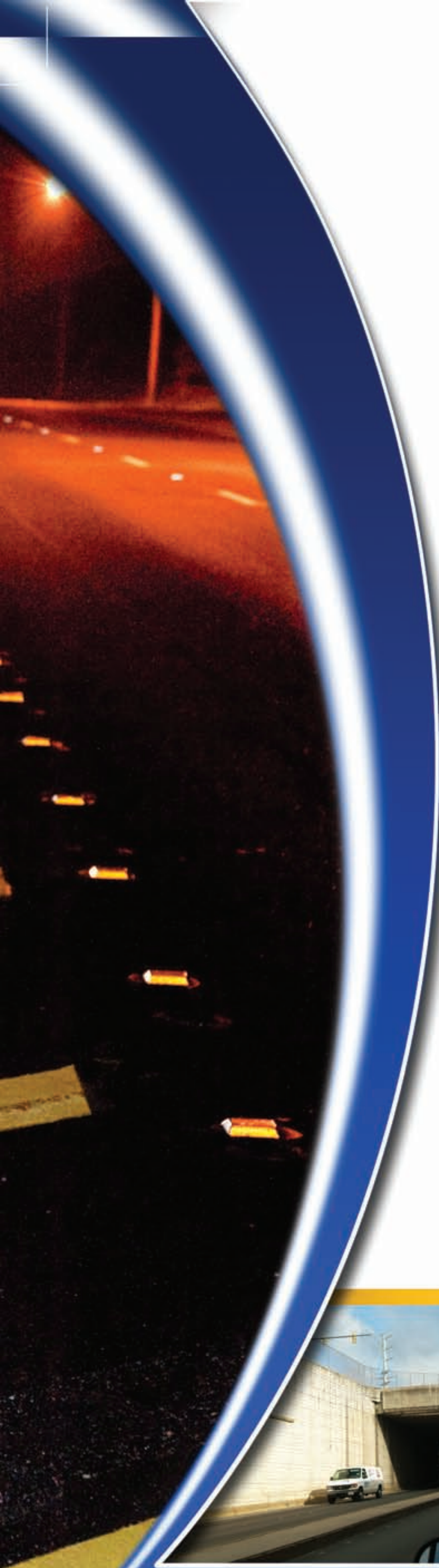

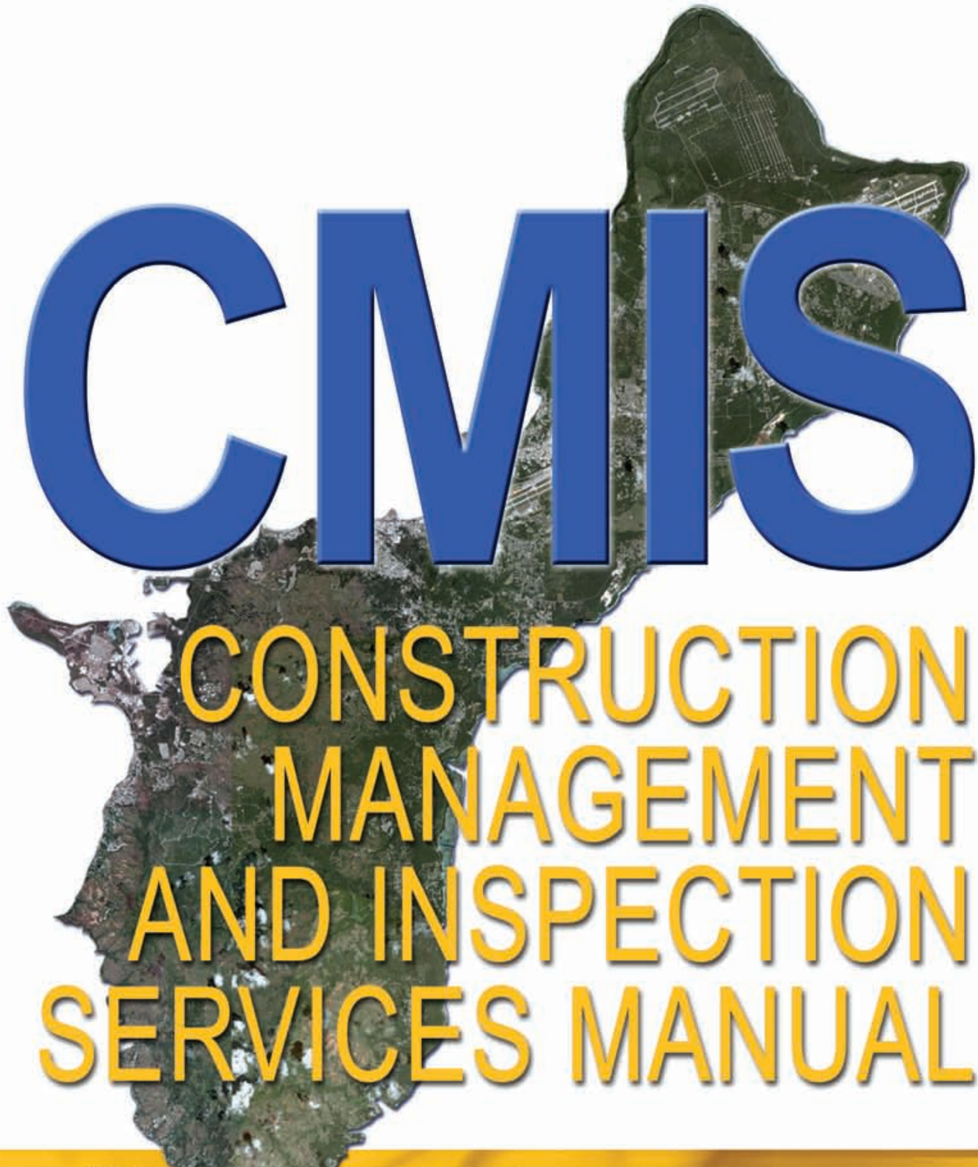

CMIS

CONSTRUCTION MANAGEMENT AND INSPECTION SERVICES MANUAL

DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

March 2010



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CONSTRUCTION MANAGEMENT AND INSPECTION SERVICES MANUAL

March 2010

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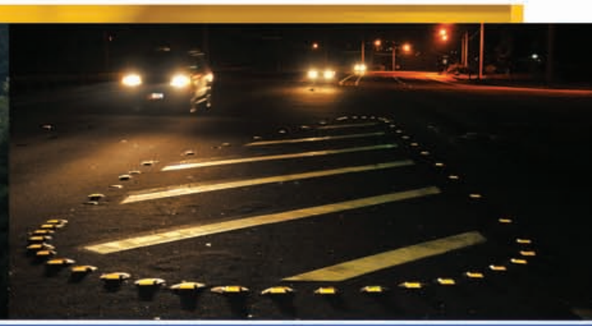

DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

March 2010

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EXECUTIVE SUMMARY

This Construction Management and Inspection Services Manual (CMIS Manual) establishes procedures and policies to be implemented by the Government of Guam, Department of Public Works, Highways Division (DPW), and project-assigned DPW or Consultant personnel for the performance of construction management, inspections, and testing performed by, or on behalf of, DPW. This CMIS Manual is consistent with, and a companion document to, the *Federal Highway Administration (FHWA) Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects* (Standard Specifications) as it relates to projects authorized and executed by DPW. Reliance has been placed on the application of established policies, procedures, and best practices employed by DPW, and various state Departments of Transportation, together with their published construction management manuals. These policies, practices and procedures are reflected in this CMIS Manual and related appendices including:

Appendix A Construction Inspection Guidelines

Appendix B Construction Administration Forms

Appendix C Materials Testing and Inspection Plan

Appendix D Construction Quality Management Plan (CQMP)

Appendix E Construction Safety Management Plan (CSMP)

This CMIS Manual delineates the roles, responsibilities, and activities of the construction management staff positions, regardless if these positions are performed by DPW staff directly or by a Consultant under the direction of DPW. The Consultant's role and responsibilities are further defined in the specific scope of services contained in its Contract with DPW for the performance of construction management.

The purpose of this CMIS Manual is to achieve uniformity in construction contract management practices and administrative procedures. The CMIS Manual is not a construction Contract Document and is not intended to supersede any construction Contract Documents, or to serve as a substitute thereof. The CMIS Manual discusses and presents procedures and requirements for fulfilling construction management and inspection requirements. This CMIS Manual does not contain detailed discussions of every technical area of construction engineering, rather, it serves to provide guidelines for administration of construction Contracts. It is not all-inclusive, and other operations not mentioned in this CMIS Manual may exist, may be developed, and may be used subject to DPW's concurrence. Although standardization is an objective of this CMIS Manual, it is not intended to prevent project personnel from developing or accepting new methods and ideas that improve the effectiveness of the construction management activities. The on-site representative will encounter situations that are not covered specifically by this CMIS Manual, necessitating the application of common sense, experience, and input from DPW and other senior personnel. To effectively administer the execution of the construction Contract Documents, and to carry out their respective responsibilities, users of this CMIS Manual will find it necessary to reference the project's specific construction Contract Documents as well as other sources of information to the extent to which they are referenced and incorporated into the construction Contract Documents. These other sources of information include, but are not limited to, the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, the Federal Acquisition Regulations (FAR), the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), the Occupational Safety and Health Administration (OSHA), the American Society for Testing and Materials (ASTM), the American Association of State Highway and Transportation Officials (AASHTO), and other industry established standards.

AUTHORIZATIONS

DPW operates under FHWA's operational guidelines, serving the needs of the residents of Guam by actively administering the construction of highway systems and related infrastructure. This will be performed by DPW's staff or contracted with professional, qualified, and experienced consultants, under the supervision of DPW. Authority for executing and administering DPW's highway construction projects is held by DPW's Director of Public Works. The Director has the authority to delegate and assign specific authorities and responsibilities to sub-tier positions, including Program/Project Managers. The delegate designee cannot formally re-delegate authority or responsibility to others unless specifically designated by the Director, including the contracting of consultant activities, materials testing, and other administration services in support of the management and execution of DPW's construction projects.

The authority of DPW and Consultant personnel will be defined in writing and copied to the Contractor, as well as discussed and summarized at the Pre-construction Conference (PRECON). In general, authorities and/or responsibilities assigned, along with general restrictions imposed as part of the scope of authority, may include, but are not limited to:

- Contract administration of the Contractor's responsibilities to execute the work. This does not include carrying out specific actions to enforce the terms of the Contract with DPW. In these situations, the DPW staff and consultants are responsible for monitoring, reviewing and providing recommendations to DPW Director for a course of action to address the contractual issue.
- Inspection of the work for compliance with requirements.
- Measurement of the work completed each month in support of recommending periodic payments to the Contractor.
- Identification, documentation, and tracking of non-complying work.
- Coordination with DPW and the Contractor on deviations to the Contract requirements, modifications, and adjustments.
- Providing DPW with negotiation and pricing support and recommendations for new or altered items of work.
- Establishing and maintaining an approved Document Control System (DCS).

- Quality assurance activities, including testing and inspection, to ensure compliance with the Contract requirements.
- Responding to the Contractor's technical questions that clarify, but do not change, the Contract requirements.
- Reviewing and recommending approval/disapproval of the Contractor's shop drawings and other submittals (including Critical Path Method [CPM] schedules and Quality Control [QC] plans).
- Reviewing and recommending approval for payment of progress invoices including stored materials, contingent sums, incentives, disincentives, retention, and liquidated damages.
- Reviewing the Contractor's certified payrolls.
- Verifying compliance with the Contract's labor provisions and providing notice of non-compliance.
- Making qualitative or quantitative judgments required by the Contract at the work site.
- Advising the Contractor of safety deficiencies and/or concerns observed on site, and providing DPW with recommendations regarding suspension of work as may be deemed necessary to eliminate the threat to personal injury.
- Evaluating a Contractor's progress with respect to the approved progress schedule, and requesting updated schedules when necessary.
- Verifying compliance with the contracting plans, providing notice of noncompliance, and accessing reduction of payment or rejection for noncompliance
- Monitoring of the day-to-day construction activities for the duration of the project to assess the delivery of the project in accordance with the approved schedule

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1 INTRODUCTION

This CMIS Manual establishes procedures and policies to be used for construction management of DPW's highway construction projects. The contents are applicable to managing and administering DPW's construction projects by its own forces, or in combination with consultant staff working under DPW's direction. Each team can be comprised of any combination of DPW/consultant staff, filling the job titles and positions commensurate with the scope and nature of the project, including Project Engineer (PE), Inspectors, Material Technicians, and administration. In this way, DPW is able to employ the services of consultants to supplement its own work force.

This CMIS Manual is intended to minimum requirements and guidance, and incorporates by reference other established documents and systems as aids to the performance of construction management and inspection services. This CMIS Manual is based on the requirements of the *Western Federal Lands Highway Division (WFLHD) Construction Manual*, the *Federal Highway Administration's Standard Specification for Construction of Roads and Bridges on Federal Highway Projects* , and supplemented with various federally-accepted state manuals and specifications. Compliance with FHWA standards is of the greatest importance, since much of Guam's highway financing comes from FHWA.

Position titles have been used in this CMIS Manual to delineate roles, responsibilities, and activities, and not intended to imply that the individuals staffing these positions are personally executing each and every task. More than one position title may perform the same role on a project, depending on the qualifications of the individual performing those functions. Many functions and responsibilities of the senior position on a project may be delegated to members; however, the original senior position retains responsibility for actions and performance of the assigned staff.

1.1 PURPOSE AND OBJECTIVES

The purpose of this CMIS Manual is to provide uniformity in construction management practices, compliance inspections, materials testing, and evaluation and administration procedures. Although this CMIS Manual is not in itself a construction Contract Document, and is not intended to supersede any Contract Document or to serve as a substitute, it discusses procedures and explanations for the necessity for fulfilling Contract requirements, and may be identified as a document that should be complied within the described scope of services for individual Contracts. This CMIS Manual does not contain detailed discussions of every technical area of construction management. It addresses the most common issues of construction management, and makes reference to appendices and documents attached to this CMIS Manual and other sources such as AASHTO, ASTM, the American Concrete Institute (ACI), Federal Regulations, and other construction industry standards. Uniformity of specification application and interpretation will also assist the contracting community in providing the necessary components for a successful highway construction project.

1.2 BASIC FUNCTION

DPW Project Engineers and Inspectors are responsible for carrying out the assigned tasks in support of overseeing the performance of each Contractor. The primary functions are to verify that:

- Work is constructed in accordance with the Contract Documents
- The Contractor develops and implements a Work Safety Plan
- Work is completed on schedule and within budget
- Claims avoidance techniques are employed
- The Contract is administered in a fair and equitable manner
- Contractual actions are accurately and timely documented
- The interests of DPW, the public, partner agencies, and other stakeholders are safeguarded

1.3 ORGANIZATION

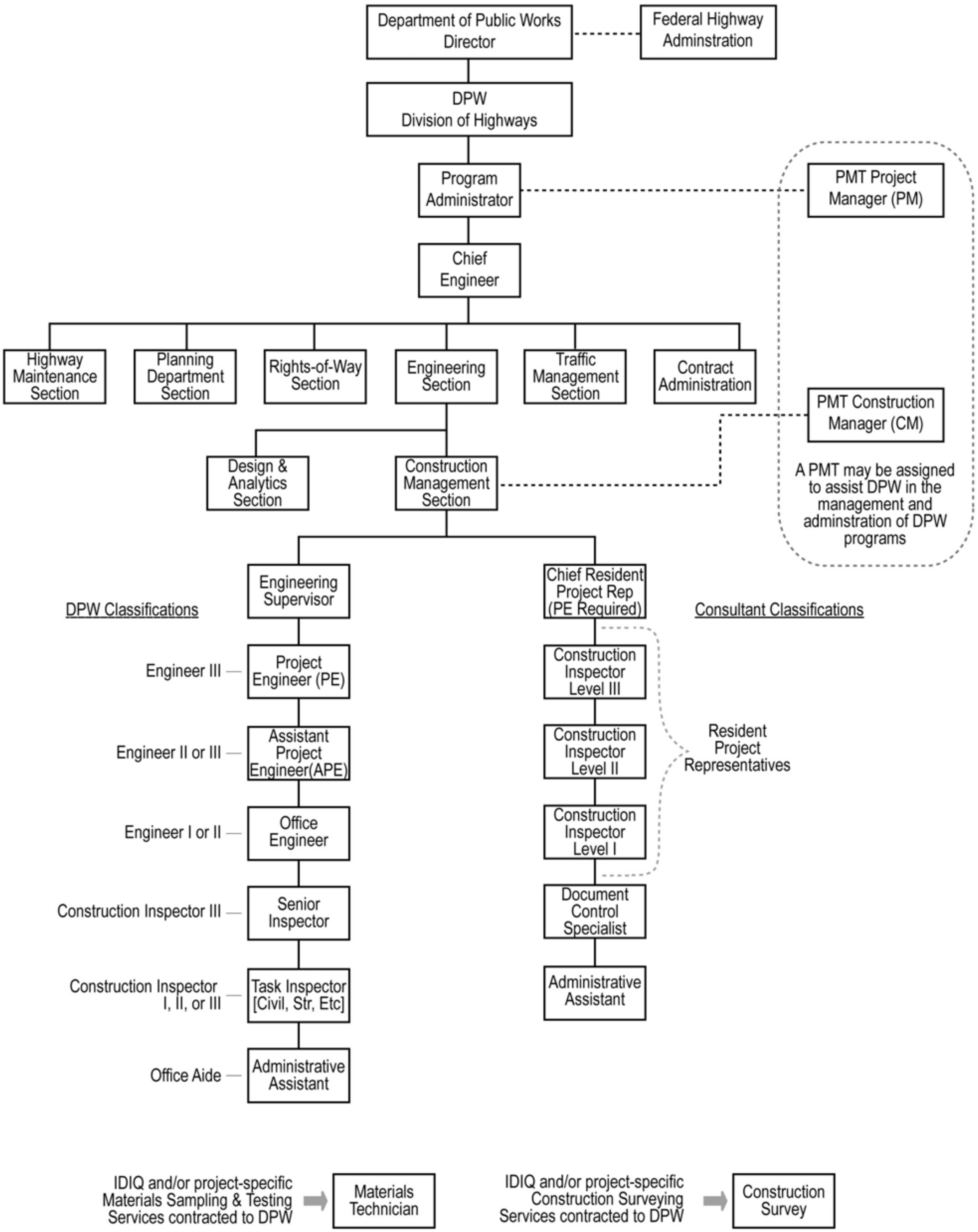
DPW administers the surveying, designing, and construction of public highways, roads, parkways, other access roads, and all associated facilities, systems, and installations related to their establishment, operation, and maintenance on the island of Guam, excluding the lands under the jurisdiction of the US Department of Defense. DPW also supports, facilitates, and provides training, technology and engineering services to further the island's transportation network. Authority for executing and administering DPW's highway construction projects is held by the Director of the Department of Public Works. The Project Engineer is responsible for executing specific projects with the assistance of other DPW staff and/or authorized consultant.

An Organization and Reporting Structure Chart is provided on page 1-4.

1.4 RESPONSIBILITIES AND AUTHORITY

The Director of the Department of Public Works is the Contracting Officer for all DPW construction contracts. All official actions related to the construction contract need to be authorized in writing by the Director. Project Engineers and Inspectors are authorized to inspect the constructed work for conformance with the contract documents but are not authorized to alter or waive any provision of the construction contract or issue an instruction that is contrary to the contract. The Project Engineer and Inspectors have the authority to identify non-conforming work and provide a notice to the Contractor of the non-conformance. The Project Engineers and Inspectors may also take necessary actions to prevent imminent and substantial risk of death or injury including stopping work.

Construction Management and Inspection Services [CMIS] Organization and Reporting Structure



1.5 DEFINITIONS

Acceptable Quality Level (AQL) – The lowest percentage of work within the specification limits that is considered acceptable for payment at the Contract price.

Activity Hazard Analysis (AHA) - The review of a particular operation or construction activity to analyze the potential risks and hazards associated with specific work elements and develop measures to mitigate the risks and hazards to an acceptable level.

Alternate Traffic Control Proposal (ATCP) – Traffic control plans prepared and submitted by the Contractor that deviate, alter, or provide more specific information as compared to the Contract Traffic Control Plans for the project.

American Recovery and Reinvestment Act (ARRA) – Economic stimulus package enacted by Congress in February 2009 to provide a stimulus to the U.S. economy in the wake of the economic downturn.

As-constructed Quantity – The final quantity of a defined permanent work element that was constructed in accordance with the Contract Documents.

Best Management Practice (BMP) – BMP is a method, technique, process, or activity that is considered to be the most effective in delivering a desired outcome, proven through repeated and successful use as compared to alternative means.

Calendar Day – Each day during the period of the project, including holidays and weekends, regardless whether work was carried out on the project.

Certificate of Compliance (COC) – A written certification from a manufacturer or supplier stating that certain identifiable materials are manufactured to, and comply with, specific listed performance requirements and criteria.

Certificate of Insurance – Documented evidence of insurance provided by a Contractor or other third party, including the type and term of coverage, value limits, deductable amounts, and the parties insured by such coverage.

Change Order – A written order, signed by DPW's Director and the Governor of Guam, directing the Contractor to make a change in the construction Contract of a particular project.

Change Request (CR) – Documentation prepared and submitted for approval that defines the purpose, scope, and impacts to the project for work that differs from the work described in the Contract Documents, which needs to be executed in order to achieve the intended outcome of the plans and specifications.

Chief Engineer (CE) – The Chief Engineer has oversight responsibility for all engineering aspects for the Division of Highways. Assisted by Project Engineers and Inspectors the Chief Engineer administers all construction Contracts according to the policies and procedures established by DPW and FHWA.

Chief Resident Project Representative (CRPR) – Refer to Project Engineer.

Completion Date – The date established by the Contract by which all Contract work is required to be completed.

Constructed Work - Refers to the interim- and end-products of all physical work and activities carried out by the Contractor in completing the work identified in the plans, specifications, and Contract Documents.

Construction Feedback Report – Non-contractual assessment or feedback on the content and effectiveness of the Contract Documents with the intent to improve the delivery of future work or projects.

Construction Inspector - The Construction Inspector reports directly to the Project Engineer and is responsible for performing actual field inspection work, recommending approval/rejection of materials and workmanship, monitoring labor and safety provisions, and maintaining inspection logs and records. Inspectors are not authorized to alter or waive provisions of the Contract or to issue instructions contrary to the Contract.

Construction Management - All management, administration, inspection, testing, and control activities collectively carried out by DPW to implement and verify the execution of requirements contained in the construction Contract between the Contractor and DPW.

Construction Management and Inspection Services (CMIS) – The generalized reference to particular construction management-related activities performed either directly by DPW or by consultant staff working under Contract to DPW.

Construction Manager (CM) – An employee of a consultant management firm delegated to overseeing the construction management effort and assisting DPW in the administration and execution of construction projects.

Construction Quality Management Plan (CQMP) – The project-specific plan for use by the DPW and consultants that includes the scope of the quality management activities, specific quality procedures, the interaction between these processes, and the responsibilities of the Contractor to perform quality work.

Construction Quality Procedures (CQPs) – Establishes the specific processes for the performance of quality activities by DPW, including bconsultants, and where applicable, Contractors and suppliers.

Construction Safety Management Plan (CSMP) – The plan prepared by DPW and/or consultants that defines the procedures and actions to be undertaken to conform to the Contractor's Project Safety Plan, Contract requirements, established industry standards, and other DPW–directed safety requirements.

Contingent Sum (CS) – Unforeseen work necessary to complete the project that is performed by the Contractor and paid for based on the actual labor, materials, equipment, and specialty services used to carry out the work, along with taxes, overhead, and profit commensurate with the work performed.

Contract – The written agreement between DPW and the Contractor setting forth the obligations of the parties for the performance of and payment for the prescribed work.

Contract Documents – Refers collectively to the Contract and all directly and indirectly referenced attachments including, but not limited to, tender documents, bids, plans, drawings, specifications, technical manuals, and performance plans that prescribe specific obligations of the Contractor.

Contract Quantity or Lump Sum – Work carried out which is verified as complete without the need for re-measuring the as-constructed work.

Contracting Officer (CO) – An official of the Government of Guam with the authority to enter into, administer, and terminate Contracts, and make related determinations. DPW's Director is the Contracting Officer's authorized representative acting within the limits of their authority as delegated by the Government of Guam.

Contractor – The term as used in this CMIS Manual defines the Contractor and its subcontractors, vendors, and suppliers performing the construction Contract work on the project being administered.

Contractor Daily Report (CDR) - Defined in the Standard Specifications as the *Inspector's Daily Report of Construction Operations* (IDRCO), the CDR is the Contractor's daily reporting of quality performance including linear tracking of material properties and a certification statement, which documents that all work complies with the requirements of the Contract.

Contractor Quality Plan (CQP) – The plan, developed by the Contractor, which identifies its specific procedures and processes for implementation of its Quality Control and Quality Assurance programs to produce quality work in conformance with the project requirements.

Contractor Quality Control Report – Periodic reporting by the Contractor on its quality control activities performed, testing carried out and associated results, and quality-related issues under discussion and pending resolution.

Controlled Low Strength Material (CLSM) – American Concrete Institute terminology used for Lean Concrete Backfill.

Current Pay Factor (CPF) – The prevailing pay factor applicable to the work during production that determines the acceptability and percent payment of a statistically evaluated element of work.

Daily Inspection Report (DIR) – Document prepared by DPW or conslutant personnel that records activities and actions occurring on the project by the Contractor, DPW, and other third parties operating within the limits of the project.

Department of Public Works (DPW) – The department of the Government of Guam that manages all facets of public work, including roads and bridges.

Document Control System (DCS) – The methods, procedures, and protocol used to manage the identification, receiving, transmission, tracking, storage, and retrieval of all formal communications on a project including, but not limited to, correspondence, submittals, minutes, drawings, payments, and records.

Final Pay Factor (FPF) – The factor applied to the work following the completion and evaluation of all inspections and tests that determine the acceptability and percent payment of a statistically evaluated element of work.

Fire Prevention Plan (FPP) – Sub-set of the Contractor's Construction Safety Plan addressing specific fire prevention practices and procedures.

Inspector's Daily Record of Contractor's Operations (IDRCO) – Refer to Contractor Daily Report.

Job-Mix Formula – The specific asphalt mix and material sources for each type of asphalt concrete required on a particular project.

Lean Concrete Backfill (LCB) – Highly flowable material used to backfill excavation areas that would otherwise be difficult to backfill using standard materials and/or equipment, and achieve the specified density requirements.

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

Material Testing and Inspection Plan (MTIP) – A subset of this CMIS Manual addressing test methods as well as policies and procedures for monitoring materials and materials-related functions on construction Contracts.

Mill Test Reports – A quality assurance document in the steel-making industry that certifies a material's compliance with specific ASTM standards, material dimensions, or physical and chemical specifications.

Non-conformance – A work element, process, or outcome that fails to comply with the requirements of the Contract documents.

Non-conformance Report – A document that identifies a nonconforming work element, process, or outcome, which defines the deficiency and the extent of work effected, as well as tracks the non-conforming work until final resolution and closure.

Notice of Termination (NOT) – Document issued which certifies that all stormwater discharges associated with the construction activity have been eliminated, final stabilization work is installed, and all NPDES-related project work has been completed.

Notice to Proceed (NTP) – Directions issued to the Contractor to proceed with construction of the project and initiates the accrual of time against the established project duration.

Partial Acceptance – The acceptance of a portion of work deemed to be complete and in compliance with the Contract.

Pavement Marking Plan – A plan that identifies the specific location, configuration, and alignment of pavement striping and markings to be installed, which follow the requirements of the Contract Documents, standard drawings, referenced industry standards, and the actual conditions that exist in the field.

Portland Cement Concrete Pavement (PCCP) – Roadway structure constructed using either reinforced or non-reinforced concrete which will form the final driving surface for vehicle traffic.

Pre-construction Conference (PRECON) – The initial formal meeting with DPW and the Contractor, which is typically conducted prior to issuing Notice to Proceed. The Pre-construction Conference addresses the parameters of the Contract, scope of work, communications, safety, and working protocols between the Contractor, DPW, involved agencies, and the Construction Management and Inspection Team.

Pre-paving Conference – A meeting held prior to the commencement of asphalt paving or PCCP operations to review the scope, roles, and responsibilities of all work and personnel involved in the paving activities on the project.

Program Administrator (PA) - The Program Administrator reports to DPW's Director and has the highest level of authority over DPW's Division of Highways.

Program Management Team (PMT) – Consultant staff contracted to DPW to assist in the management and execution of DPW's improvement programs.

Project Diary – Diary prepared by the Project Engineer to document work progress, site conditions and activities, and the Contractor's ability (or inability) to perform its work.

Project Engineer (PE) – The PE is the senior DPW representative assigned to a particular project. The PE has immediate charge of the execution of the construction project and is responsible for the administration and satisfactory completion of the project.

Project Safety Plan (PSP) – The Contractor's plan that defines its planned actions to carry out the work in compliance with all Contract and governing agency requirements, as well as define the minimum safety performance requirements for all groups and individuals working on the project.

Public Information Officer (PIO) – An individual employed by either DPW or a consultant who is assigned the responsibility of interfacing and communicating between DPW and the public in connection with one or more DPW construction projects.

QA Materials Technician (QMT) - The QMT reports directly to the Project Engineer and is authorized to inspect or test all work performed and materials furnished. Such inspections may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The Materials Technician is not authorized to alter or waive provisions of the Contract or to issue instructions contrary to the Contract. The Materials Technician is also responsible for the maintenance of all QA material-related project records.

Quality Acceptance (QA) - All those planned and systematic actions performed to validate the execution and effectiveness of a Contractors Testing and contractors QC program, and the ability to demonstrate that the work complies with the Contract and will be performed satisfactorily for the purposes intended.

Quality Assurance Manager (QAM) – An individual typically employed by a consultant who is assigned the responsibility for managing the performance of QA activities on one or more DPW construction projects.

Quality Control (QC) - The total of all activities performed by the contractor involving planning, monitoring, documenting, and production/construction processes to control the level of quality being produced in the end product. Components may include establishing procedures; calibrations and maintenance of equipment; shop drawing review; document control; production process control; and any sampling, testing, and inspection done for these purposes.

Recovery Schedule – Planning activities by modifying or accelerating the performance of specific work tasks that have failed to meet the project schedule with the intent of recovering the delay and returning all of the work to the master schedule timeline, within a limited and defined time period.

Request for Information (RFI) – A written request, typically from the Contractor, who presents a particular condition of the Contract Documents that needs to be defined, clarified or elaborated on prior to carrying out the particular work affected.

Resident Project Representative (RPR) – Refer to Construction Inspector.

Safety Manager (SM) – A specific position within an organization with the primary responsibility of managing or performing oversight of the safety planning, performance, and compliance to plan requirements.

Safety Finding – Elements of an established safety plan that are found to be deficient and documented as such, following the performance of a formal safety audit.

Safety Notice (SN) – A written notification issued by DPW to the Contractor informing them of safety concerns related to an observed activity, operation, or lack of compliance with the Contractor's Project Safety Plan.

Special Contract Requirements (SCR) – The Contract Document that defines administrative and performance requirements which are in addition to those contained in the Standard Specifications; and other Contract Documents which are applicable to a specific DPW construction project.

Staked or Ordered Quantity – An element of work that is defined in scope and quantity in the field prior to execution, and used to make final payment without the need to re-measure the work upon completion.

Standard Specifications – The Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-03 or latest version, issued by FHWA.

Stop Work Order – Written directive issued by DPW to the Contractor to stop specific activities that pose an imminent threat of bodily injury or significant damage to the completed work.

Storm Water Pollution Prevention Plan (SWPPP) – The Contractor's plan to comply with the requirements of a National Pollutant Discharge Elimination System permit that may be applicable on a specific project.

Substantial Completion - The point at which the project has met the prescribed performance criteria defined in the Contract Documents; or, in the absence of such specifics, is complete such that it can be safely and effectively used by the public without further delays, disruption, or other impediments. For conventional bridge and highway work, the point at which all bridge deck; parapet; pavement structure; shoulder; drainage; sidewalk; permanent signing and markings; traffic barrier; safety appurtenance; utility; and lighting work is complete.

Traffic Control Inspection (TCI) Diary – A document maintained by the Contractor's Traffic and Safety Supervisor that records the daily details of temporary traffic control devices and facilities in place on the project.

Traffic Control Plans (TCP) – Contract plans and/or supplemental drawings prepared by the Contractor depicting the methods, configurations, and durations of how public traffic will be routed through or around the project.

Working Day – A normally-scheduled work day, typically Monday through Friday, excluding recognized holidays. In terms of project duration, a working day is charged for each day during which the Contractor is actively performing work on the project.

1.6 ACRONYMS

AASHTO American Association of State Highway and Transportation Officials

ABC	Aggregate Base Course
AC	Asphalt Cement
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AHA	Activity Hazard Analysis
AQL	Acceptable Quality Level
ARRA	American Recovery and Reinvestment Act
ASTM	American Society for Testing and Materials
ATCP	Alternate Traffic Control Proposals
ATSSA	American Traffic Safety Services Association
BCM	Bar Chart Method
BMP	Best Management Practice
CAR	Corrective Action Report
CBR	California Bearing Ratio
CDR	Contractor Daily Report (referenced in the Standard Specifications as the "Inspector's Daily Record of Contractor's Operations")
CLSM	Controlled Low Strength Material
CM	Construction Manager
CO	Contracting Officer
COC	Certificate of Compliance
CPF	Current Pay Factor
CPM	Critical Path Method
CQMP	Construction Quality Management Plan
CQP	Contractor Quality Plan
CQR	Contractor Quality Report
CR	Change Request
CSMP	Construction Safety Management Plan
CS	Contingent Sum
CSP	Construction Safety Procedure
DCS	Document Control System
DIR	Daily Inspection Report
DLB	Daily Log Book
DPW	Department of Public Works
EEO	Equal Employment Opportunity
EPA	Environmental Protection Agency
ESC	Engineering Soil Classification
FAR	Federal Acquisition Regulations
FHWA	Federal Highway Administration
FP-03	Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (or current version referenced as FP-0#) – also referred to as Standard Specifications
FPF	Final Pay Factor

FPP Fire Prevention Plan
GCA Guam Code Annotated
GEPA Guam Environmental Protection Agency
GG Government of Guam
GHPO Guam Historic Preservation Office
GPO Guam Power Authority
GSA General Services Administration
GWA Guam Waterworks Authority
HMA Hot-mix Asphalt
LCB Lean Concrete Backfill
MTC Materials Testing Consultant
MTIP Material Testing and Inspection Plan
MUTCD Manual on Uniform Traffic Control Devices for Streets and Highways
NCR Non-conformance Report
NOT Notice of Termination
NPDES National Pollutant Discharge Elimination System
NTP Notice to Proceed
NWC Notification of Work Completion
OSHA Occupational Safety and Health Administration
PAR Preventive Action Report
PCCP Portland Cement Concrete Pavement
PCS Preliminary Construction Schedule
PE Project Engineer
PIO Public Information Officer
PPB Pedestrian Push Button
PPE Personal Protective Equipment
PRECON Pre-Construction Conference
PSP Project Safety Plan
QA Quality Assurance
QAM Quality Assurance Manager
QC Quality Control
QMT Quality Assurance Material Technician
RFI Request for Information
RPR Resident Project Representative
SCR Special Contract Requirements
SM Safety Manager
SN Safety Notice
SWPPP Storm Water Pollution Prevention Plan
TCI Traffic Control Inspection
TCP Traffic Control Plan
TSS Traffic Safety Supervisor

2 PROJECT START-UP

2.1 OVERVIEW

This chapter contains guidelines for initial project set up. These initial project tasks include, but are not limited to:

- Mobilization of designated personnel
- Establishment of the base document and project control procedures
- Procurement and start-up of authorized project equipment and facilities
- Kick-off meetings and interface with the construction Contractor and project participants

The start-up tasks should be performed within the agreed-upon schedule following finalization of the Contract, usually within the few weeks before and/or following Notice to Proceed (NTP) being issued.

2.2 FIELD OFFICE

The Contract Documents may require the Contractor to provide, establish, and maintain the specified field office facilities including, but not limited to, designated equipment, utilities, access, and security. The project field office will be the point of delivery for contractual submittals from the Contractor; and Construction Management and Inspection base of operations until such time as the project is complete or as otherwise directed by DPW.

2.3 INFORMATION PROVIDED

The PE will be provided with relevant project information prior to the issuance of NTP to the Contractor. This information will be provided in hardcopy and/or electronic documents including, but not limited to:

- Contract Documents (Plans, Specifications, Executed Contract)
- Project-specific documents and information (Cross-sections, Control Survey and Design Staking Notes, Existing Conditions Drawings)
- Stakeholder and utility agency contacts and approvals
- Pertinent correspondence with outside agencies during design
- Manuals
- Computer programs
- Contractual reporting forms and formats
- Miscellaneous forms

2.4 COORDINATION

The PE, acting as the senior DPW project staff member will provide a contact list no later than NTP identifying who within DPW or other agencies are designated as project contacts and their role in the project, together with phone numbers and e-mail addresses. In addition to the direct staff assigned to the project, the contact list may include:

- Construction Manager
- Maintenance Manager
- Finance Manager
- Contract Administrator
- Public Information Officer (PIO)
- Environmental Compliance Manager
- Design Manager
- IT Help Desk Personnel
- Utility Agency Contacts
- Stakeholder Representatives

Consultant staff assigned to the project, including the Consultant's Manager for the services performed on the project, will also provide DPW with their phone numbers and email addresses. Likewise, the Contractor will provide the PE with a comprehensive list of contact information for personnel assigned, their respective responsibilities, and after-hours emergency contact information.

3 COMMUNICATIONS

3.1 GENERAL

DPW personnel on the project should conduct themselves in accordance with the Guam Code Annotated (GCA), the General Services Administration (GSA), and/or the Government of Guam (GG) rules and regulations regarding the ethical code of conduct. Likewise, consultant members should conduct themselves in a professional, ethical, and business-like manner during any and all contact with the Contractor's representatives, the public, and any third parties involved with the project. The PE should maintain a complete list of contacts related to the project including name; agency or company; address; phone and fax number; and relationship to the project. This list will expedite appropriate communication of project problems and assist new personnel assigned to the project. This list should be turned in with the final records of the project.

3.2 COMMUNICATIONS WITH THE CONTRACTOR

The PE shall maintain primary contact with authorized representatives of the Contractor. The PE, Inspectors and office staff shall not communicate directly with subcontractors or vendors. Only those communications documented in writing shall be considered as official Contract correspondence. Directions and instructions that alter the Contract or create additional liability to DPW must be in writing and must be executed (signed) by DPW.

Integrity on the part of all members of the DPW is essential. The acceptance of any gift or favor, regardless of value, which might give the appearance of impropriety, is unacceptable. Individuals must never place themselves under obligation to the Contractor, as this would impair their ability to effectively represent DPW, and might create a condition where more serious improprieties could occur. Offers of gifts or other actions on the part of the Contractor, subcontractors, vendors, or their representatives, which could be construed as an attempt to influence the actions of any member of the DPW, should be immediately reported to DPW's Chief Engineer or the Program Administrator.

3.3 COMMUNICATIONS WITH OTHER AGENCIES

As soon as possible after assignment to the project, the PE should become acquainted with the assigned representatives of all agencies, utility companies, and property owners involved in the project, and discuss any pertinent phases of the work with them. It should be emphasized to these representatives that contact with the Contractor about Contract issues should be exclusively through the PE; however; this should not preclude them from working directly with the Contractor on non-Contract issues such as permits, pollution regulations, work zone traffic enforcement, third-party operations within the limits of the project, etc. Local officials should also be advised of DPW's limitations to add to or change Contract work; and such requests should be in writing and processed according to established procedures. These issues should be discussed at the PRECON so that the Contractor understands the relationship of the project stakeholders involved.

3.4 COMMUNICATIONS WITH THE PUBLIC

DPW personnel are potentially in daily contact with and under the critical eyes of our ultimate customer, the public. This might include adjacent property owners, daily commuters, residents of nearby communities, tourists, special interest groups, and representatives of various news media. It is essential that all employees strive to conduct themselves in a manner that will command respect and confidence. The importance of conducting construction in a way that facilitates cooperation with the public and minimizes the potential for complaints cannot be overstated. In any community, information concerning road and highway improvements is of primary interest. Requests from the public for written information should be promptly forwarded to DPW's Director for consideration and dissemination.

3.5 COMMUNICATIONS WITH THE MEDIA

DPW personnel should avoid direct interaction with the media, whenever possible. Basic information, including the inquirer's name, contact information, and media affiliation, should be communicated by the Inspectors to the PE as soon as possible, following the media contact. Media requests for written information and/or comment should be directed to the DPW Director for consideration and dissemination.

4 DOCUMENT CONTROL

4.1 PROJECT FILES

The PE is responsible for establishing a comprehensive DCS that assures the timely and accurate creation, distribution, storage, and retrieval of all project-related documents. The system should be structured so that each document is uniquely identifiable and retrievable through a hierarchy of document identifiers including type, date, subject, addressee/or, status, and project-specific parameters, as may be required. When specified by DPW, an electronic DCS should be used to perform the document control function. Hardcopy originals of all project documents should be maintained at the designated project field office, or as approved by DPW, regardless of the use of an electronic DCS. The PE is responsible for the successful integration of the DCS with the control systems in use by DPW. The structure of the system for document identification should be as approved by DPW, and should closely follow the format contained in Appendix B - Forms and Document Examples. Logs should be maintained for all project document types and/or subjects for use by project staff and DPW during the course of the project.

4.2 ELECTRONIC FILES

Electronic files consist of those documents that are generated and submitted in their initial electronic format, together with a hardcopy for project records, and the scanned version of documents that are produced and submitted in hardcopy only. Electronic formats should be as agreed upon with DPW, but in general, will consist primarily of the following types:

- Microsoft software including Word, Excel, Access, Visio
- PDF
- JPG, TIF
- Microstation and AutoCAD files
- Primavera files such as Contract Manager (Expedition)

4.3 CORRESPONDENCE

It is imperative that the project files contain all recognized correspondence generated on the project. The term “recognized correspondence” refers to all formal and informal documents that are generated to communicate project information including, but not limited to, e-mails, letters, memoranda, minutes, reports, telephone conversation memos, facsimiles (attach to the original once received), authorized electronic data, and drawings. Communications not recognized as project correspondence are verbal discussions that are not backed up by written confirmation. The original copy of all incoming correspondence should be logged into the DCS prior to being routed for review and action. This applies to correspondence; material and product submittals; test reports; construction schedules; the Quality Control (QC)/Quality Assurance (QA) Plan; the Accident Prevention Plan; the Hazardous Spill Plan, etc.; and all financial documents including Change Orders, payroll certifications, and payment requests.

The routing and filing of correspondence should follow the process as defined in the DCS established on the project. Correspondence logs should be maintained up-to-date and distributed at progress meetings for review of submittals. The log should reflect information from the project submittal matrix, actions taken or pending, and status of both open and closed items. The Contractor is required to submit multiple copies of each incoming correspondence in accordance with the Contract and approved DCS to ensure a copy is captured in the project files while concurrently being processed for review and approval.

All outgoing project official correspondence must be signed by DPW's Director. The signing of correspondence that does not involve contractual and financial issues, but deals only with the routine day-to-day project activities will be signed by the PE. All outgoing correspondence should be assigned a unique identifier and logged into the DCS established on the project prior to being transmitted to the intended recipients. The PE is responsible for the active management of all project correspondence, including the timely reporting on the status of all documents, tracking, follow-up on pending actions, and reporting the status of all documents recognized by the project's DCS.

4.4 CONTRACT REPORTING DOCUMENTS

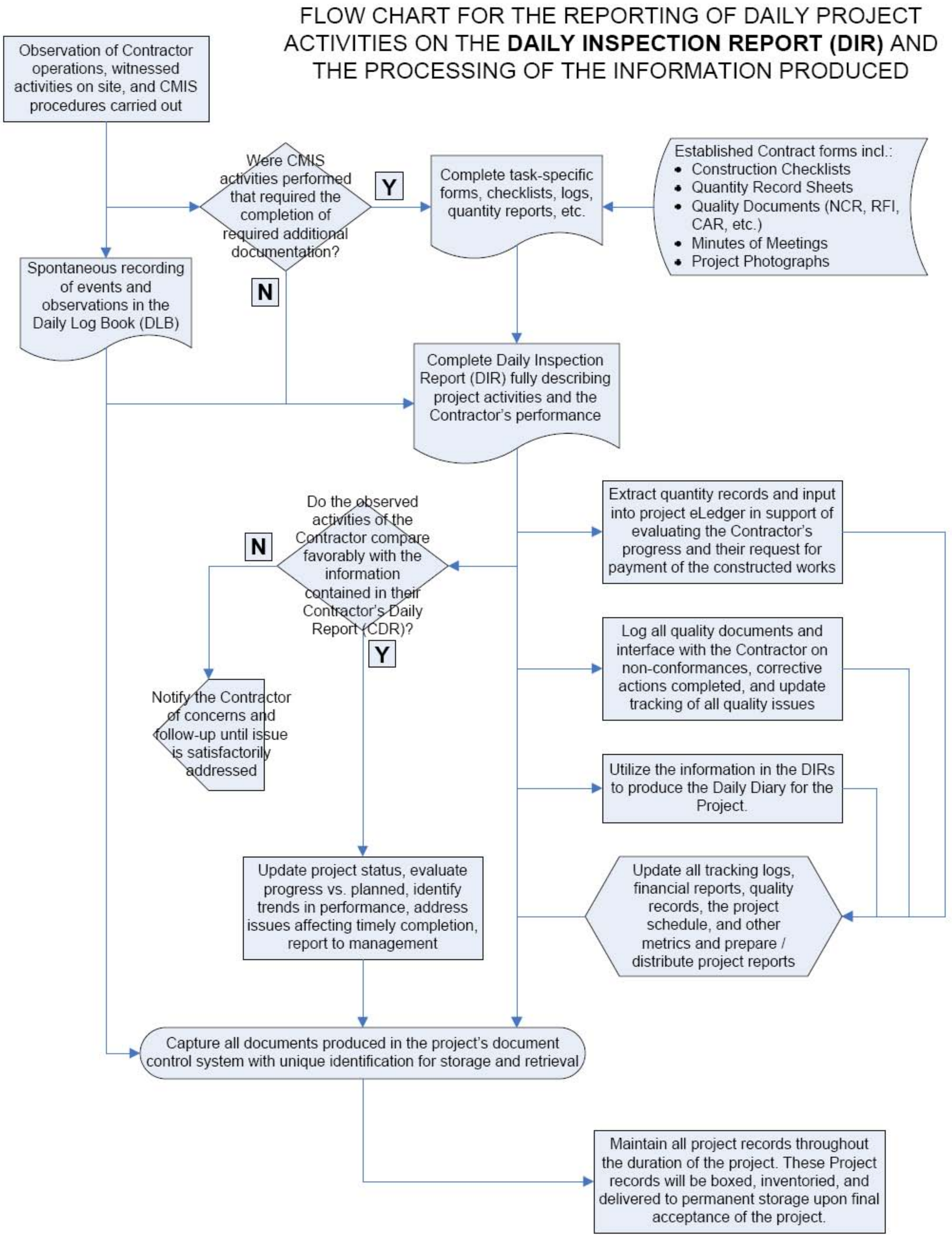
General

Project documentation of construction management activities that are required to be filled out by hand on project forms should be neat, legible, grammatically correct, and completed in a professional manner. The writing should be done using dark blue ink, including all submittals being turned in by the Contractor. Other colored inks (red, green, etc.) should not be used in filling out documents that will become part of the project records, with the exception of the color-designations for mark-ups as part of the QC/QA process for documents and drawings. The use of "whiteout" on any project records is strictly forbidden and corrections should be shown by a single strike-out line through the erroneous data, followed by the correct information. All manually-completed forms and documents should bear the name and signature of the individual who completed it, along with the date and project reference information. The page number and number of pages should also be filled out on multiple-sheet documents if this information is not readily apparent on the document form.

Daily Inspection Reports (DIRs)

The DIR is the primary mechanism in which the progress of the constructed work is acknowledged, documented, and quantified for entry into the project records. The DIR is often-times supplemented by a variety of forms and attachments that report on specific construction operations to provide a uniform method of measurement, reporting, and reference to the project documents. While these supplemental forms are optional and dependent on the specific construction operations carried out, the completion of a DIR for every Contract day is required, whether or not any construction operations are carried out. Refer to the DIR Flow Chart on page 4-4 for guidance.

DIRs are intended to report the detailed description of activities carried out within the project limits, as well as the Contractor's efforts to prepare for upcoming work, the maintenance of installations necessary for the execution of project work, and circumstances that may be interfering with the Contractor's ability to perform. This descriptive element of the DIR should be combined with the measurement and calculations for the work performed and accepted, to facilitate the overall measurement of progress and payment for the work. The PE is responsible for ensuring that DIRs are completed timely and in a clear, concise, and professional manner; contain factual data relevant to the work performed; and be free of stated opinions and preference statements. All supplemental forms and attachments should bear the DIR number and be referenced on the DIR, which is the document that introduces this information into the project record.


FLOW CHART FOR THE REPORTING OF DAILY PROJECT ACTIVITIES ON THE DAILY INSPECTION REPORT (DIR) AND THE PROCESSING OF THE INFORMATION PRODUCED
Observation of Contractor operations, witnessed activities on site, and CMIS procedures carried out
Were CMIS activities performed that required the completion of required additional documentation?
Y
N
Complete task-specific forms, checklists, logs, quantity reports, etc.
Established Contract forms incl.:
• Construction Checklists
• Quantity Record Sheets
• Quality Documents (NCR, RFI, CAR, etc.)
• Minutes of Meetings
• Project Photographs
Spontaneous recording of events and observations in the Daily Log Book (DLB)
Complete Daily Inspection Report (DIR) fully describing project activities and the Contractor's performance
Do the observed activities of the Contractor compare favorably with the information contained in their Contractor's Daily Report (CDR)?
N
Y
Extract quantity records and input into project eLedger in support of evaluating the Contractor's progress and their request for payment of the constructed works
Log all quality documents and interface with the Contractor on non-conformances, corrective actions completed, and update tracking of all quality issues
Notify the Contractor of concerns and follow-up until issue is satisfactorily addressed
Utilize the information in the DIRs to produce the Daily Diary for the Project.
Update project status, evaluate progress vs. planned, identify trends in performance, address issues affecting timely completion, report to management
Update all tracking logs, financial reports, quality records, the project schedule, and other metrics and prepare / distribute project reports
Capture all documents produced in the project's document control system with unique identification for storage and retrieval
Maintain all project records throughout the duration of the project. These Project records will be boxed, inventoried, and delivered to permanent storage upon final acceptance of the project.

Project Diary

The purpose of the Project Diary is to document work progress, site conditions, and the Contractor's ability (or inability) to perform its work. The PE should complete the Project Diary. The diary provides DPW with valuable information to accurately reconstruct the events of the project, as may be needed. This information is invaluable to establishing facts and refuting statements by the Contractor should a claim be filed by the Contractor or other involved party.

The Project Diary is considered public record and care should be taken when it is produced. All information entered into the Project Diary should be accurate, factual, complete, and void of opinion, supposition, and conjecture. All entries should be made as if the Contractor, others involved in the Contract, and the public will eventually see them. Once the responsibility of a Project Diary is undertaken, the failure to record an event carries with it the implication that the event did not occur or was insignificant, which also threatens the credibility of the entire diary. The Project Diary should not repeat information that is reported on the DIRs for that day, but should reference them as supporting and supplementary documentation.

Photographs

Photographs are an important part of the project records, providing a visual record of the status of construction, conditions within the project limits, specific details of problem areas or quality concerns, and other pertinent conditions. Project photographs are part of the project documentation and should be turned in with the project records at the end of the project. Photographs serve to document the record with respect to environmental events (landslides, cave-ins, floods, and other unusual occurrences); actual conditions; unusual construction features or practices; accidents involving death, personal injury, or property damage; encroachments within the right-of-way; and other such occurrences and conditions. They are useful in illustrating reports on experimental features and unusual construction practices; final construction reports; equipment and materials on site for constructing the work; and other reports. They are invaluable as evidence should a controversy develop during the Contract that could result in litigation. Photographs are especially useful when a Contract spans a long period of time, both to illustrate the sequence of the project and to capture the status of the project in time. It is often advantageous to take weekly/monthly photographs from specific fixed-camera positions to provide a sequenced set of progress photos with similar vantage points. As memories fade and personnel are transferred to other projects or retire, photographs provide direct evidence of the conditions that existed at a specific time or phase of the project. The old adage that "a picture is worth a thousand words" applies here.

Photographs should be captured in both printed image and electronic image formats (minimum eight megapixels digital resolution) that is compatible with the equipment used on the project, the capability of the electronic media, and the detail being reflected in the images. Each image should be uniquely identified and logged with companion information including, but not limited to:

- Project Number
- Project Name
- Date
- Time
- Description of Photo Content
- Photo Location and Direction of View
- Purpose of Photo
- Photographer Name
- Reference Number if tied to specific document (i.e., Request for Information [RFI], Claim, Pay Estimate No., etc.)

Overall project progress photos should be taken for long duration projects (greater than one year) reflecting the work progress from the same vantage points each month. This enables relative progress to be documented that corresponds to other project records, including progress payments, schedules, work sequences, and special project events.

Construction Feedback Report

The Construction Feedback Report is used to exchange information to improve the overall project delivery process; the interface and coordination between parties; the established protocols within the construction Contract Documents; and suggestions from lessons learned toward an overall improvement in the process. The Construction Feedback Report is intended to capture both the positive processes and actions that contributed to the successful aspects of the project, as well as issues of concern that need to be addressed and improved for implementation either immediately on the current project or on future projects. The Construction Feedback Report is not intended to address the personal attributes of individuals, but rather the project requirements and the various approaches for their implementation. At a minimum, each Construction Feedback Report should include the following:

- Project-specific data including project name, number, value, duration, current status, Project Manager (PM), Contractor's contact, and name of author

- Identify the issue along with the corresponding reference in the project plans, specifications, or other Contract Documents

- Describe the issue to fully detail the elements that either worked or did not work; examples that demonstrate it; and the root factor that should be either implemented on future work or corrected to eliminate the recurrence

- Provide suggestions and recommendations for the implementation of the related actions

- Identify the timeframe for implementation and what documents need to be revised to effect the change

It is best if the feedback forms are completed as the problems arise, instead of waiting until the end of the project when they become less important and are often forgotten. Issues that require alteration to the Contract Documents of an ongoing project should be processed as a Change Order that may or may not involve a change in the project value or duration.

Requests for Information (RFI)

RFIs are designed to provide further clarity on the details of the work to be constructed to facilitate the project being built correctly the first time. RFIs are generated routinely by the PE to solicit additional information or insight from the designer on the intent of the project details and design; however, they also serve as an avenue for addressing the Contractor's goal to optimize its construction efforts to comply with the construction requirements in the most efficient and cost-effective way possible. RFIs present an issue for review; identify the governing plans, specifications, and Contract conditions; elaborate on the particular points of concern or opportunities for improvements; and present a proposed solution, an alternate approach, or a revised method for consideration that ultimately achieves the intent of the design and DPW's objectives. RFIs initiated by the Contractor should be reviewed by the PE, and if considered a valid issue that the PE is not qualified to address, should be forwarded to the designer and/or DPW for evaluation, approval, and/or rejection.

4.5 CONTRACTOR'S REPORTING REQUIREMENTS

General

The Contractor is responsible for the transmittal of specific documents as outlined in the Standard Specifications and the Contract Documents. All submittals should be received, logged, and actions taken in a timely manner in accordance with the review time and status actions defined in the Contract language. Actions taken specific to the submittal type should include follow-up and preferential efforts to facilitate documents with a higher impact to the project's execution as quickly a possible; however, all reporting requirements are important and should be submitted, reviewed, and actions concluded in a timely fashion.

The Contractor is also responsible for reporting many project performance indices in a summary form on a monthly basis. This reporting provides an overview status of the performance on the project; identifies problem areas and issues of concern; and describes the overall health of the Contractor's efforts toward achieving the project requirements successfully. These summary reports are often times the medium by which DPW staff obtains information on the project, and the PE should ensure that these reports represent the status of the project accurately.

Contractor's Quality Control Report

The Contractor's Quality Control Report documents the Contractor's performance of work for compliance with the Contractor's Quality Plan and all project requirements. The Standard Specifications identify the minimum requirements for the quality records to be produced and maintained during the course of the project. The Contractor's reporting on quality will rely in part on the Contractor's Daily Report (CDR), combined with the linear control charts that track the performance of quality performance. All relevant test reports, material forms, and results of other reviews, inspections, measurements, and process or method adjustments should be included or attached. All quality issues should be identified separately in order to highlight their scope and disposition, as well as the anticipated schedule for resolution. The CDR should not describe the work locations from a production perspective, except to the extent the locations are necessary to identify the project element, timing, and description of QC activities. These records should also contain the companion QA sampling and testing results performed by or on behalf of DPW. Circumstances where the QC results are superseded by QA because of deficiencies in the QC process should be identified and addressed separately. These deficiencies are critical to the overall integrity of the quality process and should be thoroughly evaluated and resolved, and corrective actions taken should be documented. Quality Control Reports should be factual and concise, and speak specifically to individual components of work that had QC/QA-related activities associated with them. Reports that simply mimic the Contractor's activities in general, or that describe the daily whereabouts of QC personnel, are of little value.

Notification of Work Completion

The Contractor shall submit a notice when a project phase or element of work defined by the Contract Documents is completed, or as directed by DPW. The intent is to allow elements of the project to be put into beneficial use by DPW as early as possible in the project. The Contractor initiates the process for consideration of "partial acceptance" of the work by submitting a written request to DPW. The PE will assess the Contractor's notice by inspection of the work and assessment of compliance with Contract requirements, following in general terms the steps identified under Section 12.4 -- Substantial Completion of this manual. The PE will conduct an assessment meeting with the Contractor to resolve outstanding issues prior to issuing its final recommendations to DPW. The recommendation will outline what actions and inspections were done, the reasons for any conditions associated with the Contractor's request, and a recommendation for signing the approval or rejection of the work. Should the Contractor's request be rejected, the cause for rejection should be documented and photographs attached, if appropriate, in the transmittal to DPW. When practical, the PE's recommendation should also contain discussions on what actions could be taken by the Contractor to rectify the conditions preventing partial acceptance of the work.

The Contractor should notify DPW at the completion of the construction effort that it is substantially complete with the required work on the project. Upon this notice, the PE should follow the guidelines of Section 12.4 -- Substantial Completion of this manual.

5 PROJECT EXECUTION

5.1 BIDDING SUPPORT

DPW may utilize the support of its field-assigned personnel and/or a consultant during the bidding. The scope and schedule for the performance of these services will be as directed by DPW and/or defined in the consultant's scope of services. Services could include the evaluation of bidder questions, constructability reviews, validation of the Engineer's estimate, review of addenda proposed by the designer, and participation in the pre-bid meeting as may be requested. These services may involve limited staff selected to support DPW's overall bidding process, or a group of staff selected to support a particular project.

5.2 CONTRACT AWARD

DPW may utilize the support of its field-assigned personnel and/or a consultant following bid opening up to NTP for a particular project. The scope and schedule for the performance of these services will be as directed by DPW and/or defined in the consultant's scope of services. Services could include bid review, recommendations, support services for the evaluation of bids received, assessing alternative proposals, negotiation support with the apparent low bidder, or other services as may be requested.

5.3 PRE-CONSTRUCTION CONFERENCE (PRECON)

As soon as practicable after the Contract is awarded but before the Contractor begins work, the PE will schedule and conduct the PRECON on a date agreeable to DPW and the Contractor. The PRECON is conducted to review the scope, schedule, and contractual conditions in force, and establish specific protocols to be employed during the execution of the project. Mandatory participation is required by DPW, the Contractor.

The PE is responsible for notifying participants of the planned date, time, and venue for the PRECON, and for developing the information required in the PRECON meeting agenda (refer to Appendix B, Pre-Construction Conference Agenda). The list on the following page is an example of the persons and agencies who should be invited to attend the PRECON, in addition to the participation by DPW. This list should be modified as necessary to meet the specifics of the individual project.

- Mayors of villages which may be affected such as Dededo, Tamuning, Mangilao, Chalan Pago-Ordot, Hagatna, Yona, Santa Rita, Barrigada, Agat, Umatac, Talofofo, Inarajan, Toto, Sinajana, Agana Heights, Asan, Merizo, Piti, and Yigo
- Chief, Guam Police Department
- Chief, Guam Fire Department
- Administrator, Guam Environmental Protection Agency (GEPA)
- Administrator, Guam Historic Preservation Office (GHPO)
- Director, Department of Parks and Recreation
- General Manager, Guam Waterworks Authority (GWA)
- General Manager, Guam Power Authority (GPA)
- General Manager, GTA Teleguam
- General Manager, IT&E
- General Manager, Marianas Cable Vision (MCV Broadband)
- General Manager, AT&T
- General Manager, Verizon (MCI)

The PE will coordinate closely with the Contractor in developing the information to be discussed at the PRECON, and will conduct pre-meetings as necessary with the Contractor or other involved parties to address as many items as possible in advance of the meeting. The agenda will be augmented to reflect unique features of the Contract and project-specific issues.

The PE is responsible for chairing and conducting the meeting. The primary purpose of the meeting is to ensure that all parties have a common understanding of what the project involves and how the project will operate. The PE will have all in attendance sign the PRECON sign-in sheet with contact information, which will be distributed with the meeting minutes. Discussions will focus on the key aspects of the Contract (start and finish dates, duration, restrictions, etc.), identification of authorized representatives, communication protocols, early project deliverables, the Construction and Payment Schedule, the Contractor's Quality/Safety Plans, unusual site conditions, environmental permit requirements and restrictions, requirements for traffic control, the Contractor's responsibilities for accident prevention, contractual requirements for apprenticeship, payrolls, worker education, and other pertinent items which will result in better job coordination and performance. The PE will identify the participants and schedule for break-out meetings on specific project activities that require a more detailed discussion with limited participants. The PRECON will not be used as a venue to review every detail of the project; rather, it will be used as an opportunity to start the project with everyone working towards the same goal -- the successful completion of the project.

The PE is responsible for recording the minutes of the PRECON and for distributing them to all parties in attendance. The minutes will be reviewed and signed by DPW and the Contractor as acknowledgement of their accuracy, and will become a part of the permanent project records. Following sign-off, the PRECON minutes will be distributed to meeting participants, with the original filed in the official project records.

5.4 NOTICE TO PROCEED (NTP)

DPW will issue NTP to the Contractor following the release of the Contract by the Legal and Contracts departments, and only after the Contractor has submitted the approved building permit and all of the required Contract bonds and insurance. Specific requirements for the issuance of NTP to the Contractor may vary by project. These requirements are defined in Section 108 of the projects Special Contract Requirements (SCR). The SCR for each project will be reviewed so that NTP can be issued in accordance with the Contract requirements.

5.5 PARTNERING

Contractors will be encouraged to participate in a partnering program to establish a team approach to the project, effective communications, and a good working relationship among DPW, the Contractor and cooperating agencies. DPW's goal of partnering is to enhance communication, improve efficiency, promote creativity and problem solving, and reduce construction claims. The PE and all DPW personnel involved in the project are expected to support this intent in dealing with the Contractor. While the Contract establishes the legal relationships, the partnering process attempts to establish working relationships among the parties (stakeholders) through a mutually developed, formal strategy of commitment and communication. The goal is to create an environment where trust, continuous communication, and teamwork prevent disputes; foster a cooperative bond to everyone's benefit; and facilitate the completion of a successful project. Making changes to the Contract requirements or relaxation of the specifications are not a part of the partnering process. However, when changes to the Contract are appropriate, partnering principles help facilitate the stakeholders in reaching an equitable agreement.

DPW and the Contractor should determine jointly the extent to which partnering will be facilitated on a particular project. The initial partnering session will likely be conducted in multiple sessions to involve the members of each participating entity who will routinely interface during the course of the project. These sessions may or may not be facilitated by an outside party, and may or may not be limited to just management personnel. The various participants will learn how to effectively communicate with each other; how to address issues as they arise during construction; and to understand the respective goals and concerns of all parties involved in the project. On longer duration projects (more than 12 months), follow-up partnering sessions may be conducted to revisit the original objectives, address ongoing issues that are adversely affecting the project, and establish action plans to facilitate the completion of the project.

5.6 PROJECT MEETINGS

DPW staff and representatives of the Contractor must be notified of and attend all project-related meetings, and all DPW-requested meetings should be facilitated and conducted by the PE. The PE will also attend the various meetings scheduled by the Contractor and participating agencies involved in the project. The PE will take a proactive, collaborative approach to facilitating and conducting Contract-specified meetings to ensure good project-level lines of communication. All project meetings will be conducted according to a pre-established agenda, and meeting minutes taken. Project meetings will be conducted for case-specific issues that may arise during the course of the project, as well as for pre-determined topics including, but not limited to:

- PRECON
- Pre-activity meetings
- Weekly progress meetings
- Monthly safety and quality review meetings
- Invoice review meetings
- Internal DPW meetings
- Project close-out

Regularly-scheduled progress and task-specific meetings routinely result in a collaboration effort that addresses project issues. What occurs at these meetings is important and will be documented well. At the PRECON, the PE and the Contractor should establish a day and time for weekly job progress meetings. The purpose of these meetings is to discuss new and ongoing issues, coordinate submittals, and prepare for the upcoming work. At a minimum, the Contractor's Project Superintendent, Quality Manager, Safety Manager, and PM will attend. The Contractor is encouraged to invite subcontractors when their performance has a significant bearing on the project's success. Minutes of these meetings will be recorded by the Contractor and distributed to all parties in attendance. The PE will review the meeting minutes for accuracy of items that were discussed, and request changes as necessary. Copies of the conformed meeting minutes will be maintained in the project files.

Use the following guidelines for conducting and documenting all meetings.

- The minutes from the previous meeting will be reviewed to confirm their accuracy and the mutual understanding of the participants. By identifying those items that remain outstanding, the previous meeting's notes can serve as an agenda for the current meeting.

- The name, title, and affiliation of each participant will be listed. A sign-in sheet will be passed around at the start of each meeting. In the minutes, note any absentees or visitors.
- Record the subjects covered, the nature of the discussion, and the future actions to be taken by whom and when. The notes will be concise but informative. The items discussed will be identified with a unique reference to facilitate the tracking of week-to-week progress on ongoing issues.
- Minutes will be prepared and copies distributed to all participants and those affected. Objections or exceptions taken by any of the parties involved will be documented in the minutes. The objective of the meeting minutes is to provide a complete and accurate record of the agenda and a summary of the substantial discussions. Exceptions or objections to any content of the meeting minutes must be documented in writing, within the prescribed time-frame following the distribution of the meeting minutes.

5.7 SUPPLEMENTAL DRAWINGS

The Contract Documents outline the specific time requirements and number of copies for submission and approval of supplemental drawings (shop drawings, working drawings, fabrication and false-work drawings, etc.). The PE will review the Contractor's schedule of submissions to aid in scheduling DPW's and/or consultant resources necessary for review, as well as to confirm the number of copies needed for review if different than that specified in the Contract. The Contractor will also be advised to promptly submit information on suppliers and subcontractors whose work will require inspection and testing by DPW, particularly for off-site locations.

The Contractor is responsible for the preparation, checking, transmittal, scheduling, and tracking of submittals for supplemental drawings. Consultation between the Contractor and the PE is encouraged so that the drawing submittal tracking system incorporates all of DPW's requirements. This consultation will aid in determining the responsible reviewers for particular submittals, and identify what submittals can be processed by the project staff. The requisite number of copies of all submittals will be returned to the Contractor following review with a notation of *"No Exceptions Taken", "Exceptions as Noted", "Revise/Resubmit", or "Rejected/Resubmit",* as appropriate. Upon review of the submittal, stamped copies should be distributed to the necessary project participants and entered into the project filing system for permanent records on the project.

5.8 LOAD LIMITS

The Contractor is required to comply with all legal load limits and restrictions on public roads and detours for public traffic within the limits and in the vicinity of the project. This is also applicable to all material suppliers and subcontractors performing work on the project for the Contractor. PE should be aware of the legal load limits for the roadways and structures that the Contractor will be utilizing. The PE will verify that the Contractor is complying with legal load limits by reviewing weigh tickets of materials delivered to the project.

5.9 PROTECTION AND RESTORATION OF EXISTING PROPERTY

The Contractor is responsible for the protection of all public and private properties adjacent to and within the project limits, insofar as they are endangered by the construction operations. This responsibility also extends to designated material sources and property adjacent to haul roads. If the Contractor fails to take proper precautions or persists in performing the work in a manner that causes damage or poses a risk of damage to such property, the Contractor will be notified in writing of DPW's concerns. The Contractor is obligated to repair, rebuild, or otherwise restore such damaged property, or make good such damage or injury at no additional cost to DPW.

5.10 UTILITIES

Utility relocation and adjustments will be made by the respective utility company, unless otherwise provided for in the Contract Documents. The specifications typically identify DPW and the Contractor as being responsible for coordinating with the utility company and endeavoring to have all necessary adjustments made as soon as practicable.

Compensation may or may not be allowed to the Contractor for any delays, inconvenience, or damage sustained due to utilities encountered, or any interference by the utility agency operating within the limits of the project. Delays that may occur which are unforeseeable and beyond the control of the Contractor may warrant an adjustment in Contract time as well. If the utility fails to assume its responsibility for the adjustments in a reasonably expeditious manner, DPW may elect to instruct the Contractor to carry out the work. The Contractor may then be entitled to a price adjustment in accordance with the Changes clause of the Contract.

In most cases, the work by utility companies must precede work by the Contractor in the affected area. The PE will make diary entries to document the operations of the utility companies as the work of adjustment or relocation progresses. When utility adjustment is delayed, the PE must keep adequate records in the project diary of the Contractor's activities in the vicinity of the utility, and support them with appropriate photographs, whenever practical. This information is of value in the event the Contractor files a claim or damage to the utility occurs. When field conditions require significant changes from plans or agreements, the PE will request that DPW arrange for a meeting with representatives from the utility company to reach a final decision on the change.

5.11 BULLETIN BOARD

The Standard Specifications and the Contract Documents require the Contractor to maintain a weatherproof bulletin board, accessible to all employees at the site. Items contractually required to be posted on the bulletin board prior to work starting on site address labor and employment conditions and requirements in force on the project. Items specifically required by the Standard Specifications to be posted on the bulletin board are:

- “Equal Opportunity” poster, according to FAR Clause 52.222-26 Equal Opportunity
- “Notice” that the project is subject to Title 18, U.S. Criminal Code, Section 1020, FHWA Form 1022
- “Notice to Employees” poster, WH-1321, regarding proper pay
- “Right to Safe and Healthful Workplace” poster, according to Title 29, Code of Federal Regulations, Part 1903
- “General Wage Decision” contained in the Contract
- Company equal employment opportunity policy

Although it may not be contractually required, additional information may also be posted that is required by the Contractor’s Safety or Quality Plans for the project. Additional information may include:

- Job Safety and Health Protection poster
- Telephone numbers of physicians, hospitals, or ambulances
- All-hands safety meeting schedule
- Safety notices and incident/near miss corrective action notices
- Site Access Plan and notification of changes
- Quality and Safety Performance Metrics
- Blasting signals, if applicable
- Crane hoisting signals, if applicable

5.12 CONTRACTOR’S RESPONSIBILITY FOR THE WORK

The Contract identifies the Contractor’s responsibility for the work and activities within the project limits. The Contract also identifies the limitations of the Contractor’s responsibility for damage due to cataclysmic phenomena of nature, acts of the public enemy, or acts of government authorities. The Contractor may be responsible for other kinds of damage to the work, even damages which are not the result of the fault or negligence of the Contractor. When damages occur, and the responsibility for those damages is in doubt, the PE will discuss the issues with DPW and the Contractor. If immediate action is necessary due to imminent safety concerns, DPW will request the Contractor to take necessary and immediate steps to secure the work.

5.13 OPENING PORTIONS OF THE PROJECT

The Contractor may be required to open portions of the project for use by the public; either by specific requirements of the Contract or in association with the Contractor's planned sequence of work. The latter may involve opening a partially-completed portion of the project to public traffic. If the opening is part of an overall staged construction requirement, no special written order or directive is required. However, it may be prudent to review the incomplete work involved and agree with the Contractor on both the scope and schedule for the work remaining, as well as discuss the Contractor's plan to protect and maintain the completed work.

Generally, the Contractor is responsible for maintenance including vandalism and private vehicular accidents. If the opening is not a requirement of the Contract, DPW has a right to order an opening, but may encumber themselves of certain liabilities for doing so as identified in the Standard Specifications. The liability may include, but is not limited to, increased construction costs by requiring the Contractor to complete work under traffic, increased maintenance costs, and mitigation costs for increased safety risks to the Contractor and the public. If the government decides to open in spite of this liability, a written directive from DPW is required, along with a written instruction issued to the Contractor. In neither of these two cases is the government accepting the partially completed work; and the Contractor will be clearly advised of that and its continuing responsibility for completion and maintenance, as appropriate.

5.14 RIGHT-OF-WAY

The PE/RE is responsible for reviewing the project requirements, scope of construction, and limitations of the right-of-way and easements defined for the project. The Contractor should not perform any staking on private property without written permission from the owner, as coordinated through DPW. If the Contractor performs any construction operations outside of the limits of the acquired right-of-way, or permits employees to trespass on private property, the PE will notify the Contractor in writing, through the Director, to cease, and will inform the Contractor of its liability for damages to such property. If for any reason additional easements or right-of-way will be necessary, the PE will notify DPW's Right-of-Way Section in advance of the time when access will be required, to secure proper written permission for right of entry.

In cases where the right-of-way lies adjacent to privately developed land, the PE will perform a field review of the right-of-way limits to identify any and all occurrences of encroachment by buildings, fences, fixtures, or advertising signs into the right-of-way. The PE will coordinate with DPW to determine from the plans or from the right-of-way agreement, whether the removal of such items will be by the owner or by the Contractor; and if by the Contractor, whether any salvage rights have been retained by the owner or DPW. Any new encroachments after construction has begun must be reported to DPW, who will follow up with instructions on the proper course of action.

5.15 CONTRACTOR PAYROLL

The PE will monitor the Contractor's payrolls for prompt submission and proper certification. The extent to which the Contractor's certified payroll information is inspected will be as determined by DPW. Inspections will include interviews and/or records inspection to determine the correctness of job classifications and wage rates, fringe benefits, hours worked, and timeliness/accuracy of payments. These checks will also determine if all covered personnel, including owner-operators, are included on a certified payroll (refer to Appendix B, Contractor Payroll Checklist). The PRECON will include an overview of the labor and payroll reporting requirements, and the minutes will reflect that these items were covered. The Contractor should submit the required number of copies of the Contractor and subcontractor payrolls to the PE. The PE will maintain and properly secure all payroll records received from the Contractor to ensure that each individual's privacy rights are respected.

If the Contractor fails to submit timely and accurate payroll data, the PE may, with concurrence from DPW, withhold progress payment amounts until compliance is secured. In the case of subcontractor non-submission, the withholding of only the subcontractor's portion of the work may be appropriate. These actions will be discussed with DPW if they are deemed necessary. All payroll documents received will be incorporated into and retained with the project permanent records.

5.16 EQUAL EMPLOYMENT OPPORTUNITY (EEO) REQUIREMENTS

The Contractor's EEO responsibilities are specifically outlined in the Contract, in combination with the requirements and regulations of governmental authorities. Specific compliance actions are required by the Contractor with regard to the following:

- Affirmative Action
- Equal Opportunity
- Equal Opportunity for Special Veteran Designations
- Affirmative Action for Workers with Disabilities
- Nondiscrimination

Affirmative action goals for the project are listed in the Contract Documents. The PE will emphasize the Contractor's obligations to meet these goals at the PRECON, including the submittal of all required forms.

5.17 SUBCONTRACTING

The Contract Documents permit the Contractor to subcontract a portion of the work. The Contractor is required to self perform not less than 51 percent of the original Contract amount with its own forces. For portions of the work to be subcontracted, the Contractor is required to furnish the DPW with two copies of the subcontractor agreements. In some contracts, such as Small Business Set Asides, alternate percentages may be inserted which may permit a far higher percentage of the work to be subcontracted. DPW specifically encourages subcontracting to small businesses, veteran-owned small businesses, service-disabled veteran-owned small businesses, and small disadvantaged and women-owned small business concerns.

5.18 CONTRACT TIME

The time allowed for the Contractor to complete the work will be based on either a specified completion date or established by a number of calendar/working days. All work on the project will be completed no later than on the date; or within the time constraints specified in the Contract; or as may be adjusted under the Contract provisions.

If the Contractor fails to complete the work within the time frame prescribed, the Contractor is subject to liquidated damages, fines, charges, etc., that may be identified in the Contract Documents. A complete recording of the Contractor's daily activities and resources utilized should be maintained beyond the original Contract completion date, up to the date the Contractor is considered to have achieved Substantial Completion, and ultimately the completion of all work under the Contract.

When Contract modifications are issued, consideration will be given to the modification's effect on the overall Contract time. Other abnormal conditions may also warrant an adjustment to the time given to the Contractor to complete the work. Granting of additional Contract time must take into consideration several factors, including critical path activities identified on the Contractor's Construction Schedule, work being performed by others within the limits of the project, and all other conditions identified in the Standard Specifications. Often times, it is crucial for the Contractor to take specific measures to complete the project within the originally prescribed period. In situations where it is critical that the original Contract completion date be maintained, it may be in DPW's interest to instruct and compensate the Contractor for accelerating the work to meet the original completion date.

Generally, time adjustments will not be made unless the modification or change in work adversely impacts critical path items. When an adjustment in Contract time is negotiated, the proposed adjustment will be in accordance with the Contract provisions, and is fair to both the Contractor and DPW. The actual time allowed will be tailored to the particular change situation, along with consideration of the effect on non-changed work as to total Contract performance time. Consideration will be given to the time of performance of the changed work and the need to acquire and mobilize/demobilize equipment to perform the work.

Anticipated adverse weather and its impact on the Contractor's execution of work are already addressed in the Contract specifications based on historic climate data for the Island. The extent to which the Contractor's operations are affected by inclement weather will be monitored closely and documented on a daily log to validate both the severity of the climatic event and the actual impacts on the Contractor. Any consideration of additional time related to a Contractor's claim of unusual and adverse weather conditions must be discussed thoroughly with DPW to validate entitlement of the Contractor's position.

A reduction in Contract time is uncommon, but is provided for under the Contract. Circumstances that could warrant a reduction in the Contract period could be associated with a reduction in project scope, DPW-directed project acceleration, early completion incentives, or other conditions associated with a modification or change in the Contract. When a decrease in performance time is contemplated, the Contract modification will be negotiated and an equitable adjustment reached with the Contractor.

5.19 WORK SUSPENSIONS AND STOP WORK ORDERS

Interruption of the Contractor's operations imposed by DPW may occur for a variety of reasons, each with their specific impact on both the execution of the construction activity as well as the liability associated with that interruption. These interruptions can be classified and defined as follows:

- Suspension: An interruption, delay, or halting of all or any part of the work by and for the convenience of DPW, or resulting from an act (or failure to act) of DPW or their authorized representative
- Stop Order: An interruption, delay, or halting by DPW, of all or any part of the work resulting from unsuitable weather or site conditions, an act of the Contractor, or the failure of the Contractor to act.

