CHAPTER 7

FINAL MEASUREMENTS

7.1 PURPOSE

To compile final measurement requirements and techniques to ensure that items specified to be final measured are accurately and efficiently done, without needless and costly refinements.

7.2 GENERAL

Measurements for bituminous material, earthwork, and loose volume material in trucks have been addressed in other procedures of this manual. Generally, surface measured items and linear measured items will be addressed in this chapter. Requirements for final measurements of pay quantities are found in the ***Florida Department of Transportation (FDOT) Specifications***.

7.3 GENERAL REQUIREMENTS

7.3.1 Final Measurement Items: On many items, quantities for progress and final estimates, must be documented by final measurements as the work is actually accomplished. By s~~S~~ummarizing these items, the monthly progress ~~on the items derives the monthly~~ estimate is generated to reflect the work completed during this period using the final measured quantities recorded.~~that has the final measurements thus recorded.~~ When the project is completed, field books are submitted along with the other final estimate data to substantiate the final quantities.

Final measurement of pay quantities in field books will generally fall into one of the following categories:

(A) **Area Measurements:** When items are paid for on the basis of the area of the finished work, the dimensions for calculating these areas shall be documented in the field records. This shall be done in accordance with one of the following methods:~~.~~

(1) The length shall be the station-to-station dimension shown on the plans or the station-to-station dimension actually constructed within the project limits ~~as~~ designated by the Engineer. The width shall be the ~~width~~dimension actually constructed within the neat lines shown

in the plans or designated by the Engineer/Project Administrator (PA)~~(PA)~~ within the project limits.

(2) The length and width as measured in place, usually with length measured along the centerline of the construction work, and width measured at a right angle to the tangent of the centerline.

(3) Stations and offsets must be recorded and used as latitudes and departures to calculate area. Curve corrections to account for a curved baseline must be applied to area calculations. When the baseline used for measuring areas is neither the project's centerline of construction nor a baseline for stationing shown in the plans, ~~-~~the baseline must be straight lined with beginning and ending points referenced to the centerline of construction by station and offset ~~as mentioned earlier~~.

(4) When~~The~~using coding forms and output of geometry programs, they must be included in the computation book as documentation for final area measurements ~~when utilized~~. (If ~~the~~ computer programs are used, the calculations shall be checked and the actual site source measurements submitted with the computer output.)

(B) **Linear Measurements:** The dimension documented for items paid for on the basis of linear foot shall be the length shown on the plans or the length actually field measured along the finished surface of the item as required.

(C) **Volumetric M~~m~~easurements:** Field quantities for items paid for on the basis of volume = cubic yards or cubic feet, are usually determined by one of the following methods:

(1) Concrete quantities are generally paid for on the Plan Quantity basis unless authorized field changes have been made subject to ***Subarticle 9-3.2*** of the ***FDOT Specifications***, or unless final field measurements are dictated by the particular pay item such as miscellaneous concrete for contingent use.

(2) Cross Section notes are recorded along both the original surface and the surface of the completed work either by field parties, or as determined by aerial photography and the volumes ~~are~~ calculated by hand or by use of the computer facilities. Cross sections with end area and volume computations can also be used ~~to your advantage~~advantageously in calculating buildup volumes of spalled concrete members. (See ***Figure Nos. 7-1 & 7-2***)

(D) **Per Each Measurement:** - Items paid for as a unit, such as ~~–~~fence gates, etc., shall be tabulated by location in the final records.

(E) **Lump Sum Items:** Where the pay quantity for an item is designated to be a lump sum and the plans show an estimated plan quantity, compensation for that item will be adjusted proportionately when a plan change results in a significant increase or decrease in the quantity from the estimated plan quantity (see ***Subarticle 9-3.2.1*** of the ***FDOT Specifications***). When the plans do not provide adjustments for contingencies, establishment of a new unit price through a Supplemental Agreement shall compensate for changes in the cost of completing the item.

