



# **GENERAL CONDITIONS AND SPECIFICATIONS**

**Adopted by the  
Union Pacific Engineering Department**

**October 10, 2014**

This page intentionally left blank.

# INDEX OF GENERAL CONDITIONS AND SPECIFICATIONS

## DIVISION 1                      GENERAL CONDITIONS

Section	01000	General Conditions
	01010	Summary of Work
	01011	Contracts
	01041	Project Coordination
	01050	Field Engineering
	01153	Change Order Procedures
	01160	Mobilization and Equipment Rental
	01300	Submittals and Substitutions
	01340	Shop Drawings
	01410	Testing Laboratory Services
	01500	Construction Facilities and Temporary Controls
	01510	Utility and Fiber Optic Lines
	01511	Electricity
	01514	Office Space and Phone for Contractor and Engineer
	01515	Water
	01516	Sanitary Facilities
	01531	Fencing and Barricades
	01551	Access Roads and Crossings
	01562	Dust Control
	01563	Irrigation Facilities
	01572	Working and Flagging near Tracks
	01575	Haul Roads
	01620	Storage and Protection
	01710	Project Closeout and Cleaning
	01720	Project Record Documents
	01750	Guarantees, Warranties, and Bonds

DIVISION 2

SITE WORK SPECIFICATIONS

Section	02010	Soils Report
	02100	Site Preparation
	02060	Building Demolition
	02110	Clearing and Grubbing
	02120	Blasting
	02230	Roadway Excavation and Embankment
	02241	Lime Stabilization
	02250	Compaction Control and Testing
	02260	Finish Grading
	02270	Slope Protection and Erosion Control
	02270.1	Topsoil - Stockpiling and Placement
	02270.7	Silt Fence and Hay Bale Ditch Checks for Erosion Control
	02270.75	Seeding Various Methods
	02271	Slope Protection – Riprap
	02434	Culverts
	02435	Smooth Steel Pipe Culverts
	02437	Reinforced Concrete Pipe
	02438	Reinforced Concrete Box Culverts
	02444	Chain Link Fences and Gates
	02445	Right of Way Fences and Gates
	02445.5	Fence – Deer Proof
	02513	Asphalt Concrete Paving
	02515	Asphalt – Cutting and Patching
	02577	Paint Striping and Markings
	02851	Subballast
	02854	Track Construction ( Separate Document )

DIVISION 3

CONCRETE

Section	03100	Reinforced Concrete
	03200	Non-Reinforced Concrete

**DIVISION 1 – GENERAL CONDITIONS**

This page intentionally left blank.

**SECTION 01000**

**GENERAL CONDITIONS**

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. This Section describes standard Specifications which are broad in scope and apply on most construction projects.

B. DEFINITION OF TERMS

Whenever in these Specifications the following terms or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

1. Railroad - Shall mean Union Pacific Railroad Company, Southern Pacific Transportation Company and their respective affiliates and subsidiary Companies and/or Corporations.
2. Agreement - The written Agreement and any written supplements or amendments thereto covering the performance of the Work and the furnishing of all superintendence, labor, tools, equipment, material, supplies and all other things required to properly complete the Work.
3. Contractor - The person or persons, firm, partnership, corporation, or combination thereof, who have entered into the Agreement with the Railroad.
4. Drawings - The official project plans, profiles, typical cross sections, general cross sections, working drawings and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location character, dimensions and details of the Work to be performed.
5. Engineer - The Vice President Engineering of the Railroad or his authorized representative.
6. Right of Way - Land which the Railroad owns or owns an interest in sufficient to permit performance of the Work.
7. Specifications - The directions, provisions and requirements contained herein. Any special conditions shall override these specifications.
8. Project - is the total construction of which the Work performed under the Contract Document may be the whole or a part and which may include construction by the Railroad or by separate contractors.
9. Work - The carrying out of responsibilities and duties imposed by the Agreement, whether completed or partially completed, and includes all labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations.
10. Work is to be completed in accordance with any and all local, state, and federal codes which have jurisdiction.

C. SITE CONDITIONS

The Contractor shall keep himself fully appraised throughout the performance of the Agreement of existing conditions at the site, including the status and progress of other work, which may affect the performance of this Agreement. The Contractor shall verify all necessary measurements and elevations in the field.

The Contractor shall promptly notify the Railroad of:

GENERAL CONDITIONS  
Section 01000

1. Any condition at the site which differs from that indicated in the Contract Documents or information furnished by the Railroad, or would be apparent under the mandatory visit to the site to become familiar with existing conditions,
2. Any previously unknown physical conditions at the site of an unusual nature not revealed by previous investigations and differing from those ordinarily encountered at the site of the Work,
3. The presence of any hazardous substance not shown on the plans and specifications or archaeological remains.

D. SITE SUPERVISION

The Contractor shall maintain on the site at all times during Work at the site a competent resident general superintendent and any necessary assistants, all satisfactory to the Railroad. The resident general superintendent shall represent the Contractor and all directions given to him shall be binding as if given to the Contractor.

E. MATERIAL AND EQUIPMENT BY THE CONTRACTOR

Unless otherwise specified, all materials furnished by the Contractor, for installation as part of the Railroad's facility, shall be new.

No material or equipment which is deemed by the Railroad to be experimental will be accepted as complying with the requirements of the Contract Documents. Equipment or material which is provided, but fails to comply with the requirements of said documents, shall be corrected or removed and replaced with complying equipment or material at the Contractor's sole expense provided, however, if the progress of the Work is such as to make such removal impractical, the Railroad shall have the right to accept it and reduce the Agreement price by an amount equivalent to the difference in its value and the value of complying equipment or material. The Railroad may perform such factory or field tests as are deemed necessary to verify that equipment or material meets the performance standards recited in the Contractor's proposal. The Contractor shall be permitted to witness such tests.

Should equipment or material fail to meet such standards, the Contractor shall, at his own expense, modify, adjust, repair or replace same, as necessary, to assure compliance therewith and with the other applicable requirements of the Contract Documents.

Material Safety Data sheets for all hazardous substances must be submitted to the Railroad prior to bringing hazardous substances onto the property. This is in compliance with 29 CFR 1910.1200, the Federal Hazard Communication Standard. The Contractor shall dispose of hazardous substances in accordance with all Federal, State and local regulations.

F. PATENTS, OTHER INTELLECTUAL PROPERTY RIGHTS AND ROYALTIES

If any of the Work or equipment proposed to be furnished by the Contractor is covered by claims or patents of any nature, the Contractor will be required to pay all royalties thereon.

The Contractor agrees to indemnify and hold harmless the Railroad from any claim of any third party that any equipment furnished under this Agreement infringes any patent of the United States. If the Railroad notifies the Contractor promptly upon receipt of any claim that the equipment infringes a United States patent and gives the Contractor information, assistance and exclusive authority to settle and defend the claim, the Contractor shall at its own expense and option, either:

- 1. Settle or defend the claim or any suit or proceeding and pay all damages and costs awarded in it against the Railroad;**
- 2. Procure for the Railroad the right to continue using the equipment;**
- 3. Modify the equipment so it becomes non-infringing;**
- 4. Replace the equipment or portions thereof so it becomes non-infringing.**

If, in any suit arising from such claim the continued use of the equipment for the purpose intended is forbidden by any court of competent jurisdiction, the Contractor shall, at its option, take one or more of the actions under 2, 3 and 4 above without affecting the quality, performance or guarantees per the Contract Documents. The foregoing states the entire liability of the Contractor for patent infringement of any equipment.

#### G. INSPECTIONS

**The Railroad reserves the right to conduct inspections as it sees fit and hereby requires inspectors shall have the right to inspect all Work as it progresses at the site and shall have access to Contractor's and subcontractor's data relevant to the performance of this Agreement.**

**The Railroad inspectors shall have the right to reject Work which is faulty, or defective, or does not conform to the requirements of the Contract Documents. Inspection shall not relieve the Contractor from any obligations to perform the Work strictly in accordance with the requirements of the Agreement.**

#### H. OCCUPATIONAL SAFETY AND HEALTH

At all times during the performance of the Work, the Contractor shall exercise precaution for the protection of persons and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery and equipment and other hazards shall be guarded in accordance with the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, to the extent such provisions are not inconsistent with applicable law or regulations.

#### I. CLIMATIC CONDITIONS

The Contractor shall take all reasonably necessary precautions to protect the Work against adverse climatic conditions.

#### J. REMOVAL OF DEBRIS

All trash, debris, and waste materials shall be removed from the site and disposed of by the Contractor, on a regular basis.

If the Contractor does not maintain the cleanliness standards previously mentioned, the Railroad holds the right to perform these duties upon notice to the Contractor and failure by the Contractor with five (5) calendar days to commence corrective action and take other appropriate action. In such case, the costs will be accumulated and subtracted from the Agreement price.

K. SUCCESSFUL OPERATION

**Successful operation is defined as demonstration of meeting performance guarantees by performance testing and completion of all Work including punchlist items, all in accordance with the Contract Documents.**

L. FIRE PROTECTION

Only work procedures which minimize fire hazards to the extent practicable shall be used. Combustible debris and waste materials shall be collected and removed from the site each day. Fuels, solvents and other volatile or flammable materials shall be stored in separate areas in well-marked, safe containers. Good housekeeping is essential to fire prevention and shall be practiced by the Contractor throughout the construction period. The Contractor shall follow the requirements for UPRR fire prevention.

Open burning on Railroad property or related to the project although off Railroad property is strictly forbidden.

M. CONTRACTOR SECURITY

The Contractor shall be responsible for all materials and equipment in its custody or placed in construction by it. Security methods shall be employed as required to ensure the protection of all materials, equipment and construction work from theft, vandalism, fire, and all other damage and loss. The Contractor must abide by all of the provisions of the Minimum Contractor Safety Requirements. This includes demobilizing equipment left unattended on the right of way, placing crane booms on the ground when left unattended, and no cell phone use while operating equipment on the right of way.

**SECTION 01010**

**SUMMARY OF WORK**

**PART 1 - GENERAL**

**1.1 GENERAL DESCRIPTION**

The Contractor shall furnish engineering, design, labor, material, tools, equipment, and construction services necessary to provide total PROJECT SCOPE OF WORK AS HEREIN DESCRIBED.

**1.2 OCCUPANCY**

The Contractor shall allow the Railroad to take possession of and use any completed or partially completed portion of the facility during the progress of the Work as is possible without interfering with the progress of the Contractor. Possession and use of the facility shall not in any way evidence the completion of the Work or signify the Railroad's acceptance of the Work or any part of it.

**1.3 NUMBER OF SPECIFIED ITEMS REQUIRED**

Wherever in these Specifications an article, device or piece of equipment is referred to in the singular number, such reference shall apply to as many such articles as are shown on the Drawings or required to complete the Work.

**1.4 FURNISHED BY THE RAILROAD**

The following Drawings (see Drawings listed at the end of 'Index of Specifications'), furnished by the Railroad, shall be considered as part of and illustrating these Specifications. The Specifications are intended to supplement the drawings, the two being considered cooperative. They are the property of the Railroad and shall be returned when the Work is completed.

- A. The Drawings show the general character of the Work, but the Railroad may furnish large-scale detail Drawings of such portions, as in its judgment may be required, in the preparation of which slight modifications may be made in minor details of design, if necessary. The Contractor shall not execute any work requiring such large-size details until same has been approved and all work must be made in strict accordance with such detail Drawings.
- B. Dimensions on Drawings take precedence over measurements by scale, detail Drawings over small-scale Drawings, and full-size details over all other Drawings. The decision of the Railroad shall be final as to the interpretations of Drawings and Specifications.

This page intentionally left blank.

**SECTION 01011**

**CONTRACTS**

**PART 1 - GENERAL**

**1.1 RESPONSIBILITIES AND DUTIES - DOCUMENTS, SPECIFICATIONS AND DRAWINGS**

- A. **CONTRACT DOCUMENTS.** The Agreement, applicable Addenda, Exhibits, Schedule of Billable Service Items, Statement of Equipment, Contractor's Statement of Business and Legal Relationships, Drawings and the Specifications (hereinafter the Contract Documents) all set forth numerous responsibilities and duties of the Contractor. The Contractor should be thoroughly familiar with all of the above Contract Documents in order to fully understand all of his responsibilities and duties.
- B. **ACCESS TO THE SPECIFICATIONS AND DRAWINGS.** The Contractor shall keep a copy of the Specifications and Drawings at the job site, and shall at all times give the Engineer access thereto.
- C. **DRAWINGS.** The Engineer during the progress of the Work, by means of drawings or written instructions, may clarify the drawings and Specifications or make necessary changes in the Work. Any Work that may reasonably be inferred from the Specifications or Drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for.
- D. **DRAWINGS FURNISHED BY THE RAILROAD.** The drawings furnished by the Railroad shall be considered as part of and illustrating these Specifications. The Specifications are intended to supplement the drawings, the two being considered cooperative.

**1.2 INCONSISTENCIES IN SPECIFICATIONS AND CORRECTIONS**

- A. In the event of conflicting requirements, the most restrictive provision shall apply.
- B. The Contractor shall immediately report, and fully describe in writing, to the Engineer any and/or all inconsistencies, discrepancies, and/or ambiguities which the Contractor finds between the Contract Documents. The Engineer will promptly, in writing, correct such inconsistencies, discrepancies, and/or ambiguities in writing. Any such work done by the Contractor after his discovery of these inconsistencies, discrepancies, and/or ambiguities shall be done at the Contractor's risk.

This page intentionally left blank.

**SECTION 01041**

**PROJECT COORDINATION**

PART 1 - GENERAL

1.1 GENERAL

- A. The Work involves construction and operations on the Railroad's Right-of-Way, and the Contractor will be required to coordinate his activities with the activities of the Railroad as well as others not party to the Agreement. Any questions arising about coordination of work between the Contractor and the Railroad or between the Contractor and others shall be taken up with the Engineer and a method of coordination agreed upon before Work is commenced.
- B. The safe operation of the Railroad shall take precedence over all Work, and nothing shall be done or suffered to be done by the Contractor which will endanger Railroad employees or operation. The Contractor shall become familiar with and comply with the Railroad's rules and regulations concerning protection of persons and property and shall consult with the Engineer concerning the Railroad's rules and regulations.
- C. All bidders shall submit a critical path schedule, work plan, and spending plan along with their bid proposal. The schedule shall indicate the number of calendar days required for each Bid Item. In determining the calendar days the Contractor shall consider weather and local conditions which are normal for this area. The successful bidder may be required to make monthly updates of the schedule to be submitted with the invoice for payment requests. Contractor's bid may not be considered if a schedule is not included in the bid.
- D. All bidders shall provide a tentative list of sub-contractors and the work to be done by them with their bid. The successful bidder shall submit a final list of sub-contractors and the work to be done by them prior to commencing work.
- E. The Contractor shall provide evidence of a current State Contractor's license with the bid. Contractor shall be responsible to assure compliance with the laws of the State with regards to any sub-contractors used.
- F. UPRR will furnish electronic copies of plans to the Successful Contractor. Hard copies will be the responsibility of the Contractor.

This page intentionally left blank.

**SECTION 01050**

**FIELD ENGINEERING**

PART 1 - GENERAL

1.1 GENERAL

A. Provide such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:

1. All surveying, including, but not limited to establishing and maintaining lines and levels, slope stakes and grade stakes, any intermediate stakes, right-of-way fence and final blue tops (finished grade stakes) for the grading, bedding for culverts, rip rap, and bridge construction will be the responsibility of the Contractor. Horizontal and vertical control will be furnished by the Railroad. Blue tops (finished grade stakes) are required at 100' intervals, for both subgrade and subballast, at the track centerline and shoulder. The Contractor shall reestablish the engineering stationing as required.
2. Surveying by the Contractor shall also include staking for track construction to the planned horizontal and vertical alignments. All tracks shall be staked at 100-foot intervals in tangents and 50-foot in curves. Turnouts shall be staked or marked at each point of switch and the 1/2-inch point of frog.
3. Structural design of shores, forms and similar items provided by the Contractor as part of his means and methods of construction.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. Additional requirements for field engineering also may be described in other Sections of these Specifications.
3. As described in the General Conditions, and if available, the Railroad will furnish survey describing the physical characteristics, legal limitations, utility locations, and legal description of the site.

1.2 SUBMITTALS

**A. Upon request of the Engineer, submit:**

1. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.
  - a. Documentation verifying accuracy of field engineering work.
  - b. Certification, signed by the Contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance or nonconformance with requirements of the Contract Documents.
2. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

1.3 PROCEDURES

- A. In addition to procedures directed by the Contractor for proper performance of the Contractor's Responsibilities:
  - 1. Locate and protect control points before starting Work on the site.
  - 2. Preserve permanent reference points during progress of the Work.
  - 3. Do not change or relocate reference points or items of the Work without specific approval from the Engineer.
- B. Promptly advise the Engineer when a reference point is lost or destroyed, or requires relocation because of other changes in the Work.
  - 1. Upon direction of the Engineer, require the field engineer to replace reference stakes or markers.
  - 2. Locate such replacements according to the original survey control.

**SECTION 01153**

**CHANGE ORDER PROCEDURES**

PART 1 - GENERAL

1.1 GENERAL

- A. These instructions shall apply when any of the following items are identified in connection with the Work covered under this Agreement:
  - 1. Additional work is required that is not identified in the original Agreement.
  - 2. Services required at unit prices for either labor, material, or equipment not identified in the original Agreement.
  - 3. Additional compensation will exceed the amount authorized in the original Agreement.
  - 4. Additional time is needed to complete the Work authorized in the Agreement.
  - 5. A major reduction in the scope of Work covered in the original Agreement is authorized by the Railroad.
- B. When any of the above items are encountered during the Work undertaken by this Agreement, The Railroad Representative shall cause the Contractor to complete the Railroad's Change Order Form (No. 24230) and return to the Railroad Representative. The Form shall be completed, executed by the Contractor's authorized representative, submitted to the Railroad, and proper approval received prior to any additional work being performed or materials ordered for the Work.
- C. All additional, or "extra work", must be documented on the Railroad's Form 24230. No additional, or "extra work", shall be undertaken by the Contractor unless specifically authorized by the Railroad Representative and documented on Form 24230. The Contractor will not receive compensation for "extra work" without fully executed approval from the Railroad on Form 24230.
- D. Full instructions are on the back of Form 24230 with Forms available from the Railroad Representative.

This page intentionally left blank.

**SECTION 01160**

**MOBILIZATION AND EQUIPMENT RENTAL**

**PART 1 - GENERAL**

- 1.1 **MOBILIZATION DESCRIPTION:** This work consists of preparatory work and operations, including those necessary for movement of personnel, equipment, supplies and incidentals to the project site; the establishment of offices, buildings and other facilities necessary for work on the project; the cost of bonds and any required insurance; and other preconstruction expenses necessary for start of the Work, excluding the cost of construction materials.
- 1.2 **EQUIPMENT RENTAL DESCRIPTION:** This work consists of providing equipment for rent to the Railroad during the project as requested by Railroad Engineer.

**PART 2 - PRODUCTS**

- 2.1 **MOBILIZATION – N/A**
- 2.2 **EQUIPMENT RENTAL -** All equipment expected to be used on the project should be listed on the “Statement of Equipment”. These hourly rates will be used for any extra equipment rental that might occur during the project. Mobilization and demobilization costs shall be included in the hourly rate for any equipment not already on the job site. Daily work tickets must be filled out for ALL EQUIPMENT RENTAL! Contractor shall ensure that these tickets are accurately maintained on a daily basis. Hours of equipment rental use will not be continuous. Individual pieces of equipment will be used sporadically throughout the project. Equipment Rental on equipment that is not on site shall be used for a 4-hour minimum.

**PART 3 - EXECUTION - N/A**

**PART 4 - MEASUREMENT AND PAYMENT**

- 4.1 Mobilization payment will be made at the contract lump sum price subject to the following provisions:
  - A. Payment for mobilization shall be made 70% when Work is commenced and 30% upon lien release and request for 10% retention invoice.
- 4.2 Equipment Rental payment shall be based on the unit prices provided in project bid items.

This page intentionally left blank.

**SECTION 01300**

**SUBMITTALS AND SUBSTITUTIONS**

PART 1 - GENERAL

1.1 GENERAL

- A. Special brands of material or devices mentioned in Specifications, or on Drawings are for the purpose of establishing a standard or criterion of quality and character desired.
  - 1. For products specified by naming several products or manufacturers, select any product and manufacturer named.
  - 2. For products specified by naming one of more products, but indicating the option of selecting equivalent products by stating "or equal" after specified product, Contractor must submit request to the Railroad for substitution for any product not specifically named.
  - 3. For products specified by naming one or more products, but indicating the option of selecting equivalent products by stating "or approved equal" after specified product, Contractor must submit information to Railroad for approval of any product not specifically named.
  - 4. For products specified by naming only one product and manufacturer, there is no option, and no substitution will be allowed.
  - 5. Where specific make or kind of apparatus is called for and furnished by the Contractor, the furnishing of the apparatus does not relieve the Contractor of liability until he shall make such apparatus or appliance operate so it will successfully perform the function for which it is intended.
  - 6. Submittals for substitutions to be in triplicate. Include in submittals complete data substantiating compliance of proposed substitution, including product identification, manufacturer's literature, performance and necessary test data.
  - 7. In making request for substitutions, Contractor represents he will coordinate installation of accepted substitution into work, making such changes as may be required for work to be complete in all respects.
  
- B. Design drawings, design information, and other data for all construction work furnished by the Contractor shall be submitted to the Railroad. The Contractor shall submit all design drawings and data sufficiently in advance of construction requirements to allow ample time for checking, resubmitting and rechecking and to avoid any delay in progress of Work.
  
- C. All equipment supplied by Contractor shall be furnished complete with installation instructions, operating and maintenance instruction bulletins, complete parts lists, and wiring diagrams for all panels. It shall be Contractor's responsibility to furnish five (5) complete, bound sets of these instructions, lists, diagrams, etc., to the Railroad.
  
- D. Drawings, instructions and manuals supplied with equipment furnished by others, but installed under the Agreement, shall be carefully preserved and turned over to the Railroad.
  
- E. The Contractor shall provide three (3) days training to Railroad personnel on the operation and maintenance requirements of equipment installed. The Contractor shall

SUBMITTALS AND SUBSTITUTIONS  
Section 01300

provide a one week notice to the Railroad before training commences. The training dates shall be determined through consultation with the Railroad.

- F. All materials to be placed under this Contract will first be approved by the UPRR Engineer. Contractor shall submit to the UPRR Engineer, for review and exception, if any, such work, drawings, shop drawings, laying schedules, test reports, data on material and equipment and material samples, as are required for the proper control of the work. Contractor shall not begin any work covered by a submittal until the submittal is returned to him by the UPRR Engineer. Where exceptions are taken by the UPRR Engineer, the Contractor shall make the necessary revisions and re-submit the information to the UPRR Engineer. Submittals will be required for, but not limited to, the following items: Erosion control plan, subballast, and seeding.

**SECTION 01340**

**SHOP DRAWINGS**

PART 1 - GENERAL

1.1 GENERAL

- A. Drawings shall clearly indicate proposed items, capacities, characteristics and details in conformance with the Drawings or schedules. Capacities, dimensions and special features required shall be certified by the manufacturer.
- B. Shop Drawings shall indicate manufacturer's delivery time for the item after receipt of approval by the Railroad.
- C. Shop Drawings for all items requiring same or called for shall be prepared immediately upon award of Agreement and four copies submitted to the Railroad for review. No materials shown thereon shall be ordered until shop Drawings and setting diagrams are reviewed and approved as detailed below. After the review process, Contractor shall then furnish three (3) complete sets of approved Drawings for the Railroad's use on the job, and one (1) set of positive sepia prints for the Railroad's file.
- D. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Railroad will review each submittal, mark to indicate action taken, and return promptly.
- E. Compliance with specified characteristics is the Contractor's responsibility.
- F. Action Stamp: The Railroad will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:
  - 1. Final Unrestricted Release: Where submittals are marked "Approved," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
  - 2. Final-But-Restricted Release: When submittals are marked "Approved as Noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
  - 3. Returned for Resubmittal: When submittal is marked "Not Approved, Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark. Do not permit submittals marked "Not Approved, Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.
  - 4. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required".
- G. The checking and review of shop Drawings by the Railroad will not release the Contractor from any errors thereon. The Contractor is to be responsible for verifying all material and workmanship in shop work or other trades assuming all responsibility for any conflict between the various trades during construction.

This page intentionally left blank.

**SECTION 01410**

**TESTING LABORATORY SERVICES**

PART 1 - GENERAL

1.1 SUMMARY

- A. Testing and inspecting to be provided by the Contractor. Cooperation is required from the Contractor and others responsible for testing and inspecting the Work.

1. Related Work:

- a. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these Specifications.
- b. Requirements for testing may be described in various Sections of these Specifications.
- c. Where no testing requirements are described, but the Railroad decides testing is needed, the Railroad may require testing to be performed under pertinent standards for testing.
- d. Employment and payment of a concrete testing laboratory is the Contractor's responsibility. See Section on Concrete for testing requirements.

2. Work Not Included:

- a. Testing laboratory: The Contractor will select a prequalified independent testing laboratory.
- b. Selection of a construction soil engineer: The Contractor will select a prequalified independent soil engineer and a testing engineer for asphalt, if one is required, to observe performance of work in connection with excavating, trenching, filling, backfilling and grading, the placing of asphalt and to perform soils, compaction, and asphalt tests.

B. QUALITY ASSURANCE

1. The testing laboratory will be qualified to the Railroad's approval in accordance with ASTM E-329.
2. Testing will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials.

C. DELIVERY, STORAGE AND HANDLING

1. Comply with pertinent provisions of Specifications Sections.
2. Promptly process and distribute required copies of test reports and related instructions to assure necessary retesting and replacement of failed materials with the least possible delay in progress of the Work.
3. The Contractor will furnish to the Railroad's Engineer the original copies of test reports. In cases of test failure, the Engineer will be notified in the most expedient manner possible and written reports will follow. If the Engineer cannot be located immediately the Contractor will be notified of the failure and the failure shall be rectified.

D. INITIAL SERVICES OF A TESTING LABORATORY SERVICE.

1. INITIAL SERVICE REQUESTED BY THE RAILROAD.

- a. The Contractor will pay for all testing services requested by the Railroad, including, but not necessarily limited to, observing performance of work in connection with excavating and embankment, trenching, backfilling, grading and installation of asphalt.

2. CODE COMPLIANCE TESTING

Inspections and tests required by codes or ordinances or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of, and be paid for by the Contractor, unless otherwise provided in the Contract Documents.

3. CONTRACTOR'S TESTING

Inspecting and testing performed exclusively for the convenience of the Contractor shall be the Contractor's sole responsibility.

4. COOPERATION WITH TESTING LABORATORY

Representatives of the testing laboratory shall have access to the Work at all times and at all locations where the Work is in progress. The Contractor shall provide facilities for such access to enable the laboratory to perform its functions properly.

5. TAKING SPECIMENS

All specimens and samples for testing, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

E. SCHEDULES FOR TESTING

1. Establishing Schedule:

- a. Testing shall be performed in accordance of the schedule as noted in Division 2, Sections 02250, 03100, and 03200.
- b. Provide all required time within the construction schedule.

2. Revising schedule: When changes of construction schedule are necessary during construction, coordination of all such changes with the testing laboratory is required.

3. Adherence to schedule: When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra charges for testing attributable to the delay shall be back charged to the Contractor and shall not be borne by the Railroad.

PART 2 - PRODUCTS - N/A

PART 3 - EXECUTION - N/A

PART 4 - MEASUREMENT AND PAYMENT

4.1 PAYMENT

A. Initial Services of Testing Laboratory:

1. The Contractor will pay for all testing services requested by the Railroad.

This page intentionally left blank.