Suspension of Contractor Operations

The Contract Documents provide for and permit work to be suspended for the convenience of and by DPW, and such authority cannot be delegated to the PE. If a suspension is for longer than a *reasonable* time, the Contractor may be entitled to an equitable adjustment. What is *reasonable* depends on the circumstances, and DPW's liability exposure if the Contractor is allowed to proceed will be considered before suspending the Contractor's activities. Authority to issue emergency or urgent suspensions within the window of *reasonableness* is DPW's responsibility. DPW may rely in part on the observations, assessments, and recommendations provided by the PE. Upon recognition that the suspension will result in increased liability to DPW, the letter or notice ordering the suspension of work or documenting the suspension after the fact will be issued by DPW to the Contractor. Constructive suspensions of work can occur by failure of DPW to act. For example:

- Inability to acquire specific right-of-way in accordance with the stipulations in the construction specifications
- Changes directed by DPW in the materials to be procured by the Contractor
- Conflicts with construction projects by others or special events that are not addressed in the Contract provisions

Stoppage of Contractor Operations

The Contract designates DPW with the authority to issue a Stop Work Order to the Contractor to stop the work wholly or in part. Examples of conditions that could warrant the issue of a stop order include, but are not limited to:

- The prosecution of work that would be adverse to the work already constructed, or existing project elements slated to remain
- Prosecution of work that if completed, would preclude the inspection of other project elements subject to the notification requirements in the Contract
- Conditions contrary to the approved plans, which place the public at an unacceptable risk
- Unsafe conditions that place the workers or the general public in imminent danger of bodily injury or death
- Failure to carry out specific written directives given by DPW
- Performing follow-on work on a project element that has been identified as being in non-conformance with the project requirements

The PE should consider the issuance of a Stop Work Order as the last resort, and only be considered or recommended if all other efforts to communicate, address, and resolve the matter with the Contractor have failed to achieve satisfactory results. The Stop Work Order should be concise and contain specific language as to the extent of the Contractor's work being affected; the reason for the order being issued; the conditions that must be met to release the Stop Work Order; and who is authorized to release the order instructing the Contractor to resume normal construction activities.

The PE is responsible for providing DPW with a debriefing of the circumstances of the Stop Work Order, including actions leading up to the event; efforts made to resolve the matter; the time and a description of the work that was stopped; the Contractor's forces that were affected by the stoppage and alternate activities performed; the actions taken by the Contractor to remedy the condition; the time of the release of the order; and the Contractor's resumption of his construction activities. The PE will also analyze the sum total of the event and generate a "Lessons Learned" report, along with recommendations on how to avoid this situation in the future.

5.20 CONSTRUCTION STAKING AND SURVEYING

The Contract Documents will define the requirements for construction surveying and staking to be provided by the Contractor. In addition, Special Contract Requirements may amend the Standard Specifications for specific project requirements. The PE should review the specific project requirements to verify that the required surveying is being provided by the Contractor.

If provisions are made by DPW for QA survey efforts as part of DPW services, the PE will arrange to check any secondary control points established by the Contractor, and randomly check a pre-determined percentage of each of the Contractor's staking operations. If a number of these checks reveal work that is outside of the tolerance prescribed in the Contract specifications, the Contractor should be required to correct the problem and the layout of the area of concern. If survey errors become a regular occurrence, the Contractor will be notified in writing of the non-conformance and the deficiencies shall be corrected.

5.21 CONSTRUCTION SCHEDULE

The Contract Documents require the Contractor to prepare and submit a construction schedule. Both a preliminary and comprehensive schedule should be prepared and submitted, and is subject to review by DPW prior to the Contractor's commencement of work. The construction schedule should represent the sequence in which the Contractor plans to perform the work within the defined Contract period. The schedule should show the start and end dates for each activity, the inter-relationship with other construction operations, material ordering and delivery activities, all required submittals and reviews and float time.

Limitations on Completing Work

The time allowed for completion of all Contract work is the ultimate limitation or constraint on the construction activities required for the project. Numerous activities can be planned, supplied, and constructed within the Contract time by recognizing the limitations on the work and the interdependence between activities of work.

Most activities are resource dependent (i.e., they rely on resources such as equipment and labor). Other activities of work are independent and can be carried out simultaneously if sufficient resources are available, such as constructing a bridge while earthwork or paving are being completed.

Some activities, however, are completely dependent on the completion of other preceding activities, such as the sequence for road construction starting with clearing/grubbing before embankment construction, then fine grading, followed by placement of any base courses, and finally the asphalt paving. Other activities such as concrete curing or form removal are restraints, since they cannot be completed before a minimum amount of time has elapsed (i.e., seven days is required for curing and a percentage of the 28-day strength must be achieved before the forms can be removed). Other possible restraints are shop drawing approvals, traffic lane closure restrictions, limited work hours, and climate conditions. To properly manage a construction project, all of these activities, constraints, and limitations must be logically organized and developed into a construction schedule.

Construction Schedule Format

The general format for the construction schedule includes a graphic representation of the sequencing of work activities, the time to complete each of these activities, and a written narrative supporting the Contractor's logic in the development of the graphic representation. The Contract Documents require the Contractor to use one of two standard formats, the Bar Chart Method (BCM) or the Critical Path Method (CPM). The SCRs on individual projects may limit the choice to only one of these specific formats; otherwise, it is the Contractor's option.

Bar Chart Method (BCM)

The BCM format consists of a progress bar chart and a written narrative. The Contract Documents outline the information to be included on the bar chart and in the written narrative. The bar chart typically is comprised of a horizontal time scale and a vertical listing of project work activities. Bars are drawn to graphically represent the span of time necessary to accomplish each activity.

Bar charts are the least sophisticated of scheduling methods because they do not show the relationships and dependencies of different work activities; do not tie the work to resource utilization; do not show float time; and are not effective in determining overall impact (cause-effect) on time resulting from a change or disruption. As such, delay analysis is difficult to perform accurately.

Bar charts are appealing to operations personnel because they identify the general course of the work in an uncomplicated fashion, and they are easy to use in routinely monitoring the Contractor's progress.

The narrative requirement for the BCM method of scheduling increases the usefulness of the bar charts. The Contractor is required to identify anticipated resources and production rates. If the scheduled resources are not used on the project during construction, or if the production rates are not achieved for unchanged work, it is possible to prove the Contractor's original schedule was defective.

Critical Path Method (CPM)

The critical path is the longest chain of dependent activities from the project NTP date to the Contract completion date. These dependent activities define the critical activities that control the ultimate completion of the project. The critical path is of obvious importance when considering the impact of a Contract modification on the completion date. Modifications that adversely affect a critical activity may likely require the consideration of a time extension. An event that causes a delay to part of the project may not increase the time required to perform the entire project, unless it delays a critical activity on the critical path. As the work progresses and actual performance is reflected on the construction schedule, it is possible to see a change in what activities now fall on the critical path for the project.

Float Time

Float in a construction schedule is the time the start, duration, or finish of a particular work activity can vary, or float, without adversely affecting other work activities and/or the completion of the project. Float is normally associated with activities that are not defined as being on the critical path; however, the project itself can have float if the longest path of dependent activities is shorter than the time allotted for the project. *Free Float* is the amount of time an activity can be delayed without affecting an immediate following activity. The Contractor has some flexibility with Free Float work activities and when they are scheduled to start. *Total Float* is the amount of time an activity can be delayed without affecting the completion date of the Contract. Float time can also be defined as the amount of time between the earliest start date and the latest start date, or between the earliest finish date and the latest finish date. When the float time for an activity is exceeded, it has the potential of becoming a controlling activity of work, becoming part of the critical path, and affecting the Contract completion date. Activities on the critical path routinely either have no float time collectively, or together represent the least amount of float time than any other sequence of work activities.

Unless specifically defined in the Contract Documents, float is not "owned" by either the Contractor or DPW; rather, it is a mechanism to absorb limited disruptions to the planned sequence without impacting the ultimate completion of the project.

Limited or No Float and/or Multiple Critical Paths

It is important that the Contractor assign a reasonable amount of time to perform all work activities, and utilize appropriate links between activities to identify any float time in the schedule. With an overly aggressive or optimistically scheduled project, any delay to an activity with little float time can become a controlling activity of work. A schedule with little float time for a significant number of work activities places undue risk on DPW, since even minor delays can affect project completion and could result in a delay claim. CPMs with multiple critical paths will also be closely reviewed, since seldom is there more than one truly critical path. If a schedule with multiple critical paths is accepted, DPW is exposed to greater risks again because any delay will likely impact one of the critical paths identified. Multiple critical paths are often times created by assuming low production rates and eliminating float on non-critical activities, so that the activities appear critical. The PE is responsible to review the Contractor's submitted schedule closely to determine whether the claimed production rates and durations are realistic, and whether the activities will be considered as critical to the overall completion of the project.

Submittal Requirements and Review

The Contract defines the number of copies and time for the submission of the Preliminary Construction Schedule (PCS), routinely required to be submitted at least seven days prior to the PRECON. The PCS is a written narrative with a detailed breakdown of the Contractor's Contract activities for the first 45 calendar days after NTP is issued. DPW has up to seven calendar days after the PRECON to review the PCS and return it to the Contractor as accepted, rejected, or returned for revisions. The Contractor will not be permitted to start any work, except mobilization and non-invasive traffic control (i.e., erection of construction signs, etc.) until the PCS is approved. The PCS will be reviewed to determine if it generally represents those activities that logically occur in the beginning of the specific type of Contract. This could involve placement of additional traffic control devices; erection of an on-site batch plant and other equipment mobilizations; material ordering and delivery of pre-manufactured materials; and other preparatory activities. This review must consider the type of project, and will not be overly critical. The PCS will also be used to plan and schedule DPW's initial on-site personnel and equipment needs.

The initial or "as bid" construction schedule for the total Contract work will be submitted at or prior to the PRECON. This initial schedule must be accepted, rejected, or returned for revisions within 14 calendar days after receipt by the PE. This initial construction schedule is of particular importance since it shows how the Contractor plans to begin and sequence the operations to complete the principal phases of work within the time allotted by the Contract. It is the Contractor's initial construction schedule that normally warrants the most thorough, in-depth review. Once accepted, this initial schedule will establish the basis against which all future schedule changes or updates and claims will be compared and justified. This review by the PE will carefully consider each work activity on the schedule and the time proposed for its completion, and all logistic parameters associated with the activity. Particular attention will be focused on uncovering conditions including:

- Any unrealistic production rates based on proposed crew size or number of equipment
- Impractical sequencing of work activities
- Failure to acknowledge staging, phasing, or physical constraints
- Time allocation for actions involving DPW such as review of shop drawings, inspections, and testing
- Work activities scheduled during night shifts and extended construction hours requiring testing and inspections
- Pre-planning activities including material submittals and plan preparation for project safety and quality

In the absence of any contractual or supportable operational deficiencies in the submitted schedule, an overly optimistic schedule requires the Contractor to justify particular parameters used, through demonstration of its past performance in similar situations. Accepting an unrealistic schedule from the Contractor places DPW at a distinct disadvantage when defending against any future delay or impact claims. DPW will approve the construction schedule when the Contractor satisfies all DPW and project requirements, becoming the “baseline” schedule to be used to measure the progress of the work. Progress payments will be withheld until receipt and acceptance of the Contractor’s initial construction schedule, and may be withheld, in part, if schedule updates are not submitted as required. Minor problems do not normally justify any withholding.

Look-Ahead Schedules

A weekly review of the Contractor’s recent and upcoming construction operations is a common practice, and is referred to as a look-ahead schedule. The look-ahead schedule is normally presented in a three- or four-week format, showing what was accomplished during the previous week, combined with the planned day-to-day activities for the upcoming two- or three-week period. The look-ahead schedule reflects more specific detail that can be used to schedule staffing resources, the timing of specific events, material deliveries, logistics on site, and other specifics that are impractical to reflect in the baseline schedule.

An important aspect of the look-ahead schedule is the acknowledgement of the adverse weather days identified in the Contract Documents. These specific Contract days should be acknowledged by DPW and the Contractor jointly, as they may have an impact on the ultimate completion of the project. The weather will be tracked on a log that documents when the weather is unacceptable for work.

Schedule Updates

The Contract requires the Contractor to document actual progress on the approved construction schedule, which will be submitted every month along with the Contractor's request for partial payment for the work satisfactorily completed during the period. Monthly schedule updates will reflect the actual work performed, represented by an actual progress activity bar for each scheduled activity. Monthly updates are not allowed to modify the baseline schedule in any fashion. Stand-alone modifications to the baseline may occur only in cases where a Contract modification has been authorized by DPW that incorporates an associated extension of the Contract period. It is also prudent to request an updated schedule when issuing a major Contract modification, time extension, or a direction to accelerate. All modifications to the baseline construction schedule will be reviewed and accepted, rejected, or returned for revisions. The review will focus on the areas of the schedule that have been significantly changed from the previously accepted schedule. The Contractor should identify these changes in the narrative submittal. Any reservations will be documented in the acceptance letter. If there are no reservations, DPW will stamp the modification "No Exceptions Taken", and return a copy to the Contractor.

6 ENVIRONMENTAL COMPLIANCE

6.1 INTRODUCTION

One of the highest priorities on any DPW construction project is to ensure continuous compliance with all environmental requirements. One incident, no matter how unintentional or seemingly undamaging, can irreversibly harm the environment; result in civil and criminal actions; and adversely affect DPW's ability to obtain permits and environmental clearances in the future. The PE is responsible for being mindful of all of the environmental aspects of the project and foreseeing where difficulties may arise. Close coordination between the project-assigned PE and Inspection staff with an Environmental Specialist assigned by DPW is essential to a successful project being in full compliance with the GEPA, permitting, and project requirements.

6.2 ENVIRONMENTAL CLEARANCE

Environmental clearance requirements for material sources, staging, and disposal areas will vary project-by-project, depending on its location and the environmental conditions impacted by the work. DPW will endeavor to obtain all permits for critical and long-lead time activities; however, the PE should coordinate additional permits, clearances, and rights for use and access to DPW-provided sources, as well as Contractor-initiated permits and clearances for disposal sites, haul routes, temporary access, and staging areas. The PE will coordinate with DPW's permit department and other agencies to ensure the required clearances and permits are obtained to eliminate adverse impacts to historic/archaeological, endangered species, and wetlands criteria.

If a change to any work covered by a permit is contemplated, the PE will coordinate directly with DPW and the designer's Environmental Specialist, who understands the original permit application, and will also understand concerns the permitting agencies may have with the proposed deviation. For Contractor-initiated permits, the Environmental Specialist should review the proposed changes and comments prior to communicating with the permitting agency.

6.3 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT

In accordance with the Clean Water Act (Section 402(p)), all construction activities that disturb five or more acres of land require a Storm Water Discharge Permit from the US Environmental Protection Agency (EPA) or a federally-approved territory agency. Clearing, grading, excavation, borrow areas, staging areas, and waste areas constitute a disturbance. Inspections by DPW personnel, or those qualified and authorized by DPW to perform verification inspection services, are responsible for administering NPDES compliance. These personnel will be treated with respect and cooperation. They will often request to see the permit, the Erosion Control Plan, inspection reports, and related documentation. The files on this subject will be kept up-to-date and easily accessible, and a copy of the permit will be available on site. If DPW and/or authorized Inspectors issue instructions or make demands that appear to extend beyond the requirements of the Contract and existing permits, the Contractor should discuss the issues with the PE before implementing these actions, especially if the actions may result in unforeseen expenses or liability to DPW. Failure by the Contractor to comply with the requirements of the permit may result in Stop Work Orders, shutdowns, work disruptions, as well as possible injunctions, lawsuits, and other adverse actions by third parties against the Contractor.

6.4 COMPLIANCE INSPECTIONS

The PE and the Contractor's representative must jointly inspect the subject area of all permits on the project following initial installations, as well as periodically during the life of the installations to assess compliance with permit requirements. These inspections should rely on the documents submitted and approved with the issue of the permit, and should include a review of the following:

- Erosion and sediment control measures installed and/or in use
- Ongoing maintenance of installations
- Disturbed areas that have not been finally stabilized
- Material storage areas that are exposed to precipitation
- Accessible discharge locations or points
- Locations where vehicles enter or exit the site

These inspections must be performed at least bi-weekly and within 24 hours of the end of a 0.5 inch or greater storm. The inspection will determine whether the control measures are effectively preventing the discharge of significant quantities of sediment to the receiving waters. If the control measures are not effective, action must be taken and the Storm Water Pollution Prevention Plan (SWPPP) must be revised within seven calendar days of the inspection to prevent such discharge. Any modifications to the Plan should be included in the SWPPP file. An inspection report must be prepared for each inspection and must include a certification that the facility is in compliance with the SWPPP or identify any incidents of non-compliance.

For areas that have reached "final stabilization", or during off-peak seasonal periods, inspections should be conducted once per month. Documentation of the conditions observed during these inspections should also include photographs or video. This information will be used to provide a basis for the inspections performed and for comparison of vegetation at the time of final stabilization.

Unauthorized Discharge and Reportable Spills

The NPDES permit prescribes actions to be taken by all parties in cases of unauthorized discharge from the site, including the release of hazardous substances. In situations where an unpermitted stormwater discharge, or the release of unauthorized hazardous substances occurs, the following are typical actions required:

- The Contractor must notify DPW or their authorized representative within four hours of having knowledge of the discharge
- The Contractor must immediately cease activities contributing to the continuation of the unpermitted act
- The Contractor must submit a temporary mitigation plan within three calendar days if it is determined necessary to eliminate further damage in the short-term
- The Contractor must modify the SWPPP within 14 calendar days of having knowledge of the release, and provide the following information for further transmittal:
  - A written description of the release including the type and estimated quantity of material released
  - Date of the release
  - Circumstances leading to the release
  - Description of any short-term mitigation actions performed
  - Steps taken to modify the SWPPP

In addition, the SWPPP should be reviewed to identify measures to prevent the reoccurrence of such releases, respond to the subject release, and modify the plan where appropriate. This information, together with a summary report, should be forwarded to DPW for review and further actions as may be deemed necessary.

6.5 NOTICE OF TERMINATION

When all project work has been completed and the site has been finally stabilized, a Notice of Termination (NOT) of coverage under the NPDES permit for Storm Water Discharge should be prepared, executed through DPW, and transmitted to the GEPA or appropriate agency. The NOT is essentially a certification stating that all stormwater discharges associated with the construction activity have been eliminated, the final stabilization installations have been achieved, or DPW is no longer the operator of the facility. The Environmental Specialist or DPW-authorized agent will prepare the NOT relying on the documents prepared by the PE and the Contractor. DPW should retain the responsibility, and make the necessary arrangements for meeting permit requirements after completion of other work on the project, if final stabilization cannot be completed under the Contract. The NOT should be filed with the SWPPP including all inspection reports, modifications to the plan, etc., and retained as part of the permanent records on the project.

7 PROJECT SAFETY

7.1 OVERVIEW

Safety is of the greatest importance to DPW, and is a critical factor in the successful and timely completion of the project. Planning for and maintaining safety compliance on the project is a common objective for everyone working on or associated with the project. Each individual will personally adopt and follow safe practices and comply with established procedures and protocols to keep themselves safe, as well as to enhance the safety of others. The formal responsibility for safety performance varies widely among the groups and individuals on the project. The basis of understanding and commitment for all parties involved is founded on the following common objectives:

- The goals and expectations of all parties involved in the project should be clearly communicated, and the overall safety objectives are understood
- Provide the necessary training, equipment, planning, and supervision to facilitate compliance with the safety objectives
- Establish the parameters, methods, and schedule for measuring performance and compliance, including both enforcement and recognition programs
- Using a process for evaluation of performance, develop corrective measures where necessary, implement them, and measure the effectiveness of the corrective actions
- Record lessons learned and incorporate them into the Project Safety Plan (PSP)

7.2 RESPONSIBILITIES

Contractor Responsibilities

The Contractor is responsible for the execution of work within the limits and scope of the project, and for complying with all safety regulations administered by OSHA, other governing agencies, and the specific requirements in the Contract Documents. The Contractor should establish a PSP that complies with all Contract and governing agency requirements, and in part, define the minimum safety performance requirements for all groups and individuals working on the project. The Contractor is also responsible for implementation of the policies and procedures established in the PSP; the investigation of all safety incidents and near misses that occur on the project; and enforcement of the PSP in order to maintain the safety of the site, the work, the project personnel, and the public.

DPW Responsibilities and Authority

Through the PE, DPW is responsible for preparing a Construction Safety Management Plan (CSMP) for the execution of the CMIS activities in accordance with the requirements of Appendix E and all other governing documents, including the PSP prepared by the Contractor. All DPW personnel assigned to or visiting the project site are responsible for complying with the CSMP, the Contractor's PSP, and all governing agency requirements. The PE is also responsible for monitoring and observing the Contractor's administration and application of all safety requirements, including the actions of its subcontractors and suppliers. The objective of this monitoring activity is to observe the Contractor's safety efforts and assess compliance with the established safety requirements. This monitoring activity in no way diminishes the Contractor's responsibility for the overall safety within the limits of the project. DPW personnel do not have the authority to accept or reject a specific condition for compliance with the PSP and/or OSHA requirements. Qualified DPW staff are responsible for communicating particular observed activities that present a possible unsafe situation or violation of the established safety objectives on the project to the PE and senior Contractor personnel. As an employee of DPW, the PE retains the authority to issue a Stop Work Order in extreme circumstances, and will be notified immediately, along with senior Contractor personnel, of any situation that poses an imminent danger which could result in serious bodily injury or death.

Safety Notice

The PE may notify the Contractor by issuing a Safety Notice (SN) describing observed conditions that do not comply with the safety requirements of the project. This notification will first be given verbally to the senior Contractor personnel present at the specific site of the observed condition, followed up in writing within 24 hours. The PE will actively track all SNs issued to the Contractor, along with the actions taken by the Contractor in addressing these safety conditions through final resolution. The PE has the authority to direct and/or take actions appropriate to the safety risk of the condition if the Contractor fails to adequately address the safety issue in a timely manner.

Imminent Danger

Imminent danger is any situation or condition on the project that could, in the opinion of the PE/RE, result in significant property damage, bodily injury, or death. The Contractor will be notified immediately whenever an imminent danger concern is observed. In this event, the PE has the authority to immediately issue a written Stop Work Order to suspend all or portions of the work in the immediate vicinity until the hazard is adequately addressed. DPW should be notified immediately when a Stop Work Order is issued, as well as when the hazardous condition is removed and the Contractor is authorized to proceed with the work. Care should be exercised in the use of Stop Work Orders, and should be the last recourse after attempts to resolve the issue directly with the Contractor's site personnel have failed.

7.3 SAFETY OF THE DPW

The PE has the authority to cease the performance of DPW responsibilities on the project that would require personnel to work in or near unsanitary or unsafe conditions in performance of their assigned duties. The PE should inform the Contractor that the work element in question is considered rejected until such time as the unsafe or unsanitary condition is remedied. It is DPW's responsibility to provide a safe work environment for its employees.

Drug-Free Workplace

DPW does not tolerate any use of illegal drugs, controlled substances, or alcohol that impairs an employee's work performance or behavior. All DPW policies dealing with prohibited substances apply to all DPW employees and those of its subcontractors and vendors. Individuals should not be involved in any manner with the unlawful manufacture, distribution, dispensation, possession, sale, or use of prohibited substances in the workplace, and any violation of these prohibitions will result in disciplinary actions and/or immediate discharge, as well as be subject to any and all legal charges that may be applicable.

7.4 CONSTRUCTION SITE SAFETY

The PE and other DPW staff should cooperate fully with the Contractor in managing safety on the project. DPW personnel should comply with all safety mandates and protocols, actively participate in all preparatory and progress meetings, and attend weekly site "tool box" meetings with all project personnel to discuss work safety issues. The PE should participate in senior planning sessions and discussions to emphasize the attention to safety in the daily activities of all project personnel, near misses, safety incidents, incentive/recognition programs, and measurements of performance.

7.5 ACCIDENT REPORTING AND INVESTIGATIONS

Reporting of near misses, safety incidents, and investigations are an important element of both the CSMP and PSP by providing useful information to prevent similar incidents. Incident investigations identify root causes, system failures, unsafe acts and conditions, and non-compliance with or inadequacy of the Contractor's PSP. All significant near miss, injury, illness, or major equipment or property damage incidents, including process interruptions, require an investigation. The goal is always FACT finding and NOT fault finding. The Contractor has the primary responsibility to conduct incident investigations on the project, supported by the PE and DPW's Safety Manager, if provided, to ensure that the on-site investigation is conducted immediately after notification of an incident. The PE will review the incident investigation report for accuracy and completeness, and track the Contractor's reporting and performance. The

PE will also follow up to disseminate the results of the completed investigation as appropriate to implement lessons learned.

7.6 FIRE PREVENTION AND CONTROL

The Contractor's PSP should provide the requirements for fire protection on the project. This element includes extinguishers, firefighting equipment, and fire warning systems, as well as documentation and reporting requirements. This element applies to all Contractor personnel, staff of subcontractors and suppliers, and the staff of all groups or agencies working within the limits of the project under the Contractor's control. Fire emergencies have additional considerations and requirements for fire alarming, response, evacuation, and exit routes, which will be integrated into the comprehensive emergency response planning for the project.

The PE will review the Contractor's Fire Prevention Plan (FPP) as part of the overall review of the PSP. The FPP should incorporate the requirements of the Contract Documents and local building ordinances. At a minimum, the FPP should address the following elements:

- Fire Detection and Alarm Systems
- Portable Fire Extinguishers
- Standpipe and Hose Systems
- Fixed and Automatic Sprinkler Systems
- Water Supply
- Fuel Storage and Dispensing
- Inspection
- Maintenance
- Training
- Documentation

7.7 7.7 PROJECT SAFETY PLAN (PSP)

The Contractor's PSP, when required in the Contract, should identify safety and health risks and exposures, and integrate appropriate control and feedback systems into daily project activities. The PSP also identifies the schedule, content, and format to document the Contractor's due diligence in health and safety matters through the project's life cycle. Risks and hazards will change for each project phase, and must be re-analyzed during the transitions from project start-up; detour staging; construction; commissioning, and operations; punchlist and hand-over; and project close-out. Most importantly, the PSP provides clear and consistent information to the project team about the hazards of the work and the procedures to be followed to mitigate them. At a minimum, the PSP should contain:

- Project owner and project name
- Name of project Safety Manager
- Scope of Contract
- Scope of work
- Risk analysis
- Safety activity and reporting schedule
- List of key project stakeholders
- Subcontractor safety plan submittals
- Project schedule
- Initial Activity Hazards Analysis
- Other risks (identified and documented)
- PSP management structure
- Safety incentive program
- Workers compensation program

The project documents may also include security program requirements as a part of the PSP. The importance of an effective security program cannot be overemphasized, but as in all business practices, security management must be economically sustainable. The security plan should consider risks such as terrorist activities, criminal activities, environmental extremism, fraud, and other such security events.

To achieve the most efficient use of resources, security measures should be balanced against the security risks to a facility or operation. The Department of Homeland Security uses a Security Advisory System to communicate potential threats to the public. The advisory system includes a color-coded threat level system. Changes to the threat level could result in recommended changes to project work and travel activities or requirements, readiness, protective actions, emergency preparedness, and/or communications. A project should have protective measures and a communication plan that can be implemented to reduce the likelihood of impact and to mitigate potential threats. At a minimum, all DPW staff members should be vigilant, take notice of their surroundings, and report suspicious items or activities to the Contractor and project authorities.

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8 CONTROL OF MATERIALS

8.1 OVERVIEW

This chapter describes the general requirements for materials inspection and control, including the inspection and control of the installation of those materials. The Materials Testing and Inspection Plan (Appendix C) is the primary guide for sampling and testing materials. Three basic types of materials are incorporated into highway work:

- Off-the-shelf commercial items, which are represented by the manufacturer as meeting a standard or industry specification (e.g., guardrail, traffic paint, and culvert pipe).
- Commercial items manufactured specifically to meet DPW's requirements, or items of sufficient criticality to require inspection and quality assurance by DPW or an organization engaged by DPW (e.g., structural steel and precast structural elements). Specialists engaged by DPW will generally conduct testing and inspection of commercial items, other than off-the-shelf items, at the site of manufacture.
- Items manufactured at or near the work site of the Contractor, subcontractor, or supplier, and which are subject to routine inspection and quality assurance procedures by DPW (e.g., concrete, asphalt concrete pavement, and aggregate base course). The Contractor should perform tests for materials produced locally, in accordance with the requirements of the Contract.

8.2 SOURCE APPROVAL

The Contractor should obtain DPW's prior indication of "No Exceptions Taken" before the beginning production of an end-use material from a specific source. This indication of "No Exception Taken" is based on the material in the source meeting the Contract's raw material requirements for the particular item being produced (i.e., base aggregate, riprap, etc.).

Contractor Provided Sources

The Contractor is responsible for determining and providing documented evidence of the acceptability of source material proposed for use on the project. Supplemental sampling and testing for source approval by DPW is important as it may alert DPW and the Contractor to potential problems with the quality of the material and its consistency over the duration of the project. Addressing these problems or moving to an alternate source at this point in the project may provide for more reliable delivery of material and eliminate adverse impacts to the project over the long term. Questions or concerns regarding sampling, testing, or shipping of samples will be coordinated by the PE.

Source Approval Requirements

Source approval requirements are identified in the Contract Documents and further detailed in the tables at the end of particular sections of the project specifications. These tables define what sampling and testing is required for source approval for the products intended for use. The Contractor is responsible for providing its source approval test results. If all test results indicate that the source meets the Contract requirements on all characteristics, DPW will notify the Contractor in writing if DPW will take additional QA samples for verification testing prior to approval, or that the source is acceptable for the particular products. If the material fails to meet Contract requirements, the source will be considered not acceptable and the Contractor notified accordingly.

8.3 MATERIAL PRODUCTION

The production sampling and testing requirements are in the table at the end of each section of the Standard Specifications. Review these tables to determine what sampling and testing is required during production of the intended items.

Number of Samples to Submit for Verification Testing

The PE/RE is responsible for ensuring that the initial QA samples are obtained as the Contractor is producing material. If the QA results are within acceptable tolerance with the results provided by the Contractor's results, the QC process will be considered valid and the material considered acceptable for use. Further QA sampling will be random and in accordance with the prescribed frequency for the material, typically representing approximately 10 percent of the number of acceptance tests performed by the Contractor. The QA samples will be obtained by a combination of both split-sampling with the Contractor and randomly selected independent samples. When obtaining split samples, it is advisable to obtain and hold back additional material to aid in resolving out-of-tolerance discrepancies between the Contractor's QC and QA results. Consideration will be given to the material properties, sampling methods, test equipment and procedures, and personnel performance in evaluating the causes of the discrepancy and for determination of compliance with Contract specifications. Since gradation target values may not be established at this point, the test results will indicate consistent production that is within the broadband specification limits. Consult with the PE/RE to discuss all quality control test results. If the test results indicate even the smallest of problems, additional sampling and testing may be in order until confidence is achieved that problems are corrected and acceptable material is being produced.

Material Not Meeting Contract Requirements

If the test results indicate the material does not meet the requirements for one or more characteristics, the Contractor should be informed and encouraged to cease production until the discrepancy is identified and resolved. If the Contractor wishes to continue at its own risk, the material in question will be isolated to the maximum extent possible from other materials, and its location closely tracked and monitored. Every situation and project is different, but it is recommended the Contractor not be allowed to continue with production. Allowing the Contractor to continue does not solve the problem, but only delays the issue to a later, and more costly, point in the project. Issuing a non-conformance will be considered if, in the opinion of the PE, the situation poses an unacceptable risk to the successful execution of the project.

8.4 MATERIAL STORAGE

The Contractor is responsible for the handling and storage of materials to ensure the preservation of their quality and fitness for the work. Concerns over the Contractor's handling and storage methods and operations being detrimental to quality will be discussed with the Contractor and reported to the PE. DPW retains the right to re-test materials at any time during the project to verify that quality requirements have not been compromised by the Contractor's operations or the lack of adequate protection. DPW can also reject the Contractor's requests for payment for materials on site for any and all materials that are not properly stored and protected from contamination and damage.

8.5 SAMPLING AND TESTING

Collecting Samples

Prior to obtaining material samples, the PE should review sampling protocols and the acceptability requirements for containers (quality, size, type) with the Contractor. Test results, and ultimately the pay factor, can be directly affected by the manner in which a sample is obtained and handled. Clearly communicate the sample size or series of tests to be performed to ensure adequate material is obtained when sampling, particularly when samples are being collected for both the Contractor and DPW. When the Contractor is collecting samples for testing by its laboratory and by DPW, the PE will ensure a DPW representative is present to witness and observe the Contractor collecting and splitting the sample to verify the conditions of DPW's portion of the sample. This is especially important for source approval.

Sample Transmittal Form

Every sample must be accompanied by a transmittal form to identify the sample and all associated parameters and results. It is in everyone's best interest to fill out this transmittal completely, as samples with incomplete transmittals can result in delays in obtaining test results or difficulties in comparing the results to other project data. A copy of the transmittal reference number will be affixed to the sample itself in case the transmittal is separated from the sample. Transmittals will be protected from damage for samples containing any moisture. Even moisture contents as low as two percent can make a transmittal unreadable. Each sample requires its own transmittal so it is uniquely identifiable from other samples. Keep the original transmittal for the project files. As soon as practicable, the transmittal will be entered into the materials tracking log database and monitored through closure.

8.6 ACCEPTANCE

There are four methods of acceptance -- visual, certification, measured and tested, and statistical. The four acceptance methods are defined in detail in Subsections 106.02 through 106.05 of FP-03. Each section of FP-03 contains an "Acceptance" subsection that identifies how the work described in that section will be considered for acceptance. Particular sections also contain a table defining the sampling and testing requirements identifying the acceptance test type, method, frequency, and reporting for performance characteristics for particular items of work under that section.

With respect to acceptance, construction materials will fall into one of the following categories:

- Those found to exceed minimum specification requirements and are accepted at a pay factor exceeding 1.00, in accordance with a statistically-based acceptance plan in the Contract.
- Those found to be in reasonably close conformance with the specifications and are therefore accepted at full payment.
- Those not in reasonably close conformance but deemed technically serviceable and therefore accepted at reduced payment, as provided by a Contract acceptance plan or as mutually agreed if there is no acceptance plan.
- Those not in reasonably close conformance, and not deemed technically serviceable, which are therefore rejected and required to be removed, replaced, or acceptably corrected.

Determining Acceptance

Visual. Acceptance or rejection of the material or work activity is based on visual inspection for compliance with the Contract and prevailing industry standards. Use engineering judgment to determine if the material is satisfactory. The Daily Inspection Report will be used to document visual verification of the material; that the material has no observed defects; and that it appears to meet the Contract requirements. The Daily Inspection Report number and date will be entered wherever documentation for conformance is required. Visual inspections will be performed as soon as practicable, and checking the material before it is incorporated into the work, if possible, is preferred. The goal is to avoid unnecessary rework on the part of the Contractor, whenever possible.

Certification. A certification will accompany the commercially manufactured materials to document that the materials meet the specifications. Check the certification for evidence that the prime Contractor verified that the certification is acceptable. If they have not, continue with the check, but also notify the Contractor that they are expected to review the certifications before passing them on. Perform the check before the material is incorporated into the project. Verify that the certification meets the required specification. Refer to AASHTO, ASTM, or the SCRs to verify requirements. If the certification is acceptable, stamp it “Checked By” with the date, and stamp “No Exceptions Taken.” If the certification is not acceptable, formally notify the Contractor that the certification is incomplete and/or incorrect. Often times a visual inspection will be necessary to ensure the material covered by certification is in fact the same material, and no damage has occurred in the process of delivering the material to the project.

Measured and Tested. If the material was produced off-site, the Contractor should provide the required test results as stipulated in the Standard Specifications. These test results will be reviewed according to the process for certifications noted above. If the material is produced or performed on site, the test results or the work itself will be reviewed to ensure compliance with the specifications. If the work does not meet the specification, the Contractor is required to take the necessary actions to bring the work into compliance.

9 QUALITY MANAGEMENT

9.1 DEFINITIONS

Construction Quality Management Plan (CQMP). The plan developed by DPW, or by the CMIS consultant in association with DPW, which identifies the policies and procedures for the implementation and execution of QC and QA activities by DPW and/or the CMIS consultant personnel on the Project.

Contractor Daily Report (CDR). Defined in the Standard Specifications as the *Inspector's Daily Report of Construction Operations* (IDRCO), the CDR is the Contractor's daily reporting of quality performance including linear tracking of material properties and a certification statement that documents all work complies with the requirements of the Contract.

Contractor Quality Plan (CQP). The plan developed by the Contractor, which identifies its specific procedures and processes for implementation of its QC and QA programs to produce quality work in conformance with the project requirements.

Quality Acceptance (QA). All those planned and systematic actions performed to validate the execution and effectiveness of a QC program, and the ability to demonstrate that the work complies with the Contract and will be performed satisfactorily for the purposes intended. Quality Acceptance is DPW's responsibility.

Quality Control (QC). The total of all activities performed involving planning, monitoring, documenting, and production/construction processes to control the level of quality being produced in the end product. Components may include establishing procedures; calibrations and maintenance of equipment; shop drawing review; document control; production process control; and any sampling, testing, and inspection done for these purposes. Quality Control is the contractor's responsibility.

Non-conformance. A work element, process, or outcome that fails to comply with the requirements of the Contract documents.

9.2 ROLES AND RESPONSIBILITIES

The roles and responsibilities are as prescribed in this document and/or as defined in DPW's Assignment of Authority Letter.

9.3 CONSTRUCTION QUALITY MANAGEMENT PLAN (CQMP)

The PE is responsible for implementing DPW's Quality Management Plan and objectives on the project. This is done through a planned sequence of activities including daily inspections, observations, document reviews, and testing. Essentially, the PE is responsible for verifying and documenting that the project is constructed in conformance with the plans and specifications, and in compliance with the terms of the Contract. The PE is also responsible for reviewing the Contractor's daily submittals and preparing its own documentation of project activities as they relate to the quality of the work produced, and the actions to plan and document it.

The goal of an effective quality management program is to optimize the reliance on the roles of each primary participant in the quality process -- the Contractor, and the PE -- and merge their combined actions to elevate the level of quality produced and manage the process to validate it. Continuous or full-time observations and inspections by the PE should be avoided whenever possible, as it tends to lessen the responsibility on the Contractor's QC efforts. The broader assessment of the effectiveness and credibility of the Contractor's quality performance tends to identify programmatic issues, while still assessing the compliance with details through random audits and periodic companion testing. However, it is recognized that some work is of such criticality or is being obscured by subsequent construction to the extent that continuous inspection is prudent. Unless otherwise provided for in the plans or specifications, construction methods and sources of materials are the Contractor's responsibility. The PE may suggest methods for improving workmanship, and may suggest sources of better materials; however, it should always be clear that these are only suggestions and that the final decision is up to the Contractor. In the event the Contractor's methods continue to produce unsatisfactory work, the PE should escalate the issue with the Contractor and DPW, potentially ordering the stoppage of non-conforming work until the condition is remediated satisfactorily.

9.4 CONTRACTOR QUALITY PLAN (CQP)

The CQP is comprised of both its QC and internal QA approach to controlling the quality of the work produced. The Contractor's CQP should reflect the sum total of activities (inspections, tests, checklists, measurements, instructions, and communications) completed by the Contractor that are specifically performed to ensure that specific items of work meet Contract requirements. The results of QC activities within the Contractor's CQP allow the Contractor to assess and adjust production processes and methods to control the level of quality being produced for a specified end product.

The CQP should also reflect internal Contractor QA efforts, reflecting planned and systematic activities (reviews, inspections, tests, checklists, measurements, analysis, training, and instructions) performed by the Contractor to ensure that individual QC processes are functioning effectively.

Responsibility

The responsibility for construction QC on all physical, procedural, and administrative matters lies with the Contractor. The Contractor is ultimately responsible for the quality of all work performed under the Contract, and has primary responsibility for testing of all materials and any specified field tests used to control the execution of quality work. The Contractor is also responsible for performing internal QA to demonstrate the effectiveness and thoroughness of its quality efforts. This is carried out through implementation of the QC and QA activities contained within the Contractor's CQP. The goal of the Contractor's quality system is to assure that the project is delivered in its entirety, in accordance with the Contract requirements (materials, workmanship, tolerances, and schedules).

Content of the Contractor's CQP

The CQP should minimize any parroting or paraphrasing of the requirements in the Contract, and should avoid simply promising to comply with the Contract. The CQP should address the specifics of the Contractor's quality organization, the process for consistently delivering the level of quality that the Contract requires, and the process used to address quality issues that may arise during the course of the project. The Contractor shall submit a comprehensive plan for the entire project scope; however, portions of the plan could be prepared in stages in accordance with the execution of work. Although the Contractor may not be able to develop a thorough and concise quality plan at the outset of the project for late-start components of work, construction of those elements cannot proceed until the quality requirements and procedures are fully defined.

Updating and Using the CQP

Once the CQP is approved, it should be continually referenced to assist in achieving the quality objectives of the project. The CQP should be considered as a living document, subject to updates and modifications that may be required due to the specific construction methods and materials employed by the Contractor. The Contract quality requirements however, must remain as the compliance standard for all Contractor operations, unless specifically modified by DPW through a Change Order.

Reviewing the Contractor's CQP

When reviewing the Contractor's CQP, the PE needs to ensure that the Contractor clearly establishes the distinction and interface between the QC and QA elements of its program including the definition of the staffing levels for each; what inspections, tests, and activities will be performed for the start up, production, and closeout phase; and how quality procedures and the work are assessed for compliance with requirements. The Contractor should also describe inspections, testing, or other activities that will be used to monitor quality and make adjustments as necessary to ensure continual compliance. The plan should also identify the processes used during the course of the project for such issues as materials certification verification, site preparation verification, staking adequacy, methods of construction adequacy, and environmental restriction considerations. The plan should also provide the details of the training and instructions to be performed and provided to educate quality and project personnel on all quality requirements.

The QA element of the plan should describe what steps will be taken when deficiencies are noted during a QA review, inspections, or testing. QA plans should describe what activities will be performed to verify that all work is prepared, started, and completed in accordance with the Contract. The CQP should be specific as to ***Who, What, When, Where,*** and ***How***. For each described component of work, the CQP should answer these questions:

- ***Who*** is responsible for quality planning, ensuring the performance of quality work; who is responsible for the assessment of quality achieved, actions for non-conforming work; and who has the authority for making decisions?
- ***What*** is the performance criteria for measuring quality; what are the staffing and equipment requirements for the quality group, the frequency of inspection and testing, the means and methods to be used that can produce the requisite level of quality; and what is the process for notification, review, and resolution of quality issues?
- ***When*** will the quality planning and performance documents be prepared; when will the schedule for construction be provided; when will quality issues be escalated, if unresolved; and when does work transition from in-process to complete and ready for inspection?
- ***Where*** is the work being performed; where will inspections be conducted; and where will samples be collected for testing?
- ***How*** will quality inspections and tests be performed; how will quality activities be documented, recorded, and analyzed; how will quality issues be processed on the project; and how will the final confirmation of quality be demonstrated?

9.5 NON-CONFORMING MATERIAL OR WORK

Conditions may be encountered during a project where a particular material, work product, construction effort, or phase fails to fully-comply with the project specifications and Contract requirements. The reference to a non-conforming condition is not limited to a physical element of work, but can apply to procedural and administrative activities as well, provided there is an established requirement defined for the activity. Particular care must be taken when dealing with work that is completed sequentially or in phases, and it is important to establish the interface between phases so “a definable portion of work” can be jointly agreed upon. This should be clearly discussed with the Contractor in advance and/or described in the Contractor’s CQP. For the performance of QA activities by and/or on behalf of DPW, a clear delineation can often be made by polling the Contractor’s QC group for the status of its QC activity on the work in question. Care should also be taken to avoid situations where “preference” rather than “requirement” is used as the basis for the assessment of compliance. All timely efforts should be expended to resolve the issue with the Contractor before resorting to issuing a non-conformance.

Non-conforming conditions are identified in a Non-conformance Report (NCR) that fully documents the conditions surrounding the particular element of the project in question. The NCR form is used for this purpose. In addition to project reference data, the NCR form contains specific information including:

- Date
- Unique identifier number
- Specific location sufficient to isolate the work
- Description of activity
- Identification of the specific non-conformance
- Conformance criteria
- Actions required pending resolution of the condition

The NCR should be logged as soon as practicable so that actions to address and resolve the condition are tracked through closure. If the material or work does not meet the Contract requirements, four options are typically available to address the issue:

a. Remove and replace the defective material or work
b. Correct or rework the defect
c. Repair the defect to a condition acceptable to DPW
d. Propose to have the material or work accepted as-is at a reduced price

Depending on the situation, a) or b) may or may not be practical. The earlier the defect is found, the more opportunity there is to correct it. If the Contractor is obtaining the material from a stockpile, and all production is complete, it may be necessary for them to do additional screening or processing. Corrective action (or removal and replacement) would be required on the material already placed. Care should be taken when evaluating materials after a Contractor's corrective efforts. One common misconception is that an individual sample and test result represents a discrete quantity of material. However, poor quality materials often contain both passing and failing quantities. One passing test may be due solely to chance. In fact, any quantity of material is collectively represented by all the samples taken from it. Any corrective effort should be applied to the whole of any material represented by a series of samples, unless additional testing convincingly isolates the defective areas. After corrective action, additional testing must be used to verify that the corrective actions were effective. If the material has already been placed by the time the test results are received, reprocessing may not be practical, and the Contractor may propose to have the material or work accepted at a reduced price. To accept non-conforming materials at a reduced payment, two actions must be taken. DPW must make a determination that the materials will serve the purpose intended, and the Contractor and DPW must agree on the amount of the reduced payment, or as prescribed in the Contract. If this situation occurs, coordinate very closely with the PE. The PE must weigh the overall risks and determine the appropriate administrative action. Since a) or b) ultimately result in conforming material or work, no further administrative action is required. However, if the Contractor proposes to have the work accepted at a reduced price, DPW is allowing a deviation to the Contract, and a Change Order will be required. DPW will receive a lesser product than it originally bargained for; and the Contractor will receive less compensation than it originally bargained for.

9.6 CONFORMANCE INSPECTIONS

The PE is responsible for ensuring the proper execution of the project, and that the constructed work is completed in accordance with the Contract requirements, relying in part on the QC activities performed and information provided by the Contractor. This is achieved by employing a variety of inspections, observations, checklists, tests, and assessments, many of which are outlined in Appendix D, Construction Quality Management Plan (CQMP) of this CMIS Manual. The PE is responsible for preparing a CQMP for each specific project that will identify and define the specific means and methods to carry out these actions, some of which may contain Contract-defined Contractor Hold Points to facilitate assessment of the work for conformance to the requirements. The PE should take an active role in coordinating with the Contractor's staff to educate themselves on the plan and schedule of execution, to ensure the timely performance of conformance activities.

9.7 DOCUMENTATION AND REPORTING

Contractor Reporting

Contractor Quality Control, of the Standard Specifications identifies the Contractor's reporting requirements. Typically, the Contractor will prepare a Contractor Quality Report (CQR) as a monthly representation of its quality actions, performance, and results associated with all project administration and construction activities carried out on the project. The Contractor's Quality Manager should be the primary author of the CQR to document and attach details of all quality activities carried out. The report should contain a narrative, along with supplemental completed quality forms and test results addressing all testing and analysis performed; trending reports; results of other reviews; inspections; measurements; actions taken to address quality issues and non-conformances; and adjustments made to improve the overall quality process.

The Contractor will capture its efforts related to quality in its CDR, which serves as its daily quality record. These reports should be factual and concise as to specific quality activities performed and all quality-related issues that were identified and handled during that day. The CDR should be thoroughly reviewed by the PE and compared to the activities observed and reported on the Inspectors Daily Inspection Reports to validate the completeness and accuracy of the information reported by the Contractor. The linear control charts on material properties maintained by the Contractor should also be reviewed in detail, which can provide early detection of material quality concerns.

DPW Reporting

All quality-related activities performed by the PE should be documented using the various forms and report formats established by DPW. All material sampling, testing data, and performance results should be documented on the specific forms designed for that purpose, as well as entered electronically into the materials testing database for the project. All PE inspections performed on the construction operation, as well as observations of the Contractor's quality efforts, should be fully-documented on the appropriate forms and referenced in the Inspectors Daily Inspection Report. All quality issues raised that remain unresolved within a single work shift should be documented and logged to ensure that all quality issues identified are tracked through closure.

Quality-related information should be summarized on a weekly and monthly basis for use and communication at the weekly progress meetings, and for inclusion in the monthly report for the project. All quality data generated by the PE should be entered into the software databases set up for tracking and analysis of quality performance.

10 CONTRACT MANAGEMENT

10.1 OVERVIEW

This section provides guidance and procedures for administering the requirements of the Contract, and the development and processing of Contract modifications. The PE is responsible for the performance of the tasks listed in the various processes and procedures, limited by and working within the limits of authority established by DPW. Throughout the process, the PE will closely coordinate with DPW to provide the latest information on project issues that have the potential of effecting the project schedule and/or overall cost of the project.

10.2 AUTHORITY OF CONSTRUCTION MANAGEMENT PERSONNEL

The PE is responsible for the administration of all requirements of the Contract throughout the course of the project. This includes, but is not limited to, the generalized acceptance of the Contractor's work as it progresses, determination of performance and recommendation of approval for payment of authorized Contract work, and pre-negotiation discussions for the scope, schedule, and valuation of Contract modifications for which justification has been validated. However, the PE possesses only that limited authority as stated in the Contract in regards to the authorization to execute Contract modifications on behalf of DPW. With the exception of life-threatening or emergency situations, neither the PE nor their representatives are authorized to:

- Act in such a manner as to cause the Contractor to believe that they have authority to bind DPW
- Direct or encourage the Contractor to perform work that could be the subject of a Contract modification without written authorization of the change

The delegation of authority letter, issued to the Contractor between the time of award and issuance of NTP, identifies the specific levels of authority for a particular project. The PE/RE may have authority to negotiate modifications up to a specified dollar amount approved by DPW as stated in the Contract. The PE/RE will lead the negotiations with the Contractor and DPW concurrently, since the construction management staff has the greatest knowledge of the circumstances associated with the modification.

10.3 CONTRACT CHANGES

The Contract contains language defining the process by which modifications to the project can be made. The Changes clause in the Contract permits DPW to issue a Change Order to make a bilateral or unilateral change within the general scope of the Contract. A Change Order is a written directive, signed by authorized DPW staff, requiring the Contractor to make a change with or without the Contractor's consent or concurrence. A Change Order allows the Contractor to proceed with the work even though the terms and conditions of the Contract modification may not have been thoroughly defined.

DPW has the right to make changes in the work within the general scope of the Contract, including changes to the plans and specifications, the method of work, DPW-furnished materials, and the time allowed to the Contractor to complete the Contract. The Changes clause also provides the means under the Contract for DPW to make an equitable adjustment for constructive changes addressing defective plans or specifications. The term "within the general scope of the Contract" is defined as work that "should be regarded as fairly and reasonably within the contemplation of the parties when the Contract was entered into.

Changes normally fall within one of the following categories:

- Differing site conditions
- Suspension of work
- Changes in project scope or quantity
- Value engineering
- Default

The Contract modification and associated Change Order will be developed and processed in accordance with the Change Order Procedure described in Appendix B of this CMIS Manual. The process applies to all Contract modifications

In the course of construction, it is not uncommon for differences of opinion to arise between the Contractor and DPW over the interpretation of the Contract provisions, the claimed existence of differing site conditions, delays to the Contractor, or entitlement for additional time and money associated with specific Contract events. The Contractor may also express dissatisfaction or disagreement with Contract modifications. Prompt action will be taken to resolve issues and to make any equitable adjustments, giving full consideration to the terms of the Contract. The PE must keep DPW informed of issues as they arise.

Guidance for Preventing Claims

The PE and Inspectors are limited in the actions they can take by the requirements of the Contract Documents; however, they must also use common sense to administer those requirements and facilitate the actual construction of required work elements as much as possible within these limitations. Approaches to be considered by the PE to aid in balancing these two unique, but linked perspectives, include:

- Remembering that the goal is to work collaboratively to get the project constructed
- Developing a thorough knowledge of plans and specifications

- Reading all relevant portions of the Contract before answering questions or making decisions
- Performing accurate and consistent timely inspections, testing, and reporting
- Strictly adhering to established testing procedures
- Accepting nothing less and requiring nothing more than required by the Contract
- Avoiding situations where preferences are controlling instead of requirements
- Insuring that all inspectors are properly instructed to apply consistent standards for the work being performed
- Maintaining a professional and cooperative attitude with Contractor personnel
- Being sympathetic to the Contractor's problems; and complimentary when the Contractor delivers exceptional quality
- Viewing project accomplishments as a team effort between the Contractor and DPW personnel
- Working with the superintendent or at least the same people on the same issues all the time
- Trying to anticipate and recognize potential claim situations
- Facing problems regardless of who is at fault, and seeking fair and equitable resolutions
- Tracking proposed Contract modifications and following-up with those charged with making timely decisions
- Acting promptly and decisively in dealing with problems -- if you can't resolve an issue, refer it to someone who can
- Realizing that communication is typically the most effective deterrent to claims
- Thorough documentation is the best defense

10.4 CONTRACTOR PAYMENTS

Periodic partial payments to the Contractor for the work performed and found to be in compliance with the Contract requirements should be processed in accordance with the Contract Documents and FAR requirements, as well as the information contained in Section 11 of this CMIS manual.

10.5 PERIOD OF PERFORMANCE

The Contract Documents will define the project duration, along with interim and final milestone dates, as well as any other time-related restrictions placed on the Contractor's operations. These restrictions typically reflect restrictions on weekend work; recognized holidays and related limited-work days; night work;, and work restrictions on activities impacting commuter traffic. Other allowances for anticipated adverse weather days may also be defined in the Contract that can influence the period of performance. The period of performance is typically established within one of the following categories:

- **Completion Date -** Defined date for the completion of all work, regardless of the days worked, or not worked, due to weather, holidays, etc.
- **Calendar Day -** Defines the number of calendar days the Contractor has to execute the works commencing from the date of NTP or other defined event. Restrictions that limit work performed during weekends or holidays has no affect on the count of calendar days. DPW allowance of the Contractor to work double shifts or during select weekend days also has no impact on the count of calendar days.
- **Working Day -** Defines the number of days the Contractor is authorized to work on the project exclusive of weekends and holidays.

The PE will review the Contractor's submitted construction schedule to ensure the Contract time definition is properly incorporated, and the project is sequenced to be completed within the authorized Contract period.

Construction Schedule

The Contractor is responsible for producing, in a timely fashion in accordance with Contract requirements, an achievable schedule for execution of the project elements within the restrictions dictated by the Contract Documents. The PE is responsible for coordinating with the Contractor, and taking whatever actions are necessary to facilitate the timely preparation, submittal, review, and ultimate approval of the project schedule. This effort is geared towards assessing the Contractor's proposed plan for carrying out the work with particular attention to the assignment of time and the sequence of the following:

- Contract dates including NTP, completion, interim milestones, working day restrictions, and special event no-work dates in the Contract
- Work-week/work-day calendar definitions
- Allocation of anticipated non-working days due to normal anticipated weather conditions
- Work breakdown into work elements definable by work type, sequence, location, and duration
- Allocation of time for pre-planning activities including material submittals, shop drawing preparation and transmittal, DPW and Designer review and approval requirements, and temporary installations necessary to support the project construction activities

- Appropriate logistical ties between activities including limited duration of individual activities and realistic links between activities (FS, SS, etc.), adequate to identify and analyze a critical path of the work
- Sufficient definition of each task to facilitate the monitoring of the execution and progress of each defined activity

The Contractor should rely on the approved construction schedule for controlling and reporting on the work activities for the project. The Contractor typically prepares a Look-Ahead Schedule showing the next two to three weeks of activity, which is used to aid in sequencing the performance of construction management activities and coordination with the Contractor on a weekly basis. Updates to the construction schedule reflecting the actual progress against the approved baseline schedule should be submitted monthly, concurrent with the submittal of interim requests for payments.

The failure of the Contractor to meet the requirements of its construction schedule is not in itself justification for the preparation of a revised schedule. The Contractor may be required to produce a “recovery” schedule to define what temporary actions they propose to take to bring the schedule of performance back into compliance with the Contract requirements. Recovery schedules must identify the specific points where the recovery activities deviate from the approved schedule, as well as where the recovery efforts are planned to interface back into the original program. Recovery programs do not relieve the Contractor from its obligations to execute the work in accordance with the Contract.

Recovery Schedule

A Recovery Schedule is needed when the Contractor's performance lags his planned sequence of work to such an extent that the Project Schedule can no longer be used to effectively track the Contractor’s progress. A Recovery Schedule typically addresses only those portions of the project that are delayed. The Recovery Schedule identifies a specific point where the Contractor's actions deviate from the Project Schedule; describes the special efforts planned to recover the delays in carrying out the work; and identifies the point in the future where the work will catch up to the planned progress in the original Project Schedule. The Contractor's efforts should be closely monitored and their effectiveness in making up the lost time documented and reported. The Contractor should provide a progress report for both the original Project Schedule and any Recovery Schedules in force until such time as both coincide.

10.6 INSURANCE

The Contract Documents require the Contractor to procure and maintain specific insurance of the type and scale appropriate with the project scope, which typically includes public liability, property damage, and workers’ compensation insurance. Insurance coverage is evidenced by a Certificate of Insurance, which certifies that the policy is in effect and shall not be canceled without DPW receiving written notice 30 days prior to cancellation. The Contract Documents typically require all Contractor insurance policies to list DPW as an “additionally insured” party. The Contractor must forward Certificates of Insurance for the required coverage to DPW before the Contract will be executed. The PE will monitor the effective periods of the insurance coverage on the project to ensure that adequate insurance coverage is maintained in force, and be aware of notifications of cancellations of the insurance coverage. If the Contractor fails to take appropriate action and the insurance coverage expires, the PE, with the approval of DPW, will issue a written Stop Work Order to the Contractor, and work must not resume until the Contractor furnishes a valid Certificate of Insurance.

The Contractor is responsible for obtaining sufficient additional bonding and insurance if additional work is added that increases the total Contract value above the limits of the current bonding and insurance coverage. The PE will ensure that the Contractor does not proceed with the additional work until the additional coverage limits are in effect.

11 MEASUREMENT AND PAYMENT

11.1 GENERAL

The Standard Specifications prescribe methods for measuring quantities, but are not intended to be an all-inclusive listing for all work that may be executed by DPW. Refer to the plans, SCRs, and this chapter of the CMIS Manual for measurement details. Each *Construction Requirements* section of the Standard Specifications contains a subsection entitled *Measurement*, stating what is to be measured and how it is to be measured. Further, the *Payment* subsection of each section states what work is covered by the payment. Work that is not specifically identified for payment is assumed to be a subsidiary obligation, and no payment is required. Occasionally, plans and SCRs will change the standard methods of measurement and payment, or include provisions for measurement and payment for items not in the Standard Specifications. Before making any measurements on a project, study the plans, specifications, and SCRs to first determine what is to be measured, and second, how it is to be measured.

11.2 QUANTITY MEASUREMENT AND UNITS

There are three basic methods of measuring Contract items:

Lump Sum - Items of work are verified as complete and paid for with no detailed measurement required for the quantity. A Change Order must be executed to authorize a change in the payment for a Lump Sum quantity item.

Staked or Ordered Quantity - When work is staked out or ordered by DPW, the quantity for payment is defined before the work is performed. Again, although verification that the work done is necessary, no detailed re-measurement is required.

As-constructed Quantity - The performance of work is authorized by the Contract, and, subject to DPW inspection, the work is carried out and then measured, computed (if necessary), and paid for.

Quantity measurements and calculations for as-constructed quantities should be fully documented, noting the method of measurement used and performed in cooperation with the Contractor prior to the work being covered up or otherwise preventing measurement. Quantities will generally be computed to at least one significant figure more than the minimum required for reporting. If the measurement and computational methods used yield significant figures beyond the minimum required, the figure will be rounded to the significant figure as shown in the progress estimate. Items specified as Contract quantity items will always be reported for final payment with the same precision implied in the Contract.

For materials paid for on a weight basis, a daily summary of all weighed and accepted loads will be generated. The summary will be filed with the tickets indicating certified weight and acceptance, which remain the original or source document. Separate ticket books and summary reports are best used for each Contract item when more than one item is being produced at once.

11.3 PARTIAL PAYMENT FOR MATERIALS

Partial payment for materials-on-site is discretionary subject to the specific conditions stipulated in the contract documents. Since this is a temporary payment that will ultimately be **zeroed out** prior to final payment, the addition of new materials stored and the consumption of already stored materials to construct the work must be continually updated and tracked to maintain a running balance between materials in, materials out, materials stored, and materials remaining to complete the work. Materials-on-site may be included in the Contractor's invoice and paid for as one or more separate temporary payment, provided:

- The materials are stored on the project site or in the vicinity of the project and are stored in acceptable storage places. Acceptable storage places are ones that will provides security to the materials against damage and theft.
- The materials must be ones that will be incorporated into the project. Temporary materials such as form lumber, explosives, and diesel fuel cannot be paid as a partial payment for materials-on-site.
- The materials for which a partial payment is requested by the contractor must be accompanied by appropriate test reports, certifications, or other reasonable documentation stating the materials comply with Contract requirements.
- Partial payments for living or perishable materials will not be made until the material is actually incorporated into the project.

Partial payment does not constitute acceptance of the material. Requests from the Contractor for partial payments must be accompanied by an invoice for the materials and cannot exceed the lesser of the following:

- 80 percent of the contract bid price for the item; or
- 100 percent of the amount supported by copies of invoices; and
- The quantity paid cannot exceed the quantity estimated in the contract.

The PE has the right to withdraw payment for stored materials-on-site, if the conditions or security under which the material is being stored is subsequently determined unacceptable.

11.4 CONTINGENT SUM (CS)

The project specifications may provide for the performance of Contract Modification work on an actual cost or "Contingent Sum (CS)" basis when it is not possible or practical to define the quantity of work and/or negotiate a price prior to the performance of the work being accomplished. CS pricing will be used only when it is not practically possible to establish fixed unit prices or lump sum prices, or the specified work is needed on an urgent basis. When CS work is agreed to, or when work is commenced on an actual cost basis pending negotiation of unit or lump sum prices, the CMIT will closely monitor the work and agree with the Contractor on the exact hours for labor and equipment (as well as materials) associated with the work for each shift. The CMIT will strictly adhere to the requirement to document the effort daily on established forms, supported by project photographs and calculations. The PE and DPW Inspectors are responsible for monitoring the work and the Contractor's authorized representative shall maintain complete records of the work and agree and sign-off daily the labor, equipment, and materials used in the specific CS work as the activity progresses.

When CS work is being performed, detailed labor, material, and equipment information will be recorded on the "Contractor's Daily Record of Construction Operations" form (refer to Appendix B, Exhibit 8.4C). Information to be recorded includes:

- **Labor** - The name and complete minimum wage schedule description (i.e., laborer unskilled, or Operator- Asphalt Milling Machine). The PE must ascertain that the daily records of hours worked do not exceed the hours shown on the Contractor's payrolls.
- **Equipment** - Complete ownership and equipment details including type, make, year, identification number, accessories, and operating rates from the established rate schedule. In addition, the Contractor may rely on equipment rentals for carrying out the work and rental receipts and equipment operation costs must be provided as documentation.
- **Material** - A description of the material and source, together with certification or test data and invoices or other cost information. The original copies of the signed daily sheets and the material invoices are the minimum documentation required for CS work. All pertinent information will be recorded on the established CS forms.

The PE will prepare and maintain current daily summaries of CS work with separate summaries kept for each Contract modification. The daily summaries will contain financial, progress descriptive text, and photographic documentation of the CS activity.

11.5 PROGRESS PAYMENTS

The requirements for processing progress payments are stipulated in the Contract Documents and FAR by reference. These clauses appear in each Contract and will be reviewed in detail to ensure timely processing of Contractor payments. The following are common issues that arise during the processing of progress payments:

- DPW is required to make payment to the Contractor within a prescribed period after a **valid** invoice is received from the Contractor at the designated billing office.
- DPW must advise the Contractor in writing within seven days if the invoice is defective. The PE will encourage the Contractor to prepare supporting documentation as early as possible in the billing cycle, and be available to review with the PE in advance of the formal invoice submittal.
- Payment for materials-on-site will be made at DPW's discretion, subject to the materials being accepted and verified by the PE; the materials are safely and properly stored on-site or within a secure off-site facility that is acceptable to DPW.
- DPW will not become involved in disputes between Contractors and subcontractors.

11.6 RETAINAGE

Retainage is money withheld from progress payments to provide DPW with financial reserves in cases of Contractor default or conditions on the project or progress which become unsatisfactory. The Contract Documents outline the application of retainage to progress payments made to the Contractor. Retainage is applied to the entire amount of payments to date in accordance with the stipulations in the Contract Documents.

11.7 LIQUIDATED DAMAGES

Once the Contract completion date or interim milestone dates have passed, and the Contractor has failed to achieve the requirements specified in the Contract, DPW is entitled to impose liquidated damages for each day the contractor fails to meet the requirements specified in the Contract.

The amount of Liquidated Damages varies per project depending on the Original Contract Price. The PE should review the contract for the amount of Liquidated Damages which might be assessed for each project.

12 PROJECT CLOSE-OUT

12.1 PROJECT WALK-THROUGH

At such time as may be appropriate, the Contractor will declare that the work is substantially complete, and request that a project walk-through be conducted in preparation for the hand-over and acceptance of the work. The work need not be 100 percent complete at the time of this request; however, the following conditions should be satisfied:

- All substantial work has been completed
- The Contractor has satisfied themselves that the work has been constructed in compliance with the Contract Documents
- Outstanding work is minor in nature
- Disruptions to the beneficial use of the completed facility are minimal
- Work efforts are reasonably scheduled for completion concurrent with the project handover

A pre-activity meeting should be conducted with PE and the Contractor prior to conducting the walk-through to define objectives and authority of participation. The project walk-through will be conducted as a joint DPW/Contractor activity to thoroughly review the work completed and/or outstanding criteria for reaching concurrence for acceptance, and to identify the process by which the final detailed inspection should be performed and remaining work completed.

12.2 PUNCHLIST

The Contractor retains the primary responsibility for developing and maintaining the project "Punchlist". The Punchlist serves as the mechanism by which all remaining work and obligations to be performed by the Contractor are uniquely identified, located, and described; and a completion schedule and responsible person identified for the item. The scope of remaining work will include, but is not limited to:

- Original or authorized work that has not yet been carried out
- Original or authorized work that is still in progress
- Defects and deficiencies that are observed during the detailed project walk-through
- Non-conforming conditions that have previously been identified but not corrected
- Identified new work that is considered essential for the safe operation of the facilities
- Outstanding documentation and submittals associated with the work performed
- Resolution of all outstanding documented quality issues

The PE and Inspectors will fully participate in the Punchlist process and wherever possible, facilitate the timely identification, resolution, and re-inspection of all work items. The PE will track and/or audit the Contractor's efforts to accurately and thoroughly maintain the Punchlist; communicate the status of the work with all parties; schedule and coordinate the re-inspection of items; and follow-up on the PE sign-off to acknowledge the completion of work for each item.

12.3 AS-BUILT RECORDS

The Contractor is responsible for maintaining an accurate and up-to-date set of all project drawings, shop drawings, supplemental and additional design drawings, and Contract specifications reflecting the "As-Built" conditions of all authorized project work. While this is a Contractor obligation under the Contract, the PE should maintain an accurate set as well to use in verifying the as-built submittal from the Contractor. The PE will monitor the Contractor's compliance by reviewing the in-process as-built drawings representing the work for which the Contractor is requesting payment on a monthly basis. The PE should conduct an As-built Drawing pre-activity meeting with the Contractor and DPW to ensure that all requirements and procedures are fully understood prior to performance. It is also beneficial to perform a detailed review of an initial as-built submittal to jointly agree on the details of the end product.

Deficiencies in the Contractor's compliance with updating the as-built drawings observed during any single audit or monthly submittal is not in itself grounds for temporary withholding of payment. Repeated conditions of this type, however, do serve as a non-conformance condition for which appropriate actions can be taken by the PE. All changes in the scope of work, geometric layout, structural details, typical sections, standard plans, specifications, and design modifications must be incorporated into the As-Built Plans.

When stipulated in the Contract, the Contractor will be responsible for updating the As-Built Plans electronically, using a duplicate copy of the original design files and supplemental additional drawings as provided by the Design Engineer. The electronically-updated information should be clearly identified on the drawings to separate it from items constructed without revision, and labeled adequately so as to associate the revision to a particular event or condition. The original data on the drawings should not be deleted; rather, information that is no longer relevant should be crossed out.

12.4 SUBSTANTIAL COMPLETION

The project will be considered as Substantially Complete based on the successful achievement of the following project conditions:

- The major project elements have been completed and are functioning as intended in the Contract Documents
- All project elements designated as such have been placed into beneficial use by DPW and the traveling public
- All Punchlist activities have been substantially completed, and those remaining can be safely carried out without disturbing the functional use of the project improvements
- As agreed with the PE, selected Punchlist activities remain, which can be safely carried out during off-peak periods requiring limited traffic control
- The Contractor has produced a list of outstanding deliverables and a schedule for completion that is acceptable to the PE
- All significant quality and safety matters have been resolved to the satisfaction of the PE, and those remaining are minor in nature and in the process of being closed
- A time frame for the completion of all outstanding items has been agreed to, and the tentative date for final acceptance of the project has been established

The acknowledgement of Substantial Completion should be formally communicated to the Contractor in writing by DPW, and should be used in the final assessment of the Contractor's performance in accordance with the terms and conditions in the Contract Documents.

12.5 FINAL ACCEPTANCE

The PE is responsible for providing a recommendation to DPW that the project is complete in all respects and is eligible for acceptance by DPW. The PE shall facilitate a final acceptance meeting with DPW and the Contractor, and may include DPW's Maintenance Division and other parties who have a vested interest in the project. The purpose of the meeting is to acknowledge the satisfactory completion of all project work, and should include a discussion of the following:

- Project scope of work
- Contract period of performance
- Quality performance
- Safety performance
- Final list of Contract authorized changes
- Punchlist
- Incentives
- Liquidated damages
- Final payment
- Project handover
- Project maintenance

- Warranty and maintenance related information

On the same day the Contractor has satisfactorily completed all work in accordance with the Contract, the PE should prepare and forward to DPW a Letter of Recommendation of Acceptance, together with the final draft of the Project Acceptance Letter for execution by DPW with the Contractor. The date of signing by DPW of the Letter of Acceptance constitutes the start of the warranty period if prescribed in the Contract Documents.

12.6 FINAL PAYMENT

As soon as the project is accepted as substantially complete the PE will verify and check all quantities and will prepare a Final Summary of Quantities. After the Final Summary of Quantities is prepared the PE will contact the Contractor to review the Final Quantities and Final Contract Amount. The PE will also prepare the Contractor Release of Claims form for review with the Contractor. Once the PE has reviewed these with the Contractor and any disputes resolved the PE will formalize the Final Payment Application and Release of Claims and forward it along to the Contractor for signature.

The Contractor must execute sign and return the Final Payment Application and Release of Claims form within 90 days of receipt. Failure of the Contractor to do so within 90 days shall constitute and be deemed execution of these documents and the release of claims against DPW.

12.7 FINAL PROJECT RECORDS

The final project records should encompass all official project-related documents, correspondence, drawings, and submittals that were generated and used to construct and administer the work. In most cases, these documents will be the original or first-generation documents, and they are not intended to include additional copies used during the project. These documents are typically referred to as the “working files”. Logs, both electronic and hard-copy of the final records, should be produced, and will be amended to include a reference number for where in the files each document may be located to facilitate future retrieval.

12.8 WARRANTY PERIOD

The PE is responsible for assembling and transferring all warranty and maintenance-related information to DPW at the time of transmission of the final project records. Activities that may be requested of the PE during the warranty period should following the same guidelines as established in the other sections and appendices of this CMIS Manual.

13 SPECIAL REPORTING REQUIREMENTS

13.1 OVERVIEW

This chapter contains guidelines and requirements for reporting specific data on projects receiving funds from the American Recovery and Reinvestment Act (ARRA) of 2009. The primary focus of the special reporting requirements relate to:

- Job creation
- Job retention

Specific information should be captured on Recipient Reports for ARRA-funded projects and reported to FHWA, who is ultimately accountable to Congress for the utilization of ARRA funds.

13.2 JURISDICTION

All projects or services that have or will receive all or a portion of its funding from the ARRA program are responsible for collecting and reporting specific project data to DPW. This requirement applies to all projects and services procured that are receiving ARRA funds for any portion of the project. This includes ARRA funds used for all construction, consultant, and other recipients through September 2012. For the purposes of this procedure, all recipients of ARRA funds are referred to as “Contractor” herein.

13.3 REPORTING REQUIREMENTS

Reporting of job and employment data on individual ARRA-funded projects should be consistent with the consolidated format for FHWA reporting to Congress. Two options are acceptable to achieve this, subject to the collection and reporting of all relevant data required. The two options are:

- Existing State data reporting programs (supplemented as necessary)
- FHWA-furnished Excel reporting forms

For the purposes of this procedure, all data required should be reported on the FHWA-provided Excel form (ref. FHWA-1589).

13.4 REPORTING SCHEDULE

Reporting of the required project data will commence following the issuance of NTP, and continue on a monthly basis until completion of the Contract or September 2012, whichever is sooner. The monthly information will be submitted by the Contractor with the monthly invoice. It is the responsibility of the Contractor to ensure the accuracy and completeness of the information which is subject to review and acceptance by DPW and the CMIT on the project. This reporting requirement is directly linked to the project's funding; therefore, the Contractor's monthly invoice **WILL NOT** be authorized for payment until satisfactory completion of this reporting requirement.

13.5 FORMS *(Excerpts from FHWA- ARRA Reporting Requirements; March 23, 2009)*

Monthly Employment Report (Form: FHWA-1589)

This form is a guide for the States in providing employment information on each ARRA project. Monthly employment information on each ARRA project is used by States for meeting the reporting requirements of Sections 1201 and 1512. In order for States to fulfill their reporting obligations, the States must collect and analyze certain employment data for each ARRA funded contract. The data requirement in ARRA extends beyond the number of workers at the work site and, therefore, FHWA has produced a form for guidance to the States. This data to be reported is identified below and will be used by the States in developing Form 1587, which is to be submitted to FHWA. Since States may not currently collect this data, the States should develop a new specification for each ARRA-funded contract in order to obtain this information from contractors and consultants. In doing so, the States should use the provided model form and require the reporting of this data from the prime contractor or consultant. The prime contractor or consultant shall complete a report for each month from the date of the Notice to Proceed until completion of the contract or September, 2012 whichever occurs sooner. This report is only required for contracts that use ARRA funds. States should require contractors and consultants to provide the required information for their own workforce as well as the workforce of all subcontractors that were active on their ARRA funded project(s) for the reporting month. It will be up to each State to determine when they obtain the necessary data from their contractors or consultants, keeping in mind that the summary form is due from the State to the FHWA Division no later than the 20th day of each month for the preceding month's data.

It is the State DOT's responsibility to report the number of jobs on projects managed by funding recipients, such as other state agencies or local governments. The State DOT must make arrangements with each ARRA funding recipient to assure each recipient reports the required data in a timely manner.

The States shall require the following data be provided by each contractor, consultant and funding recipient working on an ARRA project. The primary contractor or consultant for each project shall be responsible for reporting their firm as well as all subcontractors' data.

Format: The State, contractors, or consultant may use the FHWA provided model form, but the use of the model form is optional and at the discretion of the State.

Due date: As determined by the State, until September 2012.

Due to: To be sent by each ARRA funded project prime contractor or consultant to the designated office in each State DOT or Federal Lands Division Office.

<u>**Coding Instructions**</u>

BOX 1. **Report Month:** The month and year covered by the report, as *mm/yyyy* (e.g. "May 2009" would be coded as "05/2009").

BOX 2. **Contracting agency:** The name of the contracting agency. Enter "State" for State DOT projects. For non-State projects, enter the name of the contracting agency (other State agency, Federal agency, tribe, MPO, city, county, or other funding recipient).

BOX 3. **Federal-aid project number:** The State assigned federal-aid project number, consistent with the format reported in FMIS.

BOX 4. **State project number or identification number:** The project number or ID, as assigned by the State of its funding recipient, consistent with the format reported in FMIS.

BOX 5. **Project location:** State where the project occurs. If the project is performed for Federal Lands, provide the FLH Division or Federal Land Managing Agency (FLMA) region.

BOX 6. **Contractor name and address:** The name and address of the contracting or consulting firm shall include the name, street address, city, state, and zip code.

BOX 7. **Contractor DUNS number:** The unique nine-digit number issued by Dun & Bradstreet. Followed by the optional 4 digit DUNS Plus number. Reported as "*999999999.9999"*

BOX 8. **Employment data:** The prime contractor or consultant will report the direct, on-the-project jobs for their workforce and the workforce of their subcontractors active during the reporting month. This jobs data includes employees actively engaged in projects who work on the jobsite, in the project office, in the home office or tele-work from a home or other alternative office location. This also includes any engineering personnel, inspectors, sampling and testing technicians, and lab technicians performing work directly in support of the ARRA funded project. This does not include material suppliers such as steel, culverts, guardrail, and tool suppliers. States should include in their reports all direct labor associated with the ARRA project such as design, construction, and inspection. The States' reports should include their own project labor, including permanent, temporary, and contract project staff. States are asked not to include estimated indirect labor, such as material testing, material production or estimated macro-economic impacts. FHWA will be estimating all indirect labor based on the information provided in this form along with other FHWA data. The form requests specifically:

a. **Subcontractor name:** The name of each subcontractor or sub-consultant that was active on the project for the reporting month.

b. **Employees:** The number of project employees on the contractor's or consultant's workforce that month, and the number of project employees for each of the active subcontractors for the reporting month. Do not include material suppliers. The total field at the bottom will be automatically calculated and reported as a whole number.

c. **Hours:** The total hours on the specified project for all employees reported on the contractor's or consultant's project workforce that month, and the total hours for all project employees reported for each of the active subcontractors that month. The total field at the bottom will be automatically calculated and reported as a whole number.

d. **Payroll:** The total dollar amount of wages paid by the contractor or consultant that month for employees on the specified project, and the total dollar amount of wages paid by each of the active subcontractors that month. Payroll only includes wages and does not included overhead or indirect costs. The total field at the bottom will be automatically calculated and will be rounded to the nearest whole dollar and reported as a whole number.

BOX 9. **Prepared by:**

a. **Name:** Indicate the person responsible for preparation of the form. By completing the form, the person certifies that they are knowledgeable of the hours worked and employment status for all the employees. Contractors, consultants, and their subs are responsible for maintaining data to support the employment form and make it available to the State should they request supporting materials.

b. **Date:** The date that the contractor completed the employment form. Reported as"*mm/dd/yyyy*." (e.g. "May 1, 2009" would be coded as "05/01/2009").

SEE NEXT PAGE FOR REPORTING FORM

This form MUST be submitted by all Contractors on projects which have ARRA funding.

MONTHLY EMPLOYMENT REPORT
AMERICAN RECOVERY AND REINVESTMENT ACT

1. Report Month: (mm/yyyy)	2. Contracting Agency	
3. Federal-Aid Project Number	4. State Project Number or ID Number	5. Project Location: State, County or Federal Region

6. CONTRACTOR NAME AND ADDRESS

Name:

Address:

City: State:

Zip:

7. Contractor/Subcontractor DUNS Number:

8. Employment Data

	EMPLOYEES	HOURS	PAYROLL
Prime Contractor Direct, On-Project Jobs (see guidance for definitions)			
Subcontractor Direct, On-Project Jobs			
Subcontractor Name			
Prime and Subcontractor Totals	0	0	0.00

9. PREPARED BY CEO or Payroll Official:	DATE:
Name: Title:	

Form FHWA-1589 (Rev. 3-25)

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APPENDICES

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APPENDIX A

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SECTION 200 - EARTHWORK

200.1 GENERAL

Site preparation and earthwork activities on DPW construction projects should be carefully monitored. This type of work generally involves removing structures and obstructions; clearing and grubbing objectionable and unsuitable materials; excavating and constructing the roadbed embankment; installing temporary and permanent erosion and sedimentation control measures; and handling and disposing non-hazardous and hazardous waste materials. Throughout this type of work, the Contractor is responsible for preserving all protected properties and for complying with all applicable federal and local laws and ordinances in accordance with the Standard Specifications.

