

SECTION 200 - EARTHWORK

200.00 Earthwork. Earthwork includes:

- Section 201 Clearing and Grubbing
- Section 202 Selective Removal of Trees or Stumps
- Section 203 Removal of Obstructions
- Section 204 Obliteration of Old Road
- Section 205 Excavation and Embankment (including borrow materials and blasting)
- Section 207 Stripping Designated Source Material Deposits
- Section 208 Interceptor Ditches
- Section 209 Small Ditches
- Section 210 Structure Excavation and Compacting Backfill
- Section 211 Source Reclamation
- Section 212 Erosion and Sediment Control
- Section 213 Topsoil
- Section 214 Roadside Cleanup.

Many potential earthwork problems can be discovered ahead of time during construction survey staking for earthwork. The Department very rarely performs construction survey staking.

Staking is done either by the Contractor or a consultant working directly for the Department. The survey work includes staking and quantity computations for pay items requiring volume measurements such as earthwork.

The Engineer is required to coordinate with the Contractor prior to work beginning regarding construction survey requirements. The Engineer should review all stake-marking procedures with the Contractor so that misinterpretation of survey stakes can be avoided.

The Contractor is required to compare staked cut and fill depths with the contract plans and report to the Engineer differences found. Verify with the Contractor throughout the work that this comparison is being performed.

Other survey requirements include:

- 1) Providing to the Engineer weekly all copies of all diaries, books and notes.
- 2) Submittal of all measurements and calculations for quantity computations including a copy of all grade calculations, cross section plots, and computer printouts. Format is to be approved by the Engineer.

The initial project staking should be completed prior to the start of earthmoving operations. The initial staking should include staking centerline, reference points, benchmarks, clearing and grubbing, right of way, and slopes. Good survey ties and references are essential. If the initial staking can be accomplished early, most errors and problems can be eliminated. Verify throughout the project that the required information is shown on the stakes.

Since field notes are the basic source document upon which pay quantities are based for volume measurements, require that care be taken so that the field notes are complete, legible, and orderly. Cross-section notes for computer use should be checked in the field for accuracy. All field books should be plainly labeled and numbered and an index of field book numbers kept.

The goal is that any person not familiar with the project can locate essential data easily. Periodic checks should be made to see that field notes are being properly kept.

When utility facilities interfere with or delay the Contractor's operations, the inspector should immediately notify the Engineer. The Engineer should meet with the utility company and the Contractor to resolve the problems and prepare a written report. The inspector should keep any additional records as may be required to substantiate or refute claims for delay.

201.00 Clearing and Grubbing. Clearing and grubbing may be measured by the acre or on a lump sum basis, depending on the contract. Generally, staking of areas to be cleared and grubbed is necessary only when measurement is specified by the acre. Areas clear of vegetation or of negligible or sparse vegetation should be excluded from measurement. All trees, shrubs and vegetation that is not to be removed must be clearly marked as required by the specifications.

Staking. Be familiar with all the staking and surveys within the areas involving clearing and grubbing to protect survey control points and control reference points, benchmarks, slope stakes, etc. Stakes should be set at the clearing and grubbing line with the specified color of flagging attached for easy identification.

The centerline reference points should be located outside the limits of clearing and grubbing, if practical. Centerline control points are less likely to be destroyed by clearing equipment if set with firmly driven iron pins and if they are well marked.

If conditions permit, clearing and grubbing limits may be set at the time of slope staking. Clearing and grubbing areas need not be re-measured provided that they are cleared as staked and so noted in the diary. Whichever method is used, sufficient survey notes and details must be provided to accurately determine pay quantities.

Additional staking for right of way lines is required and may be needed at the same time clearing and grubbing is staked to prevent encroachment on private property.

Disposal of Debris. Refer to [Section 201 Clearing and Grubbing](#) of the Standard Specifications for disposal area requirements.

Inspection Documentation. Adequate inspection of the clearing and grubbing work is essential. The inspector's records are normally used to verify the activity and document estimated quantities for the purpose of progress payments. Inspection records may also provide source data for additional areas of clearing and grubbing due to a slope revision or for other reasons not foreseen when the original staking was accomplished. Documenting in the diary that clearing and grubbing conforms to stakes eliminates the need for re-measure and is good practice.

