

CHAPTER 5 COMPUTATION BOOKS

5.1 PURPOSE

This chapter will: (1) document the Computation Book concept as utilized by the Florida Department of Transportation (FDOT), (see the Computation ~~Methods Book~~ for Design, Construction and Final Estimates Handbook); (2) briefly outline some general instructions for their utilization in a final estimate preparation; and (3) describe the forms used in compiling the **Computation Books**. (See Figure No. 5-1)

5.2 GENERAL CONCEPT

The **Computation Book** provides a method of accumulating the calculations required to substantiate the pay item quantities shown on the Final Estimates Summary of Pay Item Sheet. The method used to develop some quantities for pay items by Design **IN NO WAY** reflects the method to be used to determine final pay quantities.

Note: Multi-job contracts shall have each job separated and appropriately identified in the Computation Book. The District Design Office will submit the **Original** Computation Book to the appropriate District Construction Office.

The **Computation Book** must have supporting computations to document how the original quantity for each Final Measured and Plan Quantity item is determined.

Roadway Design: For Plan Quantity pay items, the documentation required in or with the computation book will be:

- A. The computation sheet in the computation book or matrix in the plans shall show the location, quantity and traverse/chain name.
- B. A location sketch that identifies the area, the quantity and the reference baseline/centerline name. (**Note: labeling of the chain points and curves and computer outputs, are not required to be placed in the computation book. The Designer must keep all supporting information in his/her files until the project is paid off.**)

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

1 the Department. The naming convention for these files should be in
2 accordance with the Department's "**CADD production Criteria Handbook**"
3 **Chapter 4.**

4 C. If a dispute arises during the construction of a project involving quantities for
5 one or more of the plan quantity items, then address and correct the
6 quantities in the following manner:

7 1. Quantity Errors of Minor Nature: an example of this would be if the
8 Designer left out 1000 LF of curb and gutter and showed 100 LF. A
9 simple correction here would suffice.

10 2. Quantity Errors of Major Nature: An example of this would be if the
11 Designer left out the southwest quadrant of an intersection. Errors of
12 major nature are to be resolved by the Designer Engineer. Construction
13 will request in writing, that the Designer provide detailed documentation
14 or verify the concern for the plan quantity item(s) in question.
15

16 D. Design must produce the backup documentation within 5 working days of the
17 request from construction.

18 The designer provides the original calculations, tabulations and basis of estimate as the
19 initial source records for the design quantities in the **Computation Book**. These
20 computations are to remain with the **Computation Book** through the final estimates
21 review by the District Final Estimates Office (DFEO).

22 Construction personnel are to make any necessary adjustments directly on the
23 Computation Book pages in the event there is a change in the rate of application, basis of
24 estimate, scope of construction or design error.

25 Construction personnel are to make adjustments or additions to the **Computation Book** in
26 pencil only. **Red, blue and green colors must not be used. These colors are**
27 **reserved for the use of the checking staff of the DFEO during their review of the final**
28 **estimate.** Incorrect information shown in the **Computation Book** as a result of errors or
29 revisions should never be erased or removed. The incorrect information shall be lined
30 through on the **Computation Book** sheets. Alternately, where the entire page is incorrect,
31 it may be marked VOID in large letters with a small note indicating date and reason for
32 voiding. A page showing the correct information must then be inserted after the voided
33 page.

34 Final Estimates uses and preserves the computations of design and/or construction to
35 verify the final pay quantities. Where dimensions, computations or plan intent are not

1 clear, it is recommended that construction personnel consult with the Design Section
2 responsible for such computations.

3 **5.3 BASIS OF ESTIMATING**

4 A standard method of calculation and rate of application has been established for each
5 pay item, so all design estimating functions will use the same methods and rates for
6 contingent items.

7 The basis of estimating, and the accuracy required, are all shown in the publication titled
8 ***Basis of Estimates Handbook*** produced by the State Estimates Office.

9 **5.4 FORMAT**

10 A standard approach to the ***Computation Book*** preparation expedites checking and lends
11 credibility to the contract pay quantities. The following guidelines are to be applied when
12 producing a ***Computation Book***:

13 | A loose-leaf binder that will accommodate legal size paper shall be used. ~~—~~Spiral binders
14 shall not be used (this makes additions and corrections very difficult). A gummed label with
15 the name of the project, county, Financial Project ID No., and names of the persons who
16 prepared and checked the Computation Book shall be affixed to the front of the binder.

17 Use the standard forms, (**See Chapter 14 of this manual**) to calculate and/or summarize
18 the quantities.

19 The backup calculations will be filed directly behind the pay item total, when possible, and
20 clearly cross-referenced, as required.

21 Bridge quantity calculations will be organized by component bent, piers, superstructure,
22 etc. The legal size sheets of the type the Structure Design Office uses should be used
23 along with the computer output for items such as reinforcing steel, box culverts and end
24 bent quantities. Sometimes actual conditions are found to exist which are not shown on
25 the plans, such as existing culvert dimensions being in error. In such cases measurements,
26 with sketches must be made to determine the extent of the error to be dealt with in terms of
27 ***Subarticle 9-3.2 of the Standard Specifications.***

28 .

