Colorado Department of Transportation

Standard Specifications

for

Road And Bridge Construction

No. _____

PREFACE

These standard specifications are to be used on contract work awarded by the Colorado Department of Transportation (CDOT). They may be supplemented or modified to suit specific contracts.

These specifications are expressed in United States Standard Measure (English units). The international System of Units (SI, Modernized Metric) is used only where standardized testing requires metric units. For clarity, aggregate sieve sizes appear in both SI and English Units. The dimensions, measurements, and requirements stated in English units are the specification requirements. All Contractor submittals shall be prepared in English Units. Pay item quantities will be measured in English units.

Unless otherwise identified, forms herein referred to (e.g. Form 605) are CDOT forms. Forms from other organizations or agencies are clearly identified (e.g. FHWA Form 1273).

Use of these specifications by any other organization or individual will be at the user's risk. Organizations or individuals citing these specifications by reference in their contract work will be responsible for furnishing prospective bidders copies of the specifications along with any addenda that may affect their contract.

Copies of this book may be obtained from the Colorado Department of Transportation, Office of Bid Plans, 4201 E. Arkansas Avenue, Denver, CO 80222.

Addenda to these specifications may be issued by the Department to suit its needs. Addenda may be accessed on the CDOT web site and will be available for purchase at prices established by the Department.

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SECTION 101
DEFINITIONS AND TERMS

Titles used in these specifications having a masculine gender, such as "workmen" and the pronouns "he" or "his", are for the sake of brevity and are intended to refer to persons of either sex.

The titles or headings of the sections and subsections herein are intended for convenience of reference and shall not have any bearing on their interpretation.

When the Contract indicates that work is to be "accepted, acceptable, subject to approval, approved, authorized, condemned, considered necessary, contemplated, deemed necessary, designated, determined, directed, disapproved, established, given, indicated, deemed insufficient, subject to interpretation, interpreted, ordered, permitted, rejected, required, reserved, satisfactory, specified, sufficient, suitable, suspended, unacceptable, or unsatisfactory," it shall be understood that these expressions are followed by the words "By the Engineer," or "To the Engineer."

When the Contract indicates that something "shall" be done, the action is required and is not discretionary.

Wherever the following abbreviations or terms are used in these specifications, plans, or other contract documents, the intent and meaning shall be interpreted as follows:

101.01 Abbreviations.

AAN	American Association of Nurserymen
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGC	Associated General Contractors of America
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute, Inc.
ARA	American Railway Association
AREA	American Railway Engineering Association
ARTBA	American Road and Transportation Builders Association
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials

ATSSA	American Traffic Safety Services Association
AWG	American Wire Gauge
AWPA	American Wood Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CCA	Colorado Contractors Association
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CP	Colorado Procedure
CP-L	Colorado Procedure - Laboratory
CRS	Colorado Revised Statutes, 1973, as amended
CRSI	Concrete Reinforcing Steel Institute
EIA	Electronic Industries Association
FHWA	Federal Highway Administration
FSS	Federal Specifications and Standards,
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IMSA	International Municipal Signal Association
IPCEA	Insulated Power Cable Engineers Association
ITE	Institute of Transportation Engineers
MIL	Military Specifications
MUTCD	Manual on Uniform Traffic Control Devices
NCHRP	National Cooperative Highway Research Program
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NIST	National Institute of Standards and Technology
NSF	National Sanitation Foundation (nSf)
OSHA	Occupational Health and Safety Administration
PCI	Prestressed Concrete Institute
ROW	Right of Way
SAE	Society of Automotive Engineers
UL	Underwriters Laboratories, Inc.

101.02 Advertisement. A public announcement, inviting proposals for work to be performed or materials to be furnished.

101.03 Affected Area. As related to mined land reclamation, the total disturbed surface of a pit or quarry such as sand, gravel, topsoil, or borrow, that is being mined or will be mined. The area includes, but is not limited to, the excavation area, plant, and stockpile areas, parking and storage areas, and the haul roads.

101.04 Award. The acceptance by the Department of a proposal.

101.05 Basis of Payment. The terms under which "work" is paid, as a designated "Pay Item" in accordance with the quantity measured and the "Pay Unit."

101.06 Bidder. An individual, firm, corporation, or other legal entity submitting a proposal for the advertised work. A contractor intending to contract with the Department for performance of prescribed work.

101.07 Bridge. A structure, including supports, erected over a depression or an obstruction, such as water, highway, or railroad, and having a track or passageway for carrying traffic or other moving loads and having a length measured along the center of roadway of more than 20 feet between undercopings of abutments or extreme ends of openings for multiple boxes.

Length. The length of a bridge structure is the over-all length measured along the line of survey stationing back to back of backwalls of abutments, if present, otherwise, end to end of the bridge floor; but in no case less than the total clear opening of the structure.

Roadway Width. The clear width measured at right angles to the longitudinal centerline of the bridge between the bottom of curbs or guard timbers or in the case of multiple height of curbs, between the bottoms of the lower risers.

101.08 Calendar Day. Each and every day shown on the calendar, beginning and ending at midnight. When day is used, it shall mean calendar day unless otherwise defined.

101.09 CDOT Resident Engineer. The Resident Engineer is directly responsible for the overall administration of assigned construction projects. Unless the CDOT Project Engineer is a Professional Engineer, the Resident Engineer is CDOT's full time engineer in responsible charge of the project. The Resident Engineer will delegate authority to Project Engineers consistent with their experience and abilities. Only a CDOT Resident Engineer can approve and sign vouchers for interim and final Contractor pay estimates. Only a CDOT Resident Engineer can authorize and sign changes to the Contract if the Project Engineer is a Consultant Employee.

101.10 Certificate of Compliance. A certification, including a signature by a person having legal authority to act for the manufacturer, stating that the product or assembly to be incorporated into the project was fabricated in accordance with and meets the applicable specifications.

101.11 Certified Invoice. Any invoice or billing endorsed by the Contractor, certifying that material, specialty work, subcontract work, rental, lease, services, etc. were acquired for the project and that the invoiced or billed amount represents the actual costs.

101.12 Certified Test Report. A test report from the manufacturer or an independent testing laboratory, including a signature by a person having legal authority to act for the manufacturer or the independent testing laboratory stating that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

101.13 Conformity. Compliance with reasonable and customary manufacturing and construction tolerances where working tolerances are not specified. Where working tolerances are specified, conformity means compliance with such working tolerances.

101.14 Construction Drawings. A complete set of plans, reviewed shop drawings, working drawings, and other submittals kept available on the project site at all times by the Contractor.

101.15 Construction Requirements. Specifications covering performance of work required for proper completion and acceptance.

101.16 Contract. The written agreement between the State of Colorado through the Department of Transportation and the Contractor setting forth the obligations of the parties for the performance of the work and the basis of payment.

The Contract includes the invitation for bids, proposal, contract bonds, standard specifications, supplemental specifications, special provisions, general and detailed plans, notice to proceed, contract modification orders, and authorized extensions of time, all of which constitute one instrument.

101.17 Contract Item (Pay Item). A specifically described unit of work for which a price is provided in the Contract.

101.18 Contract Modification Order. A written order issued to the Contractor by the Department covering contingencies, extra work, increases or decreases in contract quantities, and additions or alterations to the plans or specifications, within the scope of the Contract, and establishing the basis of payment and time adjustments for the work affected by the changes. The Contract Modification Order is the only method authorized for changing the Contract. Contract Modification Orders must be approved as established in subsection 105.13.

101.19 Contract Payment Bond. The security executed by the Contractor and Surety or Sureties and furnished to the Department to guarantee payment of all legal debts of the Contractor pertaining to the Construction of the project.

101.20 Contract Performance Bond. The security executed by the Contractor and Surety or Sureties and furnished to the Department to guarantee completion of the work in accordance with the Contract.

101.21 Contract Time. The number of working days or calendar days allowed for completion of the Contract, including authorized time extensions. Where a calendar date of completion is specified, the Contract shall be completed on or before that date.

101.22 Contractor. The individual, firm, or corporation contracting with the State of Colorado through the Department of Transportation for performance of prescribed work.

101.23 Contractor's Engineer. A professional engineer registered in the State of Colorado who is an employee of either the Contractor, a consulting engineer under contract to the Contractor, or a manufacturer or supplier of materials supplied to the project.

101.24 County. The county in which the work is to be done.

101.25 Culvert. Any structure not classified as a bridge which provides an opening under the roadway.

101.26 Day. See subsection 101.08

101.27 Department. State Department of Transportation. A department within the executive branch of the State of Colorado.

101.28 Engineer. The Chief Engineer of the Department acting directly or through an authorized representative, who is responsible for engineering and administrative supervision of the project.

101.29 Equipment. All machinery, tools, and apparatus together with supplies for upkeep and maintenance, necessary for the proper construction and acceptable completion of the work.

101.30 Extra Work. Work not provided for in the Contract as awarded but found by the Engineer to be essential to the satisfactory completion of the Contract within its intended scope.

101.31 Force Account Work. Work paid for on the basis of actual costs plus approved additives. See subsection 109.04.

101.32 Highway. A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way.

101.33 Holidays. Holidays recognized by the State of Colorado are:

New Year's Day
Dr. Martin Luther King, Jr.'s Birthday (observed)
Washington-Lincoln Day
Cesar Chavez Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veterans' Day
Thanksgiving Day
Christmas Day

When New Year's Day, Cesar Chavez Day, Independence Day, or Christmas Day falls on a Sunday, the following Monday shall be considered a holiday. When one of these days falls on a Saturday, the preceding Friday shall be considered a holiday.

Additional legal holidays, when designated by the Governor or the President of the United States will also be recognized by the State.

101.34 Inspector. The Engineer's authorized representative assigned to make detailed inspections of contract performance.

101.35 Invitation for Bids. All documents, whether attached or incorporated by reference, utilized for soliciting proposals. The advertisement will indicate with reasonable accuracy the quantity and location of the work to be done or the character and quantity of the material to be furnished and the time and place of the opening of proposals.

101.36 Laboratory. The testing laboratory of the Department, or any other testing laboratory designated by the Engineer.

101.37 Materials. All components required for use in the construction of the project.

101.38 Method of Measurement. The manner in which a "Pay Item" is measured to conform with the "Pay Unit."

101.39 Notice to Proceed. Written notice to the Contractor to proceed with the contract work including, when applicable, the date of beginning of contract time.

101.40 Original Contract Amount. The sum of the total dollar amounts bid for all the construction pay item quantities. In subsection 626.02 this figure is modified for use in calculating partial payments for mobilization.

101.41 Pavement Structure. The combination of one or more of the following courses placed on a subgrade to support and distribute the traffic load to the roadbed.

(a) *Subbase.* The layer or layers of specified or selected material placed on a subgrade to support a base course, surface course, or both. Subgrade that has been treated with lime, fly ash, cement kiln dust, or combinations thereof for stabilization will be considered subbase.

(b) *Base Course.* The layer or layers of specified or selected material placed on a subbase or a subgrade to support a surface course.

(c) *Surface Course.* One or more layers of a pavement structure designed to accommodate the traffic load, the top layer of which resists skidding, traffic abrasion, and the disintegrating effects of climate. The top layer is sometimes called "Wearing Course."

101.42 Planned Force Account. Items of work, included on the plans, which will be paid for in accordance with subsection 109.04.

101.43 Plans. The drawings, or reproductions, provided by the Department which show the location, character, dimensions, and details of the work to be done.

101.44 Preconstruction Conference. A meeting of CDOT project personnel, Contractor project personnel and other stake holders held prior to the beginning of construction at which topics pertinent to the successful prosecution of the work are discussed.

101.45 Profile Grade. The trace of a vertical plane usually intersecting the top surface of the proposed wearing surface and usually along the longitudinal centerline of the roadbed. Profile grade means either elevation or gradient of such trace according to the context.

101.46 Project. The specific section of the highway on which construction is to be performed as described in the Contract.

101.47 Project Engineer. The Chief Engineer's duly authorized representative who may be a CDOT employee or an employee of a consulting engineer (consultant) under contract to CDOT as defined below:

(a) *CDOT Project Engineer*. The CDOT employee, assigned by the Resident Engineer**,** who is the Chief Engineer's duly authorized representative. The CDOT Project Engineer is in direct charge of the work and is responsible for the administration and satisfactory completion of the project under contract.

(b) *Consultant Project Engineer*. The consultant employee under the responsible charge of the consultant's Professional Engineer who is in direct charge of the work and is responsible for the administration and satisfactory completion of the project. The Consultant Project Engineer's duties are delegated by the CDOT Resident Engineer in accordance with the scope of work in the consultant's contract with CDOT. The Consultant Project Engineer is not authorized to sign or approve Contract Modification Orders.

101.48 Project Special Provisions. See definition for special provisions in subsection 101.66.

101.49 Project Termini. Limits of the Project as shown on the plans.

101.50 Proposal. The offer of a bidder, on the prescribed form, to perform the work at the prices quoted. Also called bid.

101.51 Proposal Form. The documents furnished by the Department on which the offer of a bidder is submitted. Also called bid proposal.

101.52 Proposal Guaranty. The security furnished with a proposal to guarantee that the bidder will enter into the Contract if the proposal is accepted.

101.53 Record Set. A reproduction of a drawing or set of drawings, design calculations, or other record of engineering work required to be performed by the Contractor's engineer, which is signed and sealed by the Contractor's engineer in accordance with the Rules of Procedures of the State Board of Registration for Professional Engineers and Land Surveyors.

101.54 Region Transportation Director. The Department's representative, responsible for construction, maintenance and safety activities, within the geographical jurisdiction established by the Department. The Region Transportation Director is responsible for acting on written appeals made by the Contractor relating to contract claims for additional compensation or extension of contract time.

101.55 Right of Way. A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to a highway.

101.56 Road. A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way.

101.57 Roadbed. The graded portion of a highway within top and side slopes, prepared as a foundation for the pavement structure and shoulders.

101.58 Roadside. A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

101.59 Roadside Development. Those items necessary for the preservation of landscape materials and features. The rehabilitation and protection against erosion of all areas disturbed by construction through seeding, sodding, mulching and the placing of other ground covers. Suitable planting and other improvements as may increase the effectiveness and enhance the appearance of the highway.

101.60 Roadway. The portion of a highway within limits of construction.

101.61 Roadway Prism. The portion of the roadway defined as the prism of embankment situated beneath the shoulders and pavement structure and inside the lines projected downward and outward on a one to one slope from the outside edges of the roadway shoulders to their intersection with the base of the embankment.

101.62 Salvable Material. Material that can be saved or salvaged. Unless otherwise specified in the Contract, all salvable material shall become the property of the Contractor.

101.63 Shop Drawings. A general term that includes drawings, diagrams, illustrations, samples, schedules, calculations, and other data which provide details of

the construction of the work and details to be used by the Engineer for inspection. Shop drawings shall be prepared by the Contractor, subcontractors, manufacturers, suppliers, or distributors. Shop Drawings are submitted to the Engineer for formal review and return to the Contractor in accordance with subsection 105.02(c). Shop drawings include data which illustrates material, equipment, and items which are incorporated in and become part of the permanent work in accordance with the Contract.

101.64 Shoulder. The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

101.65 Sidewalk. That portion of the roadway constructed for pedestrian use.

101.66 Special Provisions. Additions and revisions to the standard and supplemental specifications covering conditions specific to an individual project or group of projects. Special provisions fall within one of the two following categories and take precedence as specified in subsection 105.08.

(a) *Project Special Provisions.* Additions and revisions to the Standard and Supplemental Specifications, specific to the project.

(b) *Standard Special Provisions.* Additions and revisions to the Standard and Supplemental Specifications, specific to a selected group of projects or which are intended for temporary use.

101.67 Specifications. A general term applied to all directions, provisions and requirements pertaining to performance of the work.

(a) *Standard Specifications:* The Department's printed book (including errata) for Road and Bridge Construction. The book is divided into three parts namely:
   (1) General Provisions (Section 100)
   (2) Construction Details (Section 200 thru 600)
   (3) Material Details (Section 700)

(b) *Supplemental Specifications:* Additions and revisions to the Standard Specifications that are adopted subsequent to the issuance of the printed book.

The outline for "Work" items in the Construction Details contains the following:
   (1) Description
   (2) Materials
   (3) Construction Requirements
   (4) Method of Measurement
   (5) Basis of Payment

101.68 Specified Completion Date. The date on which the contract work is specified to be completed.

101.69 Standard Special Provisions. See definition for Special Provisions, subsection 101.66.

101.70 State. The State of Colorado acting through its authorized representative.

101.71 Street. A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way.

101.72 Structures. Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, endwalls, buildings, storm drains, service pipes, underdrains, foundation drains, fences, guardrail, signs, end sections, traffic signals, light standards, and other features which may be encountered in the work and not otherwise classified.

101.73 Subcontractor. An individual, firm, corporation, or other legal entity to whom the Contractor sublets part of the Contract.

101.74 Subgrade. The top surface of a roadbed upon which the pavement structure, shoulders, and curbs are constructed. Subgrade that has been treated with lime, fly ash, cement kiln dust, or combinations thereof for stabilization will be considered subbase.

101.75 Substructure. All of the structure below the bearings of simple and continuous spans, skewbacks of arches, and tops of footings of rigid frames, together with the backwalls, wingwalls, and wing protection railings.

101.76 Superintendent. The Contractor's authorized employee in responsible charge of the work.

101.77 Superstructure. The entire structure except the substructure, as defined in subsection 101.75.

101.78 Supplemental Specifications. See definition for Specifications, subsection 101.67.

101.79 Surety. The corporation, partnership, or individual, other than the Contractor, executing a bond furnished by the Contractor.

101.80 Traffic Control Plan (TCP). The parts of the contract documents for each project that contain the requirements for the maintenance of traffic during construction of the project.

101.81 Traveled Way. The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

101.82 Value Engineering Change Proposal (VECP). A change to contract requirements proposed by the Contractor which will accomplish the project's

functional requirements at less cost or improve value or service at no increase or at a minor increase in cost.

101.83 Wheel Path. Wheel paths are the two sections of each through-traffic lane that bear the wheel loading. The center of each wheel path is located 3 feet from the center of the lane; each wheel path is 2 feet wide.

101.84 Work. The furnishing of all labor, materials, equipment, and incidentals necessary to successfully complete the project according to all duties and obligations imposed by the Contract.

101.85 Working Day. Any day, exclusive of Saturdays, Sundays and holidays, on which weather and other conditions not under the control of the Contractor will permit construction operations to proceed with the normal working force engaged in performing those items controlling the completion of the work.

101.86 Working Drawings. A general term that includes drawings, diagrams, illustrations, samples, schedules, calculations, and other data which illustrate the construction of the work, material, equipment, methods, and items which are necessary to construct the work in accordance with the plans and specifications. Working drawings shall be prepared by the Contractor, subcontractors, manufacturers, suppliers, or distributors. Working drawings are submitted to the Engineer for information only, and are not formally reviewed and returned to the Contractor.

101.87 Workplace Violence. Workplace violence is conduct in the workplace against employees, employers, or outsiders committed by aperson who either has an employment related connection with CDOT, or is a contractor working on a CDOT project. This conduct includes:

(1) Physical acts against persons or their property, or against CDOT or Contractor property that are perceived to be harmful or threatening.
(2) Veiled or direct verbal threats, profanity, or vicious statements or gestures that are meant to harm or create a threatening or intimidating work environment.
(3) Written threats, profanity, vicious cartoons or notes that are meant to create a threatening or intimidating environment
(4) Any other acts that are perceived to be threatening or intended to injure or convey hostility.

SECTION 102
BIDDING REQUIREMENTS AND CONDITIONS

102.01 Prequalification of Bidders. The bidder shall follow the prequalification and bidding procedures contained in the Rules for Prequalification, Debarment, Bidding, and Work on Colorado Department of Highways' Road, Highway, and Bridge Public Projects, 2 CCR 601-10, ("Rules"), on file with the Colorado Secretary of State. Copies are available upon request in the Contracts and Market Analysis Branch of the Department.

Only prequalified bidders will be allowed to bid on any project. At least ten days prior to opening of proposals, the bidder must file an experience questionnaire and a confidential financial statement on standard forms furnished by the Department.

102.02 Contents of Proposal Forms. Upon request, the Department will furnish the prospective bidder with a proposal form (bid proposal). This form will state the location and description of the contemplated construction and will show the estimate of the various quantities and types of work to be performed or materials to be furnished, and will have a schedule of items for which unit bid prices are invited. The proposal form will state the time in which the project must be completed, the amount of the proposal guaranty, and the date, time and place of the opening of proposals.

All papers bound with or attached to the proposal form are considered a part of the proposal and must not be detached or altered when the proposal is submitted.

The plans, specifications, and other documents designated in the proposal form, will be considered a part of the proposal whether attached or not.

The prospective bidder shall pay the Department the sum stated in the Invitation for Bids for each set of plans.

102.03 Interpretation of Quantities in Proposal Form. Except as otherwise provided in this subsection and the method of measurement for individual items, the quantities appearing in the proposal form are estimates prepared for the comparison of proposals. Payment to the Contractor will be made in accordance with the following procedures:

(a) *Measurement required.* When the Contract requires measurement of work performed or material furnished, payment will be made for actual quantities measured and accepted.

(b) *Measurement Not Required.* When the Contract does not require quantities of work performed or materials furnished to be measured, payment will be made for the quantities appearing in the Contract.

The estimated quantities of work to be performed and materials to be furnished may be increased, decreased or omitted.

102.04 Interpretation of Plans and Specifications. Any change to proposal forms, plans, or specifications prior to the opening of proposals will be issued by the Department by certified mail to all holders of proposal forms. Certain individuals are named in the project specifications who have authority to provide information, clarification or interpretation to bidders prior to opening of proposals. Information obtained from persons other than those named individuals is invalid and shall not be used for bidding purposes.

102.05 Examination of Plans, Specifications, Special Provisions, and Site of Work. The bidder is expected to examine the site of the proposed work, the proposal, plans, specifications, supplemental specifications, special provisions, and contract forms, before submitting a proposal. The submission of a proposal will be considered conclusive evidence that the bidder has made this examination and is aware of the conditions to be encountered in performing the work according to the Contract.

Boring logs and other records of subsurface investigations, if they exist, are available for inspection by bidders. These logs and records are made available so that all bidders have access to identical subsurface information that is available to the Department, and is not intended as a substitute for personal investigation, interpretation and judgment of the bidders.

The Department does not warrant the adequacy of boring logs and other records of subsurface investigations, and such information is not considered to be a part of the Contract. When a log of test borings is included in the subsurface investigation record, the data shown in the individual log of each test boring apply only to that particular boring and are not intended to be conclusive as to the character of any material between or around test borings. If bidders use this information in preparing a proposal, it is used at their own risk, and bidders are responsible for all conclusions, deductions, and inferences drawn from such information.

Bidders may conduct subsurface investigations at the project site at bidder's expense; the Department will afford them this opportunity prior to public opening of proposals.

If a bidder discovers an apparent error or omission in the proposal form, estimated quantities, plan, or specifications, the bidder shall immediately notify the Engineer to enable the Department to make any necessary revisions. The Department may consider it to be detrimental to the Department for a bidder to submit an obviously unbalanced unit bid price. See subsection 102.07.

102.06 Preparation of Proposal. The bidder shall submit the proposal (bid) upon the forms furnished by the Department in accordance with the "Rules" referenced in subsection 102.01.

102.07 Irregular Proposals. Proposals (bids) will be considered irregular and may be rejected for any of the following reasons:

(a) If the proposal is on a form other than that prescribed by the Department, or if the form is altered or any part thereof is detached, or if the form does not contain original signatures.

(b) If there are unauthorized additions, conditional or alternative proposals, or irregularities of any kind which may tend to make the proposal incomplete, indefinite, or ambiguous.

(c) If the bidder fails to acknowledge in the proposal the receipt of all revisions current on the date of opening of proposals.

(d) If the proposal does not contain a unit price for each pay item listed except in the case of authorized alternative pay items, the mathematical products of the respective unit prices and the estimated quantities, and the total amount of the bid obtained by adding such mathematical products.

(e) If the Department determines that any of the unit bid prices are materially unbalanced to the potential detriment of the Department. There are two types of unbalanced bids: (1) mathematically unbalanced and, (2) materially unbalanced. The mathematically unbalanced bid is a bid containing lump sum or unit pay items which do not reflect reasonable actual costs plus a reasonable proportionate share of the bidder's anticipated profit, overhead costs, and other indirect costs, but not necessarily to the detriment of the Department. These costs should all relate to the performance of the items in question. The materially unbalanced bid is a mathematically unbalanced bid which the Department determines leaves reasonable doubt that award will result in the lowest ultimate cost to the Department , or that award is in the public interest.

(f) If the Contractor submitting the bid is affiliated with another bidder that has submitted a bid on the same public project.

(g) If the bidder has been sent a notice of intent to revoke prequalification under Chapter Two of the "Rules."

(h) If the bidder has been asked in writing to show why it should not be found in default on a Department contract.

(i) If the bidder has been sent a notice of intent to debar or of suspension under Chapter Three of the "Rules."

The Department reserves the right to reject any or all bids, to waive technicalities or to advertise for new bids, if in the judgment of the Department its best interests will be promoted thereby.

102.08 Combination or Conditional Proposals. If proposal forms are issued for projects in combination and separately, the bidder may submit proposals either on the combination or on separate units of the combination. The Department reserves the right to make awards on combination or separate proposals to the advantage of the Department . Combination proposals will be considered, only when specified.

102.09 Anti-Collusion Affidavit. Every proposal (bid) submitted to the Department shall contain a statement certifying that the bidder has not participated in any collusion or taken any action in restraint of free competitive bidding. This statement shall be in the form of an affidavit provided by the Department and signed by the bidder. The original of the signed anti-collusion affidavit, Form 606, shall be submitted with the proposal. The proposal will be rejected if it does not contain the completed Form 606.

102.10 Material Guaranty. The successful bidder may be required to furnish a complete statement of the origin, composition, and manufacture of materials used in the construction of the work together with samples, which will be tested for conformance with Contract provisions.

SECTION 103
AWARD AND EXECUTION OF CONTRACT

103.01 Consideration of Proposals. After the proposals (bids) are opened and read, they will be evaluated and the Contract awarded or rejected in accordance with the "Rules" referenced in subsection 102.01.

The low responsible bidder shall submit a completed CONTRACTORS PERFORMANCE CAPABILITY STATEMENT, Form 605, and a completed ASSIGNMENT OF ANTITRUST CLAIMS, Form 621 to the Award Officer prior to 4:30 P.M. on the fifth calendar day after the bid opening. Failure to submit the Forms 605 and 621 may result in the denial of award to the apparent low responsible bidder and forfeiture of the proposal guaranty.

103.02 Award of Contract. If the Contract is awarded, the award will be made within 30 calendar days after the opening of proposals to the lowest bidder whose proposal complies with all the requirements prescribed. The successful bidder will be notified in writing of the acceptance of the proposal and the award of the Contract.

103.03 Requirement of Contract Bonds. At the time of the execution of the Contract, the successful bidder shall furnish a Contract Payment Bond and a Contract Performance Bond. Each bond shall be in a penal sum equal to the nearest integral one hundred dollars in excess of the sum of the original bid items plus all force account items specified in the project special provisions to be included in the payment and performance bonds. The bonds and the security shall be acceptable to the Department.

103.04 Execution and Approval of Contract. The Contract shall be signed and returned by the successful bidder together with the contract bonds, within 15 days after the date of award. If the signed Contract and bonds are returned by the successful bidder within 15 days after award and, if the Contract is not executed by the Department within 30 days from date of award, the bidder shall have the right to withdraw the proposal without penalty. The Contract will not be considered effective until it has been fully executed by all of the parties to the Contract.

SECTION 104
SCOPE OF WORK

104.01 Intent of Contract. The Contractor shall complete the work described and furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the Contract. Alterations of plans or the nature of the work will not involve or require work beyond the termini of the original project, until a contract modification order has been executed.

104.02 Differing Site Conditions, Suspensions of Work, and Significant Changes in the Character of Work.

(a) *Differing Site Conditions.* During the progress of work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the Contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the Contract, are encountered at the site, the party discovering such conditions shall promptly notify the other party in writing of the specific differing conditions before the site is disturbed and before the affected work is performed.

Upon written notification, the Engineer will investigate the conditions, and if the Engineer determines that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any work under the Contract, an adjustment, excluding anticipated profits, will be made and the Contract modified in writing accordingly. The Engineer will notify the Contractor of the determination whether or not an adjustment of the Contract is warranted. No Contract adjustment which results in a benefit to the Contractor will be allowed unless the Contractor has provided the required written notice.

(b) *Suspensions of Work Ordered by the Engineer.* If the performance of all or any portion of the work is suspended or delayed by the Engineer in writing for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the Contractor believes that additional compensation, contract time, or both are due as a result of such suspension or delay, the Contractor shall submit to the Engineer in writing a request for adjustment within seven calendar days of receipt of the notice to resume work. The request shall set forth the reasons and support for such adjustment.

Upon receipt, the Engineer will evaluate the Contractor's request. If the Engineer agrees that the cost, time required, or both for the performance of the Contract has increased as a result of such suspension and the suspension was caused by conditions beyond the control of and not the fault of the Contractor, its suppliers, or subcontractors at any approved tier, and not caused by weather, the Engineer will make an adjustment (excluding profit) and modify the Contract in writing accordingly. The Engineer will notify the Contractor of the determination

whether or not an adjustment of the Contract is warranted. No Contract adjustment will be allowed unless the Contractor has submitted the request for adjustment within the time prescribed.

No Contract adjustment will be allowed under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided for or excluded under any other term or condition of this Contract.

(c) *Significant Changes in the Character of Work.* The Engineer reserves the right to make, in writing, at any time during the work, such changes in quantities and such alterations in the work as are necessary to satisfactorily complete the project. Such changes in quantities and alterations shall not invalidate the Contract nor release the surety, and the Contractor agrees to perform the work as altered.

If the alterations or changes in quantities significantly change the character of the work under the Contract, whether such alterations or changes are in themselves significant changes to the character of the work, or by affecting other work cause such other work to become significantly different in character, an adjustment, excluding loss of anticipated profit, will be made to the Contract. The basis for the adjustment shall be agreed upon prior to the performance of the work. If a basis cannot be agreed upon, then an adjustment will be made either for or against the Contractor in such amount as the Engineer may determine to be fair and equitable.

If the alterations or changes in quantities do not significantly change the character of the work to be performed under the Contract, the altered work will be paid for as provided elsewhere in the Contract. The term "significant change" shall be construed to apply only to the following circumstances:

(1) When the character of the work as altered differs materially in kind or nature from that involved or included in the original proposed construction, or

(2) When a major item of work is increased in excess of 125 percent or decreased below 75 percent of the original contract quantity. Any allowance for an increase in quantity shall apply only to that portion in excess of 125 percent of original contract item quantity, or in case of a decrease below 75 percent, to the actual amount of work performed. A major item is defined to be any item having an original contract value in excess of 10 percent of the original contract amount.

104.03 Extra Work. The Contractor shall perform unforeseen work, for which there is no price included in the Contract, whenever the extra work is necessary or desirable for contract completion. This work shall be performed in accordance with the Contract and as directed, and will be paid for as provided under subsection 109.04.

104.04 Maintaining Traffic. Unless otherwise provided, the Contractor shall keep the road open to all traffic in accordance with the TrafficControl Plan during the progress of the work. The Contractor shall schedule construction operations so that only one side of the existing roadbed is denied to traffic at any time. The Contractor shall also provide and maintain in a safe condition temporary approaches or crossings and intersections with trails, roads, streets, businesses, parking lots, residences, garages, and farms. The road and the intersections of the access points shall be maintained in a manner that will safely and adequately accommodate traffic.

The Contractor shall not store materials or equipment nor park vehicles on the highway except in designated areas. The Contractor shall not have materials or equipment in the traffic lanes open to traffic at any time unless directed.

Portions of the roadway that are not included in the contract work will be maintained by the Department. Snow removal will be the responsibility of the Department. The Contractor shall be responsible for maintaining all work that is included in the Contract, and maintaining approaches, crossings, intersections, and other features as may be necessary to accommodate traffic without direct compensation, except as provided in the Contract or described in (a) and (b) below.

(a) *Approved Detours.* The cost of constructing detours and temporary bridges, and the removal of temporary bridges and obliteration of the detour road will be paid for at the appropriate unit bid prices for the items of work involved.

Maintenance requirements, as approved, will be paid for by the appropriate bid item; however, if a bid item does not exist, then payment will be made as provided in subsection 104.03.

(b) *Maintaining Traffic During Suspension of Work.* During any suspension ordered by the Engineer in accordance with subsection 105.01, the Contractor shall open to traffic the portions of the project as directed. Prior to allowing traffic on the project, the Contractor shall prepare the roadbed so that it will safely and adequately accommodate traffic. During the suspension period, the maintenance of the roadway will be the responsibility of the Department. However, when the suspension is the result of a failure by the Contractor, all costs for maintenance of traffic during the suspension period shall be borne by the Contractor. When the suspension is lifted, the Contractor shall renew any work or replace materials lost or damaged on the project and shall remove, as directed, work or materials used during the suspension. The Contractor shall complete the project as though the prosecution of the work had been continuous and without interference. All additional work caused during the suspensions, for reasons beyond the Contractor's control, will be paid for as provided in subsection 104.02 when contract unit prices exist, or as extra work as provided in subsection 104.03 when no unit price exists.

(c) *Maintaining Traffic During Free Time.* During the free time period, if provided for in the Contract, the Contractor shall be responsible for maintaining traffic

control items as long as construction operations interfere with traffic. When construction operations which interfere with traffic cease, the Contractor shall notify the Engineer, in writing, and shall adhere to the same procedures as in paragraph (b) above. The Contractor shall notify the Engineer, in writing, when construction operations which interfere with traffic will resume and shall resume responsibility for maintaining traffic.

(d) *Maintenance Directed by the Engineer.* If the Engineer directs special maintenance for the benefit of the traveling public, that is not included in the Contract, the Contractor will be paid in accordance with subsection 104.02 when contract unit prices exist, or as extra work, in accordance with subsection 104.03, when no contract unit prices exist. The Engineer will determine the work to be classed as special maintenance.

104.05 Rights in and Use of Materials Found on the Work. The Engineer may authorize the Contractor's use of materials found in the excavation for completing pay items other than excavation. Payment will be made for both the excavation of such materials at the corresponding contract unit price, and for the pay item for which the excavated material is used. The Contractor shall replace the removed material with acceptable material at no additional cost to the Department. The Department will not charge the Contractor royalty or additional cost of select material for the removed material. The Contractor shall not excavate or remove any material from within the roadway which is not within the grading limits, as indicated by the slope and grade lines, without written authorization from the Engineer.

Unless otherwise provided, the material from structures designated for removal shall be the Contractor's property and may be used temporarily by the Contractor in the erection of the new structure.

104.06 Final Cleaning Up. Before final acceptance, the highway, material pits, and all ground occupied by the Contractor in connection with the project shall be cleaned of all rubbish, excess materials, temporary structures, and equipment; and all parts of the work shall be left in an acceptable condition. The cost of final cleanup will not be paid for separately but shall be included in the work.

104.07 Value Engineering Change Proposals by the Contractor. The Contractor is encouraged to develop and offer proposals for improved construction techniques, alternative materials and other innovations. Proposals must provide a project comparable to the Department's original design either at lower cost, with improved quality, or both. Bid prices shall not be based on the anticipated approval of a Value Engineering Change Proposal (VECP). Proposals shall be submitted only by the successful bidder after contract award. If a VECP is rejected, the work shall be completed in accordance with the Contract at contract bid prices. The Contractor shall have no claim against the Department for compensable or noncompensable delay to the Contract based on the failure to respond to the proposal.

The Contractor may submit either a full VECP or a preliminary Conceptual VECP, followed by a full proposal. The Engineer will provide timely review of all proposals and advise the Contractor whether the Proposal is complete or incomplete. When the proposal is complete, the Engineer will advise the Contractor of either the approval of the proposal or the reasons for rejection of the proposal.

Cost savings generated to the Contract as a result of VECPs offered by the Contractor and accepted by the Engineer shall be shared equally between the Contractor and the Department.

If the Engineer determines that the time for response indicated in the submittal under item (c)5 below is insufficient for review, the Contractor will be promptly notified. Based on the additional time needed by the Engineer for review and the effect on the Contractor's schedule caused by the added time, the Engineer will evaluate the need for a noncompensable time adjustment to the Contract.

(a) VECPs that will be considered are those that would produce savings to the Department or provide improved project quality without impairing essential functions and characteristics of the facility. Essential functions include but are not limited to: service life, economy of operation, ease of maintenance, desired appearance, safety, and impacts to the traveling public or to the environment during and after construction.

(b) *Submittal of Conceptual Proposal.* For VECPs that require a significant amount of design or other development resources, the Contractor may submit an abbreviated Conceptual Proposal for preliminary evaluation. The Engineer will evaluate the information provided and advise the Contractor if any conditions or parameters of the Conceptual Proposal are found to be grounds for rejection. Preliminary review of a conceptual proposal reduces the Contractor's risk of subsequent rejection but does not commit the Department to eventual approval of the full VECP. The following information shall be submitted for each Conceptual Proposal.

    1. A statement that the proposal is submitted as a Conceptual VECP.

    2. A general description of the difference between the existing Contract and the proposed change, and the advantages and disadvantages of each, including effects on cost, service life, economy of operation, ease of maintenance, desired appearance, safety, and impacts to the traveling public or to the environment during and after construction.

    3. A set of conceptual plans and a description of proposed changes to the Contract specifications.

    4. An estimate of the anticipated cost savings or increase.

    5. A statement specifying:

(1) when a response to the conceptual proposal from the Department is required to avoid delays to the existing contract prosecution,
(2) the amount of time necessary to develop the full Proposal,
(3) the date by which a Contract Modification Order must be executed to obtain maximum benefit from the Proposal, and
(4) the Proposal's impact on time for completing the Contract.

(c) *Submittal of Full Value Engineering Change Proposal.* The following materials and information shall be submitted with each proposal.

1. A statement that the proposal is submitted as a VECP.

2. A description of the difference between the existing Contract and the proposed change, and the advantages and disadvantages of each, including effects on service life, economy of operation, ease of maintenance, desired appearance, safety, and impacts to the traveling public or to the environment during and after construction.

3. A complete set of plans and specifications showing the proposed revisions relative to the original Contract. This portion of the submittal shall include design notes and construction details. The proposed plans and specifications shall be signed and sealed by the Contractor's engineer.

4. A complete analysis indicating the final estimated costs and quantities to be replaced by the Proposal compared to the new costs and quantities generated by the Proposal. All costs and proposed unit prices shall be documented by the Contractor.

5. A statement specifying the date by which a Contract Modification Order must be executed to obtain the maximum cost reduction during the remainder of the Contract.

6. A statement detailing the effect the Proposal will have on the time for completing the Contract.

7. A description of any previous use or testing of the proposed changes and the conditions and results. If the Proposal was previously submitted on another Department project, the proposal shall indicate the date, Contract number, and the action taken by the Department.
8. An estimate of any effects the VECP will have on other costs to the Department.

9. A statement of life cycle costs, when appropriate. Life cycle costs will not be considered as part of cost savings but shall be calculated for additional support of the Proposal. A discount rate of four percent shall be used for life cycle calculations.

10. A statement specifying when a response from the Owner is required to avoid delays to the prosecution of the Contract.

(d) *Evaluation.* VECPs will be evaluated in accordance with the following:

1. The Engineer will determine if a Proposal qualifies for consideration and evaluation. The Engineer may reject any Proposal that requires excessive time or costs for review, evaluation, or investigations. The Engineer may reject proposals that are not consistent with the Department's design policies and criteria for the project.

2. The Engineer will reject all or any portion of work performed under an approved VECP if unsatisfactory results are obtained. The Engineer will direct the removal of such rejected work and require construction to proceed under the original Contract requirements without reimbursement for work performed under the proposal, or for its removal.

3. VECPs, whether or not approved by the Department, apply only to the ongoing Contracts referenced in the Proposal and become the property of the Department. Proposals shall contain no restrictions imposed by the Contractor on their use or disclosure. The Department has the right to use, duplicate and disclose in whole or in part any data necessary for the utilization of the Proposal. The Department retains the right to utilize any accepted Proposal or part thereof on other projects without obligation to the Contractor. This provision is subject to rights provided by law with respect to patented materials or processes.

4. If the Department is already considering certain revisions to the Contract or has approved certain changes in the Contract for general use that are subsequently proposed in a VECP, the Engineer will reject the Proposal and may proceed to implement these changes without obligation to the Contractor.

5. The Contractor shall have no claim against the Department for additional costs or delays resulting from the rejection or untimely acceptance of a VECP. These costs include but are not limited to: development costs, loss of anticipated profits, increased material or labor costs, or untimely response.

6. Proposals will be rejected if equivalent options are already provided in the Contract.

7. Proposals that only reduce or eliminate contract pay items will be rejected.

8. The savings generated by the Proposal must be sufficient to warrant a review and processing, as determined by the Engineer.

9. A Proposal changing the type or thickness of the pavement structure or changing the design of a bridge will be rejected.

10. Additional information needed to evaluate Proposals shall be provided in a timely manner. Untimely submittal of additional information will result in rejection of the Proposal. Where design changes are proposed, the additional information shall include results of field investigations and surveys, design and computations, and changed plan sheets required to develop the design changes.

(e) *Payment.* If the VECP is accepted, the changes and payment will be authorized by Contract Modification Order. Reimbursement will be made as follows:

1. The changes will be incorporated into the Contract by changes in quantities of unit bid items, new agreed unit price items, or both, as appropriate, under the Contract.

2. The cost of the revised work as determined from the changes will be paid to the Contractor. The Department will pay the Contractor 50 percent of the savings to the Department upon completion of the value analysis work. The savings to the Department shall be the difference between the cost of the revised work and the cost of the related construction required by the original Contract computed at Contract bid prices.

3. Costs incurred by the Contractor for development, design, and implementation of the VECPs will not be reimbursed.

4. When work performed under an approved VECP is modified to fit field or other conditions, the maximum amount paid for the work will be limited to that which would have been paid if the work had been performed under the original contract provisions. The rejection or limitation of reimbursement shall not constitute the basis of any claim against the Department for delay or for other costs except as allowed under the original Contract.

SECTION 105
CONTROL OF WORK

105.01 Authority of the Engineer. The Engineer will decide all questions regarding the quality and acceptability of materials furnished, work performed, and the rate of progress of the work; all interpretation of the plans and specifications; and the acceptable fulfillment of the Contract.

The Engineer will, in writing, suspend the work, wholly or in part:
(1) when the Contractor fails to correct conditions unsafe for the workmen or the general public
(2) for failure to carry out Contract provisions
(3) for failure to carry out orders
(4) for periods of unsuitable weather
(5) for conditions unsuitable for the prosecution of the work
(6) for any other condition or reason determined to be in the public interest

105.02 Plans, Shop Drawings, Working Drawings, Other submittals, and Construction Drawings.

(a) *Plans*. The Contract plans will show lines, grades, typical cross sections of the roadway, location and design of all structures, and summary of items appearing on the proposal. Only general features will be shown for steel and prestressed concrete bridges.

(b) *Shop drawings, Working Drawings, and Other Submittals - General*. All work shall be performed in accordance with the plans, reviewed shop drawings, working drawings, or other submittals. Specific requirements for the required shop drawings, working drawings, and other submittals for this project are contained in the specifications.

The Contractor shall be responsible for the accuracy of all dimensions and quantities shown on the shop drawings, working drawings, and other submittals. The Contractor shall correlate all information in the Contract, in the submittals, and in all revisions at the project site to insure that there are no conflicts and that the work can be constructed as shown. The Contractor shall be responsible for all information that pertains to the fabrication processes and methods of construction.

Shop drawings, working drawings, and other submittals shall be delivered to the Engineer. The Contractor shall notify the Engineer, in writing, at the time of submittal of shop drawings, working drawings, and other submittals, of any information submitted that deviates from the requirements of the plans and specifications. In addition, specific notation of the deviations or changes from the plans and specifications shall be placed on the shop drawing, working drawing, or other submittal.

The first sheet or page of each set of shop drawings, working drawings, and other submittals shall be stamped "Approved for Construction" and signed by the Contractor. Submittals shall be made in complete packages which will allow the Engineer to properly review them for general compliance with the Contract and to effectively evaluate the proposed methods of construction. The allowed time for review shall not begin until such submittals are complete.

The format of the shop drawings, working drawings, and other submittals shall be as follows:

1. All manually drafted shop drawings and working drawings shall be 34 inches long by 22 inches wide overall. There shall be a 2-inch margin on the left side of the sheet and a ½ inch margin on the other three sides. A blank space, 6 inches long by 3 inches wide, shall be left available near the lower right-hand corner of shop drawings, for the Engineer's review stamp. Computer drafted 11 inch by 17 inch drawings may be submitted.

2. There shall be a title block in the lower right-hand corner of each sheet. The title block shall show the project number, structure number, the location of the structure, the contents of the sheet, designer/engineer, sheet number, and revision number.

3. Design notes, calculations, lists, reports, descriptions, catalog cuts, and other non-drawing submittals shall be submitted on 8½ inch by 11 inch sheets.

4. Unless otherwise specified, seven sets of shop drawings, and other submittals shall be submitted to the Engineer. One additional set of shop drawings shall be submitted for each railroad company.

5. Unless otherwise specified, two sets of working drawings shall be submitted to the Engineer.

6. The shop drawings, working drawings, other submittals and all revisions shall be signed and sealed for the Contractor, by a professional engineer registered in the state of Colorado when required by the specifications. Submittals without the required signature and seal will not be accepted and will be returned to the Contractor without action.

Table 105-1 which summarizes the minimum required submittals is included at the end of this subsection. Table 105-1 lists submittals in one location for information. The table clarifies the type of submittal and whether the Contractor's Engineer must sign and seal the submittal. Table 105-1 may not be all inclusive. The Contractor shall provide all submittals required by the Contract, including those not listed in the table.

(c) *Shop Drawings.* The Contractor shall provide shop drawings to adequately control the work. The Contractor shall submit shop drawings to the Engineer for formal review.

The Engineer will review the shop drawings to evaluate that general conformance with the design concept and that general compliance with the information given in the plans and specifications has been achieved. The review does not extend to accuracy of dimensions, means, methods, techniques, sequences, schemes, procedures of construction, or to safety precautions. The review by the Engineer is not a complete check. Review of the shop drawings does not relieve the Contractor of the responsibility for the correctness of the shop drawings. All work done prior to the Engineer's review of shop drawings shall be at the Contractor's sole risk.

The Engineer may request additional details and require the Contractor to make changes in the shop drawings which are necessary to conform to the provisions and intent of the plans and specifications without additional cost to the Department.

After review, the Engineer will return two sets of shop drawings, for use by the Contractor and the Fabricator or Supplier. Returned shop drawings will be stamped with the Engineer's review stamp to indicate one of the following:

Reviewed, no exception taken	Shop drawings have been reviewed and do not require resubmittal
Reviewed, revise as noted	Shop drawings have been reviewed and the Contractor shall incorporate the comments noted in the shop drawings into the work. The shop drawings do not require resubmittal.
Resubmit, revise as noted	Shop drawings require correction or redrawing and shall be resubmitted for review. If shop drawings are returned for correction or redrawing, corrections shall be made and the shop drawings shall be resubmitted by the Contractor in the same manner as the first submittal. Specific notation shall be made on the shop drawing to indicate the revisions

The time required for the Engineer's review of each submittal will not exceed four weeks after a complete submittal of shop drawings is received by the Engineer. It is the intent of these specifications that no more than two submittals of shop drawings shall be required for any one particular item. If additional submittals are required by actions of the Contractor, resulting delays shall be the responsibility of the Contractor. If additional submittals are required by the Engineer's actions or if shop drawing review is delayed by the Engineer, the Contractor may request an extension of time as provided in subsection 108.07.

All revisions made to the shop drawings after the Engineer's initial review process will require resubmittal.

(d) *Working Drawings*. The Contractor shall supplement the plans with working drawings to detail the construction or to provide the Engineer with information on the proposed methods of construction.

Unless otherwise specified, the Contractor shall submit two sets of working drawings to the Engineer for information only. These drawings will not be formally reviewed by the Engineer. The Contractor shall submit working drawings to the Engineer ten days before the start of work. Working drawings will not be returned to the Contractor.

(e) *Other Submittals*. Other submittals shall be prepared and submitted by the Contractor as defined for working drawings. Unless otherwise specified two copies shall be submitted to the Engineer for information only. The plans or specifications will indicate which submittals require formal review by the Engineer.

One record set of all design work performed by the Contractor's Engineer shall be submitted to the Project Engineer.

(f) *Construction Drawings*. The Contractor shall keep one set of plans, reviewed shop drawings, working drawings, and other submittals available on the project site at all times. This set shall be defined as the "construction drawings." The Contractor shall note on these construction drawings all changes and deviations from the work shown on the plans, shop drawings, working drawings, and other submittals. The construction drawings shall be kept current as the work progresses and notations shall be made within seven days of the change or deviation.

The first sheet or page of each set of construction drawings shall be stamped "As Constructed" and signed by the Contractor.

Upon completion of the work and prior to final payment, the construction drawings shall be submitted to the Engineer.

(g) Furnishing the shop drawings, working drawings, construction drawings, and other submittals will not be measured and paid for separately, but shall be included in the work.

(h) Failure of the Contractor to comply with the requirements for shop drawings, working drawings, other submittals, and construction drawings may be considered unsatisfactory contract progress. Monthly progress payments may be withheld until the requirements are met.

(i) Except as specifically noted, all time required for review of shop drawings, working drawings, and other submittals shall be included in the work and shall not be the basis for any claim for a time extension or monetary adjustment except as provided for herein.

Table 105-1
SUMMARY OF CONTRACTOR SUBMITTALS

Section No.	Description	Type	Contractor P.E. Seal Required?
504	MSE Walls (Contractor Alternative)	Shop Drawing	Yes
504	MSE Walls (Default Design)	Shop Drawing	No
508	Timber Structures	Shop Drawing	No
509	Steel Structures	Shop Drawing	No
512	Bearing Devices Type II	Shop Drawing	No
512	Bearing Devices Type III	Shop Drawing	Yes
514	Pedestrian and Bikeway Railing	Working Drawing	No
518	Expansion Devices: 0-4”	Working Drawing	No
518	Expansion Devices: 0-6”, 9”, 12”…	Shop Drawing	Yes
601 & 618	Precast Panel Deck Forms	Working Drawing	No
601	Permanent Steel Bridge Deck Forms	Working Drawing	Yes
601	Falsework	Working Drawing	Yes
602	Reinforcing Steel	Working Drawing	No
606	Bridge Railing	Working Drawing	No
607	Sound Barriers (Alternative)	Shop Drawing	Yes
607	Sound Barriers (Default Design)	Working Drawing	No
613	Light Standards (Low Mast)	Working Drawing	Yes
613	Light Standards (High Mast)	Working Drawing	Yes
614	Overhead Sign Structures	Shop Drawing	Yes*
614	Traffic Signal Pole (Mast Arm)	Shop Drawing	No
614	Traffic Signal Pedestal Pole	Working Drawing	No
614	Traffic Signal Equipment	Working Drawing	No
618	Prestressed Concrete (Pre-tensioned)	Shop Drawing	Yes*
618	Prestressed Concrete (Post-tensioned)	Shop Drawing	Yes*
618	Steel Diaphragms between Prestressed Girders	Working Drawing	No
628	Pre-fabricated Pedestrian Bridges	Shop Drawing	Yes

*A PE seal is required where the Contractor has provided the design for the item, or performed engineering to modify the details shown on the plans. The PE seal is not required where complete details are provided on the plans.

105.03 Conformity to the Contract. All work performed and all materials furnished shall conform to the lines, grades, cross sections, dimensions, and material requirements, including tolerances, shown in the Contract.

For those items of work where working tolerances are not specified, the Contractor shall perform the work in a manner consistent with reasonable and customary manufacturing and construction practices.

When the Engineer finds that the materials furnished, the work performed, or the finished product does not conform with the Contract but that reasonably acceptable work has been produced, the Engineer will determine the extent the work will be accepted and remain in place. If accepted the Engineer will (1) document the basis for acceptance by Contract Modification Order which will provide for an appropriate reduction in the Contract price for such work or materials not otherwise provided for in this subsection or (2) notify the Contractor in writing that the Contract unit price will be reduced in accordance with this subsection when P is 25 or less, or (3) in lieu of a price reduction, permit correction or replacement of the finished product provided the correction or replacement does not adversely affect the work.

When the Engineer finds the materials furnished, work performed, or the finished product are not in conformity with the Contract and has resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor.

If asphalt cement testing demonstrates that asphalt cement was acid modified or alkaline modified, the supplier will be automatically decertified. In addition, all material placed containing the acid modified or alkaline modified asphalt cement shall be removed and replaced with specification material at no cost to the Department.

Materials will be sampled and tested by the Department in accordance with the sampling and testing schedules and procedures contained in the Department's Field Materials Manual. The approximate maximum quantity represented by each sample will be as set forth in the schedules. An additional number of samples in relation to the quantity of material represented may be selected and tested at the Engineer's discretion. The quantity represented by five consecutive random samples will constitute a lot whenever production schedules and material continuity permit. The Engineer may establish a lot consisting of the quantity represented by any number of consecutive random samples from one to seven inclusive when it is necessary to represent short production runs, significant material changes, or other unusual characteristics of the work. Tests that are determined to have sampling or testing errors will not be used.

Materials or work will be evaluated for price reduction only when deviations from specifications occur on any of the several individual tests for the lot. The several individual test values will be averaged and the percent of price reduction for the lot will be determined by applicable formula.

The formula in (a) and (b) below will be used only when the lot is represented by three to seven tests inclusive.