Any damage to, or encroachment on, private property by the Contractor or any undue damage to vegetation outside the staked clearing and grubbing limits should be brought to the Contractor's attention immediately and recorded by the inspector.

Do not expect the Contractor to clear and grub or otherwise provide special treatment to vegetation in areas not included in the measurement. Where there is the possibility of a dispute, take photographs and review the areas of clearing and grubbing with the Contractor's representative to avoid any misunderstanding as to the areas and limits.

Documentation for Pay Quantity. Diary notations shall be used to verify the activity, date, and location of the work. Quantities are to be computed to the nearest 0.01 acre and rounded off to the nearest 0.1 acre on the final estimate.

The survey staking field notes are the source documents to be used for computing quantities. The method used is a function of the method of staking and field not format.

202.00 Selective Removal of Trees or Stumps. Count all of the trees and stumps prior to removal. Many times projects that have been several years in design will have an overrun due to subsequent growth. Each tree or stump that is to be removed should be plainly marked with flagging, paint, etc. The location of each tree and stump that is to be removed should be determined with reference to the roadway centerline and recorded in advance of the actual work. The notes should include a description of the item, whether it is a tree or a stump, and its diameter and placed in summary form as part of the permanent project records. When it can be readily determined that more than one tree is growing from a single stump, only one tree will be paid for.

Document completion of the removal work as it is accomplished. Normally, there is less chance of error or duplication in reporting if only one inspector is responsible for this documentation. The inspector's records should indicate completion of subsidiary work, such as backfilling of stump holes and removal of trees and stumps of less than six inches in diameter. The method of disposal should also be noted.

Documentation for Pay Quantity. The diary record shall be used to verify the activity, date, and location of the work. Quantities shall be computed and reported to the nearest whole unit.

Watch for duplicate reporting. Periodic checks should be made between field and office personnel to eliminate duplications. If a summary is prepared as described above, it is also considered a source document.

203.00 Miscellaneous Removals. Measurements should be taken and recorded in a notebook or summary sheet. Sketches may be needed to show dimensions. All notes should refer items to centerline, how far left or right, the project number, date, and who measured the item. Stakes or marks may be required to define areas of removal and where vertical sawing will be necessary.

Ensure that the measurements are taken prior to the time the items are to be removed. If trouble is anticipated on any item, photographs may be taken to supplement field measurements. These photographs should have information written on the back (or captioned) answering the questions, "What, Where, When, and Why".

Documentation for Pay Quantity. The diary shall be used to verify the activity, date, and location of the work. When used, summary sheets are considered source documents. Pay quantities shall be computed and reported to the nearest whole unit.

Watch for duplicate reporting. Field and office personnel should coordinate to eliminate duplications.

204.00 Obliteration of Old Road. Quantities and locations of an obliterated road are normally noted on the plans. Measure and enter the actual quantity and location of the work in the construction diary and note whether or not the obliteration is in accordance with staked quantities. Any deviation from original stakes should be accounted for on a summary sheet. Verify whether removal of old pavement falls under [Section 203](#) Standard Specification requirements. Also verify whether any of the work is incidental to other pay items of the contract (e.g. in covered under a special provision or a bid item was not included).

Documentation for Pay Quantity. The diary shall be used to record the activity, date, and location of the work. When used, summary sheets shall be considered source documents. Quantities shall be computed to the nearest 0.01 station and rounded off to the nearest 0.1 station on the estimates.

205.00 Excavation and Embankment. One of the basic responsibilities for excavation and embankment is to ensure that a suitable foundation is constructed in conformance with established lines, grades, and cross-sections upon which the roadway base and surface courses and structures can be constructed. All inspection personnel must be qualified as described in [CA Section 114](#).

As soon as construction slope stakes are installed, the earthwork quantities should be calculated to verify design quantities. Slope stake notes should be checked for possible staking errors. This check should be completed before the Contractor starts work, if at all possible. If quantities vary a significant amount, the Contractor should be notified of the quantity change by letter.

On projects involving borrow, granular borrow, or different schedules of excavation and embankment, the inspector should identify and locate the various quantities of each item placed. Diaries, notebooks, and sketches can be utilized to document this information. If profiles or cross-sections are required, measurements must be made prior to changes in material placement.

