§86.144 Calculations; exhaust emissions

Read Input Data

\[ \text{i} : = 1 \ldots 54 \quad \text{input}_i = \text{READ (ftp input)} \]

Testnumber : = input_1 \quad \text{Numeric test identifier} \quad \text{Testnumber} = 199701

Procedure : = input_2 \quad \text{Procedure} = 2 \quad \text{Numeric Test Procedure}

§86.144-94(e)
For Phase II California fueled vehicle with measured fuel composition of C\(_{x}H_{y}O_{z}\):

\[ \text{x} = \text{input}_{49} \quad \text{y} = \text{input}_{50} \quad \text{z} = \text{input}_{53} \]

\[ \text{y}_{\text{HC}} = \text{y} \quad \text{y}_{\text{NMHC}} = \text{input}_{52} \]

\[ \text{r}_{\text{CH4.ct}} = \text{input}_{7} \quad \text{r}_{\text{CH4.s}} = \text{input}_{8} \quad \text{r}_{\text{CH4.ht}} = \text{input}_{9} \]

\[ \text{x} = 1 \quad \text{y} = 3.97 \quad \text{y}_{\text{HC}} = 3.97 \quad \text{y}_{\text{NMHC}} = 2.596 \]

\[ \text{FID response to methane} \]

\[ \text{r}_{\text{CH4.ct}} = 1.114 \quad \text{r}_{\text{CH4.s}} = 1.114 \quad \text{r}_{\text{CH4.ht}} = 1.114 \]

Carbon-to-carbon ratio as measured for the fuel used.

Hydrogen-to-carbon ratio as measured for the fuel used.

Hydrogen-to-carbon ratio as measured for the fuel used.

Non-Methane Hydrocarbon Hydrogen-to-carbon ratio as measured for the Non-Methane Hydrocarbon components of the fuel used.

Oxygen-to-carbon ratio as measured for the fuel used.

FID response to methane.

FID response to methane.

FID response to methane.
§86.144 Calculations; exhaust emissions

Testnumber = 199701

For the "transient" phase of the cold-start test, the analyzer concentrations were as follows:

FIDHC\textsubscript{ct,e} = 71.917  Concentration of hydrocarbon plus methane in dilute exhaust as measured by the FID, ppm carbon equivalent.

NOx\textsubscript{ct,e} = 20.859  Oxides of nitrogen concentration of the dilute exhaust sample as measured, in ppm.

CO\textsubscript{ct,e} = 120.853  Carbon monoxide concentration of the dilute exhaust sample as measured, in ppm.

CO\textsubscript{2,ct,e} = 1.504  Carbon dioxide concentration of the dilute exhaust sample as measured, in percent.

CH\textsubscript{4,ct,e} = 59.328  Concentration of methane in dilute exhaust sample as measured, ppm carbon equivalent.

FIDHC\textsubscript{ct,d} = 3.434  Concentration of hydrocarbon plus methane in dilution air as measured by the FID, ppm carbon equivalent.

NOx\textsubscript{ct,d} = 0.153  Oxides of nitrogen concentration of the dilution air sample as measured, in ppm.

CO\textsubscript{ct,d} = 0  Carbon monoxide concentration of the dilution air sample as measured, in ppm.

CO\textsubscript{2,ct,d} = 0.041  Carbon dioxide concentration of the dilution air as measured, in percent.

CH\textsubscript{4,ct,d} = 1.52  Concentration of methane in dilution air as measured, ppm carbon equivalent.

D\textsubscript{ct} = 3.602  The measured driving distance from the "transient" phase of the cold start test, in miles.

V\textsubscript{mix,ct} = 2790  Volume of dilute exhaust collected during the transient phase of the cold-start test, in scf.

K\textsubscript{H,ct} = 0.867  NOx Humidity Correction Factor
§86.144 Calculations; exhaust emissions

Testnumber = 199701

For the "stabilized" portion of the test, the analyzer concentrations were as follows:

\[ \text{FIDHC}_{s,e} = \text{input}_{23} \quad \text{FIDHC}_{s,e} = 20.257 \]
Concentration of hydrocarbon plus methane in dilute exhaust as measured by the FID, ppm carbon equivalent.

\[ \text{NOx}_{s,e} = \text{input}_{24} \quad \text{NOx}_{s,e} = 6.869 \]
Oxides of nitrogen concentration of the dilute exhaust sample as measured, in ppm.

\[ \text{CO}_{s,e} = \text{input}_{25} \quad \text{CO}_{s,e} = 16.543 \]
Carbon monoxide concentration of the dilute exhaust sample as measured, in ppm.

\[ \text{CO2}_{s,e} = \text{input}_{26} \quad \text{CO2}_{s,e} = 0.979 \]
Carbon dioxide concentration of the dilute exhaust sample as measured, in percent.

