

## Section 5.15

### FINAL MEASUREMENTS

#### 5.15.1 Purpose

To provide requirements and techniques to ensure ~~that~~ Final Measured, Plan Quantity, and Lump Sum Pay Items are accurately and efficiently prepared and documented.

Measurements for bituminous material, earthwork, loose volume material in trucks, and Contractor certified quantities are addressed in other sections of **CPAM**.

#### 5.15.2 Authority

Sections 20.23(3)(a) and 334.048(3), Florida Statutes (F.S.)

#### 5.15.3 Reference

Standard Specifications for Road and Bridge Construction

~~Construction Project Administration Manual (CPAM)~~

Basis of Estimates Manual (BOE)

#### 5.15.4 Final Measured Pay Items

On many items, quantities for progress and final estimates must be documented by measurements in the field as the work is ~~actually accomplished~~constructed. This type of measurement is considered ~~to be~~ Final Measured. ~~The monthly~~ progress estimates ~~are~~is generated to reflect the work completed during ~~this each estimate~~ period by summarizing the final measured quantities recorded. When the project is completed, the **Final As-Built Plans, Field Records**, and other Department approved forms are submitted, along with the other final estimate data, to substantiate the final quantities. Final measurement of pay quantities generally fall into one of the following categories:

(A) **Area Measurement Pay Items:** When items are paid for ~~on the basis of by~~ the area of the finished work, the dimensions for calculating these areas ~~shall~~must be documented in the **Field Records**. This ~~shall~~will be done in accordance with one of the following methods:

- (1) The length ~~shall~~will be the dimension shown on the plans or the station-to-station dimension actually constructed within the project limits

designated by the Engineer. The width ~~shall~~will be the dimension 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 ~~shall~~will be 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, the baseline must be straight lined with beginning and ending points referenced to the centerline of construction by station and offset. The Final Measurements option of the FDOT Engineering Quantities Programs can be used to verify quantities.

~~(3)(4)~~ Global Navigation Satellite System (GNSS) rovers data collection can be utilized in lieu of traditional methods for area verification. Submit GNSS output—calculations, and reports to document area measurements. Ensure GNSS output includes accuracy and precision information.

**NOTE 1:** When changes to area measurement pay items are encountered in the field, the ~~backup—documentation—and calculations~~changes must be incorporated in the ***Final As-Built Plans***, ~~or r~~Reference to the appropriate supporting documents must be made in the Plan Summary Boxes located within the Summary of Quantity Sheets in the Plans or, for final area measurements. C~~contracts using an Estimated Quantities Report (EQR), will reference supporting documentation and calculations on the~~ ***Pay Item Summary and Certification*** form, per ***CPAM 5.13***.

**NOTE 2:** If computer programs are used, check the data input and calculations ~~shall be checked~~, and submit the site source measurements ~~submitted~~ with the computer output.

**NOTE 3:** Pay item adjustments are added/subtracted as line item adjustments in PrC and are not included in the Pay Item Quantity on the estimate.

~~(B)~~ **Linear Measurement Pay Items:** The dimension documented for items paid for ~~on the basis of by~~ linear ~~feet~~ ~~shall will~~ be the length shown on the plans and in the Plan Summary Box/EQR or the length measured along the finished surface of the item.

~~(1)~~ GNSS rovers can be utilized in lieu of traditional methods for linear verification. Submit GNSS output and reports to document linear measurement. Ensure GNSS output includes accuracy and precision information.

~~(B)(C)~~ **Volumetric Measurements Pay Items:** Field quantities for items paid for ~~on the basis of by~~ volume in cubic units, are usually determined by one of the following methods:

(1) For final measure concrete pay items, the area and thickness installed per the Specifications are used to determine the final quantity.

**NOTE 43:** Per **Specifications 346**, concrete pay adjustments for low strength concrete are required when acceptance strength test results fall ~~more than 500 psi~~ below the specified minimum strength. See Attachment 5-15-1 for examples of pay adjustment calculations for low strength concrete ~~calculations~~.

(2) For Subsoil and Channel Excavation, cross-section notes (and sketches) are recorded along both the original surface and the surface of the completed work. The volumes are calculated by hand or by use of approved computer programs.

~~(3)~~ Cross-sections with end area and volume computations can also be used advantageously in calculating buildup volumes of spalled concrete members.

~~(4)~~ GNSS rovers data collection can be utilized in lieu of traditional methods for volume verification. Submit GNSS output calculations, and reports to document volume measurement. Ensure GNSS output includes accuracy and precision information.

~~(3)~~ —

~~(D)~~ **Per Each Measurement Pay Items:** Items paid for as a unit (e.g., such as fence gates or inlets, raised pavement markers, etc.) ~~shall will~~ be tabulated by location in the ~~Plan Summary Boxes~~ Site Source **Field Record**.

~~(C)~~(1) GNSS rovers can be utilized for per each items. Submit GNSS output and reports to document item locations. Ensure GNSS output includes accuracy and precision information.

#### **5.15.4.1 Spalled Concrete**

The Spalled Areas option of the FDOT Engineering Quantities Programs can be used to verify quantities. See [Attachment 5-15-2](#) for examples of spalled concrete sketches. For more information on concrete pavement criteria, see [Standard Plans Index 353-001](#). Specifications Section 347 provides acceptance criteria for non-structural concrete. Specifications 450 provides acceptance criteria for precast prestressed concrete.

#### **5.15.4.2 Prestressed Concrete and Steel Piling**

The final quantity for prestressed concrete and steel piling will be based on the length of piling furnished, driven, and accepted, including any adjustments authorized and approved by the Engineer. Refer to [Attachment 5-15-3](#), Prestressed Concrete Piling Payment Table and [Attachment 5-15-4](#), Steel Piling Payment Table. ~~It is essential that the **Field Records** are complete and clearly support the final pay quantity.~~

Pile Logs are permanent records and must be submitted with the **Final Estimates Documentation** to completely and clearly support the final pay quantity.

Ensure there is no duplication of payment when cutoffs are transported to another bridge under the same contract for use as buildups or permanent piles. Also ensure there is no duplication of payment if the pile is extracted and driven elsewhere (the pile will be paid for at 30% of the contract unit price). See **CPAM 10.1** for further information.

#### **5.15.4.3 Concrete Sheet Piling**

The final quantity for Concrete Sheet Piling is the length of piling completed and accepted. Verify the pay quantity is based on the actual width of piling used, per **Specifications Section 455-11.7**. Ensure **Field Records** clearly document the top of pile and bottom of pile elevations constructed in the field. Check for compliance with the plan elevations. See **CPAM 10.1** for more information.

#### **5.15.4.4 Drilled Shaft**

The final quantity for Drilled Shafts is the length, in feet, completed and accepted as determined by **Specifications Section 455-23.1**.