Excavation Below Subgrade. Soft spots in the subgrade which have a combination of soil type and moisture that can't be compacted to the required density must be excavated and backfilled with approved material in layers to meet compaction requirements, and to prevent trapping water under the roadway or structures. Use of nonwoven subgrade separation geotextiles and/or biaxial geogrids should be considered to reduce the depth of sub-excavation, as well as to provide stability to the subgrade.

Grade points (i.e. the junction point of sizeable excavation and embankments areas) require the same treatment as soft areas whether they show signs of failure or not. The amount to be excavated is confined between the shoulder slopes and as shown on the plans or as far in to the cut as necessary to obtain sufficient compaction in the subgrade.

All excavation below subgrade is referenced to the finished grade. For example, the plans will denote grade pointing by a note, such as "Grade Point 3.0 ft." to indicate that the depth of grade pointing will be 3.0 feet below finished grade. Measurement for excavation below subgrade should be made by the cubic yard in the original position. For small areas, the inspector should measure and record this information in the diary along with a sketch of the area. Large areas that are difficult to measure because of size or uneven floor should be cross-sectioned and computed by the Average-End-Area Method.

Removed material that is organic may be stockpiled with other topsoil if approved by the Engineer.

Wasting of Excavated Material. It is the responsibility of the Contractor, at no additional cost, to secure a suitable disposal area for all excess or unsuitable materials.

Foundation Areas Requiring Special Treatment. Situations may arise in areas that call for construction across swampy ground. The Standard Specifications permit end-dumping of granular material in swampy areas to provide a stable surface. This lift should be limited to a depth not greater than necessary to support hauling equipment. After which, the material shall be placed in layers and compacted as required by the specifications.

When end-dumping material across a swampy area, the loose lift thickness should support the hauling equipment without movement. If movement in the fill is detected after the layer is started, the operation should be backed up and material placed to a greater layer depth. It is sometimes necessary to carry the first layer at subgrade elevation. A nonwoven geotextile or/and biaxial geogrid should be considered in bridging swampy areas, and they will provide stability and keep the underlying materials from mixing with the embankment material. When both geotextile and geogrid are used for stabilizing the foundation, the geogrid should be placed on top of the geotextile. **Woven geotextiles should not be used because they have low permeability and may create a pumping problem.**

Embankment Construction. *Layering* – The specifications limit the loose layer depth for various types of materials before compaction. Layers should be placed in a uniform manner with special emphasis on the outer edges of the fill, especially regarding density and slope. A contractor may complain about not having sufficient bearing to support the equipment near the shoulders. However, this is no problem when compaction is carried out to the full shoulder width with each layer.

When shot rock is being used for embankment layer depths over eight inches, the layers should be regulated by the maximum size material, and in no case exceed three feet unless approved by the Engineer. Rock should not be end-dumped over the embankment, but dumped short of the edge and pushed with a dozer in order to fill the larger voids with smaller material.

A balance between material hauling and compacting should be maintained to keep the work progressing satisfactorily. When a density test fails, the Contractor should be immediately notified so that corrective measures may be taken. Areas that have had failing tests require check tests which show acceptable densities or, in cases of replacement with granular material, what disposition was made in the area. The Contractor should be encouraged to follow a systematic routing for compaction that will produce an acceptable and uniform result.

If, during the course of embankment construction, material is encountered which contains objectionable organic matter (such as logs, stumps, etc.), special care should be taken to see that such refuse is removed from each layer before compacting. The incorporation of frozen material in an embankment shall not be allowed unless approved by the Engineer.

If soft areas result because of poor material or excessive moisture, corrective measures (i.e. soft spot repair) should be taken before allowing additional material to be placed over the area. Where undesirable material is concentrated, it will normally cause trouble, especially when trying to get 100% density in the top foot of the embankment.

Special care must be taken when embankments are placed on existing slopes. Slopes steeper than 3H:1V must be benched to avoid creating a slipping plane in the new embankment. Benches may vary in depth of cut from layer thickness to that necessary to provide equipment working room.

Slopes - Cut and fill slopes must be constructed to the tolerances specified in the contract. Periodic visual checks should be made by looking at the slopes in profile as they are being constructed. Any obvious "bellies" or undercuts should be corrected immediately to avoid serious shortages or surpluses of materials. Diary notations should be made for slope areas that conform to the stakes or where they do not.