**SECTION 01500**

**CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

**PART 1 - GENERAL**

- 1.1 SUMMARY: This Section describes construction facilities and temporary controls required for the Work.
- A. Provide construction facilities and temporary controls and utilities for as long as needed for the Work. The Contractor shall ensure the timely removal of temporary controls and utilities as required. This includes, but is not necessarily limited to the facilities, controls and utilities covered in this Section.
1. Related Work:
- a. Documents affecting work of this Section include, but are not limited to, General Conditions, Special Conditions, and Sections in Division 1 of these Specifications.
  - b. Except equipment furnished by the subcontractors shall comply with requirements of pertinent safety regulations, such equipment normally furnished by the individual trades in execution of their own portions of the Work are not part of this Section.
- B. REQUIREMENTS
1. Provide construction facilities and temporary controls needed for the Work including, but not necessarily limited to:
  2. Temporary utilities such as heat, water, electricity, and telephone;
  3. Field office for the Contractor's personnel;
  4. Sanitary facilities;
  5. Enclosure such as tarpaulins, barricades, and canopies;
  6. Temporary fencing of the construction site;
  7. Project sign.
- C. DELIVERY, STORAGE, AND HANDLING
1. Maintain temporary facilities and controls in proper and safe condition throughout progress of the Work.
- D. MAINTENANCE AND REMOVAL
1. Maintain temporary facilities and controls as long as needed for safe and proper completion of the Work.
  2. Remove such temporary facilities and controls as rapidly as progress of the Work will permit, or as directed by the Engineer.

This page intentionally left blank.

**SECTION 01510**

**UTILITY LINES**

**PART 1 - GENERAL**

- 1.1 GENERAL: Relocation of public or private utilities requiring relocation on the Railroad's Right-of-Way, in the area of the Work, shall be arranged by the Railroad at no expense to the Contractor, unless required in the Scope of Work and/or the Schedule of Billable Service Items.
  - A. It is the Contractor's responsibility to locate and protect all utilities within the limits of construction. If damaged during grading operations, the contractor shall repair or replace at no additional cost to Railroad.
  - B. If active utility lines are encountered that are not shown on the drawings or otherwise made known to the contractor, the contractor shall promptly take necessary steps to assure that service is not interrupted. If service is interrupted, immediately restore service by repairing the damaged utility.
  - C. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the Engineer and secure his written instructions.
- 1.2 Fiber Optics - Fiber optic cable systems may be buried on Union Pacific Railroad property within the limits of this project. The Contractor shall notify the UPRR CBUD (call before you dig) at 1-800-336-9193 to arrange for a cable locator prior to commencing work.

This page intentionally left blank.

**SECTION 01511**

**ELECTRICITY**

**PART 1 - GENERAL**

- 1.1 **GENERAL:** The Contractor shall provide and pay for and/or obtain all electric power necessary to accomplish the Work. Temporary electric lines will be furnished, installed, connected and maintained by the Contractor in a manner satisfactory to the Engineer and shall be removed by the Contractor prior to completion of the Work.

This page intentionally left blank.

**SECTION 01514**

**OFFICE SPACE AND PHONE FOR CONTRACTOR AND ENGINEER**

PART 1 - GENERAL

1.1 GENERAL

- A. The Contractor shall provide and pay for the Following:
1. Field Offices and Sheds: Contractor's Facilities:
    - a. Provide a field office building and sheds adequate in size and accommodation for Contractor's offices, supply and storage.
    - b. Within the Contractor's facilities, provide enclosed space adequate for holding project meetings. Furnish with table, chairs, etc.
  2. Telephone:
    - a. Make necessary arrangements and pay costs for installation and operation of telephone service to the Contractor's office at the site.
    - b. Make the telephone available to the Engineer for use in connection with the Job.
    - c. Provide a desk, chairs and space for the Engineer.
  3. Heating and Air Conditioning:
    - a. Provide and maintain heating and air conditioning as necessary for the proper execution of the operations needed on the job.
  4. Sanitary Facilities:
    - a. Provide temporary sanitary facilities in the quantity required for use by all personnel.
    - b. The facility shall be maintained in a sanitary condition at all times.

This page intentionally left blank.

**SECTION 01515**

**WATER**

**PART 1 - GENERAL**

- 1.1 SUMMARY: The Contractor shall provide and pay for an adequate supply of water as required to properly carry out the Work and an adequate supply of uncontaminated water as required for domestic consumption and shall install and maintain necessary supply connections and piping for such water supply, but only at such locations and in such manner as may be approved by the Engineer.

This page intentionally left blank.

**SECTION 01516**

**SANITARY FACILITIES**

**PART 1 - GENERAL**

- 1.1 SUMMARY: The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his employees and the Engineer's employees, as may be necessary to comply with the requirements of Federal, State and Local Boards of Health regulations, or of other authorities having jurisdiction.

This page intentionally left blank.

**SECTION 01531**

**FENCING AND BARRICADES**

**PART 1 - GENERAL**

- 1.1 SUMMARY: The Contractor shall provide erect and maintain adequate temporary fences and barricades to prevent damage and/or trespassing upon the Right-of-Way, damage of adjoining property, and reasons of safety.

This page intentionally left blank.

**SECTION 01551**

**ACCESS ROADS AND CROSSINGS**

**PART 1 - GENERAL**

- 1.1 The contractor shall ensure all roads, whether pavement or gravel, used during construction are maintained and left in pre-construction condition when project is complete. The contractor is responsible for all bonds required by local or state agencies to ensure public roads are maintained or repaired. Any temporary barricades or traffic control, if not included as a bid item, are the responsibility of the contractor and shall be incidental.
- 1.2 Temporary Access Roads and Parking Areas - The location of access roads and parking areas which the Contractor needs to construct on the Railroad's Right-of-Way or property, which the Railroad has easement or interest in, shall be approved by the Engineer before such roads or parking areas are built. All access roads and parking areas constructed by the Contractor which the Engineer deems unsuitable for future Railroad use shall be removed upon completion of the Work and at the Contractor's expense, and shall be stabilized with gravel or put back to pre-existing conditions where required.
- 1.3 Agreements – Any agreements made between the Contractor and private landowners shall be furnished to the Engineer.

**PART 2 - CONSTRUCTION TRAFFIC CONTROL**

- 2.1 When work is being performed on or near a public or private roadway, the Contractor shall use temporary traffic control measures to warn and guide the traveling public. The temporary traffic control measures and devices shall be provided and placed in accordance with the Manual on Uniform Traffic Control Devices and the respective State, County or City traffic control requirements, whichever is more stringent.
- 2.2 Traffic control devices, and installations shall be checked by the Contractor daily. Broken, damaged, or displaced devices shall be replaced immediately.
- 2.3 The Contractor shall, at the preconstruction conference, provide the Engineer with the names and telephone numbers of personnel who will be available on a 24-hour-per-day, 7-days-per-week basis. These people shall be responsible for repair, correction, replacement, and maintenance of the traffic control devices. The Contractor shall also conspicuously post at the site a contact number for the Contractor's staff person responsible for maintaining traffic control measures and devices, and for public safety agencies.
- 2.4 It shall be the responsibility of the Contractor to furnish flagger(s) to direct traffic when construction activity occurs on or adjacent to a surface being used by the traveling public. The flagger(s) shall be properly attired with vest and head gear. They shall be provided properly installed advance warning signs, and they shall be otherwise equipped in accordance with the requirements of the plans and specifications. Flaggers shall position themselves appropriately and according to accepted flagging procedures.
- 2.5 All traffic control materials and devices shall meet the respective State Department of Transportation's Approved Products List.

**PART 3 - PERMANENT TRAFFIC CONTROL**

## ACCESS ROADS

### Section 01551

- 3.1 Permanent traffic control measures and devices shall be provided and placed in accordance with the Plans, the Manual on Uniform Traffic Control Devices and the respective State, County or City traffic control requirements, whichever is more stringent.
- 3.2 All traffic control materials and devices shall meet the respective State Department of Transportation's Approved Products List

**SECTION 01562**

**DUST CONTROL**

PART 1 - GENERAL

- 1.1 SUMMARY: Spillage of earth, dusty materials, boulders and mud on roads located on the Railroad's property will not be permitted. If spillage cannot be prevented, the Contractor shall provide an hourly patrol, or more frequently if needed, to police and sweep such areas throughout the Work day, and at the conclusion of each work day, any paved roads located on the Railroad's property which have been used by the Contractor shall be broom cleaned and left to the satisfaction of the Engineer. Any expense incurred in the use of Railroad access roads shall be borne by the Contractor.
- 1.2 The Contractor shall provide dust control for construction equipment **on and off project site.** Dust control will be incidental to grading costs. Twenty-four hour dust control may be required. Non-paved haul roads shall be periodically watered to keep dust down.

This page intentionally left blank.

**SECTION 01563**

**IRRIGATION FACILITIES**

**PART 1 - GENERAL**

- 1.1 SUMMARY: The Contractor shall in no way alter or obstruct any irrigation ditches, canals or other facilities without first securing the Engineer's approval.

This page intentionally left blank.

**SECTION 01572**

**WORKING AND FLAGGING NEAR THE TRACKS**

PART 1 - GENERAL

A. SUMMARY

1. Except as authorized by the Agreement and the Engineer, the Contractor will not work within 25 feet of the centerline of any track in service, and will locate all equipment, devices and materials at a sufficient distance from any track to ensure that no apparatus or part of any piece of equipment, device or material, such as the boom of a crane or a dragline, could under any circumstances reach closer than 25 feet to the centerline of any track. When the Contractor is required to work within 25 feet of the centerline of any track in service, a flagman will be required. The Contractor will shut down or clear equipment within 25 ft. of track when trains are approaching, as advised by railroad flagman. The Railroad will bear the cost of such Railroad flagmen required for on track safety.
  2. Railroad flagmen are for the protection of train movements only. The Contractor is responsible for all equipment movements across public and private road crossings. The Contractor's equipment shall be equipped with two-way radios for better communications with railroad flagmen and the railroad engineer. Contractor shall provide Flagger(s) with a working radio(s). All other flagging charges not involving the safety of Railroad operations will be at the Contractor's expense.
- 1.2 The Contractor must notify the Engineer at least seven (7) days in advance of the date the Contractor wishes to have a railroad flagman.

A. CONTRACTOR SAFETY

1. The Contractor shall abide by the rules set forth in the "Minimum Safety Requirements" for UPRR Contractors.(separate document)
2. General Contractor and all Subcontractors shall attend all safety meetings. Contractor shall adequately maintain their company "Safety Plan" throughout the duration of the project. Contractor will conduct FRA required "On Track Safety Training" for all contractor and subcontractor workers.
3. Emergency phone numbers shall be posted in a conspicuous place in all field offices or on the project property.
4. Cell phone use is not allowed while operating equipment or walking on UPRR property.

This page intentionally left blank.

**SECTION 01575**

**HAUL ROADS**

**PART 1 - GENERAL**

**1.1 GENERAL**

**A. CONSTRUCTION OF ROADS AND PARKING AREAS ON RAILROAD RIGHT OF WAY**

The location of haul roads and parking areas which the Contractor needs to construct, on the Railroad's Right-of-Way or property, and which the Railroad has an easement or an interest in shall be approved by the Engineer before such roads or parking areas are built. All haul roads and parking areas constructed by the Contractor which the Engineer deems unsuitable for future Railroad use shall be removed upon completion of the Work, at the Contractor's expense, and shall be stabilized with gravel or put back to pre-existing conditions where required.

**B. USE OF RAILROAD ROADS - EXISTING AND PROTECTION**

1. **HEAVY EQUIPMENT** - The Contractor shall not operate heavy equipment on paved roads located on the Railroad's property without the Engineer's prior approval.
2. **TEMPORARY PROTECTION AND REMOVAL** - The Contractor, if he needs to have heavy equipment on the right of way, shall provide a temporary protective surface, approved by the Engineer, over such paved roads. Upon completion of the Work, the Contractor shall remove any such temporary protective surfacing from the Railroad's paved roads and property.
3. **FLAGMEN** - When necessary for the Contractor's equipment to operate on or across roads, not railroad tracks or crossings, located on the Railroad's property, the Contractor shall furnish flagmen, lights and other necessary safeguards as directed by the Engineer to safely control the flow of traffic. The Contractor shall also provide flagmen to control and direct traffic where hauling equipment enters or crosses roads located on the Railroad's property. The Contractor shall conduct the Work in such a manner which will obstruct and inconvenience traffic as little as possible.

**C. PAVED ROADS**

If the Contractor must cross any paved road, on Railroad property, with cleated or crawler type equipment, then the pavement shall be protected with a temporary surfacing approved by the Engineer.

**D. RAILROAD CROSSINGS**

1. **CROSSINGS** - Except as authorized by the Engineer, the Contractor will not construct crossings over any track at any location. Where crossings are needed or desired, the Contractor shall make arrangements directly with the Engineer. If a crossing or crossings are required to complete the Work as set forth in the Request for Bids, the Proposal and Bid, the Specifications, the Drawings and the Agreement, such crossings may be constructed by the Railroad unless the Railroad specifically authorizes the Contractor to construct such crossings. If the Contractor must cross tracks with cleated or crawler type equipment, the track shall be protected with a temporary surfacing approved by the Engineer.

HAUL ROADS  
Section 01575

2. **FLAGGING - RAILROAD TRACK.** The Railroad will provide flagmen at crossings which have been established pursuant to the provisions of this Section. The Railroad will bear the cost of such flagmen, provided however, the Contractor shall bear the cost of flagmen required at crossings established for the Contractor's convenience. All other flagging charges not involving the safety of Railroad operations will be at the Contractor's expense.
3. **NOTIFICATION -** The Contractor shall notify the Engineer at least seven (7) days in advance of the date the Contractor wishes to commence using a crossing to allow the Engineer time to provide the flagmen called for herein. The Contractor must also notify the Engineer at least seven (7) days in advance of the date the Contractor will cease using crossings.

**SECTION 01620**

**STORAGE AND PROTECTION**

PART 1 - GENERAL

1.1 GENERAL

A. SUMMARY

1. Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.
2. Related Work:
  - a. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Division 1 of these Specifications.
  - b. Additional procedures also may be prescribed in other Sections of these Specifications.

B. QUALITY ASSURANCE

1. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

C. MANUFACTURERS' RECOMMENDATIONS

1. Deliver products to the job site in manufacturer's original container, with labels intact and legible.
  - a. Maintain packaged materials with seals unbroken and labels intact until time of use.
  - b. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Railroad.
2. The Engineer may reject as non-complying such material and products not bearing identification satisfactory to the Engineer as to manufacturer, grade, quality, and other pertinent information.

D. PROTECTION

1. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.
2. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.
3. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Railroad.

E. REPAIRS AND REPLACEMENTS

1. In event of damage, promptly make replacements and repairs to the approval of the Engineer and at no additional cost to the Railroad.
2. Additional time required to secure replacements and to make repairs will not be considered by the Engineer to justify an extension in the Agreement Time of Completion.

**SECTION 01710**

**PROJECT CLOSEOUT AND CLEANING**

PART 1 - GENERAL

1.1 GENERAL

- A. CLEANING UP - Upon completion of the Work involved, the Contractor shall clean the location of the Work and all ground occupied by him in connection with the Work and shall remove all rubbish, excess materials, falsework, temporary structures, and equipment, leaving the location of the Work cleaned to the satisfaction of the Engineer.
- B. MATERIAL DELIVERY - The Contractor shall pick up and deliver to a site or sites designated by the Engineer all excess and useable materials furnished by the Railroad in connection with the Work.

This page intentionally left blank.

**SECTION 01720**

**PROJECT RECORD DOCUMENTS**

**PART 1 - GENERAL**

- 1.1 SUMMARY: The Contractor shall provide a Project Closeout CD to Engineer prior to final invoice. CD shall contain (if project applicable):
- A. All as-built drawings for the project: one electronic file copy, in both CAD format and pdf format, of "as-constructed" drawings upon completion of the work. The drawings shall reflect all modifications made during construction and note the exact location of all utilities and equipment. Each sheet shall be stamped "As-Built," signed and dated.
  - B. All density tests and soil proctor data.
  - C. All concrete break tests.
  - D. All welding data.
  - E. All pile driving data.
  - F. All reviewed submittals sent to engineer during project duration.
  - G. Any DWR forms for equipment rental used on the project.
  - H. Per Section 01300, the Contractor will supply the instructions, operating and maintenance instruction bulletins, complete parts lists and wiring diagrams for all panels.
  - I. Per Section 01551, supply any agreements made between the Contractor and private landowners.

This page intentionally left blank.

**SECTION 01750**

**GUARANTEES, WARRANTIES AND BONDS**

PART 1 - GENERAL

- 1.1 SUMMARY: The Contractor shall guarantee all Work under this Agreement for a period of one year from the date of acceptance by the Railroad, unless otherwise indicated. Contractor shall leave the Work in perfect order at completion, and the final certificate of payment shall not relieve him of the responsibility for negligence, faulty materials, or workmanship; upon written notice, he shall remedy any defects or workmanship that may appear during the time hereinbefore mentioned and pay all expenses due therefrom to the entire satisfaction of the Engineer.

This page intentionally left blank.

## **DIVISION 2 – SITE WORK SPECIFICATIONS**

This page intentionally left blank.

**SECTION 02010**

**SUBSURFACE INVESTIGATION**

**PART 1 - GENERAL**

- 1.1 SUMMARY. This Section describes soils investigation at the site, and use of data resulting from that investigation.
- 1.2 SOILS INVESTIGATION REPORT
  - A. General:
    1. A soils investigation report may have been prepared for the site of this Work by an independant testing laboratory selected by the Railroad.
    2. If available, the soils investigation report is attached to the Specification and copies may be obtained upon request addressed to the Railroad.
  - B. Use of data:
    1. This report was obtained for the Railroad's use in design purposes and is not a part of the Contract Documents.
    2. The report is available for the Contractor's information, but is not a warranty of subsurface conditions and the Railroad does not guarantee the accuracy of the report.
    3. Bidders should visit the site and acquaint themselves with existing conditions.
    4. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, investigations may be performed only under time schedules and arrangements approved in advance by the Engineer.
- 1.3 QUALITY ASSURANCE
  - A. An independent testing laboratory may be retained by the Railroad to perform tests in connection with embankment, excavating, trenching, grading, and to report the findings to the Engineer and the Contractor.
  - B. The Contractor is to readjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific and written approval from the Engineer.

This page intentionally left blank.

**SECTION 02060**

**BUILDING DEMOLITION**

PART 1 - GENERAL

1.1 SUMMARY

- A. The extent of demolition work is shown on the drawings.
- B. Demolition requires removal and disposal, off site, in a proper and legal manner, of the following:
  - 1. Buildings and other structures
  - 2. Foundations
  - 3. Footings
  - 4. Slabs on grade
  - 5. Existing fence
  - 6. Above and below grade improvements

1.2 CONDITIONS

- A. Occupancy: Structures to be demolished will be vacated, discontinued in use, prior to start of work.
- B. Condition of Structure: The Railroad assumes no responsibility for actual condition of structures to be demolished. Conditions existing at time of inspection for bidding purposes will be maintained by Railroad insofar as practicable.
- C. Storage or sale of items on the right of way site will not be permitted.
- D. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with railroad service, roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways, if required, by the governing regulations.
- E. Explosives: Use of explosives will not be permitted.

1.3 PROTECTIONS

- A. Ensure safety of persons around area of demolition.
- B. Contractor will, disconnect and seal utilities, and shut off power, serving the structures to be demolished, prior to demolition work.

PART 2 - PRODUCTS – N/A

PART 3 - EXECUTION

3.1 DUST AND WIND EROSION CONTROL

- A. Excavations and embankments section on dust control is in section 02270
- B. Approved temporary methods of dust control, including sprinkling, chemical treatment, light bituminous treatment or similar methods may be approved. Sprinkling must be

BUILDING DEMOLITION  
Section 02060

repeated at such intervals as to keep all potential sources of dust wet at all times, and the Contractor shall provide sufficient sprinkling equipment to comply with this requirement.

3.2 DEMOLITION

- A. Demolish buildings completely and remove from site. Use such methods as required to complete work within limitations of governing regulations.
- B. Break up and remove concrete slabs on grade.
- C. Demolish foundation walls, footings, and basement slabs and remove.
- D. Demolish and remove below grade wood, metal and floor construction.

3.3 ABOVE AND BELOW GRADE IMPROVEMENTS

- A. Demolish and remove above and below grade construction, including concrete slab on grade, as shown on site plan.
- B. Remove existing fence, posts, and all related materials from locations at perimeter of site, and other locations on the site.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Remove from site debris, rubbish, and other materials resulting from demolition operations.
- B. Burning of removed materials from demolished structures will not be permitted on site.
- C. Transport materials removed from demolished structures and dispose of legally off site.

3.5 ASBESTOS

A. PRE-DEMOLITION WALK-THROUGH

- 1. Before building demolition, the Contractor and Engineer shall have made a thorough visual walk-through of the building(s) to be demolished.
- 2. Purpose of this inspection is to locate any suspect asbestos-containing materials (ACM). If suspect material is discovered, the Contractor must verify its composition using formal testing procedures. Example: Polarized Light Microscopy (Asbestos).
- 3. Arrangements for removal of any ACM discovered during the pre-demolition walk-through will be coordinated by the Railroad. This abatement will be performed either as an extra order on the demolition contract or under separate contract with an asbestos abatement Contractor.

3.6 ASBESTOS OR SUSPECT ASBESTOS DISCOVERED (DURING DEMOLITION)

- A. The Contractor must be able to verify any suspect material as ACM or non-asbestos during the course of the entire demolition process. In the unlikely event the Contractor finds suspect ACM, he is to immediately stop work and notify the Engineer for further instructions and arrangements for testing.
- B. Any testing or if necessary, asbestos removal, will be handled as an extra order with the demolition Contractor under the terms of the contract.

3.7 ASBESTOS - CONTRACTOR PENALTY CLAUSE

As previously stated in this section, the Contractor shall be held responsible, during the entire demolition project, for determining what, if any, materials contain ACM. If the Contractor encounters or overlooks suspect ACM and **does not stop** work immediately upon its initial discovery and notify the Engineer; the Contractor will be held responsible for the cleanup of the

ACM (if determined to be ACM) and decontamination of the project site or that portion of the project which he contaminated as a result of his demolition work.

#### PART 4 - GENERAL CONDITIONS

The Contractor shall be responsible for any damage to existing and remaining buildings or to equipment and furnishings housed therein which are due directly or indirectly to the demolition operations. Use every precaution to prevent injuries to curbs, drives and sidewalks adjacent to the site of the work and replace at no expense to the Railroad any such destroyed. Unless specified otherwise by the Railroad's Engineering Environmental Department or their representative all necessary wrecking or demolition together with the removal and disposal of items shall be performed to the following requirements.

##### 4.1 INSPECTIONS

Prior to the razing of any structure, an inspection by the Railroad Environmental Representative shall be performed to identify and quantify any existing hazardous materials.

Identify any utilities such as electrical, gas, sewers or water supply that may have to be disconnected or rerouted prior to any structural disassembly. Disconnection of said utilities not to interfere with operations of adjacent or structures not within the scope of demolition.

Identify any special conditions that exist that need to be preserved, protected, or require special handling. Examples of such being EPA monitoring devices, wells, or test locations. Any salvageable equipment or apparatus to be retained by the Railroad.

##### 4.2 PERMITS, BONDS and LICENSES

In the event of hazardous materials that require abatement prior to or during demolition, Contractor and/or subcontractors shall be familiar with all Federal, state and municipal and be licensed to perform this nature of work. The Railroad reserves the right to subcontract any abatement or remediation as separate contract to work in conjunction with the General Contractor.

##### 4.3 DISPOSAL of MATERIALS

Contractor to be responsible for segregation of all scrap, trash, structural materials, concrete, contaminates, etc., that may be required before disposal. Contractor to indemnify the Railroad of any costs or liabilities arising from his transport and disposal of said materials arising from demolition or excavation. Contractor to provide the Railroad the required documentation verifying compliance with Federal, State and Local laws, codes and regulations governing the disposal and transportation of the demolition materials.

All excavated earthen soils that, by examination, indicate contaminates from petrochemical absorption of diesel fuel, lube oils, etc., shall be placed on protective plastic, covered for protection and enclosed by a temporary berm. Railroad to furnish railcars or mode of transport for eventual disposal. Railroad to assume costs and responsibility for disposal of these soils unless specified by other Contract agreement. Structural components identified as having surface contaminates in excess of EPA guidelines shall be disposed of in an approved manner dictated by Federal, State, and Local laws, codes and regulations. Excavated concrete or mortar products indicating contamination to be segregated from soils and held for Railroad disposal. Temporary storage of this concrete to be handled the same as contaminated soils aforementioned.

#### 4.4 EXCAVATIONS and GRADING

Excavations arising from demolition to remove equipment, foundations, piping, etc., shall be restored to general grade with clean earthen fill and compacted to reduce settlement and graded to provide adequate drainage. Excavations within areas identified by a Railroad representative as having petroleum contamination shall be excavated to the extent that Federal, State and Local laws, codes and regulations require, (typically 1,000 ppm). Contaminated soils to be separated from contaminated masonry or concrete and stored for disposal by the Railroad. (See Section C above for temporary storage requirements)

#### 4.5 SCOPE OF DEMOLITION

##### A. BUILDING, STRUCTURES, AND ABOVE AND BELOW GRADE IMPROVEMENTS

1. Excavations or pits existing within the building proper shall be drained and cleared if necessary of any residual petroleum contaminants. Drainage holes shall be provided to prevent any future entrapment of water before being back filled with clean earthen fill.
2. Abandoned manholes, whether sanitary, industrial, or storm, shall have top broken to 24" below finished grade, all piping plugged and capped, bottom penetrated for drainage, then back filled with clean earth to grade.

##### B. UTILITIES

1. Natural Gas Lines
  - a. Municipal services shall be cut off and capped at street, property easement or meter, whichever is applicable to property, i.e., partial or total facility demolition.
  - b. Intra facility or building gas lines to be flushed with water, plugged and abandoned in place. Connections to be cut at 12" below grade level.
2. Water Lines
  - a. Abandoned lines shall be drained, cut off and plugged at 24" below finished grade.
3. Sanitary and Storm Sewers
  - a. Abandon in place with ends cut and capped 24" below finished grade. All drains and any other associated influent openings also removed to 24" below grade and plugged. (See Manholes Section A.7)
4. Industrial Sewers, Fuel Lines & Waste Water Systems
  - a. Industrial piping to be drained and water flushed to waste water treatment plant. After flushing, abandon in place with connections severed and plugged 24" below finished grade.
  - b. Waste Water Treatment Plants involve piping, hardware, storage tanks and in some cases, settling ponds. Each situation requires special instructions and methodologies to remediate or remove. Refer to Engineer for requirements and/or instructions.
  - c. All fuel meters and ancillary controls, pump skids, (circa 1985 or newer), and specialized valves to be property of the Railroad unless pre-designated as scrap by the Railroad.

BUILDING DEMOLITION  
Section 02060

- d. The Railroad shall salvage those items it deems necessary. The responsibility for removal by either the Contractor or another party to be dictated by the Railroad at the time of bidding.
- e. All existing EPA monitoring wells or inspection points are to be preserved and marked in a method to prevent damage from equipment or personnel during the term of the demolition contract.

5. Electrical

- a. Contact Municipal Power Company for disconnect and relocation needs
- b. All transformers to be salvaged for storage and reuse by Railroad. Panel boxes, disconnects, controllers, conduit, etc., shall be considered property of Contractor unless specified by contractual agreement.
- c. All electrical inventories or components stored as new or reusable within buildings or premises shall be property of the Railroad unless specified by contract agreement.
- d. Transformers deemed by Railroad to be obsolete or defective to be marked by Railroad as scrap together with latest date tested (PCBs) If no test date available, units shall be considered possible hazardous waste.

6. Communications

- a. Any Railroad antennas, transmitters, computer equipment, or communication devices shall be salvaged as property of the Railroad unless previously designated as scrap. Contact the Railroad Communications Department for disposition if questionable.
- b. All communication wiring and coaxial cables overhead and internal to buildings to be considered as scrap. If fiber optical cabling systems are encountered, notify Communications Department for instructions.
- c. All locations of underground fiber optics shall be located, marked and protected from excavation.

