

DIVISION 200

EARTHWORK

SECTION 201.00 -- EARTHWORK INSPECTION CHECKLIST

EMBANKMENTS/EXCAVATION

SSHC References:

Section 205 Excavation & Embankment
Section 1033 Aggregates

Other References:

NDR, Materials & Tests, Earthwork Engineering Guide
NDR Materials and Sampling Guide
NDR Standard Test Methods

Inspection Crew:

Grade Inspector

Inspection Equipment:
(AASHTO T 238)

Nuclear Density Gauge (With Manual)
Nuclear Density Gauge probe puller or auger.
Thermometer (Surface)
Scale (Dept. of Ag. Certified)
Metal Thickness Ruler
3 m (10 foot) straightedge
Gravel Sampling Bags

Equipment
(NDR T 205)

Spade.
Rubber Balloon (flexible membrane)
Sand.
Calibrated container with an air valve and a volume indicator.
Base plate.

Embankment/Excavation
Procedures:

General Comments:

1. The operations of excavating the roadway and borrow material (Roadway Excavation) and the placing, compacting and finishing of the excavation material in the embankments or fills (Embankment) are inspected and controlled as a single "Grading operation".
2. The value of grading may be considerable.
3. "No building is better than its foundation" and good quality embankments and subgrade are essential to the good performance and quality of the base course and pavement structure.
4. The grade inspector's work is of the utmost importance in producing a quality riding surface for the motorist.

- See Subsection 1300.03
5. The large and fast grading equipment employed by grading contractors means inspector should be on site to sample each lift.
 6. The inspector should be thoroughly familiar with *SSHC Section 205 Excavation and Embankment*.
 7. Check all contract documents for grading requirements.
 8. The type of embankment compaction will be specified in the plans (generally on Sheet No. 3).
 9. Construction notes in the plans should be noted and checked against physical features on the project. The right of way should be checked for physical features and obstructions which may not be shown in the plans. Typical items to be checked:
 - a. Check the construction widths needed, and fences which must be moved, and compare them with the available right of way and contracts for additional right of way, borrow and construction easements.
 - b. Utility pole lines - check against construction limits and utility agreement provisions.
 - c. Survey or other type monuments or markers - mark or relocate.
 - d. Selective placement notes.
 - e. Trees or shrubs which are indicated in the plans to be preserved -mark as necessary.
 - f. The Design file contains all of the preliminary and design information of the soils, pit sketches and contracts, preliminary soil compaction curves and soil tests.
 10. Rights of adjacent property owners will be protected.
 - a. Tile lines and intakes should be located, replaced, and repaired to maintain the integrity of the subsurface drainage. (Preventing unintended drainage from reaching adjacent property.)
 - b. Right-of-way contracts should be checked for possible special negotiated items which should be included in the work being done.
 11. Any contractor operation that causes damage to partially completed or completed work shall be reported to the Project Manager and noted in the Daily Diary.
 12. Make sure the contractor installs silt fences prior to commencing soil disturbing work.

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| Preconstruction Conf: | 13. | Preconstruction Conference (See Subsection 102.01) |
| 1-800-331-5666 | a. | The Project Manager should go over the unusual, difficult, or special items with the grading inspector, and with the contractor. |
| | b. | Remind the Contractor to call "1 CALL - Diggers Hotline of Nebraska", for buried utilities, pipe lines, sewers, communication cables, etc. - check for possibility of such not being shown and be sure provisions are made to mark or protect as necessary to prevent damage. |
| | c. | Inspection and Control of Grading Operations |
| | d. | The contractor's Pre-Watering Plan should be presented and discussed. |
| | e. | Discuss selective placement requirements. |
| | f. | Determine what contractor will do to keep stockpiles free from contamination. |
| | g. | Removal and storage of topsoil materials, shall be discussed. |
| | h. | Project schedule. (<i>SSHC Subsection 108.07</i>) |
| | i. | Partnering procedures. |
| | j. | Traffic control. |
| | k. | Archeological & palentological discoveries. |
| | l. | Environmental issues(Erosion Control, Wet Lands, Migratory Bird Nesting) |
| | m. | Detours and Shooflies. |
| | n. | Railroad Special Provisions. |
| | o. | Safety issues (Guardrail removal, etc.) |
| | p. | Material submittals. |
| | 14. | Site preparation such as clearing and grubbing, wetlands preparation, removals, and vegetation disposal on cuts, fills, and borrows are accomplished according to contract documents. |
| Stockpiling: | 15. | If stockpiling of selective placement material is necessary, <u>no payment</u> is made for re-excavation. (Topsoil, sand, or any soil identified as select materials.) |
| Clearing & Grubbing: | 16. | If contract has "Large Tree Removal" count and record trees before work starts. |
| A large tree has 1 m (3 foot) circumference at 1 m (3 foot) above ground line or if only the stump remains, a stump of 1 m (3 foot) circumference at ground level. | 17. | <i>SSHC Subsection 204.02</i> limits the surface area that the contractor may disturb to 75,000 m ² (90,000 square yards) plus an equal amount of clearing and grubbing area. |
| | 18. | The Project Manager may increase these limits but only by written notice to the contractor. |
| | 19. | The written notice should include justification |