29 Organize the calculations and other materials in the ***Computation Book*** to correspond
30 with the pay items as they appear on the Summary of Pay Items sheet and the contract.

1 **5.5 COMPUTATION BOOK CONTENTS**

2 The data to be included in the **Computation Book** at both the design and construction
3 level will vary according to the type of project. The minimum data shall consist of all pay
4 items that require any type of calculations and/or tabulations to arrive at quantities, which
5 are not shown in the plans.

6 5.5.1 Roadway items, such as surface, base, stabilizing, etc. which must be tabulated by
7 the length and width of individual sections to calculate the total, shall be shown.

8 5.5.2 Linear measure items that require a tabulation shall be shown on a standard form
9 in the **Computation Book**.

10 5.5.3 Concrete and steel quantities for bridges, box culverts and other structural facilities
11 shall be shown in the computations by individual components. A breakdown of
12 quantities at construction joints would also be helpful in controlling yields and final
13 quantities during construction. A Box Culvert Quantities computer program will be
14 used by Design to calculate concrete and steel quantities. The computer output will
15 suffice as quantity backup calculations in the **Computation Book**.

16 5.5.4 Some items (such as drainage structures and traffic items etc.) are detailed on the
17 contract plans sheet. To avoid duplication, further detailing of these items will not
18 be required in the **Computation Book** by Design.

19 5.5.5 Many final measurement items and construction quantities will be added to the
20 computations during the construction phase. These are discussed in more detail in
21 the procedures which follow in this manual. **See Chapter 2 of this manual.**

22 **5.6 CONSTRUCTION UTILIZATION**

23 The **Computation Books** as completed by the design functions are forwarded to the
24 proper construction office in accordance with District procedures.

25 **5.7 FINAL ESTIMATES RECORDS**

26 The **Computation Books** are utilized by construction to substantiate the final pay
27 quantities. As such, all changes by Supplemental Agreements and/or Change Orders, etc.,
28 must be reflected in the quantities, with their supporting computations.

29 5.7.1 Some of the standard forms may be used to record field measurements for final

- 1 quantities, such as latitude and departure sheets. All required field measurements
2 will be recorded, either on these forms or in final measurement field books.
- 3 5.7.2 Construction uses the space on the bottom of the standard forms to record brief
4 comments and notes about the differences in original and final quantities. These
5 notes are used to summarize the explanation of overruns and underruns to be
6 submitted with the final estimates package.
- 7 5.7.3 All changes in rates of application, limits, etc., shall be documented in the
8 **Computation Book** along with the revised calculations of final quantities. The
9 remarks column on the right side of the forms are intended to be used by
10 construction to explain these changes and make other explanatory comments.
- 11 5.7.4 Project Administrators (PA)s will have to add forms and calculations for some items
12 on which adjustments are required. The original quantity involved before the
13 adjustment was made, will be necessary at all times.
- 14 5.7.5 A complete index to the **Computation Books** will be made. A copy of the Pay Item
15 Summary Sheet (formerly known as the Final Estimate Sheet) from the Contract
16 Reporting System (CRS) or Project Estimating System (PES) in TRNS*PORT shall
17 be used for this index. The Pay Item Summary Sheet can be generated as
18 necessary but the one used in the **Computation Book** shall be generated at the
19 end of the project, so all approved Supplemental Agreements' pay items are
20 reflected on the Pay Item Summary Sheets.
- 21 5.7.6 The original **Computation Book** records from Design and Construction are
22 transmitted to Final Estimates upon completion of the project. They are used in
23 conjunction with other records to verify the final payment to the contractor.
- 24 5.7.7 All of Design's item-specific Computation Book sheets, supporting computations,
25 working drawings, diagrams and working plan sheets shall be left with the final
26 estimate package. Corrections for errors must be done and appropriately included
27 by the PA.
- 28 5.7.8 If a pending Supplemental Agreement (SA) is proposed on a contract, the
29 Computation Book must contain all supporting measurements, computations and
30 references relating to any new pay items that are proposed as a result of the
31 pending SA. (The Final Plans must appropriately reflect the impact of the SA.) In
32 these cases, the consecutive order of item numbers may be broken on the Pay Item
33 Summary Sheets and the proposed items may be shown at the end of the summary
34 sheets. All items on a pending Supplemental Agreement shown in the summary

1 sheets shall be identified as pending by placing the word **pending** followed by the
2 SA number, preceding the pay item number. **Example: Pending (SA No. 5) 331-**
3 **2.**

4 5.7.9 Plan matrices may be used in lieu of **Computation Book** sheets. Where it is not
5 feasible to use plan sheets, record final measurements in a field book or acceptable
6 form and transfer final quantities to the appropriate matrix summary with reference
7 noted.

8 **5.8 LIST OF FIGURES FOLLOWING THIS CHAPTER**

9 Figure No. 5-1 Computation Book Compilation Process