DIVISION 200
EARTHWORK
SECTION 201
EQUIPMENT

Unless otherwise noted, equipment shall conform to the requirements specified in Division 150.
SECTION 202

CLEARING AND GRUBBING

202.01 DESCRIPTION.

This work shall consist of clearing, grubbing, removing and disposing of all vegetation and debris within the right-of-way and easement areas, except such objects, vegetation and material that are shown on the Plans or are designated by the Engineer to remain.

BID ITEMS
Large Trees.
Clearing and Grubbing.

202.02 CONSTRUCTION REQUIREMENTS.

(a) General.

Unless designated otherwise the Engineer will establish right-of-way lines and construction limits when necessary and designate all trees, shrubs, plants, and other things to remain. The Contractor shall preserve from injury or defacement all things designated to remain. Surfaces of trees or shrubs that are cut or scarred by the Contractor shall be painted with an approved asphaltum base paint prepared especially for tree surgery.

(b) Clearing and Grubbing.

All surface objects and all vegetation including trees, brush, hedge rows, stumps, roots and other protruding obstructions, not designated to remain, shall be cleared and/or grubbed, including mowing, as required, except undisturbed stumps and roots and nonperishable solid objects which will be a minimum of one meter below subgrade or slope of embankments. When authorized, the Contractor may leave stumps and nonperishable solid objects provided they do not extend more than 150 millimeters above the ground line or low water level.

Except in areas to be excavated, stump holes and other holes from which obstructions are removed, shall be backfilled with suitable material. The backfill shall be compacted in accordance with the best standard practice for the area and type of soil encountered.
The method of disposal of all materials shall be accomplished in accordance with all applicable Federal, State and local ordinances and regulations.

The Contractor shall make all necessary arrangements, in writing, with property owners for use of disposal locations outside the limits of the project, except the arrangement need not be in writing when approved dump or waste areas managed by a city or county are used. A copy of all written agreements shall be furnished the Engineer. The waste locations shall be approved by the Engineer to avoid leaving unsightly areas. Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be removed as directed.

202.03 METHOD OF MEASUREMENT.

When the Plans and Contract do not include the items of Clearing and Grubbing and Large Trees, or provide for payment therefore, the work prescribed under this item shall not be paid for directly but shall be considered subsidiary work pertaining to other items of the contract.

When shown as a contract item, trees one meter or greater in circumference, measured 600 millimeters above the natural ground level, and undecayed stumps one meter or greater in circumference measured 300 millimeters above the natural ground level or at the top of the stump if it does not extend to that elevation shall be measured per each “Large Tree” for payment.

When the Plans and Contract include the item Clearing and Grubbing and provide for payment therefore, this work shall be measured by the lump sum. No measurement of the area will be made. This item shall include the removing and disposing of all vegetation, debris, hedge rows, brush and trees necessary for the construction and complete clearing of the project except for those items designated to remain by the Engineer.

202.04 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price for lump sum “Clearing and Grubbing” or per each for “Large Trees”, whichever is designated on the Plans and in the Contract, which prices shall be full compensation for furnishing all labor, materials, equipment, tools and incidentals necessary to complete the work.
SECTION 203
EROSION AND POLLUTION CONTROL

For erosion and pollution control practices required performing various activities of construction refer to Section 904.
SECTION 204
EXCAVATION FOR HIGHWAY

204.01 DESCRIPTION.

This work shall consist of all excavation, removal and satisfactory disposal of all materials within the scope of the work, as shown on the Plans or established by the Engineer.

BID ITEMS
Common Excavation.
Rock Excavation.
Unclassified Excavation.
Common Excavation (Contractor Furnished).
Eradication of Traveled Way.

204.02 CLASSIFICATION OF EXCAVATION.

Roadway and drainage excavation will be classified as "Common Excavation", "Rock Excavation", or "Unclassified Excavation" as hereinafter described, which classifications shall include all materials of whatever nature encountered. The classification of materials as "Common Excavation" or "Rock Excavation" will be based on the material in an unfrozen condition.

The preliminary classification of roadway and drainage excavation as "Common Excavation" or "Rock Excavation" will be shown on the Plans. The Engineering Geological information shown on the Plans, from which the quantities of "Common Excavation" and "Rock Excavation" are estimated, is based on studies made in the field and represents the best information available to the Department.

Final adjustment of the preliminary classification of roadway and drainage excavation as "Common Excavation" or "Rock Excavation" shall be determined by the Engineer as the work is performed. Authority to identify and define the physical characteristics which determine the classification as "Common Excavation" and "Rock Excavation" in accordance with the intent of the following provisions shall be vested in the Engineer.

(a) Common Excavation.

Common excavation shall consist of all excavation not included as rock excavation or excavation which is otherwise classified and paid for.
(b) Rock Excavation.

Rock excavation shall include the excavation of all sedimentary, igneous, and metamorphic rock which is naturally in place and is firm, rigid, and unweathered and all boulders or other detached stone with a volume of two cubic meters or more.

Rock excavation will also include the removal and disposal of Portland cement concrete pavement, Portland cement base course, concrete curb and gutter, Portland cement treated base courses, bituminous mix material over 150 millimeters in thickness, and all bituminous mix material laid upon these materials.

If common excavation is inter layered with rock excavation and the common excavation makes up 25 percent or less of the volume of the named unit then the entire unit will be rock excavation.

(c) Common Excavation (Contractor Furnished).

Common excavation is to be furnished by the Contractor in accordance with notes as shown on the Plans. The Contractor shall furnish this material from sites provided by the Contractor in accordance with the notes shown on the Plans. All sites shall be subject to approval by the Engineer.

Wildlife and archaeological clearance must be obtained by the Contractor prior to any excavation on contractor furnished borrow areas.

Phase I (routine clearance) and Phase II (reconnaissance type field survey) reviews will be completed by the Kansas State Historical Society at no cost to the Contractor.

If a Contractor furnished borrow area is not cleared during the Phase I review or Phase II investigation, the Contractor will be furnished an estimate of cost for a Phase III investigation (detailed archaeological field survey) or a Phase IV investigation (field salvage operation) whichever is recommended as a result of the Phase II investigation. It should be noted that even though a Phase III investigation is completed, a Phase IV salvage operation may still be required. At this time the Contractor has the option to pay for the Phase III and/or Phase IV investigation or select another site. If the Contractor elects the option of a more detailed investigation he will be required to pay for the Phase III and/or Phase IV investigation even if the site is not cleared of archaeological value.

The Contractor will make payment to the Kansas Department of Transportation, Bureau of Design, attention Environmental
Services Section, who in turn will make payment to the Kansas State Historical Society for their services.

Except by written permission from the Engineer, borrow sites and quarry sites shall be located so that they will not be visible from the highway.

The Contractor shall furnish the Field Engineer a copy of the agreement with the landowner for borrow sites. The agreement shall contain stipulations in regard to temporary seeding and water pollution control.

(d) Unclassified Excavation.

Unclassified Excavation shall include any and all materials encountered during the construction of the work. This classification shall not apply to any material which has been classified and bid upon under any of the foregoing classifications, "Common Excavation" or "Rock Excavation."

204.03 CONSTRUCTION REQUIREMENTS.

All suitable materials removed from the excavation shall be used as far as practicable in the formation of the embankment, subgrade, shoulders, and at such other places as directed. No excavation material shall be wasted without permission, and when such material is to be wasted, it shall be so placed that it will present a neat appearance and not be injurious to abutting property.

The Plans may designate certain materials to be excavated and stockpiled for a specific purpose or for future use. Such materials shall be carefully excavated and handled in a manner that will exclude foreign or undesirable material. The stockpile shall be neatly and compactly constructed in an approved manner.

No payment will be made for any excavated material which is used for purposes other than those designated, except as provided in Division 100.

During construction of the roadway, the roadbed shall be maintained in such a condition that it will be well-drained at all times. Side ditches or gutters emptying from cut to embankment shall be so constructed to avoid damage to the embankment by erosion.

Rock, shale, and other unsuitable roadbed material encountered in cuts shall be excavated to the lateral limits and depth indicated on the Plans or as otherwise directed. Any overbreakage below the depth shown on the Plans will not be paid for. If the backfill of the overbreakage is designated on the
Plans to be of material obtained through normal excavation, the material shall have the same density requirements as specified on the Plans and the compaction shall be at the expense of the Contractor. If the backfill of the overbreakage is designated on the Plans to be a crushed aggregate or other special aggregate, the entire cost of the backfill of the overbreakage shall be at the expense of the Contractor. When crushed stone backfill is designated on the Plans, layers of earth or shale shall not be permitted between the surface of rock that has been overbroken and the bottom of crushed material used for backfill. Undrained pockets shall not be left in the surface of the rock.

All slopes, except in solid rock or other material which, in the judgment of the Engineer, requires a modified slope, shall be trimmed accurately to the slope shown on the cross-section drawings, and care must be exercised that no material shall be loosened beyond the required slopes. When blasting rock slopes a reasonably uniform face shall be left, regardless of whether or not the excavation is carried beyond the specified side slopes. All breakage and slides shall be removed by the Contractor and disposed of as directed by the Engineer. Side ditches shall be excavated as shown on the Plans or directed by the Engineer.

When presplitting of rock slopes is designated on the Plans, the top of the rock slope will be established by the Contractor and approved by the Engineer. The Contractor shall employ the presplitting technique to split the face of the rock cut in a relatively smooth plane along the designated backslope, prior to shooting the interior portion of the cut. The Contractor shall drill holes of an approved diameter along the slope line. Drill holes shall be plumbed and placed at the proper angle of drilling as designated on the Plans, and the drilling maintained to insure that all drill holes are in essentially the same plane. Spacing of presplitting holes shall be such as to result in a neat break. The holes shall be drilled for the depth of the ledge to be presplit unless otherwise directed by the Engineer.

The initial presplitting of each geological formation shall be stopped after 30 meters have been presplit and enough of this area removed whereby the Engineer can determine if the spacing of the holes or amount of explosives is adequate to give an acceptable backslope. If the results are approved by the Engineer, the presplitting may continue without delay through the geological formation using the approved methods and procedures. If the presplitting is found to be unsatisfactory, the
Contractor shall make adjustments in the spacing of the holes and/or the explosives and make another check as herein outlined.

Presplitting holes shall be loaded with explosives as recommended by the Manufacturer of the explosive. The cost of presplitting will be considered as incidental and no payment will be allowed for the operation. Primary blasting on the roadway will not be allowed to approach closer than six meters to the forward limits of the presplit slope except at rock runout.