- for the increase and special procedures the contractor must use to safeguard the environment.
20. Copies of this notice must be forwarded to the Construction Engineer and the District Engineer.
21. 75,000 m² (90,000 square yards) is equal to approximately 1.6 km (1 mile) on an average project.
- Soil Moisture:
22. Check the moisture content of the excavation and borrow material 1-5 days before the contractor starts work.
23. Discuss the drying or moistening of the excavated material.
24. Check to see if contractor knows the condition of the soil.
25. Verify how the contractor will control moisture in Class "III" embankments
26. Contractor should mix clay/non-granular material to uniformly distribute the moisture and various soil types before compaction.
27. Pre-Watering can be wasteful. Ponding or sprinkling may require more water and more work than wetting the soil as it is placed.
- a. But the moisture content will be more uniform and dust will be eliminated.
 - b. The contractor is responsible to obtain the soil samples both before and during the water application.
 - c. The Project Manager will run moisture tests to determine water application rates and to check the progress of the penetration. Use nuclear density gauge to determine the moisture content at different elevations below the surface up to depth of cut. Compare the amount of prewater to the expected amount that would be required if added at time soil is placed.
 - d. The following example does not allow for water lost by evaporation, run off, etc., and will need to be supplemented by information derived from subsequent testing.
 - e. As a precautionary measure against overwatering, leave some dry material for mixing with soil which was over watered.
(Required water per cubic meter) (cubic yard) -
(Natural in place water in the soil per cubic meter) (cubic yard) = Amount of water to add or
if negative result, the amount of water to remove
per cubic meter (cubic yard).
 - f. Preserve the natural vegetation on the area until the watering is complete.

- g. If the vegetation is removed before watering, or the soil type, slope, or condition warrants, the ground should be ripped 650 mm (2 feet) deep on its contours approximately 1.2 m (4 feet) centers to allow penetration of water and minimize runoff.
 - h. Adjust the application rate to control runoff and erosion.
 - i. Construct dikes to control runoff and erosion.
 - j. Document any wasted water in field book.
 - 28. Excavation areas should be disced immediately after pre-watering to reduce evaporation.
 - a. A two to three week curing period is necessary to permit the water to move downward and become uniformly distributed in the soil.
 - b. The importance and length of this curing period will vary with the soil type and conditions of the soil. (Clay very important--sand not important.)
- Compaction:
(See *SSHC Subsection 206.03 para 9*)
- 29. Compacting equipment which produces a glossy surface shall not be allowed. This may cause lamination.
- 30. PM should approve all haul routes over structures.
- 31. Know the moisture/density requirements for each section of the project.
 - a. Review *SSHC Subsection 205.03* for construction methods and procedures which give moisture, density, and lift thickness requirements.
- 32.
 - a. A good practice is for the contractor to spread the soil as thinly and smoothly as practicable, to distribute the hauling equipment over the embankment to minimize the rolling.
 - b. Discing is required to get uniform density.
 - c. Layers must be compacted before the next layer is placed.
- 33. Require rolling over entire area--completely to the outside edges.
- 34. Require that hauling and leveling equipment is routed over the full width of the embankment.
- 35. Visually check the subgrade and the embankment under compacting equipment.
 - a. When a sheepsfoot walks out of soil you have good compaction.
 - b. Peorian clays may show movement/instability and yet be at specified density. (When this occurs, additional work is necessary to stabilize the fill.)
- 36.
 - a. Compare earthwork to the stakes--tell the Project Manager and the contractor if something does not look right.

- b. Make sure stakes are uniform and easily read.
- 37. Run one-point curves for soils that do not have corresponding compaction curves.
- Subsurface Concerns:
 - 38. Insist that all objectionable material such as logs, vegetation, trash, or unsuitable soils are removed before fill is started.
 - 39.
 - a. Require old pavements to be removed if embankment will not be greater than 1 m (3 feet). If more than 1 m (3 feet) of embankment the pavement must be broken-up.
 - b. *SSHC Subsection 104.06* defines "minor obstruction" and lists examples of when the contractor should be paid extra for removal of unforeseen obstructions.
- Drainage:
 - 40. The roadbed will be adequately drained and protected at all times. (Poor drainage during construction often results in an inferior construction.)
 - a. The roadbed should be tight (shaped, bladed smooth, and rolled, so as to shed water) at the end of each day.
 - b. Flowable fill, granular fill, drain pipes, or other requirements may be necessary to permanently correct the problem.
- Settlement:
 - 41. Things to check:
 - a. Settlement or side slip may result in slopes or sidehills if not properly stepped or plowed.
 - 42. Settlement may result at Grade points (0-0 sections) due to fill taper, improper or insufficient compaction and different soil type (Subsoil - topsoil - parent soil) meeting. Particular attention should be given to the compaction of the new embankment at 0-0 points. Usually blending to 1 m (3 feet) depth is required.
 - 43. Settlement of areas adjacent to or over structures frequently occurs. Take additional density readings in these areas.
 - a. Proper placement and compaction of material in the areas inaccessible to rollers and the earth moving equipment will eliminate this problem.
 - b. This involves close contact inspection of compaction performed by small mechanical tampers, which is tiresome, manual work.
 - c. The inspectors' must confirm that this work is properly performed.

- d. When the slope is greater than 1-vertical to 4-horizontal, step the ground to prevent wedging action against the structure.
 - e. Use selected soil which will compact readily, if available.
 - f. Silty soil should not be used.
 - g. During backfill operations, displacement of wing or abutment walls may be checked by erecting a "telltale" before backfilling is started and checking the wall for movement as the backfill progresses. If movement is detected, backfill operations should be suspended and the Project Manager advised of the problem.
44. Watch for and report unstable and unanticipated settlement to the Project Manager and Materials & Tests Engineer.
- a. Bulging at the toe of the slope.
 - b. Cracks running parallel to centerline are indicators of unstable embankment conditions.
 - c. Subsidence at bridge ends, excessive cracking inside box culverts or unanticipated swales are signs of excessive settlement.
 - d. Pumping action.
- Foundation Engineer
(479-4678)
45. Where surcharges are included in the plans as work to be accomplished during construction, the Soil Mechanics Section of the Materials and Research Division wishes to be informed before the beginning of the construction of the surcharge.
- a. Construction progress and anticipated paving date may allow a change in the height of the surcharge necessary to complete the anticipated settlement.
- Backfill:
- 46a. Confirm culvert backfill material meets specification requirements.
- 46b. Backfills on box and pipe culverts should be brought up evenly on both sides at the same time to avoid displacement of the structure.
47. When tamping under the lowest 90° of a culvert place elevation check stakes at the ends of the pipe to detect any rise.
48. The grade inspector should be alert to possible damage to any drainage structures which the contractor's heavy equipment may cause by crossing or working over such structures, and particularly to possible damage to pipe culverts covered with minimum fill.