C. STORAGE TANKS (ABOVE GROUND)

1. Tank Contents

If indicated, contents are to be pumped down and transported for disposal or salvage by the Contractor. Contractor to arrange transfer and transport of contents unless specified differently by contract. At the option of Railroad, excess fuel or oils may be sold to "scavenger" refiners or given to Contractor for his removal, transport or disposal.

2. Tank Removal

- a. Clean interior and degas, remove sludge and haul away to licensed disposal facility.
- b. Sever underground pipe lines at 24" below general grade. Prior to capping, water flush with influent routed to waste water facility for processing.
- c. Cut up tank and auxiliary steel components and haul away as scrap, if scheduled for demolition. If tanks are reusable at other Railroad facilities, clean and sever connections for transport per Railroad instructions.

BUILDING DEMOLITION  
Section 02060

- d. All work shall be accomplished in accordance with Federal, State, and Local regulations including API Bulletin 1604, 40 CFR 280 & 281 latest revisions and OSHA. Prior to mobilization Contractor is responsible for making necessary notification to appropriate state agency and obtaining proper permits from local fire departments. Prior to commencement of work, provide disposal plan to the Railroad's Engineer for approval. Upon completion, Contractor shall provide the Railroad Engineer all documentation of disposal and/or product disposition.
3. Containment Dikes
    - a. Earth berms to be bladed to general ground elevation with contaminated soils removed. Any remaining depressions shall be backfilled with clean earth and compacted to reduce settlement and provide adequate drainage. (See Section D, General Conditions)
    - b. Concrete Ring Walls to be treated as building foundations and cleared to a minimum of 24" below general grade unless prescribed to additional depths by contract.
    - c. Slab pads to be removed to 24" below grade and removed from the demolition site. If concrete or base soils indicate contamination, treat as hazardous materials. (See Section D, General Conditions)
    - d. Restore all excavations to general grade.
  4. Pump and Meters
    - a. Any pumps or meters removed during tank dismantling shall be salvaged for the Railroad, unless contract designates as scrap.
    - b. Salvaged meters or pumps shall be covered or preserved from dirt and water pending.
    - c. Railroad disposition. (See Paragraph B.4 Utilities)

**SECTION 02110**

**CLEARING AND GRUBBING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

These specifications shall govern the removal and disposal of all trees, stumps, undergrowth, brush, trash, grass, weeds, roots, concrete, debris, or other objectionable materials within the limits of the excavation, embankment, borrow, and other areas as shown on the plans and Contract Documents.

**1.2 PRESERVATION**

The designated areas shall be cleared except certain areas as directed by the Engineer for preservation. Areas designated for preservation shall be carefully protected from abuse, marring or damage during construction operations.

**1.3 TOPSOIL**

Topsoil shall be stockpiled as necessary for capping of slopes and ditch bottoms. See Section 02270.1

**1.4 DISPOSAL**

- A. All cleared and grubbed material shall be disposed of off property unless otherwise directed by Engineer, and shall comply with Federal, State and Local regulations. Pieces of rail, broken ties, and rubble within the grading limits are to be removed off of railroad property in a legal proper manner. This shall be incidental to the clearing and grubbing bid item.
- B. Material being disposed of shall not be burned either on or off Railroad property.
- C. No material will be disposed of in the grading footprint.
- D. Large trees and shrubs may be shredded into mulch and used for capping slopes and ditch bottoms, as approved and directed by the Engineer.
- E. Unless otherwise stated in the special provisions, all merchantable timber will be the property of the Contractor.

**PART 2 - PRODUCTS – N/A**

**PART 3 - EXECUTION**

**3.1 GENERAL**

All holes remaining after clearing and grubbing shall be backfilled and compacted as directed by the Engineer and the entire area bladed to provide drainage, except, in areas to be immediately excavated, the Engineer may direct that the holes not be backfilled.

**3.2 EXCAVATIONS**

Areas that are to be excavated and hauled into embankments shall be cleared and grubbed of all objectionable material to the full depth and width of the completed excavation. Areas that are to be excavated and wasted shall not be cleared unless specifically requested by the Engineer. Roots

or other vegetation existing below the finished surface of excavated sections shall be removed to a depth of 2 feet below the finished surface. There will be no allowance for any grubbing required below such finished surface. All such grubbing below the finished surface shall be considered incidental to clearing and grubbing, and shall be included in the bid item cost for clearing and grubbing.

### 3.3 BORROW PITS

Areas required for borrow sites and material sources must be cleared and grubbed, except for designated trees and shrubs, to prevent such objectionable material being used in construction.

### 3.4 EMBANKMENTS

- A. All areas that will be beneath embankments shall be free from all vegetation and roots to a minimum depth of 2 feet below the ground surface.
- B. All rubbish shall be removed in embankment areas.

### 3.5 OTHER DESIGNATED AREAS (such as staging and storage areas)

Designated portions of the right-of-way other than excavations, borrow areas, and embankments shall be cleared off level with ground surface by cutting and removal of all trees (standing or fallen), stumps, undergrowth, brush, vines, roots, and other vegetation, trash, or objectionable materials so that no obstruction will interfere with close machine or hand mowing of cleared areas. Cleared areas shall be left smooth and free of obstructions that will impound water.

### 3.6 LIMITS OF WORK

Trees or other growth outside the limits for clearing and grubbing shall be preserved and protected from damage during construction operations. If rare or endangered plants or artifacts are encountered during construction, work shall stop in the vicinity of the find, and the Contractor shall notify the Engineer of said find.

## PART 4 - MEASUREMENT AND PAYMENT

### 4.1 MEASUREMENT

- A. "Clearing and Grubbing" will be measured by the acre or bid as a lump sum.
- B. If a bid item for "Clearing and Grubbing" is not included, payment for this work will be considered as incidental to the unit price for grading.

### 4.2 PAYMENT

- A. Clearing and grubbing shall be paid for at the contract unit price per acre cleared and grubbed within the grading limits. This price shall be full compensation for furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals necessary for clearing, grubbing, and disposal of the resulting materials.
- B. Areas outside the grading limit, such as borrow areas, staging areas, and material storage areas are not included. Clearing and grubbing for these areas are incidental to their respective bid items.
- C. Pieces of rail, broken ties, and rubble within the grading limits are to be removed off of railroad property in a legal proper manner. This shall be incidental to the clearing and grubbing bid item.

END OF SECTION

This page intentionally left blank.

**SECTION 02120**

**BLASTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Description. Blasting shall be used in cut sections only as necessary to loosen rock or cemented material and to reduce such rock or cemented material to sizes that can be handled by mechanical earth moving equipment.
- B. PREFERRED METHOD OF REMOVING ROCK.
  - 1. Ripping shall be the preferred method of removing rock and cemented material from cut sections and ripping shall be used whenever possible to remove rock and cemented materials from cut sections.
  - 2. Excessive blasting will not be permitted. The Contractor shall stop any method of blasting which leads to overshooting or which is dangerous to public or destructive to property or natural features. Blasting shall not be used as a method of moving rock, cemented material or earth cut in a cut section.
- C. QUALIFICATIONS
  - 1. The blasting shall be performed by an experienced and properly licensed explosive engineer familiar with Railroad work and operations.

**PART 2 - EXECUTION**

**2.1 BLASTING**

- A. Blasting shall be conducted in a manner that follows:
  - 1. Rock or other material outside of the cut section will not be disturbed.
  - 2. The Shape of the cut section after blasting has been completed will conform as nearly as possible to the lines and grades for the cut section shown on the Drawings or established by the Engineer.
- B. REMOVAL OF OVERBURDEN PRIOR TO BLASTING
  - 1. Prior to blasting, the Contractor shall, in accordance with the excavation procedures set forth in Section 02230 of these Specifications, remove from the cut section as much overburden as possible.
  - 2. The Contractor shall stabilize slopes that require stabilization before proceeding with the blasting.

**2.2 PREPARATION TO BLAST**

- A. OPERATIONS OUTAGES
  - 1. Prior to blasting, the Engineer shall arrange a suitable track outage or work window to ensure there is no danger to passing trains.
  - 2. The contractor shall ensure that the blasting can be performed in the allotted time in the track outage. This shall include any cleanup work that may be necessary prior to train movement.
  - 3. The contractor shall ensure that any communications, electrical equipment, or weather will not interfere with the blasting operation.

B. INSPECTION

1. The railroad track and track bed, property, and facilities shall be inspected prior to blasting

2.3 LIMITATIONS

A. The following limitations are mandatory for all blasting operations except in quarries:

1. BENCHES - When drilling and blasting rock cut sections, benches shall be created at intervals not to exceed twenty feet in height. This limitation does not apply to relief holes.
2. QUANTITY OF EXPLOSIVES - Explosives shall be of such quantity and shall be used in such a manner as will neither open seams nor otherwise damage rock outside the cut section.
3. REPAIR DAMAGE - Should seams be opened or rock outside the cut section be otherwise damaged, the Contractor shall perform all work which, in the opinion of the Engineer, is necessary to remedy such damage.
4. TIME OF PLACEMENT AND DETONATION - Placement and detonation of explosives shall, to the extent reasonably possible, take place during the same work shift. Explosives shall never be placed one day and left overnight for detonation on a subsequent day.
5. BLASTING ALONG ROCK CLIFFS - In blasting along rock cliffs where preservation of bed rock at and below the subgrade is necessary to provide support for the full width of the subgrade, the Contractor shall reduce depths of all drill holes, reduce quantities of explosives, modify drill patterns and take other measures necessary to prevent breaking down, loosening, or otherwise damaging the supporting bed rock below the subgrade.

2.4 BLASTING PLANS

A. Prior to each blast, the Contractor shall furnish the Engineer with a plan showing:

1. The pattern and depth of all blast holes including relief holes.
2. The type of explosive used.
3. The loading pattern.
4. The sequence of the firing.
5. The plan shall show the position of all holes and relative charges.
6. The location of charges relating to engineering stations and distances from the centerline of track.
7. The plans shall show grades, lines and slopes of the cut section or as designated by the Engineer.
8. The blasting plan is for record purposes only and will not absolve the Contractor of his responsibility for using proper drilling and blasting procedures and protecting the Railroad's property.

2.5 DAMAGES

- A. The railroad track and track bed, property, and facilities shall be inspected after the blasting operation.
- B. Any damages to the Railroad, Railroad property or facilities, are the responsibility of the blasting contractor or general contractor.

PART 3 - EXECUTION – N/A

PART 4 - MEASUREMENT AND PAYMENT

Blasting shall not be measured directly for payment but shall be considered subsidiary to the work for which it is performed, with all costs being incorporated in the appropriate bid items for the work being performed.

This page intentionally left blank.

**SECTION 02230**

**EXCAVATION, EMBANKMENTS AND OTHER FILLS (COMMON SPECIFICATION)**

PART 1 - GENERAL

1.1 SUMMARY

- A. These specifications shall govern the removal of excavation, the placement of embankment and other fills, and the classification of soils to meet the requirements of construction shown on the drawings, described in the contract documents, and stated in the Specifications. The work shall be conducted so that the terrain outside the grading limits will not be disturbed except where approved by the Engineer.

1.2 QUALITY ASSURANCE

A. Requirements:

1. Comply with government agencies having jurisdiction.
2. Comply with the directions of the Railroad Engineer, Geotechnical Engineer, and independent testing laboratory.

1.3 DEFINITIONS AND TERMS

A. The following terms shall be interpreted as follows:

1. Borrow Area - The source, other than required roadbed excavation, where material(s) has been dug for use as fill for embankment and construction at other locations on the project.
2. Embankment (Fill) - A raised structure of soil, soil aggregate, sand, gravel, or rock; or any mixture thereof that is to be (1) used as the subgrade or foundation materials for track or other roadbeds, building(s), or other facilities; and (2) constructed to perform safely and satisfactorily under proposed train, vehicle, embankment, building and/or other proposed loading conditions.
3. Excavation (Cut) – Soil or material to be removed and used as fill for construction of a roadbed embankment or foundation for other structures or facilities; or to be disposed of properly.
4. Subexcavation –Excavation required below finished subgrade level as part of correcting unsuitable subsurface conditions.
5. Grading Area – The limits (surface) within a designated set of boundaries which includes where both excavations (cuts), embankments (fills), and fills for facilities other than track will be performed.
6. Lift - A layer (or course) of uncompacted embankment material placed on top of suitable natural subgrade or previously prepared embankmentfill.
7. Nominal Maximum Size – The maximum U.S. sieve size upon which material is retained.
8. Roadbed - The bed or foundation that supports road surfacing or a track section (i.e., subballast, ballast, ties and rails).
9. Subgrade - The upper roadbed materials that underlie and support subballast; ballast; track structure (i.e., ties and rails); road surfacing (i.e., aggregate or pavement) materials, and the floor within the lowest level of a structure.

## EXCAVATION, EMBANKMENTS AND OTHER FILLS (COMMON SPECIFICATION)

Section 02230

10. Unsuitable Material - Earthen and rock subgrade, foundation, borrow, or manufactured materials that do not possess the required strength, stability, and/or consolidation properties to safely and satisfactorily support proposed train or other facility loading conditions.

### PART 2 - PRODUCTS

#### 2.1 Excavated Materials

- A. Excavatability – The ease or difficulty, and means of excavating materials that are to be obtained from cut sections or borrow areas for a project will not be established for the Contractor. The Contractor shall be responsible for determining the methods necessary for excavation and handling of materials based on his interpretation of site conditions, geotechnical reports (if available), or other information sources.
- B. Unsuitable soil materials
  1. The contractor shall remove and dispose of unsuitable and/or contaminated materials at a defined location on the property, at other locations shown on the plans, or as directed by the Engineer.
  2. When project site restrictions mandate, the Contractor shall dispose of excess waste materials off the project site. These waste materials shall be legally disposed of at acceptable waste sites. Contaminated waste materials shall be disposed of at landfills approved to handle and store such materials without causing harm to the environment.
  3. Topsoil shall be excavated during the performance of the clearing and grubbing operations for the project. The excavated topsoil materials shall either be stockpiled for later use as top dressing in grassed areas, wasted at locations directed by the Engineer, or used as part of the construction of the outer portions of embankments outside the track, road or other facilities load-bearing area(s). See section 2270.1 for Topsoil – Stockpile and Placing.
- C. Suitable materials
  1. Suitable materials shall be used for embankment or other fill construction.
  2. Excess suitable materials, not used for embankment construction, are to be disposed of in a legal manner as follows: (1) at a designated location(s) within the project limits, (2) at other locations shown on the plans, (3) at a location(s) approved by the Engineer, or (4) at an approved landfill location(s).
- D. Rock materials
  1. Rock is considered to be material requiring blasting or the use of heavy construction breakage equipment (such as a D-8 or larger bulldozer and/or 6,000 ft.-lb. or greater breakage equipment) as part of excavation. Rock shall include all materials in ledges, bedded deposits, and cemented and conglomerated deposits exhibiting the physical characteristics and difficulty of removal that requires removal using systematic drilling and blasting or as determined by the project engineer or geotechnical engineer. The fact that blasting may be resorted to by the Contractor shall not, of itself, entitle the material to be classified as “rock”. Material that the Contractor encounters during excavation shall be uncovered and the Engineer notified so that the Engineer can classify the material. Materials from rock excavation which are to be used for embankment and fill construction shall be processed so as to produce a well-graded material which has a nominal maximum size as defined by the project Engineer or Geotechnical Engineer.

## 2.2 Embankment and Fill Materials

- A. Embankment material (fill) is suitable earthen and/or rock that are excavated from on-site and/or off-site borrow areas, and considered suitable for use during construction based on their strength and consolidation properties, and approval by the Railroad's Engineer, Geotechnical Engineer, and/or an independent soils testing laboratory.
- B. Embankment material shall be relatively free of organic materials, and not contain environmentally harmful or noxious substances.
- C. Import fill or off site borrow material supplied by the Contractor shall meet specifications for: 1) granular fill, 2) random fill, 3) an inorganic lean clay having a maximum liquid limit of 45 and a maximum plasticity index of 15, 4) a clayey sand, or 5) pit run sand. Imported borrow materials, other than listed above, that are proposed for use as compacted fill on a project will require approval of the UPRR's Geotechnical Engineer prior to being used on the project.
- D. Embankment and fill materials shall be identified and "classified" as follows:

**FINE GRAINED MATERIALS:**

1. Clayey Soils - Clay soils shall consist of soils having 50% or more by dry weight passing the No. 200 U.S. Standard sieve, that can be made to exhibit plasticity (cohesive/putty-like properties) within a range of water contents, and that exhibit considerable strength when air dry. For classification purposes, a clay is the fine-grained portion of a soil which exhibits a plasticity index equal to or greater than 4, and for which a plot of plasticity index versus liquid limit for the soil falls on or above the "A" line on the Unified Soil Classification chart. Clays with Liquid Limits above 50 are considered suitable for use as embankment materials when approved for selective placement by the Geotechnical Engineer and/or when chemically treated to reduce undesirable plasticity characteristics and associated soil properties.

2. Silty Soils – Silty soils shall consist of soils having 50% or more by dry weight passing the No. 200 U.S. Standard sieve, that can not be made to exhibit plasticity (cohesive/putty-like properties) within a range of water contents – and that are nonplastic or very slightly plastic and exhibits little or no strength when air dry. For classification purposes, a silt is the fine-grained portion of a soil which exhibits a plasticity index less than 4, and for which a plot of plasticity index versus liquid limit for the soil falls below the "A" line of the Unified Soil Classification chart. Silty soils can become unstable when saturated. As a result, silty soils are only considered suitable for use as embankment and general compacted fill construction when approved for selective placement by the Geotechnical Engineer. Silty materials are predominantly extremely fine sand particles that are best compacted using vibratory construction equipment.

**COARSE GRAINED MATERIALS:**

- 1. Sands – Sandy materials consist of granular materials having 50% or more by dry weight retained between the No. 200 and No. 4 U.S. Standard sieves. Sandy materials are generally visible to the human eye.
- 2. Granular Materials – Coarse grained soil material with more than 50% dry weight retained on the No. 200 U.S. Standard sieve, and which exhibit no characteristics of cohesiveness or plasticity.

## EXCAVATION, EMBANKMENTS AND OTHER FILLS (COMMON SPECIFICATION)

Section 02230

3. Gravels – Gravelly materials consist of granular materials having 50% or more by dry weight retained between the No. 4 and 3-inch U.S. Standard sieve.
4. Cobbles – Cobbles consist of rock materials having 50% or more by dry unit weight retained between the 3-inch and 10-inch U.S. Standard sieves.
5. Boulders – Boulders consist of rock materials having 50% or more by dry unit weight having a diameter greater than 10 inches.
6. Cinders – Cinders consist of a porous by product that routinely is the residual of partially burnt coal. Cinders have the potential for degradation (reduction in volume) when subject to freeze-thaw action and heavy loadings.

### B-STONE

1. Material. “B” Stone shall comprise of naturally-occurring limestone, dolomite, quartzite, or granite. Stone must be hard, durable, angular in shape, resistant to weathering and shall be free of cracks, seams, expansive materials or other defects that would cause accumulated deterioration from exposure to climatic conditions.
2. The material shall meet, in addition to the Specifications, the following quality requirements:
  - A. The approval of some “B” Stone from a particular source shall not be construed as constituting the approval of all riprap taken from that source.
  - B. The Engineer shall be the sole judge of “B” Stone quality and sources of material.
  - C. “B” Stone may be rejected on the basis of visual examination, regardless of laboratory tests and/or service records.
  - D. Tests to which the materials may be subjected include specific gravity, abrasion, absorption, soundness, freezing and thawing and such other tests as may be considered necessary.

TEST		REQUIREMENT
(a) Specific Gravity	(ASTM C127)	2.65 Min.
(b) Absorption	(ASTM C127)	2.0% Min. – 8.0% Max.
(c) Soundness, 5 cycles Mg S04	(ASTM C88)	2.0% Min. – 15.0% Max.
(d) Abrasion	(AASHTO)	50% Max.

3. Gradation. All “B” Stone to be loaded and quarried shall conform to the following gradation unless otherwise specified or as shown on the plans:

Nominal 8 inch size:  
100% passing the 10 inch screen  
100% retained on the 6 inch screen

Gradation compliance is determined by visual inspection, monitored by the Engineer. The Engineer may designate the material as too fine or too coarse.

### **ROCK:**

1. Rock shall include all material in ledges, bedding deposits, cemented and conglomerate deposits which exhibit physical characteristics and difficulty of removal without systematic drilling and blasting, or as determined by the Engineer. The fact that blasting may be resorted to by the Contractor shall not, in itself, entitle the material to be classified as rock.

## EXCAVATION, EMBANKMENTS AND OTHER FILLS (COMMON SPECIFICATION)

Section 02230

E. “Types” of embankment (fill) materials shall be identified as follows:

1. Select Fill Material – Select materials shall be limited to sand and gravel materials that possess minimal expansive properties and that meet the following criteria:

<u>Maximum Allowable Percent</u> Liquid Limit Passing the No. 200 Sieve (Test Method ASTM D 4318)	<u>(Test Method ASTM D 1140)</u>
Greater than 50	30%
Between 30 and 50	40%
Less than 30	50%

The plasticity index of select fill material (as determined in accordance with ASTM D 4318) shall not exceed 15.

2. Random Fill Materials – Random fill materials are defined as those non-organic cohesive soils, cohesionless soils, combined cohesive and cohesionless soils, and rock materials that possess the minimal required physical strength, consolidation and other characteristics, after placement and compaction, that are required to provide a stable and safe embankment and foundation for the project. Depending upon the physical properties required to provide a stable embankment and fill, routine materials consisting of, but not limited to, clayey silts (CL-ML), lean clays (CL), sandy lean clays (CL), clayey sands (SC), silty sands (SM), sands and gravelly sands (SP & SW), sandy gravels and gravels (GP and GW), rock, and combinations of these materials may prove satisfactory embankment materials. Highly plastic clayey (CH) soils may possess the physical properties required to perform satisfactorily as part of embankment and foundation construction but are routinely either buried within the fill or chemically stabilized prior to placement and compaction to reduce undesirable physical characteristics associated with encountering water. Random fill materials shall be defined by the Railroad and/or Geotechnical Engineers for the project. Rockfill - Rockfill shall consist only of sound, durable rock from solid rock excavation containing not more than twenty (20) percent by weight which passes through a one half (1/2) inch sieve. Mixtures of boulders and silt will not be considered as rockfill. The maximum nominal size of rock shall be twenty four (24) inches and a maximum lift thickness of thirty (30) inches, or as specified by the Engineer or Geotechnical Engineer for the project.
3. Cinder Fills - Cinder are subject to degradation when subject to forces such as frost action, heavy loading, etc. Such degradation can result in a reduction in the mass of the material resulting in settlement of the overlying fill and facilities. Cinder fills shall not be constructed within the load bearing zone under tracks and other structural facilities. Materials containing more than 25% cinders should be either wasted or uniformly blended with cohesive soil such that the blended material contains no more than 25% cinders. The soil/cinder blended material can be used to construct those portions of either the embankment or fill sections located within either the track or structure loading areas when approved by the Railroad and/or Geotechnical Engineers on the project.

## F. SOURCES OF EMBANKMENT

1. If the quantity of materials required for construction of Embankments and fills exceeds the quantity of materials removed from excavation necessary to complete the project, additional Embankment material will first be obtained by widening cuts. If widening cuts does not provide the necessary embankment, then borrow areas, either on-site or off-site, will be used.
  - a. WIDENING CUTS – The Contractor shall widen cuts in the Grading Area or widen cuts in the vicinity of the project. The Contractor shall consult with the Engineer to determine the location of cuts in the vicinity of Grading Area and to determine the volume of such cuts which are to be widened. Cuts shall be widened in such a manner as to be at least as stable as the original cut, provide adequate drainage for the Roadbed, and retain the same slope lines as the original cut.
  - b. BORROW AREAS - Borrow Areas within the Right-of-Way, if available, or from Borrow Areas outside of the Right-of-Way, provided by the Contractor, shall be required to complete the embankment. All borrow areas shall be cleared and grubbed (see section 02210). Materials must be tested by an independent testing laboratory and/or approved by the Engineer prior to placement.

## PART 3 - CONDITIONS

- 3.1 The contractor shall examine the areas and conditions under which work of this section will be performed, and correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
- 3.2 Access - The contractor shall maintain access to adjacent areas and facilities at all times, unless approved or directed by the Engineer.
- 3.3 Drainage - All grading shall be performed in a manner and sequence that will provide proper drainage at all times.
- 3.4 Signs – All signs, with the exception of safety related signs (whistle posts, stop signs, etc.) located in the construction area shall be removed, protected, and replaced in the proper locations, as directed by the Engineer. Safety related signs shall be maintained in their original location until such time they are to be relocated as directed by the Engineer. This shall be incidental to the grading.
- 3.5 Signal foundations, or other concrete, will be removed to an elevation of 2' below finished subgrade. Signal foundations will not be removed until new signals have been turned over to operations.
- 3.6 Haul – Transporting excavated or embankment material, whether on-site or off-site, shall be considered incidental to the grading work. Vehicles and equipment used for hauling shall be sufficient in number and capacity to meet the project schedule. The contractor shall route the hauling equipment over the grade in such a manner as to maintain uniform compaction across the grade and minimize damage to completed work.

## PART 4 - EXECUTION

## 4.1 GENERAL

- A. Before grading begins, the area shall be cleared and grubbed. See section 03100 Clearing and Grubbing. The Contractor shall perform all grading as shown on the Drawings, as specified herein, or as otherwise staked in the field. This Work shall consist of

## EXCAVATION, EMBANKMENTS AND OTHER FILLS (COMMON SPECIFICATION)

Section 02230

excavating the material from roadbed areas or the Borrow Areas, and placing the material as embankment, shaping and sloping as necessary for the construction, preparation and completion of roadbeds, facilities, and other earthwork.

### 4.2 EXCAVATION:

- A. Perform excavation of every type of material encountered within the limits of the work to the lines, grades, and elevations indicated on the plans and specified herein.
  - B. EXCAVATION AS EMBANKMENT - The Contractor shall excavate all materials, including rock and common materials, which must be removed to accomplish the excavation as shown on the Drawings. All excavated materials will be used in the formation of Embankments, Roadbeds, and other earthwork so long as such excavation material is satisfactory for such use.
  - C. DISPOSITION OF EXCAVATED MATERIALS - The Contractor shall utilize all satisfactory excavated materials in the formation of embankment. Where excess excavation materials or unsatisfactory material exists, such materials will be disposed of in areas on the right of way approved by the Engineer or off the right of way in a legal and proper manner. If the contractor disposes material off of the right of way, it shall be at the Contractor's expense and liability.
  - D. SCARIFYING SUBGRADE - In cut sections, the Contractor shall scarify the top six (6) inches of material below the Subgrade, adjust the moisture content, and recompact such scarified material.
  - E. PROOFROLLING - After the site has been stripped, and/or excavated to the rough subgrade elevation, the exposed subgrade should be proofrolled prior to placement of any structural fill to identify any soft, disturbed, or unstable areas. Unstable or otherwise unsuitable soils, which are revealed by proofrolling and which cannot be adequately densified in-place, should be remediated under the direction of the Engineer. If required, the methods of stabilization typically include over-excavation and replacement, a lift of crushed stone materials, a geosynthetic over the soft soils, or chemical stabilization with lime. Appropriate remediation methods shall be determined in consultation with the Engineer.
  - F. EXCAVATION IN SOLID ROCK AREAS - In cut sections where the material to be excavated is solid rock, the Contractor shall excavate twelve (12) inches below finished track subgrade elevations as shown on the Drawings and shall replace such excavated twelve (12) inches of solid rock with embankment material approved by the Engineer.
  - G. BLASTING - No blasting will be allowed without sufficient advanced notice given to the Engineer. This time will permit the safe and continuous operation of the Railroad. See section 02120 Blasting.
  - H. DITCHES AND SLOPES - The Contractor shall construct intercepting "V" ditches on the uphill side of cut slopes as directed by the Engineer. The ditches are to be 2 feet deep with 3:1 side slope.
  - I. OVER EXCAVATION – The Contractor shall not excavate below the design finished grade elevation without the Engineer's prior approval. Materials that are excavated below design finished grade elevation, prior to obtaining prior approval of the Engineer, shall be reconstructed to design grade with materials designated by the Engineer and at the Contractor's expense.
1. SUBEXCAVATION - The Contractor shall inform the Engineer when unsuitable subgrade and foundation materials are encountered. Unsuitable subgrade and foundation materials

## EXCAVATION, EMBANKMENTS AND OTHER FILLS (COMMON SPECIFICATION)

### Section 02230

shall be removed and replaced with compacted fill placed in accordance with recommendations provided by the Soils Engineer. Subexcavation that is unplanned should be quantified and the information provided to the Engineer. Subexcavation shall include suitable material for backfill, unless otherwise specified. Other considerations in lieu of subexcavation may include surcharging, or the use of geosynthetic fabric and/or geogrid in combination with a granular materials, both of which must be specified and approved by the project Engineer and/or Geotechnical Engineer prior to their installation. Geotextile/filter fabric shall be extra heavy nonwoven geotextile meeting the requirements found in Table 1-10-2 of the AREMA Manual. Geogrid shall be Tensar BX 1100 or an approved equivalent. Quantities are estimated to establish a unit price. Payment will be for square yards as installed and approved.