If the Contractor places more borrow than is required and thereby causes a waste of excavation, the amount of such waste will be deducted from the borrow volume as measured in the borrow area. All borrow areas shall be bladed and left in a reasonably smooth condition after all excavation has been completed. The Contractor shall notify the Engineer a sufficient time before beginning excavation in order that the necessary cross sections may be taken. The Contractor shall not excavate beyond the dimensions and elevations established, and no material shall be removed prior to the staking out and cross-sectioning of the site. The finished borrow area shall be approximately true to line and grade established and specified and shall be finished, where practicable, so that no water will collect or stand within. The side slope of pits or channels shall be constructed as shown on the Plans or as directed by the Engineer.

Where it is necessary that a fence be removed in order to afford access to the proposed pit or channel such removal shall be made by the Contractor, and it shall, upon completion of the pit, be replaced by him at his own expense in as good condition as it was originally. While work in connection with the pit or channel is in progress, such temporary fencing shall be provided by the Contractor as will prevent the passage of cattle, stock, etc., from adjacent land to the pit or channel or vice versa. When Contractor’s operation creates the need for a temporary fence he shall be responsible for furnishing and installing the necessary temporary fence until such time that the permanent fence is in place. The temporary fence will be removed by the Contractor that installed it unless other arrangements are made by same. Temporary fence will be subsidiary to other items of the Contract.

The use of borrow pits or waste areas, other than shown on the Plans or designated by the Engineer, may be approved, provided the material and area is satisfactory and does not cause an increase in cost to the Department including engi-
neering survey and investigation, classification of excavation, easements, and reimbursement for cost of borrow pit. Substituted pits shall not be visible from the highway unless approved in writing by the Engineer. The Contractor shall furnish the Field Engineer a copy of the agreement with the landowner for borrow or waste areas. The agreement shall contain stipulations in regard to temporary seeding and water pollution control. Approval of the site is also contingent upon wildlife and archaeological clearance.

Eradication and obliteration of old roadways shall include all excavation, removal of surfacing, if any, filling of ditches and rough grading of the old roadway to restore approximately the original contour of the ground, or to produce a pleasing appearance by forming natural rounded slopes in accordance with notes and cross sections shown on the Plans. Disposal of excess material will be on sites provided by the Contractor and approved by the Engineer. All surfacing disposed of on the right-of-way will be covered with an approved material to produce a pleasing appearance and support vegetation. Excavation and/or embankment quantities required for eradication will be included for pay purposes in the applicable item when the Contract contains the items “Excavation” or “Embankment”, unless “Eradication of Travelled Way” is shown as a separate item on the Plans and in the Contract. When noted on the Plans, all salvageable base or surface material shall be stockpiled at a site designated on the Plans or approved by the Engineer. Unless designated otherwise the stockpile location haul shall not exceed the length of project. The material shall be kept free from contamination.

Where excavation to the finished graded section results in a subgrade or slopes of unsuitable soil, the Engineer may require the Contractor to remove the unstable material and backfill to the finished grade section with approved material. The Contractor shall conduct his operation in such a way that the Engineer can take the necessary cross-sectional measurements before the backfill is placed.

The Engineer may designate as unsuitable those soils that cannot be properly compacted in embankments. All unsuitable materials shall be disposed of as directed.

When the location of unstable soils is shown on the Plans or encountered during construction, the removal and replacement shall be as shown or directed by the Engineer.

All loose rock within the right-of-way which will interfere with mechanical mowing shall be picked up and disposed of.
When the Contractor's excavation operation encounters remains of prehistoric people's dwelling sites or artifacts of historical or archaeological significance, the operation shall be temporarily discontinued. The Engineer will contact the Environmental Services Section, Bureau of Design, to determine the disposition thereof. When directed by the Engineer, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and the archaeologist or his representative shall remove them for delivery to the custody of the proper state authorities. Such excavation will be considered and paid for as extra work.

It will be the Contractor's responsibility to make use of all available suitable excavation material within the limits of the project.

204.04 METHOD OF MEASUREMENT.

(a) Plan Quantity Payment.

The quantities of excavation for which payment will be made shall be the quantities shown on the Plans for the various balances, provided the project is constructed essentially to the lines and grades shown on the Plans. No allowance will be made for any quantities included as contingencies on the Plans.

When the Plans have been altered or when disagreement exists between the Contractor and the Engineer, as to the accuracy of the plan quantities in any balance or the entire Project, either party shall have the right to request and cause the quantities involved to be measured. When the quantities are measured for payment, the original plan cross sections plotted on the Plans shall be used as original field cross sections unless errors have been found or the original ground has been disturbed prior to commencing work. Additional original cross sections may be interpolated or determined by other approved methods at points where necessary to more accurately determine the quantities.

(b) Measured Quantities.

When payment is specified on the Plans or in the Contract, on a volume basis, all accepted excavation and borrow shall be measured in its original position by cross-sectioning the area excavated, which measurements will include overbreakage or slides in common excavation and unclassified excavation, not attributable to carelessness of the Contractor, and
authorized excavation of rock, shale, or other unsuitable material. Volume will be computed from the cross-section measurements by the average end area method, or other approved methods.

Authorized excavation of rock, shale, or other unsuitable material shall consist of that excavation necessary to provide the designed section and grade or as directed. Any overbreakage below the depth shown on the Plans will not be paid for. The measurements will include overbreakage in rock excavation from the backslopes to an amount not to exceed in any 15 meters as measured along centerline, ten percent of the actual quantity required for that distance.

Measurements will be made for unsuitable materials actually excavated and removed to obtain proper compaction in cut sections and in foundations for fill sections.

Measurements will be made for quantities required for eradication of old traveled ways except as follows:

The "Eradication of Traveled Way" will be considered as an item for separate compensation when included on the Plans and in the Contract as such. In such case "Eradication of Traveled Way" shall be measured by the kilometer measured along the centerline of the traveled way being eradicated.

When the depth of compaction through cut areas is shown on the Plans or ordered by the Engineer to be greater than 150 millimeters, the material actually excavated to gain access to and to compact the lower 150 millimeter layer to the designated type of compaction, shall be included in the measurement of "Excavation for Highway". Where it is impractical to measure material by the cross-section method due to the erratic location of isolated deposits, acceptable methods involving three-dimensional measurements may be used.

No measurement will be made for water used in dust control on haul roads, around plant installations, etc. The Contractor shall meet all applicable regulations concerning environmental considerations.

204.05 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit prices per cubic meter for "Common Excavation", "Rock Excavation", "Unclassified Excavation", or "Common Excavation (Contractor Furnished)", as the case may be and per kilometer for "Eradication of Traveled Way" when shown on the Plans, which prices shall be full compensation for all excavation, the proper
formation of embankments, trimming of slopes, disposal of surplus materials, preparation and completion of roadway, subgrade and shoulders, and the furnishing of all equipment, tools, labor, and incidentals necessary to complete the work.

Unsuitable material removed in areas not designated on the Plans and encountered during construction shall be paid at two times the Contract unit price for common excavation.
SECTION 205
LINEAR GRADING

205.01 DESCRIPTION.

This work shall consist of the construction and establishment of a roadway to an approximately uniform section in accordance with these specifications and the details and notes as shown on the Plans or established by the Engineer.

BID ITEMS

Linear Grading.
Linear Grading Compacted (Type-*) (MR-*).
Water.

* Denotes type and moisture range.

205.02 CONSTRUCTION REQUIREMENTS.

The roadbed shall be constructed to the section designated on the Plans, except where the width of structures, the encountering of rock or shale, the width of right-of-way or the necessity for moving excess quantities of earth prohibit the attainment of the section.

When the Plans show a profile and grade line for all or for a portion of the project, the roadway shall be constructed to grade line and section shown on the Plans.

The excavation required for the construction shall be obtained from the right-of-way, channel changes, or from borrow pits.

Unless shown otherwise on the Plans or in the Contract, where an embankment of less than one meter below subgrade is to be made, all sod and vegetable matter shall be removed from the surface upon which the embankment is to be placed, and the cleared surface shall be completely broken up by plowing, scarifying or stepping to a minimum depth of 150 millimeters. This area shall then be recompacted. Sod not required to be removed shall be thoroughly disked before construction of embankment. Wherever a compacted road surface containing granular materials lies within one meter of the subgrade, such old road surface shall be scarified to a depth of at least 150 millimeters and recompacted.

Where embankments occur in sidehill work or if an old embankment is to be widened, the original slope or old embankment slope shall be plowed or stepped to provide adequate bond with the new embankment material. Only approved ma-
terials that will produce a dense, well-compacted embankment shall be used. Sod placed in embankments shall be thoroughly bladed until the earth has been broken from the roots.

Embankments not required to be compacted shall be constructed in horizontal layers not exceeding 300 millimeters in thickness over the full width of the embankment. Each layer shall be bladed until it is level and uniform before the succeeding layer is placed.

When compaction is required, roadway embankment of earth material shall be placed in horizontal layers not exceeding 200 millimeters (loose measurement) and shall be compacted as specified before the next layer is placed. Each layer shall be bladed to obtain uniform thickness and be level prior to compacting. As the compaction of each layer progresses, continuous leveling and manipulation will be required to assure uniform density. Water shall be added or removed, if necessary, in order to obtain the required density and moisture content. Construction equipment shall be routed uniformly over the entire surface of each layer. The type of compaction shall be that shown on the Plans. The moisture content requirements, and compaction requirements shall meet the appropriate requirements of Section 210.

205.03 TOLERANCES.

Except for bridge alignment, grades and site locations, the finished roadway may deviate at the option of the Contractor within the limits stipulated in the Contract from the lines, grades, typical sections, and dimensions shown on the Plans. Drainage patterns shall be maintained and embankment shall not extend into flowing streams.

Grade revisions or the tolerances permitted above shall not decrease the earth over any structure for which earth cover is provided, to less than 400 millimeters measured at the centerline of the project nor decrease, through a flood area, the distance from the high-water elevation shown on the Plans to the lowest elevation on the planned grade line through that area. Other conditions encountered of similar magnitude and importance shall receive the same consideration.

205.04 FINISHING.

Blading shall be continued until the roadbed is consolidated, smooth, and free from clods, sod, and other material considered unsatisfactory for the surface. The roadbed shall be within the tolerances allowed for centerline grade and shoulder align-
ment, with no abrupt breaks in either, shall have the proper crown and shall present a neat appearance. Ditches and slopes shall be finished to the section shown on the Plans as nearly as practicable within the right-of-way provided, shall be neat in appearance, and approximately to the grades provided. Ditches shall provide satisfactory drainage. The degree of finish shall be that ordinarily obtainable through the use of power equipment operated by skilled workmen under favorable conditions. Hand methods of finishing will be required only at locations inaccessible to machinery.

The degree or quality of finishing required shall be consistent with the tolerances and permissible variations.

All loose rock within the limits of construction which would interfere with mechanical mowing shall be picked up and satisfactorily disposed of.

205.05 METHOD OF MEASUREMENT.

This work shall be measured by the kilometer, measured horizontally along the centerline of the roadway.

No measurement will be made of compaction of earthwork or for foundation compaction. These items shall be subsidiary to the item of “Linear Grading Compacted”.