(F) **Plan Quantity Items:** Plan Quantity Items under ***9-3*** of the ***FDOT Specifications*** are design supported: ~~The current d~~Documentation requirements are as follows:

(1) The C~~c~~omputation ~~b~~Book ~~s~~Sheet or plan matrix will show the location, quantity, and the traverse/chain name.

(2) A location sketch-identifying the area, the quantity, and the referenced baseline/centerline name. (Note labeling of chain points and curves are not required.)

(a) The location sketch that identifies the area, the quantity, and the reference baseline/centerline name should be contained in the CADD files submitted to the Department.

(b) The naming convention for these files should be in accordance with ~~requirement's~~ the ***"CADD Production Criteria Handbook" Chapter 4***.

(3) The designer must keep all supporting information in their files until the project is ~~paid off~~completed and paid off, ~~.~~ and in compliance with the FDOT document retention requirements.

(4) Should a dispute arise involving quantities for one or more of the plan quantity items, the Construction O~~o~~ffice will request in writing, that the Designer provide detailed documentation or verify the concern for the plan quantity item(s) in question. The backup documentation must be produced within five (5) working days of the request from construction.

(5) ~~–~~The plan quantity concept, where properly utilized, will eliminate re-

measurement and recalculation

(6) Construction will not make detailed calculation entries when no changes are made. The Plan Quantity Item will not be final measured in a field book, only changes in the field or plan errors, as set forth in ***9-3*** of the ***FDOT Specifications***, are required to be documented.

(7) When no changes are made (no Plan Errors and/or Field revisions) and only Plan Quantity is to be paid, only the Plan Quantity total needs to be provided on the Comp Book ~~f~~Form, and on the Construction side of the form (the Office Administrator or PA does not need to transfer all Designer quantities to the construction side of the form).

(8) Deviation from the Plan Dimensions: ***Subarticle 9-3.4*** of the ***FDOT Specifications***. The 2007 ***Specifications*** require 5% or $5000 change for earthwork and $100 for other items.

(9) When changes in limits are authorized, the PA must show the revised quantities by showing revisions along side the original Designer's calculations. If an area is added, another form showing the calculations for these quantities can be added to the original calculations. (Do not remove, erase, etc. Designer work - please mark through.)

(10) Some method must be employed by the PA to prove or revise the Plan Quantity. Some of the suggested methods are as follows:

(a) Field measure
(b) Scale from plans
(c) Station to station calculations
(d) Joint counts (with cut-offs deducted)

(11) Plan Quantity Items on multi-project contracts are to be evaluated per contract total, not per project total. Evaluation for multi project contracts must employ a correction to the "contract total."

Note: If each project had been on a separate contract, the revised final measured quantity would have been paid. However, when two or more projects are on the same contract and the total combined change falls within the Plan Quantity Parameters, no change is made to the Plan Quantity. **Example**: Type B Stabilization (Item #160-4)

Unit Price of $1.00

Plan Quantity Revised due to plan errors.

	Original Plan Qty.	New Qty.	Plan Errors
Job 1 of 2 =	50,000 sy	42,000 sy	(-) 8,000 sy
2 of 2 =	20,000 sy	30,000 sy	(+)10,000 sy
	70,000 sy	72,000 sy	(+) 2,000 sy

Step 1 2,000 sy ÷ 70,000 sy = 0.029 = 0.03 X100 = 3% < 5%

Step 2 2,000 sy x $1.00 = $2,000.00 < $5,000

Plan Quantity for both projects will be paid due to final adjustment being less than 5% and $5,000.

(12) The PA must make his/her own analysis of the accuracy of plan quantity items. It is not the intent of the Plan Quantity concept to require more laborious measurements than the old method. It is intended to save man hours through less field survey work.

(13) Type 'A' and Type 'B' Fencing are Plan Quantity pay items. The **Payment for Extra Length Posts** will require an invoice from the Contractor. Compensation will be at invoice price plus 10~~-~~%.