- J. SOIL TREATMENT OR MODIFICATION – The treatment of soils using lime, fly ash, or other additives may be used when specified, or as directed by the project Engineer and/or Soils Engineer. See section 02241 Lime Stabilization.
- K. BORROW AREAS - Except as otherwise permitted, borrow pits and other excavation areas shall be excavated in such a manner as will afford adequate drainage. After borrowing operations are completed, areas shall be left in a neat, orderly condition with uniformly shaped slopes not steeper than two (2) foot horizontal on one (1) foot vertical. Borrow areas of fine grained material subject to wind erosion and blowing shall be stabilized or seeded. The Contractor shall ensure that the excavation of material from any source results in minimum detrimental effects on natural environmental conditions.

#### 4.3 EMBANKMENT and FILL CONSTRUCTION

##### A. Earth Fill:

1. Embankments and fills shall be constructed and compacted as shown on the plans, in these specifications, in the special provisions, or as directed by the Engineer. Embankments shall be constructed in lifts containing only that amount of material that can be compacted uniformly throughout its entire depth when utilizing the compaction construction equipment available on the project. Compaction shall be accomplished by sheeps foot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Earth fills shall be uniformly compacted to the densities specified by the project Engineer or Soils Engineer for the project using methods and equipment best suited for the materials.
2. Each successive lift or layer shall be carefully leveled and completely and uniformly compacted over the full width of the embankment before a succeeding layer is placed. Embankments built of soil material or material consisting of gravel or small pieces of rock 6 inches or less in maximum dimension shall be placed and compacted until the required degree of compaction is obtained thoroughly and uniformly throughout the layer. No stones larger than 3 inches in diameter will be permitted within the top 12 inches of the finished grade elevation.

##### B. Rock Fill:

1. Embankments built of materials comprised predominantly of rock larger than 6 inches in maximum nominal size dimension shall be constructed by placing the material in layers not exceeding the maximum size of the rock present, but in no case shall the thickness of layers exceed 24 inches, unless approved by the Engineer. The maximum size of any individual rock shall not exceed 24 inches in any one dimension, or as approved by the Engineer.
2. Rockfill shall be placed using procedures that form a dense, well-graded mass of stone with a minimum of voids. The rockfill lifts shall extend the full width of the roadbed or fill area.

## EXCAVATION, EMBANKMENTS AND OTHER FILLS (COMMON SPECIFICATION)

Section 02230

When directed by the project Engineer or Geotechnical Engineer (1) the bottom, sides and top of the rockfill shall be covered with geosynthetic fabric or (2) the voids shall be filled with finer cohesive or coarse grained materials to prevent migration of finer materials located around the rockfill into the voids, thereby avoiding settlement and/or loss of the finished subgrade profile.

### C. PREPARATION OF FOUNDATIONS FOR EMBANKMENTS

1. GENERAL – Following required clearing and grubbing, the foundation and subgrade for the proposed embankments and fills shall be prepared by scarifying the top six (6) inch layer of existing ground, adjusting the moisture content of the scarified material and compacting the scarified soils in accordance with the project specifications.
2. BENCHING OF FILL INTO EXISTING SLOPES – Slopes that are steeper than four horizontal to one vertical (4.0H:1.0V) and to receive embankment and fill materials shall be benched (stepped) to tie the existing and constructed materials. The base of each step shall be cut as nearly horizontal as possible and the face of each step cut no steeper than 1.0H:1.0V to allow fill placed adjacent to the vertical cut to be compacted in its entirety to the degree specified for the project. Benching operations should be performed so as to avoid undermining of any adjacent existing tracks or structures. Steps cut into the slope shall not be allowed to remain unsupported overnight.

- D. GRADING DURING FREEZING CONDITIONS - With the approval of the Engineer, the Contractor may construct embankment and fill materials during freezing weather. The Contractor shall not place any embankment or fill materials on frozen ground, or use frozen materials for embankment or fill construction. Fill materials that are placed must be completely compacted before freezing. The placing of fill shall stop if the materials freeze before the required compaction is obtained. Frozen materials must be removed at the Contractor's expense before filling operations resume.

- E. TOPSOIL -- Topsoil placed shall be compacted with at least two complete coverages over the area with a multiple wheel, pneumatic-tired roller designed for use in the compaction of earth fills.

### PART 5 - MEASUREMENT AND PAYMENT

- 5.1 Cross sections provided shall be considered Pay Quantities for grading. The quantities are calculated to neat line of the cross sections with no allowance for shrinkage, clearing and grubbing, or topsoil stripping and placement. Adjustments to pay quantities will not be considered after commencement of grading. If the Contractor disputes the accuracy of the plan quantities, the Contractor shall pay for the cost to perform measurements and calculations of the quantities.
- 5.2 Subexcavation quantities, which are estimated, shall be measured and approved by the Engineer. Backfill is to be included unless there is a separate bid item.

| This page intentionally left blank.

SECTION 02241

**SOIL STABILIZATION - LIME**

PART 1 - GENERAL

- 1.1 SUMMARY - Requirements. The Primary requirement of this Specification is to secure a completed course of treated subgrade material containing a uniform lime mixture, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and with a smooth surface suitable for placing subsequent embankment. It shall be the responsibility of the Contractor to regulate the sequence of his work, to use the proper amount of lime, maintain the work and rework the courses as necessary to meet the above requirements.
- 1.2 Quality Assurance.
  - A. Certification and verification.
    1. If lime is furnished in trucks, the Contractor shall be required to furnish to the Railroad weight tickets on each truck load for verification of the actual tonnage installed on the roadbed.
    2. When Type A Hydrated lime is furnished in bags, each bag shall bear the manufacturer's certified weight and the Contractor shall verify, to the Railroad, the number of bags along with the weight of each bag actually used on the project.
    3. Type B Commercial Lime Slurry, the distributor truck shall be equipped with a sampling device.
    4. Type C Quicklime to be used only when conditions require it and approved by the Engineer. Placement shall be in accordance with the State Highway specifications for the state in which the work is being performed.
- 1.3 Delivery and Storage.
  - A. Hydrated lime in bags shall be stored and handled in closed weatherproof containers until immediately before distribution on the roadbed.
  - B. Hydrated lime in bags shall be stored in weatherproof building with adequate protection from ground dampness.
- 1.4 Preparation of Subgrade.
  - A. The roadbed shall be constructed and shaped to conform to the typical sections, lines and grades as shown on the plans or as established by the Engineer.
  - B. If the Contractor elects to use a cutting and pulverizing machine that will remove the subgrade material accurately to the secondary grade and pulverize the material at the same time, he will not be required to expose the secondary grade nor windrow the material. However, the Contractor shall be required to roll the subgrade, as directed by the Engineer, before using the pulverizing machine and correct any soft areas that this rolling may reveal. This method will be permitted only where a machine is provided which is capable of cutting to the full depth of the stabilized layer in one pass. It must also ensure that the material is cut uniformly to the proper grade to a smooth surface over the entire width of the cut. The machine shall be of such design that a visible indication is given at all times that the machine is cutting to the proper depth.
  - C. In lieu of using the cutting and pulverizing machine, the Contractor shall excavate and windrow the material to expose the secondary grade. Any wet or unstable materials

SOIL STABILIZATION - LIME  
Section 02241

below the secondary grade shall be corrected, as directed by the Engineer, by scarifying, adding lime, compacting, or by other methods until satisfactory stability is obtained. When this method is used the mixing and compaction shall be done in maximum 6 inch lifts.

1.5 Pulverization

- A. The existing pavement or base material shall be pulverized or scarified so that 100 percent passes the two inch sieve.

PART 2 - PRODUCTS

2.1 Materials. The lime and lime slurry being furnished under the terms of this specification shall, in addition to all other requirements, also meet the following chemical and physical requirements.

- A. Type A Hydrated Lime, dry powdered material consisting essentially of calcium hydroxide.
- B. Type B Commercial Lime Slurry, a liquid mixture of essentially hydrated lime solids and water in slurry form.
- C. Lime shall conform to following requirements:

CHEMICAL COMPOSITION	TYPE	
	A	B
Active lime content, % by weight $\text{Ca(OH)}_2 + \text{CaO}$	90.0 min1	87.0 min2
Unhydrated lime content, % by weight CaO	5.0 max	
Free water content, % by weight $\text{H}_2\text{O}$ :	5.0 max	
<b>SIZING</b>		
Wet Sieve, as % by weight residue retained:		
No. 6	0.2 max	0.2 max2
No. 30	4.0 max	4.0 max2
Notes: 1. Maximum 5.0% by weight CaO shall be allowed in determining total active lime content. 2. Maximum solids content of slurry.		

PART 3 - EXECUTION

3.1 Safety. Precautions should be taken, including but not limited to, dust masks; eye protection; and protective clothing. Lime will not be spread on windy days. The Contractor will comply with all Federal, State and local regulations governing this type of work.

3.2 Application.

- A. Restrictions and requirements.
  1. Lime shall be spread only on that area where the first mixing operations can be completed during the same day.
  2. Hydrated lime shall be added, at the percentage specified on the plans, as a percentage of the dry weight of the soil.

B. Dry placing method.

1. The lime shall be spread by an approved spreader or by bag distribution or as directed by the Engineer.
2. Lime shall be distributed at a uniform rate and in such a manner as to reduce the scattering of lime by the wind to a minimum. Lime shall not be applied when wind conditions, in the opinion of the Engineer, are such that blowing lime becomes objectionable to traffic or adjacent property owners. A motor grader shall not be used to spread the lime.
3. The material shall be sprinkled as directed by the Engineer.

C. Slurry Placing.

1. Where Type A Hydrated Lime is specified and slurry placement is to be used, the Type "A" Hydrate shall be mixed with water to form a slurry of the solids content designated by the Engineer. The distribution truck shall be equipped with an agitator that will keep the lime and water in a uniform mixture.
2. Type B Commercial Lime Slurry shall be delivered to project in slurry form at or above the minimum dry solids content approved by the Engineer. The distribution of lime at the rates shown on the plans or approved by the Engineer shall be attained by successive passes over a measured section of roadway until the proper lime content has been secured.

3.3 Mixing.

This process will be the same for both methods.

- A. The material and lime shall be thoroughly mixed by approved road mixers or other approved equipment, and the mixing continued until, in the opinion of the Engineer, a homogenous friable mixture of material and lime is obtained, such that when all nonslaking aggregates retained on the 3/4" sieve are removed, the remainder of the material shall meet the following requirements when tested from the roadbed in the roadbed condition by the laboratory sieves:

Minimum passing 1 - 3/4" sieve	100%
Minimum passing 0 - 3/4" sieve	85%

- B. The soil-lime mixture shall be sprinkled during the mixing operation to obtain a moisture content at least 5% above optimum.
- C. During the interval of time between application and mixing, hydrated lime that has been exposed to the open air for a period of 6 hours or more, or has had excessive loss due to washing or blowing will not be accepted for payment.
- D. Hydrated lime mixing and pulverizing shall not be started until the temperature is greater than 40 degrees F. in the shade, and rising.
- E. After initial mixing, the lime-treated layer should be shaped to the approximate section and compacted lightly prior to curing in order to minimize evaporation loss. The mixture may be left to cure for one to four days or the mixing continued until the above sieve requirements are met.

SOIL STABILIZATION - LIME  
Section 02241

- F. When shown on the plans or approved by the Engineer, the pulverization requirement may be waived when the material contains a substantial quantity of aggregate.

3.4 Compaction.

A. Definitions.

1. Ordinary Compaction - The Soils shall be sprinkled and rolled as directed by the Engineer. All irregularities, depressions or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required and reshaping and recompacting by sprinkling and rolling. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereon or the work is accepted.
2. Density Control - The course shall be sprinkled as required and compacted to the extent necessary to provide the density specified in the Railroad's Earthwork Specification 02230 and Compaction Control and Testing Specification 02250. In addition to the above, the full depth of material shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After such section is completed, tests as necessary will be made by the testing laboratory, see section 01410. If the material fails to meet the testing requirements, it shall be reworked as necessary to meet these requirements. Should the material, due to any reason or cause, lose the required stability, density and finish before the next course is placed or the work is accepted, it shall be reprocessed and refinished at the cost of the Contractor.

3.5 Finishing, curing and preparing for surfacing.

- A. After the final layer, course, or lift of the lime treated subgrade, subbase, or base has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed sections shall then be finished by rolling as directed by the Engineer, with a pneumatic tire or other suitable roller sufficiently light to prevent hair line cracking.
- B. The Completed section shall be moist-cured for a minimum of 7 days before further lifts are added or any traffic is permitted, unless otherwise directed by the Engineer. In cases where subgrade treatment sets up sufficiently to prevent objectionable damage from traffic, such lifts may be opened to construction and/or access traffic, and may be covered by other courses the day following compaction, unless otherwise directed by the Engineer. If the plans provide for the treated material to be sealed or covered by additional courses of material, such seal or courses shall be applied after final mixing and compaction is completed, unless otherwise directed by the Engineer.

PART 4 - MEASUREMENT AND PAYMENT.

4.1 Measurement.

- A. Lime will be paid for at the unit price bid per ton (of 2000 pounds) for Type "A" Hydrated Lime.
- B. Lime treated Subgrade (Ordinary Compaction), or Lime treated subgrade (Density Control), of the depth specified will be paid for at the unit price bid per square yard. The unit price bid shall be full compensation for all correction of secondary subgrade, for loosening, mixing, pulverizing, spreading, sprinkling, rolling, drying, furnishing and application of lime, shaping, and maintaining, for all manipulations required, for all hauling, and freight involved, for all tools, equipment, materials, labor, and for all incidentals necessary to complete the work.

This page intentionally left blank.

**SECTION 02250**

**COMPACTION CONTROL AND TESTING**

PART 1 - GENERAL

1.1 SUMMARY

1. Describes how compacted fill shall be constructed and tested for determination of degree of compaction and moisture content. The Contractor shall acquire and pay for all testing. This shall include but is not limited to subgrade, subballast, and concrete.

PART 2 - PRODUCTS – N/A

PART 3 - EXECUTION

3.1 PLACEMENT AND COMPACTION OF EMBANKMENT

- A. **LIFT THICKNESS.** The Contractor shall provide sufficient compaction equipment to properly place and compact the material being used to construct the Embankment. Equipment used for towing shall not be considered as compaction equipment. The material used to construct the Embankment shall be placed in successive horizontal lifts. Each lift shall extend the full width of the Embankment before another lift is started. Each layer shall be adjusted for moisture content, if required, and shall be thoroughly mixed by disking or other means approved by the Engineer. Each lift shall be leveled before compacting and shall be compacted by distributing the travel of the compaction equipment uniformly over the entire length and width of the Embankment.
- B. **COMPACTION EQUIPMENT.** Only equipment that is appropriate for the material being constructed shall be used for compaction. During Embankment construction, continuous use of approved compaction equipment is mandatory. If at any time, the Contractor has not furnished sufficient compaction equipment to compact the materials being used to construct the Embankment, then placement of such Embankment materials shall be reduced accordingly. Since the number of pieces of equipment required for compaction depends on the type and quantity of embankment material being placed, the Contractor shall carefully estimate the rate at which embankment material is placed for the construction equipment available to achieve uniform fill compaction.
- C. **FROZEN MATERIALS.** Embankment material requiring water for density control shall be placed only when temperature is above freezing. No frozen material shall be placed in Embankments. Sustained periods of freezing that induce frost into the previously placed embankment material or embankment material being placed shall be cause for the suspension of construction of the Embankment.
- D. **OPERATING HEAVY EQUIPMENT OVER EMBANKMENT.** When moving over previously compacted Embankments, the Contractor's heavy earth moving equipment shall be operated over the entire area of such Embankment in order to avoid uneven compaction of such Embankment.
- E. **DEFINITIONS AND TERMS.**
  1. **Compaction** - The process of mechanically stabilizing a material by increasing its density within a range of acceptable moisture contents. "Degree of Compaction" is expressed as a percent of maximum density obtained by the test procedure described in ASTM D 1557, Test Method for Determining Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 Kn-m/m<sup>3</sup>)).

COMPACTION CONTROL AND TESTING  
Section 02250

2. Density in place. Field testing to determine the density and degree of compaction of fill in place shall be determined in accordance with ASTM D-2922, Density of Soils and Soil-Aggregate in Place by Nuclear Methods; or other methods approved by the Engineer and/or Soils Engineer.

3.2 DENSITY REQUIREMENTS

A. EXCAVATION

1. SCARIFYING SUBGRADE. In cut sections, the Contractor shall scarify the top six (6) inches of material below the top of existing ground, after cut has been completed, adjust moisture content, and compact such scarified material to not less than ninety-five (95) percent of maximum density.
2. EXCAVATION IN ROCK CUT AREAS. In cut sections where the material to be excavated is in rock or solid rock the Contractor shall excavate twelve (12) inches below the finished subgrade elevation as shown on the Drawings and shall replace such excavation with embankment material approved by the Engineer. Finished subgrade level is defined as the bottom-of-subballast level. This twelve (12) inches shall be compacted to not less than ninety-five (95) percent of the maximum dry density (ASTM D-1557).

B. EMBANKMENT

1. SCARIFYING, ADJUSTING MOISTURE CONTENT AND COMPACTION.
  - a. After the required clearing, the resultant subgrade for embankments shall be prepared by scarifying the top six (6) inch layer of existing ground, adjusting the moisture content of the scarified materials if required to comply with the project moisture content specifications, and compacting the scarified materials to not less than ninety-five (95) percent of maximum density (ASTM D-1557).
  - b. LESS THAN THREE FOOT OF FILL. The embankments which are to be three (3) feet or less in height shall be compacted for their full depth to a density not less than that equal to ninety-five (95) percent of the soils maximum dry density.
  - c. MORE THAN THREE FEET OF FILL. Fills having heights greater than 3 feet shall have the upper 3 feet compacted as stated immediately above with the fill constructed at depths more than 3 feet below finished grade uniformly compacted to a density equal to not less than ninety (90) percent of the soils maximum dry density, or as otherwise specified by the Engineer or Soils Engineer for the project.
  - d. Soil compaction and moisture content shall be “determined” with a nuclear density meter in accordance with ASTM D 2992, or other method approved by the Soils Engineer. Soil compaction shall be computed using ASTM D-1557, or another method approved by the Soils Engineer.

C. BRIDGES AND CULVERTS

- a. When back-filling at the culverts, the Contractor shall be required to attain 100% of maximum density, by modified proctor (ASTM D-1557), within 20 feet of the culvert.
- b. When back-filling at bridges, the Contractor shall be required to attain 100% of maximum density, by modified proctor (ASTM D-1557), within 100 feet of the bridge abutment.

### 3.3 MOISTURE AND DENSITY CONTROL

- A. Unless otherwise shown on the Drawings, or designated by the Engineer, embankment and those portions of cut sections which are not in rock or solid rock shall be constructed with moisture and density control. Unless otherwise directed by the Engineer, the moisture content of the soil at the time of compaction shall be at the optimum moisture content or within zero and six (6) percentage points above the soils optimum moisture content as determined by ASTM D-1557. Locations and the frequency of tests will be determined by the Engineer. Moisture content for sand and gravel materials should be near the optimum moisture content to facilitate compaction of these cohesionless materials.
- B. The application of water to embankment or borrow materials shall be done with sprinkling equipment consisting of tank trucks, pressure distributors, or other equipment designed to apply water uniformly and in controlled quantities and at variable widths. Mobile sprinkling equipment shall have adequate tractive power and shall be equipped with controls operated from the driver's seat to control the rate of water flow. The Contractor shall be required to furnish sufficient water equipment to ensure proper moisture content of all materials. Watering of embankments shall be done in such a manner that pools of water will not develop. Watering and fill placement operations shall be performed in such a manner that the compacted materials have a uniform moisture content that complies with the Engineer and Soils Engineers moisture requirements for the project.

### 3.4 MINIMUM FREQUENCY OF TESTING

- A. For density control of embankment, culvert and bridge backfill, subballast, road base, and hot mix asphalt pavements, a sufficient number of tests should be taken to ensure that the specified results are obtained. The frequency of testing will vary with the project, the placement operation, and the material being used. For a project where compaction is relatively easy to obtain, the material is reasonably uniform and the compacting methods are consistent, a minimum number of tests are needed for acceptance. The minimum frequency of test needed under the relatively ideal conditions follow. Most operations will require more tests for proper control. Each lift must meet compaction requirement prior to placing a succeeding lift of material.

COMPACTION CONTROL AND TESTING  
Section 02250

<u>Material</u>	<u>Test Type</u>	<u>Frequency</u>
Embankment	Moisture and Density	1 test per 2000 SY on each lift but no greater than 1000' spacing on each lift for narrow grading operations
Culvert, Bridge and Other Structural Backfill	Moisture and Density	1 test per 200 CY of material
Subballast	Moisture and Density	1 test per 1000 SY on each lift but no greater than 500' spacing on each lift for narrow grading operations
Road Base	Moisture and Density	1 test per 1000 SY on each lift but no greater than 500' spacing on each lift for narrow grading operations
Hot Mix Asphalt Pavements	Density	1 test per 2000 SY on each lift but no greater than 1000' spacing on each lift for narrow grading operations

- B. For compressive strength control of structural concrete, drilled shafts and pier caps, a sufficient number of tests should be taken to ensure that the specified results are obtained. The minimum frequency of test needed under the relatively ideal conditions follow.

<u>Material</u>	<u>Test Type</u>	<u>Frequency</u>
Structural Concrete	Compressive Strength	1 test per 150 CY of material

Five cylinders will be cast at the beginning of concrete placement for each shaft and each cap. Compressive strength testing on the cylinders will be as follows:

- a. 1 cylinder for a 3-day break.
- b. 1 cylinder for a 7-day break.
- c. 2 cylinders for a 28-day break.
- d. 1 extra cylinder.

PART 4 - MEASUREMENT AND PAYMENT – N/A

**SECTION 02260**

**FINISH GRADING**

PART 1 - GENERAL

1.1 SUMMARY

- A. The Roadbed shall be finished to the lines and grades shown on the Drawings and as staked. Finished Roadbeds shall be protected from damage from all causes by the Contractor until accepted by the Railroad.

1.2 ALIGNMENT AND GRADE

- A. The finished Grading and Borrow Areas shall conform to the alignment and grade set forth in the Drawings. The Engineer shall furnish control for line and grade and sufficient information for the Contractor to set the required construction stakes.

1.3 SLOPE STAKES

- A. Slope stakes will be set by the Contractor in accordance with the typical sections and cross sections on the Drawings. The Engineer shall use his judgment or soil tests to determine the stability of the materials encountered, and if the character of the materials encountered necessitates changing the slopes after an excavation has been completed, the Engineer may require the Contractor to reset the slope stakes and to steepen, flatten, or bench the slopes. The reasonable costs of re-setting stakes in this case shall be borne by the Railroad. The Contractor shall maintain and preserve all stakes and other marks established until authorized by the Engineer to remove them. If the Contractor removes or destroys such stakes or marks before receiving authorization from the Engineer the replacing of such stakes or marks shall be the Contractor's responsibility.

This page intentionally left blank.

**SECTION 02270**

**SLOPE PROTECTION AND EROSION CONTROL**

PART 1 - GENERAL

1.1 SUMMARY

- A. General information required in connection with slopes and dust control.

PART 2 - PRODUCTS – N/A

PART 3 - EXECUTION

3.1 SLOPES AND PROTECTION OF FINISHED WORK

A. CONSTRUCTION AND PROTECTION

1. The Contractor shall be responsible for developing, implementing and maintaining a Storm Water Pollution Prevention Plan. If permits are included, the Contractor must adhere to all of the conditions set forth in the permit, and the Contractor must keep a copy of the permit and SWPPP onsite at all times. UPRR has provided silt fence and stabilized construction exit details. The Contractor shall use best management practices to ensure that a proper plan is developed and followed. The Contractor shall submit a SWPPP to the Engineer for review and approval 14 days prior to the start of activities impacted by the plan. This plan shall be approved and implemented prior to the start of any grading, and cost shall be incidental to grading unless there are separate bid items. The Contractor shall submit the Notice of Intent for the NPDES permit, as well as the Notice of Termination, unless it is provided by the Railroad. If the permit is provided by the Railroad, a Transfer of Ownership form, if available, shall be completed by the Contractor and the permit shall be transferred to the Contractor. The Contractor shall be responsible for maintaining the SWPPP for the duration of the project. This shall include, but not limited to, re-staking loose hay bales, adjusting and re-staking silt fence, mucking out accumulated silt and other items as necessary to maintain the system.
2. Silt fence is normally the first item constructed, especially on import fill projects. Silt fence may be offset from toe of slopes as directed by the Engineer.
3. All reasonable precautions shall be taken to preserve the character of the material outside of the theoretical slope lines. The slope shall be finished to the lines and grades furnished by the Engineer. All loose materials shall be removed from the slopes and all materials, whether solid or loose, projecting more than one foot outside of the theoretical slope line as staked, shall be removed by the Contractor.
4. The Contractor shall not widen cuts or benches without the prior approval of the Engineer. Widened cut slopes or benches, if approved, must be constructed as follows:
  - a. In such a manner as to be at least as stable as the original cut slopes or benches.
  - b. To provide adequate drainage for the Roadbed.
  - c. In accordance with these Specifications and in the same manner as if such widened cut slopes or benches had been originally contemplated by these Specifications and the Drawings.
5. Care shall be taken to ensure drainage is diverted along or away from the toe of the slope during construction to eliminate water pockets and toe saturation. All operations shall be

SLOPE PROTECTION AND EROSION CONTROL  
Section 02270

conducted such that proper drainage shall be provided at all times, especially at the close of work shift or before anticipated rain.

3.2 DUST AND WIND EROSION CONTROL

- A. As the Work progresses, all finished grades and finished slopes both in excavation and Embankments must be protected from damage by application of water as necessary until the Work has been completed. The Contractor will be required to maintain all excavations, embankments, stockpiles of material sources, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and all other work areas inside or outside of the physical boundaries of the work, free from dust or other materials which would violate federal, state or local air pollution standards or which would cause a hazard or nuisance to people in the vicinity of the Work. Approved temporary methods of dust control, including sprinkling, chemical treatment, light bituminous treatment or similar methods will be permitted. Sprinkling must be repeated at such intervals as to keep all potential sources of dust wet at all times, and the Contractor must provide sufficient sprinkling equipment to comply with this requirement at no expense to the Railroad.
- B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

PART 4 - MEASUREMENT AND PAYMENT

4.1 BASIS OF PAYMENT

- A. The Storm Water Pollution Prevention Plan will be paid for as a lump sum. Approved installations will be paid for at the contract unit price per 50% initial installation, percentage payments each month determined by length of contract and a final payment of 10% for bid item "SWPPP".
- B. Straw bales and silt fence, if provided as separate bid items, shall be paid for at the Contract Unit Price. Silt fence and straw bales are estimated quantities in order to establish a unit price. The Contractor will be paid for the actual amount used.