Slope rounding of higher cuts should be performed during pioneering, otherwise equipment will be unable to return to the top of the cut to remove the rounding material. All cuts, except solid rock, should be rounded to the extent necessary to prevent a ragged appearance upon completion, and to comply with the plans.

Rock Work - Cuts in rock are often designed with nearly vertical slopes. Ripping or blasting is usually necessary in order to reduce the material to a usable size. When jointing and bedding planes are not strong enough to withstand the forces applied during removal of the material, over-break or shattering of material outside the neat lines of the slopes results. This loosened and shattered material must be removed to prevent its sliding into the roadway at some future date.

The Contractor should be encouraged to hold over-break to a minimum. **Over-break will not be paid for.** Over-break is defined as that portion of the material that is excavated, displaced or loosened outside of and beyond the required slopes or grades. Over-break can occur because of natural cleavage or faults in rock formations, or because planned slopes result in an unsafe or unstable condition. Over-break can also occur because of improper blasting operations.

Verify and note the Contractor's drill hole spacing, hole depths, powder usage adjacent to slopes, blasting pattern, and any other information for compliance with the contract. After completion of the work, it is sometimes difficult to reach an agreement with the Contractor on whether the excess material removed is to be classified as over-break or slide (the specifications allow for payment of slide material). Good notes will help to alleviate any disputes.

Loose rock must be removed from the steeper slopes. The operation can be accomplished by hand or machine finishing methods. The Contractor should be advised of the necessity for finishing or "scaling" during the early phase of the project. Results are usually more satisfactory if slopes are scaled (from the top down) as each lift of the cut is removed. However, the timing of the work is the Contractor's choice. On flatter slopes, loose rock which appears to be stable, need not be removed except as necessary to present a finished appearance.

Every effort must be made to scale and clean rock back slopes of as much loose material as possible. If a poor job is done on scaling, the remainder of the work will fall to Department maintenance forces.

The specifications state, "No measurement will be made for rock excavation made below the roadbed unless such excavation is required or directed by the Engineer. No measurement will be made for borrow replaced by unauthorized rock or soil excavation below roadbed." Most Contractors will drill

about 2 feet below to facilitate removal. The "shot rock" should be excavated as close as practical to subgrade elevation, allowing shot rock and spalls to fill any overshot areas. Occasional rock points extending above subgrade are permissible, but these should not exceed one-half the depth of the untreated base material. Requiring the removal of overshot material to remove objectionable material does not constitute authorization for payment for excavation below subgrade. However, if the objectionable material is encountered at this elevation, excavation should be authorized. Material used to backfill over-excavated cuts can either be granular borrow, excavation, or crushed gravel. Backfill will be paid for at the contract price for the material used.

Slides – Removal of slides is paid for at unit prices for excavation or as extra work in accordance with Standard Specifications [Subsection 104.02](#). If during the progress of the work, a slide is encountered or suspected, the District Geologist or District Materials Engineer should be consulted for proper corrective action.

Finishing Subgrade. Extreme care should be taken, especially during finishing operations, regarding ditch grades and natural drainage outside the embankments. Water pockets along the finished roadway are unsightly and induce percolation under the roadway. Shaping ditches to drain after the grade is finished introduces the problem of either disposing of excess material or placing material in small quantities that requires special treatment in grading and compaction.

Occasionally contractors have requested that the subgrade surface be finished with a fine grade material to permit easier blading to a tight, smooth surface. Such requests should be carefully considered and the District Materials Engineer consulted. In no case should a good granular or rocky subgrade be contaminated by addition of a weak or plastic (e.g. silt or clay) soil on the top merely to expedite finishing.

Areas that have been disturbed or roughened by equipment outside the roadway proper shall be reconditioned and left in an acceptable condition.

Compaction Control. The term "compaction", as applied to highway construction, may be defined as "a measure of embankment and subgrade density". The attention the inspector gives to the actual placement of embankment and subgrade materials is extremely important. The duties of the inspector regarding compaction may be summed up in two primary objectives:

- To see that specification requirements for compaction are met and maintained.
- To obtain a uniformly compacted subgrade. The subgrade or top foot of cut and embankment carries the greater share of the ballast and traffic load. Non-uniform or insufficient compaction results in differential settlement and subsequent deterioration of the roadway.

