CHAPTER 7

FINAL MEASUREMENTS

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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 ***FDOT Specifications*** ~~and ***Special Provisions***~~.

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7.3 GENERAL REQUIREMENTS

7.3.1 Final Measure Items: On many items, quantities for progress and final estimates must be documented by final measurements as the work is actually accomplished. Summarizing the progress on the items derives the monthly estimate that has the final measurements thus recorded. When the project is completed, ***field books*** are submitted along with the other estimate data to substantiate the final quantities.

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

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(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~~, as per the ***Specifications***~~.

(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 actually constructed within the neat lines shown in the plans or designated by the Engineer/Project Administrator (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, ~~then~~ 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) The coding forms and output of geometry programs 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.

~~**Note: Zinc Coating on Tension Wire**~~

~~When a failure of this nature occurs and determination is made to leave in place at a reduced price then the following pay reduction example should be used.~~

~~Example: Calculating Payment Reduction on Type B Fencing.~~

~~(1) Calculate the percentage of spelter furnished to the spelter required by the Design Standards.~~

~~Metric Furnished = 53.0 (Test Results) = 0.58%~~
~~Specified 92.0 g/m² (See table on sheet 1of 2 Design Standards Index 452)~~

~~English Furnished = 0.15 (Test Results) = 0.50%~~
~~Specified 0.30 oz/sf (See table on sheet 1of 2 Design Standards Index 452)~~

~~(2) 100 percent minus this percentage is taken as the reduction in service life~~.

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~~Metric 100% 58% = 42%~~

~~English 100% 50% = 50%~~

~~(3) Divide the reduction in service by 2. (The tension wires furnish ½ of the support for the fence):~~

~~Metric 42% = 21%~~
~~2~~

~~English 50% = 25%~~
~~2~~

~~(4) Multiply the reduction in service life by the bid price of the fence. This is the penalty:~~

~~Metric 21% x $10.00 (bid price) = $2.10/m1~~

~~English 25% x $30.00 (bid price) = $7.50/LF~~

(C) **Volumetric measurements:** 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 in calculating buildup volumes of spalled concrete members. (See ***Figure Nos. 7-1 & 7-2***)

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(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)Hourly Measurement for Off-Duty Law Enforcement Officers: Items shall be documented by the project personnel on the appropriate form. (See Chapter 13, Figure No.13-38) The inspector is to contact the officer and have him/her sign this form each time he/she works on the job site, verifying the hours worked at that time. (Refer to Special Provisions for pay item requirements.)~~

~~(F)~~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.

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

(1) The computation book 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 ***"CADD Production Criteria Handbook" Chapter 4***.

(3) The designer must keep all supporting information in their files until the project is paid off.

(4) Should a dispute arise involving quantities for one or more of the plan quantity items, the Construction office 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

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produced within five (5) working days of the request from construction.

~~(5)~~5 The plan quantity concept, where properly utilized, will eliminate re-measurement and recalculation~~. Plan quantities cannot be accepted by the PE until the control points for developing the item on the physical project are checked. Some of these controls for roadway items are:~~

~~(a)Centerline lengths down the project~~

~~(b)Radii length~~

~~(c)Intersection angles between the project and other roadways~~

~~(d)Project widths, etc~~

~~(6)~~(6) Construction ~~is not required to~~will not make detailed calculation entries when no changes are made. The Plan Quantity Item will not be final measured in a ~~Non-Standard Bound~~ 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 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).

~~(7)Plan errors do happen. When an error is found, it shall be corrected with proper documentation and references made to location.~~

~~(8)If plan quantity items increase or decrease as set forth in ***Section 9-3 of the Standard Specifications***, field measurements and/or revised computations must be submitted with the Final Estimates.~~

~~(9)~~(8) Deviation from the Plan Dimensions: ~~=~~ ***Subarticle 9-3.4 of the FDOT~~Standard~~ Specifications***. The 200~~7~~0 ***Specifications*** require 5% or $5000 change for earthwork and $100 for other items.

~~(10)~~(9) When changes in limits are authorized, the PA~~E~~ must show the revised quantities by showing revisions along side the original D~~d~~esigner'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,

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erase, etc. ~~d~~Designer work - please mark through.)

~~(11)~~(10) Some method must be employed by the PA~~E~~ 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)

~~(12)~~(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 ~~final field measurements taken~~ due to plan errors.

	Original Plan Qty.	~~Field~~ **New Measured ~~Qty.~~**	**Plan Errors ~~Difference~~**
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.

