

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 Department), (see the Computation Methods 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** on **Computation Book Compilation Process**.

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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 by Design to develop some quantities for pay items by Design **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.)~~

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1 The location sketch that identifies the area, the quantity and the reference
2 baseline/centerline name should be contained in the CADD files submitted to
3 the Department. The naming convention for these files should be in
4 accordance with the Department's "**CADD production Criteria Handbook**"
5 **Chapter 4.**

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

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

12 2. Quantity Errors of Major Nature: An example of this would be if the
13 Designer left out the southwest quadrant of an intersection. Errors of
14 major nature are to be resolved by the Designer Engineer. Construction
15 will request in writing, that the Designer provide detailed documentation or
16 verify the concern for the plan quantity item(s) in question.
17

18 D. Design ~~must~~ **needs to** produce the backup documentation within 5 working
19 days of the request from construction.

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

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

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

1 Final Estimates uses and preserves the computations of design and/or construction to
2 verify the final pay quantities. Where dimensions, computations or plan intent are not clear,
3 it is recommended that construction personnel consult with the Design Section responsible
4 for such computations.

5 5.3 BASIS OF ESTIMATING

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

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

11 5.4 FORMAT

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

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

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

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

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

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1 (E) Organize the calculations and other materials in the **Computation Book** to
2 correspond with the pay items as they appear on the Summary of Pay Items
3 sheet and the contract.

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4 5.5 COMPUTATION BOOK CONTENTS

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

9 **5.5.1** Roadway items, such as surface, base, stabilizing, etc. which must be tabulated by
10 the length and width of individual sections to calculate the total, shall be shown.

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11 **5.5.2** Linear measure items that require a tabulation, shall be shown on a standard form
12 in the **Computation Book**.

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

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19 **5.5.4** Some items (such as drainage structures and traffic items etc.) are detailed on the
20 contract plans sheet. To avoid duplication, further detailing of these items will not be
21 required in the **Computation Book** by Design.

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22 **5.5.5** Many final measurement items and construction quantities will be added to the
23 computations during the construction phase. These are discussed in more detail in
24 the procedures which follow in this manual. **See Chapter 2 of this manual.**

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25 5.6 CONSTRUCTION UTILIZATION

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

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1 5.7 FINAL ESTIMATES RECORDS

2 The **Computation Books** are utilized by construction to substantiate the final pay
3 quantities. As such, all changes by Supplemental Agreements (SA) and/or Change Work
4 Orders, etc., must be reflected in the quantities, with their supporting computations.

5 **5.7.1** Some of the standard forms may be used to record field measurements for final
6 quantities, such as latitude and departure sheets. All required field measurements
7 will be recorded, either on these forms or in final measurement field books.

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8 **5.7.2** Construction uses the space on the bottom of the standard forms to record brief
9 comments and notes about the differences in original and final quantities. These
10 notes are used to summarize the explanation of overruns and underruns to be
11 submitted with the final estimates package.

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12 **5.7.3** All changes in rates of application, limits, etc., shall be documented in the
13 **Computation Book** along with the revised calculations of final quantities. The
14 remarks column on the right side of ~~the each~~ forms ~~are~~is intended to be used by
15 construction to explain ~~these any~~ changes and make other explanatory comments.

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16 **5.7.4** Project Administrators (PA)s will have to add forms and calculations for some items
17 on which adjustments are required. ~~The original quantity involved before the~~
18 ~~adjustment was made, will be necessary at all times. They will have to add all~~
19 ~~contractual adjustments such as composite pay factors, thickness, and deficiencies.~~
20 ~~These will be documented and cross referenced with supporting calculations. The~~
21 ~~original quantity involved before the adjustment was made, will be necessary at all~~
22 ~~times.~~

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23 **5.7.5** A complete index to the **Computation Books** will be made. A copy of the Pay Item
24 Summary Sheet (~~formerly known as the Final Estimate Sheet~~) from ~~the the Contract~~
25 ~~Reporting System (CRS) or~~ Project Estimating System (PES) in TRNS*PORT shall
26 be used for this index. The Pay Item Summary Sheet can be generated as
27 necessary but the one used in the **Computation Book** shall be generated at the
28 end of the project, so all approved Supplemental Agreements' pay items are
29 reflected on the Pay Item Summary Sheets.

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30 **5.7.6** The original **Computation Book** records from Design and Construction are
31 transmitted to Final Estimates upon completion of the project. They are used in
32 conjunction with other records to verify the final payment to the contractor.

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33 **5.7.7** All of Design's item-specific **Computation Book** sheets, supporting computations,

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1 working drawings, diagrams and working plan sheets shall be left with the final
2 estimate package. Corrections for errors must be done and appropriately included
3 by the PA.

4 **5.7.8** If a pending ~~Supplemental Agreement (SA)~~ is proposed on a contract, the
5 **Computation Book** must contain all supporting measurements, computations and
6 references relating to any new pay items that are proposed as a result of the
7 pending SA. (The Final Plans must appropriately reflect the impact of the SA.) In
8 these cases, the consecutive order of item numbers may be broken on the Pay Item
9 Summary Sheets and the proposed items may be shown at the end of the summary
10 sheets. All items on a pending SA shown in the summary sheets shall be identified
11 as pending by placing the word **pending** followed by the SA number, preceding the
12 pay item number. **Example: Pending (SA No. 5) 331-2.**

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13 **5.7.9** Plan matrices may be used in lieu of **Computation Book** sheets. Where it is not
14 feasible to use plan sheets, record final measurements in a field book or acceptable
15 form and transfer final quantities to the appropriate matrix summary with reference
16 noted.

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18 **Note: Only final measured pay items should be final measured. Plan quantity items**
19 **are not final measured. Only field changes and Plan errors are**
20 **measured/documentated in the field book.**

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21 5.8 LIST OF FIGURES FOLLOWING THIS CHAPTER

22 Figure No. 5-1 Computation Book Compilation Process

**Figure 5-1
COMPUTATION BOOK COMPILATION PROCESS**