Water ordered by the Engineer or added with the consent of the Engineer shall be measured per cubic meter by means of calibrated tanks or water meters.

Deductions shall be made for the number of cubic meters of water considered to be in excess of the quantity required as defined above and for the number of cubic meters lost due to waste or other avoidable losses.

No measurement will be made for water used in dust control on haul roads, around plant installation, etc. The Contractor shall meet all applicable regulations concerning environmental considerations.

205.06 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the contract unit prices per kilometer for “Linear Grading” or for the various types of “Linear Grading Compacted” and per cubic meter for “Water”, which prices shall be full compensation for furnishing all materials, water, equipment, tools, labor, and incidentals necessary to complete the work.
When the quantity of water furnished overruns or underruns the Contract quantities, the contract unit price shall govern regardless of the total quantity furnished.
SECTION 206

REMOVAL OF STRUCTURES AND OBSTRUCTIONS

206.01 DESCRIPTION.

This work shall consist of the removal, wholly or in part, and satisfactory disposal of all buildings, fences, structures, abandoned pipelines and any other obstructions which are not designated or permitted to remain, and shall include any items which may not be specifically listed in the Plans but are in conflict with the new construction and which would normally be encountered upon a careful examination of the site of the work, except for the obstructions to be removed and disposed of under other items in the Contract. It shall also include the salvaging of designated materials and backfilling the resulting trenches, holes and pits. When the Contract does not include pay items for removal of structures and obstructions, as set out in this Section, such work shall be performed under Sections 204 and 209.

BID ITEM
- Removal of Existing Structures.

206.02 CONSTRUCTION REQUIREMENTS.

The Contractor shall raze, remove and dispose of all buildings and foundations, footings, concrete floors, aprons, structures, fences and other obstructions, any portions of which are on the right-of-way, except utilities and those for which other provisions have been made for removal. All material to be salvaged as designated on the Plans shall be removed, without unnecessary damage, in sections or pieces which may be readily transported, and shall be stored by the Contractor at specified places within the project limits. Unusable perishable material shall be destroyed. Non-perishable material may be disposed of outside the limits of view from the project with written permission of the property owner on whose property the material is placed. Copies of all agreements with property owners are to be furnished the Engineer prior to placing of waste material. Easements or cavities left by structure removal shall be filled to the level of the surrounding ground and, if within the prism of construction, shall be compacted to the type of compaction and within the moisture range designated on the Plans.
Salvaged pipe culverts or other structures shall be stored at designated and accessible points on the project and shall remain the property of the Department, County, or City as applicable.

Bridges, culverts and other drainage structures in use by traffic shall not be removed until satisfactory arrangements have been made to accommodate traffic.

Unless otherwise directed, the substructures of existing structures shall be removed to the natural stream bottom and those parts outside of the stream shall be removed to 300 millimeters below natural ground surface or 300 millimeters below new finished lines, whichever is at lowest elevation.

Where such portions of existing structures lie wholly in or part within the limits for a new structure, they shall be removed as necessary to accommodate the construction of the proposed structure.

Steel bridges and wood bridges as designated on the Plans shall be carefully dismantled without unnecessary damage. Steel members shall be match marked, unless such match marking is waived by the Engineer.

Blasting or other operations necessary for the removal of an existing structure or obstruction, which may damage new construction, shall be completed prior to placing the new work.

Unless otherwise provided, all pipe, regardless of whether it is designated as salvage on the Plans, shall be carefully removed and every precaution taken to avoid breaking or damaging the pipe. The Contractor shall be held responsible for the satisfactory removal of such structures in a usable condition, providing the pipe was determined to be in a usable condition prior to removal. The Contractor shall clean usable pipe of mud, debris, etc., in order to permit satisfactory drainage and store it at locations on the project designated by the Engineer.

In case these provisions are violated, all material to be salvaged that is damaged in removal and which would impair its future use will be charged to the Contractor at 60 percent of the current quoted price, delivered to the project, of an equal amount of new material. This amount of money shall be deducted from any money due or to become due the Contractor.

206.03 METHOD OF MEASUREMENT AND BASIS OF PAYMENT.

If the Contract contains a separate item for “Removal of Existing Structures”, the Contract price shall be payment in full
for the removal and disposal of the existing structures as specified herein.

If the Contract does not contain a separate item for "Removal of Existing Structures", this work shall be done and considered as subsidiary work pertaining to other items of the Contract.
SECTION 207
EXCAVATION FOR STRUCTURES

207.01 DESCRIPTION.

This work consists of all excavation for structures except culverts and head walls for culverts, but including retaining walls and shall include all necessary clearing and grubbing, all necessary bailing, drainage, pumping, sheeting and the construction of cofferdams or cribs if found necessary and their subsequent removal; also the disposal of all material obtained from such excavation and backfilling to the level of the original ground; including the removal of that portion of existing structures below the ground which is necessitated by the construction of the new structure.

BID ITEMS
Class _____ Excavation.
Water.
Class _____ Concrete.
Foundation Stabilization.

207.02 CLASSIFICATION.

(a) General.

Class I and Class II Excavation normally applies only to the classification of excavation for bridges and the classification shall be made with reference to an “Excavation Boundary Plane” which is a horizontal plane shown at a given elevation on the Plans.

(b) Class I Excavation.

Class I Excavation includes all material of whatever nature except water found above the “Excavation Boundary Plane”, regardless of water level during construction.

(c) Class II Excavation.

Class II Excavation includes the entire volume of whatever nature found below the “Excavation Boundary Plane”, within the limits specified for measurement.

(d) Class III Excavation.

Class III Excavation applies to excavation for bridges not classified as Class I or Class II Excavation, and to excavation
for retaining walls, and such other miscellaneous structures for which the Plans and Contract specifically list an item of Class III Excavation. Class III Excavation shall otherwise be unclassified and shall include any and all materials, including water, encountered during the construction of the work. The water level for determining quantities of Class III Excavation shall be interpreted as the average or mean water level during construction at which pumping or bailing becomes necessary in the work of excavating.

Class III Excavation shall not be paid for separately but shall be subsidiary to other items, unless an item for "Class III Excavation" is shown on the Plans and in the Contract.

207.03 CONSTRUCTION REQUIREMENTS.

(a) General.

The Contractor shall notify the Engineer a sufficient time in advance of the beginning of excavation for structures so that the cross-sectional elevations and measurements may be taken of the existing ground and structure. Any materials removed or excavated before these measurements have been taken will not be paid for.

The foundation pits shall be excavated according to the outlines of the footings as shown on the Plans and shall be of sufficient size to permit the placing of the full widths and lengths of the footings shown with full horizontal beds. Rounded or undercut corners and edges of footings will not be permitted.

The excavation shall be carried to the elevation shown on the Plans or as established by the Engineer.

Where rock bottom is secured, the excavation shall be done in such manner as to allow the solid rock to be exposed and prepared in horizontal beds or properly serrated for receiving the concrete. All loose and disintegrated rock and thin strata shall be removed.

When blasting is necessary in any one pier or abutment after part of the concrete is poured in a column of that pier or abutment, the size of the charge used shall be limited to insure against damage to the previously placed portion of the structure.

Where rock is encountered in the toe wall excavation for box bridges, concrete box culverts or concrete head walls for pipe culverts and the rock is of such quality that will prevent ero-
sion, part of the toe wall may be eliminated in the rock strata as directed, but the toe wall shall be keyed into the rock strata.

When unstable or other unsuitable material is encountered below foundation elevation of reinforced concrete box structures the Contractor shall excavate such material and replace with suitable and stable backfill material. The foundation stabilization, including the degree of instability of the existing material, necessary depth of excavation, and suitability of the proposed backfill material shall be approved by the Engineer prior to the work.

Where foundation piles are used, the excavation of each pit shall be completed before the piles are driven. All the foundation piling shall be driven in any one pier or abutment before concrete is poured in any column of that pier or abutment. After the driving is completed, all loose and displaced material shall be removed at the Contractor’s expense, leaving a smooth solid bed to receive the concrete.

Suitable and practically watertight cofferdams shall be used whenever water-bearing strata are encountered above the elevation of the bottom of the excavation. They shall be sufficiently large to give easy access to all parts of the foundation form and shall be of dimensions not less than those for which payment for excavation is made.

Cofferdams shall be sunk to a depth well below the bottom of the excavation or to an elevation as near the bottom of the excavation as foundation conditions will permit; shall be substantially braced in all directions, and of such construction as will permit them to be pumped free of water, and kept free until the concrete has been placed. They shall be such that leakage can be kept out of the concrete or masonry area. Unless otherwise shown on the Plans or agreed upon, cofferdams and all sheeting or bracing shall be removed after the completion of the concrete or masonry. When the bottom is of sandy or porous material which will not permit the footing to be poured in the dry, it shall be sealed up to the bottom of the footing elevation with the type of concrete specified for the footings so that it may be pumped dry. Other satisfactory methods of sealing out the water may be approved. Under ordinary circumstances the cement content for the seal concrete shall be increased approximately ten percent and the slump of the concrete shall be approximately 150 millimeters. A seal course shall not be used unless shown on the Plans or authorized in writing by the Engineer. If the necessity for a seal course is due to inadequate or improper cofferdam construction, he may order the removal
and/or reconstruction of the cofferdam, or permit the placing of a seal course at the Contractor's expense. After the seal course has set, the cofferdam shall be cleared of water and work completed in the dry. When massed cribs are employed and the mass utilized to overcome partially the hydrostatic pressure acting against the bottom of the foundation seal, special anchorage such as dowels or keys shall be provided to transfer the entire mass of the crib into the foundation seal.

Seven copies of the detailed drawings (maximum size 560 mm × 910 mm) of cofferdams and cribbing to be used on work adjacent to a railroad track shall be submitted by the Contractor for approval by the Railroad Company and the Engineer. These drawings shall be designed and sealed by a registered professional engineer.

(b) Excavation and Forming Bed.

For Pipe Culverts, Metal Arch Culverts, Sectional Plate Pipe, and Sectional Plate Pipe Arch Culverts that are one meter or under in diameter. The channel shall be excavated to the depth and grade shown on the Plans or established by the Engineer. In excavating, the bottom of the channel shall be so shaped to a template that at least ten percent of the overall height of the pipe or arch will be in contact with the bottom of the channel as excavated. Recesses shall be excavated to receive bells or other parts which extend below the outside perimeter of the culvert. The template may be formed by placing a minimum of a 100 millimeter layer of sand or other suitable aggregate and shaping this material to form the required template. As an alternate method, the channel may be excavated to the designated grade without cutting a template, the pipe set in place, and then placing and tamping a suitable granular material on the bottom of the channel and under the haunch area of the pipe for a minimum depth of 100 millimeters.