~~(13)~~ (11) The PA~~E~~ 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.

(14) Type 'A' and Type 'B' Fencing are Plan Quantity pay items. The

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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).

~~(H)~~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.

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7.4 DEGREE OF ACCURACY

Degrees of Accuracy for pay items shall be as indicated in ***~~Section 2~~Chapters 11 through 20 of the Basis of Estimates Handbook***.

7.5 LIST OF FIGURES FOLLOWING THIS CHAPTER

Figure 7-1
SPALLED AREAS SKETCHES

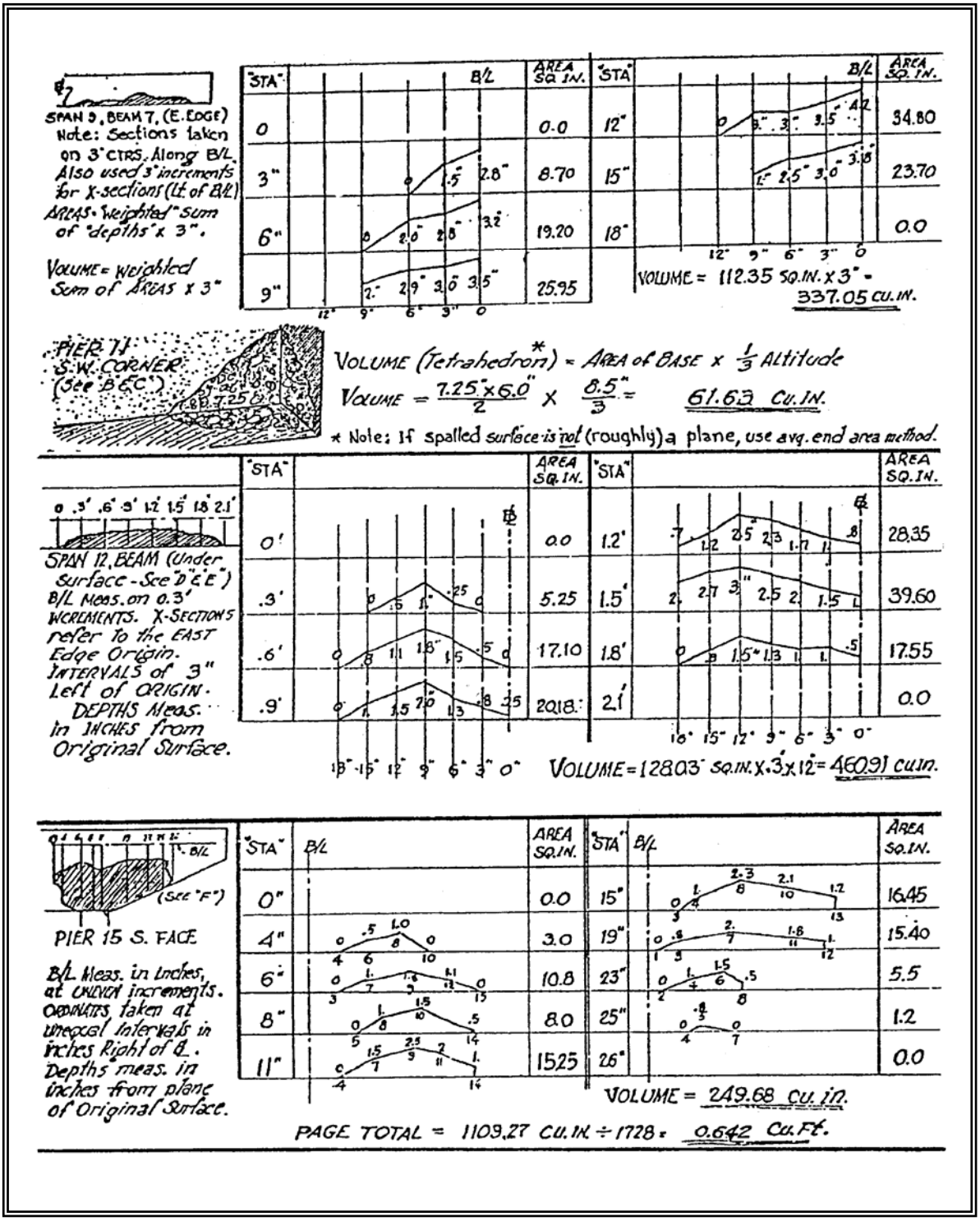

Figure 7-2
SPALLED AREAS SKETCHES