Examples for Calculating Adjustments

Example 1

Calculate the quantity of asphalt in Hot Mix Asphalt (HMA).

Revised SSP: The engineer calculates the quantity of asphalt in HMA using the formula

$$Qh = HMATT \times [Xa / (100 + Xa)]$$

Where:

Qh	=	quantity in tons of asphalt used in HMA
HMATT	=	HMA total tons placed
Xa	=	theoretical asphalt content from job mix formula expressed as percentage of the weight of dry aggregate

Given: The contractor placed 50,000 tons of HMA within an estimate period. Xa is 5.2 percent.

Find: Qh

Solution: $Qh = 50{,}000 \times [5.2 / (100 + 5.2)] = 2{,}471.48$ tons

Example 2

Calculate the quantity of asphalt in rubberized HMA.

Revised SSP: The engineer calculates the quantity of asphalt in rubberized HMA (RHMA) using the formula

$$Qrh = RHMATT \times 0.80 \times [Xarb / (100 + Xarb)]$$

Where:

Qrh	=	quantity in tons of asphalt in asphalt rubber binder used in RHMA
RHMATT	=	RHMA total tons placed
Xarb	=	theoretical asphalt rubber binder content from the job mix formula expressed as percentage of the weight of dry aggregate

Given: The contractor placed 50,000 tons of RHMA within an estimate period. Xarb is 7 percent with specified 20 percent crumb rubber modifier in asphalt rubber binder.

Find: Qrh

Solution: $Qrh = 50{,}000 \times 0.80 \times [7 / (100 + 7)] = 2{,}616.82$ tons

Example 3

Calculate the quantity of asphalt in Modified Asphalt Binder used in HMA.

Revised SSP: The engineer calculates the quantity of asphalt in modified asphalt binder using the formula

$$Qmh = MHMATT \times [(100 - Xam) / 100] \times [Xmab / (100 + Xmab)]$$

Where:

Qmh	=	quantity in tons of asphalt in modified asphalt binder used in HMA
MHMATT	=	modified asphalt binder HMA total tons placed
Xam	=	specified percentage of asphalt modifier
Xmab	=	theoretical modified asphalt binder content from the job mix formula expressed as percentage of the weight of dry aggregate

Given: The contractor placed 50,000 tons of HMA containing modified asphalt binder within an estimate period. Xam is 10 percent and Xmab is 6 percent.

Find: Qmh

Solution: $Qmh = 50{,}000 \times [(100 - 10) / 100] \times [6 / (100 + 6)] = 2{,}547.17$ tons

Example 4

Calculate the quantity of asphalt in HMA containing Reclaimed Asphalt Pavement (RAP).

Revised SSP: The engineer calculates the quantity of asphalt in HMA containing RAP using these formulas:

$$Xaa = Xta - [(100 - Xnew) \times (Xra / 100)] \text{ and } Qrap = HMATT \times [Xaa / (100 + Xaa)]$$

Where:

Qrap =	quantity in tons of asphalt used in HMA containing RAP
HMATT =	HMA total tons placed
Xaa =	asphalt content of HMA adjusted to account for the asphalt content in RAP expressed as percentage of the weight of dry aggregate
Xta =	total asphalt content of HMA expressed as percentage of the weight of dry aggregate
Xnew =	theoretical percentage of new aggregate in the HMA containing RAP determined from RAP percentage in the job mix formula
Xra =	asphalt content of RAP expressed as percentage

Given: The contractor placed 50,000 tons of HMA containing RAP within an estimate period. Xta is 6.3 percent, Xnew is 85 percent and Xra is 5.7 percent.

Find: Xaa and Qrap

Solution: $Xaa = 6.3 - [(100 - 85) \times (5.7 / 100)] = 5.45$ percent
$Qrap = 50{,}000 \times [5.45 / (100 + 5.45)] = 2{,}584.16$ tons

Example 5

Calculate the quantity of asphalt in asphaltic emulsion.

Revised SSP: The engineer calculates the quantity of asphalt in asphaltic emulsions, including fog seals and tack coat, using the formula $Qe = AETT \times (Xe / 100)$

Where:

Qe =	quantity in tons of asphalt used in asphaltic emulsions
AETT =	undiluted asphaltic emulsions total tons placed
Xe =	minimum percent residue specified in Section 94, "Asphaltic Emulsions," of the Standard Specifications based on the type of emulsion used

Given: The contractor placed 5,000 tons of asphaltic emulsion within an estimate period. Xe is 55 percent.

Find: Qe

Solution: $Qe = 5{,}000 \times (55 / 100) = 2{,}750.00$ tons

Example 6

Calculate the quantity of asphalt in Modified Asphalt Binder.

Revised SSP: The engineer calculates the quantity of asphalt in modified asphalt binder using following formula

$$Qmab = MABTT \times [(100 - Xam) / 100]$$

Where:

Qmab =	quantity in tons of asphalt used in modified asphalt binder
MABTT =	modified asphalt binder total tons placed
Xam =	specified percentage of asphalt modifier

Given: The contractor placed 5,000 tons of modified asphalt binder within an estimate period. Xam is 10 percent.

Find: Qmab

Solution: $Qmab = 5{,}000 \times [(100 - 10) / 100] = 4{,}500.00$ tons

Example 7

Calculate the payment adjustment for asphalt when the index increases by more than 5 percent.

Revised SSP: The engineer includes payment adjustments for price index fluctuations in progress pay estimates. If material containing asphalt is placed within 2 months during 1 estimate period, the engineer calculates 2 separate adjustments. Each adjustment is calculated using the price index for the month in which the quantity of material containing asphalt subject to adjustment is placed in the work. The sum of the 2 adjustments is used for increasing or decreasing payment in the progress pay estimate.