- a. The contractor shall be informed immediately of any observed damage and the information recorded in the field book.
- Grades, Lines & Profile:
- 49. Large shortages or overages of excavation material may be encountered.
 - a. Revising the grade lines, rebalancing, or obtaining additional material outside construction limits or balance points require prior District approval.
 - b. The Project Manager should be contacted on all overage or shortage conditions.
 - 50. The grade inspector should inspect and advise the Contractor of deviations from the lines and grades as staked by the Project Manager.
 - 51. The inspector should note any actual construction balance points in the grading notebook.
- See Survey Blue Tops
- 52. Finish grading
 - a. The roadbed surface should be finished within 15 mm (5/8 inch) of the finish grade stakes.
 - b. The shoulder lines and slopes should be reasonably true.
 - c. Side ditches and borrow areas should be finished reasonably true to grade and should drain.
 - d. Finish grade stakes should be set for finishing flow line grades in borrow pits if the width and grade are such that stakes are essential to finishing the pit to provide proper drainage without ponding.
 - e. Finish grading must be completed on a timely basis so that erosion control measures may progress satisfactorily.
- Covercrop Seeding:
(Agronomist Dick Gray
479-4537)
- 53. All finished work and any other areas that need erosion control should be kept current with covercrop seeding performed as the work progresses.
 - 54. Any repair required on a section that has been tentatively accepted will be paid as extra work (unless considered to be the fault of the contractor). (*SSHC Subsections 105.13, 107.14 and 109.08* define tentative acceptance.)

Soil Tests:
(Form DR 86)

- 55. The inspector should require the contractor to move the field lab as necessary to facilitate the field testing.
- 56. The grade inspector will test soil samples for two primary purposes.
 - a. To monitor the effectiveness of the contractor's operations and use of forces and equipment in controlling the moisture and the compaction of the soil. These are called "job control tests".
 - b. To verify that the completed work (compacted embankment) meets the requirements for moisture (if specified) and density. These are called "acceptance tests".

The minimum number of tests necessary to verify that the compacted embankment meets the specified requirements for moisture and density will be shown in the *Materials Sampling Guide*.
- 57. The number of moisture-density tests will vary but the minimum is spelled out in the *Materials Sampling Guide*. However, the inspector is encouraged to take additional tests as are necessary because with the nuclear density gauge, moisture and density are easily monitored. "Job control tests" which indicate the need for additional work to meet moisture-density requirements shall not be counted in the "acceptance tests" since a check test would be required in the area represented by the original sample.

Grading Diary:

- 58. Grading diary, shall include:
 - a. Date, weather, soil conditions.
 - b. Information on contractor's forces -include numbers of personnel, numbers, types, and sizes of equipment, hours worked each day.
 - c. Data on work in progress -section of the project, balance limit, channels, dikes, rough grading or finish grading, etc. This should include a record of known construction balance points, particularly balance points between "off-site" borrow pits.
 - d. Weather conditions or other conditions affecting the progress of or delaying prosecution of the work, equipment break downs, etc.
 - e. Sufficient records of the progress of the work, to enable the Project Manager to prepare progress reports, working day reports and progress estimates accurately.
 - f. Estimates of wasted water, and cause.
 - g. Disputes.

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| | | h. | Contractor's progress should be monitored to check that the work is being completed according to the construction schedule. Report major deviations. |
| Field Book | 59. | | Field Book Entries |
| | | a. | Any supporting information or records necessary to facilitate the preparation of the required reports on sampling and testing (see Materials and Research "Earthwork Engineering Guide"). |
| | | b. | Calibration of distributor water tanks and of meter accuracy if the water is metered. |
| | | c. | Daily record of water hauled (on large projects the water applied may be kept in a separate "water application notebook"). Include location (i.e., station of the excavation, borrow pit, embankment or surface) where water was applied and obtained. |
| | | d. | Select placement, confirming information, etc. |
| | | e. | Identify all work performed on the project by the contractor and subcontractor actually completing each pay item. |
| | | f. | Make entries supporting extra work quantities. |
| | | g. | Get the contractor representative signature agreeing to pay quantities in the entry. |
| Measurement: | 60. | | Method of Measurement |
| | | a. | See CM Subsection 1300.04 for instructions to take cross sections. (Use Geopak when possible.) |
| | | b. | Measure and pay authorized excavation of material below grade and overbreakage or slides. |
| | | c. | Unsuitable material which is removed below grade in excavation areas, or below existing ground in embankment areas, is considered to be "authorized excavation of material below grade". |
| | | d. | If the existing ground in an embankment area must be dried to such a depth as to be impractical to dry in place, the contractor may be ordered to undercut (excavate below grade) and haul this material to higher areas, drying and using it in the construction of embankment. |
| | | e. | The volume of the undercut would also be considered to be authorized excavation below grade, and the volume measured and paid. |
| | | f. | Larger quantity under cuts should be authorized by the District Construction Engineer and the volume should be measured by cross sections. |

