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 Computation 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

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

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

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

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

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

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

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

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

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

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

5.3 BASIS OF ESTIMATING

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

The basis of estimating, and the accuracy required, ~~the design and construction responsibilities relative to the Computation Book and the appropriate form to use,~~ are all shown in the publication titled ***Basis of Estimates Handbook*** produced by the State Estimates Office.

5.4 FORMAT

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

A loose-leaf binder that will accommodate legal size paper shall be used. ~~The book covers shall be Accopress binder, legal size, stock no. 754242 to order from warehouse use no. 611021 or equal. Any functional facsimile, either purchased or constructed, may be substituted.~~ Spiral binders shall not be used (this makes additions and corrections very difficult). A gummed label with the name of the project, county, Financial Project ID No., and names of the persons who prepared and checked the Computation Book shall be affixed to the front of the binder.

Use the standard forms, (**See *Chapter 13* of this manual**) to calculate and/or summarize the quantities.

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

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

~~Computer output for earthwork, COGO or other bulky calculation programs shall be bound in a separate book, and cross-referenced in the Computation Book's appropriate pay item sheet~~.

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

5.5 COMPUTATION BOOK CONTENTS

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

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

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

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

~~5.5.4 Special calculations or plots that Design must do, but are not required to be shown in the plans (Spline grades, curb return profiles, grading contours, sketches showing points, curves and areas on COGO runs and bridge component details, shall all be shown in the appropriate Computation Book.~~

5.5.5~~4~~ Some items (such as drainage structures and traffic items etc.) are detailed on the contract plans sheet. To avoid duplication, further detailing of these items will not be required in the ***Computation Book*** by Design.

5.5.6~~5~~ Many final measurement items and construction quantities will be added to the computations during the construction phase. These are discussed in more detail in the procedures which follow in this manual. ***See Chapter ~~Two~~ 2 of this manual.***

5.6 CONSTRUCTION UTILIZATION

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

5.7 FINAL ESTIMATES RECORDS

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

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

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

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

5.7.4 Project ~~Engineers (PE)s~~ Administrators (PA)s will have to add forms and calculations for some items on which adjustments are required. ~~An estimate of the~~ The original quantity involved before the adjustment was made, will be necessary at all times.

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

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

5.7.7 All of Design's item-specific Computation Book sheets, supporting computations, working drawings, diagrams and working plan sheets shall be left with the final

estimate package. Corrections for errors must be done and appropriately included by the ~~PE~~PA.

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

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

5.8 LIST OF FIGURES FOLLOWING THIS CHAPTER