(a) The formula, P = (Xn + aR- Tu)F, will be used if a maximum limit only is specified or; when the average of the several test values is above the mid point of the specification band or above the job-mix formula value.

(b) The formula, P = (TL + aR- Xn)F, will be used if a minimum limit only is specified or; when the average of the several test values is below the mid point of the specification band or below the job-mix formula value.

(c) When the lot is represented by fewer than three tests, the materials will be evaluated for price reduction by the following procedure: Lots represented by two tests will be divided into two separate lots represented by one test each, as determined by the Engineer. Each lot which deviates from the specifications will be price reduced by one of the following formulas. When a maximum limit only is specified or the test value is above the maximum specified limit, the formula P = 0.76(To-Tu)F will be used. When a minimum limit only is specified or the test value is below the minimum specified limit, the formula P = 0.76(TL-To)F will be used. When a lot is represented by one test only, the materials will be evaluated for price reduction as described in this paragraph.

Where:

P	is the percent of reduction in contract price,
Xn	is the average of the several test values from samples taken from the lot, with "n" indicating the number of values,
a	is a variable factor to be used in "n" changes according to the following: when n is 3, a = 0.45; n is 4, a = 0.38; n is 5, a = 0.33; n is 6, a = 0.30; and n is 7, a = 0.28.
R	is the difference between the highest and lowest values in the group of several test results from the lot,
Tu	is the upper or maximum tolerance limit permitted by the specifications,
TL	is the lower or minimum tolerance limit permitted by the specifications, and
To	is the test value of the test which deviates from the specifications,
F	is price reduction factor to be applied for each element as shown in the following table:

TABLE OF PRICE REDUCTION FACTORS

Element	Factor "F"
100 percent size sieve	1
12.5 mm (½") sieve and larger	1
150 µm (No. 100) sieve to 9.5 mm (3/8") sieve inclusive (except 100 percent size sieve)	3
75 µm (No. 200) sieve	6
75µm (No. 200) sieve (cover coat material)	25
Compaction, bituminous mixtures (Section 403)	7
Liquid Limit	3
Plasticity Index	10
Asphalt content, (all asphalt- aggregate mixtures)	20
Asphalt penetration	1
Asphalt residue	3
Portland Cement Concrete Pavement Fine Aggregate Sand Equivalent	0.3
Hydrated Lime Gradation	0.3
Toughness, inch-pounds, minimum	0.8
Tenacity, inch-pounds, minimum	0.8
Elastic Recovery, 25 °C, percent minimum	1.25
Ductility, 4 °C (5cm/min) cm, minimum	1.25

If P is less than 3, or a negative quantity, the material will be accepted as being in conformity. In cases where one or more elements show a positive P value, such positive values will be added and the resulting sum will be used to determine whether the material is in conformity. If the total P value is between 3 and 25, the Engineer may require correction or may accept the material at a reduced price. If P is greater than 25, the Engineer may: (1) require complete removal and replacement with specification material at no additional cost to the Department; (2) require corrective action to bring the material into conformity at no additional cost to the Department; or (3) where the finished product is found to be capable of performing the intended purpose and the value of the finished product is not affected, permit the Contractor to leave the material in place with an appropriate price reduction to be based on engineering evaluation but not to be less than that which would have occurred had a reduction been made where P = 25.

If the P for aggregate gradation for Items 206 or 304 is 3 or greater the reduction will apply to the contract price multiplied by the Multipliers (M) listed in the following table.

Multiplier for Price Reductions for Miscellaneous Items

Item Number-Name	Element	Multiplier (M)
206- Structural Backfill	Gradation	0.60
304-Aggregate Base Course	Gradation	0.60

If the P for gradation, asphalt cement content, or compaction for Items 301 or 403 is 3 or greater and asphalt cement is not paid for separately, the reduction will apply to the contract price multiplied by the following Multiplier (M) listed in the following table:

Multiplier for HMA Price Reductions
Where Asphalt Cement is not paid for separately:

Item Number-Name	Element	Multiplier (M)
403-Stone Matrix Asphalt	Gradation, Asphalt Cement Content, or Compaction	0.60
403-Hot Mix Asphalt*	Hydrated Lime Gradation	0.60

* The P value for hydrated lime shall be applied to the price of the HMA item. Lime gradation P values will not be combined with Pay Factors for other elements.

The following equation shows how the Multiplier is used to determine the price reduction.

Price reduction = (P/100) • Multiplier • Price per Unit • Quantity.

If no multiplier is listed no adjustment to the computed P is required. This is equivalent to a multiplier of one.

Price reduction for those elements which are not included in the Table of Price Reduction Factors will be determined by the Engineer.

The Contractor will not have the option of accepting a price reduction in lieu of producing specification material. Continued production of non-specification material will not be permitted. Material which is obviously defective may be isolated and rejected without regard to sampling sequence or location within a lot.

105.04 Conformity to the Contract of Superpave Performance Graded Binders. Superpave Performance Graded binders shall be price reduced according to the following if the requirements of subsection 702.01 are not met:

(1) High Service Temperature Requirements from Table 702-1

The Dynamic Shear (G*/sin•, kPa) of Rolling Thin Film Oven (RTFO) residue will be measured at the appropriate temperature for the binder type, as specified in Table 702-1. If the Dynamic Shear of the RTFO aged binder is less than 2.20 kPa , the temperature at which G*/sin• = 2.20 kPa will be determined. A “P” of 3 shall be applied for each degree C the material temperature must be lowered below the specified temperature to achieve a Dynamic shear of 2.20 kPa. Price adjustments for high service temperature properties will be calculated as follows:

$P(high) = 3 \bullet [T_{spec} - T_{DS}]$,

Where T_{DS} = Temperature in °C where G*/sin• = 2.20 kPa
T_{spec} = Appropriate test temperature in °C for binder specified from Table 702-1

(2) Low Service Temperature Requirements from Table 702-1:

The m-value of Pressure Aging Vessel (PAV) aged binder will be measured at the appropriate temperature (T_{spec}) as specified in Table 702-1. If the m-value is less than 0.300, the test temperature at which the m-value = 0.300 will be determined. A "P" of 3 shall be applied for each degree C the material temperature must be raised above the specified test temperature to achieve an m-value of 0.300. Price adjustments for low service temperature properties will be calculated as follows:

$P(low) = 3 \bullet [T_m - T_{spec}]$

Where T_m = Temperature in °C where m-value = 0.300
T_{spec} = Appropriate test temperature in °C for binder specified from Table 702-1

(3) The price reductions will be cumulative. When the binder is included in the contract unit price for HMA, the total price reduction will be calculated as follows:

$P(total) = P(low)+P(high)$

Amount of Reduction = [P(total)] • [(1/100) • (Invoice price for PG Binder)]

When binder is paid for separately, the total price reduction will be calculated as follows:

$P(total) = P(low)+P(high)$

Amount of Reduction = [P(total)] • [(1/100) • (Contract Unit price for PG Binder)]

(4) Price reductions based on the "F" factors in the Table of Price Reduction Factors will be added to the P (low) and P (high) price reductions described in 105.03. Other binder requirements listed in Table 702-1 will be tested, but will not be considered for price reduction calculations. However, the Contractor shall not be allowed to continue to produce mix with out of specification Superpave PG asphalt binder. If two consecutive samples fail to meet all requirements listed in 702-1, the Contractor shall take corrective action before being allowed to continue production of Hot Bituminous Pavement. If proper corrective measures cannot be readily determined, the Engineer will suspend the use of such material until the Engineer can determine from Laboratory tests that the Contractor can provide material that is in compliance with Table 702-1.

The Contractor will not have the option of accepting a price reduction in lieu of producing specification material. Continued production of non-specification material will not be permitted. Material which is obviously defective may be isolated and rejected without regard to sampling sequence or location within a lot.

105.05 Conformity to the Contract of Hot Mix Asphalt. Conformity to the Contract of all Hot Mix Asphalt, Item 403, except Hot Mix Asphalt (Patching) and temporary pavement will be determined by tests and evaluations of elements that include asphalt content, gradation, in-place density, and joint density in accordance with the following:

All work performed and all materials furnished shall conform to the lines, grades, cross sections, dimensions, and material requirements, including tolerances, shown in the Contract.

When the Engineer finds the materials or work furnished, work performed, or the finished product are not in conformity with the Contract and has resulted in an inferior or unsatisfactory product, the work or material shall be removed and replaced or otherwise corrected at the expense of the Contractor.

Materials will be sampled randomly and tested by the Department in accordance with subsection 106.05 and with the applicable procedures contained in the Department's Field Materials Manual. The approximate maximum quantity represented by each sample will be as set forth in subsection 106.05. Additional samples may be selected and tested as set forth in Section subsection 106.05 at the Engineer s discretion.

A process will consist of either a single test value or a series of values resulting from related tests of an element of the Contractor's work and materials. An element is a material or workmanship property that can be tested and evaluated for quality level by the Department approved sampling, testing, and analytical procedures. All materials produced will be assigned to a process. A change in process is defined as a change that affects the element involved. For any element, with the exception of the joint density element, a process normally will include all produced materials associated with that element prior to a change in the job mix formula (Form 43). For joint density, a new process will be established for each new layer of pavement or for changes in joint construction. Density measurements taken within each compaction test section will be a separate process. The Engineer may separate a process in order to accommodate small quantities or unusual variations.

Evaluation of materials for pay factors (PF) will be done using only the Department's acceptance test results. Each process will have a PF computed in accordance with the requirements of this Section. Test results determined to have sampling or testing errors will not be used.

Except for density measurements taken within a compaction test section, any test result for an element greater than the distance 2 times V (see Table 105-2) outside the tolerance limits will be designated as a separate process and the pay factor will be

calculated in accordance with subsection 105.05(a). A pay factor less than zero shall be zero. The calculated PF will be used to determine the Incentive or Disincentive Payment (I/DP) for the process.

In the case of in-place density or joint density, the Contractor will be allowed to core the exact location (or immediately adjacent location for joint density) of a test result more than 2 times V outside the tolerance limit. The core must be taken and furnished to the Engineer within eight hours after notification by the Engineer of the test result. The result of this core will be used in lieu of the previous test result. Cores not taken within eight hours after notification by the Engineer will not be used in lieu of the test result. All costs associated with coring shall be at the Contractor's expense.

(a) *Representing Small Quantities.* When it is necessary to represent a process by only one or two test results, PF will be the average of PFs resulting from the following:

If the test result is within the tolerance limits then PF = 1.00

If the test result is above the maximum specified limit, then

$$PF = 1.00 - [0.25(T_O - T_U)/V]$$

If the test result is below the minimum specified limit, then

$$PF = 1.00 - [0.25(T_L - T_O)/V]$$

Where: PF = pay factor.
V = V factor from Table 105-2.
T_O = the individual test result.
T_U = upper specification limit.
T_L = lower specification limit.

The calculated PF will be used to determine the I/DP for the process.

(b) *Determining Quality Level.* Each process with three or more test results will be evaluated for a quality level (QL) in accordance with Colorado Procedure 71.

(c) *Gradation Element.* Each specified sieve, with the exception of 100 percent passing sieves, will be evaluated for QL separately. The lowest calculated QL for a sieve will be designated as the QL for gradation element for the process.

(d) *Joint Density Element.* Joint Density will be tested according to subsection 401.17.

(e) *Process Pay Factor.* Using the calculated QL for the process, compute the PF as follows: The final number of random samples (Pn) in each process will determine the final pay factor. As test values are accumulated for each process, Pn will change accordingly. When the process has been completed, the number

of random samples it contains will determine the computation of PF, based on Table 105-3 and formula (1) below. When Pn is from 3 to 9, or greater than 200, PF will be computed using the formulas designated in Table 105-3. Where Pn is equal to or greater than 10 and less than 201, PF will be computed by formula (1):

$$PF = \frac{PF_1 + PF_2}{2} + \left[\frac{PF_2 + PF_3}{2} - \frac{PF_1 + PF_2}{2} \right] \bullet \frac{(Pn_2 - Pn_X)}{(Pn_2 - Pn_3)} \quad \text{formula (1)}$$

Where, when referring to Table 105-3:

PF_1= PF determined at the next lowest Pn formula using process QL
PF_2= PF determined using the Pn formula shown for the process QL
PF_3= PF determined at the next highest Pn formula using process QL
Pn_2= the lowest Pn in the spread of values listed for the process Pn formula
Pn_3= the lowest Pn in the spread of values listed for the next highest Pn formula
Pn_x= the actual number of test values in the process

When evaluating the item of Furnish Hot Mix Asphalt, the PF for the element of In-Place Density shall be 1.0.

Regardless of QL, the maximum PF in relation to Pn is limited in accordance with Table 105-3.

As test results become available, they will be used to calculate QL and PF numbers for each process. The process I/DP's will then be calculated and accumulated for each element and for the item. The test results and the accumulated calculations will be made available to the Contractor upon request.

Numbers from the calculations will be carried to significant figures and rounded according to AASHTO Standard Recommended Practice R-11, Rounding Method.

(f) *Evaluation of Work.* When the PF of a process is 0.75 or greater, the finished quantity of work represented by the process will be accepted at the appropriate pay factor. If the PF is less than 0.75, the Engineer may:

1. Require complete removal and replacement with specification material at the Contractor's expense; or

2. Where the finished product is found to be capable of performing the intended purpose and the value of the finished product is not affected, permit the Contractor to leave the material in place.

If the material is permitted to remain in place, the PF for the process will not be greater than 0.75. When condition red, as described in subsection 106.05(g), exists for any element, resolution and correction will be in accordance with Section 106. Material which the Engineer determines is defective may be

isolated and rejected without regard to sampling sequence or location within a process.

Table 105-2
"W"AND "V" FACTORS FOR VARIOUS ELEMENTS

Hot Mix Asphalt		
Element	**V Factor**	**W Factor**
2.36 mm (No. 8) mesh and larger sieves	2.80	N/A
600 µm (No. 30) mesh sieve	1.80	N/A
75 µm (No. 200) mesh sieve	0.80	N/A
Gradation	N/A	15
Asphalt Content	0.20	25
In-place Density	1.10	45
Joint Density	1.60	15

Table 105-3
FORMULAS FOR CALCULATING PF BASED ON Pn

Pn	When Pn as shown at left is 3 to 9, or greater than 200, use designated formula below to calculate Pay Factor, PF = ...,when Pn is 10 to 200, use formula (1) above:	Maximum PF
3	$0.31177 + 1.57878\ (QL/100) - 0.84862\ (QL/100)^2$	1.025
4	$0.27890 + 1.51471\ (QL/100) - 0.73553\ (QL/100)^2$	1.030
5	$0.25529 + 1.48268\ (QL/100) - 0.67759\ (QL/100)^2$	1.030
6	$0.19468 + 1.56729\ (QL/100) - 0.70239\ (QL/100)^2$	1.035
7	$0.16709 + 1.58245\ (QL/100) - 0.68705\ (QL/100)^2$	1.035
8	$0.16394 + 1.55070\ (QL/100) - 0.65270\ (QL/100)^2$	1.040
9	$0.11412 + 1.63532\ (QL/100) - 0.68786\ (QL/100)^2$	1.040
10 to 11	$0.15344 + 1.50104\ (QL/100) - 0.58896\ (QL/100)^2$	1.045
12 to 14	$0.07278 + 1.64285\ (QL/100) - 0.65033\ (QL/100)^2$	1.045
15 to 18	$0.07826 + 1.55649\ (QL/100) - 0.56616\ (QL/100)^2$	1.050
19 to 25	$0.09907 + 1.43088\ (QL/100) - 0.45550\ (QL/100)^2$	1.050
26 to 37	$0.07373 + 1.41851\ (QL/100) - 0.41777\ (QL/100)^2$	1.055
38 to 69	$0.10586 + 1.26473\ (QL/100) - 0.29660\ (QL/100)^2$	1.055
70 to 200	$0.21611 + 0.86111\ (QL/100)$	1.060
$\geq$ 201	$0.15221 + 0.92171\ (QL/100)$	1.060

(g) *Process I/DP Computation.*

$$I/DP = (PF - 1)(QR)(UP)(W/100)$$

Where:
- I/DP = Incentive or Disincentive Payment
- PF = Pay Factor
- QR = Quantity in Tons of HMA Represented by the Process
- UP = Unit Bid Price of Asphalt Mix
- W = Element factor from Table 105-2

When AC is paid for separately UP shall be:

$$UP=[(Ton_{HMA})(UP_{HMA})+(Ton_{AC})(UP_{AC})]/Ton_{HMA}$$

Where:
- Ton_{HMA} = Tons of Asphalt Mix
- UP_{HMA} = Unit Bid Price of Asphalt Mix
- Ton_{AC} = Tons of Asphalt Cement
- UP_{AC} = Unit Bid Price of Asphalt Cement

For the joint density element:

$$UP = UP_{HMA}$$

Where: UP_{HMA} is as defined above

When AC is paid for separately UP shall be:

$$UP=[(BTon_{HMA})(BUP_{HMA})+(BTon_{AC})(BUP_{AC})]/BTon_{HMA}$$

Where:
- $BTon_{HMA}$ = Bid Tons of Asphalt Mix
- BUP_{HMA} = Unit Bid Price of Asphalt Mix
- $BTon_{AC}$ = Bid Tons of Asphalt Cement
- BUP_{AC} = Unit Bid Price of Asphalt Cement

(h) *Element I/DP.* The I/DP for an element shall be computed by accumulating the process I/DPs for that element.

(i) *I/DP for a Mix Design.* The I/DP for a mix design shall be computed by accumulating the process I/DPs for the asphalt content, in-place density, and gradation elements for that mix design. The accumulated quantities of materials for each element must be the same at the end of I/DP calculations for a mix design.

(j) *Project I/DP.* The I/DP for the project shall be computed by accumulating the mix design I/DPs and the joint density I/DPs. The accumulated quantities of materials for each element must be the same at the end of I/DP calculations for the project.

105.06 Conformity to Contract of Portland Cement Concrete Pavement. Conformity to the Contract of all Portland Cement Concrete Pavement, Item 412, will be determined in accordance with the following:

When the Engineer finds that the materials furnished, the work performed, or the finished product does not conform with the Contract, or the Pay Factor (PF) for an element's process is less than 0.75 but that reasonably acceptable work has been produced, the Engineer will determine the extent of the work that will be accepted and remain in place. The Engineer will use a Contract Modification Order to document the justification for allowing the work to remain in place and the price adjustment that will be applied.

When the Engineer finds the materials furnished, work performed, or the finished product is not in conformity with the Contract, or the PF for an element's process is less than 0.75 and has resulted in an inferior or unsatisfactory product, the work or material shall be removed and replaced or otherwise corrected by and at the expense of the Contractor. When the PF for any process is 0.75 or greater, the finished quantity of work represented by the process will be accepted at the calculated pay factor.

Materials will be sampled and tested by the Contractor and the Department in accordance with subsection 106.06 and with procedures contained in the Department's Field Materials Manual. The approximate quantity represented by each sample will be as set forth in subsection 106.06, Tables 106-2 and 106-3. Additional samples may be selected and tested at the Engineer's discretion.

(a) Incentive and Disincentive Payments (I/DP) will be made based on a statistical analysis that yields Pay Factors (PF) and Quality Levels (QL). The PF and QL will be made based on test results for the three elements of compressive strength, sand equivalent, and pavement thickness (compressive strength criteria) or the two elements of flexural strength and pavement thickness (flexural strength criteria). The Contractor shall choose whether compressive strength or flexural strength criteria will be used and indicate the choice in writing to the Engineer when the initial proposed mix design is submitted to the Engineer. Once the selection of acceptance criteria is made, they shall remain the acceptance criteria for all processes for the duration of the project.

    Incentive or Disincentive payment will not be made for thickness of concrete pavement furnished by the Contractor and placed by others.

    If the Contractor chooses compressive strength criteria then the QL will be calculated for the elements of compressive strength, sand equivalent and pavement thickness on a process basis. If the Contractor chooses flexural strength criteria, then the QL will be calculated for the elements of flexural strength and pavement thickness on a process basis. A separate process will be established for an element when a change in the process affects that element. A process will consist of the test results from a series of random samples. Test results determined to have sampling or testing errors will not be used. All materials produced will be assigned to a

process. A change in process is defined as a change that affects the element involved. Changes in mix design, material source, design pavement thickness, or the method being utilized to place the pavement are considered changes in process. The following is provided to clarify changes in processes for each element:

1. Construction of mainline pavement, including the shoulders if placed with the mainline, is a single process, providing there are no changes in process as described above.
2. Construction of ramps, acceleration and deceleration lanes, shoulders placed separately and areas requiring hand work are considered separate processes.
3. A change in the mix design is a process change for the compressive strength element or the flexural strength element, but is not a process change for the pavement thickness element.

(b) When it is necessary to represent material by one or two tests, each individual test shall have a PF computed in accordance with the following:

If the value of the test is at or above the lower tolerance limit, then PF = 1.000. If the value of the test is below the lower tolerance limit, then:

$$PF = 1.00 - [0.25(T_L - T_0)/V]$$

where: PF = pay factor.
V = V factor from Tables 105-6 and 105-7.
T_0 = the individual test value.
T_L = lower tolerance limit.

(c) The following procedures will be used to compute Incentive and Disincentive Payments (I/DP), quality levels (QL), and pay factors (PF) for processes represented by three or more tests:

1. Quality Level (QL) will be calculated according to CP-71.
2. Compute the PF for the process. When the process has been completed, the number of tests (Pn) it includes shall determine the formula to be used to compute the final pay factor in accordance with the following:

A. For compressive strength and pavement thickness:
When $3 \leq Pn \leq 5$
If $QL \geq 85$, then $PF = 1.00 + (QL - 85)0.001333$
If $QL < 85$, then $PF = 1.00 + (QL - 85)0.005208$

When $6 \leq Pn \leq 9$
If $QL \geq 90$, then $PF = 1.00 + (QL - 90)0.002000$
If $QL < 90$, then $PF = 1.00 + (QL - 90)0.005682$

When $10 \leq Pn \leq 25$
If $QL \geq 93$, then $PF = 1.00 + (QL - 93)0.002857$
If $QL < 93$, then $PF = 1.00 + (QL - 93)0.006098$

When $Pn \geq 26$
If $QL \geq 95$, then $PF = 1.00 + (QL - 95)0.004000$
If $QL < 95$, then $PF = 1.00 + (QL - 95)0.006757$

B. For flexural strength:
When $3 \leq Pn \leq 5$
If $QL \geq 85$, then $PF = 1.00 + (QL - 85)0.002000$
If $QL < 85$, then $PF = 1.00 + (QL - 85)0.005208$

When $6 \leq Pn \leq 9$
If $QL \geq 90$, then $PF = 1.00 + (QL - 90)0.003000$
If $QL < 90$, then $PF = 1.00 + (QL - 90)0.005682$

When $10 \leq Pn \leq 25$
If $QL \geq 93$, then $PF = 1.00 + (QL - 93)0.004286$
If $QL < 93$, then $PF = 1.00 + (QL - 93)0.006098$

When $Pn \geq 26$
If $QL \geq 95$, then $PF = 1.00 + (QL - 95)0.006000$
If $QL < 95$, then $PF = 1.00 + (QL - 95)0.006757$

C. For sand equivalent:
When $3 \leq Pn \leq 5$
If $QL \geq 85$, then $PF = 1.00 + (QL - 85)0.000667$
If $QL < 85$, then $PF = 1.00 + (QL - 85)0.005208$

When $6 \leq Pn \leq 9$
If $QL \geq 90$, then $PF = 1.00 + (QL - 90)0.001000$
If $QL < 90$, then $PF = 1.00 + (QL - 90)0.005682$

When $10 \leq Pn \leq 25$
If $QL \geq 93$, then $PF = 1.00 + (QL - 93)0.001429$
If $QL < 93$, then $PF = 1.00 + (QL - 93)0.006098$

When $Pn \geq 26$
If $QL \geq 95$, then $PF = 1.00 + (QL - 95)0.002000$
If $QL < 95$, then $PF = 1.00 + (QL - 95)0.006757$

3. Compute the I/DP for the process:

$$I/DP = (PF-1)(QR)(UP)$$

where: QR = Quantity Represented by the process.
UP = Unit Price bid for the Item.

The total I/DP for an element shall be computed by accumulating the individual I/DP for each process of that element.

(d) As acceptance test results become available, they will be used to calculate accumulated QL and Incentive and Disincentive Payments (I/DP) for each element and for the item. The Contractor's test results and the accumulated calculations shall be made available to the Engineer upon request. The Engineer's test results and the calculations will be made available to the Contractor as early as reasonably practical. Numbers from the calculations shall be carried to significant figures and rounded according to AASHTO Standard Recommended Practice R-11, Rounding Method.

I/DP will be made to the Contractor in accordance with subsection 412.24(a). During production, interim I/DP will be computed for information only. The Pn will change as production continues and test results accumulate. The Pn at the time an I/DP is computed shall determine the formula to be used.

(e) The Contractor will not have the option of accepting a price reduction or disincentive in lieu of producing specification material. Continued production of non-specification material will not be permitted. Material which is obviously defective may be isolated and rejected without regard to sampling sequence or location within a process.

Table 105-4
"V" FACTORS AND INCENTIVE PAYMENTS
COMPRESSIVE STRENGTH CRITERIA

Element	V Factor	Maximum Incentive Payment	Lower Tolerance Limit, T_L
Compressive Strength	400 psi	2.00%	28 day strength, Table 601-1
Pavement Thickness	0.4 inch	2.00%	Plan Thickness-0.4"
Sand Equivalent	4%	1.00%	80%

Table 105-5
"V" FACTORS AND INCENTIVE PAYMENTS
FLEXURAL STRENGTH CRITERIA

Element	V Factor	Maximum Incentive Payment	Lower Tolerance Limit, T_L
Flexural Strength	50 psi	3.00%	570 psi
Pavement Thickness	0.4 inch	2.00%	Plan Thickness-0.4"

105.07 Conformity to Roadway Smoothness Criteria. Roadway smoothness shall be tested as described below. Roadway smoothness testing will not be measured and paid for separately, but shall be included in the work.

(a) Transverse Pavement Surface Smoothness. The finished transverse surface elevation of the pavement will be measured using a 10 foot straightedge.

The Contractor shall furnish an approved 10 foot straightedge and depth gauge and provide an operator to aid the Engineer in testing the finished pavement surface. Areas to be measured shall be as directed by the Engineer. Areas showing high spots of more than $^{3}/_{16}$ inch in ten feet shall be marked and diamond ground until the high spot does not exceed $^{3}/_{16}$ inch in ten feet. Additional diamond grinding shall be performed as necessary to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from and parallel to the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins and ends at lines normal to the pavement centerline within the ground area. All ground areas shall be neat rectangular areas of uniform surface.

(b) Longitudinal Pavement Surface Smoothness. Pavement surfaces shall be tested and evaluated for longitudinal smoothness as described herein.

1. Testing Procedure (General). The longitudinal surface smoothness of the pavement shall be tested using the profilograph method described below.

The Contractor shall determine a Profile Index (PI) in inches per mile for each section of finished pavement surface. A pavement section is defined as a continuous area of finished pavement 0.1 mile in length and one lane 12 feet in width. A partial section resulting from an interruption of the continuous pavement surface is subject to the same evaluation as a whole section.

Each profilograph shall be certified in accordance with CP 73 and have a certification sticker which includes the date of certification, the type of filter, and the filter setting used when the profilograph was certified.

The Project Engineer may require a profilograph to be recertified at any time. If the profilograph being recertified meets the criteria for certification on the first try the costs of recertification will be paid as extra work. If not, the cost of the recertification shall be borne by the Contractor.

The Contractor shall provide, operate, and maintain on the project, an approved profilograph that meets the following requirements:

The profilograph shall be equipped with:

(1) A microcomputer capable of automatically reducing the recorded profilograph data and downloading it to a disk. The data on the disk shall be

formatted to permit evaluation of the data by the Engineer. If software is required for this evaluation, the Contractor shall provide copies of the software for the Engineer's use.

(2) A printer compatible with the microcomputer that prints a profilogram with the required data.

The Contractor shall demonstrate to CDOT project personnel the calibration, operation and maintenance of the profilograph that will be used on the project. The demonstration shall be conducted on the project prior to measurement.

The profilograph shall be operated at a speed recommended by the Manufacturer. To ensure that these speeds are maintained, the profilograph may be propelled by a motorized vehicle which is capable of maintaining the correct speed. The motorized vehicle shall propel the profilograph in accordance with the Manufacturer's recommendations without interfering with traffic or the operation of the profilograph.

The profilograph shall be calibrated after transportation and before each day's use in accordance with the manufacturer's instructions.

As directed by the Engineer, additional profiles shall be taken to retest paved surfaces that have received corrective work, to check previously submitted data or to identify the limits of irregularities.

The profile shall include transverse joints when pavement is placed on both sides of the joint. When pavement is placed on only one side of the joint the profile shall begin 25 feet from the joint. One sided joints shall be profiled to determine conformity to the bump specification.

The Contractor shall notify the Engineer prior to beginning each profilograph operation.

A Department employee or designated representative will:

(1) Witness and document the calibration of the profilograph prior to each test.

(2) Accompany the Contractor's operator during the entire profilograph testing procedure.

(3) Immediately take possession of the profilogram and disk containing the results and document the inspection by signing the profilogram report.

(4) Document that the testing has been completed in accordance with the specification.

Each profilogram shall include the following information:

(1) Project subaccount number.
(2) Project number.
(3) Project location.
(4) Date.
(5) Lane and wheel path profiled.
(6) Operator's signature.
(7) Profile Index in inches per mile for each 0.1 mile section.

Each profilogram trace shall be marked by the computer or the Contractor to indicate the following:

(1) Beginning and ending stations.
(2) Intermittent reference stations every 0.1 mile.
(3) Beginning and ending reference points.
(4) Horizontal equations stations.
(5) Construction joints.
(6) Location of bridge abutments.
(7) Net total linear feet of each lane.
(8) Net square yards of each lane.
(9) Bumps: when the perpendicular distance from a 25 foot baseline to the profile exceeds 0.4 inch.

The Contractor shall determine a Profile Index for each 0.1 mile section of completed pavement. The Profile Index shall consist of two profiles taken 3 feet from and parallel to the edge of each lane. The two profiles for each section shall be averaged to determine the Profile Index.

The entire length of each through lane, climbing lane and passing lane including bridge approaches and bridge decks from the beginning to the end of the project shall be profiled. Shoulders, ramps, tapers, turn slots, acceleration lanes, deceleration lanes, and medians shall not be profiled and will not be subject to incentive/ disincentive adjustments. The profile of the entire length of a lane may be taken at one time or the lane may be profiled in increments. Profiles may be taken with or against stationing.

All other longitudinal pavement surfaces will be measured using a 10 foot straightedge. The Contractor shall furnish an approved 10 foot straightedge and depth gauge and provide an operator to aid the Engineer in testing the finished pavement surface. Areas to be measured shall be as directed by the Engineer. Areas showing high spots of more $^{3}/_{16}$ inch in ten feet shall be marked and diamond ground until the high spot does not exceed $^{3}/_{16}$ inch in ten feet. Additional diamond grinding shall be performed as necessary to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from and parallel to the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins

and ends at lines normal to the pavement centerline within the ground area. All ground areas shall be neat rectangular areas of uniform surface.

When both new pavement and a new bridge are being constructed on a project, the profile of the area 25 feet each side of every bridge expansion device (joint) shall be deleted from the profile before the Profile Index (PI) is determined. Incentive and disincentive payments will not be made for this area. All bumps that exceed 0.4 inch in 25 feet shall be diamond ground until the bump does not exceed 0.4 inch in 25 feet. Diamond grinding will not be measured and paid for separately, but shall be included in the work.

For all other projects, the profile of the area 25 feet each side of every bridge expansion device (joint) shall be deleted from the profile before the Profile Index (PI) is determined. Incentive and disincentive payments will not be made for this area. If the Engineer determines that corrective work is required in this area, payment will be made in accordance with subsection 109.04.

2. Smoothness testing procedures. The Contractor shall profile the surface of the pavement placed on the second day of paving as soon as possible after completion of this paving. Production shall be suspended if:

   (1) The Profile Index for any 0.1 mile section exceeds the Profile Index which requires corrective work on pavements subject to Inches/Mile requirements; or
   (2) The Profile Index for any 0.1 mile section exceeds the original Profile Index on pavements subject to Percent Improvement (%I) requirements.

   Production shall remain suspended until the problem is identified and corrected. Each time production is suspended, corrective actions shall be proposed in writing by the Contractor and approved in writing by the Engineer before production may resume.

   When production is resumed, the Contractor shall profile the pavement placed on the first day of paving after paving resumes and the conditions above for suspension of work shall apply.

   The Contractor shall take sufficient profiles during construction to control the paving process.

   The Contractor shall profile the finished pavement surface and determine a Profile Index using a 0.1 inch blanking band.

   When incentive and disincentive payments are based on percent improvement, the Contractor shall also profile the original pavement surface and determine a Profile Index for each 0.1 mile section, before commencing work, using a 0.1 inch blanking band.

3. Bumps. All bumps that exceed 0.4 inch in 25 feet shall be diamond ground until the bump does not exceed 0.4 inch in 25 feet. Additional diamond grinding shall be performed as necessary to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from and parallel to the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins and ends at lines normal to the pavement centerline within the ground area. All ground areas shall be neat rectangular areas of uniform surface.

   The exact location of each bump shall be determined with a profilograph and the location marked on the pavement before diamond grinding commences. The area that is diamond ground shall also be checked with a profilograph after grinding is complete to ensure that the area now meets specifications.

   Diamond grinding of bumps, including all necessary traffic control, shall be completed at the Contractor's expense.

   On asphalt pavements, the diamond grinding shall not reduce planned pavement thickness by more than 0.3 inches and the entire ground area shall be covered with a fog seal coat when grinding is complete.

   When longitudinal tining is required on concrete pavement, the pavement shall be grooved to restore the longitudinal texture, whenever the length of the ground area exceeds 45 feet. It will not be necessary to groove ground areas that are less than 45 feet in length.

   When bump grinding on concrete pavement occurs where a core for determining pavement thickness has been previously taken, another core shall be taken after the bump grinding has been completed. Joint sealant that has been damaged by bump grinding on concrete pavement shall be repaired or replaced at the Contractor's expense in accordance with Standard Plan M-412-1 and subsection 412.18

4. Corrective Work. When the Contract specifies pavement smoothness based on inches per mile or the criteria for determining if corrective work is required is specified in Table 105-6. For asphalt pavements, when the Contract specifies pavement smoothness based on percent improvement, the criteria for determining if corrective work is required is specified in Table 105-7.

   If the first Profile Index for a 0.1 mile section taken on the finished pavement surface exceeds the specified limit for corrective work, the lane shall be reprofiled and another Profile Index determined after all bumps exceeding 0.4 inch in 25 feet have been diamond ground. Corrective work will be required if the Profile Index still exceeds the specified limit.

If corrective work is required, the Contractor shall submit a written corrective work proposal to the Engineer, which shall include the methods, and procedures that will be used. The Contractor shall not commence corrective work until the methods and procedures have been approved in writing by the Engineer.

The Engineer's approval shall not relieve the Contractor of the responsibility of producing work in conformity with the specifications.
When longitudinal tining is required on concrete pavement, the pavement shall be grooved to restore the longitudinal texture, whenever the length of the ground area exceeds 45 feet. It will not be necessary to groove ground areas that are less than 45 feet in length.

Use of a rotomill, diamond grinder, feathering, scab patching, or any combination thereof will not be permitted for corrective work on asphalt pavements.

Corrective work on asphalt pavements shall consist of an approved overlay or removal and replacement. Corrective work on asphalt pavements shall conform to the following conditions:

A. Removal and replacement. The pavement in areas requiring corrective work shall be removed the full width of the lane and the full thickness of the course in accordance with subsection 202.09 Removal of Asphalt Mat (Planing).

   The removal area shall begin and end with a transverse butt joint which shall be constructed with a transverse saw cut perpendicular to centerline. All replacement shall be made with approved hot bituminous mixtures that meet all contract requirements. Replacement material shall be placed in sufficient quantity so the finished surface will conform to grade and smoothness requirements. The corrective area shall be compacted to the specified density.

B. Overlay. The overlay shall cover the full width of the pavement including shoulders. The area overlaid shall begin and end with a transverse butt joint which shall be constructed with a transverse saw cut and asphalt removal. All material shall be approved hot bituminous mixtures that meet all contract requirements. The overlay shall be placed so the finished surface will conform to grade and smoothness requirements. The overlayed area shall be compacted to the specified density. The overlay thickness shall be equivalent to that of the final pass made in accordance with the plans and specifications.

When the corrective work is complete, the Contractor shall profile the corrective work area and determine a Profile Index for each 0.1 mile section.. Bumps which exceed 0.4 inch in 25 feet shall be diamond ground in the corrective work area.

If the first Profile Index for a 0.1 mile section taken on the finished pavement surface in the corrective work area exceeds the specified limit for corrective work, the lane shall be reprofiled and another Profile Index for each 0.1 mile section determined after all bumps exceeding 0.4 inch in 25 feet have been diamond ground. Additional corrective work in accordance with this specification will be required if the Profile Index for a 0.1 mile section exceeds the specified limit.
Regardless of the corrective method used, the final product shall provide a pavement surface equal to adjacent sections not requiring corrective work.

All corrective work, including all necessary traffic control, shall be at the Contractor's expense.

When any corrective work on concrete pavement occurs where a core for determining pavement thickness has been previously taken, another core shall be taken after the corrective work has been completed. Joint sealant that has been damaged by bump grinding on concrete pavement shall be repaired or replaced at the Contractor's expense in accordance with Standard Plan M-412-1 and subsection 412.18.

5 Final acceptance and incentive and disincentive payments for pavement smoothness will be made on a square yard basis in accordance with the following:

A. When the pavement is subject to an incentive/disincentive payment for pavement smoothness based on inches per mile the following applies:

Incentive payments will be based on the Profile Index (PI) for each 0.1 mile section using a 0.1 inch blanking band before diamond grinding of bumps or any corrective work has been done.

Disincentive payments will be based on the Profile Index (PI) for each 0.1 mile section using a 0.1 inch blanking band after the bumps that exceed 0.4 inch in 25 feet have been diamond ground and before any other corrective work has been completed.

Incentive and disincentive payments for Pavement Smoothness will be made in accordance with Table 105-6.

Table 105-6
PAVEMENT SMOOTHNESS
(INCHES PER MILE)
0.1 INCH BLANKING BAND

Pavement Smoothness Category[1]	Incentive Payments[2]			Disincentive Payments[3]			Corrective Work Required[4] [5]
	PI (in./mi.)	Asphalt $/Sq. Yd.	Concrete $/Sq. Yd.	PI (in./mi.)	Asphalt $/Sq. Yd.	Concrete $/Sq. Yd.	PI (in./mi.)
I	8 or less	$0.16	$1.40	22.1-24	-$0.16	-$1.40	24.1 or more
RURAL	8.1-10	$0.12	$1.05	20.1-22	-$0.12	-$1.05	
INTERSTATE	10.1-12	$0.08	$0.70	18.1-20	-$0.08	-$0.70	
	12.1-14	$0.04	$0.35	16.1-18	-$0.04	-$0.35	
	14.1-16	$0.00	$0.00				
II	8 or less	$0.16	$1.40	25.6-28	-$0.16	-$1.40	28.1 or more
ALL OTHER	8.1-10.6	$0.12	$1.05	23.1-25.5	-$0.12	-$1.05	
HIGHWAYS WITH	10.7-13.3	$0.08	$0.70	20.6-23	-$0.08	-$0.70	
SPEED LIMITS	13.4-16	$0.04	$0.35	18.1-20.5	-$0.04	-$0.35	
EQUAL TO OR	16.1-18	$0.00	$0.00				
GREATER THAN							
45 MPH							
III[6]	8 or less	$0.16	$1.40	29.1-34	-$0.16	-$1.40	34.1 or more
ALL HIGHWAYS	8.1-11.7	$0.12	$1.05	26.1-29	-$0.12	-$1.05	
WITH SPEED	11.8-15.4	$0.08	$0.70	23.1-26	-$0.08	-$0.70	
LIMITS LESS	15.5-18.0	$0.04	$0.35	20.1-23	-$0.04	-$0.35	
THAN 45 MPH	18.1-20	$0.00	$0.00				

Footnotes on page 52

Footnotes for Table 105-6

[1]The pavement smoothness category will be shown on the plans.

[2]Incentive Payments will be based on the Profile Index (PI) for each 0.1 mile section before diamond grinding of bumps or any corrective work has been done.

[3]Disincentive payments will be based on the Profile Index (PI) for each 0.1 mile section after bumps have been diamond ground and before any other corrective work has been completed.

[4]Asphalt pavement - A disincentive of $0.16/sq. yd. will be applied in addition to the corrective work.

[5]Concrete pavement - A disincentive of $1.40/sq. yd. will be applied in addition to the corrective work

[6]a.This category applies to the following asphalt pavement construction: (1) new construction; (2) complete reconstruction, including replacement of existing curb and gutter; (3) construction of more than one layer; (4) construction of one layer over an intermediate treatment; and (5) urban construction where smoothness is not affected by existing curb and gutter or numerous intersections. All other asphalt pavement construction where the speed limit is less than 45 mph is subject to percent improvement incentive or disincentive in accordance with Table 105-7. b. This category applies to the following concrete pavement construction: (1) new construction; and (2) complete reconstruction. All other concrete pavement construction where the speed limit is less than 45 mph is not subject to incentive or disincentive; however, all bumps that exceed 0.4 inch/25 feet must be diamond ground until they are less than 0.4 inch/25 feet in accordance with these specifications.

B. When the pavement is subject to an incentive or disincentive payment for asphalt pavement smoothness based on the Percentage of Improvement (%I), the following applies:

Incentive payments will be based on the %I of the Profile Index (PI) for each 0.1 mile section on the final paved surface before diamond grinding of bumps or any corrective work has been done compared to the Profile Index (PI) for each 0.1 mile section of the original surface.

Disincentive payments will be based on the %I of the Profile Index (PI) for each 0.1 mile section on the final paved surface after the bumps that exceed 0.4 inch in 25 feet have been diamond ground and before any other corrective work has been completed compared to the Profile Index (PI) for each 0.1 mile section of the original surface.

The %I will be calculated as follows:

$$\%I = \frac{(\text{PI OF ORIGINAL SURFACE} - \text{PI OF FINAL SURFACE}) \cdot 100}{\text{PI OF ORIGINAL SURFACE}}$$

Incentive and disincentive payments for Pavement Smoothness will be made in accordance with Table 105-7.

Disincentives and corrective work will not be required for a 0.1mile section if the final Profile Index (PI) after grinding bumps and before any other corrective action is equal to or less than the PI shown in Table 105-8.

Table 105-7
ASPHALT PAVEMENT SMOOTHNESS
PERCENT IMPROVEMENT (%I)
0.1 INCH BLANKING BAND

Incentive Payments[1]		Disincentive Payments[2]		Corrective Work Required[3]
%I	$/Sq.Yd.	%I	$/Sq.Yd.	%I
More than 75.0	$0.16	20.1-26.2	-$0.16	20.0 OR LESS
70.1-75.0	$0.12	26.3-32.5	-$0.12	
65.1-70.0	$0.08	32.6-38.8	-$0.08	
55.1-65.0	$0.04	38.9-45.0	-$0.04	
45.1-55.0	$0.00			

[1]Incentive payments will be based on the Profile Index (PI) for each 0.1 mile section before diamond grinding of bumps or any corrective work has been done.[2]Disincentive payments will be based on the Profile Index (PI) for each 0.1 mile section after bumps have been diamond ground and before any other corrective work has been completed.[3]A disincentive of $0.16/sq. yd. will be applied in addition to the corrective work.

Table 105-8
PI FOR NO DISINCENTIVE OR CORRECTIVE WORK
FOR PERCENT IMPROVEMENT (%I)

Pavement Smoothness Category	Description	PI
I	Rural Interstate	16 inches/mile
II	All other highways with speed limits greater than or equal to 70 km/hour (45 MPH)	28 inches/mile
III	All highways with speed limits less than 70 km/hour (45 MPH)	20 inches/mile

(c) Smoothness Requirements for the work items: Removal of Asphalt Mat (Planing), Heating and Scarifying, Cold Bituminous Pavement Recycle, Heating and Repaving, and Heater Remixing.

1. Testing procedures. A Profile Index (PI) for each 0.1 mile section shall be determined on the original pavement surface prior to beginning the work, using a 0.2 inch blanking band in accordance with CP 64.

   A Profile Index (PI) for each 0.1 mile section shall be determined on the pavement surface after the work is complete using a 0.2 inch blanking band.

2. Final pavement smoothness acceptance will be made as follows:

   0.1 mile sections with a final Profile Index (PI) that is greater than the Profile Index prior to performing the work shall be corrected by a method approved in writing by the Engineer. Corrective work shall be such that the resulting final PI is equal to or less than the initial PI. All corrective work shall be at the Contractor's expense, and shall include traffic control, and all additional hot bituminous pavement required.

105.08 Coordination of Plans, Specifications, Supplemental Specifications, and Special Provisions. These specifications, the supplemental specifications, the plans, special provisions, and all supplementary documents are essential parts of the Contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work.

In case of discrepancy the order of precedence is as follows:

(a) Special Provisions
    1. Project Special Provisions
    2. Standard Special Provisions
(b) Plans
    1. Detailed Plans
    2. Standard Plans

    Calculated dimensions will govern over scaled dimensions.
(c) Supplemental Specifications
(d) Standard Specifications

The Contractor shall not take advantage of any apparent error or omission in the Contract. If the Contractor discovers an error or omission, the Engineer shall immediately be notified. The Engineer will make corrections and interpretations as necessary to fulfill the intent of the Contract.

105.09 Cooperation by Contractor. The Contractor will be supplied with a minimum of six sets of contract documents.

The Contractor shall give the work the constant attention necessary to facilitate progress and shall cooperate with the Engineer, inspectors, and other contractors.

The Contractor shall have on the project, at all times that work is being performed, a competent superintendent capable of reading and understanding the contract documents and experienced in the type of work being performed. The superintendent will receive instructions from the Engineer and shall be authorized to act for the Contractor on the project and to execute orders or directions of the Engineer without delay. The superintendent shall promptly supply, irrespective of the amount of work sublet, materials, equipment, tools, labor, and incidentals to complete the Contract.

105.10 Cooperation with Utilities. The Department will notify all utility companies, pipe line owners, or other parties affected, and have all necessary adjustments of the public or private utility fixtures, pipe lines, and other appurtenances within or adjacent to the limits of construction made as soon as practicable.

Water lines, gas lines, wire lines, service connections, meter and valve boxes, light standards, cableways, signals, and all other utility facilities within the limits of the proposed construction are to be relocated or adjusted at the owner's expense unless otherwise provided in the Contract. The Contractor shall cooperate with the utility owners in their removal and relocation operations, so that progress is expedited, duplication of work is minimized and service interruptions are avoided.

The Contract will indicate those utility items which are to be relocated or adjusted by the utility owner or which are to be relocated or adjusted by the Contractor. The Contractor shall consider in the bid proposal all of the permanent and temporary utility facilities in their present or relocated positions as shown in the Contract and as revealed by site investigation. Utility delays due to changes which are the responsibility of the Contractor will be considered nonexcusable delays. The Contractor and the Engineer shall meet with the utility owners as often as necessary to coordinate and schedule relocations or adjustments. Additional compensation will not be allowed for foreseeable coordination, inconvenience, or damage sustained due to interference from the utility facilities or the removal or relocation operations as indicated in the Contract. Delays shall be dealt with in accordance with subsection 108.07.

If utility facilities or appurtenances are found that are neither identified in the Contract, nor revealed by site investigation, the Engineer will determine whether adjustment or relocation of the utility is necessary. The Engineer will make arrangements with either the utility owner or the Contractor to accomplish necessary adjustments or relocations when not otherwise provided for in the Contract. Extra work will be considered for payment in accordance with subsection 104.03. Consideration for delays shall be in accordance with subsection 108.07(d).

Where the Contractor's operations are adjacent to properties of railroad, telegraph, telephone, power, or other utility companies, to which damage might result in considerable expense, loss, or inconvenience, work shall not commence until arrangements for the protection of the utilities have been made.

If water or utility services are interrupted, the Contractor shall promptly notify the owner and shall cooperate in the restoration of service. Repair work shall be continuous until the service is restored. Work shall not be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

105.11 Cooperation Between Contractors. The Department reserves the right to contract for and perform other or additional work on or near the work covered by the Contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work without interfering or hindering the progress or completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with the Contract and shall protect and save harmless the Department from any and all damages or claims that may arise because of inconvenience, delay, or loss because of the presence and operations of Contractors working within the limits of the same or adjacent project.

105.12 Construction Stakes, Lines and Grades. Construction work shall not be performed until adequate lines and grades have been established by the Department or by the Contractor.

(a) *Contractor Surveying.* When the bid schedule contains pay item 625, Construction Surveying, the Department will provide control points and bench marks as described in the Contract. The Contractor shall furnish and set construction stakes establishing lines and grades in accordance with the provisions of Section 625. The Engineer may order extra surveying which will be paid for at the established rate of $100 per hour.

(b) *Department Surveying.* When the bid schedule does not contain pay item 625, Construction Surveying, the Engineer will furnish one set of construction stakes and marks establishing lines and grades as described below for proper prosecution of the work.

Roadway staking will include stakes for; fence, centerline, slopes, grades (bluetops), curb and gutter, sidewalk, and median barrier. Grade stakes for finished subgrade will not be set until the grade established by the slope stakes is constructed to within 0.3 foot of the finished subgrade elevation.

Minor structures and retaining wall staking will be limited to stakes establishing line and grade by using offset line and grade stakes.

Major structures staking and references will be limited to centerlines (or work lines or control lines) as shown on the plans, appropriate offset lines and grades;

and elevations set for footings, piers, pier caps, abutments, bottom of deck grades and finish deck screed grades.

It will be the responsibility of the Contractor to use these references and marks and establish any additional control and layout necessary for the proper prosecution of the work in its final location. The Contractor shall be responsible for the accuracy of all the vertical and horizontal control it transfers and establishes. The Contractor shall, when required, provide access to abutments, piers or other locations, and shall furnish working platforms that meet applicable safety requirements so the Engineer's duties can be performed.

The Contractor shall be held responsible for the preservation of all stakes and marks, and if any are destroyed, disturbed or removed by the Contractor, subcontractors, or suppliers, the cost of replacing them will be charged against the Contractor and will be deducted from the payment for the work at the rate of $100 per hour.

It is the responsibility of the Contractor to perform all required layout work which shall include, but will not be limited to the following:

(1) Piling locations and cut off elevation.
(2) Girder seats on piers and abutments.
(3) Bolt locations and patterns.
(4) Construction sign locations.
(5) Guardrail.

The Engineer reserves the right to inspect all staking and work in place to insure conformance with the Contract. A minimum of two working days will be required as advance notice to the Engineer to provide project control staking.

105.13 Authority and Duties of the Project Engineer. The Project Engineer has immediate charge of the administration and engineering details of each construction project. The Project Engineer has the authority to exercise all duties and responsibilities of the Engineer contained in the Contract, except those specifically retained by the Chief Engineer. The CDOT Project Engineer and the CDOT Resident Engineer are the only representatives of the Chief Engineer authorized to sign Contract Modification Orders. The Project Engineer is responsible for initial decisions relating to Contractor claims for additional compensation or extension of contract time filed pursuant to subsection 105.21.

105.14 Duties of the Inspector. Inspectors employed by the Department are authorized to inspect all work done and materials furnished. This inspection may extend to all or any part of the work and to the preparation, fabrication or manufacture of the materials to be used. The inspector is not authorized to alter or waive the provisions of the Contract. The inspector is not authorized to issue instructions contrary to the provisions of the Contract or to act as foreman for the Contractor.

105.15 Inspection and Testing of Work. All materials and each part or detail of the work shall be subject to inspection by the Engineer. The Engineer shall be allowed access to all parts of the work and shall be furnished with information and assistance by the Contractor as required to make a complete and detailed inspection.

Before final acceptance of the work, the Contractor shall remove or uncover such portions of the finished work, as directed. After examination, by the Engineer, the Contractor shall restore the work to the standard required by the Contract. If the work thus exposed or examined proves acceptable, the uncovering, removing, or restoring the work will be paid for as extra work. If the work exposed or examined proves unacceptable, the uncovering, removing, or restoring the work shall be at the Contractor's expense.

Any work done or materials used without inspection by an authorized Department representative may be ordered uncovered, removed, or restored at the Contractor's expense.

When any unit of government or political subdivision, utility, or railroad corporation is to pay a portion of the cost of the work covered by a highway Contract, its respective representatives shall have the right to inspect the work. This inspection shall not make any unit of government or political subdivision, utility, or railroad corporation a party to the Contract, and shall not interfere with the rights of either party.

All inspections and all tests conducted by the Department are for the convenience and benefit of the Department. These inspections and tests do not constitute acceptance of the materials or work tested or inspected, and the Department may reject or accept any work or materials at any time prior to the inspection pursuant to subsection 105.20(b) whether or not previous inspections or tests were conducted by the Engineer or authorized representative.

105.16 Removal of Unacceptable Work and Unauthorized Work. Unacceptable work is work that does not conform to the requirements of the Contract.

Unacceptable work, resulting from any cause, found to exist prior to the final acceptance of the work, shall be removed and replaced in an acceptable manner at the Contractor's expense. The fact that the Engineer or an inspector may have overlooked the unacceptable work shall not constitute an acceptance of any part of the work.

Unauthorized work is work that was done without adequate lines and grades having been established by the Engineer or by the Contractor, work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans, or extra work done without the Engineer's authorization. Unauthorized work will not be paid for under the provisions of the Contract, and may be ordered removed or replaced at the Contractor's expense.