For large diameter pipes (one meter and larger), the template shall be formed by placing granular material only (sand or other suitable aggregate), so that a minimum of 20 percent of the overall height of the pipe or arch will be in contact with the bottom of the channel. To facilitate installation procedures, approximately one-half of the granular material may be placed and a template formed. The pipe may then be set in place and the remainder of the granular material added. This material shall be carefully placed and tamped under the haunch area until a minimum of 20 percent of the height of the pipe is supported. (see Section 712 for pipe installation).
Granular material used for bedding of pipe shall be moist and rolled or tamped in place. It should contain sufficient binder so as to compact readily and limit the flow of water through the material.

Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the bottom of the structure as ordered by the Engineer for a depth of 300 millimeters and full width of the channel. This extra depth excavation shall be backfilled with suitable material obtained from roadway excavation or other approved sources.

When a firm foundation is not encountered at the grade established due to soft, spongy or other unstable soil, unless other construction methods are called for on the Plans, all of such unstable soil under the pipe and for a width equal to the width of the channel shall be removed and replaced with suitable material. If a suitable granular material is not available in the roadway excavation for this backfill, the Engineer will designate material to be measured and paid for as foundation stabilization.

(c) Backfilling for Structures.

(1) General. All structures shall be backfilled in accordance with the following requirements:

Only approved materials that will produce a dense, well-compacted backfill shall be used.

Backfill procedures should be performed by working parallel with the structure when possible.

No backfilling shall be placed against any structure without permission of the Engineer. In general no concrete structure shall be subjected to the pressures of backfilling or to live loads until three days after the expiration of the period designated for the removal of forms. At the direction of the Engineer this period may be extended if subnormal curing conditions exist. Adequate provisions shall be made for thorough drainage and not less than 0.05 cubic meters of crushed stone or sand gravel shall be placed at each weep hole. Backfill, placed around culverts, abutments and piers, shall be deposited on both sides to approximately the same elevation at the same time. Special care shall be taken to prevent any wedging action against the structure. The slopes bounding the excavation shall be stepped when necessary, to prevent such wedge action.

Jetting of fills, or other hydraulic methods, involving or likely to involve liquid or semi-liquid pressure shall be prohibited.
When the Plans or Contract provide for "Compaction of Earthwork" the material shall be placed in layers and compacted by means of suitable equipment, exclusive of track-laying equipment, or by tamping with mechanical tampers or hand tampers. Each layer shall be compacted to a density equal to or greater than 90 percent of the Standard Compaction of the soil except when Type "C" compaction is shown. Each successive layer shall contain only that amount of material which will insure proper compaction, but in no case shall any layer be greater than 200 millimeters (loose measurement) in depth. The moisture content of the soil to be used for backfill shall be uniform and shall be within the moisture range designated on the Plans for the embankment adjacent to the structure. If no moisture range is designated, the moisture content of the soil to be used shall be uniform and shall be such that a density of 90 percent of Standard Compaction can be obtained. When the Plans or Contract do not provide for compaction or when Type "C" compaction is shown, then compaction of backfill will be performed in accordance with Type "C" compaction requirements. Lift thickness shall be as determined by the Engineer.

On County Secondary projects only, when the Plans and Contract provide for "Compaction of Earthwork", the compaction of backfill structures shall be in accordance with the requirements provided in Section 210, "Compaction of Earthwork", for the type of compaction and the moisture range designated on the Plans for the adjacent embankment. The compaction may be obtained by equipment other than rollers.

The "original ground line" as used hereinafter shall be considered as the surface of the ground before excavation is started for the structure.

The reference to original ground line, as applied to backfill, shall define the backfilling around structures to be performed by the various Contractors, as that backfill, within the limits of the excavation for which each Contractor is responsible.

Water shall be drained from the areas to be backfilled whenever practical, except for piers when backfill compaction is not required. In cases where it is not practical to drain the areas to be backfilled, the backfill material shall be deposited in the water in thin layers and compaction will not be required until the backfilling has progressed to the point where all water has been absorbed in the backfill material.

In no case shall surplus material be dumped in the channel of the stream but shall be disposed of in the approach embankments or as directed.
(2) Box Culverts. The Earthwork and Culvert Contractor shall complete the backfill around box culverts, as outlined above, to the level of the original ground line for the full width of the excavation area. If the top of the culvert extends above the original ground line the Contractor shall continue the compacted backfill to the top of the culvert and for a width of 3 meters on each side of the culvert for the full width of the roadway embankment.

(3) Pipe Culverts (including metal arch culverts and sectional plate pipe culverts). The Earthwork and Culvert Contractor shall complete the backfill around these culverts as outlined above to the level of the original ground line for the full width of the excavation area. If the top of the culvert extends above the original ground line, the Contractor shall continue the compacted backfill to the top of the culvert for a width of 1 1/2 times the maximum external width of the culvert on each side of the centerline of the culvert for the full width of the roadway embankment.

On large diameter metal pipes (one meter and larger) backfill techniques should be used and deflection control measures maintained to see that the original shape of the pipe remains intact. Backfilling operations that permit “peaking” or “rolling” of the pipe should be avoided. Plumbbobs should be used or periodic measurements taken to detect distortion. Distortion indicates that equipment is working too close to the pipe and creating unequal pressure on each side. Hand tamping operations may be required adjacent to the pipe to prevent distortion.

When it is necessary for heavy construction equipment to travel over metal pipe, the structure should be protected by adequate cover to prevent damage by excessive loads. The following table should be used as a guide to determine the approximate minimum cover required for the loads indicated.

**CONSTRUCTION LOADS AND PER AXLE-APPROXIMATE MINIMUM COVER**

<table>
<thead>
<tr>
<th>Corrugated Steel Pipe Size</th>
<th>8-23 Metric Tons</th>
<th>23-34 Metric Tons</th>
<th>34-50 Metric Tons</th>
<th>50-68 Metric Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3 m to 1.0 m</td>
<td>0.6 m</td>
<td>0.8 m</td>
<td>1.0 m</td>
<td>1.0 m</td>
</tr>
<tr>
<td>1.2 m to 1.8 m</td>
<td>1.0 m</td>
<td>1.0 m</td>
<td>1.0 m</td>
<td>1.5 m</td>
</tr>
<tr>
<td>2.0 m to 3.0 m</td>
<td>1.0 m</td>
<td>1.0 m</td>
<td>1.5 m</td>
<td>1.5 m</td>
</tr>
</tbody>
</table>

In the event the height of fill over the top of the reinforced concrete pipe culvert is greater than 8 meters the backfill shall
be placed by the imperfect trench method as hereinafter described.

After the culvert has been bedded the backfill must be placed and compacted for the width and as described above to a height above the top of the culvert equal to the maximum external width of the culvert. The earth material in the prism directly over the culvert shall then be excavated and the trench backfilled with earth material deposited in the loosest possible condition. The construction of the embankment will then proceed in accordance with the standard methods as set out herein.

Excavation over the culvert made necessary by backfilling under the imperfect trench method shall not be paid for directly but shall be considered as subsidiary to other items of the Contract.

(4) Arch Culverts (including concrete arch, sectional plate pipe arch and sectional plate arch culverts). Arch culverts shall be backfilled as outlined above for box culverts and in accordance with the following additional requirements:

The method used in backfilling arches shall conform to one of the methods shown on the standard backfill sheet for arches included in the Plans. No backfill shall be placed against a concrete arch until the concrete has attained a flexural strength of 2.0 megapascals, as determined by third point loading test of specimens cast at the time of pouring the concrete or until normal form removal.

The excavation area on each side of the arch shall be cleared of all boards and other debris; any standing water shall be drained or pumped from the area, and the soil allowed to dry before backfilling is started. If the condition is such that seepage is flowing into the area to be backfilled, the water shall be drained to a weep hole in the arch or drained to a sump and pumped outside the area. Any muck or saturated soil shall be removed directly ahead of placing the backfill so that compaction is started on a firm foundation.

(5) Arch Bridges. Arch bridges shall be backfilled in the manner outlined above for "Arch Culverts" except that the Bridge Contractor shall backfill all the material that was excavated by him to the level of the ground as it was when the bridge excavation started and the Earthwork Contractor shall complete the compacted backfill of the arch.

(6) Box Bridges. Box bridges shall be backfilled in the manner outlined above for box culverts, except that the Bridge Contractor shall backfill all the material that was excavated by
him to the level of the ground as it was when the bridge excavation started and the Earthwork Contractor shall complete the compacted backfill of the bridge.

(7) Other Bridges. The Bridge Contractor shall complete the back fill at abutments for bridges as outlined above to the level of the original ground. If required on the Plans, the portion of the backfill next to the surface of the substructure shall be composed of coarse gravel or crushed stone. The Bridge Contractor shall furnish and place the coarse gravel or crushed stone to the required height as shown on the Plans.

When porous backfill material and/or pipe underdrains are required, the Earthwork and Culvert Contractor and the Bridge Contractor shall so arrange their work to cause the least possible delay and interference to each other.

Backfill compaction will not be required around piers, except piers adjacent to railroad tracks, roadway, or in the toe slopes of embankments unless otherwise noted on the Plans.

(8) Retaining Walls. Backfill around retaining walls shall be compacted to the level of the original ground line and to such heights above the original ground line as indicated on the Plans. The backfill shall be placed as outlined previously under “General” and shall be placed simultaneously in front and back to the level of the original ground line or to the level indicated on the Plans for the front of the retaining wall. Extreme care shall be exercised to prevent forward movement of the wall.

(9) Catch Basins, Manholes, Inlets, and Miscellaneous Structures. These structures shall be backfilled in accordance with the method outlined above under “General” except that compaction of the backfill will not be required when the structures are outside the roadway area or any other roadway, such as approach roads, streets, alleys, or similar areas.

207.04 METHOD OF MEASUREMENT.

No measurement shall be made of excavation for box culverts, pipe culverts, arch culverts or entrance pipe culverts nor for head walls for any culvert regardless of the type used, except that the actual quantity of rock, hardpan, or other unyielding material that is removed in accordance with subsection 207.03 (b) “Excavation and Forming Bed” shall be measured by the cubic meter.

Excavation for bridges other than box bridges and concrete arch bridges will be that actually removed, except that no measurement will be made of material removed outside of a
volume bounded by vertical planes 600 millimeters outside the footings and tie beams unless otherwise shown by special excavation dimensions on the Plans. In such cases where the Plans show special excavation dimensions, the excavation to be measured will be that actually removed as limited by the dimensions shown. The term "actually removed" as used in this paragraph shall not be interpreted to preclude payment for a volume of air between the "Excavation Boundary Plane" and the elevation of water or solid material.

When an item is shown in the Contract, excavation for box bridges and concrete arch bridges will be that actually removed except that no measurement will be made of material removed outside of a volume bounded by vertical planes 600 millimeters outside the footings.