Drilled Shaft Logs are permanent records and ~~shall~~ must be submitted with the **Final Estimates Documentation** to completely and clearly support the final pay quantity.

The Contractor is allowed to supply a Drilled Shaft casing with an inside diameter smaller than the specified Drilled Shaft diameter. In this case, the Contractor is required to provide an additional length of drilled shaft at no cost to the Department. The additional length required is determined by the following relationship. See **CPAM 10.5** for more information.

$$\text{Additional Length} = \frac{(D_1 - D_2)L}{D_2}$$

where:

D<sub>1</sub> = casing inside diameter specified = shaft diameter specified

D<sub>2</sub> = casing inside diameter provided (D<sub>2</sub> = D<sub>1</sub> minus twice the wall thickness)

L = authorized shaft length below ground for temporary casing methods or below casing for permanent casing methods.

### 5.15.5 Lump Sum Pay Items

Where the pay quantity for an item is designated to be a Lump Sum (LS) and the plans show an estimated plan quantity (secondary units), 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 **Specifications Section 9-3.2-1**). For these items, 1 LS will be paid on the pay item and overruns will be made as a line item adjustment, using adjustment type *LSAD -- LS Pay item Adj for Overruns*. The most common pay items eligible for this type of adjustment are Clearing and Grubbing (110-1) and Structural Steel (460-2), ~~although~~ this adjustment method would also apply to the proration ~~offer~~ actual costs for the Partnering (999-16) and Electrical Power Service – Contribution in Aid of Construction (639-8) pay items. See the example below and contact the State Final Estimates Office for more information.

**NOTE 5:4:** The MOT LS pay item 102-1 is NOT to be adjusted by construction for overruns/underruns using the secondary units of days.

When the plans do not provide secondary units, a new unit price may be established ~~of a new unit price~~ through a Supplemental Agreement (SA) shall to compensate the Contractor for changes in the cost of completing the item. Likewise, when it is apparent that miscellaneous items, such as maintenance of traffic or grading, have been included

in the LS price for clearing and grubbing, any adjustment in the final LS price ~~shall~~must be negotiated and documented by SA.

**NOTE 65:** For Lump Sum Projects, see **CPAM 6.2**.

### **5.15.5.1 Clearing and Grubbing**

Example of adjustment to LS Clearing and Grubbing pay item:

Plan Quantity (PQ) = 1 LS (20 AC)  
Change in Plan Quantity = 1.23 AC  
LS Unit Price = \$13,290

Determine if the change in plan quantity meets **Specifications Section 9-3.2** criteria for Substantial Error using secondary units:

Check 1 (exceeds 5%):  $\frac{1.23 \text{ AC}}{20 \text{ AC}} \times 100 = 6.15\% > 5\%$  (does qualify)

Check 2 (exceeds \$5,000):  $1.23 \text{ AC} \times \frac{\$13,290}{20 \text{ AC}} = \$817.34$  (does not qualify)

Since only one of the checks need to qualify to be considered a substantial error, a pay adjustment will be applied.

$$\begin{aligned} \text{Final Pay Quantity} &= \frac{\text{PQ (Secondary Units)} + \text{Change in PQ (Secondary Units)}}{\text{PQ (Secondary Units)}} \\ &= \frac{20 \text{ AC} + 1.23 \text{ AC}}{20 \text{ AC}} = \frac{21.23 \text{ AC}}{20 \text{ AC}} = 1.0615 \text{ LS} = 1.06 \text{ LS} \end{aligned}$$

The PA must verify the quantity change before any line item adjustment to the LS item is made. For this example, 1 LS will be paid on the pay item and 0.06 LS will be applied as a *LSAD -- LS Pay item Adj for Overruns* line item adjustment.

### **5.15.6 Plan Quantity Pay Items**

Plan Quantity Items under **Specifications Section 9-3** are based on backup information and calculations by the Designer. Documentation requirements are as follows:

- (A) The Plan Summary Boxes/EQR will show the Pay Item, Pay Item Description, Unit of Measure, Quantity, Location, and Stationing.
- (B) Area ID numbers are listed in the Plan Summary Boxes/EQR to reference corresponding area shapes within the Design files. For more information on how to find these areas, use the resource called [MicroStation Basics for Construction](#) on the State Construction website.
- (C) 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 produced within five (5) working days of the request from Construction per [BOE Chapter 8](#).
- (D) Plan Quantity Items will not be final measured. Only changes in the field or plan errors, as set forth in **Specifications Section 9-3**, are required to be documented as final measurements (see **CPAM 5.15.4**). The Construction Office will not make detailed calculation entries when no changes are made.
- (E) When no changes are made and only Plan Quantity is paid, a simple red check (✓) should be shown under the "F" or "Final" column within the Plan Summary Box. If a change occurs, then the differing quantity should be shown in the "Final" column of the Plan Summary Box. Add reference under the "Remarks" column on where the backup documentation can be found and mark up the station columns to the correct information, if necessary.
- (F) Deviation from the Plan Dimensions: **Specifications Section 9-3.4** requires the aggregate change must exceed 5% or \$5,000 of the original plan quantity for earthwork and more than \$100 for other items.
- (G) When changes in limits are authorized, the PA must show the revised quantities by showing revisions alongside the original Designer's calculations. If an additional area is added, the PA should show the area under a new empty row within the same pay item in the Plan Summary Box, and reference to the appropriate supporting documents must be made under the "Remarks" column. Additional plan sheets with Plan Summary Boxes can be added to the **Final As-Built Plans**, if empty rows or extra space is not available.

**NOTE 76:** Do not remove Designer quantity and/or work. Strike through and notate corrections appropriately.

- (H) Some method must be employed by the PA to prove or revise the Plan Quantity. Some of the suggested methods are as follows:
- (1) Field measure
  - (2) Scale from plans
  - (3) Station to station calculations
- (I) Plan Quantity Items on multiple-financial projects under one contract (multi-FINs) are to be evaluated per contract total, not per project total. Evaluation for multi-FINs must employ a correction to the “contract total”. See **Attachment 5-15-5** **Attachment 5-15-6** for examples of Plan Quantity analysis on multi-FINs.
- NOTE 87:** When two or more projects are on the same contract and the total combined change falls below the Plan Quantity parameters as outlined in **Specifications Section 9-3.2-1**, no change is made to the Plan Quantity.
- (J) The PA 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 laborious measurements, but rather to save man hours through less field survey work.

### **5.15.6.1** Type ‘A’ and Type ‘B’ Fencing

Type ‘A’ and Type ‘B’ Fencing are Plan Quantity pay items. The Payment for **Extra Length Posts** will require an invoice from the Contractor. Compensation will be at invoice price plus 10%, per **Specifications Section 550-6.2**. The invoice will be submitted with the **Final Estimates Documentation**.

