

## Summary of Administrative Revisions to Uniform Standard Specifications and Drawings – July through December, 2009

| <b>Section</b> | <b>Description of Revision</b>   |
|----------------|--|
| <b>104</b>     | <ul style="list-style-type: none"> <li>Subparagraph 104.04.E.3 – Deleted “of these Standard Specifications” at the end of the sentence (reference to self).</li> </ul>   |
| <b>105</b>     | <ul style="list-style-type: none"> <li>Subparagraph 105.04.A.4 – Changed “Standard Drawings” to “Uniform Standard Drawings”.</li> <li>Subparagraph 105.04.A.5 – Changed “Standard Drawings” to “Uniform Standard Drawings”.</li> <li>Subparagraph 105.13.E – Changed first sentence to read: “Construction loads greater than legal loads may be carried over structures within the project which have spans of 10 feet to 20 feet only when the Contractor complies with the above Subparagraph C, numbers 3 through 9 inclusive; however, the limitations as set for in Subparagraph C, numbers 3 through 5 inclusive, may be waived by the Engineer for reinforced concrete box structures which are adequately supported by shoring.”</li> </ul> |
| <b>108</b>     | <ul style="list-style-type: none"> <li>Subparagraph 108.06.D – Changed “Subsection 101.73” to “Subsection 101.74”</li> <li>Subparagraph 108.06.E - Changed “Subsection 101.73” to “Subsection 101.74”</li> <li>Subparagraph 108.08.A - Changed “Subsection 101.73” to “Subsection 101.74”</li> </ul>   |
| <b>212</b>     | <ul style="list-style-type: none"> <li>Subparagraph 212.02.03.A – Changed the first sentence to read: “It is the intent that all plant materials meet the standards as set forth herein, throughout the life of the contract.”</li> </ul>  |
| <b>501</b>     | <ul style="list-style-type: none"> <li>Subparagraph 501.03.04.A.1 – Deleted “o” after the end of the sentence</li> <li>Table 2 – Concrete Mix Designation – Changed Max. Nom. Coarse Aggregate Size for Class C and CA concrete from “50” to “2-1/2” inches.</li> </ul>  |
| <b>601</b>     | <ul style="list-style-type: none"> <li>Subparagraph 601.03.01.A.1 – Changed this Subparagraph to read: “The pipe shall be bedded as shown in the plans and/or drawings appended to the plans or as specified in the Special Provisions.</li> </ul>   |
| <b>613</b>     | <ul style="list-style-type: none"> <li>Subparagraphs 613.03.06.A, 613.05.01.A, and 613.05.01.F – Replaced “valley gutter” with “cross gutter”.</li> </ul>  |
| <b>704</b>     | <ul style="list-style-type: none"> <li>Subparagraph 704.04.04.C.6 – Replaced “standard specifications” with “above noted specifications”.</li> <li>Subparagraph 704.04.04.C.7 - Replaced “standard specifications” with “above noted specifications”.</li> <li>Subparagraph 704.04.04.D.1.d - Replaced “standard specifications” with “above noted specifications”.</li> <li>Subparagraph 704.04.04.D.2 - Replaced “standard specifications” with “above noted specifications”.</li> <li>Subparagraph 704.04.04.D.2.a - Replaced “standard specifications” with “above noted specifications”.</li> </ul>   |
| <b>707</b>     | <ul style="list-style-type: none"> <li>Subsections 707.03.03, 707.03.04, and 707.03.05 – Deleted “FILLER” at the end of each subsection heading.</li> </ul>  |

| <b>Drawing</b> | <b>Description of Revision</b>  |
|----------------|---|
| <b>234.3</b>   | <ul style="list-style-type: none"> <li>Notes: - Changed all references of "Type I Pavement Marking Film" to "Type II Pavement Marking Film" and all references of "Type II Pavement Marking Film" to "Type I Pavement Marking Film", to be consistent with modifications in USS 714.</li> </ul> |
| <b>244.5</b>   | <ul style="list-style-type: none"> <li>Notes: - Changed all references of "Type I Pavement Marking Film" to "Type II Pavement Marking Film" and all references of "Type II Pavement Marking Film" to "Type I Pavement Marking Film", to be consistent with modifications in USS 714.</li> </ul> |
| <b>246</b>     | <ul style="list-style-type: none"> <li>Notes: - Changed all references of "Type I Pavement Marking Film" to "Type II Pavement Marking Film" and all references of "Type II Pavement Marking Film" to "Type I Pavement Marking Film", to be consistent with modifications in USS 714.</li> </ul> |
| <b>246A</b>    | <ul style="list-style-type: none"> <li>Notes: - Changed all references of "Type I Pavement Marking Film" to "Type II Pavement Marking Film" and all references of "Type II Pavement Marking Film" to "Type I Pavement Marking Film", to be consistent with modifications in USS 714.</li> </ul> |
| <b>246B</b>    | <ul style="list-style-type: none"> <li>Notes: - Changed all references of "Type I Pavement Marking Film" to "Type II Pavement Marking Film" and all references of "Type II Pavement Marking Film" to "Type I Pavement Marking Film", to be consistent with modifications in USS 714.</li> </ul> |
| <b>246.1</b>   | <ul style="list-style-type: none"> <li>Notes: - Changed all references of "Type I Pavement Marking Film" to "Type II Pavement Marking Film" and all references of "Type II Pavement Marking Film" to "Type I Pavement Marking Film", to be consistent with modifications in USS 714.</li> </ul> |
| <b>246.2</b>   | <ul style="list-style-type: none"> <li>Notes: - Changed all references of "Type I Pavement Marking Film" to "Type II Pavement Marking Film" and all references of "Type II Pavement Marking Film" to "Type I Pavement Marking Film", to be consistent with modifications in USS 714.</li> </ul> |

**SECTION 104****SCOPE OF THE WORK****104.01 INTENT OF THE CONTRACT**

- A. The intent of the contract is to provide for the construction and completion in every detail of the work described. The Contractor shall furnish all labor, material, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

**104.02 INCREASED OR DECREASED QUANTITIES AND CHANGE IN CHARACTER OF WORK**

- A. The Contracting Agency reserves the right to make by written order and without notice to surety, such alterations in the plans and specifications or character or quantity of the work which may be considered necessary or desirable from time to time during the progress of the work to complete satisfactorily the proposed construction. Such alterations shall not be considered as a waiver of any conditions of the contract or invalidate any of the provisions thereof.
- B. Whenever an alteration in character of work on the project involves a substantial change in the nature of the design or in the type or extent of construction which materially increases or decreases the cost of the performance, the work shall be performed in accordance with the plans and specifications and as directed, provided however, that before such work is started, a supplemental agreement acceptable to both parties to the contract shall be executed.
- C. The right is reserved to increase or decrease any or all of the items in the estimate of approximate quantities as shown in the proposal. The length of the project may be increased or decreased by adding or omitting sections or by relocation. Under no circumstances shall alterations of plans or of the nature of the work, involve work beyond the termini of the proposed construction except as may be necessary to satisfactorily complete the project.
- D. If it is found that the quantity of any major item required to complete the work underruns or overruns less than 25 percent of the proposed quantity, payment for the work performed will be made at the contract unit price for the quantity of work actually performed.
- E. Whenever the termini of the project are changed or whenever any change or combination of changes results in increasing or decreasing the original contract amount as calculated from the bid quantities and contract unit prices by more than 25 percent, a supplemental agreement acceptable to both parties to the contract shall be executed in advance of performing the affected work.
- F. Whenever an overrun or underrun of more than 25 percent of the original bid quantity for one or more major contract items occurs, either party to the contract may demand a supplemental agreement to be negotiated satisfactory to both parties.
- G. Revision of any unit price requested by the Contractor shall be negotiated on the basis of actual cost plus a reasonable allowance for profit and overhead. Written request for supplemental agreement shall set forth in detail the particulars and character by which the work was changed and by what amount the unit price of the proposal item will be altered. Failure of the Contractor to file a request for a supplemental agreement within 10 calendar days after any of the above outlined conditions are encountered shall be considered as a

waiver thereof on the part of the Contractor and payment shall be made at the contract unit price for the actual quantity of work performed.

- H. If a supplemental agreement satisfactory to both parties cannot be agreed upon, the Contracting Agency may order the work in dispute to be performed and the controversy shall be settled as provided in Subsection 105.17, "Claims for Adjustment and Disputes."
- I. Changes not requiring negotiated agreements, except as to extra work involved, shall be ordered by means of a contract change order, and acceptance by the Contractor, as evidenced by Contractor's signature, shall constitute agreement that the change does not involve any adjustment of contract unit prices. Attention is directed to Subsection 108.08, "Determination and Extension of Contract Time." Work shall not be started on any such change until the change order has been delivered to and accepted by the Contractor.
- J. In case the Contractor refuses to accept a change order, the Contracting Agency may order the work to proceed while proceeding as expeditiously as possible with settlement of the disputed points.

#### **104.03 EXTRA WORK**

- A. The Contractor shall perform unforeseen work, for which there is no price included in the contract, whenever it is deemed necessary or desirable in order to complete fully the work as contemplated. Such work shall be performed in accordance with the specifications and as directed, and will be paid for as agreed unit prices, force account, or a combination of the two. Agreed unit prices together with the estimated quantities of each unit shall be shown. Orders involving extra and force account work shall be as detailed in Subsection 109.03, "Extra and Force Account Work," and conform to the requirements contained therein.

#### **104.04 MAINTENANCE OF TRAFFIC**

- A. While undergoing improvements, all roads upon or within which any work is being done shall be kept open to all traffic by the Contractor unless otherwise provided for in the contract documents. If the useable roadway is not sufficient to safely accommodate two-way traffic, the Contractor shall adequately maintain one-way traffic. Wherever one-way traffic is in effect, the distance shall be as set forth in writing by the Engineer.
- B. Where controlled traffic is necessary for protection of the work or for the safety of public travel, it shall be in accordance with the provisions of Subsection 624.03.02, "Flaggers," and 624.03.03, "Pilot Cars," of these specifications. 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 Contractor shall bear all expense of maintaining all roads upon or within which any work is being done and of constructing and maintaining such approaches, crossings, intersections, and other features as may be necessary, without direct compensation, except as provided in Subsection 107.15, "Relief from Maintenance and Responsibility," or in 1. below:
  - 1. The Contractor shall be responsible for the maintenance of the roadway during suspension of the work when such suspension is due to the Contractor's negligence. Attention is directed to Subsection 108.06, "Temporary Suspension of Work." During any other suspension, the Contractor shall make passable and shall open to traffic such portions of the project and temporary roadways or portions thereof as may be ordered by the Engineer for the temporary accommodation of traffic during the anticipated period of suspension. Thereafter, and until issuance of an order for the resumption of construction operations, the maintenance of the temporary route or line of travel agreed upon will be by and at the expense of the

Contracting Agency. Contractor's maintenance and responsibility will include and be restricted to: the traveled roadway for the convenience of public travel; opening plugged pipes and roadway ditches and drains or correcting any other hazard which may be detrimental to adjacent property owners or the traveling public. When work is resumed, it shall be the Contractor's responsibility to replace, renew, and repair any work or materials lost or damaged because of such temporary use of the project regardless of the cause of such damage or loss, except as provided in Subsection 107.15, "Relief from Maintenance and Responsibility." It is herewith expressed that the Contracting Agency is in no way responsible to the Contractor to maintain the roadway and appurtenances in any certain condition or state of repair. It is incumbent upon the Contractor to complete the project in every respect as though its prosecution had been continuous and without interference.

- C. Where construction of a project is staged in the plans, or otherwise outlined by the contract documents, and if a change in the staging or sequence of operations is desirable, the Contractor may submit such change in writing to the Contracting Agency. Consideration will be given to each such proposal and may be rejected, modified, or accepted as is deemed best by the Contracting Agency. The Contractor will not proceed with any such change in the staging until permission is granted by the Contracting Agency in writing.
- D. When detours, temporary connections, crossovers, connection roads, and frontage roads are constructed by the item "Equipment Hours," such items shall be full compensation for excavating, hauling, overhaul, and compacting of the material complete and in place and for all labor involved to complete the detour. Base and surface courses will be paid for at the contract unit price for the particular type of material required. All of the above mentioned roadways will be constructed to the same standards and qualities and subject to the same tests and specifications as the main roadway, unless otherwise ordered by the Engineer. Attention is directed to Section 624, "Accommodations for Public Traffic."
- E. When a detour is requested by the Contractor, the Contractor shall make a written request to the Engineer for the establishment of a detour around all or certain designated sections of work. If arrangements for such a detour can be made which are satisfactory to the Contracting Agency, and to the Contractor, the Engineer will designate that road as a detour, subject to the following conditions:
  - 1. The Contractor shall provide and maintain the necessary route marking signs.
  - 2. The Contractor shall construct and maintain in good condition such a detour. If the Contractor fails to maintain the detour in a condition satisfactory to the Engineer, the Contracting Agency will make such repairs as is deemed suitable and will deduct the cost thereof from money due or to become due to the Contractor.
  - 3. Provisions for handling traffic will be subject to the conditions of Subsection 624.03.02, "Flaggers," and 624.03.03, "Pilot Cars."
  - 4. Upon abandoning the detour, the Contractor shall obliterate and dispose of such detour and restore as nearly as possible the condition of the ground to its original form to the satisfaction of the Engineer.
  - 5. All of the above work will be at the sole expense of the Contractor.

#### **104.05 RIGHTS IN AND USE OF MATERIALS FOUND ON THE WORK**

- A. The Contractor with the approval of the Engineer, may use on the project such stone, gravel, sand, or other material determined suitable by the Engineer, as may be found in

the excavation and will be paid for both the excavation of such materials at the corresponding contract unit price and also at the contract unit price for the pay item for which the excavated material is used. At no additional cost to the Contracting Agency, the Contractor shall replace with other acceptable material all of that portion of the excavation material so removed and used which was needed for use in the embankments, backfills, approaches, or otherwise. No charge for the materials so used will be made against the Contractor. The Contractor shall not excavate or remove any material from within the project location which is not within the grading limits, as indicated by the slope and grade lines, without written authorization from the Engineer.

- B. Unless otherwise provided, the material from any existing old structure may be used temporarily by the Contractor in the erection of the new structure. Such material shall not be cut or otherwise damaged except with the approval of the Engineer.

## **SECTION 105**

### **CONTROL OF THE WORK**

#### **105.01 AUTHORITY OF THE ENGINEER**

- A. The Engineer will decide all questions that may arise as to the quality and acceptability of materials furnished and work performed and as to the rate of progress of the work; and all questions that may arise as to the interpretation of the plans and specifications.
- B. The Engineer will have the authority to suspend the work wholly or in part due to the failure of the Contractor to correct conditions unsafe for the workmen or the general public; for failure to comply with the technical provisions of the contract; for failure to carry out orders; for such periods as the Engineer may deem necessary due to unsuitable weather; and for conditions considered unsuitable for the prosecution of the work.
- C. Whenever the Contractor fails to carry out orders of the Engineer, the Engineer will have executive authority to enforce such orders and the Engineer's decision shall be final. In the event the Contractor fails to execute work ordered by the Engineer within a reasonable period of time, the Engineer may, after giving notice in writing to the Contractor, proceed to have such work performed as deemed necessary and the cost thereof shall be deducted from compensation due or which may become due the Contractor on the contract.
- D. Decisions of the Engineer shall be subject to appeal to the Board, whose decisions shall be final and conclusive. Such appeal shall be in writing and shall be made within 10 calendar days, but in the meantime the Contractor shall diligently proceed with the work.

#### **105.02 PLANS AND WORKING DRAWINGS**

- A. The contract plans and drawings do not purport to show all the details of the work. These documents are intended to illustrate the character and extent of the performance desired under the contract; therefore, they may be supplemented or revised from time to time, as the work progresses, by the Engineer or (subject to approval of the Engineer) by the Contractor. The Contractor will keep one set of plans available on the work at all times.
- B. The plans may be supplemented by such working drawings as are necessary to adequately control the work. Working drawings for structures shall be furnished by the Contractor. Working Drawings shall include stress sheets, shop drawings, erection plans, fabrication sheets, falsework plans, cofferdam plans, bending diagrams for reinforcing steel, or any other supplementary plans or similar data required by the Engineer. Unless otherwise specified, all working drawings shall be submitted in triplicate 10 days prior to start of related work and approved by the Engineer. Such approval shall not relieve the Contractor of any of the Contractor's responsibility under the contract for the successful completion of the work. It is mutually agreed that the Contractor shall be responsible for agreement of dimensions and details as well as for conformity of the Contractor's working drawings with the approved plans and specifications.
- C. The contract price will include the cost of furnishing all working drawings.

#### **105.03 CONFORMITY WITH PLANS AND SPECIFICATIONS**

- A. Work performed and materials furnished shall be in conformity with the lines, grades, cross sections, dimensions, and materials requirements, including tolerances, shown on the plans or indicated in the specifications.

- B. In the event the Engineer finds the materials or the finished product in which the materials are used not in conformity with the plans and specifications, but that acceptable work has been produced, the Engineer shall then make a determination if the work shall be accepted and remain in place. In this event, the Engineer will document the basis of acceptance by contract modification concurred in by the Contracting Agency which will provide for an appropriate adjustment in the contract price for such work or materials as the Engineer deems necessary to conform to the Engineer's determination based on engineering judgment.
- C. In the event the Engineer finds the materials or the finished product in which the materials are used or the work performed are not in conformity with the plans and specifications and have resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by the Contractor at no additional cost to the Contracting Agency.

#### **105.04 COORDINATION OF PLANS, SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, AND SPECIAL PROVISIONS**

- A. The specifications, supplemental specifications, 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. These documents are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, the following precedence will govern:
  - 1. Permits from other agencies as may be required by law.
  - 2. Special Provisions.
  - 3. Plans.
  - 4. Uniform Standard Drawings.
  - 5. Uniform Standard Specifications.
  - 6. Reference Specifications.
- B. Change orders, supplemental agreements, and approved revisions to plans and specifications will take precedence over Items 2, 3, 4, 5, and 6 listed above. Detailed plans shall have precedence over general plans.
- C. The Contractor shall take no advantage of any apparent error or omission in the plans or specifications. In the event the Contractor discovers such an error or omission, the Contractor shall immediately notify the Engineer. The Engineer will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the plans and specifications.

#### **105.05 COOPERATION BY CONTRACTOR**

- A. The Contractor will be supplied with a minimum of 4 sets of approved plans and contract assemblies including special provisions, one set of which the Contractor shall keep available on the work at all times. Additional copies of plans and special provisions may be obtained by the Contractor upon written request to the Contracting Agency.
- B. The Contractor shall give the work constant attention necessary to facilitate the progress thereof, and shall cooperate with the Engineer, the Engineer's inspectors, and other contractors in every way possible.



- C. The Contractor shall maintain a telephone for the duration of the contract, at no additional cost to the Contracting Agency, where the Contractor or the Contractor's authorized representative may be reached directly or by message at all times.
- D. The prime Contractor shall have on the work at all times, as the Contractor's agent, a competent superintendent capable of reading and thoroughly understanding the plans and specifications and thoroughly experienced in the type of work being performed, who shall receive instructions from the Engineer or the Engineer's authorized representatives. Such superintendent shall be designated in writing before starting work. The superintendent shall have full authority to execute orders or directions of the Engineer without delay, and to promptly supply such materials, equipment, tools, labor, and incidentals as may be required. Such superintendent shall be furnished irrespective of the amount of work sublet.
- E. Whenever the Contractor or the Contractor's authorized representative is not present on any particular part of the work where it may be desired to give direction, orders will be given by the Engineer to the Contractor's superintendent, foreman, or other person in charge of the operation, who is present, and these orders shall have the same force and effect as if given to the Contractor or the Contractor's designated representative.
- F. Any order given by the Engineer, not otherwise required by the specifications to be in writing, will on request of the Contractor be given or confirmed by the Engineer in writing.

#### **105.06 COOPERATION WITH UTILITIES**

- A. The Permittee, in the case of private contract, and the Contracting Agency, in the case of cash contract or Special Improvement District contract, will search known substructure records which describe the location of utility substructures, and will indicate on the plans for the project those substructures, except for service connections, which may affect the work. Information regarding removal, relocation, abandonment, or installation of new utilities will be furnished to prospective bidders.
- B. Where underground main distribution conduits such as water, gas, sewer, electric power, telephone, or cable television are shown on the plans, the Contractor, for the purpose of preparing the Contractor's bid, shall assume that every property parcel will be served by a service connection for each type of utility.
- C. At least 2 working days before entering on the work, the Contractor shall notify all the utility owners to mark or otherwise indicate the approximate location of their subsurface facilities including, but not limited to, structures, main conduits, and service connections. This requirement will not apply to sewer and storm drain installations where their location and depth are shown on the plans for the project.
- D. It shall be the Contractor's responsibility to determine the location and depth of all utilities, including service connections, for which approximate locations have been marked by the respective owners and which the Contractor believes may affect or be affected by the Contractor's operations. If no pay item is provided in the contract for this work, full compensation for such work shall be considered as included in the prices bid for other items of work.
- E. The Contractor shall not interrupt the service function or disturb the supporting base of any utility without authority from the owner or an order from the Contracting Agency.
- F. Where protection is required to ensure support of utilities, the Contractor shall, unless otherwise provided, furnish and place the necessary protection at no additional cost to the Contracting Agency.

- G. Upon learning of the existence and location of any utility omitted from or shown incorrectly on the plans, or not properly marked, the Contractor shall immediately notify the Engineer in writing. When authorized by the Engineer, support or protection of the utility will be paid for as provided in Subsection 104.03, "Extra Work."
- H. The Contractor shall immediately notify the Engineer and the utility owner if the Contractor disturbs or damages any utility. The Contractor shall bear the costs of repair or replacement of any utility damaged if properly located as provided.
- I. When placing concrete around or contiguous to any utility installation, the Contractor, at no additional cost to the Contracting Agency, shall (1) furnish and install a 2-inch cushion of expansion joint material or other similar resilient material; or (2) provide a sleeve or other opening which will result in a 2-inch minimum clear annular space between the concrete and the utility; or (3) provide other acceptable means to prevent embedment in or bonding to the concrete. The standards of the affected utility company shall prevail. Where concrete is used for backfill or for structures which would result in embedment, or partial embedment, of a metallic utility installation, or where the coating, bedding, or other cathodic protection system is exposed or damaged by the Contractor's operations, or as may be required by the work, the Contractor shall notify the Engineer and arrange to secure the advice of the affected utility owner regarding the procedures required to maintain or restore the integrity of the system.
- J. Unless otherwise specified, the Contractor shall remove all interfering portions of utilities shown on the plans or indicated in the bid documents as "abandoned" or "to be abandoned in place." Before starting removal operations, the Contractor shall ascertain from the Contracting Agency whether the abandonment is complete, and the costs involved in the removal and disposal shall be absorbed in the bid for the items of work necessitating such removals.
- K. When feasible, the owners responsible for utilities within the area affected by the work shall complete their necessary installations, relocations, repairs or replacements before commencement of work by the Contractor. When the Special Provisions or plans indicate that a utility installation is to be relocated, altered, or constructed by others, the Contracting Agency will conduct all negotiations with the owners and the work will be done at no cost to the Contractor, except as provided in Subsection 107.17, "Contractor's Responsibility for Utility Property and Service." Utilities that are relocated in order to avoid interference with the proposed permanent work shall be protected in their relocated position and the cost of such protection shall be absorbed in the various items of the contract.
- L. A utility company installing a new line is responsible for relocation of other utility company facilities if the new line conflicts with existing locations.
- M. When the plans or specifications provide for the Contractor to alter, relocate, or reconstruct a utility, all costs for such work shall be included in the bid for the items of work necessitating such work. Temporary or permanent relocation or alteration of utilities requested by the Contractor for the Contractor's own convenience shall be the Contractor's responsibility, and the Contractor shall make all arrangements and bear all costs.
- N. The utility owner will relocate service connections as necessary within the limits of the work or within temporary construction or slope easement unless otherwise specified. When directed by the Engineer, the Contractor shall arrange for the relocation of service connections as necessary between the meter and property line, or between a meter and the limits of temporary construction or slope easements. The relocation of such service connections will be paid for in accordance with provisions of Subsection 104.03, "Extra

Work." Payment will include the restoration of all existing improvements which may be affected thereby. The Contractor may, for the Contractor's own convenience or to expedite the work, agree with the owner of any utility to disconnect and reconnect interfering service connections. The Contracting Agency will not be involved in any such agreement.

- O. The Contractor shall notify the Contracting Agency of the Contractor's construction schedule insofar as it affects the protection, removal, or relocation of utilities. This notification shall be in writing and shall be included as a part of the construction schedule required by Subsection 108.03, "Prosecution and Progress." The Contractor shall notify the Contracting Agency in writing of any subsequent changes in the Contractor's construction schedule which will affect the time available for protection, removal, or relocation of utilities.
- P. The Contractor will not be entitled to damages or additional payment for delays attributable to utility relocations or alterations if correctly located, noted, and completed. The Contractor may be given an extension of time for unforeseen delays attributable to utility relocations or alterations not shown or incorrectly shown on the plans, or for unreasonably protracted interference by utilities in performing work correctly shown on the plans. If the Contractor sustains loss due to delays attributable to interferences, relocations, or alterations which could not have been avoided by the judicious handling of forces, equipment, or plant, there shall be paid to the Contractor such amount as the Contracting Agency may find to be fair and reasonable compensation for such part of the Contractor's actual loss as was unavoidable as provided in Subsection 108.12, "Right-of-Way Delays."
- Q. When necessary, the Contractor shall so conduct the Contractor's operations as to permit access to the work site and provide time for utility work to be accomplished during the progress of the contract work.

#### **105.07 COOPERATION BETWEEN CONTRACTORS**

- A. The Contracting Agency reserves the right at any time to contract and perform other or additional work on or near the work covered by the contract.
- B. When separate contracts are let within the limits of any one project, each Contractor shall conduct Contractor's work so as not to interfere with or hinder the progress or completion of the work being performed by the other Contractors. Contractors working on the same project shall cooperate with each other as directed.
- C. Each Contractor involved shall assume all liability, financial or otherwise, in connection with Contractor's contract and shall protect and save harmless the Contracting Agency from any and all damages or claims that may arise because of inconvenience, delay, or loss experienced by Contractor because of the presence and operations of other Contractors working within the limits of the same project.
- D. The Contractor shall arrange Contractor's work and shall place and dispose of the materials being used so as not to interfere with the operations of other Contractors within the limits of the same project. Contractor shall join Contractor's work with that of the others in an acceptable manner and shall perform the work in proper sequence to that of the others.

#### **105.08 CONSTRUCTION STAKES, LINES AND GRADES**

- A. The Contractor shall notify the Engineer at least 7 days before starting work in order that the Engineer may take necessary measures to ensure the preservation of survey monuments and bench marks. The Contractor shall not disturb permanent survey monuments or bench marks without the consent of the Engineer, and shall bear the

expense of replacing any that may be disturbed without permission. Replacement shall be done only by the Engineer.

- B. When a change is made in the finished elevation of the pavement of any roadway in which a permanent survey monument is located, the Contractor shall adjust the monument cover to the new grade unless otherwise specified.
- C. The Contractor shall preserve property line and corner survey markers except where their destruction is unavoidable, and the Contractor is proceeding in accordance with accepted practice. Markers that otherwise are lost or disturbed by Contractor's operations shall be replaced at the Contractor's expense by a Registered Land Surveyor.
- D. Except for private contracts, the Engineer will perform and be responsible for the accuracy of surveying adequate for construction. The Contractor shall be responsible for preserving construction survey stakes and marks for the duration of their usefulness. If any construction survey stakes are lost or disturbed and need to be replaced, such replacement shall be by the Engineer at the expense of the Contractor.
- E. The Contractor shall notify the Engineer at least 2 working days before Contractor will require survey services in connection with the laying out of any portion of the work. The Contractor shall dig all holes necessary for line and grade stakes.
- F. The Engineer will furnish and set construction stakes establishing lines and grades for street excavation, finished base gravel, curb and gutter, walks, structures, and utilities, and will furnish the Contractor all the necessary information relating to the lines and grades. These stakes and marks shall constitute the field control by and in accordance with which the Contractor shall govern and execute the work.
- G. The line and grade stakes will be offset from the construction area. The stakes will show the offset distance, stationing, and required cut or fill to the finished grade or flow line as indicated on the plans. Grade stakes shall be set by the Engineer to the finished grade of the subgrade and also of the base gravel and the tops of these stakes marked blue or red. All stakes and grade shall be set with a surveyor's level or transit.
- H. The Contractor shall construct the work in accordance with the Engineer's stakes and marks, making use of them before they are disturbed, and shall be charged with full responsibility for conformity and agreement of the work with such stakes and marks. The Contractor shall be held responsible for the preservation of all stakes and marks, and if, in the opinion of the Engineer, any of the stakes or marks have been carelessly or willfully destroyed or disturbed by the Contractor, the cost of replacing them shall be charged against, and deducted from, the payment for the work.
- I. Surveying by private engineers on work under the control of the Contracting Agency shall conform to the quality and practice required by the Engineer.
- J. Work upon completion shall conform to the lines, elevations, and grades shown on the plans, or as ordered by the Engineer.
- K. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.
- L. Grades for underground conduits will be set at the surface of the ground. The Contractor shall transfer them to the bottom of the trench.

**105.09 BLANK****105.10 DUTIES OF THE INSPECTOR**

- A. Inspectors for the Contracting Agency will be authorized to inspect all work done and all materials furnished. Such 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 will not be authorized to issue instructions contrary to the plans and specifications, or to act in any capacity for the Contractor.

**105.11 INSPECTION**

- A. All materials and each part or detail of the work shall be subject to inspection by the Engineer. The Engineer shall be provided acceptable access to all parts of the work and shall be furnished with such information and assistance by the Contractor as required to make a complete and detailed inspection.
- B. Any work done or materials used without inspection by an authorized Contracting Agency representative may be ordered removed unless the material meets the specifications and shall be replaced at no additional cost to the Contracting Agency unless the Contracting Agency representative failed to inspect after having been given notice in writing that the work was to be performed. If the noninspected work or material proves acceptable the work or material may remain, but any expenses entailed in a late inspection shall be the Contractor's.
- C. If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing and the replacing of the covering, or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing and replacing of the covering, or making good of the parts removed will be at no additional cost to the Contracting Agency.
- D. When facilities of any unit of government or political subdivision or of any railroad corporation or public utility corporation are adjusted or constructed as a part of the work covered by this contract, its respective representatives shall have the right to inspect the work. Such inspection shall in no sense make any unit of government or political subdivision or any railroad corporation or public utility corporation a party to this contract, and shall in no way interfere with the rights of either party thereunder.