When an item is shown in the Contract for excavation of retaining walls and other miscellaneous structures, it shall be that quantity actually removed except that no measurement will be made of material removed outside of a volume bounded by vertical planes 300 millimeters outside the footings.

The Engineer may elect to use the quantities shown on the Plans for basis of payment for excavation. When the Plans have been altered or when disagreement exists between the Contractor and Engineer as to the accuracy of Plan quantities in any location or the entire project, either party shall have the right to request and use the quantities involved to be measured.

Measurement shall include the volume of the waterway of existing structures included within the limits of excavation shown above unless the old structure removal is a Contract item.

Foundation Stabilization shall be measured by the cubic meter of suitable backfill material in the vehicle at the time of unloading. No measurement will be made for backfill material not authorized by the Engineer nor backfill material placed outside of a volume bounded by vertical planes of one foot outside of the footings. Quantities of foundation stabilization material will not be measured when the foundation has become unsuitable because of negligence or improper methods of construction by the Contractor.

Concrete placed as a seal course, as shown on the Plans or ordered by the Engineer, shall be measured by the cubic meter actually in place, except that no measurement will be made of seal course placed beyond the limits of pay excavation, as defined above, or above the elevation shown on the Plans or or-
dered by the Engineer. On structures where the excavation is subsidiary to other items of the Contract and the limits of excavation are not defined herein, no measurement will be made of seal course placed outside of a volume bounded by vertical planes 300 millimeters outside the footings.

Water for compaction of earthwork (backfill) around structures other than those classified as bridges shall be measured by cubic meters. No measurement shall be made of water for compaction of earthwork (backfill) around structures classified as bridges, and which is a part of the work covered by the bridge Contract.

No measurement will be made of backfill or compaction of backfill around structures except that portion above the original ground line which is situated within an embankment designated to be compacted.

No measurement will be made for water used in dust control on haul roads, around plant installations, etc. The Contractor shall meet all applicable regulations concerning environmental considerations.

207.05 BASIS OF PAYMENT.

Excavation for box culverts, pipe culverts, arch culverts, entrance pipe culverts or head walls for any culvert shall not be paid for directly but shall be considered as subsidiary work pertaining to the other items of the Contract, except that rock, hardpan, or other unyielding material that is removed in accordance with subsection 207.03 (b) shall be paid for at a rate equal to four times the Contract price for Common Excavation.

Where the proposed structure is a retaining wall or other miscellaneous structure other than a culvert, entrance pipe, or head wall the amount of completed and accepted work, measured as provided above, shall be paid for at the Contract prices per cubic meter for "Class III Excavation", per cubic meter of "Concrete for Seal Course" when shown as a Contract item or ordered by the Engineer and per cubic meter of "Water" for compaction of earthwork, which prices shall be full compensation for furnishing all materials, for all labor, equipment, tools and incidentals necessary to complete the work.

Where the proposed structure is a bridge, the amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit prices per cubic meter for "Class I Excavation", "Class II Excavation", "Class III Excavation", and per cubic meter of "Concrete for Seal Course" when shown as an item or ordered by the Engineer which
prices shall be full compensation for furnishing all materials, for all labor, equipment, tools, and incidentals necessary to complete the work as hereinafter provided.

If it is necessary to carry a footing below the elevation shown on the Plan, that portion of the excavation between the Plan footing elevation and an elevation 600 millimeters below Plan footing elevation shall be paid for at the Contract unit price. That portion of the excavation between elevations more than 600 millimeters and to and including two meters below Plan footing elevation shall be paid for at 1.5 times the Contract unit price. That portion of the excavation below an elevation more than two meters below Plan elevation shall be paid for as provided in Division 100, "Extra Work".

In case the Plan footing elevation for any pier, abutment, or portion of a structure is above the "Excavation Boundary Plane" and it is found necessary to lower the footing to an elevation below the "Excavation Boundary Plane" the additional excavation for that pier, abutment, or portion of a structure above the "Excavation Boundary Plane" shall be paid for at revised unit prices as determined from the above schedule and the additional excavation below the "Excavation Boundary Plane" shall be paid for as provided in Division 100, "Extra Work".

Exception: The above provisions for adjustment of unit prices for excavation below the Plan footing elevations shall not apply to concrete box bridges or arch bridges with continuous floor constructed monolithic with the walls or barrel. Compensation for additional excavation for bridges of these types shall be determined in accordance with Division 100, "Alteration of Plans or Character of Work".

The actual material placed for foundation stabilization shall be measured and paid for at the contract price per cubic meter for "Foundation Stabilization", which price shall be full compensation for all excavation, furnishing all material, labor, equipment, tools and incidentals necessary to complete the work. When the quantity of foundation stabilization overruns or underruns the contract quantity, the work shall be performed at the contract unit price and no alteration or variation in contract unit price will be considered.

The Engineer may accept commercial scale tickets for this item and a conversion factor to be used as specified in Division 100.
SECTION 208
RESETTING CULVERTS

208.01 DESCRIPTION.

This item shall consist of removing and resetting the various kinds of pipe culverts or reinforced concrete box culverts where designated on the Plans to be reset.

BID ITEMS
Resetting Reinforced Concrete Box Culverts.
Resetting Pipe Culverts.
Resetting End Sections.

208.02 CONSTRUCTION REQUIREMENTS.

The Contractor shall carefully excavate around the existing pipe, box culvert, or end section so that it can be removed without damage. The structure and end section shall then be removed to the location designated on the Plans. All reinforced concrete box culverts, pipe culverts, and end sections to be reset shall be cleaned of all deposited soil and debris before being reset. The Contractor shall make the necessary excavation prior to the resetting of the culvert or end section, care being taken that proper contact and support is obtained so that when the culvert or end section is reset, it will not settle out of line due to unequal support. The culvert and end section shall then be bedded and backfilled in accordance with the requirements of Section 207 to the level of the original ground surface. Pipes, culverts, and end sections to be reset shall be removed and stored when necessary, so that there will be no loss or damage before resetting. The Contractor will be required to replace sections lost from storage or damaged by negligence or by use of improper methods.

208.03 METHOD OF MEASUREMENT.

The resetting of reinforced concrete box culverts shall be measured by the unit complete in place.

The resetting of pipe culverts and precast sectional concrete culverts shall be measured by the meter of culvert reset.

The resetting of end sections shall be measured per each. The excavation necessary in the removal and resetting of any box culvert, pipe culvert, entrance pipe, or end section shall
not be paid for directly but shall be considered subsidiary to the resetting of culverts or end sections.

208.04 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the contract unit prices per each for “Resetting Reinforced Concrete Box Culverts”, per meter for “Resetting Pipe Culverts”, or per each for “Resetting End Sections”, which prices shall be full compensation for furnishing and placing all materials, excavation and backfill, for all labor, tools, equipment, and incidentals necessary to complete the work.
SECTION 209
EMBANKMENTS

209.01 DESCRIPTION.

This work shall consist of constructing roadway embankments, including preparation of the areas upon which they are to be placed; the construction of dikes within or outside the right-of-way; the placing and compacting of approved material within roadway areas where unsuitable material has been removed; and the placing and compacting of embankment material in holes, pits and other depressions within the roadway area, in accordance with the specifications, as shown on the Plans or established by the Engineer.

Only approved materials shall be used in the construction of embankments and backfills. When "Embarkment (Contractor Furnished)" is shown on the Plans, the Contractor shall furnish this material from sites provided by the Contractor and approved by the Engineer as to suitability and location. Locations that in the opinion of the Engineer will leave an unsightly appearance will not be approved.

BID ITEM

Embarkment.
Embarkment (Contractor Furnished).

209.02 CONSTRUCTION REQUIREMENTS.

When frozen soil exists in either the surface of the original ground or the surface of a partially constructed embankment, work shall not proceed until such time that the frozen soil has completely thawed or been removed in a manner that is approved by the Engineer.

Rocks, broken concrete or other solid materials shall not be placed in embankment areas where piling is to be placed or driven.

When an embankment is to be placed against a hillside or existing embankment whose slopes are steeper than 4:1; the existing slope shall be continuously benched and the new embankment constructed in uniform lifts. Benching shall be of sufficient width to permit operations of placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus cut out shall be recompacted along with the new embankment material at the Contractor's expense.
Where an embankment of less than one meter below subgrade is to be made, all sod and vegetable matter shall be removed from the surface upon which the embankment is to be placed, and the cleared surface shall be completely broken up by plowing, scarifying or stepping to a minimum depth of 150 millimeters. This area shall then be recompacted. Sod not required to be removed shall be thoroughly disced before construction of embankment. If the original surface upon which embankment is to be placed is an old roadbed, the surface shall be plowed, scarified, or broken up regardless of the height of the embankment to be placed.

If the embankment can be deposited on one side only of abutments, wing walls, piers or culvert headwalls, care shall be taken that the area immediately adjacent to the structure is not compacted to the extent that it will cause overturning of or excessive pressure against the structure.

When an embankment is to be constructed over an area previously occupied by a building basement, cellar, silo pit or other such construction that will not permit the use of normal compaction equipment, the embankment construction shall conform to the backfilling requirements specified in subsection 207.03 (c) until the normal compaction equipment can be used.

Embankments not required to be compacted and formed of material consisting largely of rock, shall be placed in uniform, horizontal layers not exceeding 600 millimeters in thickness over the full width of the embankment. The material shall be carefully placed so that all large stones are well distributed and the voids completely filled with smaller stones, earth, sand or gravel, to form a solid embankment. Each layer shall be thoroughly leveled with suitable leveling equipment until relatively smooth and uniform before the succeeding layer is placed. Whenever possible, such material shall be placed to form the base of embankments for the full width of the embankment. When rock and other embankment materials are excavated at the same time, the rock shall be placed in the outside portion of the embankment and the other material shall be placed in the central portion of the embankment. During this construction, the elevations of both portions shall be substantially the same, but the elevation of the layers of other material shall at all times be sufficiently above the rock layers to allow for satisfactory compaction of the layers of other material.

Before rock is placed on compacted embankment constructed of other material the top of the embankment shall be sloped from the centerline to the sides. Under no circumstances shall
pockets of rock be built into the embankment in such a way that water cannot drain freely to the outside surface of the embankment. This requirement shall not exclude the use of select soil when required by the Plans and Contract. No rock larger than 75 millimeters in any dimension shall be placed in the top 300 millimeters of embankment. Unless otherwise noted on the Plans, no shale shall be placed in the upper 300 millimeters of the embankment.

The thickness of the first lift over unstable areas may be increased as directed by the Engineer.

Material for the embankments is to be obtained from the roadway, channels and borrow pits as designated on the Plans or when Embankment (Contractor Furnished) is shown on the Plans the Contractor shall furnish this material from sites provided by the Contractor and approved by the Engineer as to suitability and site location. Locations that in the opinion of the Engineer will leave an unsightly appearance will not be approved. Approval of the locations shall also be contingent upon a review of the area for wildlife and archaeological evidence. If the site is of wildlife or archaeological value approval of the site may be withheld.