Example: Contractor submits an invoice for 20 extra length posts at an invoice price of \$250.00.

$$10\% \text{ of Invoice} = \$250.00 \times 10\% = \$25.00$$

$$\text{Invoice} + 10\% = \$250.00 + \$25.00 = \$275.00$$

A positive line item adjustment will be made to compensate the Contractor in the amount of \$275.00. It is recommended to reference the Construction **Electronic Document Management System (EDMS)** document number for the invoice in AASHTOWare Project Construction (PrC).



### **5.15.6.2 Steel Sheet Piling**

The final quantity for Steel Sheet Piling is the plan quantity area, in square feet completed and accepted. Ensure **Field Records** clearly document the top of pile and bottom of pile elevations constructed in the field. Check for compliance with the plan elevations.

### **5.15.6.3 Concrete Structures**

The final quantity for concrete is the plan quantity volume, in cubic yards completed and accepted. Ensure deductions and allowances are made appropriately per **Specifications Section 400-22.2**.

**NOTE 98:** Transitional sections and end sections are included in plan quantity of traffic railing pay items. See **CPAM 10.2** and **CPAM 10.3** for more information.

### **5.15.6.4 Movable Bridges**

Movable Bridges are project specific. See the **Technical Special Provision (TSP)** for method of measurement and basis of payment.

### **5.15.6.5 Timber Structures**

The final quantity for Timber Structures is the plan quantity, in feet, board-foot measure, completed and accepted. Ensure the nominal commercial sizes shown in the plans or specified by the Engineer were used to calculate quantities. The lengths ~~shall~~ will be the overall lengths of the pieces as shown in the plans or the lengths ~~actually~~ incorporated in the structure if less than those shown in the plans.

### **5.15.6.6 Steel Grid Floors**

The final quantity for Steel Grid Floors is the plan quantity area, in square feet, completed and accepted. Station to station lengths and widths may be used in the calculation of the dimensions actually constructed within the limits designated by the Engineer for changes to the plan quantity. Determine that the proper deduction has been made for open joints in the floor as required to calculate plan quantity. See **Specifications Section 504** for more information.

### **5.15.6.7 Reinforcing Steel**

The final quantity for Reinforcing Steel is the plan quantity, in pounds, incorporated into the completed work and accepted as determined by **Specifications Sections 415-7** and **415-8**.

### **5.15.6.8 Mowing and Litter Removal**

The final quantity for mowing will be the project area multiplied by the number of completed mowing cycles. The individual areas of mowing completed will not be final measured. See **Specifications Section 107**. No field adjustments will be made to the project area.

This same concept applies to litter removal as well. Do not final measure or adjust the project area. Multiply the project area by the number of completed litter removal cycles to determine the final quantity. The number of litter removal cycles may differ from the number of mowing cycles, depending on the frequency directed by the Engineer per **Specifications 107-2.1**.

It is recommended to document the cycle dates in the Daily Work Reports and on Plan Summary Boxes or **Form 700-050-61, Final Measurement Miscellaneous**.

### **5.15.7 Degree of Accuracy**

Degrees of Accuracy for recording pay item quantitiess shall will be as indicated in [BOE Chapter 2](#).

### **5.15.8 Attachments**

[Attachment 5-15-1](#) ..... Examples of Pay Adjustments for Low Strength Concrete

[Attachment 5-15-2](#) ..... Examples of Spalled Area Sketches

[Attachment 5-15-3](#) ..... Prestressed Concrete Piling Payment Table

[Attachment 5-15-4](#) ..... Steel Piling Payment Table

[Attachment 5-15-5](#) ..... [Example of Plan Quantity Analysis](#)

[Attachment 5-15-5](#)[Attachment 5-15-6](#) ... Examples of Multi-FIN Plan Quantity Analysis

## Attachment 5-15-1 EXAMPLES OF PAY ADJUSTMENTS FOR LOW STRENGTH CONCRETE

**NOTE 10:** The following pay adjustment examples are based on 28-day compressive strengths. -Use the concrete compressive strength data at 56 days in lieu of the 28 days when the acceptance of concrete is at 56 days.

### (A) Linear Foot Pay Item Example:

Given Information:

- Item #521-5-5, Concrete Traffic Railing (42" Vertical Shape)
- One pour today was 14 CY and covered 98.7 LF = 99 LF of railing
- Certified Invoice Unit Price = \$575.00/LF
- Quantity of Concrete within the LOT = 14 CY
- 3 Cylinders were taken for the LOT. After 28 days, all cylinders failed.
- Required Strength of Class II Concrete = 3,400 Pounds per Square Inch (psi)
- Average Actual Cylinder Strength (after 28 days) = 2,850 psi

Payment Reduction per ***Specifications Section 346-11.37***:

$$\begin{aligned} \text{Reduction in Percentage of Strength} &= \frac{\text{Specified Minimum Strength} - \text{Actual Strength}}{\text{Specified Minimum Strength}} \\ &= \frac{3,400 \text{ psi} - 2,850 \text{ psi}}{3,400 \text{ psi}} = \frac{550 \text{ psi}}{3,400 \text{ psi}} = 0.1618 = 16.18\% \end{aligned}$$

Multiply the unit-certified invoice price by the reduction in percentage of strength by the quantity affected to determine the amount to deduct:

$$\text{Reduction in Pay} = \$575.00/\text{LF} \times 16.18\% \text{ (use all decimals)} \times 99 \text{ LF} = \$9,2\del{1008.4647}$$

**Apply the reduction as a negative line item adjustment of ~~-\$9,21008.476~~ with remarks of "Reduction in Pay is due to 16% Compressive Strength Failure".**

**(B) Cubic Yard Pay Item Example:**

Given Information:

- Pay Item #400-4-2: Concrete Class IV Endwalls
- This LOT represents 3 failed cylinders and 25 CY.
- ~~Certified Invoice~~ Unit Price = \$570.00/CY
- Pay Item is paid to the 10th of a CY
- Required Strength of Class IV Concrete = 5,500 psi
- Average Actual Cylinder Strength (after 28 days-) = 5,000 psi

Payment Reduction per ***Specifications Section 346-11.73***:

$$\text{Reduction in Percentage of Strength} = \frac{\text{Specified Minimum Strength} - \text{Actual Strength}}{\text{Specified Minimum Strength}}$$

$$= \frac{5,500 \text{ psi} - 5,000 \text{ psi}}{5,500 \text{ psi}} = \frac{500 \text{ psi}}{5,500 \text{ psi}} = 0.0909 = 9.09\%$$

Multiply the ~~unit-certified invoice~~ price by the reduction in percentage of strength by the quantity affected to determine the amount to deduct:

$$\text{Reduction in Pay} = \$570.00/\text{CY} \times 9.09\% \text{ (use all decimals)} \times 25 \text{ CY} = \$1,295.~~3345~~$$