If the Contractor fails to comply with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable

work to be remedied or removed and replaced, and unauthorized work to be removed. The Engineer will deduct the costs from any monies due or to become due the Contractor.

105.17 Load Restrictions. The Contractor shall comply with all legal load restrictions in the hauling of equipment or materials on public roads beyond the limits of the project. A special permit will not relieve the Contractor of liability for damage resulting from the moving of equipment or material.

The operation of equipment or hauling loads which cause damage to structures, the roadway or any other construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited by the Contractor to methods and equipment that will prevent damage to the pavement structure. Loads will not be permitted on a concrete pavement or structure before the expiration of the curing period. The Contractor shall be responsible for the repair of all damage and related expense resulting from hauling equipment and construction operations.

If a vehicle's gross weight exceeds the legal limit, and the material transported by the vehicle is delivered to the project, the material and the scale ticket (certificate of correct weight) will not be accepted.

If a scale ticket from an overweight vehicle is inadvertently accepted and the material incorporated into the project, the Engineer will adjust the price for the overweight load as follows:

(1) The pay item quantity represented by the amount of material in excess of the legal weight will not be paid for.

(2) A price reduction will be assessed for the overweight portion of the load based on the following schedule.

Overweight (Pounds)	Price Reduction (Dollars)
0 - 3000	20
3001 - 4000	40
4001 - 5,000	82
5,001 - 6,000	130
6,001 - 7,000	226
7,001 - 8,000	376

Overweight cont. (Pounds)	Price Reduction cont. (Dollars)
8,001 - 9,000	582
9,001 - 10,000	842
Over 10,000	$870 plus $164 for each 1,000 lbs over 10,000 lbs

105.18 Maintenance During Construction. The Contractor shall maintain all work that is included in the Contract during construction and until final written acceptance, except as otherwise specified in subsection 107.17. This maintenance shall constitute continuous and effective work prosecuted with adequate equipment and forces so the roadway or structures are kept in satisfactory condition at all times.

In the case of a Contract involving the placement of material on or utilization of, a previously constructed subgrade, pavement structure or structure, the Contractor shall maintain the previously constructed work during all construction operations.

All cost of maintaining the contract work during construction and before final written acceptance will not be paid for separately, but shall be included in the work, except as otherwise specified in subsection 107.17.

105.19 Failure to Maintain Roadway or Structure. If the Contractor fails to comply with the provisions of subsection 105.18, the Engineer will immediately notify the Contractor of such noncompliance. If the Contractor fails to remedy unsatisfactory maintenance within 24 hours after receipt of such notice, the Engineer may immediately proceed to maintain the project, and the entire cost of this maintenance will be deducted from monies due or to become due the Contractor on the Contract.

105.20 Acceptance.

(a) *Partial Acceptance.* If, during the prosecution of the project, the Contractor satisfactorily completes a unit or portion of the project, such as a structure, an interchange, or a section of road or pavement that can be used advantageously for traffic, the Engineer may make final inspection of that unit. If the Engineer finds that the unit has been satisfactorily completed in compliance with the Contract, the Contractor may be relieved of further responsibility for that unit except as otherwise provided in subsection 107.16. Partial acceptance shall not void or alter any of the terms of the Contract.

(b) *Final Acceptance.* Upon notice from the Contractor of presumptive completion of the entire project, the Engineer will make an inspection. If the work provided for by the Contract has been satisfactorily completed, that inspection shall constitute the final inspection and the Engineer will notify the Contractor in writing of final acceptance indicating the date on which the project was inspected and accepted.

If the inspection discloses any unsatisfactory work, the Engineer will give the Contractor a written list of the work needing correction. Upon correction of the work, another inspection will be made. If the work has been satisfactorily completed, the Engineer will notify the Contractor in writing of the date of final inspection and acceptance. Final acceptance under this subsection does not waive any legal rights contained in subsection 107.21.

105.21 Disputes and Claims for Contract Adjustments. When the Project Engineer is a Consultant Project Engineer, actions, decisions, and determinations specified herein as made by the Project Engineer may be made by the Resident Engineer.

(a) Disputes include, but are not limited to, any disagreement resulting from a change, a delay, a change order, another written order, or an oral order from the Project Engineer, including any direction, instruction, interpretation, or determination by the Project Engineer. When a dispute occurs, the Contractor shall pursue resolution through the process set forth in this subsection. The Contractor shall:

1. Provide a written notice of protest to the Project Engineer before doing the work;

2. Supplement the written protest within 15 calendar days with a written statement providing the following:

   (1) The date of the protested order;
   (2) The nature of the order and circumstances which caused the protest;
   (3) The contract provisions supporting the protest;
   (4) The estimated dollar cost, if any, of the protested work and documentation supporting the estimate; and
   (5) An analysis of the progress schedule showing the schedule change or disruption if the Contractor is asserting a schedule change or disruption; and

3. Supplement the information provided in 2. above as necessary during the time the dispute continues.

Throughout protested work, the Contractor shall keep complete records of extra costs and time incurred. The Contractor shall permit the Project Engineer access to these and all other records needed for evaluating the protest as determined by the Project Engineer.

The Project Engineer will evaluate all protests. If the Project Engineer determines that a protest is valid, the Project Engineer will adjust payment for work or time by an equitable adjustment in accordance with subsection 108.07, 109.04, or 109.10. If the Project Engineer fails to provide satisfactory resolution, the Contractor may pursue the more formalized method for submitting a claim, as outlined below.

(b) All claims filed by the Contractor based upon: (1) work or materials not clearly defined in the Contract, (2) extra work not ordered by the Engineer in accordance with subsection 104.03, (3) extensions of time made pursuant to subsection 108.07, or (4) any other cause, resulting in requests for additional compensation or time, shall be governed by this subsection.

The Contractor and the Department agree that the dispute resolution process set forth in this subsection shall be exhausted in its entirety prior to initiation of litigation.

Failure to comply with the requirements set forth in this subsection shall bar the Contractor from any further administrative, equitable, or legal remedy.

(c) Upon discovery of any facts which formulate the basis of a potential claim, or upon unsatisfactory resolution of a dispute, the Contractor shall give written notice to the Project Engineer to enable the Department to obtain its independent evidence of these facts.

Within seven calendar days after the discovery of the facts giving rise to a claim, or after unsatisfactory resolution of a dispute, the Contractor shall notify the Project Engineer in writing of the intent to file a claim as described in subsection 105.21(b), unless written notice of protest was given in accordance with subsection 105.21(a). The Contractor's formal notification of intent to file a claim shall describe the contractual and legal basis of the claim and factual evidence supporting the claim.

If notice of protest or notice of intent to file claim are not properly given by the Contractor according to these specifications, the Contractor shall not be entitled to any additional compensation or extension of time for any cause related to the claim, including any act or failure to act by the Engineer. Any such claim based upon any cause will be considered invalid and will be denied by the Project Engineer on the basis that proper notifications, as required herein, were not given. The Contractor's prior and formal notifications of intent to file a claim and subsequent Department acknowledgment of those notifications shall not be construed as proving or substantiating the validity of the Contractor's claim as related to the contractual basis of the claim, factual information related to the claim, or cost, or amount of time extension related to the claim.

(d) When the Contractor provides written notification of intent to file a claim pursuant to subsection 105.21(c), the claim will be reviewed by the Project Engineer who will render a written decision to the Contractor to either affirm the claim as valid or deny the claim, in whole or in part, in accordance with the following procedure:

1. Within 60 days after project acceptance, the Contractor shall submit to the Project Engineer a complete claim package which represents the final position the Contractor wishes to have considered by the Department. The submitted claim package shall include all documents supporting such claim, regardless of whether such documents have been provided previously to the Department. All claims filed by the Contractor shall be in writing and in sufficient detail to enable the Engineer to ascertain the basis and amount of claim. As a minimum, the following information must accompany each claim submitted:

   A. A claim certification containing the following language:

CONTRACTOR'S CLAIM CERTIFICATION

Under penalty of law for perjury or falsification, the undersigned, (name)_____, _____(title)_____, of _____(company) hereby certifies that the claim of $_____ for extra compensation and ____ Days additional time, made herein for work on this contract is a true statement of the actual costs and time incurred, and is fully documented herein and supported under the contract between the parties.

This claim package contains all documents which support the claims made herein and I understand that no further data, other than data provided for clarification purposes, may be presented by me.

Dated _____/s/
Subscribed and sworn before me this _____ day of

_____
NOTARY PUBLIC
My Commission Expires:

B. A detailed factual statement of the claim for additional compensation, time, or both, providing all necessary dates, locations, and items of work affected by the claim.

C. The date on which facts were discovered which gave rise to the claim.

D. The name, title, and activity of all known CDOT, Consultant, and other individuals who may be knowledgeable about facts giving rise to such claim.

E. The name, title, and activity of all known Contractor, subcontractor, supplier and other individuals who may be knowledgeable about facts giving rise to such claim.

F. The specific provisions of the Contract which support the claim and a statement of the reasons why such provisions support the claim.

G. If the claim relates to a decision of the Engineer which the Contract leaves to the Engineer's discretion, the Contractor shall set out in detail all facts supporting its position relating to the decision of the Engineer.

H. The identification of any documents and the substance of any oral communications that support the claim.

I. Copies of all known documents that support the claim.

J. If an extension of contract time is sought, the documents required by subsection 108.07(d).

K. If additional compensation is sought, the exact amount sought and a breakdown of that amount into the following categories:

(1) These categories represent the only costs that are recoverable by the Contractor. All other costs or categories of costs are not recoverable:

(i) Actual wages and benefits, including FICA, paid for additional non-salaried labor;
(ii) Costs for additional bond, insurance and tax;
(iii) Increased costs for materials;
(iv) Equipment costs calculated in accordance with subsection 109.04(c) for Contractor owned equipment and based on invoice costs for rented equipment;
(v) Costs of extended job site overhead;
(vi) Subcontractor's claims(the same level of detail as specified herein is required for all subcontractor's claims)
(vii) An additional 10 percent will be added to the total of items (i), (ii), (iii), (iv), (v), and (vi) as compensation for items for which no specific allowance is provided, including profit and home office overhead.

(2) In adjustment for the costs as allowed above, the Department will have no liability for the following items of damages or expense:

(i) Profit in excess of that provided in (1) above;
(ii) Loss of profit;
(iii) Additional cost of labor inefficiencies in excess of that provided in (1) above;
(iv) Home office overhead in excess of that provided in (1) above;
(v) Consequential damages, including but not limited to loss of bonding capacity, loss of bidding opportunities, and insolvency;
(vi) Indirect costs or expenses of any nature in excess of that provided in (1) above;
(vii) Attorneys fees, claim preparation fees, and expert fees.

The time period within which the Contractor is to provide such written documentation may be extended by the Project Engineer if requested by the Contractor and if the Project Engineer determines an extension would enhance the claim record and improve the potential for resolution of the claim. If the Contractor fails to provide such written documentation within 60 days after project acceptance, or within an extended time period authorized by the Project Engineer, the Project Engineer will base the decision upon the information previously submitted in the Contractor's

notification of intent to file a claim and pertinent specification and contract documents. Requests of time extension to submit documentation shall be submitted in writing prior to final acceptance of the project. The Engineer's approval or disapproval of the extension will be given to the Contractor in writing prior to final acceptance.

The Contractor shall keep full and complete records of the costs and additional time incurred for each claim. All Contractor's records and the records of all subcontractors on the Contract shall be open to inspection or audit by representatives of the Department during the life of the Contract and for a period of not less than three years after the date of final payment. The Contractor, subcontractors, and lower tier subcontractors shall provide adequate facilities, acceptable to the Engineer, for the audit during normal business hours. The Contractor shall permit the Engineer or Department auditor to examine and copy those records and all other records required by the Engineer to determine the facts or contentions involved in the claim. The audit may be performed for any claim, and is mandatory for all claims with amounts greater than $250,000.

2. The Project Engineer: (1) will review the information in the Contractor's written notification of intent to file a claim, (2) will review all written documents as submitted by the Contractor in support of the claim, and (3) may consider any other information available in rendering a decision. The Project Engineer will assemble and maintain a claim record comprised of all written documents submitted by the Contractor in support of the claim and all other written documents considered by the Project Engineer in reaching a decision. All documentation the Contractor wants considered shall be made available to the Project Engineer and will be made a part of the claim record during the review of the claim. Once the claim record has been assembled by the Project Engineer, the submission of additional information, other than clarification and data supporting previously submitted documentation, at any subsequent levels of review by anyone, will not be permitted. The Project Engineer will provide a copy of the complete claim record along with the written decision to the Contractor describing the contractual basis and factual information considered by the Project Engineer in reaching a decision.

3. The Project Engineer will render a written decision to the Contractor within 60 days from the receipt of the Contractor's submission of all written documentation supporting the claim. If more than one claim has been filed by the Contractor on the Project, the Project Engineer will have the right to consolidate all related claims and issue one decision on all such claims provided that consolidation of claims does not extend the time period within which the Project Engineer is to render a decision. Consolidation of unrelated claims will not be made. If the Project Engineer fails to render a written decision to the Contractor within the specified 60 day time period, or within any extended time period as agreed to by both, the Contractor must either: (1) accept this as a denial of the claim, or (2) appeal the claim to the

Region Transportation Director, in the same manner as if the Project Engineer had denied the Contractor's claim, according to subsection 105.21(e).

(e) If the Contractor disagrees with the written decision of the Project Engineer, the Contractor must either: (1) accept the Project Engineer's decision as final, (2) file a one-time written appeal to the Project Engineer with the submission of additional information, or (3) file a written appeal to the Region Transportation Director based upon all information previously submitted and made a part of the claim record. The Contractor's written appeal shall be made within 60 days from the receipt of the Project Engineer's written decision. The Contractor hereby agrees that if a written appeal is not properly filed within this specified 60 day time period, the claim shall be settled in the same manner as if the Contractor had accepted the Project Engineer's written decision as final. Failure by the Contractor to properly file a written appeal, according to these specifications, shall bar the Contractor from any further administrative equitable or legal remedy for said claim under the Contract.

(f) When the Contractor properly files a written appeal to the Project Engineer pursuant to subsection 105.21(e), the Project Engineer will review all new submissions made by the Contractor and render a decision to the Contractor pursuant to subsection 105.21(d). When a written appeal to the Region Transportation Director is properly filed by the Contractor pursuant to subsection 105.21(e), the Project Engineer will provide the complete claim record, as defined by subsection 105.21(d), to the Region Transportation Director. The claim will be reviewed by the Region Transportation Director who will render a written decision to the Contractor to either affirm, overrule, or modify the Project Engineer's decision, in whole or in part, in accordance with the following procedure:

1. For the purpose of this subsection, Region Transportation Director shall be understood to mean the Region Transportation Director or the Region Transportation Director's designated representative.

2. The Region Transportation Director will maintain the claim record during the review of the claim. The Contractor's written appeal to the Region Transportation Director will be made a part of the claim record. Either the Contractor or the Department may request an oral hearing of the claim before the Region Transportation Director. When an oral hearing is requested by either party, both the Project Engineer and the Contractor's representative shall be present and the hearing shall be conducted at a time which is convenient to all parties. The Region Transportation Director will consider all written documents in the claim record and all oral presentations in support of that record made by the Contractor and the Project Engineer. The Region Transportation Director will not consider any written documents or oral arguments, which have not previously been made a part of the claim record, other than clarification and data supporting previously submitted documentation.

3. The Region Transportation Director will render a written decision to the Contractor within 60 days from the receipt of the Contractor's written appeal, unless both parties agree to an extension of time. If the Region Transportation Director fails to render a written decision to the Contractor within the specified 60 day time period, or within any extended time period as agreed by both parties, the Contractor must either: (1) accept this as a denial of the claim, or (2) appeal the claim to the Chief Engineer, in the same manner as if the Region Transportation Director had denied the Contractor's claim, according to subsection 105.21(g).

(g) If the Contractor disagrees with the written decision of the Region Transportation Director, the Contractor must either: (1) accept the Region Transportation Director's decision as final, or (2) file a written appeal to the Chief Engineer within 60 days from the receipt of the Region Transportation Director's written decision. The Contractor hereby agrees that if a written appeal is not properly filed within this specified 60 day time period, the claim shall be settled in the same manner as if the Contractor had agreed with and accepted the Region Transportation Director's written decision as final. Failure by the Contractor to properly file a written appeal according to these specifications shall bar the Contractor from any further administrative, equitable, or legal remedy for said claim under the Contract.

(h) When the Contractor properly files a written appeal to the Chief Engineer pursuant to subsection 105.21(g), the complete claim record as maintained by the Region Transportation Director will be provided to the Chief Engineer. The Chief Engineer or his duly authorized delegate will review said claim and will render a written decision to the Contractor to either affirm, overrule, or modify the Region Transportation Director's decision, in whole or in part, in accordance with the following procedure:

1. The Contractor's written appeal to the Chief Engineer will be made a part of the claim record. Either the Contractor or the Chief Engineer may request that arbitration be commenced to review the claim and provide a recommendation to the Chief Engineer. Arbitration will not be convened when the value of the claim is less than $20,000. Arbitration shall be in accordance with subsection 105.21(i).

2. When arbitration is not requested by either the Contractor or the Chief Engineer, the Chief Engineer will render a decision within 60 days after reviewing the information contained in the claim record. The Chief Engineer will not consider any written documents or oral arguments, which have not previously been made available to the Region Transportation Director and properly made a part of the claim record, other than clarification and data supporting previously submitted documentation.

3. When arbitration is requested by either the Contractor or the Chief Engineer, it shall be convened pursuant to subsection 105.21(i). Either the Chief

Engineer or his duly authorized delegate will attend the arbitration. The Chief Engineer or his duly authorized delegate will consider the entire administrative claim record, including the arbitrator's written recommendation. The Chief Engineer or his duly authorized delegate will not consider any written documents or oral arguments which have not been made available to arbitration and made a part of the claim record. The Chief Engineer or his duly authorized delegate will not be bound by the recommendation of the arbitration.

(i) When requested by either the Contractor or the Chief Engineer, pursuant to subsection 105.21(h), arbitration shall consist of independent arbitrators who shall consider the claim in accordance with the following procedures:

1. The Chief Engineer shall contact an independent arbitration organization such as the American Arbitration Association (AAA) which shall appoint arbitrators according to their internal procedures. Arbitrators shall not be employed by, affiliated with, or have consultive or business connection with the claimant Contractor. Arbitrators shall not have assisted either in the evaluation, preparation, or presentation of the claim case either for the Contractor or the Department or have rendered an opinion on the merits of the claim for either party, and shall not do so during the proceedings of arbitration. The costs and reasonable expenses of arbitration shall be directly paid by the Department. The Department will subtract one-half of the cost of the arbitration from the Contractor's final payment.

2. Once established, the arbitrators shall serve until the final recommendation is made to the Chief Engineer or his duly authorized delegate. The entire claim record will be made available to the arbitrators by the Chief Engineer.

   The independent arbitrators shall administer the process pursuant to the CDOT modified version of AAA's Construction Industry Arbitration Rules, established for its construction claims, except to the extent that such rules conflict with the specifications, in which case the specifications shall control. A copy of the modified AAA rules is made a part of the Contract by special provision. Unless both parties agree otherwise one arbitrator shall be used for claims less than $250,000 and three arbitrators shall be used for claims $250,000 and greater. The arbitrators shall consider the facts of the claim and preside over an informal hearing on the claim. The hearing will be transcribed by a court recorder. Either party may have an attorney present at the arbitration hearing. Attorneys licensed in the State of Colorado may participate in the claim presentation.Unless both parties agree otherwise all hearings shall be held in Denver.

   The arbitrators shall consider all written information available in the claim record and all oral presentations in support of that record by the Contractor and the Department. The arbitrators shall not consider any written documents or oral arguments which have not previously been made a part of the claim

record, other than clarification and data supporting previously submitted documentation. The arbitrators shall not consider an increase in the amount of the claim, or any new claims.

3. After complete review of the facts associated with the claim, the arbitrators shall render a written explanation of it's recommendation, based upon it's findings of fact, to the Chief Engineer or his authorized delegate who will retain authority over disposition of the claim. When three arbitrators are used, and only two arbitrators agree then the recommendation of the two arbitrators and the recommendation of the third arbitrator shall be given to the Chief Engineer or his authorized delegate. The arbitrator's recommendation shall include: (1) a summary of the issues and factual evidence presented by the Contractor and the Department concerning the claim, (2) recommendations concerning the validity of the claim, (3) recommendations concerning the value of the claim as to cost and time impacts if the claim is determined to be valid, (4) the contractual and factual bases supporting the recommendations made, (5) detailed and supportable calculations which support any recommendation made. The arbitrators shall act only in an advisory capacity to the Chief Engineer or his authorized delegate, with no direct authority for resolution of the claim. Recommendations which are not supported by the plans, the specifications or other portions of the Contract will not be considered by the Chief Engineer or his authorized delegate. The arbitrators shall not consider Contractor's claims for legal or consultant preparation fees or anticipated profit. Recommendations concerning the value of the claim as to cost and time impacts will not be considered by the Chief Engineer or his authorized delegate if not supported by the required documents from subsection 105.21(d).

4. Upon receipt of the recommendation of the arbitration, the Chief Engineer or his authorized delegate will render a final decision within 60 days pursuant to subsection 105.21(h).

   The decision of the Chief Engineer, or the Chief Engineer's authorized delegate, shall constitute final agency action by the Department pursuant to C.R.S. § 24-4-106 and Colorado Rule of Civil Procedure 106(a)(4). In the Contractor disagrees with the Department's final agency action, Contractor's sole remedy is judicial review pursuant to C.R.S. § 24-4-106. The conclusions and recommendations of the arbitration panel shall not be admissible in any court of law. Any offer made by the Contractor or the Department at any stage of the claims process, other than the Department's final agency action, as set forth in this subsection shall be deemed an offer of settlement pursuant Colorado Rules of Evidence 408 and therefore inadmissible in any litigation.

SECTION 106
CONTROL OF MATERIAL

106.01 Source of Supply and Quality Requirements. All materials used shall meet all quality requirements of the Contract. The Contractor shall comply with the requirements of the special notice to contractors contained in the Department's Field Materials Manual, including notifying the Engineer of the proposed sources of materials at least two weeks prior to delivery.

When alternative materials are permitted for an item in the Contract, the Contractor shall state at the preconstruction conference the material that will be furnished for that item.

Reference in the Contract to a particular product, or to the product of a specific manufacturer, followed by the phrase "or approved equal" is intended only to establish a standard of quality, durability and design, and shall not be construed as limiting competition. Products of other manufacturers will be acceptable provided such products are equal to that specified.

106.02 Material Sources. Where practicable, borrow pits, gravel pits, and quarry sites shall be located so that they will not be visible from the highway.

(a) *Available Source.* When the Contract shows a location that may be used by the Contractor as a source of sand, gravel, or borrow material, the location will be known as an available source. The Department will have an agreement with the property owner which allows removal of material under certain conditions and for a stated price.

Conditions of this agreement which concern use of this material on the project and pit construction and reclamation requirements for the available source will be included in the Contract.

The Contract will indicate whether the Department has or has not obtained the necessary County or City Zoning Clearance and the required permit from Colorado Mined Land Reclamation Division needed to explore and remove materials from the available source. If the Department did not obtain the necessary clearances or permits, the Contractor shall obtain them. Any delays to the project or additional expenses that are incurred while these clearances or permits are being obtained shall be the responsibility of the Contractor. The Contractor shall ensure that the requirements of the permits do not conflict with the pit construction and reclamation requirements shown in the Contract for the available source.

The Department will investigate and obtain samples from the various available sources. These samples are not intended to indicate the full extent and composition of an entire deposit. These samples will be tested by the

Department and may be combined with various materials such as mineral fillers and additives for further testing, especially for testing aggregate sources to obtain a satisfactory design mix. The Contract will show the location of the test holes where samples were obtained, test results, and amounts and kinds of any added materials utilized in the testing to obtain a satisfactory product. If the Contractor uses an available source, all material shall meet contract specifications. The Department will not be responsible for the material as produced by the Contractor.

All costs of producing specification material shall be borne by the Contractor.

(b) *Contractor Source.* Sources of sand, gravel, or borrow other than vailable sources will be known as contractor sources. The material from a contractor source must be approved by the Engineer prior to incorporation of the material into the project. The Contractor shall produce material which meets contract specifications throughout construction of the project.

The Contractor shall obtain all permits and agreements necessary to explore and remove material from a contractor source. The Contractor shall also be responsible for any costs or delays associated with obtaining these permits and agreements.

For each source of imported embankment or topsoil the Contractor shall provide the following certification. The Contractor shall assure and certify that unacceptable levels of hazardous waste and substances; including but not limited to those defined in the Code of Federal Regulations, 40 CFR Part 261 Subparts C and D, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 101(14) as amended; are not incorporated into the project as a result of importing embankment or topsoil materials. The Contractor shall submit such certification to the Engineer, signed and stamped (or sealed) by either a certified industrial hygienist (CIH), certified hazardous materials manager (CHMM), registered professional engineer (PE), Certified Safety Professional (CSP), or Registered Environmental Manager (REM) for each contractor source outside of the project limits.

If contractor source material for embankment or topsoil, originating outside of the project limits, is placed on the project and is at anytime found to be contaminated with unacceptable levels of hazardous waste or substances, the Contractor shall remove the contaminated material from the Department's right of way, dispose of it in accordance with applicable laws and regulations, and make necessary restoration.

The cost of complying with these requirements, including sampling, testing, and corrective action by the Contractor, shall be included in the work.

106.03 Samples, Tests, Cited Specifications. All materials or the finished product in which the materials are used, will be inspected and tested by the Engineer, or by

others if specified in the Contract. The Engineer will furnish copies of test results that indicate out of specification material, to the Contractor, promptly as the test results become available. Acceptance will be based on the applicable requirements of Section 105. Any work in which untested and uninspected materials are used shall be performed at the Contractor's risk and may be considered as unacceptable and unauthorized work.

Unless otherwise designated, when AASHTO, ASTM, or other specifications, standards, or policies are cited, the reference shall be to the latest edition as revised or updated by approved supplements or interim editions published and issued prior to the date of advertisement for bids.

Sampling and testing will be done in accordance with the Department's minimum sampling, testing, and inspection schedule; the special notice to contractors; and the Colorado procedures; all contained in the Department's Field Materials Manual.

Where the method of test is not cited, the applicable procedure shall be in accordance with the Standard AASHTO Method which was current on the date of advertisement for bids.

Samples will be taken by the Department except that the Contractor shall take samples of asphalt cement, in accordance with AASHTO T 40; hot mix asphalt, in accordance with Colorado Procedure 41 and a composite of aggregates for hot bituminous mixtures, in accordance with Colorado Procedure 30. The Engineer will determine the sampling locations, and the samples shall be taken in the presence of the Engineer. The Contractor may retain a split of each sample.

All materials being used are subject to inspection and testing at any time prior to or during incorporation into the work. Tests will be made by and at the expense of the Department.

106.04 Qualification of Testing Personnel and Laboratories. Personnel performing tests used in mix design or the acceptance, rejection, or price adjustment decision, and the laboratories in which those tests are performed, shall be qualified in accordance with Colorado Procedure 10.

106.05 Sampling and Testing of Hot Mix Asphalt. All HMA, Item 403, except HMA (Patching) and temporary pavement shall be tested in accordance with the following program of process control testing and acceptance testing:

(a) Process Control Testing. The Contractor shall be responsible for process control testing on all elements listed in Table 106-1. Process control testing shall be performed at the expense of the Contractor. The Contractor shall develop a quality control plan (QCP) in accordance with the following:

1. Quality Control Plan. For each element listed in Table 106-1, the QCP must provide adequate details to ensure that the Contractor will perform process

control. The Contractor shall submit the QCP to the Engineer at the preconstruction conference. The Contractor shall not start any work on the project until the Engineer has approved the QCP in writing.

A. Frequency of Tests or Measurements. The QCP shall indicate a random sampling frequency, which shall not be less than that shown in Table 106-1. The process control tests shall be independent of acceptance tests.

B. Test Result Chart. Each process control test result, the appropriate tonnage and the tolerance limits shall be plotted. For in-place density tests, only results after final compaction shall be shown. The chart shall be posted daily at a location convenient for viewing by the Engineer.

C. Quality Level Chart. The Quality Level (QL) for each element used to calculate incentive or disincentive in Table 106-1 and each required sieve size shall be plotted. The QL will be calculated in accordance with the procedure in CP 71 for Determining Quality Level (QL). The QL will be calculated on tests 1 through 3, then tests 1 through 4, then tests 1 through 5, then thereafter the last five consecutive test results. The tonnage of material represented by the last test result shall correspond to the QL. For in-place density tests, only results after final compaction shall be shown. The chart shall be posted daily at a location convenient for viewing by the Engineer.

2. Elements Not Conforming to Process Control. The QL of each discrete group of five test results, beginning with the first group of five test results, shall be a standard for evaluating material not conforming to process control. When the group QL is below 65, the process shall be considered as not conforming to the QCP. In this case, the Contractor shall take immediate action to bring the process back into control. Except where the cause of the problem is readily apparent and corrected without delay, production shall be suspended until the source of the problem is determined and corrected. A written explanation of actions taken to correct control problems shall accompany the test data and be submitted to the Engineer on the day the actions are taken.

3. Point of Sampling. The material for process control testing shall be sampled by the Contractor using approved procedures. Acceptable procedures are Colorado Procedures, AASHTO and ASTM. The order of precedence is Colorado Procedures, AASHTO procedures and then ASTM procedures. The location where material samples will be taken shall be indicated in the QCP.

4. Testing Standards. The QCP shall indicate which testing standards will be followed. Acceptable standards are Colorado Procedures, AASHTO and ASTM. The order of precedence is Colorado Procedures, AASHTO procedures and then ASTM procedures.

5. Testing Supervisor Qualifications. The person responsible for the process control sampling and testing shall be identified in the QCP and be qualified according to the requirements of CP 10

6. Technician Qualifications. Technicians taking samples and performing tests must be qualified according to the requirements of CP 10.

7. Testing Equipment. All of the testing equipment used to conduct process control testing shall conform to the standards specified in the test procedures and be in good working order. Nuclear testing devices used for process control testing of in-place density do not have to be calibrated on the Department's calibration blocks.

8. Reporting and Record Keeping. The Contractor shall report the results of the process control tests to the Engineer in writing at least once per day. The Contractor shall make provisions such that the Engineer can inspect process control work in progress, including sampling, testing, plants, and the Contractor s testing facilities at any time.

(b) *Acceptance Testing.* Acceptance testing is the responsibility of the Department and shall not be addressed in the QCP. The Department will determine the locations where samples or measurements are to be taken. The maximum quantity of material represented by each test result and the minimum number of test results will be in accordance with Table 106-1. The location or time of sampling will be based on a stratified random procedure as described in CP 75. Acceptance sampling and testing procedures will be in accordance with the Schedule for Minimum Materials Sampling, Testing and Inspection in the Department's Field Materials Manual. Samples for project acceptance testing shall be taken by the Contractor in accordance with the designated method. The samples shall be taken in the presence of the Engineer. Where appropriate, the Contractor shall reduce each sample to the size designated by the Engineer. The Contractor may retain a split of each sample which cannot be included as part of the QCP.

All materials being used are subject to inspection and testing at any time prior to, during, or after incorporation into work. Acceptance tests will be made by and at the expense of the Department, except when otherwise provided.

(c) *Check Testing Program (CTP).* Prior to, or in conjunction with, placing the first 500 tons of asphalt pavement, under the direction of the Engineer, a CTP will be conducted between acceptance testing and process control testing programs. The CTP will consist of testing for asphalt content, HMA 4.75 mm (#4) sieve, HMA 2.36 mm (#8) sieve, HMA 75 mm (#200) sieve, voids in the mineral aggregate, air voids, in-place density, and joint density in accordance with CP 13. If the Contractor intends to test to determine air voids and VMA, check testing for these tests is recommended. The CTP will be continued until the acceptance and process control test results are within the acceptable limits shown in Table 13-1

of CP 13. For joint density, the initial check test will be a comparison of the seven cores tested by CDOT and the seven cores tested by the Contractor. These are the cores from the compaction test section used for nuclear gauge calibration and test section payment.

During production, a split sample check will be conducted at the frequency shown in Table 106-1. Except for joint density, the split samples will be from an acceptance sample obtained in accordance with subsection 106.05(b). The acceptance test result will be compared to the process control test result obtained by the Contractor using the acceptable limits shown in Table 13-1 of CP 13. For joint density, the comparison sample for testing by the Contractor will be obtained by taking a second core adjacent to the joint density acceptance core. The acceptance test result will be compared to the process control test result obtained by the Contractor using the acceptable limits as shown in Table 13-1 of CP13 and following the check testing procedure given in CP 13.

If production has been suspended and then resumed, the Engineer may order a CTP between process control and acceptance testing persons to assure the test results are within the acceptable limits shown in Table 13-1 of CP 13. Check test results shall not be included in process control testing. The Region Materials Engineer shall be called upon to resolve differences if a CTP shows unresolved differences beyond the values shown in Table 13-1 of CP 13.

(d) *Stability Verification Testing.* After the mix design has been approved and production commences, the Department will perform a minimum of three stability verification tests to verify that the field produced HMA conforms to the approved mix design:

The test frequency shall be one per day unless otherwise directed by the Engineer.

The test results will be evaluated and the Contractor shall make adjustments if required in accordance with the following:

1. The minimum value for stability will be the minimum specified in Table 403-1 of the specifications. There will be no tolerance limit.

2. Quality Level. Calculate a QL for stability.

   If the QL for stability is less than 65, then production shall be halted and the Contractor shall submit a written proposal for a mix design revision to the Engineer. The Engineer shall give written approval to the proposed mix design revision before production continues.

   After a new or revised mix design is approved, three additional stability tests will be performed on asphalt produced with the new or revised mix design. The test frequency shall be one per day unless altered by the Engineer.

If the stability QL is less than 65, then production shall be halted until a new mix design has been completed and approved using plant produced material or the Contractor shall submit a written proposal for a mix design revision to the Engineer. The Engineer shall give written approval to the proposed mix design revision before production continues.

3. New or Revised Mix Design. Whenever a new or revised mix design is used and production resumes, three additional stability field verification tests shall be performed and the test results evaluated in accordance with the above requirements. The test frequency shall be one per day unless altered by the Engineer.

4. Field Verification Process Complete. When the field verification process described above is complete and production continues, the sample frequency will revert back to 1 per 10,000 tons.

(e) *Mix Verification Testing.* After the mix design has been approved and production commences, the Department will perform a minimum of three volumetric verification tests for each of the following elements to verify that the field produced HMA conforms to the approved mix design:

(1) Air Voids
(2) Voids in Mineral Aggregate (VMA)
(3) Asphalt Content (AC)

The test frequency shall be one per day unless otherwise directed by the Engineer.

The test results will be evaluated and the Contractor shall make adjustments if required in accordance with the following:

1. Target Values. The target value for VMA will be the average of the first three volumetric field test results on project produced HMA or the target value specified in Table 403-1 and Table 403-2 of the specifications, whichever is higher. The target value for VMA will be set no lower than 0.5 percent below the VMA target on Form 43 prior to production. The target values for the test element of air voids and AC shall be the mix design air voids and mix design AC as shown on Form 43.

2. Tolerance Limits. The tolerance limits for each test element shall be:

AC	± 0.3 percent
Air Voids	± 1.2 percent
VMA	± 1.2 percent

3. Quality Levels. Calculate an individual QL for each of the elements using the volumetric field verification test results.

4. Total Quality Level. Add the three individual QLs and divide by three to determine the Total Quality Level (TQL).

   A. If TQL is 90 or greater, then no change is required and production can continue.

   B. If TQL is 65 or greater and less than 90 and the QL for the test element of air voids is 70 or greater, then no change is required and production can continue.

   C. If TQL is 65 or greater and less than 90 and the QL for the test element of air voids is less than 70 or the TQL is less than 65, then production shall be halted and the Contractor shall submit a written proposal for a mix design revision to the Engineer. Production shall not resume until the Engineer has approved a revised mix design.

   After a new or revised mix design is approved, three additional volumetric field verification tests will be performed on asphalt produced with the new or revised mix design. The test frequency shall be one per day unless altered by the Engineer.

   (1) If TQL is 90 or greater, then no change is required and production can continue.

   (2) If TQL is 65 or greater and less than 90 and the QL for the test element of air voids is 70 or greater, then no change is required and production can continue.

   (3) If TQL is 65 or greater and less than 90 and the QL for the test element of air voids is less than 70 or the TQL is less than 65, then production shall be halted until a new mix design has been completed in accordance with CP 52 or CP 54, a new Form 43 issued, and the Contractor demonstrates capability of producing a mixture meeting the verification requirements in accordance with (i) or (ii) below:

      (i) The Contractor shall produce material that shall not be placed on CDOT projects. A minimum of 48 hours notice is required, along with the approval of the Engineer, prior to placement. Three samples will be tested for volumetric properties. If the TQL is equal or greater than 65 and the QL for the element of air voids is equal or greater than 70, full production may resume or;
      (ii) The Contractor may construct a 500 ton test strip on the project. Three samples in the last 200 tons will be tested for volumetric properties. After construction of the test section, production shall be halted until the testing is complete and element QLs and a new TQL are calculated. If the TQL is equal or greater than 65 and the QL for the element of air voids is equal or greater than 70, full

production may resume. If the TQL is less than 65 or the QL for the elements of air voids or VMA is less than 70, the material shall be removed and replaced at at the Contractor's expense. The time count will continue, and any delay to the project will be considered to have been caused by the Contractor and will not be compensable. The costs associated with mix designs shall be solely at the Contractor's expense.

If the Contractor fails to verify the new mix design in accordance with (i) or (ii), then production shall be halted until a new mix design has been completed in accordance with CP 52 or CP 54, a new Form 43 issued, and the Contractor demonstrates capability of producing a mixture meeting the verification requirements in accordance with (i) or (ii).

5. New or Revised Mix Design. Whenever a new or revised mix design is used and production resumes, three additional volumetric field verification tests shall be performed and the test results evaluated in accordance with the above requirements. The test frequency shall be one per day unless altered by the Engineer.

6. Field Verification Process Complete. When the field verification process described above is complete and production continues, the sample frequency will revert back to a minimum of 1 per 10,000 tons. The Engineer has the discretion to conduct additional verification tests at any time.

(f) *Testing Schedule***.** Process control and project acceptance testing frequency shall be in accordance with Table 106-1.

(g) *Reference Conditions*. Three reference conditions can exist determined by the Moving Quality Level (MQL). The MQL will be calculated in accordance with the procedure in CP 71 for Determining Quality Level (QL). The MQL will be calculated using only acceptance tests. The MQL will be calculated on tests 1 through 3, then tests 1 through 4, then tests 1 through 5, then thereafter on the last five consecutive test results. The MQL will not be used to determine pay factors. The three reference conditions and actions that will be taken are described as follows:

1. Condition green will exist for an element when an MQL of 90 or greater is reached, or maintained, and the past five consecutive test results are within the specification limits.

2. Condition yellow will exist for all elements at the beginning of production or when a new process is established because of changes in materials or the job-mix formula, following an extended suspension of work, or when the MQL is less than 90 and equal to or greater than 65. Once an element is at condition green, if the MQL falls below 90 or a test result falls outside the specification limits, the condition will revert to yellow or red as appropriate.

3. Condition red will exist for any element when the MQL is less than 65. The Contractor shall be notified immediately in writing and the process control sampling and testing frequency increased to a minimum rate of 1 per250 tons for that element. The process control sampling and testing frequency shall remain at 1 per 250 tons until the process control QL reaches or exceeds 78. If the QL for the next five process control tests is below 65, production will be suspended.

   If gradation is the element with MQL less than 65, the Department will test one randomly selected sample in the first 1250 tons produced in condition red. If this test result is outside the tolerance limits, production will be suspended. (This test result will not be included as an acceptance test.)

   After condition red exists, a new MQL will be started. Acceptance testing will stay at the frequency shown in Table 106-1. After three acceptance tests, if the MQL is less than 65, production will be suspended.

   Production will remain suspended until the source of the problem is identified and corrected. Each time production is suspended, corrective actions shall be proposed in writing by the Contractor and approved in writing by the Engineer before production may resume.

   Upon resuming production, the process control sampling and testing frequency for the elements causing the condition red shall remain at 1 per 250 tons. If the QL for the next five process control tests is below 65, production will be suspended again. If gradation is the element with MQL less than 65, the Department will test one randomly selected sample in the first 1250 tons produced in condition red. If this test result is outside the tolerance limits, production will be suspended.

Table 106-1
SCHEDULE FOR MINIMUM SAMPLING AND TESTING FOR HMA

Element	Process Control	Acceptance	Check (CTP)
Asphalt Content	1/500 tons	1/1000 tons	1/10,000 tons
Gradation	1/Day	1/2000 tons	1/20,000 tons
In-Place density	1/500 tons	1/500 tons	1/5000 tons
Joint Density	1 core/2500 linear feet of joint	I core/5000 linear feet of joint	1 core/50,000 linear feet of joint
Aggregate Percent Moisture [3]	1/2000 tons or 1/Day if less than 2000 tons	1/2000 tons	Not applicable
Percent Lime [3 4]	1/Day	Not applicable	Not applicable

Notes for Table 106-1:
1 The minimum number of acceptance tests will be: 5 asphalt content, 3 gradation,10 in-place density, and 5 joint density for all projects.

2 When unscheduled job mix formula changes are made (Form 43) acceptance of the elements, except for in-place density, will be based on the actual number of samples that have been selected up to that time, even if the number is below the minimum listed in the schedule. At the Engineer's discretion, additional random in-place density tests may be taken in order to meet scheduled minimums, provided the applicable pavement layer is available for testing under safe conditions. Beginning with the new job mix formula, the quantity it will represent shall be estimated. A revised schedule of acceptance tests will be based on that estimate.

3 Not to be used for incentive or disincentive pay. Test according to CP 60B and report results from Form 106 or Form 565 on Form 6.

4 Verified per Contractor's QC Plan.

106.06 Sampling and Testing of Portland Cement Concrete Paving. All Portland Cement Concrete Pavement, Item 412, shall be tested in accordance with the following process control and acceptance testing procedures:

(a) *Process Control Testing*. The Contractor shall be responsible for process control testing of all elements listed in Table 106-2 or 106-3. Process control testing shall be performed at the expense of the Contractor. If the Contractor chooses flexural strength criteria, then the Quality Control testing for flexural strength shall be performed at the expense of the Contractor. The Contractor shall develop a quality control plan (QCP) in accordance with the following:

1. Quality Control Plan. For each element listed in Tables 106-2 or 106-3, the QCP must provide adequate details to ensure that the Contractor will perform process control. The Contractor shall submit the QCP to the Engineer at the preconstruction conference. The Contractor shall not start any work on the project until the Engineer has approved the QCP in writing.

   A. Frequency of Tests or Measurements. The QCP shall indicate a random sampling frequency, which shall not be less than that shown in Table 106-2 or 106-3. The process control tests shall be independent of acceptance tests.

   B. Test Result Chart. Each process control test result, the appropriate area, volume and the tolerance limits shall be plotted. The chart shall be posted daily at a location convenient for viewing by the Engineer.

   C. Quality Level Chart. The QL for each element in Table 106-2 or 106-3 shall be plotted. The QL will be calculated in accordance with the procedure in CP 71 for Determining Quality Level. The QL will be calculated on tests 1 through 3, then tests 1 through 4, then tests 1 through 5, then thereafter the last five consecutive test results. The area of material represented by the last test result shall correspond to the QL.

   D. F-test and t-test Charts. If the Contractor chooses flexural strength criteria, then the results of F-test and t-test analysis between the Department's verification tests of flexural strength and the Contractor's quality control tests of flexural strength shall be shown on charts. The F-test and t-test will be calculated in accordance with standard statistical procedures using all verification tests and quality control tests completed to date. When a verification test is completed, the F-test and t-test calculations will be redone. The area of material represented by the last test result shall correspond to the F-test and t-test. A warning value of 5 percent and an alert value of 1 percent shall be shown on each chart. The chart shall be posted daily at a location convenient for viewing by the Engineer.

2. Point of Sampling. The material for process control testing shall be sampled by the Contractor using approved procedures. Acceptable procedures are Colorado Procedures, AASHTO and ASTM. The order of precedence is Colorado Procedures, AASHTO procedures and then ASTM procedures. The location where material samples will be taken shall be indicated in the QCP.

3. Testing Standards. The QCP shall indicate which testing standards will be followed. Acceptable standards are Colorado Procedures, AASHTO and ASTM. The order of precedence is Colorado Procedures, AASHTO procedures and then ASTM procedures.

The compressive strength test for process control will be the average strength of two test cylinders cast in plastic molds from a single sample of concrete, cured under standard laboratory conditions, and tested three to seven days after molding. The trial mix proposed and conducted by the Contractor for mix design approval shall include compressive strength data including the curing time for compressive strength process control tests. CDOT may participate in the process control testing for compressive strength at a frequency determined by the Engineer.

4. Testing Supervisor Qualifications. The person in charge of and responsible for the process control testing shall be identified in the QCP. This person shall be present on the project and possess one or more of the following qualifications:

   A. Registration as a Professional Engineer in the State of Colorado.
   B. Registration as an Engineer in Training in the State of Colorado with two years of paving experience.
   C. A Bachelor of Science in Civil Engineering or Civil Engineering Technology with three years of paving experience.
   D. National Institute for Certification in Engineering (NICET) certification at level III or higher in the subfields of Transportation Engineering Technology, Highway Materials or Construction Materials Testing Engineering Technology, Concrete and four years of paving experience.

5. Technician Qualifications. Technicians performing tests, if other than the person in responsible charge, shall meet the requirements of Colorado Procedure 10.

6. Testing Equipment. All of the testing equipment used to conduct process control testing shall conform to the standards specified in the test procedures and be in good working order. If the Contractor chooses flexural strength criteria, then the Contractor shall provide the following equipment and supplies which will not be paid for separately but shall be included in the work:

   A. A separate, temperature controlled facility of at least 300 square feet usable space. This facility shall be used exclusively for the molding, storage and testing of concrete test specimens as required. This facility shall be provided in addition to other facilities required in Section 620. The storage facility shall have sufficient water storage capacity for curing all required test specimens. The storage facility shall provide separate storage tanks for each type of required testing. Each storage tank shall have a continuously recording thermometer and sufficient blank charts for the project. Temperatures of each storage tank shall be recorded for the duration of the project.

   B. A machine for testing flexural strength of concrete specimens. The machine shall be used only for flexural strength tests. Both the Contractor and the Engineer will use this machine for testing concrete specimens. The machine shall meet the requirements of AASHTO T 97

and T 22 and the following: The machine and the flexural strength assembly shall be of a rigid construction. The applied vertical load shall be uniformly distributed to the third points and uniformly across the width of the beam (transverse distribution). Uniform distribution of the load is defined as less than a 3 percent variation in the load between each of the nine strain gages placed in the middle third section of the tension face for loads from 1,000 to 10,000 pounds. The Engineer must approve the firm prior to assessing the machine. The machine shall be ready for use and calibration two days before paving begins. After the machine has been calibrated and accepted by the Engineer it shall not be moved until all portland cement concrete paving and flexural strength acceptance tests have been completed.

C. Beam molds for molding all test specimens required. This shall include all testing described in subsection 106.06.

7. Reporting and Record Keeping. The Contractor shall report the results of the tests to the Engineer in writing at least once per day. The Contractor shall make provisions such that the Engineer can inspect quality control work in progress, including sampling, testing, plants, documentation and the Contractor's testing facilities at any time.

(b) *Acceptance Testing.* Acceptance testing frequencies shall be in accordance with Table 106-2 or Table 106-3. Except for flexural strength, acceptance tests will be conducted by and at the expense of the Department. Acceptance sampling and testing procedures will be in accordance with the Department's Field Materials Manual with the following exceptions and inclusions:

A split sample from an acceptance test shall not be used for a process quality control test. The Engineer shall designate the location where samples are to be taken. Samples shall be taken by the Contractor. The Engineer will be present during the sampling and take possession of all acceptance samples. Samples transported in different containers will be combined and mixed before molding specimens. All materials are subject to inspection and testing at all times.

Pavement thickness acceptance will be determined by cores.

The compressive strength test for acceptance will be the average compressive strength of three test cylinders cast in plastic molds from a single sample of concrete and cured under standard laboratory conditions prior to testing. If the compressive strength of any one specimen differs from the average by more than 10 percent, that specimen will be deleted and the average strength will be determined using the remaining two specimens. Each set of three cylinders will be tested at 28 days after molding.

Acceptance tests for flexural strength shall be the Contractor's quality control tests. The flexural strength tests shall be the average flexural strength of four test beams. The test beams shall be prepared according to AASHTO T 23 with the following

additional requirements: Specimens shall be consolidated by internal vibration without the vibrator being inserted in the center six inches of the specimen's long dimension. After the initial curing, specimens shall be stored in a moist condition at 73.4 °F ± 3 °F. The flexural strength of each specimen shall be measured according to AASHTO T 97 with the following additional requirements: If the flexural strength of only one specimen differs from the average by more than 10 percent, that specimen shall be deleted and the average strength shall be determined using the remaining three specimens. If the flexural strength of more than one specimen differs from the average by more than 10 percent, the test value shall be the average of all four specimens. Each set of four beams shall be tested at 28 days after molding. Specimens shall be properly centered in the machine for each test. Leather shims shall be used in each test. The loading rate shall remain constant after the initial loading of a maximum of 1000 pounds has been applied.

(c) *Verification Testing.* Verification testing will be used only when the Contractor chooses flexural strength criteria and is the responsibility of the Department. The Department will determine the locations where samples or measurements are to be taken. The maximum quantity of material represented by each test result and the minimum number of test results shall be in accordance with Table 106-2. The location of sampling shall be based on a stratified random procedure.

Verification sampling and testing procedures will be in accordance with Sections 105, 106, 412 and the Schedule for Minimum Materials Sampling, Testing and Inspection in the Department's Field Materials Manual, and CP 13. Samples for verification and acceptance testing shall be taken by the Contractor in accordance with the designated method and shall be taken in the presence of the Engineer.

An analysis of test results will be performed after all test results are known using the t-test and F-test statistical methods using an alpha value set at 0.05. If either the above t-test and F-test analysis shows a significant difference then the following items shall be checked; comparison of beam fracture locations and types, computations and flexural testing machine outputs, curing tank temperature charts, slump and air contents, plant batch tickets for major changes, review of sampling, molding, testing procedures, along with IAT check tests and any other investigations that may clarify the significant differences. If after a review of the data no reasons can be determined for the significant difference, the Department's test data shall be used for determining Quality Levels and Incentive or Disincentive according to the methods in this Section.

(d) *Check Testing.* The Contractor and the Engineer shall conduct a check testing program (CTP) prior to the placement of any concrete pavement. The check testing program will include a conference directed by the Region Materials Engineer of the Contractor's testers and the Department's testers concerning methods, procedures and equipment for compressive or flexural strength testing. Check testing shall be completed before any portland cement concrete pavement is placed. A set of three cylinders or four beams will be molded by both the Contractor and the Department's project testers from a split sample. The

specimens will be sampled, molded and cured for seven days and tested for compressive or flexural strength according to the procedures of Section 106. The Department's Independent Assurance Tester will also mold, cure and test a set of three cylinders or four beams, but the Independent Assurance Test results will not be entered in the check testing analysis. If the results of the check tests do not meet the following criteria, then the check testing will be repeated until the following criteria are met:

1. The average of the Contractor's test results and the average of the Department's test results shall be within 10 percent of the average of all test results.
2. Each specimen test result shall be within 15 percent of the average of all test results.

When the compressive strength criteria is chosen, a check test must also be conducted on the sand equivalent test. A set of 5 sand equivalents will be run by both the Contractor's and the Department's project tester, from a split sample. The average of the absolute differences between the process control and the acceptance testing personnel will be compared to the acceptable limits shown in Table 13-1 of CP-13. The CTP will be continued until the acceptance and process control test results are within the permissible ranges shown in Table 13-1 of CP-13.

During production, split samples of randomly selected acceptance tests will be compared to the permissible ranges shown in Table 13-1 of CP 13. The minimum frequency will be as shown in Table 106-3.

If production has been suspended and then resumed, the Engineer may order a CTP between process control and acceptance testing persons to assure the test results are within the permissible ranges shown in Table 13-1 of CP 13. Check test results shall not be included in process control testing. The Region Materials Engineer shall be called upon to resolve differences if a CTP shows unresolved differences beyond the ranges shown in Table 13-1 of CP 13.

(e) Independent Assurance Tests (IAT) for flexural strength will be performed at a frequency of 1 per 50,000 sq. yds. The sample for the IAT will be a split sample of the Contractor's quality control test. The Department's representative performing verification tests shall also use a split sample of the Contractor's quality control test and participate in the IAT. The IAT for flexural strength will be the average flexural strength of four test beams prepared according to the requirements of Section 106 and cured for seven days.

(f) *Testing Schedule.* All samples used to determine Incentive or Disincentive payment by quality level formulas in accordance with Section 105, will be selected by a stratified random process.