**105.12 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK**

- A. All work which does not conform to the requirements of the contract will be considered as unacceptable work, unless otherwise determined acceptable under the provisions in Subsection 105.03, "Conformity with Plans and Specifications."
- B. Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause, found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner.
- C. Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans, or as given except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions

of the contract. Work so done may be ordered removed or replaced at no additional cost to the Contracting Agency.

- D. Upon failure on the part of the Contractor to comply forthwith with any order of the Engineer, made under the provisions of this article, the Contracting Agency will have authority to cause unacceptable work to be remedied or removed or replaced and unauthorized work to be removed and to withhold the costs from any money due or to become due to the Contractor.

#### **105.13 LOAD AND SPEED RESTRICTIONS**

- A. The Contractor shall be responsible for all damage to the work caused by Contractor's hauling equipment.
- B. In hauling material for incorporation in portions of the project, loads which are in excess of the limits set by the Contracting Agency will not be permitted on any existing bridge or new and existing bituminous base and surface, cement treated base, or Portland cement concrete paving which is to remain in place for vehicular traffic within the project or between the project and the pits or other sources of materials. Load limits established by the Contracting Agency for the project shall be complied with regardless of the source of materials, whether from described pits, approved pits, or commercial sources. Unless otherwise stated in the Special Provisions, the maximum loads shall not exceed the limits set forth in Chapter 484, "Traffic Laws," of the Nevada Revised Statutes and all acts amendatory thereto or supplementary thereto.
- C. Construction loads greater than legal loads may be carried over any new bridge structure within the project providing the Contractor complies with all of the following limitations and provisions:
  - 1. Concrete in any such structure shall have attained designed strength as shown on the structure plans.
  - 2. The gross load of the vehicle shall not exceed 108,000 pounds.
  - 3. Gross load on any individual axle shall not exceed 48,000 pounds.
  - 4. The gross load on any individual set of tandem axles spaced not more than 6 feet apart shall not exceed 72,000 pounds.
  - 5. The center to center spacing of individual axles or center to center spacing of pairs of tandem axles shall not be less than 14 feet.
  - 6. No more than one lane of vehicles shall operate over any structure.
  - 7. The speed of any vehicle approaching or traveling on any structure shall not exceed 10 mph.
  - 8. The roadway surface approaching any structure shall be kept smooth and uniformly graded for 150 feet each side of the structure and shall be maintained to provide a uniform transition onto the structure.
  - 9. A cover of 6 inches  $\pm$  1 inch shall be placed and maintained on the decks of all structures. Cover material shall not include rocks of diameter greater than 2 inches.
- D. The limitations specified in items 2, 3, 4, 5, 6, 7, 8, and 9 above may be waived for all reinforced concrete box culverts providing that the depth of fill compacted and in place over the reinforced concrete box culvert is equal to or greater than the distance between

inside faces of outside walls measured along center line of roadway. Fill may be placed not to exceed profile grade elevation.

- E. Construction loads greater than legal loads may be carried over structures within the project which have spans of 10 feet to 20 feet only when the Contractor complies with the above Subparagraph C, numbers 3 through 9, inclusive; however, the limitations as set forth in Subparagraph C, numbers 3 through 5, inclusive, may be waived by the Engineer for reinforced concrete box structures which are adequately supported by shoring. The Contractor shall submit Contractor's proposed shoring details and the actual loads and axle spacings to the Engineer for review prior to the planned hauling. Approval will be based on a review of the shoring details and a physical inspection of the shoring complete and in place.
- F. The Engineer shall make sufficient checks to satisfy Engineer that the Contractor is complying with all limitations, and any violation shall result in denying the Contractor use of the structure until the violation has been corrected to the satisfaction of the Engineer.
- G. The provision that the Contractor may haul construction loads greater than legal loads on new structures shall not relieve the Contractor of Contractor's responsibility for all damage caused by Contractor's hauling equipment.
- H. The Engineer may, for the protection of the traveling public, establish speed limits on or adjacent to the project. Such limitations of speed shall be strictly observed by the Contractor.

#### **105.14 MAINTENANCE DURING CONSTRUCTION**

- A. The Contractor shall maintain the work during construction and until the project is accepted, except as provided for in Subsection 104.04, "Maintenance of Traffic," and 107.15, "Relief from Maintenance and Responsibility." This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces to the end that the roadway and structures are at all times, to be kept in a condition satisfactory to the Engineer.
- B. In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.
- C. Except as provided for in Subsection 104.04, "Maintenance of Traffic," and 107.15 "Relief from Maintenance and Responsibility," all costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various pay items and the Contractor will not be paid an additional amount for such work.

#### **105.15 FAILURE TO MAINTAIN ROADWAY OR STRUCTURE**

- A. If the Contractor, at any time, fails to comply with the provisions of Subsection 105.14, "Maintenance During Construction," the Engineer will immediately notify the Contractor in writing 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 money due or to become due the Contractor.
- B. If a condition develops that is dangerous to public safety in the opinion of the Engineer, such condition may be immediately remedied with whatever means is available and the cost of this maintenance will be deducted from money due or to become due to the Contractor.

**105.16 FINAL ACCEPTANCE**

- A. Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer will make an inspection and if all construction and final cleanup provided for and contemplated by the contract are found completed to Engineer's satisfaction, that inspection shall constitute the final inspection and the Engineer will so advise the governing body or commission, who will notify the Contractor in writing of the acceptance of the contract as of the date of the final inspection. Such notice will not be given to the board or commission until all work has been completed to the satisfaction of the Engineer.

**105.17 CLAIMS FOR ADJUSTMENT AND DISPUTES**

- A. If, in any case, the Contractor deems that additional compensation is due Contractor for work or material not clearly covered in the contract or not ordered by the Engineer as extra work as defined herein, the Contractor shall notify the Engineer in writing of Contractor's intention to make claim for such additional compensation before Contractor begins the work on which Contractor bases the claim. If such notification is not given, and the Engineer is not afforded proper facilities by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor, and the fact that the Engineer has kept account of the cost as aforesaid, shall not in any way be construed as proving or substantiating the validity of the claim. If the claim, after consideration by the Engineer, is found to be just, it will be paid as extra work as provided herein for "Force Account" work. Nothing in this subsection shall be construed as establishing any claim contrary to the terms of Subsection 104.02, "Increased or Decreased Quantities and Change in Character of Work."
- B. For all claims, the Contractor shall certify in writing that the claim is made in good faith, that the supporting data are accurate and complete to the best of Contractor's knowledge and belief, and that the amount requested accurately reflects the Contract adjustment for which the Contractor believes the Contracting Agency is liable. Subcontractor claims shall not be considered except as submitted by the Contractor as the Contractor's claims.
- C. Any controversy or claim arising out of or relating to this contract which cannot be resolved by mutual agreement shall be settled by arbitration in accordance with the Rules of the American Arbitration Association.



**SECTION 108****PROSECUTION AND PROGRESS****108.01 SUBLETTING OF CONTRACT**

- A. If the bidder intends to sublet any portion of the work, the bidder shall furnish a list of the subcontractors as a material part of the bidder's sealed proposal on the form provided, listing a description of the work to be performed by each subcontractor. If the bidder does not intend to sublet any part of the work, the bidder shall insert the word "NONE" on the form provided. In the event that the prospective bidder fails to complete the subcontractor's list, either with the insertion of the bidder's intended subcontractors, or with the word "NONE," the bidder's proposal shall be rejected without consideration. The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the contract or contracts or any portion thereof, or of the Contractor's right, title, or interest therein, without prior written consent of the Contracting Agency and of the surety.
- B. Requests for permission to sublet, assign, or otherwise dispose of any portion of the contract shall be in writing and accompanied by a letter showing that the organization which will perform the work is particularly experienced for such work.
- C. Consent to sublet, assign, or otherwise dispose of any portion of the contract shall not be construed to relieve the Contractor of the Contractor's liability under the contract and bonds.
- D. All subcontractors and assignees of the prime or general Contractor shall be required to comply with the provisions of NRS 408.373, NRS Chapter 338, and all other applicable federal, state, and local laws or regulations in the same manner as the prime or general Contractor.
- E. Contract bid prices will prevail for purposes of computing the monetary value of all subcontracts.
- F. The Contractor shall perform with the Contractor's own organization, unless otherwise authorized by the Special Provisions, work amounting to not less than 25 percent of the combined value of all items of the work covered by the contract except as follows:
  - 1. Should the Contractor elect to furnish materials for work to be performed by an approved subcontractor, and the materials are not obtained from the same firm that is to perform the work of incorporating these materials into the project, the cost of the materials, when set forth in a written statement accompanying the subcontract agreement or contained therein, will be excluded from amounts applicable to the subcontracted percentage.
- G. When a firm both sells materials to a Contractor and performs the work of incorporating the materials into the project, these two phases of work must necessarily be considered a single subcontract.
- H. Roadside production of materials is construed to be the production of crushed stone, gravel, or other material with portable or semi-portable crushing, screening, or washing plants, established or reopened in the vicinity of the work for the purpose of supplying materials to be incorporated into the work on a designated project or projects. Roadside production of materials shall be considered subcontracting if performed by other than the Contractor.

- I. The Contracting Agency will not recognize any subcontractor on the work as a party to the contract. Nothing contained in any subcontract shall create any contractual relation between the subcontractor and the Contracting Agency. The Contractor will be held responsible for the progress of the work in accordance with the contract progress required.

#### **108.02 NOTICE TO PROCEED**

- A. The successful bidder agrees to conform to the following which shall govern the Physical Notice to Proceed for this project:
  1. Authorization to commence actual physical work shall be issued by the Contracting Agency.
  2. The authorization to proceed shall be given verbally to the successful bidder. The Contracting Agency shall confirm this authorization in writing.
  3. The verbal authorization to proceed shall have an actual start date for physical work to commence and a scheduled completion date.
  4. After the verbal Notice to Proceed has been issued by the Contracting Agency, failure of the successful bidder to commence work by the actual start date shall be grounds for breach of contract.
- B. A Material Notice to Proceed may be issued by the Contracting Agency subject to the same conditions as items 1, 2, and 3 of the Physical Notice to Proceed requirements. The maximum time allowed for acquisition of materials shall be the number of calendar days specified in the contract after verbal authorization has been given by the Contracting Agency.
- C. At the successful bidder's option, the successful bidder may elect to start work during the Material Notice to Proceed time. If the successful bidder elects to commence physical work prior to the calendar days of the Material Notice to Proceed expiration, the following shall apply:
  1. Once the actual date the successful bidder elects to enter the project and commence physical work, the time allotted for Physical Work shall commence.
  2. No stop orders shall be issued due to lack of materials that have not arrived.
  3. Any time remaining under the calendar day Material Notice to Proceed shall expire automatically at the end of the last calendar day for physical work to be completed.

#### **108.03 PROSECUTION AND PROGRESS**

- A. When required by the Engineer, the Contractor shall furnish the Engineer with a "Progress Schedule" for the Engineer's approval. The progress schedule may be used as the basis for establishing major construction operations and as a check on the progress of the work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the Special Provisions. Should the prosecution of the work for any reason be discontinued, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

#### **108.04 LIMITATION OF OPERATIONS**

- A. The Contractor shall conduct the work in such a manner and in such sequence as will ensure the least interference with traffic. The Contractor shall have due regard to the

- B. No productive work will be required on Saturdays, Sundays, or holidays unless otherwise provided for in the Special Provisions. If, however, the Contractor elects to work on such days, those days worked will be charged as working days. The Contractor shall give the Engineer notice of the Contractor's intention to work on the aforementioned days at least 48 hours in advance of such work. Holidays are defined in Subsection 101.29, "Holidays."
- C. The Engineer is authorized to notify the Contractor in writing and require the Contractor to cease construction operations the day before, during, and the day after said holidays, or at any other time if the Contractor's operations are of such nature, the project is so located, or the traffic is of such volume that it is deemed expedient to do so.

#### **108.05 CHARACTER OF WORKMEN; METHODS AND EQUIPMENT**

- A. The Contractor shall at all times employ sufficient labor and equipment for prosecuting the several classes of work to full completion in the manner and time required by these specifications.
- B. Workmen shall have sufficient skill and experience to perform properly the work assigned to them. Workmen engaged in special or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.
- C. Any person employed by the Contractor or by a subcontractor who, in the opinion of the Engineer, does not perform the Contractor's or subcontractor's work in a proper manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the Engineer.
- D. Should the Contractor fail to remove such person or persons as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Contracting Agency may suspend the work by written notice until such orders are complied with.
- E. All equipment which is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the project shall be such that no injury to the roadway, adjacent property, or other improvement will result from its use.
- F. When the methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed in the contract, the Contractor is free to use any methods or equipment that the Contractor demonstrates to the satisfaction of the Engineer will accomplish the contract work in conformity with the requirements of the contract.
- G. When the contract specifies that the construction be performed by the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use methods or types of equipment other than those specified in the contract, the Contractor may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed to be used and an explanation of the

reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements and with the concurrence of the Contracting Agency. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substituted method or equipment and shall complete the remaining construction with the specified methods and equipment. The Contractor shall remove the deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the construction items involved nor in contract time as a result of authorizing a change in methods or equipment under these provisions.

#### **108.06 TEMPORARY SUSPENSION OF WORK**

- A. The Engineer shall have the authority to suspend the work wholly or in part, for such period as the Engineer may deem necessary due to unsuitable weather, or to such other conditions as are considered unfavorable for the suitable prosecution of the work. The Contracting Agency shall have the authority to suspend the work wholly or in part for such time as it may deem necessary, due to the failure on the part of the Contractor to carry out orders given, or to perform any provision of the contract. The Contractor shall immediately comply with the written order of the Engineer or Contracting Agency to suspend the work wholly or in part. The suspended work shall be resumed when conditions are favorable and methods are corrected, as ordered or approved in writing by the Engineer.
- B. In the event that a suspension of work is ordered as provided above, and should such suspension be ordered by reason of the failure of the Contractor to carry out orders or to perform any provision of the contract, or by reason of weather conditions being unsuitable for performing any item or items of work, which work, in the sole opinion of the Engineer, could have been performed prior to the occurrence of such unsuitable weather conditions had the Contractor diligently prosecuted the work when weather conditions were suitable, the Contractor, at no additional cost to the Contracting Agency, shall do all the work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public traffic during the period of such suspension as provided in Subsection 107.07, "Traffic and Access," and as specified in the Special Provisions for the work. In the event that the Contractor fails to perform the work above specified, the Contracting Agency will perform such work and the cost thereof will be deducted from money due or to become due the Contractor.
- C. In the event that a suspension of work is ordered by the Contracting Agency due to unsuitable weather conditions, and in the sole opinion of the Engineer, the Contractor has prosecuted the work with energy and diligence prior to the time that operations were suspended, the cost of providing a smooth, and unobstructed passageway through the work will be paid for as extra work as provided in Subsection 104.03, "Extra Work," or at the option of the Contracting Agency such work will be performed by the Contracting Agency at no cost to the Contractor.
- D. If the Engineer orders a suspension of all the work or a portion of the work which is the current controlling operation or operations, due to unsuitable weather or to such conditions as are considered unfavorable to the suitable prosecution of the work, the days on which the suspension is in effect shall not be considered working days as defined in Subsection 101.74, "Working Day." If a portion of work at the time of such suspension is not a current controlling operation or operations, but subsequently does become the

current controlling operation or operations, the determination of working days will be made on the basis of the then current controlling operation or operations.

- E. If a suspension of work is ordered by the Contracting Agency, due to the failure on the part of the Contractor to carry out orders given to perform any provision of the contract, the days on which the suspension order is in effect shall be considered working days if such days are working days within the meaning of the definition set forth in Subsection 101.74, "Working Day."
- F. In the event of a suspension of work under any of the conditions set forth in this section, such suspension of work shall not relieve the Contractor of the Contractor's responsibilities as set forth in Section 107, "Legal Relations and Responsibility to the Public."

#### **108.07 PRECONSTRUCTION CONFERENCE**

- A. After the contract has been awarded and prior to commencing work, the Contracting Agency may designate a time and place satisfactory to the Contractor for a preconstruction conference. At such time the Engineer will outline detailed requirements to be followed in performance of the contract.

#### **108.08 DETERMINATION AND EXTENSION OF CONTRACT TIME**

- A. The contract time for completion will be fixed by the Contracting Agency, and will be stated in the Special Provisions, either as a calendar date, or based on a number of working days, or on a specified number of calendar days. Attention is directed to Subsection 101.74, "Working Day."
- B. The Contractor shall perform the work in an acceptable manner within the time stated in the contract except that the contract time for completion may be adjusted as follows:
  - 1. If the satisfactory completion of the contract shall require performance of work in greater quantities than those set forth in the proposal, the time allowed for performance shall be increased in the same ratio as the final estimate bears to the original contract amount, except that the final monetary amount of any supplemental agreement or contract change order for which an extension of contract time was previously allowed shall be deducted from the final estimate prior to making the pro-rata time adjustment. The final monetary amount of supplemental agreements or contract change orders for which an extension of contract time has not been allowed will be included in the final estimate for making the pro-rata time adjustment. The amount for asphalt cements and liquid asphalts will not be considered in the original or the final estimates for determining time extensions.
  - 2. If delays beyond the Contractor's control are caused solely by action or inaction by the Contracting Agency, such delays will entitle the Contractor to an extension of time which will be based upon the effect of delays to the project as a whole and will not be granted for noncontrolling delays to minor included portions of work, unless it can be shown that such delays did, in fact, delay the progress of the project as a whole.
  - 3. When delays occur due to unforeseen causes beyond the control and without the fault or negligence of the Contractor, including, but not restricted to acts of God, acts of the public enemy, acts of government agency, fires, floods, epidemics, strikes, and freight embargoes, the time for completion shall be extended an amount determined by the Contracting Agency to be equivalent to the delays; provided,

however, written request for such extension of time is made by the Contractor within 10 calendar days after the beginning of such delay. No allowance shall be made for delay or suspension of the work due to fault of the Contractor.

- C. Certain critical materials such as steel, copper, aluminum, and bituminous products may be difficult to obtain due to a nationally recognized shortage or defense needs. The Contractor shall make every reasonable effort necessary to order and procure all such critical materials sufficiently in advance so as not to delay the completion of the project. Should a delay occur in obtaining critical materials that were properly ordered by the Contractor, the time for completion of the contract may be extended an amount determined by the Contracting Agency to be equivalent to the delay in project progress due to said delay in obtaining critical materials provided that:
1. The delay in furnishing critical materials was due to defense needs or nationally recognized shortage.
  2. The Contractor furnishes evidence to the Engineer's satisfaction that the Contractor had taken adequate steps for a guaranteed delivery date from the Contractor's supplier.
  3. The evidence shall contain certification of adequate steps for a guaranteed delivery by not less than 3 suppliers of the material or if 3 suppliers are not available, the Contractor shall so certify and supply certification from such suppliers as there are.
  4. That the Contracting Agency does not find a source when notified of the shortage by the Contractor.
  5. That the Contractor obtains such material from the first source available after such certification.
- D. The contract time shall begin as set forth in Subsection 108.02, "Notice to Proceed." When the final acceptance has been duly made by the Engineer as prescribed in Subsection 105.16, "Final Acceptance," the daily time charge shall cease.

#### **108.09 FAILURE TO COMPLETE THE WORK ON TIME**

- A. Time is an essential element of the contract and it is important that the work be pressed vigorously to completion. The cost to the Contracting Agency of the administration of the contract, including engineering, inspection, and supervision will be increased as the time occupied in the work is lengthened. The public is subject to detriment and inconvenience when full use cannot be made of a project.
- B. Should the Contractor fail to complete the work within the time agreed upon in the contract or within such extra time as may have been allowed by increases in the contract or by formally approved extensions granted by the Contracting Agency, there shall be deducted from any money or amounts due or that may become due the Contractor, the sum set forth in the Special Provisions for each day the work shall remain uncompleted. This sum shall be considered and treated not as a penalty but as liquidated damages due the Contracting Agency from the Contractor by reason of inconvenience to the public, added cost of engineering and supervision, and other items which have caused an expenditure of public funds resulting from the Contractor's failure to complete the work within the time specified in the contract.
- C. Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been

extended, will in no way operate as a waiver on the part of the Contracting Agency of any of its rights under the contract.

- D. The Contracting Agency may waive such portions of the liquidated damages as may accrue after all work is completed, except "Final Cleanup" and seeding gravel pit and borrow areas and haul roads.

#### **108.10 DEFAULT AND TERMINATION OF CONTRACT**

- A. If for any cause whatsoever, the Contractor fails to carry on the work in an acceptable manner, the Contracting Agency will give notice in writing to the Contractor and the Contractor's surety of such delay, neglect, or default. The Contractor shall be considered in default and the contract may be terminated if any of the following shall occur:
1. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or
  2. Fails to perform the work with sufficient workmen and equipment or with sufficient materials to ensure the prompt completion of the work, or
  3. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or
  4. Discontinues the prosecution of the work, or
  5. Fails to resume work which has been discontinued after notice to do so, or
  6. Becomes insolvent or is declared bankrupt or commits any act of bankruptcy or insolvency, or
  7. Allows any final judgment to stand against the Contractor unsatisfied for a period of 5 days, or
  8. Makes an assignment for the benefit of creditors, or
  9. For any other cause whatsoever, fails to carry on the work in an acceptable manner, the Engineer will give notice in writing to the Contractor and the Contractor's surety of such delay, neglect, or default.
- B. If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Contracting Agency shall have full power and authority without violating the contract, to take the prosecution of the work out of the hands of the Contractor. The Contracting Agency may, at the Contracting Agency's option, call upon the surety to complete the work in accordance with the terms of the contract; or the Contracting Agency may take over the work, including any or all materials and equipment on the project as may be suitable and acceptable, and may complete the work by force account, or may enter into a new agreement for the completion of the contract according to the terms and provisions thereof, or use such other methods as, in the Contracting Agency's opinion, will be required for the completion of the contract in an acceptable manner.
- C. All costs and charges incurred by the Contracting Agency, together with the cost of completing the work under the contract, shall be deducted from any money due or which may become due the Contractor. In case the expense so incurred by the Contracting Agency shall be less than the sum which would have been payable under the contract if it had been completed by the Contractor, then the Contractor shall be entitled to receive the difference, and in case such expense shall exceed the sum which would have been

payable under the contract, then the Contractor and the Contractor's surety shall be liable and shall pay to the Contracting Agency the amount of said excess.

#### **108.11 TERMINATION OF THE CONTRACTOR'S RESPONSIBILITY**

- A. Whenever the improvement contemplated and covered by the contract shall have been completely performed on the part of the Contractor and all parts of the work have been approved and accepted by the Contracting Agency according to the contract, and the final estimate paid, the Contractor's obligations shall then be considered fulfilled, except as set forth in the Contractor's contract bond and as provided in Subsection 107.11, "Responsibility for Damage Claims."

#### **108.12 RIGHT-OF-WAY DELAYS**

- A. The Contractor may be compensated for delays caused solely by the failure of the Contracting Agency to furnish necessary rights-of-way, failure to deliver materials shown on the contract documents to be furnished by the Contracting Agency, or for the suspension of the work by the Contracting Agency for its own convenience or benefit. If the Contractor sustains loss which could not have been avoided by the judicious handling of forces, equipment, or plant, there shall be paid to the Contractor such amount as the Engineer may find to be fair and reasonable compensation for such part of the Contractor's actual loss as was unavoidable.
- B. If performance of the Contractor's work is delayed as the result of the failure of the Contracting Agency to acquire or clear right-of-way, an extension of time determined pursuant to the provisions of Subsection 108.08, "Determination and Extension of Contract Time," will be granted.

#### **108.13 TERMINATION OF CONTRACT**

- A. The Contracting Agency may, upon 30 days' written notice, terminate the contract or a portion thereof.
- B. When contracts, or any portion thereof, are terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract unit price, or as mutually agreed for items of work partially completed or not started. No claim for loss of anticipated profits shall be considered.
- C. Reimbursement for organization of the work (when not otherwise included in the contract) and moving equipment to and from the job will be considered where the volume of work completed is too small to compensate the Contractor for these expenses under the contract unit prices, the intent being that an equitable settlement will be made with the Contractor.
- D. Acceptable materials, obtained by the Contractor for the work, that have been inspected, tested, and accepted by the Contracting Agency and that are not incorporated in the work may, at the option of the Engineer, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records, at such points of delivery as may be designated by the Contracting Agency.
- E. Termination of the contract or a portion thereof shall not relieve the Contractor's surety of its obligation for any just claims arising out of the work performed.



## **SECTION 212**

### **LANDSCAPING**

#### **DESCRIPTION**

##### **212.01.01 GENERAL**

- A. This work shall consist of furnishing and planting trees, shrubs, and ground covers where shown on the plans or as established by the Engineer, all in accordance with specifications and accepted horticultural practices.

#### **MATERIALS**

##### **212.02.01 GENERAL**

- A. The materials used shall be those prescribed for the several items which constitute the finished work and shall conform to the applicable requirements of Section 726, "Roadside Materials."

##### **212.02.02 NOMENCLATURE**

- A. Nomenclature for plant names and varieties shall be in accordance with the latest edition of "Standardized Plant Names" as prepared by the American Joint Committee on Horticultural Nomenclature.
- B. All plant material in these specifications will be classified by group as follows:
1. Plants, Group A: Denotes container plant material
  2. Plants, Group B: Denotes balled and burlapped plant material
  3. Plants, Group C: Denotes ground cover
  4. Plants, Group D: Denotes grass (turf)

##### **212.02.03 QUALITY OF PLANT MATERIALS**

- A. It is the intent that all plant materials meet the standards as set forth herein, throughout the life of the contract. During inspections, as set forth hereinafter, all plant material will be judged and rejections shall be based upon these standards.
- B. All plants shall conform to the applicable requirements as specified in Subsection 726.03.06, "Plants."
- C. In determining the quality of plant material, the following elements shall be evaluated:
1. Root condition.
  2. Plant size (above ground).
  3. Insect and disease free condition.
  4. General appearance (color, shape, prior pruning).
- D. All container grown plants specified in the plans shall be established in the container in which the plants are sold, and grown in that container sufficiently long for the new fibrous roots to have developed so that the root mass will retain its shape and hold together when removed from the container.

- E. Balled and burlapped plants shall be plants dug with the ball of earth in which the plants are growing. Ball sizes shall be of the diameter and depth specified in the plans and contain enough fibrous root system for the full recovery of the plant. Balled plants shall have the ball firm and unbroken.
- F. Pruning of plants shall not be done prior to delivery to the planting site except by approval of the Engineer. Plant pruning when found necessary to remove damaged branches and to improve the plant shape and form when approved by the Engineer shall be accomplished after completion of individual planting operations.
- G. A deficiency in any one or more of these areas shall be sufficient reason to reject selectively or by lot.
- H. Grass or legume seeds shall conform to the requirements of Subsection 211.02.03, "Seed."

#### **212.02.04 HANDLING AND SHIPPING**

- A. Plants shall be packed for shipment according to standard practice for the type of plant being shipped. The root system of plants shall not be permitted to dry out at any time. Plants shall be protected against heat and freezing temperatures, sun, wind, climatic, or seasonal conditions during transit. Plant material shall be furnished in containers unless otherwise specified. Plants specified balled and burlapped (B & B) shall be handled by the ball of earth and not the plant. Broken or "made" balls will not be acceptable. Container grown plants shall be well developed with sufficient root development to hold the earth intact after removal from the container without being root bound.

#### **212.02.05 INSPECTION OF PLANT MATERIAL**

- A. The Contractor shall inform the Engineer as soon as possible of the source of plant material for the project. At the Engineer's option an inspection of all plant materials at the source may be required prior to shipping of plants from the nursery. This inspection shall coordinate the judgment areas regarding size and quality of plant material between the Contracting Agency, the Contractor and the nursery. However, there will be no acceptance of any plant material during this inspection. All plant material shall meet the requirement specified in Subsection 726.02.01, "Certificates and Samples."
- B. All plant material will be inspected by the Engineer on arrival at the site or storage area for quality. These inspections shall determine the acceptance or rejection of the plant material based on quality as specified in Subsection 212.02.03, "Quality of Plant Materials." This inspection is for quality of plant material only and does not constitute final acceptance. Plants which are rejected shall be immediately removed from the holding area and replaced by acceptable plants at no additional cost to the Contracting Agency.
- C. All plant material will be continually inspected by the Engineer from the time of arrival at the holding area, during planting and through the plant establishment period. Plants may be individually rejected during this time based on mechanical damage, quality or physical change of the plant which is not normal to the plant or to the season of the year. Plants which are rejected shall be immediately removed from either the holding area or the project and replaced by the Contractor at no additional cost to the Contracting Agency.

#### **212.02.06 SUBSTITUTION OF PLANTS**

- A. No substitution of plant material will be permitted unless evidence is submitted in writing to the Engineer that a specified plant cannot be obtained and has been unobtainable since

the award of the contract. If substitution is permitted, it can be made only with written approval by the Engineer. The nearest variety, size, and grade as approved by the Engineer shall then be furnished.

#### **212.02.07 TEMPORARY STORAGE**

- A. Plant material delivered and accepted at the project site shall be planted immediately. Plants that cannot be planted within 1 day after arrival shall be "held" in accordance with accepted horticultural practice, and as follows:
  - 1. Balled and burlapped plants shall have the root ball protected by moist earth, sawdust, or other acceptable material.
  - 2. Container grown plants shall be placed under shelter and kept moist. Plants stored under temporary conditions shall be protected at all times from extreme weather conditions, and shall be kept moist.

#### **212.02.08 PLANTING SOIL**

- A. Planting soil shall conform to the applicable requirements of Section 726, "Roadside Materials."

#### **212.02.09 LUMBER**

- A. Lumber for header boards and planter boxes, as may be called for on the plans, shall conform to the requirements of Section 718, "Timber."

#### **212.02.10 MULCH**

- A. Hay or straw, wood cellulose fiber, wood chips and bark shall conform to the applicable requirements of Subsection 726.03.04, "Mulch."