200.2 PRE-CONSTRUCTION CONSIDERATIONS

The following issues should be addressed before earthwork begins. These topics should be communicated to the Contractor at the Pre-construction Conference.

200.2.1 Limits of Construction

The limits of construction define the area in which construction personnel and equipment are permitted to operate. These limits are generally bounded by the Government of Guam's right-of-way. Private property may be involved as discussed in Section 200.2.2. Verify that these limits have been properly staked. Stakes and other markings should be preserved until they have served their purpose.

200.2.2 Construction Permits and Easements

Access to private property is obtained on a project-by-project basis. Private property access is permitted only through written agreement between the land owner and the Government of Guam. This agreement will define the limits of access, permitted use, and restoration requirements. The PE will be furnished with a copy of these agreements before accessing private property. The Inspector should periodically check that points of access to all affected private properties remain open during the project. Contact the Design Engineer and DPW's Right-of-Way Section for assistance.

200.2.3 Utilities and Existing Highway Facilities

The schedule and status of any utility adjustments or relocations should be carefully reviewed and understood by all affected parties. Contact the Design Engineer for assistance.

200.2.4 Historical Sites and Markers

Historical sites and historical markers are scattered throughout Guam. The Inspector should verify that protected historical sites and markers within the limits of construction have been properly marked. Check to ensure that the Contractor is aware of the importance of preserving these sites and markers during construction. Contact the Design Engineer and the Guam Historic Preservation Office for assistance.

200.2.5 Wetland Areas and Animal Habitats

Ensure that protected wetland areas and animal habitats within the limits of construction are clearly staked or otherwise delineated. Inform the Contractor of the sensitivity of these areas and the importance of their preservation. Contact the Design Engineer for assistance.

200.2.6 Trees and Shrubs

Verify that protected trees and shrubs are clearly staked or otherwise delineated. Contact the Design Engineer for assistance.

200.2.7 Highly Erodible Soils

Where clearing and grubbing is required, the limits of clearing in highly erodible areas will be discussed in the Stormwater Management Plan and defined in the Contract Plans. Verify that these areas are clearly staked or otherwise delineated. During construction, the effectiveness of the Best Management Practices (BMPs) employed for erosion and sedimentation control will be inspected for compliance.

200.2.8 Archaeological and Paleontological Sites

Thoroughly review the SCRs for the project for special archeological and paleontological requirements. Ensure that archaeological and paleontological sites discovered during the site investigation are clearly staked or otherwise delineated. Ensure the Contractor understands the importance of preserving these resources. If unforeseen archeological or paleontological discoveries are encountered during construction, the Contractor's affected operations should cease immediately, and the Design Engineer and DPW's Archeologists should be notified immediately.

200.2.9 Hazardous Operations

As governed by the Standard Specifications, the Contractor is solely responsible for adhering to federal and local laws and ordinances with respect to the safety of project personnel and the general public. The Contractor will periodically review construction operations for obvious signs of non-compliance. Explosives handling, blasting operations, felling of timber, and burning of debris present significant hazards. The Contractor will immediately notify the PE and Inspector of any suspected hazardous operation, and contact the project Safety Officer for assistance.

200.2.10 Hazardous Material/Hazardous Waste

Ensure that all suspected hazardous material/hazardous waste sites that have been identified during the modified environmental site assessment and site investigation are properly staked or otherwise delineated. All special requirements of the Contract should be strictly enforced. The PE will contact the Design Engineer who in turn will confer with the design staff should any hazardous materials be encountered during construction.

200.2.11 Salvageable Materials

Salvageable materials that become DPW's property must be carefully removed, separated into manageable sections, and properly marked and stored. Where required, check that the Contractor uses match markings for the re-assembly of structures. Check the Contract for special requirements, and verify that the Contractor is aware of the disposition of all salvageable material before earthwork activities begin. Inspect all materials for damage if they are to be reused on the project. Refer to the Contract Documents for the requirements governing situations where materials are allowed to be stored on private property.

200.2.12 Stakes and Survey Monuments

Check stakes for compliance with the Standard Specifications and to ensure that all survey benchmarks, monumentation, and stakes are adequately marked and preserved during the project. Contact the Design Engineer and DPW's Right-of-Way Division for assistance.

200.2.13 Noxious Weeds

All mulch, seed, sod, plants, shrubs, and other similar biological material must be free from noxious weeds to minimize their propagation. Noxious weeds are plants that are detrimental to the health and well-being of other living organisms. This should be discussed with the Contractor at the Pre-construction Conference and reiterated at Project Progress Meetings before operations such as excavating and placing topsoil, seeding, sodding, planting, and mulching begin. Contact the Design Engineer for additional information.

200.2.14 Visual Documentation

Visual aids can substantially complement the written documentation required by DPW, especially when claims and litigation are anticipated. Prior to and during the project, use cameras and video recorders to document field conditions prior to construction.

END OF SECTION

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SECTION 201 – CLEARING AND GRUBBING

201.1 GENERAL REQUIREMENTS

The purpose of clearing and grubbing is to eliminate all vegetation and unsuitable material from roadway excavation and embankments within the clearing limits designated on the plans. If organic material is allowed to remain, it will rot and create voids within or under the compacted embankment material. As the embankment material settles to fill the voids, a pavement failure will generally occur.

201.1.1 Excavation Areas and Borrow Pits

One objective during roadway design is to balance cuts with fills by reusing excavated material elsewhere on the project to construct embankments, thus minimizing construction costs. The excavated material is not always suitable for use in roadway embankments. In these areas, specially located borrow pits are used for the required additional material. Both excavated and borrowed material must be suitable in terms of soil characteristics, and also be free of organic matter. Clearing and grubbing is typically specified for excavation areas and borrow pits to completely remove organic matter such as trees, undergrowth, stumps, roots, and ground cover.

201.1.2 Embankment Areas

For embankment areas, the treatment of stumps and vegetation depends on many factors as discussed in this section, including the depth of the fill.

The projects Special Contract Requirements may require the underlying embankment foundation to be pre-compacted, which necessitates complete clearing, grubbing, and removal of organic ground cover.

Stumps may be cut to a height of 6 inches above the natural ground and remain in place in areas outside the excavation, embankment and slope rounding limits

201.2 INSPECTION GUIDELINES

201.2.1 Before Construction

Before clearing and grubbing begins, review the pre-construction considerations presented in Section 200.2. In addition, verify acceptability of the Contractor’s proposed method of debris disposal.

201.2.2 During Construction

Stumps and Vegetation. Verify that vegetation and stumps are treated consistent with the specifications. Treatment depends on many factors including fill height and location.

3. Unsuitable Material. Verify that unsuitable materials are removed and backfilled as specified in the Contract. Ensure that objectionable materials are not mixed with excavated materials.
4. Tree Branches. Verify that tree branches are pruned as required in the specifications. Pruning must be performed using good tree surgery practices.
5. Debris Disposal. Check that debris is disposed of properly and that approved burning operations are performed safely and within legal limits.

201.2.3 After Construction

A newly-cleared site is vulnerable to erosion. Check the Stormwater Management Plan and the provisions of the Contract with respect to the Best Management Practices (BMPs) required for erosion and sedimentation control.

END OF SECTION

SECTION 203 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS

203.1 GENERAL REQUIREMENTS

All structures and obstructions such as buildings, fences, structures, pavements, culverts, curbs, sidewalks and other obstructions marked for demolition within the limits of construction must be safely removed and properly disposed of. The trenches, holes, or pits resulting from such activities must be backfilled and compacted in accordance with the provisions required by the Special Contract Requirements and the specifications.

203.2 INSPECTION GUIDELINES

203.2.1 Before Construction

Consider the following before removal of structures and obstructions:

1. Methods of Removal. Prior acceptance by DPW of the Contractor's methods of removal may be necessary. Check the provisions of the Contract.
2. Damage to Structures. Do not allow any construction method or equipment operation to continue if it could damage an adjacent structure or portion of structure designated to remain in place.
3. Blasting. The handling of explosives and blasting operations will be performed as specified in the Contract and as required by applicable federal and local laws and regulations.
4. Measurements. Many items designated for removal, such as curbs, gutters, and sidewalks, will require measurement for payment prior to the actual removal work. The Contractor should measure and mark these items and the Inspector should ensure that the Contractor understands the limits of removal and the basis for measurement and payment.

203.2.2 During Construction

1. Salvageable Materials. If culverts are to be reused, ensure they are removed without damage and properly stored or salvaged in accordance with the Contract requirements.
2. Pavements and Sidewalks. When the Contract specifies for the complete removal of pavement, sidewalks, curbs, etc., the Inspector should verify removal to the proper width and depth and check that the material is disposed of properly or recycled as may be provided for in the Contract. If partial removal is specified, verify that saw cut lines are true and maintained.
3. Basements. Basements and other similar cavities left by demolition must be filled and compacted in accordance with the Contract requirements. Special attention is needed to achieve uniform density and to provide drainage in such areas.

4. Maintenance of Traffic. Verify that pavement markings are completely eradicated before new traffic patterns are established. Check the Contract Plans for conformance with the Maintenance of Traffic, or Traffic Control Plan.
5. Bridges. Check for removal to the proper depth (e.g., columns, abutments, and footings).
6. If burning of debris is permitted, check that the necessary permits and approvals have been obtained by the contractor.

203.2.3 After Construction

Items to be removed are sometimes removed in sections or a portion at a time. Where partial removal is necessary, carefully check the site to ensure that the remaining portion of the item does not impose a public hazard or compromise adjacent property (e.g., the remaining structure appears unstable, or a section of guardrail is left exposed without proper end treatment). Prior to reopening roadways to traffic, also check that all debris has been removed from the roadway.

END OF SECTION

SECTION 204 – EXCAVATION AND EMBANKMENT

204.1 GENERAL REQUIREMENTS

Excavation and embankment refers to the work required to construct a new surface profile or graded roadbed, upon which subsequent base and wearing courses or other project features are constructed. Excavation is that part of the earthwork that is dug up, hauled, or reused as fill material to construct the embankment portion of the roadbed. Roadway excavation may be composed of common earth, solid rock, loose rock, or any combination of these materials. Where there exists an insufficient quantity of suitable roadway excavation for embankment construction, borrow excavation is specified to make up the difference.

204.1.1 Excavation

204.1.1.1 Types of Excavation

1. Roadway excavation is all material excavated from within the right-of-way or easement areas. This type of excavation does not include any subexcavation or excavation necessary for structures.
2. Subexcavation is material excavated from below subgrade elevations in cut sections or from below the original groundline in embankment areas.
3. Borrow excavation is material used for embankment construction that is obtained from outside the roadway prism. Borrow excavation may also include unclassified borrow, select borrow and select topping.

204.1.1.2 Excavation Near Wetlands

Excavation in and near wetland areas should be carefully monitored for compliance with environmental requirements. Unpermitted encroachment of wetland areas is unacceptable. Such practices may cause permanent damage to these protected areas and result in litigation.

204.1.2 Embankment Construction

204.1.2.1 Embankment Materials

1. Embankment Material. Embankment material consists of approved material acquired from excavations, which is hauled and placed in embankments.
2. Rock Fill. Rock fill is stone, boulders, or broken rocks that normally consists of at least 50 percent material having a volume of 2 cubic feet or more as determined by physical or visual measurement.

204.1.2.2 Foundation Inspection

Before embankment construction begins, carefully inspect the area that will serve as the embankment foundation. Pay particular attention to areas that have questionable supporting capacity. Where soft or very wet areas are found, consider the following:

1. Unsuitable Materials. If the material is found to be unsuitable, it should be replaced with a material that is suitable for use as an embankment foundation.
2. Springs/Seeps. Where springs or seeps are found, underdrain facilities may be required to adequately remove the spring or seepage water.
3. Poor Surface Drainage. The material may have become saturated due to poor surface drainage. Saturated material must be dried or removed and replaced with an acceptable material.

204.1.2.3 Embankment Uniformity

The importance of uniformity in embankment construction cannot be overemphasized. Practical construction methods that ensure uniformity include, layer thickness, moisture content, and compactive effort. Most roadway failures can generally be traced to a lack of uniformity in the embankment.

204.1.3 Steep Slopes and Transitions

Where embankments are constructed on steep slopes, a good interlock must be achieved between the sloping foundation and the new embankment material. Material interlock can be effectively achieved by plowing, terracing, or benching the foundation slope. Consider the following guidelines:

1. Vegetation. Vegetation on very steep slopes must be completely removed to prevent the creation of a slip plane between the foundation slope and the new embankment material.
2. Hard-Sloping Surfaces. Slopes that have a relatively hard surface will create a slip plane unless properly treated. Such slopes must be plowed, terraced, or benched to properly key the embankment material as it is placed and compacted.
3. Existing Embankments. Where the grade of existing embankments is widened or raised, plowing, terracing, or benching are used to key the new material into the existing embankment.
4. Transition Areas. Benching is used in the transition area between sizable cuts and fills. The transition area is the point where a cut section changes to a fill section. Particular attention should be placed in these areas. Failure to provide sufficient transverse benching and uniformity in compaction generally will result in a rough pavement surface at this junction.

204.2 INSPECTION GUIDELINES

204.2.1 Before Construction

In addition to the general pre-construction guidelines presented in Section 200.2, consider the following before excavation and embankment construction begins:

1. Utilities. Know the location of existing utilities, the status of any relocation work, and permits for future relocation work that may be authorized within the limits of the project. All utilities should be marked on the ground prior any earthwork commencing.
2. Environmental Considerations. Verify compliance with respect to erosion and sedimentation control; vegetation and tree protection; wetlands; and other environmental requirements. Make certain that protected wetland areas are marked and communicated to the Contractor (see Section 200.2.5 and Section 200.2.6).
3. Types of Excavation. Understand the types of excavation that may be required for the project (see Section 204.1.1.1). Verify that borrow sites, where used, have been approved, and that cross-sections have been taken. Where explosives and blasting are required, verify compliance with the Contract specifications and territorial requirements.
4. Compaction Considerations. Become familiar with and understand the moisture and density requirements for embankment construction. Check the provisions of the Contract for any required special compaction equipment. Understand the proper operation of such equipment.
5. Typical Sections/Staking. Become familiar with the typical sections of the Contract Plans. Pay particular attention to required treatments for steep slopes and transition areas (see Section 204.1.3). Verify that slope stakes are properly set (see Section 200.2.12). Visually check staking for obvious irregularities (e.g., off right-of-way).
6. Foundation Inspection. Observe the area for unsuitable material and wet spots. Verify removal or treatment based on the direction given by the PE. Document the locations, quantities, and disposition of materials and treatments (see Section 204.1.2.2).

204.2.2 During Construction

Consider the following guidelines during excavation and embankment construction:

1. Blasting and Explosives. Monitor any handling of explosives and blasting operations for conformance with legal requirements.
2. Slide Areas. Be alert to any condition that could indicate a possible slide area.
3. Slope Stake Preservation. Make certain the Contractor preserves slope stakes and control point references during the operation.
4. Clearing and Grubbing. Verify that the site has been properly cleared and grubbed.

5. Excavated Materials. Observe and report noticeable changes in excavated material with regard to type, texture, and color. Such factors may indicate the presence of unsuitable materials. Verify removal based on directives from the PE. Document the locations, quantities, and disposition of such materials. Watch for encounters with materials that could be used elsewhere, such as topsoil and riprap. Where topsoil stripping is specified, ensure that topsoil is properly salvaged.
6. Base of Cut/Top of Slope. Verify that rock encountered at the base of cuts has been excavated to the proper grade. Observe that rounding along the top of cut slopes is performed where specified.
7. Sub-excavated Areas. Ensure that sub-excavated areas have been measured for payment before backfilling.
8. Drainage and Erosion. Verify ditch construction (e.g., typical sections, staking, natural drainage, and interceptor ditches at tops of cuts). Watch for damage to the embankment such as unexpected high water; improperly drained foundation or roadbed; or damage from precipitation. Ensure that the BMPs for water quality control are monitored as required.
9. Benching. Verify that slopes and transition areas are being treated as specified with regard to keying the new material (see Section 204.1.3).
10. Embankment Material. Check to ensure that the embankment is maintained free of organic materials and is mixed uniformly. Rocks, concrete, and asphalt chunks larger than allowable dimensions must be removed and disposed of properly.
11. Placement and Compaction. Verify that the embankment material is placed in uniform horizontal lifts that do not exceed the allowable maximum thickness. Note the use and permissibility of any end-dumping. Observe the compaction operation for uniformity with respect to moisture content and target density. Monitor the operation of specialized compaction equipment for compliance. Check that the top 2 feet of embankment is constructed with rock-free material.
12. Structure/Pile Locations. Ensure that embankment material is placed to avoid damage to adjacent structures. Oversize material should not be used around structures or pile driving locations.
13. Debris Disposal. Roots, logs, and other unsuitable materials must be disposed of in designated areas outside of the fill area.
14. Cross-Sections. Frequently monitor the earthwork cross-section -- width, side slopes, grade -- for conformance with regard to tolerance of typical sections.

204.2.3 After Construction

After construction, verify that the roadway grade and prism are within specified tolerances, and that embankment construction meets the specified requirements for sampling and testing as specified in the contract requirements. Check the installation of drainage facilities for proper operation, and that the Contractor maintains the roadbed in proper condition.

END OF SECTION

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SECTION 207 – EARTHWORK GEO-TEXTILES

207.1 PRELIMINARY CONSIDERATIONS

Geo-synthetics such as geo-textiles, geo-grids, and geo-membranes are specified for many types of applications. For the material to function as intended, it is important that the specified type of material be furnished and properly placed. Before the application of geo-synthetics, consider the following guidelines:

1. Contract Plans and Specifications. Review the Contract, Standard Specifications, and SCRs with respect to the type of application; limits of treatment and material, construction, measurement, and payment requirements.
2. Material Considerations. Various types of geo-synthetics are available for different applications. Check the material delivered for conformance with the requirements specified in the contract.
3. Geo-synthetic Technician. If required in the contract, verify that a technician from the geo-textile supplier is present for technical advice.
4. Surface Preparation/Tearing Considerations. Pay particular attention to the surface upon which the geo-synthetic will be placed. The surface should be reasonably smooth to a grade that conforms to the intended application. Observe the surface for items that could tear the material. In addition, the cover material should be placed carefully to avoid ruptures and tears.

207.2 INSPECTION GUIDELINES

207.2.1 Impervious Lining Applications

Geo-membranes are typically used for impervious lining applications. Check to ensure that the geo-membrane is loosely laid to avoid rupture, and that wrinkles are smoothed where practical. Verify that field lap joints are properly placed and that the joint contact surfaces are cleaned and treated with bonding adhesive as specified. Enforce the provisions of the Contract with respect to any needed repairs.

207.2.2 Erosion Control and Drainage Applications

Geo-textiles are typically used for erosion control and drainage applications. The manner in which the geo-textiles are laid should minimize displacement of the fabric by water. Check that the fabric is loosely laid in the direction of water flow and anchored as required. Verify that trenching is placed at the top of slopes where designated on the Contract Plans. Check joint overlaps and sewn seams for conformance with the specifications.

207.2.3 Sub-grade Applications

Geo-textiles and geo-grids are typically used in sub-grade applications. Prior to placement, inspect the prepared surface for acceptability. Consider the following guidelines:

1. Fabric Placement. The fabric should be placed in the direction of construction traffic in a relatively stretched condition, without wrinkles or folds, and secured as specified. Folds that are in the direction of construction traffic are acceptable on curved sections. Do not allow the fabric to be dragged across the sub-grade. Verify overlaps at joints for conformance and inspect the fabric for damage prior to placement of the cover material. Enforce the Contract provisions with respect to any needed repairs.

2. Cover Placement/Compaction. Verify that the placement, grading, and compaction operation for the first lift of cover material conforms to specified requirements. Watch for damage to the fabric caused by the compaction operation, and ensure that needed repairs are made.

3. Traffic Considerations. Enforce the provisions with respect to equipment traffic (e.g., minimum thickness of cover, and type and weight limitations). In general, equipment should not make turning movements on the first lift of compacted cover. Watch for fabric damage and sub-grade rutting; and ensure that any needed repairs are made.

207.2.4 Landscape Applications

Geo-textile fabric is typically used for weed barriers in mulched landscape applications. Prior to placement, verify that the soil has been properly prepared and graded. Check to ensure that the fabric is placed loosely, lapped in the direction of water flow, and anchored as required. Where designated on the Contract Plans, verify that check slots are provided at the top of slopes. Also check for the installation of metal landscape borders where required.

END OF SECTION

SECTION 209 – STRUCTURAL EXCAVATION AND BACKFILL

209.1 GENERAL

Construction requirements for excavation and backfill for structures are provided for in the plans, Special Contract Requirements and the specifications. The PE and inspectors should thoroughly review all of these requirements prior to the start of construction.

Damage and failures can be avoided if sound construction practices are used in the structural excavation and backfill operations. Monitor the operation for obvious signs of unsound practices, and bring any instances to the attention of the PE. Factors that typically contribute to structural damage and failures include:

- The presence of rock in backfill material
- Uneven backfilling on opposing sides of the structure
- Backfilling too soon against freshly-poured concrete
- Placement of backfill material in lifts that are too thick
- Providing insufficient cover over pipe structures, and operating heavy equipment too close to pipe structures

The plans and specifications are designed so that backfilling operations can be accomplished without causing structural damage or failure, provided that sound construction practices are employed. For example, the structural integrity of a large diameter steel pipe relies on the side support provided by the compacted backfill material. If this side support is not adequately developed, the structure may fail. Such types of failure can generally be attributed to a lack of uniformity in the compacted backfill material. It is critical that such operations be carefully monitored for compliance.

209.2 INSPECTION GUIDELINES

209.2.1 Before Construction

1. Contract Plans and Specifications. Review the Contract for any special requirements, and understand the requirements for excavation and the class and quality of backfill material specified. Take cross-sections and profiles for verification, as needed.
2. Staking. Check stakes for any irregularities.
3. Structure Inspection. Compare the Contract Plans to the site. Inspect and note the condition of the structure, and make certain that structural concrete has attained the minimum required strength before backfilling.

209.2.2 During Construction

1. Unsuitable Materials. Verify that unsuitable materials have been properly excavated and removed. Document the location, quantity, and disposition of the material.

2. Embankment. Where required, embankment must be completed for structures located above natural ground.
3. Excavation Limits. Check excavated limits, dimensions, and grades; and document quantities.
4. Trenching. OSHA has strict regulations regarding the provision of shoring in trench operations. As required by the Standard Specifications, such operations are entirely the responsibility of the Contractor. Verify that adequate shoring and side-slope treatments are being installed, where required.
5. Base of Excavation. The base of excavation must be firm and comply with specified requirements. Check the base to ensure it has been properly drained and prepared for any placement of concrete.
6. Pipe. Check the adequacy of the pipe bedding and bed treatment, especially where rock is present. Check the direction of flow, camber, cradles, etc. Pushing the pipe out of line or raising the pipe off its bed during backfilling is unacceptable. Pay particular attention to the backfill material. Direct contact with rock greater than 3 inches may cause failure in pipes. Refer to the contract requirements for the material required for this type of backfill.
7. Compaction. Use extreme caution when backfilling and compacting; and stress uniformity. Verify material lifts, moisture, and the compaction operation for compliance. Pipes and box culverts should be uniformly backfilled in equal lifts on both sides.
8. Hazards. During excavation and backfill operations, protruding structures and surface cavities pose significant hazards to workers and equipment. Check that these types of hazards are clearly marked to prevent mishaps and equipment damage.

END OF SECTION

SECTION 213 – SUB-GRADE STABILIZATION

213.1 GENERAL

In terms of structural longevity and riding smoothness, overall pavement quality depends primarily on the quality and uniformity of the material layers constructed under the surface course. Sub-grade, materials must meet specified requirements and must be properly and uniformly prepared, placed, and compacted to adequately support the loads of vehicular traffic. Deficiencies in the sub-grade construction will invariably degrade the riding surface and cause a need for premature rehabilitation.

213.1.1 SUB-GRADE PREPARATION

The excavation and/or embankment construction within the roadway area will establish the sub-grade for the road. The resulting sub-grade is the primary foundation of the total pavement structure; therefore, its construction should be closely monitored. Examine the sub-grade for soft spots, ruts, and grade deficiencies. Such deficiencies must be corrected. Consider the following general guidelines:

1. Low Areas. Low areas should be filled with a suitable sub-grade material, re-graded, and compacted to target moisture and density. Pay particular attention to areas such as ruts. If not filled and compacted with sub-grade material, ruts will invariably be filled with base material. Most compaction equipment will bridge over ruts. This bridging effect creates areas that will fail to meet specified uniform density requirements.
2. High Areas. Pay particular attention to rocky areas above grade. It is an unacceptable practice to scalp these areas and reuse the resulting rocky material to fill low spots further ahead in the sub-grade. The rocky material produced by the scalping operation will be poorly graded and will promote pavement failure. Rather, these areas should be scarified to a depth sufficient to accommodate the required compacted thickness of approved base course material.
3. Moisture Content. Pay particular attention to the uniformity of the moisture content of the sub-grade material placed for compaction. Uniform moisture content (+/- 2 percent of optimum moisture) is critical for uniform compaction.

213.2.1 RECONDITIONING

213.2.1.1 GENERAL

Reconditioning is the preparation of a specified depth of the top layer of the existing sub-grade. This work is generally performed by scarifying, grading, watering, and compacting. Uniform moisture content of the in situ material is critical during compaction to achieve target density and a suitable sub-grade. Moisture content during compaction should be +/- 2 percent of optimum moisture to ensure uniform compaction.

213.4.1 INSPECTION GUIDELINES

213.4.1.1 Before Construction

Before reconditioning of sub-grade material begins, consider the following:

1. Contract Plans and Specifications. Review the Contract. Specifically note the required cross-sectional elements (e.g., width, depth of thickness, cross slope). Specified surface tolerances may change on a project-by-project basis, especially where surface materials are to be placed directly on the reconditioned sub-grade.
2. Equipment. The Contractor should gather the necessary inspection equipment and be prepared to check the depth of treatment and surface tolerance.
3. Staking. The Inspector should spot check and verify that the correct lines and grades have been staked.

213.4.2 During Construction

Consider the following guidelines when inspecting the reconditioning of sub-grade material:

1. Scarifying. Check the depth of treatment for conformance. To ensure that the proper quantity of water is being added to the sub-grade material, periodically verify the moisture content with the Contractor's laboratory, especially in areas suspected of being too wet or too dry.
2. Compaction. Observe the compaction operation for obvious signs of failure. Visually inspect the sub-grade for soft spots and other unacceptable deficiencies.
3. Surface Tolerance. Check the surface tolerance frequently for conformance to the Contract specifications.

213.4.3 After Construction

Check that the surface is satisfactorily maintained until the next course (e.g., base course) is ready to be placed.

END OF SECTION

SECTION 251 – RIPRAP

251.1 GENERAL

Erodible slopes, such as slopes along the banks around bridge structures within the right-of-way, are typically treated with an erosion and sedimentation counter-measure. Riprap is the careful placement of relatively large, angular stone on the erodible slope, and may be specified to require grout placed between individual rocks. Refer to the plans, Special Contract Requirements and specifications for the class of riprap to be used.

251.2 INSPECTION GUIDELINES

251.2.1 Before Construction

Before construction begins, consider the following guidelines:

1. Contract Plans and Specifications. Review the Contract with respect to the location, limits, and type of treatment required. Pay particular attention to the nominal size and material requirements of the stone and depth of treatment.
2. Materials. Review the requirements for riprap with respect to nominal size, shape, dimensional ratio, specific gravity, gradation, abrasion resistance, and compressive strength. Visually observe the required material samples from the quarry and site for compliance. Look for size, angularity, and gradation. If the material delivered to the site is suspect, verification testing should be required.
3. Surface Preparation/Excavation. Verify the acceptability of the slope after it is prepared, including the bed for riprap. Check the excavation for the toe or cut-off wall, where required, to ensure that it conforms to the lines and grades designated in the Contract.

251.2.2 During Construction

The following present inspection guidelines that should be considered during the construction of riprap treatments.

251.2.2.1 Riprap Treatment

The types of riprap treatments include placed riprap, keyed riprap and grouted riprap. The stone for riprap is generally placed and spread using a combination of mechanical and hand methods. Check the limits of treatment and depth of stone for compliance. Pay particular attention to the placement of the final surface layer. Regardless of the placement method used, the final surface should appear relatively smooth with interlocking faces of adjacent stones.

251.2.3 After Construction

Walk the treated area and look for obvious signs of improperly-placed stone and inadequate depth of stone.

END OF SECTION

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SECTION 253 – GABIONS AND REVET MATTRESSES

253.1 GENERAL

Erodible slopes along the banks around bridge structures are typically treated with erosion control devices. For erodible slopes, two types of treatments that may be designated are gabions or revet mattresses. Gabions and revet mattresses are similar to riprap, except that multiple pre-fabricated wire-cage units are used to contain graded rock. These pre-fabricated wire-cage units are tied together to form a complete gabion or revet mattress system.

253.2 INSPECTION GUIDELINES

253.2.1 Before Construction

Before construction begins, consider the following:

1. Contract Plans and Specifications. Review the plans and specifications with respect to the location, limits, and type of treatment required. Pay particular attention to the nominal size and material requirements of the rock, depth of treatment, and fabrication details for wire-cage units. The contractor is required to submit installation drawings necessary to construct the work.
2. Materials. Review the requirements for the rock material with respect to nominal size, shape, dimensional ratio, specific gravity, gradation, abrasion resistance, and compressive strength. Verify that the required testing has been conducted by the Contractor prior to construction. Verify that the rock from the quarry or site complies with the plans and specifications. Verify that the pre-fabricated wire-cage units have been approved for use on the project. Check the size of the wire used to fabricate the wire-cage units. Review delivery certifications for all materials for conformance with the Contract requirements including fasteners.
3. Surface Preparation. Verify that the slope has been properly prepared according to the details and dimensions shown on the plans.

253.2.2 During Construction

The following sections present inspection guidelines that should be considered during the construction of gabions and revet mattresses.

253.2.2.1 Gabion Treatment

Gabions are wire-cages that are filled with rock. They are placed and tied to each other on the slope to provide a protective structure. Check the acceptability of the wire-cages in terms of dimensions and selvaged perimeter edges. Ensure that the rock is placed in the cages as dense as practical. Verify that the units are placed closely together and tied to each other as specified.

Confirm that the gabion bed has been excavated to the width, depth, line, and grade as shown on the plans. Confirm that the assembly of the sides, ends, lids, and diaphragms is in accordance with the manufacturer's recommendations. Verify that the pre-fabricated wire-cage cells conform to the dimensions shown on the plans, including length, width, and depth. The edges of the cells must be securely bound together in accordance with the manufacturer's recommendations. Confirm that each cell is filled with rock placed as specified in the plans and specifications. Rock should be placed carefully so as not to damage the wire mesh or coating. Tie connecting tie-wires between each lift as specified in the plans and specifications. The last lift must be even with the top of the cell. Secure all contacting sides to neighboring gabions.

253.2.2.2 Revet Mattress Treatment

Revet mattresses are similar to gabions except that the horizontal dimensions of the wire cage are much greater than the depth. Where revet mattresses are specified, verify the proper use of secured diaphragms within the cage. Their use will depend on the unit's length-to-width ratio. Each diaphragm contains the rock material in smaller cells within the mattress. Prior to filling, check that adjoining surfaces and edges of lids are tied as specified. Verify that each mattress is properly anchored with stakes. Where holes are pre-drilled for stakes, check the depth for compliance.

Excavate the mattress bed to the width, line, and grade as shown on the plans. Be sure the excavation for toe- or cut-off walls are made to the neat lines of the walls. Assemble the sides, ends, lids, and diaphragms of the revet mattress into rectangular units at the job site. All edges must be securely selvaged or bound so the joints are as strong as the mesh. Before filling the slope mattress, tie the adjoining units with wire ties or spiral ties and anchor the units according to the project plans and/or the manufacturer's recommendations. Place the rock carefully so not to damage the wire mesh.

253.2.3 After Construction

Walk the treated area and look for obvious signs of improperly-placed rock, inadequate depth of stone, and misaligned or untied wire cages. Confirm that areas have been measured for payment.

END OF SECTION

SECTION 301 – UNTREATED AGGREGATE COURSES

301.1 GENERAL

Aggregate base course is a graded aggregate material that is hauled, placed, and compacted as a base course on a prepared surface for the pavement structure. The physical properties of the aggregates and their gradation shall conform to the requirements of the contract.

301.2 INSPECTION GUIDELINES

301.2.1 Before Construction

Before construction of the aggregate base course begins, consider the following:

1. Contract Plans and Specifications. Review the Contract and specifically note the allowable lift thickness, total required depth, and cross-slope required. Check the SCRs for any changes to the requirements of the Standard Specifications.
2. Material Requirements. Become familiar with the material requirements of the Contract specifications, such as the gradation requirements and the related tests and acceptance criteria. Gradation requirements, in particular, may change on a project-by-project basis.
3. Scale/Weigher Certification (Tonnage Basis). Check to ensure that the commercial scale and weigher have been properly certified.
4. Load Restrictions. Become familiar with the load restrictions of roadway features in Guam, particularly those facilities likely to be used by the project during construction.
5. Equipment. Have the Contractor gather the necessary inspection equipment and be prepared to check the lift thickness, total depth, and surface tolerance.
6. Spread Yield. Review and fully understand how the Contractor will check the spread yield for placed base course material.
7. Sub-grade/Sub-base. Ensure that the cross slope, elevation, and alignment are correct. Visually inspect the sub-grade/sub-base for soft spots, ruts, and grade deficiencies. Ensure that the sub-grade/sub-base is prepared within allowable tolerances to properly receive the required thickness of base course material.
8. Staking. Spot check and verify that width and thickness have been properly staked.

301.2.2 During Construction

Consider the following guidelines when inspecting the construction of aggregate base course:

1. Load Tickets (Tonnage Basis). Do not accept any load of material without receipt of a properly completed and validated load ticket. Do not accept or sign a load ticket unless

the load was actually placed as specified. Do not accept load tickets from overweight haul vehicles.

2. Material Quality. Verify that the material delivered meets specified criteria with regard to gradation requirements, and ensure that samples are tested at the required frequency. Poorly-graded, oversize, and contaminated material, such as balls of clay, are grounds for rejection.
3. Placement. Verify the uniformity of the aggregate material. Observe the material as it is placed and spread for obvious signs of degradation (e.g., segregation, foreign material, and mixing with sub-grade material). Take measurements, as needed, to verify placement to the required width and depth. Frequently check the yield to verify actual quantities.
4. Compaction. Observe the compaction operation for obvious signs of improper operation. Each lift must be uniformly compacted to the target density before subsequent lifts are placed. To ensure optimum density, verify the proper application of water before compaction.
5. Surface Tolerance. Check the cross-section (e.g., cross slope, thickness, evenness of surface and elevation, as needed, to ensure that the final compacted base is within the limits of the Contract specifications.

301.2.3 After Construction

Check that the surface is satisfactorily maintained to the correct line, grade and cross section until the placement of the next course.

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END OF SECTION

SECTION 302 – TREATED AGGREGATE COURSES

302.1 GENERAL

Hydraulic cement, fly ash or lime is typically added to the aggregate courses to improve its physical characteristics as a base for the surface courses. The PE and inspectors should review the contract for the additives required and the limits at which the treated aggregate course is to be placed.

302.2 INSPECTION GUIDELINES

302.2.1 Before Construction

Before work on the treated aggregate course begins, consider the following:

1. Contract Plans and Specifications. Review the Contract and specifically note the number of courses, depth of treatment, and required cross-sectional tolerance. Check the SCRs for any changes in the Method of Measurement or Basis of Payment.
2. Material Requirements. Become familiar with the material and processing requirements of the Contract specifications, such as slurry mixing, and the related tests and acceptance criteria.
3. Scale/Weigher Certification. Check to ensure that the commercial scale and weigher have been properly certified.
4. Load Restrictions. Become familiar with the load restrictions of roadway features in Guam, particularly those facilities to be used by the project during construction.
5. Equipment. Have the Contractor gather the necessary inspection equipment and be prepared to check the depth of material being placed and surface tolerance.

302.2.2 During Construction

Consider the following guidelines when inspecting the construction of treated aggregate base courses:

1. Preparation. Ensure that the sub-grade has been properly prepared and that the cross-section, elevation, and alignment are correct. Visually inspect the sub-grade for soft spots, ruts, and grade deficiencies
2. Load Tickets. Do not accept any load of material without receipt of a properly-completed and validated load ticket. Do not accept or sign a load ticket unless the material was applied as specified.
3. Material Quality. Verify that the material delivered meets specified criteria and ensure that sampling and testing is performed at the required frequency. Reject loads based on non-compliance with the Contract provisions.

4. Weather Limitations. Check weather forecasts and verify that the operation is being performed within the limits of the Contract specifications with regard to inclement weather. Do not allow the operation to continue when the sub-grade material is too wet.
5. Compaction. Observe the compaction operation for obvious signs of improper operation, and verify that the target density is being obtained. Pay particular attention to the density obtained near the edges and joints.
6. Surface Tolerance. Check the cross-section (e.g., cross-slope, thickness, and elevation) as needed to ensure that the final compacted sub-grade is within the limits of the Contract specifications.

302.2.3 After Construction

Check that the surface is satisfactorily maintained until the next course ready to be placed.

END OF SECTION

SECTION 400 – ASPHALT PAVEMENTS AND SURFACE TREATMENTS

400.0 GENERAL

Section 400 of the Standard Specifications governs the requirements for Hot Bituminous Pavement construction. The following sections briefly discuss considerations that are common to these pavement construction materials.

QC/QA Provisions

The Contractor is responsible for QC, and DPW is responsible for QA, including final acceptance of pay items under the provisions of the Contract. It is the PE's responsibility to review the appropriate specifications and provisions for the project.

It is important that DPW and Contractor personnel clearly understand their respective responsibilities. As such, these responsibilities are to be discussed at the Pre-paving Conference prior to the commencement of any paving activities, as well as at the beginning of major changes in the phase or work area of the project. Concurrent with the paving operations, the status and results of QC/QA sampling, testing, and inspections should be discussed during routine, weekly meetings. Attendees should generally include the Contractor's Superintendent, the Quality Control Supervisor, the Paving Foreman, and the PE. Supplemental meetings held to discuss the specifics of a paving activity or issue should also include the participation of the Inspectors, and QC/QA Material Technicians.

Vertical Clearance Under Structures

After completing a new or rehabilitative paving project, the PE is responsible to ensure the vertical clearance from the new paved surface to all overhead obstructions such as bridges and sign structures is verified and communicated to DPW. This requires measuring the vertical clearance under bridges and overhead signs at the crossing with the highest point across the paved surface and reporting the findings to DPW'S Chief Engineer. This should be completed prior to the roadway being re-opened to the travelling public.

400.1 PRELIMINARY CONSIDERATIONS

Before plant-mix production and paving operations begin, many factors should be considered. The following sections briefly discuss these considerations.

400.1.1 Contract Plans and Specifications

Review the Contract, including the SCRs. Pay particular attention to the following:

- Type of pavement specified
- Material specifications and mix design requirements
- Temperature limitations for the mix at time of production, transport, and placement, mat surface for compactive rolling, and ambient air
- Number and thickness of courses

- Construction dimensions and tolerances (e.g., widths, grades, and cross-section)
- Compaction procedures and density requirements
- Sampling and testing requirements and responsibilities
- Acceptance and payment criteria

400.1.2 Asphalt Paving Publications

For additional guidance, review and reference the following publications during the project:

- *Hot-Mix Asphalt Paving Handbook*, (AASHTO)
- *Segregation Causes and Cures for Hot-Mix Asphalt*, AASHTO
- *The Asphalt Handbook*, Asphalt Institute

400.1.3 Job-Mix Formula

The Contractor is required to submit a proposed mix design for each type of asphalt specified in the Contract. The PE will review the proposed mix design which is referred to as the Job-Mix Formula. A trial batch will typically be produced using Contractor-furnished samples of the materials intended for use in the Job-Mix Formula. Following verification of compliance, DPW will issue an approval of the mix design which will include the following information:

- Mix design number
- Mix gradation
- Source of materials
- Percent of materials
- Name of suppliers
- Percent of reclaimed asphalt pavement materials, if selected
- Grade of asphalt binder
- Other relevant project information

The PE will require the Contractor to have the mix design approval prior to the Pre-paving Conference, and should verify that copies have been distributed to the proper personnel. Changes affecting the mix design, such as the plant used or the type, source, and proportions of materials, require the Contractor to prepare and submit a new Job Mix Formula for review and approval.

400.1.4 Longitudinal Joint and Pavement Marking Plan

The Contractor is responsible for submitting a paving plan that includes a Longitudinal Joint and Pavement Marking Plan. This plan should illustrate the location and configuration of longitudinal joints and pavement markings, including the proposed method of establishing control. Verify that the Contractor submits this plan for review before the Pre-paving Conference. Acceptance of the plan should be provided to the Contractor.

400.1.5 Pre-paving Conference

The Pre-paving Conference is intended to be a forum to discuss all aspects of the Contractor's paving operation and the requirements of the Contract. The Pre-paving Conference should address at a minimum the following issues;

- Scope of paving work contained in the Contract
- Personnel and communications
- The Contractor's schedule and placement plan
- Material and performance requirements
- QC/QA activities
- Traffic control
- Material delivery and placement logistics, sequencing, and safety protocols

One of the goals of the meeting should be to establish and maintain effective communications with the Contractor's personnel such as Superintendents, Foremen, Material Testing Supervisors, Plant Operator, and Certified Weighers. Feedback between the production plant and the paving site is invaluable to ensure necessary mix adjustments are made in a timely manner to consistently produce a quality pavement. The Contractor is responsible for submitting his Contractor Quality Plan to the PE for review and acceptance prior to the Pre-paving conference so all parties understand their respective roles and responsibilities. before the paving operation begins.

400.1.6 Weather Conditions

DPW should review and be familiar with the Contract limitations with respect to paving and inclement weather, including allowable conditions and restrictions for applying tack coat, placing asphalt over a previously-placed lift, compaction activities.

400.1.7 Foundation Preparation and Conditioning

Quality, in terms of surface smoothness, uniformity, and durability, is dependent on the quality of the underlying foundation including the sub-grade, base courses, and existing pavement. If the foundation is not true to the grade and cross-section, or is rutted, the surface course thickness will vary and it will be difficult to obtain uniform density. This will generally result in surface undulations, dips, and swales.

400.1.7.1 Sub-grade/Base

Verify that the sub-grade and/or base have been properly graded and compacted. Check the cross-slope, elevation, and alignment for conformance. Proof-rolling should be performed to check for soft spots and ruts, and ensure that the Contractor corrects these deficiencies. Require that any damage to the sub-grade or base be repaired before paving. Approve the foundation preparation and conditioning work prior to placement of the next asphalt course.

400.1.7.2 Existing Pavement

On rehabilitation projects requiring an overlay, any needed pavement repair should be completed and approved before the overlay is placed. Edges of all asphalt removal areas should be both longitudinal and perpendicular to the flow of traffic whenever practical. Care should be taken during asphalt removal to ensure the soundness of the surrounding asphalt area to remain. The entire surface, including the edge of pavement, must also be swept and maintained in a clean and dry condition just prior to placing and compacting the plant-mix bituminous overlay.

400.1.8 Application of Prime and Tack Coats

As specified or directed, ensure that the underlying and adjacent hard surfaces are properly tacked with an approved bituminous material before the mix is placed. In addition, verify that contact surfaces such as curbs, gutters, manholes, and barriers are tacked just ahead of the paving operation, taking care to avoid application on surfaces that will be left exposed following the completion of the paving operation. Once a surface is coated, vehicle access should be restricted to only the equipment necessary for the placement operation. Tack and prime coat materials should not be applied beyond the limits of the final surface course. Where overspray or smearing is observed, require the affected surfaces to be cleaned.

400.1.9 Project Stationing

Verify that project stationing has been clearly marked for the purpose of documenting the placement of the mix and yield checks. Review the method that will be used to perform yield checks and monitor these values closely in order to avoid unacceptable deviations in pavement uniformity.

400.1.10 Control Strip

The Contractor will typically be required to construct a control strip using material that conforms to the approved Job-Mix Formula and the equipment planned for use. The purpose of the control strip is to verify material and mix properties and assess the Contractor’s placement methods including the rolling pattern and sequence, the number, type, and combination of rollers, and other equipment and material handling actions that contribute to obtaining target density. Density tests will be performed to verify compliance in accordance with the Standard Specifications. The Contractor is responsible for documenting and correlating all test results and must optain approval from the PE before production paving can begin. The Contractor should prepare a new control strip whenever the plant, mix properties, or materials are changed .

400.1.11 Mix Segregation

Mix segregation is the distribution of non-uniformly-graded coarse and fine aggregate material throughout the mix. In simple terms, the aggregate material in various locations in the mat can fail to meet gradation specifications. This is a common problem with plant-mix bituminous pavements that should be closely monitored. Areas with too much coarse aggregate will be low in asphalt content and high in voids, which makes them prone to premature deterioration. Segregation can be introduced in several locations throughout the paving process (e.g., stockpiling, mixing, hauling, dumping, and laydown). For example, segregation can be introduced where a windrow is not completely picked up and deposited into the paver. Areas with an excessively high percentage of fines can also be prone to rutting and should be corrected.

400.2 PRODUCTION

400.2.1 Plant Facilities

The plant must be in good mechanical condition and have adequate capacity to keep up with production demands during the laydown and compaction operations. Prior to production, consider the guidelines in the following sections.

400.2.1.1 Laboratory Facilities

Verify that the Contractor has furnished the required laboratory facilities and is prepared to perform the QC sampling and testing specified in the Contract.

400.2.1.2 Air Quality Considerations

Verify that the Plant Operator is in receipt of a proper and current air quality certification from the Government of Guam's environmental agency.

400.2.1.3 Plant Scales

Verify scales have a valid calibration certification, check for accuracy and zero balance, and confirm the operation is controlled by a Certified Weigher. Verify that the platform is clean, free of obstructions, and operating freely. Verify that scale tickets document the proper information.

400.2.1.4 Job-Mix Formula

Verify that the Plant Operator is in receipt of a properly completed and approved formula for the project.

400.2.2 Material Considerations

There are several factors related to material type, storage, and handling that should be considered at the plant, as discussed in the following sections.

400.2.2.1 Component Materials

Prior to mix production, verify that component materials at the plant such as aggregates, mineral filler, hydrated lime, bituminous material, reclaimed asphalt pavement, and additives have been properly sampled, tested, and approved for use as provided for in the Contract.

400.2.2.2 Aggregate Stockpiles

Aggregate stockpiles should be built in layers to minimize segregation and separated to avoid intermingling. Discourage any handling procedure that would push or dump aggregate over the side of a stockpile or otherwise degrade the material. Aggregate should be handled in such a manner as to avoid contamination from underlying or adjacent materials and each load removed from the stockpile is uniform in gradation.

400.2.2.3 Aggregate Handling

To minimize segregation, the loader operator should work the full face of the aggregate stockpile. Dividers should be installed between cold-feed bin compartments so that aggregate piles do not overflow.

400.2.3 Mix Production and Storage

Once the plant is in operation, the plant should be monitored by the QC/QA team with respect to mix production and storage. Consider the guidelines in the following sections.

400.2.3.1 Bituminous Materials

The bituminous material should be uniformly heated to the correct temperature. Localized overheating is unacceptable and should be carefully monitored by the Contractor. Improper handling can destroy or deteriorate the binder properties that are required by the Contract. Examples of improper handling include:

- Storing in tanks at excessive temperatures
- Storing for excessive periods of time
- Mixing in the plant at excessive temperatures
- Contamination by storing in tanks containing other material

The mix discharge and delivery temperatures required in the Contract specifications should be verified by the Inspector. The Contractor should consult its binder supplier for further information on the ideal production temperatures appropriate for the grades of binder supplied to the project, and for proper handling and incorporation of the binder material.

400.2.3.2 Addition of Lime

Verify that lime, if required by the project specifications, is introduced to the aggregate as required. Verify the proportions of lime and water for conformance with the Job Mix Formula.

400.2.3.3 Mix Proportions

Verify that QC/QA samples and tests are performed as specified. Make frequent visual checks to ensure acceptability of the mix. If the aggregates are not completely and uniformly coated with bituminous material, it will result in non-uniform asphalt content. Check for signs of segregation.

400.2.3.4 Mix Discharge Temperature

Check the mix temperature at plant discharge for conformance with Contract requirements. Require adjustments as needed to conform.

400.2.3.5 Surge Silo Storage

Temporary storage in a surge silo is acceptable, provided it does not adversely affect mix quality (e.g., binder stripping, segregation, and heat loss). Pay particular attention to evidence of segregation. If the silo is improperly charged or operated, mix segregation is inevitable. The conveying device should deposit the mix into the center of the batcher at the top of the silo. The batcher gate should remain closed while charging; be fully-opened when the batch is dropped; and then be quickly closed to prevent dribbling.

400.3 LOADING/HAULING OPERATION

The following sections provide general inspection guidance.

400.3.1 Haul Trucks

The Contractor should have an adequate number of haul trucks available to provide a constant supply of mix to the paving site. Check that truck beds are tight, smooth, clean, and treated with an approved release agent before loading. Fuel oil is not an acceptable release agent.

401.3.2 Truck Loading Considerations

If trucks are not loaded properly, segregation of the mix may occur. Trucks should be laterally centered (i.e., left to right) under the discharge gate of the surge silo. Trucks should be loaded in multiple drops (e.g., first drop at the rear, second drop at the front, alternating drops in between). From three to seven drops may be necessary depending on the size of the truck -- single unit or semi. The mix should not dribble from the bottom gate of the surge silo into the bed of the truck.

400.4 LAYDOWN OPERATION

Inspectors should focus on the following areas since placement is often associated with poor workmanship at these locations:

- Tapers
- Ramps
- Manholes
- Joints
- Repair areas in underlying lift
- Where adverse paving conditions are encountered such as inclement weather, wind, rain, equipment breakdowns, and delays in material delivery.

400.4.1 Paving Equipment

Verify that approved and properly-adjusted paving equipment is furnished and used by the Contractor. Pay particular attention to the acceptability of the receiving hopper, screed, strike-off assembly, automatic screed control, grade sensors, and sensor reference line. Verify that the paver is capable of placing the mix uniformly and non-segregated in front of the screed. Check the length of the automatic leveling ski for acceptability.

400.4.2 Mix Delivery

Once an acceptable mix has been established, note the appearance of the load (e.g., peaking or flat, dull or shiny, white or blue smoke). A differing appearance in subsequent loads may indicate an unacceptable change in mix proportions or temperature. Visually inspect the mix for signs of segregation or incomplete coating of the aggregate. The Project Inspector should notify the PE if any of these noted conditions occur.

400.4.3 Charging the Paver Hopper

When mix is dumped into the paver hopper, the truck should be aligned properly with the hopper and should not bump or jar the paver. Before the tailgate is opened, the truck operator should first raise the bed to move the material to the tailgate. Once opened, this will provide the necessary surge of mix into the hopper, which minimizes segregation. If mix is spilled on the roadway in front of the paver, ensure that it is removed before the paver moves ahead. The hopper should be kept more than half full at all times.

400.4.4 Paver Operation and Adjustment

To ensure the mix is placed properly without segregation, consider the guidelines in the following sections.

400.4.4.1 Paver Control

The paver should be operated under automated controls such as screed controls, grade sensors, and sensor reference lines. The proper use of this automated control system is paramount to ensure a quality pavement. However, the following instances of manual operation are acceptable:

- Irregular Areas. Manual operation of the paver is permitted in irregularly shaped and minor areas, such as tapers. Closely monitor these areas for conformance.
- Automated System Failure. If the automated control system of the paver fails, the equipment may be operated manually for the remainder of the workday. Paving should not commence if the Contractor is unable to fix the control system before the next workday.

400.4.4.2 Paver Speed

The operator should use the slowest paver speed that will accommodate production and delivery of the mix. The use of windrow equipment should be encouraged since it can eliminate the majority of any starts/stops that would be anticipated using other equipment. When starts/stops are necessary, they should be performed quickly at a normal operating speed to avoid gradual deceleration and acceleration. This will minimize imperfections and damage to the mat such as holes, tears, and drags.

400.4.4.3 Material Feed

The feed sensor and flow gates at the rear of the hopper should be adjusted so that the quantity of material moved by the slat conveyor from the hopper to the midpoint of the augers is continuous. The hopper should be kept no less than half full.

400.4.4.4 Paver Hopper Wings

Paver wings should be dumped only at the end of the day and the material disposed of properly. Material retained on the wings should not be incorporated into the pavement. Dumping the wings or manually incorporating this material into the pavement can result in segregation that will adversely affect the quality of the mat.

400.4.4.5 Augers

The augers should span the full-width of the screed. The auger height should be adjusted so that the bottom of the auger is at least 2 inches above the finished surface of the mat.

400.4.4.6 Screed

The paver should be equipped with a full-width vibratory screed. A sufficient quantity of mix should be supplied by the augers to maintain a constant level of mix in front of and across the full-width of the screed. The use of drag wings is unacceptable. Verify that the screed is in proper adjustment to produce an acceptable and uniform mat.

400.4.5 Quality Considerations

The Inspector should consider the following guidelines:

- Surface and Texture. The surface of the mat should be uniform in appearance and texture (without holes, tears, gouges, drags, or segregation).
- Segregation. If segregation is observed behind the paver, immediately notify the PE and the Contractor.
- Mat Temperature. Check the temperature of the mat behind the paver screed for conformance. Ensure that the mixture is at the proper temperature before rolling. The risk of thermal segregation increases when paving in cool temperatures .
- Subsequent Lifts. Ensure that rejected areas such as segregated areas and soft spots have been corrected prior to placing a subsequent lift.

- Cross-Section/Thickness/Yield. Ensure that the mat is placed in conformance with the required cross-section (e.g., slope and crown) and lift thickness. Check the total thickness and yield as required, and adjust the screed as necessary.

400.5 COMPACTION OPERATION

The mat will be uniformly compacted using the procedures established by the control strip. Consider the guidelines in the following sections.

400.5.1 Rolling Procedures

Document the rolling procedures used by the Contractor. Particularly note deviations from the procedures established by the control strip.

400.5.1.1 Rolling Sequence

In general, the compaction operation will be sequenced as follows:

- Initial Rolling. Initial rolling is the first pass of the rollers on the freshly-placed mat just behind the paver. It is used to break down and consolidate the mix.
- Intermediate Rolling. Intermediate rolling is the second pass of the rollers that takes place just after initial rolling. It is performed to obtain the required mat density in accordance with applicable temperature requirements.
- Finish Rolling. Finish rolling is performed after intermediate rolling to improve the finish of the surface. It is preformed while the mix is warm enough to permit the removal of roller marks.

400.5.1.2 Roller Speed

In general, rollers should not travel faster than approximately three miles per hour (brisk walking pace). A rippled surface may occur if the rollers are operated at too high of a speed. The Contractor should avoid stopping rollers on the freshly placed mat.

400.5.1.3 Pneumatic-Tire Rollers

Where pneumatic-tire rollers are used, the compaction effort is directly related to the tire pressure. Verify that the correct tire pressure is used in accordance with the compaction test section.

400.5.1.4 Vibratory Rollers

Vibratory rollers can be used in either the static or vibratory mode. Where the vibratory mode is used, the frequency should be as high as practical without detrimental impacts to the mat. Consider the following guidelines:

- Static Mode. Static mode, or non-vibratory rollers, should be used on mats that are less than 1.25 inches thick. The vibratory mode should not be used during finish rolling of surface courses or on bridge decks.

- Low Amplitude. A low-amplitude vibratory mode should be used for mat thicknesses between 1.25 and 3 inches.
- High Amplitude. A high-amplitude vibratory mode should be used for mats greater than 3 inches thick.

400.5.1.5 Manual Compaction Methods

Hand-operated mechanical tampers should be used in areas that are inaccessible to rollers. Areas compacted by this means should be inspected closely to ensure the material is adequately compacted, particularly areas that will be routinely exposed to vehicle loadings.

400.5.2 Temperature Considerations

Temperature plays a critical role in the compaction of plant-mix bituminous pavements, and should be closely monitored. This can be the most critical when placing relatively thin lifts on existing pavements or bridge decks in relatively low ambient air temperatures combined with breezes that can quickly draw off the temperature from the asphalt mat.

400.5.3 Joint Construction

The quality of longitudinal and transverse joints will affect the quality and long-term performance of the asphalt pavement. The surface must be smooth across the joints after density is obtained. New asphalt placed against an adjacent lift or edge of existing pavement should be "pinched" prior to the initial rolling of the remaining area of the mat in order to achieve a uniform level across the joint. Avoid situations where any of the new lift is lapped over onto the existing pavement. The following sections provide additional guidance.

400.5.3.1 Transverse Joints

When transverse joints are required, refer to the requirements of the Standard Specifications, particularly in situations where a vertical transverse joint is temporarily opened to traffic. These areas should be vertically cut and the tapered remnants removed prior to continuing asphalt placement.

400.5.3.2 Longitudinal Joints

When longitudinal joints are required, refer to the requirements of the Standard Specifications, particularly in situations where the longitudinal joint is temporarily opened to traffic.

END OF SECTION

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SECTION 403 – HOT ASPHALT CONCRETE PAVEMENT

403.1 GENERAL

This work consists of constructing Hot Asphalt Concrete Pavement in accordance with the requirements of the project specifications. The PE and Inspectors should also refer to Section 400 of this manual for additional information related to construction of Hot Asphalt Concrete Pavement.

403.2 INSPECTION GUIDELINES

403.2.1 Before Construction

Before construction of the plant-mix bituminous base course begins, consider the following:

1. Contract Plans and Specifications. Review the Contract and specifically note the required cross-sectional elements (e.g., width, thickness, and cross slope). Check the SCRs for any changes to the typical requirements of the Standard Specifications.
2. Material Requirements. Become familiar with the material requirements of the Contract specifications such as the Job-Mix Formula and gradation requirements, and the related tests and acceptance criteria. Gradation requirements, in particular, may change on a project-by-project basis.
3. Scale/Weigher Certification. Check to ensure that the commercial scale and weigher have been properly certified.
4. Load Restrictions. Become familiar with the load restrictions on public facilities.
5. Equipment. Have the Contractor gather the necessary inspection equipment and be prepared to check the mix temperature, depth, and surface tolerance of the base course. Ensure that the Contractor has the proper placement and compaction equipment on hand.
6. Spread Yield. Review and understand how to check spread yield for placed base course material.
7. Sub-grade/Sub-base. Ensure that the cross slope, elevation, and alignment are correct. Visually inspect the sub-grade/sub-base for soft spots, ruts, and grade deficiencies. Ensure that the sub-grade/sub-base is prepared within allowable tolerances to properly receive the required thickness of base course material.

403.2.2 During Construction

The construction of plant-mix bituminous base course is governed by Sections 401, 402, and 403 of the Standard Specifications for plant-mix bituminous pavements. See Section 400 of this CMIS Manual for construction inspection guidance and consider the following:

1. Load Tickets. Do not accept any load of material without receipt of a properly completed and validated load ticket. Do not accept or sign a load ticket unless the load was actually placed as specified, and do not accept load tickets from overweight haul vehicles.
2. Mix Temperature. Check the mix temperature at the required sampling frequency and record the temperature on the delivery ticket and in the Daily Inspection Report.
3. Weather Limitations. Check weather forecasts and verify that the operation is being performed within the limits of the Contract specifications with regard to paving and inclement weather. Do not allow the operation to continue during rain or when the sub-grade/sub-base is too wet.
4. Placement. Observe the material being placed for obvious signs of degradation such as segregation and foreign material. Check the Contractor's measurements as needed to ensure that the material is being placed to the required width and depth. Check and verify the yield frequently.
5. Compaction. Observe the compaction operation for signs of improper operation. Check density at the required sampling frequency to be certain that the Contractor is uniformly obtaining the specified target density.

403.2.3 After Construction

Check the cross-section (e.g., cross slope, thickness, and elevation) as needed to ensure that the final compacted base is within the limits of the Contract specifications.

END OF SECTION

SECTION 408 – COLD RECYCLED ASPHALT BASE COURSE

408.1 GENERAL

Cold bituminous pavement recycling is typically specified as a rehabilitative treatment for bituminous pavements. The work generally consists of pulverizing or milling the existing bituminous surface within the limits and to the depth required by the Contract; mixing a recycling agent with the pulverized material; combining it with new aggregate; and then spreading and compacting the recycled material to the specified grade, cross-section, and density.

408.2 INSPECTION GUIDELINES

408.2.1 Before Construction

Before the cold bituminous pavement recycling operation begins, consider the following guidelines:

1. Contract Plans and Specifications. Pay particular attention to the requirements for the pulverized material, recycling agent, and sealing emulsion.
2. Surface Preparation. Items such as manholes should be clearly marked.
3. Recycling Equipment. Check the operation of the recycling equipment for conformance with respect to its pulverizing capabilities; control over width and longitudinal joint offset; automatic depth control; screening and crushing capabilities; continuous measurement of recycled material and automatic metering of recycling agents; and mixing and windrow placement capabilities.
4. Paving Equipment. Check the paving equipment for conformance. Verify the proper operation and adjustment of the pick-up machine, paver, and screed. The screed does not have to be heated.
5. Compaction Equipment. Check the compaction equipment for conformance. Both pneumatic-tire and steel-wheel rollers, either static or vibratory, will be required. The use of the vibratory mode for finishing requires previous approval.
6. Representative. Verify that a manufacturer's representative of the recycling agent is present at the beginning of the operation and remains on site to provide guidance until acceptable production has been established.

408.2.2 During Construction

During the cold bituminous pavement recycling operation, consider the following guidelines:

1. Depth of Milling. Verify that the underlying material is not disturbed beyond the depth of milling designated on the Contract plans.
2. Longitudinal Overlap. Verify that the overlap of adjacent passes meets specified minimum requirements.

3. End Overlap. Where the operation is halted, check that the operation is restarted by overlapping the end where the operation stopped.
4. Vertical Faces. Verify that the faces of vertical cuts in the pavement are properly cleaned during the operation and are not left overnight.
5. Mixing Operation. The recycling agent will be automatically metered based on the continuous weight measurement of pulverized material. Verify that the rate of application is calibrated to within allowable tolerances. Water may be added to the pulverized material to facilitate mixing uniformity.
6. Spreading Mix. Verify that the production of recycled material is balanced with paving for a continuous operation. Check that the mix is uniformly placed in windrows to prevent segregation. The paving equipment should pick up the entire windrow and place the recycled material in one pass to the required grade and cross-section.
7. Segregation Considerations. Watch for segregation in the windrows and the screeded surface, and enforce the provisions of the Contract with respect to removal and replacement of unacceptable mix. If segregation is evident, suspend the operation until the problem can be identified and corrected.
8. Compaction Operation. A vibratory steel-wheel roller should be used for the initial breakdown and pneumatic-tire rollers used for the primary compaction rolling effort, followed by a non-vibratory steel-wheel roller for the finish rolling operation. Compaction should generally stop where no further displacement is observed. Hand methods will be necessary for areas inaccessible to rollers, and finish rolling will be performed with steel-wheel rollers using either the static or vibratory mode. Note, however, that the use of the vibratory mode requires previous approval and low amplitude. Verify that the required density is obtained and that the surface finish is free of roller marks and damage. Where cracks, movement, or pavement distress is observed, suspend the operation until the problem can be identified and resolved. Enforce the Contract provisions with respect to removal and replacement of deficient areas.
9. Longitudinal Joints. Verify that longitudinal joints are laterally offset between layers at the specified minimum distance, but do not fall within wheel paths.
10. Free Moisture Tests. Check that free moisture tests are being performed as required, and enforce the specified limits of free moisture before allowing placement of a designated sealing emulsion or asphalt overlay. Enforce the Contract provisions with respect to removal and replacement of damaged and soft areas before any sealing emulsion or asphalt overlay is placed.

408.2.3 After Construction

Review the work to ensure acceptability, and discuss any unacceptable areas with the Contractor. Enforce the Contract provisions with respect to needed corrections and minimum time before opening the section to any traffic after compaction. A sealing emulsion may be specified to minimize surface raveling. Where applicable, verify the limits of treatment and rate of application for conformance. Where an asphalt overlay is designated, verify that the minimum overlay thickness is placed over the recycled pavement within the minimum specified time limit. Check the density, grade, and cross-section of the final surface for conformance.

END OF SECTION

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SECTION 410 – SLURRY SEAL

410.1 GENERAL

Asphalt slurry seals or polymer modified microsurfacing mixes are typically specified to lengthen the service life of an existing pavement and to improve the skid resistance of the surface. Prior to placing a slurry seal it is important that the surface be properly prepared. The Contract plans will designate the limits of treatment. Generally, aggregate cover will not be specified where the bituminous material will be used as a fog seal.

410.2 INSPECTION GUIDELINES

410.2.1 Before Construction

Before the seal coat operation, consider the following guidelines:

1. Contract Plans and Specifications. Pay particular attention to the type, grade, and temperature requirements of the bituminous material; the gradation requirements of the aggregate cover material; and their respective rates of application.
2. Equipment. Check equipment for conformance. The Contractor should provide adequate bituminous distributors, aggregate spreaders, pneumatic-tire rollers, and rotary power brooms for a continuous operation. Pay particular attention to the distributor, as it should have adequate means for controlling and monitoring the temperature, rate, and width of application of bituminous material.
3. Test Section. As needed, a test section will be used to evaluate the application rates, yield, and penetration. Embedment of approximately 75 percent of aggregate into the bituminous material is recommended. The operation should consistently use either butt or lap seams, but no seams should be placed in the wheel paths of operating traffic. The sequence of placement should minimize turning movements on the freshly-placed surface.
4. Maintenance of Traffic. Verify that the correct types of temporary pavement markings and signing have been properly placed.
5. Surface Preparation. Prior to sealing, verify that the surface has been properly prepared and approved. The surface should be to the desired line and grade; free of irregularities; clean; and dry. Power brooms are generally used to remove loose and foreign material. Items such as manhole covers, drop inlets, valve boxes, and valley pans should be covered with dirt or paper to prevent bonding with the bituminous material.

410.2.2 During Construction

410.2.2.1 Application of Bituminous Material

During the application of the bituminous material, the Inspector should ensure conformance with respect to the type, grade, temperature, and application rate of the material within the limits designated on the Contract plans. Consider the following guidelines:

1. Temperature/Initial Quantity. Check the temperature of the material in the distribution truck for conformance. Determine the initial quantity of material in the distribution truck before it is applied.
2. Distribution Bar/Nozzles. Check that the distribution bar applies at a uniform, continuous spread. End nozzles should be normal to the surface (i.e., turned at 90 degrees) to reduce overspray on curbs and reduce development of false seams. Adequate bituminous material should be applied along the seam line, not just over-sprayed. The Contractor should have spare nozzles readily available.
3. Application Uniformity. Check to ensure that the bituminous material is applied at the specified rate uniformly over the surface in a continuous operation without producing deficient areas or areas of excess material. Check the yield as required for confirmation. Particularly watch for streaking. Halt the operation if streaking is observed and require corrective action. Junctions of adjacent passes should be closely monitored. Areas with too little or too much bituminous material must be corrected before application of the cover aggregate. In addition, the application rate should be adjusted to compensate for oxidized and open-graded surfaces.
4. Overspray. Check that the bituminous material is not over-sprayed on adjacent locations such as curbs and sidewalks. If observed, require the Contractor to thoroughly clean the excess.
5. End Overlaps. Pay particular attention to the start and cut-off operation of the distribution truck. The truck should be moving forward in the direction of the application when the spray bar is opened or closed. Verify that building paper is used at the beginning and end of each spread. Such practice minimizes excess from overspray and dripping, and helps to square the ends of application.
6. Length of Application. The length of application of the bituminous material should be balanced with the aggregate spreader. In general, the spreader should be maintained relatively close behind the distribution truck. Otherwise, the bituminous material may begin to cool sufficiently to prevent the aggregate from being embedded and held in place by the bituminous material when rolled.

7. Fog Seal. Where fog seal is specified, verify that the bituminous material is applied at the specified rate. Aggregate cover will generally not be required where fog seal is specified.

410.2.2.2 Application of Aggregate Cover

During the application of aggregate cover material, the Inspector should ensure conformance with respect to the type, gradation, and application rate of the material within the limits designated on the Contract plans. Consider the following guidelines:

1. Material and Quantity. Check that the type and gradation of the aggregate material conforms to specified requirements. Record the quantity of aggregate delivered and spread (i.e., volume or weight from the delivery ticket).
2. Dust Considerations. As specified or directed, verify that the cover material is moistened with water prior to placement to prevent dust emission. This also reduces the dust coating on the aggregate, which enhances bonding with the bituminous material.
3. Timing of Operation. The aggregate spreader should be following closely behind the application of the bituminous material. Do not allow the aggregate to be placed on bituminous material that has been allowed to chill, set, or dry.
4. Width of Application. Check to ensure that the aggregate cover is placed within the limits of the bituminous material previously applied to the surface.
5. Application Rate/Yield. Ensure adequate coverage and verify the application rate and yield for conformance. Deficient areas must be adequately covered with additional aggregate, and excess piles must be trimmed prior to rolling.
6. Haul Truck Considerations. Verify that the equipment tires do not roll over and damage the freshly applied and uncovered bituminous material; and that the equipment tires do not pick up the aggregate material. Enforce the Contract provisions with respect to needed repairs. Haul trucks should stagger their wheel paths to help embed the aggregate into the bituminous material.

410.2.2.3 Rolling Operation

After the aggregate has been spread, the rolling operation should begin immediately behind the spreader to embed the aggregate into the bituminous material. Consider the following guidelines:

1. Roller Tires. The correct tire pressure should be used in the pneumatic tire rollers. Pay particular attention to the operation to ensure that the aggregate is not picked up by the tires.
2. Rolling Operation. To properly embed the aggregate, pneumatic-tire rollers should perform three complete passes over the aggregate prior to the bituminous material

taking its initial set. Verify that the rolling operation is keeping up with the aggregate spreader; otherwise, it will be difficult to embed the aggregate into the bituminous material. Verify that areas of exposed bituminous or loose aggregate are not left at the end of the day. In addition, rapid start and stop movements should be avoided to minimize damage to the treated surface.

3. Coverage. Check the surface behind the rolling operation to ensure that adequate coverage of aggregate remains over the bituminous material. Require correction of areas identified with deficient or excess aggregate material.
4. Embedment. Check the acceptability of embedment of the aggregate in the bituminous material. Embedment of approximately 75 percent of aggregate into the bituminous material is recommended. In addition, check for proper bonding of the two materials. If weak bonding is evident after the bituminous material takes its initial set, notify the Contractor of the deficient area.
5. Bleeding. Blotting sand should be used in areas where bleeding of excess bituminous material occurs.

410.2.2.4 Brooming Operation

After the rolling operation has embedded the aggregate into the bituminous material and set sufficiently to hold bond, the brooming operation should begin. Brooming is performed to remove loose aggregate and chips that did not bond with the bituminous material that could pose a safety hazard when the road is opened to traffic. The operation is generally performed at the beginning of the next work day. Ensure that the operation does not remove embedded aggregate. In such cases, lighter brooming or a delay in the operation may be needed.

410.2.3 After Construction

After the brooming operation, verify the acceptability of the final surface with respect to proper coverage, embedment, and bonding of the aggregate with the bituminous material. Enforce the Contract provisions for any needed surface corrections. Verify the correct installation of traffic control devices, such as temporary paving markings and drums, prior to opening the section to traffic.

END OF SECTION

SECTION 411 – ASPHALT PRIME COAT

411.1 GENERAL

Where prime coat is specified, the Contractor will be responsible for preparing and treating the surface with a bituminous material within the limits designated on the Contract plans. Prime coat is typically applied to a base or foundation course to provide a dust-free surface that promotes adhesion between the underlying surface and the overlying asphalt mix. Prime coat may be either cut-back or emulsified asphalt. The PE and Inspectors should review the contract to ensure that the proper material is being used.

411.2 INSPECTION GUIDELINES

411.2.1 Before Construction

Before prime coat is applied, consider the following guidelines:

1. Contract Plans and Specifications. Pay particular attention to the type and grade of bituminous material specified and its application rate and temperature requirements.
2. Distribution Equipment. Verify that the distribution unit meets specified requirements with respect to material heating, circulation, and application control. Before the operation, verify that the application rate and the spray width have been properly set and that the distributor is capable of positively cutting off the flow of material.
3. Material Considerations. Retain and check the Certificates of Compliance and delivery tickets to ensure that the type and grade of bituminous material conform to specified requirements.
4. Surface Preparation. Verify that the surface to be treated has been properly prepared. The base must not be too dry, because this will cause the prime coat material to ball up.

411.2.2 During Construction

Consider the following guidelines during the application of prime coats:

1. Application Rate. The application must be uniform and continuous at the specified rate. Verify that spray bar nozzles deliver without streaking. Skipped or deficient areas must be corrected. Excess material, such as overlaps and puddling, must also be corrected by using squeegees or blotter material. In general, no more material than that needed for the day's operation should be applied. Overspray and smearing of curbs, gutters, and barriers is unacceptable and should be corrected. The Inspector should consult the Project Engineer and advise the Contractor if penetration appears to be an issue.
2. Blotter Material. Where traffic must be maintained on the treated lane and the material does not adequately penetrate the surface, blotter material must be spread to absorb the excess bituminous material.

3. Traffic. Check for proper handling of traffic to prevent pickup, tracking, and contamination of the bituminous material. Traffic should generally be kept off of the material as long as possible. Where traffic must be maintained on the facility, not more than one-half the width of the section should be treated in the same pass.

END OF SECTION

SECTION 412 – ASPHALT TACK COAT

412.1 GENERAL

Where tack coat is specified, the Contractor will be responsible for preparing and treating the surface with a bituminous material. Tack coat is applied between asphalt pavements layers to promote bonding between the layers. The rate of application should be carefully monitored. Too much tack coat promotes slippage between the two layers, rather than adhesion, and the excess material may bleed to the surface. If tack coat is applied too far ahead of the paving operation, the material may collect a film of dust causing poor adhesion. The same is true for areas with excessive use by construction equipment.

412.2 INSPECTION GUIDELINES

412.2.1 Before Construction

Before tack coat is applied, consider the following:

1. Plans and Specifications. Pay attention to the type and grade of bituminous material specified and its application rate, temperature requirements and weather limitations.
2. Distribution Equipment. Verify that the distribution unit meets specified requirements with respect to material heating, circulation, and application control. Before the operation, verify that the application rate and the spray width have been properly set and that the distributor is capable of positively cutting off the flow of material.
3. Material Considerations. Retain and check the Certificates of Compliance and delivery tickets to ensure that the type and grade of bituminous material conform to specified requirements.
4. Surface Preparation. Before tack coat is applied, ensure that the existing surface has been properly cleaned, repaired, patched, and swept. Vertical edges, such as adjoining pavements, curbs, and manholes must also be clean. Pressurized air may be necessary to adequately remove contaminants or the tack will not adhere to the surface properly.

412.2.2 During Construction

Consider the following guidelines during the application of tack coat:

1. Application Rate. The application must be uniform and continuous at the specified rate. Verify that spray bar nozzles deliver without streaking. Skipped or deficient areas must be corrected by the application of additional material. Excess material also must be corrected. In general, do not apply more tack than needed for the day's operation. Overspray and smearing of curbs, gutters, and barriers is unacceptable and should be corrected.

2. Blotter Material. Where traffic must be maintained on the treated lane, blotter material must be spread to absorb the excess bituminous material to prevent being picked up on vehicles.
3. Traffic. Check for proper handling of traffic to prevent pickup, tracking, and contamination of the bituminous material. Traffic should generally be kept off of the material as long as practical. Where traffic must be maintained on the facility, not more than one-half the width of the section should be treated in the same pass. Where access to tacked areas by construction vehicles is unavoidable, ensure vehicle tires are clean to prevent unnecessary contamination.

END OF SECTION

SECTION 413 – ASPHALT PAVEMENT MILLING

413.1 GENERAL

The removal of the upper portions of an existing asphalt mat by milling is often performed to repair a damaged pavement surface, improve the ride-ability of a roadway, or add to the width or overall thickness of the pavement section. This work is typically performed on an in-service roadway, and requires the performance of companion activities including temporary traffic control, pavement markings, monuments and markers, and new asphalt construction.

413.2 INSPECTION GUIDELINES

413.2.1 Before Construction

Review the Contract for the location, width, depth, and sequence of required asphalt pavement removal by milling. Consider the following:

1. Traffic Management. Traffic Control Plans (TCPs) should be prepared to control the interface between the Contractor's milling operations and the maintenance of viable traffic lanes through the construction zone. Pay particular attention to access locations onto the corridor from side streets and driveways.
2. Safety Considerations. Milling operations can create flying debris during the milling in the immediate area around the equipment, and milled asphalt debris can be kicked up by tires once the milled surface is opened to traffic. Uneven surfaces can also be created that will be navigated by drivers.
3. Logistics. The movements of the milling equipment, hauling trucks entering and leaving the immediate work zone, and construction personnel, pedestrians, and the traveling public must all be planned for in advance, taking appropriate precautions necessary to ensure the efficient and safe execution of the work.
4. Equipment. The contractor will need to provide a self propelled milling machine with sufficient power, traction and stability to accurately and maintain a depth of cut. The milling machine shall also be capable of maintaining profile and cross slope by referencing the existing pavement or independent grade control, limit dust or milled material from escaping during the milling operation, have a loading system to completely recover the milled material and be capable of a cutting width of at least one third of the lane width.

413.2.2 During Construction

Consider the following guidelines during the construction of culverts and sewers:

1. TCPs. Ensure TCPs are set up properly prior to the start of construction. Milling operations typically stretch out over a relatively long distance of roadway, and need to "move" with the operations. Coordinate closely with the Traffic/Safety Supervisor to

verify that all aspects of the TCP are properly and timely established and maintained until no longer required.

2. Communications. Milling operations, combined with traffic noise, can make verbal communications difficult. Establish eye contact with equipment operators prior to entering the work zone, and limit the time within the work zone to only what is specifically necessary.
3. Limits of Milling. The interim limits of milling should correspond to the work zones established in the TCPs. The ultimate limits of milling should be monitored closely, noting that minor adjustments may be required to achieve the desired outcome of the milling operation. The depth of milling should be closely monitored to ensure sufficient materials are removed to support the follow-on paving activities.
4. Removal of Millings. Millings should be carefully loaded into trucks for hauling away and disposal. The Contractor should inspect trucks leaving the work zone to ensure that no loose materials are taken into the traffic areas where they could become safety hazards.
5. Clean-up. All milled areas that are going to be placed back into service should be thoroughly cleaned and inspected to ensure that all loose material is removed, which could otherwise become a hazard to traffic. All uneven surfaces should be inspected and adjusted as necessary to ensure they can be effectively traversed by vehicles, without unduly redirecting the vehicles' movement.
6. Temporary Striping. Surfaces should be cleaned and properly prepared before the application of temporary pavement markings are applied, as may be required by the TCP. Temporary markings should be in place prior to opening the area to traffic, and monitored during the initial period of use to verify the material will remain in place during its intended period of use.