Table 106-2
TESTING SCHEDULE - ITEM 412 PORTLAND CEMENT CONCRETE PAVEMENT, FLEXURAL STRENGTH CRITERIA

Element	Minimum Testing Frequency Contractor's Process Control	Minimum Testing Frequency CDOT Acceptance Testing
Aggregate Gradation and Sand Equivalent	For the first five days, 1/10,000 sq. yds. or one/day if less than 10,000 sq. yds. are placed in a day. After 5 days, 1/40,000 sq. yds.	None
Slump	First three loads each day, then as needed for control.	Witness by the Engineer.
Water Cement Ratio	First three loads each day, then 1/500 cu. yds.	First three loads each day, then 1/2000 cu. yds.
Air Content and *Yield	1/2500 sq. yds. or one/day if less than 2500 sq. yds. are placed in a day. tests.	Minimum of 1/day. If the project total <50,000 sq. yds. then a minimum of ten If the project total ≥ 50,000 sq. yds. then 1/5000 sq. yds.
Flexural Strength	1/2500 sq. yds. or one/day if less than 2500 sq. yds. are placed in a day.	One verification test per four quality control tests performed by the Contractor. (Approximately 1/10,000 sq. yds.).
Compressive Strength	1/10,000 sq. yds.	None
Pavement Thickness	In accordance with subsection 412.21.	Minimum of 1/day. If the project total < 50,000 sq. yds. then a minimum of ten tests. If the project total ≥ 50,000 sq. yds. then 1/5000 sq. yds.
Pull Test Joints	Minimum of six transverse and six longitudinal joint locations in each 2500 linear feet.	Witness by the Engineer.
Load Transfer Dowel Bar Placement	Minimum of six transverse joint locations in each 2500 linear feet.	Witness by the Engineer.
Tining Depth	1 per 528 linear feet in each lane and shoulder wider than 8 feet.	Witness by the Engineer.

*Yield is for information only.

Table 106-3
TESTING SCHEDULE -
ITEM 412 PORTLAND CEMENT CONCRETE
PAVEMENT, COMPRESSIVE STRENGTH CRITERIA

Element	Minimum Testing Frequency Process Control	Minimum Testing Frequency CDOT Acceptance Testing
Aggregate Gradation and Fractured Faces	1/10,000 sq. yds. or one/day if less than 10,000 sq. yds. are placed in a day	None
Slump	First three loads each day, then as needed for control.	Witness by the Engineer.
Compressive Strength, Air Content, *Yield, and Sand Equivalent	1/2500 sq. yds. or one/day if less than 2500 sq. yds. are placed in a day.	Minimum of 1/day. If the project total < 50,000 sq. yds. then a minimum of ten tests. If the project total ≥50,000 sq. yds., then 1/5,000 sq. yds.
Pavement Thickness	In accordance with subsection 412.21.	Minimum of 1/day. If the project total < 50,000 sq. yds. then a minimum of ten tests. If the project total ≥ 50,000 sq. yds. then 1/5000 sq. yds.
Pull Test Joints	Minimum of six transverse and six longitudinal joint locations in each 2500 linear feet.	Witness by the Engineer.
Load Transfer Dowel Bar Placement	Minimum of six transverse joint locations in each 2500 linear feet.	Witness by the Engineer.
Tining Depth	1 per 528 linear feet in each lane and shoulder wider than 8 feet.	Witness by the Engineer.

*Yield is for information only.

106.07 Material Inspection at Plant. If the Engineer inspects the materials at the source, the following conditions shall be met:

(1) The Engineer shall have the cooperation and assistance of the Contractor and the materials producer.

(2) The Engineer shall have full entry to all parts of the plant necessary for the manufacture or production of the materials being furnished.

(3) Adequate safety measures shall be provided and maintained.

The Department reserves the right to retest all materials which have been previously tested or inspected. The retesting may be prior to or after incorporation of the materials into the work. Those materials inspected and tested after delivery on the project or after incorporation into the work, that do not meet the requirements of the Contract will be rejected, or accepted with an adjustment in price in accordance with the requirements of subsection 105.03.

106.08 Storage of Materials. Materials shall be stored to assure the preservation of their quality and fitness for the work. Stored materials, even though conditionally approved before storage, will be subject to inspection and testing prior to incorporation into the work. Stored materials shall be located to facilitate prompt inspection. With prior approval portions of the right of way may be used for storage of materials and equipment, and for the Contractor's plant. Any additional space required shall be provided at the Contractor's expense. Stored materials will be paid for in accordance with subsection 109.07. Private property shall not be used for storage purposes without written permission of the owner or lessee. If requested, copies of such written permission shall be furnished to the Engineer. All storage sites shall be restored to their original condition at the Contractor's expense.

106.09 Handling Materials. All materials shall be handled so their quality and fitness for the work is preserved. Aggregates shall be transported to the work in vehicles constructed to prevent loss or segregation of materials.

106.10 Department Furnished Materials. Material furnished by the Department will be made available to the Contractor at the points specified in the Contract.

The cost of handling and placing materials after they are made available to the Contractor shall be included in the contract price for the item.

The Contractor will be held responsible for all material received until it is incorporated into the work and accepted.

Demurrage charges resulting from the Contractor's failure to accept the material at the designated time and point of delivery will be deducted from monies due the Contractor.

106.11 Buy America Requirements. All manufacturing processes, including the application of a coating, for all steel and iron products permanently incorporated in the work shall have occurred in the United States of America. All manufacturing processes are defined as " processes required to change the raw ore or scrap metal into the finished, in-place steel or iron product". This requirement will not prevent a minimal use of foreign steel or iron provided the total project delivered cost of all such steel and iron which includes the cost of delivering the steel and iron to the project, does not exceed one-tenth of one percent of the total contract cost or $2,500, whichever is greater.

With every steel or iron product that requires pre-inspection, pretesting, certified test results, or certificate of compliance, the Contractor shall provide a certification by each supplier, distributor, fabricator, and manufacturer that has handled the steel or

iron product that every process, including the application of a coating, performed on the steel or iron product either has or has not been carried out in the United States of America. These certifications shall create a chain of custody trail that includes every supplier, distributor, fabricator, and manufacturer that handles the steel or iron product. The lack of these certifications will be justification for rejection of the steel or iron product. Upon completion of the project, the Contractor shall certify in writing of compliance with this requirement and provide evidence of the project delivered cost of all foreign steel or iron permanently incorporated into the project.

106.12 Certificates of Compliance. The Contract will designate products and assemblies that can be incorporated in the work, if accompanied by Certificates of Compliance. Each certificate shall include:

(1) The Department's project number
(2) Manufacturer's name
(3) Address of manufacturing facility
(4) Laboratory name & address
(5) Name of product or assembly
(6) Complete description of the material
(7) Model, catalog, stock no. (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 required by the Department for this particular product or assembly. Certificates shall reference the actual tests conducted on samples taken from the same lot, heat, or batch, and shall include a statement that the product or assembly to be incorporated into the project was fabricated in accordance with and meets the applicable specifications.
(11) The following certification, signed by a person having legal authority to act for the Contractor:

> I hereby certify under penalty of perjury that the material listed in this Certificate of Compliance represents _____ (quantity) of pay item _____ (pay item number and Description) for installation on project number _____.
>
> _____ _____
> Contractor Date

The Certificate of Compliance shall be an original document, not a facsimile, with an original signature (including corporate title) by a person having legal authority to act for the manufacturer. It shall state that the product or assembly to be incorporated into the project has been sampled and tested, and the samples have passed all specified tests. One copy of the Certificate of Compliance shall be furnished to the Engineer at the time of material delivery. Failure to comply may result in delays to the project or rejection of the materials.

Each product or assembly delivered to the project must contain the lot, heat, or batch number identical to that on the accompanying Certificate of Compliance.

Products or assemblies furnished on the basis of Certificates of Compliance may be sampled and tested by the Department and if determined not to meet the applicable specifications will be rejected or accepted according to subsection 105.03.

106.13 Certified Test Report. The Contract will designate products and assemblies that can be incorporated in the work if accompanied by Certified Test Reports. Each report shall include:

(1) The Department's project number
(2) Manufacturer's name
(3) Address of manufacturing facility
(4) Laboratory name & address
(5) Name of product or assembly
(6) Complete description of the material
(7) Model, catalog, stock no. (if applicable)
(8) Lot, heat, or batch number identifying the material delivered
(9) Date(s) of the laboratory testing
(10) All test results are required to verify that the material furnished conforms to all applicable Department specifications. Test results shall be from tests conducted on samples taken from the same lot, heat, or batch.
(11) The following certification, signed by a person having legal authority to act for the Contractor:

> I hereby certify under penalty of perjury that the material listed in this Certified Test Report represents _____ (quantity) of pay item _____ (pay item number and Description) for installation on project number _____.
>
> _____ _____
> Contractor Date

The Certified Test Report shall be an original document, not a facsimile, with an original signature (including corporate title) by a person having legal authority to act for the manufacturer or the independent testing laboratory. It shall state that the test results show that the product or assembly to be incorporated into the project has been sampled and tested, and the samples have passed all specified tests. One copy of the Certified Test Report shall be furnished to the Engineer at the time of material delivery. Failure to comply may result in delays to the project or rejection of the materials.

Each product or assembly delivered to the project must contain the lot, heat, or batch number identical to that on the accompanying Certified Test Report.

Products or assemblies furnished on the basis of Certified Test Reports may be sampled and tested by the Department and if determined not to meet the applicable specifications will be rejected or accepted according to subsection 105.03.

SECTION 107
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

107.01 Laws to be Observed. The Contractor shall keep fully informed and comply with all Federal, State and local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which may affect those engaged or employed on the work, or affect the conduct of the work. The Contractor shall protect and indemnify the Department and its representatives against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by the Contractor, the subcontractors, suppliers of materials or services, or their employees.

107.02 Permits, Licenses, and Taxes. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the Contract.

Prior to beginning work the Contractor shall furnish the Engineer a written list of all permits required for the proper completion of the Contract. The list shall clearly identify the type of permit or permits that must be obtained before work on any particular phase or phases of work can be started. Copies of the fully executed permits shall be furnished to the Engineer upon request.

Publicly owned vehicles and Contractor's vehicles operating within the confines of the project are exempted from the payment of ton-mile taxes under Section 42-3-127, CRS. The confines of the project as exempted under Section 42-3-127, CRS are defined as including all sources of earthen or mineral aggregates and water for use on the project, and the connecting roads or areas between the project and such sources.

107.03 Patented Devices, Materials, and Processes. If the Contractor employs any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for their use by suitable legal agreement with the patentee or owner. The Contractor and the Surety shall indemnify and save harmless the Department, any affected third party, or political sub-division from any and all claims for infringement resulting from the use of any patented design, device, material or process, or any trademark or copyright, and shall indemnify the Department for any costs, expenses, and damages which they may be obliged to pay by reason of any infringement, during the prosecution or after the completion of the Contract.

107.04 Restoration of Surfaces Opened by Permit. An individual, firm, or corporation may be issued a permit to construct or reconstruct a utility service. The Contractor shall allow permit holders to perform permitted work. The Contractor shall make necessary repairs resulting from this work, as directed. The repairs will be paid for as extra work in accordance with subsection 109.04.

The repairs will be subject to the same requirements as the original work performed.

107.05 Federal Aid Provisions. When the United States Government participates in the cost of a project, the Federal laws and the rules and regulations made pursuant to such laws must be observed by the Contractor, and the work shall be subject to the inspection of the appropriate Federal agency.

Such inspection shall not make the United States Government a party to the Contract and shall not interfere with the rights of the parties to the Contract.

107.06 Sanitary, Health, and Safety Provisions. The Contractor shall observe all rules and regulations of Federal, State and local health officials. The Contractor shall not require any worker to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to health or safety.

107.07 Public Convenience and Safety. The Contractor shall conduct the work to minimize obstruction to traffic. The safety and convenience of the general public and the residents along the highway and the protection of persons and property shall be provided for by the Contractor as specified under subsection 104.04.

107.08 Railroad-Highway Provisions. If the Contract requires materials to be hauled across railroad tracks, the Department will make arrangements with the railroad company for any new crossings required or for the use of any existing crossings. The Contractor shall make arrangements for the use of crossings not provided in the Contract.

Work performed by the Contractor on the railroad right of way shall be performed to avoid interference with the movement of trains or traffic on the railroad tracks. The Contractor shall use care and precaution in order to avoid accidents, damage, or unnecessary delay or interference with the railroad company's trains or property.

107.09 Construction Over and Adjacent to Navigable Waters. Work on navigable waters shall be conducted to avoid interference with free navigation of the waterways and so the existing navigable depths will not be impaired except as allowed by permit issued by the U.S. Coast Guard or the U.S. Army Corps of Engineers, as applicable.

107.10 Barricades and Signs. The Contractor shall provide, erect, and maintain barricades, suitable and sufficient lights, pavement markings, signs, and other traffic control devices, and shall protect the work and safety of the public in accordance with the Contract. Highways closed to traffic shall be protected by barricades, and obstructions shall be illuminated during hours of darkness. Signs shall be provided to control and direct traffic.

The Contractor shall erect signs at locations where operations may interfere with the use of the road by traffic, and at all intermediate points where the new work crosses or coincides with an existing road, bikepath, or sidewalk. Signs shall be constructed, erected, and maintained in accordance with the Contract.

Barricades, warning signs, lights, temporary signals, and other protective devices shall conform with the latest revision of the "Manual on Uniform Traffic Control Devices for Streets and Highways" published by the FHWA and adopted by the Department, the latest revision of the Colorado Supplement thereto, and the required traffic control plan.

107.11 Use of Explosives. When explosives are utilized in the prosecution of the work, the Contractor shall not endanger life, property, or new work. The Contractor shall be responsible for all damage resulting from the use of explosives.

The Contractor's explosives shall be stored in a secure manner in compliance with laws and ordinances, and storage places shall be clearly marked. When electric blasting caps are used, stored or moved in the vicinity of the work, warning signs prohibiting the use of radio transmitters and mobile telephones shall be posted on all roads within 350 feet of the blasting operation.

The Contractor shall notify property owners and public utility companies having structures in the proximity of the work of the intention to use explosives. Notice shall be given sufficiently in advance to enable them to protect their property.

In advance of doing any blasting work involving the use of electric blasting caps within 200 feet of any railroad's track or structures, the Contractor shall notify the proper authority of the railroad company as to the location, date, time and approximate duration of such blasting operations.

At the conclusion of each day of blasting, all spent surface blasting components shall be removed. At the conclusion of blasting and excavation work, the Contractor shall properly dispose of all spent blasting components. At the completion of final grading, the Contractor shall inspect the project and remove all exposed blasting components.

107.12 Protection and Restoration of Property and Landscape. The Contractor shall preserve private and public property and protect it from damage. Land monuments and property marks shall not be disturbed or moved until their location has been witnessed or referenced in accordance with Section 629 and their removal approved.
The Contractor shall be responsible for the damage or injury to property resulting from:

(1) the Contractor's neglect, misconduct, or omission in the manner or method of execution or nonexecution of the work, or
(2) the Contractor's defective work or the use of unacceptable materials.

The Contractor's responsibility shall not be released until the work has been completed in compliance with the Contract. The Contractor shall restore damaged or injured property, at the Contractor's expense, to a condition similar or equal to that existing before the damage or injury occurred, by repairing, rebuilding, or restoring the property.

Existing trees, shrubs, bushes or grass, outside the designated work areas but inside project limits, that are damaged due to the Contractor's operations shall be replaced in kind at the Contractor's expense.

107.13 Forest Protection. The Contractor shall comply with all regulations of the State Department of Natural Resources, the National Forest Supervisor, or other authority having jurisdiction, governing the protection of forests, and shall observe all sanitary laws and regulations with respect to the performance of work within or adjacent to state or National Forests. The Contractor shall keep the areas in an orderly condition, dispose of all refuse, obtain permits for the construction and maintenance of all construction camps, stores, warehouses, residences, latrines, cesspools, septic tanks, and other structures in accordance with the regulations and instructions issued by the Forest Supervisor.

The Contractor shall take all reasonable precaution to prevent forest fires, and shall make every possible effort to notify a forest official at the earliest possible moment of the location and extent of any fire seen by them. The Contractor, subcontractors, and their employees shall prevent and suppress forest fires and provide assistance in this effort as directed by forest officials.

107.14 Interruption of Irrigation Water Flow. The Contractor shall arrange the work to avoid interference with the flow of irrigation water. If it is impractical to install the structure during the time the ditches are not flowing, the Contractor shall make arrangements with the ditch owners regarding temporary interruption of flow or temporary diversion of water. This will require construction of new ditches with appurtenant structures before old ditches or canals are altered. The Contractor shall provide any temporary ditches, canals or structures necessary for the uninterrupted flow of irrigation water. Temporary construction and removal shall be at the expense of the Contractor.

107.15 Responsibility for Damage Claims. The Contractor shall indemnify and save harmless the Department , its officers, and employees, from suits, actions, or claims of any type or character brought because of any and all injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or failure to comply with the provisions of the Contract; or on account of or in consequence of neglect of the Contractor in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of the Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright, unless the design, device, material or process involved is specifically required by the Contract; or from any claims or amounts arising or recovered under the Worker's Compensation Act, or other law, ordinance, order, or decree. The Department may retain as much of any moneys due the Contractor under any Contract as may be determined by the Department to be in the public interest.

The Contractor shall procure and maintain, until final acceptance of the project, liability insurance for damages imposed by law, of the kinds and in the amounts specified, with insurance companies authorized to do business in the State of Colorado. The insurance shall cover all operations under the Contract, whether performed by the Contractor or by subcontractors. Before commencing the work, the Contractor shall furnish certificates of insurance in the form satisfactory to the Department certifying that the policies are in full force and effect and shall not be changed or canceled until 30 days after written notice thereof has been received by the Department. In the event such notice of change or cancellation is received by the Department, the Contractor, within 20 days of such receipt, shall submit a substitute policy which meets all of the requirements of the Contract. Such substitute policy must be effective no less than 48 hours prior to the date of the change or cancellation.

The types and coverage limits of insurance are as follows:

(1) Workers' Compensation Insurance and employee liability in accordance with current State Statutes. Employer's Liability Insurance at a minimum of $500,000 each accident, and $500,000 each disease.

(2) Commercial General Liability at a minimum of $1,000,000 Each Occurrence; $1,000,000 Personal Injury; $2,000,000 Products/Completed Operations; $2,000,000 General Aggregate. The Policy shall be endorsed for Annual Aggregate and be written on an Occurrence form. CDOT shall be endorsed as an Additional Insured by the Contractor and by all Subcontractors. Completed Operations coverage shall be provided for a minimum period of one year following final acceptance of work.

(3) Commercial Automobile Liability shall cover all owned, non-owned, and hired vehicles with a minimum of $1,000,000 combined single limit bodily injury and property damage. The Policy shall protect CDOT as an Additional Insured and be written on an Occurrence form.

(4) Professional Liability Insurance (Errors & Omissions Insurance for Surveyors, Engineers or Architects). The Contractor shall procure and maintain, or shall ensure that all subcontractors meeting the following contract elements procure and maintain a minimum of $1,000,000 Each Occurrence and $1,000,000 Annual Aggregate when:

(1) Contract items 625, 629, or both are included in the Contract
(2) Plans, specifications, and submittals are required to be signed and sealed by the Contractor's Professional Engineer, including but not limited to:

(i) Shop drawings and working drawings as described in subsection 105.02
(ii) Mix Designs
(iii) Contractor performed design work as required by the plans and specifications
(iv) Change Orders

(v) Approved Value Engineering Change Proposals

The Contractor and any included subcontractor shall renew and maintain Professional Liability Insurance as outlined above for a minimum of one year following final acceptance of work.

(5) Umbrella or Excess Liability at a minimum of $1,000,000. This policy shall contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted. The Policy shall be written on an Occurrence form.

When the Contractor requires a subcontractor to obtain insurance coverage, the types and minimum limits of this coverage may be different than those required, as stated above, for the Contractor, except for the Commercial General Liability Additional Insured endorsement and those that qualify as needing Professional Liability Insurance.

107.16 Opening Sections of Project to Traffic. Opening certain sections of the work for traffic use shall not constitute acceptance of the work, or provide a waiver of any provision of the Contract.

The Contract will designate the sections to be opened and specify the method of compensation for signing and traffic control. The Contractor shall maintain the roadway in a condition equal to or better than the condition of the roadway when it was initially opened to traffic. Where applicable, the Contract may specify the time or date on which certain portions of the work shall be completed to provide for the accommodation of traffic.

The Engineer may order certain portions of the work opened for traffic, other than specified in the Contract. If the Engineer has not ordered the roadway opened because of unnecessary delay by the Contractor, and if no damage occurs other than that which can be attributed to traffic, the Contractor will be relieved of all responsibility for maintenance of traffic control devices and damage due to traffic. Any expense resulting from opening such sections shall be borne by the Department or the Contractor will be compensated for the added expense in accordance with subsection 109.04. If the opening causes changed working conditions, or delays the completion of other items of work on the project, compensation for the added expense and recommendations for additional time will be set forth by a Contract Modification Order.

If the Contractor is dilatory in completing the work, the Engineer may order all or a portion of the project to be opened to traffic. In such event, the Contractor will not be relieved of the liability and responsibility during the period the work is so opened prior to final acceptance. The Contractor shall conduct the remainder of the construction operations to cause the least obstruction to or interference with traffic. Damage attributed to traffic shall be paid for at the Contractor's expense.

Damages not attributable to traffic which might occur on sections opened to traffic shall be repaired at the Contractor's expense. The removal of slides that are not caused by the Contractor's operations shall be done by the Contractor on a basis agreed to prior to the slide removal.

107.17 Contractor's Responsibility for Work. The Contractor shall be responsible for and protect the contract work against injury or damage from all causes whether arising from the execution or nonexecution of the work, including but not limited to action of the elements, traffic, fire, theft, vandalism, or third party negligence, until final written acceptance of the project by the Engineer. The Contractor shall rebuild, repair, restore, or replace all contract work that is injured or damaged prior to final written acceptance at no cost to the Department.

The Engineer may, in writing, relieve the Contractor of expenses for damage to certain portions of the contract work caused by traffic or the action of the elements. The following conditions must be met before the Engineer will consider any relief:

(1) All work on the portion of contract work being considered must be complete under terms of the Contract except for seeding, mulching, landscape items, final clean-up, and bridge painting or structural coating.

(2) Traffic shall be in its final configuration and location.

Portions of contract work that may be considered are described below:

(1) A minimum of 0.5 mile of roadway, or a minimum of 0.5 mile of one direction of a divided highway.

(2) A complete bridge. This includes all approach roadway safety features that protect traffic from such items as: bridge railing and median barrier ends, piers, and abutments.

(3) A complete intersection traffic signal system.

(4) A complete highway lighting system.

Loss, injury, or damage to the contract work due to unforeseeable causes beyond the control of the Contractor, including but not limited to acts of God, such as earthquake, flood, tornado, high winds, or other cataclysmic phenomenon of nature, or acts of the public enemy or of governmental authorities, shall be restored by the Contractor under the provisions of subsection 104.02 or 104.03, as applicable.

During periods that work is suspended, the Contractor shall be responsible for the work under the Contract and shall prevent damage to the project, provide for drainage, and shall erect necessary temporary structures, signs, or other facilities required to maintain the project. During the suspension period, the Contractor shall maintain in a growing condition all newly established plantings, seedings, and soddings furnished

under the Contract, and shall protect new tree growth and other vegetative growth against injury.

107.18 (unused)

107.19 Furnishing Right of Way. The Department will be responsible for the securing of all necessary rights of way in advance of construction. Any exceptions will be indicated in the Contract.

107.20 Personal Liability of Public Employees. The Engineer or authorized representatives are acting solely as agents and representatives of the Department when carrying out and exercising the power or authority granted to them under the Contract. There shall not be any liability on them either personally or as employees of the Department.

107.21 No Waiver of Legal Rights. Upon completion of the Contract, the Department will make final inspection and notify the Contractor of acceptance. Final acceptance shall not preclude the Department from correcting any measurement, estimate, or certificate made before or after completion of the Contract, nor from recovering from the Contractor or surety or both, overpayments sustained because the Contractor failed to fulfill the obligations under the Contract. A waiver on the part of the Department of any breach of any part of the Contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor without prejudice to the terms of the Contract, shall be liable to the Department, for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Department's rights under any warranty or guaranty.

107.22 Third Party Beneficiary. It is specifically agreed between the parties executing this Contract that it is not intended by any of the provisions of any part of the Contract to create in the public or any member thereof a third party beneficiary hereunder, or to authorize any one not a party to this Contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Contract. The duties, obligations and responsibilities of the parties to this Contract with respect to third parties shall remain as imposed by law.

107.23 Archaeological and Paleontological Discoveries. When the Contractor's operations, including materials pits and quarries, encounter plant or animal fossils, remains of prehistoric or historic structures, prehistoric or historic artifacts (bottle dumps, charcoal from subsurface hearths, old pottery, potsherds, stone tools, arrowheads, etc.), the Contractor's affected operations shall immediately cease. The Contractor shall immediately notify the Engineer, or other appropriate agency for contractor source pits or quarries, of the discovery of these materials. When ordered to proceed, the Contractor shall conduct affected operations as directed. Additional work, except that in contractor source materials pits or quarries under subsection 106.02(b), will be paid for by the Department as provided in subsection 104.02 when contract unit prices exist, or as extra work as provided in subsection 104.03 when no

unit prices exist. Delays to the Contractor, not associated with work in contractor sources, because of the materials encountered may be cause for extension of contract time in accordance with subsection 108.07. If fossils, prehistoric or historic structures, or prehistoric or historic artifacts are encountered in a contractor source materials pit or quarry, all costs and time delays shall be the responsibility of the Contractor.

107.24 Air Quality Control. The Contractor shall comply with the "Colorado Air Quality Control Act," Title 25, Article 7, CRS and regulations promulgated thereunder.

107.25 Water Quality Control. The project work shall be performed using practices that minimize water pollution during construction. All the practices listed in (b) below shall be followed to minimize the pollution of any state waters, including wetlands.

(a) *Definitions.*

1. *Pollutant.* Dredged spoil, dirt, slurry, solid waste, incinerator residue, sewage, sewage sludge, garbage, trash, chemical waste, biological nutrient, biological material, radioactive material, heat, wrecked or discarded equipment, rock, sand, or any industrial, municipal, or agricultural waste. [25-8-103 (15), CRS]

2. *Pollution.* Man-made, man-induced, or natural alteration of the physical, chemical, biological, and radiological integrity of water. [25-8-103 (16), CRS]

3. *State Waters.* Based on 25-8-103 (19) CRS, state waters are defined to be any and all surface and subsurface waters which are contained in or flow through the state, including, streams, rivers, lakes, drainage ditches, storm drains, ground water, and wetlands, but not including waters in sewage systems, waters in treatment works or disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed.

(b) *Construction Requirements.*

1. The Contractor shall comply with the "Colorado Water Quality Control Act" (Title 25, Article 8, CRS), the "Protection of Fishing Streams" (Title 33, Article 5, CRS), the "Clean Water Act" (33 USC 1344), regulations promulgated, certifications or permits issued, and to the requirements listed below. In the event of conflicts between these requirements and water quality control laws, rules, or regulations of other Federal, or State agencies, the more restrictive laws, rules, or regulations shall apply.

2. If the Contractor anticipates, or if construction activities result in any change from or noncompliance with permits or certifications, then the

Contractor shall detail the anticipated changes or noncompliance in a written report to the Engineer, and revise existing permits or certifications or obtain new permits or certifications as necessary. The report shall be submitted within two days from the time the Contractor becomes aware of the change or noncompliance. Within five days after receipt of the report, the Engineer will approve or reject the request for change in writing, or detail a course of action.

3. The Contractor may be legally required to obtain permits associated with specific activities within, or off the right-of-way, such as borrow pits, concrete or asphalt plant sites, waste disposal sites, or other facilities. It is the Contractor's responsibility to obtain these permits. The Contractor shall consult with the Engineer, and contact the Colorado Department of Public Health and Environment or other appropriate federal, state, or local agency to determine the need for any permit.

4. The Contractor shall conduct the work in a manner that minimizes pollution of any adjacent waters, including wetlands. Erosion control work shall be performed in accordance with Section 208 and this subsection.

5. At least ten days prior to the beginning of construction, the Contractor shall submit to the Engineer a written report describing the location of potential pollution sources, such as vehicle fueling, storage of fertilizers or chemicals, etc. The report shall include maps indicating areas that will be used for storage of building materials, soils, or wastes, and the location of any dedicated asphalt or concrete batch plants. The report shall also include a spill contingency plan for any petroleum product, chemicals, solvents, or other hazardous materials in use, or in storage, at the work site. Work shall not be started until the report, including the spill contingency plan, has been submitted to the Engineer.

6. Required dewatering of excavations shall be conducted in a manner that avoids pollution and erosion. Water from dewatering operations shall not be directly discharged into any state waters including wetlands, irrigation ditches, canals, or storm sewers, unless allowed by a permit. Discharge into sanitary sewers will not be allowed unless written permission is obtained from the owner or controlling authority and a copy of this approval submitted to the Engineer. Unless prohibited by law or otherwise specified in the Contract, the water from dewatering operations shall be contained in basins for dissipation by infiltration or evaporation, shall be hauled away from the project for disposal in accordance with applicable laws and regulations, or shall be land applied to approved non-wetland vegetated areas and allowed to soak into the soil. Depending upon the quality of the water, land application of water to vegetated areas may require a written concurrence or permit from the Colorado Department of Public Health and Environment (CDPHE). Based on guidelines and criteria from CDPHE, the Contractor shall determine the quality of the water,

obtain applicable concurrences or permits, and furnish copies of the concurrences or permits obtained to the Engineer.

7. At least 15 days prior to commencing dredging or fill operations in a watercourse, the Contractor shall provide written notification to owners or operators of domestic or public water supply intakes or diversion facilities, if these facilities are within 5 miles downstream from the dredging or fill operations.

8. Upon completion of wetland or in stream construction activities, all temporary fills shall be removed in their entirety and disposed of in an upland location outside of flood plains unless otherwise specified in the Contract. Affected areas shall be returned to their pre-existing elevation unless otherwise specified in the Contract.

9. Construction operations in state waters, including wetlands, shall be restricted to:

   (1) Channel change areas designated in the Contract.
   (2) Areas designated in the Contract which must be entered to construct structures.
   (3) Fording waters no more than four times per day. Whenever fording waters more than four times per day is necessary, a temporary bridge or other structure shall be used.
   (4) Areas authorized by the Corps of Engineers.

10. Work in, or near, wetlands shall be performed in a manner that will minimize harm to the wetlands. Wetland areas outside of the right-of-way shall not be used for storage, parking, waste disposal, access, borrow material, or any other construction support activity.

11. Pollutant by-products of highway construction, concrete, asphalt, solids, sludges, pollutants removed in the course of treatment of wastewater, excavation or excess fill material, and material from sediment traps shall be handled, stockpiled, and disposed of in a manner that prevents entry into state waters, including wetlands.

    Removal of concrete waste and washout water from mixer trucks, concrete finishing tools, concrete saw and all concrete material removed in the course of construction operations or cleaning shall be performed in a manner that prevents waste material from entering state waters. A minimum of ten days prior to the start of concrete operations, the Contractor shall submit in writing a method for containing concrete wastewater to the Engineer for approval.

12. The use of chemicals such as soil stabilizers dust palliatives, herbicides, growth inhibitors, fertilizers, deicing salts, etc., during construction shall

be in accordance with the manufacturer's recommended application rates, frequency, and instructions. These chemicals shall not be used, stored, or stockpiled within 50 horizontal feet of the ordinary high water line of any state waters, including wetlands, except when otherwise specified in the Contract.

13. Construction waste or salvable material, excess excavated material, fill material, construction equipment, fuels, lubricants, and other petroleum distillates shall not be stored or stockpiled within 50 horizontal feet of any wetland, water impoundment area, or the ordinary high water line of any watercourse. Equipment fueling and servicing shall occur only within approved designated areas.

14. The quantity of materials stored on the project shall be limited, as much as practical, to that quantity required to perform the work in an orderly sequence. All materials stored on-site shall be stored in a neat, orderly manner, in their original containers, with the original manufacturer's label. Materials shall not be stored in a location where they may be carried into a state water at any time.

15. Spill prevention and containment measures shall be used at storage, and equipment fueling and servicing areas to prevent the pollution of any state waters, including wetlands. All spills shall be cleaned up immediately after discovery, or contained until appropriate cleanup methods can be employed. Manufacturer's recommended methods for spill cleanup shall be followed, along with proper disposal methods.

16. Use of heavy equipment in or around state waters, including wetlands, will not be allowed, except as specified in the Contract, permits, and subsection 107.25(b)10. above, unless otherwise directed by the Engineer. If any such work is allowed, the equipment shall be of such type that will produce minimal environmental damage. For allowed work in wetlands, the equipment shall be on fiber, wooden, earthen, or metallic mats to prevent undue disturbance and damage to the wetlands area. Where practical, equipment shall be operated from banks or shoulder above riparian and wetland areas.

17. The Contractor shall prevent grass or brush fires that will expose areas of soil to erosion.

18. The construction activity shall not block the movement of those species of aquatic life indigenous to the waterbody.

19. The construction activities shall not impair Indian tribal rights, including, but not limited to, water rights, and treaty fishing and hunting rights.

20. Discharges of pollutants into breeding areas of migratory waterfowl, or into fish spawning areas during spawning seasons shall not be permitted unless allowed by permits from appropriate regulatory agencies.

(c) *Measurement and Payment.*

1. All the work listed in (b) above, including but not limited to dewatering, erosion control for dewatering, and disposal of water resulting from dewatering operations, including all costs for CDPHE concurrences and permits, will not be measured and paid for separately, but shall be included in the work.

2. The Contractor shall be liable for any penalty (including monetary fines) applied to the Department caused by the Contractor's noncompliance with any water quality permit or certification. Monetary fines shall be deducted from any money due to the Contractor. If the monetary fine is in excess of all the money due to the Contractor, then the Contractor shall pay to the Department the amount of such excess.

3. The Contractor will not receive additional compensation, or time extensions, for any disruption of work or loss of time caused by any actions brought against the Contractor for failure to comply with water quality controls.

4. In the event that a spill occurs as a direct result of the Contractor's actions or negligence, the clean-up of such spill shall be performed by the Contractor at the Contractor's expense.

5. Areas exposed to erosion by fire resulting from the Contractor's operations shall be stabilized in accordance with Section 208 by the Contractor and at the Contractor's expense.

SECTION 108
PROSECUTION AND PROGRESS

108.01 Subletting of Contract. The Contractor shall not sublet, sell, transfer, assign, or dispose of the Contract or Contracts, or any portion thereof without written permission of the Engineer. Prior to beginning any work by subcontractor, the Contractor shall request permission from the Engineer by submitting a completed Sublet Permit Application, CDOT Form No. 205. The subcontract work shall not begin until the Contractor has received the Engineer's written permission. The Contractor shall make all project related written subcontracts available to the Engineer for viewing, upon request and at a location convenient to the Engineer.

The Contractor will be permitted to sublet a portion of the Contract, however, the Contractor's organization shall perform work amounting to 30 percent or more of the original total cost of bid items. Any items designated in the contract as "specialty items" may be peformed by subcontract. The cost of "specialty items" so performed by subcontract may be deducted from the original total cost of bid items before computing the amount of work required to be performed by the Contractor's own organization.

The calculation of the percentage of subcontracted work shall be based on the prime contract unit prices rather than subcontract unit prices. Proportional value for a subcontracted partial contract item will be verified by the Engineer. For the purpose of calculating the value of subcontracted work, the cost of procuring materials and manufactured products can be included in either the prime contract or subcontract. However, when a firm both sells material to a prime contractor and performs the work of incorporating the materials into the project, these two phases shall be considered in combination and as constituting a single subcontract.

Subcontracts, or transfer of Contract shall not release the Contractor of liability under the Contract and bonds.

108.02 Notice to Proceed. The Contractor shall not commence work prior to the issuance of a Notice to Proceed. The "Notice to Proceed" will stipulate the date on which contract time commences. When the Contractor proceeds with work prior to that date, contract time will commence on the date work actually begins. The Contractor shall commence work under the Contract on or prior to the fifth day following Contract execution or the twentieth day following the date of award, whichever comes later, or in accordance with the selected start date allowed in the special provisions.

108.03 Schedule. The Contractor shall be responsible for planning, scheduling, and reporting the progress of the work to ensure timely completion of the work as called for in the Contract. The Contractor shall prepare a Project Schedule that shall be used for coordination, for evaluation of progress, and for the evaluation of changes to the Contract. The Schedule shall include all activities, including those of subcontractors,

Contractor's engineers and surveyors, and suppliers. Seasonal and weather constraints, utility coordination, railroad restrictions, right of way restrictions, traffic constraints, environmental constraints, other project interfaces, expected job learning curves and other constraints shall be considered when preparing the Project Schedule. Days scheduled as no work days shall be indicated. A CPM schedule will be required unless the Commencement and Completion of work special provision allows a bar chart schedule. The Schedule shall show all work completed within the contract time.

The Contractor shall submit two copies of all required schedule information as described below. All schedules, diagrams, and reports shall include a title, project number, date of preparation, and the name of the Contractor. For CPM schedules, all required schedules and reports shall also be submitted electronically on floppy disk or compact disk.

The Bar Chart or Initial Schedule shall be submitted at least 10 working days prior to the start of the work. The Engineer's review of the Schedule will not exceed two working days. Work shall not begin until the Schedule is accepted in writing, unless otherwise approved by the Engineer.

(a) *Methods Statement*. A Methods Statement shall be prepared for the salient features listed in the Commencement and Completion of Work special provision, and for any feature not listed in the Commencement and Completion of Work special provision that the Contractor considers a controlling factor for timely completion. The Methods Statement shall be a detailed narrative describing each feature and all work necessary to complete the feature. The Methods Statement shall be submitted with the Contractor's schedule. The following format is required.

(1) *Feature:* name of the feature;
(2) *Responsibility:* Contractor, subcontractor, supplier, utility, etc. responsible for the feature;
(3) *Procedures:* procedures to be used to complete the work. The procedure to be used shall include general information regarding methods such as forming, excavation, pouring, heating and curing, backfill and embankment, trenching, protecting the work, etc. When separate or different procedures are to be employed by the Contractor due to seasonal or project phasing requirements, such differing procedures shall be described in the procedure statement;
(4) *Production Rates:* the planned quantity of work per day for each feature;
(5) *Labor Force:* the labor force planned to do the work;
(6) *Equipment:* the number, types, and capacities of equipment planned to do the work;
(7) *Work Times*: the planned time for the work to include:

A. number of work days per week
B. number of shifts per day
C. number of hours per shift.

At the Engineer's request, the Contractor shall update the Methods Statement, or any part thereof, and submit it with the next monthly schedule update.

(b) *Bar Chart.* The Bar Chart shall be time scaled and shall show the following:

(1) The salient features, as listed in the Commencement and Completion of Work special provision.
(2) Any feature not listed in the Commencement and Completion of Work special provision that the Contractor considers a controlling factor for timely completion.
(3) The number of days required to complete each feature and its relationship in time to other features.
(4) Sufficient space for each feature to permit two additional plots parallel to the original time span plot.
(5) The anticipated delivery dates for equipment or materials in any feature that could affect timely completion of the project.
(6) Critical completion dates for any activity within any feature that could affect timely completion of the project.
(7) Connecting lines between features that show the intended progression of activities.

The Schedule shall be updated as of the cutoff date for the monthly progress pay estimate and submitted to the Engineer before the payment of the progress pay estimate is approved. The Contractor shall provide a copy of the original bar chart showing, for each feature, the days actually worked and the anticipated days required to complete.

(c) *Critical Path Method*. CPM is a scheduling method which shows the interdependencies between work activities. The critical path is that path through the schedule which, if delayed, will cause a delay to project completion.

The Contractor shall use either Microsoft Project or Primavera Scheduling software to develop and manage the Critical Path Method Schedule. The Contractor shall notify the Project Engineer in writing, when submitting the first schedule which software, will be used. This choice cannot be changed after the first schedule submittal. When the Contractor uses Primavera-scheduling software, the Engineer may request an additional electronic copy of all required schedules and reports converted to the Microsoft Project format on floppy disk or compact disk, for information only. This additional information shall be submitted with all schedule submittals and updates. The Contractor shall perform all work required to ensure that the Microsoft schedule accurately reflects the planned schedule and progress.

The progress schedule shall include as a minimum the salient features of this project as listed in the Commencement and Completion of Work special provision. The progress schedule shall include all activities for all work on the project, including subcontracted work, delivery dates for critical material,

submittal and review periods, milestone requirements and no work periods. Where the project has specific phases, each phase shall be described separately for each applicable salient feature.

Construction activity duration shall not exceed 15 calendar days unless approved by the Engineer. Series of activities that have aggregate durations of five calendar days or less may be grouped in a single activity. For example, "form, reinforce, and pour pier" could be defined as a single activity rather than three.

Time Scaled Logic Diagram: This diagram shall show the logical progression of all activities required to complete the work defined in the Contract. Activity information shall include activity ID, description, duration, early start and finish dates, late start and finish dates, total float, and responsibility.

(1) Initial Schedule. The Initial Schedule shall include all necessary detail for procurement, construction and submittal activities required during the first 90 days of contract time. In addition, the Initial Schedule shall include a very basic group of activities that describes the time period after the 90th day of contract time and through the completion of the project. Only salient features and other significant activities will be required for the period after the first 90 days of contract time. The 15-calendar day activity duration limit will not apply to the portion of the Initial Schedule beyond the first 90 days of contract time. This submittal shall include a Time Scaled Logic Diagram.

(2) Project Schedule. The Project Schedule submittal shall consist of a Time Scaled Logic Diagram Schedule Report. It shall be prepared in full and submitted to the Engineer within 45 calendar days after the Engineer's acceptance of the Initial Schedule. The Engineer's review of the Project Schedule will not exceed seven calendar days. Revisions required as a result of the Engineer's review shall be submitted within 7 calendar days. Work shall not continue beyond 90 calendar days after the start of Contract Time until the Project Schedule is accepted in writing, unless otherwise approved by the Engineer.

The Project Schedule shall cover the time from the Date of Notice to Proceed to the predicted completion date.

The Schedule Report shall tabulate for each activity the activity ID, description, duration, earliest start and finish date, latest start and finish date, total float time, predecessor and successor activities, and responsibility.

(3) Schedule Updates. The Contractor shall update the Initial Schedule or the Project Schedule monthly to reflect actual construction progress of all work activities on the project. Updates shall show the previous month's progress and a projection for all remaining work activities on the project.

Schedules shall be updated as of the cutoff date for the monthly progress pay estimate and submitted to the Engineer before the payment of the progress pay estimate is approved.

Each of the diagrams, charts, and reports shall comply with the requirements for the Project Schedule above, except that they shall also include the actual completion dates and percentages of completion for the appropriate activities.

A Job Progress Narrative Report shall be submitted with all updates. It shall detail the description of job progress, problem areas, current and anticipated delaying factors and their anticipated effects, impacts to job milestones or project completion, any corrective action proposed or taken, and any minor revisions to the Schedule.

Revision of the Schedule may be required, as determined by the Engineer, for: a major revision in the schedule logic or methods of construction; the addition, deletion, or revision of activities required by contract modification; delays in milestones or the completion of the project; or for prosecution of work that revises the phasing or staging which is represented on the plans or on the progress schedule.

If it is determined that a revision to the Schedule is required, it shall be provided to the Engineer for review within 15 calendar days of written notification. The Engineer's review of the revised schedule will not exceed one week. Revisions required as a result of the Engineer's review shall be submitted within one week. When accepted by the Engineer in writing, the revised schedule shall become the Project Schedule.

The Contractor shall participate in the Engineer's review and evaluation of the submittals. Meetings will be held to review progress and planning when requested by the Engineer or Contractor.

The Contractor shall prosecute the work according to the Schedule. The Contractor ensure that its subcontractors, suppliers, and engineers, at any tier, also prosecute the work according to the Schedule. The Department shall be entitled to rely on the Contractor's Schedule for planning and coordination.

Acceptance of the Contractor's Schedule by the Engineer is not to be construed as relieving the Contractor of obligation to complete the contract work within the contract time allowed for the portion of the work or the entire Contract, or granting, rejecting or in any other way acting on the Contractor's request for extension of contract time, or claims for additional compensation.

All costs relating to the preparation, submittal, and acceptance of the Schedule, reports and revisions, and all requirements of this subsection will not be paid for separately, but shall be included in the work.

Failure of the Contractor to comply with the requirements of this subsection shall be grounds for a determination by the Engineer that no further progress payments are to be made until the Contractor is in full compliance.

108.04 Limitation of Operations. The Contractor shall conduct the work in a manner and sequence to assure the least interference with traffic. The Contractor shall not open up work to the prejudice or detriment of work already started. The Engineer may require the Contractor to finish a section of work before starting any additional sections if the opening of a section is essential to public convenience.

108.05 Character of Workers; Methods and Equipment. The Contractor shall employ resources for completing work to full completion in the manner and time required by the Contract.

All workers shall have skill and experience to perform the work assigned to them.

Any person employed by the Contractor or by any subcontractor who does not perform the work in a proper and skillful manner shall, at the written request of the Engineer, be removed by the Contractor or subcontractor and shall not be employed on the project without the approval of the Engineer.

Should the Contractor fail to remove this person or persons or fail to furnish skilled and experienced personnel for the proper prosecution of the work, the Engineer may suspend the work by written notice until compliance is achieved.

All equipment used on the project shall be of size and mechanical condition to meet requirements of the work and to produce a satisfactory quality of work. Equipment used shall not cause injury to the roadway, adjacent property, or other highways.

When the methods and equipment to be used are not prescribed in the Contract, the Contractor shall use any methods or equipment that will accomplish the contract work in conformity with the contract requirements.

When the methods and equipment to be used are specified in the Contract, other methods and equipment shall not be used in the performance of the work unless the Contractor receives written authorization from the Engineer.

If the Contractor desires to use a method or equipment other than specified in the Contract, the Contractor may request approval from the Engineer. The request shall include a full description of the methods and equipment proposed to be used and the Contractor's explanation for the proposed change. The Contractor will be fully responsible for producing work in conformity with contract requirements. If the substituted methods or equipment do not produce results conforming to contract requirements, the Contractor shall complete the remaining construction with the originally specified methods and equipment. Deficient work shall be removed, repaired, or replaced to conform with the specified quality by and at the Contractor's

expense. No increase will be made in the basis of payment for the construction items involved nor in contract time when a change in methods or equipment is authorized.

108.06 Workplace Violence. If a representative or employee of the Contractor, or a subcontractor, commits an act of workplace violence on the project, he shall be sanctioned as provided by the Contractor's employment policies and, where appropriate, shall be reported to law enforcement authorities. At the request of either the Contractor or the Engineer, the Engineer and the Contractor shall meet to discuss appropriate actions to be taken against the representative or employee. Appropriate action may include removing the representative or employee from the project. If removal is warranted and the Contractor fails to remove the representative or employee, the Engineer may suspend the work by written notice until compliance is achieved.

108.07 Determination and Extension of Contract Time. The contract time is stated in the Commencement and Completion of Work special provision. The contract time will be used to determine the Contract Completion Date.

The Contractor shall not carry on construction operations on Saturdays, Sundays or holidays unless previously arranged and approved. The Contractor shall not perform work on any day of a three or four day holiday weekend when the holiday is New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, or Christmas Day. The Contractor shall only make emergency repairs, and provide proper protection of the work and traveling public on these days.

(a) *Time Count Contract.* When the contract time is on a working day or calendar day basis, the Engineer will furnish the Contractor a weekly statement showing the number of days assessed for the preceding week and the number of days remaining for completion of the Contract. If the Contractor is in disagreement with the current weekly statement, the Contractor shall submit a request for review of the current weekly statement. Such request shall be made within 30 calendar days of the receipt of the statement and shall detail the reasons the statement is believed to be incorrect.

When final acceptance has been made by the Engineer as prescribed in subsection 105.20, the daily time charges will cease on working day and calendar day projects.

1. *Working Day Contract.* When the work is on a working day basis, one whole day of contract time will be assessed for each working day on which the work can be effectively prosecuted during six hours or more of the day. One-half day will be assessed for each working day on which the work can be effectively prosecuted for at least two hours but less than six hours of the day. Contract time will not be assessed when the work can be effectively prosecuted for less than two hours. Saturdays, Sundays, and holidays will be assessed as working days when the Contractor utilizes such days for prosecuting the work.

2. *Calendar Day Contract.* When the work is on a calendar day basis, one calendar day of contract time will be assessed for each calendar day from the date that Contract time starts including Saturdays, Sundays, and holidays. Less than full time charges may be made on those days when conditions, which are beyond the control of and unknown to the Contractor, make it impossible to prosecute the work on items controlling the completion of the work with full, normal efficiency. Less than full time charges may be allowed for inclement weather only when the Engineer directs the Contractor not to work for the safety of the traveling public. When less than full time charges are to be assessed, the following procedures will be followed: One whole day of contract time will be assessed for each calendar day on which the work is prosecuted during six hours or more of the Contractor's daily working schedule; one-half day will be assessed for each calendar day on which the work is prosecuted for at least two hours but less than six hours of the day; contract time will not be assessed when the work is prosecuted for less than two hours.

(b) *Completion Date Contract.* When the Contract specifies a completion date, all work under the Contract shall be completed on or before that date. No extension of the completion date will be allowed for inclement weather, foreseeable causes, or conditions under the control of the Contractor.

If all work under the Contract is not completed on or before the specified completion date, contract time will be assessed for each additional calendar day in accordance with subsection 108.07 (a) 2.

(c) *Delay.* Delay is defined as any event, action or factor that extends the time for the performance of the work.

1. *Excusable Delay.* A delay that was beyond the Contractor's control and not caused by the Contractor's fault or negligence, and for which a contract time extension may be granted.

A. *Compensable Delay.* An excusable delay caused by the Department for which the Contractor may be entitled to additional monetary compensation. Monetary compensation for such delays will be made in accordance with subsection 109.10.

B. *Noncompensable Delay.* An excusable delay for which the Contractor may be entitled to an extension of contract time but no additional monetary compensation. Contract time allowed for the performance of the work may be extended for delays caused by acts of God, acts of the public enemy, fires, floods, area wide strikes, freight embargoes, unusually severe weather, or delays not caused by the Contractor's fault or negligence.

2. *Nonexcusable Delay.* A delay that was reasonably foreseeable or within the control of the Contractor for which no monetary compensation or contract time extension will be granted.

Delays in delivery of materials or fabrication scheduling, resulting from late ordering, financial considerations, or other causes which could have been foreseen or prevented, will be considered nonexcusable delays. However, delays caused by fuel shortage or delay in delivery of materials to the Contractor due to some unusual market condition caused by industry-wide strike, national disaster, area-wide shortage, or other reasons beyond the control of the Contractor which prevent procurement of materials or fuel within the allowable contract time limits will be considered excusable delays.

(d) *Extension of Contract Time.* The Contractor's claim that insufficient contract time was specified is not a valid reason for an extension of contract time.

If the Contractor finds it impossible for reasons beyond the Contractor's control to complete the work within the contract time, as specified or extended, a written request for extension of contract time shall be submitted to the Engineer in two parts. The first part shall be a written notice submitted within seven days of the occurrence of a delay to the prosecution of the work. The notice shall contain a description of the activity which is delayed and information with appropriate documentation concerning the nature and cause of the delay.

The second part shall be a formal request by the Contractor for an extension of contract time which shall be submitted within 30 days of the initial notice. This part of the request shall be accompanied by evidence supporting the request. Such evidence shall demonstrate the following:

(1) The cause for the delay is allowable for consideration of a contract time extension under the terms of the Contract.
(2) The cause for the delay is allowable for consideration of monetary compensation under the terms of the Contract (to be submitted only if the Contractor is seeking monetary compensation for the delay).
(3) The delay has or will make it impossible for the Contractor to complete the work by the specified completion dates without taking steps to accelerate the work.
(4) A schedule revision as defined in subsection 108.03 shall accompany the request. The Schedule as revised shall clearly indicate that the activity or activities delayed were critical or have become critical due to the delay. For the purpose of these specifications, an activity shall be considered critical if all previously available float time has been used, and this delay will directly delay the Contract Completion Date. Float time is the length of time that an activity can be delayed without affecting the Contract Completion Date.

The Engineer's determination as to the extension of contract time to be allowed will be based on the current Schedule in effect at the time of the alleged delay, the supporting evidence submitted by the Contractor and any other relevant information available to the Engineer. The impact of the delay shall be reflected in the Schedule by adding activities or extending the duration of the affected activities, and, if appropriate, adjusting the Contract Completion Date. Delays in activities which, according to the current Schedule, do not affect the final Contract Completion Date will not be the basis for a change in the Contract Completion Date. If the Engineer grants an extension of the contract time, the Contract Completion Date as extended shall be in effect as though it were the contract time originally specified in the Contract.

108.08 Failure to Complete Work on Time. A daily charge will be made against the Contractor for each calendar day, including free time, that any work remains uncompleted after the elapse of contract time. This daily charge will be deducted from any money due the Contractor. This deduction will not be considered a penalty, but as liquidated damages.

The schedule of liquidated damages set forth below is an amount, agreed to by the Contractor and the Department, as reasonably representing additional construction engineering costs incurred by the Department if the Contractor fails to complete performance within the contract time.

The schedule of liquidated damages will be:

Original Contract Amount		**Liquidated Damages per Calendar Day ($)**
From More Than	To And Including	
0	150,000	67
150,000	250,000	174
250,000	500,000	430
500,000	1,000,000	1,086
1,000,000	2,000,000	1,778
2,000,000	4,000,000	2,363
4,000,000	10,000,000	3,240
10,000,000	----------	3,240 plus 583 Per Each Additional 1,000,000 Contract Amount or Part Thereof Over 10,000,000

Due account shall be taken of any adjustment of the contract time for completion of the work granted under the provisions of subsection 108.07.

Permitting the Contractor to continue and finish the work or any part thereof after elapse of contract time will not operate as a waiver on the part of the Department of any of its rights under the Contract.

Deductions assessed as liquidated damages under this subsection shall not relieve the Contractor from liability for any damages or costs resulting from delays to other contractors on the project or other projects caused by a failure of the assessed Contractor to complete the work according to contract times.