Example: Contractor submits invoice for 20 extra length posts at an invoice price of $250.00. An additional 10 percent = $25.00. The compensation will be $275.00 for the extra length posts. An adjusted fencing item will be shown with a quantity of one (1) at a unit price of $275.00. A copy of the invoice will be submitted with the Final Estimate Package.

Gates are to be paid as each. Location and summary needs to be provided to document quantity(s).

(14) Streamline Contracts Plan Quantity Only:

The goal of a Plan Quantity (PQ) streamline contract is to simplify administration along with reducing many of the final estimates

requirements. There should be no reduction in inspection; only sampling, testing and verification will be done at a minimum frequency involving Sections 120 (Excavation and Embankment), 125 (Excavation for Structures and Pipe), 160 (Stabilizing), 200 (Rock Base), and 346 (Portland Cement Concrete), in accordance with the contract. On PQ Streamline Contracts, all pay items are Plan Quantity Items and the projects must be under $ 2,000,000 with less than 2000 tons of asphalt.

It is recommended at the preconstruction meetings, and when the Specifications are discussed, specifically ***Section 9-3.2.1*** that all parties have a clear understanding of the term "Plan Quantity" and the requirements to make a change. Also, all field changes will be directed by the Engineer and will be added and/or subtracted from the plan quantity item with supporting documentation to accompany the field changes.

(a) Invoices and Payments: The Contractor must make request for payment in accordance with ***Section 9-5.1*** of the contract.

(b) Pay Adjustments: Pay adjustments are as stated in ***Section 9-3.2*** of the ***Specifications***. The only pay adjustments will be for (1) substantial error as defined in ***Section 9-3.2.1*** of the ***Specifications*** "Error in Plan Quantity", and (2) as defined in ***Section 9-3.2.2*** of the ***Specifications***, Field Changes. All items are based on PQ for this type of Contract. All PQ pay items are subject to be adjusted (+/−) provided the criteria specified in the subarticles are met (plan errors and/or field changes). All field changes (+/−) will be handled separately from plan error changes, and when final PQ of a pay item is determined, only then will field changes be applied.

There will be no Fuel, Bituminous, Composite Pay Factor or Thickness/Spread Rate Adjustments on these types of Contracts.

(c) Documentation: Maintain all documentation in the Project Administrator's (PA) office; such as, QC and VT asphalt and concrete reports, design mixes, core reports, etc. Only when a PQ item is changed, the change will be

supported by the appropriate measurement and documentation included in with the ***Computation Book***. It is recommended that in most cases, measurements could be documented on the ***Final Measurement Miscellaneous Form, Form No. 700-050-61*** rather than using a field book. This will help reduce cost.

(d) The PA, upon final acceptance will e-mail the "Reminder Notice" letter for Section 9-8, to the Contractor and forward a copy to the District Final estimates Office (DFEO). For additional information see Chapter 14 of the Review & Administration Manual (R & AM)

(e) Closeout: See Chapter 14 of the R & AM.

(f) The Final Estimates Guidelines for Streamline Contracts provide reminders in preparing the Final Estimate Package for submittal. For additional information on Final Estimates Guidelines for Streamline Contracts go to the attached link: http://www.dot.state.fl.us/construction/CONSTADM/Guidelist/FinalEst/FE_Guidelists_StreamlineContracts.pdf

(G) **Each Day Item for Engineer's Field Office:** This item shall be documented by project personnel on the appropriate form. Payment will be made for each day the field office is available for use by Department personnel beginning ten (10) days before contract time begins and up to thirty (30) days after final acceptance, unless the Department requests removal earlier in writing. The Contractor will be given ten (10) days notice before he removes the office. This requirement will take effect in contracts let in January 2003 and thereafter.

7.4 DEGREE OF ACCURACY

Degrees of Accuracy for pay items shall be as indicated in ***Chapters 11*** through ***20*** of the ***Basis of Estimates Handbook***.

7.5 LIST OF FIGURES FOLLOWING THIS CHAPTER