413.2.3 After Construction

Milled surfaces should be monitored until the area is resurfaced. Notify the Contractor of any additional clean up or maintenance of the temporary traffic control installations that may be required. Milling operations often uncover defects in the underlying pavement layers that will require repair prior to or during the placement of the final pavement. The locations, limits, and extent of such repairs should be determined and communicated to DPW as soon as possible, so they can be addressed.

END OF SECTION

SECTION 414 – ASPHALT PAVEMENT CRACK AND JOINT SEALING

414.1 GENERAL

Joint and crack sealing is a routine method of pavement rehabilitation. Joints and cracks in the pavement surface that are not properly sealed will allow water into the underlying layers of the pavement structure, causing premature deterioration. Where joint and crack sealing is specified, the Contractor will be responsible for cleaning and preparing joints and cracks, and furnishing and placing sealant material.

414.2 INSPECTION GUIDELINES

414.2.1 Before Construction

Consider the following guidelines before the joint and crack sealing operation begins:

1. Contract Plans and Specifications. Pay particular attention to the material requirements for the hot poured joint and crack sealant material.
2. Material. The Contractor should supply approved sealant material. Under no circumstances should different materials be substituted during the operation without specific approval.
3. Equipment. Verify that the Contractor has adequate equipment to properly heat, route, clean and pour the sealant material in a continuous operation. The PE and Inspectors shall review the contract to ensure that the proper equipment is being provided by the contractor.
4. Material Preparation. Check to ensure that the Contractor prepares the sealant material according to the manufacturer's recommendations.

414.2.2 During Construction

During the joint and crack sealing operation, consider the following guidelines:

1. Crack Width. The Contractor should be sealing cracks between 0.125 and 1 inch in width or as specified in the contract.
2. Joint and Crack Preparation. Prior to sealing, verify that joints and cracks are properly cleaned of loose and foreign material to the specified depth. This operation is generally performed with hot compressed air. Immediately prior to sealing, the vertical faces of the joint or crack should be clean, dry, and warm. This promotes a positive bond of the sealant material to the vertical faces.
3. Sealant Temperature. Periodically verify the sealant temperature for conformance. Overheating degrades the material and should not be permitted.
4. Sealing Operation. Verify that the sealant is poured in the crack or joint reservoir to a height flush with the pavement surface. Excess sealant material must not remain on the

surface but should be squeegeed to the specified width on either side of the crack or joint.

414.2.3 After Construction

Before opening to traffic, the sealant material should be allowed to cure sufficiently to prevent being picked up or pulled out of the crack or joint by traffic. If this becomes a problem, blotter material should be applied to the sealant material. Enforce the Contract provisions with respect to removal and replacement of damaged seals.

END OF SECTION

SECTION 501 – RIGID PAVEMENT

501.1 PRELIMINARY CONSIDERATIONS

The construction of Portland Cement Concrete Pavement (PCCP) is a highly mechanized operation that requires the inspection of a vast quantity of material and a working knowledge of numerous types of equipment. Inspectors who are assigned to the work should be thoroughly familiar with the Contract plans and specifications; SCRs; construction methods and details; and the sequence of operations.

501.1.1 Contract Plans and Specifications

Pay particular attention to the class of concrete required; component material specifications; mix design requirements; consistency requirements for the proposed method of operation; and the requirements for reinforcement, dowel bars, tie bars, joint sealant, and curing materials. Become familiar with the proposed method and sequence of operation with respect to mix production; mix hauling; joint construction; reinforcement and concrete placement such as fixed form and slip form; finishing; curing; joint sawing; profiling; surface tolerance; and slab and surface correction requirements.

501.1.2 PCCP Mix Design

Before mix production and paving begins, the PE and the Inspector should understand the mixing and batching procedures, and be able to verify that the PCCP mix design conforms to the requirements of the contract.

501.1.3 Tining Plan

Verify that the Contractor’s Tining Plan has been approved.

501.1.4 Pre-paving Conference/Communications

Discuss the project requirements and sequence of operations with the Contractor at the Pre-paving Conference. Establish and maintain communications with the Contractor’s personnel such as the Superintendent, Foremen, and Material Testing Supervisor. During the paving operation, communication between the plant and the paving site is invaluable to making the needed adjustments to the mix and ensuring the required quality.

501.1.5 Equipment Considerations

Verify the acceptability of the number and type of equipment supplied by the Contractor. Consider the following:

1. Hauling/Placing Equipment. Check the acceptability of haul trucks, spreading, strike-off, consolidation, and finishing equipment for the particular method of paving used such as fixed-form or slip-form paving.
2. Load Transfer Devices/Bars. Check the location and operation of equipment used to place load transfer devices and bars.

3. Vibrators. Check vibrators for conformance with respect to specified type, diameter, and spacing. The vibrators' frequency should be tested and documented.
4. Test Bridge. Verify the acceptability of the test bridge provided for DPW's personnel.
5. Joint Sawing Equipment. Check that extra saws, blades, and lighting equipment have been provided to continue joint sawing sufficiently to control cracking. Verify that spare saws are available in the event of a break down.
6. Curing Equipment. Verify that standby equipment has been provided for the curing operation in the event of a mechanical breakdown.
7. Tining/Texturing Equipment. Check the acceptability of the tining machine and the equipment needed for surface texturing.
8. Concrete Protection. Check that the Contractor has the tools and materials available that are necessary to protect the concrete from wet weather damage.
9. Profilograph. Check that the profilograph has been calibrated as specified.

501.1.6 Utilities

Verify that the manholes, inlets, and utilities that will be incorporated into the pavement are properly located and marked.

501.1.7 Sub-grade/Base Preparation

Check that the sub-grade/base has been constructed to the required grade and cross-section, and compacted to the required density. Ensure that high or low spots and soft or muddy spots have been properly corrected. The final grade must be in a smooth and even condition. Where the prepared grade is untreated, verify that the material is maintained in a moist condition just ahead of the paver without forming mud or pools of water. Intermittent sprinkling may be required.

501.1.7.1 Fixed-form Considerations

For fixed-form paving operations, consider the following guidelines:

1. Rail Forms. Verify rail forms for conformance with respect to dimensions and condition. Rails should be clean and in good repair. Reject damaged forms.
2. Limits of Trimming. Check the limits of trimming beyond the width of the forms. This area will be used as a track path for the finishing, curing, and tining equipment.
3. Foundation. Verify that the rail foundation is uniform and properly compacted. The foundation must support the operation so that the top face of the rails remains flush with the final pavement surface without moving.
4. Rail Movement. Verify that the rails are secured with stakes and locked pins. Check for movement in any direction. Visible springing or settlement is unacceptable.

5. Oiling. Ensure that the forms are thoroughly cleaned and coated with oil or other approved release agents.
6. Resetting/Removal. Require resetting of unacceptable forms. The forms should not be removed until the concrete has set sufficiently to hold the edge of the slab.

501.1.7.2 Slip-form Considerations

For slip-form paving operations, the Contractor should adjust the automatic alignment and elevation controls to spread, consolidate, screed, and finish the concrete in a single pass.

501.2 REINFORCEMENT AND JOINT CONSIDERATIONS

There are many factors that the Inspector should consider with respect to the provisions for reinforcement and joint construction. Consider the guidelines in the following sections.

501.2.1 Reinforcing Steel

Where reinforcing steel is specified, check the reinforcement for conformance with respect to material type and condition. Verify that the Contractor properly stores the reinforcing steel without damage or degradation. Pay particular attention to the storage and handling of epoxy-coated bars. Require repair or replacement of the epoxy-coated material, as needed. Verify the acceptability of the placement operation. Check the method of securing bars and the depth and location of placement. Observe the consolidation operation for evidence of unacceptable bar movement. Vibrators must not come into contact with reinforcement.

501.2.2 Construction Joints

Use the following guidelines to inspect longitudinal and transverse construction joints:

1. Longitudinal Construction Joints. Where longitudinal construction joints are built, check the following for conformance:
    a. Location. Check that longitudinal construction joints are properly located, especially with respect to lane lines.
    b. Keyways. Verify the correct installation of keyways. It is preferable to construct female keyways.
    c. Tie Bars. Where tie bars are specified, verify the diameter and length of the epoxy-coated bars for conformance. Observe the insertion operation for proper location and spacing of bars. Ensure that the Contractor demonstrates, by testing, the required pull-out resistance where tie bars are stabbed or drilled and epoxied into place.
2. Transverse Construction Joints. Verify that transverse construction joints are properly located and constructed. Check to ensure the location of joints for conformance with minimum spacing requirements.

501.2.3 Weakened Plane Joints (sawed joints)

Use the following guidelines to inspect longitudinal and transverse weakened plane joints:

1. Longitudinal Weakened Plane Joints. Where longitudinal weakened plane joints are constructed, check the following for conformance:
   a. Location. Check that longitudinal weakened plane joints are properly located, especially with respect to lane lines.
   b. Tie Bars. Where tie bars are specified, verify the diameter and length of the epoxy-coated bars. Check that the bars are inserted by an approved method ahead of the vibration operation. Observe the insertion operation for proper location, depth, and spacing of bars.
   c. Sawing. Check the dimensions of saw cuts. Ensure that the sawing is completed at the proper time to prevent random cracking and raveling.
2. Transverse Weakened Plane Joints. Where transverse weakened plane joints are constructed, check the following for conformance:
   a. Location. Check that transverse weakened plane joints are located as designated on the Contract plans.
   b. Load Transfer Devices. Verify that dowels conform to the specified type, diameter, and length of material. Check that the shipping brace is cut and that the assembly is firmly secured to the sub-base, as required. Check the welding to ensure that only one end is welded, and check the tolerance of placement for acceptability with respect to location, depth, and spacing. Ensure that the Contractor marks the center of the dowel assembly on both sides of the slab for reference by the saw crew. Verify the dowel lubrication for conformance. Ensure that the joints in widening and shoulders align with those in the adjacent slab. The Inspector should perform QA to ensure the location of the dowels.
   c. Sawing. Check the dimensions of the saw cuts for conformance. Ensure that the sawing is completed at the proper time to prevent random cracking and raveling. If uncontrolled cracking is observed, verify that the Contractor moves the sawing operation ahead and then returns to saw the joints that were skipped.

501.2.4 Expansion Joints

Check that the transverse expansion joints are properly constructed at the locations specified, and verify that the pre-formed joint filler material is placed at all structures, manholes, inlets, and other projections into the pavement.

501.3 PLACEMENT AND CONSOLIDATION OPERATION

501.3.1 Moistening of Grade

Just ahead of the placement operation, verify that the grade is kept moist without creating standing water or soft spots. Additional sprinkling of the grade may be required throughout the day, especially during hot, dry, and windy conditions.

501.3.2 Hauling and Delivery Considerations

For each load, retain the delivery ticket and check that the required information is provided. Check the mix for acceptability. The mix should be consistent from load to load with respect to uniformity and consistency (i.e., slump). Pay particular attention to signs of segregation, and verify that the mix temperature is within specified limits. Verify that molds for strength tests are cast as required and that air, slump and yield tests are performed as specified. Verify that the concrete is completely discharged within the required time limits, especially from non-agitating trucks. When water is added to truck mixers, record the additional quantity, verify the water-cement ratio, and record the number of mixer revolutions before discharge. Pay particular attention to any unacceptable movement of joint and reinforcement materials when the concrete is deposited.

501.3.3 Spreading and Strike-off Considerations

Concrete should be deposited uniformly over the base ahead of the strike-off operation and placed so that minimal re-handling is necessary. Where hand methods are needed, verify that shovels, not rakes, are used. Workers with muddy boots should not be permitted to walk through the freshly placed concrete. Ensure that any footprint areas are properly vibrated.

501.3.4 Vibration Considerations

The concrete should be vibrated across the full width of the slab. Observe consolidation and make any needed frequency adjustments. When the equipment train halts, verify that vibrators are shut off. If any vibrator malfunctions, advise the Contractor to stop the operation until it can be effectively repaired or replaced. Verify that the hand-held vibrators are used to consolidate the concrete adjacent to the forms and joint assemblies.

501.4 SURFACE FINISHING OPERATION

501.4.1 Floating Considerations

After the concrete has been placed, struck off, and consolidated, the floating operation will begin. Hand floating is only permitted to finish areas (e.g., narrow widths and irregular shapes) inaccessible to finishing equipment and for short periods where finishing equipment breaks down. The Contractor should not use DPW's test bridge for the finishing operation. Verify the grade and cross-section of the floated surface for conformance. Check for surface irregularities and enforce the Contract provisions with respect to stopping work and correcting surface defects. Check the edges for rock pockets and edge slump. A consistent concrete slump will promote a consistent slab edge.

501.4.2 Adding Water to the Surface

The Contractor is not permitted to add water to the surface for the purpose of finishing the concrete. The intent is to ensure that the concrete placed will be high-quality and durable. However, emergency situations may arise where the surface becomes dry and difficult to finish, as evidenced by tearing. In these unique cases, the PE may approve the application of water as a fog spray using atomizing nozzles. The quantity of atomized water should be just enough to restore the sheen of the surface. Examples of such emergency situations include:

- Temporary breakdown of finishing equipment
- Temporary discontinuity in the production or delivery of concrete
- Rapid evaporation of surface moisture due to hot, dry, and windy conditions

The above guidelines are not intended to promote the widespread use of additional water on the surface during the finishing operation. However, where approved by the PE, document the rationale for employing this technique.

501.4.3 Surface Texturing

Verify that the surface is textured as specified. The Contractor should not use DPW's test bridge for this operation. Consider the following guidelines:

1. Plastic Turf/Burlap. Where plastic turf and burlap are used, verify that the dragging operation completely covers the surface and produces a uniform gritty texture. The drag material should be maintained clean and free of dry mortar. Require replacement of the material as needed to ensure production of an acceptable texture. Burlap should be maintained in a moist condition during the operation; however, the quantity of added water should not be enough to introduce additional water to the surface of the concrete.
2. Tining. At any time the tining is not transverse to the longitudinal joint, uniform in depth and within the specification requirements, or neat in appearance, the concrete paving operation should be stopped immediately, and should not resume until the problem has been resolved.

Pay particular attention to the location and appearance of the tining being done by hand on small pours. Tining should be accomplished by mechanically operated equipment with horizontal and vertical controls to ensure the tining is transverse to the centerline and uniform in depth.

501.4.5 Rumble Strips

Verify that rumble strips are placed where specified (e.g., deceleration lanes, ramps, and shoulders). Check the size, shape, depth, and orientation of the strips for conformance.

501.5 CONCRETE CURING OPERATION

Immediately after finishing, check that the surface and edges are completely and uniformly sprayed with an approved impervious membrane material. Concrete should not be exposed for more than 30 minutes before being covered with curing compound. Verify the rate of application for conformance. Edges and irregular areas will usually be sprayed by hand. Halt paving if operations are not balanced sufficiently to ensure timely and adequate treatment, and ensure that all membrane damaged within 72 hours of application is immediately repaired. The Contactor should be adequately prepared to protect the pavement from rain and inclement weather damage. Use strength tests to verify compressive strength before allowing equipment to operate on the new slab.

501.6 SLAB REPAIR WORK

Know the conditions requiring repair work and the limits of removal and replacement. Coring should be used as needed to verify questionable areas. Enforce the Contract provisions with respect to repairing deficient areas, and verify that spalled joints and cracks are corrected as specified.

501.7 SURFACE SMOOTHNESS TESTING

After the concrete has cured sufficiently to support the smoothness testing operation, test the pavement (i.e., mainline, shoulders, and ramps) according to the method specified. Consider the following guidelines:

1. Profilograph. The profilograph must be operated by the Contractor’s staff in the presence of DPW’s Inspector. Know the following requirements:

    - Timing of the operation
    - Daily profile index requirements
    - Limits of profiling with respect to joints and overlaps
    - Procedures for obtaining profile traces
    - Information required on profilograms

    For each run, immediately obtain and forward the profilogram to the PE for review and evaluation. The PE will prepare and forward a report to the Contractor and Inspector documenting the daily average profile index, section profile index, and irregular and defective areas.

2. Straightedge. The straightedge method performed by the Contractor will be employed in areas not requiring testing by the profilograph method. Observe the operation, watch for surface irregularities, and ensure that the surface is within allowable tolerances.

3. Corrective Work. Check that corrective work is performed where needed to bring the surface to within allowable tolerances. High spots should be corrected by grinding the surface. Corrective work must be completed prior to testing the thickness of the pavement. Once the corrective work is completed, recheck the acceptability of the surface with respect to tolerance, texture, skid resistance, and appearance. Joint sealant damaged by grinding should be removed and replaced.

501.8 JOINT SAWING AND SEALING

501.8.1 Sawing Operation

Verify that the location of cuts that are sawed over load transfer devices are within specified tolerances. On the same day joints are to be sealed, verify that the saw cuts are properly cleaned and that all residue is removed from the joint reservoir and surface by methods such as flushing with water, sandblasting, and compressed air.

The timing for the concrete sawing operation is critical. Sawing should occur once the concrete has obtained sufficient set to prevent spalling of the surface during the cutting operation. It is crucial cutting be completed before concrete shrinkage has commenced. The Contractor should closely monitor the concrete to ensure the cutting operation is completed before shrinkage cracks appear.

501.8.2 Sealing Operation

The sealing operation may begin after completion of all corrective work, joint sawing, and curing. Immediately prior to placement of the backer rod and sealant material, verify that the joint reservoir is further cleaned with compressed air. Pay particular attention to any oil or moisture that may be blown into the cavity. This will prevent the sealant from bonding with the walls of the reservoir. Require additional cleaning, as needed. The sealing operation should not be conducted during wet weather conditions or when the ambient temperature falls below the manufacturer’s recommendations. Verify that the sealant material is properly stored, prepared, and heated prior to application. Check the acceptability of the installed backer rod and sealant material for depth, height in relation to slab surface, etc. Require the Contractor to clean any sealant material that may have smeared on the pavement surface.

501.9 PAVEMENT THICKNESS DETERMINATION

Ensure that the Contractor’s coring operation conforms to the requirements of the Contract specifications and the CQP. Pay particular attention to the frequency of the coring required for the mainline, shoulders, intersections, and miscellaneous areas. Verify that the Contractor documents daily thickness measurements. Acceptance tests must be witnessed by the Inspector and will be based on the length of the core samples measured at the time the cores are taken by the Contractor. Determine the average length of the cores and require additional coring as specified for deficient areas. Enforce the Contract provisions with respect to any needed price adjustments, and the removal and replacement of unacceptable slabs. Verify that the Contractor properly fills all core holes left in the pavement.

501.10 TRAFFIC CONSIDERATIONS

Where appropriate, ensure that the Contractor provides adequate maintenance of traffic through the construction zone, such as crossovers for construction equipment and public vehicles. Construction traffic should not be permitted on the pavement until the sawing and sealing operation has been completed. The pavement should not be opened to traffic until the test specimens obtained during the placement of the concrete indicate that the pavement has reached its minimum specified strength.

END OF SECTION

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SECTION 551 – DRIVEN PILES

551.1 GENERAL

Piles are designated as steel H-piles, concrete-filled steel shell piles, concrete-filled pipe piles, precast concrete piles, prestressed concrete piles or sheet piles. These piles are driven vertically or near vertically into natural ground to help support the structure and minimize settlement. Without a solid foundation, the attention given to constructing a quality structure will still result in a structure that may not be able to function as intended. As such, the Inspector must thoroughly and competently inspect the foundation piling provided for structures.

Many types of piles are available for foundation designs, and each design will differ based on the specific conditions at the site. The Contract will designate criteria such as pile type; number; length; horizontal arrangement; orientation such as plumb and batter; and driving specifications such as design load, driving energy, depth, and number of blows. Each pile that is driven to specification will provide a bearing capacity that will support a fraction of the structure's total load (i.e., design load). The pile's bearing capacity results from a combination of resistant forces, including the surface friction between the pile and natural ground, and the bearing pressure of the pile tip on the sub-strata material, such as bedrock.

Although it is equally important to check items such as pile type, location, and orientation, it is most important to continually inspect the driving operation. If driving is stopped too soon, the pile will not have developed the required bearing capacity to resist the design load, and the structure may eventually settle due to a lack of support. If overdriven, the pile may incur structural damage, increasing the chance that the foundation will settle or otherwise fail at the location of the damaged pile. The procedures, methods, and criteria by which this determination is made will be specified in the Contract.

551.2 INSPECTION GUIDELINES

551.2.1 Before Construction

The sub-sections that follow describe the information that should be documented with respect to pile driving.

551.2.1.1 Contract Plans and Specifications

Review the Contract with respect to equipment requirements and pile type, length, location, orientation, anticipated driving depth, structural refusal, bearing capacity, and cut-off elevation. Review the splicing, capping, and painting requirements.

551.2.1.2 Pile Location and Utility Considerations

Verify that utility locations have been staked and that any known conflicts have been resolved before the operation begins. Check to verify that all pile locations have been properly staked in accordance with the Contract.

551.2.1.3 Excavation

Where excavation is required, check the limits of excavation, such as plan dimensions and depth, for compliance. Unless otherwise authorized, excavation must be completed and accepted prior to driving foundation piles.

551.2.1.4 Equipment Considerations

Various types and energy ratings of pile drivers are available. Equipment selection depends on the type and size of piles to be driven. More than one type of driver may be required for the project. The PE should seek assistance from the project Design Engineer to determine if the equipment proposed by the contractor is adequate for the pile driving operation.

This task generally involves analysis and comparison of data supplied by the Contractor. If questionable, further inspection and testing, such as using a pile-driving analyzer, may be required. As soon as practical, provide the Contractor with written notification of equipment acceptance or rejection. Verify that the Contractor furnishes the pre-approved equipment and verify that substitutions are not made during the work. Review the contract requirements for the type of pile driving equipment required for the type of pile being installed.

551.2.1.5 Material Considerations

The PE and Inspector should carefully review the contract requirements for the size and type of pile materials that were specified. Prior to installation of any piles the PE and Inspector should verify that the materials provided by the contractor meet the requirements of the contract.

551.2.1.6 Test Piles and Pre-drilling

As designated or directed, test piles will be used to determine the need for pre-drilling. In general, if a test pile is driven to specification without reaching the designated minimum penetration depth and bearing elevation, pre-drilling will be required. Check and record the location, depth, and diameter of all pre-drilled holes. The hole diameter depends on the type and size of the pile required. This will verify that the pile will be in an accurate and stable position for driving. If the maximum diameter is exceeded, verify that voids are backfilled as specified.

551.2.1.7 Welder Certification

As needed for splice work, verify that the welders are prequalified for the work. Check each welder's Certificate of Qualification. Verify that the document complies with the minimum period of satisfactory performance for the type of welding to be performed. Retain a copy of all Certificates of Qualification in the project files.

551.2.2 During Construction

During the driving of foundation piles, consider the inspection guidelines in the following sections.

551.2.2.1 Pile Location and Direction

Verify that each pile is driven within the tolerances of its designated location. Also, check the pile alignment (i.e., vertical, batter) for deviation from allowable tolerances. Verify that pile flanges are oriented as designated in the layout of the Contract. Watch the pile as it is driven for sudden changes in direction. This is a good indication that the pile has failed below the ground surface. In such cases, contact the Design Engineer for assistance.

551.2.2.2 Hammer Cushion/Striker Plate

As needed during driving, inspect the integrity of the cushions and striker plates for compliance. Pay particular attention to the thickness of the material and require replacement based on the minimum specified thickness.

551.2.2.3 Water Jetting

Where authorized, water jets are used to facilitate pile penetration. Verify that water jets are removed, as specified, for the final depth of penetration. Once removed, determine the average penetration using test blows.

551.2.2.4 Pile Penetration and Bearing Elevation

Piles must be driven to virtual refusal into natural ground so that the elevation of the tip of the pile is at or below the designated bearing elevation. At bridge structures, the bearing elevation of the pile must be below the 500-year scour depth. Check and document the pile elevation, the number of blows at minimum final penetration, and the final depth of the pile. Consider the following guidelines:

1. Adjacent Piles. Where a new pile is being driven, closely monitor the elevation of adjacent piles. In some cases, adjacent piles will tend to "push up." Verify that the Contractor re-drives affected piles to the proper bearing elevation.

2. Sudden Changes in Penetration. Monitor the pile for sudden changes in penetration between blows. This usually indicates that the pile has failed or an unusually soft sub-surface stratum has been encountered. Sudden disappearance of the pile

confirms the presence of a cavern or large void. In such cases, contact the Design Engineer for assistance.

3. Unusually High Bedrock. Where the designated penetration depth and bearing elevation cannot be obtained without damaging the pile (e.g., encounter with unusually high bedrock), contact the Design Engineer for assistance. Pre-drilling may be required.

4. Springing/Bouncing. Watch for pile springing and hammer bouncing. Springing may occur where spliced members are not properly aligned, the pile head is not squared properly, or the pile and hammer are misaligned. Bouncing may occur where the pile has reached the point of virtual refusal, a hammer of insufficient weight is used, or too much steam or air pressure is used in double-acting hammers.

5. Pile-Driving Analyzer. The Design Engineer will determine the number and location of piles to be monitored by a pile-driving analyzer. If the Contractor is directed to setup the analyzer and monitor the piles, check and document the number and location of piles that were monitored and the results of the analysis.

551.2.2.5 Cutting of Piles

Verify that the piles are cut by an approved method and to the correct cut-off elevation. Check that the cuts made at splices are normal to the longitudinal axis of the pile. Document the pile's location, initial length, and the length of pile that was cut. Pay particular attention to the disposition of cut lengths of piles. They may or may not be reused. If reused in field-splice work, document the pile location and the length of pile that was reused.

551.2.2.6 Pile Splicing

For those piles driven deeper than the minimum penetration depth, splicing may be necessary to raise the top of the pile to the correct cut-off elevation. Either commercial splices or field-welded splices may be used. Check for acceptability and document the location, type, and number of all splices. Where commercial splices are used, check that they are of an approved type and fastened in accordance with the manufacturer's recommendations. Thoroughly inspect welding for compliance with respect to welder certification, surface preparation, root opening, welding method, type of weld, number and order of passes, and removal of slag.

551.2.2.7 Filling and Capping of Hollow Piles

After steel pipe, shell piles, and the adjacent piles have been driven and accepted, inspect the inside cavity using the lighting system supplied by the Contractor. Pay particular attention to buckling or crushing. Verify that water and debris are removed from within the pile before the Contractor fills the interior with the designated class of concrete.

551.2.2.8 Pile Damage and Defects

During the driving operation, continually monitor the piles for damage and defects, and review the provisions of the Contract with respect to corrective work. Pay particular attention to head damage; internal damage; splice defects; and improper pile location, direction, and final bearing elevation. Contact the Design Engineer as needed for assistance. Defective piles may need to be removed and replaced, or they may be permitted to remain with the provision of another treatment such as new adjacent pile, a footing adjustment, or an additional extension. Note any unusual conditions encountered and re-inspect all corrective work.

551.2.3 After Construction

Once foundation piles have been driven to specification, verify that the pile tops are cut square. Verify that all loose material is removed from around the piles before the foundation concrete is poured.

END OF SECTION

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SECTION 552 – STRUCTURAL CONCRETE

552.1 GENERAL REQUIREMENTS

This section covers the furnishing, placing, finishing and curing of concrete for major concrete structures such as bridges, retaining walls, and box culverts. Acceptability of the completed structure depends on the quality incorporated in the following distinct operations:

- Formwork, falsework, and framing
- Reinforcing material and placement (see Section 554)
- Concrete mix materials, design, and production
- Concrete placement, finishing, and curing

The Contract governs each of these operations in detail. Most problems encountered can be traced to materials and workmanship that does not conform to specified requirements.

552.2 INSPECTION CONSIDERATIONS

Before the concrete pour, thoroughly inspect the formwork for trueness to line and grade, warping, smoothness of form faces, condition of form ties, proper bracing, tightness of joints, and cleanliness of forms (e.g., shavings and sawdust). Consider the following additional guidelines:

1. Falsework Drawings. Review the contract requirements for Temporary Works to verify that all the required submittals have been made and reviewed.
2. Form Supports. Forms must be adequately supported and sufficiently rigid to minimize excessive deflection and distortion.
3. Concrete Finish/Surface Texture. Check that the surface of the forms complies with specified requirements for concrete finish and surface texture.
4. Form Release Agent. Verify that the proper treatment, such as oil or a form release agent is applied to the forms prior to the placement of reinforcement.
5. Form Tightness. Form sections should be drawn tight to minimize mortar leaks at joints.
6. Metal Forms. Where metal forms are used, check the sheet thickness and form design for compliance to verify that the forms will remain true to shape during the pour. Verify that the form joints are properly aligned. The use of metal forms should produce a smooth, concrete surface finish.
7. Chamfer Strips. Check that the specified types of chamfer strips have been properly placed in the corners of forms.

8. Form Ties. Where metal form ties are used, verify compliance with respect to type and number. The number of ties used should be sufficient to minimize bulging. Do not permit the use of twisted wire loops as form ties.
9. Omitted Backforms. The omission of backforms requires approval by the Design Engineer.
10. Embedded Materials. Verify that all materials, such as conduits, drains, utility blockouts, and anchoring devices, which will be embedded in the concrete, are placed in the proper location and adequately secured.
11. Form Cleaning. Verify that the inside surfaces of the formwork are cleaned of all dirt, mortar, and foreign material.
12. Reuse of Forms. Where form panels such as plywood are to be reused, closely inspect the panels for acceptability before they are reused. Do not allow the reuse of unsuitable form materials.

552.3 CONCRETE PRODUCTION

552.3.1 Load Tickets/Mixer Truck Certification

The Standard Specifications require the Contractor to furnish a load ticket, or delivery ticket, with each load of concrete delivered to the project. The load tickets are used to verify compliance with the specifications and to verify that quality concrete is delivered to the appropriate location on the project. Upon receipt of the first load, verify that the class of concrete delivered conforms to the specified requirements, and check that the information provided on the load ticket is accurate and complete. At the end of each day, obtain the load tickets from the Contractor and verify that the concrete meets the specified requirements for the work in progress. Note that different classes of concrete may be specified for different structural elements. Perform verification checks as needed throughout the workday to verify compliance. For bridge deck concrete, pay particular attention to the maximum allowable substitution of fly ash for cement.

552.3.2 Deviation from Specifications

The Contract specifies many requirements for concrete production, which should be strictly and uniformly enforced to verify that quality materials and workmanship are incorporated into the structure. Any consideration to change the specifications must be based on sound engineering judgment to specifically address the problem encountered in the field and must have the DPW's Chief Engineer's approval.

552.4 CONCRETE PLACEMENT

Consider the guidelines in the following sections when inspecting the placement of structural concrete (see Section 552.7 for guidelines on placing concrete for bridge decks).

552.4.1 Before Placement

Inspection guidelines before the concrete is placed:

1. Mix Design. Know the requirements of the designated concrete class, and check that the Contractor has obtained an approved mix design. Verify that the type of fly ash to be used has been approved. Know the requirements for slump, air, and admixtures, including type and quantity.
2. Pouring Schedule/Sequence. The Design Engineer is responsible for reviewing pouring sequences.
3. Truck Mixer Certification. Check that the Contractor has provided a Concrete Truck Mixer Inspection Certification for each truck mixer used on the project.
4. Time and Weather Requirements. Know the specified time limitations on placing concrete. Know the limitations and requirements for placing concrete during all weather conditions. Verify that the Contractor is adequately prepared to protect fresh concrete from damage due to inclement weather.
5. Formwork. Check lines, grades, and clearances of formwork, reinforcing steel, and embedded fixtures for compliance. Verify that all dirt, chips, sawdust, water, and other foreign materials have been removed from within the formwork. Wood forms should be thoroughly moistened with water prior to the concrete pour.
6. Drainage and Weep Holes. Check drainage and weep holes for proper location and elevation.

552.4.2 During Placement

Inspection guidelines during the placement of concrete:

1. Load Tickets. Check the information presented on load tickets for compliance with the mix design.
2. Adding Water. Verify that the quantity of water added to the concrete mix at the site is properly recorded. Verify compliance with specified procedures for adding water (e.g., mixer drum revolutions and water/cement ratio).
3. Mixer Revolutions. Check that mixer revolutions are performed at mixing speed.
4. Chutes and Troughs. Where required, verify that chutes or troughs are used properly.
5. Segregation. Check that the Contractor's method of placing concrete minimizes segregation.
6. Construction Joints. Verify that construction joints are properly formed at the correct locations, and that they are cleaned and maintained free of debris and loose material.

7. Tell-tales. Check forms for obvious signs of weakness, such as panel bulges and settlement. Monitor tell-tales for settlement beyond acceptable limits, and require immediate corrective action if they are not.
8. Pour Sequence. Verify conformance with the designated concrete pour sequence.
9. Reinforcing Steel. Monitor the operation for reinforcing steel displaced by workers or concrete pours. Check that proper cover and clearance is maintained. Prior to placement of additional concrete, verify that extraneous mortar is cleaned from exposed reinforcing steel.
10. Reinforcement Dowels. Where required, check that reinforcement dowels are properly installed at the correct locations.
11. Time Limitations. Monitor the operation to verify that specified time limitations are not exceeded during concrete placement.
12. Consolidation. Check that vibrators provide adequate consolidation; thorough, but not excessive. Do not permit vibrators to be used to move concrete along the forms.
13. Water Placement. Know the requirements for placing concrete under water.

552.5 CONCRETE FINISHING

Project Inspectors should closely monitor the finishing operation to verify that all specified finishing requirements are being met. Various classes of concrete finish may be specified for any given structure, and the designated finish must be applied properly. Do not accept a structure until the finishing operation has been thoroughly inspected and found to be acceptable. A structure's appearance is only as good as the quality incorporated into the surface finish. Consider the following guidelines:

1. Form Removal. Check that forms are removed at the proper time. The concrete must be allowed to cure to a strength that will allow the structural member to support itself without damage when formwork and falsework are removed. Minimum strength criteria and number of days required before removal of forms will be specified in the Contract.
2. Temperature Considerations. Where a structural coating is designated, verify that the concrete surface temperature is within allowable limits before application.
3. Joints. Pay particular attention to construction and expansion joints during the finishing operation. Joint cavities must be maintained free of all mortar and loose concrete.
4. Bridge Decks. See Section 552.7 for guidance on finishing concrete bridge decks.
5. Surface Preparation. Verify that exposed surfaces are thoroughly cleaned by water and/or sand blasting at the proper time, and that all irregular projections are removed. Check that all cavities, honeycomb spots, and broken edges are properly cleaned,

saturated with water, and pointed and trued with the specified mortar mixture. Check that mortar patches are cured as specified.

6. Types of Surface Finishes. Verify that the designated class of finish is properly applied at the correct location. Although a Class 1 finish is not a comprehensive treatment, it is just as important as other surface treatments. Class 1 finishes are applied immediately after form removal. Before the application of a Class 6 finish or a structural coating, the concrete surface must be allowed to cure as specified. Where a structural coating is designated, check that the coating material and color have been approved, and verify the application rate and number of coats for compliance.

552.6 CONCRETE CURING

The requirements for the allowable methods of curing structural concrete are defined in the Standard Specifications. Closely monitor the curing operation for compliance to all specifications. The intent of the specification is to maintain the surface of the concrete in a moist condition for the minimum curing period, which includes the period during which the finishing operation is performed. Check that the Contractor is adequately prepared to protect the concrete and maintain the surface in a moist condition, especially during hot, windy weather. Consider the following guidelines:

1. Curing Method. Verify that the Contractor's proposed curing method has been approved for the project.
2. Curing Compound. Where the curing compound is applied, verify that the material has been approved for use on the project, and verify the application rate for conformance.
3. Bridge Decks. See Section 552.7 for guidance on curing concrete bridge decks.

552.7 CONCRETE BRIDGE DECKS

The following Sections specifically address the construction of concrete bridge decks and provide additional information that should be considered for structural concrete work.

552.7.1 Pre-pour Conference

A Pre-pour Conference following an approved agenda will be held prior to the concrete deck pour to discuss project requirements with the Contractor. It is important to maintain communications with Contractor personnel such as the Superintendent, Foremen, and Material Testing Supervisor, who have been established at the Pre-pour Conference. During the conference, methods of pouring and pouring sequence, frequency of sampling, curing methods, and contingency plans should be discussed.

552.7.2 Stay-in-Place Forms

Consider the following where stay-in-place steel forms are used in bridge deck construction:

1. Erection Drawings. Verify that the Contractor has submitted erection drawings, and verify that materials and installation are in compliance with these drawings.
2. Form Connections. Verify that form connections are made in compliance with specified requirements.
3. Welding Considerations. Monitor the operation to verify that welding arcs do not come into contact with steel girder flanges.

552.7.3 Finish and Placement Considerations

To provide a smooth, uniform deck finish, it is important to balance the placement and finishing operation with the delivery of a uniform concrete mix. The delivery rate should be governed by the quantity of concrete that the Contractor's force and equipment can properly place and finish. The rate of placing and finishing should never be adjusted to accommodate a faster delivery rate. A proper balance will minimize frequent stops in the finishing operation, which usually creates bumps in the deck. In addition, pay particular attention to slump and air content, because these factors greatly influence mix workability and consistency.

552.7.4 Concrete Placement Considerations

552.7.4.1 Before Placement

Consider the following guidelines before the concrete bridge deck pour begins:

1. Pre-pour Conference. Verify that the Pre-pour Conference has been held. Review the conference minutes, and check that the minutes have been updated, as needed, before each pour.
2. Temporary Traffic Control. Check that all provisions for protecting vehicle and pedestrian traffic have been adequately addressed.
3. Safety. Check that all safety items, including handrails and toe rails, are installed properly to protect workers and the traveling public.
4. Reinforcing Steel. Check the reinforcing steel for compliance immediately prior to the concrete pour.
5. Deck Machine Support. Verify that the deck machine is properly supported beyond the edge of the bridge deck.
6. Finishing Equipment. Verify that the screeding and finishing equipment has been checked for trueness.
7. Dry Run. Monitor the dry run of the finishing machine to verify that the required thicknesses and clearances will result.

552.7.4.2 During Placement

Consider the following guidelines during the placement of bridge deck concrete:

1. Reinforcing Steel. Check and document clearances of reinforcing steel.
2. Mortar Roll. Check for the proper quantity of mortar rolling ahead of the screed.
3. Vibrators. Check that mechanical vibrators are being properly used to adequately consolidate the concrete.
4. Hand Work. Monitor the hand work used during the operation. Hand work should be kept to a minimum.
5. Slab Thickness. Using the stabbing method, check the slab thickness for compliance.
6. Finishing Machine. Verify that the finishing machine is providing a uniform, sealed surface finish with minimal ridges and voids.
7. Water. The application of additional water to facilitate surface finishing should be avoided as much as possible. Application of additional water will only be allowed if approved by the PE on a case-by-case basis. If approved, verify that the quantity of water applied for the purpose of finishing is the minimum required, and that the application is performed using an approved fog spray.
8. Slab Surface. Before the concrete takes its initial set, check the deck slab for irregularities and verify that the Contractor is performing straight-edge testing, as specified. Verify that the deck surface conforms to the requirements for smoothness.
9. Joints. Monitor the operation to verify that joints are properly constructed at the correct location. Where expansion joints are installed, consider the following:
   a. Angles. Angles must be accurately set with respect to cross-section, grade, and curbing.
   b. Anchor Bars. Check that anchor bars are correctly set and attached to angles.
   c. Compression Joint Sealer. Verify that the compression joint sealer is installed in conformance with specified requirements.
   d. Finger-Type Expansion Joint Devices. Where designated, check the vertical and horizontal alignment of the devices, and verify that they are installed parallel to grade without lateral contact between fingers.

552.7.5 Concrete Finishing Considerations

552.7.5.1 Before Finishing

The Standard Specifications require the use of self-propelled mechanical finishers for all concrete bridge decks. The mechanical finisher is usually supported by a rail support system that is attached to the bridge deck, which transfers the load to the outside girders. If improperly installed, the use of a rail support system on welded-plate or wide-flange girders can cause thin decks or thick overhang sections, primarily due to girder rotation and overhang settlement.

To prevent this condition, adequate cross-bracing must be installed between the outside and intermediate girders. Where rail support systems are installed, check that the spacing of the rail supports is sufficient to carry the load of the finishing operation, without causing undue girder rotation or overhang settlement. In addition, check that the rail supports have been properly adjusted for the required alignment and grade. This adjustment check is typically performed using a string line to verify the grade at various locations along the deck, while the mechanical finisher is moved into position.

552.7.5.2 During Finishing

Consider the following guidelines during the finishing of concrete bridge decks:

1. Hand Finishing. Because the use of self-propelled, mechanical finishers is required for all concrete bridge decks, DPW expects a higher quality surface in terms of smoothness and uniformity, and a conformance to designated lines and grades. Hand finishing should only be permitted where it is necessary to remove surface irregularities such as:

    - Holes and depressions resulting from test procedures
    - Surface tears caused by the screed
    - Minor incidental deformities

2. Grooving/Tining. Where designated for decks that will not receive a bituminous overlay, verify that the deck surface is properly textured.

552.7.5.3 After Finishing

Consider the following guidelines after the finishing operation:

1. Surface Check. Before the concrete takes its initial set, verify that all joints are tested with a straight edge and properly corrected. As needed, check the entire slab surface for trueness, using a string line or a straightedge.
2. Joint Edges. Verify that joint edges are rounded with an approved radius hand tool, and that any tool marks on the adjacent surface are removed by brooming.
3. Surface Protection. Verify that the finished surface is properly protected from damage due to traffic.

552.7.6 Concrete Curing Considerations

Immediately after the concrete is placed and finished, the deck will be cured and protected in accordance with specified requirements, including any SCRs. Consider the following guidelines:

1. Curing Method. Verify that the method of curing has been approved and is following immediately behind the finishing operation without damaging the designated surface finish.
2. Deck Cracking. Cracks allow moisture to penetrate the deck slab, and extensive cracking may affect the durability of the structure. Crack width is typically measured by inserting a wire gauge in the cavity. Inform the Design Engineer when crack widths of 0.02 inches or larger are observed. Where crack widths greater than 0.035 inches are found, verify that the Contractor immediately repairs the cracks in accordance with the Standard Specifications, and following a crack repair method statement subject to the approval of the Design Engineer.

552.7.7 Approach Slabs

For joint or tied approach slabs, use the guidelines for bridge deck construction to inspect formwork, reinforcement, mix production, concrete placement, and the finishing operation. The inspection of approach slabs should be performed with the same diligence as for the bridge deck.

END OF SECTION

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SECTION 553 – PRE-STRESSED CONCRETE

553.1 GENERAL

Pre-stressed concrete members differ from conventionally reinforced concrete members in that the concrete member is stressed prior to loading. This pre-compression is achieved through the action of high-strength stranded wire that is tensioned within the structural members. Pre-stressed concrete members are used to minimize tension in structural elements.

553.1.1 Pre-Tensioning/Post-Tensioning

The stressing force may be applied before the concrete is placed or after the concrete has cured. Consider the following:

1. Pre-tensioning. Pre-tensioning is the method of applying the pre-stressing force before placing the concrete. The wire strands are anchored by a continuous bond throughout the length of the structural element.
2. Post-tensioning. Post-tensioning is the method of applying the pre-stressing force after the concrete has cured. In post-tensioning, the wire strands are mechanically anchored at each end of the member.

553.1.2 Creep and Camber

Creep is the shortening of a girder after it is post-tensioned. The actual shortening is slight and occurs rapidly, tapering off over a period of about two months. Because the pre-stressing force is applied eccentrically, a noticeable uplift or camber will occur, which is anticipated during design. However, if the girder cambers beyond tolerable limits, corrective action will be necessary.

553.1.3 Pre-cast Girders

Pre-cast girders are fabricated on a flat surface at the pre-cast yard and shipped to the bridge site for erection similar to steel girders. The girders will camber when the pre-stressing force is applied. Be aware that girder age and storage conditions can produce additional camber that may render the girder unacceptable.

553.1.4 Cast-In-Place Girders

Concrete box and “I” and “T” girders are typically cast-in-place and post-tensioned in the field. During construction, ducts are cast into the girder webs. Once the concrete is cured, the wire strands are pulled through the ducts to pre-stress the member. Because these girders are produced in the field, the forms and falsework must account for deflections due to dead load and pre-stressing.

553.2 INSPECTION GUIDELINES

PRE-CAST GIRDERS

553.2.1 General

Inspection work should be performed by qualified inspection personnel who should maintain a close liaison with both the designer and girder fabricator to coordinate delivery and follow through on any repair work, prior to final acceptance of the girders.

553.2.1.1 Before Construction

Before pre-cast girder construction begins, thoroughly review the plans, specifications, shop drawings, and job safety requirements. Consider the following:

1. Construction Procedures. Review the pre-stressing procedures with the Contractor. Check the Contractor's field sheets for compliance and pay particular attention to strand elongation and tie-down details.
2. Concrete Mix. Verify acceptability and approval of the aggregate source and concrete mix design.

553.2.1.2 During Construction

Consider the following during pre-cast girder construction:

1. Reinforcement/Embedments. Inspect reinforcing cages and embedments for proper assembly and placement in forms.
2. Forms and Pre-stressing Steel. Inspect forms and pre-stressing steel for cleanliness and proper dimensions. Observe the tensioning procedure and verify compliance with the shop drawings.
3. Concrete Placement. Inspect concrete placement, form vibration, and a curing method for acceptability.
4. Tensioning. Verify that the concrete has attained the proper strength prior to tensioning.

553.2.1.3 After Construction

To maintain the integrity of the final product, it is important that the pre-cast girders be properly handled and stored. If the girders are tipped or dropped, they may split apart or become otherwise damaged. After pre-cast girder construction, consider the following:

1. Shipping/Erection. Review the methods of shipping and erecting the girders with the Contractor.
2. Camber. Check the camber in the girders. Excessive camber may cause the girder flange to project into the deck slab, interfering with the concrete deck panel or

placement of reinforcing steel. Notify the Design Structural Engineer immediately in such situations.

CAST-IN-PLACE GIRDERS

553.2.2 General

The pre-stressing materials for this work are subject to independent inspection prior to being used in the fabrication of girders on site. The PE and the Inspector are responsible for the inspection of all girder construction in the field.

553.2.2.1 Before Construction

Before cast-in-place girder construction begins, thoroughly review the plans, specifications, shop drawings, and job safety requirements. Pay particular attention to the block-out dimensions and anchorage clearances noted on the shop drawings. Consider the following additional guidelines:

1. Pre-stressing Construction Procedures. Review the pre-stressing procedures with the Contractor and become familiar with the equipment and materials to be used. The Design Structural Engineer will provide assistance with post-tensioning.
2. Concrete Mix. Verify the acceptability and approval of the aggregate source and concrete mix design.
3. Pre-stress Strand Sample. Obtain samples of the wire strand material that will be used for pre-stressing, well in advance of the post-tensioning operation. Forward the sample to DPW along with companion documentation of material properties and test results.

553.2.2.2 During Construction

Consider the following during cast-in-place girder construction:

1. Forms. Inspect forms for cleanliness and proper dimensions.
2. Grouting Ports and Vents. Verify that grouting ports and vents will remain accessible after concrete placement.
3. Concrete Placement. Verify that concrete placement complies with specified requirements. Check for proper vibration of concrete around and under anchorages to eliminate voids.
4. Ducts. Verify that ducts are blown clear immediately after the concrete is placed. Verify ducts and/or tendons are installed at the proper locations and without any wobble.
5. Pre-stressing Steel. Verify that exposed pre-stressing steel is protected from dirt and debris when threaded through ducts in the field. If not immediately tensioned, also verify that it is adequately protected from adverse weather conditions.

6. Construction Joints/Anchorage Zones. Construction joints should be located well away from anchorage zones and anchorage zone reinforcement. Verify that all anchorage zone reinforcement is placed in accordance with the plans, specifications, and shop drawings, and is reviewed by the Design Structural Engineer.
7. Concrete Curing. Check the curing of concrete for compliance, and verify that the concrete attains proper strength prior to starting the pre-stressing operation.

553.2.2.3 During Pre-stressing

Review the sequence of operations with the Contractor, and be concerned with safety. Stay away from the backside of the ram, dead-end anchorages, and above the anchorage during the pre-stressing operation. The pre-stressing operation will elongate the steel strands in the members as the jacking force is applied. The jacking force is applied by a ram that is equipped with a dial gauge, graduated in pounds per square inch. This dial gauge is used to indirectly monitor the amount of jacking force applied. A calibration curve must be provided with the dial gauge that has been calibrated for the specific ram being used in the stressing operation. Use this curve to convert the jacking force (e.g., $P_{(JACK)}$) to an associated reading on the dial gauge. Monitor strand elongation as follows:

1. Find the strand elongation length on the shop drawings. The actual strand elongation will vary from what has been calculated if the physical properties of the strand are different than those assumed in the calculations. The following equation is used as a basis to adjust the strand elongation:

   $e = P\,L / (A\,E)$ where:

   e = strand elongation (inches)
   P = force applied to the strand (kips)
   L = length of strand (inches)
   A = area of the strand (square inches or in^2)
   E = Modulus of Elasticity of the steel strand (kips/square inch or ksi)

   Moving P and L to the other side of the equation, the expression becomes: $P\,L = e\,A\,E$. The subscript "$_1$" is added to the equation to denote the assumed strand physical properties and becomes:

   $P_1 L_1 = e_1 A_1 E_1$.

   Similarly, in a second equation, the subscript "$_2$" is added to denote the actual strand physical properties and the equation becomes:

   $P_2 L_2 = e_2 A_2 E_2$.

   Since $P_1 L_1$ equals $P_2 L_2$ the two equations can be set equal to each other:

$e_1 A_1 E_1 = e_2 A_2 E_2$.

Solving for e_2 yields:

$e_2 = e_1 A_1 E_1 / (A_2 E_2)$

A_1 = 0.153 square inches for 0.5 inch strand, and

A_1 = 0.217 square inches for 0.6 inch strand

These are typical values for A_1 and should be confirmed with the strand manufacturer.

The shop drawings will show the size and strand area assumed. The value assumed for E_1 will also be shown on the shop drawings. The values for A_2 and E_2 will be reported on samples from each heat of strand submitted for use on the project.

2. Before the strand elongation is measured, the strand is usually jacked to 20 percent of $P_{(JACK)}$. This is done to remove slack in the strands. The measured strand elongation is reduced by the same percentage (20 percent).

3. Measure the strand elongation as follows:

   Mark a reference line on a strand in a tendon between 10 to 20 inches from the end of the ram (find a part of the ram that does not move as the reference point and measure from there). A permanent black felt tip marker can be used to make the mark. Monitor the dial gauge reading as the jacking force approaches $P_{(JACK)}$. At $P_{(JACK)}$, measure the distance to the mark made on the strand from the reference point. This distance, less the dead-end anchor set, should be equal to or greater than the strand elongation calculated in Step 2 above. If the elongation is not what is expected, carefully check the calculations and measurements to verify that the strand elongation is, in fact, short. If the measured strand elongation varies more than seven percent from the calculated strand elongation, or if the elongation measurements are erratic, examine the pre-stressing operation for possible problems. If the problem cannot be solved in the field, contact DPW's design consultant or the Program Management Team (PMT) for assistance. Do not permit the protruding strands to be cut until the strand elongation has been verified and all problems have been properly addressed.

553.2.2.4 After Pre-stressing

Check that tendons are grouted as soon as practical after pre-stressing. All grouting ports and vents must be operating properly to verify full-length grouting. The pre-stressing and grouting for all tendons in a particular bridge must be completed before the work is accepted.

END OF SECTION

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SECTION 554 – REINFORCING STEEL

554.1 GENERAL

The design strength of reinforced concrete structures cannot be fully realized unless the specified reinforcing steel is placed as designated in the Contract drawings. The grade, type, and size of reinforcing steel; the bar location, spacing, and clearance; and the bond developed between the concrete and the bar surface are critical factors to consider during inspection.

554.2 INSPECTION GUIDELINES

554.2.1 Before Construction

Consider the following guidelines before work involving reinforcing steel for structural concrete and concrete bridge decks begins:

1. Mill Test Reports. Upon delivery, compare bar bundle tags with Mill Test Reports to verify that bar size, material grade, and coating meet specified requirements. Check the bar identification markings for proper steel grade.
2. Certificates of Compliance. Verify that Certificates of Compliance have been received.
3. Bar List. Verify that the Contractor's list of reinforcing bars conform to the Contract with respect to bar size, quantity, and bending details.
4. Bar Condition. Check the reinforcing bars for mud, oil, rust, and detrimental scale. Concrete will only bond with a clean bar surface. In addition, check the bars for straightness, and verify that they are protected from damage. Verify that any damage to epoxy-coating is adequately repaired.
5. Bar-Bending. Become familiar with the bar-bending details. Where field-bending is required, verify that the proper procedures are being followed, and verify if the application of heat is permissible.
6. Storage. Check that the reinforcing steel is properly stored above the ground on platforms, skids or other supports.
7. Additional References. As needed, consult the *Concrete Reinforcing Steel Institute Manual of Practice* for recommended placement practices.

554.2.2 During Construction

Consider the following guidelines during the placement of reinforcing steel for structural concrete and concrete bridge decks:

1. Bar Alignment and Spacing. Check that the bar alignment and spacing conforms to the Contract. Verify that all bars and other embedded items are correctly placed so that the concrete can be adequately consolidated.

2. Bar Clearance. Check the bar clearance and the depth of concrete cover for compliance. Verify that the proper minimum clearance is obtained between the top mat of the deck bars and the surface of the concrete.
3. Bar Splicing. Check the bar splices to verify that they are the proper length for the type and size of bar placed. Note that epoxy-coated bars require longer splices than uncoated bars. Verify that the bar splices are correctly staggered.
4. Bar Supports. The type, number, and spacing of supports must be adequate to minimize sagging, displacement, and damage of reinforcing bars. Plastic or epoxy-coated supports are required for epoxy-coated bars.
5. Securing of Bars. To minimize displacement, bars must be securely tied. Verify that the bars are tied at all intersections or as otherwise designated. For bridge decks, check that the upper mat of bars is properly tied to the lower mat. Do not permit welding of bars except as noted in the Contract. The use of coated ties is required for epoxy-coated bars.
6. Post-tensioned Concrete. Adjustments made to reinforcement in post-tensioned concrete require approval by the Design Engineer.

END OF SECTION

SECTION 555 –STEEL STRUCTURES

555.1 GENERAL

The work discussed in this section consists of the inspection required during the construction of steel structures.

555.2 INSPECTION GUIDELINES

555.2.1 Before Construction

Consider the following guidelines before construction begins:

1. Contract Plans and Specifications. Inspection of steel structures requires a great deal of coordination, attention to detail, and a thorough working knowledge of the Contract Documents. These documents include, but are not limited to, the following:

   - Standard Specifications
   - SCRs
   - *ASTM Material and Testing Specifications*
   - *AASHTO Material and Testing Specifications*
   - *AASHTO Standard Specifications for Bridges*
   - *AISC Steel Construction Manual*
   - *Bridge Welding Code ANSI/AASHTO/AWS D1.5*
   - Shop Drawings
   - Contractor's Quality Plan

   Prior to the start of work, review this documentation and become familiar with the responsibilities of DPW's and the Contractor's inspection personnel; material sampling and testing requirements; fabrication, assembly, and erection details; welding and painting requirements; and the acceptance criteria specified in the Contract.

2. Storage. Verify structural steel materials are properly handled and protected from damage while stored on site or at any other alternative sites as may be authorized. All damaged or otherwise rejected materials should be removed and not stored on site to prevent inadvertent use and incorporation into the work.

3. Shop Drawings. Shop drawings are required for all steel structures. Review the drawings and become familiar with the types and locations of steel and fasteners required; the member identification and marking system; rolling orientation designations; types and locations of welds; and the location, extent, and criteria for non-destructive tests.

555.2.2 During Construction

Consider the following guidelines during field assembly and erection:

1. Material Inspection, Delivery, and Erection. Watch for materials and work that have not been previously inspected and documented. Pay particular attention to the following:
   a. Match Marking. Check match marks on members and assemblies to verify that they are arranged, assembled, and erected based on the fabricator's match-marking diagram.
   b. Coating Damage. Watch for damage to shop coating (e.g., galvanization and paint) caused by mishandling upon delivery and during erection, and require the Contractor to make immediate repairs.
2. Falsework Considerations. Where falsework is required, verify conformance with the Standard Specifications for Temporary Works and the falsework drawings.
3. Bearings and Bearing Seats. Where bearing devices are designated for steel structures, see Section 564 of this Manual.
4. Field-Welding Considerations. Field-welding is only permitted where designated in the Contract or with written permission from the Design Engineer.
5. Bolt Installation and Inspection. The Contractor will perform rotational capacity tests of all bolts on the project before installation. Connections must be drawn tightly together. All bolts in the connection must be installed before final tightening of the connection. Once the connection is complete, the Contractor will check the bolts for proper tension, as specified, under the observation of the Inspector.
6. Field Cleaning and Painting. After inspection and acceptance of erection work, verify that surfaces to be field-painted are properly cleaned. Self-weathering steel will be cleaned, but not painted, to promote development of a uniform coat of rust. Verify that a prime coat is applied to all uncoated surfaces to be painted, including damaged, shop-painted surfaces. Once the prime coat has cured, verify that the top coat is applied in the manner specified. Pay particular attention to the mishandling of painting materials, and enforce the Contract provisions with respect to mitigating environmental contamination.

555.2.3 After Construction

Upon completion of the steel structure, consider the following guidelines:

1. Removal of Supports. Check that all blocking, supports, and falsework are removed without damaging the structure.
2. Final Appearance. Check the fit and appearance of diaphragms, transverse bracing, field splices, and floor-beam connections.
3. Damaged Coating. Verify repair of galvanized units on which the spelter-coating has been burned by welding or damaged during erection.

4. Structure Number. Verify that the number stenciled on the structure is correct and placed in the proper location.

END OF SECTION

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SECTION 558 – DAMP-PROOFING

558.1 GENERAL

Where designated in the Contract, damp-proofing of concrete surfaces will be governed by of the Standard Specifications or Special Contract Requirements.

558.2 INSPECTION GUIDELINES

558.2.1 Before Construction

Before damp-proofing begins, consider the following guidelines:

1. Contract Plans and Specifications. Review the plans and specifications regarding the limits of treatment; type of material required; sampling and testing requirements; and the method and sequence of operations.
2. Materials. Check the primer and asphalt damp-proofing materials to verify they conform to the type designated for the project. Verify and retain applicable Certificates of Compliance, and verify compliance with sampling and testing requirements. Document the test results.
3. Weather Considerations. Know the limitations of application with respect to inclement weather, surface moisture, and temperature.
4. Concrete Curing. Check to verify that the concrete has been cured before application of the treatment.
5. Surface Preparation. Before the treatment is applied, check to verify that the concrete surface has been thoroughly cleaned and prepared in accordance with the manufacturer's requirements.

558.2.2 During Construction

Consider the following guidelines during the application of damp-proofing treatment:

1. Primer Application. Verify conformance with respect to limits, method, number of coats, and rate of application.
2. Asphalt Damp-proofing Application. Verify conformance with respect to timing, method, and rate of application.

558.2.3 After Construction

After the asphalt damp-proofing has been applied, check for discoloring of concrete surfaces beyond the designated limits of treatment, and require the Contractor to properly clean the marred surfaces.

END OF SECTION

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SECTION 559 – WATERPROOFING

WATERPROOF MEMBRANES

559.1 GENERAL

Waterproofing treatments, such as elastomeric membranes and concrete sealer are typically applied to concrete surfaces.

559.2 INSPECTION GUIDELINES

559.2.1 Before Construction

Before the waterproofing treatment is applied, consider the following guidelines:

1. Contract Plans and Specifications. Review the plans and specifications regarding the limits of treatment; type of waterproofing designated; sampling and testing requirements; and the method and sequence of operation.
2. Materials. Check the materials, such as the membrane, sealer, and primer, at the site to verify they conform to the type designated for the project. Verify and retain applicable Certificates of Compliance, and verify compliance with sampling and testing requirements. Document the test results.
3. Weather Considerations. Know the limitations of application with respect to inclement weather, surface moisture, and surface and ambient temperatures. Pay particular attention to required drying periods.
4. Concrete Curing. Before applying the waterproofing materials, check to verify that the age and curing status of the concrete complies with the specifications and manufacturer's recommendations.
5. Surface Preparation. Before the treatment is applied, check to verify that the concrete surface has been properly prepared. Pay particular attention to the limits of cleaning; and the sequence, timing, and methods (e.g., sand-blasting, shot-blasting, power-washing, and sweeping). Where waterproofing membrane is designated, verify that rough surface areas that could puncture or create air pockets in the membrane have been corrected.

559.2.2 During Construction

Consider the following guidelines during the application of waterproofing treatments:

1. Primer Application. If a primer is specified, verify the limits, such as the height of the curb above the asphalt overlay, and the application rate for conformance with specified requirements.
2. Placement of Reinforced Membrane. Check that the membrane is not placed too soon after application of the primer. Check the limits of placement. Verify that the membrane

is overlapped in such a manner that a shingling effect will be achieved that directs runoff toward curbs and drains. Watch for wrinkles and air bubbles, and enforce the Contract provisions with respect to repairing such defects. Pay particular attention to flashing and priming requirements for membranes placed near joints and drain pipes.

3. Placement of Elastomeric Membrane. Where elastomeric membrane is designated, check the limits of treatment and the rate and thickness of the application for compliance.
4. Placement of Protective Covering. Where protective covering is designated, do not permit any more membrane to be placed than can be properly covered in the same work day. Pay attention to the limits of covering and the required treatment of overlaps and joints.
5. Concrete Sealant Application. The Contractor's and DPW's personnel should follow the manufacturer's safety recommendations when applying concrete sealant. For protection, wear the Contractor-supplied respirators during the inspection of work involving concrete sealer. Verify the limits of treatment and the application rate for conformance.

559.2.3 After Construction

Verify that all corrective work to damaged waterproofing is completed as soon as possible.

END OF SECTION

SECTION 564 – BEARING DEVICES

564.1 GENERAL

Due to such factors as temperature change, post-tensioning, and girder rotation, bearing devices are used in structures to support the superstructure while at the same time allowing movement associated with loading and environmental factors such as expansion and contraction caused by changes in temperature.

564.2 INSPECTION GUIDELINES

564.2.1 Before Construction

Before work involving the installation of bearing devices begins, consider the following guidelines:

1. The contractor is required to submit drawings for bearing devices in accordance with the contract requirements. These drawings need to be submitted and reviewed prior to fabrication.
2. Contract Plans and Specifications. Review the plans and specifications for the location and types of bearing devices required. Know the certification and installation requirements for each type of bearing to be installed.
3. Inspection Upon Delivery. Upon delivery, verify compliance with the required certification documentation. Retain all written certifications and applicable Certificates of Compliance in the permanent project files. Check the documentation to verify that the bearings have been delivered to the correct location and are the proper type for the structure. Check that each bearing is properly packaged to prevent damage and contamination, and verify that bearing components are marked where required. Reject bearings that fail to meet these delivery requirements.

564.2.2 During Construction

Consider the following guidelines during the installation of bearing devices:

1. Thoroughly review the fabrication drawings for the type of bearing device to be installed.
2. Check the bearing alignment for conformance with the Contract, and verify the proper adjustment for temperature. Watch for interference between the bearing device and anchor bolts.

564.2.3 After Construction

Perform a final check of the bearing devices and require corrective work based on the Contract provisions. Following completion of the superstructure, inspect the installation and alignment of each device in the presence of the Contractor.

END OF SECTION

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SECTION 565 – DRILLED SHAFTS

565.1 GENERAL

Drilled shafts are large-diameter, underground columns of reinforced concrete that are constructed in pre-drilled holes to provide foundation for structures. They are designed to transfer and distribute structural loads to underlying strata through side friction and end-bearing. The drilled shaft construction consists of drilling a hole at a designated location, depth, and diameter; constructing and placing a cage of reinforcing steel; and placing and finishing concrete to the elevation required by the details shown on the plans.

565.2 INSPECTION GUIDELINES

565.2.1 Before Construction

Before the construction of drilled caissons, consider the following guidelines:

1. Construction and Testing Personnel. Review the Contract for the qualification requirements for these personnel.
2. Contract Plans and Specifications. Review the Contract with respect to the requirements for reinforcing steel and concrete materials; and location, depth, diameter, and elevation. Know the drilling sequence and dewatering requirements.
3. Location/Utilities. Verify that utility locations have been staked, and verify that all drilled shafts have been staked in accordance with the Contract specifications.
4. Boring Log/Geological Reports. Review the boring log and geological reports. Become familiar with the appearance of the type of material anticipated at the depth of the bearing strata.
5. Blasting. The use of explosives for caisson construction is not permitted.
6. Materials. Check to verify that the type of reinforcing steel and class of concrete conforms to the specified requirements. Where steel casing is required, verify conformance with respect to wall thickness, strength, diameter, and condition.

565.2.2 During Construction

565.2.2.1 Drilling Operation

Where holes are drilled, consider the following:

1. Location. Check the location of the center of the shaft to verify that it is within the allowable tolerances from those designated on the plans.
2. Depth of Embedment. The designated bottom elevation is specified, which may be revised by the Design Engineer to verify proper load-bearing capacity. Document the depth drilled into the target-bearing strata, and compare the excavated material

with geological information to verify that the adequate bearing material has been reached.

3. Diameter/Sides. Check the hole diameter and sides to verify compliance to size, vertical orientation, and allowable tolerances. Where caving is encountered, halt the operation until the situation can be evaluated and corrected. Protective steel casing may be needed.
4. Excavated Material/Cleaning. Check to verify that the hole is dewatered and cleaned of all loose material. If dewatering is not practical, the Contract provisions with respect to placing concrete under water will govern.
5. Protective Covers. Once the hole has been accepted, verify that the protective covering is installed to prevent persons and materials from falling into the hole.

565.2.2.2 Drilled Shaft Reinforcement/Steel Casing

The reinforcement for Drilled Shafts consists of a single-unit cage of reinforcing steel. The cage must be inspected prior to being placed into the drilled hole. Consider the following:

1. Cage Construction. Inspect the cage for proper bar size, spacing, and fastening. Check the cage height and diameter for conformance.
2. Steel Casing. Where designated or as directed, verify that the proper size of steel casing is installed prior to placement of the cage, support system, and concrete.
3. Installation Timing. After the hole and cage have been inspected, the cage and support system must be installed in the hole just prior to pouring concrete. If the concrete is not immediately poured, require removal of the cage, re-inspect the hole for loose material, and check the surface condition of the steel for acceptability.
4. Support System. A support system must be provided so that the cage does not sit on the bottom or lean against the wall of the hole. Check conformance with respect to the number and interval of spacers along the length of the cage. Verify that the support system does not rack or skew the cage, and require additional steel as needed to stiffen the cage.

565.2.2.3 Concrete Placement

Acceptability of the placement method used for concrete will depend on whether the hole is considered dry or wet. Just prior to placement, check the depth of water at the bottom of the hole. If the depth, without pumping, is less than approximately two inches, the hole may be considered dry for the purpose of method approval. Otherwise, the hole should be considered wet. Consider the following:

1. Dry-Hole Placement. Where the hole is dry, the concrete may be poured continuously in a free-fall from the surface with the use of a hopper or approved

device. Check to verify that the concrete does not hit the reinforcing cage or the sides of the hole on the way down.

2. Wet-Hole Placement. For wet holes, the PE must review the proposed method of placement. The Contract provisions regarding placement under water will govern.
3. Vibration Operation. Check the vibration operation for compliance with respect to the minimum depth of concrete consolidation at the top of the caisson.
4. Removal of Water-Diluted Concrete. Where water-diluted concrete has floated to the top of the caisson during the pour, verify that the minimum depth of the top surface is removed and wasted as specified.
5. Steel Casing. Unless otherwise designated or directed, the steel casing should be removed from the caisson.
6. Concrete Curing. Check that the top surface of the concrete is properly cured.
7. Adjacent Construction. Where work for foundation piles, excavation, or caissons will be performed adjacent to the freshly-poured caisson, check compliance with respect to minimum lateral clearance and compressive strength requirements.

565.2.3 After Construction

Verify that the projecting reinforcing steel is in the correct location and properly cleaned of mortar.

END OF SECTION

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SECTION 601 – MINOR CONCRETE STRUCTURES

601.1 GENERAL

The materials used and the procedures followed for constructing project elements using concrete, both reinforced and non-reinforced, should comply with all requirements of the Contract specifications. Particular attention to the method and integrity of the forms used, the placement of the concrete, and the proper curing and protection of the cast concrete are critical to ensuring the end product conforms with all project requirements.

Concrete is, or can be, an integral part of many other project elements, including but not limited to:

- Drainage structures and utility chambers
- Curbs, gutters, sidewalks, slope paving, and median cover
- Guardrails and median barriers
- Fencing
- Roadway signing
- Lighting and traffic signal installations

601.2 INSPECTION GUIDELINES

601.2.1 Before Construction

Review the Contract for the location, type, configuration, and extent of the concrete work required. Consider the following:

1. Plans and Shop Drawings. Thoroughly review all plans, standard drawings, vendor drawings (for embedded items such as frames, ladders, connection points, etc.), shop drawings, along with the specifications that apply to the item of work.
2. Materials. Understand the class of concrete specified and the limitations placed on allowable slump and aggregate size. Special installations may specify color additives, fiber-reinforcing, or other non-standard requirements. If a colored concrete is specified a sample is required. Verify that the mix design and cement/aggregate sources are approved prior to use.
3. Surface Treatments. Sidewalks, ramps, and other surface-covering installations may specify a particular surface treatment either for aesthetics or performance needs such as Americans with Disabilities Act (ADA)-accessible ramps. Refer to Section 552 for other types of surface finishes that may be required.
4. Curing. Smaller concrete placements often have a much higher ratio of surface area to volume of concrete, and proper curing is crucial to the proper development of the concrete properties. This is especially true for concrete flat work that is relatively thin (thickness generally in the range of 4” to 8”), combined with large exposed surface areas. The application of compounds used for curing must be approved prior to use and

be compatible with other final surface treatments (painting, staining, waterproofing, etc.).

5. Protection. Concrete is easily damaged until it has sufficient time to attain strength, so it needs to be protected from the weather. Rains can severely damage the exposed surface of freshly-placed concrete, and hot temperatures and winds can cause the concrete to dry prematurely, causing shrinkage cracks that prohibit proper strength gain. A work plan should also be developed to ensure the concrete work is not impacted by other construction activities. Plans should be in place to take preventative measures to protect the work. The work zone immediately around the concrete work should be controlled to prevent damage caused by equipment, worker/pedestrian traffic, and follow-on construction activities.

601.2.2 During Construction

Consider the following guidelines during the construction of culverts and sewers:

1. Grade Preparation. The existing grade should be properly compacted to the configuration shown in the Contract specifications, along with the placement of special underlying layers of material, as may be required.

2. Forms. All formwork should be in place to the required configuration, and should be firmly supported and held in place sufficient to withstand the loads of the wet concrete as it is vibrated into place. The form materials should be in a condition that can produce the desired finish, and should be properly sealed to prevent the leaking of cement paste during placement. Where required, check that any temporary supports that may be used are removed before being covered up.

   For concrete that is placed into an open excavation of other encasements, such as for embedding fence posts into the ground, ensure the surrounding soils are free of loose materials and firm enough to prevent incorporation into the concrete during placement.

3. Concrete Placement. The Contractor should take the necessary actions to place the concrete as close as possible to its final location through the use of extended chutes, cranes/buckets, or pumping. Avoid situations where hand-operated concrete vibrators are required to move material. Inspect the reinforcing during concrete placement for signs of movement from its required location.

4. Surface Finishes. Concrete surfaces should be finished as soon as practical for the particular finish specified. Ensure that crack control joints are installed in a timely manner at the locations required. The addition of water on the surface to aid in finishing should be avoided. If allowed, the water should be applied with a fine mist spray applicator.

5. Curing. Only approved curing methods should be used and applied as soon as the finishing operation is complete and the concrete has attained the initial set compatible

with the curing method selected. No additional finishing should be allowed after applying a spray-on curing compound, which must be applied in a uniform layer with 100 percent coverage to form a membrane over the exposed concrete surfaces.

6. Protection. The work zone immediately around the concrete work should be controlled to prevent damage caused by equipment, worker/pedestrian traffic, and follow-on construction activities. The concrete work should be protected from the adverse effects of wind, high temperatures, and rain as the weather conditions dictate.

601.2.3 After Construction

The concrete should be protected until it has attained sufficient strength to withstand damage for follow-on activities including:

1. Form Removal. Care must be taken during form removal to avoid damaging the concrete. During form removal, the concrete should never be used to pry against, and reinforcing steel extending from the concrete should be left undisturbed to avoid damaging the steel-concrete bond. Falsework that supports any newly-placed concrete should not be removed until the concrete has attained the required strength to support itself and other loads as determined by the PE, and validated by test data of the in-place concrete.
2. Curing. Curing of the type approved should be continued for the specified period as required by the Contract specifications. The Contractor will need to be very diligent to ensure the curing treatments are in place “continuously” throughout the curing period.
3. Surface Treatment. Preparation of exposed surfaces should proceed as soon as practical for the type of final finish specified. Certain finishes may also require additional curing once the finish is applied.

3\. Backfilling. All backfilling adjacent to newly-placed concrete should be done with care to avoid damaging the concrete, particularly any portions that will remain above ground and visible.

END OF SECTION

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SECTION 602 – CULVERTS AND DRAINS

602.1 GENERAL

The acceptability of culvert and sewer installations depends on the extent to which material and construction conform to the Contract. Many factors must be considered during inspection, including:

- Structure alignment, elevation, and grade
- Alignment of upstream and downstream channels, where applicable
- Camber and end treatments
- Bed preparation and condition and uniformity of bedding materials
- Backfilling methods and materials
- Embankment materials and construction

Culvert and sewer designs are typically based on the results of data collection and field investigations. Although adequate designs will be provided at the start of construction, it is common to discover situations that were not found during the field investigation or considered during design. DPW personnel should continuously monitor the construction operation and be watchful for situations that may warrant consideration of adjustments in the field.

602.2 INSPECTION GUIDELINES

602.2.1 Before Construction

Review the Contract for the location, type, and size of culverts and bedding required. Consider the following:

1. Pipe Material. Upon delivery, verify the receipt of proper material certifications. Inspect the pipe and coating material, if specified for cracks, defects, and damage that may have occurred during shipping, and verify that, if required, smooth-lined pipe is being used for storm drain systems. Check pipes for proper:
   - Class, type, and size
   - Thickness, gauge, and schedule
   - Coating and lining
   - Lengths of sections
2. Safety Considerations. Review the safety requirements for trenching operations and confined space entry. Do not enter manholes, inlets, vaults, trenches, or other confined spaces without taking the proper safety precautions.
3. Staking. Check that manholes, inlets, and pipes have been properly staked, and verify that staked locations and elevations are appropriate for existing field conditions.

4. Utilities. Verify that the Contractor has located all underground utilities, and verify that all conflicts have been resolved.

602.2.2 During Construction

Consider the following guidelines during the construction of culverts and sewers:

1. Grade Stakes. Frequently check grade stakes for errors.
2. Excavation. Know the requirements for pipe installation in new embankments. Check the excavation for correct depth, width, and alignment, and verify that the trench bed has been properly graded and compacted. Where rock is encountered during excavation, enforce the minimum depth of removal below grade.
3. Bedding. Check the type and depth of bedding for conformance.
4. Placement. Verify that pipe placement begins at the downstream end. Check that the entire length of pipe rests in contact with the bedding material at the proper flow line. Perform frequent alignment and elevation checks. Be exacting on sanitary sewer grades and flow-line smoothness.
5. Pipe-Jacking. Where pipe-jacking is required, verify the proper proportioning of the grout mixture. Check the roadway surface for signs of upheaval or failure, and require immediate corrective action. Where jacking is designated, proposed alternative methods require written approval by the PE.
6. Pipe Joints. Check the direction of joint laps for conformance. The bell or grooved end of concrete pipe or the outside lap of metal or plastic pipe must be placed in the upstream direction. Check that joints are properly sealed or banded and snug. Verify that joints are grouted, where required.
7. Lift Holes. Ensure that all lift holes are properly plugged.
8. Pipe Damage. Check in-place pipe for damage prior to backfilling and again before accepting the work. Verify that any damage to coating or lining is properly repaired.
9. Pressure Testing. Prior to backfilling, check that storm drain and sewer lines have been pressure-tested for water tightness, as specified.
10. Backfilling Operation. Check the backfill material for conformance. Verify that the backfill material is being placed and fully compacted in lifts of the required thickness. This operation must be performed equally and simultaneously on both sides of the pipe. Note that the required compaction must be obtained prior to placing successive lifts. Observe the operation to verify that the method of compaction does not cause pipe damage or displacement.

602.2.3 After Construction

Prior to acceptance, verify that the pipe is properly cleaned and in good repair. Trenches in roadways must be properly resurfaced before opening to traffic.

END OF SECTION

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SECTION 603 – STRUCTURAL PLATE STRUCTURES

603.1 GENERAL

Structural plate structures are typically used in culvert and arch bridge applications. Depending on the particular needs of the application, the plates will be fabricated from steel or aluminum alloy and assembled to form an arch, elliptical, or circular pipe. To obtain full design strength, this type of structure depends primarily on the specified tensioning of bolts and backfill placement.

603.2 INSPECTION GUIDELINES

603.2.1 Before Construction

Before work begins, consider the following guidelines:

1. Contract Plans and Specifications. Review the Contract plans regarding the location; type, and size of the structure; excavation and flow line; assembly method and sequence; and material requirements.
2. Materials. Check the structural plates for conformance with applicable material specifications.
3. Manufacturer/Fabricator Certificates. Verify that the Contractor has furnished the appropriate Certificates of Compliance and the required data sheets.
4. Field Coating. Where designated in the Contract, check the application of field-coating with respect to the material used, application method, rate of application, and number of coats applied.
5. Damaged Coating. Plates delivered with broken or bruised spelter coating should be repaired in accordance with the manufacturer’s recommendations.

603.2.2 During Construction

Consider the following guidelines during the work involving structural plate pipes:

1. Excavation. Check the width and depth of excavation, such as trenching, for conformance to the lines and grades designated in the Contract. Check the bedding of the flow line for compliance with the plans and specifications, paying particular attention to oversize rocks and rock protrusions.
2. Test Pits. Verify compliance of the test pit excavation with respect to the required number, location, and depth below the flow line. Where unsuitable foundation material is encountered, ensure that the material is removed to the minimum specified depth below the flow line and backfilled with suitable material.

3. Field-Cutting. Where plates are cut to form skewed or sloped ends, check the angle of the cut for compliance. Verify that the cut plates are numbered or match-marked as required.
4. Spelter Coating. Verify that damage to the spelter coating caused by field-cutting or welding is properly repaired in accordance with the manufacturer's recommendations.
5. Assembly. Watch for correct sequencing of the plate assembly. Verify that thicker invert plates are placed in the proper position. Check the longitudinal and circumferential seams, joint staggering, and bolt connections for compliance with specified requirements. Require the Contractor to demonstrate that bolts have been tightened to within the specified range. After complete assembly, but before backfilling, check all bolts for proper torque. Torque steel bolts on steel plates to a minimum of 100 foot-pounds and a maximum of 300 foot-pounds. Torque aluminum bolts on aluminum plates to a minimum or 90 foot-pounds and a maximum of 115 foot-pounds. After backfilling, perform spot checks to verify that uniform bolt tension has not been lost due to backfilling or vibratory compaction equipment. If the structure is assembled in other than its final location and will be set in place after erection, all bolts must be tightened to specification requirements before lifting.
6. Circular Pipe Distortion. Prior to backfilling, check to ensure that circular pipes are elongated (i.e., distorted) and properly set with respect to the elongated axis.
7. Backfilling. Check that backfilling complies with the Contract provisions. Watch for damage to the pipe and require immediate correction if damage occurs. Attention should be given to the progression of the backfill operation. The height of the backfill on each side of the structure should progress equally in uniform compacted layers to minimize uneven lateral stresses on the structure.