108.09 Default of Contract.

(a) The Engineer may send a written notice of intent to find the Contractor in default to the Contractor and the Surety by certified mail for any of the reasons listed below. The notice will describe the conditions causing the impending default, advise them of the actions required for remedy and state that if the conditions have not been corrected within ten days of receipt of the notice, CDOT will find the Contractor in default.

The Department may send a written notice of intent under this part (a) if the Contractor:

(1) Fails to begin the Contract work within the time specified to begin work, or
(2) Fails to perform the Contract work with sufficient resources to assure its timely completion, or
(3) Discontinues the Contract work, or
(4) Fails to resume discontinued Contract work, or
(5) Becomes insolvent, is declared bankrupt, commits an act of bankruptcy or insolvency, allows a final judgment to remain unsatisfied for a period of ten calendar days, makes an assignment for the benefit of creditors, or
(6) Fails to comply with the Contract regarding minimum wage payments, DBE requirements, or EEO requirements, or
(7) Is a party to fraud.

If the Contractor fails to correct the conditions identified in the notice of intent to find the Contractor in default within ten calendar days of receipt, the Department may serve the Contractor with an immediate notice of default and take prosecution of the work from the Contractor. Copies of the default notice will also be sent, by certified mail, to the Contractor and the Surety.

(b) The Engineer may send a written notice of intent to find the Contractor in default to the Contractor and the Surety by certified mail for the reason listed below. The notice will include a stop work order which will require the Contractor to cease work on the Contract Items that are unacceptable. The notice will describe the conditions causing the impending default, advise the Contractor of the actions required for remedy and state that if the conditions have not been corrected within ten days of receipt of the notice, CDOT will find the Contractor in default.

The Department may send a written notice of intent under this part (b) if the Contractor fails to perform the work to Contract requirements or neglects or refuses to correct or remove and replace rejected materials or unacceptable work.

The Contractor shall not resume work on the unacceptable Contract Items until the following conditions have been met:

(1) The Contractor shall submit a written proposal to the Engineer outlining the procedures which will be followed by the Contractor to correct the unacceptable conditions, and;
(2) The Engineer and the Contractor shall meet to discuss the written proposal, and;
(3) The Engineer will issue written permission for the Contractor to commence work.

If the Contractor fails to meet these three conditions within ten calendar days of receipt of the notice of intent to find the Contractor in default, or if at any time after the Contractor resumes work, the work does not meet Contract requirements or the Contractor again neglects or refuses to correct or remove and replace rejected materials or unacceptable work, the Department may serve the Contractor with an immediate notice of default and take prosecution of the work from the Contractor. Copies of the default notice will also be sent, by certified mail, to the Contractor and the Surety.

(c) In the case of default under either subsection 108.09(a) or 108.09(b):

(1) The Department will revoke the Contractor's Prequalification. If the Department chooses to rebid the remaining Contract work on this project, the Contractor will not be allowed to submit a bid for this work.
(2) The Department may appropriate or use materials at the project site and contract with others to complete the remaining Contract work.
(3) The Department will determine the methods used for completion of the Contract.
(4) Resulting costs and charges incurred by the Department will be deducted from payments owed the Contractor. If such costs exceed the payment owed the Contractor, the Contractor and Surety shall reimburse the Department for these costs. These costs and charges may include but are not limited to: cost of Contract completion, including designing, advertising, bidding and awarding the remaining work and liquidated damages or disincentives.

(d) If the notice of default is determined to be in error, the rights and obligations of the parties shall be the same as if the Contract had been terminated in accordance with Subsection 108.09. Damages for improper notice of default may be awarded accordingly.

108.10 Termination of Contract.

(a) *Termination Notice.* The Department may terminate work under the Contract in whole or in part if the Engineer determines that termination is in the Department's best interest. Contract termination will be initiated by the

Engineer's written Contract Termination Notice to the Contractor. The notice will specify the effective date.

(b) *Canceled Commitments.* The Contractor, after receiving the Contract Termination Notice, shall cancel any outstanding commitments for procurement of materials, supplies, equipment, and miscellaneous items. In addition, the Contractor shall use reasonable effort to cancel or divert any outstanding subcontract commitments to the extent they relate to any work terminated. With respect to such canceled commitments the Contractor shall:

(1) Settle all outstanding liabilities and all claims arising out of these canceled commitments. Such settlements will be approved by the Engineer and shall be final; and
(2) Assign to the Department all of the rights, title and interest of the Contractor under the terminated orders and subcontracts, as directed. The Department will then have the right to settle or pay any or all claims arising out of the termination of these commitments.

(c) *Termination Claim.* The Contractor shall submit the termination claim to the Engineer within 90 days after the termination notice effective date. During the 90 day period, the Contractor may make a written request for a time extension in preparing the claim. Any time extension must be approved by the Engineer. If the Contractor fails to submit the termination claim within the time allowed, the Engineer may determine the amount due the Contractor by reason of the termination.

(d) *Payment.* Subject to subsection 108.10(c) above, the Contractor and Engineer may agree upon the whole or any part of the amount to be paid to the Contractor because of the termination. The amount may include reasonable cancellation charges incurred by the Contractor. The amount may also include any reasonable loss upon outstanding commitments for subcontracts which the Contractor is unable to cancel, provided the Contractor has made reasonable effort to divert the commitments to other activities. The amount agreed upon shall be embodied in a Contract Modification Order and the Contractor shall be paid that amount.

Payments claimed and agreed to pursuant to termination shall be based on the Contract unit prices. Payment for partially completed lump sum items may be made in the proportion that the partially completed work is to the total lump sum item. Where work performed is of a nature that it is impossible to separate the costs of uncompleted work from completed units, the Contractor will be paid the actual cost incurred for the necessary preparatory work and other work accomplished.

The Department may from time to time, under terms and conditions it may prescribe, make partial payments against costs incurred by the Contractor in connection with the contract termination. The total of such payments shall not

exceed the amount, as determined by the Engineer, the Contractor will be entitled to hereunder.

(e) *Disposition of Work and Inventory.* The Contractor shall transfer title and deliver to the Department, as directed, such items which, if the Contract had been completed, would have been furnished to the Department including:

(1) Completed and partially completed work; and
(2) Materials or equipment produced or in process or acquired in connection with the performance of the work terminated by the notice.

Other than the above, any termination inventory resulting from the contract termination may, with written approval of the Engineer, be sold or acquired by the Contractor under the conditions prescribed by and at prices approved by the Engineer. The proceeds of any such disposition shall be applied to reduce any payments to the Contractor under the Contract, or shall otherwise be credited to the cost of work covered by the Contract, or paid in a manner as directed. Until final disposition, the Contractor shall protect and preserve all the material related to the Contract which is in the Contractor's possession and in which the Department has or may acquire an interest.

(f) *Cost Records.* The Contractor agrees to make cost records available to the extent necessary to determine the validity and amount of each item claimed.

(g) *Contractual Responsibilities.* Termination of a Contract or portion thereof shall not relieve the Contractor of contractual responsibilities for the work completed, nor shall it relieve the Surety of its obligation for and concerning any just claim arising out of the work performed.

SECTION 109
MEASUREMENT AND PAYMENT

109.01 Measurement of Quantities. All work completed under the Contract will be measured by the Engineer according to United States standard measure (English units).

A station when used as a definition or term of measurement will be 100 linear feet.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the Contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and deductions will not be made for individual structures having an area of 9 square feet or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or as ordered in writing by the Engineer.

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.

Items which are measured by linear foot, such as pipe culverts, guardrail, underdrains, etc., will be measured parallel to the base or foundation upon which the structures are placed, unless otherwise shown on the plans.

In computing volumes of excavation and embankment, the average end area method or the method incorporated into the Department's computer earthwork program will be used.

The term "gage," when used in connection with the measurement of plates, will mean the U.S. Standard Gage.

When the term "gage" refers to the measurement of wire, it will mean the wire gage specified in ASTM A510.

The term "ton" will mean the short ton consisting of 2000 pounds avoirdupois.

Materials measured or proportioned by weight shall be weighed on accurate scales. Scales shall be accurate within the allowable tolerances as prescribed by State law. The scales shall be sealed by the Measurement Standards Section of the Colorado Department of Agriculture at least once each year, each time the scales are relocated, and as often as the Engineer may deem necessary. Scales shall be furnished by the Contractor or the Contractor may utilize commercial scales.

Scales shall be operated by weighers certified by the Measurement Standards Section of the Colorado Department of Agriculture. The certified weigher shall perform the

duties according to the Colorado Department of Agriculture's regulations. The cost of the certified weighers, scales, scale tickets, scale house, and verifying the scale's accuracy will not be paid for separately but shall be included in the contract price for the weighed material.

The operator of each vehicle weighed by a certified weigher shall obtain a scale ticket (certificate of correct weight) from the weigher and deliver the ticket to the Engineer at the point of delivery of the material.

The scale ticket shall include the following information:

(1) Project Number.
(2) Date.
(3) Ticket Number.
(4) Haul Unit Number.
(5) Gross Weight.
(6) Tare Weight.
(7) Net Weight.
(8) Material Type.
(9) Certified Weigher's Name.

Vehicles used to haul material being paid for by weight shall be weighed empty daily at times directed by the Engineer and shall bear a plainly legible identification mark. The Contractor shall furnish to the Engineer, in writing, a list of identification marks, number of axles, and the distance between extreme axles of each delivery vehicle to be used on the project. This information shall be furnished prior to time of delivery of the material and at any subsequent time the Contractor changes vehicles, combination vehicles, or axle length relationships.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type, provided the body is shaped so the actual contents may be readily and accurately determined. All vehicles shall be loaded to their water level capacity and all loads shall be leveled when the vehicles arrive at the point of delivery.

Water used in the work will be measured by the M Gallon or 1000 U.S. Gallons. The weight of inherent moisture in the material will not be deducted. Water added for the Contractor's convenience will not be paid for.

Water may be measured either by volume or weight. Water meters shall be accurate within a range of $\pm$3 percent. When water is metered, the Contractor shall use an approved metering device and shall furnish the Engineer a certificate showing that the meter has been accurately calibrated within the time allowed in the following schedule:

2 inch	4 years
4 inch to 6 inch	2 years
8 inch to 10 inch	1 year

Water meters shall be calibrated when the Engineer determines there is reason to believe the meters are not accurate within the allowable tolerance. In the event water meter accuracy is found acceptable, the cost involved in checking the water meter shall be at the Department's expense. Should the water meter accuracy be found unsatisfactory, the cost involved in checking the water meter shall be at the Contractor's expense.

For those materials specified to be measured by the cubic yard, an acceptable method of computing volumes of excavation is to determine a weight to volume factor and convert weight to volumes by means of the factor. The weight to volume factor shall be determined by Colorado Procedures 22 or 80 as described in the Department's Field Materials Manual. The number of tests used to determine the material weight to volume factor will be determined by the Engineer. The locations where the tests are taken shall be at those locations specified in the "Method of Measurement" for the particular bid item; i.e., Unclassified Excavation - in its original position: Embankment Material - in its final compacted position, etc.

Bituminous materials will be measured by the gallon or ton. Volumes will be measured at 60 °F or will be corrected to the volume at 60 °F using ASTM D 1250 for asphalts or ASTM D 633 for tars. Net certified scale weight or weight based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When bituminous materials are shipped by truck or transport, net certified weight or volume subject to correction for loss or foaming, will be used for computing quantities.

Cement will be measured by the ton.

Timber will be measured by the number of thousand feet board measure or MFBM actually incorporated in the structure. Measurement will be based on nominal commercial widths and thicknesses.

The term "lump sum" when used as an item of payment will mean complete payment for the work described in the Contract.

When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will include all necessary fittings and accessories.

Rental of equipment will be measured in hours of actual working time and necessary traveling time of the equipment within the limits of the project. If special equipment has been ordered by the Engineer in connection with force account work, travel time and transportation to the project will be measured. If equipment has been ordered held on the job on a standby basis by the Engineer, and is not otherwise utilized by the Contractor, standby rental rates for the equipment will be paid at the rates specified in subsection 109.04.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gage, unit weight, section dimensions, etc., the identification will be considered to be nominal weight or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

109.02 Scope of Payment. The Contractor shall receive and accept compensation provided for in the Contract as full payment for furnishing all materials and for performing all work under the Contract in a complete and acceptable manner and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the prosecution thereof, subject to the provisions of subsection 107.21.

Work or materials for which there are pay items and which are to be paid for separately will be included in the appropriate pay item in the Summary of Approximate Quantities on the plans. Work or materials that are essential to the project but for which there are no pay items, will not be measured and paid for separately but shall be included in the project.

Payment for any pay item listed in the Summary of Approximate Quantities on the plans, having additional items shown within parentheses, shall be full compensation for all work necessary to complete the item as designated.

109.03 Compensation for Altered Quantities. When the accepted quantities of work vary from the quantities in the Contract the Contractor shall accept as payment in full, payment at the original contract unit prices for the accepted quantities of work done. Allowance will not be made except as provided in subsections 104.02 and 108.10, for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor resulting either directly from such alterations or indirectly from unbalanced allocation of overhead expense among the contract items or from any other cause.

Should any such alteration directly cause the loss of any work or materials already furnished by the Contractor under the terms of the original contract, reimbursement for such work or of salvaging such materials will be at actual cost. Any such materials may, at the option of the Department, be purchased at the actual cost to the Contractor, as evidenced by certified invoices.

109.04 Compensation for Changes and Force Account Work. Differing site conditions, changes, and extra work performed under Section 104 will be paid as stipulated in the order authorizing the work. Compensation will be at unit prices or lump sum, or the Department may require the Contractor to do the work on a force account basis to be compensated in the following manner:

(a) *Labor*. For all labor and foremen in direct charge of the specific operations, the Contractor will receive the actual rate of wage normally paid for each and every hour that the labor and foremen are actually engaged in the work, as documented by certified payrolls.

The Contractor will receive the actual costs paid to, or in behalf of, workers by reason of subsistence and travel allowances, health and welfare benefits, pension fund benefits, or other benefits, when the amounts are required by a collective bargaining agreement or other employment contract or generally applicable to the classes of labor employed on the work.

An amount equal to 67 percent of the actual wages and fringe benefits paid directly to the employees will also be paid to the Contractor. This 67 percent will not be applied to subsistence, travel allowance, or to fringe benefits paid to a third party or a trustee.

(b) *Materials.* For materials accepted by the Engineer and incorporated in the work, the Contractor shall receive the actual cost of such materials, including transportation charges paid (exclusive of equipment rentals as hereinafter set forth), to which 15 percent will be added.

(c) *Owned or Leased Equipment.* For the use of any machinery or equipment, approved by the Engineer, which is owned or leased directly by the Contractor or subcontractors, or by entities that are divisions, affiliates, subsidiaries or in any other way related to the Contractor or subcontractors or their parent companies, the Contractor will be paid in the manner hereinafter specified. Rental rates will be from the current edition of the Rental Rate Blue Book of Rental Rates for Construction Equipment and will be used as follows:

1. Determination of the rental rate to be used will be as follows:

   Hourly rate: RR=(ADJ BB/176)(RF)+EOC
   Standby rate: SR=(ADJ BB/176)(RF)(0.5)

   Where: RR = Hourly rental rate
   SR = Standby rate
   ADJ BB = Blue Book Monthly Rate adjusted for year of manufacture
   RF = Regional Factor of 1.06
   EOC = Estimated Hourly Operating Costs from Blue Book

2. The number of hours to be paid for will be the number of hours that the equipment is actually used on a specific force account activity.

3. Overtime shall be compensated at the same rate indicated in subsection 109.04(c)1. above.

4. The EOC will be used for each hour that the equipment is in operation on the force account work. Such costs do not apply to idle time regardless of the cause.

5. Idle time for equipment will not be paid for, except where the equipment has been held on the Project site on a standby basis at the direction of the Engineer. Such payment will be made at the standby rate established in subsection 109.04(c)1. above. The Engineer must approve the payment of standby rates for equipment before the costs are incurred. Payment for standby time will not be made on any day the equipment operates for eight or more hours. For equipment accumulating less than eight hours operating time on any normal work day standby payment will be limited to only that number of hours that, when added to the operating time for that day, equals eight hours. Additionally, payment for standby time will not be made in any consecutive 30 day period that the equipment operates for 176 or more hours. For equipment accumulating less than 176 hours operating time in any consecutive 30 day period, standby payment will be limited to only that number of hours that, when added to the operating time for that consecutive 30 day period, equals 176 hours. Standby payment will not be made in any case on days not normally a work day.

6. The rates established above include the cost of fuel, oil, lubrication, supplies, incidental tools valued at less than $500, necessary attachments, repairs, overhaul and maintenance of any kind, depreciation, storage, overhead, profit, insurance, all costs (including labor and equipment) of moving equipment onto and away from the site, and all incidentals, except as allowed in subsection 109.04(c)8.

7. The rental rate for small tools shall be $2.00 per hour. Small tools are defined as any tool which would be valued between $500 and $2,000 if purchased new.

8. Transportation charges for each piece of equipment to and from the site of the work will be paid provided:
   (1) the equipment is obtained from the nearest source,
   (2) charges are restricted to those units of equipment not already available or required on the Project, and
   (3) the equipment is used solely for the force account work.

9. Fast use expendable parts not included in the Rental Rate Blue Book will be paid at certified invoice cost plus 10%. Such parts not totally expended on the force account work will be prorated based on actual use.

Payable time periods will not include:
(1) time elapsed while equipment is broken down;
(2) time spent in repairing equipment; or
(3) time elapsed after the equipment is no longer needed.

If a piece of equipment, that is not in the Blue Book, is needed, rates shall be agreed to in writing before the equipment is used.

(d) *Rental Equipment.* Use of rental equipment not owned or leased by the Contractor or subcontractors will be paid for by certified invoice cost. The EOC will also be paid if not included in the rental rate. The use of and rates for rental equipment shall be approved by the Engineer prior to use. Proration of rental rates to an hourly rate for equipment not used solely for the force account shall be based on 176 hours per month, 40 hours per week or 8 hours per day as applicable. The cost of moving the rental equipment onto and away from the job will also be paid when the equipment is used solely for the force account work. An amount equal to ten percent of the total due to the Contractor for rental equipment cost will be added to compensate the Contractor for related overhead costs.

(e) *Administrative Compensation.* Administrative compensation will be paid to the Contractor for work performed on a force account basis by a subcontractor, utility, railroad, waste disposal company, or specialty firm. The compensation will be a percentage of the value of the force account work performed in accordance with the following:

To $1,000..... 10%
Over $1,000 to $10,000.....$100 plus 5% of excess over $1,000
Over $10,000..... $550 plus 3% of excess over $10,000

The percentages will be calculated after certified invoices are furnished by the Contractor. Compensation for administrative loading expenses will be applied to each individual billing for each force account, not to exceed one administrative loading per billing nor one billing per force account per month.

(f) *Records.* The Contractor's representative and the Engineer shall, on a daily basis, agree in writing on the quantities of labor, equipment and materials used for work completed on a force account basis.

(g) *Statements.* Payment will not be made for work performed on a force account basis until the Contractor has furnished the Engineer with triplicate itemized statements of the cost of the force account work, detailed as follows:

(1) Labor classification, hours, rate, and extension for each labor class or pay rate within a class.
(2) Equipment type, hours, rate and extension for each unit of equipment.
(3) Quantities of materials, prices, extensions and transportation charges.
(4) Administrative compensation when applicable.

Statements shall be accompanied and supported by certified invoices for all materials and rental equipment including transportation charges. If materials used on the force account work are not specifically purchased for the work, but are taken from the Contractor's stock, the Contractor shall furnish a written statement certifying that the materials were taken from stock, that the quantity claimed was actually used, and that the price and transportation claimed represent the actual cost to the Contractor.

(h) *Alternative Method of Documenting Force Account Work.* The following method of documenting the amount of force account work done may be used in lieu of the method described in subsections 109.04(f) and (g) above, when agreed to by both the Engineer and the Contractor.

The Engineer will keep a daily record of the labor, equipment and material used on approved force account work. The Contractor's representative shall review and initial the record each day to ensure that the record is accurate and complete, and that the costs were actually incurred.

The Contractor shall furnish certified copies of invoices for the cost of all materials used including transportation charges. If materials used on force account work are not specifically purchased for the work, but are taken from the Contractor's stock, the Contractor shall furnish a written statement certifying that the quantity claimed was actually used, and that the price and transportation charges claimed represent the actual cost to the Contractor.
The Engineer will calculate the cost of the force account work each month and include payment on the monthly progress estimate.

(i) The additional percentages stated in (a) through (h) above constitute full compensation for all items of expense not specifically designated, including general superintendence, use of incidental tools, field and office overhead and profit. The total payment made as provided above shall constitute full compensation for such work.

109.05 Eliminated Items. Should any items contained in the Contract be found unnecessary for the proper completion of the work, the Engineer will notify the Contractor in writing, to eliminate the item. Such action will not invalidate the Contract. The Contractor, by Contract Modification Order, will be reimbursed for actual work done and all costs incurred, including mobilization of materials and equipment prior to the elimination of the items.

109.06 Partial Payments. Partial payments will be made once each month as the work progresses, when the Contractor is performing satisfactorily under the Contract. Payments will be based upon progress estimates prepared by the Engineer, of the value of work performed, materials placed in accordance with the Contract, and the value of the materials on hand in accordance with subsection 109.07. The amount of the progress estimate paid to the Contractor will be subject to the following:

(a) *Standard Amount Retained.* The Department will make a deduction from the progress estimate in the amount considered necessary to protect the interests of the State, pursuant to Section 24-91-103, CRS. The amount to be retained will be 3 percent of the value of the completed work, exclusive of mobilization and payments for materials on hand, to a maximum of 1½ percent of the original contract amount. No further amount will be retained if the Contractor makes satisfactory progress in the contract work. The amount retained will be in effect until such time as final payment is made, with the following exception which

requires the Contractor's written request and consent of the Surety: Upon completion and acceptance of the project, after the project quantities are finalized, and the Contractor has submitted the necessary forms, the Engineer may make reduction in the amount retained.

(b) *Securities in Lieu of Standard Amount Retained.* When the original contract amount exceeds $80,000, the Contractor may withdraw all or any portion of the standard amount retained if acceptable securities are assigned to the Department, and deposited as set forth in Section 24-91-105, CRS and the implementing regulations. The securities shall at all times have a market value at least equal in value to the sums withdrawn. If at any time the Department determines that the market value of the securities has fallen below the sums withdrawn, the Contractor, shall deposit additional acceptable securities in an amount sufficient to reestablish a total deposit of securities equal in value to the sums withdrawn. This security substitution shall not apply if a part of the contract price is paid from federal, or other sources, and the federal or other source has requirements which are inconsistent with this subsection.

(c) *Subcontractor and Supplier Claims.* In addition to a standard amount retained, the Department will withhold funds for all claims against the Contractor filed by subcontractors and suppliers, pursuant to Sections 38-26-107 and 24-91-103, CRS.

(d) *No Payment.* A partial payment will not be made when the total value of the work done since the last estimate amounts to less than $500.

(e) *Prompt Payment*. The Contractor shall pay subcontractors and suppliers for all work which has been satisfactorily completed within seven calendar days after receiving payment for that work from the Department. For the purpose of this section only, work shall be considered satisfactorily complete when the Department has made payment for the work.

The Contractor shall include in all subcontracts a provision that this requirement for prompt payment to subcontractors and suppliers must be included in all subcontracts at every tier.

The Contractor shall ensure that all subcontractors and suppliers at every tier are promptly paid.

If the Contractor fails to comply with this provision the Engineer will not authorize further progress estimates until the required payments have been made and the Contractor agrees to make payments as specified.

(f) *Retainage by the Contractor*. The Contractor may withhold retainage of each progress estimate on work performed by subcontractors. If during the prosecution of the project, a subcontractor satisfactorily completes all work

described on CDOT Form No. 205, as amended by changes directed by the Engineer, the following procedure will apply:

1. The subcontractor may make a written request to the Contractor for the release of the subcontractor's retainage.

2. Within ten working days of the request, the Contractor shall determine if all work described on Form 205 has been satisfactorily completed and shall inform the subcontractor in writing of the Contractor's determination.

3. If the Contractor determines that the subcontractor has not achieved satisfactory completion of all work described on Form 205, the Contractor shall provide the subcontractor with written notice, stating specifically why the subcontract work is not satisfactorily completed and what has to be done to achieve completion. A copy of this written notice shall be provided to the Engineer.

4. If the Contractor determines that the subcontractor has achieved satisfactory completion of all work described on Form 205, the Contractor shall release the subcontractor's retainage within seven calendar days.

5. In determining whether satisfactory completion has been achieved, the Contractor may require the subcontractor to provide documentation such as certifications and releases, showing that all laborers, lower-tiered subcontractors, suppliers of material and equipment, and others involved in the subcontractor's work have been paid in full. The Contractor may also require any documentation from the subcontractor that is required by the subcontract or by the Contract between the Contractor and the Department or by law such as affidavits of wages paid, material acceptance certifications and releases from applicable governmental agencies to the extent that they relate to the subcontractor's work.

6. Within 14 calendar days after receiving the Contractor's request, the Engineer will make inspection of all work described on Form 205. The Engineer will measure and furnish the final quantities to the Contractor of the items completed by the subcontractor. Agreement on these final quantities by the Contractor will not constitute the acceptance of the work described on Form 205 by the Engineer.

7. If the subcontractor performs only a portion of an item of work, the Contractor shall release retainage in accordance with the procedures stated above and when the subcontractor has completed all of the work included in the subcontract, however, final measurement of quantities will not be made until the item of work and all of the work on the associated Form 205 has been completed.

8. If additional quantities of a particular item of work are required at a later date after final measurement has been made, the Contractor shall perform this work in accordance with Contract requirements and at unit bid prices.

   For this subsection only, satisfactory completion of all work described on CDOT Form No. 205 is when all tasks called for in the subcontract as amended by changes directed by the Engineer have been accomplished and documented as required by the Department.

   The requirements stated above do not apply to retainage withheld by the Department from monies earned by the Contractor. The Department will continue to process the release of that retainage based upon the completion date of the project as defined in the Commencement and Completion of Work special provision.

   The Contractor shall be solely responsible for all additional costs involved in paying retainage to the subcontractors prior to total project completion.

(g) *Good Cause Exception.* If the Contractor has "good cause" to delay or withhold a subcontractor's progress payment, the Contractor shall notify the Department and the subcontractor in writing within seven calendar days after receiving payment from the Department. The notification shall specify the amount being withheld and provide adequate justification for withholding the payment. The notice shall also clearly state what conditions the subcontractor must meet to receive payment. "Good cause" shall include but not be limited to the failure of the subcontractor to make timely submission of required paperwork

109.07 Payment for Material on Hand (Stockpiled Material). Payments may be made to the Contractor for materials to be incorporated into the work as evidenced by invoices or cost analyses of material produced on the project subject to the following:

(1) The material has been fabricated or processed and is ready for installation into the project and conforms to the requirements of the Contract. The Contractor shall provide the Engineer with a monthly accounting of all materials stockpiled on the project for which stockpiled payment is being requested and certification of compliance that the materials conform to the requirements of the Contract. This monthly accounting shall include the specific location of materials, the amounts of materials stockpiled, the amounts of materials incorporated into the work, and the net amounts of materials for which stockpile material payment is being requested.

   Payment for stockpiled structural steel (unfabricated milled plate) may be made subject to the following additional conditions:

   (i) The plan quantity of structural steel shall exceed one million pounds.

(ii) The structural steel shall have been delivered to the Contractor's fabrication plant.
(iii) The material conforms to the requirements of the Contract.
(iv) Payment shall not exceed 60 percent of the certified invoice cost of the structural steel.

(2) The material is stored on the project, on State owned property, or at an acceptable secured location within the State of Colorado. In the latter case, the Contractor must provide a document signed by the owner and lessee of the property establishing that the Department has a vested interest in, and the right of access to and possession of the material. The material shall be clearly identified for the CDOT project.

If the material is structural steel (either completely fabricated or unfabricated milled plate), it is stored on the project, stored on State owned property, or identified and stored separately from all other lots of similar material in acceptable storage places. In the latter case, the Contractor shall provide a document signed by the owner and lessee of the property establishing that the Department has vested interest in, and the right of access to and possession of the structural steel. When the structural steel is stockpiled outside the State of Colorado, the Contractor shall reimburse the Department for all costs incurred to verify the quantity of the material, conformance to contract requirements, and proper storage.

(3) The Contractor provides the Engineer with a written cost analysis which confirms that the balance of funds in the corresponding items is sufficient to complete the installation. Partial payments will not exceed 85 percent of the contract unit price for the item or 100 percent of the certified invoice cost of the stockpiled material, whichever is less.

(4) The Contractor shall provide the Engineer with a certified invoice.

Payment for stockpiled materials will not relieve the Contractor of responsibility for loss or damage to the material. Payment for living plant materials, perishable materials, or materials which will not become an integral part of the finished project will not be made under this subsection.

109.08 Reserved

109.09 Acceptance and Final Payment. When the project has been accepted as provided in subsection 105.20, the Engineer will prepare the final estimate of the quantities of the various classes of work performed. After approval of the final estimate by the Contractor, payment of the entire sum found to be due after deducting all previous payments and all amounts to be retained or deducted under the provisions of the Contract will be made.

All prior estimates and payments, except for those made in accordance with subsection 109.06(f)6. will be subject to correction in the final estimate and payment.

109.10 Compensation for Compensable Delays. If the Engineer determines that a delay is compensable in accordance with either subsection 105.21 or 108.07, monetary compensation will be determined in accordance with this subsection.

(a) These categories represent the only costs that are recoverable by the Contractor All other costs or categories of costs are not recoverable:

(1) Actual wages and benefits, including FICA, paid for additional non-salaried labor;
(2) Costs for additional bond, insurance and tax;
(3) Increased costs for materials;
(4) Equipment costs calculated in accordance with subsection 109.04(c) for Contractor owned equipment and based on invoice costs for rented equipment;
(5) Costs of extended job site overhead;
(6) Subcontractor's claims (the same level of detail as specified herein is required for all subcontractors' claims)
(7) An additional 10 percent will be added to the total of items (1), (2), (3), (4), (5), and (6) as compensation for items for which no specific allowance is provided, including profit and home office overhead.

(b) In adjustment for costs as allowed above, the Department will have no liability for the following items of damages or expense:

(1) Profit in excess of that provided in (a) above;
(2) Loss of profit;
(3) Additional cost of labor inefficiencies in excess of that provided in (a) above;
(4) Home office overhead in excess of that provided in (a) above;
(5) Consequential damages, including but not limited to loss of bonding capacity, loss of bidding opportunities, and insolvency;
(6) Indirect costs or expenses of any nature in excess of that provided in (a) above;
(7) Attorneys fees, claim preparation fees, and expert fees.

All costs claimed must be documented and accompanied by a claim certification form obtained from the Department.

CONSTRUCTION DETAILS
SECTION 200
EARTHWORK

SECTION 201
CLEARING AND GRUBBING

DESCRIPTION

201.01 This work consists of clearing, grubbing, removing, and disposing of vegetation and debris within the limits of the right of way, easement areas, borrow pits, and other areas shown in the Contract or required by the work. Vegetation and objects designated to remain shall be preserved free from injury or defacement.

CONSTRUCTION REQUIREMENTS

201.02 The Engineer will designate all trees, shrubs, plants, and other objects to remain. Every object that is designated to remain and is damaged shall be repaired or replaced as directed, at the Contractor's expense.

Clearing and grubbing shall extend to the toe of fill or the top of cut slopes, unless otherwise designated.

All surface objects, trees, stumps, roots, and other protruding obstructions not designated to remain shall be cleared and grubbed, including mowing, as required. Undisturbed stumps, roots, and nonperishable solid objects located 2 feet or more below subgrade or embankment slope may remain in place. In areas to be rounded at the tops of backslopes, stumps shall be removed to at least 2 feet below the surface of the final slope line.

Except in areas to be excavated, all holes resulting from the removal of obstructions shall be backfilled with suitable material and compacted in accordance with subsection 203.06.

Burning of perishable material will not be permitted without the written approval of the Engineer. If permitted, perishable material shall be burned under the constant care of the Contractor, at times and in a manner that will not endanger the surrounding vegetation, adjacent property, or objects designated to remain. Burning shall be done in accordance with applicable laws and ordinances.

No material or debris shall be disposed of within the project limits without the written permission of the Engineer. Material or debris that is disposed of within the project limits shall be buried to a depth of at least 2 feet and the surface shall be reshaped to match the adjacent ground line. The Contractor shall make all arrangements to obtain written permission from property owners for disposal locations outside the limits and view of the project. Copies of this written agreement shall be furnished to the Engineer before the disposal area is used.

All cleared merchantable timber shall be removed from the project and shall become the property of the Contractor.

Branches on trees or shrubs shall be removed as directed. Branches of trees extending over the roadbed shall be trimmed to give a clear height of 20 feet above the roadbed surface. All trimming shall be done in accordance with good tree surgery practices.

The Contractor shall scalp the areas within the excavation or embankment grading limits. Mowed sod need not be removed where the embankment to be constructed is 4 feet or more in height. Scalping shall include the removal from the ground surface of brush, roots, sod, grass, residue of agricultural crops, sawdust, and other vegetable matter. See subsection 208.04(d) for disturbed area limits.

METHOD OF MEASUREMENT

201.03 Measurement will be by one of the following methods:

(a) *Area Basis.* The work to be paid for will be the number of acres acceptably cleared and grubbed, including scalping, within the limits shown on the plans or staked by the Engineer.

(b) *Lump Sum Basis.* When the Contract contains a clearing and grubbing lump sum item, no measurement will be made.

BASIS OF PAYMENT

201.04 The accepted quantities of clearing and grubbing will be paid for at the contract unit prices as follows:

(a) *Area Basis.* The quantities will be paid for at the contract unit price bid per acre for each pay item that appears in the bid schedule.

(b) *Lump Sum Basis.* When the bid schedule contains a lump sum item, the lump sum price so bid will be paid and shall be full compensation for clearing and grubbing the entire project.

Clearing and grubbing beyond the limits designated under this item will be paid for as Extra Work in accordance with subsection 104.03.

Payment will be made under:

Pay Item	**Pay Unit**
Clearing	Acre, Lump Sum
Grubbing	Acre, Lump Sum
Clearing and Grubbing	Acre, Lump Sum

(c) Exclusions. When the bid schedule does not contain an estimated quantity or a lump sum item for clearing and grubbing, the work will not be paid for separately but shall be included in the work.

SECTION 202
REMOVAL OF STRUCTURES AND OBSTRUCTIONS

DESCRIPTION

202.01 This work consists of the removal and disposal of trees, slope and ditch protection, abandoned utility services, curb, gutter, pipes, sidewalk, structures, bridges or parts of bridges, railroad appurtenances, traffic control devices, impact attenuators, guardrail, fences, foundations, detours, pavements, pavement markings, and all other obstructions that are not designated or permitted to remain. It shall also include salvaging, stockpiling and loading salvable materials, sandblasting, plugging structures, cleaning culverts, and sawing and cutting to facilitate controlled breaking and removal of concrete and asphalt to a neat line. Except in areas to be excavated, the resulting trenches, holes, and pits shall be backfilled. This work also consists of plugging and abandoning water wells as designated in the Contract.

Materials removed and not designated in the Contract to be salvaged or incorporated into the work shall become the property of the Contractor.

CONSTRUCTION REQUIREMENTS

202.02 General. The Contractor shall raze, remove, and dispose of all structures and obstructions which are identified on the project, except utilities, structures and obstructions removed under other contractual agreements, and salvable material designated to remain the property of the Department.

Basements and other cavities left by structure removal shall be filled to the level of the surrounding ground with suitable material and, if within the construction limits, shall be compacted in accordance with subsection 203.06.

Bridges, culverts, and other drainage structures shall not be removed until satisfactory arrangements have been made to accommodate traffic and drainage.

Blasting or other operations used to remove existing structures or obstructions, which may damage new construction, shall be completed prior to placing the new work.

Where portions of structures are to be removed, the portions designated to remain shall be prepared to fit the new construction, and shall be protected from damage. All damage to structures designated to remain in place shall be repaired at the Contractor's expense. Method of repair shall be approved by the Engineer.

Sawing of concrete shall be done to a true line, with a vertical face, unless otherwise specified. The minimum depth of a saw cut in concrete shall be 2 inches or to the depth of the reinforcing steel, whichever occurs first.

Removed concrete and asphalt material may be used to construct embankments in accordance with subsection 203.06.

Where culverts or sewers are to be left in place and plugged, the ends of concrete or masonry culverts shall be filled with suitable material. The ends of corrugated metal pipe culverts shall be crushed. Culvert and sewer ends are to be sufficiently filled or crushed to prevent future settlement of embankments. Plugging of culverts shall include removal of headwalls and other appurtenances where necessary to accommodate the work.

Procedures for abandoning water wells shall conform to the Revised and Amended Rules and Regulations of the State of Colorado, Division of Water Resources, Board of Examiners of Water Well Construction and Pump Installation Contractors, (Board). The State Engineer who acts for the Board is located at 818 Centennial Bldg., 1313 Sherman St., Denver, CO 80203 (Phone 303-866-3587).

The Contractor shall properly plug and abandon the designated wells and file an abandonment report for each. An abandonment report shall be prepared using Form GWS-9 obtained from the Board at the above address. The report shall describe the well location and how it was plugged. This report shall be submitted to the Board, with a copy given to the Project Engineer, within 60 days after performing the work.

Existing guardrail shall not be removed unless the need for the guardrail has been eliminated or the hazard has been protected or delineated. The duration and manner of protection or delineation shall be submitted in writing for approval by the Engineer.

202.03 Salvable Material. All salvable material designated in the Contract to remain the property of the Department shall be removed without damage, in sections or pieces which may be readily transported, and shall be stockpiled by the Contractor at specified locations within the project limits. The Contractor shall safeguard salvable materials and shall be responsible for the expense of repairing or replacing damaged or missing material until it is incorporated into the work, or is loaded onto Department equipment by the Contractor.

202.04 Signs and Traffic Signals. Removal of signs shall include removal of posts, footings, pedestals, sign panels, and brackets. Concrete adhering to salvable sign posts shall be removed.

Removal of sign panel shall include removal of the panel and its attachment hardware from the existing installation and adjusting the spacing of the remaining panels.

The removal of traffic signal items shall include poles, mast arms, signal heads, span wires, footings, all attachment hardware, and other incidental materials. Removal of signal pole or pedestal pole shall include pole, span wire, cable, signal heads, overhead sign support wire, footings, and pedestrian push buttons. Removal of traffic signal controller and cabinet shall include removal of the footing and all auxiliary equipment contained within the cabinet.

202.05 Pavement Markings. Pavement markings shall be removed from the pavement to the maximum extent possible, by methods that do not materially alter or damage the surface or texture of the pavement, to the satisfaction of the Engineer. The proposed method of pavement marking removal shall be designated by the Contractor at the preconstruction conference, and approved by the Engineer. Operations that do not produce the desired result, damage the pavement, or may constitute a hazard to the traveling public will not be permitted. Materials deposited on the pavement as a result of removal of pavement markings shall be promptly removed so as not to interfere with traffic or roadway drainage.

Pavement markings, designated to be removed, shall be removed before any change is made in traffic patterns. Temporary marking tape sections longer than one foot shall be removed before placement of the final pavement course. All tape shall be removed on sections where tape conflicts with revised traffic lanes prior to opening of new lanes to traffic.

The pavement surface area to be covered with pavement marking material shall be sandblasted, or blast cleaned by another approved method, prior to the application of pavement primer or prior to the placing of pavement marking material when used without a pavement primer. A dustless-abrasive shot blasting, power washing, or other approved cleaning method may be used to do the sandblasting work. The sandblast shall be applied to remove all dirt, laitance, and curing compound residue. After sandblasting, all loose dust and dirt shall be removed before application of pavement primer or pavement marking material.

202.06 Detours. The Contractor shall completely remove the detour and dispose of the materials in accordance with the Contract.

202.07 Pavements, Sidewalks, Curbs. All concrete pavement, sidewalks, structures, curbs, gutters, etc., designated for removal, shall be disposed of in accordance with subsection 201.02. Concrete pavement to be broken and left in place shall be broken so the largest fragment does not exceed 1 square yard in surface.

202.08 Portions of structures. Unless otherwise directed, the substructures of existing structures shall be removed down to the natural stream bottom and those parts outside of the stream shall be removed down 1 foot below natural ground surface. Where such portions of existing structures lie wholly or in part within the limits of a new structure, they shall be removed as necessary to accommodate the construction of the proposed structure.

Reinforcing steel projecting from the structure, designated to remain, shall be cleaned and aligned to the new construction. Required dowels shall be securely grouted with approved grout. When concrete is removed, all exposed reinforcing steel designated to remain in place shall be cleaned by sandblasting to sound steel free of oil, dirt, concrete fragments or laitance, loose rust scale, and other coatings that would destroy or inhibit the bond with the new concrete.

Adequate measures shall be taken by the Contractor to protect the steel from contamination or corrosion. Reinforcing steel, contaminated as a result of the Contractor's failure to provide adequate protection, shall be resandblasted at the Contractor's expense with no allowance for contract time extension.

A protective device shall be placed between the sandblasting operations and the traveling public.

202.09 Removal of Asphalt Mat (Planing). The Contractor shall not commence planing operations until the hot mix asphalt (HMA) Mix Design (CDOT Form 43) has been approved and signed.

Prior to beginning planing operations, the Contractor shall submit a planing plan for approval by the Engineer. This plan shall include as a minimum:

(1) The number and types of planers to be used.
(2) The width and location of each planing pass.
(3) The number and types of brooms to be used, and their locations with respect to the planers. The Contractor shall have at least one back-up broom on the project at all times in case one of the operating brooms breaks down.

Each planer shall conform to the following:

The planer shall have sufficient power, traction, and stability to maintain an accurate depth of cut. The propulsion and guidance system of the planer shall be maintained in such condition that the planer may be operated to straight and true lines.

Operation with broken or missing teeth will not be allowed. Worn teeth shall be replaced if the planer does not produce a uniform surface.

The planer shall be capable of picking up the removed asphalt in a single operation. A self loading conveyer shall be an integral part of the planer. Windrows will not be allowed.

All planed areas shall be broomed with a pick up broom, unless otherwise specified, before being opened to traffic. A sufficient number of brooms shall be used immediately after planing to remove all planed material remaining on the roadway.

If the Contractor fails to adequately clean the roadway, work shall cease until the Engineer has approved the Contractor's revised written proposal to adequately clean the roadway.

At the completion of each days work, vertical edges caused by planing that are greater than 1 inch in height shall be: Longitudinal - tapered to not less than a 3:1 slope, Transverse - tapered to not less than a 50:1 slope.

The roadway shall be left in a safe and usable condition at the end of each work day. All required pavement markings, removed by the planing, shall be restored before the roadway is opened to traffic.

All planing shall be completed parallel to the travel lanes unless otherwise directed by the Engineer.

All planing shall be completed full width before resurfacing commences.

The longitudinal surface smoothness of the roadway prior to and after planing shall be tested in accordance with subsection 105.07(c).

202.10 Clean Culvert. Culverts designated in the Contract to be cleaned shall be cleaned by removing all sedimentation and debris from within the culvert and all appurtenant structures.

METHOD OF MEASUREMENT

202.11 When the Contract provides payment for removal of obstructions on a lump sum basis, this payment will include all stipulated structures and obstructions encountered within the right of way in accordance with this section. When the Contract provides payment for the removal of specific items on a unit basis, measurement will be by the unit.

Removal of pavement marking will be measured in square feet, completed and accepted. Sandblasting of pavement that is to be covered with pavement marking material will be measured as the same area as measured for the pavement marking for which the sandblasting is required.

Removal of temporary pavement markings will not be measured and paid for separately but shall be included in the work.

Removal of asphalt mat (planing) will be measured by the area in square yards, completed to the required depth, and accepted.

Sandblasting reinforcing steel will be measured by the square yard of deck surface. Multiple layers of reinforcing steel within a common area of the deck exposed and requiring sandblasting will not be measured separately.

Clean culvert will be measured by the number of culverts acceptably cleaned as designated on the plans, irrespective of the kind or size involved.

Abandon well will be measured by the actual number plugged, abandoned, and the abandonment report submitted.

BASIS OF PAYMENT

202.12 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule. Payment shall be full compensation for sawing, removing, disposal, excavation and subsequent backfill, and salvage of materials removed, their custody, preservation, storage, and disposal as provided herein.

Payment will be made under:

Pay Item	**Pay Unit**
Removal of Structures and Obstructions	Lump Sum
Removal of	Each, Linear Foot, Square Yard Cubic Yard
Removal of Asphalt Mat (Planing)	Square Yard
Plug	Each
Clean Culvert	Each
Abandon Well	Each
Sandblasting	Square Foot
Sandblasting Reinforcing Steel	Square Yard

When the Contract does not include pay items for removal of structures and obstructions, the removal will not be paid for separately but shall be included in the work.

Payment for abandon well will be full compensation for all labor and materials required to complete the work, including preparing and submitting the abandonment report.

SECTION 203
EXCAVATION AND EMBANKMENT

DESCRIPTION

203.01 General. This work consists of excavation, hauling, disposal, placement, and compaction of all material encountered within the limits of the work, including construction of dikes and the excavation for ditches and channels, necessary for the construction of the roadway in accordance with the Contract. All excavation will be classified, "unclassified excavation", "stripping", "muck excavation", "rock excavation", "borrow", or "potholing" as hereafter described. All embankment will be classified "embankment material" or "rock fill" as hereafter described.

203.02 Excavation.

(a) *Unclassified Excavation.* Unclassified excavation shall consist of the excavation of all materials of whatever character required for the work, obtained within the right of way, including surface boulders and excavation for ditches and channels that is not removed under some other item.

Overhanging rock or other rock considered dangerous shall be removed when ordered, and will be classified "Unclassified Excavation".

(b) *Stripping.* Stripping shall consist of removing overburden or other specified material from material pits, and the replacement of overburden or other specified material over the disturbed area of the site or pit after the underlying material has been removed.

(c) *Muck Excavation.* Muck excavation shall consist of the removal and disposal of mixtures of soils and organic matter not suitable for foundation or embankment material.

(d) *Rock Excavation.* Rock excavation shall consist of igneous, metamorphic, and sedimentary rock which cannot be excavated without blasting or the use of rippers, including all boulders or other detached stones having a volume of ½ cubic yard or more, as determined by physical or visual measurement.

(e) *Borrow.* Borrow shall consist of approved material obtained from outside the right of way, required for the construction of the project.

(f) *Potholing.* Potholing consists of exposing and verifying the location of existing utilities at locations as directed.

203.03 Embankment.

(a) *Embankment Material.* Embankment material shall consist of approved material acquired from excavations, hauled and placed in embankments. Approval of the embankment material will be contingent on the material having a resistance value when tested by the Hveem Stabilometer, or equivalent resilient modulus value, of

at least that specified in the Contract, and a maximum dry density of not less than 90 pounds per cubic foot. The material must be stable when tested in accordance with Colorado Procedure L-3102.

1. *Soil Embankment.* Soil embankment shall consist predominantly of materials smaller than 4.75 mm (No. 4) sieve in diameter. Soil embankment shall be constructed with moisture density control in accordance with the requirements of subsection 203.07.

2. *Rock Embankment.* Rock embankment shall consist of materials with 50 percent or more by weight, at field moisture content, of particles with least dimension diameters larger than 4.75 mm (No. 4) sieve and smaller than 6 inches. Rock embankments shall be constructed without moisture density control in accordance with the requirements of subsection 203.08.

(b) *Rock Fill.* Rock fill shall consist of sound, durable stones, boulders, or broken rock not less than 6 inches in least dimension. At least 50 percent of the rock used shall have a volume of 2 cubic feet or more, as determined by physical or visual measurement.

Claystone or soil-like nondurable shale, as defined by Colorado Procedure 26, shall not be treated as sound rock and shall be pulverized, placed, and compacted as soil embankment. Claystone or soil-like non-durable shale particles greater than 12 inches in diameter shall not be placed in the embankment.

CONSTRUCTION REQUIREMENTS

203.04 General. The excavations and embankments shall be finished to smooth and uniform surfaces conforming to the typical sections specified. Variation from the subgrade plan elevations specified shall not be more than 0.08 foot. Where bituminous or concrete surfacing materials are to be placed directly on the subgrade, the subgrade plane shall not vary more than 0.04 foot. Materials shall not be wasted without written permission of the Engineer. Excavation operations shall be conducted so material outside of the slope limits will not be disturbed. Prior to beginning grading operations, all necessary clearing and grubbing in that area shall have been performed in accordance with Section 201.

The Contractor shall notify the Engineer not less than five working days prior to beginning excavation so the necessary cross sections may be taken. The Contractor shall not excavate beyond the dimensions and elevations established.

Archaeological and paleontological materials encountered during the work shall be dealt with in accordance with subsection 107.23.

203.05 Excavation.

(a) *Rock.* Unless otherwise specified, rock shall be excavated to a minimum depth of 0.5 foot and a maximum depth of 1 foot below subgrade, within the limits of the roadbed. Rock removed in excess of 1 foot below subgrade will not be paid

for. Backfilling of the depth in excess of 1 foot below subgrade shall be at the Contractor's expense. Approved embankment material shall be used to bring the rock-excavated areas to subgrade elevations within the tolerances specified in subsection 203.04.

Undrained pockets shall not be left in the rock surface and depressions shall be drained at the Contractor's expense.

Any change to cut slopes by the Department will be made prior to the next drilling operations.

(b) *Unclassified.* Excess or unsuitable excavated material, including rock and boulders, that cannot be used in embankments may be placed on the side slopes of the nearest fill as approved.

Wherever specified by the Engineer, intercepting ditches shall be made above the top of cut slopes and carried to outlets near the ends of the cuts. In order to blend the intersection of cut slopes with the slope of the adjacent natural ground surfaces in a uniform manner, the tops of all cut slopes, except those in solid rock, shall be flattened and rounded in accordance with typical sections and details specified. Earth overburden lying above solid rock cuts shall be treated in the same manner as earth cuts.

The Department reserves the right to change cut slopes during the progress of excavation.

(c) *Muck.* Unsuitable materials encountered in the subgrade shall be removed to the depth directed by the Engineer. The excavated area shall be backfilled to the finished graded section with approved material.

The Engineer will designate as unsuitable those soils that are detrimental to the roadway and they shall be removed to the depth as determined by the Engineer. All unsuitable material shall be disposed of as directed.

(d) *Borrow.* If the Contractor places more borrow than is specified or approved and causes a waste of roadway excavation, the quantity of waste will be deducted from the borrow volume. All borrow areas shall be bladed and shaped to permit accurate measurements after excavation is completed. The finished borrow areas shall be graded to a smooth and uniform surface and shall be finished so water will not collect or stand therein, unless otherwise specified.

(e) *Stripping.* Overburden shall be removed to the depth required for the production of acceptable material, and at least 5 feet beyond the working limits of the area being excavated.

(f) *Potholing.* All necessary potholing as determined by the Contractor and agreed to by the Engineer shall be completed under this item with appropriate equipment as approved.

The Contractor shall acquire necessary permits, locate utilities, excavate all materials of whatever character required to expose the utilities, survey the location of the utilities, and backfill the excavation to existing grade lines with the excavated or other approved materials. Backfilling shall be accomplished in accordance with subsection 206.03.

The Contractor shall use extreme caution during this work. All damage to existing utility lines or adjacent facilities shall be repaired promptly at the Contractor's expense.

203.06 Embankment. Embankment construction shall include preparation of the areas upon which embankments are to be placed, construction of dikes, placing and compacting of approved material within roadway areas including holes, pits, and other depressions within the roadway area. Only approved materials shall be used in the construction of embankments and fills.

Free running water shall be drained from the material before the material is placed on the roadway.

The type of relative compaction required shall be as provided in the Contract.

Broken concrete, broken asphalt, or other solid materials more than 6 inches in greatest dimension shall not be placed within embankment areas supporting the roadway shoulders and pavement structure. These embankment areas are defined as the cross-sectional areas of an embankment situated beneath the shoulders and pavement structure and inside the lines projected downward and outward on a 1:1 slope from the outside edges of the roadway shoulders to their intersection with the base of the embankment. Broken concrete, broken asphalt, or other solid materials more than 6 inches in greatest dimension removed on the project may be disposed of in embankment side slope areas not supporting the roadway shoulders and pavement structure, as defined above. These materials shall be placed in layers; the thickness of each layer shall be less than 1½ times the following maximum allowable dimensions. Rocks and concrete shall not have any single dimension greater than 2 feet and asphalt shall not have any single dimension greater than 12 inches. Each layer shall be separated by a minimum of 6 inches of compacted and approved embankment material. No layer shall be within the top 2 feet of the subgrade or final finished side slope surface. These materials shall be placed as the embankment is being constructed. Excavation of in-place embankment to accommodate disposal of materials shall not be permitted.

When embankment is placed on a slope that is steeper than 4:1, as measured in the steepest direction, the embankment shall be continuously benched as the work is brought up in layers. Benching shall be well keyed and, where practical, a minimum of

8 feet wide. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous bench. Excavation from benching shall be compacted along with the new embankment material at the Contractor's expense.

Where embankment is to be placed and compacted and end dumping is permitted, the slopes of the original ground or embankment shall be deeply plowed or cut into before starting end dumping.

Where the base of embankment is within 4 feet of the subgrade, all sod, and vegetable and other organic matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be completely broken up by plowing or scarifying to a minimum depth of 6 inches, and compacted to the specified embankment density. Sod not requiring removal shall be thoroughly disked prior to embankment construction.