The engineer calculates each payment adjustment as follows:

PA = Qt x A

Where: PA = Payment adjustment in dollars for asphalt contained in materials placed in the work for a given month.

Qt = Sum of all quantities of asphalt-contained materials in pavement structural sections and pavement surface treatments placed (Qh + Qrh + Qmh + Qrap + Qtc + Qe + Qss + Qmab + Qo).

A = Adjustment in dollars per ton of asphalt used to produce materials placed in the work rounded to the nearest $0.01.

For an increase in the crude oil price index exceeding 5 percent use the following formula:
A = [(Iu / Ib) – 1.05] x Ib x [1 + (T / 100)]

For a decrease in the crude oil price index exceeding 5 percent use the following formula:
A = [(Iu / Ib) – 0.95] x Ib x [1 + (T / 100)]

Iu = California Statewide Crude Oil Price Index for the month in which the quantity of asphalt subject to adjustment was placed in the work.

Ib = California Statewide Crude Oil Price Index for the month in which the bid opening for the project occurred

T = Sales and use tax rate, expressed as a percent, currently in effect in the tax jurisdiction where the material is placed. If the tax rate information is not submitted timely, the statewide sales and use tax rate is used in the payment adjustment calculations until the tax rate information is submitted.

Given: The contractor placed 50,000 tons of HMA containing 2,471 tons of asphalt (See Example 1) within the estimate period ending April 20, 2010. 20,000 tons of HMA (of the 50,000) was placed from March 21 to March 31. The remaining 30,000 tons of HMA was placed from April 1 to April 20. Bids were opened in October 2009. Ib (Oct 2009) is 356.3, Iu (March 2010) is 400.8 and Iu (April 2010) is 426.0. The sales and use tax rate submitted by the contractor is 8.75 percent. The work was done in Sacramento and the tax rate was verified as correct at the Board of Equalization website.

Find: Qt, A and PA for March; Qt, A and PA for April; Total PA

Solution:

Step 1: Calculate Qt, A, and PA for paving done from March 21 to March 31, 2010.

The only material containing asphalt on this project is HMA, so:

Qt = Qh = 2,471.48 x (20,000 / 50,000) = 988.59 tons of asphalt.

The crude oil price index increased exceeding 5 percent between October 2009 and March 2010, so use the formula: A = [(Iu / Ib) – 1.05] x Ib x [1 + (T / 100)]

A = [(400.8 / 356.3) – 1.05] x 356.3 x [1 + (8.75 / 100)] = $29.02 per ton of asphalt

March PA = 988.59 x 29.02 = $28,688.88 (increase in payment to the contractor)

Step 2: Calculate Qt, A and PA for paving done from April 1 to April 20, 2010.

Qt = Qh = 2,471.48 x (30,000 / 50,000) x = 1,482.89 tons of asphalt

A = [(426.0 / 356.3) – 1.05] x 356.3 x [1 + (8.75 / 100)] = $56.42 per ton of asphalt

April PA = 1,482.89 x 56.42 = $83,664.65 (increase in payment to the contractor)

Step 3: Calculate Total PA.

Total PA = March PA + April PA = 28,688.88 + 83,664.65 = $112,353.53 (increase in payment to the contractor) for the April 20, 2010 progress pay estimate.

Example 8

Calculate the payment adjustment for asphalt when the index decreases by more than 5 percent.

Revised SSP: See information provided in Example 7.

Given: The contractor placed 50,000 tons of HMA containing 2,471.48 tons of asphalt (See Example 1) within the estimate period ending April 20, 2010. 20,000 tons of HMA (of the 50,000) were placed from March 21 to March 31. The remaining 30,000 tons of HMA were placed from April 1 to April 20. Bids were opened in July 2009. The new index website shows no actual index for July 2009. To illustrate adjustment calculations when the index decreases, assume Ib (July 2009) is 500.0. Iu (March 2010) is 400.8 and Iu (April 2010) is 426.0. The sales and use tax rate submitted by the contractor is 8.75 percent. The work was done in Sacramento and the tax rate verified as correct on the Board of Equalization website.

Find: Qt, A and PA for March; Qt, A and PA for April; Total PA

Solution:

Step 1: Calculate Qt, A and PA for paving done from March 21 to March 31, 2010.

The only material containing asphalt on this project is HMA, so:

Qt = Qh = 2,471.48 x (20,000 / 50,000) = 988.59 tons of asphalt.

The crude oil price index exceeding 5 percent decreased between July 2009 and March 2010, so use the formula: $A = [(Iu / Ib) – 0.95] \times Ib \times [1 + (T / 100)]$.

$A = [(400.8 / 500.0) – 0.95] \times 500.0 \times [1 + (8.75 / 100)] = – \$80.69$ per ton of asphalt

March PA = 988.59 x (- 80.69) = – $79,769.33 (decrease in payment to the contractor)

Step 2: Calculate Qt, A and PA for paving done from April 1 to April 20, 2010.

Qt = Qh = 2,471.48 x (30,000/50,000) x = 1,482.89 tons of asphalt.

$A = [(426.0 / 500.0) – 0.95] \times 500.0 \times [1 + (8.75 / 100)] = – \$53.29$ per ton of asphalt

April PA = 1,482.89 x (- 53.29) = – $79,023.21 (decrease in payment to the contractor)

Step 3: Calculate Total PA

Total PA = March PA + April PA = (– 79,769.33) + (– 79,023.21) = – $158,792.54 (decrease in payment to the contractor) for the April 20, 2010 progress pay estimate.