61. Tell the Contractor what is "larger" at the preconstruction conference.
- Water, Applied
- a. Distributor truck tanks may be calibrated by determining the mass of both the empty and filled truck. The net mass (kg) (lb) is the tank capacity, in liters (gallons).
 - b. Each truck tank should be numbered and the numbers and capacities recorded in the water haul notebook.
 - c. Calibration of meters for the pre-watering methods may be accomplished by pumping through the meter into a water truck and checking the mass of water against the liters on the meter.
 - d. Meters may be calibrated by registered pump and meter service companies and their calibrations may be used if they are current. Calibrations are good for one year.
 - e. Inspector must convert meter readings in English units to S.I. units (metric).
 - f. Trucks that are too large to measure their mass on available commercial scales may be calibrated from capacity if model numbers, serial numbers, etc., are the same as shown on the specifications literature.
 - g. If the water is measured by tank count, the grade inspector will record each day, the number and size of loads delivered to the project by each truck.
 - h. If the quantity of water is measured by a meter, the grade inspector will record the meter readings at the beginning or ending of each day or shift.
62. Calibration
- a. Water meter calibration sheets usually show a correction factor to be used to convert meter volume to actual volume for differing rates of delivery.
 - b. The rate of delivery for the application can be determined by timing the meter and computing the liters (gallons) per minute being delivered.
 - c. The liters (gallons) per minute delivered will vary with the length of pipe and number of sprinkler heads being used.
 - d. Therefore, the delivery rate should be determined and documented for each pipe setup so the correction factor can be determined and used.

- 63. Wasted Water
 - a. The quantities of water wasted or not eligible for payment should be entered in the records each day with substantiating or estimating information to support the quantity deducted or ineligible for payment.
 - b. The contractor should be furnished the documented quantities of water wasted each day, to facilitate resolving of any discrepancies in quantities.
 - c. The grade inspector is responsible for the proper determination of the quantities of water measured for payment, and each day's entry in the notebook should be validated by his/her signature and agreed to by the contractor and signed.
- 64. Metering is more practical and economical than a tank measurement.
 - a. Encourage the contractor to provide an acceptable meter at the point of loading the trucks to measure the water for payment.
 - b. If the water is being applied by the truck sprinkler method, the "Water Applied Haul Sheet" (DR Form 8) may be prepared by the truck driver, and used by the grade inspector to determine the distribution of water applied on various sections of the project, finishing, etc., and for cross-checking quantities.
 - c. These sheets are to be used for this purpose only and not for payment, and should not be submitted with the final records.

Critical Construction Requirements:

- 1. Preconstruction Conference
- 2. Verify how the contractor will control moisture in Class III" embankments.
- 3. Visually check subgrade and embankment under compacting equipment.
- 4. Stability and Settlement Indications. Watch for and report to the Project Manager and Materials & Tests Engineer indications of instability.
 - a. Bulging at the toe of the slope.
 - b. Cracks running parallel to centerline are indicators of unstable embankment conditions.
 - c. Subsidence at bridge ends, excessive cracking inside box culverts or unanticipated swales are signs of excessive settlement.
 - d. Pumping action.
- 5. The roadbed will be adequately drained and protected at all times. Roadbed should be bladed smooth and rolled tight at the end of each day.

	6.	All contract pay items will be properly documented.
Safety Areas:	1.	Maintained Traffic <ol style="list-style-type: none">Contractor's cars and trucks must adhere to project traffic control procedures.Flaggers must be certified and use proper procedures.
	2.	The contractor should be told to stop all unsafe activities such as: <ol style="list-style-type: none">Speeding trucks and other equipment.Inoperable back-up alarms.Inoperable or nonfunctional strobe lights.
	3.	Contractor vehicles shall be parked beyond the lateral obstacle clearance.
	4.	Worker protection barriers should be placed as shown in the plans.
	5.	Traffic markings should clearly indicate traffic flow.
NDR Tests:	1.	Nuclear Density NDR T 238
	2.	NDR T 99 Soil Density (See Earthwork)
	3.	Soil Type NDR T 87
	4.	NDR T 2 Sampling Aggregate from Stockpiles
	5.	Moisture: NDR T 217, T 205, or Nuclear Density Gauge AASHTO T 238/ASTM D 2922.
Sampling Requirement/ Freq.:	1.	See Materials Sampling Guide
Inspector's Records & Forms	1.	Grading diary
	2.	Water application notebook
	3.	Field book
	4.	DR Form 8, Water Applied Haul Sheet
	5.	DR Form 86, Weekly Report of Moisture-Density Tests or Nuclear Density Machine Output
NDR Point of Contact	1.	Materials & Tests Soil Mechanics Engineer 479-4678

202.00 GENERAL GRADING INSTRUCTIONS

Grading Inspection

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A grading inspector should devote the majority of his/her time to observing and checking the contractor's excavating, drying, moistening, spreading and compacting operations, and securing samples, vary the balance of his/her time in testing samples and making neat and accurate records. The grade inspector will need to check moisture (if control is required) and density at the rate shown in the Materials Sampling Guide (usually check moisture and density once for each 2,500 cubic yards (2000 m³) placed and once for each 1000 feet (300 m) of shoulder or subgrade).

Blue Tops

After the roadway excavation and roadway embankment has been constructed substantially to grade elevations, the construction survey party will set finish grade stakes for finishing the grade or subgrade to the lines and grades shown in the plans. The blue top book elevations must be checked to insure they conform to the information shown on the plan cross-sections.

Rounding of Hinge Points

The Department has determined that the rounding of "hinge points" in the cross-sectional elements can significantly reduce their potential as hazards. Rounded slopes reduce the chances of an errant vehicle becoming airborne, reduce the hazards of encroachment, and afford drivers more control over their vehicles.