The moisture-density relationship tests specified in the Standard Specifications are the criteria used to govern compaction control. As many tests as possible should be made but, in no case, should fewer tests be performed than the minimum required in the Quality Assurance Manual. Continuous observance of actual grading operations is very useful. To facilitate testing and checking, testing and inspection personnel should move with the grading operations.

A field laboratory should be located on the project and equipped with sufficient test apparatus and report forms to meet the pace of the operation. Orderly files should be kept in the field and include all laboratory reports, moisture-density curves, work papers, list of identification numbers, etc. It is the inspector's responsibility to see that sufficient tests and notes are taken to document compliance with compaction and other specifications.

Compaction is usually expressed as a percent of the laboratory-determined, maximum dry density for a given soil or mixture of soils. The inspector must first of all become familiar with the embankment materials which will be encountered on the job. Laboratory curves are usually developed during project development and may be used as the initial starting point. It is very important to verify these curves correspond with actual field conditions. This may be accomplished by studying all available laboratory curves, the soil profiles and boring logs developed during design, and (if necessary) by conducting further field investigations. When no laboratory curve is found which will fit all existing available data, a new curve must be generated in accordance with the applicable test method.

The thickness of the lifts being placed must be closely observed. In many cases, it may not be practical to compact the maximum allowable loose thickness. Some soils do not mix readily with water, so it may be necessary to spread them into thinner lifts, wetting each, and then compacting. More uniform moisture distribution may also be obtained by pre-wetting borrow pits and cut sections. Compaction may be aided and rolling time reduced by the proper routing of earth-moving and transportation equipment over the embankment. Discuss with the Contractor, but do not direct, the requirements needed to obtain the specified compaction.

Compaction tests shall be performed and reported in accordance with the Quality Assurance Manual. Most deficiencies in compaction stem from a lack of water or a lack of rolling, or both, and may be easily remedied. If a series of tests show a lack of proper compaction, the inspector should seek out the reason for the failure and then discuss with the Contractor what corrective actions will be taken. **Under no circumstances should the inspector direct the Contractor's operations by assuming the duties of the foreman.** If the deficiency is serious or if a minor deficiency is not corrected within a reasonable length of time, work should be suspended and the inspector should notify the Engineer immediately.

Class "C" Compaction and Process Old Road. Embankment foundations within 8 inches of finish grade are usually designated as areas to receive Class "C" compaction and are shown on the plans. If the area is rock or poor material is being bridged, Class "C" compaction may not be required. Judgment should be used to determine the locations that require Class "C" compaction.

Diaries or field notes should record measurements and stations of areas receiving Class "C" compaction. The quantity of Class "C" compaction and "process old road" shall be computed to the nearest 0.01 of a unit and rounded off to the nearest 0.1 of a unit on the final estimate. The calculation sheets are source documents.

Dust Abatement Water. The Engineer, or representative, shall order the Contractor to place water for the purpose of controlling dust for safety and comfort of the traveling public, for the health and comfort of people residing near the project, and to protect crops which might be damaged from dust. The Contractor can be instructed to automatically place water under certain conditions as they arise, but the Contractor must notify the Engineer when such water will be applied so that necessary documentation of quantities can be made.

Where a haul road is used exclusively by the Contractor's equipment, the Contractor will be required to abate dust at no additional cost, unless other considerations as indicated above are required.

The quantity of "water for dust abatement" shall be computed to the nearest MG and rounded off to the nearest whole unit on the final estimate. Tickets ([ITD-0072](#)) should be issued for all water intended for payment. Diaries should record placement, tank measurements, inspection to verify quantities, etc. If dust abatement water is being wasted, appropriate quantities of water should be deducted after advising the Contractor that such action will be taken.

Excavation, Channel Excavation, Borrow, and Granular Borrow. Final pay quantities for excavation, channel excavation, borrow, and granular borrow will be based on office computations and/or computer data. The quantity of all excavation, borrow, and granular borrow shall be computed and reported to the nearest whole unit.