If embankment can be placed on only one side of structures such as retaining walls, abutments, wing walls, piers, or culvert headwalls, compaction shall be accomplished without overturning of or placing excessive pressure against the structure. When noted on the plans, the fill adjacent to the abutment of a bridge shall not be placed higher than the bottom of the backwall until the superstructure is in place. When embankment is placed on both sides of a concrete wall or box type structure, the embankment shall be brought up equally on both sides of the structure.

Embankment shall be placed in horizontal layers not to exceed 8 inches loose measurement and shall be compacted as specified before the next layer is placed. Spreading equipment shall be used to obtain uniform thickness prior to compaction. As the compaction progresses, continuous mixing, leveling, and manipulating shall be done to assure uniform moisture and density. Bridging across streams, ponds, and swampy ground may be placed in layers greater than 8 inches as directed.

When embankments are constructed using claystone or soil-like non-durable shale as identified in the plans or by the Engineer, the material shall be pulverized to a maximum dimension of 12 inches in diameter, placed in a maximum layer thickness of 12 inches and watered to promote slaking and breakdown of the nondurable material in conformance with subsection 203.07.

Excavated material containing particles greater than 6 inches in greatest dimension shall not be used as embankment material unless designated in the Contract or approved by the Engineer. When the excavated material consists predominately of rock too large to be placed in 8 inch layers, the Engineer may permit the material to be placed in thicknesses up to the average rock dimension, not to exceed 3 feet. Placing of occasional boulders of sizes larger than the maximum layer thickness may be authorized by the Engineer. Each layer shall be leveled and smoothed by distribution of finer material or approved embankment material. If the use of leveling equipment is not practicable the Engineer may permit rock fill material to be cast or end dumped. In such cases sufficient hand or machine work will be required to

construct a compact, stable fill and to finish the slopes to a neat and smooth appearance. Each layer shall be compacted as specified in subsection 203.08.

Rock fill, or claystone or soil-like non-durable shale, or both shall not be constructed above an elevation 2 feet below the finished subgrade. The top 2 feet of the embankment shall be placed in layers not to exceed 8 inches loose thickness and compacted in accordance with subsections 203.07 and 203.08 as applicable.

When a rock fill is placed over any structure, the structure shall be covered with a minimum of 2 feet of compacted embankment material or other approved material before the rock is placed.

Cross hauling may be used to insure that the best available material is placed in the top 2 feet of all embankments. When directed by the Engineer, cross haul will be paid for in accordance with subsection 109.04.

Frozen materials shall not be used in construction of embankments.

During the construction of the roadway, the roadbed shall be maintained so that it is well drained at all times.

203.07 Construction of Embankment and Treatment of Cut Areas with Moisture and Density Control. Soil embankments shall be constructed with moisture and density control, and the soil upon which the embankments are to be constructed shall be scarified to a depth of 6 inches and compacted with moisture and density control. The moisture content of the soil at the time of compaction shall be as specified or directed.

The material shall be removed from the full width of roadbed in all cut sections to the designated depth. The soil below the designated depth shall be thoroughly scarified to a depth of 6 inches and the moisture content increased or reduced, as necessary, to obtain the moisture content specified. This scarified layer shall then be compacted to the relative compaction specified.

All embankment material shall also be compacted to the specified relative compaction.

Maximum dry density of all soil types encountered or used will be determined in accordance with AASHTO T 99, AASHTO T 180, or a modification thereof.

The amount of water to be used in compacting A-2-6, A-2-7, A-4, and A-6 through A-7 soils shall not deviate from optimum on the dry side by more than two percentage points as determined by AASHTO T 99, T 180, or a modification thereof, as designated in the Contract. A-4 soils which are unstable at the above moisture content shall be compacted at a lower moisture content to the specified density. The amount of water used in compacting all other soils shall be as required to obtain the percent relative compaction required.

Additional work involved in drying embankment material to the required moisture content shall be included in the contract price paid for excavating or furnishing the material with no additional compensation.

Density requirements will not apply to materials which cannot be tested in accordance with any of the above procedures for determining maximum dry density. Compaction for materials which cannot be tested shall be in accordance with subsection 203.08.

The percent of relative compaction specified shall be equal to or greater than minimum values as shown in the following table for the various classes of soil and type of compaction.

Claystone or soil-like non-durable shale shall be pulverized and compacted to the specified moisture and percent of relative compaction and shall be compacted with a heavy tamping foot roller, weighing at least 30 tons. Each tamping foot shall protrude from the drum a minimum of 4 inches. Each embankment layer shall receive a minimum of three or more coverages with the tamping foot roller to obtain density. One coverage consists of one pass over the entire surface designated. One pass consists of the passing of an acceptable tamping foot roller over a given spot. The roller shall be operated at a uniform speed not exceeding 3 miles per hour. No additional compensation will be made for additional roller coverages to achieve specified density requirements

Soil Classification (AASHTO M 145)	**AASHTO T 99 Minimum Relative Compaction (Percent)**	**AASHTO T 180 Minimum Relative Compaction (Percent)**
A-1	100	95
A-3	100	95
A-2-4	100	95
A-2-5	100	95
All Others	95	90

203.08 Construction of Embankments without Moisture and Density Control. Rock embankment material shall be placed in layers in accordance with the requirements of subsection 203.06.

Each layer of rock embankment material shall be compacted by routing construction equipment, compactors, or both, uniformly over the entire surface of each layer before the next layer is placed. At least one compactor shall be in simultaneous operation with each separate rock embankment placement operation. Specific types of compactors shall be furnished and used when required by the Contract.

Each layer of rock embankment shall not be covered by another layer until the Engineer is satisfied that adequate compaction has been obtained. If the Engineer determines that the compactive effort is unsatisfactory, the Engineer may order the Contractor to compact the unsatisfactory area by two additional passes using approved compaction equipment.

203.09 Proof Rolling. Proof rolling with pneumatic tire equipment shall be performed using a minimum axle load of 18 kips per axle. A weigh ticket from an approved scale shall be furnished by the Contractor to substantiate this weight.

The subgrade shall be proof rolled after the required compaction has been obtained and the subgrade has been shaped to the required cross section.

The proof roller shall be operated in a systematic manner so that a record may be readily kept of the area tested and the working time required for the testing. Areas that are observed to have soft spots in the subgrade, where deflection is not uniform or is excessive as determined by the Engineer, shall be ripped, scarified, dried or wetted as necessary and recompacted to the requirements for density and moisture at the Contractor's expense. After recompaction, these areas shall be proof rolled again and all failures again corrected at the Contractor's expense.

Upon approval of the proof rolling, the sub base, base course, or initial pavement course shall be placed within 48 hours. If the Contractor fails to place the sub base, base course, or initial pavement course within 48 hours or the condition of the subgrade changes due to weather or other conditions, proof rolling and correction shall be performed again at the Contractor's expense.

203.10 Presplitting. When presplitting is designated in the Contract, the top of the rock slope will be established by the Engineer. The Contractor shall drill the bore holes along the slope line, maintain the drill holes at the angle designated in the Contract, and ensure that all drill holes are in the same plane. The diameter, spacing, and loading of presplit holes shall result in a neat break. The presplitting holes shall be drilled for the full depth of the ledge.

The initial presplitting of each geological formation shall be accomplished utilizing a 100 foot test section. After drilling, loading, and shooting this test section, the material shall be removed so the Engineer can determine if the diameter, spacing, and loading of the presplit holes are adequate to give an acceptable backslope. If the results are determined acceptable by the Engineer, the presplitting may continue throughout the geological formation using those methods and procedures. If the presplitting is determined unsatisfactory, the Contractor shall make adjustments in the spacing, diameter, loading, or a combination thereof of the presplit holes utilizing another test section.

Presplitting holes shall be loaded with explosives in accordance with the manufacturer's recommendations. The cost of presplitting shall be included in the contract unit price for rock excavation.

203.11 Blading. Blading shall consist of furnishing motor graders of the specified horsepower rating, with operators, for shaping roadway, shoulders, or other areas as designated by the Engineer.

When scarifying is specified the motor grader shall be equipped with an independently operated "V"type scarifier and attachments.

203.12 Dozing. Dozing shall consist of furnishing crawler-type tractors of the specified horsepower rating, complete with operators and bulldozer blades. Rippers, if specified, will not be measured and paid for separately, but shall be included in the work.

METHOD OF MEASUREMENT

203.13 Items paid for by volume will not be remeasured but will be the quantities designated in the Contract. Exceptions will be made when field changes are ordered or when it is determined that there are discrepancies on the plans in an amount of at least plus or minus two percent of the plan quantity.

(a) *Excavation.* When payment is specified on a volume basis, all accepted excavation and borrow will be measured in its original position by cross-sectioning the area excavated. These measurements will include authorized excavation of rock, shale, muck, or other unsuitable material. All accepted stripping will be measured in stockpiled locations by cross-sectioning.

When the excavation conforms to the staked lines and grades, the original cross-sections and the staked sections shall be used for the determination of volumes excavated. Volumes will be computed from the cross-sections by the average end area or other acceptable method.

When topsoil or wetland topsoil is included as a pay item and is specified, the measured volume of excavation will be reduced by the volume of topsoil or wetland topsoil removed from the area shown as excavation on the plans.

Measurements will include over-breakage in rock excavation from the backslopes to an amount not to exceed, in any half station of 50 feet, 10 percent of the actual quantity required for that half station.

(b) *Embankment.* If provided in the Contract, embankment material will be measured in its final compacted position in the roadway. Measurement will be made upward from the original ground line without any allowance for subsidence due to compaction of the base under the embankment. The original cross-sections will be used for determination of volumes of embankment material placed, unless changes have been directed.

The measured volume of embankment material will be increased by the volume of topsoil or wetland topsoil removed from the area below the original ground line and under the embankment, only when the topsoil or wetland topsoil is designated to be removed within the roadway prism. When the topsoil source is not designated in the Contract, embankment will be measured from the original ground line.

(c) *Rock Fill.* Rock fill will be measured as the volume in cubic yards in its final position, unless otherwise specified, and shall be limited to the elevations specified.

(d) *Blading and Dozing.* The quantity measured under blading and dozing will be the number of hours that each motor grader or bulldozer is actually used as ordered. A minimum of four hours for any half shift or part thereof will be paid for unless the equipment is inoperative due to breakdown or other causes determined to be the Contractor's responsibility. Time involved in moving onto or off the project will not be measured and paid for.

Time will be paid for moving motor graders or bulldozers from one location on the project to another, if directed; but time will not be allowed for moves which are made for the convenience of the Contractor.

Payment for a minimum of four hours will not be allowed in cases where the motor grader, bulldozer, or operator is assigned to work on other pay items connected with the project.

(e) *Potholing.* Potholing will be measured by the total number of hours that excavation and backfilling equipment is actually used as directed. All other related work, including removal of existing pavement, backfilling, shoring, and labor will not be measured and paid for separately, but shall be included in the work.

(f) *Proof Rolling.* Proof rolling will be measured by the actual number of hours that the pneumatic equipment is used as a proof roller.

The time to be measured under this item will be the number of hours that each piece of equipment is actually used as ordered.

Proof rolling will be measured and paid for only once. Additional proof rolling shall be at the Contractor's expense.

BASIS OF PAYMENT

203.14 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	**Pay Unit**
Rock Excavation	Cubic Yard
Rock Fill	Cubic Yard
Unclassified Excavation	Cubic Yard
Unclassified Excavation (Complete in Place)	Cubic Yard

Pay Item (cont.)	Pay Unit (cont.)
Muck Excavation	Cubic Yard
Borrow	Cubic Yard
Borrow (Complete in Place)	Cubic Yard
Embankment Material (Complete in Place)	Cubic Yard
Stripping	Cubic Yard
Blading	Hour
Dozing	Hour
Potholing	Hour
Proof Rolling	Hour

Water will not be measured and paid for separately but shall be included in the work.

Compaction will not be measured and paid for separately, but shall be included in the work.

Excavated materials which, when specified, require more than one handling prior to final placement will be paid for at the contract unit price for unclassified excavation, rock excavation, stripping, muck excavation, or borrow as appropriate, for the first approved handling. Payment for the second approved handling will be made at the same unit price as the first handling, except that material used in conjunction with another pay item will be paid for in that pay item.

Payment for Unclassified Excavation (Complete in Place), Embankment Material (Complete in Place), and Borrow (Complete in Place) shall be full compensation for all work necessary to complete the item including construction of embankments, unclassified excavation, borrow, compaction, compaction of bases of cuts and fills, all work in available materials pits, and disposal of excess excavated material.

All costs associated with reducing the size of the claystone particles, removing the oversized particles, and disposal of the oversized particles will not be paid for separately but shall be included in the work.

Pavement replacement if required due to potholing, shall be accomplished, measured, and paid for in accordance with appropriate sections of the specifications.

Pneumatic tire equipment and load required to achieve the desired weight of proof rolling equipment will not be measured and paid for separately, but shall be included in the work.

SECTION 206
EXCAVATION AND BACKFILL FOR STRUCTURES

DESCRIPTION

206.01 This work consists of the excavation, and backfill or disposal of all material required for the construction of structures. The excavation and disposal of excavated material for ditches and channels shall be accomplished in accordance with Section 203.

All excavation and backfill for structures below the designed slope or subgrade line provided in the Contract shall be included under this item.

Unless otherwise specified, structure excavation shall include all pumping, bailing, draining, sheeting, bracing, and incidentals required for proper execution of the work.

MATERIALS

206.02 General. All structure backfill, bed course material, and filter material will be accepted in place.

(a) *Structure Backfill.* Class 1 and Class 2 structure backfill shall be composed of non-organic mineral aggregates and soil from excavations, borrow pits, or other sources. Material shall conform to the requirements of subsection 703.08. Class of material shall be as specified in the Contract or as designated.

Structure backfill (flow-fill) meeting the following requirements shall be used to backfill bridge abutments. The Contractor may substitute structure backfill (flow-fill) for structure backfill (class 1) or structure backfill (class 2) to backfill culverts and sewer pipes.

Ingredients	**Lbs./Cu.Yd.**
Cement	50
Coarse Aggregate (AASHTO No. 57 or 67)	1700
Fine Aggregate (AASHTO M 6)	1845
Water	325 (or as needed)

The amount of water shall be such that the structure backfill (flow-fill) flows into place properly without excessive segregation. Approximately 39 gallons of water per cubic yard of structure backfill (flow-fill) is normally needed.

The Contractor may use aggregate which does not meet the above specifications if the cement is increased to 100 pounds per cubic yard and the aggregate conforms to the following gradation:

Sieve Size	Percent Passing
25.0 mm (1 inch)	100
75 μm (No. 200)	0-10

The Contractor may substitute 30 pounds per cubic yard of cement and 30 pounds per cubic yard of fly ash for 50 pounds per cubic yard of cement or may substitute 60 pounds per cubic yard of cement and 60 pounds per cubic yard of fly ash for 100 pounds per cubic yard of cement.

Recycled broken glass (glass cullet) is acceptable as part or all of the aggregate. Aggregate including glass must conform to the required gradations. All containers used to produce the cullet shall be empty prior to processing. Chemical, pharmaceutical, insecticide, pesticide, or other glass containers containing or having contained toxic or hazardous substances shall not be allowed and shall be grounds for rejecting the glass cullet. The maximum debris level in the cullet shall be 10 percent. Debris is defined as any deleterious material which impacts the performance of the flowfill including all non-glass constituents.

(b) *Bed Course Material.* Material shall conform to the requirements of subsection 703.07. Upon approval, aggregate base course conforming to the requirements of subsection 703.03 may be used in lieu of bed course material.

(c) *Filter Material.* Class A, Class B, and Class C filter material shall conform to the requirements of subsection 703.09. Class of material shall be as specified or designated.

CONSTRUCTION REQUIREMENTS

206.03 Structure Excavation and Structure Backfill. Unsuitable foundation material shall be removed and wasted in a manner acceptable to the Engineer, and the excavated material will be paid for as structure excavation. Excavation and backfill for areas in excess of 3 feet below designed elevation will be paid for as provided in subsections 104.03 and 109.04. Unsuitable foundation material which is suitable for embankments, and suitable surplus excavated material shall be used in the construction of embankments. Unsuitable material removed below designed elevation shall be replaced with approved material.

Rock, hardpan, or other unyielding material encountered in trenches for culvert pipe or conduit shall be removed below the designed grade for a minimum depth of 12 inches. This extra depth excavation shall be backfilled with loose structure backfill (Class 1) or other approved material. The base of structure backfill shall be scarified to a depth of 6 inches and compacted with moisture and density control prior to placement of any structural element or structure backfill. The type of compaction shall be the same as that required for structure backfill (Class 2), as specified below. Backfill shall consist of approved materials uniformly distributed in layers brought up equally on all sides of the structure. Each layer of backfill shall not exceed 6 inches before compacting to the required density and before successive layers are placed.

Structure backfill (Class 1) shall be compacted to a density of not less than 95 percent of maximum density determined in accordance with AASHTO T 180.

Required density for structure backfill (Class 2) shall conform to subsection 203.07. The type of compaction shall be as specified in the contract for embankment construction. When there is no embankment in the Contract or the type of compaction for structure backfill (Class 2) is not designated, the type of compaction shall be AASHTO T 180.

Pipes, culverts, sewers, and other miscellaneous structures outside the roadway prism and not subjected to traffic loads shall be backfilled in layers as described above but shall be compacted to the density of the surrounding earth.

The excessive use of water during backfilling operations will not be permitted.

Compaction equipment or methods that produce horizontal or vertical earth pressures, which may cause excessive displacement or overturning, or may damage structures, shall not be used.

Backfill material shall not be deposited against newly constructed masonry or concrete structures until the concrete has developed a compressive strength of $0.8f'_c$.

Backfill at the inside of bridge wingwalls and abutments shall be placed before curbs or sidewalks are constructed over the backfill and before railings on the wingwalls are constructed.

Unless otherwise indicated in the Contract or directed, all sheeting and bracing used in making structure excavation shall be removed by the Contractor prior to backfilling.

Structure backfill placed at bridge piers in waterways and water channels, that does not support embankments, pavements, or slope protection, will not require compaction.

Compaction of structure backfill (flow-fill) will not be required.

The maximum layer thickness for structure backfill (flow-fill) shall be 3 feet. Additional layers shall not be placed until the structure backfill (flow-fill) has lost sufficient moisture to be walked on without indenting more than 2 inches. Damage resulting from placing structure backfill (flow-fill) in layers that are too thick or from not allowing sufficient time between placement of layers shall be repaired at the Contractor's expense.

When the Contractor substitutes Structure Backfill (Flow-Fill) for Structure Backfill (Class 1) or (Class 2), the trench width may be reduced to provide a minimum 6 inch clearance between the outside diameter of the culvert and the trench wall.

206.04 Bed Course Material. Construction requirements for bed course material for sidewalks and curbing shall conform to the applicable requirements of Sections 608 and 609.

206.05 Filter Material. Construction requirements for filter material for subsurface drains shall conform to the applicable requirements of Section 605.

Filter material shall be placed behind bridge abutments, wingwalls, and retaining walls as provided in the Contract and in accordance with the following requirements:

When provided in the Contract, wall drain outlets shall be backed with sacked filter material conforming to the gradation requirements for coarse aggregate No. 3 or No. 4 set forth in Table 703-2.

Filter material shall be placed in horizontal layers along with and by the same methods specified for structure backfill.

METHOD OF MEASUREMENT

206.06 Structure excavation, structure backfill, and bed course material will not be measured but will be the quantities designated in the Contract. When field changes are ordered or when there are errors on the plans, quantities will be measured as follows:

(a) For bridges and irregular shaped structures, quantities will be computed to neat lines 18 inches outside and parallel to the outline of the revised foundation plan or as shown on the plans.

(b) For pipes, a profile will be made along the bottom of the center line extending 18 inches beyond the end of the structure, including end sections. Material excavated between this profile and a profile 1 foot above the top of the pipe will not be measured for payment, but shall be included in the bid price for the pipe. In excavation sections the area above the profile 1 foot above the top of the pipe and below the limits of roadway excavation will be multiplied by the width shown on the plans to obtain the volume of structure excavation measured for payment. In embankment sections the area above the profile 1 foot above the top of the pipe and below the natural ground will be multiplied by the width shown on the plans to obtain the volume of structure excavation measured for payment.

(c) Backfill and filter material will be the calculated volume of material lying within the prism shown on the plans, from which shall be deducted the volume occupied by the structure.

(d) Bed course material will be the calculated volume of material lying within the prism shown on the plans.

BASIS OF PAYMENT

206.07 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Structure Excavation	Cubic Yard
Structure Backfill (Class____)	Cubic Yard
Structure Backfill (Flow-fill)	Cubic Yard
Bed Course Material	Cubic Yard
Filter Material (Class____)	Cubic Yard

Compaction, water, and all other work necessary to complete the above items will not be measured and paid for separately but shall be included in the work.

Structure backfill, including bed course material, for pipes and end sections will not be measured and paid for separately, but shall be included in the work. Where only end section work is required the structure excavation quantity and the structure backfill quantity will not be measured and paid for separately, but shall be included in the work.

When the Contractor substitutes Structure Backfill (Flow-Fill) for Structure Backfill (Class 1) or (Class 2), there will be no adjustment in the price or the quantity paid for structure excavation or structure backfill as a result of reducing the trench width.

SECTION 207
TOPSOIL

DESCRIPTION

207.01 This work consists of salvaging and stockpiling topsoil, and excavating suitable topsoil from stockpiles, contractor sources, available sources, or from the approved natural ground cover to place on designated areas. It shall include the placing of topsoil upon constructed cut and fill slopes after grading operations are completed.

MATERIALS

207.02 Topsoil shall consist of loose friable soil from the zone of major root development free of subsoil, refuse, stumps, woody roots, rocks, brush, noxious weed seed and reproductive plant parts from current state and county weed lists, heavy clay, hard clods, toxic substances, or other material which would be detrimental to its use on the project.

Wetland topsoil material shall consist of the moist, organic soil, including any existing wetland vegetation and seeds, to be excavated from areas as shown on the plans or as directed.

CONSTRUCTION REQUIREMENTS

207.03 Wetland topsoil material shall be excavated from the designated area to a maximum depth of 12inches, or as otherwise designated, and placed within 24 hours in the specified area. The Contractor shall prepare the relocation site to elevations specified and approved by the Engineer prior to excavating the wetlands. If the Engineer determines that this is not possible, then the Contractor shall stockpile the material in an approved area, to remain undisturbed until the relocation site has been prepared. Storage time within the stockpile shall be as short as possible. Wetland topsoil material shall be placed over the prepared relocation areas to a depth of 12 inches, or as otherwise designated.

Topsoil within the limits of the roadway shall be salvaged prior to beginning hauling, excavating, or fill operations by excavating and stockpiling the material at designated locations in a manner that will facilitate measurement, minimize sediment damage, and not obstruct natural drainage. Topsoil shall be placed directly upon completed cut and fill slopes whenever conditions and the progress of construction will permit.

Topsoil shall be placed at locations and to the thickness provided in the Contract and shall be keyed and tracked to the underlying material without creating a compacted surface by the use of harrows, bulldozers, rollers, or other equipment suitable for the purpose.

Salvaged topsoil exceeding the quantity required under the Contract shall be disposed of at locations acceptable to the Engineer.

METHOD OF MEASUREMENT

207.04 Topsoil salvaged from the roadway and placed in stockpiles shall be measured in the stockpile in cubic yards by the method of average end areas and paid for as Stockpile Topsoil.

Topsoil salvaged from the roadway, taken from stockpiles or from approved pits, hauled and placed directly upon completed cut and fill slopes shall be measured at its source in cubic yards, as described in subsection 203.13, and paid for as Topsoil.

Topsoil generated from the roadway and placed in windrows will be measured at its source in cubic yards, as described in subsection 203.13, and paid for as Stockpile Topsoil. When it is subsequently placed upon the completed cut and fill slopes, the same quantity will be paid for as Topsoil, except that adjustment in quantity shall be made if the total windrowed quantity is not utilized.

Wetland topsoil material excavated from areas within the right-of-way and placed in stockpiles will be measured in the stockpile by the method of average end areas and paid for as Stockpile Wetland Topsoil.

Wetland topsoil material excavated from areas within the right-of-way or from stockpiles, hauled and placed directly on a relocated site will be measured at its source in cubic yards, as described in subsection 203.13, and paid for as Wetland Topsoil.

Topsoil secured from the Contractor's source will be measured in place by measuring random depths of topsoil, and computing the volume by multiplying the area times the average depth

BASIS OF PAYMENT

207.05 The accepted quantities measured as provided above will be paid for at the contract unit price per cubic yard for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	**Pay Unit**
Stockpile Topsoil	Cubic Yard
Topsoil	Cubic Yard
Stockpile Wetland Topsoil	Cubic Yard
Wetland Topsoil	Cubic Yard

SECTION 208
EROSION CONTROL

DESCRIPTION

208.01 This work consists of constructing, installing, maintaining, and removing when required, erosion control measures during the life of the Contract to prevent or minimize erosion, sedimentation, and pollution of any state waters as defined in subsection 107.25, including wetlands. This work includes constructing a stabilized construction entrance, as shown on the plans, or as directed by the Engineer.

The Contractor shall coordinate the construction of temporary erosion control measures with the construction of permanent erosion control measures to assure economical, effective, and continuous erosion control throughout the construction period.

MATERIALS

208.02 The material for erosion control measures shall conform to the following:

(a) *Erosion Bales:* Material for erosion bales shall consist of Certified Weed Free hay or straw. The hay or straw shall be certified under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5., CRS. Each certified weed free erosion bale shall be identified by one of the following:

(1) One of the ties binding the bales shall consist of blue and orange twine, or
(2) One of the ties binding the bale shall consist of specially produced shiny galvanized wire, or
(3) The bale shall have a regional Forage Certification Program tag indicating the Regional Forage Certification Program Number.

Erosion bales shall be inspected for and Regionally Certified as weed free based on the Regionally Designated Noxious Weed and Undesirable Plant List for Colorado, Wyoming, Montana, Nebraska, Utah, Idaho, Kansas, and South Dakota.

The Contractor shall not unload certified weed free erosion bales or remove their identifying twine, wire or tags until the Engineer has inspected and accepted them.

The Contractor shall provide a certificate of compliance showing the transit certificate number or a copy of the transit certificate as supplied from the forage producer.

The Contractor may obtain a current list of Colorado Weed Free Forage Crop Producers who have completed certification by contacting the Colorado Department of Agriculture, Weed Free Forage Program, 700 Kipling Street, Suite 4000, Lakewood, CO 80215, (303) 239-4177.

Bales shall be approximately 5 cubic feet of material and weigh not less than 35 pounds.

(b) *Silt Fence.* Silt fence posts shall be metal or wood with a minimum length of 42 inches. Metal posts shall be "studded tee" or "U" type with minimum weight of 1.33 pounds per linear foot. Wood posts shall have a minimum diameter or cross section dimension of 2 inches. Silt fence geotextile shall conform to subsection 712.08(b). Geotextile shall be attached to posts with three or more staples per post.

(c) *Temporary Berms.* Temporary berms, shall be constructed of compacted soil.

(d) *Temporary Slope Drains.* Temporary slope drains shall consist of fiber mats, plastic sheets, stone, concrete or asphalt gutters, half round pipe, metal or plastic pipe, wood flume, flexible rubber or other materials suitable to carry accumulated water down the slopes.

(e) *Brush Barrier.* Brush barriers shall consist of brush, limbs, root mat, vines, soil, rock, or unmerchantable timber. The erosion control geotextile that covers the barrier shall conform to subsection 712.08(b).

(f) *Check Dam.* Check dams shall be constructed of stone, logs, or wooden timbers. Stone shall meet the requirements of Section 506.

(g) *Outlet Protection.* Outlet protection riprap shall conform to section 506. Erosion control geotextile shall conform to subsection 712.08(b).

(h) *Sediment Trap and Basin*. In constructing an excavated Sediment Trap or Basin, excavated soil may be used to construct the dam embankment, provided the soil meets the requirements of Section 203.

(i) *Erosion Logs*. Erosion logs shall be curled aspen wood excelsior with a consistent width of fibers evenly distributed throughout the log. The casing shall be seamless, photodegradable tube netting and shall have minimum dimensions as shown in Table 208-1, based on the diameter of the log called for in the plans. The curled aspen wood excelsior shall be fungus free, resin free and shall be free of growth or germination inhibiting substances.

Table 208-1
NOMINAL DIMENSIONS OF EROSION LOGS

Diameter	Length	Weight (minimum)	Stake Dimensions
8 inch	7-10 feet	1.6 pounds/foot	1.5 by 1.5 by 20 inches
12 inch	7-10 feet	2.5 pounds/foot	1.5 by 1.5 by 24 inches
18 inch	7-10 feet	4 pounds/foot	1.5 by 1.5 by 30 inches

Stakes to secure erosion logs shall consist of pinewood or hardwood.

(j) *Silt Dikes*. Silt dikes shall be pre-manufactured triangular shaped urethane foam covered with a woven geotextile fabric. The fabric aprons shall extend a minimum of two feet beyond each side of the triangle.

Each silt dike shall have the following dimensions:

Center height	8 to 10 inches
Base	16 to 21 inches
Section length	3 to 7 feet
Section width including fabric extensions	5.6 feet

(k) *Concrete Washout Structure.* The Contractor shall design and construct a concrete washout structure that will contain washout from concrete placement and construction equipment cleaning operations. Embankment required for the concrete washout structure may be excavated material, provided that this material meets the requirements of Section 203 for embankment.

(l) *Stabilized Construction Entrance*. Unless otherwise directed by the Engineer, aggregate for the construction entrance shall be coarse material that meets the following gradation requirements:

Sieve size	**Percent by weight Passing Square Mesh Sieves**
75 mm (3 inch)	100
50 mm (2 inch)	95-100
19.0 mm (¾ inch)	0-15

Geotextile shall conform to the requirements of subsection 420.02.

CONSTRUCTION REQUIREMENTS

208.03 Project Review, Schedule, and Erosion Control Supervisor.

(a) *Project Review.* The Contractor may submit modifications to the Contract's erosion control measures in a written proposal to the Engineer. Such proposed modifications shall be submitted at least ten working days prior to the beginning of any construction work. The written proposal shall include the following minimum information:

(1) Reasons for changing the erosion control measures.
(2) Diagrams showing details and locations of all proposed changes.
(3) List of appropriate pay items indicating new and revised quantities.
(4) Schedules for accomplishing all erosion and sediment control work.
(5) Effects on permits or certifications caused by the proposed changes.

The Engineer will approve or reject the written proposal in writing within two weeks after the submittal. The Engineer may order additional control measures prior to approving the proposed modifications. The Contractor shall obtain amendments to permits or certifications required as a result of the approved changes. Modifications to the erosion control measures shall not be reason for extension of contract time.

(b) *Schedules.* At least 10 working days prior to the beginning of any construction work, the Contractor shall submit for approval a schedule for accomplishment of temporary and permanent erosion control work. This schedule shall specifically indicate the sequence of clearing and grubbing, earthwork operations, and construction of temporary and permanent erosion control features. The schedule shall include erosion and sediment control work for all areas within the project boundaries, including but not limited to, haul roads, borrow pits, and storage and plant sites. Work shall not be started until the erosion and sediment control schedule has been approved in writing by the Engineer.

Once the work has started, and during the active construction period, the Contractor shall update the schedule for all erosion and sediment control work on a weekly basis, and submit the updated schedule to the Engineer. If during construction the Contractor proposes changes which would affect the Contract's erosion and sediment control measures, the Contractor shall propose revised erosion and sediment control measures to the Engineer for approval in writing. Revisions shall not be implemented until the proposed measures have been approved in writing by the Engineer.

(c) *Erosion Control Supervisor.* When included in the Contract, the Contractor shall assign to the project an employee to serve in the capacity of the Erosion Control Supervisor (ECS). The ECS shall be a person other than the Superintendent, unless otherwise approved by the Engineer. The ECS shall be experienced in all aspects of construction and have satisfactorily completed an ECS training program authorized by the Department. Proof that this requirement has been met shall be submitted to the Engineer at least ten working days prior to the beginning of any construction work. A list of authorized ECS training programs will be provided by the Engineer upon request by the Contractor.

The ECS's responsibilities shall be as follows:

(1) Ensure compliance with all water quality permits or certifications in effect during the construction work.
(2) Directly supervise the installation, construction, and maintenance of all erosion control measures specified in the Contract and coordinate the construction of erosion control measures with all other construction operations.
(3) Direct the implementation of suitable temporary erosion and sediment control features as necessary to correct unforeseen conditions or emergency

situations. Direct the dismantling of those features when their purpose has been fulfilled unless the Engineer directs that the features be left in place.

(4) Inspect, with the Engineer or designated representative, all erosion control features implemented for the project. The inspections shall take place at least once every 14 calendar days and after each storm event that causes surface runoff. A report shall be submitted to the Engineer after every inspection and shall become part of the Department's project records. The appropriate form for this report will be supplied by the Engineer. The inspections shall be made during the progress of the work, during work suspensions, and until final acceptance of the work. During project suspensions, inspections shall take place at least once every 30 calendar days, or as directed.

(5) Attend the Preconstruction Conference, all project scheduling meetings, and reviews by the Erosion Control Advisory Team (ECAT) and Regional Erosion Control Advisory Team (RECAT) as requested by the Engineer.

(6) Upon the Engineer's request, implement necessary actions to reduce anticipated or presently existing water quality or erosion problems resulting from construction activities. The criteria by which the Engineer initiates this action may be based on water quality data derived from monitoring operations or by any anticipated conditions (e.g., predicted storms) which the Engineer believes could lead to unsuitable water quality situations.

(7) Make available, upon the Engineer's request, all labor, material, and equipment judged appropriate by the Engineer to install and maintain suitable erosion and sediment control features.

208.04 Erosion Control.

(a) *Unforeseen Conditions.* The Contractor shall design and implement erosion and sediment control measures for correcting conditions unforeseen during the design of the project, or for emergency situations, that develop during construction. The Department's "Erosion Control and Stormwater Quality Guide" shall be used as a reference document for the purpose of designing erosion and sediment control measures. Measures and methods proposed by the Contractor shall be reviewed and approved in writing by the Engineer prior to installation.

(b) *Work Outside the Right of Way.* In areas outside the right-of-way that are used by the Contractor and which include, but are not limited to, borrow pits, haul roads, storage and disposal areas, maintenance, batching areas, etc., erosion and sediment control work shall be performed by the Contractor at the Contractor's expense.

(c) *Construction Implementation.* The Contractor shall incorporate into the project all erosion and sediment control features as outlined in the accepted schedule.

(d) *Stabilization.* Permanent stabilization is defined as the covering of disturbed areas with final seed and mulch as indicated on the plans. When required by the plans, an erosion control blanket shall be used in combination with the final seed

and mulch. Temporary stabilization is defined as the covering of disturbed areas with seed, mulch, mulch with a tackifier, or a combination thereof. Other permanent or temporary soil stabilization techniques may be proposed, in writing, by the Contractor and used upon approval, in writing, by the Engineer.

The surface area of erodible earth material exposed at one time by clearing and grubbing, and earthwork operations shall not exceed 34 acres: 17 acres for clearing and grubbing plus 17 acres for earthwork operations. The Contractor shall permanently stabilize each 17 acre increment of the project immediately upon completion of the grading of that section. Once earthwork has begun on a section, it shall be pursued until completion. If approved by the Engineer, slopes from the edge of pavement to the point of slope selection may be left unseeded until paving has been completed.

The duration of the exposure of uncompleted construction to the elements shall be as short as practicable. Completed areas shall be permanently stabilized within seven calendar days after completion. Disturbed areas where work is temporarily halted shall be temporarily stabilized within seven days after the activity ceased unless work is to be resumed within 30 calendar days after the activity ceased. Payment for temporary stabilization will be made at the contract unit price if the work was interrupted due to no fault or negligence of the Contractor. Payment will not be made for temporary stabilization required by Contractor's negligence, by the lack of proper Contractor scheduling or for the convenience of the Contractor.

Clearing and grubbing operations shall be scheduled and performed so that grading operations and permanent stabilization measures can follow immediately thereafter if the project conditions permit. Otherwise temporary stabilization measures may be required between successive construction stages. No payment will be made for additional work required because the Contractor has failed to properly coordinate the entire erosion control schedule, thus causing previously seeded areas to be disturbed by operations that could have been performed prior to the seeding. Upon failure of the Contractor to coordinate the permanent stabilization measures with the grading operations in a manner to effectively control erosion and prevent water pollution, the Engineer will suspend the Contractor's grading operations and withhold monies due to the Contractor on current estimates until such time that all aspects of the work are coordinated in an acceptable manner.

(e) *Maintenance.* The Contractor shall continuously maintain all erosion and sediment control features so that they function properly during construction and work suspensions until the project is accepted.

From the time seeding and mulching work begins until the date the project is declared complete, the Contractor shall keep all seeded areas in good condition at all times. Any damage to seeded areas or to mulch materials shall be promptly repaired as directed.

If the Contractor fails to maintain the erosion and sediment control features in accordance with the Contract, or as directed, the Engineer may at the expiration of a period of 48 hours, after having given the Contractor written notice, proceed to maintain the features as deemed necessary. The cost thereof will be deducted from any compensation due, or which may become due to the Contractor under this contract.

Temporary erosion and sediment control measures shall remain upon completion of the project unless otherwise directed by the Engineer. If removed, the area in which these features were constructed shall be returned to a condition similar to that which existed prior to its disturbance. At the completion of the Contract, removed salvageable temporary erosion control items shall become the property of the Contractor.

(f) *Disposal of Sediment.* Sediment removed during maintenance of erosion control features shall be used in or on embankment provided it meets conditions of Section 203, or it shall be wasted in accordance with subsection 107.25.

208.05 Construction of Erosion Control Measures. Erosion control measures shall be constructed in accordance with the following.

(a) *Seeding, Mulching, Sodding, Soil Retention Blanket.* Seeding, mulching, sodding, and soil retention blanket shall be performed in accordance with Sections 212, 213, and 216.

(b) *Erosion Bales.* The bales shall be placed embedded into the soil and shall be anchored securely to the ground with wood stakes. Stakes shall have a minimum diameter or cross section dimension of 2 inches. Re-bars shall not be used. Gaps between bales shall be filled with Certified Weed Free mulch to obtain tight joints.

(c) *Silt Fence.* Silt fence shall be installed in locations specified in the Contract prior to any grubbing or grading activity. Sediment shall be removed from behind the silt fence when it accumulates to one half the exposed geotextile height and shall be disposed of in accordance with subsection 208.04(f).

(d) *Temporary Berms.* Berms shall be constructed to the dimensions shown in the Contract, graded to drain to a designated outlet, and compacted with a minimum of two passes of a rubber tire vehicle, preferably a grader wheel.

(e) *Temporary Diversion.* Unless otherwise specified in the Contract or directed, the diversion's ridge and channel shall be stabilized within 14 calendar days of its installation. The diversion shall be installed prior to any up slope land disturbance.

(f) *Temporary Slope* Drains. Temporary slope drains shall be installed prior to installation of permanent facilities or growth of adequate ground cover on the

slopes. All temporary slope drains shall be securely anchored to the slope. The inlets and outlets of temporary slope drains shall be protected to prevent erosion.

(g) *Brush Barrier*. The barrier shall be constructed at the time of clearing and shall be covered by an erosion control geotextile.

(h) *Check Dam.* Logs shall be obtained, if possible, from clearing operations on the project. Sediment shall be removed from behind the check dam when it has accumulated to one half of the original height of the dam and shall be disposed of in accordance with subsection 208.04(f).

(i) *Outlet Protection.* Geotextile used shall be protected from cutting or tearing. Overlaps between two pieces of geotextile shall be 1 foot minimum.

(j) *Storm Drain Inlet Protection.* Storm drain inlet protection measures shall be constructed in locations and with materials and techniques specified in the Contract. Construction shall be in a manner that will facilitate maintenance, and minimize interference with construction activities.

At excavated drop inlet sediment traps, sediment shall be removed when it has accumulated to one-half the design dept of the trap and shall be disposed of in accordance with subsection 208.04(f).

(k) *Sediment Trap and Basin.* Sediment traps or basins shall be installed before any land disturbance takes place in the drainage area.

Area under the embankment shall be cleared, grubbed, and stripped of all vegetation and root mat. Embankment construction shall conform to Section 203.

Sediment shall be removed from the trap or basin when it has accumulated to one half of the wet storage depth of the trap or basin and shall be disposed of in accordance with subsection 208.04(f).

(l) *Erosion Logs.* The Contractor shall maintain the erosion logs during construction to prevent sediment from passing over or under the logs or from sediment accumulation greater than two thirds of the original exposed height of each erosion log.

Stakes shall be embedded to a minimum depth of 12 inches. At the discretion of the Engineer, a shallower depth may be permitted if rock is encountered.

(m) *Silt Dikes*. Prior to installation of silt dikes, the Contractor shall prepare the surface of the areas in which the dikes are to be installed such that they are free of materials greater than two inches in diameter and are suitably smooth for the installation of the silt dikes, as approved by the Engineer.

Dikes shall be secured with "U" staples, 8 inches in length and 11-gauge minimum, placed in two rows per apron along edges one foot on center. The staple pattern shall be as shown on the plans.

(n) *Concrete Washout Structure Design.* The concrete washout structure shall be designed to meet or exceed the dimensions shown on the plans. At least ten days prior to start of paving operations, the Contractor shall submit in writing a *method* statement outlining the design, site location and installation of a concrete structure that will contain washout from concrete placement operations. Work on this structure shall not begin until written acceptance is provided by the Engineer.

The structure shall meet the following requirements:

(1) Structure shall contain all washout water.
(2) Stormwater shall not carry wastes from washout and disposal locations.
(3) The site shall be located a minimum of 50 horizontal feet from state waters and shall meet all requirements for containment and disposal as defined in subsection 107.25.
(4) The site shall be signed as "Concrete Washout".
(5) Each concrete truck driver and pumper operator shall be aware of site locations.
(6) The site shall be accessible to appropriate vehicles.
(7) The bottom of excavation shall be a minimum of five feet vertical above groundwater or, alternatively, excavation must be lined with an impermeable synthetic liner that is designed to control seepage to a maximum rate of 10^{-6} centimeters per second.
(8) Freeboard capacity shall be included into structure design to reasonably ensure the structure will not overtop during or because of a precipitation event.
(9) The Contractor shall prevent tracking of washout material onto the roadway surface.
(10) Solvents, flocculents, and acid shall not be added to wash water.

The structure shall be fenced with orange plastic construction fencing or equivalent fencing material to provide a barrier to construction equipment and to aid in identification of the concrete washout area.

The concrete washout structure shall be completed and ready for use prior to concrete placement operations.

Waste material from concrete washout operations shall be removed and disposed of in accordance with subsection 208.04 (f) when it has accumulated to two-thirds of the wet storage capacity of the structure.

(o) *Stabilized construction entrance.* Stabilized construction entrances shall be constructed to the minmum dimensions shown on the plans, unless otherwise directed by the Engineer. Construction of approved stabilized construction entrances shall be completed before any excavation or work is started between such entrances, as shown on the plans.

The Contractor shall maintain the stabilized construction entrance during the entire time that it is in use in the project. The stabilized construction entrance shall be removed at the completion of this project unless otherwise directed by the Engineer.

208.06 Failure to Perform Erosion Control. The Contractor will be subject to liquidated damages for incidents of failure to perform erosion control as required by the Contract. Incidents to which these liquidated damages may be applied include the following:

(1) Failure to submit an initial schedule or failure to submit a weekly schedule update as specified in subsection 208.03(b).
(2) Failure of the Erosion Control Supervisor to perform the inspections required by subsection 208.03(c)4.
(3) Failure of the Erosion Control Supervisor to implement necessary actions requested by the Engineer as required by subsection 208.03(c)6.
(4) Failure to design and implement erosion and sediment control measures for unforseen conditions as required by subsection 208.04(a).
(5) Failure to construct or implement erosion control or spill containment measures required by the Contract, or failure to construct or implement them in accordance with the Contractor's approved schedule as required by subsection 208.04(c).
(6) Failure to limit the exposed surface area of erodible earth to 34 or fewer acres as required by subsection 208.04(d).
(7) Failure to temporarily stabilize areas where work is temporarily halted within seven days as required by subsection 208.04(d).
(8) Failure to perform maintenance of an erosion control feature within 48 hours after notice from the Engineer to perform maintenance as required by subsection 208.04(e).
(9) Failure to remove and dispose of sediment from erosion control features as required by subsection 208.04(f) and subsections 208.05(c), (h), (j), and (k).
(10) Failure to install and properly utilize a concrete washout structure for containing washout from concrete placement operations

The Engineer will notify the Contractor in writing of each incident of failure to perform erosion control, items (1) through (10) above. The Contractor will be allowed seven calendar days from the date of notification to correct the failure. The Contractor will be charged liquidated damages in the amount of $500 for each calendar day after the seventh day that one or more of the incidents of failure, items (1) through (10) above, remains uncorrected. This deduction will not be considered a penalty, but will be considered liquidated damages based on estimated additional

construction engineering costs. The liquidated damages will accumulate, for each cumulative day that one or more of the incidents remains uncorrected. The number of days to which liquidated damages are assessed will be cumulative for the duration of the project; that is: the damages for a particular day will be added to the total number of days for which liquidated damages are accumulated on the project. The liquidated damages will be deducted from any monies due the Contractor.

METHOD OF MEASUREMENT

208.07 Erosion bales and check dams will be measured by the unit.

Silt fence, erosion logs, silt dikes, temporary berms, temporary diversions, temporary drains, and brush barriers will be measured by the actual number of linear feet that are installed and accepted. Stakes, anchors, connections and tie downs used for temporary slope drains will not be measured and paid for separately, but shall be included in the work.

Concrete washout structure will be measured by the actual number of structures that are installed and accepted, and will include excavation, embankment, concrete, liner, erosion bales, fencing, and containment and disposal of concrete washout and all other associated waste material.

Storm drain inlet protection will be measured by the unit as specified in the Contract.

Sediment trap and sediment basin quantities will be measured by the unit which shall include all excavation and embankment required to construct the item. Other materials used to provide for outlet and overflow will be measured and paid for separately.

The Erosion Control Supervisor will not be measured, but will be paid for on a lump sum basis. The lump sum price bid will be full compensation for all work required to complete the item.

Excavation required for removal of accumulated sediment from traps, basins, areas adjacent to silt fences and erosion bales, and other clean out excavation of accumulated sediment, and the disposal of such sediment, will be paid for on a lump sum basis.

Stabilized construction entrance will be measured by the actual number constructed and accepted.

BASIS OF PAYMENT

208.08 Work to furnish, install, maintain, remove, and dispose of erosion and sediment control features specified in the Contract will be paid for at the contract unit price.

208.08

Payment will be made under:

Pay Item	Pay Unit
Erosion Bales (Weed Free)	Each
Silt Fence	Linear Foot
Temporary Berms	Linear Foot
Temporary Diversion	Linear Foot
Temporary Slope Drains	Linear Foot
Brush Barrier	Linear Foot
Check Dam	Each
Storm Drain Inlet Protection	Each
Sediment Trap	Each
Sediment Basin	Each
Sediment Removal and Disposal	Lump Sum
Erosion Control Supervisor	Lump Sum
Erosion Log (____ Inch)	Linear Foot
Silt Dike	Linear Foot
Concrete Washout Structure	Each
Stabilized Construction Entrance	Each

Payment for stabilized construction entrance will be full compensation for all work, materials and equipment required to construct, maintain, and remove the entrance upon completion of the work. Aggregate and geotextile will not be measured and paid for separately, but shall be included in the work.

Temporary erosion and pollution control measures required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or ordered by the Engineer or for the Contractor's convenience, shall be performed at the Contractor's expense.

In the case of repeated failures on the part of the Contractor in controlling erosion, sedimentation, or water pollution, the Engineer reserves the right to employ outside assistance or to use Department forces to provide the necessary corrective measures. Such incurred direct costs, plus project engineering costs, will be charged to the Contractor, and appropriate deduction will be made from the Contractor's monthly progress estimate.

Accepted work performed to install measures for the control of erosion and sedimentation, and water pollution, not originally included in the Contract will be paid for as extra work in accordance with subsection 104.03.

Seeding, sod, mulching, soil retention blanket, and riprap will be measured and paid for in accordance with Sections 212, 213, 216, and 506.

SECTION 209
WATERING AND DUST PALLIATIVES

DESCRIPTION

209.01 This work consists of applying water to soils or aggregates for moisture and density control, landscaping, prewetting an excavation area, and dust palliatives. It shall also include applying magnesium chloride dust palliative for the control of dust and the stabilization of soil and aggregate surfaced roads.

MATERIALS

209.02 Water applied for moisture and density control, as dust palliative, and for prewetting shall be free from injurious matter. Water for landscaping shall be free from oil, acids, alkalis, salts, or any substance injurious to plant life.

When the water source proposed for use by the Contractor is not of known quality and chemical content, samples of the water shall be submitted for approval prior to use.

Magnesium chloride dust palliative shall consist of a magnesium chloride base agent, water, and other enhancing or nondetrimental ions. The chemical analysis shall conform to the following:

Chemical Constituents	Percent by Weight
Magnesium Chloride ($MgCl_2$)	28 to 35
Enhancing or Nondetrimental Ions	0 to 5
Water	65 to 72

CONSTRUCTION REQUIREMENTS

209.03 Moisture and Density Control. Sprinkling equipment shall deliver uniform and controlled distribution of water without ponding or washing. Water for finishing operations shall be uniformly applied by spraying across the full width of the course.

209.04 Prewetting. Prewetting material in excavation areas prior to its removal for placement in embankments will be allowed when approved. The Contractor shall furnish a prewetting layout for each area to be prewetted including nozzle size, spacing, number of lines, and other equipment to be used. The Contractor shall obtain the approval of the Engineer for each prewetting layout prior to each prewetting operation.

209.05 Dust Palliative. The Contractor shall furnish and apply a dust palliative on portions of the roadway and on haul roads at the locations and in the amounts as provided in the Contract.

Dust palliative shall consist of water. Application of water shall be done with acceptable sprinkling equipment at an appropriate rate as approved by the Engineer.

Magnesium Chloride dust palliative shall be applied as follows: Scarify the top 2 inches of the existing road surface and wet with water to approximately four percent moisture content, or as directed. Apply the magnesium chloride dust palliative in two applications of 0.25 gallon per square yard in each application. Allow to soak for 30 minutes after each application. Roll the surface with a pneumatic tire roller, as specified in the Contract. Do not permit traffic on the treated surface until approved.

209.06 Landscaping. The Contractor shall furnish water for seeding, mulching, planting, transplanting, sodding, herbicide treatment, and any other landscaping work when called for on the plans or when designated.

METHOD OF MEASUREMENT

209.07 Water will be measured by the number of thousand gallons (M Gallon) used and accepted. Measurement of water may be made in the vehicle at point of delivery or by meter. When water is to be metered for measurement, the Contractor shall provide and use an approved metering device.

Magnesium Chloride dust palliative will be measured by the number of gallons applied and accepted.

BASIS OF PAYMENT

209.08 The accepted quantities of water measured as provided above will be paid for at the contract unit price per M Gallon. The accepted quantities of Magnesium Chloride dust palliative measured as provided above will be paid for at the contract unit price per Gallon.

Payment will be made under:

Pay Item	Pay Unit
Water	(M Gallon)
Water (Landscaping)	(M Gallon)
Dust Palliative (Magnesium Chloride)	Gallon

Water required for all items of work will not be measured and paid for separately, but shall be included in the work, except that water for dust palliative, and water ordered for the benefit or safety of the public will be measured and paid for separately in accordance with the Contract.

If the area for landscape work is irrigated by a Department-owned system, the Contractor may use the water from this source. Water used from a Department source will not be measured and paid for.

SECTION 210
RESET STRUCTURES

DESCRIPTION

210.01 This work consists of removing, relaying, resetting, or adjusting structures and related materials. All designated items shall be carefully removed, and stored, reinstalled, or adjusted, in a manner that will avoid loss or damage.

CONSTRUCTION REQUIREMENTS

210.02 General. Relaid pipe and conduit, and reset structures shall be cleaned of foreign material prior to reinstallation.

Except in areas to be excavated, all holes resulting from the removal of structures shall be neatly backfilled. Methods shall conform to those required in the specifications for the various types of construction involved.

Materials in good condition from removed structures may be re-used. Salvable material, as designated in the Contract, that is not re-used shall remain the property of the Department, and the Contractor shall be held responsible for safekeeping of all materials until receipted by the Department. Materials damaged, stolen, or lost prior to receipt by the Department shall be repaired or replaced, as determined by the Engineer, at no cost to the Department.

Unserviceable material, as determined by the Engineer, shall be replaced with new material of similar dimensions, and the material costs will be paid for in accordance with subsection 109.04(b), except as otherwise provided in this section. All new materials and replacement parts shall conform to the requirements of the Contract for the appropriate items.

210.03 Light Standard. Light standards shall be reset on new concrete foundation pads complete with conduit and wiring in accordance with the Department's Standard Plans at locations indicated in the Contract.

210.04 Fences and Gates. Where fences (except snow fence) are reset the Contractor shall supply and install any new materials required to restore the fence to acceptable condition except for new posts. The Contractor shall supply new posts as needed for the reset fence in accordance with Section 607. Wire in the old fence shall be salvaged and used in the reset fence.

Where snowfences are reset, panels shall be removed from their existing location and reset at the new location.

Gates designated to be reset shall be removed and restored for service at the new locations.

Right of way fence shall be reset approximately 6 inches inside the boundary of the highway right of way shown on the plans. Anchorages, footings, or fence appurtenances shall not extend beyond the limits of the highway right of way without the written consent of the abutting property owner.