The Construction Division suggests that finish grading and ground preparation activities that result in the rounding of hinge points be permitted, if not encouraged. For example, an 8' disc that "hangs over" a 6' shoulder will provide the desired effect and should not be ruled unacceptable. However, this suggestion is not meant to imply that the cuts and embankments may be built to other than the cross-sections shown in the plans.

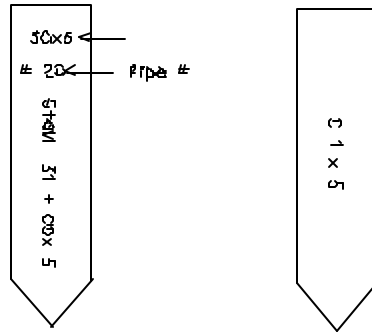
Erosion Control

@

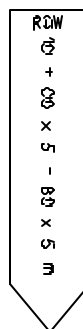
The contractor must have as a minimum silt fence or other erosion control measures as shown in the plans installed to keep silt on our ROW before any grading is allowed.

CULVERT STAKES

Offset



ROW STAKES



Green-yellow flag for easements

Orange flag ROW

203.00 CLEARING AND GRUBBING (SSHC Section 202)

203.01 CONSTRUCTION METHODS

There may be considerable elapsed time between an estimate of clearing and grubbing and the actual work. If actual site conditions are different than those shown in the contract documents, the following suggested resolutions are provided:

- @ • If the pay item is "General Clearing and Grubbing" then no action is necessary because tree removal is subsidiary **for trees with circumference of 80 inches or less at 40 inches above ground level.**
- If the pay item is "Large Tree Removal" then a new tree count should be taken and recorded before the contractor starts work.
- @ • If **a** tree has been cut, leaving branches and the stump, payment is covered under "Clearing and Grubbing" or "Large Tree Removal." If the stumps is the only item remaining and payment method is large tree removal, you would count just the stump as a tree.
- If a fence is partially removed or in poor condition but requires an identifiable removal operation, full price for fence removal may be made.
- @ • Where brush and/or junk has recently (**After the letting was** announced) been deposited within the right-of-way, a price agreeable to both the contractor and the Project Manager may be negotiated or a force account extra work order may be used.

Disposal of Waste

Disposal of the clearing and grubbing waste is restricted according to applicable federal, state, and local laws. Disposal options include:

- Open Burning
- @ Contractor must obtain necessary permits. In locations where burning is allowed, the burning of the waste must be located at least **1/4 mile (400 m)** from any inhabited building.
- Chipping
- Chipping of the down timber for mulching material.
- Firewood
- Salvage of the logs for firewood.
- Landfill
- Disposal at a "yard waste" landfill.

204.00 REMOVAL OF STRUCTURES AND OBSTRUCTIONS

204.01 CONSTRUCTION METHODS

Removal and Disposal of Old Pavement

@ Pavement is removed from all cuts and fills with less than **3 feet (1 m)** of cover. The removed concrete is to be broken into pieces with an area of **2 square feet (0.2 m²)** or less if placed in fills. (*SSHC Section 203*)

@ Where existing PCC pavement would be located more than **3 feet (1 m)** under the proposed profile grade, the PCC pavement will be required to be broken into surface areas that will not exceed **4 square feet (0.4 m²)** when left in place. If the existing pavement has been resurfaced, the asphalt resurfacing will be removed if the PCC pavement is to be used as slope protection or in a waterway. (*SSHC Subsection 205.03*)

Disposal of Asphaltic Concrete Pavement

The contractor shall manage the material in accordance with all current federal and state rules and regulations. (*SSHC Subsection 107.01*)

@ Salvaged asphaltic cement concrete pavement may be used as special backfill material. When intended for special backfill material, the ACC pavement is normally removed by scarification. Removed bituminous materials may be placed in the outer slopes of embankments, **12 inches (300 mm)** below the finished shoulders and foreslopes. (See *SSHC Subsection 205.03*)

Hazardous Material (Wells, Asbestos Fibers in ACC, Building Removal, Underground Storage Tanks, Archeological Remains)

Appropriate federal, state and local regulations must be followed. (See *Construction Manual Division 1100* for further guidance).

205.00 EXCAVATION (SSHC Section 205)**205.01 DESCRIPTION**

The importance of being able to identify soil types cannot be overemphasized. Some soil types have to be placed in the proper location. The inspector must be sure that the work is performed according to the plans.

The balance factor is the change in quantity from cut to fill and includes subsidence, change from borrow density to the final compacted density, incidental loss, and all other factors changing density.

205.02 MATERIAL REQUIREMENTS**Embankment and Excavation Soils Criteria (SSHC Section 206)**

There are four basic categories of earthwork.

- Excavation
 - ◆ Usually final cross sections determine pay quantity.
 - ◆ No off-site borrow is required.
- Excavation (Established Quantity)
 - ◆ Payment is based on the plan quantities.
 - ◆ No off-site borrow is required.
- Excavation Borrow
 - ◆ Usually final cross sections determine pay quantities.
 - ◆ Borrow will be needed from off-site source(s).
- Earthwork-Measured-in-Embankment (SSHC Subsections 205.04/205.05)
 - ◆ Plan quantities of the proposed embankment are used to determine the payment quantity.
 - ◆ Contractor must forecast shrinkage. (A change from borrow density to compacted density.)
 - ◆ Borrow from off-site sources.

