

# CHAPTER 9

## FINAL SURVEYS

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### *Sec. 9.01* **General**

The district survey review and preparation procedures for final estimates shall be in accordance with the **Post Construction Manual**, or as directed by the District Construction Engineer. If the District Construction Engineer requests finals, the following sections should be used as guidelines. **Excerpts of the Post Construction Manual are attached as [Figure 9-A](#).**

### *Sec. 9.02* **Alignment**

The centerline should be retraced accurately putting in all points where slope DTM's were taken. In case the centerline can be retraced accurately without running a traverse line over the project, a note conspicuously placed in the digital file, ascii file, or field book should state that a traverse line was not run as it was not necessary for the establishing of the centerline, and that the project was constructed according to plan alignment. When the line is retraced this is to be done in accordance with the procedures outlined in [Sec. 8.02](#).

### *Sec. 9.03* **Levels**

After the centerline has been re-established, centerline levels are to be run taking elevations at all points where slope stake DTM's were taken. These levels shall be run in accordance with the procedure outlined in [Sec. 8.03](#).

### *Sec. 9.04* **Cross-Sections**

Cross Sections are no longer used in final surveys. **In lieu of securing cross-section information, a DTM surface is the accepted VDOT format for determining final volumetric and final grading information. In case of emergency or a special situation, cross sections can be requested.**

Except in the case of Plan Quantity projects [Section 9.06](#), DTMs shall be secured as outlined below.

### *Sec. 9.05* **Borrow Pits**

DTM readings must be secured on all borrow pits, prior to the removal of any topsoil from the borrow pit. The same benchmark elevation must be used when securing both the original and final ground elevations. If DTM's are to be secured on the borrow pit a traverse or baseline must be established and referenced, and used when securing both the original and final surfaces. DTM readings must be taken in a manner to ensure that an accurate computation of volume of material removed be obtained. If it becomes necessary to secure DTM readings for an area not covered by original ground elevations, the original ground elevation must be interpolated and placed in the same format as the originals. If DTM readings were secured, a breakline must be secured to define

the beginning of excavation. In the case of more than one borrow pit, they must be numbered to correspond with the number used in staking them out.

#### *Sec. 9.06* **Plan Quantity Projects**

A centerline profile at "Final" stage on plan quantity projects is not required. Spot checks will be made to assure that the vertical alignment is within required specifications. In some cases, a complete profile may be needed to provide proper assurance; but in most cases, this can be accomplished by use of reference stakes and benchmarks along the project.

On secondary roads having a daily traffic count of two hundred (200) or less, five-tenths (**0.5 ft.**) of a foot tolerance would be allowed provided such tolerances tend to equalize and are not to the detriment of the quality of the project.

On Class IV primary roads and comparable secondary roads the allowable tolerance is three-tenths (**0.3 ft.**) of a foot. On Class I, II and III primary and on secondary roads comparable thereto, the allowable tolerance is two-tenths (**0.2 ft.**) of a foot except in the case of Portland cement concrete surfaces where the tolerance is reduced to one-tenth (**0.1 ft.**) of a foot.

When setting slope stakes, in the event areas are found that show changes from the original location of the DTM's, these areas will again be DTM'd to show the changes and a final DTM surface taken to coincide with these sections.

**DTMs are required on all borrow pits and material pits.**

#### *Sec. 9.07* **Federal Aid State Force Account Projects**

Finals on Federal Aid State Force Account Projects are to be taken up in the same manner as regular contract projects.

#### *Sec. 9.08* **Non-Federal Aid State Force Account Projects**

If deemed necessary by the District Construction Engineer, finals can be taken on this type project and specific information obtained.

*Sec. 9.09* **Minimum Plan Projects**

A Minimum Plan Project is to be handled the same as the Plan Quantity Project, except that DTMs are **not** necessary.

*Sec. 9.10* **Submitting Survey Data**

As soon as the final survey is completed, the Survey Supervisor should send to the District Survey Parties Engineer all notebooks and Inspector's records which are in his possession. The District Survey Parties Engineer will then transmit these books to the District Design Unit.

Below are excerpts from the latest Post Construction manual July 2007 version. For the complete manual please click here:

[http://www.virginiadot.org/business/resources/pc\\_manual.pdf](http://www.virginiadot.org/business/resources/pc_manual.pdf)

**Figure 9-A**

**Virginia Department of Transportation**

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(Imperial & Metric)**

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## APPENDIX A - Pre Project Acceptance - Construction Activities that will Facilitate Finals Acceptance

Time is always a critical factor in the preparation, review, and submittal of the Final Estimate because final payment is due within ninety (90) days after project acceptance from the contractor. It is essential that every effort be made to complete as much work as possible prior to VDOT's acceptance of the project.