**Apply the reduction as a negative line item adjustment of ~~-\$1,295.3345~~ with remarks of "Reduction in Pay is due to 9% Compressive Strength Failure".**

**(C) Cubic Yard Pay Item Example (Plastic Properties Pay Reduction)**

Given Information:

- Pay Item #400-2-11: Class II Concrete, Retaining Wall
- Contract Plan Quantity = 7 CY
- Certified Invoice Price of Concrete = \$150.00/CY
- 8 CY was delivered in a single ready-mix truck
- Rejected load due to a failed plastic properties test - placement continued

Payment Reduction per **Specifications Section 346-12:**

Pay Reduction (cast-in-place) =  $2 \times (\text{Certified Invoice Price per CY}) \times (\text{Concrete Quantity in Rejected Load})$

$$= 2 \times (\$150.00/\text{CY}) \times (8 \text{ CY}) = \$2400$$

**Apply the reduction as a negative line item adjustment of -\$2400 with remarks of "Reduction in Pay is due to Plastic Properties Failure".**

**NOTE 11:** For placing a rejected load of concrete in a precast product, plastic pay reductions will be two times the certified invoice price of the precast product multiplied by a reduction factor (% of concrete in the precast product).

**(C)(D) Each Pay Item Example (with Partial Payment):**

Given Information:

- Pay Item #425-1-351: Inlets, Curb, Type P-5, <10'
- Contract Plan Quantity = 7 EA
- ~~Unit~~ Certified Invoice Unit Price = \$3,300.00/EA
- Partial Pay: 65% paid for bottom and 35% for top
- 18 CY was placed for 7 inlet tops
- Required Strength of Class II Concrete = 3,400 psi
- Average Actual Cylinder Strength (after 28 days) = 3,275 psi

Payment Reduction per **Specifications Section 346-11.73**:

$$\text{Reduction in Percentage of Strength} = \frac{\text{Specified Minimum Strength} - \text{Actual Strength}}{\text{Specified Minimum Strength}}$$

$$= \frac{3,400 \text{ psi} - 3,275 \text{ psi}}{3,400 \text{ psi}} = \frac{125 \text{ psi}}{3,400 \text{ psi}} = 0.0368 = 3.68\%$$

$$\begin{aligned} \text{Equivalent quantity effected due to partial pay} &= \text{Quantity affected} \times \text{partial pay percentage} \\ &= 7 \text{ EA} \times 35\% = 2.45 \text{ EA} \end{aligned}$$

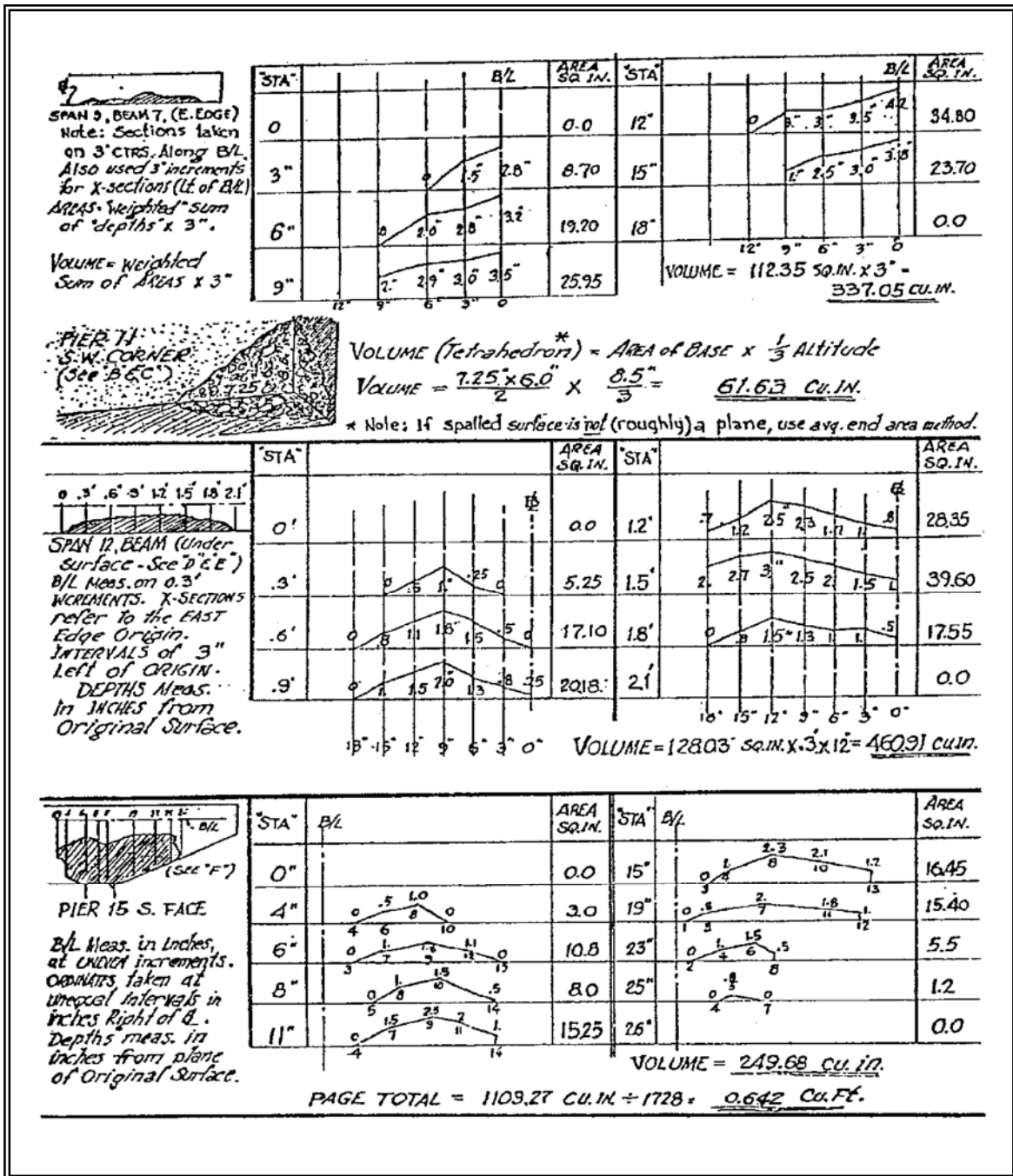
Multiply the ~~unit~~ certified invoice price by the reduction in percentage of strength by the equivalent quantity affected to determine the amount to deduct:

$$\text{Reduction in Pay} = \$3,300.00/\text{EA} \times 3.68\% \text{ (use all decimals)} \times 2.45 \text{ EA} = \$297.53$$

**Apply the reduction as a negative line item adjustment of -\$297.53 with remarks of "Reduction in Pay is due to 4% Compressive Strength Failure".**

