Equations for RSP level 2 Infrastructure Form:

Equation 1:
\[
\frac{N_1}{N_0} = (\frac{V_1}{V_0})^\alpha
\]

Where:
- \(N_0\) = number of crashes on the roadway before
- \(N_1\) = number of crashes on the roadway after
- \(\bar{V}_1\) = average operating speed of a roadway after
- \(\bar{V}_0\) = average operating speed of a roadway before
- \(\alpha\) = 4 for fatal crashes
- \(\alpha\) = 3 for fatal & serious injury crashes
- \(\alpha\) = 2 for all injury crashes

Equation 2:
\[
N_{\text{expected}} = w \times N_{\text{predicted}} + (1 - w) \times N_{\text{observed}}
\]

Where
- \(N_{\text{expected}}\) = expected average crashes frequency for the study period.
- \(N_{\text{predicted}}\) = predicted average crash frequency predicted using a SPF for the study period under the given conditions.
- \(w\) = weighted adjustment to be placed on the SPF prediction.
- \(N_{\text{observed}}\) = observed crash frequency at the site over the study period.

\[
w = \frac{1}{1 + k \times \left( \sum_{\text{all study years}} N_{\text{predicted}} \right)}
\]

Where
- \(k\) = overdispersion parameter from the associated SPF.

Equation 3:
Incremental BCR = \((PV_{\text{benefits} 2} - PV_{\text{benefits} 1}) / (PV_{\text{costs} 2} - PV_{\text{costs} 1})\)

Where
- \(PV_{\text{benefits} 1}\) = Present value of benefits for lower-cost project
- \(PV_{\text{benefits} 2}\) = Present value of benefits for higher-cost project
PV_{costs \_1} = \text{Present value of cost for lower-cost project}\\
PV_{costs \_2} = \text{Present value of cost for higher-cost project}\\

\textbf{Equation 4:}\\
\text{Std. error of estimate} = \sqrt{\frac{\sum \left( Y_{\text{actual}} - Y_{\text{pred}} \right)^2}{N}}\\
\text{Where:}\\
\quad N = \text{number of comparisons}\\

\textbf{Equation 5:}\\
\text{Std. error} = \frac{s}{\sqrt{n}}\\
\text{where:}\\
\quad s = \text{standard deviation of the population}\\
\quad n = \text{size of sample}\\

\textbf{Equation 6:}\\
\text{Variance} = S^2 = \frac{\left( \sum \left( x_i - x_{\text{mean}} \right)^2 \right)}{(n-1)}\\
\text{where}\\
\quad n = \text{number of observations}\\
\quad \Sigma = \text{summation sign}\\
\quad x_i = \text{the } i\text{th value in the sample}\\
\quad x_{\text{mean}} = \text{the arithmetic mean of the sample}\\

\textbf{Equation 7:}\\
\text{SE} = s / \sqrt{n}\\
\text{where:}\\
\quad S = \text{standard deviation of the population}\\
\quad n = \text{size of sample}\\

\textbf{Equation 8:}\\
CI (y\%) = AMF_y \pm SE_y \times MSE\\
\text{Where}
CI (y%) = the confidence interval for which it is y-percent probable that the true value of the CMF is within the interval

CMF\_x = Crash Modification Factor for condition x

SE\_x = Standard Error of the CMF\_x

\textit{MSE} = Multiple of Standard Error

\textbf{Equation 9:}

\[ SE = \sqrt{\frac{S_a^2}{n_a} + \left(\frac{S_b^2}{n_b}\right)} \]

where:

SE = standard error of the difference between the means of two samples

\( S_a \) = the standard deviation of sample A

\( S_b \) = the standard deviation of sample B