If the computer run is used as the source document, the computer run should be spot-checked for accuracy. Several cross-sections such as elevation and distances that are outside normal limits should be selected and the elevations of both the cross-sections and the computer listings should be reconciled. The plan quantity should also be compared with the computer quantity. Changes and corrections should be listed and checked on the computer run. The final quantity should be summarized, checked, and listed on the last page.

Quantities for progress payments may be determined by using the Contractor's daily load count. When possible, load count quantities should be verified by checking the quantities in an isolated cut. Estimated quantities should be frequently compared with plan quantities and any major discrepancies checked. The method used for obtaining quantities for progress estimates should be noted in the diary.

207.00 Stripping Designated Source Material Deposits. Section 207 normally applies to designated sources only.

The source approval may stipulate that a certain area of the source is to be used or a certain area is restricted, or possibly that the stripping shall begin at a certain point and not exceed a specified slope. In these cases, the area involved may need to be staked.

Staking consists of designating baselines, benches, source boundaries, and area boundaries.

Measurement is by the average end area method when the contract specifies stripping materials deposits by the cubic yard. Cross-sections should be established and recorded before and after stripping from a baseline that is referenced for horizontal and vertical reestablishment. Diaries should document completion and acceptance of this work. All material not acceptable for incorporation into the finished product must be stripped regardless of whether payment is by the cubic yard or as an incidental cost.

The standard specifications allow for measurement of stripping in its original position or in approved stockpiles. Since stripping may later be used for borrow or top soil, the stockpiles should not contain excessive vegetation or other foreign matter. However, this work is not considered as clearing and grubbing, which is not paid for on sources. Good construction practice would require that an attempt be made to consolidate the stockpile to a density matching the original in-place density. An understanding must be reached with the Contractor as to what constitutes an approved stockpile prior to using this method.

The contract special provisions or source approval may specify a certain area of the source is to be used or that a certain area is restricted, or possibly that the stripping shall begin at a certain point and not exceed a specified slope. In these cases, the area involved may need to be staked.

When alternate deposits are requested by the Contractor and approved, it will be at no additional cost to the Department.

Care should be taken to insure the source is not worked beyond the area to be worked as identified in the source approval. In the event additional material needs to be obtained, a revision of the area to be worked should be approved by the Engineer. The Engineer's approval should be supported by prior or additional materials investigation.

Documentation for Pay Quantity. The diary shall be used to verify the activity, date, and location of the work, and should show estimated quantities. The original and final cross-section notes and computer printouts shall be considered source documents, and used to compute quantities. Quantities shall be computed and reported to the nearest whole unit.

208.00 Interceptor Ditches. Interceptor ditches must be carefully located to serve their intended purpose of controlling drainage. The ditches should be staked after the slopes limits are established. Low spots or pockets in the flow line should be avoided or drained when possible. Special treatment, such as contour or riprap on excessive grades, may be necessary to prevent excessive erosion in some soils

Since most ditches are constructed off or near the edge of the right-of-way, the Contractor should be informed of the construction limits and Contractor responsibility for damage or trespass.

The inspector should prevent unnecessary damage to roadside vegetation. The inspector must check for conformity with stakes and plans and for workability of the design as grading progresses. Any necessary changes should be called to the Engineer's attention immediately. Delay may make any changes very difficult and expensive.

Documentation for Pay Quantity. The diary shall be used to verify the activity, date, and location of the work and any changes. If quantities are surveyed, the survey may serve as a source document. Staking notes and summary sheets, when used, may be source documents. A summary sheet is very helpful in determining compliance with plans, omissions, or additions in staking, and construction and duplication of quantities. Interceptor ditches shall be measured to the nearest foot and reported to the nearest 0.1 station on the final estimate.

209.00 Small Ditches. Small ditches, by definition, are ditches having volume that is on an average of less than 0.2 CY per linear foot. This volume limits the size of the ditch to an average end area of 5.5 square feet. Any excavation, borrow, or haul required to provide cuts or fills to carry small ditches will be paid for under Section 205. Ditch which is not considered as small ditch will not be paid for separately, but as the items required such as excavation, borrow, haul, etc.