### **CONSTRUCTION**

#### **212.03.01 SITE PREPARATION**

- A. This work shall consist of all work necessary, as set forth in the contract documents, such as roadway construction, drainage facilities, grading, cleaning, etc., to prepare the area for the actual landscaping work. All work as set forth herein shall be completed and approved by the Engineer prior to beginning any preparation of the planting areas.

#### **212.03.02 LAYOUT OF PLANTING**

- A. The Contractor will designate, by means of stakes or other approved markings, the ground location of each randomly placed plant. Areas of massed or uniform solid plantings shall be marked at their outer extremes only. The Engineer's approval of plant stakeout will be required prior to the commencement of the preparation of planting areas.
- B. In mixed planting areas, trees shall be planted first, followed by the larger shrubs, low shrubs, and the final planting or ground covers.

#### **212.03.03 PREPARATION OF PLANTING AREAS**

- A. During the preparation of planting areas, all clods, rocks, or other debris over 1 inch in dimension shall be removed from both cultivated areas and backfill material, and disposed of as directed by the Engineer. In addition thereto, the following requirements will apply:

1. **Planter Boxes:** Backfill material shall consist of 1 part organic matter to 3 parts soil by volume. This material shall be thoroughly and uniformly mixed before placing in the planter boxes. After placing in the planter box, the material shall be watered until it is completely saturated. Sufficient backfill mixture shall be added and adequately wet so that after settlement has taken place, the material is approximately 2 inches below the top of the box.
2. **Planting Beds:** The soil preparation shall not be initiated until all grading has been completed and the irrigation system has been installed, tested, adjusted, and accepted by the Engineer. The ground surface within the area shall then be loosened and thoroughly pulverized to a depth of 6 inches. When required, organic matter, commercial fertilizer, or agricultural minerals and other additives shall be incorporated at the rate specified in the contract documents, and shall be thoroughly and uniformly tilled into the soil to a depth of 6 inches. The area shall then be brought to a plane in conformance to the elevations shown on the plans.
3. **Seed Beds:** The soil preparation shall be the same as specified for planting beds.
4. **Planting Holes:** Prior to drilling holes, the proposed location of the irrigation lines shall be designated by means of stakes or other approved markings. In the event of conflict between individual planting holes and irrigation lines, the planting holes in question shall be relocated under the direction of the Engineer.
  - a. All holes shall be drilled with a power auger to the dimensions specified in the contract documents unless otherwise approved by the Engineer. Holes shall be drilled at the location of each individual plant, the stake or marking being considered the center of the hole. The holes shall have vertical walls and horizontal bottoms.
  - b. When required, organic matter, commercial fertilizer, or agricultural minerals and other additives shall be incorporated at the rates specified in the contract documents and shall be thoroughly and uniformly mixed with the material removed from the holes prior to backfilling. After backfilling the holes, the material shall be saturated with water to the full depth of the hole and until ponding appears in the basin. Sufficient backfill material shall be placed so that after planting and settlement has taken place, the basin will conform to the section as shown in the plans.
5. **Planting Trenches:** Trenches shall be excavated to the dimensions specified in the contract documents and shall be centered on the planting line as staked or otherwise marked. When required, organic matter, commercial fertilizer, or agricultural minerals and other additives shall be incorporated at the rates specified in the contract documents and shall be thoroughly and uniformly mixed with the material removed from the trenches prior to backfilling. After backfilling the trenches, the material shall be saturated with water to the full depth of the trench. Cross checks may be formed as necessary to permit ponding of water during the saturation period but must be removed prior to planting. Sufficient backfill material shall be placed so that after planting and settlement has taken place, the basin will conform to the section as shown in the plans.

#### 212.03.04 PLANTING

- A. No planting shall be done in any area until the Contractor has received the Engineer's approval that the area concerned has been satisfactorily prepared as provided in Subsection 212.03.03, "Preparation of Planting Areas."

- B. No more plants shall be distributed within the project area on any 1 day than can be planted and watered on that day.
- C. Any planting done in soil that is too wet or dry or not properly conditioned as provided herein will not be accepted. No payment will be made for such planting and any further planting work will be suspended until the Contractor has complied in every way with the specifications.
  - 1. **Plants (Group A):** Nursery stakes supporting plants in containers shall be removed and the plants pruned, if necessary, as specified herein, after planting.
    - a. Containers shall be cut 3 times from top to bottom.
    - b. Plants shall be removed from the containers in such a manner that the ball of earth surrounding the roots is not broken, and the plants shall be planted and watered as hereinafter specified immediately after removal from the containers.
    - c. Containers shall not be cut prior to delivery of the plants to the planting areas.
  - 2. **Plants (Group B):** Balled and burlapped material shall have all strings or cords cut, and the burlap shall be laid back from the top half of the ball. This shall be done only after the plant is placed in its final position and before completion of the backfill.
  - 3. **Plants (Group C):** As soon as each plant is removed from its container, it shall be planted in the prepared planting bed, in a hole previously prepared with a broad, blunt end trowel. The plant shall be carefully lifted with the trowel, inserted in the hole, and the earth shall be gently firmed and watered around it to eliminate air pockets.
    - a. Plants brought to the jobsite in plastic or clay pots shall be tapped loose from their containers in such a manner that the ball of earth surrounding the roots is not broken, and then immediately planted. Plants which are brought to the jobsite in peat pots may be planted in the pots. No plants brought to the jobsite in pony pacs or bare root will be accepted.
    - b. Plants shall be watered as hereinafter specified immediately after planting.
    - c. Roots of plants not in containers shall be kept moist and covered at all times and shall not be exposed to the air except while actually being placed in the ground.
    - d. Plants shall be set in a plumb position in the backfill mixture material to such a depth that, after the soil has settled, the top of the plant ball will be 2 inches below finished grade.
    - e. Plants shall be planted in such a manner that the roots will not be restricted or distorted. Soil shall be firmed around the roots or ball of the plant during planting operations by foot tamping or saturation with water. Any plants which have settled deeper than specified in the above paragraph shall be raised back to the required level, or replaced, at the option of the Contractor.
  - 4. **Plants (Group D):** The seed bed shall be in a moist, friable condition when seeding is begun. Seeding shall be done as soon as soil conditions allow after the initial watering of the amended soil. Seeding done in soil that is too wet or too dry, or in a condition not generally accepted as satisfactory for lawn seeding will not be accepted. No payment will be made for seeding when the soil condition is considered unsatisfactory and any further seeding work will be suspended until the Contractor has complied in every way with these provisions.

- a. Seed shall be sown from standard mechanical grass seeding equipment with adjustable gate, as appropriate to the area, and at the rate shown on the plans. After sowing, the seed shall be embedded by light rolling. The Contractor shall exercise care to avoid leaving footprints or other depressions in the compacted seed bed.
- b. Organic mulch shall be evenly applied immediately after the seed bed has been firmed, with manure spreaders, mulch blowers or other approved equipment. The mulch shall be spread at the rate of 1 cubic yard per 1,000 square feet. As soon as mulch is in place, the surface of the seed bed shall be dampened with a fine spray from a nozzle until the mulch is thoroughly moist.

#### **212.03.05 STAKING AND GUYING**

- A. All staking and guying shall be done concurrently with the planting operation.
  1. **Staking:** Plants that are to be staked will be specified in the contract documents.
    - a. The size, number of stakes, and the depth to be driven shall be as specified in the contract documents, or as approved by the Engineer.
    - b. The stakes shall be placed against but not through the plant ball in the case of plants (Groups A and B).
  2. **Tree Ties:** The method of attaching the ties to stakes and trees shall provide firm connection, but the trunk loop shall be sufficiently loose to prevent damage to the bark. It may, on occasion, as determined by the Engineer, be considered necessary to use number 10 gage galvanized wire encased in at least 1/2-inch rubber hose as tree ties, in which case all connections shall be twisted.
  3. **Guying:** Plants that are to be guyed will be specified in the contract documents.
    - a. All guying shall be done as specified in the contract documents or as approved by the Engineer.

#### **212.03.06 PRUNING**

- A. Pruning shall be done as determined by the Engineer after plant materials are planted.
- B. Pruning of evergreen coniferous plants will not be permitted except under the direction of the Engineer.

#### **212.03.07 WATERING**

- A. The Contractor shall make arrangements for furnishing and applying water at no additional cost to the Contracting Agency.
- B. Valves at meters shall be kept closed at all times, except while the irrigation system is actually in use.
- C. Precautions shall be taken during times when the irrigation system is on to prevent water from wetting vehicles, pedestrians, and pavement. Any erosion, slippage, or settlement of the soil caused by watering shall be repaired by the Contractor at no additional cost to the Contracting Agency.
- D. Compliance with the provisions in this section shall not relieve the Contractor of responsibility for the replacement of plants as provided hereinafter.

**1. Plants (Groups A and B):**

- a. All plants shall be watered immediately after planting. Water shall be applied in a moderate stream until the backfill soil around and below the roots or ball, or earth around each plant, is thoroughly saturated. Where watering is done with a hose, a metal or plastic pressure reducing device approved by the Engineer shall be used. Under no circumstances shall the full force of the water from the open end of a hose be allowed to fall within the basin around any plant.
- b. After the first watering, water shall be applied to all plants as often and in sufficient amount as conditions may require to keep the soil moist, above, around, and below the root systems of the plants during the life of the contract. After the installed irrigation system has been accepted, it may be used to water the planted area.
- c. Any additional watering measures required to initially saturate the backfill, water the plants immediately after planting, or to maintain the plants in a satisfactory growing condition shall be anticipated and furnished by the Contractor at no additional cost to the Contracting Agency.

**2. Plants (Group C):**

- a. As soon as all the perennials in a given area have been planted, water shall be applied to that area in a fine mist from an atomizing nozzle until the entire planting bed is saturated. This initial watering shall not be done with the installed irrigation system.
- b. After the first watering, water shall be applied to the areas as often and in sufficient amount as conditions may require to keep the soil wet, above, around, and below the root systems of the plants during the life of the contract.

**3. Plants (Group D):**

- a. The seed bed shall be kept in moist but not soggy condition until after germination. After germination, water shall be applied to the areas as often and in sufficient amount as conditions may require during the life of the contract.
- b. The installed turf irrigation system may be used to water those areas as long as care is taken to prevent erosion or other damage to the area. However, should the irrigation system prove to be unsatisfactory, other means of watering, as approved by the Engineer, shall be used until germination is complete and all grass has attained a height of 1 inch. After a uniform stand of grass which has attained a height of 1 inch has been achieved over the entire turf area, the installed turf irrigation system may be used to keep the area moist.

**212.03.08 REPLACEMENTS****1. Plants (Groups A, B, and C):**

- a. During the planting and plant establishment period of the project, all plants that show signs of failure to grow normally or which are so injured or damaged as to render the plants unsuitable for the purpose intended, as determined by the Engineer, shall be removed and replaced in kind. The Engineer will

inspect the work on the first and second working day of each week during the planting and plant establishment periods, and will mark or otherwise indicate all plants to be replaced. The Contractor shall complete replacement of such plants as soon as possible, but in no case shall the Contractor take more than 2 weeks to complete the replacement.

- b. Replacement plants shall be furnished and planted by the Contractor at no additional cost to the Contracting Agency.
- 2. **Plants (Group D):** The Engineer will inspect the turf at the time of the first cutting and will designate any areas which need reseeding. Seed used for reseeding shall be the same types and amounts as specified for the initial planting and shall be planted in accordance with the contract documents or as directed by the Engineer. The cost of the seed and actual reseeding shall be borne by the Contractor.

#### **212.03.09 FERTILIZERS, AGRICULTURAL MINERALS AND ADDITIVES**

- A. When fertilizers or other agricultural minerals or additives are called for, the fertilizers, minerals, and additives shall be applied at the rates and as specified in the contract documents or as approved by the Engineer.

#### **212.03.10 PROTECTION OF EXISTING FACILITIES**

- A. Any existing buildings, equipment, piping, pipe covering, sprinkling systems, sewers, sidewalks, landscaping, utilities, roadways, or any other improvement of facilities damaged due to the Contractor's operations shall be repaired or replaced by the Contractor at no additional cost to the Contracting Agency as directed by the Engineer.

#### **212.03.11 PLANT ESTABLISHMENT WORK**

- A. This work shall consist of watering and caring for all of the plants and planting areas, the replacement of plants, the weeding and general maintenance as specified in the contract documents.
- B. The plant establishment period shall begin at such time as all planting has been accomplished and all other work has been completed and the project is in a neat and clean condition.
- C. The length of the plant establishment period shall be as specified in the contract documents.
- D. The Engineer will notify the Contractor in writing of the start of the plant establishment period and will furnish statements regarding days credited to the plant establishment period after said notification.
- E. The time required for plant establishment work shall be considered as included in the total time limit specified for the contract. Any day upon which no work is required, as determined by the Engineer, will be credited as one of the plant establishment days regardless of whether the Contractor performs plant establishment work.
- F. Any day when the Contractor fails to adequately water plants, replace unsuitable or damaged plants, do weed control, adjust or replace bracing and ties, or other work, as determined necessary by the Engineer, will not be credited as one of the plant establishment days. No extension of contract time will be granted beyond the final completion date by reason of failing to perform plant establishment work on days when such work is necessary.



- G. All plants shall be kept watered as provided in Section 210, "Watering."
- H. Surplus earth, papers, trash, and debris, which accumulate in the planted areas shall be removed and disposed of in accordance with the provisions in Subsection 107.14, "Disposal of Material Outside Project Right-of-Way," and the planted areas shall be so cared for as to present a neat and clean condition at all times. During the plant establishment period, trees and shrubs shall be pruned or headed back by the Contractor at no additional cost to the Contracting Agency, when and as directed by the Engineer.
- I. In order to carry out the plant establishment work, the Contractor shall furnish sufficient men and adequate equipment to perform the work during the plant establishment period.

#### METHOD OF MEASUREMENT

##### **212.04.01 MEASUREMENT**

- A. The quantity of materials and work measured for payment will be materials and work complete and in place. The various items will be measured in the manner and in the units as follows:
  - 1. Site preparation will be measured by the acre or square foot.
  - 2. Planting soil will be measured by the cubic yard.
  - 3. Preparing soil (plant boxes) will be measured by the cubic foot.
  - 4. Preparing soil (plant bed) will be measured by the square foot.
  - 5. Fertilizer or agricultural minerals will be measured by the pound determined by marked quantities and sack count, by the ton, by each stick or pellet, or by the gallon, all as designated in the proposal.
  - 6. Organic matter will be measured by the cubic yard, or determined by marked quantities and sack count.
  - 7. Mulch will be measured by the cubic yard or determined by marked quantities and sack count.
  - 8. Hole preparation will be measured by the actual number of holes prepared.
  - 9. Trench preparation will be measured by the linear foot and the depth and width of the trench will be designated in the contract documents.
  - 10. Tree rings will be considered incidental to "Hole Preparation" and there will be no measurement or payment therefor.
  - 11. Mowing strips will be measured by the number of linear feet along the top of the strip.
  - 12. Planter boxes will be measured by the number of boxes placed on the project that conform to the sizes specified in the contract documents.
  - 13. Header boards will be measured by the thousand foot board measure (Mfbm).
  - 14. Plants in Groups A through C will be measured by the number of plants in each group.
  - 15. Plants in Group D will be measured by the square foot in place.
  - 16. The unit of measure for Plant Establishment Work will be lump sum.

- B. All measurements will be made in accordance with Subsection 109.01, "Measurement of Quantities."

### BASIS OF PAYMENT

#### 212.05.01 PAYMENT

- A. The accepted quantities for items of this section measured as provided in Subsection 212.04.01, "Measurement," will be paid for at the contract unit price bid for the type, size, group, or whatever information is necessary for identification, and so identified in the proposal. Such payment shall be full compensation for all the labor, materials, and incidentals necessary to complete the work.
- B. Water will be considered subsidiary to the major items of work and no further compensation will be allowed therefor.
- C. All payments will be made in accordance with Subsection 109.02, "Scope of Payment."
- D. Payment will be made under:

| PAY ITEM  | PAY UNIT                   |
|---|----------------------------|
| Site Preparation including removal of excess soil ..... | Acre, Square Foot          |
| Planting Soil .....                                     | Cubic Yard                 |
| Preparing Soil (plant boxes) .....                      | Cubic Foot                 |
| Preparing Soil (planting bed) .....                     | Square Foot                |
| Fertilizer (type and class) .....                       | Pounds, Ton, Each, Gallons |
| Organic Matter (type) .....                             | Cubic Yard                 |
| Mulch (type) .....                                      | Cubic Yard                 |
| Hole Preparation .....                                  | Each                       |
| Trench Preparation .....                                | Linear Foot                |
| Mowing Strips .....                                     | Linear Foot                |
| Planter Boxes (type, size) .....                        | Each                       |
| Header Boards (type, lumber, size) .....                | Mfbm                       |
| Plants (Group A - C) .....                              | Each                       |
| Plants (Group D) .....                                  | Square Foot                |
| Plant Establishment Work . . . .                        | Lump Sum                   |

## SECTION 501

### PORTLAND CEMENT CONCRETE

#### DESCRIPTION

##### 501.01.01 GENERAL

- A. This work shall consist of Portland cement, fine aggregate, coarse aggregate, water and when specified, an air entraining admixture, proportioned, mixed, placed, and cured as herein specified. All concrete shall meet the most current requirements of American Concrete Institute (ACI) with the following additions and/or exceptions indicated in this specification.
- B. As used in this section, the term Portland Cement shall be considered synonymous with the term Hydraulic Cement.

##### 501.01.02 QUALITY CONTROL TESTING AND INSPECTION

- A. The testing and inspection of Portland cement concrete shall comply with this specification. The inspection of the mixing plant shall comply with the ACI 311, Chapter 2. In Clark County unincorporated areas and if required by other Contracting Agencies, all field and laboratory sampling and testing for project control shall be performed by NAQTC or ACI certified technicians in an AASHTO or A2LA accredited laboratory. The concrete designs shall comply with Tables 1 and 2 and the IQAC website [http://www.accessclarkcounty.com/depts/public\\_works/pages/iqac.aspx](http://www.accessclarkcounty.com/depts/public_works/pages/iqac.aspx) or comply with Contracting Agency requirements.

#### MATERIALS

##### 501.02.01 GENERAL

- A. Materials shall meet the requirements of the following sections and subsections:

| Materials                                | Section |
|--|---------|
| Aggregate for Portland Cement Products   | 706     |
| Concrete Curing Materials and Admixtures | 702     |
| Portland Cement                          | 701     |
| Water                                    | 722     |

##### 501.02.02 GRADATION REQUIREMENTS

- A. Refer to ACI 304 Chapters 2.1 and 2.2, and comply with the gradation requirements specified in Section 706, "Aggregates for Portland Cement Products," and the following:
  - 1. The gradation requirements represent the extreme limits in determining the suitability of material. The gradation from any one source shall maintain a uniformity such that variations in the fineness modulus will not exceed 0.2 from the "Base Fineness Modulus."
    - a. The "Base Fineness Modulus" shall be the average of the most recent 10 fineness modulus values (or the average of all preceding values if less than 10 have been completed) from any one source.

- b. Fine aggregate from any one source having a variation in fineness modulus exceeding  $\pm 0.2$  as prescribed above will be rejected, or at the discretion of the Engineer, may be accepted subject to approved changes.
  - c. The fineness modulus of fine aggregate shall be determined by adding the cumulative percentages, by weight, of material retained on each of U.S. Standard sieves No. 4, No. 8, No. 16, No. 30, No. 50, and No. 100, and dividing by 100.
- 2. Fine aggregates from different sources of supply shall not be mixed or stored in the same stockpile and shall not be used alternately in the same class of construction or job mix without written permission. Such permission will be contingent on amending the job mix and batch masses as necessary to protect the quality of the concrete produced.
  - 3. If the fine aggregate for a job mix is to be a composite material from 2 or more sources, material from respective sources shall be blended by methods that will maintain the degree of uniformity of gradation required by these specifications.
  - 4. Adequate supplies of aggregate shall be produced and stockpiled sufficiently in advance of construction operations to permit sampling and testing before use.
  - 5. Coarse aggregates which vary in gradation shall be placed in separate stockpiles or bins and recombined in approved proportions. Different sizes of aggregates shall be stored in stockpiles sufficiently removed from each other to prevent the materials from becoming intermixed.
  - 6. If the Contractor changes the source of any size of aggregate, a new mix design shall be submitted to the Engineer for approval.

### **501.02.03 ADMIXTURES**

- A. Refer to ACI 212. Air-entraining admixtures and water reducers and retarders shall conform to the requirements of Subsection 702.03.02, "Air-Entraining Admixtures," and Subsection 702.03.03, "Admixtures Other Than Air-Entraining."
- B. Admixtures that are not listed in the mix design shall not be used without written permission from the Engineer, except as otherwise provided in these specifications or in the Special Provisions.
- C. Admixtures used in Class EA Concrete, Modified shall be an approved chemical admixture for concrete, meeting the requirements of ASTM C494. Use Type "A" admixture when the anticipated high temperature for the day is 80 degrees F or below. Type "D" admixture shall be used when the anticipated high temperature is above 80 degrees F. The water-cement ratio shall not be adjusted once the chemical admixture has been incorporated into the mix.
- D. Admixtures shall not be used to replace cement. Admixtures containing chlorides as  $\text{Cl}^-$  in excess of 1 percent by weight shall not be used in prestressed concrete. If admixtures are used to entrain air, to reduce the water-cement ratio, to retard or accelerate setting time, or to accelerate the development of strength, the admixtures shall be used at the dosage specified in the mix design, or in the contract documents, or as provided by the Engineer.
- E. When the use of an air-entraining agent is specified, it shall be added in a quantity conforming to Table 2 in Subsection 501.03.04, "Classifications and Proportions." It shall be measured into each batch by equipment and methods approved by the Engineer. Adjustments shall be made in the weights of the aggregates used per batch to compensate for increased yield due to air-entrainment so that the quantities of cement per

- cubic yard of concrete remain constant. Such adjustments shall be made by decreasing the weight of fine aggregate without changing the weight of coarse aggregate unless otherwise approved by the Engineer.
- F. When a High Range Water Reducing admixture is used, the initial slump is waived and the slump of the concrete after the admixture is added shall not exceed 8 inches.
  - G. Admixtures shall be measured accurately into each batch by methods approved by the Engineer.
  - H. Except as otherwise provided for air-entraining agents, samples of admixtures proposed for use shall be submitted by the Contractor to the Engineer in advance of intended use to permit tests to be made to determine compliance with claimed properties.
  - I. Any type of admixture shall be uniform throughout its use in the work. Should it be found that the admixture as furnished is not uniform, its use shall be discontinued.
  - J. Admixtures shall be dispensed in liquid form. Dispensers for admixtures shall have sufficient capacity to measure at one time the full quantity required for each batch. Unless admixtures are added to premeasured water for the batch, their discharge into the batch shall be arranged to flow uniformly into the stream of water. Dosages of admixtures shall not vary from the dosage indicated in the mix design or as approved by the Engineer by more than 5 percent, with the exception of air entraining admixtures where the dosage is required to achieve the specified range. Equipment for measurement shall be designed for convenient confirmation of the accuracy of measurement. If more than one admixture is used, each shall be dispensed by separate equipment unless otherwise permitted in writing by the Engineer.
  - K. When water-reducing agents or water-reducing retarders are used, the permitted dosage of the admixture shall not exceed that which will result in an increase in the drying shrinkage of the concrete of 20 percent when used in precast, prestressed concrete; 10 percent when used in cast-in-place prestressed concrete; 10 percent when used in cast-in-place reinforced concrete; or 3 percent when used in non-reinforced concrete pavements.
  - L. Water reducers shall reduce the water demand of concrete for a given slump at least 7 percent when used at the maximum dosage recommended by the manufacturer. Set retarders shall not be used in greater dosages than those recommended by the manufacturer, nor more than that needed to obtain the desired retardation. The strength of the concrete containing the admixture in the amount approved by the Engineer shall at the age of 48 hours and longer, be not less than that of similar concrete without the admixture.
  - M. When the Contractor proposes to use an air-entraining admixture which has been previously approved, the Contractor shall submit a certification stating that the admixture is the same as that previously approved.
  - N. If an admixture offered for use is essentially the same (with only minor differences in concentration) as another previously approved material, a certification will be required stating that the product is essentially the same as the approved admixture and that no other admixture or chemical agent is present.
  - O. Before or during construction, the Engineer may require that the admixture selected be further tested to determine its effect upon the strength of the concrete. The 7-day compressive strength of concrete containing the admixture under test shall not be less than 88 percent of the strength of concrete made with the same materials, the same cement content, and consistency, but without the admixtures.

- P. Subject to the following conditions, pozzolan conforming to Subsection 702.03.04, "Pozzolans (Fly Ash)," shall be used to a minimum of 20 percent and a maximum of 35 percent, by weight, of the required Portland cement in concrete, or as required by the Engineer.
1. The replacement of cement with pozzolan shall be at a rate of 1 pound of pozzolan for each pound of Portland cement.
  2. Silica fume may be used to replace 3 percent to 7 percent, by weight, of the total cementitious material.
  3. Store pozzolan in separate weather-tight facilities.

#### 501.02.04 CONCRETE MAKING PROPERTIES

- A. The mix design procedure shall comply with the method indicated on the IQAC website (see Subsection 501.01.02, "Quality Control Testing and Inspection"). The type of cement permitted, the minimum sacks of cement required, and the maximum water/cement ratio shall be as shown in Table 1.

| <b>Table 1 - Cements Permitted, Sack Requirements, and W/C Ratio</b> |   |                                   |
|--|---|-----------------------------------|
| <b>Type of Cement Permitted</b>                                      | <b>Minimum Sacks of Cement Per Cubic Yard<sup>3</sup></b> | <b>Maximum Water/Cement Ratio</b> |
| Type II & Fly Ash  | 6.5 <sup>2, 3</sup>                                       | 0.45                              |
| Type MS & Fly Ash  | 6.5 <sup>1, 2</sup>                                       | 0.45                              |
| Type 1-P (MS)  | 6.5   | 0.45                              |
| Type V   | 6.5 <sup>3</sup>  | 0.45                              |
| Type HS  | 6.5 <sup>2</sup>  | 0.45                              |
| Type V & Fly Ash   | 6.0 <sup>2, 3</sup>                                       | 0.45                              |
| Type HS & Fly Ash  | 6.0 <sup>1, 3</sup>                                       | 0.45                              |

- B. The testing frequency shall comply with the Contracting Agency requirements or the Special Provisions.
- C. Prior to mix design approval, the Contracting Agency reserves the right to verify the mix design test results, using the sources and proportions of materials as indicated by the mix design.
- D. The mix design submittal shall include the information indicated in the concrete design report form on the IQAC website.

#### 501.02.05 ZERO SLUMP CONCRETE FOR THE MANUFACTURING OF PRECAST CONCRETE PRODUCTS

- A. Concrete products manufactured by the zero slump method shall comply with Subsection 501.02.03, "Admixtures" and Subsection 501.02.04, "Concrete Making Properties." Zero slump concrete shall also exhibit design and performance requirements meeting IQAC and relevant ASTM specifications. Air entrainment is not required in a dry cast manufacturing process.

<sup>1</sup> Maximum of 8 sacks.

<sup>2</sup> Sacks per cubic yard before replacement with fly ash.

<sup>3</sup> 5.0 sacks per cubic yard for precast products, pipe and box, with zero slump mix design.

- B. For zero slump concrete, all other parts of this Section 501, "Portland Cement Concrete," do not apply.

**501.02.06 LOW SLUMP CONCRETE FOR THE MANUFACTURING OF EXTRUDED SLIP FORM CONCRETE**

- A. Extruded slip form concrete shall comply with material requirements contained in Table 1, above, and with design and performance requirements meeting IQAC and relevant ACI specifications. The plastic properties may be adjusted on-site with an appropriate type admixture to ensure compliance with Subsection 501.03.04, "Classification and Proportions," and to aid Contractor in placement and finishing of low slump slip form concrete.

**501.02.07 SELF-CONSOLIDATING CONCRETE**

- A. The Contractor's use of self-consolidating concrete shall require the approval of the Engineer and shall be subject to the following requirements:
1. Substitutions. Class S concrete may be substituted for selected applications for classes A, D, Modified A, and Modified D; and Class SA concrete may be substituted for selected applications for classes AA, DA, PAA, Modified AA, and Modified DA, as approved by the Engineer.
  2. Trial Placement.
    - a. The Contractor shall submit details of a representative test section (mockup) for approval.
    - b. Produce a trial batch of classes S and SA concrete, conforming to the proposed mix design.
    - c. As part of the concrete placement demonstration, provide the labor, equipment, and materials to test the concrete. Evaluate the mixture for strength, air content, slump flow, visual stability index, J-ring value, and hardened visual stability index.
    - d. Place a test section when the atmospheric conditions approximate the conditions anticipated for placing the final work. Finish and cure the mockup according to this section.
    - e. If it is determined that the trial batch is not workable or not able to be properly placed or finished, modify the mix design or batching sequence. Submit the revised mix design and batching sequence to the Engineer, and place another test section. Repeat the submittal and trial pour process until a workable and finished trial batch is produced.
    - f. Do not place any Class S and SA concrete until the Engineer accepts the mockup pour.
    - g. A new mix design and a new trial pour will be required whenever there is a change in the source of any component material.
    - h. Segregated concrete, as determined by NV Test Method SCC-2, shall not be incorporated into any component of the anticipated concrete work.
    - i. When a truck mixer or agitator is used for transporting concrete, deliver the concrete to the site of the work and complete discharge within 60 minutes after the introduction of the mixing water to the cement and aggregates, or the introduction of the cement to the aggregates. In hot weather, or under

conditions contributing to quick stiffening of the concrete, a mixing and delivery time of less than 60 minutes may be required. A mixing and delivery time exceeding 60 minutes may be approved by the Engineer if a trial pour is performed with satisfactory results.

- j. Place each successive batch within a maximum time interval of 20 minutes. Place the concrete in continuous layers. When it is necessary by reason of emergency or other delay, to place less than a complete horizontal layer in one operation, terminate each layer by using a vertical bulkhead. Do not rod or vibrate the concrete to attempt restoring the fluidity to the mix. Plan and regulate the delivery of concrete so that minor interruptions due to form repair, material testing, etc. will not impact the required 20-minute time interval between successive placements.
3. Concrete Slump Requirements. Except for concrete used in drilled shafts, the requirements of NV Test Method T438 will be performed at 2 hours, 3 hours, or for extended times depending on the concrete placement duration.
4. Drilled Shafts. Use Class S or SA concrete for drilled shaft construction. Upper portions of drilled shafts (top of shaft down to bottom of embedded vertical column reinforcing) may be constructed using the column concrete mix.