**SECTION 02270.1**

**TOPSOIL - STOCKPILE AND PLACING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Roadbed slopes, both in excavation and embankment sections, and any disturbed soils that will not support plant life and/or will cause or allow soil erosion shall be covered with six (6) inches of top soil at the completion of the grading operation or the project.
- B. Areas which have soils which are suitable for use as topsoil, at the completion of the project, shall be cleared of all vegetation, brush, rocks that are larger than 2 (two) inches, and any other debris on the surface, which is part of the Clearing and Grubbing section 02110.
- C. Related work:
  - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Special Conditions, Clearing and Grubbing, Earthwork, Seeding and Soil erosion.
  - 2. Testing and quality control requirements will be as indicated in the Earthwork, testing and laboratory services sections.

**PART 2 - PRODUCT**

**2.1 MATERIAL**

- A. **TOPSOIL**
  - 1. Topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoil, roots, heavy or stiff clay, stones larger than 2" in greatest dimension, noxious weeds, sticks, brush, litter and other deleterious matter.
  - 2. Obtain topsoil from sources within the project limits, or provide imported topsoil obtained from sources outside the project limits, or both so.

**PART 3 - EXECUTION**

**3.1 REMOVAL AND STOCKPILING OF TOPSOIL.**

- A. The top six (6) inches of suitable topsoil, or the soil that complies with the requirements for topsoil to any depth within the template for the excavation area will be removed and stockpiled during construction.
- B. Stockpiles shall be shaped or graded to maintain drainage and protect the topsoil material from being over wetted which will require time to disk, roll and dry back to moisture requirements for compaction of embankment.
- C. After construction, the topsoil will be placed on slopes, trouble areas and ditches as specified by the Engineer.

TOPSOIL - STOCKPILE AND PLACING  
Section 02270.1

- D. See Section 02270.75 or the Schedule of rates and prices for seeding, should it be required.
- E. Care shall be taken not to damage any area in the process of moving the topsoil from the stockpile to the final location.
- F. The stockpile shall be wetted to control dust.
- G. The Contractor shall check with the Engineer, the drawing, and the Specifications for the origin, the stockpile location, and the areas which will require topsoil.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

- A. Topsoil is the removing from the excavation areas, the hauling and stockpiling, the protecting of the stockpile from the elements, and the hauling and placing of the topsoil, with compaction as required in section 02230, and the redressing of slopes and areas involved.

4.2 PAYMENT

- A. Stockpiling of Topsoil is to be paid for at the unit of Cubic Yard. This price includes the following:
  - 1. The removal from the excavation area.
  - 2. The hauling to and placing in the stockpile.
  - 3. The maintaining of the stockpile.
  - 4. The hauling and placing of the topsoil in areas requiring topsoil, as designated by the Engineer.
  - 5. The care and repair of areas disturbed while moving, placing, and compacting the topsoil.
- B. If there is no Stockpiling of Topsoil bid item, Stockpiling of Topsoil shall be included in the embankment or excavation unit price.

**SECTION 02270.70**

**SILT FENCE AND STRAW BALES FOR EROSION CONTROL**

PART 1 - GENERAL

This work shall consist of installing silt fence and ditch checks for controlling stormwater erosion during construction as shown on the plans or designated by the Engineer.

1.1 SUMMARY

A. DESCRIPTION

1. This work shall consist of furnishing, placing, and removal of silt fence and ditch checks in accordance with these Specifications at locations shown in the plans or designated by the Engineer.

1.2 MATERIAL REQUIREMENTS

- A. All filter fabric shall be a pervious sheet of polypropylene, nylon, polyester, or polyethylene yarn in a continuous roll to avoid joints conforming to the requirements below:

<i>Physical Property</i>	<i>Requirements</i>
Filtering Efficiency	75% - 85% (minimum)
Tensile Strength at 20% (maximum) Elongation	Standard Strength - 30 lb/linear inch (minimum) Extra Strength - 50 lb/linear inch (minimum)
Slurry Flow Rate	0.3 gal/sq. ft./min (minimum)

Filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0<sup>^</sup> to 120<sup>^</sup> F. Burlap of 10 ounces per square yard of fabric can also be used. Wire fencing shall be used as backing for reinforcing standard strength filter fabric. The wire fence shall be 14 gauge minimum, 22-48 inches wide, and have a maximum mesh spacing of 6 inches.

- B. Posts for filter fabric shall be 1.00 to 1.33 lb/linear ft. steel and have projections for fastening wire and fabric.
- C. Straw bales for ditch checks shall be either straw or hay tied firmly with a wire or plastic tie and shall be approximately 14" - 16" (height) x 18" x 36" in size.
- D. Hold down stakes for straw bales shall be wood approximately 1-1/2" x 1-1/2" x 36" in size. Hold down stakes in shale shall be re-bars of appropriate length. The two re-bars shall be wired together to prevent the bale from floating off stakes.

SILT FENCE AND STRAW BALES FOR EROSION CONTROL  
Section 02270.70

PART 2 - PRODUCTS – N/A

- A. Only products on the respective State Department of Transportation's Approved Products List will be allowed for use on this project, unless specified elsewhere in these specifications or on the Plans.

PART 3 - EXECUTION

3.1 FILTER FABRIC

- A. Height of silt fence shall not exceed 36”.
- B. Posts shall be spaced a maximum of 10’ apart when using standard strength filter fabric with wire fence backing and spaced a maximum of 6’ apart when using extra strength filter fabric. Posts shall be driven a minimum of 12 inches into the ground.
- C. A trench shall be excavated approximately 4” deep x 4” wide along the line of posts and upslope from the barrier.
- D. When standard strength filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least 1 inch long, tie wires or hog rings. The wire shall extend into the trench a minimum of 2 inches and shall not extend more than 36 inches above the original ground surface.
- E. The standard strength filter fabric shall be stapled or wired to the fence and 8 inches of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches above the original ground surface.
- F. When extra strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric shall be stapled or wired directly to the posts and 8 inches of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches above the original ground surface.
- G. The trench shall be backfilled and the soil compacted over the filter fabric.
- H. Inspection shall be frequent and repair or replacement shall be made promptly as needed or as directed by Engineer. Silt fences shall be replaced every 6 months and removed when the seeding has been established or as directed by the Engineer.
- I. Sediment deposits shall be removed periodically as directed by Engineer or when depth reaches 1/3 height of silt fence.

3.2 STRAW BALE DITCH CHECKS

- A. Bales shall be placed in a single row, lengthwise, oriented perpendicular to the contour, with ends of adjacent bales tightly abutting one another.
- B. All bales shall be either wire-bound or plastic tied. Bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales.
- C. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked, the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier.
- D. Each bale shall be securely anchored by at least two stakes or rebars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or rebars shall be driven deep enough into the ground to securely anchor the bales.

SILT FENCE AND STRAW BALES FOR EROSION CONTROL  
Section 02270.70

- E. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales.
- F. The barrier shall be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment-laden runoff will flow either through or over the barrier but not around it.
- G. Sediment deposits shall be removed after each storm event or when depth reaches 1/3 height of bales to prevent sediments from reaching further downstream via a channel.
- H. Inspection shall be frequent and repair or replacement shall be made promptly as needed or as directed by Engineer. Bales should be replaced every 3 months and removed when the seeding has been established or as directed by the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 PAYMENT

- A. The Storm Water Pollution Prevention Plan will be paid for as a lump sum. Approved installations will be paid for at the contract unit price per 50% initial installation, percentage payments each month determined by length of contract and a final payment of 10% for bid item "SWPPP".
- B. Straw bales and silt fence, if provided as separate bid items, shall be paid for at the Contract Unit Price. Silt fence and straw bales are estimated quantities in order to establish a unit price. The Contractor will be paid for the actual amount used.

This page intentionally left blank.

## SECTION 02270.75

### SEEDING

#### PART 1 - GENERAL

This work shall consist of the preparing and seeding of disturbed areas of roadbed slopes, ditch bottoms, and areas shown within the grading limits on the plans. . Disturbed areas outside the grading limits shall be seeded at the contractor's expense.

##### 1.1 SUMMARY

###### A. DESCRIPTION

1. This work shall consist of furnishing and placing seed, fertilizer and mulch in accordance with these Specifications at locations shown in the plans or designated by the Engineer.
2. Rates of application and seed mixtures shall be as determined by the state D.O.T., area of construction, and approval of the Engineer.

##### 1.2 MATERIAL REQUIREMENTS

- A. Hydro seeding, fertilizing and mulching shall be in accordance with the state DOT specifications. The Contractor shall coordinate with the UPRR Engineer as to when seeding shall be done. The Contractor shall guarantee seeding for one year and remove silt fence when seeding is established.
- B. Contractor shall be responsible for reseedling to obtain satisfactory germination and growth, even if failure is due to weather. Hydro seeding shall be paid for per acre inclusive of tilling, seeding, fertilizing, herbicide application, mulching and erosion protection, and initial watering.

#### PART 2 - PRODUCTS

##### 2.1 EQUIPMENT – GENERAL

The Contractor shall furnish equipment in satisfactory working condition, and in sufficient quantity to perform the work as specified. The equipment shall be on the project site and approved by the Engineer before work on the corresponding item begins.

#### PART 3 - EXECUTION

##### 3.1 CONSTRUCTION METHODS

- A. NOTICE. The Contractor shall notify the engineer at least 48 hours in advance of the time he intends to begin work and shall not proceed with such work until permission to do so has been granted by the engineer.
- B. WEATHER. Seeding operations shall be performed only during the periods of favorable weather. Seeding shall not be done before or during hot, dry weather except by express permission of the engineer. No work shall be performed during excessively windy weather or when the ground is frozen, excessively wet or untillable.
- C. BED PREPARATION. Not more than five days prior to the sowing of the seed, the seedbed shall be prepared by loosening the soil to a depth of not less than two inches by disking, harrowing, raking or by other approved means. Repeated disking, harrowing or

similar means may be required to provide a satisfactory seedbed. Disking, harrowing and raking shall be longitudinal on all slopes. If needed, the seedbed shall be compacted.

- D. WEEDING. Existing weed stubble and small weeds shall be cut and partially incorporated into the soil during the seedbed preparation work. All other growth of vegetation that interface with seeding operations shall be removed.
- E. PRESERVING PLANTS. Extreme care shall be exercised to avoid injury to trees and shrubs that have been designated by the Engineer to be preserved.
- F. FERTILIZER shall be uniformly applied to all areas requiring seeding.

### 3.2 PLANTING METHODS.

- A. GENERAL - All seed shall be sown at the specified rate. When several species are specified and cannot be combined due to different characters such as size, weight, hulled, the seed shall be planted separately to obtain the specified seeding rates. Equipment shall not be operated on areas where rutting or slippage would mar the soil surface.
- B. METHODS
  - 1. GRASS DRILL SEEDING METHOD. The seed shall be planted with a grass seed drill conforming to section 2.1.a. All drilling shall conform to the counter of area.
  - 2. HAND BROADCASTING METHOD. Hand broadcasting shall not be used except in areas that are too small or inaccessible to accommodate the specified equipment.
  - 3. CORRUGATED ROLLER SEEDER METHOD. The seed shall be distributed to conform to section 2.1.c. which has been adjusted to accurately apply the proper amount.
  - 4. HYDRAULIC AND HYDRO-SEEDER METHODS. The seeding shall consist of mixing and applying seed, commercial fertilizer and stabilizing emulsion, or any combination thereof, with fiber and water. The materials and quantities thereof to be mixed with water will be specified in the special provisions. The quantity of water shall be as needed for the application. Except that when stabilizing emulsion is specified, the ratio of total water to total stabilizing emulsion in the mixture shall be as recommended by the manufacturer of the emulsion, but shall not exceed 6 gallons of water for each 5 pounds of stabilizing emulsion solids specified. Tanks shall be of a size that is appropriate to the size of the seeding area.

### 3.3 METHODS OF MULCHING.

- A. The Contractor shall apply the protective mulch within 48 hours after sowing the seed, unless otherwise directed by the engineer. The mulch shall be applied with mulch blowing machine or other approved methods.
- B. Immediately following the spreading of the mulch on the seeding areas, the material shall be anchored to the soil by "Cat Walking" with a bulldozer, a V-type wheel land packer, a soil erosion mulch tiller, or other suitable equipment which will secure the mulch firmly to form a soil binding mulch, or by the use of a chemical tackifier.

## PART 4 - MEASUREMENT AND PAYMENT

### 4.1 MEASUREMENT

Seeding will be measured by the ACRE as shown in the bid items. If the area is small, it may be measured in square yards.

4.2 PAYMENT

Payment for seeding will be at the contract unit bid per acre. Includes preparing the soil, purchasing and sowing of seed, mulching, fertilizing, tacking, watering, protecting and caring for the area until the contract is complete, or the growing season is over, or if placed late in the year, until the seed has germinated in the spring of the following year. Water used in connection with seeding is considered incidental to the job.

4.3 METHOD

The method of applying seed, emulsion, tackifier, water, equipment, and all things required in seeding shall be considered as included in the price for seeding.

If the method of seeding is not stated in the bid item, it should be stated in your return bid item.

This page intentionally left blank.

**SECTION 02271**

**RIP RAP**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Description: Riprap furnished, hauled, and placed by the Contractor to the locations and of the types shown on the drawings and as directed by the Engineer.
- B. Related work:
  - 1. Documents affecting work of this section include, but are not necessarily limited to, General Notes and Details for Round Steel Pipe Culverts Drawing 680000, and Section 02230, and related earthwork sections, Construction of Roadbeds. Riprap is also affected in sections 02434 and 02437 Culvert Installation.

**1.2 QUALITY ASSURANCE**

- A. Sections covering Responsibilities and Duties include, but are not necessarily limited to, General Requirement Specification, Section 01000.

**PART 2 - PRODUCTS**

**2.1 MATERIAL REQUIREMENTS**

- A. Material. Riprap shall be hard, durable, angular in shape, resistant to weathering and shall be free of cracks, seams, expansive materials or other defects that would cause accumulated deterioration from exposure to climatic conditions.
- B. The material shall meet, in addition to the Specifications, the following quality requirements:
  - 1. The approval of some riprap from a particular source shall not be construed as constituting the approval of all riprap taken from that source.
  - 2. The Engineer shall be the sole judge of riprap quality and sources of material.
  - 3. Rip rap may be rejected on the basis of visual examination, regardless of laboratory tests and/or service records.
  - 4. Tests to which the materials may be subjected include specific gravity, abrasion, absorption, soundness, freezing and thawing and such other tests as may be considered necessary.

TEST	REQUIREMENT
Specific Gravity (ASTM Designation C127)	2.65 Minimum
Absorption (ASTM Designation C127)	2.0% Minimum 8.0% Maximum
Soundness, 5 cycles Mg S04 (ASTM Designation C88)	2.0% Minimum 15% Maximum

- C. Requirements. All riprap to be loaded and quarried shall conform to the following limitations unless otherwise specified or as shown on the plans:

RIP RAP CLASS	AVERAGE PER STONE (LBS)	DIMENSION (INCHES)	TYPICAL VELOCITIES (FT/S)
I	50 to 200	9 to 14	6-8
II	200 to 1,000	14 to 24	8-12
III	1,000 to 4,000	24 to 38	≥12
IV	> 4,000	> 38	Special cases

D. Requirements, Limitations, and Allowances

1. The riprap class(es) required shall be well distributed and the entire mass of stone shall conform to the limitations specified. However, the following allowances shall be acceptable to produce the required riprap protection:
  - a. Riprap Class I - No allowances are permitted
  - b. Riprap Class II - 15% of Riprap Class I.
  - c. Riprap Class III - 15% of Riprap Class I and 15% of Riprap Class II.
  - d. Riprap Class IV - 15% of Riprap Class I, 15% of Riprap Class II and 15% of Riprap Class III.
  
- E. The above allowances may be adjusted in the field where at the discretion of the engineer a greater or lesser percentage would be required. Individual pieces, larger than the maximum specified size may be toed in at the bottom of the riprap toe.

PART 3 - EXECUTION

3.1 Construction Methods.

- A. Riprap shall be placed in such a manner as:
  1. To produce a compact mass of rock which shall provide adequate embankment protection and erosion control.
  2. To avoid segregation of the various sizes of rock.
  
- B. Placement of stones.
  1. Individual stones shall be tightly in contact with other stones in order to produce the least possible amount of void spaces.
  2. All material going into riprap protection shall be so placed and distributed that there will be no large accumulations of either the larger or smaller sizes of stone.
  3. Rearranging of individual stones by mechanical equipment or by hand may be required to the extent necessary to obtain a reasonably well graded distribution of stone sizes.
  4. The Contractor shall maintain the riprap protection until accepted. Material displaced by any cause shall be replaced at no additional cost to the Railroad.
  
- C. Sources.
  1. The sources proposed for use by the Contractor shall be selected in advance, and approval of a source by the Engineer may depend upon laboratory test data, visual examination and service records.

2. If such records are not available, such as in the case of newly opened quarries, the materials shall be subject to tests considered necessary by the Engineer.

#### PART 4 - MEASUREMENT AND PAYMENT

##### 4.1 MEASUREMENT

Measurement of acceptable riprap, complete in place, will be made on the basis of the area actually covered, and the volume will be computed on the basis of the measured area and the thickness specified on the plans.

##### 4.2 PAYMENT

- A. The Riprap quantities measured as provided above, will be paid for at the unit prices bid per cubic yard.
- B. The Riprap of the various classifications shown above will each be bid separately.
- C. Riprap shall be included with culvert installation unless specified separately with a bid item. The cost of Riprap material and installation at the end of culverts shall be included in the unit price per foot cost of installing of the culvert.
- D. The unit price bid will include full compensation for furnishing, hauling, placing of all materials and furnishing of all labor, tools, equipment, incidental and necessary to the completion of the work.

This page intentionally left blank.

**SECTION 02434**

**CULVERTS**

**CORRUGATED ALUMINUM ALLOY PIPE (AAP), CORRUGATED STEEL PIPE (CSP) AND  
CORRUGATED STRUCTURAL PLATE PIPE (CPP).**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. DESCRIPTION. These Pipe Culvert Specifications cover the assembly and installation of (a) corrugated steel pipes, (CSP), (b) corrugated structural plate pipe (CPP), and (c) corrugated aluminum alloy pipe (CAAP), each hereinafter referred to as "pipe culverts." Pipe culverts shall be assembled and installed in accordance with these Specifications and Chapter 1, Part 4 of the current AREMA Specifications for Culvert installation and the Union Pacific Railroad Company's Engineering Culvert Pipe Standard Drawings 680000, 680010 and 680030. The most restrictive provisions shall govern when there are differences in the requirements.
- B. RELATED WORK. Documents affecting work of this section include, but are not necessarily limited to, the General Requirements, Section 01000 - Division I, General and the Special Conditions.

**PART 2 - PRODUCTS**

**2.1 PIPE CULVERT MATERIAL**

- A. All pipe culverts will be furnished with annular corrugations. The exposed ends of all corrugated pipes shall be square. Pipe culvert material, if any, furnished by the Contractor, must meet the standards for pipe culverts set forth in Chapter 1, Part 4 of the current AREMA Specifications and the Union Pacific Railroad Company's Engineering Culvert Pipe Standard Drawings 680000, 680010 and 680030 or as required and approved by the Engineer. 3" x 1" annular corrugations shall be used for all CMP pipes with 36" diameters and larger, 2-2/3" x 1/2" or 3" x 1" annular corrugations shall be used for 30" diameter CSP pipes. 3" x 1" annular corrugations shall be used for all CAAP pipes. 6" x 2" annular corrugations and a Minimum of 4 bolts per foot for all SPP pipes. Bolts and nuts shall be per the current AREMA Specifications, chapter 41, part 4. Minimum gage requirements are specified in UPRR Engineering Culvert Pipe Standards. All CMP culverts under the railroad shall be aluminized and double-riveted. Any deviations of these Specifications are to be submitted to the Engineer for approval prior to starting construction.
- B. All flared end sections furnished by the Contractor must meet the standards for pipe culverts set forth in Chapter 1, Part 4 of the current AREMA Specifications. Flared end sections shall match the annular corrugations and gage of the adjacent pipe culvert. Any deviations of these Specifications are to be submitted to the Engineer for approval prior to starting construction.

PART 3 - EXECUTION

3.1 HANDLING OF PIPE CULVERT MATERIAL

- A. The Contractor shall handle pipe culverts and the pipe culvert material carefully in order to prevent damage, including, but not limited to, distortion of the pipes, injury to bituminous and other pipe culvert coatings. Pipe culverts shall never be dragged over the ground, but shall be handled with skids, rolling slings, or cranes. The Contractor shall promptly repair, to the satisfaction of the Engineer, any damage to the pipe culvert or pipe culvert material. In the event such damaged pipe culverts or pipe culvert material cannot be repaired to the satisfaction of the Engineer, replacement pipe culverts or pipe culvert material must be provided by the Contractor at his expense.

3.2 EXCAVATION AND LOCATION

- A. Preparation for the culvert bedding shall be included in the culvert installation or extension cost and shall include all necessary clearing and grading necessary to place the bedding material, as well as placement and compaction of aggregate base bedding. The Contractor may use CLSM, for the culvert bedding. Any ditching required, unless there is a bid item for ditching, shall be incidental to the culvert installation. Culvert bedding preparation is included in the cost per foot and will not be classified as subexcavation.
- B. If any shoring is required for culvert work, it shall be incidental to the service item. Shoring plans must conform to the General Shoring Requirements (dwg.# 710000), and must be stamped by a P.E. in the state where the work is to be performed. The shoring plan is to be submitted to the UPRRStructures Design Group. for review and approval.
- C. Pipe culverts shall be placed at the location, elevation and alignment shown on the Drawings.
- D. CULVERT PIPE EXCAVATION AND EMBANKMENT - The Contractor shall perform all pipe culvert excavation. Prior to pipe culvert excavation, embankment must be constructed to a height no less than two (2) feet above the top of the proposed pipe culvert. When embankment is placed, alternate methods may be used if approved by the Engineer. Pipe culvert excavations shall be wide enough to permit thorough compaction of the backfill under and around the pipe culvert as required by paragraph "laying culvert pipe" page 4 of this section. The base width of the pipe culvert excavation shall not exceed the external width of the pipe culvert plus
  1. 12 inches on each side for pipes less than 48 inches in diameter.
  2. 18 inches on each side for pipes 54-78 inches in diameter.
  3. 24 inches on each side for pipes 84 inches in diameter or larger.
- E. PROTECTION OF FOUNDATION AND BEDDING. Unless soft soil is encountered in which case "Soft Soil Condition" Page 3 shall govern. Pipe culvert excavation shall be deep enough to permit compliance with the foundation and bedding requirements for pipe culverts. Care shall be taken to insure drainage is diverted away from the pipe bed during preparation. Any damage to or deterioration of pipe bedding prior to installation shall be repaired by the Contractor at no expense to the Railroad.
- F. The Contractor shall comply with all current and applicable Federal, State, local rules, and regulations governing the safety of men and materials during pipe culvert excavation, installation and backfilling operations. The Contractor shall observe requirements of the Occupational Safety and Health Administration relating to excavations, trenching and shoring as set forth in Title 29, Part 1926, Subpart Paragraph P, Sections 1926.650 through 1926.653, Code of Federal Regulations, and any subsequent revisions.

### 3.3 FOUNDATION, BEDDING, AND COMPACTION

- A. Pipe culverts shall be placed at the flowline grade and elevation established by the Engineer on a uniform bed of stable earth or granular material such as gravel or sand, and such bedding shall be compacted to not less than one hundred (100) percent of maximum density determined by ASTM D 1557 with moisture content adjusted. The compacted bed shall contain the camber required by the Engineer or as covered by these Specifications, Para. 3.4 Camber. The compacted bed shall also be shaped to fit the bottom one-third (1/3) of round pipe culvert or shaped to fit the entire bottom of pipe arch culvert. Where the granular material is used for bedding, the ends of the pipe culvert in embankment shall be sealed to prevent leaking and infiltration of water along the pipe culvert. Such sealing can often be accomplished by blanketing the ends of the pipe culvert embankment with well tamped clay. In all cases, ends of pipe culverts shall be protected by riprap as outlined in the UPRR Engineering Culvert Pipe Standards.
- B. SOFT SOIL CONDITIONS. Where the flowline grade crosses soft areas of soil which will not provide a suitable uniform foundation for the pipe culvert bed, the Contractor shall excavate eighteen (18) inches below the flowline grade for a width equal twice the outside width of the pipe culvert. Prior to backfilling, the Engineer shall inspect the excavation and the Contractor shall perform any additional excavation beneath eighteen (18) inches of the flowline grade which may be required by the Engineer; provided, however, that the expense of any such additional excavation beneath eighteen (18) inches of the flowline grade shall be considered extra work. Upon completion of the excavation, the Contractor will backfill such excavation with granular material which shall be compacted and formed as described above.
- C. ROCK. When the flowline grade passes over rock, the Contractor shall excavate such rock to a depth which is at least (12) inches below the flowline grade. Excavations in rock shall maintain sufficient area so that the pipe culvert will not rest on rock at any point. The Contractor will backfill excavation in rock with granular material which shall be formed as described above.

### 3.4 CAMBER

- A. Camber shall be placed in all culverts where it is anticipated that the culvert will settle as the result of high embankment construction or compressible foundation soils below the culvert bedding. Unless otherwise specified by the Engineer, all culverts shall be cambered in accordance with the following:
  - 1. In no case shall the culvert be cambered so high in the center that water will be pocketed at the inlet end of the pipe.
  - 2. Culverts resting on rock foundation need not be Cambered. Refer to Paragraph 3.3 C ROCK.
  - 3. Embankments up to 8 feet high (measured base of rail to flowline) require a 1-1/2 inch camber.
    - a. Embankments 8 feet to 12 feet high require a 2 - 1/2 inch camber.
    - b. Embankments 12 feet to 24 feet high require a 4-inch camber.
    - c. Embankments 24 feet to 36 feet high require a 6-in. camber.

- B. The above camber standards, based on the height of embankments, may be adjusted in the field, where at the discretion of the Engineer a greater or lesser amount of camber should be built into pipe to adjust for soil conditions encountered at the site. For fills higher than 36 feet, the Chief Engineer will provide the camber requirements.

### 3.5 RIPRAP PROTECTION

Both the inlet and outlet ends of all culverts shall be protected by riprap, concrete headwall, or as shown on the Drawings. Riprap shall be installed per detail on Drawing 680000, or as shown on the Plan.

### 3.6 INSTALLATION

#### A. ASSEMBLY OF CULVERT PIPE

1. Pipe culverts will generally be joined using two (2) foot wide corrugated metal connecting bands. The inside of corrugated connecting bands and the outside of pipe culverts to be joined by corrugated connecting bands shall be kept clean and free of all dirt or gravel to ensure that the corrugations on the connecting bands and the pipe culvert fit snugly as the connecting bands are tightened. They should be tapped with a mallet or hard rubber hammer to ensure a tight joint. Connecting bands for 48 inch or less coated culvert pipe shall be two (2) foot wide, two pieced type, connecting bands and the outside surface of the culvert pipe under the connecting band often need be lubricated with fuel oil or similar solvent to allow the connecting bands to be drawn firmly into place.
2. Corrugated structural plate pipe shall be assembled in accordance with the manufacturer's detailed assembly instructions. Bolts shall be tightened progressively uniformly, starting at one end of the corrugated structural plate pipe after all plates are in place. Tightening shall be repeated to ensure all bolts are tight.
3. When a power wrench is used for tightening bolts, the Contractor shall check the tightening of the bolts with one handled structural or socket type torque wrench. Bolts shall be torqued uniformly to a minimum of 100 ft. lb. and a maximum of 300 ft. lb. or as specified in the manufacturer's detailed assembly instructions.
4. Where field cutting of culvert pipes is required, the Contractor shall make saw cuts. Torch burning will not be permitted.