603.2.3 After Construction

After assembly and backfilling, check the dimensions of the final cross-section, such as the diameter, span, and rise; and the grade of the flow line for conformance. Verify that adequate earth cover has been placed and compacted before allowing heavy equipment traffic to operate over the structure.

END OF SECTION

SECTION 604 - MANHOLES, INLETS, AND CATCH BASINS

604.1 GENERAL

This section discusses the construction requirements for concrete manholes, inlets, and catch basins. Unless the type is specifically designated, these items, or portions thereof, may be pre-cast or cast-in-place. Refer to other sections for information on reinforced concrete structures and reinforcing steel.

604.2 INSPECTION GUIDELINES

604.2.1 Before Construction

Prior to starting work on constructing or adjusting drainage structures, review the Contract. Verify existing drainage conditions, and check that the structures are staked at the proper location and elevation. Consider the following:

1. Safety. Review safety requirements for trenching operations and confined space entry. Do not enter manholes, inlets, vaults, trenches, or other confined spaces without taking the proper safety precautions.
2. Pre-cast Structures. Upon delivery of pre-cast structures, verify the receipt of proper material certifications. Check the type and dimensions of pre-cast items for conformance. Where applicable, check the spacing of stair rungs for compliance, and pay particular attention to defects and damage that may have occurred during shipping.
3. Cast-in-Place Structures. Where cast-in-place structures are used, check the forms and reinforcing steel for proper condition and dimension. Check the Contractor's Bar List.

604.2.2 During Construction

Consider the following during construction of manholes, inlets, catch basins, and meter vaults:

1. Pipe Invert and Flow Line. Check pipe invert and flow-line elevations.
2. Manholes. A smooth flow line must be provided between manholes and pipes. Check that a good union with pipes is achieved. Where pre-cast sections are used, check that neat joints are constructed. Verify the proper use of brick and mortar to make field adjustments.
3. Inlets and Catch Basins. The staking of the station, offset, and orientation is critical for properly placing these structures so they accurately line up with the surface improvements that may tie into them, such as curb and gutter sections, drain pans, and driveway entrances. Verify the proper size is installed if precast units are used. Check for proper dimension, formwork, grate frame support and alignment, concrete placement, and curing for units cast-in-place.

4. Backfilling. The placement of properly compacted backfill is critical as the area immediately surrounding manholes, inlets, and catch basins is historically prone to settlement associated with improperly placed backfill materials. This is even more critical where these structures are exposed to vehicle loadings that can accelerate the development of differential settlement around these structures. Lean concrete backfill or other self-consolidating materials may be used if specified.

604.2.3 After Construction

Verify that all drainage structures are cleaned of any debris prior to accepting the work. Consider the following:

1. Grates. Check grates for acceptability with respect to type, dimension, orientation, and galvanization.
2. Manhole Covers. Check the type and dimension of manhole covers for compliance. Where located within pavements, check the slope and elevation of covers and for proper seating into the frame to prevent movement when driven over.
3. Mortar/Grouting. Verify that any needed mortar repairs and grouting around pipe are properly performed and cured prior to backfilling.

END OF SECTION

SECTION 614 – LEAN CONCRETE BACKFILL

614.1 GENERAL

Lean Concrete Backfill (LCB) is a low-strength material mixed to a wet, flowable slurry, which is used as an economical fill or backfill material. LCB is self-leveling, with relatively high slumps and a consistency similar to pancake batter. LCB is placed with minimal effort and without additional vibrations or tamping, by pouring it into the cavity to be filled. Although it hardens and develops strength, ACI refers to it as "Controlled Low Strength Material" (CLSM), and does not consider it to be concrete. Other names used for this material are flowable fill, flowable mortar, and lean-mix backfill. If the LCB has the potential of being excavated at some point in the future, the strength should be much lower than the 1200 psi which ACI uses as the upper limit for CLSM. Typical uses of LCB include:

- Backfill (sewer trenches, utility trenches, bridge abutments, conduit trenches, pile excavations, and retaining walls)
- Structural fill (foundation sub-base, sub-footing, floor slab base, and pipe bedding)
- Other uses (abandoned underground storage tanks, wells, and utility company vaults; voids under pavement; sewers and manholes; and muddy conditions)

614.2 INSPECTION GUIDELINES

614.2.1 Before Construction

Before work begins, consider the following guidelines:

1. Contract Plans and Specifications. Review the Contract and pay particular attention to any restrictions placed on the use of LCB, and any requirements for the mix design.
2. Ensure that the mix designs have been submitted and approved prior to use.
3. Manufacturer/Fabricator Certificates. Verify that the Contractor has furnished the appropriate Certificates of Compliance. Also check that the manufacturer has furnished the required data sheets.
4. Thoroughly review the location and type of existing utilities in the vicinity of the planned use of LCB that could potentially be damaged due to the ingress of the flowable material.

614.2.2 During Construction

Consider the following guidelines during the construction operations involving LCB:

1. Mix designs. Ensure that the proper mix is used in their respective designated areas.
2. Backfill of manholes, chambers, and pipelines. Verify that structures and pipelines are properly secured to resist buoyancy forces associated with the flowable nature of LCB.

3. Excavations and shoring. LCB exerts significant hydraulic forces on supporting soils and shoring/falsework due to its flowable properties. Ensure that these loadings have been accounted for before placement of LCB in these areas.
4. Covering up. Ensure that the LCB has attained sufficient strength prior to covering up with soils and application of additional surface live loadings. The top of LCB should be limited to the elevation restrictions identified in the Contract Documents.
5. Contamination. Ensure that proper precautions are in place to protect the surrounding area and special zones (wetlands, live traffic corridors, etc.) from damage due to unwanted flow and migration of LCB materials.

614.2.3 After Construction

Consider the following upon completion of LCB placement:

1. Strength. Setting and early strength may be important where equipment, traffic, or construction loads must be carried. Judge the setting by scraping off loose accumulations of water and fines on top, and see how much force is necessary to cause an indentation in the material. This should be confirmed by proper testing in accordance with the Contract requirements.
2. Future excavations. Care should be taken when excavating into placed LCB materials and adjacent soil areas, as the discontinuity of materials (LCB compared to existing soils) may cause larger masses of similar material to act together, which could pose a safety hazard.
3. As-Built Drawings. The location of LCB used on the project should be accurately documented on as-built records for future reference.

END OF SECTION

SECTION 615 – SIDEWALKS, DRIVE PADS, AND PAVED MEDIANS

615.1 GENERAL

Sidewalks, drive pads, and paved medians will usually be constructed using either concrete, bituminous materials, concrete brick or clay brick. Surface treatments may also be specified in accordance with the intended use, particularly where compliance with ADA requirements is concerned. These project elements are constructed on a solid foundation -- typically sub-grade material -- that has been properly graded and compacted.

615.2 INSPECTION GUIDELINES

615.2.1 Before Construction

615.2.1.1 Sub-grade

Check the cross-slope, elevation, density, and alignment of the sub-grade for compliance. Where base course material is required, ensure that the required type and depth of material is properly placed, shaped, and compacted. Check for soft spots, and enforce the Contract provisions with respect to needed repairs. All formwork should be measured for compliance with required dimensions.

615.2.1.2 Curb Ramps

Review the location and construction details of curb ramps that are designated in the Contract. Attention should be given to the configuration, slope, and surface-finishing requirements of curb ramps that require compliance with ADA criteria. A textured surface finish is typically required, and field adjustments may be needed to meet slope requirements. Review the locations of the drainage structures to ensure that new drainage structures are not aligned with curb ramps.

615.2.1.3 ADA-compliant Ramp Inspection Protocol

Several ramp configurations can be used for providing ADA-compliant access, each requiring strict conformance to the dimensions, elevations, and slopes established for that particular configuration as described below.

<u>Type "A" Ramps or Type "D" Curb Ramps</u>

Running and cross slopes of the ramp and the top landing should be measured approximately 1 foot from each edge, along the edges of the planar surface as shown in Figure 1 below. In addition, a running slope and cross slope should be measured in the center of each element. The running slopes of the left and right flares should be measured parallel to the curb approximately 1 foot from the curb face (see Figure 1).

The following are measurements that should be taken (see Figure 2 for ramp orientation):

1. Running slope of ramp
2. Cross slope of ramp
3. Running slope of left flare
4. Running slope of right flare
5. Running slope of top landing
6. Cross slope of top landing
7. Running slope of left sidewalk
8. Cross slope of left sidewalk
9. Running slope of right sidewalk
10. Cross slope of right sidewalk
11. Gutter counter-slope
12. Width of ramp
13. Length of top landing
14. Vertical elevation differences
15. Length of bottom landing within crosswalk if striped; or outside of travel lane if un-striped
16. If Pedestrian Push Button (PPB) present:
    a. Height of PPB
    b. Distance from 30 inches by 48 inches level area to PPB
    c. Running slope of level area
    d. Cross slope of level area

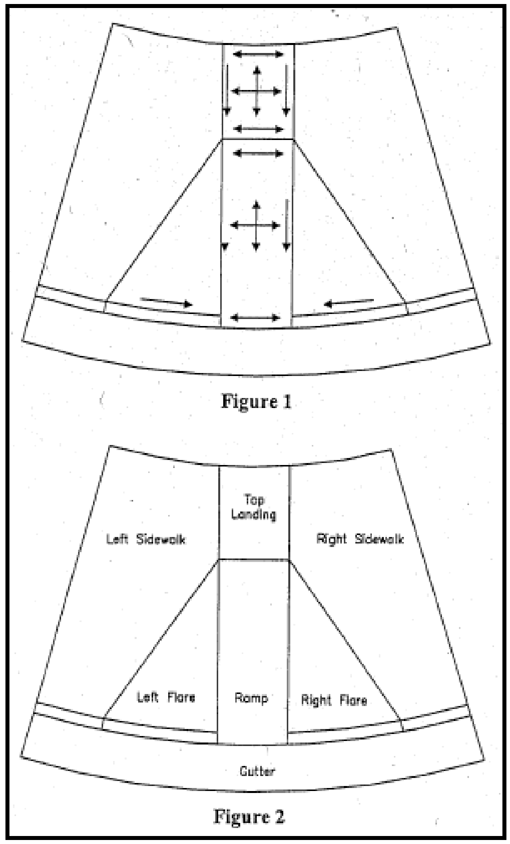

Figure 1

Figure 2

<u>Type "B" Curb Ramp</u>

Running and cross slopes of each element should be measured approximately 1 foot from each edge, along the edges of the planar surface as shown in Figure 3. In addition, a running slope and cross slope should be measured in the center of each element (see Figure 3). The following are the measurements that should be taken (see Figure 4 for ramp orientation):

1. Running slope of bottom landing
2. Cross slope of bottom landing
3. Running slope of left ramp
4. Cross slope of left ramp
5. Running slope of right ramp
6. Cross slope of right ramp
7. Running slope of left sidewalk
8. Cross slope of left sidewalk
9. Running slope of right sidewalk
10. Cross slope of right sidewalk
11. Gutter counter-slope
12. Width of bottom landing
13. Vertical elevation differences
14. Width of pedestrian path within crosswalk if striped; or outside of travel lane if un-striped
15. If PPB present:
    a. Height of PPB
    b. Distance from 30 inches by 48 inches level area to PPB
    c. Running slope of level area
    d. Cross slope of level area

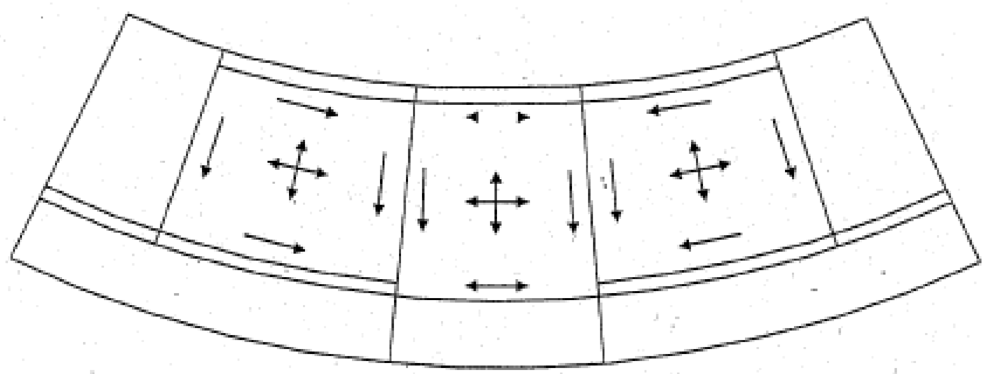

Figure 3

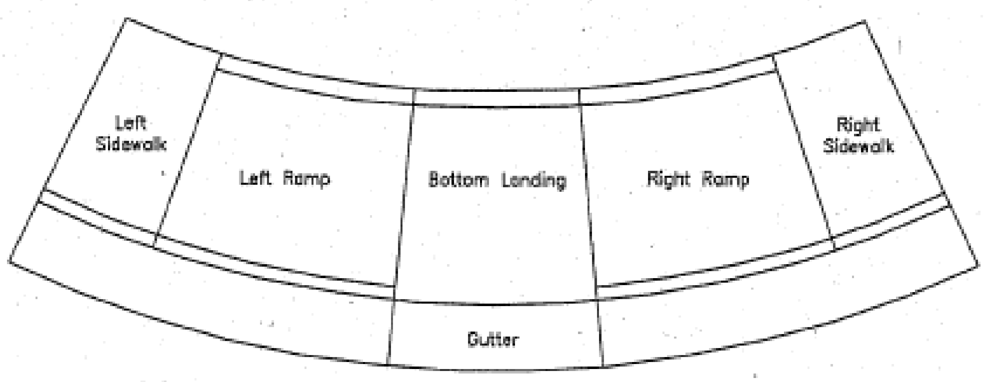

Figure 4

Type "B" (Truncated) Curb Ramp

Running and cross slopes of the bottom ramp, middle landing, and left and right ramps should be measured approximately 1 foot from each edge, along the edges of the planar surface as shown in Figure 5. In addition, a running slope and cross slope should be measured in the center of each element. Running slopes of the left and right flares should be measured parallel to the curb approximately 1 foot from the curb face (see Figure 5). The following are the measurements that should be taken (see Figure 6 for ramp orientation):

1. Running slope of bottom ramp
2. Cross slope of bottom ramp
3. Running slope of left flare
4. Running slope of right flare
5. Running slope of middle landing
6. Cross slope of middle landing

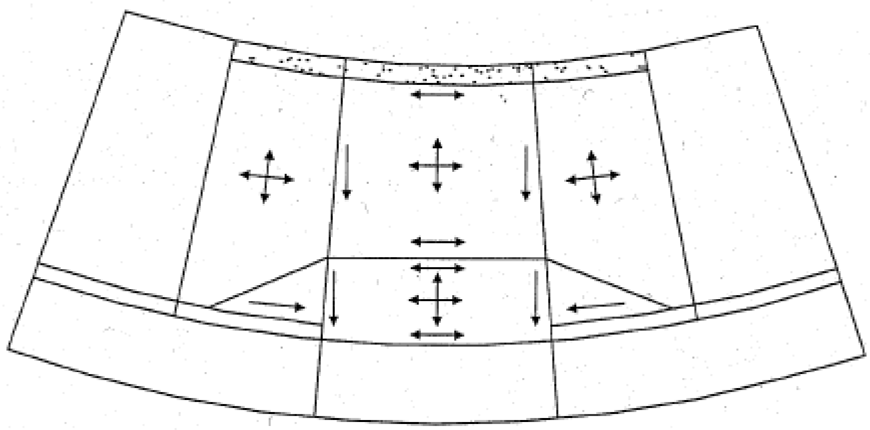

Figure 5

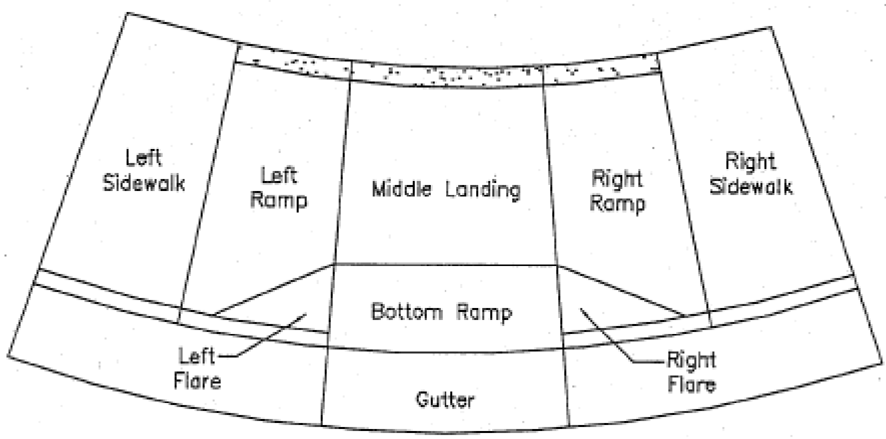

Figure 6

7. Running slope of left ramp
8. Cross slope of left ramp
9. Running slope of right ramp
10. Cross slope of right ramp
11. Running slope of left sidewalk
12. Cross slope of left sidewalk
13. Running slope of right sidewalk
14. Cross slope of right sidewalk
15. Gutter counter-slope
16. Width of middle landing
17. Length of middle landing
18. Vertical elevation differences
19. Length of bottom landing within crosswalk if striped; or outside of travel lane if un-striped
20. If PPB present:
    a. Height of PPB
    b. Distance from 30 inches by 48 inches level area to PPB
    c. Running slope of level area
    d. Cross slope of level area

615.2.1.4 Concrete Materials and Equipment

Where concrete will be used for construction, check that the concrete complies with the specified class and that the mix design has been approved. Verify that the specified sampling and testing requirements are being met. Where reinforcing steel is required, check to ensure that the reinforcement is of the proper type and size. Check the type, number, and condition of equipment that will be used to place, consolidate, finish, and cure the concrete. Where forms are used, ensure that they are in good condition and of the proper type and dimension. Where slip-forming is used, check the slip-forming equipment for acceptability in terms of ability to produce a uniform product in both form and finish. Verify that the Contractor has adequate materials on hand to properly cure and, as needed, protect the concrete during hot and/or rainy weather.

615.2.1.5 Bituminous Materials and Equipment

Where bituminous materials will be used for sidewalks and bikeways, check materials for conformance and that the mix design has been approved. Verify that the specified sampling and testing requirements are being met. Check the type, number, and condition of equipment that will be used to place and compact the mix. Where it is impractical to use standard paving equipment, verify that the Contractor's proposed alternative methods have been accepted.

615.2.2 During Construction

615.2.2.1 Concrete Sidewalks

Consider the following guidelines during the construction of concrete sidewalks:

1. Forms. Where forms are used, check that they are set to the proper line and elevation with respect to grade stakes, and that they are firmly staked into position. Pay particular attention to how the forms are set with respect to locations of inlet sections, curb ramps, and driveways, and make adjustments where needed. Verify that the forms are set to accommodate drainage. Prior to placement of the concrete, verify that the forms are treated with an approved release agent. All formwork installed should be measured for compliance with required dimensions.
2. Reinforcement. Where reinforcing steel is required, check spacing, clearance, and supports for acceptability.
3. Moistening of Sub-grade. Verify that the forms and sub-grade have been thoroughly moistened before the placement of concrete, avoiding standing water at the time of placement. All loose and disturbed sub-grades that cannot be reconditioned and/or re-compacted prior to concrete placement should be removed, and the resultant depression replaced with concrete during the normal placement operation.
4. Placement and Consolidation. Check for the proper placement and consolidation of concrete. Where slip-forming is used, check that the grade has been trimmed to the correct line, cross-slope, and elevation. Check grade stakes, grade line, and electronic controls for proper adjustment, including locations of inlet sections, curb ramps, and driveways. Regularly check alignment, elevation, and cross-slope during slip-forming, and ensure that the extruded section conforms to a typical section.
5. Joints. Check that transverse expansion joints and saw cuts are located and constructed properly. Joint types and locations should match those in adjacent concrete. Verify that where sawed contraction joints are required, they are installed in a timely manner to avoid unacceptable and uncontrolled shrinkage cracking from occurring. Check that approved expansion material is placed to full depth in the expansion joints. Verify that edging is performed, where required.
6. Finishing. Check the acceptability of the surface finish. Pay particular attention to texturing requirements, such as ADA curb ramps. Ideally, the finishing operation should be accomplished without the use of additional water. Special attention should be given to the surface finish requirements for ADA compliance, along with the installation of a tactile surface, as required.
7. Curing. Verify that the concrete is properly cured for the specified curing period. Where the curing compound is used, check that it is of an approved type and that the rate and time of application are acceptable. Verify that the Contactor prepares

and documents an acceptable curing and protection method statement prior to placement activities.

8. Protection. Verify that the Contractor protects the concrete sidewalks and bikeways for the specified time period from environmental factors and unauthorized use and access prior to achieving the required strengths.
9. Form Removal and Backfill. Form removal and backfill must not be started until the concrete has reached sufficient strength to withstand damage. Verify the edges are adequately shouldered and the Contractor uses the appropriate equipment and procedures to avoid damage to the completed work. Watch for damage to the concrete during the backfill operation, and instruct the Contractor as necessary should the potential for damage occur.

615.2.2.2 Bituminous Sidewalks

Check the alignment, elevation, depth, and cross-slope of the base course material and document that it has been thoroughly compacted and is at the proper grade. Verify that the correct mix is being used. Where tack coat is specified, check that a proper type of bituminous material is being applied at the specified rate. Monitor the operation for proper mix placement and ensure that full compaction is being achieved.

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SECTION 616 – SLOPE PAVING

616.1 GENERAL

Slope and ditch paving is used primarily for erosion and sedimentation control, but it also offers a neater appearance over other treatments, especially on slopes around major structures. The Inspector must verify that the construction of slope paving is in compliance with the Contract, and follows the slope paving criteria discussed in this section.

616.2 INSPECTION GUIDELINES

616.2.1 Before Construction

Before slope and ditch paving begins, consider the following guidelines:

1. Contract Plans and Specifications. Review the Contract and pay particular attention to the location, limits, depth, and type of paving required.
2. Materials. The materials required for the work will depend on the type of paving specified, which may include concrete, reinforcing steel, grout, bituminous material, riprap, and rubble. Check the required materials such as type, class, size, classification, and gradation for compliance.
3. Surface Preparation/Excavation. Verify that the area to be treated is properly prepared. Check the toe or cut-off wall excavation for compliance. Where unsuitable soil material is encountered, it may be necessary to replace the material.

616.2.2 During Construction

616.2.2.1 Concrete Paving

Where concrete slope and ditch paving is specified, check the mixing and placement of concrete for conformance. To enforce the Contract provisions for slip-form and hand placement methods, pay particular attention to the designated paving thickness and what the Contractor proposes. Where required, check the acceptability of forms and the placement of reinforcing steel. Monitor the depth of paving for compliance, and verify that expansion joint materials, where required, are placed at the proper thickness and location. Verify compliance with requirements for inclement weather paving; curing method and materials; surface moisture; and curing period.

The construction of slope paving is often carried out in sections for ease of forming, concrete placement, and finishing. Pay particular attention to the forms between sequential pours and verify they remain in their proper location. Remove all waste concrete that may have spilled over from the first concrete placement operation.

616.2.2.2 Rubble Paving

Check that larger stones are placed on the lower course. Verify compliance with requirements for total paving thickness and appearance of the final surface. Pay particular attention to oversized stones and protrusions that could present a safety hazard and require immediate corrective action.

616.2.2.3 Grouted-rubble Paving

Where grouted-rubble slope is specified, check the placement of the stones for acceptability. Inspect the joints prior to grouting and require cleaning, as needed, to remove soil and debris. Verify that the elapsed time between grout mixing and placement does not exceed specified limits. Check that all joints are properly grouted and that the grout is kept moist for the required curing period. This is especially important during hot, dry, and windy conditions. Verify that the final surface is swept to expose the faces of the rocks without removing grout from the joints.

The intent of this method of construction is to place grout beneath and in between stones, and to avoid conditions where the grout comes into contact with the surface of stones that are to be left exposed. A small diameter hand-manipulated placement hose may be the optimum method of grout placement to achieve the desired results.

616.2.2.4 Grouted-riprap Paving

Where grouted-riprap slope and ditch paving is specified, verify that the riprap material is properly placed. Where required, check weep holes with respect to bedding, pipe, geotextile fabric, and rock cover. Verify that the elapsed time between mixing and placement of concrete mortar does not exceed specified limits, and do not permit mortar to be applied during inclement weather without proper protective measures in place. Verify the use of pencil vibrators between rocks, and inspect mortar penetration for acceptability. Verify that the top layer of the exposed rock is properly cleaned and is the required height above the mortar. Check to ensure that the concrete mortar is properly finished and cured.

The intent of this method of construction is to place grout beneath and in between the riprap, and to avoid conditions where the grout comes into contact with surfaces that are to be left exposed. A small diameter hand-manipulated placement hose may be the optimum method of grout placement to achieve the desired results.

616.2.3 After Construction

After construction, verify that excavated areas that were not paved are properly backfilled with acceptable material and compacted and graded to the level of the original ground.

END OF SECTION

SECTION 617 - GUARDRAILS

617.1 GENERAL

Where guardrail systems are warranted, they are installed to prevent errant vehicles from leaving the traveled way and moving into fixed objects, steep slide slopes, and opposing traffic. Different types of designs exist to address specific conditions.

617.2 INSPECTION GUIDELINES

617.2.1 Before Construction

Consider the following guidelines before installing guardrail systems:

1. Materials Considerations. Check the type of rail system for conformance, including rail sections, hardware, and posts.
2. Location. Verify locations. Check lateral off-set, longitudinal length, termini location, post spacing, rail curvature, parabolic flares, and special features, where applicable.
3. Installation. Verify that adequate traffic control plans and safety precautions are in place prior to the start of work. All manufacturers' installation drawings and requirements should be available on site, together with the Contract plans and any approved shop drawings for the installation.

617.2.2 During Construction

Consider the following guidelines during the construction of guardrail systems:

1. Guardrail Post Installation. Unless designated otherwise, guardrail posts may be driven in place, set in dug holes, or set on a concrete base. Check the post spacing, elevation, and alignment for conformance to the plans. Where posts are driven, watch for irregular movement, possibly indicating an underground obstruction. Check driven posts for damage such as distortion and burring. Where posts are set in dug holes, watch for over-drilling, and require backfilling and compaction as needed to adjust depth and provide a firm foundation. After setting, verify that the backfill material is placed and compacted in layers around the posts. Check that all posts are set firm and plumb, and that they are within tolerance of the required alignment and elevation.
2. Installation of Rail Sections. Check that all fittings and metal plates are securely placed in the correct position, and that rail sections are properly lapped in a smooth, continuous installation. Check that all bolts required to be installed are drawn tight, unless specific locations are identified to allow controlled slippage. Check the rail height and rail face (i.e., with respect to lateral offset and alignment) for conformance and any needed adjustment.
3. Terminals and Transitions. Pay particular attention to the construction details for end treatments, median terminals, and rail transitions (e.g., post type, post spacing, number of rail sections, lapping direction, splices, method of connecting, fastener type, and

reflector tab location). Specialized hardware and designs are commonly used at these locations and require close inspection prior to acceptance.

4. Dissimilar Metals. Where dissimilar metals contact each other, ensure that the surfaces are separated by an approved protective coating or spacer.
5. Traffic Considerations. Where the facility will be maintained open to traffic, it is good construction practice for the installation of rail sections to closely follow the installation of guardrail posts. At the end of the workday, check to ensure that the termini of exposed rail sections are treated as specified. Inspect partially-completed installations to ensure that adequate temporary end treatments are in place for the safety of the travelling public.

END OF SECTION

SECTION 618 – CONCRETE BARRIERS AND PRECAST GUARDWALLS

618.1 GENERAL

Where concrete barriers or guardwalls are warranted, they are installed to prevent errant vehicles from leaving the traveled way and moving into fixed objects, steep slide slopes, and opposing traffic. Different types of designs exist to address specific conditions.

618.2 INSPECTION GUIDELINES

618.2.1 Before Construction

Consider the following guidelines before installing concrete barriers or guardwalls:

1. Materials Considerations. The concrete mix designs and aggregate source must be reviewed and approved prior to use in constructing concrete barriers or guardwalls.
2. Fabrication. For precast concrete guardwalls a full size sample and test section is required.
3. Location. Verify that staking information complies with the intended layout and alignment, and that termination or tie-in points are correctly located. Review the site conditions for potential hazardous obstructions that would warrant an adjustment or extension of the proposed barrier or guardwall.
4. Installation. Verify that adequate traffic control and safety precautions have been developed prior to the start of work, by analysis of the work zone hazards. All fabrication drawings and requirements should be available, together with the Contract plans and any approved shop drawings for the installation.
5. Fabrication Sample. Verify that the fabrication sample of pre-cast elements is acceptable and is readily accessible for comparison and compliance to production quality fabrication.

618.2.2 During Construction

Refer to the Contract specifications and Sections 552 Structural Concrete and 554 Reinforcing Steel of this CMIS Manual, which provide additional information for this particular work element. Consider the following guidelines during the construction of concrete barriers and guardwalls:

1. Concrete Barrier Rail. Concrete barrier rail may be either pre-cast, slip-formed, or cast-in-place. Check the lines and grades for conformance and ensure that the base is properly prepared before the barrier is placed. At transitions, check the connection hardware for conformance, and verify that it is properly installed. Verify that cast-in-place and pre-cast barriers are given a specified finish. Verify that crack control and expansion joints are properly installed at the correct locations and spacing, and that

they conform to the specific details in the plans. Check that lift holes are properly filled and sealed. Verify that the barrier is checked with a straightedge in the longitudinal direction and corrected where out of tolerance.

2. Pre-cast Guardwalls. Monitor production at the fabrication facilities, as well as transport and installation operations, to ensure continual compliance with Contract requirements. Inspect the preparation of the base for adequacy in supporting the pre-cast units once installed.

3. Traffic Considerations. Where the facility will be maintained open to traffic, efforts should be made to confine construction activities to within a limited length of roadway. Check that the work zone is thoroughly restored and cleared of debris prior to re-opening it to traffic. At the end of the workday, check that the termini of barrier or guardwall sections exposed to oncoming traffic are adequately protected and can operate safely.

618.2.3 After Construction

Observe the installations after construction/installation, noting any deficiencies that may have developed which require the Contractor's actions to rectify. Items to be aware of include shifts in alignment that may indicate inadequate support, damage due to vehicle impact that poses a safety risk, or defects in the materials used or finishes applied.

END OF SECTION

SECTION 619 – FENCES, GATES, AND CATTLE GUARDS

FENCES AND GATES

619.1 GENERAL

Fences and gates are generally placed along and within DPW's right-of-way, but can also be detailed and installed at other locations as specified in the contract.

619.2 INSPECTION GUIDELINES

619.2.1 Before Construction

Consider the following guidelines before the installation of fencing begins:

1. Agreements. Check the right-of-way agreements for special fence requirements.
2. Material Considerations. Know the required type of fencing and gates. Check the material certifications for compliance and document the material condition. Check the weight, length, and coating of steel posts, fabric, and accessories for acceptability. Verify that barbed and woven-wire fabric rolls are tagged with the required information. Check the hardware for conformance. Concrete used for fence installations should comply with the contract requirements. The use of field-mixed concrete requires previous approval.
3. Staking. Check that the staked alignment is approximately 6 inches inside of DPW's right-of-way, unless otherwise specified, and that the post spacing is properly marked.
4. Temporary Fence. Verify if temporary fencing is required for conditions such as stock control, pedestrian safety, and wetlands protection.

619.2.2 During Construction

Regularly check line, grade, and post spacing, and consider the following guidelines during the installation of fencing:

1. Existing Boundary Monuments. Ensure that existing survey and monument points that could be damaged during fence construction are adequately protected and/or temporarily referenced for re-installation.
2. Clearing and leveling. Check that the contractor has adequately cleared and leveled with minimal disturbance to the terrain outside of where the fence will be placed.
3. Posts. Check that posts are set at the proper spacing and to the proper depth.
4. Corner and Line Brace Posts. Check for properly located corner and line brace posts. Verify that line braces have been installed where needed for grade changes. Check that the posts are adequately supported to eliminate movement during concrete placement/curing.

5. Concrete Curing. Concrete must be allowed to set sufficiently around posts and braces. Verify that the concrete has the required strength before the fabric or wire is stretched.
6. Wire/Fabric. Know which side of the post the fence fabric or wire is to be installed. Check that the fence fabric or wire is properly stretched and fastened.

619.2.3 After Construction

1. Verify that no advertising tags or signs are placed on fencing or within the right-of-way.
2. All temporary supports and materials should be removed and disposed of off site.
3. All necessary surface clean-up, re-grading, and restoration is completed.

CATTLE GUARDS

619.3 GENERAL

Cattle guards may be either pre-cast or cast-in-place, combined with other steel elements. The Contract will designate the location and type to be constructed, and each cattle guard must be constructed in accordance with the Contract specifications.

619.4 INSPECTION GUIDELINES

Cattle guards must be carefully constructed to the specified grade and cross-slope to provide a smooth riding surface and a well-drained facility. Ensure that bumps, ponding, and other errors in elevation are properly corrected. Consider the following guidelines:

1. Material Certification. Verify that all required material certifications have been obtained and that they reflect proper materials.
2. Concrete Foundation. Verify that the concrete foundation is placed, finished, and cured in accordance with the contract requirements.
3. Wings. Steel materials that are used in wings of cattle guards must conform to the contract requirements. Verify that posts are the correct size and type.
4. Backfill. Verify that backfill material is properly placed and compacted to the correct grade and cross-slope.

END OF SECTION

SECTION 621 – MONUMENTS AND MARKERS

621.1 GENERAL

All property monuments, survey control points, and boundary markers that are within the limits of disturbance, both inside and outside of the right-of-way should be adequately protected and/or re-located/re-established in order to maintain their validation and functional use at the conclusion of the project.

621.2 INSPECTION GUIDELINES

621.2.1 Before Construction

Before work begins, consider the following guidelines:

1. Contract Plans and Specifications. Review all Contract Documents regarding the location and type of survey monuments known to exist within the project limits.
2. Right-of-way Plans. Consult with DPW's Right-of-Way Department to review all right-of-way information for the project and discuss any particular issues that may exist.
3. When a street is to be reconstructed, a thorough search should be made for existing intersection monuments, prior to any excavation. Monuments should be perpetuated by standard survey methods.
4. All monuments that are to remain undisturbed during construction should be clearly identified in the field and adequately protected from damage, both by movement of surrounding supporting soils and from construction equipment and materials.
5. Planning. All pre-activity meetings should include a discussion of any monuments that could be affected by the construction activity.

621.2.2 During Construction

Consider the following guidelines during the work to protect, transfer, and re-establish survey and property monumentation:

1. Protection. Ensure that the identification and protection measures to be installed around existing monumentation to remain in place are in place, and are being honored by the construction forces. Report all observed damage or risky operations that pose potential damage to the credibility of the monument condition.
2. Temporary relocation. All temporary reference/tie points installed for use to re-establish monuments in conflict with the construction operations should be placed outside of the influence of construction activities, whenever possible. Alternatively, temporary reference/tie points that must remain within the construction zone should be protected in the same fashion as described in Item 1 above.

621.2.3 After Construction

All temporarily relocated monuments should be re-established once the construction in the immediate area is complete and the threat of damage by follow-on construction operations no longer exists. A validation survey should be carried out by a registered professional surveyor to document the exact coordinate location and elevation of all monuments within the limits of the project and the surrounding areas influenced by the construction operations. All temporary protection and cross-tie reference points should be removed and the area restored to DPW's satisfaction.

END OF SECTION

SECTION 624 – TOPSOIL

624.1 GENERAL

Topsoil is placed on the final surface of cut slopes and fill slopes to promote the reestablishment of vegetation.

624.2 INSPECTION GUIDELINES

624.2.1 During Construction

Consider the following guidelines during the topsoil operation:

1. Objectionable Material. Check for the proper removal of debris, roots, heavy clay, hard clods, brush, toxic substances, and stones larger than six inches from the area requiring topsoil. Check topsoil at the site for compliance with the specifications. If noxious weeds, seeds, or reproductive vegetative plant parts are present, the topsoil should not be used.
2. Tilling/Scarification. Verify that tilling or scarification is being performed at the specified depth. Check for cross-tilling, where required. Verify that topsoil is not applied over un-tilled or un-scarified areas.
3. Distribution. Check that the Contractor is evenly distributing the topsoil at the specified depth.
4. Compaction. Check the acceptability of the compaction operation. Over-compaction is unacceptable.
5. Grading. Check the grades and make certain that provisions are made for adequately draining surface water, especially away from buildings and other improved structures. Check the finished grade for conformance with the specifications and tolerances.

624.2.2 After Construction

Check the Stormwater Management Plan in the Contract plans for the erosion and sedimentation control BMPs that are required upon completing the placement of topsoil.

END OF SECTION

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SECTION 625 – TURF ESTABLISHMENT

625.1 GENERAL

Seed, fertilizing, and sodding may be specified for both landscaping and erosion and sedimentation control purposes. For landscapes to be successful, proper topsoil preparation, adequate fertilization, healthy plants, quality seed material, judicious watering, and proper follow-up care must be performed.

625.2 INSPECTION GUIDELINES

625.2.1 Before Construction

Consider the following guidelines before seeding, fertilizing, and sodding are performed:

1. Seed Material. Verify the mixture, names, purity, germination, weed content, and the date of the last test on the seed labels for compliance. Retain seed labels and vendor statements for the project records. Verify the certification requirements (i.e., Contractor-furnished and laboratory tests), and that the pure-live-seed content has been determined based on the formula in the Contract specifications. Check the condition of the seed for water, insect, and mold damage. Enforce the provisions of the Contract with respect to rejection, and ensure the mixture is free from noxious weeds.
2. Fertilizer Material. Check the bag label for compliance with respect to mixture type (e.g. pellet or granular), percent, and class, and retain the labels for the project records. Check the certification requirements (e.g., Contractor-furnished and soil tests). Verify that the fertilizer is delivered in unopened containers.
3. Seeding Coverage. Check the coverage of seeding.
4. Surface Preparation. Spot-check the prepared soil to ensure that the specified depth, has been prepared as required.
5. Application Rate. Know the application rate of the seed, fertilizer, and water for the operation.
6. Seasonal and Geographical Location Considerations. Verify the season of the year and the geographical location for compliance with respect to seeding, planting, etc.
7. Watering/Maintenance. Know if water and maintenance are required. If specified, ensure that the irrigation or sprinkler system is completed and inspected.

625.2.2 During Construction

Consider the following guidelines during seeding, fertilizing, and sodding:

1. Application Rates. Check for even distribution and rate of application for seed, fertilizer, water, etc. Check coverage of seed in remote areas.
2. High Wind. Watch for loss of seed and fertilizer in high winds and, as necessary, postpone application.

3. Quantity Checks. Check the total quantities of pure live seed and fertilizer used against the acreage covered. Retain empty bags until the number is recorded.
4. Drill Seeding. Verify that drill seeding is being performed at right angles to the slope. The seed should be drilled or sown to provide the required cover.
5. Fertilizer Treatment. Verify that the fertilizer is being worked into the top of the soil as specified.
6. Mulching. Where mulching is required, verify that it is being applied at the application rates specified in the contract.
9. Maintenance. Seeded areas should be inspected frequently. Areas with failures should be repaired and re-seeded as specified.

625.2.3 After Construction

Check the Contract specifications for landscape maintenance requirements.

END OF SECTION

SECTION 626 – PLANTS, TREES, SHRUBS, VINES, AND GROUNDCOVERS

626.1 GENERAL

Planting may be specified on projects for both landscaping and erosion and sedimentation control purposes.

626.2 INSPECTION GUIDELINES

626.2.1 Before Construction

Consider the following guidelines before the planting operation begins:

1. Planting Layout. Understand the planting layout included in the Contract.
2. Utilities. Verify that planting locations have been properly coordinated with existing utilities, and any utilities that will be adjusted or relocated. Also consider any proposed utilities.
3. Plant Types. Check that plants have been properly labeled regarding species and variety with respect to the requirements of the Contract plans. Verify that the specified types and sizes are provided according to the Plant List in the Contract.
4. Plant Condition. Check the quality and size of the plants against the requirements in the *American Standards for Nursery Stock*, the Contract plan tabulations, and the Contract specifications. Verify that the plants supplied are healthy, with well-developed branch and root systems. Reject all plants where the roots have become dry or damaged, and check the foliage for wilting or dryness. Observe any obvious signs of insect or other damage. Verify balled and burlapped plants for a solid ball that conforms to the specified dimensions, and check for broken, cracked, soft, or pliable balls. Such types of damage are grounds for rejection.
5. Certification. Check the plants, trees, shrubs, vines, and ground cover for compliance. Check the certificates of inspection for plants, trees, and shrubs (e.g., inspected at nursery and Contractor-furnished samples), and retain the certificates for the project records. Do not accept plants without certificates.
6. Season. Check that the planting will be performed during the appropriate season. Verify whether the plants should be balled and burlapped or container-grown.

626.2.2 During Construction

Consider the following guidelines during the planting operation:

1. Shipping/Handling. Check that the shipping and handling of plants meets the specified requirements, and check for any damage caused by shipping and handling.
2. Plant Location. Check that trees and shrubs are planted according to the Contract plans, especially with regard to the required roadway clear zone and sight distance.

Check for any conflicts with utilities or underground and overhanging structures, and relocate plants, when necessary.

3. Ground/Plant Preparation. Verify that the soil has been properly prepared with the proper type and quantity of soil conditioner and fertilizer. Check that the type of material used for this purpose has been properly approved. Check the depth and diameter of the planting hole and the spacing in beds. Topsoil and soil preparation are generally rototilled prior to planting ground cover type plants.
4. Plant Preparation. Observe the preparation of plants. Plants must be prepared according to specified requirements (e.g., soaked and unwrapped). Pruning must be performed using good tree-surgery practices.
5. Backfill. Check that plants are properly backfilled with the specified soil conditioner and fertilizer. Saucers should be covered with approved moist wood chip mulch.
6. Staking. Verify that the trees are staked as specified, and that the staking locations are based on the prevailing wind direction. Check that the operation is being performed without damage to the tree, such as damage from guy wires, and that the tree trunks are wrapped as required.
7. Maintenance. Verify that the Contractor provided for watering and maintenance of the plants as specified in the Contract.

626.2.3 After Construction

Check the Contract requirements for maintenance requirements and plant establishment requirements.

END OF SECTION

SECTION 629 – ROLLED EROSION CONTROL PRODUCTS AND CELLULAR CONFINEMENT SYSTEMS

629.1 GENERAL

Soil retention covering is specified on projects for the purpose of erosion and sedimentation control. Blankets are used to stabilize the soil and protect it from the impact of rain and overland flow or runoff. Areas to be treated will be designated in the Contract plans.

629.2 INSPECTION GUIDELINES

629.2.1 Before Construction

Consider the following guidelines before soil retention covering is placed:

1. Contract Plans and Specifications. Review the Contract specifications for the type of materials to be used and any special requirements of the operation.
2. Marking/Staking. Verify that areas to be treated have been properly marked or staked. Ensure that the Contractor fully understands the limits of treatment.

629.2.2 During Construction

During construction, verify that the blanket material conforms to the specified requirements and is placed in the areas designated for treatment. Verify the correct placement of blankets with respect to unrolling and overlapping requirements. Check that the blankets are being maintained properly.

END OF SECTION

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SECTION 633 – PERMANENT TRAFFIC CONTROL

633.1 GENERAL

Permanent traffic control devices must be installed in accordance with the contract requirements, plans and specifications.

633.2 HIGHWAY SIGNS

633.2.1 Before Construction

Before the installation of highway signs, consider the following guidelines:

1. Material Certifications. Verify that material certifications have been received.
2. Permanent Barricades. Verify if permanent barricades are required.
3. Steel Posts. Check steel post certifications, welding, and coating for acceptability.
4. Hardware. Inspect fastening hardware prior to installation, and verify that bolt heads and washers match the background color of panels and legends, as appropriate. Check that anchor bolts and washers are galvanized.
5. Sign Location. Inspect staked sign locations for compliance with the contract requirements. Check for obstructions to sign visibility. When inspecting sign staking, consider placing signs behind guardrail, where appropriate.
6. Sign Panels. Check for closure strip on vertical seams. Verify that the back side of all panels is stamp-dated, and if masking of sign legends is required.

633.2.2 During Construction

Verify that highway signs are installed in accordance with the contract requirements and the MUTCD. Verify that removal and installation of signs follows a logical sequence to maintaining traffic safety.

633.2.2.1 Post Installation

Consider the following guidelines during installation of highway sign posts:

1. Footings. Verify that concrete, reinforcing steel, and backfill for footings conform to the specified requirements.
2. Posts. Check for correct type and size of posts. Verify if modifications to existing posts are required.
3. Plate Bolts. Check torque on breakaway and fuse plate bolts.
4. Breakaway Assembly. Check the ground level with reference to the top of the footing. Clearance of the breakaway assembly is critical. Check the breakaway holes for spacing and diameter on 6-inch by 6-inch timber posts.

5. Vertical Alignment. Ensure that all posts are plumb.
6. Post Embedment. Verify that post embedment is proper for the post size.

633.2.2.2 Sign Panels

Consider the following guidelines during installation of sign panels:

1. Illumination. Verify if sign illumination is required.
2. Sign Panels. Check for the correct type and size of panels. Verify if modifications to existing sign legends are required. Inspect for cleanliness and general appearance.
3. Angular Placement. Inspect the angle of sign placement to the roadway for compliance.
4. Height and Clearance. Check for proper height above the edge of the traveled way and the proper vertical and horizontal clearance of the sign panel.

633.3 OVERHEAD SIGN STRUCTURES

633.3.1 General Considerations

Overhead sign structures have a substructure component constructed of reinforced concrete, and a superstructure component typically constructed of structural steel. In most cases, the substructure is a drilled caisson with anchor bolts that project from the top of the foundation to connect with the superstructure. Drilled caissons are designed to provide support for the overhead sign from structurally-stable soil. It is essential that the anchor bolts are accurately located, have the proper orientation, and project the specified length from the top of the foundation. It is important to examine the proposed overhead sign location for acceptability, and inspect the soil conditions to ensure they are as described in the Caisson Drilling and Installation Notes in the Contract.

633.3.2 Shop Drawings/Fabrication Inspection

Shop drawings are required for sign structures. Upon receipt of the drawings, the PE will forward them to the Design Engineer for review. Once reviewed and accepted, the drawings will be returned to the PE. The PE will perform a thorough field inspection of the fabricated structure and report the fabrication's acceptability, in combination with fabrication inspections that may have been conducted. The Inspector must have a thorough understanding of the shop drawings, and the drawings must be readily accessible at all times. Whenever the Contractor is working, the Inspector should actively monitor erection and assembly to ensure compliance, and report any problems. Significant problems may warrant stoppage of work until the structure's Design Engineer can review the situation and evaluate solutions.

633.3.3 Substructure Considerations

Before construction, verify that the ground surrounding the sub-structure is well-drained, and that the overhead sign will have the minimum vertical clearance required above the finished roadway surface. The inspection guidelines provided in Section 565- Drilled Shafts are also applicable to overhead sign substructures. Consider the following:

1. Anchor Bolts. Check that anchor bolts are accurately located, have the proper orientation, and project the specified length above the top of the drilled caisson concrete. For bridge type overhead signs, verify that anchor bolts are placed so that the distance between the drilled caissons, as referenced between the centerline of anchor bolt groups, complies with that specified on the shop drawings.
2. As-constructed Survey. The Contractor should perform an As-constructed Survey of the substructure as soon as possible after it has been completed. The requirements for the As-constructed Survey are defined in the notes on the plan sheets for the overhead sign.

633.3.4 Superstructure Considerations

Bolted connections are used to connect the superstructure to the substructure, and to fasten structural elements within the superstructure itself. Bolts must be tightened as specified without gaps between connection plates and without over-tightening. Consider the following during erection of overhead sign structures:

1. Bolt Tightening. Verify that bolts in field splices are tightened in an incremental and progressive manner. This must be performed while the splice connections are not carrying load. To create this no-load condition, a crane will be necessary to lift the fabricated components during tightening.
2. Over-tightening. Do not permit the over-tightening of bolts to close non-designated gaps, or where such action will distort steel components.
3. Adjustment and Leveling. Once erected, the anchor and leveling nuts may require adjustment to level the sign. When assessing the need for leveling, no external support should be attached to the superstructure; however, during adjustment, a crane may be necessary to lift the superstructure. Verify that the leveling nuts are in contact with the base plate before releasing the overhead sign from the crane and tightening the anchor nuts.
4. Field-Welding. Unless designated, field-welding is not permitted.

END OF SECTION

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SECTION 634 – PERMANENT PAVEMENT MARKINGS

634.1 GENERAL

Pavement marking material and construction requirements are detailed in Section 634 of the Standard Specifications, and placement must be in accordance with the manufacturer's recommendations, the MUTCD, and the Contract Documents.

634.1.1 Surface Preparation and Payment Considerations

Cleaning of the pavement surface prior to applying extruded thermoplastic, epoxy, and pre-formed tape is required. This cleaning should remove oil, dirt, dust, grease, and similar foreign materials, and payment is generally included under the pavement marking item.

634.2 INSPECTION GUIDELINES

634.2.1 Before Construction

Before applying pavement markings, consider the following:

1. Pavement Marking Plan. If the Contract does not include a pavement marking layout, verify that the Contractor has provided a layout of existing conditions for review and approval.
2. Control Points. Check control points to verify compliance with the Pavement Marking Plan.
3. Conflicts. Verify that there are no conflicts between the typical sections, the Pavement Marking Plans, or existing markings.
4. Material. Confirm the type of material such as paint, thermoplastic, or tape to be installed. Check that the material to be installed meets the specifications.
5. Surface Preparation. Verify that the surface is properly cleaned and free of moisture, grease, oil, dirt, and laitance. Check the need for primer and sandblasting.
6. Temperature. Check that the air temperature complies with the specifications.
7. Signing Conflicts. Check for conflicts with highway signing.

634.2.2 During Construction

During the placement of pavement markings, perform regular checks to ensure that the surface is clean and dry. Regularly check completed lines for good workmanship and straightness. Consider the following:

1. Application Procedures. Check application procedures for compliance with the manufacturer's recommendations.

2. Application Rate. Check the application rate of paint, thermoplastics, and epoxies for compliance.
3. Beads. Check that the application rate of beads complies with the specified requirements.
4. Protection. Make sure that adequate cones are used to prevent tracking by vehicular traffic.
5. Full-compliance Markings. Verify the proper application of full-compliance markings at crossovers, detours, and no-passing zones.
6. Conflicting Pavement Markings. Check that conflicting or confusing pavement markings are properly removed.
7. Epoxy Pavement Markings. Verify that Certificates of Compliance have been received and consider the following:
    a. Curing. Check for proper curing of epoxy-marking material.
    b. Component Ratio. Ensure that proper equipment is on hand that is capable of metering components at the correct ratio and able to maintain the material at the correct temperature.
    c. Thickness. Check that the correct thickness of material is applied.
8. Thermoplastic Pavement Marking. Ensure that suitable equipment is on hand to provide proper extrusion, heating, mixing, and control of the flow of material. Consider the following:
    a. Alignment and Size. Check that a continuous uniformity in stripe dimensions and alignment is maintained.
    b. Thickness. Check that the correct thickness of material is applied.
9. Pre-formed Pavement Marking. For the application of pre-formed pavement markings, consider the following:
    a. Existing Pavement. When placed on existing cold pavement, check for a clean, dry, and properly-prepared surface. Verify if sandblasting is required and ensure that primer has been properly applied. Check for the appropriate splicing sequence and roller weight.
    b. Inlay. For hot bituminous inlay placement, ensure that the material is applied in the proper location and sequence on the new mat. Check that the pavement surface is at the recommended temperature to obtain complete inlay.

END OF SECTION

SECTION 635 - TEMPORARY TRAFFIC CONTROL

635.1 GENERAL

Coordination and advance planning by the Contractor, the Contractor's Traffic/Safety Supervisor (TSS), and the PE are required to provide for the safe and efficient maintenance and protection of traffic during construction. Every reasonable and practical effort should be made to reduce hazards and inconvenience to the traveling public, and to adequately protect project personnel at the site. The TCPs and the Alternate Traffic Control Proposals (ATCPs) must address all Contract requirements. DPW and the Contractor's personnel must continually monitor the construction area and immediately report potentially hazardous situations for correction. Construction zone temporary traffic control should be thoroughly addressed at the Pre-construction conference, and should be a topic of discussion at all project and pre-activity meetings.

635.2 TRAFFIC CONTROL PLAN

635.2.1 Overview

The review of the Contract-specific TCP provides for the participation of DPW and the project designer to assist the PE in administering the traffic control aspects of a construction project. This review capitalizes on the experience and expertise of all those with detailed knowledge of the project and its impact on existing traffic requirements. This also applies to ATCPs submitted by the Contractor for consideration/approval.

635.2.2 Implementation Procedures

The objective of the TCP review is to obtain a confirmation of compliance with all project requirements. The following procedure should be used to implement the TCP review:

1. Review Frequency. The PE will perform a joint TCP review every six months on active, long-term projects, as well as prior to each significant change or traffic phase of the project.
2. Reviewers. In addition to the PE, the TCP should be reviewed by the project designer, and the PE of adjacent projects, which may be significantly impacted by the project.
3. Comment Resolution. All reviewer comments need to be summarized and resolved along with documentation of each comment including originator, disposition, and final resolution.

635.2.3 Inspections During Non-working Hours

TCPs that extend beyond single work shifts require night inspections of traffic control. The following guidelines are established to ensure island-wide uniformity:

1. TSS Inspections. The PE is responsible for verifying that the TSS, employed by the Contractor, inspects and documents the work zone traffic control during working and non-working hours for compliance, including nights and weekends.
2. DPW Inspections. The PE should make at least one nighttime inspection upon implementation of a temporary traffic control.

635.2.4 Review of Alternate Traffic Control Proposals (ATCPs)

The PE is responsible for reviewing ATCPs submitted by the Contractor for compliance with all project requirements, including the project's TCP and reference documents such as the MUTCD and proprietary drawings for installed traffic control devices. This review should also verify that the ATCP provides adequate protection for workers, motorists, pedestrians, and bicyclists. Consider the following:

1. Contractor Review. Verify that the ATCP has been reviewed and initialed by the Contractor.
2. Speed Reduction. If a speed reduction is requested, check that the ATCP complies with the conditions of any approval issued by DPW for temporary speed limit reductions.
3. Emergency Vehicle Access. Ensure that there is an adequate plan for emergency vehicle access.
4. Unnecessary Devices/Flaggers. Do not approve an ATCP that includes unnecessary devices or flaggers. Part 6 of the MUTCD specifies the type, number, location, and arrangement of devices and flaggers that are acceptable for use in construction applications. Occasionally, Contractors will propose more devices and flaggers than are warranted, making a false assumption that such practice will provide additional safety. On the contrary, such practice can be a detriment to safety. Too many devices and flaggers can cause confusion, render other control measures ineffective, and exacerbate the hazard potential. If a Contractor insists on using unnecessary traffic control, contact DPW's Traffic Engineer for immediate assistance.
5. Pedestrian and Bicycle Traffic. Verify that the ATCP adequately provides for pedestrian, bicycle, and other non-vehicular traffic. Check that bicycle and recreational trail detours have been correctly identified and signed.
6. Access/Crossovers. Verify that the ATCP adequately provides access for construction and maintenance of traffic, including turnaround locations. Verify that median crossings and crossovers comply with the Contract requirements.
7. Restrictive Clearances. Where the ATCP includes detours and construction activities at bridge structures, the PE should verify that the appropriate signing has been provided, and check for restrictive vertical and lateral clearances. Also consider the following:
   a. Vertical Clearance. If a vertical clearance of less than 16 feet, 6 inches is necessary, verify that the condition is appropriately signed and notify DPW's Maintenance and

Traffic Operations sections immediately to inform them of the restriction. Include the following information:

- Highway number
- Beginning mile post for the restriction
- Ending mile post for the restriction
- Direction of travel that is restricted
- Restriction description (e.g., vertical, lateral)
- Beginning date and approximate time of restriction
- Name and phone number to contact regarding the project restriction

Note that the ending date of the restriction is an approximation. Although, the restriction will not be removed from the report until notification of the end of the project, an estimate assists the permit writers in answering queries about the restriction.

b. Lateral Clearance. If a restriction to the existing lane width or shoulder is necessary, immediately notify DPW's Maintenance and Traffic Operations sections as previously discussed for vertical clearance restrictions.

c. Advance Notice. Provide DPW's Maintenance and Traffic Operations sections with as much advance notice as possible (i.e., at least 72 hours) to properly notify permit holders. Provide a similar notification when the restriction will be lifted followed by a confirmation after the fact.

635.2.5 Responsibilities of the Traffic/Safety Supervisor (TSS)

The TSS is an individual working for or subcontracted to the Contractor, other than the Contractor Superintendent. The TSS is responsible for carrying out the requirements of the Contract, which include the following:

1. ATCP. The TSS should prepare, revise as needed, and implement each ATCP in accordance with the TCP. Each ATCP must designate the traffic control operations and devices necessary for its respective phase of construction. The ATCP must be prepared and submitted on 11-inch by 17-inch paper for convenient use by project personnel. The TSS should provide multiple copies of the ATCP for distribution to DPW along with Contractor/subcontractor personnel who are involved in the construction phase.

2. Communications. The TSS is responsible for providing supervision and management of all traffic control activities on a 24-hour-per-day basis. The required minimum level of communication includes:

   a. Communicate with the Contractor to determine what traffic control measures need to be provided by subcontractors and material suppliers.

   b. Inform local police, fire agencies, and emergency responders of any lane closures or delays. Regular updates are required as operations change.

c. Provide emergency contact numbers of project personnel to local police, fire, and emergency responders. This allows the proper project personnel to be notified in case of an emergency on the project during working and non-working hours.

d. Response Time. During non-working hours, the TSS or authorized designee is required to respond to the site within the time restrictions imposed in the Contract (typically within 45 minutes of notification).

3. Inspections. The TSS is responsible for inspecting traffic control devices for each shift worked on each calendar day they are deployed on the project (removed from storage) regardless if they are in use, masked, or turned away from traffic. These inspections should include at least one night inspection per week. Verify that the proper type and number of traffic control devices are located and arranged as designated on the active ATCP. Check devices for damage, undesirable relocation, and acceptable visibility. Verify that lights and flashing beacons are functioning properly. Supervise the cleaning of devices as frequently as necessary to preserve legibility and retro-reflectivity. All devices must be cleaned a minimum of once every two weeks.

4. Traffic Control Inspection (TCI) Diary. A TCI Diary should be maintained and signed by the person that conducted the inspection (i.e., TSS or certified designee). The TCI Diary needs to contain a statement certifying that all traffic control devices are clean and properly maintained, and include the following information:

   - Date and time of inspection
   - Project number
   - List of flaggers and hours
   - Uniformed traffic control hours used
   - ATCP used
   - Weather conditions
   - Interference with normal traffic flow
   - Detours in use
   - Contract work performed by Contractor and/or subcontractors
   - Work performed by others within the project limits (i.e., utility companies)
   - Significant material deliveries
   - Location of flagging stations and flagging hours
   - Problems encountered and corrections made
   - Crashes or other incidents involving the traveling public
   - Types and quantities of traffic control devices used
   - Maintenance or cleaning performed on the traffic control devices
   - Unusual conditions or problems encountered during the day

5. Project Meetings. The TSS should attend all project pre-activity and scheduling meetings to verify the TSS is properly informed of the planned operations, and develop

an appropriate ATCP. Any conflicts in traffic control between subcontractors should be addressed at project scheduling meetings.

6. Relief Flagging. The TSS should not act as a flagger, except in emergency situations or when it is necessary to relieve the stationed flagger for a period of a half-hour or less (e.g., lunch breaks, rest periods). Relief flagging will be performed only when such action will not interfere with the normal duties of the TSS; otherwise, another flagger must be provided.

635.3 INSPECTION GUIDELINES

The information in the following subsections should be used for guidance in conducting inspections of construction zone traffic control provided by the Contractor, and should be applied as a checklist for compliance.

635.3.1 Traffic Operations and Project Documents

Verify that the following documents are available at the project site:

1. Check that a current version of the MUTCD with up-to-date FHWA revisions is readily available.
2. Verify that the availability of the TCP sheets, installation plans for fabricated devices, and detour plan and profile sheets, where applicable.
3. Inspect traffic control operations for compliance with the approved ATCP. Verify that each ATCP addresses the following:
   a. Approved by the Contractor and DPW for each construction operation
   b. Tabulation of traffic control devices and flaggers
   c. Match layout for location and approved speed limitations
   d. Provide for emergencies, special events, and non-vehicular traffic
   e. Provide for access, median crossings, and turnaround locations
4. Check that current and proper certifications are provided for the TSS and all flaggers.
5. Verify that 24-hour Contractor emergency phone numbers are provided for the TSS and response personnel. Verify that the appropriate emergency numbers are given to the local agencies. As appropriate, contact local law enforcement and request copies of any incident reports occurring within the work zone and traffic control influence area. Review the incident reports and determine if improvements to the TCP/ATCP are warranted.
6. Verify that approval of requested temporary speed limit reductions and ensure a copy of the approval is retained in the project files.
7. Verify that a TCP review is performed and documented in accordance with the frequency required and conditions on the project.

635.3.2 Traffic/Safety Supervisor (TSS)

Verify that the TSS is available on the project as required; is appropriately dressed (e.g., reflectorized clothing at night); and performing/documenting periodic project inspections, day and night, as required. Consider the following:

1. Verify that the TSS has a copy of the relevant project documents, plans, etc. that relate to the traffic control activities on the project.
2. Verify that the TSS possesses a valid TSS certification as well as a current flagger certification, if used as a relief flagger.
3. Verify that night inspections are being conducted and properly documented. Check that device cleaning and maintenance activities are being properly documented.
4. Verify that the TSS is completing a daily diary and properly reporting construction activities, unsafe conditions, traffic incidents, flagging and device quantities for the active ATCP, and any changes implemented and why. Verify that discrepancies, as noted in the diary, have been corrected in a timely manner.

635.3.3 Flaggers

During construction, check the following with respect to flaggers:

1. Verify that current and proper flagger certifications are provided and correspond to the individual deployed.
2. Check the flaggers' dress and equipment to verify compliance with the Standard Specifications and the MUTCD. Pay particular attention to compliance with the following:
    - Hard hat and vest of the proper type of material
    - Correct size and shape of "Stop/Slow" paddle
    - Proper reflectorized clothing and equipment for night operations
3. Check that proper flagging methods are being used.
4. Check the location of the flaggers as follows:
    - Flagger facing oncoming traffic
    - Visible to oncoming traffic
    - Proper distance in advance of the work
    - Flagger station illuminated during night operations

635.3.4 Construction Signing

The ATSSA publication *Quality Standards for Work Zone Traffic Control Devices* may be used as a guideline when inspecting signing and traffic control devices. Inspect construction signing for proper installation and satisfactory conditions. Consider the following:

1. Verify that temporary construction and traffic control signs conform to the Contract and MUTCD, paying particular attention to compliance with the following:
   - Size, shape, and color
   - Retro-reflective sheeting
   - Appropriate location and orientation
2. Verify that signs and devices conform to the TCP and the active ATCP with regard to content.
3. Check that the signs are clean, legible, and in good repair.
4. Check for required breakaway bases on post-mounted signs.
5. Check that temporary signs are properly weighted, mounted, and at the correct height.
6. Signs not in use should be properly stored. Check that signs are:
   - Lying flat, including the base
   - Beyond the shoulder
   - Outside of the normal roadside recovery area
   - Not on landscaped areas or sidewalks
7. Check that conflicting, permanent signs are properly masked.
8. Confirm that sign and barricade sheeting placed on the project is in compliance with the retro-reflective sheeting material requirements. (Refer to FHWA-sponsored publications to facilitate inspection of the proper application of retro-reflective sheeting materials on FHWA-funded projects).

635.3.5 Traffic Control Devices

Traffic control devices are used to warn the traveling public of hazards, advise them of the proper path through the work zone, delineate areas where they may not operate, and separate them from construction workers. The effectiveness of these markings depends on their visibility upon installation and throughout the life of the project. Because it is not practical to require new devices to be installed on each construction project, the ATSSA publication *Quality Standards for Work Zone Traffic Control Devices* can be used for guidance in assessing the quality of traffic control devices used in construction zones. Consider the following during the inspection of traffic control devices:

1. Verify that flashing arrow panels, when identified for use, are in the correct location and are functioning properly. Check flashing arrow panels for:
   - Properly working lights in the correct mode
   - Correct automatic dimming at night
   - Correct panel size mounted at the correct height

2. Verify that channelizing devices conform to the Contract specifications, the MUTCD, the project's TCP, and any active ATCPs. Pay particular attention to the following:
   - Correct dimensions in a clean, serviceable condition
   - Proper retro-reflectorized sheeting or collars
   - Correct placement with proper taper lengths and spacing
   - Proper and functioning warning lights that are set in the correct mode
   - Weighting by acceptable methods
3. Check that temporary concrete barriers are correctly placed with proper treatment at end sections. Pay particular attention to the acceptability of connecting pins and the color and retro-reflectorization of sheeting.
4. Verify that impact attenuators are properly located and installed according to the Contract and manufacturer's recommendations including:
   - Correct weight of proper material placed in each barrel
   - Provisions for preventing filler material from freezing
5. Temporary traffic control devices are subjected to wear during use, storage, shipment, installation, relocation, and removal. A large number of worn devices on a project are unacceptable. The ATSSA publication *Quality Standards for Work Zone Traffic Control Devices* should be used to assess device quality. Such assessments should be made while the devices are in storage before use on the project, during initial set up, and periodically during the life of the project. Require removal and replacement of unacceptable devices in accordance with the Standard Specifications.
6. Flashing beacons, when specified, should be sized in accordance with the signal head lens and wattage specified in the Contract Documents (typically either 12-inch signal head lens with a 150 Watt lamp or 8-inch signal head lens with a 110 Watt lamp). Substitutions are subject to DPW's approval.

635.3.6 Temporary Pavement Markings

Verify that temporary pavement markings meet the requirements of the TCP's and/or the ATCP's Striping Plan and the Contract specifications. Check temporary markings for correct placement in a timely manner, and ensure that conflicting markings have been completely removed. Check that the existing substrate surface has been properly cleaned and prepared in order that temporary striping remains in place throughout its useful life.

635.3.7 Pilot Car Operations

Verify that flaggers and pilot vehicles are properly equipped and located in accordance with the Contract requirements and the MUTCD.

END OF SECTION

SECTION 636 – SIGNALS, LIGHTING, AND ELECTRICAL SYSTEMS

636.1 TRAFFIC SIGNAL SYSTEMS

636.1.1 General Considerations

The supports for traffic signals have a substructure component constructed of concrete; a superstructure component constructed of structural steel; and an electrical system component. The substructure is designed to provide support from structurally stable soil. It is important to examine the proposed location for acceptability, and inspect the soil conditions to ensure they are as described in the Contract. The following types of support systems are typically installed for traffic signals:

1. Span Wire. In span-wire installations, the strain pole is typically placed in a drilled hole, and concrete is poured around the pole for support. Span wire is then strung between the poles once the concrete has hardened.
2. Mast Arm. In mast-arm installations, the substructure is typically a drilled caisson with anchor bolts projecting from the top of the caisson. It is essential that the anchor bolts are accurately located, have the proper orientation, and project from the top of the caisson to the specified length. The pole of the superstructure is connected to the anchor bolts of the substructure using bolted connections. Bolted connections are also used to connect the mast arm to the pole of the superstructure. It is important that all bolts are tightened as specified without over-tightening, and without gaps or spaces between connection plates.

636.1.2 Shop/Working Drawings

The type of drawing submittal necessary is specified on the traffic signal plan sheets.

636.1.3 Substructure Considerations

636.1.3.1 Before Construction

Review the plans and specifications before construction of the substructure begins:

1. Soil. Verify that the soil surrounding the substructure location is well-drained. Bogs and sloughs are undesirable locations, especially where the lower portion of the superstructure will be in a wet or frequently-moist environment. If such conditions are found, prompt notification is required to ensure that the Design Engineer can consider alternatives.

2. Vertical Clearance. Verify that the proposed location will accommodate the minimum required vertical clearance above the roadway surface. Provide immediate notification if

encroached, because the Design Engineer will need to evaluate alternatives such as relocating the substructure or raising its elevation.

3. Survey References. Verify that the Contractor has established adequate survey referencing to locate the center of the bolt circle and pole. Multiple survey reference points are preferred.

4. Utilities. Verify that the Contractor has staked known utility locations, resolved utility conflicts, and coordinated any needed adjustments or relocations.

636.1.3.2 During Construction

Section 565 - Drilled Shafts provides inspection guidance that is applicable to the construction of traffic signal substructures. Consider the following additional guidelines:

1. Drilling Auger. Check the auger diameter used for boring the foundation hole for acceptability.
2. Drilling Operation. During the drilling operation, inspect the soils and provide immediate notification of any discrepancies with the soil specifications in the Contract so that the Design Engineer can assess the situation and consider any needed alternatives. Check the depth of the hole for compliance, and verify that all loose material is removed. On span-wire installations, ensure that crushed rock is placed in the bottom of the hole as specified.
3. Reinforcing Steel. Verify that the reinforcing steel complies with the requirements of Section 554 of the Standard Specifications. Check the bar arrangement and spacing for compliance. Do not permit the welding of reinforcing steel.
4. Concrete Placement. Verify that concrete material and placement, respectively, complies with the requirements of Section 552 of the Standard Specifications.
5. Anchor Bolts. Verify that anchor bolts are accurately located, have the proper orientation, and project the specified length above the top of the drilled caisson concrete. Do not permit the welding of any attachments to the anchor bolts.
6. Concrete Curing. Verify that the concrete at the top of the drilled shaft is cured in accordance with the Standard Specifications or Special Contract Requirements.
7. Cover Plate. Check that cover plates are installed when the pole is erected to prevent intrusion by wildlife.

636.1.4 Superstructure Considerations

636.1.4.1 Span-Wire Installations

For span-wire installations, verify that the strain pole and span wire are installed in compliance with the plans and specifications. The span wire should not have more than a 5 percent sag after loading. Upon completion, ensure that the Contractor furnishes the requisite As-Constructed Plans. **636.1.4.2 Mast-Arm Installations**

Bolted connections are used to connect the pole to the substructure and to connect the mast arm to the traffic signal pole. Bolts must be tightened as specified without gaps between connection plates and without over-tightening. To ensure adequate vertical clearance, the traffic signal pole must be placed such that it is plumb when deflected by the load it carries. Verify that the leveling nuts are in contact with the base plate before the anchor bolt nuts are tightened, and ensure that the anchor and leveling nuts are tightened in accordance with the manufacturer's recommendations. Upon completion, verify that the Contractor furnished the required As-Constructed Plans.

636.1.5 Electrical Considerations

636.1.5.1 Before Construction

Verify that all Certificates of Compliance for materials have been received and checked, and that the Contractor has furnished the required list of materials, equipment, and schematic wiring diagram. Where applicable, verify that provisions have been met to properly coordinate new traffic signals with existing systems.

636.1.5.2 During Construction

The Design Engineer and DPW's Traffic Engineer may be contacted for inspection assistance. During electrical work on traffic signal systems, consider the following:

1. Conductors. Verify that the correct number of active and spare conductors has been provided. Verify that the end of each run is taped until connected. Do not permit the splicing of conductors outside of specified areas such as pull boxes and handhole locations.
2. Wire Slack. Verify that the proper slack is provided at pull boxes and handhole locations.
3. Control Cable. Check that the control cable is properly tagged and identified, and that its ends are taped until connected. In span-wire installations, verify that the control cable is properly attached to the span wire by cable rings spaced a maximum of 1 foot apart. There should be no sag in the control cable.
4. Vehicle Detector Loops. Verify that vehicle detector loops are of the proper type and are installed in accordance with the Contract specifications. Check the depth of the detector for compliance, and verify that saw cuts are properly filled after installation.
5. Pull Wire. If cable is added or replaced, verify that pull wire has been placed in all new and existing conduits. Ensure that there is a minimum of 2 feet of pull wire doubled back at each termination.

6. Bonding and Grounding. Verify that all bonding and grounding are in compliance with Article 250 of the *National Electrical Code*.
7. Controller Cabinet. Verify that the controller cabinet is of the proper type, and verify that it is mounted to provide a clear view of the intersection when the cabinet door is open.
8. Preemption Equipment. Verify the proper location and installation of any required preemption equipment for emergency preemption or railroad coordination.
9. Signal Heads. Verify that traffic signal heads, pedestrian signal heads, and push-buttons are of the proper type and installed in compliance with the Contract specifications. Pay particular attention to the mounting height and orientation with respect to driver and pedestrian approaches. Verify that signal heads are covered until the system is operational.
10. Signal Lamps. Verify that the traffic signal lamps are of the proper type and wattage.

636.1.5.3 After Construction

Consider the following after installation of the traffic signal systems:

1. Backfilling and Patching. Where required, verify that trenches are properly backfilled and the roadway surface is properly patched.
2. As-constructed Plans. Verify that the Contractor has furnished the required As-constructed Plans.
3. Testing. Before accepting the system, if required, verify the Contractor performs functional tests and that any needed adjustments are performed.
4. Diagrams. Verify that the controller diagram and intersection-phase diagram are placed inside the controller cabinet.
5. Manufacturer's Guarantee. Verify that the Contractor has furnished and handed over all manufacturer's operations, maintenance, and warranty information to DPW's Traffic Maintenance Department, and obtain confirmation of DPW's take-over of signal operations.
6. DPW's Traffic Maintenance Department. Where applicable, verify that DPW's Traffic Maintenance Department has been notified to accept operation of the signal system.
7. Cleanup. Verify that the area is left in an acceptable manner and know the disposition of any material or equipment removed from the job site.

636.2 LIGHTING

636.2.1 GENERAL

The materials and construction requirements for lighting will be governed by the the Standard Specifications and Special Contract Requirements.

636.2.2 INSPECTION GUIDELINES

636.2.2.1 Before Construction

Before lighting work begins, consider the following:

1. Pre-construction conference. If a lighting plan is included in the Contract, the Contractor is required to supply a list of all material and equipment to be incorporated into the work at the Pre-construction conference. In addition, coordination with the local utility company will begin to check the systems compatibility and to plan for required utility connections and any needed utility relocations or adjustments.

2. Materials Considerations. Check the type, dimension, coating, and condition of all lighting materials including light poles, arms, luminaires, galvanized fastener hardware, breakaway bases, conduits, cables, pull boxes, and expansion fittings. Ensure that required material certifications have been submitted.

3. Concrete Foundations. Where concrete foundations will be used, they may be either pre-cast or cast-in-place. Check the concrete materials for conformance. Check that the foundation locations and dimensions conform to designated requirements, and verify that a solid and properly compacted foundation sub-grade is provided.

4. Layout and Obstructions. Review the general layout of the work for acceptability, and verify that the Contractor has accounted for underground obstructions and overhead lines such as power, telephone, and cable television.

5. Conduit and Cable. The location of conduit runs will be established during construction, with consideration given to existing and future installations. Know the requirements for conduit placed under roadway sections, and the circumstances that require pull boxes such as wire splices and conduit ends and angles. Check if conduit jacking is required.

636.2.2.2 During Construction

Consider the following guidelines during the installation of highway lighting:

1. Concrete Foundations. Verify that they are properly poured or placed. Pay particular attention to reinforcement, curing, and backfill requirements.

2. Light Poles. Verify that the Contractor installs light poles and luminaires in accordance with the specified requirements and the manufacturer’s installation guidelines. Check that light poles are set plumb at the correct location, and verify the proper installation and location of breakaway bases. Require that any coating damage is properly repaired.

3. Pull Boxes. Verify that pull boxes are being installed at the correct location and at the proper grade.

4. Trenches. Check the trench depth and shape for compliance, and watch for obstructions. Verify that the correct material and procedures are being employed for the backfill operation.

5. Jacking. Check the jacking pits for clearance from the roadway and verify the specified minimum is not encroached. Do not permit the use of water to aid jacking.

6. Expansion Fittings. Check that conduit expansion fittings are properly installed on bridges.

636.2.2.3 After Construction

Check backfilled trenches for settlement and the correct operation of lights at night prior to project acceptance.

END OF SECTION

APPENDIX B

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APPENDIX B

PRE-CONSTRUCTION

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Notice to Proceed
Instructions

A. Originated by:

Project Engineer

B. Guidelines:

Once the Contractor has secured all required permits and paid all fees necessary, a Notice to Proceed will be issued to the Contractor. The Notice to Proceed will identify the date the Contract calendar days begin.

C. Distribution:

2 Originals: To the Contractor to be signed as received by.
1 Original signed by Contractor: To be placed in the project files.
.

D. Form:

Format will be as shown.

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO
Lawrence P. Perez
Director
Andrew Leon Guerrero
Deputy Director

Official Contact Name Listed in the Contract
Title of the Official Contact
Company Name (**exactly as shown on the Contract**)
Street Address of Organization (**exactly as shown in the Contract**)
Village, Guam ZIP CODE

Reference: **Project Name (exactly as shown in the Contract)**
Project No.: GU-NH-xxxx(yyy) (exactly as shown in the Contract)
NOTICE TO PROCEED

Gentlemen:

You are hereby notified to commence work on the above referenced project on **(insert the date of the Notice to Proceed)** which shall be day number one (1) of the calendar days stipulated in the Contract. All work, including final cleanup shall be completed within **(insert the number of calendar days allowed for completion of work as specified in the contract)** calendar days. Failure to complete the project within the time stipulated in the contract will result in Liquidated Damages being assessed in the amount of **(insert the dollar amount of Liquidated Damages)** per calendar day.

All changes, deviations from, or clarifications to the plans and specifications will be valid only if directed, in writing, by the Department of Public Works Contracting Officer. All inspections, acceptance testing and other requirements shall be coordinated with **(insert name and title of the DPW Project Engineer)**.

Please include the above Project Name and Project Number on all project correspondence. Should you have any questions or need additional information, please contact **(insert name of the DPW Chief Engineer and contact information)**; **(insert name of the DPW Engineer Supervisor and contact information)**; or **(insert name of the Project Management Team, Construction Manager, if assigned, and contact information)**.

Acknowledge receipt of this notice on the space provided below and return a copy to the Department of Public Works, Division of Highways to the attention of (**insert name of the DPW Engineer Supervisor)**.

Sincerely,

(insert name of the Director of the Department of Public Works)
Director

RECEIPT OF THE ABOVE NOTICE TO PROCEED IS HEREBY ACKNOWLEDGE
THIS______________ DAY OF______________________ 2009.

By:____ Signature: _________________________
(Print Name & Title)

Pre-Construction Conference Instructions

A. Originated by:

Project Engineer

B. Guidelines:

The Pre-construction Conference is meant to inform the Construction Management group of the supervisory personnel and contacts that the Contractor will have on the project. The Pre-construction Conference is also meant to inform the Contractor of specific issues and requirements of the Contract. The Project Engineer/Resident Engineer should review the Contract and Plans for any special items that need to be addressed at the Pre-construction Conference. Additional items can also be included in the Pre-construction Conference Memorandum for the Record.

C. Distribution:

Original: To be placed in the project records
Copy: Submitted to the PMT Construction Manager (if assigned)
Copy: Submitted to the DPW Chief Engineer
Copy: Submitted to the Contractor

D. Form:

Format will be as shown.