## CONSTRUCTION

### 501.03.01 EQUIPMENT

- A. With the exception of items indicated in Subsection 501.03.05, "Proportioning Methods," and Subsection 501.03.06, "Machine Mixing," the measurement of materials and batching shall comply to the ACI 304, Chapters 3 and 4 recommendations and those in this section or as approved by the Engineer.
  1. Certify concrete production facilities and delivery equipment by complying with National Ready-Mix Concrete Association certification requirements.
  2. Methods employed in performing the work and all equipment, tools, and machinery used for handling materials and executing any part of the work shall be subject to the approval of the Engineer.
  3. All equipment necessary shall be on hand and approved before concrete operations are begun by the Contractor.
- B. Provide adequate internal vibrating equipment, including power, to enable the Engineer to fabricate concrete cylinders for testing purposes.
- C. Furnish internal vibrators with rigid or flexible shafts, preferably powered by electric motors, capable of operating at a frequency of 7,000 vibrations per minute or greater.
  1. The outside diameter or the side dimensions of the vibrating element shall be at least 3/4 inch and not greater than 1-1/2 inches.
  2. The length of the shaft shall be at least 24 inches.
- D. The Contractor shall maintain the equipment in good condition and adjustment. Concrete mixers and other equipment which are not adequate or suitable for the work shall be removed and suitable equipment shall be provided by the Contractor.



**501.03.02 PROTECTING AND SAMPLING CEMENT**

- A. Suitable means of storing and protecting the cement against moisture or other injurious effects shall be provided by the Contractor. Sacked or bulk cement which, for any reason, has become partially set or which contains lumps of caked cement shall be rejected and shall be immediately removed from the worksite.
- B. Different brands of cement shall not be mixed during use or in storage, nor shall different brands be used alternately in any one structure. The same brand and kind of cement shall be used in a given structure above the ground line. A change in brand of cement will require a new mix design.
- C. The sacked cement shall be so piled as to permit access for tally, inspection, and identification of each shipment.
- D. The Contractor shall obtain from the cement company from which the cement is purchased, a certificate stating that the cement delivered to the work complies with the specifications for the type of cement specified for use, with tests pertaining to the delivered lot. The certificate shall be dated, signed, and indicate the quantity of shipment. Two copies shall be delivered directly to the Engineer.
- E. Upon receipt of the certificate of compliance, the Engineer may permit the use of the cement. When a certificate of compliance is not furnished to the Engineer, the cement shall not be used in the work until a release for its use has been received by the Contractor from the Engineer.
- F. Whenever it is determined by a laboratory test of mill or field samples that the cement does not comply with the specifications, the use of that cement will be suspended until tests by a third party paid for by the Contractor can be made and the test results are approved by the Engineer.
- G. All cement not conforming to the specifications and all cement damaged by exposure to moisture shall be removed immediately and permanently from the work.

**501.03.03 STORAGE OF AGGREGATES**

- A. Refer to ACI 304, Chapter 2.2.3. The handling and storage of aggregates shall be such as to prevent segregation or contamination by foreign materials.
- B. Maintain aggregate stockpiles in saturated surface dry condition.
- C. In placing materials in storage or in moving materials from storage to the mixer, any method which may cause the segregation, degradation, or the combining of material of different gradings which will result in any stockpile or bunker material failing to meet specified requirements shall be discontinued and the materials shall be reprocessed or wasted.

**501.03.04 CLASSIFICATION AND PROPORTIONS**

- A. For non-commercial sources, the Contractor shall notify the Engineer not less than 30 calendar days in advance of use of the proposed sources of materials and shall make arrangements for the Engineer to obtain samples as required for testing purposes.
  - 1. The sources of materials to be used on a project shall not be changed during the job except with the written consent of the Engineer.
  - 2. If permission to change sources of material is granted, a new job mix formula shall be required.
  - 3. Samples shall not exceed 500 pounds for each separate grading.

- B. When requested by the Contractor, exceptions to the above requirement may be granted in writing by the Engineer under either of the following conditions:
1. The concrete structures on the project are minor in nature, such as culvert headwalls, manholes, small boxes, sidewalks, etc., generally, when less than 100 cubic yards of concrete are called for on the project.
  2. When the aggregate source has been previously tested within the past 1 year and accepted by the Contracting Agency.
- C. The Contractor shall give the Engineer advance notice in writing when any changes are to be made in the batch proportions. In the case of Class EA concrete, no changes will be allowed without new laboratory trial testing and subsequent approval.
- D. Batches of concrete shall not vary more than  $\pm 3$  pounds per cubic foot in unit weight from design mix. The cement factor of any individual batch placed in the work shall not be more than 14 pounds per cubic yard less, nor more than 23 pounds per cubic yard greater than the designated cement factor. Batch aggregates and report by weight to the Engineer. The weights used may be varied as necessary to comply with the above tolerances in cement factor and unit weight.
- E. For Class EA Concrete, Modified, perform laboratory trial tests to determine strength and compatibility of all materials (as specified in Table 2 of this subsection and in Subsection 501.02.03, "Admixtures") to be used. Contractor shall have an approved laboratory perform the tests and furnish documentation of such tests. Laboratory trial batches may be observed by the Engineer.

| <b>Table 2 - Concrete Mix Designation<sup>4, 5</sup></b> |   |   |   |                           |                              |  |  |
|--|---|---|---|---------------------------|------------------------------|--|--|
| <b>Class of Concrete</b>                                 | <b>Cementitious Range lb/yd<sup>3</sup></b> | <b>Max. Nom. Coarse Aggregate Size inches</b> | <b>Min. 28-Day Compressive Strength<sup>6</sup> psi</b> | <b>Slump Range inches</b> | <b>Entrained Air Range %</b> | <b>Unit Weight Variation lb/ft<sup>3</sup></b> | <b>Use</b>                                 |
| A  | 564-705                                     | 1-1/2   | 3000  | 1-4                       | 4-7                          | $\pm 3$  | General use and reinforced structures      |
| AA   | 564-705                                     |   |   |                           |                              |  |  |
| B  | 517-705                                     | 2   | 3000  | 1-5                       | 4-7                          | $\pm 3$  | Massive or lightly reinforced sections     |
| BA   |   |   |   | 1-4                       |                              |  |  |
| C  | 470-611                                     | 2-1/2   | 2500  | 1-5                       | 4-7                          | $\pm 3$  | Massive unreinforced and backfill          |
| CA   | 517-658                                     |   |   |                           |                              |  |  |
| D  | 564-705                                     | 3/4   | 3000  | 1-4                       | 4-7                          | $\pm 3$  | Thin reinforced sections, hand rails, etc. |
| DA   | 564-752                                     |   |   |                           |                              |  |  |
| PA A   | 564-752                                     | 3/4   | Specified on Plans                                      | 1-4                       | Specified on Plans           | $\pm 3$  | Prestressed members                        |
| Modified   | 564-752                                     | 1-1/2   | Specified on  | 1-4                       | 4-7                          | $\pm 3$  | Where specified on                         |

<sup>4</sup> Blend the coarse aggregate gradation from stockpiles conforming to the requirements of Subsection 706.03.01, "Coarse Aggregate," and the stated nominal maximum size. Submit test reports for trial batches showing each stockpile sieve size and the proportions used for blending. Adhere to Subsection 706.02.01, "General," for the combined gradation regardless of coarse aggregate gradation. If approved, coarse aggregate nominal maximum size of 1 inch may be used in lieu of 3/4 inch.

<sup>5</sup> Air entrainment on mixes placed above 6000 feet elevation

<sup>6</sup> Comply with Subsection 501.02.04, "Concrete Making Properties," of the NDOT Standard Specifications for the moving average method of evaluating concrete specified under Statistical Evaluation of Concrete Strength.

| <b>Table 2 - Concrete Mix Designation<sup>4, 5</sup></b> |   |   |   |                           |                              |  |                             |
|--|---|---|---|---------------------------|------------------------------|--|-----------------------------|
| <b>Class of Concrete</b>                                 | <b>Cementitious Range lb/yd<sup>3</sup></b> | <b>Max. Nom. Coarse Aggregate Size inches</b> | <b>Min. 28-Day Compressive Strength<sup>6</sup> psi</b> | <b>Slump Range inches</b> | <b>Entrained Air Range %</b> | <b>Unit Weight Variation lb/ft<sup>3</sup></b> | <b>Use</b>                  |
| A and AA   |   |   | Plans   |                           | (AA only)                    |  | plans                       |
| Modified D and DA  | 564-752                                     | 3/4   | Specified on Plans                                      | 1-4 <sup>7</sup>          | 4-7 (DA only)                | ± 3  | Where specified on plans    |
| Modified EA <sup>8</sup>                                 | 564-752                                     | 3/4   | Specified on Plans                                      | 1/2 -4                    | 4-7                          | ± 3  | High Performance Concrete   |
| S and SA   | 639-925 <sup>9</sup>                        | 3/4 <sup>10</sup>                             | Specified on Plans                                      | N/A                       | 4-7 (SA only) <sup>11</sup>  | ± 3  | Self Consolidating Concrete |

### 501.03.05 PROPORTIONING METHODS

- A. Except as hereinafter noted, aggregate bins shall conform to either 1 or 2 as follows:
- Each specified size of aggregates shall be stored in a separate bin. Except as hereinafter specified, each bin shall be provided with an individual outlet gate, designed and constructed to prevent leakage when closed. The gates shall cut off quickly and completely.
  - Each size aggregate shall be weighed individually in a single bin, providing there is a satisfactory method employed to eliminate any excess material resulting from over-charging of the bin before the material reaches the surge hopper.
- B. Conformance to 1 and 2 above will not be required when batching for culvert headwalls, manholes, small boxes, sidewalks, etc., and the total quantity of concrete called for on the project does not exceed 300 cubic yards.
- C. All aggregates for use in Portland cement concrete shall be proportioned by weight, with the exception that aggregates for culvert headwalls, short pieces of curb and gutter, or small sections of sidewalk and related minor work may be proportioned either by weight or volume as the Contractor may elect. Measuring boxes of known capacity shall be furnished and used to measure each size of aggregate proportioned by volume.
- D. Water shall be proportioned to maintain batching consistency with regard to stockpile moisture contents and varying absorption values for both coarse and fine aggregates. The Engineer may request the Contractor to submit a new mix design if either the coarse or fine aggregate absorption values vary from the approved mix design by more than 1 percent.
- E. Bulk cement shall be weighed separately when the batch is 1 cubic yard or more.
- The scale and weigh hopper for the cement shall be separate and cement hopper shall be interlocked against opening before the full amount of cement is in the

<sup>7</sup> For extruding barrier or bridge rail, slump range is 0.5-4 inches.

<sup>8</sup> Aggregates shall consist of a blend of coarse, intermediate, and fine aggregates in order to produce a dense grading. Consideration of the grading, workability factor, and coarseness factor, as outlined in ACI 302 shall be utilized. The aggregate maximum nominal size shall consist of at least a nominal 3/4 inch stone size.

<sup>9</sup> The maximum shrinkage requirement of 0.06% in 28 days air dry after 28-day wet cure, ASTM C157, shall apply if the total cementitious material exceeds 752 pounds per cubic yard.

<sup>10</sup> If approved, 1/2 inch or 3/8 inch may be used in lieu of 3/4 inch.

<sup>11</sup> Air content shall be as follows: For 1/2 inch max. aggregate size, 4.5% - 7.5%, and for 3/8 inch max. aggregate size, 5% - 8%.

hopper, against closing before the contents of the hopper are entirely discharged and the scales are back in balance, and against opening when the amount of cement in the hopper is underweight by more than 1 percent of the amount specified.

2. An interlock system will not be required on projects having less than 300 cubic yards in the bid schedule.
- F. Scales utilized in the proportioning device may be of the springless dial type or of the multiple beam type.
- G. If of the dial type, the dial shall be of such size and so arranged that it may be read easily from the operating platform.
- H. If of the multiple beam type, the scales shall be provided with an indicator operated by the main beam which will give positive visible evidence of over or under weight.
  1. The indicator shall be so designed that it will operate during the addition of the last 400 pounds of any weighing.
  2. The over travel of the indicator hand shall be at least 1/3 of the loading travel.
  3. The indicator shall be enclosed against moisture and dust.
- I. Weighing equipment shall be insulated against vibration or movement of other operating equipment in the plant. When the entire plant is running, the scale reading and cutoff shall not vary from the weight designated by more than 1 percent for cement and 1-1/2 percent for any size aggregate, nor 1-1/2 percent for the total aggregate in any batch.
- J. Scales shall be approved with a certificate of inspection as required by Subsection 109.01, "Measurement of Quantities."
- K. When the entire plant is running, the scale reading and cutoff weights shall not vary from the mix design by more than 1 percent for cement, fly ash, and silica fume, 1.5 percent for any individual size aggregate, and 1 percent for the total combined aggregate in any batch. The total water shall not exceed the maximum water specified in the mix design.
- L. Should separate supplies of aggregate and material of the same size group, but of different moisture content or specific gravity be available at the proportioning plant, withdrawals shall be made from one supply exclusively and the material therein completely exhausted before starting upon another.
- M. Stockpiled aggregates shall be in a saturated surface dry condition just prior to batching.
  1. The moisture content of the aggregate shall be such that no visible separation of moisture and aggregate will take place during transportation from the proportioning plant to the point of mixing.
  2. Aggregate containing excess moisture shall be stockpiled prior to use until sufficiently dried to meet the above requirements.
- N. Batches with cement in contact with damp aggregates shall be mixed within 30 minutes after being proportioned. Batch trucks hauling more than 1 batch of cement and aggregate shall be so constructed that materials do not flow from one compartment to another during haul or discharge.
- O. Coarse and fine aggregate shall be handled and measured separately. Cement shall be emptied directly into the charging skip of the mixer. Water shall be measured either by volume or by weight.

- P. The equipment for measuring and supplying the water to the mixer shall be so constructed and arranged that the amount of water added to the mixture can be measured in one operation into the mixing drum without dribbling.
1. The equipment shall be so designed that water from the source of supply cannot enter the measuring tank while the water is being discharged from the measuring tank into the mixer.
  2. Tanks or other equipment for measuring and discharging water into the mixer shall be sufficiently accurate that the amount of water delivered to the mixer for any batch shall not vary more than 1 percent from the required quantity of water for any position of the mixer with respect to a level plane.
  3. The tanks or other equipment shall be so arranged as to permit the checking of the amount of water delivered by discharging into measured containers.

#### **501.03.06 MACHINE MIXING**

- A. Concrete manufactured by any procedure which results in any unmixed lumps of cement in the mixed product shall be rejected. The preparation of the mix shall be in accordance to ACI 318, Section 5.8, "Mixing," and this section. The Cement and Concrete terminology is defined in ACI 116.
- B. The Engineer shall be provided with a legible ticket with each load of concrete delivered to the project site which shall contain the following information:
1. Name of Vendor.
  2. Name of Contractor.
  3. Number of Cubic Yards in the Load.
  4. Actual Weights of Cement and of each Size of Aggregate.
  5. Amount of Water Added at the Plant.
  6. Amount of Water in the Aggregate.
  7. Brand and Type of Cement.
  8. Brand and Amount of Admixture.
  9. Time and Date of Batching.
- C. Space shall be provided on the ticket so the amount of water added on the job may be indicated.
- D. All concrete shall be mixed in mechanical mixers, except that when permitted by the Engineer, batches not exceeding 1/3 cubic yard may be mixed by hand methods in accordance with the provisions of Subsection 501.03.07, "Hand Mixing."
1. Mixers shall have legible permanently attached plates showing manufacturer's rated capacity, mixing speeds, and serial number.
  2. Mixers may be stationary mixers or truck mixers.
    - a. Agitators may be truck mixers operating at agitating speed or truck agitators.
    - b. Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or

container in terms of the volume of mixed concrete, and the speed of rotation of the mixing drum or blades.

3. The Contractor, at no additional cost to the Contracting Agency, shall furnish samples of the fresh concrete and provide safe and satisfactory facilities for obtaining the samples.
4. Concrete mixers may be of the revolving drum or the revolving blade type and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacturer.
5. The temperature of materials as charged into the mixer shall be such that the temperature of the mixed concrete at the time it is placed in final position is not less than 50 degrees F nor more than 90 degrees F as specified in Subsection 501.03.10B, "Cold Weather – General," and Subsection 501.0310C, "Low Temperature Protection." Aggregates and water used for mixing shall not exceed 150 degrees F
6. Concrete for structures shall be mixed for a period of not less than 60 seconds nor more than 5 minutes after all materials, including water, are in the mixer.
7. Cement shall be batched and charged into the mixer by means that will not result either in loss of cement due to the effect of wind, or an accumulation of cement on surfaces of conveyors or hoppers, or in other conditions which may vary the required quantity of cement in the concrete mixture.
8. Stationary mixers having a capacity of 1 cubic yard or more and all paving mixers shall be operated with an automatic timing device that can be locked by the Engineer. The time device and discharge mechanisms shall be so interlocked that during normal operations no part of the batch will be discharged until the specified mixing time has elapsed.
9. The total elapsed time between the intermingling of damp aggregates and cement and the start of mixing shall not exceed 30 minutes.
10. Mixers and agitators which have an accumulation of hard concrete or mortar or worn blades shall not be used.
11. When central-mixed concrete is furnished and non-agitating hauling equipment is used for transporting concrete to the delivery point for Portland cement concrete pavement, discharge into the laydown machine shall be completed within 45 minutes after the addition of the cement to the aggregates.

**E. Ready-Mixed Concrete.**

1. Ready-mixed concrete shall be central-mixed, shrink-mixed, or transit-mixed concrete. Shrink-mixed concrete is that which has been mixed partially in a stationary mixer and the mixing completed in a truck mixer.
2. The size of batch in truck mixers and truck agitators shall not exceed the rated capacity as determined by the current Standard Requirements of Truck Mixer Manufacturers Bureau. The size of batch in stationary mixers shall not exceed the rated capacity of the mixer as determined by the standard requirements of the Associated General Contractors of America. No batches requiring fractional sacks of cement will be permitted unless all of the cement is weighed when added to the batch.

3. If the use of ready-mixed concrete is approved, the producers shall use only that cement approved by the Contracting Agency for use on the project. Contracting Agency approved cement shall be stored at the concrete plant in such a manner that it can be identified and kept separate from other cement.
4. Ready-mixed concrete for structures shall be transported in truck mixers or truck agitators.
5. The mixer, when loaded to capacity, shall be capable of combining the ingredients of the concrete within the specified time, into a thoroughly mixed and uniform mass and of discharging the concrete with a satisfactory degree of uniformity. The agitator, when loaded to capacity, shall be capable of maintaining the mixed concrete in a thoroughly mixed uniform mass and of discharging the concrete with a satisfactory degree of uniformity.
6. Mixers and agitators shall be examined periodically for changes in condition due to accumulation of hardened concrete or mortar or to wear of the blades.
  - a. When any such change in condition is found, the concrete shall be subjected to the slump tests.
  - b. If the tests indicate that the concrete is not being properly mixed, the faulty equipment shall be corrected before its further use is allowed.
7. Truck mixers shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may be readily verified. The counters shall be of the continuous-registering, non-resettable type, which accurately register the number of revolutions, and shall be mounted on the truck mixer so that the Engineer may safely and conveniently inspect them from alongside the truck.
8. When a truck mixer is used, each batch of concrete shall be mixed for not less than 70 and no more than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment as mixing speed. If any additional mixing is done, it shall be at the speed designated by the manufacturer of the equipment as agitating speed.
9. When shrink-mixed concrete is furnished, concrete that has been partially mixed at a central plant shall be transferred to a truck mixer and all requirements for transit-mixed concrete shall apply. No credit in the number of revolutions at mixing speed shall be allowed for partial mixing in a central plant.
10. No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless permitted by the Engineer. If the Engineer permits additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.
11. The rate of discharge of mixed concrete from truck mixer-agitators shall be controlled by the speed of revolution of the drum in the discharge direction with the discharge gate fully open.
12. When truck mixer or truck agitator is used for transporting concrete that has been completely mixed in a stationary mixer, mixing during transportation shall be at the speed designated by the manufacturer of the equipment as agitating speed. Do not exceed a total of 300 revolutions from the time of initial batching to complete discharge of delivered concrete.

13. When a truck mixer or agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within 90 minutes after the introduction of the mixing water to the cement and aggregates, or the introduction of the cement to the aggregates. In hot weather, or under conditions contributing to quick stiffening of the concrete as determined by the Engineer, a delivery time of less than 90 minutes may be required. When a truck mixer is used for the complete mixing of the concrete, the mixing operations shall begin within 30 minutes after the cement has been intermingled with the aggregate.
14. If the mixing plant is such a distance from the site of the work that it is not practical to have the mixed concrete delivered and placed in forms within the time limit specified, cement and water shall not be added until such time as requirements can be complied with.
15. The organization supplying concrete shall have sufficient plant capacity and transporting apparatus to ensure continuous delivery at the rate required.
  - a. The rate of delivery of concrete shall be used as to provide for the proper handling and placing of concrete.
  - b. An interval of more than 45 minutes between any 2 consecutive batches or loads, or a delivery and placing rate of less than 8 cubic yards of concrete per hour shall constitute cause of shutting down work for the remainder of the day, and if so ordered by the Engineer, the Contractor shall make, at no additional cost to the Contracting Agency, a construction joint at the location and of the type directed by the Engineer in the concrete already mixed.
16. After mixing of ready-mixed concrete has been completed, it shall be agitated continuously at agitating speed until it has been discharged from the drum.
17. Wash water shall be completely discharged from the drum or mixing container before the succeeding batch is introduced. Cement balling (intermittent clumping) and mix foaming shall be prevented by controlling the batch sequence, mixing speed, and mixing time.
  - a. When intermittent clumping exceeds 1-2 clumps per yard or 10 clumps per truck, the entire load will be rejected.
  - b. The clumps shall not exceed 5 inches in diameter.

#### **501.03.07 HAND MIXING**

- A. Hand mixing shall not be permitted, except in case of an emergency or under written permission of the Engineer.
- B. When permitted, hand mixing shall be done only on watertight platforms.
  1. The sand shall be spread evenly over the platform and the cement spread upon it.
  2. The sand and cement shall then be thoroughly mixed while dry by means of shovels until the mixture is of uniform color, after which it shall be formed into a "crater" and water added in the amount necessary to produce mortar of the proper consistency.
  3. The material upon the outer portion of the "crater" ring shall then be shoveled to the center and the entire mass turned and sliced until a uniform consistency is produced.
  4. The coarse aggregate shall then be thoroughly wetted and added to the mortar and the entire mass turned and returned at least 6 times and until all of the stone



particles are thoroughly covered with mortar and the mixture is of a uniform color and appearance.

- C. Hand mixing will not be permitted for concrete to be placed under water.
- D. Preproportioned sack concrete may be used for grout caps or other nonstructural uses as approved by the Engineer.

#### **501.03.08 RETEMPERING**

- A. Concrete shall be mixed only in such quantities as are required for immediate use and shall be placed before initial set has taken place. Any concrete in which initial set has begun shall be wasted and not used in the work.
- B. No retempering of concrete shall be allowed.

#### **501.03.09 CURING**

- A. Comply with ACI 308, Standard Specification for Curing Concrete, with the following exceptions or additions:
  - 1. **General.** All concrete shall be cured for the length of time hereinafter specified. If Type III cement is used, the curing time may be reduced as directed by the Engineer. In the event of low temperatures, the time will be increased according to the procedures specified in Subsection 501.03.10B, "Cold Weather – General."
    - a. Cure all bridge decks and approach slabs according to Subsection 501.03.09A(6), "Bridge Deck Curing."
    - b. Curing shall commence immediately upon completion of the finish. In the event that the application or placement of the curing medium is delayed, curing will be as described under 2 below.
  - 2. **Water Method.** The concrete shall be kept continuously wet by the application of water for a minimum period of 7 days after the concrete has been placed.
    - a. Use fogging equipment capable of applying water through an atomizing nozzle in the form of a fine mist, not a spray. The equipment may use water pumped under adequate high pressure, or a combination of air and water pumped under high pressure. Use equipment sufficiently portable for use in the direction of any prevailing wind. Adapt equipment for intermittent use as directed to prevent excessive wetting of the concrete.
    - b. Cotton mats, rugs, carpets, or earth or sand blankets may be used as a curing medium to retain the moisture during the curing period. The cotton mats, rugs, or carpets shall be of such character that they will retain water.
  - 3. **Curing Compound Method.** The entire surface of the concrete shall be sprayed uniformly with a curing compound. It shall be applied when just a light film of water is present on the surface. If the surface is dry, water shall be added as specified in 2 above before the curing compound is applied.
    - a. On decks or slabs cured by this method, foot traffic shall be held to a minimum and these surfaces shall not be used as a work area during the cure period. Should the film of the compound be damaged before the expiration of 7 days, the damaged portions shall be repaired immediately with additional compound.
    - b. Uniformly spray the entire surface of the concrete with a curing compound conforming to Subsection 702.03.01, "Curing Materials," except as hereinafter

specified for concrete bridge decks that are to be the roadway surface. The curing compound shall be applied to the exposed surface at a uniform minimal rate of 1 gallon per 150 square feet of area.

- c. Do not apply the curing compound until all patching and surface finishing, except grinding, have been completed. When ordered during periods of hot weather, continue fogging of the concrete with water after curing compound is applied until no longer required. Such fogging after the application of the curing compound will be paid for as extra work as provided in Subsection 104.03, "Extra Work."
- d. The curing compound shall be delivered to the work in ready-mixed form. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. The compound shall not be diluted or altered in any manner, unless dilution is recommended by the manufacturer.
- e. Provide curing compounds which remain sprayable at temperatures above 40 degrees F and do not hard settle in storage.
- f. Curing compound that has become chilled to such an extent that it is too viscous for satisfactory application shall be warmed to a temperature not exceeding 100 degrees F
- g. Curing compound shall be packaged in clean 55-gallon steel barrels or round 5-gallon steel containers or supplied from a suitable storage tank located at the jobsite.
  - 1) Each 55-gallon barrel shall be equipped with a built-in agitator having 2 sets of blades, one at the bottom and one midway between top and bottom, and with removable lids and airtight band fasteners.
  - 2) On-site storage tanks shall be kept clean and free of all contaminants. Each tank shall be provided with a permanent system designed to completely redisperse any settled material without introducing air or any other foreign substance.
  - 3) Barrels shall be filled in a manner that will prevent skinning.
  - 4) Ring seals and lug type crimp lids shall be used to seal 5-gallon containers well.
  - 5) Containers shall be provided with lining that will resist the solvent of the curing compound and will not permit skins to be loosened into the body of the curing compound.
  - 6) Each container shall be labeled with the manufacturer's name, batch number, type of compound, number of gallons, and date of manufacture. Each container shall also be labeled with an Interstate Commerce Commission Red Label warning concerning flammability. The label shall also warn that the curing compound shall be well stirred before use.
  - 7) When the curing compound is shipped in tanks or tank trucks, a shipping invoice shall be supplied with each load containing the same information as that required herein for container labels.

- h. Curing compound may be sampled by the Engineer at the source of supply, at the job site, or at both locations.
  - i. Curing compound not used within 6 months of the date of manufacture will require certification from the manufacturer that the curing compound still conforms to ASTM C309. Curing compound more than 1 year old or without a manufacture date on the container will not be allowed for use.
- 4. Waterproof Membrane.
  - a. Keep the exposed finished surfaces of concrete damp with water using an atomizing nozzle, as specified in Subsection 501.03.09.A.2, until the concrete has set.
  - b. Place the curing membrane after the concrete has set.
    - 1) The membrane shall be formed into sheets of such width as to provide a complete cover of the entire concrete surface.
    - 2) All joints in the sheets shall be securely cemented together in such a manner as to provide a waterproof joint.
    - 3) Overlap of sheets shall have a minimum lap of 18 inches.
    - 4) The sheets shall be securely weighted down by placing a bank of earth on the edges of sheets or by other means satisfactory to the Engineer.
    - 5) Sheeting material shall conform to Subsection 702.03.01, "Curing Materials."
  - c. The curing membrane shall remain in place for a period of not less than 7 days.
  - d. Should any portion of the sheets be broken or damaged before the expiration of the curing period, the broken or damaged portion shall be immediately repaired with new sheets properly cemented into place, or water curing as described above shall commence immediately.
  - e. Sections of the membrane which have lost their waterproof qualities or have been damaged to such an extent as to render them unfit for curing shall not be used.
- 5. Form Method.
  - a. If forms are kept on the concrete surfaces, this will be considered adequate cure for these surfaces.
  - b. However, should the forms be removed within 7 days after the concrete has been placed, one of the above methods shall be used on the exposed surfaces.
  - c. Comply with Subsection 502.03.11, "Removal of Falsework and Forms."
- 6. Bridge Deck Curing.
  - a. Submit a quality control plan for concrete placement and curing, for review and approval, a minimum of 30 days prior to the pre-pour conference for bridge decks and approach slabs. The plan shall include, but not be limited to, information on the procedures for when and how the concrete and the curing system is to be placed, frequency for monitoring, maintaining, and re-wetting the curing system chosen, and a list of personnel responsible for

performing such work. Include in the plan, equipment to be used for placement of concrete and the curing system, methods of protecting the covers from displacement from wind or weather, and methods of preventing loss of heat and moisture.