210.05 Guardrail. Where guardrail is reset the Contractor shall supply and install any new materials needed to restore the guardrail to acceptable condition. New materials shall include additional posts, blocks, and hardware needed to complete the intermediate post installations as shown on the Department's Standard Plans. Posts with similar tops shall be installed in groups as directed. Installation of fiat-top posts alternately with other top shapes will not be permitted. Posts may be cut, rotated, or turned upside down to eliminate unacceptable tops. If the posts are cut, the Contractor shall treat the exposed surface with two coats of an approved preservative.

Adjust guardrail shall be the work necessary to adjust the height to the standard 27 inches in accordance with Standard Plan M-606-1, and filling the resulting voids under the posts with a lean concrete mixture consisting of one part cement and ten parts sand.

210.06 Mailbox. Mailboxes complete with supporting structures are to be removed and temporarily reset at points near their original location to be accessible for mail delivery service. Upon completion of surfacing operations, the boxes shall again be reset at the locations designated. A supporting structure may contain one or more mailboxes. New permanent mailbox support posts and mounting brackets shall be furnished and installed in accordance with the Department's Standard Plans.

210.07 Ground Sign. Signs and posts designated to be reset shall be removed, cleaned, and reset at designated locations, including all work necessary to provide the existing posts with break-away devices, where required.

210.08 Sign Structure. Sign structures shall be sandblasted and repainted prior to reinstallation.

210.09 Traffic Signal. Traffic signals designated to be reset shall be removed along with existing poles and electrical equipment. New concrete footings shall be installed along with any new electrical equipment necessary to restore the structure to service at the new location. Equipment and materials shall be cleaned prior to being reset.

210.10 Adjust Structure. Adjusting structures shall apply, but not be limited to, manhole rings and covers, inlet gratings and frames, water valve boxes, water meters, gate posts, and other structures and facilities. Construction operations shall consist of raising, lowering, moving, or removing masonry or concrete; adding brick-work, masonry, or concrete; and resetting grates, frames, or rings and covers to fit the new construction. Structures in the traveled roadway shall be adjusted to a tolerance of ¼ to ½ inch below the surface of the roadway. Work on water services shall be subject to inspection and testing by the owners. Damage to any fire hydrant or any part of the water system by the Contractor shall be repaired at the Contractor's expense.

210.11 Flashing Beacon. Reset Flashing Beacon shall consist of providing a new concrete foundation or footing, adjustments of post and breakaway device as required, and providing all electrical equipment and materials necessary to restore the installation to service at the new location. The Contractor shall provide necessary connections from the nearest power source or from the source designated on the plans to the new location.

METHOD OF MEASUREMENT

210.12 The quantity to be measured where items are reset or adjusted on an "each" basis shall be the actual number of those items restored for service at new location, completed and accepted.

Concrete foundation pads will be measured and paid for as "Concrete Foundation Pad" in accordance with Section 613.

Concrete footings for ground signs and overhead sign structures, if required, will be measured and paid for in accordance with Section 614.

Steel post extensions, if required, will be measured and paid for as "Steel Sign Post" in accordance with Section 614, of the type shown on the plans.

The quantity to be measured where items are reset or adjusted on a "linear foot" basis shall be the actual number of linear feet of the items completed and accepted, measured end to end, except guardrail and snow fence. Guardrail will be measured as the actual number of linear feet completed and accepted, as shown on the Department's Standard Plans. Snow fence shall be measured end to end of the anchor posts.

The quantity to be measured for "Relay Pipe" shall be the number of linear feet of relaid pipe including end sections, measured end to end, in place, completed and accepted.

The quantity to be measured for "Reset Mailbox Structure" shall be the number of supporting structures, complete with mailboxes, restored at new locations and accepted. Moving the mailbox structures for temporary mail service during construction, and installing new support post, base, mounting brackets, and hardware will not be measured or paid for separately but shall be included in the work.

Resetting of structures, fences, and related materials shall include all work necessary to remove the items from their existing location to the new location, and shall include all mounting hardware, footings, and all other work necessary to complete the reset item, except for new fence posts. Fence posts required and approved will be measured and paid for in accordance with Section 607.

Resetting of traffic signals, poles, controllers, cabinets, preemption units, coordination and interconnection equipment, and related equipment and materials shall include all work necessary to remove the items from their existing location and reset them at the new location, and shall include all mounting hardware, footings,

other electrical equipment and service, and all other materials and work necessary to complete the reset item in service at the new location.

BASIS OF PAYMENT

210.13 The accepted quantities, measured as provided above, will be paid for at the contract price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	**Pay Unit**
Reset	Each, Linear Foot, Square Yard, Lump Sum
Relay Pipe (___)	Linear Foot
Adjust	Each, Linear Foot
Modify	Each
Reset Mailbox Structure (Type___)	Each
Adjust Guardrail	Linear Foot

Structure excavation and structure backfill required for "Relay Pipe" will be measured and paid for in accordance with Section 206. Any void in the structure excavation prism created by the removal of pipe will be excluded from measurement and payment of structure excavation.

Except as otherwise provided in the Contract, collars and connecting devices will not be measured and paid for separately but shall be included in the work.

SECTION 212
SEEDING, FERTILIZER, SOIL CONDITIONER, AND SODDING

DESCRIPTION

212.01 This work consists of soil preparation, application of fertilizer, soil conditioners, or both, and furnishing and placing seed and sod. The work shall be in accordance with the Contract and accepted horticultural practices.

MATERIALS

212.02 Seed, Soil Conditioners, Fertilizers, and Sod.

(a) *Seed.* All seed shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the seed name, the lot number, net weight, origin, the percent of weed seed content, the guaranteed percentage of purity and germination, pounds of pure live seed (PLS) of each seed species, and the total pounds of PLS in the container. All seeds shall be free from noxious weed seeds in accordance with current state and local lists and as indicated in Section 213. The Contractor shall furnish to the Engineer a signed statement certifying that the seed is from a lot that has been tested by a recognized laboratory for seed testing within six months prior to the date of seeding. Seed which has become wet, moldy, or damaged in transit or in storage will not be accepted.

Seed types and amount of PLS required per acre shall be provided in accordance with the Contract.

Seed and seed labels shall conform to all current State and Federal regulations and will be subject to the testing provisions of the Association of Official Seed Analysis. Computations for quantity of seed required on the project shall include the percent of purity and percent of germination.

The formula used for determining the quantity of PLS shall be:

Bulk Pounds of Seed Species • (%Purity • %Germination) = Pounds of PLS

(b) *Soil Conditioners and Fertilizer* .

1. Fertilizer: Fertilizer (plant nutrients) shall conform to the applicable State fertilizer laws. It shall be uniform in composition, dry, and free flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Fertilizer which becomes caked or damaged will not be accepted.

2. Soil conditioner: Soil conditioner shall consist of an organic amendment, biological nutrient, biological culture or humic acid based material.
   .
   Humic acid based material (Humate) shall include the following:

(1) pH 3 to 5
(2) Maximum 20 percent inert ingredient
(3) Minimum 80 percent organic matter with 40 percent minimum humic acid.

Organic amendment shall be an organic product containing a mixture of composted cow or sheep manure and plant residue produced by aerobic (biological) decomposition. It shall be processed at a consistent temperature of 140 °F or greater to accomplish the following:

(1) Compost the windrows of composted organic amendment (cow or sheep manure) for 90 to 120 days. Certification must be provided to prove the product has gone through this process.

(2) Eradicate harmful pathogens including coliform bacteria.

(3) Create a carbon to nitrogen ratio of 15:1 to 25:1.

(4) Contain no solid particle greater than ½ inch diameter.

(5) Have a non-offensive smell similar to fresh turned soil.

(6) Contain no significant level of dirt, soil, or chemical preservatives and contain a maximum of 30 percent composted plant residue.

(7) Have a pH after composting between 6 and 8 with an organic matter content of at least 20 percent.

(8) Contain soluble salts not greater than 5mmhos/cm.

The Contractor shall submit a two pound sample of the soil conditioner product four weeks before its use on the project site for the Engineer's approval. A certificate of Compliance shall be provided to the Engineer to verify the organic matter content, pH, and carbon matter to nitrogen ratio, and salt levels (by electrical conductivity mmhos/cm).

(c) *Sod.* Sod shall be nursery grown and 99 percent weed free. Species shall be as shown on the plans. Other sod types may be used only if approved in writing by the Engineer. The one percent allowable weeds shall not include any undesirable perennial or annual grasses or plants defined as noxious by current State statute. Soil thickness of sod cuts shall not be less than ¾ inch nor more than 1 inch. Sod shall be cut in uniform strips with minimum dimensions of 18 inches in width and 48 inches in length. The Contractor shall submit a sample of the sod proposed for use, which shall serve as a standard. Any sod furnished, whether in place or not, that is not up to the standard of the sample may be rejected. Sod that was cut more than 24 hours prior to installation shall not be used.

Each load of sod shall be accompanied by a certificate from the grower stating the type of sod and the date and time of cutting.

CONSTRUCTION REQUIREMENTS

212.03 Seeding Seasons. Seeding in areas that are not irrigated shall be restricted according to the following time table and specifications.

Zone	Spring Seeding	Fall Seeding
Areas OtherThan Western Slope		
Below6000'	Spring thaw toJune 1	September 1 until consistent ground freeze
6000'to 7000'	Spring thaw toJune 1	September 15 until consistent ground freeze
7000'to 8000'	Spring thaw toJuly 15	August 1 until consistent ground freeze
Above8000'	Spring thaw to consistent ground freeze	
Western Slope		
Below6000'	Spring thaw to May 1	August 1 until consistent ground freeze
6000'to 7000'	Spring thaw to June 1	September 1 until consistent ground freeze
Above7000'	Spring thaw to consistent ground freeze	

(1) "Spring thaw" shall be defined as the earliest date in a new calendar year in which seed can be buried ½ inch into the surface soil (topsoil) thru normal drill seeding methods.

(2) "Consistent ground freeze" shall be defined as that time during the fall months in which the surface soil (topsoil), due to freeze conditions, prevents burying the seed ½ inch thru normal drill seeding operations. Seed shall not be sown, drilled, or planted when the surface soil or topsoil is in a frozen or crusted state.

Seeding accomplished outside the time periods listed above will be allowed only when ordered by the Engineer or when the Contractor's request is approved in writing. When requested by the Contractor, the Contractor must agree to perform the following work at no cost to the Department: reseed, remulch, and repair areas which fail to produce species indicated in the Contract.

When seeding is ordered by the Engineer outside the time periods listed above, the cost of additional material will be paid for by the Department. The Contractor will not be responsible for failure of the seeded area to produce species indicated in the Contract due to reasons beyond the control of the Contractor.

The seeding, the soil conditioning, and the fertilizing application rate shall be as specified. The Engineer may establish test sections for adjusting the seeding and the

fertilizing equipment to assure the specified rate. The Engineer may order equipment readjustment at any time.

Seed , soil conditioner and fertilizer shall not be applied during inclement weather including rain and high winds, or when soil is frozen or soil moisture is too high to evenly incorporate seed, soil conditioner or fertilizer.

212.04 Lawn Grass Seeding. Lawn grass seeding shall be accomplished in the seeding seasons described in subsection 212.03.

(a) *Soil Preparation.* Preparatory to seeding lawn grass, irregularities in the ground surface, except the saucers for trees and shrubs, shall be removed. Measures shall be taken to prevent the formation of low places and pockets where water will stand.

Immediately prior to seeding, the ground surface shall be tilled or hand worked into an even and loose seedbed to a depth of 4 inches, free of clods, sticks, stones, debris, concrete, and asphalt in excess of 2 inches in any dimension, and brought to the desired line and grade.

(b) *Fertilizing and Soil Conditioning.* The first application of fertilizer, soil conditioner, or both shall be incorporated into the soil prior to seeding, and shall consist of a soil conditioner, commercial fertilizer, or both as designated in the Contract. Fertilizer called for on the plans shall be worked into the top 4 inches of soil at the rate specified in the contract. Biological nutrient, culture or humic acid based material called for on the plans shall be applied in a uniform application onto the soil service. Organic amendments shall be applied uniformly over the soil surface and incorporated into the top 6 inches of soil.

The second application of fertilizer shall consist of a fertilizer having an available nutrient analysis of 20-10-5 applied at the rate of 100 lbs. per acre. It shall be uniformly broadcast over the seeded area three weeks after germination or emergence. The area shall then be thoroughly soaked with water to a depth of 1 inch.

Fertilizer shall not be applied when the application will damage the new lawn.

(c) *Seeding.* After the surface is raked and rolled, the seed shall be drilled or broadcast and raked into the top ¼ inch of soil. Seeding shall be accomplished by mechanical landscape type drills. Broadcast type seeders or hydraulic seeding will be permitted only on small areas not accessible to drills. Seed shall not be drilled or broadcast during windy weather or when the ground is frozen or untillable. All loose exposed rock larger than 2 inches shall be removed from slopes that are to be seeded by drilling.

Hydraulic seeding equipment shall include a pump capable of being operated at 100 gallons per minute and at 100 pounds per square inch pressure, unless

otherwise directed. The equipment shall have a nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have a means of estimating the volume used or remaining in the tank.

212.05 Sodding.

(a) *Soil Preparation.* Preparatory to sodding, the ground shall be tilled or hand worked into an even and loose sod bed to a depth of 4 inches, and irregularities in the ground surface shall be removed. Sticks, stones, debris, clods, asphalt, concrete, and other material more than 2 inches in any dimension shall be removed. Any depressions or variances from a smooth grade shall be corrected. Areas to be sodded shall be smooth before any sodding is done.

(b) *Sodding.* The sod shall be laid by staggering joints with all edges touching. On slopes, the sod shall run approximately parallel to the slope contours. Where the sod abuts a drop inlet, the subgrade shall be adjusted so that the sod shall be 1 ½ inch below the top of the inlet.

Within one hour after the sod is laid and fertilized it shall be watered. After watering the sod shall be permitted to dry to the point where it is still wet enough for effective rolling. It shall then be rolled in two directions with a lawn roller weighing at least 150 pounds.

(c) *Fertilizing and Soil Conditioning.* Prior to laying sod, the 4 inches of subsoil underlying the sod shall be treated by tilling in fertilizer, soil conditioner, or both. The rate of application shall be as designated in the Contract. Fertilizer called for on the plans shall be worked into the top 4 inches of soil at the rate specified in the contract. Biological nutrient, culture or humic acid based material called for on the plans shall be applied in a uniform application onto the soil service. Organic amendments shall be applied uniformly over the soil surface and incorporated into the top 6 inches of soil.

After laying, the sod shall be fertilized with a fertilizer having an available nutrient analysis of 20-10-5 at the rate of 200 pounds per acre. Fertilizer shall not be applied when the application will damage the sod.

212.06 Native Seeding. Areas that are unirrigated shall be seeded in accordance with subsection 212.03.

(a) *Soil Preparation.* Slopes flatter than 2:1, shall be tilled into an even and loose seed bed 4 inches deep. Slopes 2:1 or steeper shall be left in a roughened condition. Slopes shall be free of clods, sticks, stones, debris, concrete, and asphalt in excess of 4 inches in any dimension, and brought to the desired line and grade.

(b) *Fertilizing and Soil Conditioning.* Prior to seeding, fertilizer, soil conditioner, or both shall be applied. The fertilizer and soil conditioner type and rate of application shall be as designated in the Contract. Fertilizer called for on the

plans shall be worked into the top 4 inches of soil at the rate specified in the contract. Biological nutrient, culture or humic acid based material called for on the plans shall be applied in a uniform application onto the soil service. Organic amendments shall be applied uniformly over the soil surface and incorporated into the top 6 inches of soil.

(c) *Seeding.* Seeding shall be accomplished within 24 hours of tilling or scarifying to make special seed bed preparation unnecessary. The seeding application rate shall be as designated in the Contract. All slopes flatter than 2:1 shall be seeded by mechanical power drawn drills followed by packer wheels or drag chains. Mechanical power drawn drills shall have depth bands set to maintain a planting depth of at least ¼ inch and shall be set to space the rows not more than 7 inches apart. Seed that is extremely small shall be sowed from a separate hopper adjusted to the proper rate of application.

If strips greater than 7 inches between the rows have been left unplanted or other areas skipped, the Engineer will require additional seeding at the Contractor's expense.

When requested by the Contractor and approved by the Engineer, seeding may be accomplished by broadcast or hydraulic type seeders at twice the rate specified in the Contract at no additional cost to the project.

All seed sown by broadcast-type seeders shall be "raked in" or covered with soil to a depth of at least ¼ inch. Broadcasting seed will be permitted only on small areas not accessible to machine methods.

Hydraulic seeding equipment and accessories shall conform to the equipment and accessories described in subsection 212.04(c).

Seeded areas damaged due to circumstances beyond the Contractor's control shall be repaired and reseeded as ordered. Payment for this corrective work, when ordered, shall be at the contract prices.

Multiple seeding operations shall be anticipated as portions of job are completed to take advantage of growing conditions and to comply with Section 208 and subsection 212.03.

METHOD OF MEASUREMENT

212.07 The quantities of lawn seeding and native seeding will not be measured but shall be the quantities designated in the Contract, except that measurements will be made for revisions requested by the Engineer, or for discrepancies of plus or minus five percent of the total quantity designated in the Contract. The quantity of lawn seeding shall include soil preparation, water, fertilizer, and seed, completed and accepted. The quantity of native seeding shall include soil preparation, fertilizer, soil conditioner, and seed applied, completed, and accepted.

The quantity of sod to be measured will be the actual number of square feet, including soil preparation, water, fertilizer, and sod, completed and accepted.

The Contractor shall furnish the Engineer with seed certifications and analysis, fertilizer analysis, and bag weight tickets prior to placing any seed or fertilizer. Any seed or fertilizer placed by the Contractor without the Engineer's approval will not be paid for.

Measurement for acres will be by slope distances.

BASIS OF PAYMENT

212.08 The accepted quantities of lawn seeding, native seeding, soil conditioning, and sod will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Seeding (Lawn)	Acre
Seeding (Native)	Acre
Sod	Square Foot
Soil Conditioning	Acre

Soil preparation, water, seed, fertilizer, and soil conditioner, incorporated into the seeding sodding or soil conditioning will not be paid for separately but shall be included in the work.

Adjusting or readjusting seeding or fertilizing equipment will not be paid for separately but shall be included in the work.

SECTION 213
MULCHING

DESCRIPTION

213.01 This work consists of mulching the seeded areas, furnishing and placing wood chip mulch in the planting beds and plant saucers, furnishing and applying hydromulch with tackifier on roadway ditches and slopes, furnishing and placing tackifier on mulch or soil on roadway ditches or slopes, and furnishing and installing metal landscape border for the separation of planting beds, in accordance with the Contract or as directed. Mulching may be accomplished by the crimping method using straw or hay, by the hydraulic method using wood cellulose fiber mulch, or by other approved methods with approved materials. When a specific mulching method is required, it will be designated in the Contract.

MATERIALS

213.02 Materials for mulching shall consist of Certified Weed Free field or marsh hay or straw of oats, barley, wheat, rye or triticale certified under the Colorado Department of Agriculture Weed Free Forage Certification Program and inspected as regulated by the Weed Free Forage Act, Title 35, Article 27.5, CRS. Each certified weed free mulch bale shall be identified by one of the following:

(1) One of the ties binding the bale shall consist of blue and orange twine, or
(2) One of the ties binding the bale shall consist of specially produced galvanized shiny wire, or
(3) The bale shall have a regional Forage Certification Program tag indicating the Regional Forage Certification Program Number.

Mulch shall be inspected for and Regionally Certified as weed free based on the Regionally Designated Noxious Weed and Undesirable Plant List for Colorado, Wyoming, Montana, Nebraska, Utah, Idaho, Kansas and South Dakota.

The Contractor shall not unload certified weed free mulch bales or remove their identifying twine, wire, or tags until the Engineer has inspected and accepted them.

The Contractor shall provide a transit certificate that has been filled out and signed by the grower and by the Department of Agriculture inspector.

The Contractor may obtain a current list of Colorado Weed Free Forage Crop Producers who have completed certification by contacting the Colorado Department of Agriculture, Division of Plant Industry.

Straw or hay in a stage of decomposition (discolored, brittle, rotten, or moldy) or old, dry mulch which breaks in the crimping process will not be accepted.

The type and application rate of mulch material shall be as designated in the Contract.

The hydromulch material for hydraulic mulching shall consist of virgin wood fibers manufactured expressly from clean whole wood chips. The chips shall be processed in such a manner as to contain no growth or germination inhibiting factors. Fiber shall not be produced from recycled materials such as sawdust, paper, cardboard, or residue from pulp and paper plants. The wood cellulose fiber mulch shall be dyed green to aid in visual metering during application. The dye shall be biodegradable and not inhibit plant growth. The wood cellulose fibers of the mulch must maintain uniform suspension in water under agitation. Upon application, the mulch material shall form a blotter-like mat covering the ground. This mat shall have the characteristics of moisture absorption and percolation and shall cover and hold seed in contact with the soil. The Contractor shall obtain certifications from suppliers that laboratory and field testing of their product has been accomplished, and that it meets all of the foregoing requirements pertaining to wood cellulose fiber mulch.

The wood cellulose fiber mulch shall conform to the following specifications:

(1)	Percent moisture content	10.0% ± 3.0%
(2)	Percent Organic Matter* (Wood Cellulose Fiber)	99.3% ± 0.2%
(3)	Percent Ash Content*	0.7% ± 0.2%
(4)	pH	4.9 ± 0.5
(5)	Water Holding Capacity*	**1200-1600 grams

*Oven-Dried Basis
**Per 100 grams of fiber

The wood cellulose fiber mulch shall be packaged in units containing current labels, with the manufacturer's name, the net weight, and certification that the material meets the foregoing requirements for wood cellulose fiber mulch.

Material for mulch tackifier shall consist of a free-flowing, noncorrosive powder produced from the natural plant gum of Plantago insularis (Desert Indianwheat), applied in a slurry with water and wood fiber. The powder shall possess the following properties:

(1)	Protein content	1.6% ± 0.2%
(2)	Ash content	2.7% ± 0.2%
(3)	Fiber	4.0% ± 0.4%
(4)	pH 1% solution	6.5 - 8.0

The material used for mulch tackifier shall not contain any mineral filler, recycled cellulose fiber, clays, or other substances which may inhibit germination or growth of plants. Water shall conform to subsection 209.02.

Wood chip mulch shall consist of fresh, moist pole peelings material having approximate dimensions;

Width: ¼ to ½ inch; Length: 3 to 4 inches

The Contractor shall submit a sample to the Engineer for approval at least 30 days prior to placing on the project.

The metal landscape border shall consist of a strip of metal such as steel conforming to ASTM A 1011 or approved equal.

CONSTRUCTION REQUIREMENTS

213.03

(a) *Hay or Straw Mulching.* After seeding has been completed or when required for erosion control, hay or straw shall be uniformly applied, with no bare soil showing, at the rate designated in the Contract or as directed. It shall be crimped in with a crimper or other approved equipment. The Engineer may order hand-crimping on areas where mechanical methods cannot be used.

The seeded area shall be mulched and crimped within four hours after seeding. Areas not mulched and crimped within four hours after seeding or prior to precipitation or damaging winds on site shall be reseeded with the specified seed mix at the Contractor's expense, prior to mulching and crimping.

When tackifier is required in the Contract it shall be applied in the following order: (1)hydraulic mulching, (2)mulch tackifier.

(b) *Hydraulic Mulching.* Cellulose fiber mulch and tackifier shall be added to water to form a homogeneous slurry. The operator shall spray apply the slurry mixture uniformly over the designated seeded area.

Hydraulic mulching shall not be done in the presence of free surface water.

1. Mixing procedure for the hydraulic mulch and tackifier mixture shall be as follows:

   (1) Fill tank with water approximately ¼ full.
   (2) Continue filling while agitating with engine at full rpm.
   (3) Pour tackifier, at a moderate rate, directly into area of greatest turbulence.
   (4) With the recommended amount of tackifier in solution, add wood cellulose fiber mulch. Do not add fertilizer.

   Apply the hydromulch and tackifier mixture at the following rate:

Wood Cellulose Fiber Mulch	Tackifier
2000 lbs./Acre	100 lbs./Acre

2. Mixing procedure for Mulch Tackifier shall be as follows:
   (1) Fill tank with desired amount of water and run engine at full R.P.M.

(2) Add wood fiber. Agitate until a homogenous, non-lumpy slurry is formed. Do not add fertilizer
(3) Slowly sift powdered tackifier into slurry and continue to agitate for at least five minutes.
(4) Spray onto mulch or soil using a nozzle that will disperse the spray into a mist that will uniformly cover the mulch.

Application Rate: Apply this as an overspray at the following rate or as approved by the Engineer.

Powder	Fiber	Water
200 lbs./Acre	300 lbs./Acre	1000 gal./Acre

(c) *General.* Mulch shall be tacked simultaneously or immediately upon completion of mulching and crimping to avoid non-uniform coverage. Areas not properly mulched, or areas damaged due to the Contractor's negligence, shall be repaired and remulched as described above, at the Contractor's expense.

Mulch removed by circumstances beyond the Contractor's control shall be repaired and remulched as ordered. Payment for this ordered corrective work shall be at the contract prices.

The Engineer may order test sections be established for adjusting the mulching equipment to assure conformance with the specified application rate. The Engineer may order equipment readjustment at any time.

(d) *Wood Chip Mulch.* A 4-inch layer, unless otherwise shown in the plans, of wood chip mulch shall be uniformly applied to all planting beds as shown on the plans or as directed. Wood chip mulch shall be placed in all tree and shrub saucers in seeded areas. Wood chip mulch shall be capable of matting together to resist scattering by the wind.

(e) *Metal Landscape Border.* Metal Landscape border shall be installed along the lines and at the grades shown on the plans by an approved method that will not damage the border. Ends of metal landscape border shall overlap the next adjacent section a minimum of 6 inches. Metal landscape border shall be anchored with wire tiedowns at intervals of approximately 2 feet. Wire tiedowns shall be 9 gage wire at least 14 inches long. Metal landscape border shall be inserted into the ground by driving against the wire tiedowns; ground may be moistened to ease entrance into the ground. Driving on edge of metal landscape border will not be permitted except when the edge is properly shielded. Metal landscape border may be bent for sharp angles, and overlapped at closure of perimeter.

METHOD OF MEASUREMENT

213.04 The quantity of hay and straw mulch, wood chip mulch, wood cellulose fiber hydromulch, and tackifier will not be measured but shall be the quantity designated in

the Contract, except that measurements will be made for revisions requested by the Engineer, or for discrepancies of plus or minus five percent of the total quantity designated in the Contract. Measurement for acres will be by slope distances.

The quantity of mulch tackifier to be measured will be the actual number of pounds of dry tackifier powder used.

Metal landscape border will be measured by the linear foot of completed and accepted metal border. Measured length of metal landscape border will not include required overlap splices.

BASIS OF PAYMENT

213.05 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	**Pay Unit**
Mulching (___)	Acre
Mulching (Weed Free Hay)	Acre
Mulching (Weed Free Straw)	Acre
Mulching (Wood Chip)	Cubic Foot
Mulch Tackifier	Pound
Metal Landscape Border __x__ Inch	Linear Foot

Water, wood fiber, mixing and application for mulch tackifier will not be measured and paid for separately but shall be included in the work.

Adjusting or readjusting mulching equipment will not be paid for separately but shall be included in the work.

SECTION 214
PLANTING

DESCRIPTION

214.01 This work consists of furnishing and planting trees, shrubs, wetland perennials, and other plant material, hereinafter referred to as "plants" and obtaining live brush layer cuttings from on-site willow species designated by the Engineer near the project site and planting them in moist areas as shown on the plans or as directed.

MATERIALS

214.02 General. Plants shall be of the species or variety designated in the Contract, in healthy condition with normal well developed branch and root systems, and shall conform to the requirements of the current "American Standard for Nursery Stock." The Contractor shall obtain certificates of inspection of plant materials that are required by Federal, State, or local laws, and submit the certificates to the Engineer.

All plants shall be free from plant diseases and insect pests. All shipments of plants shall comply with all nursery inspection and plant quarantine regulations of the State of origin and destination, and the Federal regulations governing Interstate movement of nursery stock.

The minimum acceptable sizes of all plants, with branches in normal position, shall conform to the measurements specified in the Contract.

Plants hardy in hardiness zones 2, 3, 4, and 5 only will be accepted. Hardiness zones are defined in U.S. Department of Agriculture publications.

All container grown plants shall be those plants that have been growing in a nursery for at least one growing season, or plants that have established themselves in accordance with definitions set forth in the Colorado Nursery Act, Title 35, Article 26, CRS.

Trees and shrubs shall have been root-pruned during their growing period in the nursery in accordance with standard nursery practice.

If plants of acceptable quality and specified variety or size are not available locally, the Contractor may:

(1) Substitute acceptable plants that are larger than specified at no change in contract price.
(2) On written approval, substitute smaller plants than those specified in the Contract at the adjusted price stated in the written approval.
(3) On written approval, substitute plants of a different genus, species, or variety at the adjusted price stated in the written approval.

Before any substitution of plants will be considered, the Contractor shall furnish to the Engineer written statements from three sources verifying that the plants designated on the plans are not available.

At the landscape pre-construction conference, the Contractor shall name the nursery stock supplier for all items. The Contractor shall tag all nursery stock for inspection by the Engineer. The Engineer will reject any nursery stock not meeting the Contract at any of the three following times and locations:

(1) At the named supplier's location. The Engineer will notify the Contractor when nursery stock will be inspected at the supplier's location.
(2) On the project site at the time of delivery, prior to planting.
(3) At the time of installation. Final acceptance of all plant material will be made at the time of installation on the project site.

Deciduous plants, broadleaf evergreens, and conifers shall be balled and burlapped, or in containers used in standard nursery practice. Balling and burlapping shall conform to the recommended specifications in the "American Standard for Nursery Stock". The ball of the plant shall be natural, not made, and the plant shall be handled by the ball at all times. No balled and burlapped plant shall be accepted if the ball is broken or the trunk is loose in the ball.

Each species shall be identified by means of grower's label affixed to the plant. The grower's label shall include the data necessary to indicate conformance to specifications.

Plants for fall planting shall be furnished balled and burlapped or container-grown unless otherwise designated in the Contract or approved.

(a) *Brush Layer Cuttings*. Brush layer cuttings taken from designated plants shall be at least 0.5 inch in diameter or larger. Brush layer cuttings shall be 24 to 36 inches long with the bottom end cut off at an angle and the top end with a straight cut. Cuttings shall be taken and installed while dormant in early spring. Cuttings shall not be planted when the ground is frozen. Brush layer cuttings shall be stored no longer than one week. The cuttings shall be stored by submerging them at least $^{2}/_{3}$ of their length in containers of water, free from any harmful oil, chemical, sprays, or other materials. The containers shall be kept in the shade.

(b) Wetland Perennial Plants. Perennial wetland plants shall be supplied in containers as designated in the Contract; no bare root material will be allowed. The original plant stock for the plants shall be from Colorado. Perennial plants shall have been growing at least one growing season in the nursery. Perennials shall not be shipped while in a dormant condition. Perennials shall be a minimum of 6 inches in height when applicable to the species. Water shall be applied to wetland perennial plants until soil is saturated. Wetland perennial plants shall be watered thoroughly every day for a period of one month.

(c) *Stakes.* Wood stakes shall be 2 inches x 2 inches square, or 2 ½ inch diameter and 6 feet long free from bends. Metal stakes shall be 6 feet long standard T-bar steel fence post or #4 or larger rebar. Wood stakes shall be made of untreated wood guaranteed to last in the ground at least two growing seasons. The bottom of wood stakes shall be pointed.

(d) *Soil Conditioners and Fertilizer.* Soil conditioner shall consist of composted plant material, 90 percent ¼ inch or less with a carbon to nitrogen ratio of 15:1 to 25:1. A sample of the soil conditioner and certificate of compliance shall be provided to the Engineer to verify the organic matter content, and carbon matter to nitrogen ratio shall be submitted one month prior to planting for a approval.

Fertilizer for planting shall be used as specified in the Contract.

CONSTRUCTION REQUIREMENTS

214.03 General. All plants shall be protected from drying out or other injury. Broken and damaged roots shall be pruned before planting.

(a) *Planting Seasons.* Plants shall be planted in accordance with the Contract.

Areas to be planted shall be brought to the lines and grades designated or approved. The location of plants shown in the Contract is approximate to the degree that unsuitable planting locations shall be avoided. Trees shall be planted at least 30 feet from the edge of the traveled way, except when guardrail or vertical curb exists, this distance may be reduced to 20 feet. Locations and layouts shall be approved before preparatory work for planting is started. Shrubs shall not be planted closer than 6 feet from the edge of pavement.

All layout staking for planting shall be done by the Contractor and shall be approved by the Engineer before planting holes are prepared.

The Contractor shall place all plant material according to the approved planting plans, or as directed.

(b) *Excavation.* Planting pits shall be circular in outline with vertical or sloped sides. Pits for trees and shrubsshrubs shall be at least two times greater in diameter than the earth ball.

(c) *Planting.* Planting shall be done in accordance with good horticultural practices. Plants of upright growth shall be set plumb and plants of prostrate type shall be set normal to the ground surface. Plants with dry, broken, or crumbling roots will not be accepted for planting.

Planting pits shall be dug 2 to 4 inches shallower than the height of the rootball for trees, and 2 inches shallower for shrubs. In non-irrigated areas, planting pits shall be dug so that the top of the rootball is level with the final grade. The

tree rootball shall be set in the center of the planting pit on undisturbed soil. Trees shall be stabilized and then the wire basket, any twine or wire, and burlap shall be removed before the pit is backfilled. Shrubs shall be planted in the center of the pit. Plastic, metal, fabric, or peat containers shall be removed. Shallow scores ¼ to ½ inch deep shall be made along the edges of the rootball.

Areas to be planted with ground cover shall be prepared by placing topsoil and a ½ inch layer of soil conditioner on the ground surface, and roto-tilling to a depth of 6 inches. Ground cover shall be planted by excavating to a depth sufficient to accommodate the root structure of plant materials without crimping or bending roots. After planting, backfill shall be placed around the ground cover and compacted firmly around the roots. The planted areas shall be brought to a smooth and uniform grade, and then top dressed with a 2 inch mulch cover of the type specified on the plans.

(d) *Backfilling.* When soil conditioner is specified, composted plant material shall be added and thoroughly mixed into the backfill material at the rate of 0.5 cubic foot per tree and 0.1 cubic foot per shrub.

Backfill shall be thoroughly worked and watered-in to eliminate air pockets. Watering shall be done immediately after the plant is placed. Backfilling of the planting pit shall be resumed after this water is absorbed. Roots and crown shall be covered with soil at this time. After the soil has settled, plants must be in the proper position and at the proper depth. Saucers shall be prepared around each plant to the dimensions shown on the planting details. When saucers are required they shall be covered with a 4 inch thick layer of fresh moist wood chip mulch conforming to Section 213. After completion of all planting and before acceptance of the work, the Contractor shall water plants installed under this Contract, as needed to maintain a moist root zone optimum for plant growth. Plants damaged by the Contractor's operations shall be replaced at the Contractor's expense.

Surplus soil remaining after backfilling is completed shall be used for constructing water retention berms, or, if not needed for berms, shall be thinly distributed (wasted) in the vicinity, subject to approval of the Engineer.

(e) *Pruning.* All deciduous trees and shrubs shall be pruned in accordance with standard horticultural practice, preserving the natural character of the plant. Guidelines for pruning are indicated in the planting details. Pruning cuts shall be made with sharp clean tools.

All clippings shall become the property of the Contractor and be removed from the site..

(f) *Staking.* All deciduous trees 2 inch caliper and greater shall be staked with two stakes. Stakes shall conform to subsection 214.02(c). Stakes shall be driven 2

feet into the ground with one stake on the side of the prevailing wind (generally the west side) and the other stake on the opposite side. Stakes shall be driven at least 1 foot outside each edge of the planting pit. Trees shall be guyed with 1 to 2 inch wide strips of nylon webbing with metal grommets.

Coniferous trees 4 feet or taller shall be staked as designated in the Contract or directed.

Stakes shall be spaced equally around the tree.

Trees specified to be guyed with wire shall be secured with No. 12 gage annealed galvanized steel wire free of bends and kinks.

(g) *Wrapping Materials.* Wrapping material shall be horticulturally approved waterproof wrapping paper. Wrapping shall be applied from the base of the tree upward to the second scaffold branch and secured with arbor tape. *Populus sp.* are exempt from tree wrap. The Contractor shall submit the manufacturer's certification for the wrapping material requirements. Wrapping shall be done in the fall months prior to freeze, and removed in the spring. Wrapping shall not remain on any trees throughout the summer months. Wrapping shall be removed by the Contractor.

All plant tags shall be removed from plants and all packing or other material used by the Contractor shall be removed from the site.

(h) *Brush Layer Cuttings.* Using a rock bar or other tool, holes at least 20 inches deep shall be made in the streambank or other areas. A cutting shall be placed in each hole. If in riprap, the hole shall be backfilled with soil to within 3 inches of the riprap surface. The top 3 inches of the void shall be filled with gravel from the streambank or streambed and compacted slightly. The remaining exposed length shall be cut off 2 to 3 inches above the ground line. The placement of these cuttings shall be in areas shown on the plans that remain damp or are seasonally inundated, as directed. Brush layer cuttings shall be planted at a density of one cutting per square yard on streambank or other designated areas that have been regraded, riprapped, or disturbed. The strip that is most successful for brush layer cutting establishment is only several yards wide and approximately, plus or minus, 2 feet from the ordinary high water line.

Water shall be applied to the brush layer cuttings planted areas until the soil mass is saturated. Brush layer cuttings shall be watered thoroughly every day for a period of one month.

(i) *Irrigation*. Plantings that are to be irrigated shall be planted so that the irrigation system is operating and supplying the designated amount of water as planting is occurring. Plants shall be watered within 15 minutes of planting.

214.04 Landscape Establishment. From the time of installation, during construction, and throughout the Landscape Establishment period the Contractor shall maintain all plant material and seeded areas in a healthy and vigorous growing condition, and ensure the successful establishment of vegetation. This includes performing establishment, replacement work, and landscape maintenance work as described below.

(a) *Establishment and Replacement.* After all planting on the project is complete, a plant inspection shall be held including the Contractor, Engineer and CDOT Landscape Architect to determine acceptability of plant material. During the inspection, an inventory of rejected material will be made, and corrective and necessary cleanup measures will be determined.

Dead, dying, or rejected material shall be replaced each month during the Landscape Establishment period as directed. Plant replacement stock shall be planted in accordance with the Contract and be subject to all requirements specified for the original material. Plant replacement shall be at the Contractor's expense.

(b) *Landscape Maintenance.* During the Landscape Establishment period the Contractor shall perform landscape maintenance as described herein. The Contractor shall maintain all landscaped areas in the condition they were in when first installed and accepted.

Prior to the Notice of Substantial Landscape Completion, the Contractor shall submit a detailed maintenance plan which includes a schedule showing the number of hours or days personnel will be present, the type of work to be performed, supervision, equipment and supplies to be used, emergency program and responsible person to contact for emergency work, and inspection schedule. The detailed maintenance plan is subject to review and approval by the Engineer. The Engineer will not issue the Notice of Substantial Completion until the Engineer has received and approved the maintenance plan.

The proposed types, brand names, material safety data sheets, and rates of application of herbicides, pesticides, and fertilizers to be used shall be submitted for approval with the detailed maintenance plan. Herbicides, pesticides, and fertilizers shall meet all local, state, and federal regulations and shall be applied by a licensed applicator.

The Contractor shall perform start-up, watering, programming, operation, and fall winterization of the irrigation system. The Contractor shall do a spring start-up of the irrigation system prior to Final Acceptance and perform all irrigation system warranty work as specified in Section 623.

The Contractor shall keep a project diary documenting all landscape and irrigation maintenance activities including work locations and time spent. The Contractor shall provide copies of the diary to the Engineer upon request.

The Contractor shall restore and reseed eroded areas and areas of poor establishment in accordance with Sections 212 and 213. The Contractor shall maintain staking and guying until the end of the Landscape Establishment period. The Contractor shall remove all guying wire, straps, and stakes at the end of the Landscape Establishment period.

1. *Watering in Irrigated Areas.* Trees planted at all locations on the project shall be watered once per month at the rate of 30 gallons per tree for the months November through April until the Landscape Establishment period ends.

   Shrubs planted at all locations on the project shall be watered once per month at the rate of 10 gallons per shrub for the months November through April until the Landscape Establishment period ends.

2. *Watering in Non-irrigated Areas.* Trees planted shall be watered twice per month by the Contractor at the rate of 30 gallons per tree per watering for the months May through October, and once per month at the rate of 30 gallons per tree for the months November through April of the 12 month period following planting.

   Shrubs planted in upland areas shall be watered twice per month by the Contractor at the rate of 10 gallons per shrub per watering for the months May through October, and shall be watered once per month at the rate of 10 gallons per shrub for the months November through April of the 12 month period following planting.

The contract performance bond, required by subsection 103.03, shall guarantee replacement work during the plant establishment period.

If all other work is completed on a project, no contract time will be charged during the plant establishment period.

METHOD OF MEASUREMENT

214.05 The quantity of planting to be measured will be the number of plants, of the types and sizes designated in the Contract, that are actually planted and accepted.

The quantity of brush layer cuttings will be measured by the actual number planted, complete in place and accepted.

Landscape Maintenance will not be measured, but will be paid for on a lump sum basis.

BASIS OF PAYMENT

214.06 The accepted quantities of planting, and brush layer cuttings will be paid for at the contract unit price for each of the various items listed below that appear in the bid schedule.

Payment for the total cost of the item will be made at the completion of planting.

Cost of the performance bond shall be included in the cost of the plant items.

Payment will be made under:

Pay Item	**Pay Unit**
_____ Tree ____Inch Caliper	Each
_____ Tree ____Foot	Each
_____ Shrub (____Gallon Container)	Each
Perennials (____Quart Container)	Each
Perennials (____Gallon Container)	Each
Brush Layer Cuttings	Each
Landscape Maintenance	Lump Sum

Water required for all items of work will not be measured and paid for separately, but shall be included in the work.

Payment shall be full compensation for all work necessary to complete the item.

For each month that landscape maintenance is performed and accepted during the Landscape Maintenance period as specified in subsection 214.04, payment for Landscape maintenance will be made in installments as follows:

(1) 10 percent of the lump sum amount will be paid for each of the eight growing season months, March through October.
(2) 5 percent of the lump sum amount will be paid for each of the winter months, November through February.

Landscape maintenance performed during construction will not be measured and paid for separately, but shall be included in the work.

Landscape Establishment, except for landscape maintenance, will not be paid for separately, but shall be included in the work.

SECTION 215
TRANSPLANTING

DESCRIPTION

215.01 This work consists of transplanting trees, shrubs, plugs of wetland material including root mats from existing wetlands, and other plant material, hereinafter referred to as "plants," of the designated species in accordance with this specification and accepted standard horticultural practice at the designated locations. Transplanting season is that period when plants are in a dormant condition and can be moved. Dormant means that deciduous material is without leaves and coniferous material is without new candle growth. Transplanting done in periods not considered dormant transplanting season shall require advance approval.

MATERIALS

215.02 Plants to be transplanted shall be those which are flagged on the project site within the right of way, or as directed.

Plugs shall be dug from areas noted in the Contract or as directed by the Engineer. Removal shall be dispersed throughout the areas so as not to impact the existing wetland. Plugs shall be taken in early spring, when plants are emerging. Plugs shall be a minimum of 4 inches in diameter and 6 inches to 8 inches deep with the root mat to remain intact. Plugs shall not be stockpiled but shall be transplanted directly to wetland mitigation sites as directed. Transplanting shall be accomplished the day they are dug. Plugs shall be kept moist and shall not be placed in holding beds

CONSTRUCTION REQUIREMENTS

215.03 Plants shall be dug, properly pruned, and prepared for transplanting in accordance with standard practice. The root system shall be kept moist and plants shall be protected from adverse conditions due to climate and transporting from the time they are dug to the actual planting.

Prior to removal for transplanting, all coniferous trees shall be sprayed with an approved anti-desiccant.

The following table represents the minimum diameter of root balls for collected plants.

Type 6 - Collected Pinon Pine

Caliper	**Min. Ball Dia.**
1 to 1½ inch	15 inch
1½ to 2 inch	17 inch
2 to 2½ inch	20 inch
2½ to 3 inch	24 inch
3 to 3½ inch	26 inch
3½ to 4 inch	28 inch
4 to 4½ inch	30 inch
4½ to 5 inch	32 inch

Type 7 - All Collected Plants Other than Pinon Pine

Caliper	**Min. Ball Dia.**
1 to 1½ inch	14 inch
1½ to 2 inch	16 inch
2 to 2½ inch	20 inch
2½ to 3 inch	24 inch
3 to 3½ inch	28 inch
3½ to 4 inch	32 inch
4 to 4½ inch	36 inch
4½ to 5 inch	40 inch

For caliper sizes larger than those given under Type 7, the ratio of ball diameter to caliper shall be 8:1.

Planting pits for balled and burlapped trees shall be circular in outline with vertical sides. Pits shall be at least two times greater in diameter than the earth ball. Before a tree is placed in a plant pit, the pit shall be filled half full of water. Backfill shall be thoroughly worked and watered to eliminate air pockets. Unsuitable backfill soils shall be replaced.

Trees shall be machine transplanted with tree spades. The following table represents the minimum size of spade machine equipment to be used for transplanting plants based upon caliper size. The table also represents the minimum diameter of root-balls for machine transplanted plants.

Caliper	**Min. Spade Machine Size (Based upon root ball width)**
1 to 3 inch	44 inch
3 to 6 inch	65 inch
6 to 9 inch	80 inch
9 to 12 inch	90 + inch

Each tree shall be transported to the new site using the same spade with which it was dug, or several trees may be spade-dug and transported in a pod trailer manufactured specifically for this purpose. Trees shall not be removed from spade or transported in a haul truck. The Contractor shall give the Engineer one week notice prior to transplanting trees. At the time of transplanting the Engineer will designate a Department landscape architect to be on the site to oversee all tree planting.

Planting pits for machine-dug trees shall have the same dimension as the machine ball being placed. Before a tree is placed in a planting pit, the pit shall be filled half full of water and allowed to drain. Once the tree is placed, voids in the pit shall be filled with clean suitable backfill and tamped. If unsuitable soil is encountered in the planting pits, the Contractor shall dispose of said material and backfill with suitable material as determined by the Engineer.

After the tree is planted (collected or machine transplanted), a basin shall be built to hold at least 30 gallons of water. For each inch of trunk diameter greater than 3 inches, the basin capacity shall be increased by 10 gallons. The depth of saucer shall not be below the top of the root system of the tree. The basin shall be filled with water three times and allowed to stand each time until empty before refilling. Saucers shall be covered with a 4 inch thick layer of fresh moist wood chip mulch as shown on the plans. The size of mulch shall be approximately ¼ to ½ inch wide and 3 to 4 inches long. A sample shall be submitted in advance to the Engineer for approval.

Transplanting shall be accomplished within one day. Trees shall not be placed in holding beds.

All transplanted trees shall be subject to a 180-day maintenance period during one or more growing seasons and shall be watered every seven calendar days. Each watering shall be 100 gallons per tree.

All transplanted trees shall be guyed in accordance with Standard Plan M-214-1. Guying material shall be removed at the end of the 180 day maintenance period. All trees damaged by the Contractor's operations shall be replaced and replanted at the Contractor's expense as approved. At the end of the 180 day maintenance period all dead trees shall be replaced and replanted with trees at the Contractor's expense. Further maintenance will not be required.

The Contractor shall not damage existing landscaped areas, including but not limited to turf, irrigation equipment, and other plants, during the transplanting operation. The Contractor may use suitable platform material over existing turf to prevent damage from heavy machinery.

Wetland plugs shall be a minimum of 4 inches in diameter and 6 to 8 inches in depth. Holes left in the existing wetlands from plug removal shall be filled with topsoil and tamped lightly. After tamping, the filled hole shall be at the same elevation as the existing surrounding wetlands.

Transplant plugs shall be placed in containers (one plug per container) after harvesting to facilitate handling and placing of material.

Plugs shall be spaced as directed in the Contract. Plugs shall be planted to match surrounding grade.

Water shall be applied to plugs until soil is saturated. Plugs shall be watered thoroughly every day for a period of one month.

METHOD OF MEASUREMENT

215.04 The quantity of transplanting to be measured will be the actual number of plants of the various types transplanted and accepted.

The quantity of transplanted trees to be measured will be the actual number of trees of the various caliper and types transplanted and accepted in their final location.

Caliper measurement shall conform to the USA Standard for Nursery Stock, sponsored by the American Association of Nurserymen, Inc.

Only living plants in healthy condition at the end of the maintenance period will be accepted. If all other work is completed on the project, contract time will not be charged during the maintenance period.

The quantity of transplanted plugs to be measured will be the actual number of plugs transplanted and accepted in their final locations.

BASIS OF PAYMENT

215.05 The accepted quantities of transplanting measured as provided above will be paid for at the contract unit price each.

Payment will be made under:

Pay Item	**Pay Unit**
Transplant Tree __Inch	Each
Transplant Shrub	Each
Transplant Plug	Each

Water required will not be measured and paid for separately, but shall be included in the work.

Hauling plants to their new location, removing unsuitable backfill, and providing clean suitable backfill for planting pit voids will not be measured and paid for separately but shall be included in the work.

SECTION 216
SOIL RETENTION COVERING

DESCRIPTION

216.01 This work consists of furnishing, preparing, applying, placing, and securing soil retention covering for erosion control on roadway ditches or slopes as designated in the Contract or as directed.

MATERIALS

216.02

(a) *Covering.* Covering shall consist of blankets with close weave mesh and nettings with open weave mesh made of various materials as specified herein.

Blankets and nettings shall be photodegradeable or biodegradable, non-toxic to vegetation or germination of seed, and shall not be toxic or injurious to humans.

1. *Excelsior.* Excelsior soil retention covering shall be either photodegradable or biodegradable as follows.

   A. The blanket shall consist of a machine produced mat of curled wood excelsior of 80 percent, 6 inch or longer fiber length with a consistent thickness of fibers evenly distributed over the entire area of the blanket. The top side of the blanket shall be covered with a photodegradable extruded plastic mesh and stitched on 2 inch centers the entire width of the blanket.

Dimensions:	48" by 180' or 96" by 90'
Roll Weight:	0.9 to 1.1 pounds per sq. yd.

   B. The blanket shall consist of a machine produced mat of curled wood excelsior of 80 percent, 6 inch or longer fiber length with a consistent thickness of fibers evenly distributed over the entire area of the blanket. The top side of the blanket shall be covered with a biodegradable netting, manufactured from a jute or other biodegradable material and stitched on 2 inch centers the entire width of the blanket.

Dimensions:	48" by 180' or 96" by 90'
Roll Weight:	0.9 to 1.1 pounds per sq. yd.

2. *Soil Retention Blanket (Coconut).* Soil Retention Blanket (Coconut) shall be a machine produced mat consisting of 100 percent coconut fiber. The blanket shall be of consistent thickness with the coconut fiber evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom side with polypropylene netting having ultraviolet additives to reduce breakdown and an approximate $^{5}/_{8}$ inch x $^{5}/_{8}$ inch mesh

size. The blanket shall be sewn together with polyester, biodegradable or photodegradable thread.

Material requirements:

Coconut Fiber Content:	100%, 0.50 to 0.60 lb. per sq. yd.
Netting:	Both sides, heavyweight nondegradable 3 lbs. per 1000 sq. ft.
Thread:	Polyester, biodegradable or photodegradable
Roll Width:	6.5 to 7.5 feet
Roll Length:	83.5 to 90 feet
Area Covered by One Roll:	60 to 75 sq. yds.

A sample of the soil retention blanket (coconut) shall be submitted at least 2 weeks in advance of its use on the project for approval by the Engineer.

3. *Soil Retention Blanket (Straw).* Soil Retention Blanket (Straw) shall be a machine produced mat consisting of 100 percent agricultural straw. The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with polypropylene netting having an approximate $^{5}/_{8}$ inch x $^{5}/_{8}$ inch to ½ inch x ½ inch mesh and on the bottom with polypropylene netting with an approximate ¼ inch x ¼ inch to ½ inch x ½ inch mesh. The blanket shall be sewn together with biodegradable or photodegradable thread.

Material requirements:

Straw Content:	100%, 0.50 lb. per sq. yd.
Netting:	Bottom side lightweight polypropylene photodegradable, 1 to 1.65 lbs. per 1000 sq. ft. Top side heavyweight or lightweight polypropylene photodegradable, 1.65 to 3 lbs. per 1000 sq. ft.
Thread:	Biodegradable or photodegradable
Roll Width:	6.5 to 7.5 feet
Roll Length:	83.5 to 90 feet
Area Covered by One Roll:	60 to 75 sq. yds

A sample of the soil retention blanket (straw) shall be submitted at least 2 weeks in advance of its use on the project for approval by the Engineer.

4. *Soil Retention Blanket (Straw and Coconut).* Soil Retention Blanket (Straw/Coconut) shall be a machine produced mat consisting of 70 percent agricultural straw and 30 percent coconut fiber. The blanket shall be of consistent thickness with the straw and coconut fiber evenly distributed

over the entire area of the mat. The blanket shall be covered on the top side with polypropylene netting having an approximate $^{5}/_{8}$ inch x $^{5}/_{8}$ inch mesh and on the bottom with polypropylene netting with an approximate ¼ inch x ¼ inch to ½ inch x ½ inch mesh. The blanket shall be sewn together with cotton, biodegradable or photodegradable thread.