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO
Lawrence P. Perez
Director
Andrew Leon Guerrero
Deputy Director

Department of Public Works
Division of Highways
Pre-Construction Conference

MEMORANDUM FOR THE RECORD

Project Number: **Insert Project Number exactly as shown in the Contract**	**Date:** **Insert date of Pre-Conference**
Project Title: **Insert Project Title exactly as shown in the Contract**	**Time:** **Insert time of Pre-Conference**
Location: **Insert the location of the Pre-Construction Conference**	

I. **Participants:** **See Attached Attendance Sheet**

II. **Administration:**

1. The Contractor is to address all correspondence to:

   (insert name of the Director of Public Works), Director
   Department of Public Works
   Government of Guam
   542 North Marine Corps Drive
   Tamuning, GU 96911

   - Attention to the Project Engineer: **Insert name of Project Engineer**
   - Deliver all correspondence to the Director's Office.
   - Provide the Project Engineer a copy of all correspondence.

2. Four (4) copies of Progress Schedule and Narrative

   ☐ Submitted ☐ Submit Later

3. Schedule of Working Hours **(Insert Contractor's Schedule of Working Hours)**

   ☐ Submitted ☐ Submit Later

4. Name of Contractor's Superintendent: **(Insert name of Contractor's Superintendent)**

   ☐ Submitted ☐ Submit Later

5. List of other key and supervisory personnel, including persons authorized to sign for Contractor.

   1. **(Insert name of Contractor's Supervisory Personnel)**

   2. **(Insert name of Contractor's Supervisory Personnel)**

   3. **(Insert name of Contractor's Supervisory Personnel)**

6. Name, address and telephone and cellular phone numbers of at least three (3) persons to contact in case of emergency during non-working hours.

   1. **(Insert name of name, address and phone numbers for emergency contacts)**

   2. **(Insert name of name, address and phone numbers for emergency contacts)**

   3. **(Insert name of name, address and phone numbers for emergency contacts)**

7. Request for overtime work must be made 48 hours in advance to provide for proper inspection.

8. Shop drawings and Submittals must be submitted for review and approval at the earliest possible date.

   Insert List of Shop Drawings and Submittals submitted by the Contractor at the Pre-Construction Conference. Job Mix formulas for Hot Asphalt Concrete and Portland Cement Concrete shall be noted below, if submitted.

9. Job mix formulas for Hot Asphalt Concrete Pavement and Concrete design mixes must be submitted for approval at the earliest possible date. Form FHWA 1608 must be used for Hot Asphalt Concrete Pavement job mix formulas for the Marshall method.

   ☐ Submitted ☐ Submit Later

10. The Contract requires that a Contractor Quality Control Plan be submitted.

   ☐ Submitted ☐ Submit Later

III. Documentation

1. Critical materials necessary for the project must be ordered as soon as possible. Test samples, if required, must be submitted at the earliest possible date.

2. By American Provisions apply to this Contract.

3. All products obtained from manufacturers (not tested) must have notarized certifications supported by appropriate independent test stating that product meets specification.

IV. Payment

1. The contractor shall prepare and submit **"Monthly Invoices"** for work completed through and including the 25th day of the Month. Only work completed by the 25th day shall be included on the "Monthly Invoice". The contractor shall concur on quantities during invoice preparation with the Project Engineer before final submittal of the Monthly Invoice. Contractor's Monthly Invoice form shall contain the Contractor's letterhead. For additional Invoice requirements please refer to Section 109.

2. As required in the contract, 10% will be retained from payments due to the Contractor. This will be deducted from each “Monthly Invoice” and shall be included on the Contractor’s Monthly Invoice.

3. Liquidated Damages are provided for in the Contract. Liquidated Damages will be deducted from payments due to the Contractor if the project is not completed within the time specified in the Contract. For this project the Liquidated Damages are set at

$ Insert the Liquidated Damages dollars per calendar day.
<<Varies by contract amount>>

4. Before final payment can be made, the following must completed:

   a. A final inspection of the project by the DPW must be conducted

   b. Items from the final inspection found to be deficient or in need of correction need to be completed

   c. All required documents need to be properly submitted

   d. Contract Release of Claims Form

   e. Final As-built Drawing

V. Equal Employment Opportunity

1. Section II of Form FHWA covers Equal Opportunity. The Contractor should be familiar with all parts of the section as well as ***Executive Order 11246*** and the rules and regulations of the Secretary of Labor.

2. Specific EEO Responsibilities are included in the Contract (pages EO-1 thru EO-6). The Contractor and all subcontractors holding subcontracts if $10,000 or more must follow these requirements.

3. All products obtained from manufacturers (not tested) must have notarized certifications supported by appropriate independent test stating that product meets specification.

4. The Contractor and all subcontractors are required to complete and submit Form PR-1391, Federal-aid Highway Construction Contractors Annual EEO Report, for all work performed on Federal-aid projects in Guam during the month ending July 31st. All of the information requested on the Form PR-1391 must be provided and must be LEGIBLE. All of the requested information, with the exception of the “Estimated Peak Employment” is for the pay period preceding July 31st. This form is available on the web at http://www.fhwa.dot.gov/eforms/fhwa1391.pdf. It is the Contractor’s responsibility to see that their subcontractors complete and submit Form PR-1391.

5. The name and title of the Contractor’s EEO officer is: **(Insert name and title of EEO officer)**

6. The name of the Government’s EEO Officer is: Jesse Duenas

VI. Labor Compliance

1. The Prevailing and Minimum Wage Rates that apply to this Contract can be found on pages PWR-1 and MWR-1 thru MWR-3. The Contractor is to pay particular attention to the labor classification and the minimum hourly rates for each classification. .

2. The Contractor shall submit “Weekly Payroll Records” for each week in which any Contract work is performed. Weekly payroll records must be submitted within seven calendar days after the regular

payment date of the payroll period. The Contractor will be responsible for seeing that all subcontractors submit payroll records on time. The Contractor's Monthly Invoice will not be considered complete until correct Weekly Payroll Records have been received.

3. The Weekly Payroll Records need to include a Statement of Compliance. It is highly recommended that the standard Statement of Compliance **WH-348** be submitted to speed the payroll checking process.

4. Deduction other than those provided for in ***Section 3.5, Title 29***, Code of Federal Regulation, will not be allowed unless authorized in writing by the U.S. Department of Labor.

5. Submit two copies of list of all classification and wage rates to be employed on the project.

☐ Submitted ☐ Submit Later

6. Executive Order No. 2000-10, included in the Contract, requires the use of Apprentice/Trainee on all Federally Funded projects with a contract value over $100,000. There shall be one Apprentice/Trainee for every ten workers but not less than one Apprentice/Trainee on the project. Monthly reporting of Apprentice/Trainee is required to be submitted with each invoice (Form PR-03). The invoice will not be considered complete until Form PR-03 is submitted with attachments as necessary.

VII. <u>Safety</u>

1. Attention is called to the provisions of the Contract regarding Public Convenience and Safety; Barricades, Warning Signs and other Devices; and Construction Safety Requirements. All requirements of OSHA and the Manual on Uniform Traffic Control devices must be adhered to all times.

2. Contractor's plan for public and employee safety as required by OSHA regulations.

☐ Submitted ☐ Submit Later

3. Executive Order No. 2000-10, included in the Contract, requires the use of Apprentice/Trainee on all Federally Funded projects with a contract value over $100,000. There shall be one Apprentice/Trainee for every ten workers but not less than one Apprentice/Trainee on the project. Monthly reporting of Apprentice/Trainee is required to be submitted with each invoice (Form PR-03). The invoice will not be considered complete until Form PR-03 is submitted with attachments as necessary.

4. Name of Contractor's Traffic and Safety Supervisor: **(Insert name of Traffic and Safety Supervisor)**

5. Name of Contractor's Safety Officer: **(Insert name of Safety Officer)**

6. The name of the DPW Safety Officer is: **(insert name of DPW Safety Officer)**

7. The name of the Project Safety Officer is: **Insert name of the Project Engineer**

8. Traffic Control Plans shall be strictly adhered to. Supplemental Traffic Control Plans and project signage shall be submitted whenever revisions and/or changes from the traffic plans in the Contract are necessary.

9. In emergencies involving traffic accidents call 911 dispatcher. Contractor shall also coordinate w/ DPW Highway Maintenance.

VIII. Bulletin Boards

1. Before construction starts, a Bulletin Board shall be erected at the construction site. The Bulletin Board shall be in a conspicuous and readily accessible area available to be viewed by all workers.

2. The following information is required to be posted on the bulletin board:

   a. "Equal Opportunity" EEO poster, according to FAR Clause 52.222-26 Equal Opportunity FHWA Form 1273

   b. Company Equal Employment Opportunity policy and letter appointing Company EEO Officer

   c. Notice that the project is subject to Title 18, U.S. Criminal Code, Section 1020, FHWA Form 1022

   d. "Notice to Employees" poster, WH-1321, regarding proper pay

   e. "Right to Safe and Healthful Workplace" poster, according to Title 29, Code of Federal Regulations, Part 1903

   f. Prevailing and Minimum Wage Rates contained in the Contract

   g. Form WH-1420 Family Medical Leave Act

3. The Location of the Bulletin board will be **(Insert the location that the Contractor will install the Bulletin Board)**.

IX. Work Operations and Coordination

1. Schedule and Method/Sequence of Work
2. Weekly Progress Meeting
   a. Time and Day: **(Insert Time and Day for Weekly Progress Meeting)**
   b. Location: **(Insert Location for Weekly Progress Meeting)**
3. Traffic Control
   a. Method of Handling Traffic
   b. **Name(s) of person(s) at Department of Public Safety/Guam Police Department (DPS/GPD) and DPW Traffic Management Center (TMC) to coordinate closing of lanes, etc.**
4. Discussion on any Utility issues or concerns
5. Discussion on any Environmental Compliance concerns for the project.
6. It is very important to make sure all Materials are properly Documented. Please submit your list of materials followed by subsequent certifications as early as possible.

X. Other Related Issues:

1. List other related issues that were discussed.
2.

XI. Meeting Adjourned:

Prepared by: Date:

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APPENDIX B

LABOR COMPLIANCE

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Labor Compliance Interview Instructions

A. Originated by:

Project Inspector

B. Guidelines:

Labor Compliance interviews will be conducted weekly. Interviews will be conducted on both the Contractor's and subcontractor's workforce. Ten percent of the workforce should be interviewed each week.

C. Distribution:

Original: To be placed in the project files.

D. Form:

Format will be as shown.

Department of Public Works
Division of Highways

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO

LABOR COMPLIANCE INTERVIEW

Prime Sub Contractor Name: ______________________________

Project:______________________ Route No.:______________________

The following employee of the above contractor/subcontractor was interviewed on the indicated project and was asked the following questions on the following date by the following interviewer:

______________________ ____________

(DPW Representative) **(Date)**

	YES	NO
1. Have you been advised that this project has minimum established wage rates?	❑	❑
2. Do you know your job classification?	❑	❑
3. Is your daily work consistent with your job classification?	❑	❑
4. Are you being paid at least the minimum wage rate for your classification?	❑	❑
5. Are you paid weekly?	❑	❑
6. Are you paid overtime for work over 40 hours per week?	❑	❑
7. Do you know where the project EEO Bulletin Board is?	❑	❑
8. Do you know who your Company EEO Officer is?	❑	❑

9. What is your hourly wage rate? ______________________

EMPLOYEES NAME

Printed Name: ______________________ Signed: ______________________
(Employee Signature)

Job Classification:______________________

NOTE:
DPW Representative needs to direct any “No” answers to the appropriate Contractors EEO Officer to be addressed.

Additional comments:

Contractor's and Subcontractor's Payroll Check Sheet Instructions

A. Originated by:

Project Engineer

B. Guidelines:

The Contractor's and subcontractor's Payroll Check Sheet will be used to verify that payrolls submitted are in compliance with the Contract provisions. Each Contract may have different classifications and different wage rates. The person performing the review of the Certified Payrolls will need to be aware of the Prevailing and Minimum Wage Rates for that particular Contract. These Wage Rates are included in each Contract, MRW-1 for resident workers and PWR-1 for H2-B workers.

If any of the items in the Payroll Check Sheet are answered **NO,** a Supplemental Payroll Letter will need to be prepared.

UNDER NO CIRCUMSTANCES should any payroll be returned to the Contractor for corrections. All necessary corrections should be made on a supplemental payroll prepared and submitted with the certification and statement, in the same manner as the original payroll.

C. Distribution:

Original: To be placed in the project files.

D. Form:

Format will be as shown.

CONTRACTOR'S AND SUBCONTRACTOR'S PAYROLL CHECK SHEET

CONTRACTOR'S SUBCONTRACTOR'S NAME: ______________________________

PROJECT NUMBER: ______________________________

PROJECT LOCATION: ______________________________

Payroll No. ____________ Payroll Period: ______________ to ______________

Checked by: ______________________
DPW Representative

		Yes	No
1.	Is the Project number shown on the payroll and is it consecutively numbered?	☐	☐
2.	Does the payroll show the appropriate pay period?	☐	☐
3.	Are all work classifications in accordance with the wage decision of the contract?	☐	☐
4.	Are all workers properly classified for the pay period?	☐	☐
5.	Are all hours, regular and overtime, shown on the payroll?	☐	☐
6.	Does all work comply with the 40-hour work week requirement?	☐	☐
7.	Are the wage rates equal to, or greater than the contract wage decision?	☐	☐
8.	Are names and Social Security numbers shown?	☐	☐
9.	Is the address of the workers shown?	☐	☐
10.	Are wages shown as an hourly rate?	☐	☐
11.	Are deductions shown allowable?	☐	☐
12.	Does the Statement of Compliance contain the anti-kickback statement?	☐	☐

If any of the above questions are answered No, a supplemental payroll will be required.

UNDER NO CIRCUMSTANCES shall any payroll be returned to the Contractor for corrections. All necessary corrections shall be made on a supplemental payroll prepared and submitted with the certification and statement, in the same manner as the original payroll.

This check sheet shall be filed with and attached to all payrolls and supplemental payrolls being checked.

Supplemental Payroll Letter
Instructions

A. Originated by:

Project Engineer

B. Guidelines:

The Supplemental Payroll Letter is used to notify the Contractor of payroll errors, and will be sent to the Contractor immediately upon discovery of any payroll errors.

C. Distribution:

Original: To Contractor
Copy: With original payroll to project files

D. Form:

Format will be as shown.

SUPPLEMENTAL PAYROLL LETTER

Prime Contractor____________________ Project__________________________

Address___________________________ Name of Road____________________

____

As of _________________________ we are in receipt of

Contractor
Subcontractor:____

Payrolls numbered ____________ for Payroll Period:__________ to ________________

The following item(s) need(s) correction:

____

____

____

____

____

____

____

____

Each payroll needing correction requires a supplemental payroll showing revised and correct information. Please forward to this office a revised payroll numbered ________ for period ending_______________________.

Thank You,

____

Monthly Apprentice/Trainee Reporting Form Instructions

A. Originated by:

Contractor

B. Reviewed by:

Project Engineer

C. Guidelines:

Reporting of Apprentice/Training is mandatory on all DPW projects with a Contract Value over $100,000, in accordance with Executive Order No. 2000-10. The Executive Order requires at least one (1) apprentice for every ten (10) workers, but not less than one (1) apprentice per project. See Executive Order No. 2000-10 for additional requirements and provisions.

D. Distribution:

Original: To be submitted by the Contractor with the Contractor's Monthly Invoice. The original shall be kept in the project files with the Contractor's Monthly Invoice.

Copy: To be submitted to the DPW Program Administrator for quarterly reporting to the Guam Community College.

E. Form:

Format will be as shown.

Monthly Apprentice/Trainee Reporting Form

Instructions to the Contractor/Subcontractor:

This form is to be completed monthly for the duration of the project and submitted with monthly progress payments on Public Works Projects over $100,000. Attach to this form the Apprenticeship Program and verification that the Apprentice is enrolled in a qualified program.

Project Information

Project Number	
Project Name	
Name of Contractor/ Subcontractor	

Reporting Period

From		To	

Total number of employees working on the project this reporting period.	
Total number of apprentices working on the project this reporting period.	

List of Apprentices this Reporting Period (attach additional sheets if necessary)

Name	Job Classification	Social Security No.	Hours Worked this Reporting Period

Comments/Remarks

____
____
____
____

Prepared by:	Reviewed by:
X______________________________ Contractor's Representative Date	X______________________________ DPW Representative Date

APPENDIX B

CONSTRUCTION

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Non-Conformance Report
Instructions

A. Originated by:

Project Engineer

B. Guidelines:

Non-conformance Reports are intended to report and track the resolution item(s) that are not in conformance with the Contract, the project plans, and the project specifications. A non-conformance can be written relating to any aspect of the Contract.

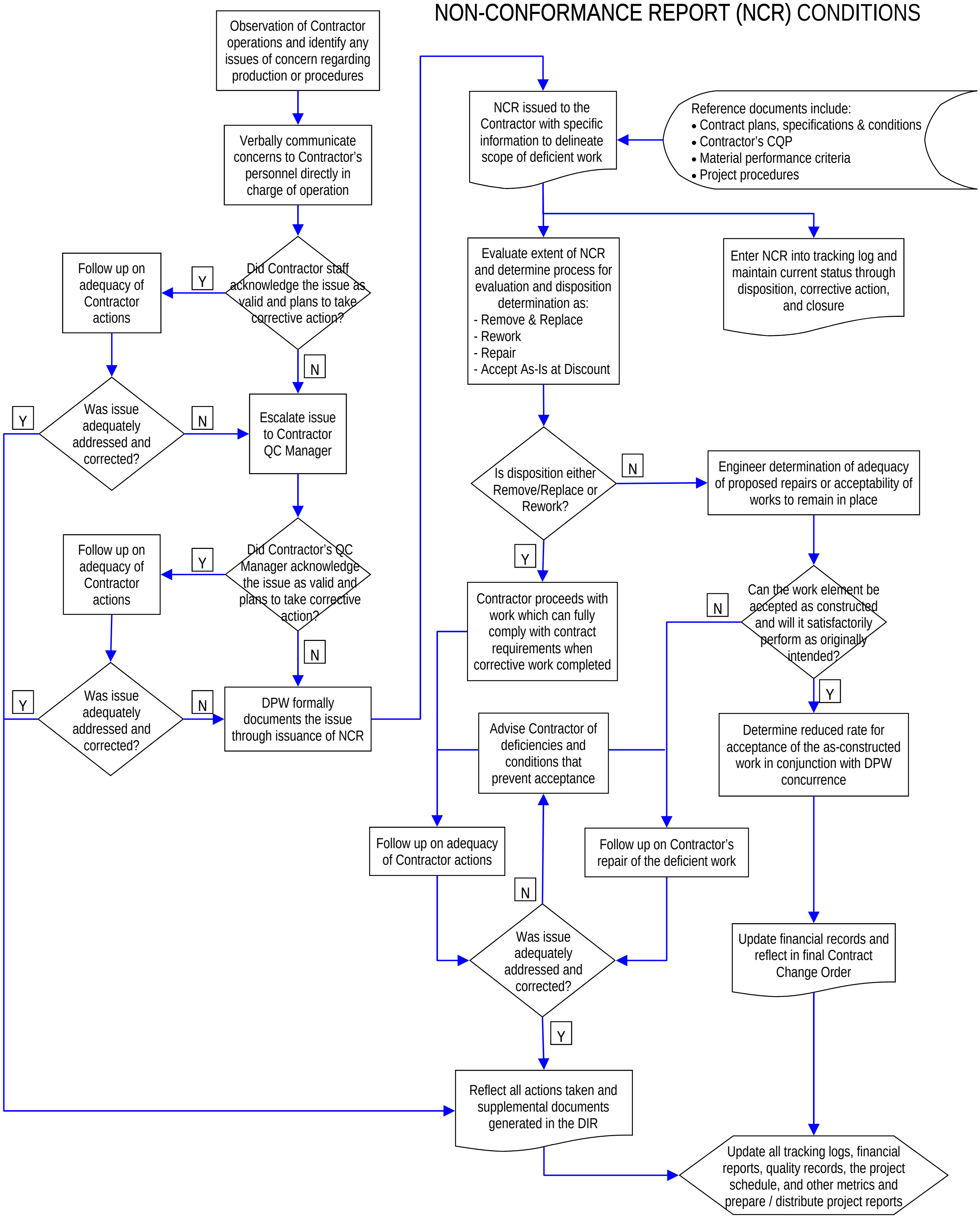
C. Distribution:

Original: To be placed in the project files
Copy: To the Contractor

D. Form:

Format will be as shown.

FLOW CHART FOR IDENTIFYING , ISSUING, TRACKING, RESOLUTION, AND CLOSURE OF NON-CONFORMANCE REPORT (NCR) CONDITIONS



Department of Public Works
Division of Highways

CONSTRUCTION NON-CONFORMANCE REPORT

To:____ Date:____________________
(Contractor)

Non-Conformance Report Number:____________________________ Time:____________________

Project Number: ____

Project Name: ____

Specification Section: ____________________ Drawing Number: ____________________

The following listed item(s) are not in conformance with the contract plans and specifications for the reasons stated below (attach additional sheets as necessary):

____

____

____

____

____

By:____ Date:____________________
(Name, Initials and Title)

Reviewed by:____ Date:____________________
(Name, Initials and Title)

Acknowledgement of receipt by:_______________________________ Date:____________________
(Name & Initials of Contractor or Designee)

This section to be completed only after the non-conformance is corrected and/or resolved.

RESOLUTION: Date: _______________

The above noted construction non-conformance has been corrected and/or resolved as indicated below (attach additional sheets as necessary):

____

____

____

____

By:____ Date:____________________
(Name, Initials and Title)

Reviewed by::____ Date:____________________
(Name, Initials and Title)

Send copy of completed form to the Department for permanent project records.

Daily Inspection Report
Instructions

A. Originated by:

Project Inspector

B. Guidelines:

The Daily Inspection Report (DIR) is the primary mechanism in which the progress of the constructed work is acknowledged, documented, and quantified for entry into the Project Records. The DIR is often times supplemented by a variety of forms and attachments that report on specific construction operations to provide a uniform method of measurement, reporting, and reference to the project documents. A DIR for every contract day is required, regardless of whether or not any construction operations are carried out.

DIRs are intended to report the detailed description of activities carried out within the project limits, as well as the Contractor's efforts to prepare for upcoming work, the maintenance of installations necessary for the execution of project work, and circumstances that may be interfering with the Contractor's ability to perform. This descriptive element of the DIR should be combined with the measurement and calculations for the work performed and accepted to facilitate the overall measurement of progress and payment for the work. The DIRs should be completed in a clear, concise, and professional manner; contain factual data relevant to the work performed; and be free of stated opinions and preference statements. All supplement forms and attachments should bear the DIR number and should be referenced on the DIR, which is the document that introduces this information into the project record.

C. Distribution:

Original: To the project files after verification and checking by the Project Engineer/Resident Engineer

D. Form:

Format will be as shown.

Department of Public Works
Division of Highways
DAILY INSPECTION REPORT

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO

Project:	Project Number:	Date: Report No:

No. of Workers:	Equipment:

AM WEATHER:	PM WEATHER:

Location, Comments, and Supporting Calculations:

( ) Interim ( ) Final	Calculated By:	Measured By:
	Posted by	Checked by:

Reference and Item Number	Item Description	Quantity	Unit

SEE BACK PAGE

The item(s) and/or materials(s) were above were inspected and found to conform reasonably to the Contract Plans and Specifications, except as noted.

Signed:	Title:	No.:

Department of Public Works
Division of Highways
DAILY INSPECTION REPORT

CONTINUATION

Reference and Item Number	Item Description	Quantity	Unit

FIELD MEASUREMENTS/CALCULATIONS

Checked by: Date:

Logged by: Date:

The item(s) and/or materials(s) were above were inspected and found to conform reasonably to the Contract Plans and Specifications, except as noted.		
Signed:	Title:	No.:

Quantity Record Sheet
Instructions

A. Originated by:

Project Inspector

B. Guidelines:

The Quantity Record Sheet is the primary documentation of items that are installed on the construction project. The Quantity Record Sheet is to be filled out on a daily basis when contract items are completed. Only one contract item shall be recorded on a Quantity Record Sheet. If more than one contract item is completed on a day, then a separate Quantity Record Sheet shall be made for each contract item.

The Quantity Record Sheet shall include the following information:

- Date: The date that the Quantity Record Sheet is prepared. This is the same as the date that the contract items are completed
- Report No.: This report number is the same number as the Daily Inspection Report
- Sheet____of____: This shall be filled out to indicate the number of Quantity Record Sheets that were made for the contract item. If only one Quantity Record Sheet is necessary this section shall be completed as: **Sheet _1__of __1_.** If more than one Quantity Record Sheet is necessary to document the completed item the sheets shall be consecutively number and the total number of sheets also shown

  Example: If three sheets were necessary to document the completed item the sheets would be numbered as follows:

  Sheet _1__of __3_; Sheet _2__of __3__; and Sheet _3__of __3

- Project Number: This section is used to show the Federal Aid project number
- Item Number: This section is used to show the item number. Each item has a specific "Pay Item Number" This information can be found in the construction contract Bid Schedule.
- Item Description: This section is used to show the item description. Each item has a specific "Description". This information can be found in the construction contract Bid Schedule.

- The table section of the Quantity Record Sheet is used to record the following:
  - Location – This portion shall be filled out to identify the location that the contract item was installed
  - Unit – This portion shall be filled out to record the unit of payment for the contract item (this unit of payment can be found in the contract Bid Schedule)
  - Quantity – This portion shall be filled out to document the quantity of the contract item installed. This portion will summarize (total) the calculations made in the graph portion of the Quantity Record Sheet
- Drawing / Calculations: The graph portion of the Quantity Record Sheet is for the Inspector to show measurements and calculations of the completed contract item. All calculations need to be shown. A hand sketch of the completed contract item also needs to be included. The sketch should be a graphical representation of the completed contract item.
- The bottom section of the Quantity Record Sheet is used to record the signature of the person who prepared the Quantity Record Sheet and the signature of the person who checked the information on the Quantity Record Sheet.
- The Logged portion of the quantity record sheet is used to record the signature of the person that logs the quantity of the completed contract item into the quantity ledger for the project.

C. Distribution:

Original: To be placed in the Project Files after verification, checking and logging. A separate project file shall be maintained for each contract item

Copy: After the Original Quantity Record Sheet is checked and logged a copy shall be placed with the Daily Inspection Report

D. Form:

Format will be as shown.

Department of Public Works
Division of Highways

Date ____________________

Report No. ______________

Sheet _______ of ________

DAILY INSPECTION REPORT
QUANTITY RECORD SHEET

PROJECT NO. ______________________________

ITEM NO. ____________________ **ITEM DESCRIPTION:** ______________________________

LOCATION (STA TO STA)	UNIT	QUANTITY

DRAWING / CALCULATIONS (REQUIRED)

SIGNATURE: ______________________________ **DATE:** ____________________

CHECKED BY: ______________________________ **DATE:** ____________________

LOGGED BY: ______________________________ **DATE:** ____________________

Change Orders
Instructions

A. Originated by:

Project Engineer

B. Guidelines:

Change Orders will only be initiated when the project cannot be completed as intended.

The Change Order will specifically address the following:

1) Description of work – describe the work associated with the Change Order
2) Reason for Change Order – Provide a reason that the change Order is necessary.
3) Provide a summary of changes to the total Contract amount and additional time, if any.
4) Provide a Tabulated Summary of each item that the Change Order involves.

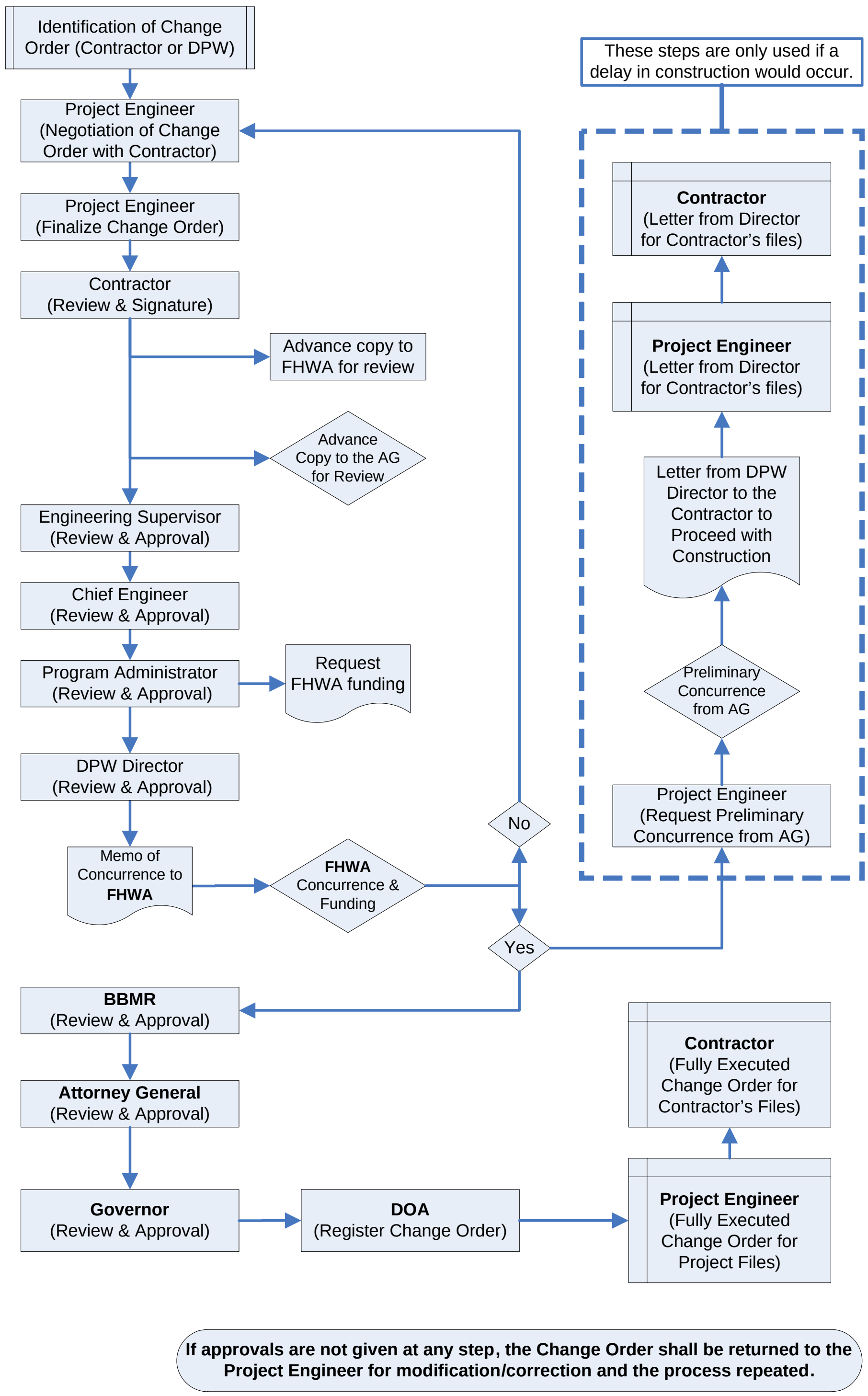
C. Distribution:

Original: Completely executed Original to project files
Copy: Completely executed copy to the Contractor

D. Form:

Format will be as shown.

CHANGE ORDER FLOW CHART



PROJECT NAME:	**PROJECT NAME AS SHOWN IN THE CONTRACT DOCUMENTS**
Project Number	**PROJECT NUMBER AS SHOWN IN THE CONTRACT DOCUMENTS**
Date	**DATE OF CHANGE ORDER**
Page	**1 of NUMBER OF PAGES IN THE CHANGE ORDER (INCLUDING ATTACHMENTS)**

CHANGE ORDER NO. XX (change orders to be numbered consecutively for each project)

Name of Contractor(Exactly as shown in the contract)
Contractors Address Line 1
Contractors Address Line 2

Gentlemen:

In accordance with the provisions of the contract and the change order documents attached, your original contract will be modified as described herein.

APPROVED FOR FEDERAL PARTICIPATION SUBJECT TO COVERAGE BY FUNDS UNDER THE EXISTING PROJECT AGREEMENT.

I CONCUR: Date:____________

Name of FHWA Division Administrator
Division Administrator

By:________________________________

Name of FHWA Guam Representative
Transportation Engineer

Cleared by:

Name of BBMR Director **Date**
Director
Bureau of Budget and Management Research

The work shall be performed in accordance with the appropriate sections of the standard specifications and the special provisions of the contract.

/ /Without modification
/ / As modified by the attached provisions.

We, the undersigned contractor, have given careful consideration to the change proposed and hereby agree, if this proposal is approved that we will provide all equipment, furnish all materials except as may be otherwise noted above, and perform all services necessary for the work above specified, and will accept as full payment therefore the prices shown above.

CONTRACTOR'S REPRESENTATIVE:

Authorized Contractor Representative, Title **Date**
Contractor Name (Exactly as Shown in the contract)

Prepared by:

Name of Project Engineer Date
Project Engineer
Federal-Aid Highway Construction Section

Name of Engineer Supervisor Date
Engineer Supervisor
Federal-Aid Highway Construction Section

Name of Chief Engineer Date
Chief Engineer
Federal-Aid Highway Section

CERTIFIED FUNDS AVAILABLE:
Job Order No. Insert Job Order Number
Amount: Total amount, This Change Order

Name of Division Chief or Program Administrator Date
DPW - Certifying Officer
Acting Program Administrator
Division of Highways

APPROVED BY:

Name of DPW Director Date
Director
Department of Public Works

APPROVED AS TO LEGALITY & FORM

Name of Attorney General Date
Attorney General

APPROVED:

Name of the Governor of Guam Date
Governor of Guam

PROJECT NAME:	**PROJECT NAME AS SHOWN IN THE CONTRACT DOCUMENTS**
Project Number	**PROJECT NUMBER AS SHOWN IN THE CONTRACT DOCUMENTS**
Date	**DATE OF CHANGE ORDER**
Sheet	**2 of NUMBER OF PAGES IN THE CHANGE ORDER (INCLUDING ATTACHMENTS)**

SUMMARY OF CHANGE ORDER NO. XX (change orders to be numbered consecutively for each project)

DESCRIPTION OF WORK:

Briefly describe the work associated with this Change Order.

REASON FOR CHANGE ORDER:

Briefly provide a reason for this Change Order.

Original Contract Amount	$ xxx,xxx.xx	Contract NTP Date	Calendar Days provided for in the Contract
Change Order No. WW (Additive/Deductive)	$ xxx,xxx.xx	Time Extension (days) this Change Order	Number of days
Change Order No. XX (Additive/Deductive)	$ xxx,xxx.xx	Time Extension (days) this Change Order	Number of days
Change Order No. YY (Additive/Deductive)	$ xxx,xxx.xx	Time Extension (days) this Change Order	Number of days
Change Order No. ZZ (Additive/Deductive)	$ xxx,xxx.xx	Time Extension (days) this Change Order	Number of days

ADDITIONAL REMARKS:

Provide additional remarks to describe the purpose of the Change Order as necessary.

Prepared by:

Preparer's Title: ________________________ ____________
Preparer's Name Date

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO
Lawrence P. Perez
Director
Andrew Leon Guerrero
Deputy Director

PROJECT NAME:	PROJECT NAME AS SHOWN IN THE CONTRACT DOCUMENTS
Project Number	PROJECT NUMBER AS SHOWN IN THE CONTRACT DOCUMENTS
Date	DATE OF CHANGE ORDER
Page	3 of NUMBER OF PAGES IN THE CHANGE ORDER (INCLUDING ATTACHMENTS)

Summary of Change In Cost to the Contract

ITEM NO.	ITEM	UNIT	ORIGINAL PLAN QUANTITY	NEW TOTAL ESTIMATED QUANTITY	ESTIMATED CHANGE IN QUANTITY	ORIGINAL UNIT PRICE	NEW UNIT PRICE	CHANGE IN UNIT PRICE	ESTIMATED CHANGE IN COST

Prepared by:_______________________________ __________
Name Date
Title

Reviewed by:_______________________________ __________
Name Date
Title

Bulletin Board Check List for Federal-Aid Projects
Instructions

A. Originated by:

Project Engineer or Project Inspector

B. Guidelines:

For all Federal Aid projects, the individual inspecting the bulletin board should complete this form. The bulletin board should be on the project until project completion and be reviewed periodically. This periodic review should be documented in the Daily Inspection Report.

C. Distribution:

Original: When the bulletin board has been satisfactorily installed, the Bulletin Board Check list should be completed and filed in the Project Records.

D. Form:

Format will be as shown.

Department of Public Works
Division of Highways

BULLETIN BOARD CHECK LIST FOR FEDERAL-AID PROJECTS

Project: ______________________________ Inspected by: ________________________

Road: ______________________________ Date: ______________________________

I. Equal Employment Opportunity Posters: Contractual Requirement.

__ A. Form OFCCP-1420, Equal Employment Opportunity
__ B. Form OSHA-3165, Job Safety and Health Protection
__ C. Form FHWA-1022, Title 18, USC, Section 1020
__ D. Form FHWA-1495, Wage Rate Information
__ E. Contractors and Subcontractors Equal Opportunity Policy
__ F. Form 1321, Notice to Employees

II. EEO: Requirements for the Prime and Subcontractors.

A. The prime contractor shall complete and post the following showing:
__ 1. Name of the Company's EEO Officer.
__ 2. Title of the Company's EEO Officer.
__ 3. Address of the Company's EEO Officer.
__ 4. Phone Number of the Company's EEO Officer.

B. Each subcontractor working on the project shall complete and post the following showing:
__ 1. Name of the Subcontractor's EEO Officer.
__ 2. Title of the Subcontractor's EEO Officer.
__ 3. Address of the Subcontractor's EEO Officer.
__ 4. Phone number of the Subcontractor's EEO Officer.

III. Contract Wage Determination: Contractual requirements.

A. The Wage Determination shall be for this project and must display:
__ 1. Project Number.
__ 2. The Prevailing Wage Rate (PWR-1)
__ 3. The Minimum Wage Rate (MWR-1 thru MWR-3)

The Wage Determination shall be separated and spread across the bulletin board so that each and every wage classification is visible to the employees.

IV. Location of the Bulletin Board:

		Yes	No
1.	Is the bulletin board located within the physical limits of the project? (if **NO** explain below)	❐	❐
2.	Is the bulletin board located in an area where the employees gather?	❐	❐
3.	Is the bulletin board located outside offices/trailers and accessible 24 hours a day?	❐	❐
4.	Is the area around the bulletin board kept clean and free of obstructions?	❐	❐

Remarks:

____

____

____

Weekly Construction Report
Instructions

A. ORIGINATED BY:

Project Engineer

B. GUIDELINES:

The first Weekly Construction Report will be prepared the week that Notice to Proceed is issued to the Contractor. The reports will be numbered consecutively throughout the duration of the Contract. Any factors that affect the Contractor's progress will be reported on this form. More detailed instructions for each section are provided herein.

C. DISTRIBUTION:

Original to Project File
Copy to PMT Construction Manager (if assigned)
Copy to Supervising Engineer (Department of Public Works)
Copy to Chief Engineer (Department of Public Works)

D. FORM:

Format will be as shown.

Detailed Instructions

1. Report Number:

   This section is used to denote the weekly report number. Reports should be numbered consecutively, starting with Report No. 1.

2. Contractor:

   This section is used for the Contractor's name, which shall be exactly as shown in the Contract.

3. Project Title:

   This section is used for the project title (name) and should be exactly as shown in the Contract.

4. Route No.:

   This section is for the DPW-assigned Route No. that the project involves.
   For Island-wide Projects, the Route No. will be **Island-wide**.

5. Project No.:

   This section is for the Project Number and should be exactly as shown in the Contract.

6. Type of Work:

   This section is for the project description as described in the Contract or Bid Documents.

7. Work Section

   This section corresponds to the first three (3) numbers of the bid items and also corresponds to the Sections in the Standard Specifications (FP-03). **The numbers is these columns do not need to be changed.**

8. Percent of Contract

   The percent of Contract will need to be calculated for each of the Work Sections. (Example: Total contract amount is $250,000 and the total of all Work Section 100 items is $24,550. The percent of the Contract for Work Section 100 would be 9.7%.) This percentage needs only to be shown to the nearest 0.1%.

9. Percent this Week

   This is the estimated amount of work completed for each Work Section for the week of the report. This section is updated on a weekly basis from weekly quantities tabulated in the project ledger.

10. Percent Complete

    This is the estimated amount of work completed to date.

11. Date Finished

    This is the date that a Work Section is completed.

12. Key Contract Days

    a. Date of Notice to Proceed (This is the date that the Contractor is officially notified to proceed with the Contract.)
    b. Contract Calendar Days (This is the number of Calendar days allowed to complete the work and is specified in the Contract.)
    c. Contract Completion Date (This date is the last day that the Contractor has to complete the work. This date is calculated by taking the date of Notice to Proceed, which is day number 1, and adding the Contract Calendar days.
    d. Additional Days available by Change Order (This is the number of Calendar days that may be provided by a Change Order. If there are no additional calendar days, a ZERO needs to be shown.)
    e. Actual Date of Work Beginning (This is the date that the Contractor begins physical construction work on the project.)
    f. Substantial Completion Date (This is the date when the project is substantially complete.)
    g. Actual Date of Completion (This is the date that the Contractor physically completes all work including cleanup and correction of punch-list items.)

13. Days

This section of the Weekly Construction Report is for the days covered by the report. Weeks will always begin on a Sunday and will always end on a Saturday. Every day of the Contract from Notice to Proceed to the completion date will be shown in this section of the report. After reaching the completion date, the Days Charged Overtime will be used to record every day that the Contractor has not completed the work within the number of calendar days provided in the Contract.

The column in the Days section "Adverse Weather Days" should be used to record days when work cannot be done on the project due to unfavorable climatic conditions. The number of non-working (Adverse) days is shown on a monthly basis in SCR 108 of the Contract.

Example 1:

In this example, Notice to Proceed was issued to the Contractor on September 8, 2009. The Contractor did no physical work on the project until September 11, 2009 and only worked Friday.

Year - 2009 Date			Calendar Days	Days Worked	Adverse Weather Days	Days Charged Overtime	Days Worked Overtime
6	Sep	Sun.	0	0	0	0	0
7	Sep	Mon.	0	0	0	0	0
8	Sep	Tues.	1	0	0	0	0
9	Sep	Wed.	1	0	0	0	0
10	Sep	Thur.	1	0	0	0	0
11	Sep	Fri.	1	1	0	0	0
12	Sep	Sat.	1	0	0	0	0
Total This Week			5	1		0	0
Total Prev. Week			0	0		0	0
Total to Date			5	1		0	0

Example 2:

In this example, the last calendar day for the project to be completed was January 27, 2010. The project was not completed on that date and the Contractor worked on the project Thursday and Friday of that week.

Year – 2010 Date			Calendar Days	Days Worked	Adverse Weather Days	Days Charged Overtime	Days Worked Overtime
24	Jan	Sun.	1	0	0	0	0
25	Jan	Mon.	1	1	0	0	0
26	Jan	Tues.	1	1	0	0	0
27	Jan	Wed.	1	1	0	0	0
28	Jan	Thur.	0	0	0	1	1
29	Jan	Fri.	0	0	0	1	1
30	Jan	Sat.	0	0	0	1	0
Total This Week			4	3		3	2
Total Prev. Week			296	212		0	0
Total to Date			300	215		3	2

14. Weather

This section is used to record the weather conditions and temperature for each day of the week. The Project Engineer/Resident Engineer will review the Daily Inspection Reports for this information.

15. Contract Progress

This section is used to note how the project is progressing. The Project Engineer/Resident Engineer will use their best judgment to determine if the Contractor will be able to complete the project within the number of calendar day allowed for in the Contract. The Project Engineer/Resident Engineer will also use their best judgment to determine if the labor and materials used meet the Contract requirements. Based on these judgments, the Project Engineer/Resident Engineer will enter a choice of **Satisfactory** or **Unsatisfactory**.

16. Actual Progress versus Schedule

This section is used to note how the Contractor is progressing with the work. The Project Engineer/Resident Engineer will compare the actual construction progress with the Contractor's Bar Chart or CPM schedule. Based on this review, the following choices entered for this section are **Ahead**, **On**, or **Behind**. When the Contractor is Behind schedule, a reason should be noted in the "Contract Progress" section.

17. Time Used

This section is used to report the percent of Contract time used. Example: 60 calendar days have passed since Notice to Proceed to the Contractor for a project that has 300 calendar days. The Time Used would be 20.0%.)

18. Work Completed

This section is used to report the percent of work completed.

19. Project Documents Outstanding

This section is used to record documents that have been requested by the Contractor but have not been received. The date that the documents are received should be noted in the "Date Rec'd column".)

20. Monthly Adverse Weather Days

This section is used to record, on a monthly basis, the number of non-working "Adverse" days due to weather. The days accumulated in the "Days" section are transferred to this section of the report.)

21. Contract Progress

This section is used to briefly describe the activities and communications with the Contractor on the project for the week.)

22. Time Extensions

This section is used to describe the Time Extensions that have been provided to complete the project by Change Order. The Change Order Number and a short description of the reason for the Time Extension should be provided. If there are no Time Extensions on the project, it should be noted as **NONE**.

23. Other

This section is used to note other relevant aspects of the project that cannot be included in other portions of the Weekly Construction Report.

Government of Guam
Department of Public Works

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO

WEEKLY CONSTRUCTION REPORT

Report No. 1 1

Contractor: 2	Project Title: 3
Route No.: 4	Project No. : 5
Type of Work: 6	

Work Section 7	Percent of Contract 8	Percent this Week 9	Percent Complete 10	Date Finished 11	Key Contract Dates 12	
100	0%	0.0%	0%		Date of Notice to Proceed	12a
200	0%	0.0%	0%		Contract Calendar Days	12b
300	0%	0.0%	0%		Contract Completion Date	12c
400	0%	0.0%	0%		Additional days available by Change Order	12d
500	0%	0.0%	0%		Actual Date of Physical Work Beginning	12e
600	0%	0.0%	0%		Substantial Completion Date	12f
					Actual Date of Completion	12g

Year - 20XX 13 Date			Calendar Days	Days Worked	Adverse Weather Days	Days Charged Overtime	Days Worked Overtime	Weather 14 Condition	Weather 14 Temperature
1	Jan	Sun.	0	0	0	0	0		
2	Jan	Mon.	0	0	0	0	0		
3	Jan	Tues.	0	0	0	0	0		
4	Jan	Wed.	0	0	0	0	0		
5	Jan	Thur.	0	0	0	0	0		
6	Jan	Fri.	0	0	0	0	0		
7	Jan	Sat.	0	0	0	0	0		
Total This Week			0	0		0	0		
Total Prev. Week			0	0		0	0		
Total to Date			0	0		0	0		

Contract Progress 15	
Actual Progress vs. Schededule 16	
Time Used 17	0.0%
Work Completed 18	0.0%

Project Documents Outstanding	Date Rec'd
19	

20 Monthly Adverse Weather Days				
	Month	Plan	Actual	Excess
Total This Month				
Total Previous Month				
Total to Date				

Remarks:

A. Contract Progress: 21

B. Time Extensions: 22

C. Other: 23

DPW Representative

Date

Contractor's Monthly Invoice Check Sheet
Instructions

A. Originated by:

Project Engineer

B. Guidelines:

This Invoice Check Sheet should be used to determine if the Contractor has supplied the necessary information in support of its Monthly Invoice.

C. Distribution:

Original: To be attached to and filed with the Contractor's Monthly Invoice.

D. Form:

Format will be as shown.

CONTRACTOR'S MONTHLY INVOICE CHECK SHEET

CONTRACTOR'S NAME: ______________________________

PROJECT NUMBER: ______________________________

PROJECT LOCATION: ______________________________

Invoice No. ____________ Invoice Period: ____________ to ____________

Checked by: ______________________
DPW Representative

		Yes	No
1.	Is the Project Number Shown on the Invoice?	○	○
2.	Is the Invoice Period shown correctly?	○	○
3.	Has the Contractor submitted Daily Inspection Reports (CDIR) for Invoice Period?	○	○
4.	Have the quantities in the CDIR been compared with Daily Inspection Reports?	○	○
5.	Do quantities in the Inspection Reports reflect the quantities in the Invoice?	○	○
6.	Are the Percentages for Lump Sum Payments correctly calculated?	○	○
7.	Does the Invoice show previous Invoice amounts and total to date amounts?	○	○
8.	Have Certified Payrolls been submitted for the Invoice Period?	○	○
9.	Are the Certified Payrolls correct for the Invoice Period?	○	○
10.	Has the Contractor submitted a schedule update for the Invoice Period?	○	○
11.	Does the Contractor's schedule update include a narrative?	○	○
12.	Has the Contractor Submitted the Monthly Apprentice/Training Reporting Form?	○	○
13.	Is the Apprentice/Training Form Correct?	○	○
14.	Has the Traffic and Safety Supervisor's weekly reports been submitted for the Invoice Period?	○	○
15.	Has the Contractor submitted the ARRA reporting form? (FHWA-1589) **	○	○

If any of the above questions are answered No, the Contractor will be notified of missing or deficient items. Invoices will not be considered complete until all of the above items are answered Yes.

** Only required on projects that are funded by the American Recovery and Reinvestment Act (ARRA). Mark this item as **N/A** on projects that do not receive ARRA Funding.

This check sheet shall be filed with and attached to all Contractor Invoices.

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APPENDIX B

PROJECT CLOSEOUT

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Finalizing a Construction Contract
and
Project Closeout

1.0 Procedure for Final Inspection and Final Acceptance

The following is the procedure for Final Inspection and Final Acceptance of a construction project.

- Contractor to request "in writing" that the project is complete and requests a Final Inspection.

- Project Engineer will arrange for a date and time for the inspection after discussing it with the contractor.

- Once the date has been established between the Project Engineer and the Contractor the Project Engineer will prepare the following letters and memorandums. (see Final Inspection Letters and Memo templates)

  - The Project Engineer will prepare a letter to the Contractor from the Director indicating the date and time of the final inspection

  - The Project Engineer will prepare a memorandum to other Guam agencies, from the Director, informing them of the Final Inspection and requesting their participation in the inspection

  - The Project Engineer will also prepare letters to other utilities or agencies, from the Director, who had facilities in the construction area informing them of the Final Inspection and requesting their participation in the inspection

- The Project Engineer will meet with the Contractor at the agreed time and date and conduct a Final Inspection. Others that were informed of the Final Inspection and agreed to participate will also take part in the Final Inspection.

- At the end of the Inspection the Project Engineer will prepare a punch-list of items that were found needing correction. The Project Engineer will also incorporate comments from others (agencies/utilities…) into the punch-list if the comments are valid to the work performed by the contractor.

- The Project Engineer will finalize the punch list and provide a written copy of the items needing correction within 2 days after the Final Inspection. (see Inspection Punch-List template)

- The Project Engineer will follow up with the Contractor on the status of the items that need correction from the punch list.

- Once the Contractor has notified the Project Engineer that the punch-list items have been corrected the Project Engineer will arrange with the Contractor for a follow up inspection.

- Once all of the items in the punch-list have been corrected the Project Engineer will prepare a Notice of Final Acceptance for the Director to send to the Contractor. (see Notice of Final Acceptance template)

2.0 Procedure for Plan, Specification and Special Contract Requirement Review and Project Materials Check List

Plan, Specification and Special contract Requirement Review

Once the contractor has formally notified the Project Engineer that the project is completed and ready for the Final Inspection the Project Engineer shall conduct a complete review of the project plans, the specifications governing the contract and the special contract requirements. The review shall consist of a review of all of the materials that were incorporated into the project for comparison of what was specified in the contract against what was provided by the contractor. The review will also include a comparison of what was represented on the plans to be built against the actual constructed work. After completing the review the Project Engineer will prepare a report, in memo format, to the Chief Engineer describing the work that was constructed. The report should note any items or issues that were identified as having particular significance or required changes during construction. The report should be a through, professional, candid and honest appraisal of the contract and the constructed work.

Project Materials Check List

Upon completion of the construction contract the Project Engineer shall compile a list of the materials sampled and tested in the field and compare the number of samples and tests completed to the frequency of sampling and testing required by the contract documents.
If the frequency of tests performed varies from the frequency of testing required by more than -10%, a reason for the deviation is required. Testing in excess of the frequency required need not be explained.
The Project Engineer shall include the analysis of this review with the report to the Chief Engineer attesting that based on materials submittals, materials certifications, various

tests, and field observations that the project has been constructed in substantial compliance with the requirements set forth on the plans, specifications and contract documents. The Project Engineer will use the information that was obtained in this review to complete the Project Materials Check List. (see Project Material Check List template)

3.0 Procedure for review of As-Built Plans

The contractor is responsible for maintaining the As-Built Plans for the construction project. As-Built Plans are necessary to provide an accurate permanent record of the actual location of features for future maintenance, design, and development. During the construction phase of the project the Project Engineer should periodically review the as-built drawings to verify that the contractor is properly maintaining these drawings.
The As-Built Plans should be drawn accurately, and to scale, with all necessary explanatory information such as notes and dimensions clearly and accurately shown. The As-Built Plans should show all changes that were implemented into the contract by way of responses to requests for information, Project Engineer's site instructions, change orders, supplemental agreements, or other changes that may have been made in the field to accommodate field conditions.

The location, including depth, of underground communications systems, electrical systems, traffic signal systems, cable TV networks, waterlines, sanitary sewer facilities or the like have to be shown on the as-built drawings.

The contract requires that the contractor submit the As-Built Plans upon completion of construction. Upon receiving the As-Built Plans the Project Engineer will review what has been submitted. Any discrepancies will be noted and the As-Built Plans returned to the contractor for corrections. The project should not be considered as fully complete until the contractor has submitted the As-Built Plans and have been accepted as complete by the Project Engineer. Final payment cannot be made to the contractor until acceptable As-Built Plans have been received.

4.0 Procedure for Final Project Quantities and Costs

As soon as the contractor notifies the Project Engineer that the project is complete and is requesting a final inspection the Project Engineer will verify all of the quantities of work.

Upon completing the final quantities and costs for the project the Project Engineer will review the final quantities and costs with the contractor. If there are quantities or costs that are in dispute between the Project Engineer and the contractor the disputes will be resolved prior to preparing a final invoice for the project.

The Project Engineer will prepare a final invoice for the project based on the final quantities. The Project Engineer will use this final invoice to verify the final invoice submitted by the contractor.

In conjunction with preparation of the final invoice the Project Engineer will prepare a final Change Oder with the final quantities and costs for the project. Variances in final quantities by +/- 10 percent or $10,000 require a brief explanation to justify the variance. Once the final change order is prepared the Project Engineer will transmit the final change order to the contractor for signature. The format will be the same format as the change order in the construction section and will follow the same flow chart as with any Change Order.

It is recommended that the contractor sign the final Change Order prior to sending the final invoice in for processing. Once the contractor has signed the final Change Order the contractor is making a commitment to accept the final quantities and costs.

5.0 Final Acceptance Checklist

The Project Engineer will compile all of the information collected during the close out of the construction project and utilize this information to complete the Final Acceptance Checklist. This check list shall be used by the Project Engineer to verify that the information included in the check list has been completed and/or submitted by the contractor. (see Final Acceptance Checklist template)

6.0 Final Records

The Project Engineer is responsible for maintaining all of the project records and for properly cataloging and transmitting these record to the Chief Engineer upon completion of the project. The project records shall be indexed, placed in files, properly boxed and sealed, for transportation, and storage at the Department of Public Works headquarters office. The storage boxes shall be “book box size”. The boxes shall be labeled with the project number, official project name as shown on the construction contract, the name of the contractor, and date submitted. The boxes shall be sealed with tape. The final project records shall include, but not necessarily be limited to, files that include:

1. Correspondence
2. Inspectors daily reports
3. Quantity records
4. Materials test reports
5. Materials certifications and submittals

6. Certified payrolls
7. Apprentice and Trainee reports
8. Photo logs
9. Weekly time reports
10. Copy of original contract documents
11. Change Order s
12. Safety meetings
13. Accident reports
14. Utility damage reports
15. Other reports of a special nature that may be unique to an individual project

Final Inspection Letters and Memo Instructions

A. Originated by:

Project Engineer

B. Guidelines:

Once the Contractor has notified the Director, with a copy to the Project Engineer, that the project is complete and ready for final inspection the Project Engineer will arrange a date and time for the Final Inspection. Once the date and time has been established the Project Engineer will prepare the following:

- The Project Engineer will prepare a letter to the Contractor from the Director indicating the date and time of the final inspection
- The PE will prepare a memorandum to other Guam agencies from the Director, informing them of the Final Inspection and requesting their participation in the inspection
- The PE will also prepare letters to other utilities or agencies, from the Director that have facilities in the construction area informing them of the Final Inspection and requesting their participation in the inspection

C. Distribution:

Originals: Letter to the Contractor, copies to be signed as received by
Originals: Letter to the Utilities or other non-Guam agencies, copies to be signed as received by
Originals: Memos to other Guam Agencies, copies to be signed as received by

Copies signed as received by: To be placed in the project files.

D. Form:

Format will be as shown.

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO
Lawrence P. Perez
Director
Andrew Leon Guerrero
Deputy Director

(Insert the contractors contact person's name)
(Insert the title of the person above)
(Insert the Contractors name exactly as it appears in the Contract)
(Insert the correct address of the Contractor)
(Insert the village name), Guam (Insert the correct zip code)

Reference: (Insert the project number exactly as shown in the contract)
(Insert the project name exactly as shown in the contract)
NOTICE OF FINAL INSPECTION

Dear (Insert the contractors contact person's name),

This is in response to your letter dated (insert date of the Final Inspection) requesting a Final Inspection for the above referenced project. As per subsection 106.7(b) of FP-03, the Department of Public Works will be conducting a final inspection of the (insert the project name exactly as shown in the contract) on (insert the date of the Final Inspection). The inspection will begin at (insert the time that the Final Inspection will start) starting at the (insert the place that the Final Inspection will start at)**.**

If you have any questions please contact (Insert name of the DPW Chief Engineer), Chief Engineer at the Department of Public Works at (Insert phone number of the Chief Engineer), (Insert name of the DPW Engineering Supervisor), Engineering Supervisor at the Department of Public Works at (Insert phone number of the Engineering Supervisor), or (insert name and phone number of the program management construction manager and phone number, if assigned).

Sincerely,

(Insert the name of the DPW Director)
Director

cc Include all persons and their organization that received a cc of this letter

File: (insert file name for this Notice of Final Inspection)

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO
Andrew S. Leon Guerrero
Acting Director

Person invited to the inspection
Name of Organization
Street Address of Organization
Village, Guam ZIP CODE

Re: **GU-NH_xxxx(yyy) (**Project number **exactly** as listed in the contract documents**)**
Short project description **exactly** as listed in the contract documents
Inspection for Final Acceptance

Dear (Mr. or Ms. As may be applicable) (insert name of the addressee above)

A final project inspection (the preceding needs to be updated if for a partial or semi-final inspection) is scheduled on **(Date and time for the inspection)** for the above referenced project. The inspection will begin at the **(Location where the start of the inspection will begin)**. If you are unable to attend, please review the constructed work, note any deficiencies in the Contractor's work, and return a **written list** of deficiencies noted to (insert name of the Director), Department of Public works, within 7 calendar days of the date of this notification so that we may have these deficiencies reviewed/corrected in a timely fashion.

Sincerely,

(insert name of the Director)
Director

cc Include all persons and their organization that received a cc of this letter

File: (insert file name for this letter for Final Inspection Letter)

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO
Andrew S. Leon Guerrero
Acting Director

MEMORANDUM

TO: Superintendent, Highway Maintenance & Construction Department of Public Works
General Manager, Guam Power Authority
General Manager, Guam Water Authority
Administrator, Guam Environmental Protection Agency
Chief of Police, Guam Police Department
Fire Chief, Guam Fire Department
(the above list needs to be modified as necessary for Guam agencies that should be part of the Final Inspection)

FROM: (insert name of the Director), Director

Re: **GU-NH_xxxx(yyy) (**Project number **exactly** as listed in the contract documents**)**
Short project description **exactly** as listed in the contract documents
Inspection for Final Acceptance

The Department of Public Works will be conducting an inspection of completed portions of the (insert project name exactly as shown in the contract) on (insert date of the final inspection) . The inspection will begin at (insert the starting time of the inspection) starting at the (insert the meeting place where the inspection will begin)**.** It is anticipated that the inspection will take approximately (insert an approximate length of time that the inspection will take) hours to complete.

If you are unable to attend, please review the constructed work, note any deficiencies in the Contractor's work, and return a **written list** of deficiencies to (insert name of the director), Director, Department of Public Works, within seven (7) calendar days of the inspection date noted above so that the deficiencies can be reviewed/corrected in a timely fashion.

If you have any questions please contact (insert name of the DPW Project Engineer), Project Engineer, at the Department of Public Works at (insert the phone number of the Project Engineer); (insert name of the Engineering Supervisor) Supervisor, Federal-Aid Highway Construction Section at (insert the phone number of the Engineering Supervisor); or (insert the name and phone number of the Program Management Construction Manager, if assigned).

Cc Include all persons and their organization that received a cc of this letter

File: (insert file name for this letter for Final Inspection Memo)

Final Inspection Punch-List
Instructions

A. Originated by:

Project Engineer

B. Guidelines:

At the time the Final Inspection is conducted the Project Engineer will review all items of work for completeness in accordance with the contract. Based on this inspection the Project Engineer will note each item that requires correction and develop a Punch-List to be formally transmitted to the Contractor.

Participation at the Final Inspection may also include other agencies and affected utilities. The Project Engineer will take comments from these agencies/utilities and review these comments. If the comments represent a valid item that requires correction by the contractor the Project Engineer will incorporate these comments into the Punch-List.

The punch list with all comments from the Final Inspection will be delivered to the contractor within 2 days from the date of the Final Inspection. If comments from other agencies/utilities are received after the Final Inspection is conducted but within the 7 day period indicated in the Final Inspection letter and if these comments represent an item that the contractor needs to correct then an amended Punch-List will be prepared and formally delivered to the contractor.

C. Distribution:

Originals: Original Punch-List signed by the Project Engineer to be placed in the project files

Copies: Copy of the Punch-List signed by the Project Engineer delivered to the contractor

D. Form:

Format will be as shown.

Department of Public Works
Division of Highways

Project Number: Contractor:
Project Name: Date of Inspection:

Punch-List

Item No.	Location	Item Requiring Correction	Date	Date Corrected	Corrected Item Inspected by

Signed by:_______________________________ Date:____________________
Project Engineer

Department of Public Works
Division of Highways

Project Number: Contractor:
Project Name: Date of Inspection:

Punch-List

Item No.	Location	Item Requiring Correction	Date	Date Corrected	Corrected Item Inspected by

Department of Public Works
Division of Highways

Project Number: Contractor:
Project Name: Date of Inspection:

Punch-List

Item No.	Location	Item Requiring Correction	Date	Date Corrected	Corrected Item Inspected by

Notice of Final Acceptance Letter
Instructions

A. Originated by:

Project Engineer

B. Guidelines:

Once all of the contract items have been completed and items listed in the Punch-List have been satisfactorily corrected the Project Engineer shall prepare the Notice of Final Acceptance for the Directors review and signature.

Note that Final Payment cannot be made until the contractor has submitted the "As-Built' plans and that the Project Engineer has verified the correctness and completeness of the "As-Built" plans.

C. Distribution:

Originals: Letter to the Contractor, copies to be signed as received by

Copies signed as received by: To be placed in the project files.

D. Form:

Format will be as shown.

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO
Andrew S. Leon Guerrero
Acting Director

(Insert the contractors contact person's name)
(Insert the title of the person above)
(Insert the Contractors name exactly as it appears in the Contract)
(Insert the correct address of the Contractor)
(Insert the village name), Guam (Insert the correct zip code)

Reference: (Insert the project number exactly as shown in the contract)
(Insert the project name exactly as shown in the contract)
NOTICE OF FINAL ACCEPTANCE

Dear (Insert the contractors contact person's name),

This is to inform you that the work performed on the above referenced project has been satisfactorily completed in substantial conformance with the provisions of the contract on (Insert the date that the project was substantially complete). Final acceptance is effective on the above date and you are hereby relieved of further maintenance obligations in accordance with Subsection 106.07 of the Specifications.

Final payment will not be made until the "As-Built" plans have been submitted and the information on the "AS-Built" plans has been verified in accordance with Subsection 104.03 of the Specifications. (Include this language if the Contractor has not submitted the "AS-Built" plans.)

If you have any questions please contact (Insert name of the DPW Chief Engineer), Chief Engineer at the Department of Public Works at (Insert phone number of the Chief Engineer), (Insert name of the DPW Engineering Supervisor), Engineering Supervisor at the Department of Public Works at (Insert phone number of the Engineering Supervisor), or (insert name and phone number of the program management construction manager and phone number, if assigned).

Sincerely,

(Insert the name of the DPW Director)
Director

File: (insert file name for this Notice of Final Acceptance)

Contractor's Release of Claims
Instructions

A. Originated by:

Project Engineer/Contractor

B. Guidelines:

Once the final cost of the contract has been determined based on the final quantities the contractor needs to submit a notarized Contractor's Release of Claims. The release of claims indicates that the contractor has been or will be paid the amount equal to the final contract amount and that upon receiving such payment the contractor releases the Government from further liabilities, obligations or claims as a result of the contract.

The Project Engineer needs to thoroughly review the Release of Claims for its completeness and accuracy as to the total contract amount, the amount already paid and the amount yet to be paid. If any of these amounts are incorrect or in dispute, the Project Engineer will notify the contractor immediately in writing that the Contractor's Release of Claims is not accepted and that a revised Contractor's Release of Claims needs to be submitted.

The Contractor's Release of Claims is generally submitted by the contractor with or after the contractor's final invoice. The Project Engineer will not submit the final invoice for payment until the Contractor's Release of Claims is submitted and verified.

C. Distribution:

Originals: Placed in the project file

Copies signed as received by: Returned to the contractor acknowledging its receipt

D. Form:

Format will be as shown

CONTRACTOR'S RELEASE OF CLAIMS

Project Name: **(Insert project name exactly as shown in the contract)**
Project No.: **(Insert project number exactly as shown in the contract)**
Contract No. : **(Insert DPW contract number)**

KNOW ALL MEN BY THESE PRESENTS: In consideration of the premise and the sum of total contract amount in words___ ($_________) lawful money of the United States of America _ amount already paid in words_____, ($__________) of which has already been paid, and _ amount yet to be paid in words_____, ($__________) of which is to be paid by the Government of Guam under the above mentioned contract, the undersigned contractor does, and by the receipt of the said sum shall, for himself, his successors and assignees, remise, release and forever discharge the Government of Guam, its officers, agents, and employees of and from all liabilities, obligations and claims whatsoever in law and in equity under or arising out of said contract.

IN WITNESS WHEREOF, this release has been executed this _____ day of __________ 20___.

____
Contractors Name/Signature
(Insert the title of the person above)
(Insert the Contractors name exactly as it appears in the Contract)
(Insert the correct address of the Contractor)
(Insert the village name), Guam (Insert the correct zip code)

GUAM, U.S.A.)
(
City of ________)

On this ____ day of _____________, 200__, before me, a notary public in and for the Territory of Guam, U.S.A., personally appeared ____(Insert name of person signing above)___, known to me to be the person whose name is subscribed to the **Contractor's Release of Claims** and he acknowledged to me that he executed the same in behalf to himself.

WITTNESS my hand and official seal.

Project Materials Checklist
Instructions

A. Originated by:

Project Engineer

B. Guidelines:

Upon completion of the construction contract the Project Engineer shall compile a list of the materials sampled and tested in the field and compare the number of samples and tests completed to the frequency of sampling and testing required by the contract documents. If the frequency of tests performed varies from the frequency of testing required by more than -10%, a reason for the deviation is required. Testing in excess of the frequency required need not be explained.

The Project Engineer shall include the analysis of this review with the report to the Chief Engineer on the review of the plans, specifications and special contract requirements attesting that based on materials submittals, materials certifications, various tests, and field observations that the project has been constructed in substantial compliance with the requirements set forth on the plans, specifications and contract documents. The Project Engineer will use the information that was obtained in this review to complete the Project Materials Checklist.

C. Distribution:

Originals: Placed in the project file

D. Form:

Format will be as shown

Department of Public Works
Division of Highways
Project Materials Checklist

Project Number:
Project Name:
Contractor:

	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 authorized for use on the project.				
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 Contract Requirements are documented.				
4. When required, change of material/product letters and a revised Certification 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 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.				
9. All required acceptance actions and documentation were completed and satisfactory test results demonstrated before payment was made on each item.				
10. Acceptance sampling & testing frequencies for each item accepted is adequate for the total quantities of those items incorporated into the project.				
11. 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.				
12. All required catalog cuts have are on file.				
13. All required Certificates of Materials Origin have been received and are on file.				

* 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.

Materials deficiencies on all projects must be resolved prior to Final Payment. If the issue is not resolved it may result in the loss of Federal participation.

PROJECT ENGINEER DATE

SUPERVISING ENGINEER DATE

CHIEF ENGINEER DATE

Final Acceptance Checklist
Instructions

A. Originated by:

Project Engineer

B. Guidelines:

The Project Engineer will compile all of the information collected during the close out of the construction project and utilize this information to complete the Final Acceptance Checklist. This check list shall be used by the Project Engineer to verify that the information included in the check list has been completed and/or submitted by the contractor.

C. Distribution:

Originals: Placed in the project file

D. Form:

Format will be as shown

Department of Public Works
Division of Highways
FINAL ACCEPTANCE CHECKLIST
FOR FEDERAL-AID PROJECTS

PROJECT TITLE/DESCRIPTION

Project Title/Description ____________________

Route	________	Project Number	________
Date Awarded	________	Date Executed	________
Notice to Proceed	________	Work Started	________
Contract Days	________	Total Contract Days	________
Final Inspection Date	________	Project Acceptance Date	________
Liquidated Damages(No. of Days and total amount)	________		

SUBMITTALS

	Submitted?	Date
Material Certifications		
Proposed Final Estimate		
Last Statement of Working Days		
Contractor's Written Statement of Claims		
List of Change Orders		
A=Approved /Pe= Pending		
Pa=Participating/N=Non-Participating		
List of Time Extension		
FHWA Approved/Not Approved		
Utilization of DBE		
Environmental Commitments Completed		

ADDITIONAL INFORMATION

Labor Compliance Problems

____
____
____
____

Any Other Changes

____
____
____
____

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APPENDIX B

MISCELLANEOUS

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Department of Public Works
Division of Highways

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO

Recommended Changes to Specifications, Contract Requirements and CMIS Manual

To: Department of Public Works Construction Office 542 North Marine Corps Drive Tamuning, Guam 96913	From:	
		Date
Recommended Changes To: ☐ Standard Specifications ☐ Special Contract Requirements ☐ CMIS Manual	Section ________ Number ________ Chapter ________	Page ____ Page ____ Page ____

Recommended Change:

____
____
____
____
____
____
____
____
____

Reasons for Recommendation:

____
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____

Disposition of Recommendation: ☐ As Proposed ☐ As Modified per Following Comments;

____
____
____
____
____

Actions: ☐ Reject Recommendation ☐ Implement Recommendation ☐ Modify and Re-Submit

Signed ______________________________ Date ______________________________
DPW Chief Engineer

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO
Lawrence P. Perez
Director
Andrew Leon Guerrero
Deputy Director

Department of Public Works
Division of Highways

MEETING ATTENDANCE SHEET

Project Name:	
Project No.	
Subject:	
Meeting Place:	
Date & Time:	

NAME	Company Name	Tel. No.	E-Mail Address

542 North Marine Corps Drive, Tamuning, Guam 96913 * Tel. (671) 646-3131 * Fax: (671) 649-6178/3777

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO
Lawrence P. Perez
Director
Andrew Leon Guerrero
Deputy Director

FAX TRANSMITTAL

TO:	FAX NO.: TEL. NO.:
FROM:	FAX NO.: TEL. NO.:
SUBJECT:	NO. OF PAGES: (Including this Page)
REMARKS:	
Note: If you do not receive legible copies of all the pages, please call back as soon as possible: (671) 649-3104 and ask for sender	

542 North Marine Corps Drive, Tamuning, Guam 96913 * Tel. (671) 646-3131 * Fax: (671) 649-6178/3777

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO
Lawrence P. Perez
Director
Andrew Leon Guerrero
Deputy Director

DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

SPEEDY MEMO

TO: ______________________	DATE: ______________________
ATTENTION: ______________________	SUBJECT: ______________________
PROJECT: ______________________	______________________
______________________	

MESSAGE:

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____
By

542 North Marine Corps Drive, Tamuning, Guam 96913 * Tel. (671) 649-3106 * Fax: (671) 649-3124

The Honorable
Felix P. Camacho
Governor

The Honorable
Michael W. Cruz, M.D.
Lieutenant Governor

public works
DIPATTAMENTON CHE'CHO' PUPBLEKO

Lawrence P. Perez
Director
Andrew Leon Guerrero
Deputy Director

DEPARTMENT OF PUBLIC WORKS
DIVISON OF HIGHWAYS

T R A N S M I T T A L

DATE:

TO:
Attention:

FROM:

SUBJECT:

FORWARDED HEREWITH:

( ) Drawing Plan ( ) Specifications ( ) Estimate ( ) Electronic File or Disktte(s)
( ) Copies of Drawings ( ) Letter ( ) Others

This Package includes the following:

Qty.	Unit	Description

These are forwarded as indicated below:

( ) For Comment ( ) Approved as noted ( ) Return ________ Corrected plans
( ) For your use ( ) Approved as submitted ( ) Resubmit _____ Copies for Approval
( ) As requested ( ) For information and records ( ) Submit _______ for Distribution
( ) For review and approval ( ) Returned for corrections ( ) Others

REMARKS:

Received By Date Sender Date

542 North Marine Corps Drive, Tamuning, Guam 96913 * Tel. (671) 646-3131 * Fax: (671) 649-3777

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APPENDIX C

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APPENDIX C

MATERIALS TESTING AND INSPECTION PLAN

1.0 INTRODUCTION

The purpose of this Materials Testing and Inspection Plan (MTIP) is to provide guidance to construction management and inspection services personnel on DPW projects relating to the sampling and testing of construction materials and associated documentation requirements. It is not the intent of this MTIP to provide a complete summary of all sampling and testing methods and procedures; rather, it is to establish a general understanding of the materials sampling, testing, and inspection requirements for DPW projects.

The Contract specifications establish the requirements for the sampling and testing of construction materials by the Contractor for use in determining acceptance. The testing requirements for materials to be tested, types of tests, performance criteria, and test frequency are identified in selected sections of the project specifications and replicated in this MTIP as the “Frequency Schedule for Contractor Sampling and Testing”. The Contractor is required to prepare a Contractor Quality Plan (CQP) identifying the methods and procedures it will use to meet the quality requirements for the project.

DPW will carry out specific actions to validate the Contractor’s QC program and results through the assignment of a Materials Testing Consultant (MTC) for the project. The DPW-contracted MTC will prepare a plan to validate the quality processes used on the project in compliance with the “Frequency Schedule for Quality Assurance (QA) Evaluation” included in this MTIP. The MTC will interface through the PE assigned to the project to carry out the necessary QA activities.

The processes described above establish the minimum requirements for performance, and must be interfaced with the sequence and magnitude of the Contractor’s construction operations in order to reflect a realistic plan for compliance. The plans should be continually updated to reflect the as-constructed work, and modified as necessary to accommodate upcoming construction activities in order to meet the minimum requirements at the conclusion of the project.

END OF SECTION

2.0 ACKNOWLEDGEMENTS

This MTIP incorporates information from multiple published sources, as well as many more incorporated by reference in the text of this document. The intent is to reference standardized, time-tested procedures and methods in order to produce, control, and measure the various materials produced and incorporated into the permanent work on DPW projects. The State Department of Transportation agencies across the United States have established and continue to maintain a thorough set of material testing procedures in compliance with FHWA and other industry benchmark criteria. For the purpose of developing this MTIP for DPW, the policies, procedures, and methods described and employed by FHWA and the Colorado Department of Transportation (CDOT) Materials Division serve as the most direct source of much of the material contained in this document.

The following is a non-exclusive list of sources for published information used as reference in the development of this MTIP.

- AASHTO, Guide for Design of Pavement Structures
- CDOT, Construction Manual
- CDOT, Pavement Design Manual (PDM)
- Federal Lands Highway Field Materials Manual (FHWA)
- Metropolitan Government Pavement Engineers Council (MGPEC) Pavement Design Standards and Construction Specification Manual
- Portland Cement Association, Design and Control of Concrete Mixes, Thirteenth Edition

END OF SECTION

3.0 DEFINITIONS

The following are definitions of words and/or phrases used in describing the procedures, methods, and criteria for materials sampling, testing, evaluation, and acceptance. Additional definitions applicable to a specific material or procedure may be identified in the respective section or write-up, and supplements the information contained herein.

Acceptance Program - All factors that determine the quality of the product as specified in the Contract requirements.

Accredited Laboratory - A laboratory accredited by the AASHTO Accreditation Program.

Batch - A unit or subdivision of a lot, such as a mixer load of concrete, a batch of bituminous mix, or a square yard of base course.

Bias – A constant error in one direction, which causes the average test result to be off-set from the true average value.

Calibration - The act or process of determining the relationship between a set of standard units of measure and the output of an instrument or test procedure.

Control Chart – A chart or graph, which is usually conspicuously displayed, showing an up-to-date plot of specific test results.

Correlation - A statistical relation between two or more variables such that systematic changes in the value of one variable are accompanied by systematic changes in the other.

Designated Agent – Employee(s) of a consultant or independent laboratory that is employed, paid by, and/or directly accountable to DPW, which excludes the Contractors' or vendors' personnel.

Independent Assurance Program (IA) - Activities that are unbiased, and an independent evaluation of all of the sampling and testing procedures and testing equipment, and in some cases, the witnessing of certain specified samples and sampling techniques used in the acceptance program.

Lot - An isolated quantity of material from a single source. A measured amount of construction material considered to be produced by the same process.

Mix Verification Testing – After a mix design has been approved and production commences, independent tests performed to verify that materials produced in the field conform to the approved mix design.

Nominal – Representative value of a measurable property determined under a set of conditions, by which a product may be described.

Nominal Value – A value assigned for convenient designation, existing in name only. For example, "2 x 4" lumber (actually measures 1 ½" x 3 ½") and "one-inch" pipe (inside and outside diameters varying according to strength (schedule) of pipe.

Practice – A definitive procedure for performing one or more specific operations or functions that does not produce a test result.

Proficiency Samples - Homogeneous samples that are distributed and tested by two or more laboratories.

Quality Assurance (QA) - All those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality.

Quality Control (QC) - All Contractor/vendor operational techniques and activities that are performed or conducted to fulfill Contract requirements.

Random Sample - A sample drawn from a Lot in which each increment in the Lot has an equal probability of being chosen.

Reasonable Conformance - When construction and materials substantially comply with the plans, specifications, and pre-defined variations deemed to be acceptable.

Recycled Pavement – When used in the context of cold in-place recycled pavement or hot in-place recycled pavement, the asphaltic material is re-worked within the footprint of the roadway without removing it off site.

Sample - A small part of a Sub-lot or Batch that represents the whole. A sample may be divided into several Test Specimens.

Split Sample - A sample taken and evenly divided to be tested by two or more individuals or laboratories.

Sub-lot – A definable portion of a Lot that is isolated from the originally identified quantity of material from a single source due to conditions of time, quality, and/or quantity. The Sub-lot and remnant portion of the original Lot are evaluated independently as material considered to be produced by the same process.

Test Method – A definitive procedure for the identification, measurement, and evaluation of one or more qualities, characteristics, or properties of a material, product, system, or service that produces a test result.

Test Specimen – Materials extracted from a Sample and used to determine specific material characteristics and/or performance properties and used for determination of compliance with Contract requirements.