## Attachment 5-15-2 SPALLED AREAS SKETCHES

### (A) Spalled Area Example 1

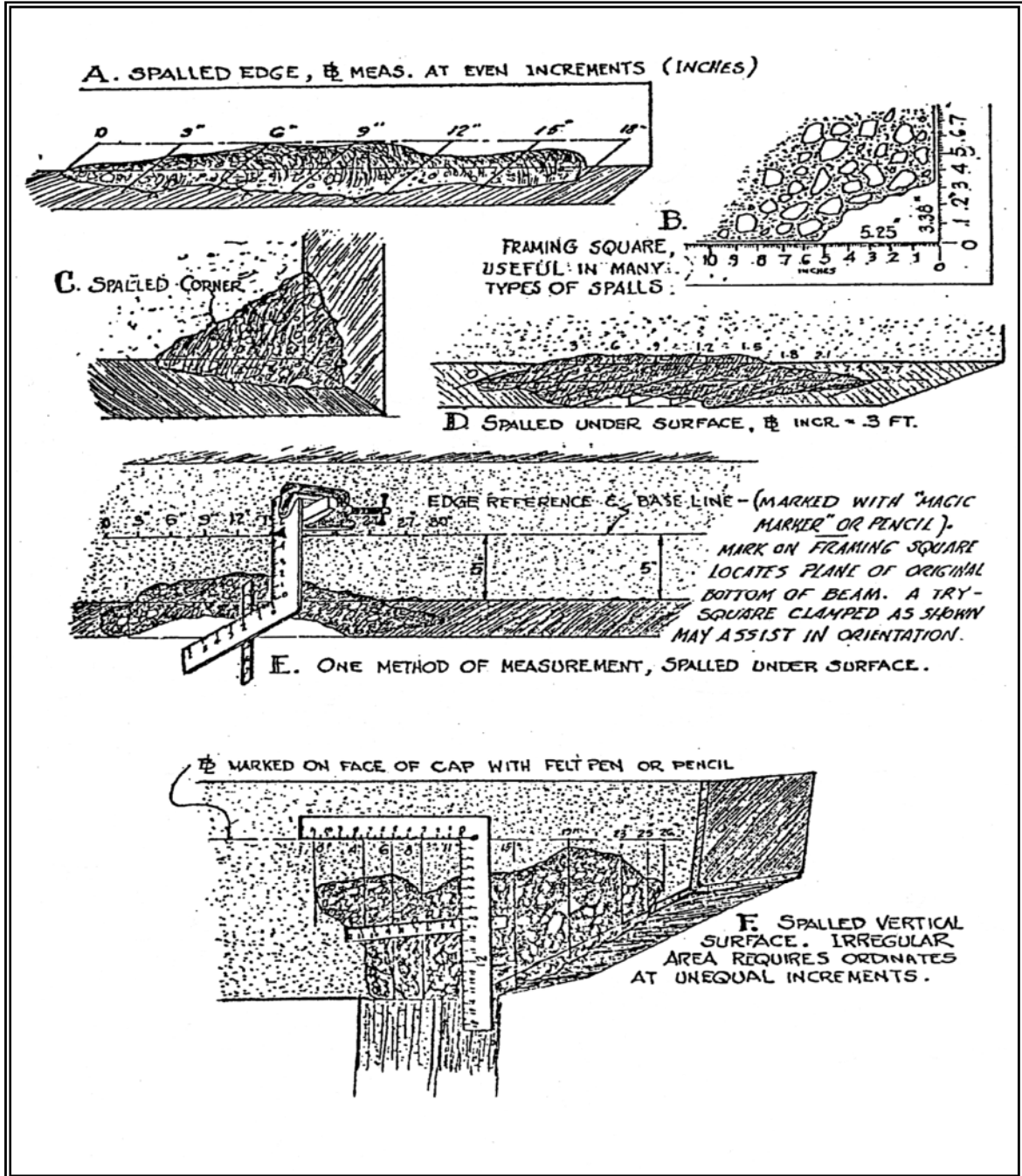


VOLUME = 12803' sq.in. x 3" x 12' = 46091 cu.in.

VOLUME = 249.68 cu.in.

PAGE TOTAL = 1103.27 CU. IN. ÷ 1728 = 0.642 Cu. Ft.

(B) Spalled Area Example 2





## Attachment 5-15-3 PRECAST CONCRETE PAYMENT SUMMARY TABLE

<u>ITEM</u>	<u>PAYMENT</u>	<u>455 SPEC.</u>
<b><u>Prestressed Concrete Piling</u></b>	<u>Authorized Pile Length – Casting length as authorized. Paid from head to tip (LF) at contract unit price</u>	<u>455-11.2.1</u>
<b><u>Prestressed Concrete Test Piling</u></b>	<u>Furnished, Driven, and Accepted (LF) at contract unit price</u>	<u>455-11.4</u>
<b><u>Cut-off (remaining piling)</u></b>	<u>No Payment (Cost included in the pay item for piling)</u>	<u>455-11.1</u>
<b><u>Driving of Test Pile Splice</u></b>	<u>No Payment</u>	<u>455-12.4</u>
<b><u>Static Load Tests</u></b>	<u>Number of static load tests, each, completed and accepted at contract unit price</u>	<u>455-11.11</u>
<b><u>Extracting and Replacing Piles</u></b>		
<u>(Contractor Responsible) Broken and irreparable piling, or mislocated piling</u>	<u>No payment for extraction or replacement</u>	<u>455-3 455-7.4</u>
<u>(Engineer elects) Piling driven below cut-off without achieving bearing and substituted with longer pile</u>	<u>Extraction paid as Unforeseeable Work</u>	<u>455-11.2.3</u>
<u>(Department Responsible) Broken and irreparable piling, or mislocated piling</u>	<u>Extraction paid as Unforeseeable Work</u>	<u>455-11.2.3</u>
<u>(Department Responsible) Replacement required for damaged or misplaced piling</u>	<u>Pay for both original and replacement piling under piling furnished</u>	<u>455-11.2.3</u>
<u>(Contractor elects) Piles without capacity - extracting of original pile to substitute for longer pile in lieu of splicing and build-up of original pile</u>	<u>Pay original authorized pile length + additional authorized length of buildup as piling + 30 ft of piling furnished for extracting original pile</u>	<u>455-11.2.3</u>
<u>Redriving of an extracted and "Undamaged" Pile</u>	<u>Paid at 30% of contract unit price for piling</u>	<u>455-11.2.3</u>
<b><u>Set-Checks &amp; Redrives</u></b>		
<b><u>Test piles:</u></b>		
<u>4 initial set checks on each test pile performed the day of and working day following initial driving.</u>	<u>No Payment</u>	<u>455-11.9.1</u>
<u>Each additional set check (after the 4 mentioned above) ordered by the engineer and performed within the following working day of initial driving.</u>	<u>Pay 10 LF of piling furnished</u>	<u>455-11.9.1</u>
<u>Redrives ordered by the Engineer and performed after the following working day from initial driving</u>	<u>Pay 20 LF of piling furnished</u>	<u>455-11.9.3</u>
<b><u>Production piles:</u></b>		
<u>2 set-checks performed the day of initial driving and working day following the initial driving</u>	<u>No Payment</u>	<u>455-11.9.2</u>
<u>Each additional set check (after the 2 mentioned above) ordered by the Engineer and performed within the following working day of initial driving</u>	<u>Pay 10 LF of piling furnished</u>	<u>455-11.9.2</u>
<u>Redrives ordered by the Engineer and performed after the following working day from initial driving</u>	<u>Pay 20 LF of piling furnished</u>	<u>455-11.9.3</u>
<b><u>Dynamic Load Tests</u></b>		
<b><u>Test Piles:</u></b>		
<u>For instrumentation, materials, and labor</u>	<u>No Payment (included in the cost of test pile)</u>	<u>455-11.5</u>
<b><u>Production piles:</u></b>		
<u>For structures with 100% dynamic testing</u>	<u>No Payment (included in cost of production pile)</u>	<u>455-11.5</u>
<u>For structures without 100% dynamic testing</u>	<u>Pay 20 LF of additional pile</u>	<u>455-11.5</u>

