

ENGINEERING DIRECTIVE
Chief Engineer

In an effort to more efficiently perform final reviews of all MassHighway contracts, the Department has developed a new procedure for verifying final quantities. This engineering directive's intent is to standardize and expedite the process utilized by the Department's Final Review Engineers. Generally, the new process involves the application of random sampling techniques in the selection of the contract items to be reviewed and the selection of those line items to be reviewed within the contract items.

This new procedure will become effective on all contracts that have not had a final review as of the date of this policy, and should be implemented immediately. Once the random sampling technique is applied to select the items to be reviewed, current final review procedures will be applied in the audit of the selected items.

All final reviews will continue to be performed at the District level. In order to carry out the new procedure at the District level, at least one Final Review Engineer will be assigned to each District. The Assistant District Construction Engineer, in conjunction with the District Final Review Engineer, will be responsible for pre-finalizing all contracts performed within the District.

All District Final Review Engineers will be directly supervised by the Final Review Engineer in Boston and will not be considered District personnel. Please note that the District Final Review Engineer's main responsibility will be to conduct final reviews. Although the Final Review Engineer will be available to instruct field personnel in the proper processing of all source documentation, it is the responsibility of each Resident Engineer to properly process all source documentation while the contract is in progress.

PROCEDURE FOR STATISTICAL AUDIT OF FINAL QUANTITIES

1. Selection of the Contract Items to be Audited:

- (a) Select the largest valued items that total at least 30% of the final total contract amount (exclude lump sum items). The selected items will be given a complete audit. For example, the item with the largest dollar value equals 12% of the total final contract amount, the item with the second largest dollar value equals 10% of the total final contract amount, the item with the third highest dollar value equals 8% of the total final contract amount and the item with the fourth highest dollar value equals 3% of the total final contract amount. A full audit will be given to the first three items, as those items total at least 30% of the total final contract amount.
- (b) Random sample the remaining contract items (exclude lump sum items).
 - (1) Number remaining contract items that do not fall under 1(a) above beginning with 001.
 - (2) To determine sample size, take 10% of the total number of remaining items and round off to the next highest whole number.
 - (3) To determine the first contract item to be reviewed, use random tables numbered 1 through 31 and utilize the table that corresponds with the beginning date of the final review. For example, if the audit report begins on October 20, 1993, use table #20.
 - (4) From the selected table, use the random numbers to select the items to be audited until the required sample as determined in 1(b) (2) is obtained.

2. Selection of the Line Items Comprising a Contract Item:

- (a) Consecutively number the line items for each selected contract item in the left margin.
- (b) To determine the sample size, take 10% of the total number of line items counted and round-off to the next highest whole number.
- (c) Audit the number of line items within each contract item as obtained in 2(b).
- (d) Circle the line item numbers selected for purposes of identification.

3. Audit of the Selected Line Items:

- (a) A complete audit shall be made to verify the field quantity and corresponding source documentation of field measurements. The audit trail will be traced to its source(s), through the documentation references provided by the resident engineer. All mathematical computations shall be checked. The source of all figures used in computations shall be readily discernible.
- (b) The final quantity for the line item as determined by the reviewer shall be entered in the Item Estimate Book in the final quantity column.
- (c) A difference between the field quantity and the final quantity under $\pm \$100$ or $1/2$ of the one percent of that line item, whichever is greater, may be considered acceptable for any line items less than \$100,000. For any line items greater than \$100,000, a difference of up to \$999 may be considered acceptable (any difference should be corrected and reflected on the final estimate).
- (d) A difference between the field quantity and the final quantity over $\pm \$100$ or $1/2$ of one percent of that line item, whichever is greater, shall require that the next line item also be audited.

For line items greater than \$100,000, a difference over \$999 shall require an audit of the next line item.

(1) If the difference between the field quantity and the final quantity of a line item requires that an audit of the next line be performed, and if the next line item is also in violation of paragraph 3(d), all line items for that contract item shall be audited.

(e) The final pay quantity for the contract item shall be the sum of the final quantity for each line item audited plus the sum of the field quantity for the line items not audited.

4. Rejection of Project Records:

- (a) If at the first instance the audit reveals inadequate source verification of any sort necessary to substantiate final payment or if the condition described in 3.d.1. occurs twice, the audit operation ceases. Notify the District Construction Engineer for corrective action on the part of the Resident Engineer.
- (b) Upon corrective action, the audit shall be performed as stated in Paragraph 1(b).
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