#### B. LAYING CULVERT PIPE

Each pipe culvert shall be laid true to the flowline grade. The minimum gradient for any pipe culvert shall be 0.5 percent unless indicated otherwise on the Plans, or as directed by the Engineer. If two or more pipe culverts are to be laid parallel to each other, such parallel pipe culverts shall be spaced per Drawing 6800000 and to permit thorough compaction of the backfill as required by Para. 3.7. Parallel culverts shall be spaced to permit thorough compaction of the backfill as required by Para. 3.7. Parallel culverts shall be separate by a distance of at least one-half (1/2) of the nominal diameter of the pipe culverts or one-third (1/3) the span width of pipe arch culverts but not less than twelve (12) inches, nor does it in any case need to exceed 48 inches. Riveted corrugated metal pipe culverts must be placed with the inside circumferential laps pointing downstream. The Contractor shall cover exposed metal on the surface of any bituminous coated pipe culvert before backfilling is commenced. Such exposed metal must be covered with material which is approved by the Engineer and which includes:

1. Fiber Bonded Bituminous (composite) coating ASTM A-825 (steel only)

2. Polymeric Coating - ASTM A762 or AASHTO M245 (steel only)
3. Galvanized - AASHTOM218 or Aluminum (Type 2) - AASHTO M274 (steel only)
4. Asphaltic Coating - AASHTO M190 (steel and aluminum) (only 3 and 4 for structural plate pipe)

Such material shall be applied to a thickness of approximately one sixteenth (1/16) of an inch.

C. SPECIAL INSTALLATION CONDITIONS

1. STRUTTING: All pipe culverts with a nominal diameter of 48 inches or greater shall be provided with a five (5) percent vertical elongation. Field strutting shall be required only on very large structural steel pipes (10 foot or greater). Strutting shall be removed immediately after installation and backfill are complete. In all cases, strutting may be required if specifically stated in the Request for Bids

3.7 BACKFILLING AND COMPACTION.

- A. Backfill materials shall be placed simultaneously on both sides of the pipe culvert in uniform layers not to exceed six (6) inches in thickness. For multiple pipes, the backfill shall be placed simultaneously in uniform 6 inch layers between and outside of pipes. Each successive layer shall be compacted, in accordance with the Railroad's Specifications 02230 through 02270, and to not less than one hundred (100) percent of maximum density as determined by ASTM D 1557 with moisture content adjusted if necessary, and each (6) inch layer shall be properly compacted before the next layer is placed.
- B. Backfilling shall be started and completed as quickly as possible after the pipe culvert has been assembled and placed on its bed.
- C. Where granular material is used for backfill, the ends of the pipe culvert embankment shall be sealed with well tamped clay to prevent leaking and infiltration of water along the pipe culvert.
- D. Where compaction may be difficult to obtain due to space constraints or other factors, the Contractor may, with the approval of the Engineer, utilize Controlled Low-Strength Concrete Fill Material (CLSM), commonly called flowable fill, as backfill material to a point one foot above the top of the culvert per Drawing 680000.
- E. PIPE PROTECTION. Materials used to complete the embankment over the pipe culvert should be essentially the same as the material used for the pipe culvert backfill and should be placed and compacted in the same manner as pipe culvert backfill materials are placed. Such material must be used to complete the embankment at least to a height over the top of the pipe culvert equal to the nominal diameter of the pipe culvert, or if the height of the completed embankment over the top of the pipe culvert is less than the nominal diameter of the pipe culvert then such material must be used to complete the embankment. The pipe culvert must be protected from damage during the entire construction period, especially if heavy compaction equipment is used. Heavy construction equipment shall not be operated over the pipe culvert until it has been covered with compacted backfill material to a depth of twenty-four (24) inches.

3.8 RETIGHTENING OF BOLTS

As soon as possible after completion of the embankment over corrugated structural plate pipes, all bolts in the corrugated structural pipe must be retightened to the standards set forth in Para.

3.6. Such retightening must be started at one end of the pipe culvert and all bolts must be tightened progressively through the length of the pipe culvert.

### 3.9 PREPARATION OF EXISTING PIPE CULVERTS

- A. The Contractor shall remove existing headwalls and the ends of damaged culverts that are to be extended. The Contractor shall also verify the culvert size prior to ordering material for the culvert extension. All culverts in the project limits are to be cleaned by the Contractor unless they are to be removed or plugged and filled.
- B. The Contractor shall use Controlled Low-Strength Concrete Fill Material (CLSM) per Drawing 680000, with an unconfined compressive strength of between 50 and 300 PSI, for filling culverts that are to be plugged and filled.
- C. Culverts that are to be removed become the property of the Contractor and must be removed from Railroad property, unless otherwise noted.

### PART 4 - MEASUREMENT AND PAYMENT

- A. The number of linear feet of pipe culvert installed will be determined by measuring the installed pipe culvert along its longitudinal axis and shall be paid for on the unit price bid per linear foot of pipe installed.
- B. The cost of RIP RAP is to be included in the price per linear foot of pipe.
- C. Included in the above L.F. cost is the removal and disposal of 18 inches of unsuitable material and the installation of 18 inches of bedding.
- D. Below the 18 inches, removal and replacement of bedding material is considered extra work and shall be paid on the Cubic Yard basis.
- E. The number of flared end sections will be measured and paid for at the contract unit price bid per each flared end section acceptably installed.
- F. No additional payment will be made for the use of CLSM, or flowable fill, as backfill around culverts, but shall be considered subsidiary to the cost of the culvert pipe.

**SECTION 02435**

**SMOOTH STEEL PIPE CULVERTS**

PART 1 – GENERAL

1.1 DESCRIPTION

- A. These specifications shall govern fabrication, furnishing, and installation of smooth steel pipe culverts in accordance with these special conditions, standard construction specifications and the details shown on the plans.
- B. The size, type, length, wall thickness, and location of pipe culverts will be shown on the plans or as directed by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. See Standard Plan No. 680010 for material requirements, diameter, wall thickness, and welding requirements.
- B. Fabrication and materials shall be in accordance with Chapter 1, Part 4 of the AREMA Manual for Railway Engineering except as specified otherwise.

2.2 END TREATMENT

- A. End treatments shall be provided as specified on the plans or as directed by the Engineer.
- B. Ends of smooth steel pipes shall be finished square.

PART 3 - EXECUTION

3.1 HANDLING

- A. Material shall be handled to final position in such a manner as to prevent its damage. Steel pipes shall not be dropped to, or dragged over, the ground, but shall be handled with rolling slings, on skids, or with cranes.
- B. Bent or otherwise damaged steel pipes shall be straightened and repaired, if feasible and as directed by the Engineer, before being placed in final position. No extra payment will be allowed for this work unless authorized in writing by the Engineer.

3.2 PIPE CONNECTIONS

- A. Pipe connections shall be as shown on the plans or as stated in the specifications.
- B. Sections of smooth steel pipe shall be joined by complete joint penetration welds in accordance with Standard Plan No. 680010 and AWS D1.1 Structural Welding Code unless specified otherwise on the plans or by the Engineer.

3.3 PIPE EXTENSIONS

- A. Connection of smooth steel pipe for extensions shall be as shown on the plans or as stated in the specifications. Sections of smooth steel pipe shall be welded as specified.
- B. Prior to performing any pipe/culvert extensions, the pipe shall be cleaned out. Pipes shall be free of any obstructions that could impede the flow. The clean out of the pipe/culvert is incidental to the cost of performing the pipe extension and shall be included in the contract unit price for pipe extensions.

3.4 PIPE ABANDONMENT

- A. All pipes/culverts being abandoned will be plugged and filled as indicated on the plans or special conditions. No abandoned pipes will be left open, unless otherwise directed by the Engineer. The abandoned pipes will be indicated on the plans.
- B. Culverts that are to be removed become the property of the Contractor and must be removed from Railroad property, unless otherwise noted.

3.5 FOUNDATION PREPARATION

- A. No foundation preparation shall be required for the length of pipe installed by jacking and boring.
- B. Foundation preparation shall be performed as required by Section 02434.

3.6 PROTECTION OF FOUNDATIONS

- A. The Contractor shall by diversion ditches, dikes, or other means, keep the foundations free of water at all times after the work is started, and until the embankment is placed over the pipe. Any channel work necessary to allow free flow through the pipe shall be completed before the embankment is placed.

3.7 EARTH BORING AND JACKING CULVERT PIPE

- A. General:
  - 1. Only smooth steel pipe shall be used for installation by jacking or boring.
  - 2. Pipe damaged in jacking or boring operations shall be repaired in place to the satisfaction of the Engineer. Pipe damage beyond repair shall be removed and replaced. Repair or removal and replacement of damaged pipe shall be done at the Contractor's expense.
  - 3. Excessive voids shall not be permitted in the jacking process. If voids develop during installation, or track or ballast movement exceeds  $\frac{1}{4}$ ", stop work immediately, notify UPRR and submit a corrective action plan.
  - 4. If the grade of the pipe at the jacking or boring end is below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking or boring operation and for placing end joints of the pipe. The pits shall be

SMOOTH STEEL PIPE CULVERT  
Section 02435

a minimum of 12 feet from centerline of the nearest track. Shoring for jacking pits shall meet the requirements of Standard Plan No. 710000. Jacking pits will not be permitted in Zone A unless approved by the Engineer. Design of shoring for jacking pits shall be performed, signed and sealed by a licensed Civil Engineer in the respective State the project is located. Temporary guardrail shall be provided for protection of the pit or trench when specified by the Engineer. Excavations greater than five (5) feet in depth shall be protected in accordance with OSHA Trench Safety Guidelines.

5. Where pipe is required to be installed under railroad embankments, highways, streets, or other facilities by jacking or boring methods, installation shall be made in such a manner that it will not interfere with the operation of the railroad, street, highway, or other facility, and shall not weaken or damage any embankment or structure.
6. The pits or trenches excavated to facilitate jacking or boring operations shall be backfilled immediately after the installation of the pipe has been completed.

B. Jacking:

1. Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used. A suitable jacking head and suitable bracing between the jacks and the jacking head shall be provided so that pressure will be applied to the pipe uniformly around the ring of the pipe. Joint cushioning material of plywood or other material may be used as approved by the Engineer. Plywood cushioning material shall be 3/4-inch minimum thickness. Cushioning rings may be made up of single or multiple pieces. A suitable jacking frame or backstop shall be provided. The pipe to be jacked shall be set on guides, properly braced together, to support the section of the pipe and to direct the pipe in the proper line and grade. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe. In general, the embankment material shall be excavated just ahead of the pipe, the material removed through the pipe, and the pipe forced through the embankment with jacks, into the space thus provided.
2. The excavation for the underside of the pipe, for at least one-third of the circumference of the pipe, shall conform to the contour and grade of the pipe. Over-excavation to provide not more than 1 inch of clearance may be provided for the upper half of the pipe. This clearance shall be tapered to zero at the point where the excavation conforms to the contour of the pipe. Over-excavation in excess of 1 inch shall be pressure grouted the entire length of the installation.
3. The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but shall not exceed 2 feet. This distance shall be decreased when directed by the Engineer.
4. Preferably, the pipe shall be jacked from the low or downstream end. The final position of the pipe shall not vary from the line and grade shown on the plans, or established by the Engineer, by more than 1/8 inch per 1 foot. The maximum deviation shall be  $\pm 2''$  from the line and grade shown. The variation shall be

SMOOTH STEEL PIPE CULVERT  
Section 02435

regular and in one direction and the final flow line shall be in the direction shown on the plans.

5. The Contractor may use a cutting edge of steel plate around the head end of the pipe extending a short distance beyond the end of the pipe with inside angles or lugs to keep the cutting edge from slipping back onto the pipe.
6. Work should be done continuously to minimize the tendency of the material to "freeze" around the pipe.
7. Excavated material shall be disposed of by the Contractor, as approved by the Engineer.

C. Boring:

1. The boring shall proceed from a pit provided for the boring equipment and workmen. The location of the pit shall be approved by the Engineer. The boring shall be done mechanically either using a pilot hole or by the auger method.
2. When the pilot hole method is used, an approximate 2 inch pilot hole shall be bored the entire length of the crossing and shall be checked for line and grade on the opposite end of the bore from the work pit. This pilot hole shall serve as the centerline of the larger diameter hole to be bored.
3. When the auger method is used, a smooth steel pipe of the appropriate diameter equipped with a cutter head to mechanically perform the excavation shall be used. Augers shall be of sufficient diameter to convey the excavated material to the work pit.
4. Excavated material shall be disposed of by the Contractor, as approved by the Engineer. The use of water or other fluids in connection with the boring operation will be permitted only to the extent necessary to lubricate cuttings; jetting will not be permitted.
5. In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least 10 percent of high grade carefully processed bentonite may be used to consolidate cuttings of the bit, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and immediate installation of the pipe.
6. Allowable variation from line and grade shall be as specified in Paragraph 3.7.B.4.

END OF SECTION

**SECTION 02437**

**REINFORCED CONCRETE PIPE**

PART 1 - GENERAL

1.1 SUMMARY

- A. These reinforced concrete pipe (RCP) Specifications cover the fabrication and installation of concrete;
  - 1. Round, elliptical, arch pipes
  - 2. Manhole riser
  - 3. Flared end pipes

Each of which will be referred to as "pipe culverts". Pipe culverts may be for culverts, siphons, drains, and conduits as shown on the plans or directed by the Engineer in accordance with these Specifications, C.E. Drawings 680000, and in all accordance with Chapter 8 Part 10 of the current American Railway Engineering and Maintenance of Way Association (AREMA) Specifications for Culverts.

PART 2 - PRODUCTS

2.1 PIPE CULVERT MATERIAL

- A. Pipe culvert material must meet the standards set forth in Chapter 8, part 10 of the current AREA Specifications. RCP pipe culvert materials shall be furnished in lengths not less than 4 feet. Material is to be new material.
- B. All pipe material shall be designed for Cooper E80 loading and no pipe lighter than Class IV will be permitted. The minimum factor of safety against formation of a 0.01 inch crack shall be 1.0. In lieu of design analysis, the Contractor may furnish Class V pipe for installations with 14 feet maximum cover.

PART 3 - EXECUTION

3.1 HANDLING OF PIPE CULVERT MATERIAL

- A. The Contractor shall handle pipe culverts, and the pipe culvert material, carefully in order to prevent damage including, but not limited to, injury to bituminous and other pipe culvert coatings. The pipe culverts shall never be dragged over the ground but shall be handled with skids, rolling slings, or crane. The Contractor shall promptly repair, to the satisfaction of the Engineer, any damage to the pipe culverts or culvert material which the Contractor causes. In the event that such damage to culverts or pipe culvert material cannot be repaired to the satisfaction of the Engineer, replacement of pipe culvert and/or pipe culvert material must be provided by the Contractor at his expense.

3.2 EXCAVATION AND LOCATION

- A. Pipe culverts shall be placed at the location, elevation and alignment shown on the Drawings.
- B. The Contractor shall perform pipe culvert excavation. Prior to pipe culvert excavation, embankment must be constructed to a height no less than two (2) feet above the top of the proposed pipe culvert when it is in place. Pipe culvert excavations shall be wide enough to permit thorough compaction of the backfill under and around the pipe culvert, as required by Para. 3.7, and around the pipe culvert, as required by Para. 3.7, and the base

width of the pipe culvert excavation shall not exceed the external width of the pipe culvert plus:

1. 12 inches on each side for pipes less than 48 inches in diameter.
2. 18 inches on each side for pipes 54-84 inches in diameter.
3. 24 inches on each side for pipes 84 inches in diameter or larger.

- C. PROTECTION OF FOUNDATIONS AND BEDDING. Unless soft soil conditions are encountered in which case Para. 3.3 Pt. B shall govern, pipe culvert excavations shall be deep enough to permit compliance with the foundation and bedding requirements for pipe culverts. Care shall be taken to insure drainage is diverted away from the pipe bed during preparation. Any damage or deterioration of pipe bedding prior to installation shall be repaired by the Contractor at no expense to the Railroad.
- D. Trenching: The Contractor shall comply with all current applicable Federal, State and local rules and regulations governing the safety of men and materials during pipe culvert excavation, installation, and backfilling operations. The Contractor shall comply with all requirements of the Occupational Safety and Health Administration relating to excavations, trenching and shoring as set forth in Title 29, Part 1926, Subpart Sections 1926.650 through 1926.653, Code of Federal Regulations, and any subsequent revisions.

### 3.3 FOUNDATION, BEDDING AND COMPACTION

- A. Pipe culverts shall be placed at the flowline grade and elevation established by the Engineer on a uniform bed of stable earth or granular material such as sand, gravel and such bedding shall be compacted to not less than one hundred (100) percent of maximum density as determined by ASTM D 1557, with moisture content adjusted as necessary. The compacted bed shall contain the camber required by the Engineer or as covered by these Specifications, Para., 3.4. The compacted bed shall be shaped to fit the bottom of the pipe and shall conform to Class A, B or C bedding (see Table 10.33.4 bedding factors) AREMA chapter 8-10. Where sand-gravel material is used for bedding, the ends of the pipe culvert excavation shall be sealed to prevent leaking and infiltration of water along the pipe culvert. Such sealing can often be accomplished by blanketing the ends of the pipe culvert embankment with well tamped clay. In all cases, the ends of pipe culverts shall be protected by riprap as outlined in Para. 3.5. and C.E. Drawing 680000.

#### B. SOFT SOIL CONDITIONS

Where the flowline grade crosses soft areas of soil which will not provide a suitable uniform foundation for the pipe culvert bed, the Contractor shall excavate eighteen (18) inches below the flowline grade for a width equal to twice the outside width of the pipe culvert. Prior to backfilling, the Engineer shall inspect the excavation and the Contractor shall also perform any additional excavation below eighteen (18) inches of the flowline grade which may be required by the Engineer; provided, however, that the expense of such additional excavation beneath eighteen (18) inches of the flowline grade shall be considered extra work. Upon completion of all the excavation, the Contractor will backfill such excavation with sand-gravel material formed as required in Para. 3.6 , Pt. B.

- C. ROCK. When the flowline grade passes over rock, the Contractor shall excavate such rock to a depth which is at least six (6) inches below the flowline grade. The pipe culvert will not rest on rock at any point. The Contractor will backfill excavations in rock with sand-gravel material which shall be compacted and formed as required by Para. 3.7.

### 3.4 CAMBER

- A. Camber shall be placed in all culverts where it is anticipated that the culvert will settle as the result of high embankment construction or compressible foundation soils below the culvert bedding. Unless otherwise specified by the Engineer, all culverts shall be cambered in accordance with the following:
  1. In no case shall the culvert be cambered so high in the center that water will be pocketed at the inlet end of the pipe.
  2. Culverts resting on rock foundation need not be cambered. In accordance with Para. 3.3 C.
  3. Embankments up to 8 feet high (measured base of rail to flowline) require 1-1/2 inch camber.
  4. Embankments 8 feet to 12 feet high require a 2-1/2 inch camber.
  5. Embankments 12 feet to 24 feet high require a 4 inch camber.
  6. Embankments 24 feet to 36 feet high require a 6 inch camber.
- B. The above camber standards, based on the height of embankments, may be adjusted in the field where, at the discretion of the Engineer, a greater or lesser amount of camber should be built into pipe to adjust for soil conditions encountered at the site. For fills higher than 36 feet, the Chief Engineer - Design will provide the camber requirements.

### 3.5 RIPRAP PROTECTION

Both the inlet and outlet ends of all culverts shall be protected by riprap, packaged riprap, concrete headwalls, or as shown on the Drawings. Riprap shall be installed per detail on C.E. Drawing 680000 or as shown on the Drawings.

### 3.6 INSTALLATION

- A. JOINING PIPE.
  1. Pipe may be bell and spigot or tongue and groove unless otherwise specified. When bell pipe is used, a shallow excavation shall be made underneath the bell of sufficient depth so the bell does not rest on the bedding material. Ends of reinforced concrete pipe shall be of such design that when properly laid, they shall have a smooth and uniform interior surface. In areas where the pipe will tend to separate, suitable ties shall be installed.
  2. Joints shall be made with mortar, grout, rubber gaskets, plastic mastic compounds, or by a combination of these types. Any joint system must be approved by the Engineer prior to installation.
  3. Curved pipes shall have one or both ends beveled to provide a smooth curve. In no case shall any pipe end be beveled greater than seven and one-half (7-1/2) degrees for a change in grade or more than two degrees for a horizontal change. If the resulting gap is less than one inch, the resulting space is to be filled with mortar concrete. For gaps of one inch or greater, a reinforced concrete collar shall be poured around the joint as directed by the Engineer.

B. LAYING CULVERT PIPE

1. Each pipe culvert shall be laid true to the following grade. The minimum gradient for any pipe culvert shall be 0.5 percent unless indicated otherwise on the Plans, or as directed by the Engineer. If two or more pipe culverts are to be laid parallel to each other, such parallel pipe culverts shall be spaced to permit thorough compaction of the backfill as required by Para. 3.7. Parallel culverts shall be separated by a distance of at least one-half of the nominal diameter of the pipe culverts or one-third (1/3) of the span width of pipe arch culverts, but not less than twelve (12) inches nor more than excess of 48".
2. Pipe laying shall begin at the downstream end of the culvert. The bell or groove end of the pipe shall be placed facing upstream. No culvert shall be placed in service until a suitable outlet is provided.
3. Elliptical and elliptically reinforced pipe shall be placed with the vertical axis within 5 degrees of a vertical plane through the longitudinal axis of the culvert.

C. SPECIAL INSTALLATION CONDITIONS

1. JACKING PIPE - Shall be accomplished by the AREMA Specifications, Chapter 8 Part 10. The Contractor shall prepare and submit plans showing the construction details to the Engineer for approval before installing pipe.
2. CONSTRUCTING CULVERTS IN TUNNELS - When necessary to place pipe by tunneling, (AREMA) Specification Chapter 8, Part 10.4.3.6 and the Plans and Specifications for the completed structure shall be prepared by the Engineer. The Contractor shall set forth construction procedures and other necessary details and submit for review by the Engineer before starting the installation.

3.7 BACKFILLING AND COMPACTION

- A. Backfill materials shall be placed simultaneously on both sides of the pipe culvert in uniform layers not exceeding six (6) inches in thickness. For multiple pipes, the backfill shall be placed simultaneously in uniform layers between and outside of the pipes. Each successive layer shall be compacted to not less than one hundred (100) percent of maximum density as determined by ASTM D 1557, with moisture content adjusted, if necessary, and six (6) inch layers shall be properly compacted before the next layer is placed.
- B. Backfilling shall be started and completed as quickly as possible after the pipe culvert has been assembled and placed on its bed.
- C. Special care must be taken to obtain adequate compaction under the pipe culvert haunches; however, care must be exercised to avoid lifting of the pipe culvert as the result of tamping to compact material under the haunches.
- D. Where compaction may be difficult to obtain due to space constraints or other factors, the Contractor may, with the approval of the Engineer, utilize Controlled Low-Strength Concrete Fill Material (CLSM), commonly called flowable fill, as backfill material to a point one foot above the top of the culvert. Unless specified or shown elsewhere in the plans the CLSM shall meet the requirements for flowable fill of the respective Department of Transportation.

- 3.8 PIPE PROTECTION. Materials used to complete the embankment over the pipe culvert should be essentially the same as the materials used for the pipe culvert backfill and should be placed and compacted in the same manner as pipe culvert backfill materials are placed. Such

material must be used to complete the embankment at least to a height over the top of the pipe culvert equal to the nominal diameter of the pipe culvert, or if the height of the completed embankment over the top of the pipe culvert is less than the nominal diameter of the pipe culvert, then such material must be used to complete the embankment. The pipe culvert must be protected from damage during the entire construction period, especially if heavy compaction and/or construction equipment is used. Heavy equipment shall not be operated over the pipe culvert until it has been covered with compacted backfill material to a depth of at least twenty-four (24) inches.

3.9 REMOVAL OF EXISTING HEADWALLS OR CULVERTS IN PREPARATION FOR  
EXTENSION OF EXISTING PIPE CULVERTS

- A. The Contractor shall remove existing headwalls and/or culverts in whole or in part as shown on the Drawings and shall perform all work called for, as shown on the drawings, and in the Specifications and which may be necessary to adapt existing pipe culverts for extension or reconstruction, including required excavation and backfilling. Except as otherwise provided for in the Specifications, the Contractor will determine the method of extending existing pipe culvert structures by consulting with the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

- A. The number of linear feet of pipe culvert installed will be determined by measuring the installed pipe culvert along its longitudinal axis and shall be paid for on the contract unit price per linear foot of pipe installed per the Specifications.
- B. The Cost of Riprap required per the Engineering Standard Drawings is to be included in the price per linear foot of pipe.
- C. Included in the L.F. cost is the 18 inches of bedding, and the removal and disposal of the excavated unsuitable soil.
- D. Below 18 inches, the bedding and removal and disposal of unsuitable soils will be paid for on the Cubic Yard, "C. Y." basis.
- E. No additional payment will be made for the use of CLSM, or flowable fill, as backfill around culverts, but shall be considered subsidiary to the cost of the culvert pipe.

**SECTION 02438**

**REINFORCED CONCRETE BOX CULVERTS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Specifications covers the furnishing of material, construction and curing of, and/or extension of reinforced concrete box culverts, hereinafter referred to as "concrete boxes". Concrete boxes shall be constructed in accordance with this Specifications, the design drawings and Chapter 8 Part 16, reinforced concrete box culverts and Chapter 29 Part 3, Damp proofing, of the current American Railway Engineering and Maintenance of Way Association (AREMA) Specifications.
- B. RELATED WORK:  
Documents affecting the work of this Section include, but are not necessarily limited to Division I, General conditions of these Specifications.

1.2 HANDLING OF CONCRETE BOX MATERIALS

- A. All material used in the construction of concrete boxes shall be handled carefully in a workmanlike manner to avoid damage and/or contamination. Reinforcing steel reduced in section or with bends or kinks not shown on the plans shall not be used.
- B. In the event materials are damaged and/or contaminated and cannot be repaired to the satisfaction of the engineer, replacement of such material must be provided by the Contractor at his expense.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. CONCRETE BOX MATERIAL  
Concrete box material shall meet the standards set forth in Chapter 8 Part 16 of the current AREMA Specifications. Reinforcing steel shall conform to ASTM A-615, Grade 60. The minimum 28 day compressive strength of concrete shall be 4,000 pounds per square inch (psi).
- B. Reinforcing steel, fabricated to shapes and dimensions shown, shall be placed where indicated on the Drawings or where required to carry out the intent of the Plans.
- C. Damp-proofing materials shall meet the standards set forth in Chapter 29, Part 3 of the current AREMA MANUAL.

PART 3 - EXECUTION

3.1 EXCAVATION AND LOCATION

- A. Concrete box culverts shall be placed at the location, elevation and alignment as shown on the Drawings. The Contractor shall preserve all stakes established until authorized by the Engineer to remove them. Additional layout required will be the responsibility of the Contractor and he alone shall be responsible for restoring any points destroyed.
- B. The Contractor shall perform all concrete box embankment and excavation. Excavations shall be made wide enough to permit thorough compaction of backfill around the concrete box culverts. Care shall be taken to ensure that methods used in excavation will not reduce the stability of the material adjacent to the excavation.
- C. If soft soil conditions are encountered, Sub-Section 3.2 shall govern. Excavation shall be deep enough to permit compliance with the foundation requirements set forth in Sub-Section 3.3.

3.2 SOFT SOIL CONDITIONS

- A. For concrete boxes, where the soil encountered will not provide a suitable uniform foundation, the Contractor shall excavate eighteen (18) inches below the foundation grade and at least one (1) foot beyond the horizontal limits of the structure on all sides. The Engineer shall inspect the excavation and the Contractor shall perform any additional excavation required to obtain a stable foundation. The Contractor will backfill these areas with granular material formed as required in 3.6.
- B. PROTECTION OF FOUNDATIONS AND BEDDING. Unless soft soil conditions are encountered, in which case sub-section 3.2 shall govern, concrete box excavation shall be deep enough to permit compliance with the foundation and bedding requirements for the concrete boxes. Care shall be taken to ensure drainage is diverted away from the concrete box bedding during preparation. Any damage or deterioration shall be repaired by the Contractor at no expense to the Railroad.
- C. TRENCHING: The Contractor shall comply with all current applicable Federal, State and local rules and regulations governing the safety of men and materials, during concrete box excavation, installation, and backfilling operations. The Contractor shall comply with all requirements of the Occupational Safety and Health Administration relating to excavations, trenching and shoring as set forth in Title 29,, Part 1926, Subpart Sections 1926.650 through 1926.653, Code of Federal Regulations, and any subsequent revisions. The contractor shall also comply with the Railroad's Chief Engineer's instruction bulletin CE 88-005-G Trenching Safety Rules and Shoring Standards. Where there is a conflict between the two standards, the more restrictive will apply.