Consideration is to be given to the following:

1. Excavation:
  - a. Payment on Plan Quantity Basis
  - b. Upon receipt of Slope Stake Notebooks, the District Design Unit should check the Levels and Cross Section Notes for those locations to be covered by Final Cross Sections (i.e., entrances, channel changes, borrow pits, etc.) From there, the District Design Unit should plot and check sections and save the information for use when further data is available. It is noted that cross sections are usually taken today by the use of Digital Terrain Models. (DTM)
  - c. Payment on Final Cross section Basis
  - d. Upon receipt of the Slope Stake Notebooks, all centerline levels and cross section notes (in addition to those items outlined in A(1) above) should be checked. Plot and check cross sections when further data is available.

When possible, Final Cross Sections are to be taken as work progresses and it shall be the responsibility of the of the Area Construction Engineer to assure that the field notes on all items are transmitted to the District Office for checking and incorporation into the Final Estimate.

### 2. Bridges and Culverts

"As-built" plans are needed for all bridge projects and special design box culverts. The project inspector shall prepare "as-built" plans or other records as designated, showing the dimensions of the parts of the structure that were changed during construction. This generally consists of documenting structure excavation, pile lengths, footing depths, column lengths, and the actual weight of all reinforcing steel used. The dimensions which differ from the plans should be converted into quantities (decrease or increase) by the inspector. The District Structure and Bridge Office will prepare "as-built" plans from the information and "as-built" plans furnished by the inspector.

When bridges and box culverts are completed prior to other items of contract work, data should be promptly forwarded to the District Structure and Bridge Office. Upon receipt of this data, the District Structures and Bridge Engineer should proceed

**\*Procedures for determining the final pay quantity on projects with Borrow Excavation are outlined in the following.**

1. Check the levels and cross sections in the original and final level books on borrow pit cross sections.
2. Plot and check the original and final ground lines. \*\*
3. Check areas. \*\*
4. Compute and check the yardage or cubic meters. \*\*
5. Check for any disallowed fill on the borrow pit cross sections and mainline cross sections.
6. Check areas; Compute and check the yardage or cubic meters of all disallowed fill.
7. Subtract item (6) from item (4) to obtain the pay quantity on borrow excavation

\* Note that these procedures are not applicable on "Minimum or No Plan" projects.

\*\* Also note that certain elements of these steps will be accomplished by means of Line Remote Tele-processing terminals.

**Procedures for determining the final pay quantities on projects with Box Culverts are outlined in the following.**

1. Description should include the station, length, size, standard and degree of skew, height of cover, and type of wings.
2. Quantities for both concrete and steel are to be computed using the applicable values for box culverts as indicated in the contract designated edition of Standard Bridge Designs.
3. Note that when a box culvert structure is completed without the necessity of altering either the length, size, or number of reinforcing bars detailed on the plans, the Department will pay for the plan estimated quantity for reinforcing steel, provided the plan and shipping invoice quantities agree within plus or minus (1) percent.
4. In the event that an alteration was made in the structure which affected the quantity of reinforcing steel, or in the event that the plan and shipping invoice quantities do not agree within plus or minus one (1) per cent, payment must be made for the actual quantity used (as determined by the Project Inspector). (Total length of each size bar multiplied by its theoretical unit weight). The weight of the reinforcing steel used for lapping will not be allowed.

10. Check the total pay quantity from the Summary against the actual quantity in the "Reasons for Differences." **It is noted that this item is now usually listed as a plan quantity item, and as such no measurement would be required.**

## **District Survey Review and Preparation Procedures**

### **Borrow Pits**

Borrow pits must be cross-sectioned or DTM, prior to top-soiling the borrow pit, using the same base line stations and bench marks used in staking out the borrow pits. Cross sections must be taken which insure an accurate computation of the volume of the material removed. If it becomes necessary to take a final cross section or DTM at a point not covered by an original ground section, an original ground section must be interpolated and shown in the proper space in the Original Level Notebook or ASii file format. The actual beginning and ending of the excavation must be shown. In the case of more than one borrow pit, the pits must be numbered to correspond with the number used in staking them out.

On projects requiring small amounts of borrow material and where actual measurements are difficult to obtain, payment may be made for as "load count measurement" as indicated in Section 109.01 of the Specifications. This applies, in particular, to "Minimum or No Plan" projects.

Also in accordance with Section 109.01 of the Specifications and when approval is given by the Engineer in writing, material specified to be measured by the cubic yard may be weighed and such weights converted to cubic yards for payment purposes. Factors for conversion from weight to volume measurement will be determined by the Engineer and shall be agreed to by the contractor before they are used.

### **Contract Surveying**

The Contractor's field books as noted in the surveying special provision are to be turned in to the Project Inspector prior to making 100% payment for construction surveying.