Vendor - A supplier of materials incorporated into the project, who is not the Contractor. May or may not be the manufacturer.

Witness – To witness is to observe an act of work, verifying that the work was performed correctly. After observation, the Witness is to testify by written and verbal communication protocols to the Engineer in charge.

END OF SECTION

4.0 ACRONYMS

The following is a list of acronyms used within the text of this MTIC. Additional acronyms may be referenced within individual sections, and are defined in that context. The complete term or the acronym may be used interchangeably.

3R	Resurfacing, Restoration, Rehabilitation
AAP	AASHTO Accreditation Program
AASHTO	American Association of State Highway and Transportation Officials
ABC	Aggregate Base Course
ACI	American Concrete Institute
ACPA	American Concrete Pavement Association
ACPA	American Concrete Pipe Association
AI	Asphalt Institute
AMRL	AASHTO Materials Reference Laboratory
ASTM	American Society of Testing and Materials
ATSSA	American Traffic Safety Services Association
CBC	Concrete Box Culvert
CCRL	Cement and Concrete Reference Laboratory
COC	Certificate of Compliance
CRSI	Concrete Reinforcing Steel Institute
DPW	Government of Guam Department of Public Works
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
HAZMAT	Hazardous Material
HBP	Hot Bituminous Pavement
HMA	Hot-mix Asphalt
LabCAT	Laboratory for Certification of Asphalt Technicians
MSDS	Materials Safety Data Sheets
MUTCD	Manual on Uniform Traffic Control Devices
NCAT	National Center for Asphalt Technology
NCHRP	National Cooperative Highway Research Program
NDT	Non-destructive Testing
NEPA	National Environmental Protection Act
NHS	National Highway System
NICET	National Institute for Certification of Engineering Technologies
NIST	National Institute of Standards and Technology
NPCA	National Precast Concrete Association
OGFC	Open-grade Friction Course
PCCP	Portland Cement Concrete Pavement
PE	Project Engineer
PMT	Program Management Team
PS&E	Plans, Specifications, and Estimate

QA	Quality Assurance
QC	Quality Control
ROW	Right-of-Way
RSO	Radiation Safety Officer
SHRP	Strategic Highway Research Program

END OF SECTION

5.0 SAMPLE IDENTIFICATION AND HANDLING

This section outlines the general requirements for identification, handling, and storage of material samples obtained on the project.

5.1 IDENTIFICATION

All samples collected on the project for testing should be adequately labeled with the appropriate project information. The samples should be collected and transported in the proper type of container, and the labeling method should be compatible with the container type so that the sample and related information do not become separated. At a minimum, the following information should be included on any sample. Additional information may be required, depending on the specific location and/or purpose for the sample:

- Project name and reference number
- Pay item number and description
- Sample number
- Lot and Sub-lot number
- Date
- Specific location where sample was obtained
- Purpose of sample

5.2 HANDLING AND STORAGE

Samples should be stored and handled appropriately to ensure that the integrity of the material has not been compromised. The samples should be properly labeled and identified so that all information regarding the sample location and test results can be correlated. If the samples are transported, proper containers should be used to maintain the integrity of the sample throughout the shipping process.

Care should be taken to avoid damage to sample containers, disturbance of the sample, or contamination of its contents. Most samples should be stored in a dry environment and kept free from contamination until final acceptance of the project. It is important that all samples be cared for in this manner in the event that complete testing of verification or acceptance samples becomes necessary. Other samples may require specific storage environments such as concrete cylinders, which must be stored (cured) in a 100 percent humidity environment.

5.3 RETENTION

A protocol for the disposition of material samples for each project should be established at the start of the project. Samples of all materials should be retained until no further question remains as to the properties of the material, and the properties are confirmed in writing prior to final disposal.

5.4 DISPOSAL

All non-hazardous materials should be placed in authorized trash receptacles, unless particular arrangements to the contrary have been made. Materials that are considered hazardous should be handled in accordance with specific procedures for managing hazardous materials.

END OF SECTION

6.0 SAMPLE LOTS USED FOR ACCEPTANCE

This procedure describes the use of standardized non-biased methods for sampling and evaluation of materials by Lot for assessment of conformity to project specifications.

6.1 RANDOM SAMPLING

The most important factor in obtaining information for the purpose of enforcing specifications is the action of sampling. The process of Stratified Random Sampling should be used for this process. This is a method of random sampling that causes the samples to be spread more uniformly throughout the Lot. A schedule for random sampling should be developed for the project following ASTM guidelines prior to the start of testing.

Projects often include scattered and isolated areas of work such as tapers and gores, and it may not always be possible to strictly conform to the procedure described above. Judgment must be used and a reasonable attempt made to select samples without bias.

The location or time of sampling must be selected by a random method as well, which means that the location or time of sampling must be pre-determined without bias, such as by the use of a table of random numbers. Every load, ton, or square yard in the Sub-lot must have an equal probability of being chosen, which means that the sample location or time chosen must be accessible. It is not possible to obtain a probability sample from a stockpile of aggregates, because samples cannot be taken from the interior of the pile. To sample such material properly, it must be sampled at randomly determined intervals, either as it is placed in the pile or removed from the pile.

6.2 SAMPLING LOTS

A Lot is any well-defined quantity of material produced by essentially the same process through continuous production. The standard size Lot consists of five samples, but a Lot may include as few as three or as many as seven samples, due to changes in production or when total quantities require more or less than five tests.

Establishing Lots is not difficult when the production process and materials sources are uniform. When production begins under good process control and there is little need for plant adjustment, the first five samples should be used to establish the quantity represented by the first Lot. Thereafter, each Lot should contain five samples. More than a single day's run may be included if there is no significant change in the production process or raw material. When the production process is erratic or out-of-control, establishing Lots becomes a problem.

Often, the first few samples at the beginning of the production run will be erratic or off-target, and several major adjustments may be required before production is resumed. In such cases, these first few samples should be Lot No. 1. Then, after production levels out, five sample Lots should be used. After the five sample Lots have become routine, only a major production change or a quantity of material for which more or less than five samples are required should be cause for altering the number of tests.

END OF SECTION

7.0 COORDINATION WITH CONTRACTORS

This chapter provides guidelines to the Contractor or subcontractor so that they can properly present their materials for inclusion into the construction project. The Contractor should follow the procedures listed below to ensure the proper inspection, sampling, testing, and certification of materials and products incorporated into the construction project.

7.1 PROVIDE NOTIFICATION OF MATERIAL SOURCES AND SUPPLIERS

The Standard Specifications require the Contractor to submit a list of material sources and suppliers it intends to incorporate into the work. This can happen prior to delivery; however, it is preferable that the list be presented at the (PRECON). The list should include the items to be supplied, the quantities, the level of acceptance required, the name and address of the company supplying the material, and the contact person.

The Contractor is responsible for providing all required product or material documentation at the point and time of delivery to the construction project. Failure to provide the required documents may result in either a delay in allowing the material to be incorporated into the work or rejection of the materials. Although not preferred, it is possible that the Contractor will be allowed to install materials “at its risk” pending receipt of the necessary documentation.

7.2 BUY AMERICA REQUIREMENTS

In accordance with the project specifications:

- All manufacturing processes, including the application of coatings, for all steel and iron products permanently incorporated into the work should have occurred in the United States.
- The Contractor should provide a certification from each supplier, distributor, fabricator, and manufacturer who has handled the steel or iron product, including the application of coatings.
- These certifications should create a chain of custody. The lack of these certifications will be justification for rejection of the steel or iron product.
- Upon completion of the project, the Contractor should certify in writing its compliance with this requirement. An original signature is required on the Certificate for the Project record.

7.3 ASBESTOS MANAGEMENT CERTIFICATE

Asbestos-containing materials on the project will be addressed in accordance with the requirements of the project specifications. An original signature is required on the Certificate for the Project record. The Certificate is part of the Final Materials Documentation Process.

7.4 DESIGNATED PRODUCTS AND ASSEMBLIES

The majority of materials submitted for inclusion on DPW projects will fall within one of four levels of product acceptance for sampling and testing. Through its QA Program, DPW retains the right to obtain samples for additional testing and/or require supplemental documentation.

Materials or products not referenced within the four levels of product acceptance must be fabricated or supplied in accordance with the requirements of the applicable project specifications, plans, and standards. Examples of processed materials not found in the following four levels are Aggregate Base Course (ABC), Hot-mix Asphalt (HMA), and concrete.

7.4.1 PRE-INSPECTION

Pre-inspection is defined as the time when representatives from DPW or its designated agent visit a manufacturer's facility to perform an initial review of the company's QC plan and employee certifications, as well as subsequent inspection visitations during the manufacturing of the product. Inspection arrangements should be made by contacting DPW a minimum of 10 days prior to the beginning of fabrication. Failure to give notification may result in delays to the project and/or rejection of materials or products. Products requiring pre-inspection include:

- Bearing Devices (Type III) - Bridge
- Bridge Expansion Devices
- Pre-stressed Concrete Units - Bridge
- Structural Steel – Bridge

7.4.2 CERTIFIED TEST REPORT (CTR)

The CTR level of acceptance occurs when a manufacturer is required to submit the actual test results performed on the material being provided. A CTR should contain the actual results of tests for the chemical analysis, heat treatment, and/or mechanical properties, in accordance with the drawing and/or specification. The Contract will designate products and assemblies that can be incorporated into the work, if accompanied by CTRs. The word preceding "Test Report" may vary between different industries, such as Certified, Mill, Metallurgical, and Laboratory; however, they are all considered equivalent. Each CTR should include:

1) Project number
2) Manufacturer's name
3) Address of manufacturing facility
4) Laboratory name and address
5) Name of product or assembly
6) Complete description of the material
7) Model, catalog, and stock number (if applicable)
8) Lot, heat, or batch number identifying the material delivered
9) Date(s) of the laboratory testing
10) All test results from tests conducted on samples taken from the same lot, heat, or batch
11) Signed certification such as the following:

> I herby certify under penalty of perjury that the material listed in this Certified Test Report represents ____________________________ (quantity & units) of pay item ____ (pay item # and description) that will be installed on Project no. ________________ .
>
> _________________________ _________________________ ___________
>
> Signed Contractor Date

The original CTR should include the Contractor's original signature, and should state that the product or assembly to be incorporated into the project has been sampled and has passed all specified tests. Products or assemblies based on CTRs may be sampled and tested by DPW, and are subject to rejection if the material fails to meet the applicable specifications. The following is a partial list of products or categories that can be evaluated using a CTR:

- Cribbing
- Mechanical Fasteners (Field)
- Glass Beads (for pavement marking)
- Overhead Sign Structures
- Top Soil
- Traffic Signal Structures
- Welded Wire Fence

7.4.3 CERTIFICATE OF COMPLIANCE (COC)

The COC level of acceptance occurs when a manufacturer is required to submit a document certifying that the material being provided meets all required specifications. A COC should reference the required specifications for the chemical analysis, heat treatment, and/or mechanical properties in accordance with the drawing and/or specification, but not the actual test results. At a minimum, COCs should supply the following information:

1) Project number
2) Manufacturer's name
3) Address of manufacturing facility
4) Laboratory name and address
5) Name of product or assembly
6) Complete description of the material
7) Model, catalog, and stock number (if applicable)
8) Lot, heat, or batch number identifying the material delivered
9) Date(s) of the laboratory testing
10) Listing of all applicable specifications for this particular product or assembly, and a statement that it was fabricated in accordance with and meets these applicable specifications
11) Signed by an authorized representative

The original COC should state that the product or assembly has been sampled and passed all specified tests. COCs should be provided by the Contractor at the time of material delivery, but no later than the beginning of installation. Products or assemblies furnished on the basis of COCs may be sampled and tested by DPW, and are subject to rejection if the material fails to meet the applicable specifications. The following is a partial list of products or categories requiring COCs.

PRODUCTS REQUIRING CERTIFICATES OF COMPLIANCE

- Bearing Devices (Type I, II)
- Bridge Deck Forms, Permanent Steel
- Bridge Rail, Steel
- Chloride
- Concrete Box Culverts, Pre-cast
- Damp-proofing, Asphalt
- Dust Palliative, Asphaltic or Magnesium
- Emulsified Asphalt for Tack Coat
- Erosion Bales
- Expansion Joint Material, Pre-formed Filler
- Flumes (all types)
- Gabions and Slope Mattress
- Gaskets
- Guard Rail - End Anchors
- Guard Rail Metal
- Guard Rail Posts - Metal
- Guard Rail - Precast
- Hay
- Headgates
- Inlets, Grates, and Frames (Pre-fab)
- Interior Insulation
- Lighting
- Light Standards, High Mast
- Light Standards, Metal
- Luminaires (Inclusive)
- Manholes, Rings, and Covers (Pre-fab)
- MC-70 - Prime Coat (Liquid Asphalt)
- MSE Wall - Elements
- Piling
- Pipes - All material compositions
- Retaining Wall Blocks
- Seed
- Sign Panels
- Sprinkler System(s)
- Steel Sign Posts
- Steel Sheet Piling
- Straw
- Structural Glazed and Ceramic Tile
- Structural Plate Structures
- Structural Steel Galvanized
- Treated Timber
- Wood Cellulose Mulch

END OF SECTION

8.0 GENERAL REQUIREMENTS

This MTIP outlines the various components that together serve as the plan for testing and inspecting the materials incorporated into the permanent work on a project. This information should be used in combination with the other sections of the CMIS Manual as a comprehensive guideline for handling materials issues on DPW construction projects.

8.1 ACCEPTANCE

Material to be incorporated into the work should be evaluated for compliance and/or tested prior to final acceptance. There are four typical methods for evaluating and accepting material, each having varying degrees of involvement by both the Contractor and DPW. The Contract specifications define the methods to be used for particular materials and work processes.

Visual Inspection - This is the simplest method of acceptance and allows material to be accepted with or without companion certification or test results. Selected materials and/or processes can be accepted or rejected solely on visual inspection of the material, relying on experience and engineering judgment to determine the acceptability of the material.

Certification - A commercial certification, commonly referred to as a Certificate of Compliance (COC), is a manufacturer's representation that the material complies with certain specifications. It typically consists of a supplier's certification, indicating the material has been produced to a particular specification, and is often accompanied by product catalog data. COCs are routinely required for products purchased off-the-shelf such as paint, sign hardware, mortar, grout, and fencing materials. Typically only one COC is required for all similar materials. A ***production certification*** requires a supplier's or contractor's certification that the material has been produced to a specific standard, accompanying test data, and more. A production certification covers materials that are specifically manufactured or fabricated for a specific project. Examples might include culvert pipes, structural elements, bridge hand rails, and asphalt binder.

Measured and/or Tested - Acceptance can be based on measuring or testing specific material for conformance to the specifications stated in the Contract. The Contractor may perform tests on the material and provide the results to demonstrate that the product meets the Contract requirements. DPW may accept the results provided by the Contractor for materials either on- or off-site, or arrange for QA sampling and testing once the material has arrived on-site. This also applies to material used in highway construction projects that may be fabricated or manufactured at plants or locations off-site, such as pre-stressed concrete girders and steel bridge girders.

Statistical Evaluation - The Contract specifications may include acceptance based on making an evaluation of the value of the work, and is often called "Statistical Acceptance". Statistical Acceptance relies on random sampling of materials during production of a uniformly processed material. The timing and locations of random sampling should not be divulged until moments before a sample is to be taken, and DPW should witness the actual sampling and splitting of each sample. Test results should be entered immediately into the statistical program to determine the acceptability and value of the work.

8.2 SAMPLING AND TESTING

All sampling and testing should be performed in such a manner as to provide an acceptable level of certainty that the results accurately portray the actual conditions of the material being evaluated. This process relies heavily on the following conditions:

Qualified Personnel - Personnel performing sampling and testing of materials are properly trained and experienced in the use of proper methods and procedures.

Calibrated Equipment - Testing of materials used in highway construction projects requires specialized and calibrated materials testing equipment and laboratories that are accredited as capable of producing valid test data.

Standardized Procedures - Materials are obtained, handled, and tested following established procedures that are capable of producing repeatable results.

Uniform Materials - The work represented by the samples taken was constructed using consistent material, processes, and handling methods, so the sample can be considered a true representation of the work element.

Documentation and Reporting - All test results are documented and reported in the same fashion, so comparable results can be evaluated for trends in performance.

8.3 TESTING FREQUENCY

Sampling and testing should be carried out in accordance with the type and frequency as stated in the project specifications. This information defines the minimum requirements that must be fulfilled in order for the quality testing program to be considered a valid representation of the work performed on the project. The actual number and frequency of tests required to be performed is highly dependent on the specific methods and sequence the Contractor elects to use in carrying out the work. The number of tests performed should be continually compared to the units of work produced to ensure the minimum testing frequency is maintained throughout the duration of the project.

END OF SECTION

9.0 EARTHWORK

9.1 GENERAL

Typical highway construction uses existing, native materials to form the roadbed prior to placement of the manufactured materials that compose the pavement structure. If properly handled and compacted, these native materials can be used successfully to construct the roadbed.

Soils are the most abundant material used in highway construction. They form the foundation or supporting surface for roadways, bridges, and other highway structures. Work involved in preparing the foundation and using soils in the construction of a normal highway project can be a major cost to the project. Due to this concern, knowledge of soil properties, conditions, and proper construction practices is a high priority.

Soil testing is designed to provide information on the classification, engineering properties, and any unexpected conditions that may be encountered during construction. The project specifications will determine the required testing for the project; however, in most cases, earth embankment materials will need to be classified to determine proper handling and compaction.

Earthwork construction can also consist of excavating and embanking material; preparing the foundation; bedding' and backfilling for structures. In these instances, materials for construction may be specified. To ensure compliance with the project specifications, testing will be required to verify the quality of materials used.

Imported sub-grade materials will typically need to be tested and evaluated prior to use. These materials include unclassified borrow, select borrow, topping, and select topping. In addition, sub-grade stabilization techniques where lime, fly ash, or hydraulic cement is incorporated into the upper layer of the sub-grade will require additional testing to establish the appropriate proportioning for the desired design properties.

9.2 DEFINITIONS

Boulders - All rocks larger than 10 inches in diameter.

Clay - A very fine-grained soil, which passes the No. 200 screen and has a Plastic Index of 11 or more.

Cobbles - Rocks that range from 3 to 10 inches in diameter.

Compaction - The process of increasing the density of a material by mechanical means, such as, tamping, rolling, vibration, etc.

Consolidation - The process of decreasing the thickness of a soil layer by applying a vertical load.

Density - The mass of a substance per unit volume, usually expressed in pounds per cubic foot (pcf).

Embankment - A raised structure consisting of soil, aggregate, or rock. Usually the material is compacted and is used to support roadway pavement.

Gradation - Indicates the range and relative distribution of particles in soil or aggregate.

Gravel - A granular material that is retained on the No. 10 screen and has a maximum particle size of 3 inches.

Liquid Limit - The moisture content at which a soil changes from the plastic state of consistency to the liquid state of consistency.

Maximum Density - The unit dry weight pcf of a soil compacted at optimum moisture and at a specific compactive effort.

Optimum Moisture - Percent moisture of a soil that will yield a maximum dry unit weight for a specified compactive effort.

Plastic Index - The numerical difference between the liquid limit and the plastic limit of a soil.

Plastic Limit - The moisture content at which a soil changes from the semi-solid state of consistency to the plastic state of consistency.

Poorly-Graded - Particle sizes of a soil mass that are not evenly distributed.

Rock - Any naturally-formed consolidated aggregate or mass of minerals, which cannot be excavated by manual methods alone. (Pieces of rock that pass the No. 4 screen are considered soil particles.)

Sand - A granular soil that passes the No. 10 screen and is retained on the No. 200 screen.

Silt - A very fine-grained soil that passes the No. 200 screen and has a Plastic Index of ten or less.

Stratified - Soil deposited in layers with different and distinct characteristics.

Void Ratio - The ratio of the volume of void space to the total volume of the particles within a mass.

9.3 CLASSIFICATION

The AASHTO method of Engineering Soil Classification (ESC) groups soils according to their load-carrying capacity and service characteristics. Designations are A-1, A-2, A-3, A-4, A-5, A-6, and A-7. Generally speaking, the higher numbers indicate poorer quality. Soils classified as A-1, A-2, and A-3 are considered granular material (35 percent or less passing the No. 200 sieve). Soils classified as A-4, A-5, A-6, and A-7 (35 percent or more passing the No. 200 sieve) are considered silt-clay materials.

9.4 TESTING

To accurately classify soil by the AASHTO method, a series of standard tests must be performed:

- Dry Preparation of Disturbed Soil Samples
- Mechanical Analysis of Soils
- Liquid Limit of Soils
- Plastic Limit and Plasticity Index of Soils

Refer to AASHTO for a chart indicating soil classification by the AASHTO method. Although this method separates soils into specific types according to gradation and Atterberg Limits characteristics, further testing is needed to obtain specific soil strength values such as Resistance-values (R-values), cohesion, and angle of internal friction. Other laboratory tests to determine engineering values are as follows:

- Compaction - AASHTO T 99 (Standard)
- Compaction - AASHTO T 180 (Modified)
- Consolidation/Swell Potential – AASHTO T 216
- Expansion Pressure and Resistance Values - AASHTO T 190
- Tri-axial Compression - AASHTO T 234
- Direct Shear Test - AASHTO T 236
- Permeability - AASHTO T 215

9.5 MOISTURE CONTENT

Water can greatly influence engineering properties of soil. Too much or too little water can render what would otherwise be desirable and stable material virtually useless. Knowledge of the in-place moisture content of soils is necessary for making decisions regarding the QC of materials. The actual moisture content of the soil can be compared with the optimum moisture content to determine if the material is in a suitable condition for compaction.

9.6 COMPACTION

Proper compaction of embankments is necessary to provide a stable base for roadway pavement, as well as the strength of the foundation soil directly beneath the embankment. Embankment strength is dependent upon three basic conditions -- Moisture Content, Compactive Effort, and Soil Characteristics. The Contractor’s efforts to apply the proper moisture and compactive equipment are highly dependent on the accuracy of the soil classification using the AASHTO method, and if the soil samples tested truly represent the material being used.

Optimum moisture and maximum density values are determined according to either

AASHTO T99 (Standard) or AASHTO T180 (Modified) as called for in the plans and specifications. This is typically achieved by placement and compaction of material in horizontal layers in lifts not exceeding 8 inches in thickness prior to compaction. AASHTO T99 is commonly referred to as the Standard Proctor Test, and uses a 2.5 kg (5.5 lb.) rammer dropped from 305 mm (12 in.). AASHTO T180 is commonly referred to as the Modified Proctor Test, and uses a 4.54 kg (10 lb.) rammer dropped from 457 mm (18 in.). Comparing compactive efforts, AASHTO T180 produces a compactive effort four-and-a-half times greater than the compactive effort produced by AASHTO T99. The Contract specifications identify the type of compaction standard that should be used for the particular work element.

During construction, the compaction control should comply with the plans, specifications, and the Frequency Guide Schedule for Minimum Materials Sampling, Testing, and Inspection.

The type of compaction equipment to be used is determined by the Contractor to meet the density and percent moisture requirements of the Contract specifications. Common types of compaction equipment used are:

- Sheepsfoot Roller - Used with silt and clay
- Rubber-tired Roller - Used with granular or cohesive soils
- Smooth-wheel Roller - Used with base coarse materials and for finishing operations
- Vibratory Roller - Used with granular soils

9.7 SOIL STRENGTH

Soil strength can be determined through various test methods, most common being the R-value and the California Bearing Ratio (CBR). Regardless of the method used, the purpose is to determine the support capacity of the soil.

Soil strength testing may also be performed as part of a stabilization technique, which may include treatment with cement, lime, fly ash, asphalt, or possibly some other chemical treatment. During construction, it may become necessary to validate the original stabilization through testing the on-site materials. The specification requirements will address any strength testing that will be needed to verify the original design work. Specific sampling and testing requirements will be included based on the treatment method.

9.8 GEOTEXTILES

Geotextile material may be specified as part of the work. The type and properties of the material will be identified in the plans and specifications. The sampling and testing requirements for the types of materials specified will also be called out in the specifications. The collection of samples for testing should be witnessed, along with the collection of the product data and COC associated with the material.

9.9 RETAINING WALLS

Retaining wall construction will typically use materials identified elsewhere in this MTIP and should be evaluated accordingly.

9.10 GROUND ANCHORS (INCLUDING SOIL NAILS AND ROCK BOLTS)

Anchor systems can use a variety of methods and components, which will be described thoroughly in the plans and specifications. The plans and specifications will also identify specific requirements for specialty items not already addressed elsewhere in the specifications, and should include the documents and/or sampling/testing that is required for material acceptance. The performance of anchorages in soils is highly dependent on the physical properties of that soil, so care should be taken to ensure the accuracy of determining the properties of actual soils encountered in the field, as compared to the information used as the basis for the design. The potential variation of soil strata within the project area should also be closely scrutinized to avoid preventable delays to the project.

END OF SECTION

10.0 AGGREGATE COURSES

10.1 GENERAL

The design and construction of a pavement structure may include one or more base courses. A base course is a layer of material below the wearing surface of a pavement. Bases considered as untreated are typically constructed of gravels or a mixture of soil and aggregate. Treated bases are typically constructed using a combination of soil and/or aggregates mixed with a binder such as asphalt materials, cement, lime, or other binding agents.

Base courses under rigid pavements provide a drainage layer, reduce pumping, and provide support for the heavy equipment usually used for placing rigid pavements. There is some increase in structural capacity when a base is placed under a rigid pavement, but it is typically not a significant amount.

Base courses under flexible pavements provide a significant increase in structural capacity. Pavement design of flexible pavement depends on the wheel loads being distributed over a greater area as the depth of the pavement structure increases. Additional benefits are improved drainage.

10.2 AGGREGATE BASE COURSE

Compaction of untreated bases is important for the stability of the pavement it supports. A standard is established in the laboratory with a sample of the base material before construction. The maximum dry density is determined. During construction, measurements of the field compacted density are compared to the maximum dry density determined in the laboratory. The requirements for compaction of ABC are shown in the Standard Specifications.

Two methods for determining maximum dry density of soils are AASHTO T99 and AASHTO T180, which are described in detail in the Earthwork section of this MTIP. The plans and specifications identify the type of compaction standard that should be used for the particular work element. During construction, the compaction control should comply with the plans, specifications, and the Frequency Schedule for Contractor Sampling and Testing.

10.3 PORTLAND CEMENT AND FLY ASH

Sources of Portland Cement and/or fly ash used in treated base courses is subject to DPW's review and approval on an individual project basis. The Contractor will be responsible for preparing and submitting its proposed mix designs for treated bases. Test results from trial mixes should accompany all mix design submittals. Placement of treated bases and the sampling/testing required for verification of compliance is very sensitive to the timing of when samples are taken during the placement, compaction, and curing process. The overall approach and methods of Contractor Testing and QA activities should be thoroughly discussed and agreed to prior to the start of production of treated bases in the field.

END OF SECTION

11.0 ASPHALT PAVEMENTS

11.1 GENERAL

This section describes the terminology and information regarding the use of bituminous materials in the construction of roadway pavements and structures.

11.2 BITUMINOUS MIXTURES AND BINDERS

Bituminous materials are used for a variety of purposes. The bituminous material, typically referred to as Asphalt Cement (AC) or binder, is combined with aggregate to bind the aggregate together and form a durable pavement. Binder may also be sprayed on a surface to protect it. Binders at room temperature are too viscous (stiff) to mix with aggregate or to be sprayed. Mixing is achieved by reducing viscosity by one of three approaches:

Hot Mix Asphalt (HMA) is produced by heating the binder to reduce its viscosity, then combining the hot binder with hot, dry aggregate. HMA has also been referred to as Hot Bituminous Pavement (HBP) in the past; however, HMA is now used to be consistent with the current national terminology.

Emulsion is a second method for lowering viscosity to improve mixing, which involves combining binder with water and emulsifiers to produce an emulsion.

Cutback Asphalt is produced by combining AC with solvent to produce a lower viscosity material, which can be readily mixed with aggregate.

A discussion of the comparative uses of these three types of bituminous materials is as follows:

HMA - Of the three mixing approaches, HMA provides the strongest and most durable pavements. Combining hot AC with hot dry aggregate provides the strongest bond between the binder and the aggregate. However, drying the aggregate plus heating the aggregate and binder requires considerable energy. In addition, the HMA must be transported, placed, and compacted before it becomes too cool for proper compaction.

Emulsions - Emulsions can be stored and used at lower temperatures than binder for use in HMA. Emulsions can also be used with wet, cool aggregate. These emulsion properties allow energy savings and more flexibility in application. Emulsions are more suited to maintenance activities and the preparation of surfaces prior to placement of HMA.

Cutbacks - Cutbacks contain solvents that could otherwise be used for fuel, petrochemicals, or other more effective uses of a non-renewable resource. A more serious problem with cutbacks is that the solvents can be absorbed through the skin or may be breathed after evaporation. Many solvents used in cutbacks present health hazards and some solvents are highly flammable and a fire hazard. Health, safety, and environmental regulations have significantly reduced or even eliminated the use of cutbacks for highway construction by federal and state highway departments.

11.3 HOT MIX ASPHALT DESIGNS

The PE should have a basic understanding of the concept for HMA design. Bituminous material used in road mix may be cutback asphalt or emulsified liquid asphalt and may be one of several grades available as specified in the Standard Specifications or the SCRs. The types and grade of bituminous material used will depend on the grading of the mineral aggregate, the atmospheric temperature at the time of mixing and laying, and the traffic requirements.

Specification bands are given to identify acceptable starting points for the mix design, they are NOT for production control. Once the mix design is complete and accepted, the Project Inspector should refer to the Production Control bands (upper and lower limits) that are based on the target values given in the particular approved mix design for each individual project. Production Control bands should be used to monitor materials produced for acceptance in accordance with the approved mix design and project specifications.

11.4 ASPHALT EMULSIONS

Overview - Binder and water do not normally mix well. Even if thoroughly mixed, the droplets of binder quickly recombine (coalesce) to become separate from the water. The mixture of binder and water are made more permanent by using an emulsifier to suspend the binder droplets within the water. The emulsifier bonds to the surface of the binder droplets, causing them to repel each other and not coalesce.

Emulsions are manufactured to yield a viscosity low enough for the emulsion to disperse throughout an aggregate or to be sprayed on a surface. After application, the emulsion sets or breaks as the asphalt droplets coalesce, the water evaporates, and the binder coats the aggregate or sprayed surface. Time required for the emulsion to break is influenced by many factors including emulsion characteristics, temperature, humidity, aggregate gradation, and aggregate surface properties.

Production - Emulsions are produced by mixing binder with water containing an emulsifier in a colloid mill. This process is augmented by heating both the binder and the water. In some cases, the water is heated under pressure to above boiling. Polymers and adhesion promoter additives may be added during the process to modify and improve the performance of the residual binder.

Classification Nomenclature - The series of letters and numbers used to classify emulsions contain a wealth of information about the properties of the emulsion. These properties determine the appropriate use for each emulsion. For example, consider the emulsions classified below and the following explanation of material properties:

Sample A - "CSS-1h" Sample B - "HFMS-2sP"

- Sample A – "C" in this location would indicate a cationic emulsion. All cationic emulsions start with a "C". If there is not a "C", the emulsion is anionic or non-ionic.
- Sample B – "HF" indicates the float properties of the emulsion. All high-float emulsions must pass the float test. No letter "C" in this location would indicate that this is not a cationic emulsion; therefore, sample b above is an anionic emulsion.
- Sample A – "SS" indicates a *slow-setting* emulsion. An "RS" in this location would indicate a *rapid-setting* emulsion, and an "MS" would indicate a *medium-setting* emulsion, such as Sample B listed above.
- The "1" or "2" following the "SS" and the "MS" in the examples above give an indication of the emulsion viscosity (Saybolt-Furol). A "2" indicates a higher viscosity than a "1".
- An "h" indicates the binder residue is hard (Sample A), as measured by the penetration test on the residue. An "s" indicates the binder residue is soft (Sample B), and no letter indicates a penetration range between an "s" and an "h".
- A "P" indicates the binder is polymerized. No "P" indicates a non-polymer modified binder.

11.5 EMULSION APPLICATIONS

Tack Coats - Tack coats are used on lower lifts of HMA to provide a bond to the HMA layer above, and to avoid slippage. Slippage can cause severe distress for pavements, so an effective tack coat is critical, and the specified use of CSS-1h and SS-1h is common for tack coats. Other asphalt emulsions may be used for tack coats; however, it is very important that the tack coat results in sufficient residual binder to provide a good bond. In addition, there should not be an excessive delay between application of the tack coat and the paving. During the delay, traffic can pick up the binder or track dirt on the binder, which will reduce bonding. HMA should be placed as soon as possible after the emulsion has set to prevent contamination (dust, dirt, etc.) or pickup by tires.

Prime Coats - Prime coats are used on aggregate base courses to provide good adhesion to the HMA layer placed above. Property requirements for prime coats are identified in the Contract specifications.

Chip Seals - A chip seal (cover coat) consists of a spray bar application of emulsion, topped by chips dropped by a spreader. Light, pneumatic tire-rolling seats the chips. The chips are clean, 3/8" aggregate. Single-sized, hard aggregates are desirable for chip seals. A fog seal, applied after the chip seal has completely cured, provides a uniform appearance and better chip retention. CRS-2P and HFRS-2P emulsions are used for chip seals. The Rapid Set (RS) grabs the chip quickly and the Polymer in the binder holds the chip better. It is desirable to use the same emulsion for the fog coat that was used in the chip seal for better compatibility and chip retention.

Cold In-Place Recycling (CIPR) - Cold in-place recycling consists of:

- Rotomilling the surface of an existing pavement to remove it
- Adding additional binder to the millings
- Mixing and then spreading the combination on the surface
- Compacting to an adequate density

HMA is normally placed over the cold in-place recycle layer. Emulsions are used to add the binder to the CIPR, since this is a cold process. HFMS-2sP is normally used for CIPR construction operations. The soft binders help soften the hard oxidized existing pavement and the Polymer helps with adhesion and crack resistance.

END OF SECTION

12.0 CONCRETE

12.1 GENERAL

This section describes the terminology, methods, testing, and use of concrete materials and mixes of various classes in the construction of roadway elements, pavements, and structures.

12.2 CONCRETE DESIGN MIXES

All concrete placed on the project should conform to a design mix that has been approved by DPW or a designated Oversight Laboratory. The design mix is defined by the proportions and sources of all ingredients in the concrete.

The Contractor (or Supplier) will establish and is responsible for developing the concrete design mix proportions and source of all ingredients for each class of concrete used. DPW may verify any or all properties of the submitted mix design prior to approval. When a trial mix check is requested, aggregate sources will be sampled by the Contractor and the samples submitted for evaluation. A submittal form should accompany the samples and contain the following information:

- Supplier name and location
- Source, location, and type of cement
- Company, plant location, and type of each aggregate
- Brand and name of admixtures

The Standard Specifications and/or SCRs for the project provide the data table for each class of concrete established for the work on that project. The column "Concrete Class" lists each class of concrete and the required field compressive strength. The cement content for each class of concrete is the minimum amount or range that will be used for designing the concrete mix.

For all classes of concrete, the compressive and/or flexural strength of the laboratory trial mix should be at least 15 percent greater than the required field compressive and/or flexural strengths.

When a concrete mix design is approved, DPW will issue a notice of its approval for the project.

12.3 CONCRETE MIX DESIGN

12.3.1 REFERENCE PROCEDURE

Projects having small quantities of concrete and/or using mixes newer than two years may choose to reference existing designs. The concrete mix designs used on DPW projects should be referenced in the following manner:

1. Mixes must be reviewed by DPW prior to use
2. Mix designs older than two years will require a new trial mix prior to use
3. Document the concrete mix design on an appropriate form, listing:
    a. Class of concrete
    b. The project number and code where the mix was originally used
    c. The mix reference number
    d. Copy of the Contractor's data

A sufficient quantity of aggregates should be submitted to DPW for all classes of concrete and mixes proposed by the Contractor. All aggregate samples should be accompanied by the results of the required tests for the aggregate source being proposed. Upon review of the referenced design mix and approval of the concrete mix design, an approval form will be issued for the project and sent to the PE. Mix design approval is required before concrete placement commences on the project.

12.4 COMPRESSIVE STRENGTH TESTING

Determination of compressive strength of concrete cylinders should be done in accordance with ASTM requirements. This method consists of applying a compressive axial load to molded cylinders or cores at a rate within the prescribed range until failure occurs. All specimens should be properly cured prior to testing on equipment properly calibrated within the time limits prescribed. Specimens tested using neoprene caps should be properly prepared prior to testing. The use of neoprene pads should be closely monitored to ensure use within prescribed limitations.

12.5 PROPERTIES OF CONCRETE CYLINDERS

Concrete properties should be determined as prescribed by AASHTO methods and procedures for establishing the following:

- Unit weight (pounds per cubic foot)
- Yield (volume of concrete produced per batch)
- Relative yield (ratio of the actual volume to the volume as designed for the batch)
- Cement content (pounds of cement per cubic yard)
- Air content (percentage of voids in the concrete)
- Water-cement ratios

Water-cement ratios should be closely monitored, and the Contractor should take appropriate action to maintain water-cement ratios at or below the specified maximum. Excessive water-cement ratios can sometimes be caused by one or more of the following:

- Incorrect batch weights due to mathematical errors or scales out of adjustment
- Stockpiles of aggregate drying to less than a saturated surface-dry condition, requiring more water than the design
- High mix temperatures causing loss of workability and premature stiffening
- Excessive length of haul requiring more revolutions at an agitating speed, thereby drying the mix

12.6 MAKING AND CURING CONCRETE CYLINDERS IN THE FIELD

All cylinders made at the job site should be made and cured in accordance with AASHTO requirements. Cylinders may be produced for the following purposes:

Design Cylinders - Test cylinders made for checking the adequacy of laboratory mixture proportions for strength.

Acceptance (QC) and Verification (QA) Cylinders - Test cylinders made for determination of compliance with strength specifications are tested 28 days after casting for all classes of concrete except H & HT, which are tested at 56 days.

Information Cylinders - Test cylinders made for determining the adequacy of concrete strength at specific phases of the work. Information cylinders are typically used for form removal, stressing operations, or when a structure is ready to be put into service. Information cylinders should be cured in the same manner as the structure. Information cylinders should be stored where they will not be disturbed by Contractor personnel, and should remain in the molds with the structure until the next phase of work is ready to proceed.

Standardized methods should be used for the identification and numbering of test cylinders. Mark the identifying number and information on the cylinders with red or black grease pencil, crayon, or waterproof felt-tipped pen. Do not scratch numbers on the end of the cylinders as it will make them difficult to cap and will affect test results.

12.7 ADMIXTURES - GENERAL

Admixtures of any type or amount should be identified in all concrete mix designs and should not be considered a substitute for good concreting practices. Admixtures should be used only after evaluation of their effects on a particular concrete mix, under the conditions of the use intended. Admixtures are required to conform to applicable AASHTO or ASTM specifications in accordance with the instructions provided by the manufacturer. Admixtures can be classified according to the following types:

Surface Retarders - To produce exposed aggregate textures, surface retarders may be used. Sample panels should be constructed on the job site using the design mix and surface retarder, if required by the Contract Documents. As with other admixtures, it is important to follow all manufacturers' instructions. Sample panels, if required, should be a minimum of 2 feet by 2 feet. for ¾-inch exposed coarse aggregate. If larger-sized coarse aggregate is required, the panel dimensions should be increased accordingly. Most surface retarders require an initial curing period prior to removal of the matrix.

Workability Agents and Pumping Aids - Improved workability is important for concrete placed in heavily reinforced members or placed by pumping or tremie methods. Frequently, increasing the cement content or the amount of fine aggregate will give the desired workability. One of the best workability agents is entrained air. It acts as a "lubricant" and is especially effective in improving workability and preventing segregation.

Finely-divided materials are also used as admixtures to improve workability of mixes deficient in material passing the No. 50 and No. 100 sieves. These materials may be chemically inert or pozzolanic. Inert materials include ground quartz, ground limestone, hydrated lime, and talc. Pozzolans include fly ash, volcanic glass, diatomaceous earths, and some clays and shales, heat-treated or raw.

Cement Replacement - Various materials can be used in place of cement within prescribed limits, provided they are identified in submitted concrete mix designs. Fly ash, Ground Granulated Blast Furnace Slag (GGBFS), and silica-fume, are common substitutes for cement and must be documented as coming from an approved source, provided a design mix has been submitted using the substitution. Class C Fly Ash should not be used in concrete that may be subjected to sulfate exposure in soil or water.

Monomolecular Film Coatings/Water Fog Sprays - Monomolecular Film Coatings may be applied to concrete slabs or other flatwork as a method to effectively retard surface evaporation. When placing bridge deck concrete or roadway concrete pavement, a film coating should only be used ahead of the finishing machine during emergency situations, such as a breakdown of the finishing machine. Under these conditions, this type of application is considered to be equivalent to water fog spray.

Accordingly, its usage should be subject to the established construction guidelines as may be approved by DPW. A monomolecular film coating may be used after the finishing operation to prevent evaporation until the wet curing material is in place. The film should be applied as a fine mist in small quantities.

12.8 PAINTING

Protective coating systems are widely used on bridge and highway structures primarily for corrosion control of metals and to protect concrete from deterioration. Coating systems are generally categorized as non-volatiles and volatiles. The non-volatile component remains on the surface after the volatile component evaporates. The non-volatiles are stated as a percentage of the total volume, known as the “Solids by

Volume". The percentage of Solids by Volume is used to calculate wet film thickness and coverage rates of the coating.

Coating System Components - A coating system includes the surface preparation and the application of a specified number of coats. The coats include a primer, intermediate, and top. Each coat requires the application of multiple passes to achieve the specified thickness.

Coating Types - Following are the generic coating types and general performance characteristics:

- **Alkyd -** Alkyd coatings are relatively inexpensive, flexible, and easy to apply. Alkyds cure by oxidation and can be very slow drying.
- **Epoxy -** Epoxy coatings exhibit excellent adhesion, acid, alkali, and solvent resistance, as well as good flexibility. Epoxy coatings are two-component and must be mixed properly to achieve full cure.
- **Urethane -** Urethanes are commonly specified as top coats because they have superior gloss and color retention. They are sensitive to moisture during curing and require careful mixing to achieve full cure.
- **Moisture-cured Urethane -** Moisture-cured urethane coatings cure by a reaction with moisture in the air. They are single component, surface tolerant, easy to apply, and some can cure at low temperatures.
- **Zinc-rich -** Zinc-rich coatings are primarily used as primers to provide galvanic protection. Zinc-rich coatings are categorized as either inorganic (better corrosion protection, but harder to apply) or organic (more tolerant of deficient surface preparation), the difference being the type of binder used.
- **Acrylic latex -** Acrylic latex coatings are relatively easy to apply, have moderate abrasion resistance, and must be applied in temperatures above 50°F.

It is important to review and be familiar with the manufacturers' product data sheets, which contain important information for the safety requirements when working with the material, and successful application techniques by brush, roller, and/or spray. Regardless of the application method, the coating must be applied to provide a uniform specified thickness.

The Contractor's QCP should include a detailed list of QC tests to be performed. Weather conditions should be recorded including air and wet bulb temperature, relative humidity, dew point temperature, surface temperature, and wind velocity. After the coating application, the wet and dry film thicknesses should be measured, as well as the final adhesion and gloss retention properties.

END OF SECTION

13.0 REINFORCING STEEL

13.1 INTRODUCTION

This section describes the terminology, methods, materials, testing, and use of reinforcing steel in the construction of project elements and structures.

13.2 REINFORCING STEEL

The design of structures and other civil work often uses several different strengths of reinforcing steel to meet the structural strength needs of the design. Field inspection personnel should closely examine the reinforcing requirements on the bridge plans and shop drawings for different strength grades that may be specified to ensure that the correct reinforcing steel size and grade are being used in their proper location. Commonly-used grades are as follows:

Grade 40 has a yield strength of 40,000 psi and is the lowest grade of reinforcing steel.

Grade 60 has a yield strength of 60,000 psi and has either a "60" on the bar or a single continuous longitudinal line through at least five spaces off-set from the center of the bar side. This grade may be substituted on an equal basis for Grade 40, without prior approval. However, make note of this in the project records and as-built drawings if a substitution is made.

Grade 75 has a yield strength of 75,000 psi and has either a "75" on the base or two continuous longitudinal lines through at least five spaces, off-set each direction from the center of the bar.

Higher grades of steel are also common in structures that are either pre-stressed at off-site fabrication facilities, which are normally installed as strand; or structures that are post-tensioned on-site using either strand or high-strength bar stock materials. Reinforcing may also be specified in other forms including dowel bars and steel fabric mats, all fabricated in accordance with AASHTO requirements.

All reinforcing steel used on the project should be identified with the necessary information to define the properties of the source material, the resulting properties of the bar produced, and the location of where the material should be installed. An effort should be made to note in DIRs and on appropriate project forms the grades of reinforcing steel used and when different grades were used in special locations.

13.3 EPOXY-COATED REINFORCEMENT

Reinforcing steel bars that will be epoxy-coated should be fabricated to and conform to the grade and performance requirements of the plans and specifications. All bars that will be fabricated reinforcing bars should be prepared in accordance with AASHTO procedures, and epoxy coatings applied in accordance with ASSHTO requirements. All epoxy-coated materials should be accompanied by applicable COCs, and remain with the materials until incorporated into the work in their final position. Epoxy-coated reinforcing should be handled and stored in accordance with the project specifications and accepted industry practices to prevent damage to the epoxy coating.

Coated bars should be tied with coated tie wires and placed on plastic supports or fully-coated steel supports during installation. Epoxy-coated steel should be inspected thoroughly in the field for damage and repaired in accordance with AASHTO requirements.

END OF SECTION

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APPENDIX C-1

FREQUENCY SCHEDULE FOR CONTRACTOR SAMPLING AND TESTING

Source Document

Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-03

U.S. Customary Units

By

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration

PREFACE

The Standard Specifications for the Construction of Roads and Bridges on Federal Highway Projects, FP-03, U.S. Customary Units are issued by the Government of Guam for constructing roads and bridges under the jurisdiction of the Department of Public Works (DPW). FP-03 Section 106 ACCEPTANCE OF WORK describes the requirements by which work can be considered acceptable and relies in part on the performance of sampling and testing required at the end of particular sections of FP-03.

The schedule for Sampling and Testing provided herein is intended to accurately reflect the requirements of FP-03; however, should any discrepancy occur, the requirements stated in FP-03 take precedence.

U.S. customary measure units are used in the FP-03 U.S. Customary Units as authorized by the Waiver Request of DOT Metric Policy approved on May 5, 1999. A conversion table between U.S. Customary Units and Metric Units is contained in the FP-03 document and has been replicated here for convenience of the user.

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	204							
Topping (704.05)	Measured and tested for conformance (106.04)	Classification	—	AASHTO M 145	1 per soil type	Processed material before incorporating in work	Yes, when requested	Before using in work
		Moisture-density	—	AASHTO T 180, method D(1) or T 99, method C(1)	1 per soil type but not less than 1 per 13,000 yd^3	"	"	"
		Compaction	—	AASHTO T 310 or other approved procedures	1 per 6000 yd^2 but not less than 1 per layer	In-place	—	—
Select topping (704.08)	Measured and tested for conformance (106.04)	Classification	—	AASHTO M 145	1 per soil type but not less than 1 for each day of production	Processed material before incorporating in work	Yes, when requested	Before using in work
		Gradation	—	AASHTO T 27 & T 11	"	"	"	"
		Liquid limit	—	AASHTO T 89	"	"	"	"
		Moisture-density	—	AASHTO T 180, method D(1) or T 99, method C(1)	1 per soil type but not less than 1 per 13,000 yd^3	"	"	"
		Compaction	—	AASHTO T 310 or other approved procedures	1 per 6000 yd^2 but not less than 1 per layer	In-place	"	Before placing next layer

(1) Minimum 5 points per proctor.

SECTION	208							
Foundation fill (704.01)	Measured and tested for conformance (106.04)	Classification	—	AASHTO M 145	1 per soil type	Source of material	Yes, when requested	Before using in work
		Gradation	—	AASHTO T 27 & T 11	"	"	"	"
		Moisture-density	—	AASHTO T 99, method C(1)	"	"	"	"
		Compaction	—	AASHTO T 310 or other approved procedures	1 per 300 yd3	In-place	—	Before placing next layer
Structural backfill (704.04)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per soil type	Source of material	Yes, when requested	Before using in work
		Liquid limit	—	AASHTO T 89	"	"	"	"
		Moisture-density	—	AASHTO T 99, method C(1)	"	"	"	"
		Compaction	—	AASHTO T 310 or other approved procedures	2 per lift	In-place	—	Before placing next layer

(1) Minimum 5 points per proctor.

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	209							
Backfill material (704.03)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per soil type	Source of material	Yes	Before using in work
		Moisture-density	—	AASHTO T 99, method C(1)	"	"	"	"
		Compaction	—	AASHTO T 310 or other approved procedures	2 per lift	In-place	—	Before placing next layer
Bedding material (704.02)	Measured and tested for conformance (106.04)	Moisture-density	—	AASHTO T 99, method C(1)	1 per soil type	Source of material	Yes	Before using in work
		Compaction	—	AASHTO T 310 or other approved procedures	2 per lift	In-place	—	Before placing next layer
Foundation fill (704.01)	Measured and tested for conformance (106.04)	Moisture-density	—	AASHTO T 99, method C(1)	1 per soil type	Source of material	Yes	Before using in work
		Compaction (204.11)	—	AASHTO T 310 or other approved procedures	2 per lift	In-place	—	Before placing next layer
Unclassified borrow (704.06)	Measured and tested for conformance (106.04)	Moisture-density	—	AASHTO T 99, method C(1)	1 per soil type	Source of material	Yes	Before using in work
		Classification	—	AASHTO M 145	"	"	"	"
		Compaction	—	AASHTO T 310 or other approved procedures	2 per lift	In-place	—	Before placing next layer

(1) Minimum 5 points per proctor.

SECTION	213							
Remix material	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per 6000 yd^2	Processed material	Yes	Before using in work
		Moisture-density	—	AASHTO T 99, method C(1)	"	"	"	"
		Compaction	—	AASHTO T 310 or other approved procedures	1 per 2500 yd^2, but not less than 1 per layer	In-place	—	Before placing next layer
		Strength	—	ASTM D 5102, C 593, & D 1633	1 per mix design	After proportioning	Yes	Before producing

(1) Minimum 5 points per proctor.

SECTION	251							
Riprap (705.02)	Measured and tested for conformance (106.04)	Apparent specific gravity & absorption	—	AASHTO T 85	1 per material type	Source of material	Yes	Before using in work
		Coarse durability index	—	AASHTO T 210	"	"	"	"
		Sodium sulfate soundness	—	AASHTO T 104	"	"	"	"
		LA abrasion	—	AASHTO T 96	"	"	"	"
Mortar	Measured and tested for conformance (106.04)	Making test specimens Compressive strength	—	AASHTO T 23 & T 22	1 per mix design	—	Yes, when requested	Before using in work

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	255							
Backfill (704)	Measured and tested for conformance (106.04)	Classification	—	AASHTO M 145	1 per soil type	Source of material	Yes	Before using in work
		Gradation	—	AASHTO T 27 & T 11	"	"	"	"
		Moisture-density	—	AASHTO T 180, method D(1) or T 99, method C(1)	"	"	"	"
		Compaction	—	AASHTO T 310 or other approved procedures	2 per lift	In-place	—	Before placing next layer

(1) Minimum 5 points per proctor.

SECTION	256							
Aggregate source quality (fine) (703.01)	Measured and tested for conformance (106.04)	Quality	—	AASHTO M 6	1 per material type	Source of material	Yes	Before producing
Grout mix design (722.02(e))	Measured and tested for conformance (106.04)	Flow	—	ASTM C 939	1 per mix design	Source of material	Yes, when requested	Before producing
		7-day compressive strength	—	AASHTO T 106	"	"	"	"

SECTION	259							
Centralizers	Certification of compliance (106.03)	Quality & performance	—	Subsection 722.02(f)	Each shipment	Source	—	Before using in work
Soil nails	Certification of compliance (106.03)	Quality & performance	—	Subsection 722.04	Each shipment	Source	—	Before using in work
Epoxy coating	Certification of compliance (106.03)	Quality & performance	—	Subsection 722.04(c)	Each shipment	Source	—	Before using in work
Geocomposite sheet drain	Certification of compliance (106.03)	Quality & performance	—	Subsection 714.02(b)	Each shipment	Source	—	Before using in work
Grout mix design	Certification of compliance (106.03)	Quality & strength	—	Subsection 259.05	1 per source of material	—	—	30 days before beginning soil nail work
Nail grout	Measured and tested for conformance (106.04)	Compressive strength	—	Subsection 722.02(e) AASHTO T 106	1 per mix design	Mixer	—	30 days before beginning soil nail work
Verification test nail	Measured and tested for conformance (106.04)	Performance	—	Subsection 259.08(b) Table 259-5	Each verification nail	Installation	—	—
Proof test nail	Measured and tested for conformance (106.04)	Performance	—	Subsection 259.08(c) Table 259-5	Each proof nail	Installation	—	—
Wall elements	Measured and tested for conformance (106.04)	Installation	—	Table 259-3	—	Installation	—	—
Permanent shotcrete facing	Measured and tested for conformance (106.04)	Placement	—	Table 259-4	—	Installation	—	—

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	301							
Aggregate source quality 703.05(a)	Measured and tested for conformance (106.04& 105)	LA abrasion (coarse)	—	AASHTO T 96	1 per type & source of material	Source of material	Yes, when requested	Before using in work
		Sodium sulfate soundness loss (coarse & fine)	—	AASHTO T 104	"	"	"	"
		Durability index (coarse & fine)	—	AASHTO T 210	"	"	"	"
		Fractured faces	—	ASTM D 5821	"	"	"	"
Subbase courses grading A & B	Statistical (106.05)	Gradation		AASHTO T 27 & T 11	1 per 1000 tons	From windrow or road bed after processing	Yes	4 hours
		No. 4	I					
		No. 200	I					
		Other specified sieves	II					
Base course grading C, D, & E	Statistical (106.05)	Gradation		AASHTO T 27 & T 11	1 per 1000 tons	From windrow or roadbed after processing	Yes	4 hours
		3/8 inch	I					
		No. 4	I					
		No. 200	I					
		Other specified sieves	II					
Subbase & base course grading A, B, C, D & E	Measured and tested for conformance (106.04)	Liquid limit	—	AASHTO T 89	1 per 1000 tons	From windrow or roadbed after processing	Yes	4 hours
		Moisture-density (max. density)	—	AASHTO T 180, method D (1)	1 per type & source of material	Material source before using	Yes	
		Compaction	—	AASHTO T 310 or other approved procedures	1 per 500 tons	In-place	—	Before placing next layer
Surface course aggregate	Statistical (106.05)	Gradation		AASHTO T 27 & T 11	1 per 1000 tons	From windrow or roadbed after processing	Yes	4 hours
		No. 4	I					
		No. 40	I					
		No. 200	I					
		Other specified sieves	II					
		Liquid limit	II	AASHTO T 89	"	"	"	"
		Plasticity index	I	AASHTO T 90	"	"	"	"
	Measured and tested for conformance (106.04)	Moisture-density (max. density)	—	AASHTO T 180, method D (1)	1 per type & source of material	Source of material	Yes	Before using in work
		Density	—	AASHTO T 310 or other approved procedures	1 per 500 tons	In-place	—	Before placing next layer
		Fractured faces	—	ASTM D5821	1 per 1000 tons	From windrow on roadbed after processing	Yes	Before using in work

(1) Minimum 5 points per proctor.

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	302							
Aggregate (703.05)	Statistical (106.05)	Gradation (1)		AASHTO T 27 & T11	1 per 1000 tons	From windrow or roadbed after processing	Yes, when requested	4 hours
		3/8 inch	I					
		No. 4	I					
		No. 200	I					
		Other specified sieves	II					
		Liquid limit	—	AASHTO 89	1 per 3000 tons	"	"	
Mixture (302)	Measured and tested for conformance (106.04)	Moisture-density	—	AASHTO T 180, method D (1)	1 per aggregate grading produced	Processed material before incorporating in work	Yes, when requested	Before using in work
		Compaction	—	AASHTO T 310 or other approved procedures	1 per 500 tons	In-place	—	Before placing next layer

(1) Minimum 5 points per proctor.

SECTION	303							
Existing roadbed	Measured and tested for conformance (106.04)	Classification	—	AASHTO M 145	1 per soil type	Roadbed	Yes, when requested	Before using in work
		Moisture-density	—	AASHTO T 180, method D (1)	1 for each mixture or change in material	Processed material before incorporating in work	—	Before using in work
		In-place density & moisture content	—	AASHTO T 310 or other approved procedures	1 per 3000 yd2	Compacted material	—	End of shift

SECTION	304							
Aggregate Cement Mixtures								
Proportioning (304.03)	Measured and tested for conformance (106.04)	Moisture-density	—	Cement: AASHTO T 134 (minimum of 4 points)	1 for each mixture or change in material	Processed material before incorporating in work	Yes, when requested	Before using in work
Aggregate, Fly Ash, Lime, and Cement (AFLC)								
Proportioning (304.03)	Measured and tested for conformance (106.04)	Moisture-density	—	AFLC ASTM C 593 Section 10 & 11 (minimum of 4 points)	1 for each mixture or change in material	Processed material before incorporating in work	Yes, when requested	Before using in work
Imported Aggregate								
Aggregate (703.05)	Statistical (106.05)	Gradation		AASHTO T 27 & T 11	1 per 1000 tons	Processed aggregate before stabilizing	Yes, when requested	4 hours
		3/8 inch	I					
		No. 4	I					
		No. 200	I					
		Other specified sieves	II					
	Measured and tested for conformance (106.04)	Liquid limit	—	AASHTO T 89	1 per 3000 tons	Processed aggregate before stabilizing	—	4 hours
Stabilized Aggregate								
Mixture (304)	Measured and tested for conformance (106.04)	In-place density & moisture content	—	AASHTO T 310 or other approved procedures	1 per 500 tons or 3000 yd^2	Compacted material	—	End of shift

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	305							
Aggregate – Topsoil	Measured and tested for conformance (106.04)	Moisture-Density Compaction	— —	AASHTO T 99, method C (1) AASHTO T 310 or other approved procedures	1 per soil blend 1 per 4000 yd²	Production output or stockpile In-place	— —	36 hours 24 hours

(1) Minimum 5 points per proctor.

SECTION	308							
Crushed aggregate	Measured and tested for conformance (106.04)	Moisture-density Compaction	— —	AASHTO T 180, method D(1) AASHTO T 310 or other approved procedures	1 for each aggregate supplied 1 per 500 tons	Production output or stockpile In-place	— —	Before using in work Before placing next layer

(1) Minimum 5 points per proctor.

SECTION	309							
Aggregate quality	Measured and tested for conformance (106.04 & 105)	LA abrasion (coarse) Durability index (coarse & fine) Sodium sulfate soundness	— — —	AASHTO T 96 AASHTO T 210 AASHTO T 104	1 for each source " "	Source of material " "	Yes, when requested " "	Before using in work " "
Emulsified asphalt-treated aggregate base, grading C, D & E	Statistical (106.05)	Gradation 3/8 inch No. 4 No. 40 No. 200 Fractured faces Sand equivalent SE/P_{200} index	 I I II — I — I I	AASHTO T 30 " " " " ASTM D 5821 AASHTO T 176, alternate method no. 2, reference method Note 1	1 per 1000 tons " " "	In-place " " Belt feed before adding emulsified asphalt —	Yes, when requested " " " —	4 hours " " " —
Emulsified asphalt-treated aggregate base, grad. D	Measured and tested for conformance (106.04)	Compaction	—	AASHTO T 310 or other approved procedures	1 per 500 tons but not less than 1 per layer	In-place	—	Before placing next layer

(1) SE/P_{200} index (SEP) is a measure of a material's ability to perform based on the quality and quantity of fines present. The quality is represented by the sand equivalent (SE) and quantity is represented by the percent passing the No. 200 sieve (P_{200}). The SEP is computed as follows: For an SE ≥ 29, SEP = SE/(P_{200} + 25) and for an SE < 29, SEP = (SE + 4)/(SE + P_{200}). Where: SE = Plastic fines in graded aggregates and soils by using the sand equivalent test AASHTO T 176, alternate method no.2, referee method P_{200} = Material finer than the No. 200 sieve in mineral aggregates by washing AASHTO T 11

SECTION	401							
Aggregate source quality	Measured and tested for conformance (106.04 & 105)	LA abrasion (coarse) Sodium sulfate soundness loss (coarse & fine) Fine aggregate angularity Sand equivalent	— — — —	AASHTO T 96 AASHTO T 104 AASHTO T 304, method A AASHTO T 176, alternate method no. 2, reference method	1 per type & source of material " " "	Source of materials " " "	Yes " " "	Before producing " " "
Asphalt concrete (mix design)	Measured and tested for conformance (106.04)	Gradation VMA VFA Voids TSR	— — — — —	AASHTO T 27 & T 11 AASHTO PP 28 " " AASHTO T 283	1 per submitted mix design " " " "	Stockpiles — — — —	Yes — — — —	28 days before producing " " " "

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	401 'cont'-							
Asphalt binder	Measured and tested for conformance (106.04)	Quality	—	Subsection 702.01	1 per submitted source & mix design 1 per 2100 t of mix, but not less than 5 samples	In line between tank & mixing plant	2 – 1-quart samples	—
Asphalt concrete mixture (all)	Measured and tested for conformance (106.04)	Mix temperature	—	—	First load & as determined by the CO thereafter	Hauling vehicle before dumping or windrow before picking up	—	Upon completing test
Hot asphalt concrete pavement (control strip)	Statistical (106.05)	Gradation No. 4 No. 30 No. 200 Other specified sieves Asphalt content VMA VFA Core density(1)	 I I I II I I I I	AASHTO T 308 & T 30 AASHTO T 308 AASHTO PP 28 " AASHTO T 166	3 minimum " " " 5 minimum	Behind paver before compacting " " " In-place after compacting	Yes " " " Cores to CO after determining specific gravity & compaction	4 hours " " " —
	Measured and tested for conformance (106.04)	Maximum specific gravity (density)	—	AASHTO T 209	3 minimum	Behind paver before compacting	Yes	24 hours
Hot asphalt concrete pavement (production)	Statistical (106.05)	Asphalt content VMA Core density(1)	I I I	AASHTO T 308 AASHTO PP 28 AASHTO T 166	1 per 700 tons " "	Behind paver before compacting " In-place	Yes " Cores to CO after determining specific gravity	4 hours " 24 hours
	Measured and tested for conformance (106.04)	VFA Gradation Maximum specific gravity (density)	— — —	AASHTO PP 28 AASHTO T 308 & T 30 AASHTO T 209	" " At least 1 per day	Behind paver before compacting " "	Yes " "	4 hours " "
Hot asphalt concrete pavement (final surface)	Statistical (106.05)	Type I & II smoothness	I	FLH T 504	See Subsection 401.16	See Subsection 401.16	—	14 days after final paving
Hot asphalt concrete pavement (final surface)	Measured and tested for conformance (106.04)	Type III & IV roughness	—	AASHTO PP 50, PP 51, & PP 52	See Subsection 401.16	See Subsection 401.16	—	14 days after final paving

(1) Cut core sample from the compacted pavement according to AASHTO T 230, method B. Fill and compact the sample holes with asphalt concrete mixture. Cores shall be 6 inches in diameter. Perform specific gravity and thickness tests on cores and deliver to CO after testing is completed. Label cores and protect from damage due to handling or alteration due to temperature during storage or transfer.

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	402							
Aggregate source quality	Measured and tested for conformance (106.04)	LA abrasion (coarse)	—	AASHTO T 96	1 per type & source of material	Source of material	Yes	Before producing
		Sodium sulfate soundness loss (coarse & fine)	—	AASHTO T 104	"	"	"	"
		Sand equivalent	—	AASHTO T 176, alternate method no. 2, reference method	"	"	"	"
Asphalt concrete (mix design)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per submitted mix design	Stockpiles	Yes	28 days before producing
		Voids	—	AASHTO T 209	"	"	"	"
		Moisture susceptibility	—	AASHTO T 165 & T 167	"	"	"	"
Aggregates (production)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per 6 hours of production but not less than 2 per day	Flowing aggregate stream (bin or belt discharge) or off of conveyor belt	Yes, when requested	End of shift
		Sand equivalent	—	AASHTO T 176, alternate method no. 2, reference method,	1 per type & source of material	"	"	"
		Fractured faces	—	ASTM 5821	"	"	"	"
		Sample for job-mix formula verification	—	Subsection 401.03	1 per aggregate stockpile	"	—	21 days before approval of job- mix formula
Asphalt binder	Measured and tested for conformance (106.04)	Quality	—	Subsection 702.01	1 per submitted source & mix design 1 per 2100 t of mix but not less than 5 samples	In line between tank & mixing plant	2 – 1-quart samples provided to DPW	—
Asphalt concrete mixture (all)	Measured and tested for conformance (106.04) & Section 105	Mix temperature	—	—	First load & as determined by the CO thereafter	Hauling vehicle before dumping or windrow before picking up	—	Upon completing test
Hot asphalt concrete pavement (control strip)	Statistical (106.05)	Gradation		AASHTO T 308, T 30, & T 110	3 minimum	Behind paver before compacting	Yes	4 hours
		1/2 inch	I					
		3/8 inch	II					
		No. 4	I					
		No. 8	I					
		No. 40	II					
		No. 200	I					
		Other specified sieves	II					
		Asphalt content	I	AASHTO T 308	"	"	"	"
Hot asphalt concrete pavement (control strip)	Statistical (106.05)	Core density(1)	I	AASHTO T 166 & T 209	At least 5 samples per control strip	In-place	Cores to CO after determining specific gravity & compaction	—

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	402 –cont.'-							
Hot asphalt concrete pavement (production)	Statistical (106.05)	Gradation		AASHTO T 308, T 30, & T 110	1 per 700 tons	Behind paver before compacting	Yes	4 hours
		1/2 inch	I					
		3/8 inch	II					
		No. 4	I	"	"	"	"	"
		No. 8	I					
		No. 40	II	"	"	"	"	"
		No. 200	I					
		Other specified sieves	II	"	"	"	"	"
		Asphalt content	I		"	"	"	
		Core density(1)	I	AASHTO T 166 & T 209	"	In-place	Cores to CO after determining specific gravity	24 hours
Hot asphalt concrete mixture (final surface)	Statistical (106.05)	Type I & II smoothness	I	FLH T 504	See Subsection 401.16	See Subsection 401.16	—	14 days after final paving
Hot asphalt concrete pavement (final surface)	Measured and tested for conformance (106.04)	Type III & IV roughness	—	AASHTO PP 50, PP 51, & PP 52	See Subsection 401.16	See Subsection 401.16	—	14 days after final paving

(1) Cut core sample from the compacted pavement according to AASHTO T 230, method B. Fill and compact the sample holes with asphalt concrete mixture. Cores shall be 6 inches in diameter. Perform specific gravity and thickness tests on cores and deliver to CO after testing is completed. Label cores and protect from damage due to handling or alteration due to temperature during storage or transfer.

SECTION	403							
Hot asphalt concrete pavement	Measured and tested for conformance (106.04)	Job-mix formula verification	—	Subsection 403.03	1 per aggregate stockpile	Flowing aggregate stream (bin or belt discharge) or off of conveyor	—	21 days before approval of job-mix formula
		Gradation	—	AASHTO T 30	1 per 700 tons	Behind paver before compacting	Yes, when requested	24 hours
		Asphalt content	—	AASHTO T 308	"	"	"	"
		Compaction	—	ASTM D 2950 or other approved procedures	"	Completed roadway after rolling	"	"
		Smoothness	—	Subsection 403.16	—	—	—	—
Asphalt binder		Quality	—	Subsection 702.01	1 per 130 tons of liquid	Line between storage tank & asphalt plant	2 — 1-quart samples	Tested by Government

SECTION	404							
Asphalt mixture (404.07)	Measured and tested for conformance (106.04)	Compaction (roadway paving)	—	AASHTO T 310	1 per 1200 yd2	In-place	—	Upon completing tests

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	405							
Open-graded asphalt friction course	Statistical (106.05)	Asphalt content	I	AASHTO T 308 or T 164	1 per 300 tons	Hopper of lay down machine after discharging from plant	Yes	—
		Gradation		AASHTO T 30	1 per 300 tons	“	—	—
		No. 4	I					
		No. 200	I					
		Other specified sieves	II					
Asphalt binder	Statistical (106.05)	Quality	—	Subsection 702.01	1 per 300 tons	Line between storage tank & asphalt plant	Yes	—

SECTION	408							
Emulsified asphalt (702.03)	Measured and tested for conformance (106.04)	Quality	—	Subsection 702.03	1 per 130 tons but not less than 5 samples	Line between storage tank & mixing plant	Yes	—
		Density	—	AASHTO T 310	1 per 600 yd2	In-place	—	24 hours

SECTION	409							
Aggregate surface treatment source quality (1) (703.10)	Measured and tested for conformance (106.04 & 105)	LA abrasion	—	AASHTO T 96	1 per type & source of material	Source of material	Yes, when requested	Before using in work
		Sodium sulfate soundness loss (course & fine)	—	AASHTO T 104	“	“	“	“
		Fractured faces	—	ASTM D 5821	“	“	“	“
		Flat & elongated particles	—	ASTM D 4791	“	“	“	“
		Durability index (course & fine)	—	AASHTO T 210	“	“	“	“
		Clay lumps & friable particles	—	AASHTO T 112	“	“	“	“
Aggregate surface treatment aggregate (1)	Statistical (106.05)	Gradation. See Table 703-7 for applicable sieves.	I	AASHTO T 27& T 11	1 per 750 tons	Production belt or spreader discharge	Yes	24 hours
	Measured and tested for conformance (106.04 & 106.05)	Fractured faces	—	ASTM D 5821	1 per 750 tons	Production belt or spreader discharge	Yes	24 hours
		Liquid limit (2)	—	AASHTO T 89	“	“	“	“
Asphalt binder(3) (702.01)or emulsified asphalt (3) (702.03)	Measured and tested for conformance (106.04)	Quality	—	Subsection 409.13	1 per tanker truck including trailer	Point of shipment delivery	2 — 1-quart samples	—

(1) Applies to each aggregate grade furnished. (2) For blotter material only. (3) Applied to each asphalt material furnished.

SECTION	410							
Aggregates for surfacing mixture (703.11)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per 500 tons	Production output or stockpile	Yes, when requested	Before using in work
		LA abrasion	—	AASHTO T 96	1 per aggregate	Aggregate source	“	“
		Soundness (micro-surfacing only)	—	AASHTO T 104	“	“	“	“
		Sand equivalent	—	AASHTO T 176, alternate method no. 2, reference method	“	Production output or stockpile	“	“

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	416							
Emulsified asphalt	Measured and tested for conformance (106.04)	Quality	—	Subsection 702.03	1 per submitted source	Line between storage tank & mixing plant	2 — 1-quart samples	—
Recycled mix	Measured and tested for conformance (106.04)	In-place density (1)	—	AASHTO T 310	1 per 1200 yd²	In place after compaction(2)	—	4 hours
		Smoothness	—	Subsection 403.16	—	—	—	—
		Quality	—	Subsection 702.03	1 per 130 tons but not less than 5 samples	Line between storage tank & mixing plant	Yes	—

(1) Testing required when cold recycled asphalt base course compaction is designated type A.
(2) See Subsection 416.08.

SECTION	501							
Aggregate source quality (703.02)	Measured and tested for conformance (106.04 & 105)	Quality	—	AASHTO M 80	1 per material type	Source of material	Yes	Before producing
Concrete composition (mix design)	Measured and tested for conformance (106.04 & 105)	All	—	Subsection 552.03	1 per mix design	Source of material	Yes	Before producing
Produced aggregate (fine & coarse)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per day	Flowing aggregate stream (bin, belt, discharge conveyor belt, or stockpile)	Yes, when requested	Before batching
		Fineness modulus	—	AASHTO T 27	—	"	"	"
		Moisture test	—	AASHTO T 255	—	"	"	"
Concrete(1) (552.09 (b)(3))	Measured and tested for conformance (106.04)	Unit mass	—	AASHTO T 121	1 per load	Point of discharge	—	Upon completing tests
		Air content	—	AASHTO T 152 or T 196	"	"	—	"
		Slump	—	AASHTO T 119	"	"	—	"
		Temperature	—	Field measured	"	"	—	"
Structural concrete (552.09 (b)(3))	Statistical (106.05)	Compressive strength(2)(3)	II	AASHTO T 23 & T 22	1 set per 30 yd3 but not less than 1 per day	Discharge stream at point of placement	Note 4	Subsection 552.09(b)(4)
Concrete pavement	Statistical (106.05)	Type A smoothness	I	See Subsection 501.12	See Subsection 501.12	See Subsection 501.12	—	Upon completing paving
	Measured and tested for conformance (106.04)	Type B roughness	—	See Subsection 501.12	See Subsection 501.12	See Subsection 501.12	—	"
	Statistical (106.05)	Pavement thickness (5)	II	AASHTO T 24	1 core per 2400 yd2	In place after sufficient hardening	—	72 hours

(1) Sample according to AASHTO T 141 except composite samples are not required.
(2) Cast at least 4 compressive strength test cylinders and carefully transports the cylinders to the job site curing facility.
(3) A single compressive strength test result is the average result from 2 cylinders cast from the same lead and tested at 28 days.
(4) Deliver cylinders to designated laboratory for test.
(5) Thickness is not a statistically evaluated parameter unless concrete pavement payment is by the square yard.

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	502							
Aggregate source quality (703.02)	Measured and tested for conformance (106.04 & 105)	Quality	—	AASHTO M 80	1 per material type	Source of material	Yes	Before producing
Concrete composition	"	All	—	Subsection 552.03	1 per mix design	Source of material	Yes	Before producing
Produced aggregate (fine & coarse)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per day	Flowing aggregate stream (bin, belt, discharge conveyor belt, or stockpile)	Yes, when requested	Before batching
		Fineness modulus	—	AASHTO T 27	—	"	"	"
		Moisture test	—	AASHTO T 255	—	"	"	"
Concrete (552.09(b)(3))	"	Unit mass	—	AASHTO T 121	1 per load (2)	Point of discharge (1)	—	Upon completing tests
		Air content	—	AASHTO T 152 or T 196	"	"	—	"
		Slump	—	AASHTO T 119	"	"	—	"
		Temperature	—	Field measured	"	"	—	"
Structural concrete (552.09(b)(3))	Statistical (106.05)	Compressive strength(3)	II	AASHTO T 23 & T 22	1 set per 30 yd^3 but not less than 1 per day	Discharge stream at point of placing	Note 4	See 552.09(b)(4)

(1) Sample according to AASHTO T 141 except composite samples are not required.
(2) Cast at least 4 compressive strength test cylinders and carefully transport the cylinders to the job site curing facility.
(3) A single compressive strength test result is the average result from 2 cylinders cast from the same lead and tested at 28 days.
(4) Deliver cylinders to designated laboratory for test.

SECTION	552							
Aggregate source quality (703.02)	Measured and tested for conformance (106.04 & 105)	Quality	—	AASHTO M 80	1 per material type	Source of material	Yes	Before producing
Concrete composition (mix design)	Measured and tested for conformance (106.04 & 105)	All	—	Subsection 552.03	1 per mix design	Source of material	Yes	Before producing
Produced aggregate (fine & coarse)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per day	Flowing aggregate stream (bin, belt, discharge conveyor belt, or stockpile)	Yes, when requested	Before batching
		Fineness modulus	—	AASHTO T 27	—	"	"	"
		Moisture test	—	AASHTO T 225	—	"	"	"
Concrete (552.09(b)(3))	Measured and tested for conformance	Unit mass	—	AASHTO T 121	1 per load	Point of discharge	—	Upon completing tests
	(106.04)	Air content	—	AASHTO T 152 or AASHTO T 196	"	"	—	"
		Slump	—	AASHTO T 119	"	"	—	"
		Temperature	—	Field measured	"	"	—	"
Structural concrete (552.09(b)(3))	Statistical (106.05)	Compressive strength(3)	II	AASHTO T 23 & T 22	1 set per 30 yd3 but not less than 1 per day	Discharge stream at point of placing	Note 4	See Subsection 552.09(b)(4)

(1) Sample according to AASHTO T 141 except composite samples are not required.
(2) Cast at least 4 compressive strength test cylinders and carefully transport the cylinders to the job site curing facility.
(3) A single compressive strength test result is the average result from 2 cylinders cast from the same lead and tested at 28 days.
(4) Deliver cylinders to designated laboratory for test.

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	553							
Pre-stressed concrete	Measured and tested for conformance (106.04)	Compressive strength	—	AASHTO T 23 & T 22	1 per 30 yd^3 (2)	Discharge stream at point of placing(1)	Yes, when requested	Upon completing tests
Grout	Measured and tested for conformance (106.04)	—	—	PTI Guide Specification for Grouting of Post-Tensioned Structures	Each mixture	Each source	—	Upon completing tests

(1) Sample according to AASHTO T 141 except composite samples are not required.
(2) In addition to the test cylinders required to determine 28-day strength, cast 2 release cylinders for each concrete member. Cure the release-strength cylinders with the concrete member that they represent.

SECTION	566							
Aggregate source quality (703.18)	Measured and tested for conformance (106.04 & 105)	Quality	—	AASHTO M 80	1 per material type	Source of material	Yes	Before producing
Shotcrete composition (mix design)	Measured and tested for conformance (106.04)	All	—	Subsection 566.03	1 per mix design	Source of material	Yes	Before producing
Production aggregate (fine & course)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per material type	Flowing aggregate stream (bin, belt, discharge conveyor belt, or stockpile)	Yes, when requested	Before batching
		Fineness modulus	—	"	—	"	"	"
Shotcrete	Measured and tested for conformance (106.04)	Unit mass	—	AASHTO T 121	1 per load (1)	Truck mixer or agitator(2)	—	Upon completing tests
		Air content	—	AASHTO T 152 or T 196	"	"	—	"
	Statistical (106.05)	Compressive strength	II	AASHTO T 24	1 set per 30 yd3 but not less than 1 per day	Production test panels	Note 4	Note 3

(1) See Subsection 552.09(b)(3).
(2) Sample according to AASHTO T 141.
(3) Prepare production test panels according to Subsection 566.07(a). Obtain two 3-inch diameter core specimens from each panel according to AASHTO T 24. A single compressive strength test result is the average result from two 3-inch diameter core specimens from the same test panel tested according to AASHTO T 23 at 28 days.
(4) Deliver cores to designated laboratory for testing.

SECTION	601							
Concrete	Measured and tested for conformance (106.04)	Unit mass	—	AASHTO T 121	1 set per 30 yd3 but not less than 1 per day	Point of discharge	—	Upon completing tests
		Air content	—	AASHTO T 152 or T 196	"	"	—	"
		Slump	—	AASHTO T 119	"	"	—	"
		Temperature	—	Field measured	"	"	—	"
		Compressive strength	—	AASHTO T 23 &T 22	"	Discharge stream at point of placing	—	"

SECTION	605							
Granular backfill	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27& T 11	1 per 600 yd3	Production output or stockpile	Yes	4 hours

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods or Specifications	Sample Frequency	Point of Sampling	Split Sample	Reporting Time
SECTION	608							
Bed course	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per 600 yd3	Production output or stockpile	Yes, when requested	24 hours
	“	Liquid limit	—	AASHTO T 89	“	“	“	“
Granular backfill	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27& T 11	1 per 600 yd3	Production output or stockpile	Yes, when requested	24 hours
Mortar	Measured and tested for conformance (106.04)	Making test specimens Compressive strength (2)	—	AASHTO T 23 & T 22	1 per installation (1)	Job site	Yes, when requested	24 hours

(1) Sample consists of 2 test specimens.
(2) The compressive strength will be the average of two test specimens.