3.3 FOUNDATION, BEDDING, AND COMPACTION

Concrete boxes shall be placed at the flowline, with grade and elevation established by the Engineer. The concrete box culverts shall be placed on a uniform bed of stable earth or granular material such as sand or gravel, and such bedding shall be compacted to not less than one hundred (100) percent of maximum density, and with moisture content at the optimum moisture content or within minus four (4) percentage points of optimum moisture content as determined by ASTM D-1557 and field density in place test D 1556. The compacted bed shall contain the camber required by the drawings, by the Engineer, or as covered by these Specifications, Sub-Section 3.8-D. The compacted bed shall be shaped to fit the bottom of the box and shall conform to the entire bottom of the box. Where granular material is used for bedding, ends of the concrete box excavation shall be sealed to prevent leaking and infiltration of water along the concrete box.

REINFORCED CONCRETE BOX CULVERTS  
Section 02438

Such sealing can often be accomplished by blanketing the ends of the concrete box embankment with well tamped clay.

3.4 ROCK

When the concrete box foundation is resting entirely on rock or other hard foundation material, the foundation shall be freed from all loose material, cleaned and cut to a firm surface. Excavation in rock or other hard material shall be made as near as practicable to the size required to properly construct the concrete box.

3.5 COMPRESSIBLE AND INCOMPRESSIBLE

Where the material encountered at the foundation grade is found to be partially rock or incompressible material and partially a soil or material that is compressible but otherwise satisfactory for the foundation the incompressible material shall be removed for a depth of six (6) inches below the foundation grade and backfilled with a material similar to the compressible foundation used for the rest of the concrete box.

3.6 CONSTRUCTION

- A. All work shall be constructed on a reasonably dry foundation material. The Contractor shall, at his expense, perform all bailing, pumping, and draining to protect the area and provide this condition. Should the Contractor's operation damage the foundation, the Contractor shall restore the foundation to its previous condition at the Contractor's expense. All cleanup and removal of temporary facilities shall be the Contractor's responsibility.
- B. Each concrete box shall be constructed true to the following grade. The minimum gradient for any concrete box shall be 0.2 percent, unless shown otherwise on the plans, or as directed by the Engineer. If two or more concrete boxes are to be constructed parallel to each other, such parallel concrete boxes shall be spaced to permit thorough compaction of the backfill as required by sub-section 3.7. Parallel box culverts shall be separated by a distance of at least one-half of the nominal height of the concrete boxes but not less than 48 inches.
- C. Installation including, but not limited to forms, construction joints, curing and all that is required or incidental to the proper construction of the concrete box culvert shall be done in accordance with Chapter 8 of the AREMA Specifications.

3.7 BACKFILLING AND COMPACTION.

- A. Backfill shall not be placed until the top slab has been in place for at least four (4) days or the concrete has attained at least 85% of its required strength.
- B. Backfill materials shall be placed simultaneously on both sides of the concrete box in uniform layers not exceeding six (6) inches in thickness. For multiple boxes, the backfill shall be placed simultaneously in uniform layers between and outside of the boxes. Each successive layer shall be compacted to not less than one hundred (100) percent of maximum density as determined by ASTM D1557, with moisture content adjusted, if necessary. Each six (6) inch layer shall be properly compacted before the next layer is placed.
- C. Special care must be taken to obtain adequate compaction along the side walls of the concrete box; however. Where the concrete box is placed in a confined area, making it difficult to obtain adequate compaction along the sides of the concrete box through tamping, special backfill material consisting of fine dry sand shall be used and shall be

REINFORCED CONCRETE BOX CULVERTS  
Section 02438

compacted by vibrating. Compaction shall be accomplished by rodding the special backfill material with a power vibrator. The special backfill material shall be compacted by vibrating the material until compaction can be obtained in a conventional manner.

- D. All backfilling material placed around and adjacent to culverts to a point at least one foot above the top of the pipe culvert shall consist of sand-gravel material containing less than 15% material passing the No. 200 sieve.
  - E. Where sand-gravel material is used for backfill, the ends of the concrete box embankment shall be sealed with well tamped clay to prevent leaking and infiltration of water along the concrete box.
  - F. Where compaction may be difficult to obtain due to space constraints or other factors, the Contractor may, with the approval of the Engineer, utilize Controlled Low-Strength Concrete Fill Material (CLSM), commonly called flowable fill, as backfill material to a point one foot above the top of the culvert. Unless specified or shown elsewhere in the plans the CLSM shall meet the requirements for flowable fill of the respective Department of Transportation.
  - G. **BOX CULVERT PROTECTION.** Materials used to complete the embankment over the concrete box should be essentially the same as the materials used for the concrete box backfill and should be placed and compacted in the same manner as concrete box backfill materials are placed. The concrete box must be protected from damage during the entire construction period, especially if heavy compaction and/or construction equipment is used. Heavy equipment shall not be operated over the concrete box until it has been covered with compacted backfill material to a depth of at least twenty-four (24) inches.
- 3.8 **REMOVAL OF EXISTING HEADWALLS OR CULVERTS IN PREPARATION FOR EXTENSION OF EXISTING CONCRETE BOXES.**
- A. The Contractor shall remove that portion of the existing apron, curtain, toe, head or wingwalls, and/or culverts or arches that interferes in whole or in part as shown on the Drawings, or stated in the Specifications, and shall perform all work that is required to extend, adapt, or reconstruct the existing concrete boxes, including required excavation and backfilling. Except as otherwise provided for in this Specification, the Contractor will determine the method of extending existing concrete box structures by consulting with the Engineer.
  - B. When extending a structure, dowel bars are to be placed as shown on the drawings for the box or into holes drilled into the face of the existing box at locations to match the horizontal steel of the new concrete box extension. Dowels shall be 18" long and set with an epoxy adhesive. A sufficient amount of epoxy should be used to ensure a strong bond between the dowels and dowel holes. Dowel holes shall be drilled and cleaned.
  - C. Care shall be taken to prevent uneven settlement at the joint between the existing and the extension. The face of the existing box shall be prepared to ensure a tight bond at the connection.
- 3.9 **RIPRAP PROTECTION** - Both the inlet and outlet ends of all concrete box culverts shall be protected by riprap, concrete headwall, or as shown on the Drawings. Riprap shall be installed as shown on the Plan.

REINFORCED CONCRETE BOX CULVERTS  
Section 02438

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

- A. The number of linear feet of concrete box installed will be determined by measuring the installed concrete box along its longitudinal axis and shall be paid for by the contract unit price per linear foot of box installed per the Specifications.
- B. The cost of riprap required per Engineering Standard drawings, is to be included in the price of the concrete box culvert.
- C. Included in the cost of the concrete box culvert is the 18 inches of bedding, removal and disposal of the excavated unsuitable soil and the replacement of that soil with acceptable bedding.
- D. Below 18 inches, the bedding, removal, disposal and replacement of unsuitable soils will be paid for on the cubic yard "C.Y." basis.
- E. No additional payment will be made for the use of CLSM, or flowable fill, as backfill around culverts, but shall be considered subsidiary to the cost of the culvert pipe.

**SECTION 02444**

**CHAIN LINK FENCING AND GATES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. **DESCRIPTION:** The extent of chain link fence and gates is indicated on the drawings, in the bid items, or as designated by the Engineer.
- B. **QUALITY ASSURANCE:** Provide chain link fence and gates, including all accessories erection accessories, fittings, and fastenings as complete units, which are called for in the specifications and approved by the Engineer.
- C. **SUBMITTALS:** Submit manufacturer's technical data and installation instructions for all fence material. Submit data early enough to permit review and approval by the Engineer before ordering material.
- D. Comply with provisions of shop drawings as noted.

**PART 2 - PRODUCTS**

- 2.1 **GENERAL:** Dimensions indicated for posts, roll formed and H Section, are outside dimensions, exclusive of coatings.
- 2.2 **MANUFACTURER:** Subject to compliance with requirements, provide products of one of the following:
  - 1. Allied Tube and Conduit Corp.
  - 2. American Fence Corp.
  - 3. Anchor Fence, Inc.
  - 4. Cyclone Fence - A Div. of U.S. Diversified Group or other approved source
- 2.3 **STEEL FABRIC:**
  - A. **Fabric:** No. 9-gauge or 0.148" coated steel wire size 2" mesh fabric 60" and under Knuckled both selvages, for fabric 72", or over, bottom selvage knuckled and the top selvage twisted and barbed.
  - B. **Furnish one-piece fabric widths.**
  - C. **Fabric Finish:** Galvanized, ASTM A 392, Class II, with not less than 2.0 oz. zinc per square foot of surface.
- 2.4 **GENERAL FITTINGS AND POSTS.**
  - A. **ACCESSORIES**
    - 1. **STEEL FRAMEWORK, GENERAL:** Galvanized steel, ASTM A 120 or KA 123, with not less than 1.8 oz. zinc per square foot of surface.
    - 2. **FITTINGS AND ACCESSORIES:** Galvanized, ASTM A 153, with zinc weights per Table I.
    - 3. **END, CORNER, AND PULL POSTS:** Minimum sizes and weights as follows:
      - a. 2.875" O.D. steel pipe, 5.79 lbs. per lin. ft.

CHAIN LINK FENCING AND GATES  
Section 02444

4. LINE POSTS: Space 10' o.c. maximum, unless otherwise indicated, of following minimum size and weight:
    - a. 2.375" O.D. steel pipe, 3.65 lbs. per lin. ft.
    - b. 2.25" x 1.70" H Section line posts, 3.26 lbs. P.L.F.
  5. GATE POSTS: Furnish posts for supporting 12'-6" nominal gate leaf, as follows:
    - a. 6.625" O.D. pipe post, 18.97 lbs. per lin. ft.
  6. TENSION WIRE: 7-gauge, coated coil spring wire, metal and finish to match fabric.
  7. WIRE TIES: 11-gauge galvanized steel or 11 gauge aluminum wire, to match fabric core material.
  8. TOP AND BRACES RAILS Use 1.626" O.D. pipe as top rail for brace, and truss to line post.
  9. TRUSS ROD: Use 0.375" diameter rod and adjustable tightener.
  10. STRETCHER BARS: One-piece lengths equal to full height of fabric, with minimum cross section of 3/16" x 3/4".
  11. STRETCHER BAR BANDS: Space not over 15" o.c. to secure stretcher bars to end, corner, pull and gate posts.
  12. BARBED WIRE: Two-strand, 12-1/2 gauge wire, with 14 gauge 4 point barbs spaced not more than 5" o.c.; metal and finish to match fabric, if required.
  13. BARBED WIRE SUPPORTING ARMS: Capable of withstanding 250 lbs. of downward pull at the outermost end.
  14. FENCE SLATS: (If Required)
    - a. Manufacturer: P.D.S. Division of AB Plastics, Inc.
    - b. Type: Tubular shaped plastic, to fit fencing mesh size for vertical installation.
    - c. Color of slats will be selected by the Engineer.
- 2.5 GATES:
- A. SWING GATES:
    1. Manually Operated
      - a. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153.
      - b. Hinges: Size and material to suit gate size, nonlift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf.
      - c. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
      - d. Keeper: Provide keeper which automatically engages gate leaf and holds it in open position until manually released.
      - e. Make perimeter frames of min. 1.90" O.D. pipe.
    2. Double Swing gates.
      - a. Provide gate stops for double gates, consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar.

CHAIN LINK FENCING AND GATES  
Section 02444

- b. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.

B. SLIDING GATES.

- 1. SLIDING GATES MANUAL. Provide manufacturer's standard heavy-duty inverted channel track, ball bearing hanger sheaves, supports, guides, stays, bracing, hardware, and accessories as required. Provide for locking with padlock.
- 2. SLIDING GATES AUTOMATIC. "Electrical gate opener" provide manufacturer's standard heavy-duty inverted channel track, ball bearing hanger, guides, sheaves, support, stays, bracing, hardware, and accessories as required and controlled by a single source.

NOTE: These gates may be single or double gates, which will be called out in the bid item.

C. CONCRETE:

- 1. Provide concrete consisting of Portland cement, ASTM C 150, aggregates ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3,000 psi, using a min. of 5 sack cement per C.Y. 1" maximum size aggregate, maximum 3" slump and 2% to 4% entrained air.

PART 3 - PART 3 - EXECUTION

3.1 INSTALLATION:

- A. GENERAL: Do not begin installation and erection before asphalt paving under fence area is completed. If fence is not on asphalt, the area along the fence line shall be cleared to permit proper construction. Any clearing required for fence installation is incidental to fence construction bid item.
- B. EXCAVATION: Drill or hand-excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed, and/or compacted soil. Excavate holes for each post to minimum diameter of not less than four times largest cross-section of post.
- C. SETTING POSTS: Center and align post hole 3' above bottom of excavation. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Unless otherwise indicated, extend concrete footings 2" above grade, and trowel to a crown to shed water.
- D. CENTER RAILS: Provide center rails where indicated. Install in one piece between posts, and flush with post on fabric side, using special offset fittings where necessary.
- E. POST BRACE ASSEMBLIES: Install braces so posts are plumb when diagonal rod is under tension. Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric.
- F. TENSION WIRE: Install tension wires through post cap loops before stretching fabric, and tie each post cap with not less than 6 gauge galvanized wire. Fasten fabric to tension wire using 11 - gauge galvanized steel hog rings, spaced 24" o.c. Install tension wire at top and bottom of fence fabric.
- G. FABRIC: Leave approximately 1" above top of asphalt or ground and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in

CHAIN LINK FENCING AND GATES  
Section 02444

tension after pulling force is released. Install plastic slats in areas shown on drawings, if required.

- H. **STRETCHER BARS:** Thread through or clamp to fabric 4" o.c., and secure to posts with metal bands spaced 15" o.c. Provide one stretcher bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.
- I. **BARBED WIRE:** Pull wire taut and install securely to extension arms, and secure to end post or terminal arms in accordance with manufacturer's instructions.
- J. **BARBED WIRE SUPPORTING ARMS:** Manufacturer's standard barbed wire supporting arms, metal and finish to match fence framework, with provision for anchorage to posts and attaching tree rows of barbed wire to each arm. Supporting arms may be either attached to posts or integral with post top weather cap, and must be capable of withstanding 250 lbs. downward pull at outermost end. Single 45 degree arm; for three strands barbed wire, one for each post and vertical arm installation.
- K. **TIE WIRES:** Use U-shaped wire, conforming to diameter of pipe to which attached, clasp pipe and fabric firmly with ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons or clothing. Tie fabric to line posts, with wire tie spaced 12" o.c. Tie fabric to rails and braces, with wire ties spaced 24" o.c. Tie fabric to tension wires, with hog rings spaced 24" o.c.
- L. **FASTENERS:** Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Pen ends of bolts or score threads to prevent removal of nuts.

3.2 **GATES:**

- A. **INSTALLATION AND FABRICATION.** Install gates plumb, level, and secure for full opening without interference. Install ground set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
  - 1. **Fabrication:** Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding or with special fittings and rivets for rigid connection, providing security against removal or breakage connections. When welding or damage occurs, repair finish so as to protect from rust. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members maximum of 8' apart, unless otherwise indicated.
  - 2. Provide same fabric as for fence. Install fabric with stretcher bars at vertical edges, and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" o.c.
  - 3. Install diagonal cross-bracing, consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity, without sag or twist.
  - 4. Extend end members of gate frames 1'-0" above top member, and prepare to receive three strands of wire. Provide necessary clips for securing wire to extensions.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT.

- A. Chain Link or Cyclone Fencing shall be measured by the linear foot of fence which is a certain height constructed per specifications and excluding gates.
- B. Gates for Chain Link or Cyclone fencing shall be measured as each type, a certain height and width of gate, complete in place as per specifications.

4.2 PAYMENT

- A. Chain Link Fence shall be paid for at the contract unit price per linear foot.
- B. Gates for Chain Link Fence shall be paid for at the contract lump sum price per each gate for a certain type, height and width.

4.3 GENERAL

Security fence systems will sometimes have noise detectors. These systems hang on the fence and also pick up noise from the fence. Care shall be taken to install the fence in a manner that caps, arms, braces, wire and posts do not set off a noise sensitive system.

Gates, Support arms for barbed wire, the barbed wire, razor wire, and fence slats will be included in the Bid Items if they are required and noted.

This page intentionally left blank.

**SECTION 02445**

**RIGHT OF WAY FENCES AND GATES**

PART 1 - GENERAL

1.1 SUMMARY

A. DESCRIPTION. STANDARD RIGHT OF WAY FENCE

1. DESCRIPTION: The extent of the Standard Right of Way fence and gates is as indicated on the drawings or as designated by the Engineer and in accordance with typical details shown on drawing 0075.
2. QUALITY ASSURANCE: Provide wire fences and gates as complete units, controlled by a single source, or approved by the Engineer, including necessary erection accessories, fittings and fastenings.
3. SUBMITTALS: Submit manufacturer's technical data and installation instructions for all fence material, a sufficient time in advance to permit review by the Engineer, before ordering material.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. GENERAL: Dimensions indicated for material are outside dimensions, exclusive of coating and shall consist of all new materials unless otherwise specified herein.
- B. HOG TIGHT, WOVEN WIRE, STEEL FABRIC: A 26 inch woven wire galvanized steel fabric is to be used. With 7 horizontal bars of no. 9 galvanized wire and stays on 6 inch centers. Weight is approximately 266 pounds per 20 rod roll.
- C. POSTS:
  1. Line Posts: Use painted studded tee steel fence posts 7'-0" long, with anchor plate, spaced as shown on drawing 0075.
  2. Corner Post: Use 6 inch diameter by 9'-0" with 5 percent solution penta treated wood posts or 7" x 9" second hand wood ties.
  3. Brace Panel Posts: Use 6 inch diameter 9'-0", with 5 percent solution penta treated wood posts or 7" x 9" second hand wood ties.
  4. Horizontal Brace Posts: Brace posts shall be 4 inch diameter or 4" x 4" x 8'-0" wood with 5 percent solution penta treated horizontal braces.
  5. Gate Posts: Use 7" x 9" x 9' second hand ties. Each side of gate shall have a brace panel constructed to support gate.

RIGHT OF WAY FENCES AND GATES  
Section 02445

- D. BARBED WIRE: Barbed wire shall be two-strand 12.5 galvanized wire, twisted, with 14-gauge 4-point barbs spaced not more than 5 inches center to center. Metal and finish to match fabric (galvanized)
- E. DIAGONAL TIE WIRE: Use double number 8 galvanized steel wire twisted.
- F. WIRE CLIPS: Use 12 gauge galvanized wire clips.
- G. WIRE STAPLES: Use 1.5 inch 9 gauge galvanized steel wire staples.
- H. GATES: Gate frames shall be constructed of 1.625 in. diameter steel tube with .066 wall. Rails shall be high strength 16 gauge s-bend shape. Stays shall be roll-formed 12 gauge welded in pairs. Latch shall be double pine 1/2" x 1" steel with lock and saddle horse type handle. Hinge shall be full wrap omega style 1/4" steel with bottom in fixed position and top will adjust vertically 5" between rails.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. GENERAL: Do not begin installation and erection until timely notice has been given to the Engineer. The area along with the fence line shall be cleared enough to permit proper construction. Any clearing required for fence construction shall be incidental to the fence construction bid item.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

- A. Fencing shall be measured by the linear foot of fence constructed, excluding gates. Gates shall be measured as each gate, complete in place.

4.2 PAYMENT

- A. Fence shall be paid for at the unit price bid per linear foot.
- B. Gates shall be paid for at the lump sum price bid per each gate.
- C. The price shall be full compensation for furnishing, fabricating and installing all materials, preparation, hauling, including all labor, tools, equipment and incidentals necessary to complete the work. Excavation, backfilling, disposal of surplus material and clean-up is also included.

**SECTION 02445.5**

**WIRE FENCES (DEER PROOF)**

PART 1 - GENERAL

1.1 SUMMARY

- A. DESCRIPTION: The extent of the "Deer Proof" fence and gates is as indicated on the drawings or as designated by the Engineer and in accordance with typical details shown on drawing no. 02712.1 - DGW dated Jan. 28, 1988.
- B. QUALITY ASSURANCE: Provide wire fences and gates as complete units, controlled by a single source, or approved by the Engineer, including necessary erection accessories, fittings and fastenings.
- C. SUBMITTALS: Submit manufacturer's technical data and installation instructions for all fence material, a sufficient time in advance to permit review by the Engineer, before ordering material.

1.2 MATERIALS

- A. GENERAL: Dimensions indicated for material are outside dimensions, exclusive of coatings.
- B. STEEL FABRIC: A woven wire galvanized steel fabric is to be used. Fabric may be furnished in two-piece widths with prior approval of the Engineer. The top and bottom wire widths to be of 10-gauge galvanized steel wire. Intermediate wires and stays to be of 12.5-gauge galvanized steel wire. The bottom fabric is to have horizontal wires with gradually increasing spacing, starting narrowest at the bottom, up to but not more than 6-8 inches. Vertical stays are to be spaced at 6 inches. Where two piece fabric widths are used, the fabrics shall be connected by use of 11-gauge galvanized steel hog rings on 18-24 inch centers.
- C. POSTS:
  - 1. Line Posts: Use painted studded tee steel fence posts 10 feet long, with anchor plate, spaced on 25 foot centers. Approximate weight of 1.33 lbs./ft. Splicing of posts will not be allowed.
  - 2. Corner Posts: Use 8 inch diameter or 8 inch by 8 inch penta or CCA treated wood posts 12 feet long, set in concrete.
  - 3. Brace Panel Posts: Use 6 inch diameter or 6 inch by 6 inch penta or CCA treated wood posts 12 feet long. Brace panels to be spaced not more than 650 feet apart.
  - 4. Horizontal Brace Posts: Brace posts shall be 2.5 inch diameter galvanized steel posts. Approximate weight of 3.79 lbs./ft.
  - 5. Gate Posts: Gate posts shall be 4 inch diameter galvanized steel posts 12 feet long with top cap, set in concrete. Approximate weight of 9.36 lbs./ft.

WIRE FENCES (DEER PROOF)  
Section 02445.5

- D. BARBED WIRE: Barbed wire shall be two-strand 121.5 gauge wire, twisted, with 14 gauge 4-point barbs spaced not more than 5 inches center to center. METAL AND FINISH TO MATCH FABRIC (galvanized).
- E. TOP WIRE: Top wires shall be two-strand 12.5 gauge galvanized twisted barbless wire with metal and finish to match fabric.
- F. DIAGONAL TIE WIRE: Use two strand 9 gauge galvanized steel wire.
- G. WIRE CLIPS: Use 10 gauge galvanized wire clips on approximately 12 inch centers on the fabric and t each tension and barbed wire.
- H. WIRE STAPLES: Use 1.5 inch 9 gauge galvanized steel wire staples.
- I. GATES: Gate frames shall be constructed of 1.875 inch diameter galvanized steel pipe with approximate weight of 1.89 lbs./ft., except the vertical hinge side which shall be constructed of 1.875 inch diameter galvanized steel pipe with approximate weight of 2.50 lbs./ft. Gate frame shall be covered with the same fabric and wires as the fence.
- J. MISCELLANEOUS FITTINGS AND ACCESSORIES: These shall be galvanized steel of good commercial quality and design and approved by the Engineer before ordering.

PART 2 - PRODUCTS – N/A

PART 3 - EXECUTION

3.1 INSTALLATION

- A. GENERAL: Do not begin installation and erection until timely notice has been given to the Engineer. The area along the fence line shall be cleared enough to permit proper construction. Any clearing required for fence construction shall be incidental to the fence construction bid item.
- B. EXCAVATION; Drill or hand-excavate (using post hole digger) holes for posts to spacing indicated, in firm, undisturbed, or compacted soil. Excavate holes for each post to a minimum diameter of 16-24 inches.
- C. SETTING POSTS: Fence posts shall be spaced at the intervals and set to the depth shown on the plans. Check each post for vertical and top alignment. Metal line posts may be driven in place providing such driving does not damage the posts. Posts must be set to the desired depth and tops of posts not cut off to height. Eight-inch wood corner posts and 4-inch galvanized gate posts shall be set in concrete. Place concrete around posts and vibrate or tamp for consolidation. Extend concrete 2 inches above grade and trowel to a crown to shed water. Metal line posts that will not drive in and 6 inch wood brace posts shall be backfilled in 4-inch layers with each layer thoroughly tamped. Corner posts shall be braced in both directions and end and gate posts shall be braced in one direction. Brace panels will also be installed at all grade breaks as directed by the Engineer. At all grade depressions where stresses tend to pull the posts out of the ground, the fencing shall be snubbed or guyed at the critical point by means of a double 9 gauge galvanized wire connected to each horizontal line of barbed and top wire and to the top and bottom wire of the fabric. This shall be connected to a deadman of sufficient weight to hold the fence down.
- D. FABRIC: Leave fabric approximately 2 inches above the top of ground level. Pull fabric taut and tie or staple to posts. Install and anchor so that fabric remains in tension after

WIRE FENCES (DEER PROOF)  
Section 02445.5

pulling force is released. Existing cross fences shall be connected, if required, to the new fence. Where this occurs, a braced corner post shall be installed.

- E. **BARBED AND TOP WIRE:** Pull wire taut and tie or staple to the posts such that it remains tight. Install the barbed wire 1 inch above the top of ground level. Install one top wire 1 inch from the top of the post and the other midway between it and the top of the fabric.
- F. **HORIZONTAL BRACE POST:** The horizontal brace post shall be installed 6 feet above the ground on brace panels and fastened with a no. 60 spike on wood posts or the proper fitting n galvanized steel posts.
- G. **DIAGONAL TIE WIRES:** Wires shall be securely fastened to posts and provide rigidity to brace panels.
- H. **GATES:** Fabricate perimeter frames of gates from metal as described above. Assemble gate and frames by welding or with special fittings and rivets for rigid connection and provide security against removal or breakage of connections. When welding or damage occurs, repair finish so as to protect from rust. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories. Provide same fabric for gate as the fence. Stretch fabric on frame and securely fasten. Install diagonal cross-bracing, consisting of 3/8 inch diameter adjustable length truss rods on gate to ensure frame rigidity without sag or twist. Extend end members of gate frame above and below the fabric a sufficient distance to attach barbed and top wires. Provide necessary clips for securing wire to extensions. Provide end caps on top of vertical members. Provide hinges to suit gate size, non lift-off type, and permit 180 degree gate opening. Latch shall be forked type or plunger bar type to permit operation from either side. Latch shall have padlock eye as integral part of latch. Provide keeper which automatically engages gate leaf and holds it in an open position until manually released. Where double gates are used, provide gate stops for double gates, consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage center drop rod as integral part of latch, permitting both gate leaves to be locked with a single padlock. Padlocks will be applied by the owner.

#### PART 4 - MEASUREMENT AND PAYMENT

##### 4.1 MEASUREMENT

- A. Fencing shall be measured by the linear foot of fence constructed, excluding gates. Gates shall be measured as each gate, complete in place.

##### 4.2 PAYMENT

- A. Fence shall be paid for at the unit price bid per linear foot.
- B. Gates shall be paid for at the lump sum price bid per each gate.
- C. The price shall be full compensation for furnishing, fabricating and installing all materials, preparation, hauling, including all labor, tools, equipment and incidentals necessary to complete the work. Excavation, backfilling, disposal of surplus material and clean-up is also included.

This page intentionally left blank.