Material requirements:

Straw Content:	70% 0.35 lb. per sq. yd.
Coconut Fiber Content	30% 0.15 lb. per sq. yd.
Netting:	Bottom side lightweight polypropylene photodegradable, 1 to 1.65 lbs. per 1000 sq. ft. Top side heavyweight or lightweight polypropylene photodegradable, 1.65 to 3 lbs. per 1000 sq. ft.
Thread:	Cotton, biodegradable or photodegradable
Roll Width:	6.5 to 7.5 feet
Roll Length:	83.5 to 90 feet
Area Covered by One Roll:	60 to 75 sq. yds

A sample of the soil retention blanket (straw and coconut) shall be submitted at least 2 weeks in advance of its use on the project for approval by the Engineer.

(b) *Pins and Staples.* Pins and staples shall be made of wire 0.162 inch or larger in diameter. "U" shaped staples shall have legs 8 inches long and a 1 inch crown. "T" shaped pins shall not be used.

CONSTRUCTION REQUIREMENTS

216.03

(a) *Excelsior.* The area to be covered shall be prepared, fertilized, and seeded in accordance with Section 212, before the blanket is placed. When the blanket is unrolled, the netting shall be on top and the fibers shall be in contact with the soil. In ditches, blankets shall be unrolled in the direction of the flow of water. The end of the upstream blanket shall overlap the buried end of the downstream blanket a maximum of 8 inches and a minimum of 4 inches, forming a junction slot. This junction slot shall be stapled across at 8 inch intervals. Adjoining blankets (side by side) shall be offset 8 inches from center of ditch and overlapped a minimum of 4 inches. Six staples shall be used across the start of each roll, at 4 foot intervals, alternating the center row so that the staples form an "X" pattern. A common row of staples shall be used on adjoining blankets.

(b) *Soil Retention Blanket (Coconut), (Straw), and (Straw and Coconut).* The area to be covered with Soil Retention Blanket (Coconut), (Straw), and (Straw and Coconut) shall be properly prepared, fertilized, and seeded before the blanket is placed. When the blanket is unrolled, the heavyweight polypropylene netting shall be on top and the lightweight polypropylene netting shall be in contact with

the soil. In ditches and on slopes, blankets shall be unrolled in the direction of the flow of water. Installation shall be in accordance with manufacturer's recommendations. A representative of the manufacturer shall be present to give instruction during the installation of the soil retention blanket.

The blanket shall be placed smoothly but loosely on the soil surface without stretching. The upslope end shall be buried in a trench 6 inches wide by 6 inches deep beyond the crest of the slope to avoid undercutting. For slope applications, there shall be a 6 inch overlap wherever one roll of blanket ends and another begins with the uphill blanket placed of top on the blanket on the downhill side. There shall be a 4 inch overlap wherever two widths of blanket are applied side by side. Insert staples in a pattern according to the manufacturer's recommendation at approximately two staples per square yard.

At terminal ends, and every 35 feet, Soil Retention Blanket (Coconut), (Straw), and (Straw/Coconut) placed in ditches shall be buried in a trench approximately 6 inches deep by 6 inches wide. Before backfilling, staples shall be placed across the width of the trench spaced at 6 inches on center in a zigzag pattern. The trench shall then be backfilled to grade and compacted by foot tamping.

(c) *Maintenance.* The Contractor shall maintain the blanket, fabric, or netting areas until all work on the Contract has been completed and accepted. Maintenance shall consist of the repair of areas where damage is due to the Contractor's operations. Maintenance shall be performed at the Contractor's expense. Repair of those areas damaged by wind, fire, or other causes not attributable to the Contractor's operations shall be repaired by the Contractor and will be paid for at the contract unit price. Areas shall be repaired to reestablish the condition and grade of the soil prior to application of the covering and shall be refertilized, reseeded, and remulched as directed.

METHOD OF MEASUREMENT

216.04 Soil retention covering, including staples, complete in place and accepted, will be measured by the square yard of finished surface. No allowance will be made for overlap.

BASIS OF PAYMENT

216.05 The accepted quantities of soil retention covering will be paid for at the contract unit price per square yard.

Payment will be made under:

Pay Item	**Pay Unit**
Soil Retention Blanket (____)	Square Yard

Preparation of seedbed, fertilizing, and seeding will be measured and paid for in accordance with Section 212.

Mulching will be measured and paid for in accordance with Section 213.

SECTION 217
HERBICIDE TREATMENT

DESCRIPTION

217.01 This work consists of furnishing and applying herbicides to prevent or control plant growth in areas shown on the plans or designated.

MATERIALS

217.02 Herbicides shall be designated in the contract.

All herbicide labels shall be currently registered with the Colorado Department of Agriculture and the U.S. Environmental Protection Agency. All herbicides shall be supplied to the project in labeled containers. The labels shall show the product name, chemical composition, expiration date, and directions for use.

CONSTRUCTION REQUIREMENTS

217.03 All herbicides shall be applied by commercial pesticide applicators licensed by the Colorado Department of Agriculture as qualified applicators. The Contractor shall furnish documentation of such licensing prior to herbicide application. Herbicide mixing and application shall be done in accordance with instructions on the registered product label. The Engineer shall be furnished such label information prior to mixing and application.

The Contractor shall notify the Engineer at least 24 hours prior to each herbicide application and shall indicate the time and location application will begin. Application will not be allowed on Saturdays, Sundays, or holidays unless otherwise approved by the Engineer.

Herbicides shall not be applied when weather conditions, including wind conditions, are unsuitable for such work. Herbicides shall not be applied when soil is extremely dry.

Herbicide application method shall be such that plant growth outside the designated treatment areas will not be damaged. All damage caused by improper herbicide application shall be repaired at the Contractor's expense.

Herbicides shall not be used on areas that are to be topsoil sources unless otherwise approved by the Engineer.

METHOD OF MEASUREMENT

217.04 The quantity of herbicide treatment to be measured will be the actual number of square yards treated in accordance with the foregoing requirements or the actual number of hours the Contractor spends applying the herbicide and accepted by the Engineer. Areas designated to receive herbicide treatment will be measured once for each designated application. Reapplication of herbicide required due to inappropriate timing of the original application will not be measured or paid for.

BASIS OF PAYMENT

217.05 The accepted quantities of herbicide treatment will be paid for at the contract unit price per square yard or per hour.

Payment will be made under:

Pay Item	Pay Unit
Herbicide Treatment	Square Yard
Herbicide Treatment	Hour

Water will not be measured and paid for separately but shall be included in the work.

SECTION 250
ENVIRONMENTAL, HEALTH AND SAFETY MANAGEMENT

DESCRIPTION

250.01 This work consists of protection of the environment, persons, and property from contaminants that may be encountered on the Project. This includes monitoring the work for encounters with contaminants, and the management of solid, special and hazardous waste when encountered on the Project.

MATERIALS AND EQUIPMENT

250.02 The Contractor shall furnish all personnel, materials, equipment, laboratory services and traffic control necessary to perform the contamination monitoring, testing, and site remediation when required. Traffic control shall be in accordance with the requirements of Section 630.

Monitoring equipment used to detect flammable gas, oxygen level, and toxic gas shall be capable of detection to meet the following standards:

Instrument Detection

Constituent	Threshold Limit	Increments
Flammable Gas	1% LEL	1%
Oxygen	19%	0.1%
Toxic Gas	1 PPM	1 PPM

LEL = lower explosive limit
PPM = parts per million

CONSTRUCTION REQUIREMENTS

250.03 General. Prospective bidders, including subcontractors, are required to review the environmental documents available for this project. These documents are listed in subsection 102.05 as revised for this project.

This project may be in the vicinity of property associated with petroleum products, heavy metal based paint, landfill, industrial area or other sites which can yield hazardous substances or produce dangerous gases. These hazardous substances or gases can migrate within or into the construction area and could create hazardous conditions. The Contractor shall use appropriate methods to reduce and control known landfill or industrial gases and hazardous substances which exist or migrate into the construction area.

Encountering suspected contaminated material, including groundwater, is possible at some point during the construction of this project. When suspected contaminated material, including groundwater, is encountered or brought to the surface, the procedures under subsection 250.03(d)4. shall be followed.

Transportation of waste materials on public highways, streets and roadways shall be done in accordance with Title 49, Code of Federal Regulations (CFR). All labeling, manifesting, transportation, etc. of waste materials generated on this project shall be coordinated with the Engineer. All hazardous waste manifests for waste materials generated on this project shall list the Colorado Department of Transportation as the generator of the waste materials except as otherwise noted. If the Contractor contaminates the site, the Contractor shall be listed as the generator on the hazardous waste manifests, permits, and other documents for such material. If the project is not on a State Highway or frontage road, then the appropriate local governmental entity having jurisdiction over the transportation system facility shall be listed as the hazardous waste generator.

If waste materials must be handled in a permitted treatment, storage and disposal (TSD) facility, the facility shall be designated in writing by the Engineer. If the waste materials are the result of the Contractor's actions, the Contractor shall designate the facility.

The hazardous waste transportation phase of the work involves insurance required by law and regulations. If the waste materials are determined to be hazardous, the Contractor must submit proof that the transportation company is covered by the appropriate type and amount of insurance required by laws and regulations governing the transportation of hazardous waste.

The Contractor alone bears the responsibility for determining that the work is accomplished in strict accordance with all applicable federal, state and local laws, regulations, standards, and codes governing special waste, petroleum and hazardous substance encounters and releases.

The Contract will list known or suspected areas of contamination. Health and Safety Officer, Monitoring Technician, and Health and Safety Plan shall be required when so stated in the Contract.

(a) *Health and Safety Officer (HSO).* The Contractor shall designate a HSO, not the project superintendent, who shall have at least two years field experience in chemical related health and safety. The HSO shall be either a certified industrial hygienist (CIH), certified hazardous materials manager (CHMM), professional engineer (PE) licensed in the State of Colorado, certified safety professional (CSP), or registered environmental manager (REM) meeting the criteria set forth in 29 CFR 1926. The HSO shall meet the minimum training and medical surveillance requirements established by the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) for a supervisory Site Safety Official per 29 CFR 1962.65. The Contractor shall furnish documentation to the Engineer, at the preconstruction conference, that the above requirements have been met.

The HSO shall be equipped with the following:

(1) Communication equipment as required in subsection 250.03(d)2.A. and a vehicle.
(2) Monitoring and detection equipment for flammable gas, oxygen sufficiency, toxic gas, radiological screening and other hazards. This includes, as required, a combustible gas indicator, flame ionization or photo ionization detector, oxygen meter, radiation monitor with Geiger Mueller detector and other foreseeable equipment.
(3) Depth gauging equipment, sampling equipment and sampling containers.
(4) Personal protective equipment (levels C and D) when required.

The HSO shall recommend and supervise those actions which will minimize the risk of hazardous substance related injury to the workers, Department personnel, the general public, property and the environment. Hazardous substance is defined in 29 CFR 1926.32. The HSO shall prepare written procedures for the monitoring of confined space entry and working in or near excavations, including but not limited to trenches and drill holes associated with this project. The HSO shall conduct or supervise all hazardous substance and solid waste related testing, sampling, monitoring and handling for this project to ensure compliance with applicable statutes and regulations, and other applicable environmental requirements under subsections 107.01 and 107.02.

The HSO shall be available for consultation and assistance with contaminated materials related testing, sampling, and field monitoring as required by the Engineer.

The HSO shall prepare and submit a bound and indexed final site report to the Engineer at the end of the project. This site report shall include a detailed summary of all contaminated materials and contaminated water that were encountered and their final disposition.

During each week the HSO is utilized, the HSO shall prepare a daily diary which shall be submitted to the Contractor and the Engineer. This diary shall be submitted at the end of the week and shall become a part of the Department's records. The diary shall contain a chronological log of activities on the project including: dates and times on site, equipment used and calibrations, field monitoring results, visual observations, conversations, directives both given and received, and disposition of suspected hazardous substances. The Engineer will review this submittal and approve the actual number of hours to be paid.

(b) *Monitoring Technician (MT).* The Contractor shall designate a monitoring technician to be responsible for monitoring of hazardous substances during work on the project. The MT shall have a minimum of two years of actual field experience in assessment and remediation of hazardous substances that may be encountered during highway construction projects. The MT shall be experienced in the operation of monitoring devices, identifying substances based upon experience and observation, and field sampling (for testing) of all media that may be found on the site. Completion of the 40 hour hazardous waste and 8 hour

supervisory training required by OSHA and U.S. EPA rules and regulations which complies with the accreditation criteria under the provisions of the proposed 29 CFR 1910.121 is required prior to beginning work. The Contractor shall furnish documentation at the Preconstruction Conference that demonstrates these requirements have been met.

The MT shall be equipped with the following:

(1) Communication equipment as required in subsection 250.03(d)2.A. and a vehicle.
(2) Monitoring and detection equipment for flammable gas, oxygen sufficiency, toxic gas, radiological screening and other hazards. This includes, as required, a combustible gas indicator, flame ionization or photo ionization detector, oxygen meter, radiation monitor with Geiger Mueller detector and other foreseeable equipment.
(3) Personal protective equipment (levels C and D) when required.

The MT shall be present on site and perform monitoring as required by 250.03(d) when work is being performed in areas of suspected contamination and on a predetermined basis throughout other work on the project.

The MT shall monitor for compliance with regulations, the project Health and Safety Plan and the Materials Management Plan (if they exist for the project), the Contract, and the environmental documents for the project. The MT shall immediately notify the Contractor, the Engineer and the HSO of any hazardous condition.

During each week the MT is utilized, the MT shall prepare a daily monitoring diary which shall be submitted to the Contractor, HSO and the Engineer. This diary shall be submitted at the end of the week and shall become a part of the Department's records. The diary shall contain a chronological log of activities on the project including: dates and times on site, equipment used and calibrations, field monitoring results, visual observations, conversations, directives both given and received, and disposition of suspected hazardous substances. The Engineer will review this submittal and approve the actual number of hours to be paid.

(c) *Health and Safety Plan (HASP).* The HSO shall prepare a written HASP for the project, formatted as shown in Appendix B, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, DHHS (NIOSH) Publication Number 85-115, available from the Superintendent of Documents, U.S. Government Printing Office. The Contractor and the HSO shall review the environmental documents listed prior to preparation of the HASP.

Four signed copies of the HASP shall be furnished to the Engineer for acceptance. The Engineer shall have seven calendar days to review and accept or reject the proposed HASP. Within five calendar days after acceptance, the HSO

shall distribute signed and stamped (or sealed) copies of the accepted HASP to each emergency response agency servicing the project area, the HASP designated emergency hospital, and five copies to the Engineer. Earth or demolition work shall not occur until after the HASP is accepted and the HASP has been distributed. The HASP shall also be available to the Contractor's employees, their representatives, and officials of OSHA, EPA, Colorado Department of Public Health and Environment (CDPHE), local government health department, Federal Highway Administration, and other appropriate agencies and officials as may be designated by the Engineer. The Engineer will distribute the accepted HASP to appropriate Department personnel. The HASP shall be kept current and shall be revised by the HSO as warranted by changes in the field conditions.

All on-site workers (Contractor's, Department's, Utilities', and others) shall be briefed by the HSO on the contents of the HASP and any revisions thereof. The HSO shall conduct briefings (group or individual) to inform new employees, subcontractors, utility companies and other on-site workers of the HASP contents prior to their entry on site. A signature log of all briefing attendees shall be kept and furnished to the Engineer.

The Contractor shall provide, as required, eye wash equipment and stations, emergency showers, hand and face washing facilities and first aid equipment.

The Contractor shall provide, as required, decontamination facilities for personnel and equipment employed in the work. The exact procedure for decontamination and frequency shall be included in the accepted HASP. Decontamination facilities shall meet the criteria set forth in the Code of Federal Regulations (29 CFR and 40 CFR).

(d) *Precautions and Procedures.* The following minimum precautions and procedures shall be followed during the construction of the project:

1. General construction precautions:

   A. All monitoring and piezometer wells and test borings shall be established or abandoned by the Contractor as regulated by the State Engineer's Office. Copies of all required permits, notification, and abandonment documents shall be submitted to the Engineer prior to payment approval.

   B. Hazardous substance related activities shall have a work plan for each work phase which shall be coordinated with the Engineer at least three working days prior to commencement of each phase of the work.

   C. The Contractor shall properly handle all investigation derived waste generated by this project. Documentation shall be submitted to the Engineer of all tests performed for Treatment, Storage and Disposal (TSD) determination; classification of waste; hauling records; TSD

acceptance; manifest (if required); etc. in accordance with applicable laws and regulations.

D. When the work may involve air emissions, the Contractor shall contact the Colorado Department of Public Health and Environment(CDPHE), Air Pollution Control Division to ascertain if an air pollution emission notice (APEN) or permit is required for this operation. The Contractor shall be responsible for filing the APEN and obtaining said permit, if required. The processing of air pollution permits, if required, in non-attainment areas or where public hearings are required, likely will take more than 90 days.

2. For construction on a known or potentially contaminated site, the following conditions shall apply, in addition to those listed in subsection 250.03(d)1.:

A. The HSO shall be on site or readily available by radio, telephone or pager at all times during the work. When on site, the HSO shall have an operational portable or mobile cellular telephone available for immediate use in areas where such service is available. When on site in cellular telephone non-service areas, the HSO shall have available, for immediate use, radio access to a site with telephone service. The HSO shall be notified at least 24 hours prior to the start of confined space entry, storage tank removal, drilling, excavation, trenching, or dewatering operations.

B. The HSO shall designate the on site monitoring equipment for flammable gases, oxygen deficient or enriched atmosphere, and toxic gases, such as but not limited to, a flame ionization detector, photoionization detector, combustible gas indicator, and oxygen meter. This designated equipment shall be on site during all construction operations and be utilized during trenching, drilling, excavating, confined space entry, underground storage tank removal, and other appropriate construction operations. The exact equipment to fulfill this requirement shall be specified in the accepted HASP. The HSO shall conduct or supervise the monitoring. The monitoring equipment shall be calibrated as recommended by the manufacturer.

C. When drilling, trenching, or excavating in the presence of detectable concentrations of explosive gases, the soil shall be wetted and the operating equipment shall be provided with spark proof exhausts.

D. The Contractor, through the HSO, is responsible for ensuring that 29 CFR 1926 is fully complied with during the construction of the project.

E. Affected excavation operations shall be discontinued and personnel shall be removed from the affected excavation sites where any of the following levels are detected:

(1) 20.0 percent or more LEL flammable gas, or 10.0 percent in an underground or confined space,
(2) Permissible Exposure Limit (PEL) of any toxic gas,
(3) 19.5 percent or less oxygen,
(4) 25.0 percent or more oxygen,
(5) Greater than 2 mrem/hr. (Beta particle & photon radioactivity),
(6) Greater than 15 pCi/L (Gross alpha particle activity), or
(7) Other action levels as determined by the HSO.

F. Personnel shall be issued and utilize appropriate Health and Safety equipment as determined by the HSO, who shall provide the Engineer with a written explanation of what personal protective equipment (PPE) shall be worn, when, and by which personnel. Except in emergency cases, the Engineer shall be advised by the HSO of changes in the degree of PPE prior to implementation.

G. Personnel shall avoid the area immediately downwind of any excavation unless the excavation is monitored and declared safe.

H. The operators of excavating, trenching, or drilling equipment shall wear appropriate PPE as required in the HASP.

I. Exhaust blowers shall be present at the location where required in the accepted HASP.

J. The Contractor shall accomplish the work with employees who have been trained and equipped as required by the HASP and applicable provisions of 29 CFR 1910 and 29 CFR 1926.

K. Fire extinguishers, electrical equipment and wiring shall conform to the applicable requirements of 29 CFR 1926 and 49 CFR.

L. Smoking shall not be permitted within 50 feet of any excavation.

3. For construction within 1000 feet of a known or potentially contaminated site, the following conditions, in addition to those listed in subsection 250.03(d) 1. shall apply:

A. The areas under construction shall be checked with a combustible gas indicator before excavation begins to determine if flammable or combustible gas is in the area.

B. Excavations, trenches and drill holes shall be monitored by the HSO for flammable gas, toxic gas and oxygen deficiency or enrichment. This shall be carried out continuously unless the presence of flammable, combustible or toxic gas, or oxygen deficiency or enrichment in the area can be ruled out by the HSO. The

recommendation to discontinue monitoring must be agreed to by the Engineer and the Contractor. Prior to implementation, this agreement shall be written, and shall contain specific conditions that will require re-evaluation of the area.

C. When flammable or toxic gas is found in the area, those precautions and procedures in subsection 250.03(d)2. shall apply.

4. The following procedures shall be followed if the level of contamination as documented in the environmental documents referenced in subsection 102.05 as revised for this project is exceeded, or if previously unidentified contaminated air, soil or water, is encountered during the construction of the project:

A. Work in the immediate area of the release or discovery of contamination shall cease. The Engineer shall be immediately notified.

B. If no HSO is required by the Contract, the Contractor shall designate an HSO as directed, in accordance with subsection 250.03(a).

C. The Engineer may direct the HSO to evaluate the material for potential hazardous substance or other contamination or unsafe conditions. This evaluation may include, but is not limited to, on site field monitoring, on site testing, and on or off site laboratory analysis. Removal of storage tanks and surrounding contaminated soils shall be in accordance with applicable laws, regulations and established procedures. If the contaminated material cannot be placed in the embankment or remediated on site, it must be removed to an appropriate TSD facility, as designated in writing by the Engineer. The HSO shall supervise the necessary testing required to make appropriate TSD determinations. Disposal of the unsuitable material shall be considered as remediation work as described in subsection 250.03(d)4.D. and 250.03(d)4.E.

D. If this site is determined to be contaminated with petroleum products, hazardous substances or other solid waste in excess of that indicated in the above listed site investigation documents, a thorough Site Investigation and Waste Management Plan may be accomplished under the supervision of the HSO, if proposed by the HSO and approved by the Engineer. This investigation and study shall determine the extent of contamination and study the feasibility of at least three types of remedial action for the contaminated area as required by applicable statutes and regulations. The HSO shall be available to assist the Engineer in explaining this study to the regulatory agencies. The Contractor shall prepare the Remediation Plan as directed. The time required for the Engineer's review of the Remediation Plan,

including all necessary drawings, calculations, specifications, and other documentation will not exceed four weeks after a complete submittal is received. This work shall not be done unless authorized in writing by the Engineer.

E. If the site is determined to be contaminated with petroleum products; hazardous chemicals, materials, or wastes; or other solid wastes, and is required to be remediated, the HSO or other qualified individuals will supervise the Remediation Plan implementation as concurred to by the regulatory agencies, as directed. Hazardous Waste generated by remedial activities shall list the Colorado Department of Transportation as the hazardous waste generator on the required paperwork for projects on State Highways and their associated frontage roads. If this project is not on a State Highway or frontage road, then the appropriate local governmental entity having jurisdiction over the transportation system facility shall be listed as the hazardous waste generator. If the waste produced was caused by Contractor action, the Contractor shall be listed as the hazardous waste generator. Remediation work shall be done only when authorized by the Engineer in writing.

250.04 Heavy Metal Based Paint Management. When the work includes the removal of paint or items covered with paint which may contain lead, chromium or other heavy metals, the requirements of this subsection shall apply in addition to the requirements of subsection 250.03.

The requirements of the HASP shall be in accordance with OSHA Publication Number 3142, *Working with Lead in the Construction Industry.*

Paint Removal and Waste Disposal work shall be performed in accordance with 29 CFR 1926.62, State and local air quality regulations, the Steel Structures Painting Council (SSPC) Guide for Containing Debris Generated During Paint Removal Operations, the "Industrial Lead Paint Removal Handbook" (SSPC 91-18), and the references contained therein.

The following minimum precautions and procedures shall be followed unless modified in the approved HASP or its updates:

(a) The Contractor shall contact the CDPHE, Air Pollution Control Division to ascertain if an air pollution permit is required for the cleaning or demolition work. If an air pollution permit is required, the Contractor shall obtain the permit. The Contractor shall furnish the Engineer with a copy of the permit application and the permit issued prior to starting cleaning or demolition activities. A copy of the Air Pollution Emission Notice [APEN] shall be provided to the Engineer, if such notice is required under the Colorado Air Quality Control Commission's regulations. The processing of air pollution

permits in non-attainment areas, or where public hearings are required, likely will take more than 90 days.

(b) The Contractor shall contain paint chips, corrosion residues, and spent abrasives, herein referred to as waste materials, resulting from the cleaning or demolition operations. The Contractor shall not deposit or release waste material into the water, air or onto the ground below or adjacent to the structure. The Contractor shall conduct cleaning operations to minimize the waste materials produced. Prior to beginning the work, the Contractor shall submit to the Engineer for acceptance, a detailed methods statement for capturing, testing, and disposing of the removed materials. The Engineer will have seven calendar days to review, and accept or reject this methods statement.

(c) Abrasives utilized for blast cleaning shall be low-dusting and low waste. Unless approved otherwise, vacuum blasting or wheel blasting shall be used.

(d) The HSO shall sample and test the waste material for lead, chromium, and other paint associated heavy metals using the Toxicity Characteristic Leaching Procedure (TCLP) Test, Method 1311 of the EPA publication, Test Methods for Evaluating Solid Waste 846. Sample collection methodology and frequency shall be recommended by the HSO and accepted by the Engineer with an adequate number of samples taken to be representative of all waste material collected. If the waste material does not pass the TCLP test, it shall be disposed of in a permitted TSD facility as designated in writing by the Engineer. The waste materials handling decision shall be documented by a report (five copies) submitted to the Engineer. This documentation shall include a description of sample collection methodology, testing performed, test results and comparison of test results with hazardous waste requirements. The waste material shall not be held at an unpermitted TSD facility site in excess of Resource Conservation and Recovery Act (RCRA) temporary storage time limits.

(e) When an item coated with paint is removed, all loose paint shall be removed and collected from the item within 24 hours of the time it is removed or placed onto the ground. All loose paint shall be removed and collected from a painted item before it is removed from the site. The Contractor shall contain loose paint until it is removed and collected. Loose paint is defined as that which can be removed by manual scraping methods. Over waterways, the Contractor shall capture all paint debris by the method specified in the methods statement. The paint debris shall be collected on a daily basis and shall be stored in a properly labeled, tightly sealed container and placed in a secured location at the end of each working day.

(f) All painted steel components which are not designated to be salvaged shall be recycled. Contractor possession of the steel for future use shall be considered a form of recycling. Prior to transport of the components off-site, the Contractor shall obtain a letter from the recipients of the painted steel components stating that they have been fully informed of the contents of the paint and are capable of

handling the paint. If the Contractor is to maintain future possession of the steel, the Contractor shall supply this letter. If there will be more than one recipient of the painted material, one letter shall be obtained from each recipient. The Contractor shall provide a copy of each letter to the Engineer. If the painted steel components will be recycled by melting, this letter is not required. The Contractor shall submit a letter stating the destination of the painted steel components and that they will be melted.

(g) When the work consists of the removal of a bridge or components of a bridge coated with paint which has been assumed to contain lead, chromium, other heavy metals, or a combination thereof the Contractor shall capture paint debris which is dislodged during removal operations. The Contractor may choose any method for dismantling the bridge, subject to the following required construction sequence limitations:

(1) The concrete deck shall be removed prior to removal of the steel superstructure.

(2) If the methods statement indicates that girders will be dropped to the ground during dismantling, all debris from the concrete deck removal operation shall be removed from the area below the bridge before any girders are dropped into this area.

(3) Girders may be cut and dropped only if the span is located entirely over land.

250.05 Material Handling. This work consists of the additional handling of soils to be excavated for construction of the project which are suspected or known to be contaminated. This work also includes stockpiling or containerization, analytical sampling and testing, and final disposition of soils specially handled.

The Contractor shall maintain vertical trench walls for the work in the specified areas of known or potential contamination, as shown on the plans. Shoring may be necessary to meet this requirement. The Contractor shall confine the removal of contaminated soils in the specified areas to the vertical and horizontal limits of structure excavation specified in the Contract. The Contractor shall be responsible for any contaminated materials generated beyond the limits of excavation. This shall include any sampling, analysis, and disposal required, and the costs thereof. The Contractor shall be listed as the generator of any such material. The limits of excavation shall be determined as 18 inches outside of structures, including sewers, water lines, inlets, manholes, and other underground structures to be constructed, or as directed.

Specific areas of known or potential contamination have been identified in the project plans. There is the potential of encountering contaminated soil, which has

not been summarized in the plans or specifications, at unknown locations on the site. Suspected contaminated soil will be handled by one of three methods as follows:

(a) *Materials Handling (Stockpile).* When recommended by the HSO and authorized by the Engineer, material will be stockpiled for analysis and characterization for proper handling and, disposal, or both. Sampling and testing of materials shall be as described in the Contract. If analysis indicates that soil samples are designated as uncontaminated, as determined by the criteria shown in the Contract or as determined by the CDPHE, the associated soils will not require any special handling and will become the property of the Contractor and may be used on site, subject to other requirements of the Contract. Health and safety monitoring and strict fugitive dust control shall be conducted during the placement of these soils.

Stockpiled materials shall be secured in compliance with the following provisions until they are determined to be uncontaminated:

1. The Contractor shall not store the material for more than 90 days.

2. The Contractor shall prevent any runoff from infiltrating the ground or running out of the containment area.

3. Soils containing different contaminants shall be placed in separate stockpiles.

4. The Contractor shall prevent the dispersion of materials or the dilution or mixing of stockpiles.

5. The ground surface on which the contaminated soils will be placed shall be covered with plastic sheeting which will withstand the placement and removal of stockpiled materials without breaching.

6. The ground surface shall be graded to drain toward the edge of the soil piles and the berm or trench around them shall be covered by plastic sheeting.

7. Proper security shall be provided in accordance with 40 CFR.

(b) *Solid Waste Disposal.* Soils determined to be contaminated, but not hazardous, as established by criteria in the Contract or as determined by CDPHE or other regulatory agencies having jurisdiction, shall be handled and,disposed of, or both as recommended by the HSO and approved by the Engineer. The Contractor shall haul this material to a solid waste disposal facility.

(c) *Hazardous Waste Disposal.* Soils that are designated or suspected to be hazardous shall be containerized immediately upon excavation or upon discovery. Hazardous material shall be labeled and transported to a hazardous waste disposal facility designated by the Engineer.

(d) *Additional Requirements*. Stockpiled or containerized material characterized as uncontaminated, contaminated or hazardous shall be stored and disposed of in a manner consistent with current established federal, state, and local regulations for waste materials.
Materials with contaminants not specifically regulated shall be disposed of by the Contractor as directed, in consultation with CDPHE. All areas where wastes are generated shall be reviewed by the HSO to identify potential contaminant sources that may result in a contaminated waste stream.

Contaminated soils, which have been identified as solid waste or hazardous waste, requiring disposal according to federal, state, and local regulations, shall be transported in accordance with 49 CFR by the Contractor to an appropriately permitted landfill, incinerator or asphalt plant or other facility approved to accept the waste. CDPHE and the landfill or other treatment or disposal facility shall be notified by the HSO of the material to be disposed of and the corresponding analytical test results prior to shipment.

Potentially contaminated water collected from the lined trench of a stockpile shall be treated as required by Colorado Wastewater Discharge Permit System (CDPS) permits, 29 CFR and 40 CFR and reimbursed separately in accordance with Contract requirements.

250.06 Sample delivery. This work consists of the collection, containerization and delivery of material samples for analysis to the testing facility designated in the Contract.

Environmental Protection Agency (EPA) protocol and standards shall be followed in the collection, containerization and transport of samples to be analyzed, including the documentation of the proper chain of custody of all samples. The Contractor shall collect sufficient sample material to perform the required analysis and is responsible for ensuring that appropriate climate control has been provided for sample transport. Sample delivery shall be made within the maximum allowable holding time for each sample type, not to exceed 24 hours, excluding weekends. The time period required for sample collection and delivery to the testing facility will not be considered an excusable delay. The analysis to be completed and turnaround time shall be approved by the Engineer.

The Contractor shall provide the Engineer with a copy of documentation indicating that proper chain of custody requirements have been followed for all samples.

Quality control samples shall be provided by the Contractor in accordance with the quality control requirements of the testing facility designated in the Contract (quality control requirements are available from the Engineer). The Contractor shall prepare, label and transport these samples to the testing facility in conjunction with the

delivery of other samples authorized for analysis by the Engineer, at no additional cost.

The Engineer may request splits of samples, in advance of collection, which shall be provided at no additional cost by the Contractor.

250.07 Asbestos-Containing Material Management. If known or suspected asbestos-containing material is encountered, the requirements of subsection 250.03(d)4. shall be followed. Management of asbestos-containing materials shall be by an Asbestos Inspector and Manager.

METHOD OF MEASUREMENT

250.08 Environmental Health and Safety Management will not be measured, but will be paid for on a lump sum basis. This will include all work, materials, and hourly time charges by the HSO and other personnel required to accomplish the following:

Preparation and briefing of the initial HASP;
Procedures and equipment specified in subsections 250.03 - 250.07;
PPE (levels C and D) for Contractor's personnel for any contamination identified in the preconstruction investigations;
Preparation and submittal of the final site report.

The quantity to be measured for Health and Safety Officer will be the total number of hours that the Health and Safety Officer is actually used, as authorized, for the following work:

Field monitoring necessary to ensure the safety of workers on the site;
Hours in excess of the items listed under Environmental Health and Safety Management;
Hours that are necessary due to unforeseen site conditions; and
Hours of additional consultation or field work that is requested by the Engineer.

Equipment specified in subsection 250.03(a), preparation and submittal of the daily HSO diary, travel to and from the project site, and PPE (Levels C and D) required for use by the HSO will not be measured and paid for separately, but shall be included in the hourly cost of the HSO.

The quantity to be measured for Monitoring Technician will be the total number of hours that Monitoring Technician is actually used as authorized. Equipment specified in subsection 250.03(b), supervision of the MT, preparation and submittal of the daily monitoring diary, travel to and from the project site, and PPE required for use by the MT (Levels C & D) will not be measured and paid for separately, but shall be included in the hourly cost of the MT.

Materials stockpiled under the requirements of this specification will be measured by the cubic yard computed from cross sections by the average end area or other acceptable

method. Disposal of solid waste and hazardous waste materials will be measured by the cubic yard in the disposal container.

Materials Sampling and Delivery will be measured by the actual number of samples collected, containerized and transported to the testing facility indicated in the Contract.

Additional environmental health and safety management work required and authorized by the Engineer, but not included in the items listed above, will be considered extra work to be paid for in accordance with subsection 109.04, unless such work is caused by the Contractor's action.

BASIS OF PAYMENT

250.09 Partial payment for Environmental Health and Safety Management, as determined by the Engineer, will be made as the work progresses. The Contractor shall submit a schedule of environmental related Health and Safety Management work before the first partial payment is made. The schedule shall indicate the environmental related Health and Safety Management time for each work item that requires Contractor environmental related Health and Safety Management effort and the total time for the project.

The accepted quantity for Health and Safety Officer will be the number of hours actually used and approved for payment by the Engineer and will be paid for at the contract unit bid price.

The accepted quantity for Monitoring Technician will be the number of hours of on site monitoring as approved by the Engineer and will be paid at the Contract unit price.

Environmental Health and Safety Management, Health and Safety Officer and Monitoring Technician bid items shall include vehicles, phone charges, supplies, printing, postage, office support, and all other miscellaneous costs associated with the work.

Payment for Materials Handling (Stockpile) will be made at the contract unit price for all excavated material required to be stockpiled for analysis. The contract unit price will be full compensation for furnishing all materials, labor, equipment and incidentals necessary to complete this work, and all handling of the material prior to disposal. This includes haul, stockpile, water collection, and security. Payment for this work will be in addition to any payment made under other bid items for excavation, embankment or backfill on the project, or waste disposal of this material.

Payment for Solid Waste Disposal and Hazardous Waste Disposal will be made at the appropriate contract unit price for the disposal of material determined to be either solid waste or hazardous waste. The contract unit prices will be full compensation for furnishing all materials, labor, equipment, tools, storage containers for transport, containerization of material for up to 60 days, and incidentals necessary to complete this work. This includes all handling of the material, loading for disposal, unloading for disposal, and borrow material required for replacement of excavated material disposed of off site. It does not include stockpiling required for analysis which is included in the item Materials Handling (Stockpile) paid for as described above.

Payment for waste disposal fees and transport of hazardous waste will be made as shown below. Payment for this work will be in addition to any payment made under other bid items for excavation, embankment, backfill or material handling (stockpile) on the project.

(1) *Solid Waste Disposal.* Transport costs to the disposal facility and disposal fees will be included in the contract unit price for this work.

(2) *Hazardous Waste Disposal.* Transport costs to the disposal facility and disposal fees will be paid for in accordance with subsection 109.04

The cost of shoring required to limit the removal of contaminated materials to the specified limits shall be included in the bid unit prices for any excavation to be performed. Such shoring ordered by the Engineer in areas other than the specified areas of known or potential contamination, as shown in the plans, will be paid for in accordance with subsection 109.04.

Payment for Materials Sampling and Delivery will be made at the contract unit price for each material sample collected, containerized and transported to the laboratory testing facility as designated in the Contract. The Contract unit price will be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete this work including required sampling kits, containers, sample splits and quality control samples.

The Contractor shall be responsible for damage caused by construction operations to the environment, persons, or property. Expenditures associated with actions of the Contractor shall be borne by the Contractor at no cost to the project.

The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	**Pay Unit**
Environmental Health and Safety Management	Lump Sum
Health and Safety Officer	Hour
Monitoring Technician	Hour
Materials Sampling and Delivery	Each
Materials Handling (Stockpile)	Cubic Yard
Solid Waste Disposal	Cubic Yard
Hazardous Waste Disposal	Cubic Yard

SECTION 300
BASES

SECTION 304
AGGREGATE BASE COURSE

DESCRIPTION

304.01 This work consists of furnishing and placing one or more courses of aggregate and additives, if required, on a prepared subgrade.

MATERIALS

304.02 Aggregate. The aggregates shall meet the requirements of subsection 703.03.

Acceptance will be based on random samples taken from each lift.

304.03 Commercial Mineral Fillers. Portland cement shall conform to subsection 701.01. Hydrated lime shall conform to subsection 712.03.

CONSTRUCTION REQUIREMENTS

304.04 Placing. If the required compacted depth of the aggregate base course exceeds 6 inches, it shall be constructed in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches. When vibratory or other approved types of special compacting equipment are used, the compacted depth of a single layer may be increased to 8 inches upon request, provided that specified density is achieved and written approval is given.

304.05 Mixing. The Contractor shall mix the aggregate by methods that insure a thorough and homogenous mixture.

304.06 Shaping and Compaction. Compaction of each layer shall continue until a density of not less than 95 percent of the maximum density determined in accordance with AASHTO T 180 has been achieved. The surface of each layer shall be maintained during the compaction operations so that a uniform texture is produced and the aggregates are firmly keyed. Water shall be uniformly applied during compaction in the quantity necessary for proper consolidation.

The surface of the base course will be tested with a 10 foot straightedge, or other approved device. The surface shall be tested prior to the application of any primer or pavement. The variation of the surface from the testing edge of the straightedge between any two contacts with the surface shall not exceed ¼ inch. All irregularities exceeding the specified tolerance shall be corrected to the satisfaction of the Engineer at no additional cost to the Department.

The above compaction and straightedge requirements shall not apply to shoulder gravel. Compaction of shoulder gravel shall be accomplished by wheel rolling, as directed.

METHOD OF MEASUREMENT

304.07 Aggregate base course will be measured by the ton, or by the cubic yard compacted in place.

BASIS OF PAYMENT

304.08 The accepted quantities of aggregate base course, of the class specified, will be paid for at the contract price bid per ton or per cubic yard, as shown in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Aggregate Base Course (Class___)	Ton, Cubic Yard

Water will not be measured and paid for separately but shall be included in the work.

Commercial mineral fillers, when used, will be measured and paid for in accordance with Section 307 or as provided in the Contract.

SECTION 306
RECONDITIONING

DESCRIPTION

306.01 This work consists of blading, shaping, wetting, and compacting the existing subgrade with moisture and density control.

CONSTRUCTION REQUIREMENTS

306.02 The top 6 inches of the existing subgrade shall be reconditioned by blading and rolling. Sufficient water shall be added to meet the density requirements as specified in the Contract. The reconditioned surface shall not vary above or below the lines and grades as staked by more than 0.08 foot. The surface shall be tested for smoothness and density prior to the application of any base course material. Where bituminous surfacing materials are to be placed directly on the subgrade, the subgrade plane shall not vary more than 0.04 foot. All irregularities exceeding the specified tolerance shall be corrected to the satisfaction of the Engineer at no additional cost to the Department. The surface shall be satisfactorily maintained until base course has been placed.

METHOD OF MEASUREMENT

306.03 Reconditioning will be measured by the square yard of subgrade, including auxiliary lanes, and shall include blading, shaping, scarifying, compacting the subgrade, finishing, and maintenance of the finished surface.

BASIS OF PAYMENT

306.04 The accepted quantities of reconditioning will be paid for at the contract unit price for reconditioning.

Payment will be made under:

Pay Item	Pay Unit
Reconditioning	Square Yard

Water will not be measured and paid for separately but shall be included in the work.

SECTION 307
LIME TREATED SUBGRADE

DESCRIPTION

307.01 This work consists of treating the earth subgrade by combining lime and water with the pulverized soil subgrade material to the specified depth and compaction requirements as shown on the plans.

MATERIALS

307.02 Lime. Lime for lime treated subgrade shall be applied in slurry form. Dry application of lime will not be allowed unless otherwise approved by the Engineer. Commercial lime slurry shall be a pumpable suspension of solids in water. Lime for lime treated subgrade shall conform to the requirements of ASTM C 977 and rate of slaking test for moderate reactivity per ASTM C 110 and shall be the product of a high-calcium limestone as defined by ASTM C 51.

307.03 Water. Water used for mixing or curing shall be shall be in accordance with subsection 712.01, with the additional requirement that the sulfate content shall be less than 500 ppm.

CONSTRUCTION REQUIREMENTS

307.04 General. The Contractor shall construct one or more compacted courses of treated material, to the depth specified in the Contract. The treated material shall be a uniform blend of soil, lime, and water, free from loose or segregated areas. It shall have uniform density and moisture content and be void of all vegetation and other organic or man-made material. The subgrade shall be well bound for its full depth and width with a smooth surface suitable for placing subsequent courses. The Contractor shall regulate the sequence of the work to accurately apply and uniformly blend the lime at the designated rate and rework the courses as necessary to meet the above requirements.

The Contractor shall submit a mix design to the Engineer for approval, prior to constructing the test section.

The Contractor shall mix hydrated or quicklime with water to produce lime slurry at the job site with equipment specifically manufactured for this purpose.

Excessive aeration of lime slurry will not be permitted

The lime-treated subgrade shall not be mixed when it is raining, or when the subgrade material is frozen. The lime-treated subgrade shall not be mixed or compacted if the temperature of the lime or soil is below 35 °F.

307.05 Preparation of Subgrade. Prior to beginning any lime treatment the subgrade shall be constructed and finished to smooth and uniform surfaces conforming to the grades and typical sections specified. Variation from the subgrade

plane elevations specified shall not be more than ± 0.1 foot. The subgrade shall also be proof rolled in accordance with subsection 307.07. Soft or otherwise unsuitable subgrade disclosed by proof rolling shall be over-excavated, and replaced to a compacted stable state. The in-place density shall be at least 95 percent of AASHTO T 99 density within 0-3 percent of optimum moisture content.

307.06 Test Section. Prior to full-scale production, the Contractor shall construct a test section to demonstrate, to the satisfaction of the Engineer, subgrade stabilization using the materials, equipment, and methods to be used in full-scale production. The test section shall be at least 100 feet long, two spreading and mixing lanes wide, and the same depth as the course represented in the plans. The test section shall be constructed at a location approved by the Engineer.

The test section shall be tested in accordance with the same test requirements for the lime and soil design mix, and as determined by the Contractor.

If the test section is unsatisfactory, the Contractor shall adjust the materials, equipment, and methods or combinations thereof as necessary to conform to the specifications. Additional test sections shall be constructed as required to produce a satisfactory test section prior to full-scale production. Unsatisfactory test sections shall be removed and replaced at the Contractor's expense. Full production shall not begin until a satisfactory test section is completed and approved by the Engineer.

Prior to start of work, the Contractor shall determine the lime application rate, and the maximum dry density and optimum moisture content of the material after it has been treated with lime. All tests shall be performed in the presence of the Engineer. These test results will be used to determine the Contract requirements for lime application.

307.07 Proof Rolling. Both prior to and after the lime treatment, the Contractor shall perform proof rolling in accordance with subsection 203.09, except that final proof rolling will take place a minimum of seven days after lime treatment, unless otherwise approved by the Engineer.

307.08 Processing Materials. After the subgrade has been finished and approved as specified, the subgrade shall then be cut and pulverized by a cutting and pulverizing machine to the depth and width shown on the plans. Precautions shall be taken to avoid forming furrows of loosened material below the depth specified for the lime-stabilized soil mixture. The machine shall uniformly cut and pulverize the loosened material to a depth not greater than 10 percent over the thickness of the lime-treated layer as specified in the Contract and shall have cutters that plane the base of the cut and pulverize zone to a smooth surface over the entire width of the cut. The machine must give visible indication at all times that it is cutting to the proper depth.

(a) *Lime Application.* Lime shall be applied in the form of a slurry, on that area where the initial mixing operations can be completed during the same working day, and at the specified percentage of hydrated lime, by equipment capable of

pumping and re-circulating the mixture while in transit. The slurry shall be applied through spray bars to assure a uniform flow and distribution.

(b) *Initial Mixing.* Initial mixing shall take place immediately after lime application. The lime, soil, and water shall be thoroughly mixed and blended by a self propelled rotary type mixing machine, until a uniform mixture throughout the required depth and width is obtained and all clods and lumps are reduced to a maximum 2 inch diameter size. There shall be a minimum 6 inch overlap between passes to assure consistent mixing and breakdown.

The mixing machine shall make at least of two passes to uniformly mix the lime, water, and soil to the full depth of the pulverized layer. Non-uniformity of color reaction, when the treated material is tested with the standard phenolphthalein alcohol indicator, will be considered evidence of inadequate mixing. Streaks and pockets of lime will also be considered evidence of inadequate mixing, and shall require additional mixing to correct.

The moisture content of the mixture immediately following the blending of water, lime, and soil shall not be less than optimum as determined by AASHTO T 99, plus necessary hydration moisture. Hydration moisture will be considered as one percentage point for each percent of lime being added. When proper mixing has been accomplished, the mixture shall be cured for at least 48 hours. Light rolling to seal the surface of the mixture shall be required. The mixture shall be maintained in a moist condition throughout the entire curing period.

(c) *Final Mixing.* After the required curing period, the mixture shall be uniformly mixed by a self-propelled rotary type mixing machine and maintained at approximate optimum moisture content as determined herein. If the lime stabilized soil mixture contains clods, they shall be reduced by approved pulverization so that the remainder of the material shall meet the gradation requirements of Table 307-1 when tested dry by laboratory sieves. If it is determined that additional lime needs to be added to the previously mixed subgrade, the total depth of the subgrade shall be mixed.

307.09 Compaction

(a) Compaction of the lime and soil mixture shall begin immediately after final mixing. The material shall be aerated or sprinkled as necessary to maintain the mixture within the specified moisture content limits during and following compaction. The field density for the compacted mixture shall be at least 95 percent of the maximum density of laboratory specimens prepared from samples taken from the lime soil material in place after curing and prior to compacting. The specimens will be compacted and tested in accordance with AASHTO T 99, and the in-place field density will be determined in accordance with Colorado Procedure (CP) 80. Any mixture that has not been compacted shall not be left undisturbed for more than 30 minutes. The moisture content of the mixture at the start of compaction shall be at 2 ± 1 percent above the optimum moisture

content. The optimum moisture content will be determined in accordance with AASHTO T 99.

(b) The finished surface shall be smooth and uniform conforming to the typical sections specified. All irregularities, depressions, or weak spots, which develop, shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and re-compacting by sprinkling and rolling. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereon or the work is accepted.

(c) In addition to the requirements specified for density, the full depth of the materials shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, the Engineer will conduct tests. If the material fails to meet the density and strength requirements in accordance with the lime and soil design mix, it shall be reworked to meet these requirements at the Contractor's expense. Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and shall conform with the typical section shown on the plans and to the established lines and grades. Variation from the subgrade plan elevations specified shall not exceed 0.04 foot. Should the material, due to any reason or cause, lose the required stability, density, or finish, before the next course is placed or the work is accepted, it shall be recompacted and refinished at the Contractor's expense.

307.10 Finishing and Curing . When initial compaction of the top layer of the lime-stabilized soil mixture is nearing completion, the surface shall be shaped to the required lines, grades, and cross section, and compaction continued until uniform and adequate compaction is obtained. The treated material shall be maintained at a moisture content satisfactory for proper curing by one of the following:

(1) Sprinkling for a period of seven days.

(2) Sprinkling for a period less than seven days until emulsified asphalt prime coat (diluted 1 to 1) is applied in accordance with subsection 307.10, item (3) below.

(3) Applying a protective film of emulsified asphalt prime coat (diluted 1 to 1 with water) immediately after the lime-treated subgrade has been finished. One application shall be made consisting of 0.20 gallon diluted mixture per square yard.

The completed section shall be cured for a minimum of seven days before further courses are added or any traffic is permitted, unless otherwise directed by the engineer. Acceptable compressive strength test results shall be in a range from a minimum of 160 pounds per square inch to 500 pounds per square inch.

307.11 Construction Joints. Construction joints are not required after each day's work unless there is a time lapse of seven days or more between the processing of adjacent sections. If construction joints are required, they shall be formed by cutting back into the completed work to form a vertical face. Damage to completed work shall be avoided.

307.12 Thickness Acceptance. Lime treated subgrade will be accepted for minimum thickness on a lot basis. A lot will consist of 1,500 square yards. One core shall be taken at random by the Contractor's Quality Control Inspector in each lot. When the measurement of the core from a lot is not deficient by more than 0.5 inch from the minimum plan thickness, full payment will be made. When such measurement is deficient by more than 0.5 inch and not more than 1.0 inch from the plan thickness, two additional cores shall be taken at random and used in determining the average thickness for that lot. The thickness of the core shall be determined by average caliper measurement of cores tested in accordance with ASTM C 174. When the average measurement of the three cores is not deficient by more than 0.5 inch from the plan thickness, full payment will be made. If the average measurement of the three cores is deficient by more than 0.5 inch but less than 1.0 inch from the plan thickness, the entire lot may be left in place and a 10 percent price reduction to the contract unit price will be made. If the average measurement of the three cores is deficient more than 1.0 inch but less than 2.0 inches from the plan thickness, the entire lot may be left in place and a of 50 percent price reduction to the contract unit price will be made. When the average thickness is deficient by more than 2.0 inches, the entire lot shall be replaced at the Contractor's expense.

Table 307-1
SCHEDULE FOR MINIMUM SAMPLING AND TESTING

Element and Procedure	Process Control	Acceptance	Remarks
pH ASTM C 977 (App) (Design) *ASTM G 51 (Field)*	1/5,000 sq. yds. or fraction thereof	1/10,000 sq. yds. or fraction thereof	pH will be determined after % lime has been established based on unconfined compressive strength
Atterburg Limits AASHTO T 89, T 90	1/5,000 sq. yds. or fraction thereof	1/10,000 sq. yds. or fraction thereof	Reduce by ½ original PI
Swell Potential ASTM D 4546	1/5,000 sq. yds. or fraction thereof	1/10,000 sq. yds. or fraction thereof	½ % or less with 200 psf surcharge pressureModified as per local practices
Unconfined Compressive Strength ASTM D 5102(Procedure B)	1/5,000 sq. yds. or fraction thereof 1/soil type	1/10,000 sq. yds. or fraction thereof 1/soil type.	Determined by design plan criteria. Do not immerse in water after moist-cure period. The tests shall be conducted on samples cured in a moist environment for 5 days @ 100 °F
Thickness Acceptance ASTM C 174	A lot is defined as 1 core per 1,500 sq. yds. or fraction thereof	1/3,000 sq. yds. or fraction thereof	When measurement is <0.5", 2 additional cores shall be taken in that lot and the average of 3 cores will determine the thickness of that lot
Gradation CP 31	1/5,000 sq. yds. or fraction thereof	1/10,000 sq. yds. or fraction thereof	1" – 100% passing; #4 – 60% passing, dry sieving after final mixing
Determining Percent Relative Compaction Soil-Aggregate by Nuclear Method CP 80	1/5,000 sq. yds. or fraction thereof	1/10,000 sq. yds. or fraction thereof	Minimum 95% of maximum dry density as per AASHTO T 99. Moisture content of mixture at the start of compaction shall be at 2 ± 1% above optimum moisture content
Moisture Density CurveAASHTO T 99	1/soil type	1/soil type	
Sulfate AASHTO T 290	1/soil type	1/soil type	Sulfate content shall be less than 0.2% by weight in a 10:1 water to soil solution.

METHOD OF MEASUREMENT

307.13 Hydrated lime will be measured by the ton. If quicklime is used the pay quantity will be determined using the certified lime purity for each truckload as follows:

Pure quicklime (CaO) • 1.32 = Hydrated Lime ($Ca(OH)_2$)
Quicklime delivered • % purity • 1.32 = A
Quicklime delivered • % inert material = B
A + B = total hydrated lime produced = pay quantity

Processing lime-treated subgrade will be measured by the square yard for the area completed and accepted. Overlap mixing will not be measured and paid for separately but shall be included in the work.

BASIS OF PAYMENT

307.14 The accepted quantities will be paid for at the contract unit price for each of the pay items listed below that appear in the bid schedule. Payment shall include all processing materials, lime application and mixing, compaction, and materials used in curing.

Payment will be made under:

Pay Item	**Pay Unit**
Hydrated Lime	Ton
Processing Lime Treated Subgrade (____Inch)	Square Yard

Test sections and coring will not be measured and paid for separately, but shall be included in the work.

All proof rolling will be measured and paid for in accordance with Section 203.