When the Contract item of "Embarkment" is shown, excavation quantities shown on the Plans are for information purposes only.

When the Plans and Contract show the item "Embarkment" or "Embarkment (Contractor Furnished)", excavation for embankments shall conform to all of the requirements of Section 204.

Unless shown otherwise on the Plans, the Contractor shall arrange his construction procedures so that the top 300 millimeters of the shoulder slopes and fill slopes contains suitable material for the growth of normal vegetation. Such material shall meet the approval of the Engineer.

Embankments required by the Plans and Contract to be compacted shall be constructed in accordance with Section 210. Foundations for embankments and compaction in cut sections shall be compacted to the specified requirements.

When the Plans and Contract do not provide for compaction of earthwork, the embankment and backfill shall be formed of suitable material, placed in uniform layers of not to exceed 200 millimeters of loose measured thickness and shall be compacted until each layer is hard, firm and free from soft and spongy areas or dust pockets. The addition of water will be required as directed by the Engineer, and the Contractor shall
select the backfill material to eliminate the use of extremely
dry or otherwise objectionable material.

The Contractor shall have in operation a sufficient number
of motor graders to properly smooth and maintain the surface
of each layer of freshly placed embankment prior to and during
rolling and compacting operations.

The Engineer shall have full authority to require at any time,
the suspension of delivery of material to the embankment until
previously delivered materials are properly placed and pre-
ceding layers are satisfactorily smooth and uniform.

Embankments shall not be constructed by means of a drag-
line except with the permission of the Engineer and when pro-
visions are made to keep the lifts uniform and the embankment
level and well drained at all times.

In order that embankments may be allowed natural settle-
ment to as great an extent as possible, all culverts and other
structures below the road surface shall be constructed and
backfilled before the embankments are constructed.

The Contractor shall be responsible for the stability of all
constructed embankment, and shall replace at his own ex-
 pense any portion which, in the opinion of the Engineer, has
been displaced due to carelessness or negligent work on the
part of the Contractor.

When unsuitable material is encountered, the unsuitable
material will be excavated and the excavation backfilled with
suitable material.

All loose rock within the right-of-way which will interfere
with mechanical mowing, shall be picked up and satisfactorily
disposed of.

209.03 METHOD OF MEASUREMENT.

No measurement of this section will be made unless the
Plans and Contract contain the item "Embankment" or "Em-
bankment (Contractor Furnished)".

If either of the embankment bid items are shown, the work
prescribed under this item shall be the embankment in place
measured by the average end area method and designated in
cubic meters. No allowance will be made for additional ex-
cavation occasioned by actual compacted densities to meet the
requirements stipulated by the Contract.

The quantities of embankment for which payment will be
made shall be the quantities shown on the Plans for the various
balances, provided the project is constructed essentially to the
lines and grades shown on the Plans.
Where the Plans have been altered or in case of disagreement between the Contractor and Engineer as to the accuracy of the plan quantities in any balance or the entire project, either party shall have the right to request and cause the quantities involved to be measured as provided above.

When the quantities are measured for payment the original cross sections or contour data plotted on the Plans shall be used as original field cross sections, unless errors have been found or the original ground has been disturbed prior to commencing work. Additional original cross sections may be interpolated or determined by other means, at certain points where necessary to more accurately determine the quantities.

When unsuitable material is encountered, the unsuitable material shall be excavated and the excavation backfilled with suitable material. The backfill shall be measured as cubic meters of "Embankment" or "Embankment (Contractor Furnished)" when these items appear on the Plans as a bid item. When the item "Embankment (Contractor Furnished)" is used the Contractor shall give the Engineer notice, and time to take original cross-sections before placing embankment. Payment for the embankment used for the backfill in these areas shall be made at the rate of two times the unit price Contract cubic meter for embankment.

No measurement will be made for water used in dust control on haul roads, around plant installations, etc. The Contractor shall meet all applicable regulations concerning environmental considerations.

209.04 BASIS OF PAYMENT.

The work prescribed in this section will not be paid for directly, but shall be considered as subsidiary work pertaining to the several classes of "Excavation for Highway", unless the Plans and Contract contain the item "Embankment" or "Embankment (Contractor Furnished)".

If the item "Embankment" or "Embankment (Contractor Furnished)" is shown the amount of completed and accepted work, measured as provided above, shall be paid for at the contract unit price per cubic meter for "Embankment" or "Embankment (Contractor Furnished)", which price shall be full compensation for furnishing all water, equipment, tools, labor, fuel and incidentals necessary for all excavation, the proper formation of embankment, all compaction, trimming of slopes, disposal of surplus materials, preparation and completion of roadway, subgrade and shoulders. Excavation of earthwork from its origi
inal position, compaction and water for compaction will not be paid for directly but shall be considered as subsidiary work to the item of "Embankment" or "Embankment (Contractor Furnished)". No measurement shall be made of the suitable material temporarily removed and replaced to facilitate compaction of the material for the full depth shown on the Plans.

Haul routes for "Embankment (Contractor Furnished)" shall be provided at the Contractor's expense. If the haul route is over an existing road, the Contractor shall repair this road at his expense. The Field Engineer and the Contractor shall view the road before use and upon completion of hauling. The road shall be repaired to the approximate condition it was prior to hauling operations.
SECTION 210

COMPACTION OF EARTHWORK

210.01 DESCRIPTION.

This work shall consist of the compaction of earthwork by rolling or tamping or any combination of these methods in accordance with the requirements specified for the Type and Moisture Range designated on the Plans or ordered by the Engineer.

BID ITEMS

Compaction of Earthwork (Type _____ *) (MR _____ *).

Water.

* Denotes Type and Moisture Range.

210.02 CONSTRUCTION REQUIREMENTS.

(a) General.

The provisions of Section 209 shall apply to the construction of embankments that are to be compacted except as specifically superseded herein relative to preparation of the areas upon which the embankment is to be placed and to the thickness of the layers of embankment being placed.

Compacting operations shall include adequate blading with motor graders to insure uniformity of the lifts or layers of embankments being compacted. The number of blades and rollers in use shall be sufficient to blade and compact adequately all materials being delivered to the embankment. The Engineer shall have full authority to suspend the delivery of materials to the embankment until previously delivered materials are properly placed and satisfactorily compacted.

(b) Foundation Treatment.

Where an embankment of less than one meter below subgrade is to be made, all sod and vegetable matter shall be removed from the surface upon which the embankment is to be placed, and the cleared surface shall be completely broken up by plowing, scarifying or stepping to a minimum depth of 150 millimeters. The material of which the foundation is composed shall be adjusted to a moisture content within the moisture range and compacted to the type of compaction to which the subsequently placed embankment is to be constructed as designated on the Plans. If the original surface upon which
embankment is to be placed is an old roadbed, the surface shall be plowed, scarified, or broken up regardless of the height of the embankment to be placed.

(c) Compaction in Cuts.

When required on the Plans or ordered by the Engineer, the soil below grade line in cut sections shall be scarified, broken up, adjusted to a moisture content within the designated moisture range and compacted to the designated type of compaction.

When the depth of compaction in cut sections is shown to be more than 150 millimeters, all material shall be removed to within 150 millimeters of the lower limit of the compaction. The layer of material left in place shall be scarified, broken up, adjusted to a moisture content within the designated moisture range and compacted to the designated type of compaction. This process shall be repeated until the cut section is compacted to the grade shown on the Plans.

Allowance for compaction in cut sections will be made only for that material that is removed and backfilled. No allowance will be made for compaction of the bottom layer that was left in place. Compaction of this layer shall be considered similar to foundation treatment and shall be subsidiary to other items of the Contract.

(d) Moisture Control Requirements.

The moisture content of the soil at the time of compaction shall be within the moisture range designated on the Plans, unless it is determined by the Engineer that the soil is unstable in the designated moisture range.

When the moisture content of the embankment soil does not fall within the required moisture range, water shall be added or the material shall be aerated, whichever is needed to adjust the soil to the proper moisture content.

Water may be transported in calibrated trucks or in pipe lines with calibrated meters, and the water may be added to the soil in the borrow and cut areas before hauling or may be added to the soil on the embankment after hauling, so long as the moisture content of the soil at the time of compaction is uniform and within the designated moisture range.

No water shall be added without the consent of the Engineer and without providing him adequate opportunity to measure the quantities used. The amount of water to be added shall be only that amount that will, as determined by the Engineer by
field tests, provide a moisture content in the soil to be within the required range plus a reasonable amount to compensate for evaporation and other unavoidable losses. Water added in excess of this amount shall be considered as excess water and will not be included in the quantities for which payment is made. Satisfactory methods and sufficient equipment shall be used for the furnishing and handling of the water so there will be no undue loss due to evaporation or waste. If water is added to cut areas or borrow pits, the surface of the areas or pits shall be maintained in such a manner that will prevent undue loss of moisture.

The moisture content of the soil being compacted shall be considered as being too high to insure compaction when after repeated rolling with the sheepsfoot roller, the roller continues to pick up excessive amounts of soil and refuses to "build up" so that the tamping feet eventually ride the compacted surface. When heavy clay soils are encountered actual moisture content of the soil shall be no more than two percentage points above the lower plastic limit of that soil during compaction.

When other types of rollers are used, the moisture content of the soil shall be considered as excessive when "bridging" or "building up" of the soil occurs in front of, or behind the wheels of such rollers, and/or when earth hauling equipment produces excessive ruts in the rolled surfaces.

(e) Pre-watering.

The Contractor may pre-water in excavation areas. This shall be done by use of a sprinkler system, flooding of the area, or other approved methods.

The Contractor shall furnish a sketch for each area to be pre-watered showing the pre-watering layout, including nozzle size, spacing of nozzles, number of lines to be used, and other equipment to be used. The Contractor must have the approval of the Engineer for each pre-watering layout prior to each pre-watering operation.

The Engineer will determine the amount of water required to bring the material to optimum moisture for the full depth of the excavation plus a reasonable amount to compensate for evaporation. The amount of water allowed for evaporation will not exceed 20 percent of the amount required unless justified by field conditions. In any case, prior approval will be obtained before the 20 percent maximum is exceeded. Water in excess of the approved amount will not be included in the pay quantity.
The Contractor shall provide adequate drilling equipment to obtain samples for moisture determinations. The Contractor shall drill enough holes prior to, during and after the pre-wa-tering operations so that the Engineer may determine the amount of water required, amount wasted, etc. The Engineer will determine the number of holes, the locations for the holes and the time to drill the holes.

The natural growth of vegetation shall not be removed until all watering of the area has been completed, unless otherwise designated by the Engineer. If runoff is excessive the Contractor shall rip the area on the contour of the ground to a depth of 600 millimeters on approximately one meter centers.