- b. Describe procedures to be followed in the event of equipment breakdown or inclement weather during concrete placement. In addition, describe the method to be used to protect pedestrian and vehicular traffic under the structure.
- c. Use Figure 2.1.5 from ACI 305R, Hot Weather Concreting, to determine the evaporation rate. Additional protection measures shall be provided if the rate of evaporation exceeds 0.1 pound per square foot per hour.
  - 1) Accurate record of placement location, air temperature, relative humidity, concrete temperature, and wind velocity shall be provided.
  - 2) Readings shall be taken an hour prior to the concrete placement and at 1-hour increments during concrete placement, until the final curing blanket is placed.
  - 3) Required data shall be submitted to the Engineer.
- d. Concrete temperature shall be monitored during the entire curing period by utilizing recording thermocouples embedded at 1 inch below the concrete surface and 1 inch above the bottom concrete surface.
  - 1) A minimum of 2 sets of thermocouple installations will be required per each day's placement.
  - 2) The thermocouple shall be capable of recording the concrete temperature as a function of time.
  - 3) Acceptable devices include thermocouples connected to electronic data loggers.
  - 4) The recording time intervals shall be a maximum of 30 minutes.
  - 5) The recording devices shall be accurate to within  $\pm 1.8$  degrees F. Concrete temperature between the top and bottom of the slabs and the supporting girders shall be maintained to a maximum differential temperature of 30 degrees F.
  - 6) If differential temperatures exceed the requirements, measures shall be taken to correct the curing process.
  - 7) Required data shall be submitted to the Engineer.
- e. Immediately after the concrete is placed, the moisture content shall be maintained by humidifying the air directly above the concrete surface until the curing covers are placed. Fogging equipment described in Subsection 501.03.09.A.2, "Water Method," shall be used, mounted on a finishing bridge that is separate from the concrete placing equipment.
- f. Begin placing pre-soaked burlap within 30 minutes after finishing has started. Wet curing of the surface shall be performed for 10 days, unless otherwise directed, with the following covering:
  - 1) Burlap and Polyethylene Covering. Burlap conforming to Subsection 702.03.01, "Curing Materials," and polyethylene (white or reflective) conforming to

ASTM C171 shall be furnished. Soaker hose shall be placed or other approved method shall be used to provide continuous wetting of burlap between the burlap and polyethylene covering.

- g. Pre-wetted curing coverings shall be placed with a finishing bridge. Covers shall be placed directly behind the concrete fogging operation.
  - h. The covering shall be maintained uniformly wet during the entire curing period. Provide 24-hour monitoring of the wet curing for the full length of the curing period. Water temperature shall not be more or less than 20 degrees F from the temperature of top of bridge deck.
  - i. Covers shall be lapped a minimum of 18 inches. All lapped edges shall be sealed to prevent loss of heat and moisture.
  - j. If the ambient temperature drops below 45 degrees F during the first 4 days of curing, additional protection shall be provided according to Subsection 501.03.10.C, "Low Temperature Protection."
  - k. After completion of wet curing and removal of curing covering, immediately remove excess water and apply an application of curing compound according to Subsection 501.03.09.A.3, "Curing Compound Method."
  - l. All cracks on new bridge decks and approach slabs shall be repaired. Requested method of repair shall be submitted for approval.
7. Maturity Meter Method:
- a. This method may be used if referred to in the Contract Special Provisions.
  - b. The method specified in ASTM C1074 may be used in order to reduce the cure time. This method requires training and certification of the Quality Assurance and Control personnel.
  - c. This method shall not be used for acceptance but for reducing the time required for form removal. The Contractor shall have a plan of action approved by the Engineer and monitored by a third party engineer for meter placement and monitoring.

#### 501.03.10 WEATHER LIMITATIONS

- A. **General.** If impending inclement weather conditions exist, the Contractor shall decide whether or not to begin the placement and the Contractor shall have sole responsibility for Contractor's decision.
- 1. Before any concrete is placed, the Contractor shall have adequate provisions readily available as approved by the Engineer, to protect the concrete from any impending weather conditions.
  - 2. In case precipitation should occur after placing operations have started, the Contractor shall provide ample covering to protect the work.
  - 3. The placing of concrete shall be stopped before the quantity of precipitation is sufficient to cause a flow or to wash the surface.
- B. **Cold Weather – General.** Comply with ACI 306, Cold Weather Concreting, with the following exceptions or additions:
- 1. All concrete shall be maintained at a temperature of not less than 50 degrees F for 3 days or not less than 40 degrees F for 7 days. The count of time shall commence

immediately upon completion of final placement and vibration. The three 50-degree F days need not be consecutive.

2. One 24-hour period shall constitute 1 day.
  3. The temperature of the concrete shall be determined by placement of thermometers on the concrete surfaces and properly insulating these devices to record the surface temperature of the concrete.
    - a. Temperature shall be monitored continuously throughout the total protection time required by this subsection.
    - b. In case the surface temperature of the concrete falls below 40 degrees F for a duration of 3 hours or more in any 24-hour period during the time of temperature protection, the time shall be increased 1 day for each day this occurs.
    - c. An absolute minimum temperature of 35 degrees F shall be maintained for the total time of protection specified in this subsection.
    - d. Should the temperature of the concrete fall below 35 degrees F at any time, damage may occur.
    - e. The assessment of damage will be determined by a professional engineer registered in Nevada and paid for by the Contractor and concrete so damaged may require repair or replacement at the option of the Engineer.
  4. The concrete shall have a temperature of at least 50 degrees F and not more than 90 degrees F at the time of placing. (Also, comply with temperature constraints specified in Subsection 501.03.06, "Machine Mixing.")
    - a. Heating equipment or methods which alter or prevent the entrainment of the required amount of air in the concrete shall not be used.
    - b. The equipment shall be capable of heating the materials uniformly.
    - c. Aggregates and water used for mixing shall not be heated to a temperature exceeding 150 degrees F.
    - d. Concrete containing frost or lumps at the time of placing shall not be used.
  5. Stockpiled aggregates may be heated by the use of dry heat or steam. Aggregates shall not be heated directly by gas or oil flame or on sheet metal over fire.
  6. Reinforcing steel shall be free of ice, snow, and frost during placement of concrete. Concrete shall not be placed on frozen ground.
- C. **Low Temperature Protection.** Refer to guidelines in ACI 306, Cold Weather Concreting, with the following exceptions or additions:
1. **General.** After the concrete has been placed, means shall be taken to protect the concrete from any impending low temperatures.
    - a. Methods and materials not hereinafter prescribed may be used if approved by the Engineer and the following requirements adhered to:
      - 1) Materials shall be fire resistant
      - 2) Materials shall be waterproof
      - 3) Materials shall not adhere, abrade or damage the surface of the concrete.

- b. Approval of the Engineer shall not relieve the Contractor from obtaining specification results.

**2. Insulating Blankets.**

- a. Insulating blankets used to protect concrete from low temperatures shall be fire resistant and waterproof.
- b. The blankets shall be secured and overlapped along the edges and joints to ensure that no opening will exist in the protection during high winds or other adverse conditions.
- c. Provisions shall be made to allow the reading of thermometers placed inside of the protection.
- d. When depositing concrete against previously cast concrete, the blanket insulation shall extend at least 14 inches onto the existing concrete and shall be securely held in place.

**3. Low Temperatures Protection – Heating and Housing.**

- a. In order to meet the provisions of Subsection 501.03.09, paragraphs A and B, the concrete may be protected by applying artificial heat within an enclosure.
- b. The enclosure shall be constructed with fire resistant material, unless otherwise directed by the Engineer, and shall be subject to Engineer's approval.
- c. The heating system shall be so arranged as to provide uniform heating, ensuring that the concrete farthest from the source of heat is receiving adequate protection without drying the concrete near the source of heat so as to cause shrinkage cracks.

**4. The temperature of the concrete will be determined by placement of thermometers on the concrete surfaces and properly insulating these devices to record the surface temperature of the concrete according to NV Test Method T440.**

- a. Temperature will be monitored continuously throughout the total projection time required by this subsection.
- b. If the surface temperature of the concrete falls below 50 degrees F during the first 3 days and 40 degrees F during the next 4 days of the temperature protection for a duration of 3 hours, the curing time will be increased 1 day for each day this occurs.
- c. Should the temperature of the concrete fall below 35 degrees F at any time during the 7 days of temperature protection or if the surface temperature of the concrete falls below 40 degrees F during the first 24 hours of temperature protection period, the assessment of damage will be determined by a Nevada registered professional engineer paid for by the Contractor and damaged concrete shall be repaired or replaced at the option of the Engineer.
- d. Contractor shall be responsible for all costs associated with damage assessment and repair.

**D. Hot Weather.** Comply with guidelines in ACI 305, Hot Weather Concreting, with the following exceptions or additions:

- 1. The maximum temperature of cast-in-place concrete shall not exceed 90 degrees F immediately before placement.

2. For continuous placement of concrete on the deck with reinforcing steel units, retard the initial set of the concrete sufficiently to ensure that concrete remains plastic for subsequent placement.
3. For both simple and continuous spans, submit a retardation schedule for approval.
4. The consistency of the concrete as placed shall allow the completion of initial finishing operations without the addition of water to the surface. When conditions are such that additional moisture is needed for initial finishing, the required water shall be applied to the surface fog spray only, and shall be held to a minimum amount. Apply fog spray for this purpose as specified in Subsection 501.03.09.A.2, "Water Method." Fog spray for this purpose may be applied with hand-operated fog equipment, as approved by the Engineer.
5. From the time of initial strike-off until final finish is complete, the unformed surfaces of slab concrete shall be protected from rapid evaporation of mixing water from the concrete due to wind, high temperature, low humidity, or combination thereof.
6. Equipment for fogging, type of evaporation retarder, and method of application shall be approved by the Engineer. Equipment shall be portable, adapted for intermittent use, and operable in the direction of any prevailing wind.
7. Use fogging equipment capable of providing a fog mist, as necessary, to the area between the finishing machine and the tining machine. The fogging equipment shall meet the requirements of Subsection 501.03.09.A.2, "Water Method." If at any time it becomes apparent that the combination of fogging and curing application are not, or will not be effective in preventing plastic shrinkage cracking, stop the concrete placement until environmental conditions improve substantially, or until other preventative measures are approved in writing by the Engineer.
8. After all finishing operations are complete a final curing membrane shall be applied.

#### **501.03.11 TRIAL SLAB AND PROCESS CONTROL TESTING**

- A. If silica fume is used in bridge deck concrete, construct a trial slab at least 30 days prior to placement of concrete on a bridge deck. Submit a written plan for the casting of decks. Include in this plan, at a minimum, the location of slab, the equipment and personnel used for construction, and disposal of slab. Prior to placement of the trial slab, conduct a Pre-Activity Meeting.
- B. Use approved mix designs. Place concrete at a location other than the bridge deck, but under similar conditions to those that exist during bridge deck concrete placement.
  1. The trial slab shall have a minimum length and width of 50 feet and a depth of 8 inches.
  2. Reinforce slab with a top and bottom mat of No. 5 bars spaced 6 inches longitudinally and transversely.
  3. Place top mat at a depth of 2-1/2 inches from the top of the slab.
  4. Place bottom mat at a depth 1-1/2 inches from the bottom of slab.
  5. The trial slab shall be wet-cured in accordance with the specifications.
  6. Use personnel such as superintendent, key operators, and finishers that are the same personnel who will be involved in the final construction of the bridge deck.
  7. Demonstrate the use of equipment, proficiency of personnel, and techniques for mixing, transporting, placing, and curing of the concrete during the trial.



8. Fifteen days after the placement of the trial slabs, conduct a post construction critique of the trial slab placement in writing.
- C. Do not commence placement of bridge deck concrete until after any issues from the post construction critique of trial slab construction have been resolved to satisfaction of the Engineer.
- D. Upon notification, remove and dispose of trial slabs according to Subsection 107.14, "Disposal of Material Outside Project Right-of-Way."

### 501.03.12 MORTAR

- A. Cement mortar shall consist of a mixture of Portland cement, sand, and water. Cement and sand shall first be combined in the proper proportions, and then thoroughly mixed with the required amount of water.
1. Cement mortar shall be designated by class and proportioned by loose volume as follows:

| Table 3 - Mortar Proportioning |                                   |
|--------------------------------|-----------------------------------|
| Designation                    | Proportions                       |
| Class "A" Mortar               | 1 Part Cement to 1 Part Sand      |
| Class "B" Mortar               | 1 Part Cement to 1-1/2 Parts Sand |
| Class "C" Mortar               | 1 Part Cement to 2 Parts Sand     |
| Class "D" Mortar               | 1 Part Cement to 2-1/2 Parts Sand |
| Class "E" Mortar               | 1 Part Cement to 3 Parts Sand     |
| Class "F" Mortar               | 1 Part Cement to 3-1/2 Parts Sand |

2. The quantity of water to be used in the preparation of mortar shall be only that required to produce a mixture sufficiently workable for the purpose intended.
3. Mortar shall be used as soon as possible after mixing and shall show no visible signs of setting prior to use. Re-tempering of mortar will not be permitted.
- B. **Cement.** Cement shall conform to the requirements of Section 701, "Hydraulic Cement."
- C. **Sand.** Sand shall conform to the requirements of Subsection 706.03.04, "Grout and Mortar Sand." In proportioning the sand it shall be measured loose (without shaking or compacting) in measuring boxes or other suitable containers of known capacity.
- D. **Admixtures.** No admixture shall be used in mortar unless otherwise specified or approved by the Engineer.

## METHOD OF MEASUREMENT

### 501.04.01 MEASUREMENT

- A. Portland cement concrete will be measured for payment in accordance with the provisions specified in the various sections of these specifications covering construction requiring concrete.

## BASIS OF PAYMENT

**501.05.01 PAYMENT**

- A. Portland cement concrete shall be paid for in accordance with the provisions specified in the various sections of these specifications covering construction requiring concrete.

**501.05.02 TRIAL SLAB PAYMENT**

- A. Full compensation for construction and removal of trial slabs and trial pours shall be considered as included in the contract unit price paid for other appropriate items and no separate payment will be made therefor.

**SECTION 601****PIPE CULVERTS – GENERAL****DESCRIPTION****601.01.01 GENERAL**

- A. This section includes general requirements that are applicable to all types of culvert pipes regardless of the material or culvert use with the following exceptions:
1. Structural plate pipe,
  2. Water distribution systems and sanitary sewer system specifications will specify the pipe to be used in their respective installations.
- B. This work shall consist of furnishing and installing pipe culverts, siphons, end sections, end walls, and so forth, as may be required to complete the work shown on the plans or established by the Engineer.
- C. The pipe shall comply with AASHTO Design and Construction LRFD Specifications most current edition and these specifications. The more stringent requirements shall apply.

**MATERIALS****601.02.01 GENERAL**

- A. The materials used shall conform to the requirements in the following subsections:

| <b>Materials</b>  | <b>Section/Subsection</b> |
|---|---------------------------|
| Bituminous Coated Corrugated Metal Pipe and Pipe Arches | 709.03.02                 |
| Clay Pipe   | 708.03.04                 |
| Corrugated Aluminum Pipe                                | 709.03.04                 |
| Corrugated Metal Pipe and Pipe Arches                   | 709.03.01                 |
| Grout and Mortar Sand                                   | 706.03.04                 |
| Nonreinforced Concrete Pipe                             | 708.03.02                 |
| Portland Cement   | 701                       |
| Reinforced Concrete Pipe                                | 708.03.01                 |
| Rubber Gaskets  | 707.03.06                 |
| Thermoplastic Pipe                                      | 709.03.10                 |

- B. When the location of manufacturing plants allows, the plants will be inspected periodically for compliance with specified manufacturing methods.
1. Material samples will be obtained for laboratory testing for compliance with materials quality requirements as specified in the referenced specifications.
  2. This can be the basis for acceptance of manufacturing lots.
- C. All materials will be subject to inspection for acceptance as to condition at the latest practicable time the Engineer has the opportunity to check for compliance prior to or during incorporation of materials in the work.
- D. The lengths shown on the plans are approximate.

- E. For structural plate pipe and arches, comply with Section 606, "Structural Plate Pipe and Pipe Arch Culverts."

## CONSTRUCTION

### 601.03.01 EARTHWORK

- A. Excavation and backfill shall conform to the requirements of Section 206, "Structure Excavation," and Section 207, "Structure Backfill," or Section 208, "Trench Excavation and Backfill," when the culvert is placed in a trench.
  - 1. The pipe shall be bedded as shown in the plans and/or drawings appended to the plans or as specified in the Special Provisions.
  - 2. When no bedding class is specified, the requirements for normal bedding as shown in the Uniform Standard Drawings shall apply.
  - 3. The lines and grades will be established by the Engineer or as designated in the contract documents.
- B. Where pipes are to be installed in new embankments on a steep slope or in a difficult location, the height of new embankments may be varied as directed by the Engineer before installing pipes.
- C. When headwalls are not required and granular materials are used for backfilling, the fill at the ends of the structure shall be sealed against the infiltration of water by bedding the ends of the structure using Class II CLSM or concrete.

### 601.03.02 HEADWALLS

- A. Where shown on the plans, inlet and outlet headwalls shall be constructed or installed in connection with culvert pipes.
- B. Where headwalls are constructed or installed, the ends of pipes shall be placed flush or cut off flush with the headwall face, unless otherwise permitted by the Engineer.
- C. Headwalls shall be constructed to conform to Section 501, "Portland Cement Concrete" and Section 502, "Concrete Structures."

### 601.03.03 END SECTIONS

- A. The bed for the end section shall be excavated to the required width and grade.
- B. For metal end sections with toe plates, a trench shall be excavated for the toe plate in a manner to permit the toe plate from being against the inner face of the trench when the end section is in its final position. After end sections have been properly secured to the pipe, this trench shall be backfilled and firmly compacted.
- C. Precast concrete end section shall be placed with its tongue (or groove) fully entered in the groove (or tongue) of the pipe.
- D. Thermoplastic pipe greater than 30 inches shall not be used at the open-end sections.

### 601.03.04 JACKED PIPES

- A. Culvert pipe to be jacked in place between the limits shown on the plans shall conform to the requirements of the respective section of pipe culverts.

- B. The strength of pipe or gauge of pipe will be determined for vertical load only in embankment conditions. Any additional reinforcement or strength required to withstand jacking pressure shall be determined and furnished by the Contractor at no additional cost to the Contracting Agency.
- C. Variation from theoretical alignment and grade at the time of completion of placing shall not exceed 0.2 foot for each 20 feet of pipe placed.
- D. The diameter of the excavated hole shall not be more than 0.1 foot greater than the outside diameter of the pipe.
  - 1. Sluicing and jetting with water will not be permitted.
  - 2. When the material tends to cave in from outside these limits, a shield shall be used ahead of the first section of pipe or the face of excavation shall not extend beyond the end of the pipe greater than 1-1/2 feet unless permitted by the Engineer.
- E. Areas resulting from caving or excavating outside the above limits shall be backfilled with sand or grout by a method that will fill the voids.

#### **601.03.05 LAYING CULVERT PIPE**

- A. Laying of culvert pipe shall conform to the requirements of the respective sections of culvert pipe.

#### **601.03.06 EXTENDING EXISTING CULVERTS**

- A. Where shown on the plans or directed by the Engineer, existing culverts shall be extended in accordance with the provisions for installing new culverts and the following additional provisions.
- B. Existing headwalls shall be demolished and removed and disposed of or moved to the extended location as indicated on the plans or ordered by the Engineer. Comply with Section 202, "Removal of Structures and Obstructions."
- C. A headwall that is not to be reset shall be demolished without injury to the existing culvert and removed and disposed of in accordance with the provisions of Section 202, "Removal of Structures and Obstructions." If shown on the plans or ordered by the Engineer, a new concrete headwall shall be constructed in accordance with the provisions of Section 501, "Portland Cement Concrete," of these specifications or a flared end section shall be attached thereto.

#### **601.03.07 VIDEO INSPECTION**

- A. Unless otherwise approved by the Contracting Agency, all video inspection shall be completed by a National Association of Sewer Service Companies (NASSCO) certified operator, certified at the user level minimum.
  - 1. The user shall have completed the Pipeline Assessment and Certificate Program (PACP).
  - 2. Video inspection reports must follow the NASSCO format and use standard sewer defect codes.

## METHOD OF MEASUREMENT

**601.04.01 MEASUREMENT**

- A. The materials to be paid for under these specifications will be listed in the contract items by size, class, type, gauge, or whatever information is necessary for identification.
- B. The quantity of culvert pipe to be measured for payment will be the actual number of linear feet of pipe including the stub on end sections, complete and in place. When pipes are cut to fit a structure or slope, the quantity to be paid for will be the length of pipe necessary to be placed before cutting, measured in even 2-foot increments.
- C. Culvert pipe bends, wyes, tees, and other branches will be measured and paid for by the linear foot for the sizes of pipes involved. Wyes, tees, eccentric reducers, and other branches will be measured along centerlines to the point of intersection.
- D. Structure excavation and structure backfill, Portland cement concrete, and reinforcement required for headwalls, end walls, structures, and other items of work required by the plans and Special Provisions to complete the work, will be measured and paid for as separate items as provided for under their respective sections of these specifications, or the contract documents. Structure excavation and backfill will not be measured for payment on preformed end sections.
- E. No separate measurement or payment will be made for constructing jacking pits and backfilling all pits after the pipe is jacked, or for excavation and backfill between the limits shown on the plans for jacking the pipe. Full compensation therefor will be considered as included in the price paid for jacked pipe.
- F. Culvert pipe to be placed outside the limits for jacked pipe shall conform to the requirements of the respective section of pipe culverts. The limits for payment of structure excavation and backfill will be the original ground line before jacking pits are excavated.
- G. All measurements will be made in accordance with Subsection 109.01, "Measurement of Quantities."

## BASIS OF PAYMENT

**601.05.01 PAYMENT**

- A. The accepted quantities of culvert pipe measured as specified in Subsection 601.04.01, "Measurement," will be listed under the respective sections of pipe culverts.
- B. When any of the various sizes, types, and gauges of pipe is installed by the jacking method, the contract price paid per linear foot for jacked pipe shall include full compensation for furnishing the pipe, excavating, jacking, furnishing and placing backfill material, and all incidentals and for doing all the work involved in jacking the pipe as specified.
- C. Full compensation for furnishing pipe with end finish, including distortion if required, will be considered as included in the price paid per linear foot for the pipe involved and no additional compensation will be allowed therefor. Full compensation for bedding will be considered included in the price paid per cubic yard for backfill or granular backfill as the case may be and such payment shall include compensation for all the materials, labor, tools, and incidentals necessary to complete the work.

- D. Provisions for handling of whatever water may be encountered at the site shall be an obligation of the Contractor, and payment therefor shall be considered as subsidiary to the items involved, and no further compensation will be allowed therefor.
- E. All payments will be made in accordance with Subsection 109.02, "Scope of Payment."

**SECTION 613****CONCRETE CURB, WALK, GUTTERS, DRIVEWAYS AND ALLEY INTERSECTIONS****DESCRIPTION****613.01.01 GENERAL**

- A. Concrete curb, walk, gutters, cross gutters, driveways, and alley intersections shall be constructed of Portland cement concrete prepared as prescribed in Section 501, "Portland Cement Concrete."

**MATERIALS****613.02.01 GENERAL**

- A. Materials shall conform to the applicable requirements of Section 501, "Portland Cement Concrete," Section 502, "Concrete Structures," and Section 505, "Reinforcing Steel."

**CONSTRUCTION****613.03.01 GENERAL**

- A. The thickness of Type I or II aggregate base under concrete curbs, gutters, walks, driveways, and alley intersections shall be as shown on the plans or Standard Drawings or as specified in the Special Provisions.
- B. The subgrade shall be constructed true to grade and cross sections as shown on the Plans or as established by the Engineer.
- C. The subgrade shall be watered and compacted until the subgrade reaches the compaction required for the adjacent roadway or base course.

**613.03.02 DIMENSIONS**

- A. The dimensions of the concrete curbs, gutters, walks, driveways, and alley intersections shall be as shown on the Plans or Standards Drawings or as specified in the Special Provisions.

**613.03.03 DRAINAGE OUTLETS THROUGH CURB**

- A. The Contractor shall provide suitable outlets through new curb for all existing building drains along the line of the work. The Contractor shall place outlets opposite any low area on adjacent property, the drainage of which will be affected by the new work.
- B. Where sidewalk or curb will be higher than adjacent property, the Contractor shall provide at least one 4-inch diameter opening through the curb for each parcel when directed by the Engineer.

**613.03.04 DRIVEWAY ENTRANCES AND ALLEY INTERSECTIONS**

- A. Driveway entrances and alley intersections shall be provided in new curb at all existing driveways and alley intersections along the line of the work at locations shown on the plans or Standard Drawings, or as specified in the Special Provisions.



### 613.03.05 STANDARD FORMS

- A. Form material shall be free from warp, with smooth and straight upper edges and, if used for the face of curb, shall be surfaced on the side against which the concrete is to be placed.
- B. Wooden forms for straight work shall have a net thickness of at least 1-1/2 inches; metal forms for such work shall be of a gauge that will provide equivalent rigidity and strength.
- C. Curb face forms used on monolithic curb and gutter construction shall be of a single plank width when the curb face is 10 inches or less, except for those used on curb returns.
  - 1. Wooden forms used on curb returns shall be not less than 3/4 inch in thickness, cut in the length and radius as shown on the plans, and held rigidly in place by the use of metal stakes and clamps.
  - 2. The curb face shall be cut to conform exactly with the curb face batter as well as being cut in the required length and radius.
  - 3. Forms shall be of sufficient rigidity and strength, and shall be supported to adequately resist springing or deflection from placing and tamping the concrete.
  - 4. Metal forms shall not be used for curb returns or on curves of less than 250-foot radius.
- D. Form material shall be clean at the time it is used, and shall be given a coating of light oil or other equally suitable material, immediately prior to the placing of the concrete.
- E. All forms, except back planks of curb, shall be set with the upper edges flush with the specified grade of the finished surface of the improvement to be constructed, and all forms shall be not less than a depth equivalent to the full specified thickness of the concrete to be placed.
- F. Back forms shall be held securely in place by stakes driven in pairs at an interval not to exceed 4 feet, 1 at the front form and 1 at the back.
  - 1. Clamps, spreaders, and braces shall be used as necessary to ensure proper form rigidity.
  - 2. Forms for walk, gutter, and similar work shall be firmly secured by stakes driven flush with the upper edge of the form at intervals not to exceed 5 feet.
  - 3. Form stakes shall be of sufficient size and be driven to adequately resist lateral displacement.
- G. Commercial form clamps for the curb and gutter may be used, provided the clamps fulfill the requirements specified herein.

### 613.03.06 SLIP FORMS

- A. At the option of the Contractor and with the approval of the Engineer, slip form equipment may be used for the construction of concrete curb and gutter and concrete curb, gutter, and sidewalk except for commercial driveways and curb returns with cross gutters.
- B. If machines designed specifically for such work and approved by the Engineer are used, the results shall be equal to or better than that produced by the use of forms.
  - 1. If the results are not satisfactory to the Engineer, the use of the machines will be discontinued.

2. All applicable requirements of construction by use of forms shall apply to the use of machines.
- C. Slip form equipment shall be provided with traveling side and top forms of suitable dimensions, shapes, and strength to support the concrete for a sufficient length of time during placement to produce curb and gutter of the required cross section. The equipment shall spread, consolidate, and screed the freshly placed concrete in such a manner as to provide a dense and homogeneous product.
- D. Any curb, except on structures, may be placed by using an extrusion machine provided the finished curb is true to line and grade and the concrete is dense and of the required surface texture and strength. The combined aggregate for the concrete placed by the extrusion method shall be of such size that the percentage composition by weight will conform to the grading limits of combined aggregates as specified in Subsection 706.02.01, "General," for the 3/4-inch maximum grading.
- E. The grading limits shall be further restricted, if necessary, to produce concrete that after extrusion has well defined web marks of water on the surface and is free from surface pits larger than 3/16 inch in diameter.
- F. The concrete shall be of such consistency that after extrusion, the concrete will maintain the shape of the curb section without support. The concrete shall contain the maximum amount of water that will permit this result.
- G. In lieu of placing dowels and bar reinforcing steel and in advance of placing curbs on existing pavement or base, the surface shall be thoroughly cleaned and the adhesive specified below shall be applied.
  1. Cleaning of the pavement or base shall be accomplished by wire brushing or by blast cleaning if the latter method is ordered by the Engineer.
  2. The cleaned surface shall be free from dust, loose material, and oil.
- H. The adhesive shall consist of 2 components which shall be mixed together at the site of the work and shall conform to Subsection 728.03.11, "Binder (Adhesive), Structural Epoxy."
- I. The grade for the top of the curb shall be indicated by an offset guide line set by the Contractor from survey marks established by the Engineer.
  1. The forming tube portion of the extrusion machine shall be readily adjustable vertically during the forward motion of the machine to provide, when necessary, a variable height of curb conforming to the predetermined curb grade.
  2. A grade line gauge or pointer shall be attached to the machine in such manner that a continual comparison can be made between the curb being placed and established curb grade as indicated by the offset guide line.
- J. In lieu of the above method for maintaining the curb grade, the extrusion machine may be operated on rails or forms set at uniform depth below the predetermined finished top of the grade.
- K. The top and face of the finished curb shall be true and straight, and the top surface of curbs shall be of uniform width, free from humps, sags, or other irregularities. When a straightedge 10 feet long is laid on the top or face of the curb or on the surface of gutters, the surface shall not vary more than 0.01 foot from the edge of the straightedge, except at grade changes or curves.

## 613 CONCRETE CURB, WALK, GUTTERS, DRIVEWAYS AND ALLEY INTERSECTIONS

### L. Extrusion Machines:

1. Crawler track driven extrusion machines shall not be used on finished course plantmix surface.
2. Concrete shall be fed to the machine at a uniform rate.
3. The machine shall be operated under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete free from surface pits larger than 3/16 inch in diameter and requiring no further finishing, other than light brushing with a brush filled with water only.
4. Finishing with a brush application of grout will not be permitted.

M. Expansion joints shall be required at EC and BC of curb returns, and also along the line of work at regular intervals not to exceed 300 feet.

N. Unless otherwise specified, transverse weakened plane joints on curb and gutter produced by an extrusion machine shall be constructed at 10-foot intervals along the line of the work.

O. Weakened plane joints shall be constructed as specified in Subsection 613.03.10, "Weakened Plane Joints."

P. Expansion joints shall be constructed as specified in Subsection 613.03.09, "Expansion Joints."

Q. Curing of slip form curb, gutter, and sidewalk shall be done as specified in Subsection 613.03.15, "Curing."

### 613.03.07 PLACING CONCRETE

A. Concrete shall be placed on a subgrade sufficiently dampened to ensure that no moisture will be absorbed from the fresh concrete.

B. Concrete shall be placed in curb, gutter, and curb and gutter forms in horizontal layers not exceeding 6 inches in thickness, each layer being spaded along the forms and thoroughly tamped. Concrete may be placed in layers of more than 6 inches in thickness only when authorized by the Engineer and when the spading and tamping is sufficient to consolidate the concrete for its entire length.