SECTION	609							
Bed course	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per 600 yd3	Production output or stockpile	Yes	4 hours
	“	Liquid limit	—	AASHTO T 89	“	“	“	“
Mortar	Measured and tested for conformance (106.04)	Making test specimens Compressive strength (2)	—	AASHTO T 23 & T 22	1 per installation (1)	Job site	—	—

(1) Sample consists of two test specimens.
(2) The compressive strength will be the average of two test specimens.

SECTION	615							
Bed course (704.09)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per 600 yd3	Production output or stockpile	Yes, when requested	—
		Liquid limit	—	AASHTO T 89	“	“	“	—

SECTION	616							
Bed course (704.09)	Measured and tested for conformance (106.04)	Gradation	—	AASHTO T 27 & T 11	1 per 600 yd3	Production output or stockpile	Yes, when requested	—
		Liquid limit	—	AASHTO T 89	“	“	“	—
Mortar (712.05)	Measured and tested for conformance (106.04)	Making test specimens Compressive strength	—	AASHTO T 23 & T 22	1 per installation	Job site	—	—

SECTION	620							
Mortar (712.05)	Measured and tested for conformance (106.04)	Making test specimens Compressive strength	—	AASHTO T 23 & T 22	1 per installation	Job site	—	—

APPENDIX C-2

FREQUENCY SCHEDULE FOR QUALITY ASSURANCE (QA) SAMPLING AND TESTING

Frequency shall be as listed in Appendix C-2 or 10% of the Frequency listed in Appendix C-1, whichever is greater.

ITEM	DESCRIPTION	TYPE OF TEST REQUIRED	MINIMUM SAMPLING FREQUENCY	WITNESS OR SPLIT SAMPLE REQUIRED
204	EMBANKMENT	% Moisture % Compaction	1 per 100,000 cu yds (75,000 m3), or a fraction thereof. None required if plan quantity is less than 25,000 cu yds (20,000 m3).	1)* witness compaction
207	FILTER MATERIAL	Gradation	1 per 2,000 cu yds. (1,500 m3), or a fraction thereof. None required if plan quantity is less than 1,000 cu yds (750 m3).	1) split sample
208 209	STRUCTURE BACKFILL (Class I)	Gradation % Compaction	1 per 10,000 cu yds (7,500 m3), or a fraction thereof. None required if plan quantity is less than 1,000 cu yds (750 m3).	1)* witness compaction 2) split sample of Aggregate
208 209	STRUCTURE BACKFILL (Class II)	% Moisture % Compaction	1 per 10,000 cu yds (7,500 m3), or a fraction thereof. None required if plan quantity is less than 1,000 cu yds (750 m3).	1)* witness compaction
301	AGGREGATE BASE COURSE	Gradation % Compaction	1 per 20,000 tons (20,000 t), (10,000 cu yds), or a fraction thereof. None required if plan quantity is less than 10,000 tons (10,000 t), (5,000 cu. yds.).	1)* witness compaction 2) split sample of material
302	LIME-TREATED SUB-GRADE	% Moisture % Compaction	1 per 50,000 sq yds. (42,000 m2), or a fraction thereof. None required if plan quantity is less than 25,000 sq yds (20,000 m2).	1)* witness compaction
302	PORTLAND CEMENT-TREATED BASE	Gradation % Compaction	1 per 50,000 tons (50,000 t) or a fraction thereof. None required if plan quantity is less than 5,000 tons (5,000 t).	1)* witness compaction 2) split sample of mix and aggregate
303	RECONDITIONING	% Moisture % Compaction	1 per 50,000 sq yds (40,000 m2), or a fraction thereof. None required if plan quantity is less than 25,000 sq yds (20,000 m2).	1)* witness compaction
304	PROCESS ASPHALT MAT	% Compaction	1 per Project or as determined by the DPW ME.	1)* witness compaction
400	HOT MIX ASPHALT - GRADATION ACCEPTANCE PROJECT Basis	% Asphalt Gradation % Compaction Maximum SG Joint Density	1 per 10,000 tons (10,000 t), or a fraction thereof greater than 2,500 tons (2,500 t). None required if plan quantity is less than 2,500 tons (2,500 t).	1)* witness compaction 2) split sample mix & aggregate
400	HOT MIX ASPHALT - GRADATION ACCEPTANCE SYSTEM Basis	% Asphalt Gradation % Compaction Maximum SG Joint Density	1 per 25,000 tons (25,000 t), or a fraction thereof greater than 2,500 tons (2,500 t), and perform at a minimum one IA every two months on each HMA project tester and their equipment. None required if plan quantity is less than 2,500 tons (2,500 t).	1)* witness compaction 2) split sample mix and aggregate
400	HOT MIX ASPHALT - VOIDS ACCEPTANCE PROJECT Basis	% Asphalt % Compaction Maximum SG Joint Density Hveem Stability Air Voids Voids in Mineral Aggregate	1 per 10,000 tons (10,000 t), or a fraction thereof greater than 2,500 tons (2,500 t). None required if plan quantity is less than 2,500 tons (2,500 t).	1)* witness compaction 2) split sample mix when no voids verification equipment is available
400	HOT MIX ASPHALT - VOIDS ACCEPTANCE SYSTEM Basis	% Asphalt % Compaction Maximum SG Joint Density Hveem Stability Air Voids Voids in Mineral Agg.	1 per 25,000 tons (25,000 t), or a fraction thereof greater than 2,500 tons (2,500 t), and perform at a minimum one IA every two months on each HMA project tester and their equipment. None required if plan quantity is less than 2,500 tons (2,500 t).	1)* witness compaction 2) split sample mix when no voids verification equipment is available
403	PLANT MIX BITUMINOUS BASE COURSE	Gradation % Compaction % Asphalt	1 per 20,000 tons (20,000 t), or a fraction thereof. None required if plan quantity is less than 5,000 tons (5,000 t).	1)* witness compaction 2) split sample of mix
403	HOT-IN-PLACE RECYCLE	% Compaction Maximum Sp Gravity	1 per 50,000 sq yds (40,000 m2), or a fraction thereof. None required if plan quantity is less than 25,000 sq yds (20,000 m2)	1)* witness compaction 2) split sample for 1- point ck.

ITEM	DESCRIPTION	TYPE OF TEST REQUIRED	MINIMUM SAMPLING FREQUENCY	WITNESS OR SPLIT SAMPLE REQUIRED
403/ 408/ 409	ASPHALT CEMENT /PERFORMANCE-GRADED ASPHALT AND BINDER, AND BITUMINOUS MATERIAL	Determined by Central Laboratory	Asphalt Cement/Performance Graded Binder and Emulsion for Chip Seal Coats and Cold-In-Place Recycling: Project acceptance sampling will be witnessed by DPW's IA Tester, and documented. **Project Basis:** 1 per 20,000 tons (20,000 t), or a fraction greater than 2,500 tons (2,500 t). None required if plan quantity is less than 2,500 tons (2,500 t). **System Basis:** A minimum of one per two months per tester or one per project /mix design. None required if plan quantity is less than 2,500 tons (2,500 t).	1) IA binder samples will be witnessed. 2) IA samples shall be taken by the contractor or his representative.
408	COLD BITUMINOUS PAVEMENT (RECYCLE)	% Compaction	1 per 50,000 sq yds (40,000 m2), or a fraction thereof. None required if plan quantity is less than 25,000 sq yds (20,000 m2).	1)* witness compaction
409	COVER COAT MATERIAL - AGGREGATE	Gradation	1 per 5,000 tons (5,000 t), or a fraction thereof. None required if plan quantity is less than 1,200 tons (1,200 t). 1 per 285,000 sq yds (230,000 m2). None required if plan quantity is less than 62,500 sq yds (50,000 m2).	1) split sample
409/ 410	COVER COAT MATERIAL - EMULSION	Determined by Central Laboratory	1 per 5,000 tons (5,000 t), or a fraction thereof. None required if plan quantity is less than 1,200 tons (1,200 t). **Note:** Verify if the sample is diluted or undiluted in the field.	1) IA emulsion samples will be witnessed only. 2) IA samples shall be taken by the contractor or his representative.
501	PORTLAND CEMENT CONCRETE PAVEMENT	Compressive Strength Slump Air Content Sand Equivalent Flexural Strength	1 set of cylinders per 50,000 sq yds (40,000 m2), or a fraction thereof for all thicknesses. None required if total plan quantity for all thicknesses is less than 5,000 sq yds (4,000 m2). As specified in the Plans/Special Provisions.	Split sample: for slump, air content; **SE, and cylinders, when required. 1) When no field compressive machine is used for QA and there is no IA compressive machine: Witness molding of QA cylinders. 2) When a field compressive machine is used for QA: Witness molding of QA cylinders and cast IA cylinders to break on an independent machine. ** Sand Equivalent (SE)
552	STRUCTURAL CONCRETE	Compressive Strength Slump Air Content	1 per 2,000 cu yds. (1,500 m3), or a fraction thereof for each Class. None required if total plan quantity for all classes is less than 500 cu yds (380 m3).	
552	STRUCTURAL CONCRETE (Median Cover Mat'l)	Compressive Strength Slump Air Content	1 set of cylinders per 90,000 sq ft (8,361 m2), or a fraction thereof for each class. None required if total plan quantity is less than 10,000 sq ft (929 m2).	
553	PRE-STRESSED CONCRETE UNITS	Compressive Strength Slump Air Content	1 per 2,000 cu yds (1,500 m3), or a fraction thereof. None required if plan quantity is less than 500 cu yds (380 m3).	
565	DRILLED CAISSONS	Compressive Strength Slump	1 set of cylinders per 2,000 cu yds (1,500 m3), or a fraction thereof. None required if plan quantity is less than 500 cu yds (380 m3).	
609	CURB AND GUTTER (Concrete)	Compressive Strength Slump Air Content	1 per Project. None required if plan quantity is less than 3,000 linear ft (900 m).	
615	SIDEWALKS (Concrete)	Compressive Strength Slump Air Content	1 per 10,000 sq yds. (8,000 m2), or a fraction thereof. None required if total plan quantity for all classes and for all thicknesses is less than 1,500 sq yds (1,250 m2)	
615	DRIVE PADS (HMA)	Gradation AC Content	1 per Project. None required if total plan quantity is less than 2,500 tons (2,500 t).	

ITEM	DESCRIPTION	TYPE OF TEST REQUIRED	MINIMUM SAMPLING FREQUENCY	WITNESS OR SPLIT SAMPLE REQUIRED
615	PAVED MEDIANS (HMA)	Gradation AC Content	1 per Project. None required if total plan quantity is less than 3,000 linear feet (900 m).	
616	SLOPE AND DITCH PAVING (Concrete)	Compressive Strength Slump Air Content	1 per 2,000 cu yds (1,500 m3), or a fraction thereof. None required if plan quantity is less than 500 cu yds (380 m3).	
617	GUARD RAIL (Cast-In-Place)	Compressive Strength Slump Air Content	1 per 10,000 linear feet (3,000 m). None required if plan quantity is less than 3,000 linear feet (900 m).	

NOTE 1 When all Items subject to Independent Assurance Sampling on a particular project have quantities less than the minimums set forth in the (QA) Frequency Guide Schedule for Minimum Materials Sampling, Testing, and Inspection.

NOTE 2 Independent Assurance Sampling shall be accomplished at the Point of Verification or Acceptance listed for each Item in the (QA) Frequency Guide Schedule for Minimum Materials Sampling, Testing, and Inspection in the construction specifications.

NOTE 3 **Abrasion Test for Concrete Aggregates:** No Independent Assurance Samples required.

NOTE 4 **Item 554, Reinforcing Steel:** No Independent Assurance Samples required.

NOTE 5 **Gradation:** A minimum of 80% of all of the gradation tests shall be split with the field tester and run independently by personnel who have no direct responsibility for verification sampling and testing.

NOTE 6 **Compaction:** Compaction tests using a Nuclear Moisture/Density (M/D) Gauge require that a Standard Count be made prior to the test as a check on the gauge. If the sand replacement method is used, documentation of sand calibration must be retained in the Project Files. If the calibration is not on file, a calibration will be required before the compaction test is performed.

NOTE 7 **Asphalt Content:** When a Nuclear Asphalt Content Gauge is used, the Slope - Y Intercept shall be verified as the calibration. A minimum of 80% of the Independent Assurance tests shall be split with the field tester and run independently by personnel who have no direct responsibility for verification sampling and testing.

NOTE 8 The Maximum Specific Gravity of project-produced mix is used to determine the target density for compaction compliance. A minimum of 80% of tests shall be split with the field tester and run independently by personnel who have no direct responsibility for acceptance/verification and testing.

APPENDIX D

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APPENDIX D

CONSTRUCTION QUALITY MANAGEMENT PLAN (CQMP)

1.0 Scope

This Construction Quality Management Plan (CQMP) has been developed for DPW personnel administering construction projects. The CQMP identifies the roles and responsibilities of DPW positions, and establishes an outline for the planning, developing, managing, and delivering the administration and inspection of constructed work to meet DPW's requirements, as set out in the Contract plans, Special Contract Requirements and the specifications.

2.0 Reference Documents

The following are reference documents from which this CQMP was derived. While the reference documents are generic standards, this CQMP develops the specific approach to achieving the goals of the standards for DPW projects.

- ISO 9000:2000 Quality Management Systems - Fundamentals and Vocabulary
- ISO 9001:2000 Quality Management Systems - Requirements
- ISO 9004:2000 Quality Management Systems - Guidelines for Performance Improvements
- ISO 19011:2004 Guidelines for Auditing Quality Systems
- ISO 10012:2003 Quality Assurance Requirements for Measuring Equipment – Parts 1 and 2

3.0 Terms and Definitions

For the purposes of this CQMP, the terms and definitions are consistent with the CMIS Manual and ISO 9000.

4.0 Quality Management System

4.1 General Requirements

DPW developed, implemented, and maintains the CMIS Manual to control the performance of CM services on its construction projects. The CMIS Manual contains the CQMP requirements, which are developed in accordance with ISO 9001:2000 requirements to provide that the project deliverables conform to the Contract requirements. DPW will continually strive to improve the CQMP's effectiveness in accordance with the requirements of this International Standard, and:

- Identify the processes needed for management of quality and its applications. The CQMP describes methods and procedures for implementation of a quality management system during construction.
- Determine the sequence and interaction of these processes.
- Determine the criteria and methods needed to verify that both the operation and control of these processes are effective.
- Provide for the availability of resources and information necessary to support the operation and monitoring of these processes.
- Implement actions necessary to achieve planned results and continual improvement of these processes. These actions are described more fully in subsequent sections of this CQMP and are audited to determine compliance.

The Project organization provides the necessary supervision, QC processes, and QA of all items of work, including the work of Contractors, consultants, and suppliers to provide for compliance with the specified requirements.

4.2 Documentation Requirements

DPW has established the following documents as appendices to this CMIS Manual, which together comprise the guidelines and requirements for the effective operation of the quality management system:

- Appendix A- Construction Inspection Guidelines
- Appendix B- Forms and Document Samples
- Appendix C- Materials Testing and Inspection Plan
- Appendix D- CQMP
- Appendix E- CSMP

4.3 Construction Quality Management Plan (CQMP)

The PE is responsible for establishing and maintaining a project-specific CQMP that includes the scope of the quality management system, specific quality procedures, and the interaction between the processes of the quality management system. The approved project-specific CQMP will serve as the guiding document for the quality system for construction, and should not to be modified without DPW's approval.

The implementation of the CQMP is fundamental to the success of the any Project. The CQMP is a dynamic document and changes may be required, subject to the same review and approvals of the original document. By defining the scope and content, the project personnel are responsible for identifying project activities that require a new procedure, and preparing the procedure, as applicable.

Procedures will be established as part of the CQMP development to define specific processes for the performance of quality activities by the Construction Management staff, including consultants, and where applicable, Contractors and suppliers.

4.4 Control of Documents

The PE will establish a DCS to store and record all documents generated under the Contract. Complete project documentation will be maintained in hardcopy in a readily accessible file system. Complete project documentation in electronic format will also be maintained in a Web-based document control system, which serves as a database accessible, in varying degrees, to other personnel involved in the construction project. Procedures for access and usage of the Web-based document control system are developed by DPW and disseminated to all concerned.

Procedures for receipt, filing, distribution, retrieval, etc., of construction records should be described in detail, noting that quality records are a special type of document and are controlled as required in Section 4.5 of this CQMP.

The PE is responsible for ensuring that all documents and data relating to the construction projects, provided by the designer, Contractor, consultants, and suppliers will be controlled from receipt, through review, filing, and project handover to be stored in the project archives. These controls will ensure that only current and properly-approved construction documents and data are available for use at the place of work. These controls will ensure:

- Approval of documents for adequacy is accomplished prior to issuance
- Review, update, and re-approval of documents as necessary is accomplished
- Changes and the current revision status of documents are identified
- Relevant versions of applicable documents are available at points of use
- Documents remain legible and readily identifiable
- Documents of external origin are identified and their distribution controlled
- The unintended use of obsolete documents is prevented and suitable identification of these obsolete documents is provided

All construction documentation, including plans and specifications, will be recorded in the DCS. Subsequent changes to design drawings, specifications, and shop drawings and/or data required during construction will be recorded with revision dates in the DCS. The reporting capability is such that all revision dates of the most current document revisions can be extracted from the DCS in a printed format.

4.5 Control of Records

Quality records provide evidence of conformity to requirements and the effective operation of the quality management system. Quality records are maintained in the DCS in a legible, readily identifiable, and retrievable manner.

The PE is responsible for the management of construction documents as well as the control and storage of these records. Quality Records should be collected, stored, and preserved in a manner that precludes damage, loss, or deterioration. Some examples of Construction Quality Records are:

- Project Daily Diary
- Inspectors' DIRs
- Project Weekly Report
- Test result records
- All Meeting Minutes
- Monthly Payment Certificate records
- Change Order files
- Contingent Sum (CS) work records
- Submittals and log of submittals
- RFIs and log of RFIs
- Project correspondence
- Project photographs
- Traffic Control Plans (TCPs) and records
- Accident reports
- Non-Conformance and Corrective/Preventive Action records
- Correspondence Files
- Any other documentation pertinent to the project

5.0 Management Responsibility

5.1 Management Commitment

DPW will demonstrate their commitment to the implementation of the quality management system and continually improve its effectiveness by:

- Communicating to the project team, the subconsultants, and the Contractor the importance of meeting DPW's and the statutory and regulatory requirements
- Committing to the quality policy
- Ensuring that quality objectives are established
- Conducting management reviews
- Ensuring resource availability

5.2 Quality Policy

This Quality Policy relates to the DPW's goals and expectations to provide a quality project on time and within budget. The PE should be made fully aware of this policy and committed to its implementation.

5.3 Planning

5.3.1 Quality Objectives

The quality objectives of DPW are as follows:

Objective	Goal
Respond to the needs of DPW through continual compliance with this CMIS Manual	Maintain zero findings in audit reports
Establish and maintain a personnel focus on quality	Conduct training sessions on quality and continuously track performance
Meet or exceed Contract requirements on deliverables	Measure performance by monitoring output against target schedule
Meet or exceed Contract requirements on adequacy of construction QC and QA	Fully audit all construction document records; take corrective action; and monitor the trend of non-conformances
Ensure all personnel understand the CMIS Manual requirements and associated quality procedures	All current DPW employees and new hires who are assigned to a project will be given an introduction to the CMIS Manual prior to starting work.

5.3.2 Quality Management System Planning

Quality is achieved by accurate planning, coordination, supervision, and technical direction; proper definition of job requirements and procedures; and the use of appropriately-skilled personnel performing their work functions with care.

Quality is controlled through thorough checking of the construction materials delivered to the project site to ensure that they meet the project specification requirements; the inspection, testing, and verification of the constructed work; verifying any corrections or rework necessary; and accurately documenting the process according to set procedures developed to facilitate the audit. Quality is assured by assigning qualified personnel to perform the specified procedures, validated by quality audits of both the work and the QC process.

5.4 Responsibility, Authority, and Communication

5.4.1 Responsibility and Authority

Oversight of construction projects managed by DPW, as well as other support activities, is the responsibility of the PE who reports directly to DPW's Chief Engineer. The PE will periodically review the project status with DPW's Chief Engineer. The PE will ensure that responsibilities and authorities are defined and communicated within the construction management team, and that the quality policy, objectives, and procedures are understood within the PE's organization.

The PE has the overall responsibility for quality management for the specified construction projects under his/her direction. The PE is responsible for the management and training of the project team to ensure their knowledge and ability to monitor and accurately record the progress of the work, and to ensure that the constructed work meets all Contract requirements. In order to carry this out, the PE:

- Is fully knowledgeable of the requirements of this CMIS Manual
- Manages and, where necessary, trains the inspection staff on the project team to ensure that all materials and constructed work are inspected, sampled, and tested as specified in the contract documents and the CMIS, and that accurate records of these functions are maintained on a daily basis
- Provides that document control procedures are accurately implemented for the completeness of construction records
- Performs day-to-day supervision of project activities
- Maintains a Project Daily Diary, recording all key aspects of work constructed, meetings held, construction processes agreed upon, and problems encountered and/or resolved
- Reviews and certifies Daily Inspection Reports and materials testing results
- Holds a PRECON at project commencement, and any other meetings pertinent to the progress of the work; and records minutes of these meetings and distributes them to all attendees expeditiously, to ensure that all parties to the work are fully informed of the current status of the project
- Maintain a record of project progress, by digital photos or by digital video, the construction work as it is performed and completed
- Issues RFIs, where applicable, to facilitate the resolution of any questions regarding the intent of the Project plans

- Logs in and transmits all shop drawings to the project's Designer of Record for review and approval; and records their status and notifies the Contractor when the shop drawings are approved for use
- Ensures that all project material conforms to the plans and specifications prior to delivery and that material delivered to and stored at the project site are received and stored in an acceptable condition
- Issues NCRs to the Contractor when materials or the constructed work fail to meet Contract specifications. Issues Corrective/Preventive Action Reports (CARs/PARs) when construction processes result, or may result, in repetitive failure to meet the Contract requirements. Monitors the remediation of these deficiencies by the Contractor and ensures that they are resolved to meet Contract requirements
- Reviews the Contractor's monthly Payment Applications for accuracy, prior to making a recommendation for payment
- Reviews Traffic Control Plans submitted by the Contractor, and performs regular safety inspections throughout the project site to ensure the safety of the construction operations, in order to minimize hazards to both construction workers and the general public
- Coordinates QA materials testing to monitor the Contractor's QC materials testing program
- Develops punch lists of outstanding work to be completed as construction progress nears completion
- Performs a Final Acceptance Inspection of the project upon receiving notification from the Contractor that all project work is complete
- Ensures that all completed project records are properly collated, filed, and indexed prior to transmitting them to the Chief Engineer

The **Lead Inspector** provides support to the PE regarding all construction matters relating to the progress of the work. The Lead Inspector reports to the PE and facilitates the transmission, logging, processing, and tracking of all project documentation.

The Lead Inspector will also be responsible for directing and coordinating the activities of the other Inspectors employed on the project. The Lead Inspector will:

- Complete a Daily Inspection Report detailing activities regarding the inspection and testing of the work, meetings attended, and discussions with Contractor representatives with regard to work methods
- Delegate responsibilities for inspection to the Inspectors and Technicians
- Assist in coordinating QA testing of materials

- Review the DIRs of the Inspectors under the Lead Inspector's supervision
- Aid the PE in reviewing test result reports and materials certification submittals
- Ensure that current, approved drawings are available for inspection staff to fully monitor the work
- Regularly check to confirm that the Contractor is updating construction drawings to reflect As-Built conditions, and that As-Built changes have been reviewed and changes are concurred by the PE, Chief Engineer and Contracting Officer, prior to their implementation
- Perform the duties of the PE during the PE's absence
- Identify and report on quality matters impacting the work

The **Inspectors** will perform the tasks assigned to them by the PE and/or Lead Inspector. The Inspectors will:

- Perform inspections required and complete checklists to confirm that the work has been inspected for Contract conformance prior to and during construction operations and make record of daily quantities of work installed
- Report directly to the PE or Lead Inspector regarding any construction or safety problems encountered during inspection.
- Provide advance notification to the QA Testing Technicians so that the construction materials to be sampled and tested may be adequately and timely performed as described in Appendix C- Material Testing and Inspection Plan or as may otherwise be specified in the contract
- Perform inspections that work to be constructed has been properly surveyed by the Contractor to conform to the requirements of the approved construction drawings.
- Complete a Daily Inspection Report to record all construction activities and construction personnel and equipment observed performing the work, together with a record of any discussions with Contractor personnel regarding the work and any non-conformances observed. The Inspectors will sign the completed report and submit it to the PE within 24 hours from the date of the Report.
- Inspect the safety and traffic safety requirements are being met for the safety of both the construction workers and the general public.

The **QA Materials Technicians** (QMT) will generally be employed directly as consultants to DPW and may be assigned to multiple construction projects. However, day-to-day activities will be performed under the PE's instruction with regards to the locations and requirements for sampling and testing of delivered and constructed materials incorporated into the project. The QMT will perform sampling and testing of materials as outlined in this CMIS

Manual, in particular Appendix C- Material Testing and Inspection Plan or as may otherwise be specified in the contract

5.4.2 CQMP Implementation

The PE is responsible for directing and implementing the QA program guided by the construction contract and this CMIS Manual. The described responsibilities, functions, and policies, with the objective being to provide validation and confidence that the constructed work meets the Contract requirements. The PE's duties for implementation include:

- Establishing, implementing, and updating the project-specific CQMP
- Providing quality-related direction to staff
- Providing training of personnel to ensure awareness of quality procedures and specific responsibilities in the QC process, including the interface and response to external audits such as those conducted by DPW
- Evaluating QC activities of staff and consultants for conformance with the Quality Management Plans and Contract requirements
- Identifying, monitoring, and reporting design-related non-conformances
- Examining project submittals to ensure that all of the documents have gone through QC, and are in compliance with the CQMP

5.4.3 Communication

The PE will ensure that appropriate communication processes are established within the organization, and that communication takes place regarding the effectiveness of the CQMP.

Regularly scheduled coordination meetings between the construction management team, and designers, serve as the organizational and technical interface between the parties involved. Progress and other issues are addressed and documented at these meetings. Issues that involve possible changes to in-progress work are assigned as action items to a responsible party, logged, and tracked to resolution. Changes to future work and designs are tracked in the meeting minutes and, when resolved, are forwarded to all parties involved.

During construction, occasional RFIs/clarification are conducted in person, by telephone or email, and documented in the DCS for future reference. Design changes, no matter where they originated, are processed and approved in accordance with the project procedures before the changes are built.

Progress reporting for each construction project should be summarized in the Weekly Construction Report. The report should include, but is not limited to:

- Weekly Report Number

- Key Contract Dates
- A summary of contract days
- A summary of weather conditions for each day of the report
- An indication of the how the project is progressing
- An indication if the projects is on schedule or not
- A list of project documents that are outstanding from the Contractor
- A brief narrative of the contract progress for the week
- Outstanding non-conformances

5.5 Management Review

DPW shall review the implementation of the CQMP semi-annually or as needed to ensure its continuing suitability, adequacy, and effectiveness. This review includes assessing opportunities for improvement and the need for changes to specific procedures and the quality objectives. Records of this review and associated revisions, if any, should be documented and maintained in the DCS.

5.5.1 Review Input

The input to the management review includes information on:

- Results of audits
- DPW management feedback
- Process performance and work conformity
- Status of preventive and corrective actions
- Follow-up from previous management reviews
- Changes that could affect the CQMP
- Recommendations for improvement

5.5.2 Review Output

The output from the management reviews includes any decisions and actions related to:

- Improvement of the effectiveness of the CQMP and its processes
- Improvement of design related to DPW requirements
- Resource needs

All actions and/or decisions from these reviews are monitored for closure and documented as such in the follow-up meetings, and transmitted to the DPW Chief Engineer

6.0 Resource Management

6.1 Provision of Resources

DPW Chief Engineer will assess organizational and project needs to ensure that adequate resources are provided.

6.2 Human Resources

6.2.1 General

Personnel involved in construction management activities affecting the quality of the constructed product will be competent on the basis of appropriate education, licensing, certification, training, skills, and experience.

6.2.2 Competence, Awareness, and Training

DPW Chief Engineer will:

- Identify competency needs for personnel performing activities affecting quality
- Identify training needs on quality performance, technical work, and safety; and ensure that training is performed in order to satisfy competency requirements
- Evaluate the effectiveness of the training provided
- Maintain records of resumes, certifications, licenses, and training skills

6.3 Infrastructure

The DPW Chief Engineer, with assistance from DPW upper management, is responsible for determining, providing, and maintaining facilities and support equipment (transport, communications, office, etc.) needed to carry out the work activity requirements. This can include:

- Buildings, workspace, and associated utilities
- Equipment, computers, software, cell phones, and Personal Protective Equipment (PPE) required to perform and record inspection and testing activities required under the Contract
- Transportation, maintenance, and communication support services

6.4 Work Environment

The DPW Chief Engineer will ensure that the work environment has a positive influence on motivation, satisfaction, and performance of personnel in order to enhance the efficiency of the organization and achieve conformity to project requirements.

7.0 Quality Work Realization

7.1 Planning and Quality Work Realization

In planning for the realization of quality work, the PE should plan for and communicate the following elements through the development of the CQMP and its implementation:

- Quality objectives and requirements for the work
- The need to establish processes and documents, and provide resources specific to the work
- Required verification, validation, monitoring, inspection, and test activities specific to the work, and the criteria for work acceptance
- Records needed to provide evidence that the realization processes and resulting work meet requirements

7.2 Related Processes

7.2.1 Determination of Requirements Related to Construction

In the preparation of the CQMP for a particular project, the PE is responsible for identifying and assessing:

- Requirements specified by the Contract, including the requirements for delivery and acceptance of the work
- Requirements not stated in the Contract, but necessary for specified or intended use as the project develops
- Particular requirements of the Contract scope of constructed work and the construction means and methods employed to carry out the work
- Statutory and regulatory requirements related to the products and services produced

7.2.2 Review of Contract Requirements Related to Construction Management Services

The PE is responsible for reviewing requirements related to construction and the performance of construction management and inspection services to ensure that:

- Construction requirements and parameters are defined
- Contract requirements differing from those previously expressed are resolved
- The construction management organization has the ability to meet the defined requirements

Where construction requirements or construction scope are changed, the PE will ensure that relevant documents are amended, and that relevant personnel are made aware of the changed requirements.

7.2.3 Communication

The PE is responsible for determining and implementing effective means for communicating with project stakeholders, and the Contractor during all aspects of the Project. This should include both formal and informal communications involving written, electronic, telephone, and face-to-face discussions.

The PE will participate in regular project status meetings to discuss organizational and technical agenda issues. At any of these meetings, issues, concerns, or complaints may be presented, discussed, formally resolved, and documented promptly. A methodology of handling issues will be mutually established and agreed upon at the early stages of the Contract through a partnering process.

The PE will communicate to the Chief Engineer on the adequacy of the CMIS Manual and the need for additional information to complete the plan for performing construction management and inspection services associated with a particular project. Construction input includes functional and performance requirements; applicable statutory and regulatory requirements; information derived from previous similar project designs; and other requirements essential for construction management completion and project acceptance. This information is gathered from meetings with agencies affected by the Project; from public input, where applicable; or from the regular, in-house progress meetings. Information gathered through the interface with construction management groups of other construction projects is particularly beneficial by incorporating first-hand experience into the CQMP for a project.

7.3 Project Construction Management

Construction progress is managed through Pre-construction, Weekly Progress and Pre-activity Meetings, in addition to the generation of and response to project correspondence between all interested parties involved in the project, including any utility agencies or private parties whose domain or equipment may be affected by the construction work.

Construction Management includes correspondence records, meeting minutes, Project Daily Diary, inspection reports, materials certification approvals, materials test results, project progress photographs, and non-conformance and corrective and preventive action reports and their resolution. In addition, records of audits and their findings are stored and handed over as deliverables at project completion.

7.3.1 Pre-construction Conference (PRECON)

A PRECON will be held at the beginning of the project between the PE; the Contractor; any subcontractors performing the work; consultants performing project materials testing and survey work; utilities agencies affected by project construction; and any other interested parties. The meeting agenda will include a discussion of quality and safety requirements, and performance during construction. Particular quality issues will include:

- Materials certification
- Scheduling of the work
- Inspection requirements
- Sampling and testing requirements
- Project non-conformances and their resolution

Meeting minutes will be issued to all attendees typically within seven days of the meeting date.

7.3.2 Weekly Progress Meetings

Weekly construction progress meetings will be held between the PE and the Contractor. DPW's representatives and utilities agencies' representatives will also be invited to attend, as applicable. During the meeting, any quality issues requiring resolution will be discussed, as well as the organizations responsible for the actions and the dates for resolution of the issues recorded. The construction staff will meet on a weekly basis, or as needed, and their activities will include:

- Tracking and resolution of construction quality and safety issues
- Discussion/agreement on Contract requirements, RFIs, and Change Orders
- Communication of construction priorities and schedules, and inspection and testing requirements
- Tracking progress of construction work, to include requests for approval of and/or payment for delivered materials and completed work

Meeting minutes will be distributed by the contractor to all attendees typically within two days of the meeting date.

7.3.3 Pre-Activity Meeting

Prior to the commencement of any construction activity to be performed on the project for the first time, the Contractor should conduct a Pre-activity Meeting to provide a "paper walk-through" of the construction activity. The PE, Contractor, subcontractor, and any concerned utilities agencies should attend the meeting. The meeting will discuss and define the following:

- Drawings and specifications applicable to the work to be performed
- Work plans and procedures to perform the work
- Materials to be incorporated into the work and the status of their submittals
- All supplemental drawings (shop drawings, working drawings, fabrication and falsework drawings, etc.), where applicable
- Inspection, sampling, and testing requirements
- Safety hazard analysis of potential hazards to construction workers during

the work process

The processes and equipment necessary to ensure that the constructed work will be performed safely and will meet Contract requirements will be agreed to by all parties. Discussion of items and agreements reached should be recorded by the Contractor and distributed to all participants within two days of the meeting date. The PE should follow-up with the Contractor to ensure this information is distributed prior to the commencement of the construction activity.

7.3.4 Project Correspondence

Formal project correspondence will be used to communicate with the Contractor, other DPW departments, and outside parties. Correspondence should include submittal of materials and shop drawing approval requests, RFIs, monthly payment certificates, meeting minutes, and all other documents that make up the formal Contract records. Correspondence may be in the form of letters, transmittal forms, and memoranda; and in some cases, telephone conversation communiqués. The use of e-mails in facilitating project work is anticipated and encouraged but will not be considered, on its own, as a formal project document and cannot convey substantive instruction or modify the requirements of the Contract. Correspondence will be tracked and responses to submittals will be addressed expeditiously by the PE. Database logs of incoming and outgoing correspondence to/from the Contractor, and all concerned utilities agencies will be maintained and kept current. All correspondence will be responded to in a timely manner. All project correspondence will be maintained and stored as project records.

7.3.5 Constructed Work Verification

During the course of the project from NTP through final acceptance, verification of the constructed work is conducted throughout the Contractor QC process and the PE's QA process to verify that the constructed work meets the design requirements, and that specification requirements in the Contract are being fulfilled.

These project quality records become a subset of the final project records and will be maintained in the DCS, and represent the implementation of the CQMP by verification that the constructed work meets project requirements.

7.3.6 Constructed Work Validation

Validation of the constructed work is an ongoing process at different stages of construction, aimed at ensuring that the requirements for the designs' intended application are continuously fulfilled. All data supplied by others such as geotechnical, survey, utility, right-of-way, and materials testing are first analyzed, validated, and documented by the PE, prior to acceptance of the constructed work. Internal quality audits monitoring the progress of construction will provide validation that the constructed work QC/QA processes have been accurately followed.

7.3.7 Requests for Information (RFIs)

If there is any clarification of the intent of the construction documents, or any site condition unforeseen during the construction process, the Contractor will issue a RFI to the PE. If the RFI relates to a design issue the PE will forward it to the Designer of Record for formal clarification. All RFIs will be logged and monitored by the PE, with their status reviewed at the Weekly Progress meetings. Once resolved, the resolution will be transmitted to the Contractor, along with revised drawings or further actions identified, where applicable

7.3.8 Contingent Sum (CS) Work

The CS is for unforeseen work, for which an amount may be included in the Contract Documents. This item is for other items of work not included in the Contract Documents, but is deemed necessary or desirable in order to complete the work as contemplated. Such work identified by the PE will be performed by the Contractor in accordance with the specifications and the SCR's. The amounts to be paid will include the costs of labor, tools, supplies, equipment, specialized services, materials, applicable taxes and overhead, and to include a profit commensurate with those costs.

During the progress of the CS work, man and equipment hours will be strictly monitored by the Inspection staff, and recorded man/equipment hours signed-off as agreed to by both the Inspector and the Contractor on a daily basis, until the CS work is complete. If overtime hours are identified as being necessary for the prompt and safe conclusion of the work, the hours will be agreed to by both the PE and the Contractor, prior to overtime being worked.

All documents pertaining to CS work will be retained in a CS work file. Each CS work activity will be allotted its own unique file number and stored separately in that file, which will be recorded in the DCS.

7.3.9 Control of Changes in the Work

Changes to the design after documents have been issued for construction may originate from the PE, contractor, internal or external utility organizations, or field personnel through the issuance of RFIs or Change Orders. Communications to the project's designer will follow the process for Notice and Documentation of Changes that originates from the field.

Changes to drawings or specifications already issued for construction are noted as revisions on the altered document. The changes should be clearly highlighted to identify what is changed in accordance with the CADD standards for the project. All changes to the plans, SCR's or Standard Specifications require a Change Order.

The revised document undergoes design QC/QA processing similar to the original design. Major changes are defined as follows:

- Any revision in the scope of the Contract including the following:

- Revision of any standard design feature or specific project design element to the alignment, structures, stations, and significant detours, including structural sections and changes in access control
- Modification of major structures such as bridges, box culverts, and walls, necessitating a calculations check by independent analysis
- Addition, deletion, or modification to the work stipulated by written agreement between DPW and private parties or governmental units, or generating new work under the Contract that requires written agreement
- Changes in the character of the work or site condition

- Any changes to the specifications in type or quality of materials to be furnished or "proprietary" materials for which specific or blanket approval has not been documented.

Proposed changes are first reviewed by the PE for validity, before submitting them to the designer for concurrence to incorporate the proposed changes to the drawings and/or specifications. At this time, the Contractor will be instructed to submit the estimated cost breakdown and requested time extension, if applicable, for performing the work. The proposed change and its related cost/time implications will then be reviewed by the PE and, if considered acceptable, a Change Order will be developed and submitted to the Contractor for acceptance and signature. If approved by DPW, the Change Order will be issued to the Contractor to perform the work identified.

If the proposed Change Order addresses a reduction in the scope of the Contract, a similar process will be followed; the reduced costs and/or time will be quantified; and a Change Order will be issued to the Contractor.

Approved changes are documented and provided to all holders of affected documents with instruction to discard superseded documents when the updated document or record is received. Document Control maintains a master list of currently accepted changes.

Changes that result from a change in design input such as regulatory requirements, design criteria, etc., require more than drawing revisions -- a feedback into the system is necessary so that the change is considered in upcoming designs.

All documents pertaining to the Change Order will be retained and indexed in a Change Order File. Each potential or approved Change Order will be allotted its own specific Change Order number and file number, and will be recorded in the DCS.

7.3.10 Change Orders

Development of change directives generally follows a path originating from a RFI, or a Change Request (CR), submitted by the Contractor, which may result in a project Change Order. The CR generally reflects an unforeseen aspect of site conditions, necessitating a change to the scope of the work, and is drafted and submitted to the PE, along with all supporting documentation. The status of each CR and follow-on Change Order should be reviewed as necessary at the weekly construction progress meetings, as well as at dedicated Change Order review meetings where any additional input from other concerned parties may be included and discussed. All CR and Change Order documents are filed in hard copy and electronically, and logged under a separate Change Order File for each CR, so that each one can be identified and located at any time. Basic inputs are the following:

- Originating documents (RFI, CR, etc.)
- Reference documents
- Baseline designs versus changes
- Project specifications
- Schedule impact analysis
- Cost estimate of materials, labor, and equipment to carry out the work
- Surveys, test results, and other supporting information

The PE will review all documents and supporting information with the project designer so there is sufficient information to support the CR. All incomplete, ambiguous, or conflicting requirements should be resolved prior to review with the Chief Engineer. Upon DPW's approval, a Change Order will be issued and the PE will instruct the Contractor accordingly.

7.3.11 Internal Quality Assurance (QA) Audits

Internal quality audits should be carried out to provide assurance that all QC procedures are being fully implemented, and that all QC records are being collated, stored, and indexed. Deficiencies identified will be documented as a Quality Finding, and will be addressed and formally resolved.

7.3.12 As-Builts

The process for preparation of As-Built drawings will be initiated by the Contractor and coordinated with the PE. The issued for construction drawings should be used as base drawings and changes should be clouded and identified by the letter "A" for "As-Built".

Initially, all recorded changes should be made in "red-line" on copies of issued for construction drawings retained on site. This is the responsibility of the Contractor as required by the Contract. The PE will also be responsible for producing sufficient information about the As-Built conditions necessary to validate the accuracy of the Contractor's submittal at the end of the project. At the completion and prior to final acceptance of the constructed work, all of the "red-line" changes should be noted on the base drawings by the Contractor and verified by the PE.

As-Built utility drawings should show the locations of existing utilities, structures, trees, streets, and existing highway right-of-way limits. The same information should be obtained from each utility owner performing its own construction. Such information should be shown on the final project As-Built drawings.

7.3.13 Final Acceptance

Final acceptance of a construction project indicates that all elements within the scope of the constructed work have been completed to Contract requirements, including resolution of any non-conformances and audit comments. The PE will provide documentation that all such comments have been resolved and incorporated. At a minimum, the formal project deliverables submittal includes:

- As-Built construction plans
- Project Daily Diary and DIRs
- Materials Testing reports
- Materials Certification
- Survey Records
- Project Progress digital pictures and video
- Project Correspondence records
- Project Meeting Minutes
- Monthly Report records, including approvals of Contractor's Monthly Pay Applications
- Final Acceptance Punch Lists, signed-off as completed
- A Release of Claims letter from the Contractor and any subcontractors the Contractor may have employed, stating that payment has been made in full and that no outstanding claims remain in effect

7.4 Consultants

7.4.1 Consultant Process

The PE should inspect all work and materials of the Consultants to verify that their work product conforms to specified Contract requirements and follows this CQMP. The DPW evaluates and selects consultants based on their ability to supply products in accordance with the specific project requirements. The criteria for selection, evaluation, and re-evaluation are:

- Ability to provide the amount of qualified manpower to complete the required tasks on time
- Meet all state and local laws
- Record of completing projects on time and within budget
- Quality of previous project work completed, including references from past project owners
- Ability to start when required

Records of evaluations and any necessary actions arising from the evaluation will be maintained by DPW.

7.4.2 Consultant Information

Consultant contract information should include the following:

- Parties to the Contract
- Contract start and end dates
- Scope of work, including deliverables and requirements for approval of products, procedures, processes, and equipment
- Definition of consultant's responsibilities
- Requirements for qualification of personnel
- Payment due dates
- Terms and conditions relating to premature Contract termination
- Terms and conditions relative to undue delays
- Means to resolve claims and disputes
- Indemnification terms and conditions
- Insurance requirements
- Quality management system requirements
- Provisions for Contract changes
- Compensation

7.4.3 Verification of Consultant Work

DPW is responsible for the complete review of its Consultants' Contracts. Consultants should adhere to all applicable aspects of the CMIS Manual and its appendices relating to their work. They should acknowledge, by their execution of the subcontract, that they have received, reviewed, and will comply with the quality programs. Each of their submittals, as well as the QC process at their office, is subject to quality audits by the DPW to verify compliance with the CQMP.

7.5 Production and Service Provisions

7.5.1 Control of Production and Service Provisions

The PE is responsible for planning and carrying out its construction management services under controlled conditions identified in the CMIS. The PE will perform internal audits of the project team and consultants to verify compliance with the requirements for controlling production. Controlled conditions include:

- Availability of information that describes the characteristics of the work. Contract documents, design drawings, specifications, and shop drawings are forms of information that describe characteristics of the work.

- Availability of work instructions, as necessary. Work instructions must be provided to the individuals performing the operation. Survey and materials sampling and testing directives and directions given at meetings are examples.

- Use of suitable equipment. Tools and equipment selected to monitor and test the construction materials and constructed work should be appropriate for the job.

Equipment maintenance activities should keep the equipment in satisfactory condition.

- Availability and use of monitoring and measuring devices. For construction monitoring, subconsultants providing special construction support services should use monitoring and measuring devices that must be kept in good and accurate working condition.
- Consultants must control the use of devices required for the implementation of monitoring and measurement.

7.5.2 Validation of Processes for Production and Service Provisions

The PE is responsible for validating any processes for production and service provisions where the resulting output cannot be verified by subsequent monitoring or measurement. This includes any processes where deficiencies become apparent only after the project element has been commissioned and in use, or the service has been delivered. Validation should demonstrate the ability of these processes to achieve planned results. The PE will establish arrangements for these processes including, as applicable:

- Defined criteria for review and approval of the processes
- Approval of equipment and qualification of personnel
- Use of specific methods and procedures
- Requirements for records
- Re-validation

7.5.3 Identification and Traceability

The PE is responsible for providing a documented system for the identification of deliverable items, including, but not limited to, inspection, monitoring, and testing of delivered materials and constructed work by suitable means that permit traceability.

Records of approved, delivered materials and work products are maintained and include the name of the supplier; the delivery and identification documents title; the unique number (where applicable); and the date of delivery or construction date.

The PE monitors the Contractor's system for identifying, numbering, and storing all of the delivered materials. All materials delivered to the work site will be accompanied by delivery documentation and materials testing certificates that are clearly identified to the material delivered. Copies of these documents will be submitted to the PE so that the delivered materials can be identified and traced.

All delivered materials will be inspected for Contract conformance and their condition after delivery. Any materials found to be in non-compliance with the Contract or that have been damaged during transit will be clearly identified and quarantined separately from approved material. The rejected material will remain in quarantine until it is either removed from the site, or repaired, re-inspected, and approved for construction use.

All construction materials delivered to the site should be stored as required under best construction practices, or stored in accordance with the manufacturers' instructions. Any material that deteriorates prior to its intended use due to inadequate storage or protection methods should be identified and clearly marked as rejected for use.

7.5.4 Client Property

The PE is responsible for managing DPW-provided materials to the Contractor for use on the project. The PE identifies, verifies, protects, and instructs the Contractor to store and safeguard the property provided for use or incorporation into the project. The PE will report to DPW any property that is damaged or otherwise found to be unsuitable for use, with the associated records maintained as part of the project files.

7.5.5 Preservation of the Work

The PE is responsible for preserving the conformity of construction documents through Contract completion. As part of the Contract requirements, the Contractor should preserve, identify, handle, package, store, and protect all existing, delivered, and constructed work. Records that serve as evidence that quality is achieved in construction, such as materials certifications; inspection and testing reports; and survey records and audit reports; should be adequately identified, filed, indexed, and stored. Retention periods and the storage medium of such records should be established. Physical protection from damage or loss should be verified, and record storage should be maintained so that documents are retrievable in a timely manner.

7.6 Control of Monitoring and Measuring Devices

The PE is responsible for providing and maintaining monitoring and measurement equipment necessary to perform inspection and acceptance of the constructed work needed to provide evidence of conformity of the work to determined requirements. Generally, the PE relies on consultants such as laboratories, surveyors, and inspection service organizations to provide inspection/test services and equipment at manufacturing facilities and construction sites. Where necessary to validate test results, measuring equipment should be:

- Calibrated or verified at specified intervals, or prior to use, against measurement standards traceable to international or national measurement standards. Where no such standards exist, the basis used for calibration or verification should be recorded.
- Adjusted or re-adjusted as necessary
- Identified to enable the calibration status to be determined
- Safeguarded from adjustments that would invalidate the measurement result

- Protected from damage and deterioration during handling, maintenance, and storage

In addition, the PE will assess the validity of previously measured results when the equipment is found not to conform to requirements. The PE will take appropriate action to rectify the equipment and any affected work product. Records of the results of calibration and verification should be maintained by all subconsultants operating such equipment.

When used in the monitoring and measurement of specified requirements, the ability of computer software to satisfy the intended application should be confirmed. This will be undertaken prior to initial use and reconfirmed, as necessary. Records of software validation should be maintained for inspection.

8.0 Measurement, Analysis, and Improvement

8.1 General

The PE is responsible for planning and implementing the monitoring, auditing, witnessing, and testing analysis and improvement processes needed to:

- Demonstrate conformity of the work
- Provide for conformity with the CMIS and the construction contract
- Continually improve the effectiveness of the CQMP

8.2 Monitoring and Measurement

8.2.1 General

The PE will monitor the perception of team participants as to whether construction quality requirements are being achieved, and the construction management team is meeting its requirements. The PE should have regular meetings with Chief Engineer to review the status of the project and receive feedback on the performance of the Contractor and construction work.

8.2.2 Internal Audit

The PE should arrange for non-project-assigned personnel to conduct internal audits of the project performance at planned intervals to determine whether the construction management and inspection activities executed have been:

- Performed as planned, meeting the requirements of the CMIS Manual and the CQMP, and corresponding to the International Standards and quality management system established by DPW

- Effectively implemented, monitored, and maintained throughout the duration of the project

An audit program should be developed and planned by the PE taking into consideration the status and importance of the processes and areas to be audited, as well as the results of previous audits. The audit criteria, scope, frequency, and methods are defined. The unbiased selection of auditors and transparency of the audits performed provides for objectivity and impartiality of the audit process.

The responsibilities and requirements for planning and conducting audits, and for reporting results and maintaining records are defined in the construction quality procedures.

PE's responsible for the area being audited should verify that actions are taken without undue delay to eliminate detected non-conformances and their causes. Follow-up activities should include the verification of the actions taken and the reporting of verification results.

8.2.3 Monitoring and Measurement of Processes

The results of the internal and external audits and DPW's feedback are essential information that provides the PE with evidence to re-examine the process and take corrective and/or preventive action.

8.2.4 Monitoring and Measurement of the Work

The PE is responsible for reviewing, measuring, and providing evidence of conformity on the characteristics of the construction work to verify that requirements have been met as established in the CMIS Manual, the Contract specifications and drawings, and construction quality procedures. This should be carried out at appropriate stages of the work realization process, in accordance with the planned arrangements. Acceptance of the work and placement into service should not proceed until the planned arrangements have been satisfactorily completed and approved.

8.3 Control of Non-conforming Work

During the course of a construction management quality audit by the PE or an external review of constructed work, it may be determined that the work is not in accordance with the approved Contract requirements, or that the level of workmanship is not producing the required quality end–product. The PE will verify that products/services that do not conform to Contract requirements are identified and controlled to prevent their unintended use or delivery.

The responsibility for the review/recommendation of and the authority to approve the disposition of non-conforming materials or constructed work ultimately rests with the PE and Chief Engineer, respectively. Checking, review, and audit procedures allow for re-working of delivered materials and constructed work until they meet the specified requirements, if applicable.

Non-conforming conditions are identified and documented as quality records in the form of NCRs and/or Quality Audit Findings. The documented non-conformance record includes accounts of deliberations, re-testing (checking and reviewing), and resolution activities. The final determination may require the Contractor to take corrective and/or preventive actions, and may also require other administrative actions by DPW.

8.4 Analysis of Data

The PE should use a variety of statistical techniques to assess the performance of the Contractor including trend analysis, F&T distribution, tracking of issues and corresponding parameters, and whatever means that can provide insight to the quality performance of the project. In addition to being directly applicable to the current project, this information is valuable in evaluating the performance of the Contractors for selection on future construction projects for DPW.

Quality records such as audit reports, NCRs, and materials test results are used to identify quality trends. Through statistical techniques, the PE can identify and analyze:

- Quality process improvements, including corrective and preventive actions
- Critical non-conformances and/or audit findings
- Ineffective or lack of construction quality procedures
- DPW's acceptance criteria and satisfaction requirements

8.5 Improvement

8.5.1 Continual Improvement

DPW should continually pursue improvements to the effectiveness of the CQMP through emphasis of the quality policies and objectives in communicating and explaining these objectives with its employees, consultants, Contractors, and subcontractors. Audit records, analysis of data, corrective and preventive actions, and the results of both internal and external reviews serve as the basis for instituting reforms to improve the quality system.

8.5.2 Corrective Action

The PE is responsible for taking actions as may be necessary within the limits of its authority to eliminate the cause of non-conformances in order to prevent recurrence. In the construction process, inspection, sampling, testing, and audit procedures are essential means of monitoring, correcting, and/or preventing problems before construction projects are finalized.

While all construction–related non-conformances are re-worked to meet specified requirements, the existence and/or recurrence of such non-conformances does require the establishment of corrective or preventive actions to eliminate their root causes. This is formalized through the use of the Corrective and Preventive Action Process, in which the non-conformity is stated, the desired corrective action is specified, the root cause is identified, the action taken subsequently is recorded, and such action is verified.

8.5.3 Preventive Action

Preventive action procedures are established to eliminate the causes of potential non-conformances in order to prevent their recurrence.

Methods for preventive actions are integral to the construction process. The Pre-construction, Weekly Progress, and Pre-activity Meetings, and the test results review process are essential means of preventing problems before the constructed work is finalized. The inspection processes and inspection checklists are effective tools for preventing possible construction non-conformances. The procedures are similar to corrective action, except that a period of observation is allowed to evaluate the effectiveness of the preventive action taken, before the case is closed. The evaluation of the effectiveness of actions taken is the responsibility of the PE and subject to the assessment by and/or concurrence of DPW.

END OF SECTION

APPENDIX E

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APPENDIX E

CONSTRUCTION SAFETY MANAGEMENT PLAN (CSMP) GUIDE AND OUTLINE

1.0 Scope

This Construction Safety Management Plan (CSMP) guide and outline has been developed for the use of DPW construction management staff administering roadway construction projects. The CSMP identifies the roles and responsibilities of key positions, and establishes an outline for the planning, developing and managing a safety program.

2.0 Reference Documents

The following are health and safety reference documents and should be reviewed when developing a project-specific CSMP.

- ANSI Z-10
- 29 CFR 1910
- 29 CFR 1926

3.0 Terms and Definitions

For the purposes of this CSMP, the terms and definitions given in the CMIS Manual apply.

4.0 Safety Objectives and Goals

To meet health and safety objectives, all DPW personnel are expected to act proactively with regard to the prevention, identification, and resolution of health and safety issues as they relate to the performance of construction management and inspection on DPW construction projects. This requires the combined efforts of a concerned management, responsible and knowledgeable supervision, and conscientious, well-trained employees. DPW will take all reasonable action to meet or exceed the applicable health and safety requirements, and will continuously monitor and improve operations, procedures, technologies, and programs that promote a safe and healthy working environment.

The safety objectives and goals of DPW are as follows:

Objective	Goal
Respond to the needs of DPW staff by providing a safe and healthy work environment	*Maintain zero findings in audit reports, and achieve a zero safety incident rate*
Establish and maintain a personnel focus on safety	*Conduct training sessions on safety and continuously track performance* *All current DPW employees and new hires who are assigned to a project will be given an introduction to the CMIS Manual, the safety program, site protocols, and associated documents prior to starting work.*
Strive to continuously improve the work environment of the DPW staff	*Measure performance by monitoring both leading and trailing indicators* *Fully audit all safety document records, implement preventive and corrective actions, and monitor trends in safety awareness, near misses, and incidents*

Safety is achieved by detailed planning, coordination, supervision, and direction; proper definition of job requirements and procedures; identification of hazards; development of procedures and controls to either eliminate or reduce existing hazards; and the use of appropriately skilled personnel performing their work functions with care.

5.0 Construction Safety Management Plan (CSMP)

5.1 CSMP Outline

The PE is responsible for establishing and maintaining a project-specific CSMP. The CSMP needs to be specifically tailored for the type of construction being done and the risks associated with that construction. The CSMP should include the following elements:

- Responsibility and Identification of Staff
- Statement of Safety and Health Policy
- Identification of Competent/Qualified Persons
- Scope of Work Evaluation
- Hazard/ Risk/Exposure Assessment
- Control Measures and Activity Hazard Analysis
- Periodic Safety Inspections and Audits

- Review of Safety Incidents
- System for Corrective Actions and Lessons Learned
- System for Measurement and Reporting
- Training and Instruction
- Project Site Staff Orientation Program
- Staff Communication System
- Recordkeeping
- Accident and Exposure Investigation Procedure
- Emergency Action Plan
- Site Specific Medical Emergency Plan
- Contractors Safety Plan

5.2 Preconstruction Safety Activities and CSMP Development/Implementation

Preconstruction risk reviews and safety planning are elements that need to be completed prior to the start of construction management and inspection activities. The PE is responsible for conducting a preconstruction safety meeting with DPW project assigned staff to identify potential safety risks that the construction management and inspection staff may be exposed to. The preconstruction safety meeting will develop a list of activities that the staff will be exposed to and develop a Hazard/Risk/Exposure Assessment that are associated with the scope of work of the construction project. A non-inclusive list of work activities and associated Hazard/Risk/Exposures that may be incorporated into the CSMP is shown in Section 5.2.1. This list should be thoroughly reviewed and additional Hazard/Risk/Exposures added as may be necessary for the specific operations that will be involved in the construction project.

5.2.1 Work Operation – Hazard/Risk/Exposure Assessment

- Traffic Control
    - Heavy Equipment Hazards
    - Climate / Temperatures / Lighting
    - Tripping Hazard
    - Noise
    - Live Traffic Hazard
    - Night Work
    - Overhead Loads

- Housekeeping & Stored Materials
    - Materials of all Shapes and Sizes
    - Climate / Temperatures
    - Lighting (Materials Not Visible)
    - Buried Materials (Water, Mud)

  - Flammable, Combustible or Hazardous Materials Not Labeled (MSDS Sheets not Posted)
  - Required Safety Notices Not Posted
  - Wind Blowing Materials Around

- Sediment and Erosion Control
  - Dust
  - Heavy Equipment Hazards
  - Climate / Temperatures / Lighting
  - Tripping Hazard
  - Noise
  - Live Traffic Hazard
  - Slopes
  - Vehicles Operating on Wet Ground (Slopes)
  - Wild Animals
  - Falls
  - Nose

- Demolition Work
  - Grinding and Grit Blasting of Concrete Surfaces
  - Heavy Equipment Hazards
  - Falls
  - Climate / Temperatures / Lighting
  - Tripping Hazard
  - Live Traffic Hazard
  - Noise
  - High Pressure Equipment (Compressed Air, Waterblast)
  - Airborne Concrete Materials (Chipping Guns, Waterblast, Sandblast)

- Crane Placement
  - Heavy Equipment Hazards
  - High Voltage Lines
  - Falls
  - Climate / Temperatures / Lighting
  - Tripping Hazard
  - Overhead Loads
  - Live Traffic Hazard
  - Noise
  - Falling Objects
  - Crushing
  - Swinging Loads
  - Tripping (Uneven Terrain, Slopes

- Drainage and Utility Installation
  - Heavy Equipment Hazards
  - Climate / Temperature / Lighting
  - Tripping Hazard
  - Noise
  - Electrical Burns / Electrocution (Buried Existing Utilities)

  - Slopes or Trenches
  - Falling Objects
  - Overhead Loads
  - Live Traffic Hazard

- Electrical Systems and Lighting
  - Heavy Equipment Hazards
  - Climate / Temperature / Lighting
  - Tripping Hazard
  - Noise
  - Electrical Burns / Electrocution
  - Live Traffic hazard

- Asphalt Pavement Placement
  - Heavy Equipment Hazards
  - Climate / Temperature / Lighting
  - Tripping Hazard
  - Noise
  - Burns
  - Live Traffic Hazard

- Portland Cement Concrete Pavement Placement
  - Heavy Equipment Hazard
  - Climate / Temperatures / Lighting
  - Tripping Hazard
  - Noise
  - Live Traffic Hazard
  - Chemical Burns (Cement is Alkaline)
  - Overhead Loads

- Form Traveler
  - Heavy Equipment Hazard
  - Traveler Movements and Securing
  - Climate / Temperatures / Lighting
  - Noise
  - Falls
  - Tripping Hazard
  - Overhead Loads

- Formwork
  - Heavy Equipment Hazards
  - Falls
  - Climate / Temperature / Lighting
  - Tripping Hazard
  - Noise

- Concrete Placement and Repairs
  - Heavy Equipment Hazard
  - Falls

- Climate / Temperature / Lighting
- Tripping Hazard
- Overhead Loads
- Chemical Burns (Cement is Alkaline)
- Dust From Patching Materials
- Use of Epoxy Bonding Materials
- Surface Preparation (Sandblast, Waterblast, Compressed Air)
- Burns and Fumes from Construction Equipment
- Noise

- Reinforcing Steel Placement
  - Heavy Equipment Hazard
  - Material Handling
  - Walking on
  - Falls (impalement)
  - Cut and Scratches
  - Exposure to Back Injuries
  - Climate / Temperature / Lighting
  - Unsafe Access / Slipping & Tripping Hazard
  - Overhead Loads
  - Noise

- Operating Testing Equipment (Field)
  - Heavy Equipment Hazards
  - Climate / Temperature / Lighting
  - Live Traffic Hazard
  - Night Work
  - Noise
  - Tripping Hazard
  - Falls
  - Chemical Burns (Concrete, Grout)
  - Dust
  - Exposure to Back Injuries (Heavy Lifting)
  - Slopes and Terrain

- Batch Plant Inspection
  - Heavy Equipment Hazards
  - Climate / Temperature / Lighting
  - Live Traffic Hazard
  - Noise
  - Chemical Burns
  - Use of Ice and Liquid Nitrogen
  - Duct
  - Falls (Uneven Terrain Outside)
  - Exposure to Back Injuries)
  - Night Work

- Drill Shaft Inspection
  - Heavy Equipment Hazards

  - Falls
  - Climate / Temperature / Lighting
  - Tripping Hazard
  - Overhead Loads
  - Noise
  - Chemical Burns (Cement is Alkaline)

- Photography of Project Work
  - Heavy Equipment Hazards
  - Falls
  - Climate / Temperatures / Lighting
  - Tripping Hazards
  - Overhead Loads
  - Noise
  - Live Traffic Hazards

- Vehicle Operation
  - Live Traffic Hazards
  - Roadway Hazards
  - Mobile Phone Operation (Distracts Attention, Static Electricity)
  - Mechanical or Equipment Failure (Vehicle Maintenance and Tires)
  - Fire Hazard
  - Switchbacks
  - Physical Traffic Barriers
  - Slopes
  - Night Work
  - Adverse Weather
  - Risk of Accident
  - Slopes and Terrain

5.2.2 Control Measures and Activity Hazard Analysis

In performing Construction Management and Inspection on construction projects DPW does not perform any of the construction work activities but monitors the constructed work for compliance with the contract documents. The best way to control risk and exposure to hazards involved in the work is to be aware of your surroundings at all times and to remain a safe distance from the work. The following control measures are standard requirements to be used at all times when performing construction management and inspection activities and shall be incorporated into every project-specific CSMP.

The following shall be worn at all times when on the contraction site:

- Hard Hat
- Reflective Safety Vests
- Eye Protection
- Ear Protection

- Long Pants and Shirts
- Sturdy Steel Toe Shoes

In addition, control measures for specific hazards will be developed and incorporated into the CSMP. A non-inclusive list of control measures follows. These should be reviewed for appropriateness for the specific construction project and modified as necessary. This list should be thoroughly reviewed and additional Control Measures added as may be necessary for the specific operations that will be involved in the construction project.

- Working on Construction Sites
    - Wear Personal Protective Equipment (PPE) at all times
    - Follow the implemented on-site safety plans
    - Keep away from flammable, combustible or hazardous materials
    - Be aware of your surroundings
    - Keep a safe clear distance from heavy equipment
    - Keep clear of areas where overhead work is in progress
    - Do not enter areas that are marked as "No Entry Zones" or "Do Not Enter"
    - Be aware of the weather forecast. Move to a safe location before severe weather arrives
    - Wear proper clothing for the weather forecast. Use sunscreen as skin protection
    - During nighttime work, remain in the lighted work zone. If you must leave the lighted work zone, carry a lit flashlight for visibility

- Heavy Equipment Hazards
    - Personal Protective Equipment (hard hat, safety vest, safety glasses with side shields, proper clothing, proper work boots or shoes, hearing protection)
    - Be aware of your surroundings
    - Keep clear of all heavy equipment and swing radii of cranes, excavators, drill rigs, etc
    - Avoid blind spots / areas of equipment operators
    - Make sure all backup alarms are functional and operating
    - Communication system

- Falls
    - Safety harness with proper lanyards
    - Utilize climber protective system
    - Personal Protective Equipment (Hard hat, safety vest, safety glasses with side shields, proper clothing, proper work boots or shoes, hearing protection)
    - When possible keep clear of edge of structure, trench, embankment, etc.

- Working at Heights
    - Wear a safety harness with 2 lanyards for 100% tie-off at all times in areas that require fall protection
    - Be sure a manlift has a qualified operator before use
    - Be sure ladders are secure before use
    - Hold a railing while climbing stairs
    - Communication System (Cell Phones)

- Climate / Temperatures / Lightning
    - Personal Protective Equipment (hard hat, safety vest, safety glasses with side shields, proper clothing, proper work boots or shoes, hearing protection)
    - Drink plenty of fluids to avoid dehydration / heat stroke
    - Have adverse Weather Plan
    - Communication system (Cell Phones)

- Noise
    - Hearing protection
    - Personal Protective Equipment (hard hat, safety vest, safety glasses with side shields, proper clothing, proper work boots or shoes).

- Live Traffic Hazard
    - Reflective safety vest
    - Personal Protective Equipment (hard hat, safety glasses with side shields, proper clothing, proper work boots or shoes)
    - Work in designated areas only
    - Lighting as needed

- Roadway Hazards On-Site
    - Wear a seat belt at all times
    - Drive defensively
    - Do not drive above designated speed limit
    - Observe traffic signs placed on-site by Contractor
    - Do not use mobile phones during driving (pull over, park vehicle and then use)
    - Drive slowly on wet roads, especially going down steep slopes
    - Observe traffic patterns of heavy constructionequipment before proceeding
    - Do not drive or park near heavy equipment such as loaders, backhoes, cranes, etc.

- Tripping Hazards
    - Personal Protective Equipment (hard hat, safety Glasses with side shields, proper clothing, proper work boots or shoes)
    - Watch your step in all areas of job

- Night Work
    - Lighted work area
    - Reflective safety vest

- Personal Protective Equipment (hard hat, safety glasses with side shields, proper clothing, proper work boots or shoes)

- Welding / Torch Cutting
  - Personal Protective Equipment (hard hat, safety glasses with side shields, proper clothing, proper work boots or shoes)
  - Wear correct eye shield, or do not stare directly at welding or torch cutting
  - Stand back away from welding, torch cutting, grinding and gouging operations
  - Do not touch any metal being welded, flame cut, gouged or grinded until cooled sufficiently
  - Stand back in a ventilated area
  - Clean housekeeping rules in effect
  - Make sure that a First Aid Kit is in your Vehicle for Emergencies

- Overhead Loads
  - Personal Protective Equipment (hard hat, safety glasses with side shields, proper clothing, proper work boots or shoes)
  - Do not stand under any load when possible

- Chemical Burns (Concrete / Grout)
  - Personal Protective Equipment (hard hat, safety glasses with side shields, proper clothing, proper work boots or shoes, Tyvek suites when required)
  - No direct contact with concrete or grout
  - Make sure that a First Aid Kit is in your Vehicle for Emergencies

- Burns
  - Personal Protective Equipment (hard hat, safety glasses with side shields, proper clothing, proper work boots or shoes)
  - Make sure that a First Aid Kit is in your Vehicle for Emergencies

- Electrocution
  - Personal Protective Equipment (hard hat, safety glasses with side shields, proper clothing, proper work boots or shoes)
  - Do not perform inspections of live circuits
  - Do not handle electrical power cords

- Falling Objects
  - Personal Protective Equipment (hard hat, safety glasses with side shields, proper clothing, proper work boots or shoes)
  - Do not stand under live loads

- Mechanical or Equipment Failure for Vehicles
  - Maintain proper maintenance of vehicles
  - Keep safety equipment in vehicles (fire extinguisher, first aid kit)
  - Follow DPW Policy

- Fire Hazard
  - Fire extinguisher
  - Be aware of damaged or frayed electrical power cords or cords in or around water / rain
  - Personal Protective Equipment (hard hat, safety glasses with side shields, proper clothing, proper work boots or shoes)

- Survey
  - Ensure formwork is safe prior to survey (safety rails or fall protection are in place)

- Concrete Placement
  - Remain at a safe distance out of range of concrete spatter
  - Do not step into wet concrete
  - Remain clear of finishing operations such as bull floating and broom finishing
  - Remain clear of mixer during mixing operations of concrete repairs and patches
  - Do not handle the concrete repair / patch materials or the epoxy bonding agent

- Reinforcing Steel Placement
  - Be sure that reinforcing steel is securely tied prior to walking onto
  - Take care when walking on reinforcing steel

- Mobile Phone Operation
  - Follow DPW Policy
  - Do not use mobile phone while driving
  - Do not use mobile phone while refueling a vehicle

5.2.3 Periodic Safety Inspections and Audits

Every CSMP shall have provisions for periodic safety inspection and audits to evaluate the on-going work hazards. These shall be performed by the PE and other competent persons identified in the CSMP. The CSMP shall also identify a schedule for these safety inspections and audits. The following is a minimum recommended schedule for safety inspections and audits. This schedule should be thoroughly reviewed and additional inspections and audits added as necessary for the specific operations that will be involved in the construction project.

- When the project-specific CSMP is initially established
- Monthly and as construction conditions change

- When new substances, processes, procedures or equipment which present a potential hazard are introduced into the workplace
- When new or previously unidentified hazards are recognized
- When occupational injuries or illness occur
- When a new staff member or reassigned staff member is placed on the project for which a hazard evaluation has not been previously conducted
- Whenever workplace conditions warrant and inspection and assessment

These inspections and audits shall consist of evaluation and identification of hazards. If the inspection and audits discover safety or health issues these issue will be recorded and appropriate action shall be taken to correct and mitigate the health or safety issue. Records of the inspection and audit shall be prepared and reviewed with the DPW Chief Engineer.

5.2.4 Review of Safety Incidents

The CSMP shall contain provisions for the PE and other competent person identified in the CSMP to review all safety incidents that involve DPW staff, the contractor's staff or the public. The PE shall be responsible for creating a report describing the incident, its location and time and other relevant issues about the incident. The PE will obtain photographic information of the incident and interview persons that were involved with or observed the incident. The PE will include this information in the incident report along with police reports if applicable. The report shall also contain corrective actions that were implemented by DPW or others to mitigate the reoccurrence of the incident. The report shall also contain a Lessons Learned from the incident to be shared with DPW project staff and the DPW Chief Engineer at a follow up safety incident meeting.

5.2.5 Training and Instruction

The CSMP shall contain provisions for training and instruction of DPW project staff on the CSMP and safety and health issues that might be encountered while working on the construction project. The training and instruction shall include, at a minimum, the following elements:

- Training and instruction with the DPW project staff when the project-specific CSMP is first established
- To all new project staff before they physically begin work on the project
- To all project staff given new job assignments for which training has not been previously provided
- Whenever new substances, processes, procedures or equipments are introduced to the work place and represent an new hazard

- Whenever DPW or the PE is made aware of new or previously unrecognized hazards
- To other supervisors to familiarize them with the safety and health hazards to which non-project staff under their immediate direction and direction may be exposed
- To all project staff with respect to hazards specific to each staff members job assignment
- The training and instruction shall also include the provisions of the project-specific CSMP, emergency action plan, fire prevention plan and measures for reporting any safety incident, unsafe condition or work practice
- The use of appropriate clothing, including gloves, footwear, and personal protective equipment (PPE)
- Information on chemical hazards to which project staff could be exposed to and other hazard communication program information
- Availability of toilet, hand-washing, and drinking water facilities
- Provisions for medical services and first aid including emergency procedures

5.2.6 Project Site Staff Orientation Program

The CSMP shall contain provisions to orient the DPW project staff on the CSMP, the project site and the construction work that will be involved. The orientation shall be developed specifically for the project that the DPW staff will be working on and shall be conducted by the PE. The following are recommended project site staff orientation subjects that should be included in the project-specific CSMP. This should be thoroughly reviewed and additional orientation subjects added as necessary for the specific operations that will be involved in the construction project.

- DPW safety requirements
- DPW Code of Safe Practices
- Road and highway safety practices
- Traffic control safety practices
- Good housekeeping, fire prevention, safe practices for working around construction equipment
- Safe access to work areas
- Protection from falls
- Electrical hazards, including working around high voltage lines
- Crane operations
- Trenching and excavation areas
- Moving belts and pulleys, gears and sprockets, and conveyor nip points
- Machine, machine parts and prime movers guarding
- Materials handling

- Unsafe weather conditions
- Yarding operations, including skidding, running lines, rigging and communication
- Landing and loading areas, including release of rigging, landing layout, moving vehicles and equipment, truck locations, loading and shipping
- Fall protection from elevated locations
- Use of elevated platforms, including condors and scissor lifts
- Driver safety
- Traffic safety
- Slips, falls and back injuries
- Ergonomic hazards, including proper lifting techniques and working on ladders or in a stooped posture for a prolong period of time
- Personal protective equipment
- Hazardous chemical exposures
- Hazard communication
- Physical hazards, such as heat stress, noise, and ionizing and non-ionizing radiation
- Bloodborne pathogens and other biological hazards

5.2.7 Staff Communication System

DPW recognizes that open, two-way communications between management and staff on health and safety issues is essential to an injury-free, productive work place. The project-specific CSMP shall contain a system of communication that is designed to facilitate a continuous flow of safety and health information between DPW management and the project staff in a form that is readily understandable and consists of one or more of the following items.

- New worker orientation including a discussion of safety and health policies and procedures.
- Review of the project-specific CMSP
- Workplace safety and health training programs
- Regular weekly and daily safety meetings
- Effective communication of safety and health concerns between staff and supervisors, including translation where appropriate
- Posted or distributed safety information
- A system for workers to anonymously inform DPW management about workplace hazards.

- A labor/management safety and health committee that meets regularly, prepares written records of the safety and health committees meetings, reviews results of the periodic scheduled inspections, reviews investigations of accidents and exposures and makes suggestions to management for the prevention of future incidents, reviews investigations of alleged hazardous conditions, and submits recommendations to assist in the evaluation of employee safety suggestion

5.2.8 Recordkeeping

The PE shall be responsible for documentation and record keeping. The PE shall document health and safety related issues involved with construction management and inspection. The CSMP shall contain the following steps to document the implementation of the project-specific CSMP.

- Records of hazard assessment inspections, including the persons conducting the inspection, the unsafe conditions and work practices that have been identified and the action taken to correct the identified unsafe conditions and work practices, are recorded on a hazard assessment and correction report
- Documentation of safety and health training for each staff member, including the staff member's name or other identifier, training dates, types of training, and training provided
- Other records are retained as required by local or federal(OSHA regulations. Where regulations do not specify the length of records retention, a period of three years after project completion will be used.

5.2.9 Accident and Exposure Investigation Procedure

The PE and other competent person identified in the CSMP are responsible for the investigation and reporting of accident and safety/hazardous related exposures. The CSMP shall contain procedures for conducting these investigations. These procedures shall include the following:

- Responding to the accident scene as soon as possible
- Reporting immediately to the appropriate DPW point-of-contact
- Interviewing injured workers and witnesses
- Examining the workplace for factors associated with the accident/exposure

- Determining the probable cause of the accident/exposure
- Taking corrective action to prevent the accident/exposure from reoccurring
- Recording the findings and corrective actions taken

5.2.10 Emergency Action Plan

The PE and other competent person identified in the CSMP are responsible for developing an site-specific emergency action plan to be included in the project-specific CSMP. The emergency action plan shall contain at a minimum the following information:

- The names and contact numbers of the DPW project staff
- In the event of an emergency how all of the DPW staff members will be contacted
- The designation of a predetermined rally point where all DPW staff members shall report in the event of an emergency
- A reporting structure to delineate how all DPW staff members will be accounted for

5.2.11 Site Specific Medical Emergency Plan

The PE and other competent person identified in the CSMP are responsible for developing an site-specific medical emergency plan to be included in the project-specific CSMP. The medical emergency plan shall contain at a minimum the following information:

- A statement that a DPW staff member must remain present until Emergency Medical Teams arrive
- Contact number for Emergency Medical Services
- Contact number for fire department
- Contact number for police department
- A map of the project site with the shortest route to emergency medical services

5.2.12 Contractor's Safety Plan

The project-specific CSMP shall also include the Contractors safety plan as an appendix to the CSMP.

6.0 Additional Meetings with discussions on Safety

The PE shall take every opportunity at meetings to discuss and plan for health and safety related issues. Some examples of project meetings which should include safety as part of the agenda are:

Pre-Construction Conference Safety Content

A Pre-construction conference will be held at the commencement of the project among the construction management staff; the Contractor; subcontractors performing the work; suppliers; utilities agencies affected by project construction; and any other interested parties. The PRECON will be chaired by the PE and will include a discussion of safety requirements, responsibilities, and performance during construction. Particular safety issues will include:

- The contractors Project Safety Plan (PSP)
- Responsibility for safety performance and reporting
- Schedule for site safety assessments
- Time and place for weekly safety meetings
- Near miss and incident reporting procedures
- Project safety non-conformances and how they will be resolved

Weekly Progress Meetings

Weekly construction progress meetings will be held between the PE and the Contractor. Other DPW representatives and utilities agencies' representatives may also be invited to attend. The Agenda for the weekly progress meetings will include a discussion on safety related issues. This discussion will vary depending on the particular type of construction project and the current and future work activity that the contractor will be performing. Items that may be discussed could include the following:

- Traffic Control
  - Is the existing traffic control adequate
  - Do modification need to be made
- Contractors work operations
  - What safety concerns should be reviewed and discussed for the current operations
- 2-Week Look Ahead Schedule
  - What will the contractor be doing in the next 2 weeks
  - What are the safety issues related to this work activity

- Future traffic control concerns
  - What future traffic control is planned
  - Has the contractor submitted a plan to the PE for review
- Changes in construction activities, risk identification and proposed mitigation plans
- Activity Hazard Analysis
- New and unresolved issues
  - Near misses
  - Safety incidents
  - Investigations
  - Resolution of non-conformance safety incidents

Pre-Activity Meetings

Prior to the commencement of any construction activity to be performed on the project for the first time, the Contractor should conduct a Pre-Activity Meeting to provide a "paper walk-through" of the construction activity. The PE, Contractor, subcontractor, and any concerned utilities agencies should attend the meeting. While the meeting will discuss the construction activity that will be taking place, the meeting will also contain a discussion on health and safety related issues and concerns. While each activity will be different the Pre-Activity meeting should address the following at a minimum:

- Traffic Control
  - How is the contractor planning on handling traffic for this work operation
  - Has the Traffic control plan been reviewed
- Equipment
  - What kind of equipment will be used for this activity
  - What safety issues are associate with this kind of equipment
- Construction materials
  - What material will be used
  - What are the healthy and safety issues related to these materials
- Inspection of work activity
  - What inspections will be required
  - Will the inspections be in close proximity to construction equipment
- Notification of change in the activity
  - The procedure for notification if the proposed activity is changed

END OF SECTION