The excavation areas shall be stripped as soon as possible after the pre-watering has been completed. The time limit for such stripping shall be subject to the control of the Engineer and shall be strictly adhered to by the Contractor.

The rate of application by the irrigation system shall be rea-sonably close to the maximum rate that excessive runoff will not occur. The nozzle size and water pressure shall be adjusted so that the optimum amount of water is applied to the exca-vation area with minimum amount of evaporation loss.

All waste water shall be deducted as determined by the En-gineer and such computations will be available to the Con-tractor at the time the waste occurs.

In the event water is applied by pre-watering with a sprin-kler system, the water shall be metered through approved me-tering devices which are located near the point of discharge.

The pre-watered excavation areas shall be cured for a period as determined by the Engineer to insure proper penetration to the full depth of excavation and to obtain uniformity in mois-ture content of the various soils.

Pre-watering shall not be allowed on frozen ground or when the ambient air temperature is 0 °C or below.

(f) Compaction Control Requirements (Earth).

Roadway embankment of earth material shall be placed in horizontal layers not exceeding 200 millimeters (loose measure-ment) unless otherwise approved by the Engineer, and shall be compacted as specified before the next layer is placed. Ef-fective spreading equipment shall be used on each lift to ob-tain uniform thickness prior to compacting. As the compaction of each layer progresses, continuous leveling and manipulat-ing by a motorgrader will be required to assure uniform den-sity. Water shall be added or removed, if necessary, in order
to obtain the required density. Construction equipment shall be routed uniformly over the entire surface of each layer. A motorgrader shall be used on the embankment at all times to level and manipulate the material during the placing and compacting of the earth material.

The thickness of the lift of earth material over unstable areas may be increased as directed.

(g) **Compaction of Embankments Containing Rock.**

Embankments required by the Plans and Contract to be compacted which are predominantly rock may be placed in the embankment in layers not exceeding in thickness the approximate average size of the larger rocks, except that no layer shall exceed 600 millimeters of loose measurement. Whenever possible, such material shall be placed to form the base of embankments for the full width of the embankment. When rock and other embankment materials are excavated at the same time, the rock shall be placed in the outside portion of the embankment and the other material shall be placed in the central portion of the embankment. During this construction, the elevations of both portions shall be substantially the same, but the elevation of the layers of other material shall at all times be sufficiently above the rock layers to allow for satisfactory compaction of the layers of other material.

Before rock is placed on compacted embankment constructed of other material the top of the embankment shall be sloped from the centerline to the sides. Under no circumstance shall pockets of rock be built into the embankment in such a way that water cannot drain freely to the outside surface of the embankment. This requirement shall not exclude the use of select soil when required by the Plans and Contract.

Where a grass median is to be constructed, no rock will be permitted in the top 450 millimeters of the median area.

The rock shall be carefully placed so that all large stones will be reasonably well distributed and the voids completely filled with smaller stones, earth, sand or gravel to form a solid embankment. Each layer shall be bladed or leveled with a motorgrader, bulldozer or similar equipment capable of shifting and forming the layer into a neat orderly condition. Conformance to these provisions will be considered as fulfillment of the requirements for the type of compaction shown on the Plans without additional rolling, tamping or the addition of moisture.

Embankments, required by the Plans and Contract to be compacted, which are formed of material that contains rock, but
also contains sufficient compactable material other than rock or other hard material to make rolling feasible, shall be placed and compacted in the manner provided for Type B compaction. This provision shall apply regardless of the type of compaction designated on the Plans. Conformance to this provision will be considered as fulfillment of the requirements for the type of compaction shown on the Plans.

(h) **Tamping.**

Whenever embankments are placed adjacent to structures or at locations where it is not practicable to use a roller, the embankment materials shall be tamped by the use of mechanical rammers or tampers. Each layer shall be compacted to a density equal to or greater than that obtained under the above rolling procedure for the type of compaction designated. Each successive lift shall contain only that amount of material which will insure proper compaction but in no instance shall any layer be greater than 200 millimeters (loose measurement) in depth, unless otherwise approved by the Engineer. When the quantity of work is small, a hand tamper may be used with the permission of the Engineer.

(i) **Compaction of Earthwork in Subgrade.**

When the Plans designate previously placed subgrade to be compacted, the subgrade, within the dimensions and locations shown on the Plans, shall be compacted to the type of compaction within the moisture range designated on the Plans.

The exact locations of compaction required shall be determined by the Engineer at the time of the construction.

**210.03 MOISTURE CONTENT REQUIREMENTS.**

The Moisture Range requirements are as follows:

(a) **Moisture Range 0 (MR-0).** The moisture content of the soil at the time of compaction shall be uniform and shall be not higher than five percentage points above the optimum nor lower than the optimum of the soil involved. If the soil is unstable at this moisture range, the moisture shall be lowered to the point it is stable as determined by the Field Engineer.

(b) **Moisture Range 3 (MR-3).** The moisture content of the soil at the time of compaction shall be uniform and shall not be lower than three percentage points below the optimum moisture content of the soil involved.

(c) **Moisture Range 3-3 (MR-3-3).** The moisture content of the soil at the time of compaction shall be uniform and shall not
be lower than three percentage points below the optimum moisture content nor higher than three percentage points above the optimum moisture content of the soil involved.

(d) **Moisture Range 5 (MR-5)**. The moisture content of the soil at the time of compaction shall be uniform and shall be not lower than five percentage points below the optimum moisture content of the soil involved.

(e) **Moisture Range 90 (MR-90)**. The moisture content of the soil at the time of compaction shall be uniform and shall be such that the soil can be compacted to the requirements of the type of compaction designated on the Plans.

If Type B compaction is specified with this moisture control, the moisture content shall be sufficient to produce a uniform mixture of the soil and moisture. It will be determined by visual inspection that satisfactory compaction and moisture content is obtained.

### 210.04 COMPACTION REQUIREMENTS.

The compaction requirements are as follows:

(a) **Type AAA**. Compacted density of the soil shall be equal to or greater than 100 percent of standard density.

(b) **Type AA**. Compacted density of soil shall be equal to or greater than 95 percent of standard density.

(c) **Type A**. Compacted density of soil shall be equal to or greater than 90 percent of standard density.

(d) **Type B**. Compacted density of soil to be such that the tamping or sheepfoot roller, while rolling the layer or lift will walk-out of the material and ride the top portion of the lift.

Compaction of low plasticity or nonplastic fine-grained materials shall be considered adequate when additional passes of the roller do not bring the tamping feet closer to the surface of the lift, provided the entire mass of the roller is supported on the tamping feet and none by material directly in contact with the drum.

Sand and gravel which cannot be compacted satisfactorily with a sheepfoot roller shall be rolled with a pneumatic-tired roller or other approved types. Each lift shall be rolled until no further consolidation is evident.

(e) **Type C**. Material being compacted shall be brought to satisfactory moisture content during placing, shaping and rolling as required by the Engineer. After placing and shaping, the material shall be firmly and satisfactorily compacted. The Engineer will determine by visual inspection that satisfactory
compaction is being obtained. Blading will be required while rolling is being performed.

210.05 METHOD OF MEASUREMENT

(a) Plan Quantity Payment.

The quantities of compaction of earthwork for which payment will be made shall be the quantities shown on the Plans for the various balances, provided the project is constructed essentially to the lines and grades shown on the Plans. No allowance will be made for any quantities included as contingencies on the Plans.

When the Plans have been altered or when disagreement exists between the Contractor and Engineer as to the accuracy of plan quantities in any balance or the entire Project, either party shall have the right to request and cause the quantities involved to be measured. When the quantities are measured for payment the original cross sections plotted on the Plans shall be used as original field cross sections, unless errors have been found or the original ground has been disturbed prior to commencing work. Additional original cross sections may be interpolated or determined by other methods at certain points where necessary to more accurately determine the quantities.

No measurement or allowance will be made for compaction when "Embankment" or "Embankment (Contractor Furnished)" is shown on the Plans as a Contract item. Compaction shall in this case, be considered as subsidiary to the embankment item shown.

(b) Measured Quantities.

Compaction of earthwork, including all types, shall be measured by the average end area method by the cubic meter of earth material in place in the embankment after compaction by rolling and/or tamping as designated on the Plans. Compacted volumes through cut sections shall be measured for payment when designated on the Plans. Foundation treatment under fills will not be measured nor paid for directly but shall be considered subsidiary to the item of "Compaction of Earthwork" of the various types.

When the depth of compaction through cut areas is shown on the Plans or ordered by the Engineer to be greater than 150 millimeters, the material actually excavated to gain access to and to scarify and compact the lower 150 millimeter layer to
the designated type of compaction, shall be included in the measurement of "Excavation for Highway". No measurement will be made for compaction of the bottom 150 millimeter layer in the cut section.

Water ordered by the Engineer shall be measured per cubic meter by means of calibrated tanks or water meters.

The Contractor shall submit certification as to the accuracy of meters which shall be reasonably up to date and should subsequent measurements prove the meter unreliable, another certified meter producing satisfactory measurements shall be furnished for use.

Deductions shall be made for the number of cubic meters of water considered to be in excess of the quantity required as defined above and for the number of gallons lost due to waste or other avoidable losses.

No measurement or allowance will be made for compaction or water when the item of "Embankment" or "Embankment (Contractor Furnished)" is shown as a bid item on the Plans. Compaction and water, in this case, shall be considered as subsidiary to the embankment item shown.

No measurement will be made for water used in dust control on haul roads, around plant installations, etc. The Contractor shall meet all applicable regulations concerning environmental considerations.

210.06 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit prices per cubic meter for "Compaction of Earthwork" of the several Types and Moisture Ranges designated in the Contract, and per cubic meter for "Water", which prices shall be full compensation for furnishing all materials, water, equipment, tools, labor, fuel, and incidentals necessary to complete the work.

When the quantity of water furnished overruns or underruns the Contract quantities, the Contract unit price shall govern regardless of the total quantity furnished.

Payment for the water used in pre-watering of the excavation areas shall be metered as provided above and shall be paid for at a rate of 75 percent of the Contract unit price which price shall be full compensation for furnishing irrigation equipment, drilling equipment, labor, tools and incidentals necessary to complete the work. When the quantity of pre-watering water furnished overruns or underruns the Contract quantities, 75
percent of the Contract unit price shall govern regardless of the total quantity used.

No payment will be made for compaction or water when the item of "Embankment" or "Embankment (Contractor Furnished)" is shown as a bid item on the Plans.
SECTION 211
OVERHAUL

211.01 DESCRIPTION.

Overhaul shall consist of authorized hauling in excess of the free-haul distance.

Free-haul distance is the specified distance that excavated material shall be hauled without additional compensation. Unless otherwise provided in the Contract or on the Plans, the free-haul distance shall be 600 meters.

All excavated materials shall be moved as shown on the Plans from the locations from which the materials are to be obtained to the locations where the materials are to be deposited and, regardless of the length of haul, no overhaul will be considered.