"Excavation" and "Excavation Borrow" are paid based on final cross sections. The Project Manager may forego the final cross sections when the contractor agrees, **in writing**, that the plan quantities, **including field adjustments and revisions**, accurately reflect the work done. **Payment will be made under the original contract items. It is not necessary to eliminate the original contract item and establish a new "E. Q." item. Refer to Page 129.**

The Project Manager and the contractor may elect to measure areas in question and accept the remaining areas as "Established Quantities."

Unsuitably Wet Material

In low-lying areas and in wet soil contact zones, it may be necessary to declare most of the material as unsuitably wet at the direction of the Project Manager. A granular material that will drain can be used to replace the wet soil. An effort should be made to provide an outlet for water which may occur in the embankment or subgrade. Most wet soils that are removed can be dried and reused in some other area.

Soft shale, in some cases, can be moved in a manner similar to soil excavation. Shale cuts are usually benched and covered with topsoil in accordance with the plans. If unexpected shale is found, contact the Materials and Research Soil Mechanics Engineer. Slides can occur in backslopes of shale cuts, and flatter slopes may be required.

Rock Material (See *SSHC Subsection 107.08 and Section 206*)

If material to be excavated is too tough to be ripped, the Project Manager, contractor and a geotechnical specialist experienced in blasting should discuss the aspects of the work to be done.

Contractor Furnished Borrow Areas (*SSHC Subsection 205.03*)

On some projects, the contract documents will require a "contractor borrow." In these cases, the contractor is responsible for submitting a site approval request to the Construction Division (allow 60 calendar days for the Construction Division to obtain site approval from Nebraska agencies).

Construction Engineer
Nebraska Department of Roads
1500 Highway 2
P.O. Box 94759
Lincoln, Nebraska 68509-4759
Fax No. (402) 479-4854

The approval request shall include:

- A Borrow Pit/Materials Pit Identification and Evaluation Form for each site.
- An aerial photo or topographical map showing the location of the pit site (one photo or map for each site).

No material will be removed from the site prior to the Project Manager's written approval of the sites.

The contractor shall also obtain a Corps of Engineers approval letter for the site and submit this to the Project Manager. The contractor shall submit a topographical map or a photocopy of an ASCS aerial photograph showing the exact location of the proposed pit sites to the Corps of Engineers. A legal description of the location should also be included.

Corps of Engineers
Regulatory Branch
P.O. Box 5
Omaha, NE 68101-0005

ASCS aerial photos are available at county ASCS offices at a nominal cost. ASCS aerial photos cover agricultural ground only. In some instances, aerial photos of urban areas are not available from the ASCS.

Topographic maps may be obtained from the following source:

University of Nebraska
Conservation & Survey Division
113 Nebraska Hall
Lincoln, NE 68588-0517
Attn: Judy Otteman
(402) 472-7523

Approval For Soil Type (Contractor furnished borrow)

- The Contractor will obtain soil samples to verify material is acceptable. The Project Manager will forward the samples to the Materials & Tests Office for evaluation. (See *SSHC Subsection 205.02.*)

Preservation of Cultural Resources (*SSHC Subsections 205.03 and 107.10*)

Cultural resources are the composite of archaeological and historic/architectural resources in an area. A common cultural resource site is a burial ground or remains of a Native American village.

Nebraska law requires action be taken to insure that cultural resources are not damaged or destroyed.

If a cultural site is discovered during construction, the contractor is required to temporarily discontinue work at the site. Upon discovering such a site, the Project Manager shall notify the Construction Office of the finding.

Nebraska Game and Parks Commission Approval of Borrow Sites

- All Contractor borrow sites must be submitted to the Nebraska Game and Parks Commission (NGPC) for approval. The NGPC will examine the proposed site for endangered plant and wildlife species and for potential Platte River drainage system depletion. This process can take 60 days or more.

Borrow Pit/Materials Pit Identification and Evaluation

Project No.:		Date:
Project Location:		Control No.:
Requesting Contractor:		County(s):
		Phone:

Pit Size and Location

- Pit Identification No.: _____
- Identify the precise location of the pit (to 2.5 acres):
 _____ ¼, of _____ ¼, of _____ ¼, of _____ ¼, of Section _____, T- _____ -N, R- _____ -
- Attach a copy of an ASCS aerial photo and/or a copy of an USGS 1:24,000 scale topographic map precisely depicting the pit location.
- Give pit dimensions (in feet) and orientation (NE-SW, etc.) for long axis (length), short axis (width) and depth.
 Length: _____ Feet: _____ Orientation: _____
 Width: _____ Feet: _____ Orientation: _____
 Depth: _____ Feet: _____
- This is a: ☐ Dry Pit ☐ Wet Pit
- Will this pit pond water when completed? ☐ Yes ☐ No
- Pit location is owned by: ☐ Private Owner ☐ Commercial/Business
☐ State/County/City Government ☐ Federal Government
- Name of Owner: _____

Pit Characteristics

- Pit location is for: ☐ Borrow ☐ Material ☐ Both ☐ Other (Explain)
- To your knowledge, has this pit location been used previously for borrow and/or materials? ☐ Yes ☐ No ☐ Unknown
- The pit location is presently used for: ☐ Commercial Borrow/Materials ☐ Pasture
☐ Row-Crop Agriculture ☐ Stock Pond
☐ Irrigation Recharge Pit ☐ Urban/Suburban Residential
☐ Stockpiled Borrow/Material ☐ Other (Explain)
- Vegetation cover is: ☐ Grass ☐ Trees ☐ Weeds ☐ Crops ☐ Other (Explain)
- Name, address, phone number of contact person, if additional information is required:
Contractors requesting use of borrow or materials pits for Nebraska Department of Roads' construction projects need to identify their location and character on this form. Please fill in the blanks with the correct information or select appropriate answers to questions. Send the completed form to the Construction Division, Nebraska Department of Roads, PO Box 94759, Lincoln NE 68509-4759 or FAX to (402) 479-4854.