- <u>For supplying and installing embedded gauges or attaching external gauges to each production pile for dynamic load testing prior to initial driving, authorized by the Engineer</u>		
<b>Other:</b>		
<u>Evaluating changes in Driving Equipment</u>	No Payment	455-11.5
<u>Evaluating integrity of pre-planned epoxy-bonded dowel splices</u>	No Payment	455-11.5
<u>Attaching dynamic testing equipment for set-checks or redrive</u>	No Payment	455-11.5
<u>Dynamic load testing when driving using followers</u>	No Payment	455-11.5
<u>Dynamic load testing on temporary piles</u>	No Payment	455-11.5
<b>Splices (Build-up) ≤ 5 feet below cut-off elevation</b>		
<b>Test Piles:</b>		
<u>Build-ups for test piles left in place as permanent production pile for drilling and grouting the dowels, etc.</u>	9 LF of Production Pile	455-11.8
<u>Pile Build-up length (left in place as permanent pile)</u>	Additional LF at Production Pile unit price	455-11.4
<b>Production Piles:</b>		
<u>Build-ups for production piles for drilling and grouting the dowels, etc.</u>	9 LF of Production Pile	455-11.4 455-11.8
<u>Pile Build-up length</u>	Additional LF at Production pile unit price	455-11.2.1
<b>Splices (Build-up) &gt; 5 feet below cut-off elevation</b>		
<b>Test Piles:</b>		
<u>Splice Length Authorized – Non-driven</u>	Additional LF of Production Pile as authorized for the additional test pile length	455-11.2.1 455-11.4
<u>Splice Length Authorized – Driven for test purposes only</u>	Additional LF of Test Pile as authorized for the additional test pile length	455-11.4
<u>Splice (Material and Labor)</u>	Pay 30 LF Production Pile	455-11.8
<u>Driving of Unplanned Epoxy-bonded Dowel Splice</u>	No payment	455-11.2.2
<b>Production Pile:</b>		
<u>Splice Length Authorized</u>	Additional LF of Production Pile as authorized for the additional piling length	455-11.2.1
<u>Splice (Material and Labor)</u>	Pay 30 LF Production Pile	455-11.8
<u>Driving of Unplanned Epoxy-bonded Dowel Splice</u>	Pay 10 LF of Production Pile	455-11.2.2
<b>Preforming</b>		
<b>Test Pile and Production Pile:</b>		
<u>Once required penetration is achieved and authorized by the Engineer.</u>	30% of the length of the preformed pile hole (test pile or production pile) from the existing surface or the bottom of any required excavation, whichever is lower, to the bottom of the preformed hole	455-11.12

Updated 2-22-2017		
ITEM	PAYMENT	455 SPEC.
<b>Prestressed Concrete Piling</b>	Piling bid price, Feet	455-12.2
<b>Prestressed Concrete test Piling</b>	Piling bid price, Feet	455-12.4
<b>Cut-off (remaining piling)</b>	No Payment 455-12.12	455-11.2.4
<b>Driving of Test Pile Splice</b>	No Payment	455-12.4
<b>Replacing Piles</b>		
- Broken and irreparable piling, or mislocated piling and Contractor is responsible-extract and replace	- No payment	455-11.2.7
- Piling driven below cut-off without achieving bearing and the Engineer elects to extract pile and replace	- Unforeseeable Work	455-11.2.7
- Broken and irreparable piling, or mislocated piling and Department is responsible – extract and replace	- Unforeseeable Work; pay piling furnished bid price	455-11.2.7
- “Undamaged” Pile extracted and driven somewhere else	- Paid at 30% of contract unit price for piling	455-11.2.7
- Damaged or misplaced piling, and replacement is required and Department is responsible	- Pay for both original and replacement piling under piling furnished	455-11.2.7
- Extracting of original pile to substitute for longer pile in lieu of splicing and build-up of original pile	- Pay original pile length + additional authorized build up + 30 Ft. of piling furnished for extracting original pile	455-11.2.7
<b>Set-Checks &amp; Redrives</b>		
<b>Test piles:</b> Engineer may elect to interrupt pile driving up to 4 times on each test pile performed the day of and the working day following initial driving (i.e. 4 total set checks included in cost)	- No Payment	455-11.9 455-5.12.1
- Each additional set check determined necessary by the Engineer after the 4 previously mentioned above and within 1 working day following initial driving	- 10 feet piling furnished bid price	455-11.9
- Any <del>redrive</del> after the working day following initial driving	- 20 feet piling furnished bid price	455-11.9.3
<b>Production piles:</b> 2 set-checks performed the day of initial driving and working day following initial driving.	- No Payment	455-5.10.4a 455-11.9.2
- Any additional set check performed the day of initial driving and working day following initial driving.	- 10 feet piling furnished bid price	455-11.9.2
- Any <del>redrive</del> after the working day following initial driving	- 20 feet piling furnished bid price	455-11.9.3
<b>Dynamic Load Tests</b>		
<b>Test Piles:</b> Prices include instrumentation, materials and labor.	- No Payment	455-11.5 455-12.5.1
<b>Production piles:</b> Authorized by the Engineer for hooking up the instrument and begin driving	- 20 feet piling furnished bid price	455-11.5
- Instrumentation on set-checks	- No Payment	455-11.7 455-11.5
<b>Splices (Build-up) ≤ 5 feet below cut-off elevation</b>		
<b>Test Piles:</b>		
- Material and labor	- No payment	455-11.8
- Pile Build-up length	- No additional Payment	455-11.4
- Build-ups, for test purposes only, left in place as permanent Production Pile	- 9 feet of Production Pile	455-11.8
<b>Production Piles:</b>		
- Materials and labor	- 9 feet of Production Pile	455-11.8
- Piling Build-up length	- No additional payment	455-11.8
<b>Splices (Build-up) &gt; 5 feet below cut-off elevation</b>		
<b>Test Piles:</b>		
- Splice Length Authorized –Non driven	- Length in feet of Production Pile bid price	455-11.8
- Splice Length Authorized - Driven for test purposes only	- Length in feet of Test Pile bid price	455-11.8
- Splice (Material and Labor)	- 30 feet Production Pile bid price	455-11.8
- Driving of Splice for test purposes only	- No payment	455-11.2.6
<b>Production Pile:</b>		
- Splice Length Authorized	- Length in feet of Production Pile bid price	455-11.8
- Driving of Production Pile splice	- 10 feet Production Pile bid price	455-11.2.6
- Splice (Material and Labor)	- 30 feet of Production Pile bid price	455-11.8
<b>Static Load Tests</b>		
	- Static Load test bid price	455-11.11
<b>Preforming (Paid under either Test Pile or Production Pile)</b>		
	- 30% of piling per foot	455-11.12