211.02 METHOD OF MEASUREMENT.

The limit of free haul shall be determined from a mass diagram by fixing on the volume curve, two points, one on each side of the neutral grade point, one in excavation and the other in embankment, such that the distance between them equals the free-haul distance, and the included quantity of excavation and embankment are in balance. All materials within the free-haul limit shall be eliminated from further consideration. The distance between the center of gravity of the remaining mass of excavation and the remaining mass of embankment minus the free-haul distance shall be the overhaul distance. The quantity of overhaul shall be the product of the overhaul distance multiplied by the number of units of material hauled in excess of the free-haul distance. Analytical methods may be used for computing overhaul in lieu of the mass diagram method described herein.

The quantity of material hauled may be determined by vehicle measurement upon approval by the Engineer.

211.03 BASIS OF PAYMENT.

Payment for overhaul, as measured above, shall be made at the unit price of 13 cents per cubic meter hundred meters which price shall be full compensation for furnishing all equipment and labor necessary to complete the work.
SECTION 212
DISPOSAL OF SURPLUS MATERIAL

212.01 CONSTRUCTION REQUIREMENTS.

All surplus excavated material shall be used to widen embankments or flatten slopes uniformly, or shall be deposited in such places and for such purposes as the Engineer may direct. Excess rock which cannot be disposed of as outlined above shall be placed in piles which shall present a neat appearance and which will not cause damage to abutting property. Waste banks shall be constructed as shown on the Plans or as directed by the Engineer.

212.02 METHOD OF MEASUREMENT.

No part of this section is a bid item and no measurement will be made.

212.03 BASIS OF PAYMENT.

The work provided for in this section will not be paid for directly, but shall be considered as subsidiary work pertaining to the several classes of "Excavation for Highway" and "Overhaul."
SECTION 213
SHOULDERS

213.01 DESCRIPTION.

This work shall consist of constructing shoulders for pavement, base courses, and other types of surfaces in accordance with these Specifications, as shown on the Plans or established by the Engineer.

BID ITEMS
Shoulders.
Shoulders (Earth Portion).
Water.

213.02 CONSTRUCTION REQUIREMENTS.

(a) General.

Vegetable matter shall be removed from the surface of the original shoulders and, if required, from the adjacent foreslopes upon which the shouldering is to be constructed. The original shoulders and, if required, the adjacent foreslopes shall be scarified to provide adequate bond.

The material used for shouldering shall be obtained from locations shown on the Plans or in the Contract and shall be free from weeds, roots, sod, or other material that will not compact readily. The material shall be deposited and spread in uniform layers not to exceed 200 millimeters thickness (loose measurement) and compacted in accordance with the provisions of Section 210 for the type of compaction and the moisture range designated. Dumping or mixing of any shouldering material on any paved surface constructed for traffic lanes will not be permitted.

The designated compaction shall be obtained at the edge of the pavement, base or surface, but extreme care shall be exercised to prevent injury to the pavement, base or surface edges, due to the rolling operations. If deemed necessary, the Engineer may require planking of the edges to prevent such injury.

Only pneumatic-tired equipment will be permitted to operate on or across the pavement, base course or other surfacing, during the construction of the shoulders. If it is necessary to cross or turn on the pavement, base or surface course, with rollers or other nonpneumatic-tired equipment, the surface at such lo-
cation shall be protected with planking or a layer of earth of sufficient thickness to prevent damage to the surface.

When completed, the shoulders shall be smooth, compact, and shall conform to the required cross section.

The grade of entrances and side roads shall be raised to meet the edge of the pavement, base or surface course. In raising the grade of the entrance or side road, sufficient embankment material shall be added to provide a roadway width equal to that of the approaching roadway with adequate shoulder slopes and shoulder radii adjacent to the shoulder of the project. Approach grades shall slope slightly away from the edge of the pavement, base, or surface course and the surface shall be adequately crowned, bladed, and consolidated to present a smooth surface with uniform lines and a neat appearance. The embankment material for this purpose shall be obtained from adjacent slopes or ditches or other sources approved by the Engineer.

(b) Surface Drop-off Treatment.

(1) General.

On projects that carry traffic through construction, the following criteria shall be considered a minimum for treatment of surface drop-offs adjacent to traffic lanes not physically separated by acceptable positive barrier. A surface drop-off is defined as "the vertical distance between the top of the lift being constructed or riding surface to the top of the existing shoulder or adjacent lane".

(2) Shoulder Treatment.

All lifts regardless of thickness shall be constructed with an edge slope of 1:1 or flatter. Appropriate signing and delineation as shown in the Contract documents will be required.

When the surface drop-off is greater than 130 millimeters, a temporary or permanent wedge shall be constructed against the pavement edge to provide a 3:1 or flatter slope. For unusual and justifiable conditions, the Engineer may modify this requirement to permit the use of drums, barricades, or other channelizing devices in lieu of the wedge to alert drivers of the drop-off condition. Surface drop-offs greater than 130 millimeters shall not be left unprotected overnight without a wedge or channelizing device in place. An obstruction free recovery area should be provided to the extent possible.

For multi-lane projects with lifts greater than 130 millimeters, shoulders may be constructed in conjunction with the placement of all lifts or the vertical drop-off shall be treated as stated previously.
When used, wedges shall be constructed of a material acceptable to the Engineer and constructed with a final maximum slope of 3:1 or flatter. Construction of the wedge or the use of alternate channelizing devices shall be considered as subsidiary to other items of the Contract.

When channelizing devices are used, the space between the devices (in meters) should be approximately one third the posted speed limit for high speed roadways. For low speed or urban streets, a closer spacing should be used.

Shouldering operations shall commence as soon as practicable and no later than three weeks after placement of the final lift. The shouldering shall be a continuous operation from that time on until completion with the weather being the only delay factor.

(3) Centerline and Adjacent Lane Treatment.

When any compacted centerline or adjacent lane joint height is greater than a nominal 40 millimeters but not in excess of 130 millimeters, the joint shall be constructed to produce an edge slope of 3:1 or flatter. This slope shall be maintained as long as traffic is traversing the edge.

213.03 METHOD OF MEASUREMENT.

The construction of shoulders will be considered as an item for separate compensation only when included on the Plans and in the Contract as such. In such cases Shoulders and Shoulders (Earth Portion) shall be measured by the kilometer for each shoulder on each side of the roadway surface measured along the pavement or wearing surface edge and shall include all shoulder work within the roadway. No deductions shall be made for side roads and entrances.

Water ordered by the Engineer shall be measured by the cubic meter by means of calibrated tanks, distributors, or by accurate water meters.

Deductions shall be made for the number of cubic meters of water considered to be in excess of the quantity required and for the number of cubic meters lost due to waste or other avoidable losses.

No measurement will be made for water used in dust control on haul roads, around plant installations, etc. The Contractor shall meet all applicable regulations concerning environmental considerations.

213.04 BASIS OF PAYMENT.

Payment shall be made at the Contract unit prices per kilometer for "Shoulders", or "Shoulders (Earth Portion)" and per
cubic meter of "Water", which prices shall be full compensation
for obtaining, hauling, spreading, and compacting the shoulder
material, for all blading, shaping, and incidental work required
to construct the shoulders to the required sections.

When the quantity of water furnished overruns or underruns
the Contract quantities, the Contract unit price shall govern
regardless of the total quantity furnished.

When the Plans and Contract do not provide for shoudering
as an item for separate compensation the quantities of excava-
tion, compacting, and water will be included in the quan-
tities of those items for the work involved.
SECTION 214
SELECT MATERIAL

214.01 DESCRIPTION.

This work shall consist of placing select soil or furnishing and placing selected embankment material on the finished slopes in accordance with these specifications, as shown on the Plans or as directed by the Engineer.

BID ITEM
Placing Select Soil.
Selected Embankment Material (Vehicle Measurement).

214.02 MATERIALS.

Select material shall consist of surface soil as designated on the Plans or other suitable soils as approved by the Engineer. Select material may contain humus and organic matter and any grass roots, native seeds and duff that may have accumulated in the surface layer. The top 25 millimeters of surface soil shall be a part of the select material when feasible. The Contractor shall use all reasonable care to avoid using select material containing toxic material.

214.03 CONSTRUCTION REQUIREMENTS.

(a) General.

All areas from which select material is to be obtained shall be cleared by removing brush, weeds, tall grass or other objectionable foreign material. Select material shall be obtained to a depth of approximately 150 millimeters, or as otherwise indicated on the Plans, or in the Report of Soil Survey. If stockpiling of select material is necessary, the site for stockpiling must be approved by the Engineer and stockpiled in such a manner that the maximum amount of the material can be recovered. Undue excavation or scalping below the original ground line in removal of the selected material from the stockpile shall be avoided.

(b) Preparation of Roadway.

All roadway and embankment areas shall be finished as shown on the Plans or established by the Engineer prior to
placement of the select material. Slopes and disturbed areas to be covered shall be scarified as directed by the Engineer.

(c) Placing of Select Material.

Slopes, disturbed areas and excavated areas shall be covered with select material to the approximate thickness shown on the Plans. Harrowing, discing, or both will be required as necessary in breaking down clods and lumps.

In the event the heavier clay bearing soils are used as topsoil on the light sandy soils, the harrowing and discing shall extend to such a depth as to result in a more homogeneous mixture of the two soils. Sufficient rolling and manipulation with placing or spreading equipment, and wetting if needed will be required to consolidate the select material with the finished grading.

214.04 METHOD OF MEASUREMENT.

The Engineer may elect to use the quantity shown on the Plans for the basis of payment for “Placing Select Soil” provided that the project is constructed essentially to the lines and grades shown on the Plans. Select soil shall come from within the limits of the construction at those areas designated on the Plans.

When the Plans have been altered or when disagreement exists between the Contractor and the Engineer, as to the accuracy of the Plan quantity in any balance or borrow area or the entire project, either party shall have the right to request and cause the quantity involved to be measured. When the quantity is measured for payment, the quantity for select soil will be measured in place by the cross-sectional area or the three dimensioned method and computed in cubic meters. All area measurements will be based upon slope measurements.

The “Selected Embankment Material” shall be measured by the cubic meter in the vehicle at the time and place of unloading or at such other point as may be designated by the Engineer. Selected Embankment material shall be furnished by the Contractor from sites approved by the Engineer.

214.05 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract price per cubic meter for “Placing Select Soil”, which price shall be full compensation for hauling, stockpiling if required, scarifying if
required, placing and for all equipment, labor, tools and incidentals necessary to complete the work.

The amount of completed and accepted work, measured as provided above, shall be paid for at the contract unit price per cubic meter for "Selected Embankment Material (Vehicle Measurement)", which price shall be full compensation for furnishing, loading, hauling and placing the material and for all labor, equipment, tools and incidentals necessary to complete the work.