C. After the concrete for walk has been placed, a strike-off shall be used to bring the surface to the proper elevation when compacted. The concrete shall be spaded along the form faces and tamped to ensure a dense and compact mass, and to force the larger aggregate down while bringing to the surface not less than 3/8 inch of free mortar for finishing purposes.

D. Concrete shall be placed in cross gutters in horizontal layers of not more than 4 inches in thickness, each layer being spaded along the form faces and thoroughly tamped into a dense and compact mass. If internal vibrators are used, the full specified thickness may be placed in 1 operation.

E. After the concrete has been placed and tamped, the upper surface shall be struck off to the specified grade.

### 613.03.08 JOINTS

A. Joints in concrete curb, gutter, and walk shall be designated as expansion joints and weakened plane joints.

**613.03.09 EXPANSION JOINTS**

- A. Expansion joints shall be constructed in curbs, walk, and gutter as shown on the plans, Standard Drawings, or as specified herein.
  - 1. The joints shall be filled with pre-molded joint filler conforming to Section 707, "Joint Material."
  - 2. No expansion joints shall be constructed in cross gutters, alley intersections, or driveways except as approved by the Engineer.
- B. One-half-inch joints shall be constructed in curb and gutter at the end of all returns except where cross gutter transitions extend beyond the curb return, in which case the joints shall be placed at the ends of the cross gutter transition.
  - 1. No joints shall be constructed in returns.
  - 2. Where monolithic curb and gutter is constructed adjacent to concrete pavement, no expansion joints will be required except at EC and BC of curb returns.
- C. Expansion joint filler 1/2-inch thick shall be placed in walk at the EC and BC of all walk returns, around all utility poles that project into the concrete along the line of the work, and in walk returns between the walk and the back of curb returns when required by the Engineer.
  - 1. At the EC and BC and around utility poles, the joint filler strips shall extend the full depth of the concrete placed.
  - 2. Joint filler strips between walk and curb shall be the depth of the walk plus 1 inch with the top set flush with the specified grade at the top of curb.
- D. All expansion joint filler strips shall be installed vertically, shall extend to the full depth and width of the work in which they are installed, and shall be constructed perpendicular to straight curb or radially to the line of the curb constructed on a curve.
  - 1. Expansion joint filler materials shall completely fill these joints to within 1/4 inch of any surface of the concrete.
  - 2. Excess filler material shall be trimmed off to the specified dimension in a neat and workmanlike manner.
  - 3. During the placing and tamping of the concrete, the filler strip shall be held rigidly and securely in proper position.

**613.03.10 WEAKENED PLANE JOINTS**

- A. Weakened plane joints shall be straight and constructed in accordance with paragraphs D or E below, unless otherwise shown on the plans.
- B. In walks, joints shall be transverse to the line of work and at regular intervals not exceeding 10 feet. At curves and walk returns, the joints shall be radial.
- C. In gutters, including gutters integral with curb, joints shall be at regular intervals not exceeding 10 feet. Where integral curb and gutter is adjacent to concrete pavement, the joints shall be aligned with the pavement joints where practical.
- D. **Control Joint.**
  - 1. After preliminary trowelling, the concrete shall be parted to a depth of 2 inches with a straightedge to create a division in the coarse aggregate.

## 613 CONCRETE CURB, WALK, GUTTERS, DRIVEWAYS AND ALLEY INTERSECTIONS

2. The concrete shall be refloated to fill the parted joint with mortar.
3. Headers shall be marked to locate the weakened plane for final joint finishing, which shall be accomplished with a jointer tool having a depth of 1/2 inch and a radius of 1/8 inch.
4. The finished joint opening shall not be wider than 1/8 inch.

### E. Plastic Control Joint.

1. The joint material shall be a T-shaped plastic strip at least 1 inch deep, having suitable anchorage to prevent vertical movement, and having a removable stiffener with a width of at least 3/4 inch.
2. After preliminary trowelling, the concrete shall be parted to a depth of 2 inches with a straightedge.
3. The plastic strip shall be inserted in the impression so that the upper surface of the removable stiffener is flush with the concrete.
4. After floating the concrete to fill all adjacent voids, the removable stiffener shall be stripped.
5. During final trowelling, the edges shall be finished to a radius of 1/8 inch using a slit jointer tool.

### 613.03.11 FINISHING

- A. Finishing shall be completed as specified herein for the type of work being performed.

### 613.03.12 CURB

- A. The front forms may be stripped as soon as the concrete has set sufficiently.
- B. The face and top of the curb shall be carefully trowelled to a smooth and even finish; the top shall be finished to a transverse slope of 1/4 inch toward the gutter, with both edges rounded to a radius of 3/4 inch.
- C. The trowelled surface shall be finished with a fine hair broom applied parallel with the line of the work.
- D. The edge of the concrete at all expansion joints shall be rounded to a 1/4-inch radius.
- E. The surface of the work shall be finished as prescribed, after which the name of the Contractor, together with the year in which the improvement is constructed, shall be stamped therein to a depth of 1/4 inch in letters not less than 3/4 inch high, at BC and EC curb returns.

### 613.03.13 WALK

- A. The forms shall be set to place the finished surface in a plane sloping up from the top of curb at a rate of 1/4 inch to 1 foot when measured at right angles to the curb.
- B. Following placing, the concrete shall be screeded to the required grade, tamped to consolidate the concrete and to bring a thin layer of mortar to the surface, and floated to a smooth, flat, uniform surface. The concrete shall then be edged at all headers, given a preliminary trowelling, and provided with weakened plane joints.
- C. Walks shall be steel trowelled to a smooth and even finish.
1. All formed edges shall be rounded to a radius of 1/2 inch.

2. Edges at expansion joints shall be rounded to a radius of 1/8 inch.
  3. Preliminary trowelling may be done with a long-handled trowel or "Fresno," but the finish trowelling shall be done with a hand trowel.
  4. After final trowelling, walks on grades of less than 6 percent shall be given a fine hair broom finish applied transverse to the centerline.
  5. On grades exceeding 6 percent, walks shall be finished by hand with a wood float.
  6. Walks shall be remarked as necessary after final finish, to ensure neat uniform edges, joints, and weakened plane lines.
- D. Weakened plane lines, where required, shall have a minimum depth of 1-1/2 inch and a radius of 1/8 inch.
1. When longitudinal weakened plane lines are required, the lines shall be parallel to, or concentric with, the lines of the work.
  2. Walks 20 feet or more in width shall have a longitudinal center weakened plane line.
  3. In walk returns, 1 weakened plane line shall be made radially midway between the BCR and ECR.
  4. When directed by the Engineer, longitudinal and transverse weakened plane lines shall match the adjacent walk.
  5. The Contractor shall have sufficient metal bars, straightedges, and joint tools on the project.
- E. Headers shall remain in place for at least 16 hours after completion of the walk but shall be removed before the work is accepted.
- F. The name of the Contractor, together with the year in which the improvement is constructed, shall be stamped therein to a depth of 1/4 inch in letters not less than 3/4 inch, at intervals of not less than 200 feet.
1. A metal identification plate with the exposed face set flush with the finished surface of the concrete, anchored to a depth of not less than 1-1/2 inches, may be substituted for the stamping in the concrete.
  2. At least 1 such stamping or identification plate shall be made on each cement concrete job at the project.

#### **613.03.14 GUTTER**

- A. After the concrete has been thoroughly tamped in such manner as to force the larger aggregate into the concrete and bring to the top sufficient free mortar for finishing, the surface shall be worked to a true and even grade by means of a float, trowelled with a long-handled trowel (or "Fresno") and wood float finished.
1. The flow line of the gutter shall be trowelled smooth for a width of approximately 4 inches for integral curb and gutter and 4 inches on either side of the flow line on cross and longitudinal gutters.
  2. The outer edges of the gutter shall be rounded to a radius of 1/2 inch.
- B. Side forms shall remain in place for at least 24 hours after completion of the gutter, but shall be removed before the work will be accepted.
- C. Median island paving shall be as shown on the Standard Drawings.

## 613 CONCRETE CURB, WALK, GUTTERS, DRIVEWAYS AND ALLEY INTERSECTIONS

### 613.03.15 CURING

- A. Immediately after finishing operations are completed, the exposed surfaces shall be cured in accordance with Section 502, "Concrete Structures."

### 613.03.16 REPAIRS AND REPLACEMENTS

- A. Any new work found to be defective or damaged prior to its acceptance shall be repaired or replaced by the Contractor at no additional cost to the Contracting Agency and in accordance with Subsection 105.12, "Removal of Unacceptable and Unauthorized Work."

### 613.03.17 BACKFILLING AND CLEANUP

- A. Backfilling to the finished surface of the newly constructed improvement shall be complete before acceptance of the work.
- B. Upon completion of the work, the surface of the concrete shall be thoroughly cleaned and the site left in a neat and orderly condition.

### 613.03.18 DETECTABLE WARNINGS

- A. In accordance with the Americans with Disabilities Act (ADA), detectable warnings shall be constructed on all sidewalk ramps.
- B. Detectable warnings shall provide a tactile surface which visually contrasts with ramp and street surfaces to assist visually impaired persons in the identification of street and driveway crossings.
- C. Detectable warnings shall be constructed at the bottom of sidewalk ramps to a minimum depth of 24 inches and extending the full width of the ramp in accordance with the Standard Drawings.
- D. The materials and method of constructing the warning strips shall be as directed by the Engineer of the entity having jurisdiction over the ramp.
- E. Additional information on detectable warning materials and applications is available from the U.S. Access Board.

## METHOD OF MEASUREMENT

### 613.04.01 MEASUREMENT

- A. The quantity of curb, gutter, and combination curb and gutter measured for payment will be the number of linear feet along the base of the curb face or along the flow line of the gutter.
- B. The quantity of sidewalk, driveway, and alley intersections shall be measured for payment by area in square feet.
- C. In the case of integral curb and walk, the width of the walk shall extend to the back face of the curb.
- D. All quantities measured for payment herein will be complete and in place.
- E. All measurements will be made in accordance with Subsection 109.01, "Measurement of Quantities."

## BASIS OF PAYMENT

**613.05.01 PAYMENT**

- A. The accepted quantities of concrete measured as provided in Subsection 613.04.01, "Measurement," will be paid for at the contract unit price bid per linear feet for curb, gutter, curb and gutter and per square foot for sidewalks, driveways, cross gutters, and alley intersections.
- B. All excavation and base course work required for and performed during construction of the items of this section will be paid for as provided in the respective sections of the specifications; however, when the contract does not provide bid items for excavation or base course, such work required and performed will be considered subsidiary to the pay item contained herein and no further payment will be made therefor.
- C. Any excavation or backfill required other than roadway quantities will be considered subsidiary to the major items of work and no further payment will be made therefor.
- D. Reinforcing steel placed in curbs and gutters as shown on the plans or ordered by the Engineer will not be paid for directly but the cost thereof shall be considered as included in the contract bid prices for other items of work.
- E. All payments shall be made in accordance with Subsection 109.02, "Scope of Payment."
- F. Payment will be made under:

**PAY ITEM****PAY UNIT**

|                                      |             |
|--------------------------------------|-------------|
| Type A Curb.....                     | Linear Foot |
| Type L Island Curb and Gutter .....  | Linear Foot |
| Type L Curb and Gutter .....         | Linear Foot |
| Concrete Sidewalk.....               | Square Foot |
| Concrete Driveway .....              | Square Foot |
| Concrete Sidewalk and Driveway ..... | Square Foot |
| Concrete Alley Intersection.....     | Square Foot |
| Concrete Cross Gutter.....           | Square Foot |
| Concrete Commercial Driveway .....   | Square Foot |



## SECTION 704

### BASE AGGREGATES

#### SCOPE

##### 704.01.01 MATERIALS COVERED

- A. This specification covers the quality and size of mineral materials used in base courses, trench backfill, or other construction locations.
- B. The term Source shall mean any of the following:
  - 1. A permanent commercial location.
  - 2. Contractor manufactured material either commercial or on-site.

##### 704.01.02 REFERENCE CODES AND STANDARDS:

- A. "Related Interagency Quality Assurance Committee (IQAC) procedures at:  
[www.accessclarkcounty.com/depts/public\\_works/Pages/iqac.aspx](http://www.accessclarkcounty.com/depts/public_works/Pages/iqac.aspx) (IQAC website)

#### REQUIREMENTS

##### 704.02.01 GENERAL

- A. The mineral aggregate shall be the crushed and screened product from approved aggregate deposits, except that Type I aggregate base need not be crushed. The Engineer reserves the right to prohibit the use of aggregates from any source when:
  - 1. The character of the material is such, in the opinion of the Engineer, as to make improbable the furnishing of aggregates conforming to the requirements of these specifications.
  - 2. The character of the material is such, in the opinion of the Engineer, that undue additional costs may be accrued by the Contracting Agency.
- B. The mineral aggregate shall be clean, hard, durable, free from any frozen lumps, deleterious matter, and harmful adherent coatings. Crushed Portland cement concrete and asphaltic concrete pavement will be permitted, subject to the requirements of these specifications. No materials subject to regulation as hazardous wastes as defined in the Nevada Administrative Code 444.8565 shall be allowed.

##### 704.02.02 IQAC SOURCE QUALIFICATION

- A. For expediting of material source and type approvals, a listing of qualified materials has been provided on the IQAC website.
- B. Any listed material is considered qualified for use without a material testing submittal. However, this does not relieve the Contractor of project testing of the material as required in these specifications.
- C. The IQAC posted materials indicated in Table 1 are subject to reapproval "annually for continued posting on the IQAC website. The procedure is annotated in Subsection 704.04.02, "IQAC Annual Material Prequalification."

**Table 1 – IQAC Materials that Require Annual Qualification**

|   |
|---|
| Type II Aggregate Base                          |
| Type II Controlled Low Strength Material (CLSM) |

**Table 2 – Materials that Require 6-Month Qualification**

|  |
|--|
| Type II blended with recycled Portland Cement Concrete |
|--|

**704.02.03 DEFICIENCIES**

- A. If the product of a deposit is deficient in material passing the No. 16 sieve, filler from other approved deposits may be added at the crushing and screening plants. This is not to be construed as a waiver of any of the requirements contained herein.

**PHYSICAL PROPERTIES AND TESTS****704.03.01 PLASTIC LIMITS**

- A. When specified, aggregates shall conform to the applicable requirements of the following table:

**Table 3 – Plastic Limits**

| Percentage by Weight Passing 200 Sieve | Plasticity Index Maximum |
|--|--------------------------|
| 0.1 to 3.0                             | 15                       |
| 3.1 to 4.0                             | 12                       |
| 4.1 to 5.0                             | 9                        |
| 5.1 to 8.0                             | 6                        |
| 8.1 to 11.0                            | 4                        |
| 11.1 to 15.0                           | 3                        |

**704.03.02 DRAIN BACKFILL**

- A. This aggregate shall conform to the following requirements:

**Table 4 – Drain Rock Gradation Acceptance Limits**

| Sieve Sizes | Percentage by Dry Weight Passing Sieve |             |               |
|-------------|--|-------------|---------------|
|             | 3-Inch Size                            | 2-Inch Size | 3/4-Inch Size |
| 3-Inch      | 100                                    | --          | --            |
| 2-Inch      | 90-100                                 | 100         | --            |
| 1-1/2-Inch  | 70-100                                 | 95-100      | --            |
| 3/4-Inch    | 0-50                                   | 50-100      | 100           |
| 1/2-Inch    | --                                     | --          | 95-100        |
| 3/8-Inch    | 0-10                                   | 0-55        | 70-100        |
| No. 4       | --                                     | 0-25        | 0-70          |
| No. 8       | 0-5                                    | 0-15        | --            |
| No. 200     | 0-3                                    | 0-3         | 0-3           |

- B. Unless otherwise specified in the contract documents, the Contractor may use any of the sizes.

**Table 5 – Drain Backfill Durability Acceptance Limits**

| Source Requirement Test       | 3-Inch Size | 2-Inch Size | 3/4-Inch Size |
|-------------------------------|-------------|-------------|---------------|
| Percentage of Wear (500 Rev.) | 45% Maximum | 45% Maximum | 45% Maximum   |

**704.03.03 TYPE I AGGREGATE BASE**

- A. This aggregate shall conform to the following requirements:

**Table 6 – Type I Gradation Acceptance Limits**

| Sieve Sizes | Percentage by Dry Weight Passing Sieve |             |
|-------------|--|-------------|
|             | 3-Inch Size                            | 2-Inch Size |
| 3-Inch      | 100                                    | --          |
| 2-Inch      | 90-100                                 | 100         |
| 1-1/2-Inch  | --                                     | 95-100      |
| 1-Inch      | --                                     | 70-90       |
| No. 4       | 30-65                                  | 30-65       |
| No. 16      | 15-40                                  | 15-40       |
| No. 200     | 2-12                                   | 2-12        |

**Table 7 – Type I Acceptance Limits**

| Project Control Test  | Test Method             | Requirements |
|---|-------------------------|--------------|
| Sieve Analysis  | AASHTO T27              | Table 6      |
| Sampling Aggregate from Calibrated Conveyor stream or belt cut <sup>1</sup> | AASHTO T2               | --           |
| Plasticity Index  | AASHTO T90 <sup>2</sup> | Table 3      |
| Liquid Limit  | AASHTO T89              | 35 Maximum   |
| Resistance (R Value)  | ASTM D2844              | 60 Minimum   |
| Percentage of Wear (500 Rev.)   | AASHTO T96              | 45% Maximum  |

**704.03.04 TYPE II AGGREGATE BASE**

- A. This aggregate shall conform to the following requirements:

**Table 8 – Type II Gradation Acceptance Limits**

| Sieve Sizes | Percentage by Dry Weight Passing Sieve |
|-------------|--|
| 1-Inch      | 100                                    |
| 3/4-Inch    | 90-100                                 |
| No. 4       | 35-65                                  |
| No. 16      | 15-40                                  |
| No. 200     | 2-10                                   |

<sup>1</sup> Sampling from a stockpile permitted only after approval of the Engineer; the conveyor device shall be calibrated every 3 months and record attached to sample document.

<sup>2</sup> Test specimens shall be prepared following the dry preparation procedure AASHTO T87.

**Table 9 – Type II Acceptance Limits**

| Quality Control Test  | Test Method                  | Requirements                          |
|---|------------------------------|---------------------------------------|
| Sieve Analysis  | AASHTO T27                   | Table 8                               |
| Sampling Aggregate from Calibrated Conveyor stream or belt cut <sup>3</sup> | AASHTO T2                    | --                                    |
| Fractured Faces   | Nev. T230                    | 70% Minimum                           |
| Plasticity Index  | AASHTO T90 <sup>4</sup>      | Table 3                               |
| Liquid Limit  | AASHTO T89                   | 35 Maximum                            |
| Resistance (R Value)<br>or<br>Resilient Modulus                             | ASTM D2844                   | 78 Minimum for road base              |
|   | AASHTO T307                  | 35,000 psi minimum for road base      |
| Percentage of Wear (500 Rev.)   | AASHTO T96                   | 45% Maximum                           |
| Total Available Water Soluble Sulfates <sup>5</sup>                         | AWWA 3500-NaD<br>AWWA 4550 E | Less than 0.3% by dry weight of soil. |

- B. Type II Plantmix Aggregate as specified in Subsection 705.03.01, "Plantmix and Roadmix Bituminous Base and Surface Aggregate, Types Two Fine and Coarse and Three," may be used in lieu of Type II Base Aggregate as specified above.

#### 704.03.05 TYPE III AGGREGATE

- A. The soluble sulfate content shall not exceed 0.3 percent by dry weight of soil. The mineral shall be clean, hard, durable, free from any frozen lumps, deleterious matter, and harmful coatings. In addition thereto, the material shall conform to the gradation requirements of Type II aggregate base in accordance with Subsection 704.03.04, "Type II Aggregate Base," with the following property testing:

**Table 10 – Type III Acceptance Limits**

| Quality Control Test  | Test Method                  | Requirements                         |
|---|------------------------------|--------------------------------------|
| Sieve Analysis  | AASHTO T27                   | Table 8                              |
| Sampling Aggregate from Calibrated Conveyor stream of belt cut <sup>6</sup> | AASHTO T2                    | --                                   |
| Plasticity Index  | AASHTO T 90 <sup>7</sup>     | Table 3                              |
| Liquid Limit  | AASHTO T 89                  | 35 Maximum                           |
| No. 200 Sieve   | AASHTO T 27                  | 2-15%                                |
| Total Available Water Soluble Sulfates <sup>8</sup>                         | AWWA 3500-NaD<br>AWWA 4550 E | Less than 0.3% by dry weight of soil |

#### 704.03.06 CRUSHED ROCK

- A. Crushed rock shall be the product from approved aggregate deposits and shall only be used as directed by the Contracting Agency. The mineral aggregate shall be clean, hard,

<sup>3</sup> Sampling from a stockpile permitted only after approval of the Engineer; the conveyor device shall be calibrated every 3 months and record attached to sample document.

<sup>4</sup> Test specimens shall be prepared following the dry preparation procedure AASHTO T87.

<sup>5</sup> Required only for placement around waterline pipe.

<sup>6</sup> Sampling from a stockpile permitted only after approval of the Engineer.

<sup>7</sup> Test specimens shall be prepared following the dry preparation procedure AASHTO T87.

<sup>8</sup> Required only for placement around waterline pipe.

durable, free from any frozen lumps, deleterious matter, and harmful coatings. In addition thereto, the material shall conform to the following gradation requirements:

**Table 11 – Crushed Rock Gradation Acceptance Limits**

| Sieve Sizes | Percentage of Weight Passing |
|-------------|------------------------------|
| 3/8-Inch    | 100                          |
| No. 4       | 20-80                        |
| No. 200     | 0-15                         |

**Table 12 – Crushed Rock Acceptance Limits**

| Quality Control Test  | Test Method                  | Requirements                         |
|---|------------------------------|--------------------------------------|
| Sieve Analysis  | AASHTO T 27                  | Table 11                             |
| Sampling Aggregate From Calibrated Conveyor stream of belt cut <sup>9</sup> | AASHTO T 2                   | -----                                |
| Fractured Faces   | Nev. T 230                   | 90% Minimum                          |
| Plasticity Index  | AASHTO T 90 <sup>10</sup>    | Table 3                              |
| Liquid Limit  | AASHTO T 89                  | 35 Maximum                           |
| Percentage of Wear (500 Rev.)   | AASHTO T 96                  | 45% Maximum                          |
| Total Available Water Soluble Sulfates <sup>11</sup>                        | AWWA 3500-NaD<br>AWWA 4550 E | Less than 0.3% by dry weight of soil |

#### 704.03.07 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

- A. CLSM shall consist of a low-strength, self-leveling concrete material composed of various combinations of cement, fly ash, aggregate, water, and chemical admixtures. CLSM shall have a design compressive strength at an age of 28 days within the ranges required below for the specified class:
1. Class I - (50 to 150 psi): Specified where the maximum strength is of primary concern due to the desire to have material that can be excavated in the future with relative ease.
  2. Class II – (100 to 300 psi): Specified where the minimum strength is of primary concern for pipe support.
  3. Class Special (as shown in project specifications or drawings): Specified where project unique criteria, such as erosion control, are the primary concern.
  4. Class I and II CLSM:
    - a. The mix shall result in a product having a slump in the range of 6 to 10 inches at the time of placement.
    - b. The Source of Contractor shall submit a mix design for approval by the Engineer prior to placement.
    - c. The mix design shall be supported by laboratory test data verifying the potential of the mix to comply with the requirements for these specifications.

<sup>9</sup> Sampling from a stockpile permitted only after approval of the Engineer; the conveyor device shall be calibrated every 3 months and record attached to sample document.

<sup>10</sup> Test specimens shall be prepared following the dry preparation procedure AASHTO T87.

<sup>11</sup> Required only for placement around waterline pipe.

- B. CLSM shall be proportioned in general compliance with the methods outlined in ACI 211.1-91, reapproved 1997, "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete." The following materials shall be used:
1. Cement shall meet the requirements of Section 701, "Hydraulic Cement." Type V cement shall be used unless otherwise specified.
  2. Fly ash shall meet the requirements of Section 729, "Fly Ash." Fly ash not meeting the requirements of Section 729, "Fly Ash," may be used if prior testing indicates to the satisfaction of the Engineer the ability of the CLSM with this fly ash to meet these specifications.
  3. Water shall meet the requirements of Section 722, "Water."
  4. Aggregates shall have 100 percent by total weight of the aggregate passing the 1 inch screen and 15 percent or less passing the No. 200 sieve. The aggregate shall meet the plastic limits requirements of Subsection 704.03.01, "Plastic Limits."
  5. Chemical admixtures shall meet the requirements of Subsection 702.03.02, "Air-Entraining Admixtures," and Subsection 702.03.03, "Admixtures Other Than Air-Entraining."
    - a. Other admixtures specifically approved for CLSM may be used.
    - b. All materials proportions shall be measured and the CLSM mixed in accordance with Section 501, "Portland Cement Concrete."
    - c. Other proportion measuring and CLSM mixing systems are acceptable, if control can be demonstrated to be satisfactory to the Engineer.
    - d. These other methods include continuous feed, volumetric measurement of proportions, and pug mill and continuous mixing plants.
- C. If the CLSM mix does not produce a flowable consistency or exhibits excessive bleeding, the mix shall be adjusted.
1. Excessive bleeding is considered to occur when water flows from the CLSM in a manner that causes disturbance or displacement of the exposed surface of the CLSM.
  2. Mix adjustments shall include, but not be limited to: aggregate gradation, cementitious material content, admixtures, water content, or a combination of adjustments.
- D. The testing procedures for approval of CLSM mix designs by the IQAC or if required in the contract special provisions shall be as follows:
1. The material Source, which may be the Contractor, shall cast one set of six each 4-inch diameter by 8-inch high specimens in split cylinders.
  2. No rodding method shall be used for the placement of the CLSM into the cylinders.
  3. All field curing and environmental protection shall conform to AASHTO T23, "Test Methods for Making and Curing Concrete Test Specimens in the Field."
  4. The cast specimens shall then be laboratory-cured in a 100 percent humidity, temperature-controlled concrete cure room (cure tanks shall not be used).
  5. Compressive strength testing shall be performed in accordance with AASHTO T22 and T23 with samples from each set at the ages of 7, 28, and 90 days.

6. A report of the results shall be submitted to the Engineer.
- E. Class Special: The compressive strength testing procedures shall be as specified in the project specifications or on the project drawings.
- F. **Bonded Aggregate Fill (BAF):**
  1. This material is a crushed rock-cement slurry consistency.
  2. BAF may be used only with the prior approval of the Engineer.
  3. The material Source shall have it designed under the responsible charge of a Nevada PE, and the mix shall consist of a gap-graded 1/2-inch maximum nominal size crushed gravel with a 1-sack minimum Type V cement and water slurry.
  4. The material shall be plant mixed and placed from a truck.
  5. Due to the gap-graded nature of the material, it shall not be used where water drainage is an issue and in all cases shall use dams as specified in Subsection 208.03.16, "Drain Backfill."
  6. This procedure does not require concrete cylinder break testing; however, it does require a visual inspection and shall be documented in a report to the Engineer summarizing the inspection to be performed as follows:
    - a. After the first batch is placed and initially cured, excavate to the bottom of the pipe or structure.
    - b. If a self-supporting vertical face is maintained, the material is functioning properly.

#### 704.03.08 AGGREGATE FOR PORTLAND CEMENT TREATED BASE

- A. This aggregate shall conform to the following requirements:

**Table 13 – Portland Cement Treated Base Gradation  
Acceptance Limits**

| Sieve Sizes | Percentage by Dry Weight Passing Sieve |
|-------------|--|
| 3-Inch      | 100                                    |
| 2-Inch      | 90-100                                 |
| No. 4       | 35-75                                  |
| No. 200     | 20                                     |

**Table 14 – Portland Cement Treated Base Acceptance Limits**

| Test   | Test Method | Requirements                           |
|--|-------------|--|
| Sieve Analysis   | AASHTO T27  | Table 13                               |
| Sampling Aggregate from Calibrated Conveyor stream or belt cut <sup>12</sup> | AASHTO T2   | 1/1000 Tons per day or portion thereof |
| Percentage of Wear (500 Rev.)  | AASHTO T96  | 45% Maximum                            |

- B. Aggregate for cement or lime treated bases will be sampled as follows:
1. Where the material is being mixed at a stationary plant, samples will be taken from the conveyors just prior to delivery to the mixer and prior to adding lime or cement.

<sup>12</sup> Sampling from a stockpile permitted only after approval of the Engineer. The conveyor device shall be calibrated every 3 months and record attached to sample document.

2. Where material is being mixed on the roadbed, samples will be taken after the material has been placed on the roadbed and processed and prior to adding cement or lime.

#### **704.03.09 SHOULDERING MATERIAL**

- A. This aggregate shall conform to the following requirements:

**Table 15 – Shouldering Material Acceptance Limits**

| Sieve Sizes | Percentage by Dry Weight Passing Sieve |
|-------------|--|
| 1-Inch      | 100                                    |
| 3/4-Inch    | 90-100                                 |
| No. 4       | 35-65                                  |
| No. 16      | 15-40                                  |
| No. 200     | 2-6                                    |

#### **SOURCE QUALITY CONTROL TESTING**

##### **704.04.01 GENERAL**

- A. There are 2 testing aspects to Source material acceptance.
  1. Testing by the Source for annual posting on the IQAC website of qualified materials.
  2. Contractor project quality control Source testing for non-qualified materials.
- B. The acceptance of the Source material shall be at the production plant while the acceptance of the Contractor-placed material is at the project site.
- C. Any laboratory submitting to an agency shall be R-18 AASHTO accredited in the appropriate test method in accordance with Table 16, "Source Quality Control Testing Requirements," where applicable and testing reviewed and stamped by a Nevada professional engineer who has responsible charge of the work. The use of a professional engineer by the Source could be the Source staff engineer or third party, but the professional engineer must have responsible charge of the testing and/or inspection.