## Attachment 5-15-4 STEEL PILE PAYMENT SUMMARY TABLE

<u>ITEM</u>	<u>PAYMENT</u>	<u>455 SPEC.</u>
<u>Steel Piling Length</u>	<u>Authorized Pile Length Paid from head to tip (LF) at contract unit price</u>	<u>455-11.3.1</u>
<u>Steel Test Piling</u>	<u>Furnished, Driven, and Accepted (LF) at contract unit price</u>	<u>455-11.4</u>
<u>Point Protectors</u>	<u>Per each authorized, furnished &amp; installed</u>	<u>455-11.3.2</u>
<u>Cut-Off (remaining piling)</u>	<u>No Payment (Cost included in the pay item for piling)</u>	<u>455-11.1</u>
<u>Driving of Test Splice</u>	<u>No Payment</u>	<u>455-12.4</u>
<u>Static Load Tests</u>	<u>Number of static load tests, each, completed and accepted at contract unit price</u>	<u>455-11.11</u>
<b>Set-Checks &amp; Redrives</b>		
<u>Test piles:</u>		
<u>4 initial set checks on each test pile performed the day of and working day following initial driving.</u>	<u>No Payment</u>	<u>455-11.9.1</u>
<u>Each additional set check (after the 4 mentioned above) ordered by the engineer and performed within the following working day of initial driving.</u>	<u>Pay 10 LF of piling furnished</u>	<u>455-11.9.1</u>
<u>Redrives ordered by the Engineer and performed after the following working day from initial driving</u>	<u>Pay 20 LF of piling furnished</u>	<u>455-11.9.3</u>
<u>Production piles:</u>		
<u>2 set-checks performed the day of initial driving and working day following the initial driving</u>	<u>No Payment</u>	<u>455-11.9.2</u>
<u>Each additional set check (after the 2 mentioned above) ordered by the Engineer and performed within the following working day of initial driving</u>	<u>Pay 10 LF of piling furnished</u>	<u>455-11.9.2</u>
<u>Redrives ordered by the Engineer and performed after the following working day from initial driving</u>	<u>Pay 20 LF of piling furnished</u>	<u>455-11.9.3</u>
<b>Dynamic Load Tests</b>		
<u>Test Piles:</u>		
<u>For instrumentation, materials, and labor</u>	<u>No Payment (included in cost of test pile)</u>	<u>455-11.5</u>
<u>Production piles:</u>		
<u>For structures with 100% dynamic testing</u>	<u>No Payment (included in cost of production pile)</u>	<u>455-11.5</u>
<u>For structures without 100% dynamic testing</u> <u>- For supplying and installing embedded gauges or attaching external gauges to each production pile for dynamic load testing prior to initial driving, authorized by the Engineer</u>	<u>Pay 20 LF of additional pile</u>	<u>455-11.5</u>
<u>Other:</u>		
<u>Evaluating changes in Driving Equipment</u>	<u>No Payment</u>	<u>455-11.5</u>
<u>Attaching dynamic testing equipment for set-checks or redrive</u>	<u>No Payment</u>	<u>455-11.5</u>
<u>Dynamic load testing when driving using followers</u>	<u>No Payment</u>	<u>455-11.5</u>
<u>Dynamic load testing on temporary piles</u>	<u>No Payment</u>	<u>455-11.5</u>
<b>Splices</b>		

<b><u>Test Piles:</u></b>		
<u>Splice Length Authorized – Non driven</u>	<u>Additional LF of Production Pile as authorized for the additional test pile length</u>	<u>455-11.8</u>
<u>Splice Length Authorized - Driven for test purposes only</u>	<u>Additional LF of Test Pile as authorized for the additional test pile length</u>	<u>455-11.8</u>
<u>Splice (Material and Labor)</u>	<u>Pay 20 LF of Production Pile</u>	<u>455-11.8</u>
<u>Driving of Splice for test purposes only</u>	<u>No Payment</u>	<u>455-11.8</u>
<b><u>Production Pile:</u></b>		
<u>Splice Length Authorized</u>	<u>Additional LF of Production Pile</u>	<u>455-11.8</u>
<u>Splice (Material and Labor)</u>	<u>Pay 20 LF of Production Pile</u>	<u>455-11.8</u>
<u>Driving of production pile splice</u>	<u>No Payment</u>	<u>455-11.8</u>
<b><u>Preforming</u></b>		
<b><u>Test Pile and Production Pile:</u></b>		
<u>Once required penetration is achieved and authorized by the Engineer.</u>	<u>30% of the length of the preformed pile hole (test pile or production pile) from the existing surface or the bottom of any required excavation, whichever is lower, to the bottom of the preformed hole</u>	<u>455-11.12</u>