Approval Block – For State Use Only

Nebraska State Historical Society	Nebraska Game and Parks Commission
Date received from the contractor: _____	Date received from the contractor: _____
Date submitted to NSHS: _____	Date submitted to NGPC: _____
Return due date: _____	Return due date: _____
Approval date: _____	Approval date: _____
Non-approval date: _____	Non-approval date: _____
Signature: _____	Signature: _____

205.03 EQUIPMENT (*SSHC Subsection 206.03, Paragraph 9.a.*)

- Equipment should be sufficient to meet compaction requirements and the type of equipment used should be recorded in the field book.

Overweight Axle Loads (*SSHC Subsection 105.11*)

All oversize hauling units delivering equipment or materials to the project shall be legal loads and/or have appropriate hauling permits issued by the Motor Carrier Permit Office. The State Patrol Carrier Enforcement Division has enforcement authority outside of the project limits and on those portions of the construction project maintained to through traffic.

Hauling On or Over Surfaced Roads

The contractor must protect from damage all public roads that will be used by the contractor. Usually berms (greater than 300 mm (12 inches) thick) are constructed over the road surface for the earth moving equipment to use.

Certified flaggers are required when the berm is on an active road.

The berm must be removed from the road and shoulders at the end of each day when the road is active and the surface area cleaned.

The berm must be maintained constantly by the contractor. This will allow safe traffic flow over the berm.

205.04 CONSTRUCTION METHODS

Embankment Construction (*SSHC Section 205*)

The construction of embankments is covered in *SSHC Section 205*. This Subsection provides a more detailed picture of certain procedures mentioned in the *Specifications*. These comments should be regarded as explanatory but in no way supersede or invalidate Specification requirements.

Site Preparation

All trees, shrubs, cornstalks, sod, and other vegetation are to be removed and disposed of according to *SSHC Section 202*. After cornstalks and tall grass are cut and removed, the area within the limits of construction is to be thoroughly disced and scarified.

Deposition of Embankment Material (*SSHC Subsection 205.03*)

On projects where a slope is being widened, "benching" will be required.

Hauling units should be directed over a fill so that uniform compaction will result.

The self-propelled tamping type roller may be used on the embankment area for leveling as long as the unit follows the prescribed rolling pattern, does not spin the power drums, and accomplishes both rolling and leveling to the satisfaction of the Project Manager.

Decisions and unusual situations should be recorded in the field book.

Compaction

Embankments shall be compacted as prescribed in *SSHC Subsection 206.03*.

Class I embankments are to be rolled when specified by special provisions or plans; no moisture-density tests required.

Class II embankments require rolling; no moisture-density tests required.

Class III embankments require moisture-density control. The moisture content of soils being handled for these embankments is very important because the objective is to stabilize soils and improve their engineering behavior by compaction. Maintaining a soil to near "optimum moisture" during grading operations will reduce the time and compaction effort necessary to obtain the required density.

- Note:
- Class I and II embankments require only enough moisture in the soil to attain a compaction acceptable to the Project Manager.
 - Class I - no moisture requirement by *Specifications*.
 - Class II - drying only required if necessary to obtain compaction.

Moisture control; water acts as a lubricant and helps the soil particles move relative to each other into a denser condition when compaction effort is applied. Dry soils must have water added and be thoroughly mixed before compacting. A general guide would be to add water to silt-clay soils when lab or field tests indicate moisture content is five percent or more below the optimum.

When wet and dry soils are placed in the same lift, they should be disc blended to a uniform condition prior to compaction.

Soft Ground; embankments that cross low wet areas may require an initial stabilization layer which is granular material. Usually the Project Manager will permit a working platform, up to 1.0 m (3 feet) thick, to be placed in one lift when bridging a soft area. Sand, gravel, or well graded crushed rock may be used for this initial lift. Compaction should proceed with caution. In general, the use of vibratory rollers should be discouraged since the vibrations may cause underlying soil to pump into the granular fill. In some areas, capillary action will move moisture into the upper grade by equipment moving on it. Contact Materials & Tests when you encounter this situation and it is not covered in the Plans.

◆ HELPFUL HINTS

Sand embankment directly deposited by dredge pipe will obtain about 95% of NDR T 99 proctor density by the transporting water flowing through the fill. For this method of placing sand, other methods of compaction may be required. Testing should be done at regular intervals and recorded in the field book. The time for this test is just after the free water leaves the top 200 mm (8 inches) of fill and can be done very quickly with a nuclear density gauge.

Sand lifts should be placed the full width of the embankment. If this cannot be done, a sand trench drain should be placed to eliminate ponding water.

If soils are too wet, compactive effort increases the pore water pressure and holds the particles apart. The upper limits on moisture has been set above optimum and recommendations are based on the type of surfacing or embankment designed. (Requirements are shown on the plans and/or in design files).

Wet soils can become elastic and result in heaving or pumping of the embankment when loads are applied. This is caused by water pore pressure and the strength of the soil is substantially reduced. If the embankment has not been damaged, equipment should stay off of the area long enough to allow excess pore pressures to dissipate naturally. If loading were to continue on wet soil, it may have shear failure or rutting. The Project Manager should explain to the contractor that continued operations can only worsen the situation and require removal. Take a moisture measurement to show the contractor that the soils moisture content is rising and to document that the contractor is damaging the soil.

The contractor should be encouraged to route hauling equipment as evenly as possible over the entire surface area of the embankment during soil placement. This will reduce possible rutting or damage caused by heavy equipment following one path.

The nuclear gauge for moisture and density determination may be used. Only properly trained and qualified nuclear gauge operators can use a nuclear gauge.