##### **704.04.02 IQAC ANNUAL MATERIAL PREQUALIFICATION**

- A. Each individual location or "pit" shall be referred to as a "Source." The responsibility for testing and inspection is the material Source. Material shall be tested, inspected, and certified in accordance with Table 16 "Source Quality Control Testing Requirements." The Source shall submit to the IQAC agency engineer assigned for that Source. The reviewing agency is listed on the IQAC website page next to the Source material.
- B. Test data shall be included with the certifying document.
- C. The maximum qualification period is 1 year, or 6 months for aggregate blended with crushed concrete. The entire qualification process shall be completed, in accordance with the sections above, prior to the first day of April, or for aggregates blended with crushed concrete, the first day of April and the first day of October of each year. This includes, but is not limited to, submittal, agency review, all required retesting, and qualification from the IQAC member.

##### **704.04.03 NON-PREQUALIFIED MATERIALS**

- A. If the material is not posted on the IQAC web page, the Source may elect to submit non-prequalified material to the Engineer for approval prior to use that complies with the above noted specification and shall have been tested within 60 days of the intended use.



**704.04.04 SUBMITTAL**

- A. All tests specified in this section shall be performed.
  - 1. The report(s) shall include any graphical representation of plotted data such as the R-value or the Proctor value(s) along with the pit name and location.
  - 2. The most current ASTM, AASHTO, NDOT, and AWWA methods shall be used when performing the tests.
- B. All samples shall be "cut" from the "belt." When circumstances do not allow for sampling during production, the Source shall coordinate with the Engineer to identify an alternative plan for sampling.
- C. IQAC Annual Submittal
  - 1. For the purposes of IQAC submittal, the Engineer is the IQAC reviewing agency as noted on the IQAC web page.
  - 2. For the annual submittal by the supplier, the material to be approved for use as aggregate shall be obtained and "split" by an AASHTO accredited laboratory with the Engineer present at the time the sample is obtained with the sample large enough for a full suite of testing for the Source and Engineer.
  - 3. The Engineer shall be notified a minimum of 48 hours prior to obtaining the sample.
  - 4. If the Engineer is not present during the sampling of the material, the results for that sample will not be accepted.
  - 5. Sampling shall be performed during normal working hours for the Engineer.
  - 6. If the Source laboratory results are in compliance with the above noted specifications, Source shall submit the test report to the Engineer within 21 days of sampling requesting the review and approval of the materials for the proposed use of the material.
  - 7. Notification by the Source of samples not in compliance with the above noted specifications is requested but not required. Samples without notification or a qualification submittal within the 21-day period will be assumed by the IQAC to be outside the above noted specifications.
  - 8. The agency Engineer for a particular pit may accommodate minor adjustments for "tuning" of an operation. This courtesy shall not be extended during the qualification process.
- D. Non-prequalified materials (materials not posted on the IQAC list)
  - 1. The material to be approved for use as aggregate shall be obtained and "split" by an AASHTO accredited laboratory with the Engineer present at the time the sample is obtained with the sample large enough for a full suite of testing for the Source and Engineer.
    - a. The Engineer shall be notified a minimum of 48 hours prior to obtaining the sample.
    - b. If the Engineer is not present during the sampling of the material, the results for that sample will not be accepted.
    - c. Sampling shall be performed during normal working hours for the Engineer.

- d. If the Source laboratory results are in compliance with the above noted specifications, the Source shall submit the test report to the Engineer within 21 days of sampling with a letter requesting the review and approval of the materials report for the proposed use of the material.
2. Notification by the Source of samples not in compliance with the above noted specifications is requested but not required.
  - a. Samples without notification or a qualification submittal within the 21-day period will be assumed by the IQAC to be outside the above noted specifications.
  - b. The Source shall submit the material test report to the Engineer no earlier than 60 days and no later than 14 days prior to use.
3. The qualification is for one project only.

#### **704.04.05 REPORT FORMAT**

- A. The report shall be prepared and stamped by, or under the direction of, a professional engineer registered in the state of Nevada. The report shall be on the standard IQAC<sup>13</sup> form and shall include the pit name and location. The report shall include the following:
  1. Recommendation by the Source Professional Engineer.
  2. The testing results in accordance with the appropriate Table 16, "Source Quality Control Testing Requirements," test methods and reporting requirements, along with any graphs and charts.
- B. When "no exceptions" are taken, a conditional posting on the web site will be provided by the IQAC within 10 days of the receipt of the submittal.
- C. Discrepancies between test results will be reviewed on a case-by-case basis. The Engineer will notify the aggregate producer of substantial test variations within 10 days of receipt of the qualification submittal.

#### **704.04.06 SAMPLING AND TESTING**

- A. When the Contractor/Material Source or Engineer acquires aggregate samples at an aggregate production plant, the plant shall provide a calibrated mechanical means for obtaining samples.
  1. If a mechanical means is not provided, a belt cut from a stopped conveyor will be required.
  2. Any mechanical sampling device shall be approved by the Engineer prior to starting the respective phase of the project, or shall have been approved as part of a prior plant inspection by the Engineer or the Engineer's representative.
  3. The sampling device shall be so constructed to provide for simultaneous "cutting" of the entire section of material being discharged or conveyed, and so constructed that small representative samples may be taken frequently and these samples combined to form the complete sample.
  4. The reference method for the mechanical procedure shall be a "belt cut" sample taken from a stopped conveyor belt.

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<sup>13</sup> The form is on the IQAC website, or use an Agency approved form

5. Samples of the finished product of the plant shall be obtained prior to or as the material leaves the conveyor belt for the bin or stockpile.
- B. Test results run from samples taken will be furnished to the Engineer by the Contractor or the Contractor's representative. The results of such tests shall not be the basis for final acceptance of the material.
- C. Sampling for final acceptance of materials will be as required in the appropriate USS sections and in general shall comply with the AASHTO requirements, where applicable, and with any exception to the method(s) listed on the IQAC website.

**Table 16 – Source Quality Control Testing Requirements<sup>14</sup>**

| Spec Section                               | Description   | Item   | Reference Specification and/or Test Procedure | Frequency   |
|--|---|--|---|---|
| 704.03.02, 704.03.03, 704.03.04, 704.03.08 | Drain Rock  | Submittal  | IQAC and/or Agency Requirements               | Annually for IQAC Source Approval OR per project      |
|  | Type I, Type II Aggregate                                     | Sampling from calibrated conveyor stream or belt cut | AASHTO T2                                     | 1/day at plant  |
|  | Cement treated base   | Sieve Analysis                                       | AASHTO T11 & T27                              | 1/day at plant  |
|  |   | Percentage of Wear (500 Rev.)                        | AASHTO T96                                    | Annually for Source Approval OR per project           |
| 704.03.04, 704.03.05, 704.03.06            | Drain rock, Type II, and Type III aggregate around water pipe | Total Available Water Soluble Sulfates <sup>15</sup> | AWWA 3500-NaD<br>AWWA 4550 E                  | 1/month at plant                                      |
| 704.03.03, 704.03.04                       | Type I and Type II Aggregate                                  | Plasticity Index                                     | AASHTO T90 <sup>16</sup>                      | 1/day at plant  |
|  |   | Liquid Limit   | AASHTO T89                                    | 1/day at plant  |
|  |   | Resistance (R Value) or Resilient Modulus            | ASTM D2844                                    | Annually for IQAC Source Qualification OR per project |
|  |   |  | AASHTO T307                                   | Annually for IQAC Source Qualification OR per project |
| 704.03.07                                  | CLSM  | Mix Design   | USS 704.03.07                                 | Annually for IQAC Source Qualification OR per project |
|  |   | Compressive Strength                                 | USS 208.02.07 & AASHTO T22, T23               | Annually for IQAC Source Qualification OR per project |
|  | CLSM-BAF  | Visual Inspection Report                             | USS 208.02.07 Split cylinders                 | Annually for IQAC Source Qualification OR per project |

<sup>14</sup> Review the IQAC website for any exceptions to the listed test methods.

<sup>15</sup> Required only for placement around waterline pipe

<sup>16</sup> Test specimens shall be prepared following the dry preparation procedure AASHTO T87

**SECTION 707****JOINT MATERIAL****SCOPE****707.01.01 MATERIAL COVERED**

- A. This specification covers the quality requirements for poured filler, preformed fillers, and resilient and rubber type gaskets used in the construction of bridges, culverts, sidewalks, and so forth.

**REQUIREMENTS****707.02.01 BLANK****PHYSICAL PROPERTIES AND TESTS****707.03.01 JOINTS**

- A. Materials for joints in concrete structures shall comply with provisions specified below.

**707.03.02 POURABLE JOINT SEALER**

- A. The materials specified in this subsection shall be supplied and installed in weakened plane joints, contraction joints, and construction joints when required by the Engineer and as shown on the drawings.
- B. Joint Sealant:
1. 2-component polyurethane pourable joint sealant (ACI 504R, Table 1, Type IV).
  2. Sealant shall be able to expand and compress plus or minus 25 percent movement as the joint opens and closes.
  3. Sealant shall be self-leveling for flat surfaces and non-sagging for sloped and vertical joints.
  4. Sealant shall meet or exceed requirements of Table 1 below.

**Table 1 - Minimum Requirements for Pourable Joint Sealer**

| <b>Material Characteristics</b>                            | <b>Self-Leveling</b>                                 | <b>Non-Sagging</b>                                  |
|--|--|---|
| Application Temperature                                    | 40 to 100 degrees F                                  | 40 to 100 degrees F                                 |
| Service Range  | -40 to 170 degrees F                                 | -40 to 170 degrees F                                |
| Curing Rate  | Tack-free Time:<br>1-2 hours<br>Final Cure: 3-5 days | Tack-free Time: 6-<br>8 hours<br>Final Cure: 3 days |
| Tear Strength (ASTM D624)                                  | --   | 45 lbs/in   |
| Shore A Hardness<br>(ASTM D2240)                           | 45 ±5 (21-day)                                       | 25 ±5   |
| Tensile Properties (ASTM D412):                            |  |   |
| Tensile Strength   | 550 psi (21-day)                                     | 120 psi (at break)                                  |
| Elongation   | 700% (at break)                                      | 500%  |
| Modulus of Elasticity (100%)                               | 150 psi  | 70 psi  |
| Adhesion in Peel, Concrete Substrate (Fed Spec TT-00227E): |  |   |
| Peel Strength  | >30 pounds   | 25 pounds   |
| % Adhesion Loss  | 0%   | 0%  |

- C. No material shall be used that has skinned over or settled in the container to the extent that it cannot be easily redispersed by hand stirring to form a smooth uniform product.
- D. Each container shall be clearly labeled or each delivery of material in the tanks of 2-component equipment shall be accompanied with a ticket showing designation (Component A or B), the manufacturer's name, lot or batch number, date of manufacture, date of packaging, date, if any, beyond which the polyurethane sealant shall not be used without additional testing and approval, and manufacturer's instructions for use.
- E. The sealant shall be machine mixed and placed with equipment that accurately proportions and mixes the 2 components and extrudes the mixed material into the joint.
  - 1. Such equipment shall be of a type approved by the manufacturer of the sealant and all manufacturer's instructions shall be followed.
  - 2. Polyurethane liquid components that have been exposed to the atmosphere for more than 24 hours shall not be used.
- F. Primer:
  - 1. Special material furnished by the manufacturer of the sealant to improve bond of polyurethane sealant to concrete.
  - 2. Primer shall be applied to the sides of the groove and to all exposed vertical surfaces in the joint prior to placing the polyurethane sealant.
  - 3. The primer shall be dry prior to placing the sealant.
  - 4. Contaminated primer shall be removed and replaced.

#### **707.03.03 CHANNEL EXPANSION JOINT (1-INCH OR LESS)**

- A. The materials specified in this subsection shall be supplied and installed in expansion joints with widths 1-inch or less designed for channels included in Clark County Regional Flood Control District's Master Plan.
- B. Joint Sealant:
  - 1. 2-component polyurethane pourable joint sealant (ACI 504R, Table 1, Type IV).
  - 2. Sealant shall be able to withstand up to plus or minus 25 percent movement.
  - 3. Sealant shall be self-leveling for flat surfaces and non-sagging for slopes.
  - 4. The sealant shall meet or exceed requirements of Table 1 in Subsection 707.03.02, "Pourable Joint Sealer."
- C. No material shall be used that has skinned over or settled in the container to the extent that it cannot be easily redispersed by hand stirring to form a smooth uniform product.
- D. Each container shall be clearly labeled or each delivery of material in the tanks of 2-component equipment shall be accompanied with a ticket showing designation (Component A or B), the manufacturer's name, lot or batch number, date of manufacture, date of packaging, date, if any, beyond which the polyurethane sealant shall not be used without additional testing and approval, and manufacturer's instructions for use.
- E. The sealant shall be machine mixed and placed with equipment that accurately proportions and mixes the 2 components and extrudes the mixed material into the joint.
  - 1. Such equipment shall be of a type approved by the manufacturer of the sealant and all manufacturer's instructions shall be followed.

2. Polyurethane liquid components that have been exposed to the atmosphere for more than 24 hours shall not be used.
- F. Joint Filler: Preformed, ASTM D1752, Type I (sponge rubber) or inert, preformed, closed cell, polypropylene material.
- G. Bond Breaker Tape:
  1. Adhesive backed polyethylene tape meeting or exceeding the following:
    - a. Adhesive Strength: 35 ounces/inch width.
    - b. Tensile Strength: 20 pounds./inch width.
    - c. Mil thickness: 14.
  2. Size tape so that it covers the entire back surface of the joint without extending up the concrete slabs.
  3. In joints that have considerable width variation, 1 tape may be lapped over another to accomplish total backside coverage.
  4. Bond breaker tape shall be thick enough to permit easy handling and proper insertion.
- H. Backer Rod:
  1. Non-absorbent expanded, closed cell polyethylene foam.
  2. The backer rod shall be approximately 25 percent larger in diameter than the width of the joint to be sealed.
  3. Other back-up materials (paper, rope and open cell foam) are unacceptable.
  4. The backer rod shall be compatible with the sealant, and no bond or reaction shall occur between the backer rod and sealant.

**707.03.04 EXPANSION JOINT (1-INCH OR LESS)**

- A. The materials specified in this subsection shall be supplied and installed in expansion joints with widths 1-inch or less designed for structures other than those listed in Subsection 707.03.03, "Channel Expansion Joint (1-Inch or Less) Filler."
- B. Joint Sealant:
  1. 2-component polyurethane pourable joint sealant (ACI 504R, Table 1, Type IV).
  2. Sealant shall be able to withstand up to plus or minus 25 percent movement.
  3. Sealant shall be self-leveling for flat surfaces and non-sagging for slopes.
  4. The sealant shall meet or exceed requirements of Table 1 above.
- C. No material shall be used that has skinned over or settled in the container to the extent that it cannot be easily redispersed by hand stirring to form a smooth uniform product.
- D. Each container shall be clearly labeled or each delivery of material in the tanks of 2-component equipment shall be accompanied with a ticket showing designation (Component A or B), the manufacturer's name, lot or batch number, date of manufacture, date of packaging, date, if any, beyond which the polyurethane sealant shall not be used without additional testing and approval, and manufacturer's instructions for use

- E. The sealant shall be machine mixed and placed with equipment that accurately proportions and mixes the 2 components and extrudes the mixed material into the joint.
  - 1. Such equipment shall be of a type approved by the manufacturer of the sealant and all manufacturer's instructions shall be followed.
  - 2. Polyurethane liquid components that have been exposed to the atmosphere for more than 24 hours shall not be used.
- F. Joint Filler:
  - 1. Preformed filler conforming to AASHTO M213 or ASTM D1751 (fiber type).
  - 2. Filler material shall be punched or drilled to admit dowels where called for on the plans.
  - 3. Filler for each joint shall be furnished in a single piece for the full depth and width required for the joint unless otherwise specified by the Engineer.
  - 4. When the use of more than 1 piece is authorized for a joint, the abutting ends shall be fastened securely and held in place, by stapling or other positive fastening satisfactory to the Engineer.
- G. Bond Breaker Tape:
  - 1. Adhesive backed polyethylene tape meeting or exceeding the following:
    - a. Adhesive Strength: 35 ounces/inch width.
    - b. Tensile Strength: 20 pounds./inch width.
    - c. Mil thickness: 14.
  - 2. Size tape so that it covers the entire back surface of the joint without extending up the concrete slabs.
  - 3. In joints that have considerable width variation, 1 tape may be lapped over another to accomplish total backside coverage
  - 4. Bond breaker tape shall be thick enough to permit easy handling and proper insertion.
- H. Backer rod:
  - 1. Non-absorbent expanded, closed cell polyethylene foam.
  - 2. The backer rod shall be approximately 25 percent larger in diameter than the width of the joint to be sealed.
  - 3. Other backer materials (paper, rope and open cell foam) are unacceptable.
  - 4. The backer rod shall be compatible with the sealant and no bond or reaction shall occur between the backer rod and sealant.

#### **707.03.05 EXPANSION JOINT (GREATER THAN 1-INCH)**

- A. The materials specified in this subsection shall be supplied and installed in expansion joints with widths greater than 1-inch.
- B. Joint Sealant:
  - 1. Impermeable closed-cell, cross-linked, ethylene vinyl acetate, low density polyethylene copolymer, nitrogen blown foam material.

2. Joint sealant shall have a minimum working movement range of 60 percent compression and 30 percent tension.
  3. The sealant shall meet or exceed the requirements listed in Table 2 below.
  4. Joint sealant shall have 1/8-inch" deep by 1/8-inch wide grooves spaced at 1/4 inch to 1/2 inch along both sides of the joint and running the entire length of the joint to increase bond surface area.
  5. Joint sealant material shall be resistant to degradation due to ultraviolet radiation or shall be coated with a material that provides adequate protection.
  6. The joint sealant shall be installed with a width 25 percent greater than width of joint opening at a near neutral condition.
  7. All direction changes in joint sealant shall be done using heat welding method.
  8. Joint sealant shall be installed using all of manufacturer's recommendations.
  9. Joint sealant shall be installed prior to significant joint movement after concrete placement.
- C. Contractor shall prevent construction equipment from traversing joint after sealant has been placed or adequate steps shall be taken to protect sealant from construction traffic.

**Table 2 - Minimum Requirements for Preformed Joint Sealer**

| <b>Material Characteristics</b>         | <b>Physical Requirements</b>   |
|---|--------------------------------|
| Service Range                           | -94 degrees F to 160 degrees F |
| Tensile Strength                        | 115 lb/in <sup>2</sup>         |
| Elongation at break                     | 255%                           |
| Tear Resistance (ASTM D624)             | 16 lb/in <sup>2</sup>          |
| Water Absorption (ASTM D3575, Suffix L) | 0.2 lb/ft <sup>2</sup>         |
| Density                                 | 2.8–3.4 lb/ft <sup>3</sup>     |

- D. Joint Filler: Inert, preformed, closed cell, polypropylene material.
- E. Bond Breaker Tape:
1. Adhesive backed polyethylene tape meeting or exceeding the following:
    - a. Adhesive Strength: 35 ounces/inch width.
    - b. Tensile Strength: 20 pounds./inch width.
    - c. Mil thickness: 14.
  2. Size tape so that it covers the entire back surface of the joint without extending up the concrete slabs.
  3. In joints that have considerable width variation, 1 tape may be lapped over another to accomplish total backside coverage.
  4. Bond breaker tape shall be thick enough to permit easy handling and proper insertion.
- F. Bonder: 2-component, 100 percent solid epoxy adhesive designed to bond joint material to steel, cured concrete, or wood.

#### **707.03.06 RUBBER GASKETS**

- A. The ring gaskets shall conform to AASHTO M198.



**707.03.07 WATERSTOPS**

A. Waterstops shall conform to the following requirements:

1. Natural rubber waterstops shall be manufactured from a stock composed of a high grade compound made exclusively from new plantation rubber, reinforced carbon black, zinc oxide, accelerators, antioxidants, and softeners.
2. This compound shall contain not less than 72 percent by volume of new plantation rubber.

**NATURAL RUBBER.**

| <b>Test</b>   | <b>Test Method</b> | <b>Requirements</b>   |
|---|--------------------|---|
| Tension Testing of Vulcanized Rubber  | ASTM D412          | Tensile strength: 3,500 psi minimum<br>Elongation at breaking: 550 percent<br>Unit stress (300 percent): 1,100 psi minimum<br>Unit stress (500 percent): 2,800 psi minimum  |
| Test for Accelerated aging of Vulcanized Rubber by the Oxygen Pressure Method | ASTM D572          | After 7 days in air at 158 degrees F ( $\pm 2$ degrees F) or after 48 hours in oxygen at 158 degrees F ( $\pm 2$ degrees F) and 300 psi, the tensile strength and elongation shall not be less than 65 percent of the original. |
| Test for Indentation of Rubber by Means of a Durometer                        | ASTM D2240         | 55 to 65 hardness   |

**SYNTHETIC RUBBER**

| <b>Test</b>   | <b>Test Method</b> | <b>Requirements</b>  |
|---|--------------------|--|
| Tension Testing of Vulcanized Rubber  | ASTM D412          | Tensile strength 2,500 psi minimum<br>Elongation at breaking of 425 percent.   |
| Test for Accelerated aging of Vulcanized Rubber by the Oxygen Pressure Method | ASTM D572          | After 7 days in air at 158 degrees F ( $\pm 2$ degrees F) or after 48 hours in oxygen at 158 degrees F ( $\pm 1$ degree F) and 300 psi, the tensile strength and elongation shall not be less than 65 percent of the original. |
| Test for Indentation of Rubber By Means of a Durometer                        | ASTM D2240         | 50 to 70 hardness  |

**POLYVINYL CHLORIDE**

| <b>Test</b>                   | <b>Test Method</b>      | <b>Requirements</b>         |
|-------------------------------|-------------------------|-----------------------------|
| Polyvinyl Chloride Waterstops | Corps of Engr CRD-C 572 | Compliance with paragraph 6 |

**707.03.08 ASPHALT PLANK**

A. Asphalt plank shall conform to ASTM D517 for Plain Asphalt Plank.

**707.03.09 PREFORMED ELASTIC JOINT SEALER**

- A. Preformed elastic joint sealer and lubricant adhesive shall conform to AASHTO M220.
- B. The lubricant adhesive shall be homogeneous and shall remain workable from 5 degrees F to 120 degrees F.
1. Each lot of the adhesive shall be in containers with the manufacturer's name or trademark and the date of manufacture plainly marked.

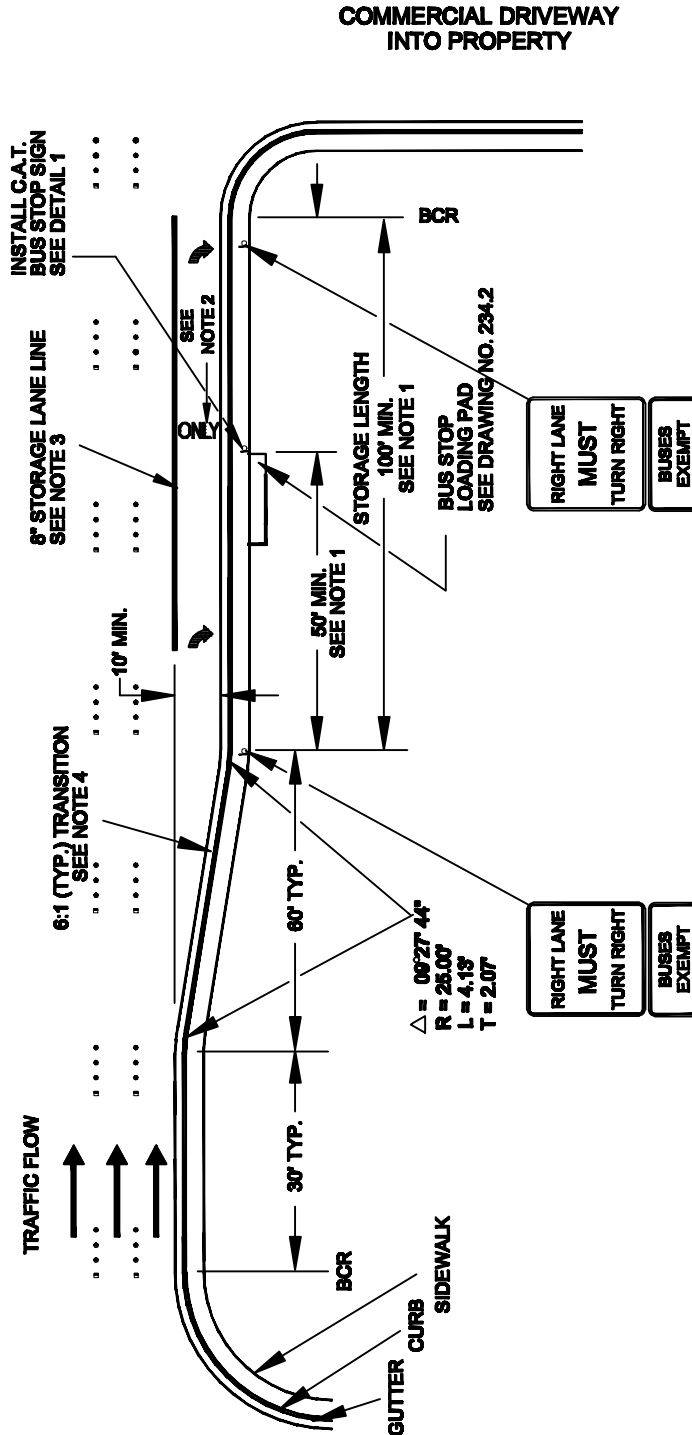
2. Adhesive shall be stored at a temperature of 50 degrees F to 80 degrees F and shall be used within 270 days after the date of its manufacture.
- C. The lubricant adhesive shall conform to the following requirements:
  1. Average new weight per gallon, pounds: 7.84  $\pm$ 5%.
  2. Solids content by weight, percent: 22 - 28.
- D. Each lot of the preformed elastic joint sealer and lubricant adhesive furnished under these specifications shall be identified as specified herein and shall be products that have been tested by a reputable testing laboratory, recognized by the Contracting Agency.
  1. The testing laboratory shall certify that the materials meet these specifications and requirements.
  2. The Contractor shall furnish the Contracting Agency with these certifications prior to using the material.