Staking must be done carefully to ensure a satisfactory installation. The intended usage and required volumes must be considered and provided for. Stakes should be set for flow line, slopes on fills and cuts, and easement lines (if required). The layout should be reviewed in the field to be sure that the ditch will be satisfactory and that sufficient construction room is available without unnecessary waste of land. Staking should be done, or at least considered, early in the project and thoroughly discussed with the Contractor because of the effect the construction may have on irrigation and other items, such as minor structures, pipes, fencing, etc.

The inspector should be completely familiar with the required installation and its layout to insure satisfactory results. Material for fill ditches must be carefully selected to provide an impervious ditch and prevent erosion. Foundations should be carefully prepared and embankment properly compacted to prevent future settlement and washouts. The slopes of fills and cuts are usually limited by right-of-way and/or construction easements, and the Contractor must be advised of these limits. Trespassing without the owner's permission shall not be allowed.

Soaking the ditch prior to full use will generally help prevent erosion. In some soils, it may be necessary to line the ditch with coarse gravel or other material to prevent washing. The inspector should recognize these situations and notify the Engineer.

Documentation for Pay Quantity. The diary shall be used to verify the activity, date, and location of the work. The diary must contain enough information to assure proper payment for selective placement of material when required. Field books and summary sheets, when used, shall be considered source documents. Small ditches will be measured and reported to the nearest foot.

210.00 Structure Excavation and Compacting Backfill. The Contractor, (or consultant surveyors if applicable) are responsible for staking, recording grades and ground elevations, setting references, computing grades, and computing quantities. The crew must cooperate with the inspector and Contractor in scheduling their work. The Department verifies conformity with plans, note any problems or revisions, and approve the foundation. Pipe or structure locations must not be revised without the concurrence of the Engineer.

Specific densities are required in compacting backfill and foundation soils. Compaction tests shall be performed and reported in accordance with the Quality Assurance Manual minimum testing requirements.

The specifications require a waiting period and minimum strength of concrete before backfilling against newly constructed concrete structures. These requirements are listed in Table 502.03-5 "Form And Falsework Removal And Loading Of Concrete", in Subsection 502.03, Part E, Falsework and Forms. If a compelling reason exists to waive these requirements, a change order will be required. Minor structures, as defined in Section 609, may be excluded from such a waiting period or minimum strength requirement.

The material to be placed behind abutments, retaining walls, and wing walls shall be granular and allow thorough and effective drainage behind these structures. (Refer to standard drawings).

When designating additional excavation below staked grade, the inspector should carefully record reasons, depth, etc. If the Contractor does not agree with payment at contract prices for any additional depth, the Engineer should be notified immediately and force account records must be kept for work on the additional excavation.

The Contractor may use regular roadway equipment for compacting around structures. This requires extra care but can produce satisfactory results when properly controlled. The limiting planes used in calculating quantities will be the same regardless of the type of equipment used.

Documentation for Pay Quantity. The inspector should verify original and final measurements on structure excavation prior to and during the work to ensure that proper notes are available for quantity computation. The inspector shall report quantities of structural excavation, backfill, compacting backfill, concrete, etc., and should compute the quantities. A calculation book should be set up in advance of construction. Dimensions may be recorded in the diary during construction then transferred to the calculation book and all computations made on an [ITD-0404 Standard Computation Sheet](#). A sketch should be drawn for each individual portion of a major structure showing dimensions and elevations both before and after excavation.

The diary shall be used to verify the activity, date, location of the work, and any measurements. The calculation sheet shall be the source document for pay quantity. Quantities shall be computed to 0.1 of a cubic yard and rounded off to the nearest whole cubic yard on each structure.

211.00 Source Reclamation. Section 211 normally applies to designated sources only.

Source reclamation consists of grading and contouring material sources used for borrow, or the production of aggregates, to a pleasing, natural appearing conformation, placing topsoil over the slopes and floor, and seeding in accordance with the applicable subsections of [Section 621 – Seeding](#) in the Standard Specifications.

The inspector should make a careful review of the plans, special provisions and source plat before any work begins. Any proposed changes to the reclamation plan should be approved by the State Land Board through the ITD headquarters Construction/Materials section.

Slopes steeper than that specified on the plans may present serious erosion and safety problems. Slopes must be constructed as shown on the plans, to allow vegetation to be re-established.

Stockpiles of aggregates or overburden should not be allowed unless specifically shown on the plans.