Nuclear gauges are to be operated according to NDR T 238, AASHTO T 238 and ASTM D 2922. Test results are distributed according to the instructions on the test form. This form may be used without field book entries.

Use the nuclear gauges printout as the official project record.

Moisture Density Curves

When a grading inspector is not sure which moisture density curve to use, he/she should review the available soils information at the location in question. If it is determined that there is not a moisture density curve to represent the soil in question, then a 1-point moisture density curve may be run in the field according to NDR T 505. Only use the 1-point curve method until Materials & Tests can determine the complete curve data for the soil.

During compaction, the mold shall rest on a firm surface such as concrete box culverts, bridges, and pavements.

Construction of Embankment Toe Berms

If the plans require a berm, it should be constructed at the same time as the embankment.

Toe berms are built in areas where the roadway is used as a dam for a pond. In these areas the berm is used to protect the embankment from saturation by the standing water. Also to help construct fills on unstable ground. Proper compaction and soil types are needed to reduce permeability of the fill.

Construction of Bridge Approach Fills

Toe stakes should be set and the slopes and the centerline checked during the construction of the embankment. The slopes should be finished to the lines and grade called for in the plans.

In the construction of these berms, particular attention should be given to prevent the incorporation of rocks over 100 mm (4 inches) in diameter as the lifts are placed. Rocks cause extreme difficulty when driving piling or preboring for piling.

The removal of boulders greater than 1 m (3 feet) in diameter in bridge berms should be covered as "extra work".

Bridge approach fills should be constructed to grade with adequate length along the centerline for the bridge contractor to work. This length should be adequate for the bridge contractor's storage of material. Usually 30 to 45 m (100 to 150 feet) are adequate. This can be shortened by mutual agreement between the contractors.

On some projects settlement plates are required along with delay periods for abutment construction. The settlement plate readings are sent to Materials & Tests for comparison with the design settlement predictions. In cases where the settlement differential is minimal (near the end of the delay period), the delay period may be reduced with Materials & Tests approval.

Earthwork-Measured-in-Embankment

Payment for embankment in place will be based on the plan quantity.

Sections of deep fills may have the quantities adjusted, based on settlement plates. These settlement plates should be well protected to insure that they are not damaged or destroyed.

A graph may be plotted with fill height vs. settlement to determine settlement at intermediate heights of fill. Using this chart, the settlement below the original ground line can be determined and plotted. The volume between the plotted settlement line and original ground can then be calculated using the average end cross section method. This volume is added to the plan quantity for final payment.

Prewatering Plan

The contractor shall present a prewatering plan at the pre-construction conference when prewatering is required. The plan should be approved by the Project Manager.

Payment for Water for Embankment Construction

When water is required for compaction of embankments other than Class III, it should be paid for as extra work if no contract item has been provided.

When water is required for moisture and density control, the cost of adding and incorporating water is a part of the item.

Finishing

Finish grading must be completed on a timely basis so that erosion control measures may progress satisfactorily. Special provisions on many projects limit the surface area that the contractor may disturb. Generally, this area is 75,000 m² (90,000 square yards), excluding areas to be paved, plus an equal amount of clearing and grubbing area may be opened up. The Project Manager may increase these limits but only by written notice to the contractor. If used, this written notice should include justification for the increase and special procedures the contractor must use to safeguard the environment. Copies of this notice must be forwarded to the Construction Engineer and the District Engineer. 75,000 m² (90,000 square yards) is equal to approximately 1.6 km (1 mile) on an average two-lane, full grading project. Any repair required on sections that have been tentatively accepted will be considered extra work (unless considered to be the fault of the contractor) and if performed by the contractor they are entitled to additional pay as provided for in *SSHC Subsection 109.05*. Therefore, final cross sections may be taken on a section of grading after it is tentatively accepted per *SSHC Subsection 105.13*.

If the finishing work is not performed on a timely schedule, the Project Manager is advised to follow these progressive steps:

- Project Manager should notify the contractor of the concerns in writing.
- If this does not obtain results, suspend estimate payments.

Tentative Acceptance

Areas that have been final graded may be accepted by the Department. However, do not accept an area until silt fence, cover crop, erosion checks, and other erosion control measures are in-place. Do not tentatively accept areas where the contractor must operate equipment to do other requirements. For example, shoulders and foreslopes should not be accepted until pavement and shoulders are finished. Ditch bottoms are a questionable area for tentative acceptance. Often, the Contractor plans to use material in the roadside ditch bottom to build the shoulder. In these cases, do not tentatively accept the ditch bottom until the shoulder work is also complete.

206.00 TOPSOIL (SSHC Section 207)

206.01 CONSTRUCTION METHODS

Stripping, Salvaging, and Spreading

The areas of stripping, salvaging, and spreading of topsoil should be identified on the plans or Special Provisions.

Topsoil on Roadway Cuts and Embankments

Where sand pockets are encountered on backslopes and where sand is used for embankment, every effort is made by Roadway Design to place topsoil on these areas. Where these situations are missed, every effort should be made by the Project Manager to obtain topsoil for use as cover for the sand areas. If no topsoil is available, see plans for proper erosion control.

206.02 BASIS OF PAYMENT

- As topsoil is removed and stockpiled, the contractor may be paid at one half the item unit price on the progress estimate. At the time the topsoil is spread and finish graded, the remaining one half may be paid on a progress estimate.
- Topsoil quantity is based on the area where the topsoil is placed. The excavation volume is not adjusted when the project has topsoil as a pay item.

207.00 OVERHAUL

SSHC Section 209 outlines the method used to determine the quantity for overhaul.

CHAPTER NOTES:

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