**707.03.10 SUBMITTAL**

- A. Material shall be tested and certified in accordance with the Table 3 frequencies.
  1. Prior to the use of these materials, the Contractor shall submit to the Engineer for approval a document certifying that the material meets these specifications and requirements.
  2. The test shall be performed in an accredited laboratory such as the American Association for Laboratory Accreditation (A2LA) or other as approved by the Engineer.
  3. A test certificate shall be included with the certifying document.
  4. Subsequent submittals shall be reviewed by the Contractor for compliance then transmitted to the Engineer.
- B. The Statute of Limitations duration for the record storage shall be as required by the Nevada Revised Statutes.

| <b>Table 3 - Quality Control Inspection and Testing</b> |                   |   |  |                       |
|---|-------------------|---|--|-----------------------|
| <b>Product</b>  | <b>Subsection</b> | <b>Reference</b>  | <b>Submittal</b>                       | <b>Frequenc<br/>y</b> |
| Joint Sealant   | 707.03.02         | Table 1 requirements  | Certification<br>with copy of<br>tests | 1 per lot             |
|   | 707.03.03         |   |  |                       |
|   | 707.03.04         | ACI 504R, Table 1, Type IV                                  | Certification<br>with copy of<br>tests | 1 per lot             |
|   | 707.03.05         | Table 2 requirements  |  |                       |
|   | 707.03.03         | Tested per ASTM D1752 Type I                                |  |                       |
| Joint Filler  | 707.03.04         | AASHTO M213   | Certification<br>with copy of<br>tests | 1 per lot             |
|   | 707.03.05         | Inert, preformed, closed cell,<br>polypropylene material    |  |                       |
| Backer Rod  | 707.03.03         | Non-absorbent expanded, closed cell                         | Certification                          | 1 per lot             |
|   | 707.03.04         | polyethylene  |  |                       |
| Bond Breaker Tape                                       | 707.03.03         | Adhesive strength 35 ounces/in                              | Certification<br>with copy of<br>tests | 1 per lot             |
|   | 707.03.04         | width   |  |                       |
|   | 707.03.05         | Tensile Strength 20 lb/in width<br>Thickness 14 mil minimum |  |                       |
| Rubber Gaskets  | 707.03.06         | AASHTO M198   |  |                       |
| Waterstops Natural<br>and Rubber                        | 707.03.07         | ASTM D412<br>ASTM D572                                      |  |                       |

|                                |           |                                       |
|--------------------------------|-----------|---------------------------------------|
| Waterstops Polyvinyl Chloride  | 707.03.07 | ASTM D2240<br>Corps of Engr CRD-C 572 |
| Asphalt Plank                  | 707.03.08 | ASTM D517                             |
| Preformed Elastic Joint Sealer | 707.03.09 | AASHTO M220                           |

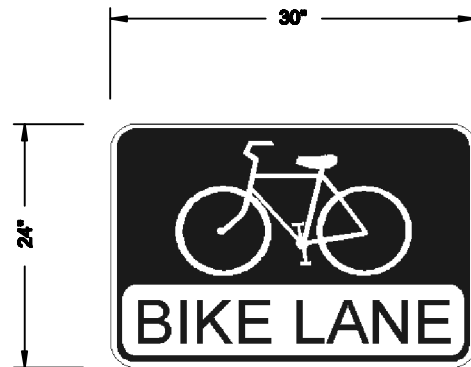
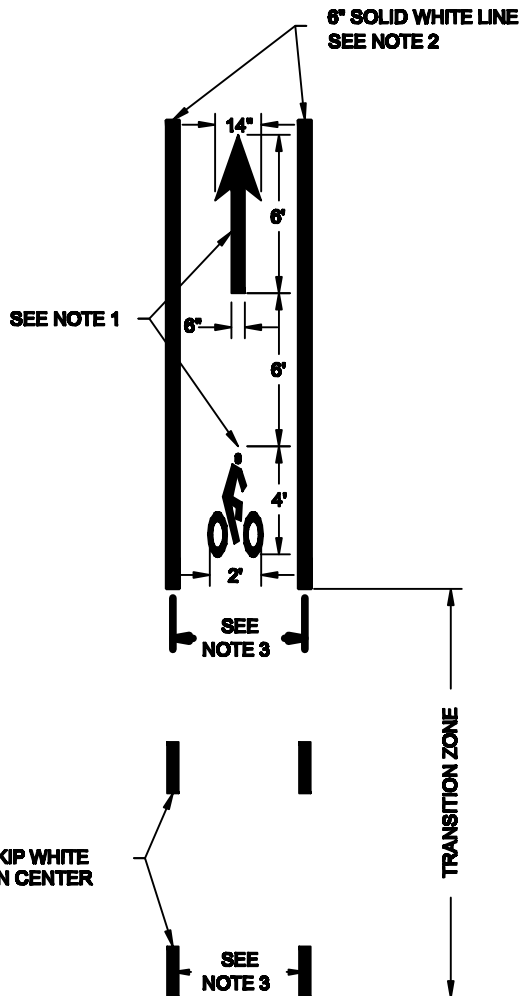


DETAIL 1  
BUS ROUTE  
SIGN

**NOTES:**

1. IF ARTICULATED BUSES ARE EXPECTED TO SERVICE BUS STOP, DISTANCE FROM END OF ENTRY TAPER TO THE END OF THE BUS STOP LOADING PAD SHALL BE INCREASED TO 70 FT. MIN. AND THE RIGHT TURN STORAGE LANE LENGTH SHALL BE INCREASED TO 120 FT. MIN.
2. WHERE ADDITIONAL MOTORIST GUIDANCE IS DEEMED NECESSARY BY THE ENGINEER, INSTALL ARROW AND "ONLY" SYMBOL PAVEMENT MARKINGS FOR THE LENGTH OF THE STORAGE LANE. SYMBOLS SHALL BE APPROVED TYPE II PAVEMENT MARKING FILM.
3. STORAGE LANE LINE SHALL BE APPROVED TYPE I PAVEMENT MARKING FILM, OR IF APPROVED BY THE ENGINEER, RAISED PAVEMENT MARKERS MAY BE USED.
4. REVERSE CURVE TRANSITION MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER.

| SPECIFICATION REFERENCE |                            | UNIFORM STANDARD DRAWINGS<br>CLARK COUNTY AREA                                      |          |                |
|-------------------------|----------------------------|---|----------|----------------|
| 302                     | AGGREGATE BASE             | BUS STOP PLACEMENT WITHIN<br>EXCLUSIVE RIGHT TURN LANE<br>FOR COMMERCIAL PROPERTIES |          |                |
| 501                     | CONCRETE                   |   |          |                |
| 502                     | CONCRETE STRUCTURES        |   |          |                |
| 628                     | PAINTING TRAFFIC STRIPING, |   |          |                |
|                         | PAVEMENT MARKINGS...       |   |          |                |
|                         |                            | DATE  | 12-08-09 | DWG. NO. 234.3 |



R3-17

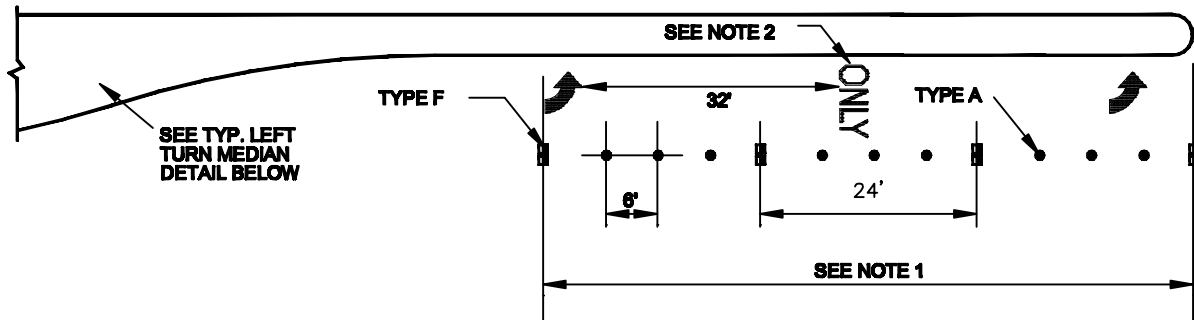
#### BIKE LANE SIGNAGE

#### BIKE LANE DELINEATION AND LEGEND

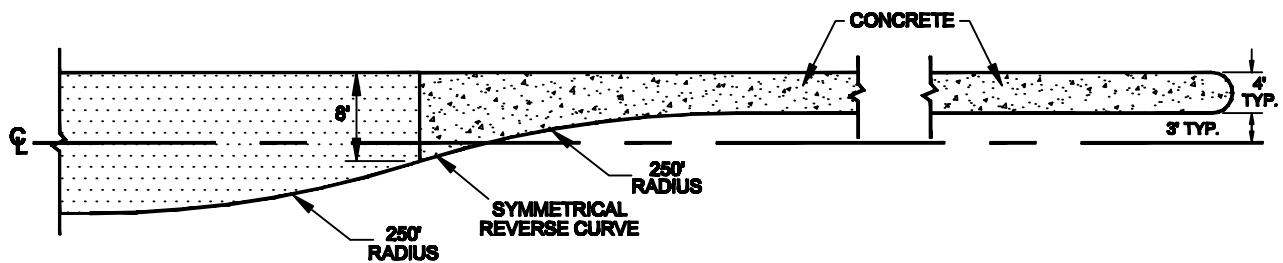
##### NOTES:

1. BIKE LANE LEGENDS SHALL BE APPROVED TYPE II PAVEMENT MARKING FILM AND SHALL BE SLIP RESISTANT.
2. BIKE LANE LINES SHALL BE APPROVED TYPE II PAVEMENT MARKING FILM AND SHALL BE SLIP RESISTANT.
3. BIKE LANES MUST BE A MINIMUM OF 5 FEET WHEN ADJACENT TO A PARKING LANE, 4 FEET MINIMUM IN OTHER CASES AND NO GREATER THAN 8 FT WIDE; HOWEVER A WIDTH OF 5 FEET IS PREFERRED.
4. BICYCLE LANE DELINEATION, LEGEND, AND SIGNING SHALL CONFORM TO THE MUTCD LATEST EDITION.
5. PER THE MUTCD LATEST EDITION, BICYCLE LANE SIGNS SHALL BE USED IN ADVANCE OF THE BEGINNING OF A MARKED BICYCLE LANE.
6. THE BIKE LANE SIGNAGE SHALL BE CLASS 6 SHEETING.

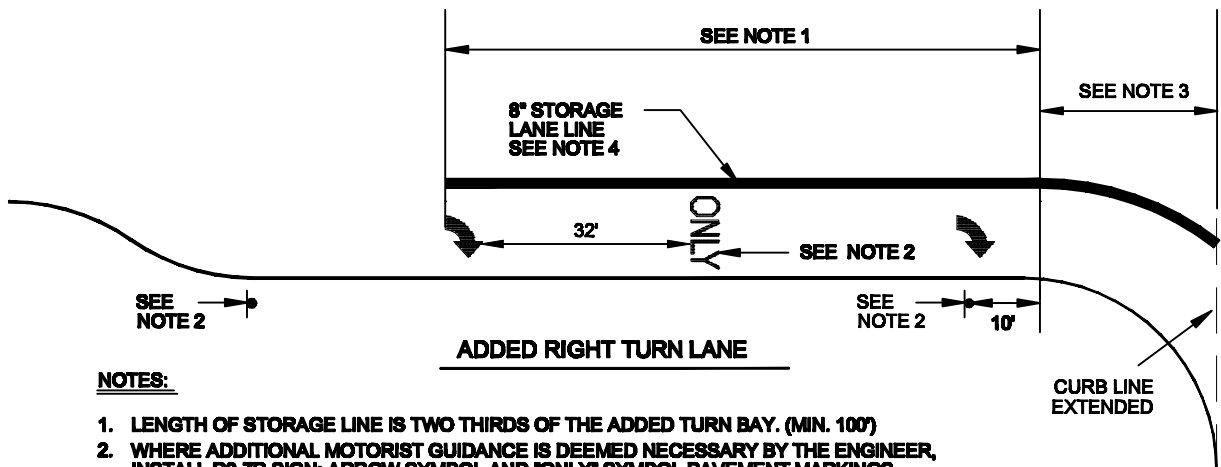
| SPECIFICATION REFERENCE |          | UNIFORM STANDARD DRAWINGS<br>CLARK COUNTY AREA   |       |
|-------------------------|----------|--|-------|
|                         |          | BICYCLE LANE DELINEATION,<br>LEGEND, AND SIGNAGE |       |
|                         |          |  |       |
|                         |          |  |       |
|                         |          |  |       |
|                         |          |  |       |
| DATE                    | 12-08-09 | DWG. NO.   | 244.5 |



ADDED LEFT TURN LANE



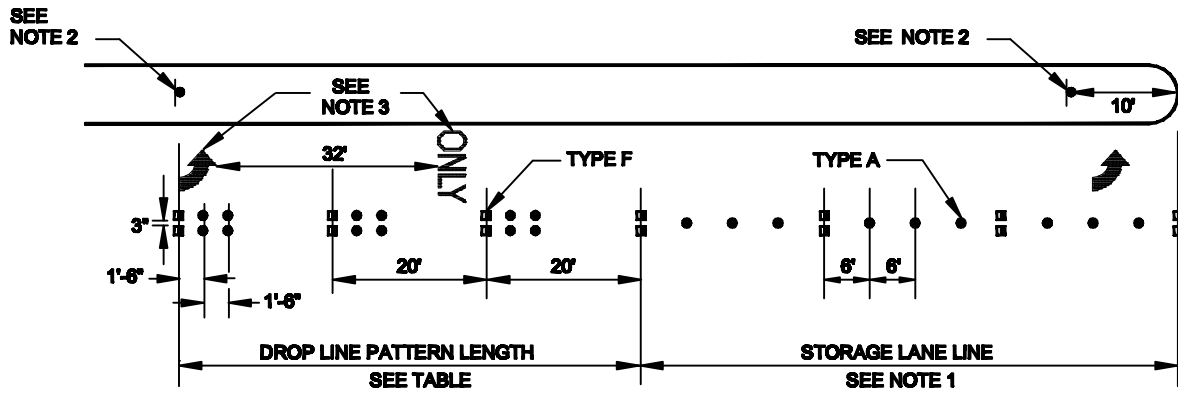
TYPICAL LEFT TURN MEDIAN DETAIL



**NOTES:**

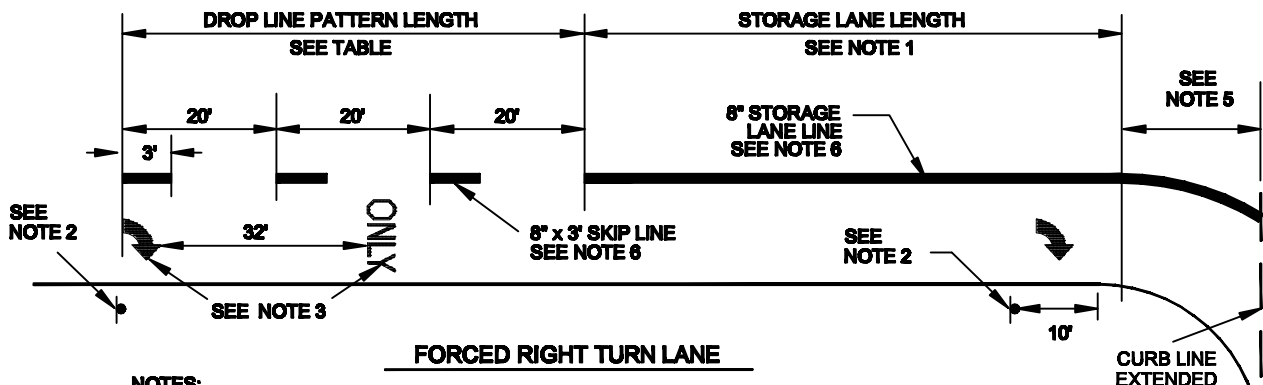
1. LENGTH OF STORAGE LINE IS TWO THIRDS OF THE ADDED TURN BAY. (MIN. 100')
2. WHERE ADDITIONAL MOTORIST GUIDANCE IS DEEMED NECESSARY BY THE ENGINEER, INSTALL R3-7R SIGN; ARROW SYMBOL AND "ONLY" SYMBOL PAVEMENT MARKINGS FOR THE LENGTH OF THE STORAGE LINE. SYMBOLS SHALL BE APPROVED TYPE II PAVEMENT MARKING FILM.
3. APPROVED TYPE II PAVEMENT MARKING FILM OR RAISED PAVEMENT MARKERS MAY BE USED FOR ADDITIONAL GUIDANCE AT THE DISCRETION OF THE ENGINEER.
4. STORAGE LANE LINE SHALL BE APPROVED TYPE I PAVEMENT MARKING FILM OR IF APPROVED BY THE ENGINEER, RAISED PAVEMENT MARKERS MAY BE USED.

| SPECIFICATION REFERENCE |                            | UNIFORM STANDARD DRAWINGS<br>CLARK COUNTY AREA |              |
|-------------------------|----------------------------|--|--------------|
| 633                     | PAVEMENT MARKERS           | STANDARD PAVEMENT MARKERS<br>ADDED TURN LANE   |              |
| 628                     | PAINTING TRAFFIC STRIPING, |  |              |
|                         | PAVEMENT MARKINGS...       |  |              |
|                         |                            |  |              |
|                         |                            |  |              |
|                         |                            | DATE 12-08-09                                  | DWG. NO. 246 |



| TYP. DROP LINE LENGTHS |             |
|------------------------|-------------|
| POSTED SPEED (MPH)     | LENGTH (FT) |
| 25                     | 240         |
| 30                     | 320         |
| 35                     | 400         |
| 40                     | 480         |
| 45                     | 560         |
| 50                     | 640         |
| 55                     | 720         |

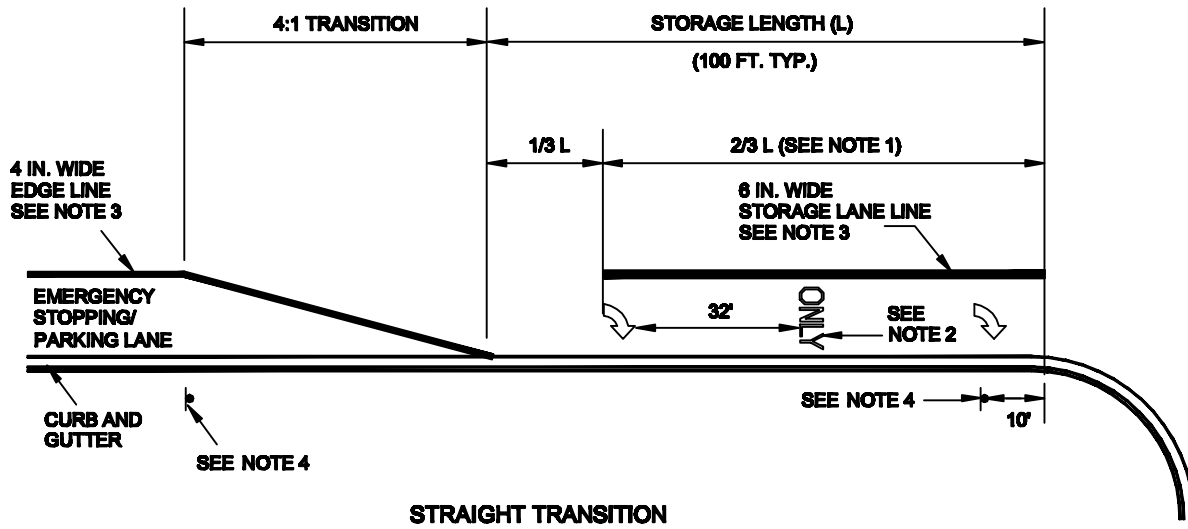
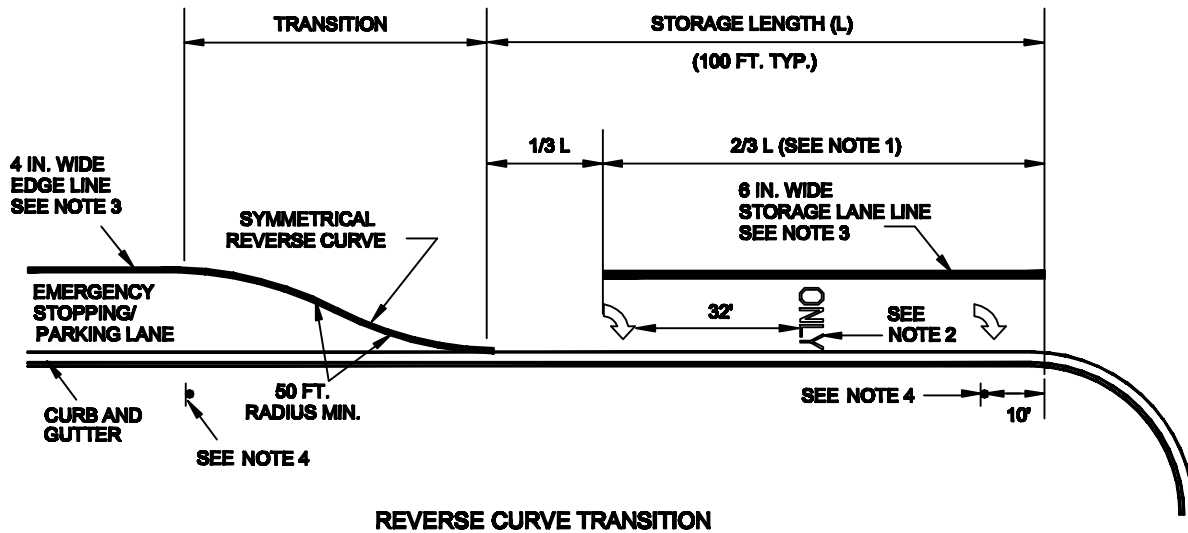
#### FORCED LEFT TURN LANE



#### NOTES:

1. THE MINIMUM LENGTH OF STORAGE LINE IS 250 FT. ON ARTERIALS AND 150 FT. ON ALL OTHERS.
2. A MINIMUM OF 200 R3-7R OR R3-7L SIGNS SHALL BE INSTALLED IN ADVANCE OF THE INTERSECTION AT DISTANCES APPROVED BY THE ENGINEER. RECOMMENDED LOCATIONS ARE SHOWN ABOVE.
3. ONE SET OF PAVEMENT MARKINGS CONTAINING ONE ARROW SYMBOL AND ONE "ONLY" SYMBOL SHALL BE PLACED AT THE BEGINNING OF THE DROP LANE.
4. WHERE ADDITIONAL MOTORIST GUIDANCE IS DEEMED NECESSARY BY THE ENGINEER, ADDITIONAL ARROW AND "ONLY" SYMBOL PAVEMENT MARKINGS AND OVERHEAD MOUNTED R3-5 SIGNS MAY BE INSTALLED. SYMBOLS SHALL BE APPROVED TYPE II PAVEMENT MARKING FILM.
5. APPROVED TYPE I PAVEMENT MARKING FILM OR RAISED PAVEMENT MARKERS MAY BE USED FOR ADDITIONAL GUIDANCE AT THE DISCRETION OF THE ENGINEER.
6. STORAGE LANE LINE AND SKIP LINES SHALL BE APPROVED TYPE I PAVEMENT MARKING FILM OR IF APPROVED BY THE ENGINEER, RAISED PAVEMENT MARKERS MAY BE USED.

| SPECIFICATION REFERENCE |  | UNIFORM STANDARD DRAWINGS<br>CLARK COUNTY AREA |               |
|-------------------------|--|--|---------------|
| 633                     | PAVEMENT MARKERS                                   | STANDARD PAVEMENT MARKERS<br>FORCED TURN LANE  |               |
| 628                     | PAINTING TRAFFIC STRIPING,<br>PAVEMENT MARKINGS... |  |               |
|                         |  |  |               |
|                         |  |  |               |
|                         |  | DATE 12-08-09                                  | DWG. NO. 246A |

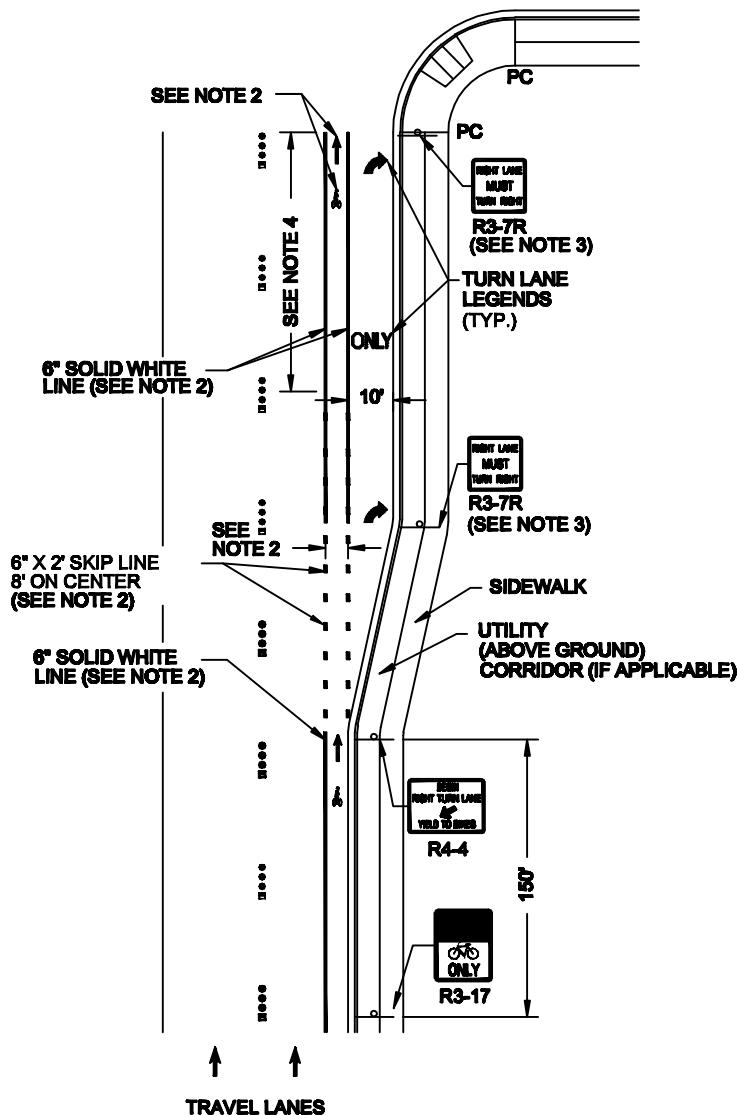


**NOTES:**

1. LENGTH OF STORAGE LANE LINE IS TWO THIRDS OF THE TURN LANE STORAGE LENGTH.
2. WHERE ADDITIONAL MOTORIST GUIDANCE IS DEEMED NECESSARY BY THE ENGINEER, INSTALL ARROW AND "ONLY" SYMBOL PAVEMENT MARKINGS FOR THE LENGTH OF THE STORAGE LINE.
3. PAVEMENT MARKINGS SHALL BE TYPE I TAPE OR PAINT AS DIRECTED BY THE ENGINEER.
4. INSTALL "NO PARKING" SIGNS FOR ENTIRE LENGTH OF TURN LANE. WHERE ADDITIONAL MOTORIST GUIDANCE IS DEEMED NECESSARY BY THE ENGINEER, INSTALL R3-7R SIGNS.

| SPECIFICATION REFERENCE |                  | UNIFORM STANDARD DRAWINGS<br>CLARK COUNTY AREA   |      |
|-------------------------|------------------|--|------|
| 633                     | PAVEMENT MARKERS | <b>PAVEMENT MARKING AND SIGNAGE<br/>RIGHT TURN LANE AT MINOR INTERSECTIONS<br/>(ARTERIALS WITH EMERGENCY/PARKING LANE)</b> |      |
|                         |                  |  |      |
|                         |                  |  |      |
|                         |                  |  |      |
|                         |                  |  |      |
| DATE 12-08-09           |                  | DWG. NO.   | 246B |

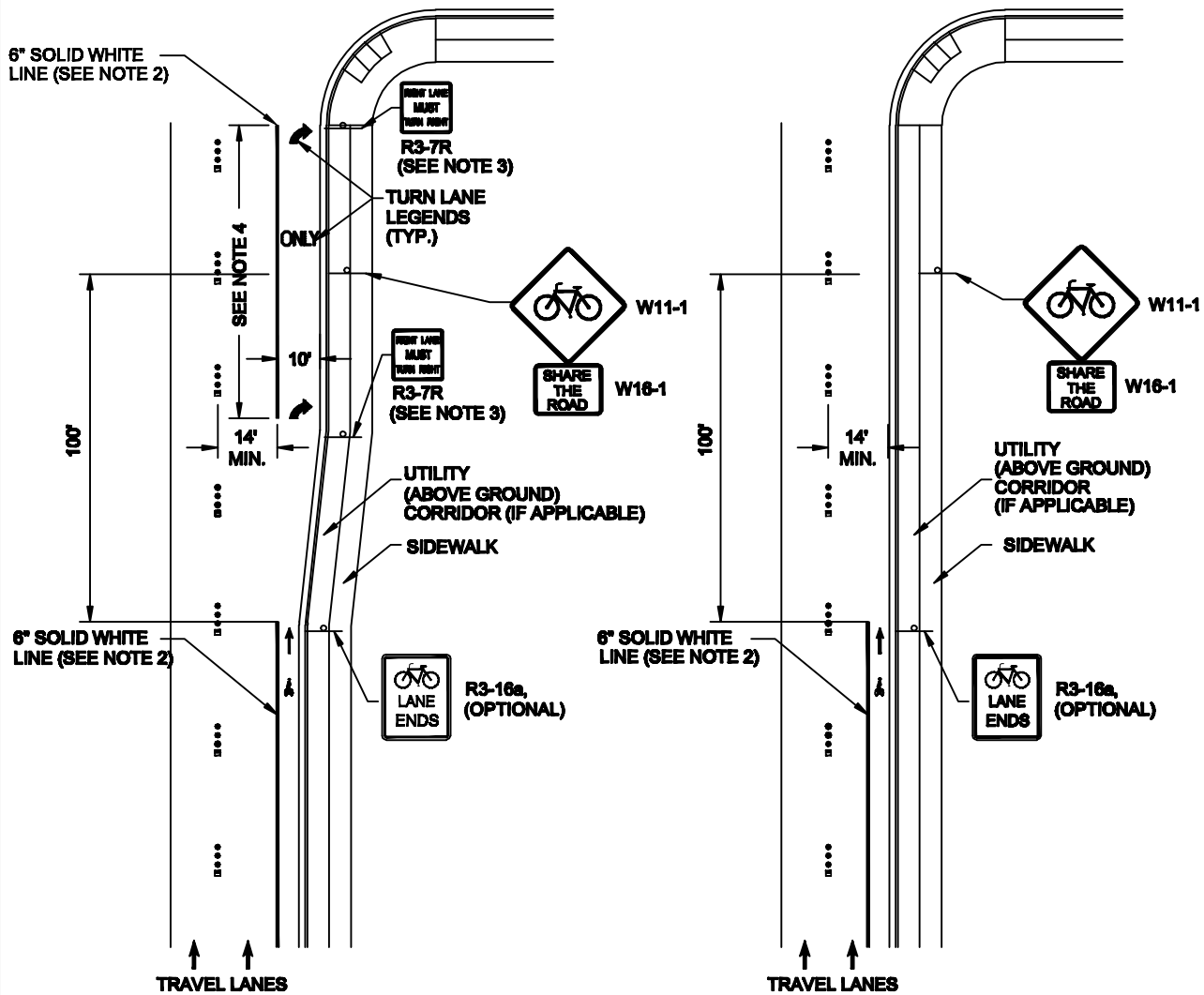




**NOTES:**

1. STORAGE LENGTH TO BE DETERMINED BY TRAFFIC ENGINEER.
2. SEE DRAWING NO. 244.5 FOR BIKE LANE LEGEND AND SIGNAGE.
3. WHERE ADDITIONAL MOTORIST GUIDANCE IS DEEMED NECESSARY BY THE TRAFFIC ENGINEER, INSTALL R3-7R SIGN, ARROW SYMBOL AND "ONLY" SYMBOL PAVEMENT MARKINGS FOR THE LENGTH OF THE STORAGE LINE. APPROVED TYPE II PAVEMENT MARKING FILM SHALL BE USED FOR SYMBOL MARKINGS.
4. SEE DRAWING NO. 246 NOTE 1 FOR STANDARD PAVEMENT MARKERS ADDED TURN LANE.

| SPECIFICATION REFERENCE |                           | UNIFORM STANDARD DRAWINGS<br>CLARK COUNTY AREA                             |                |
|-------------------------|---------------------------|--|----------------|
| 628                     | PAINTING TRAFFIC STRIPING | BICYCLE LANE APPROACH TO<br>INTERSECTION WITH EXCLUSIVE<br>RIGHT TURN LANE |                |
| 633                     | PAVEMENT MARKERS          |  |                |
|                         |                           |  |                |
|                         |                           |  |                |
|                         |                           |  |                |
|                         |                           | DATE 12-08-09  | DWG. NO. 246.1 |



**NOTES:**

1. STORAGE LENGTH TO BE DETERMINED BY TRAFFIC ENGINEER.
2. SEE DRAWING NUMBER 244.5 FOR BIKE LANE LEGEND AND SIGNAGE.
3. WHERE ADDITIONAL MOTORIST GUIDANCE IS DEEMED NECESSARY BY THE ENGINEER, INSTALL R3-7R SIGN, ARROW SYMBOL AND "ONLY" SYMBOL PAVEMENT MARKINGS FOR THE LENGTH OF THE STORAGE LINE. APPROVED TYPE II PAVEMENT MARKING FILM SHALL BE USED FOR SYMBOL MARKINGS.
4. SEE DWG. 246 NOTE 1 FOR STANDARD PAVEMENT MARKERS ADDED TURN LANE.
5. THE ABOVE DETAIL SHOULD BE FOLLOWED IN SITUATIONS WHERE THERE IS NOT ADEQUATE SPACE TO PROVIDE A SEPARATE BICYCLE LANE.

| SPECIFICATION REFERENCE |                           | UNIFORM STANDARD DRAWINGS<br>CLARK COUNTY AREA            |                |
|-------------------------|---------------------------|---|----------------|
| 628                     | PAINTING TRAFFIC STRIPING | BICYCLE LANE TRANSITION TO SHARED<br>LANE AT INTERSECTION |                |
| 633                     | PAVEMENT MARKERS          |   |                |
|                         |                           |   |                |
|                         |                           |   |                |
|                         |                           |   |                |
|                         |                           | DATE 12-08-09   | DWG. NO. 246.2 |