Burying of trash in a materials source should not be allowed

Documentation for Pay Quantity. The diary shall be used to verify the work completed, the date, and the source number.

212.00 Erosion and Sediment Control. At the preconstruction conference, or prior to commencement of the applicable contract work, the Contractor shall submit a plan of preventive measures for approval in accordance with [Section 212](#) of the Standard Specifications, and special provisions, the plans, applicable permits and the Department's [Best Management Practices \(BMP\) Manual](#).

Project personnel should be aware of potential soil erosion areas during the construction of the project and take steps to reduce or eliminate or erosion or sediment. The condition of the project prior to winter shutdown can be the most important factor in reducing unnecessary erosion the following spring.

Trouble Areas and Possible Corrections. The following list describes some potential trouble areas that need protection from erosion and sediment:

- Fill slopes left unprotected until curbs and embankment protectors are installed can, in some cases, be protected by a shoulder berm or combination ditch and berm. Water should be channeled to an area where less damage can occur.
- Interceptor ditches should be placed above cut slopes in problem areas as soon as practical.
- Steep haul roads can be cross-ditched at intervals when not in use.
- Projects that extend past one season may require partial seeding.
- Transitions from cut to fill may require treatments such as placing of granular material, or other methods, to avoid erosion as water leaves the cut and follows a natural course along the toe of the fill.
- Temporary stream crossings should be constructed with granular material or be protected from erosion by riprap. Pipes through the crossing should be large enough to handle high water levels.
- Fine sand or silt on slopes subject to wind erosion should be covered with granular material or soil that is less susceptible to movement by wind.
- Stripping of more area than is necessary for removal of material from sources must be avoided.
- All cross drains that can be placed should be complete prior to winter shutdown if possible. Headwalls or aprons should be in place, if required, or acceptable channeling and diversion of water into the pipe should be accomplished. Drainage channels into and away from pipes and structures should be clear of debris.
- Additional information on erosion and pollution controls can be obtained from the District Environmental Planner or the Department's Best Management Practices (BMP) Manual.

Documentation for Pay Quantity. When items of work performed are covered under other sections, they shall be measured and documented as outlined in the appropriate section.

Work not covered by other sections is either already incidental to the contract or will need a change order prepared in accordance with [Subsection 104.02](#) of the Standard Specifications.

213.00 Topsoil. Topsoil consists of surface soil that is suitable germination of seeds and supportive of vegetative growth. Topsoil should be reasonably free of weeds and debris. The quality of topsoil varies depending on its source. Only very high quality topsoil should be utilized for irrigated planting beds and lawn construction. A lesser quality may be appropriate for rural highway slope seedbed construction. Any questions regarding suitability of topsoil for an intended use should be conferred with the Roadside Vegetation Coordinator.

Topsoil placement on slopes requires special treatment to avoid creep and erosion of the soil from the underlying base soil. The topsoil shall be keyed to the slope (if feasible) by harrowing, disking, or rolling. An ideal method, especially on steeper slopes, is to utilize the cleats of a crawler tractor that is driven or winched up and down the slope.

Documentation for Pay Quantity. Topsoil may be measured by the cubic yard in its original position or in temporary stockpiles. Topsoil measured by the square yard will be measured complete in place. When topsoil is excavated from the roadway prism, it will be paid for as excavation in addition to payment as topsoil.

Final pay quantities are based on office computations and/or computer data from surveys. Quantity of topsoil should be computed and reported to the nearest whole unit.

214.00 Roadside Cleanup. Roadside cleanup is intended to provide a means by which payment can be made to clean up debris from outside the clearing limits and the right-of-way line. Roadside cleanup should not be construed to include debris cleanup covered by other items, such as 201 - Clearing and Grubbing; 202 – Selective Removal of Trees or Stumps; 203 - Removal of Obstructions; or 205 – Excavation and Embankment.

The removal of unsightly or hazardous items not covered by the above-mentioned items should be disposed of under the Roadside Cleanup item.

Documentation for Pay Quantity. The diary should be used to verify the activity, date, and location of the work. The [ITD-0370](#), [ITD-0371](#), [ITD-0372](#), and [ITD-0373](#), Weekly Force Account sheets, should be used to document labor, equipment, and any materials needed.