 1
Station 299+93 Left and Right = 2

Pay 2.00 each

Group 2
Station 302+43 Left and Right = 2

Pay 2.00 each

Item Num	Material Brand Name/Model Type	Manufacturer	RAMS/QPL Ref. No.	Appr/Acc Code	Basis of Accept	Acceptance Date	Acceptance Init.
019.01	9-16 Fence and Guardrail W and Thrie Beam + componants	Trinity Highway Products, LLC	QPL-0012	3002	Document conformance to approved plan	04/27/09	JL
019.02.00	9-09 Timber and Lumber	Superior Wood Treating	QPL-0013	2110	Verify Cert of Treatment and Lumber Grade Stamp.	04/27/09	JL
019.02.02	Steel Fasteners Threaded Rods,Nuts,and Washers	Portland Bolt and Mfrg	QPL-0022	2015	Verify Product along with MCC and CMO	04/27/09	JL
019.02.03	9-26 Epoxy Resins Acrylic Tie (AT)	Simpson Strong Tie Co., Inc.	QPL-0021	3008	Visually Verify Product	04/27/09	JL

Item Num	Item Description	Grp	Date Work Complete	Unit	Quantity	Ledger Entry No.	Posted By Init.	Posted By Date	Checked By Init.	Checked By Date	Est. No.
0019	TYPE B GUARDRAIL CONNECTION	1	4/27/2009	EACH	2.00	48	rah	05/07/09	TH	05/07/09	
0019	TYPE B GUARDRAIL CONNECTION	2	4/27/2009	EACH	2.00	49	rah	05/07/09	TH	05/07/09	

Attachments

File Attachment

DOT Form IP 422-635ER EF
Revised 2/2009

Figure 10-8

IDR Sheet 1 of Sheets

Washington State Department of Transportation

Inspector's Daily Report

Contract	SR Nos.	Day	Shift	Date
7675	2	Tuesday	Day	4/7/2009

Weather
AM clear/cool PM clear/warm

Prime Contractor	Representative/Title
A. Hi Tech Rockfall	Dan Rivas

	Subcontractor or Agent	Appr'd	DBE	Representative/Title
B	Northstar	X		Laurie P

Work Activity Summary
Description and Location

Rock slope scaling on Slope 5A

Pay Note Made Today?
☑ No - Work not complete. Will complete Paynote on completion or at estimate cutoff.
☐ No - LS Item. Work is not completed. Will complete paynote on completion or percentage at estimate cutoff.
NOTE: Any "No" will be explained in Diary.

Item No.	Contract Item Description	Location	Required Backup Samples Taken Y/N	Matls Documentation Approved Y/N	Matls Source Approved Y/N	Y/N
27	Rock slope scaling	Slope 5A	NA	NA	NA	N/A
20	project temporary traffic control	slope 5A and 5B	-	-	-	-

File upload

File Attachment

Contractor's Equipment

Operating Contractors Id (A-E Above)

	No.	Equipment - ID No. and Description	Opr	Stdby	Down	Idle
A		CAT 420 E Backhoe, Rental	X			
B	25	PCMS, #MB-25, southbound US 97	X			

Contractor's Workforce

Operating contractors ID(A-E see above)

	Number/Hours																Number			
	Laborers		Carpenters		Operators		Teamsters		IronWorkers		Masons		Flaggers		Electricians		Male	Female	Appr	Trnee
A	6	7															6	0		
B													3	9			1	2		

Traffic Control

Was Traffic Control Labor Required Today? ☑ Yes ☐ No
Was WZTC according to approved TCP? ☑ Yes ☐ No
Photos/Video taken Today? ☑ Yes ☐ No
Do all Flaggers and Spotters have current flagging card? ☑ Yes ☐ No

Inspector's On Site Hours
From 7:15 am
To 3:30 pm

Joseph Burnell
(Signed) Inspector

Jerry White
(Signed) Reviewed By

DOT Form IP 422-004b EF
Revised 9/2008

Reviewed by JLW **C.I./P.M.** **A.P.E.** epp **P.E.** JLW **O.E.**

Figure 10-9

IDR Sheet of Sheets

Washington State
Department of Transportation

Inspector's Daily Report

Contract	Day	Date
7675	Tuesday	2009-04-07

File Attach 004 A

File Attachment

DIARY - Including but not limited to: a report of the day's operations, time log (if applicable), orders given and received, discussions with contractor, and any applicable statements for the monthly estimate.

7:15 am I arrived to site. Hi tech is starting scaling on slope 5A. Traffic control is set up according to plan. Hi tech installed inlet protection on slope 5. I informed Dan that they installed an item that was not on the ROM. The inlet protection that they installed was not the product that they submitted on the RAM. I told him that they need to use the materials that they submitted. I looked the product up and it is a approved item in the QPL. I told him that the product they used is ok as is.
8:20 am Hi-Tech starts bringing down rock on slope 5A from scaling. We are now holding traffic for the maximum 20 minutes as shown in the plans. The TCS is documenting the wait times for traffic.
9:00 am The TCS is switching out the tubular markers with cones.
12:15 pm Eric Pierson and Mike Mulhern are on site to look at slope 5B. We decided that we need to remove the rock slope below the crack at the top of slope 5B. Dan said that they will plan to remove the rock starting next Monday.
1:30 pm Claton Belmont arrived on site to take a look at environmental concerns for the additional work needed on slope 5B. We walked around the top of slope 5B and Claton does not have any concerns about the additional work needed on the slope.
2:30 pm Done scaling for the day. Hi-Tech worked on slope 5A for the entire day.
scaling hours: 7:00 to 2:30, 1/2 hour lunch
7 hours scaling, 2 scaling crews
I told Dan that they need to get an equipment operator on site. As of now they are using a scaling foreman (Roy) to operate the backhoe to remove the roadway debris. Dan said that they will get another scaler or get an equipment operator.
3:00 pm Ron, Garret, and Arnie from Pipkin construction stop by to look at slope 5B. They said that they would like to use an excavator to perform the additional work on slope 5B. They said that they could carve in an access road to get the excavator to the top of the slope. Garrett said that maybe we will pay for the equipment by the hour because of the difficulty in estimating how long it will take to remove the rock on slope 5B. They said that they would like to stock pile the material in the large pull out that we are currently stockpiling the scaling debris. Dave with DOT maintenance in Waterville stopped by. He said that there is plenty of room in waste site no. 2 to hold any additional rock that that we bring down on slope 5B.
3:30 pm I left the site.

	Joseph Burnell
Signed	Inspector

Figure 10-9 (continued)

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