<b>Updated 2-22-2017</b>		
ITEM	PAYMENT	455 SPEC.
<b>Piling Length</b>	Piling bid price, Feet	455-12.3
<b>Test Piling</b>	Piling bid price, Feet	455-12.4
<b>Point Protectors</b>	Per each authorized, furnished & installed	455-11.3.2
<b>Cut-Off</b>	No Payment	455-12.11
<b>Driving of Test Splice</b>	No Payment	455-12.4
<b>Set-Checks &amp; Redrives</b>		
<b>Test piles:</b>		455-11.9.1
- Engineer may elect to interrupt pile driving up to 4 times on each test pile performed the day of and the working day following initial driving (i.e. 4 total set checks included in cost).	- No Payment	455-5.12.1
- Each additional set check determined necessary by the Engineer after the 4 previously mentioned above and within 1 working day following the initial driving	- 10 feet piling furnished bid price	455-11.9.1
- Any re-drive after 1 working day from end of initial driving	- 20 feet piling furnished bid price	455-11.9.3
<b>Production piles:</b>		455-5.10.4a
- Engineer may elect to interrupt pile driving up to 2 times on each production pile performed the day of and the working day following initial driving (i.e. 2 total set checks included in cost).	- No Payment	455-11.9.2
- Each additional set check determined necessary by the Engineer after the 2 mentioned above and within 1 working day following the initial driving	- 10 feet piling furnished bid price	455-11.9.2
- Any re-drive after 1 working day from end of initial driving	- 20 feet piling furnished bid price	455-11.9.3
		<del>455-5.10.4b</del>
<b>Dynamic Load Tests</b>		
<b>Test Piles:</b>		455-11.5
- Prices include instrumentation, materials and labor	- No Payment	455-12.5.1
<b>Production piles:</b>		455-11.5
- Authorized by the Engineer for hooking up the instrument and begin driving	- 20 feet piling furnished bid price	455-11.5
- Instrumentation on set checks	- No Payment	455-11.5
<b>Splices</b>		
<b>Test Piles:</b>		455-11.4
- Splice Length Authorized – Non driven	- Length in feet of Production Pile bid price	455-11.8
- Splice Length Authorized - Driven for test purposes only	- Length in feet of Test Pile bid price	455-11.8
- Splice (Material and Labor)	- 20 feet Production Pile bid price	455-11.8
- Driving of Splice for test purposes only	- No Payment	455-11.2.6
<b>Production Pile:</b>		455-11.8
- Splice Length Authorized	- Length in feet of Production Pile bid price	455-11.2.6
- Driving of production pile splice	- No Payment	455-11.8
- Splice (Material and Labor)	- 20 feet Production Pile bid price	455-11.8
<b>Static Load Tests</b>		
- Static Load Tests	- Static Load test bid price	455-11.11
<b>Preforming (Paid under either Test Pile or Production Pile)</b>	- 30% of piling per foot	455-11.12

## Attachment 5-15-5 PLAN QUANTITY ANALYSIS

<small>STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION FINAL MEASUREMENTS "MISCELLANEOUS"</small>	<small>700-050-61 CONSTRUCTION 12/07 Page No. 1 of 1</small>
<p><b>Date: 12/29/2015</b></p>	
<p><b>Pay item #: 520-17 CONCRETE CURB AND GUTTER, TYPE E</b></p>	
<p><b>Plan ERROR; STA.436+36.88 SHOULD HAVE BEEN 436+26.88</b></p>	
<p><b>Gross Length PQ from STA 436+36.88 to 436+77.27 =131.7 LF</b></p>	
<p><b>Plan Error from STA 436+26.88 to 436+77.27 = 141.7 LF</b></p>	
<p><b>Added additional of 10 LF</b></p>	
<p><b>Unit Price = \$ 14.00 per LF</b></p>	
<p><b>Total PQ = 963 LF</b></p>	
<p><b>Plan Quantity Analysis:</b></p>	
<p><b>10 LF X \$ 14.00 = \$ 140.00 &lt; \$ 5,000</b></p>	
<p><b>(10 ÷ 963) 100 = 1.03% &lt; 5% both scenarios do not qualify to change PQ.</b></p>	
<p><b>Therefore Pay PQ of 963 LF</b></p>	
<p>65453</p>	





## Attachment 5-15-65 MULTI-FIN PLAN QUANTITY ANALYSIS

### (A) Plan Quantity Does Not Change

Given Information:

- Pay Item #160-4: Type B Stabilization
- Contract Plan Quantity = 70,000 SY
- Unit price = \$1.00/SY

Plan Quantity Analysis		
Contract T1234	Original Plan Quantity	Plan Errors
Project 1 of 2	50,000 SY	(-) 8,000 SY
Project 2 of 2	<u>20,000 SY</u>	<u>(+) 10,000 SY</u>
	<b>70,000 SY</b>	<b>(+) 2,000 SY</b>

What is the Final Pay Quantity for each job?

Step 1: Determine if the error exceeds 5%:

$$\frac{\text{Total Contract Plan Error}}{\text{Contract Plan Quantity}} = \left( \frac{2,000 \text{ SY}}{70,000 \text{ SY}} \right) \times 100 = 2.9\% < 5\%$$

Step 2: Determine if the error exceeds \$5,000:

$$\begin{aligned} &\text{Total Contract Plan Error} \times \text{Unit Price} \\ &= 2,000 \text{ SY} \times \$ 1.00/\text{SY} = \$2,000.00 < \$ 5,000.00 \end{aligned}$$

Both calculations in Step 1 and Step 2 do not qualify to change the original plan quantity for the contract; therefore, plan quantity for both projects will be paid due to final adjustment being less than 5% and less than \$5,000.00.

**Final Type B Stabilization Quantity for Project 1 of 2 = 50,000 SY**

**Final Type B Stabilization Quantity for Project 2 of 2 = 20,000 SY**

**(B) Plan Quantity Does Change**

Given Information:

- Pay Item #160-4: Type B Stabilization
- Contract Plan Quantity = 70,000 SY
- Unit Price = \$1.00/SY

Plan Quantity Analysis			
Contract T4321	Original Plan Quantity	Plan Errors	Field Changes
Project 1 of 2	50,000 SY	- 3,000 SY	- 320 SY
Project 2 of 2	20,000 SY	+ 8,000 SY	- 400 SY
	<b>70,000 SY</b>	<b>+ 5,000 SY</b>	<b>- 720 SY</b>

What is the Final Pay Quantity for each job?

Step 1: Determine if the error exceeds 5%:

$$\frac{\text{Total Contract Plan Error}}{\text{Contract Plan Quantity}} = \left( \frac{5,000 \text{ SY}}{70,000 \text{ SY}} \right) \times 100 = 7.1\% > 5\%$$

Step 2: Determine if the error exceeds \$5,000:

$$\begin{aligned} &\text{Total Contract Plan Error} \times \text{Unit Price} \\ &= 5,000 \text{ SY} \times \$1.00/\text{SY} = \$5,000 \quad (\text{Equal to } \$5,000) \end{aligned}$$

Only one of the criteria above must be met for plan errors to qualify for additional payment. Although the error did not exceed \$5,000, it did exceed 5% and qualifies for additional payment.

**NOTE 129:** All Field Changes will be added or subtracted under each job for final pay regardless of plan errors.

**Project 1 of 2:**

Original Plan Quantity = 50,000 SY  
 Plan Error = -3,000 SY  
 Field Change = -320 SY  


---

**Final Quantity = 46,680 SY**

**Project 2 of 2:**

Original Plan Quantity = 20,000 SY  
 Plan Error = +8,000 SY  
 Field Change = -400 SY  


---

**Final Quantity = 27,600 SY**