**SECTION 02513**

**ASPHALT CONCRETE PAVING**

**PART 1 - GENERAL**

**1.1 SUMMARY AND DESCRIPTION.**

- A. Provide asphaltic concrete paving, wheel stops, speed bumps, and curbs where shown on the drawing or as stated in the bid items, and as needed for complete and proper installation.
- B. The extent of each type and thickness of Asphalt Paving is shown on the drawings or identified in the bid items.
- C. In addition to the asphalt paving courses, the items in this section include, but are not limited to:
  - Sub-grade
  - Soil treatment
  - Base-Aggregate
  - Prime, tack and seal coats
  - Asphalt pavement
- D. Patching, repairing, surface preparation - new, and repair to existing asphalt is included in this section.

**1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS:**

- A. Excavating, grading and compaction required in the preparation of subgrades are specified in section 02230 and 02250.
- B. Vegetation Control is specified in section 02282.
- C. Synthetic Resilient Matting "PETROMAT" is specified in section 02542
- D. Seal Coats are specified in sections as follow:
  - 1. "Gilsonite Base Penetrating" Section 02576.1
  - 2. "Rubberized Asphalt Slurry" Section 02576.2
  - 3. "Guardtop Base Preservative" Section 02576.3

Items are to be checked in the Schedule of Rates and Prices.

- E. Paint Striping and Marking specified in section 02577.

**1.3 CODES AND STANDARDS**

Reference Standards:

ASTM: American Society of Testing Materials

State Department of Transportation Standards and Specifications latest edition of the state in which the work is being done.

AASHTO: American Society of State Highway Transportation Officials.

1.4 SUBMITTALS

Materials Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

1.5 JOB CONDITIONS

- A. Apply prime and tack coats when ambient temperature above 50 degrees F, and when temperature has not been below 35 degrees F for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
- B. Construct asphalt concrete surface course when atmospheric temperature is above 40 degrees F. and rising and when sub-base is dry. Sub-base shall be placed when air temperature is above 30 degrees F. and rising and no frost in the existing sub-base or soil.
- C. Grade Control: Establish and maintain required line and elevations.
- D. The Contractor shall provide, erect, remove, relocate, clean, replace and maintain, if required, suitable signs, barricades, fences or other necessary traffic control devices as may be required or directed by the Engineer. Requirements of local, city, state or federal agencies shall be complied with, including all necessary permits. The Contractor will be required to coordinate his activities with the activities of the Railroad as well as others not party to the Contract.

PART 2 - PRODUCTS

2.1 SUBGRADE

- A. Shall be compacted in accordance with Sec. 02200 of Union Pacific Co. General Construction Specification.
- B. See the special instructions for subgrade stabilization, if required.

2.2 AGGREGATE BASE

Unless otherwise specified, aggregate base material shall conform to sub-ballast specifications section 02851.

2.3 PRIME COAT

- A. Prior to the application of the asphaltic concrete, apply a bituminous prime coat of liquid asphalt on the prepared compacted base at a rate of 0.25 gallons per square yard or at a rate approved by the Engineer.
- B. Apply liquid asphalt by pressure distributors.
- C. Allow sufficient time before placing the asphaltic concrete to permit the prime coat to penetrate the prepared compacted base.

2.4 TACK COAT

- A. Tack coat is used to promote a bond between new and existing courses.
- B. Tack coat, if required, shall be applied immediately in advance of the new surfacing.
- C. Tack coat, if required, shall be applied at very low orders of coverage to preclude the development of a slip plane between courses.

2.5 PRODUCT HANDLING

Protect asphalt paving materials before, during and after installation, and prevent damage to the installed work of other trades. In the event of damage, immediately make repairs or replacements necessary for approval of the Engineer and at no additional cost to the Railroad.

2.6 ASPHALT MIX

Asphalt mix shall conform to the most current State Department of Transportation Specifications in which the work is being performed. All mix designs shall be approved by the Engineer prior to placement.

PART 3 - EXECUTION

3.1 INSTALLATION OF ASPHALT

- A. Asphalt installation shall conform to the most current State Department of Transportation Specifications of the State in which the work is to be performed. Installation shall be approved by the Engineer prior to installation.
- B. SURFACE PREPARATION
  - 1. The subgrade shall conform to the design grade and cross section, be freed from irregularities and compacted to specified densities.
  - 2. Remove loose material from compacted Aggregate surface immediately before applying herbicide treatment and prime coat.
  - 3. Proof-roll prepared subgrade surface to check for unstable areas and areas requiring additional compaction.
  - 4. Notify Engineer of unsatisfactory conditions. Do not begin paving work until deficient subgrade areas have been corrected and are ready to receive aggregate and paving.
  - 5. It shall be the Contractor's sole responsibility to maintain the subgrade and aggregate as prepared, and any deterioration which may develop shall be corrected at the Contractor's expense.
  - 6. When the surface is constructed on an existing bituminous surface, it shall be cleaned of all foreign material and broomed free of dust before tack coat is applied.
  - 7. When the surface is constructed on an existing concrete or brick surface, it shall be cleaned of all foreign material and broomed free of dust before tack coat is applied, with special care taken in cleaning cracks.
  - 8. Joints or wide longitudinal or diagonal cracks shall be filled with surface course material and compacted as designated by the Engineer. Filling of joints or cracks shall be considered incidental and included in the price of the paving.
  - 9. All waste material as a result of Contractor's operations and site preparation shall be disposed of by the Contractor in an approved manner.

### 3.2 TACK COAT

Tack coat is the application of a very light film of asphalt to an existing paved surface prior to placing new asphalt surfacing.

### 3.3 APPLICATION OF PRIME COAT

Apply prime coat at a rate of 0.20 to 0.50 gallons per square yard over the compacted aggregate base after weed killer has been applied. Apply material to penetrate and seal, but not flood, the surface and/or reduce the adhesion between the aggregate and the surfacing material. Cure and dry as long as necessary to attain penetration and evaporation of volatiles.

### 3.4 PATCHWORK ON EXISTING SURFACE

If the existing surface requires patching, the defective area will be saw cut around its limits and the defective material removed. The remaining hole shall be filled with aggregate base rock material and the asphalt patch should be applied at least as thick as the surrounding asphalt. Both base and asphalt shall be compacted to a minimum density of 96%.

### 3.5 PLACING MIX

- A. The mix shall be placed by means of a mechanical spreader and shall spread the mix without tearing the surface. The spreader shall strike a finish that is smooth, true to cross section, uniform in density and texture and free from hollows, transverse corrugation and other irregularities. The mix may be spread and finished by hand methods only where machine methods are impractical as determined by the Engineer.
- B. The paving operations shall be maintained as continuously as possible. The speed of the spreader should be adjusted to the capacity of the plant and hauling operations. If the spreader stops for any considerable time and the mix cools below optimum viscosity of the asphalt for proper spreading and compaction and causes roughness in the finish surface and poor densification of the finish mix, the Contractor shall remove and repair that portion of the work at his own expense.
- C. Asphalt mixture shall be spread at a minimum temperature of 225 degrees F. When conditions warrant, the mixture in hauling equipment shall be protected to maintain the minimum mix temperature.
- D. Place in strips not less than ten (10) feet wide, unless otherwise approved by the Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.
- E. Make joints between old and new pavements or between successive days' work to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

### 3.6 ROLLING

- A. Begin rolling when mixture will bear roller weight without excessive displacement.
- B. Compact mixture with hot hand-tampers or vibrating plate compactors, in areas inaccessible to rollers.
- C. Breakdown rolling: Accomplish breakdown or initial rolling immediately following rolling of joint and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling required, with hot material.
- D. Second rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.
- E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.
- F. Patching: Remove and replace areas with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness. Patch areas remaining after thickness test.

### 3.7 QUALITY CONTROL

- A. In addition to the specified testing of subgrade base material, test asphalt courses for thickness, smoothness and compaction.
- B. Thickness: In-place compacted thickness will not be acceptable if exceeding 1/2" greater, nor 3/8" less than the designated course thickness. Any areas found to be deficient in thickness will be overlaid with a minimum of 1" thickness, or totally removed and replaced, as determined by the Engineer, at no additional cost to the Railroad. Furnish core tests at locations designated by the Engineer, a minimum rate of one (1) test per 40,000 square foot of paved areas, or as directed by the Engineer.
- C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness using a 10-foot straightedge. Surfaces will not be acceptable if the tolerances for smoothness exceed 3/8" in 10'-0".
- D. Compaction: Rolling shall be continued until all roller marks are eliminated and a minimum density of 96 percent has been obtained.
- E. Prior to the seal coat, perform a flood test, if required by, and in the presence of the Engineer.
  - 1. Flood the entire paved area with water.
  - 2. If a depression is found where water ponds to a depth of 1/8" in six feet, fill and correct.
  - 3. Feather and smooth the edges of fill so that the joint between fill and surface isn't visible.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

- A. Asphalt Paving will be paid for at the contract unit price per square yard, installed according to specifications, including grade control.
- B. Asphalt prime will be paid for at the contract unit price per square yard, installed according to specifications, and includes cleaning of surfaces.
- C. Tack will be paid for at the contract unit price per square yard, installed according to specifications.
- D. Patchwork on existing surfaces will be paid for at contract unit price per square yard, installed according to specifications, which includes disposal of defective material.

**SECTION 02515**

**ASPHALT - CUTTING AND PATCHING**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section establishes general requirements pertaining to cutting (including excavating), and asphalt fitting and patching of the Work required to:
1. Make the several parts fit properly;
  2. Uncover work to provide for installing, inspecting or both, of ill-timed work;
  3. Remove and replace work not conforming to requirements of the Contract Documents; and
  4. Remove and replace defective work.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
2. In addition to other requirements specified, upon the Engineer's request, uncover work to provide for inspection by the Engineer of covered work, and remove samples of installed materials for testing.
3. Do not cut or alter work performed under separate contracts without the Engineer's written permission.

1.2 SUBMITTALS

A. Request for Engineer's Consent:

1. Prior to cutting which effects structural safety, submit written request to the Engineer for permission to proceed with cutting.
2. Should conditions of the Work or schedule indicate a required change of materials or methods for cutting and patching, so notify the Engineer and secure his written permission and the required Change Order prior to proceeding.

B. Notice to the Engineer:

1. Prior to cutting and patching performed pursuant to the Engineer's instructions, submit cost estimate to the Engineer. Secure the Engineer's approval of cost estimates and type of reimbursement before proceeding with cutting and patching.
2. Submit written notice to the Engineer designating the time the Work will be uncovered to provide for the Engineer's observation.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. For replacement of items removed, use materials complying with pertinent Sections of these Specifications.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, patching and backfilling.
2. After uncovering the work, inspect conditions affecting installation of new work.

B. Discrepancies:

1. If uncovered conditions are not as expected, immediately notify the Engineer and secure directions.
2. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION PRIOR TO CUTTING

- A. Provide required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the Work.

3.3 PERFORMANCE

- A. Perform required excavating and backfilling as required under pertinent other Sections of these Specifications.
  1. Perform cutting and demolition by methods which will prevent damage to other portions of the Work and provide proper surfaces to receive installation of repair and new work.
  2. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.

PART 4 - MEASUREMENT AND PAYMENT

4.1 PAYMENT FOR COSTS

- A. The Railroad will reimburse the Contractor for cutting and patching actually performed by the Contractor at the bid price quoted in the Proposal and Bid.

**SECTION 02577**

**PAINT STRIPING AND MARKINGS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide traffic and parking lot paint marks, as indicated on the drawings, shall be a yellow latex paint especially formulated and manufactured for use on asphaltic concrete under traffic conditions.
- B. Cleaning: Sweep and clean surface to eliminate loose material and dust.
- C. Painting: Apply paint in two (2) coats. Allow the first coat to dry prior to applying the second coat, or as directed by the Engineer.
- D. Color: Yellow, unless otherwise specified.

PART 2 - PRODUCT

2.1 STRIPING PAINT

- A. Paint for striping and markings shall be a yellow latex paint especially formulated and manufactured for use on asphaltic concrete under traffic conditions. Acceptable striping paints are:
  - 1. Lane Marking Paint #7800 Ameritone
  - 2. "Nonreflectorized" Sherwin-William Co.

PART 3 - EXECUTION

3.1 EXECUTION

- A. Apply paint with mechanical equipment to produce uniform straight lines with straight edges and a minimum of overspray. Striping and markings shall comply with site plan layout or located as directed by the Engineer. Sizes are as follows:

Parking Lot Striping: 4" wide - 2 coats  
Arrows: 18" high  
Letters: 18" high for aisle  
Letters: 12" high for speed limit painted on asphalt (see attached drawing)  
Numbers: 12" high

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

- A. Markings, including arrows, numbers or letters, will be paid for at the contract unit price per each marking applied according to Specifications.
- B. Striping will be paid for at the contract unit price per linear foot applied according to Specifications.

This page intentionally left blank.

**SECTION 02851**

**SUBBALLAST**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. "Subballast": This item shall consist of a foundation course for asphalt surface course or railroad ballast and shall be composed of crushed stone from an approved source, materials and shall be constructed as herein specified in one or more courses in conformity with the typical sections shown on plans and to the lines provided by the Engineer.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

**A. REQUIREMENTS**

Materials shall be 100% crushed stone produced from oversize quarried aggregate, sized by crushing and produced from a naturally occurring single source. Aggregate shall have a percentage of wear, by the Los Angeles abrasion test, of not more than 50. A higher or lower percentage of wear may be specified by the Engineer, depending on the material available. 10% max loss freeze/thaw test.

**B. GRADATIONS**

It is the intent of this specification, that unless otherwise indicated on the plans, the subballast shall consist of gradations as set forth in the following table:

SIEVE SIZE	2"	1"	3/8"	No. 10	N0. 40	No. 200
% passing (opt.)	100	95	67	38	21	3
% passing (perm.)	100	90-100	50-84	26-50	12-30	0-8

**2.2 DESIGN REQUIREMENTS**

- A. Subballast will be used as indicated by the following charts or as directed by the Engineer:

**6" OF SUBBALLAST SHALL BE REQUIRED WHEN SUB-GRADE MATERIAL SIZES ARE SMALLER THAN LISTED ABOVE, BUT NOT FINER THAN THE GRADATIONS LISTED BELOW:**

PERCENT PASSING	SIEVE SIZE	GRAIN SIZE
By Weight	N0. Mesh per in.	In mm.
19	200	.08
74	100	.16
92	60	.26
100	40	.42

**12" OF SUBBALLAST SHALL BE REQUIRED WHEN SUB-GRADE MATERIALS HAVE GRADATION SMALLER THAN LISTED ABOVE.**

### PART 3 - EXECUTION

#### 3.1 CONSTRUCTION METHODS

- A. Preparation of Subgrade. The road bed shall be shaped in conformity with the typical sections shown on plans and to the line and grades provided by the Engineer. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with approved material. All holes, ruts and depressions shall be filled with approved material and if required, the subgrade shall be properly wetted with water and reshaped and rolled to the extent directed in order to place the subgrade in an acceptable condition to receive the subballast material. Sufficient subgrade shall be prepared in advance to insure satisfactory progression of the work.
- B. If the required compacted depth of the subballast exceeds 6 inches, the subballast shall be constructed in two or more layers of approximate equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches and shall be compacted to a density of not less than 95% modified proctor compaction.
- C. If the material is laid and compacted in more than one layer, the Contractor shall plan and coordinate this work in such a manner that the previously placed and compacted layers be allowed ample time for curing and development of sufficient stability before vehicles hauling materials for the succeeding layers, or other heavy equipment are permitted on the subballast. Prior to placing the succeeding layers of material, the top of the under layer shall be sufficiently moist to insure a strong bond between the layers. The edges and/or edge slopes of the subballast shall be bladed or otherwise dressed to conform to the lines and dimensions shown on the plans and present straight, neat, and workmanlike lines and/or slopes as free of loose material as practicable.

### PART 4 - MEASUREMENT AND PAYMENT

Placement of subballast shall be measured in cubic yards within the neat lines of the typical sections, line, grades and slopes established. Subballast shall be paid for at the contract unit price as placed according to the specifications including furnishing, unloading, hauling, compacting, dressing, testing and incidental work or equipment required.

**DIVISION 3 – CONCRETE**

This page intentionally left blank.

**SECTION 03100**

**REINFORCED CONCRETE**

PART 1 - GENERAL

1.1 Scope

This item of work consists of installation of reinforced concrete, in accordance with these Specifications, and in close conformity with the lines, grades and dimensions as shown on the drawings or established by the Engineer.

PART 2 - PRODUCTS

2.1 Reinforcing Steel

The Contractor shall furnish all reinforcing steel bars fabricated to shapes and dimensions shown on drawings. Contractor shall unload and place reinforcing steel where indicated on drawings or where required to carry out the intent of the drawings or specifications. Before being placed, reinforcing steel shall be thoroughly cleaned of loose or flaky rust, mill scale or coating, including ice, or any other substance that would reduce or destroy the bond.

Reinforcing steel reduced in section shall not be used. It shall not be bent or straightened in a manner injurious to the steel. Bars with kinks or bends not shown on plans shall not be placed. The use of heat to bend or straighten reinforcing steel will be permitted only if the entire operation is approved by the Engineer.

Splicing of reinforcing steel, if required, will be made of lap splices of a minimum length of 24 bar diameters, not less than twelve (12) inches.

All reinforcing steel shall meet the requirements of ASTM Designation A615 for Grade 60 deformed billet steel bars for concrete reinforcement.

2.2 Concrete

Contractor shall furnish and place concrete in accordance with these Specifications and in close conformity with the lines, grades and dimensions as shown on the drawings or established by Engineer.

Concrete material, mixing, transportation, placing and curing shall conform to AREMA Specifications for Concrete and Reinforced Concrete Railroad Bridges and Other Structures.

Compressive Strength - 4,000 lbs. per square inch @ 28 days.

Water Content - 6-½ Gallons Maximum per Sack of Cement.

Concrete Aggregates - To comply with current ASTM-C33 Specifications.

Coarse aggregate shall be graded #4 to 1 inch size.

Mix - Approximate proportions Cement: Sand: Gravel: by volume measure to be 1:2.5:3.2.  
Minimum cement content to be 6.5 sacks per Cu. Yd.

Slump - 2" to 3" for heavy mass construction and pavements.

2" to 5" for reinforced foundation walls and footings.

3" to 5" for reinforced structural members - slabs, columns, beams and walls.

Curing - Membrane curing shall be used following recommendations and procedures of AREMA Specifications Chapter 8, Part 1, Sec. P, Art. 4.

### PART 3 - EXECUTION

Construct forms accurately to dimensions and elevations required and to be strong and unyielding. Construct forms with tight joints to prevent the escape of mortar and to avoid the formation of fins. Brace as required to prevent distortion during concrete placement.

Concrete shall be placed within 1-½ hours after the cement has been added to the mix. A delivery ticket shall be furnished to the Engineer with the following information: name of concrete firm, serial number of ticket, date, truck number, specific class of concrete, amount of concrete, time loaded, water added and time unloaded.

Prior to placing concrete, remove water, all debris and foreign material from forms. Check the reinforcing steel for proper placement and correct any discrepancies. Place concrete as soon as possible after leaving mixer, without segregation or loss of ingredients, without splashing forms or steel above, and in layers not over two (2) ft. deep.

The vertical drop to final placement shall not exceed four (4) feet. Placement shall conform to the requirements of the before mentioned. Do not place concrete when the ambient temperature is below (40) degrees F. and falling, without special protection as approved by the Engineer. Any concrete damaged by freezing shall be removed and replaced at no additional cost to the Railroad.

After the initial water has been absorbed, float with wood float and trowel with steel trowel to a smooth finish free from trowel marks. Concrete abutments shall not vary from level or true plane more than 1/8 inch in 10 feet when measured with a straightedge.

Construction joints shall be placed as indicated on the plans or as directed by the Engineer and shall be formed so as not to impair the strength and appearance of the structure.

In joining fresh concrete to concrete that has already set, the work already in place shall have its surface sand or water blasted until well bonded aggregate is exposed. This surface shall be washed and scrubbed with wire brooms and thoroughly drenched with water until saturated. It shall remain saturated until the new concrete is placed. Immediately prior to the placing of the new concrete, all forms shall be drawn tight against the concrete already in place and the old surface shall be thoroughly coated with a water cement paste, scrubbed into the existing concrete surface.

Remove form after concrete has set sufficiently to carry the dead load and construction load it has a sustain and when approved by the Engineer. Remove forms with care to prevent scarring and damaging the surface. As soon as forms are removed, remove fins or projections from surface of exposed areas and rub surface with wood float or burlap sack to provide a uniform surface texture.

Cure formed surfaces with an approved curing compound applied in conformance with the manufacturer's directions as soon as the forms are removed and finishing completed.

The quantity of concrete for which payment will be made shall be computed from the dimensions shown in the plans, or ordered by the Engineer. No deductions shall be made for the volume of concrete displaced by steel reinforcement, floor drains or expansion joint material.

### 3.1 Sampling and Testing Concrete

Concrete samples shall be obtained in accordance with the requirements of ASTM C 172. Air content, slump, and unit weight shall be checked at least twice during each shift that concrete is placed. Air content shall be determined in accordance with ASTM C 231. Slump shall be measured in accordance with ASTM C 143. Unit weight shall be checked in accordance with ASTM C 138.

Samples for strength testing of each concrete mix shall be taken not less than once each day, nor less than once for each 150 cubic yards of concrete. A minimum of three cylinders shall be made from each sample, two shall be tested at 28 days and one shall be tested at 7 days. Compression test specimens shall be made and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39.

Any concrete represented by a test which indicates a strength which is less than the specified 28-day strength by more than 500 psi will be subject to rejection and shall be removed and replaced with acceptable concrete as directed by the Engineer at no additional cost to the Railroad.

## PART 4 - MEASUREMENT AND PAYMENT

### 4.1 Payment

Payment for "Reinforced Concrete" will be made at the contract unit price and shall be full compensation for all costs involved in furnishing, forming and placing all concrete, reinforcing steel, welded wire fabric, required grouts, dowels, expansion joint material, epoxy, and mortars, all as specified herein and shown on the drawings. It includes all tools, labor, supplies, materials, equipment, testing and work incidental thereto.

This page intentionally left blank.

**SECTION 03200**

**NON-REINFORCED CONCRETE**

**PART 1 - GENERAL**

**1.1 Scope**

This item of work consists of installation of non reinforced concrete paving, in accordance with these Specifications, and in close conformity with the lines, grades and dimensions as shown on the drawings or established by the Engineer.

**PART 2 - PRODUCTS**

**2.1 Horizontal and Longitudinal Tie Bars**

The Contractor shall furnish all reinforcing steel bars fabricated to shapes and dimensions shown on drawings. Contractor shall unload and place reinforcing steel where indicated on drawings or where required to carry out the intent of the drawings or specifications. Before being placed, reinforcing steel shall be thoroughly cleaned of loose or flaky rust, mill scale or coating, including ice, or any other substance that would reduce or destroy the bond.

Reinforcing steel reduced in section shall not be used. It shall not be bent or straightened in a manner injurious to the steel. Bars with kinks or bends not shown on plans shall not be placed. The use of heat to bend or straighten reinforcing steel will be permitted only if the entire operation is approved by the Engineer.

Splicing of reinforcing steel, if required, will be made of lap splices of a minimum length of 24 bar diameters, not less than twelve (12) inches.

All reinforcing steel shall meet the requirements of ASTM Designation A615 for Grade 60 deformed billet steel bars for concrete reinforcement.

**2.2 Concrete**

Contractor shall furnish and place concrete in accordance with these Specifications and in close conformity with the lines, grades and dimensions as shown on the drawings or established by Engineer.

Concrete material, mixing, transportation, placing and curing shall conform to AREMA Specifications for Concrete and Reinforced Concrete Railroad Bridges and Other Structures.

Compressive Strength - 4,000 lbs. per square inch @ 28 days.

Water Content - 6-½ Gallons Maximum per Sack of Cement.

Concrete Aggregates - To comply with current ASTM-C33 Specifications.

Coarse aggregate shall be graded #4 to 1 inch size.

Mix - Approximate proportions Cement: Sand: Gravel: by volume measure to be 1:2.5:3.2.  
Minimum cement content to be 6.5 sacks per Cu. Yd.

Slump - 2" to 3" for heavy mass construction and pavements.

2" to 5" for reinforced foundation walls and footings.

3" to 5" for reinforced structural members - slabs, columns, beams and walls.

Curing - Membrane curing shall be used following recommendations and procedures of AREMA Specifications Chapter 8, Part 1, Sec. P, Art. 4.

### PART 3 - EXECUTION

Construct forms accurately to dimensions and elevations required and to be strong and unyielding. Construct forms with tight joints to prevent the escape of mortar and to avoid the formation of fins. Brace as required to prevent distortion during concrete placement.

Concrete shall be placed within 1-½ hours after the cement has been added to the mix. A delivery ticket shall be furnished to the Engineer with the following information: name of concrete firm, serial number of ticket, date, truck number, specific class of concrete, amount of concrete, time loaded, water added and time unloaded.

Prior to placing concrete, remove water, all debris and foreign material from forms. Check the reinforcing steel for proper placement and correct any discrepancies. Place concrete as soon as possible after leaving mixer, without segregation or loss of ingredients, without splashing forms or steel above, and in layers not over two (2) ft. deep.

The vertical drop to final placement shall not exceed four (4) feet. Placement shall conform to the requirements of the before mentioned. Do not place concrete when the ambient temperature is below (40) degrees F. and falling, without special protection as approved by the Engineer. Any concrete damaged by freezing shall be removed and replaced at no additional cost to the Railroad.

After the initial water has been absorbed, float with wood float and trowel with steel trowel to a smooth finish free from trowel marks. Concrete abutments shall not vary from level or true plane more than 1/8 inch in 10 feet when measured with a straightedge.

Construction joints shall be placed as indicated on the plans or as directed by the Engineer and shall be formed so as not to impair the strength and appearance of the structure.

In joining fresh concrete to concrete that has already set, the work already in place shall have its surface sand or water blasted until well bonded aggregate is exposed. This surface shall be washed and scrubbed with wire brooms and thoroughly drenched with water until saturated. It shall remain saturated until the new concrete is placed. Immediately prior to the placing of the new concrete, all forms shall be drawn tight against the concrete already in place and the old surface shall be thoroughly coated with a water cement paste, scrubbed into the existing concrete surface.

Remove form after concrete has set sufficiently to carry the dead load and construction load it has a sustain and when approved by the Engineer. Remove forms with care to prevent scarring and damaging the surface. As soon as forms are removed, remove fins or projections from surface of exposed areas and rub surface with wood float or burlap sack to provide a uniform surface texture.

Cure formed surfaces with an approved curing compound applied in conformance with the manufacturer's directions as soon as the forms are removed and finishing completed.

The quantity of concrete for which payment will be made shall be computed from the dimensions shown in the plans, or ordered by the Engineer. No deductions shall be made for the volume of concrete displaced by steel reinforcement, floor drains or expansion joint material.

### 3.1 Sampling and Testing Concrete

Concrete samples shall be obtained in accordance with the requirements of ASTM C 172. Air content, slump, and unit weight shall be checked at least twice during each shift that concrete is placed. Air content shall be determined in accordance with ASTM C 231. Slump shall be measured in accordance with ASTM C 143. Unit weight shall be checked in accordance with ASTM C 138.

Samples for strength testing of each concrete mix shall be taken not less than once each day, nor less than once for each 150 cubic yards of concrete. A minimum of three cylinders shall be made from each sample, two shall be tested at 28 days and one shall be tested at 7 days. Compression test specimens shall be made and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39.

Any concrete represented by a test which indicates a strength which is less than the specified 28-day strength by more than 500 psi will be subject to rejection and shall be removed and replaced with acceptable concrete as directed by the Engineer at no additional cost to the Railroad.

## PART 4 - MEASUREMENT AND PAYMENT

### 4.1 Payment

Payment for "Reinforced Concrete" will be made at the contract unit price and shall be full compensation for all costs involved in furnishing, forming and placing all concrete, reinforcing steel, welded wire fabric, required grouts, dowels, expansion joint material, epoxy, and mortars, all as specified herein and shown on the drawings. It includes all tools, labor, supplies, materials, equipment, testing and work incidental thereto.

This page intentionally left blank.