\[ \text{CH4}_{s,e} = \text{input}_{27} \quad \text{CH4}_{s,e} = 16.709 \]
Concentration of methane in dilute exhaust sample as measured, ppm carbon equivalent.

\[ \text{FIDHC}_{s,d} = \text{input}_{28} \quad \text{FIDHC}_{s,d} = 3.21 \]
Concentration of hydrocarbon plus methane in dilution air as measured by the FID, ppm carbon equivalent.

\[ \text{NOx}_{s,d} = \text{input}_{29} \quad \text{NOx}_{s,d} = 0.102 \]
Oxides of nitrogen concentration of the dilution air sample as measured, in ppm.

\[ \text{CO}_{s,d} = \text{input}_{30} \quad \text{CO}_{s,d} = 0 \]
Carbon monoxide concentration of the dilution air sample as measured, in ppm.

\[ \text{CO2}_{s,d} = \text{input}_{31} \quad \text{CO2}_{s,d} = 0.042 \]
Carbon dioxide concentration of the dilution air as measured, in percent.

\[ \text{CH4}_{s,d} = \text{input}_{32} \quad \text{CH4}_{s,d} = 1.52 \]
Concentration of methane in dilution air as measured, ppm carbon equivalent.

\[ \text{D}_{s} = \text{input}_{33} \quad \text{D}_{s} = 3.872 \]
The measured driving distance from the "transient" phase of the cold start test, in miles.

\[ \text{V}_{\text{mix},s} = \text{input}_{34} \quad \text{V}_{\text{mix},s} = 4738 \]
Volume of dilute exhaust collected during the transient phase of the cold-start test, in scf.

\[ \text{K}_{\text{H},s} = \text{input}_{35} \quad \text{K}_{\text{H},s} = 0.867 \]
NOx Humidity Correction Factor
§86.144 Calculations; exhaust emissions

For the "transient" portion of the hot-start test, the analyzer concentrations were as follows:

\[ \text{FIDHC}_{ht.e} = 45.516 \]  
\[ \text{NOx}_{ht.e} = 14.714 \]  
\[ \text{CO}_{ht.e} = 15.39 \]  
\[ \text{CO}_2_{ht.e} = 1.319 \]  
\[ \text{CH}_4_{ht.e} = 39.687 \]

- **FIDHC** is the concentration of hydrocarbon plus methane in dilute exhaust as measured by the FID, ppm carbon equivalent.
- **NOx** is the oxides of nitrogen concentration of the dilute exhaust sample as measured, in ppm.
- **CO** is the carbon monoxide concentration of the dilute exhaust sample as measured, in ppm.
- **CO2** is the carbon dioxide concentration of the dilute exhaust sample as measured, in percent.
- **CH4** is the concentration of methane in dilute exhaust sample as measured, ppm carbon equivalent.

\[ \text{FIDHC}_{ht.d} = 3.21 \]  
\[ \text{NOx}_{ht.d} = 0.102 \]  
\[ \text{CO}_{ht.d} = 0 \]  
\[ \text{CO}_2_{ht.d} = 0.042 \]  
\[ \text{CH}_4_{ht.d} = 1.52 \]

- **FIDHC** is the concentration of hydrocarbon plus methane in dilution air as measured by the FID, ppm carbon equivalent.
- **NOx** is the oxides of nitrogen concentration of the dilution air sample as measured, in ppm.
- **CO** is the carbon monoxide concentration of the dilution air sample as measured, in ppm.
- **CO2** is the carbon dioxide concentration of the dilution air as measured, in percent.
- **CH4** is the concentration of methane in dilution air as measured, ppm carbon equivalent.

\[ \text{D}_{ht} = 3.608 \]  
\[ \text{V}_{mix.ht} = 2753 \]  
\[ \text{K}_{ht} = 0.867 \]

- **D** is the measured driving distance from the "transient" phase of the cold start test, in miles.
- **V mix** is the volume of dilute exhaust collected during the transient phase of the cold-start test, in scf.
- **K H** is the NOx Humidity Correction Factor.
§86.144 Calculations; exhaust emissions

Test number = 199701

CONSTANTS

\[
\begin{align*}
\text{Density } \text{HC} &= 16.33 & \text{Density is grams per cubic foot, at 68°F and 760 mm Hg pressure.} \\
\text{Density } \text{THC} &= 16.33 & \text{Density is grams per cubic foot, at 68°F and 760 mm Hg pressure.} \\
\text{Density } \text{NMHC} &= 16.33 & \text{Density is grams per cubic foot, at 68°F and 760 mm Hg pressure.} \\
\text{Density } \text{CH}_4 &= 18.89 & \text{Density is grams per cubic foot, at 68°F and 760 mm Hg pressure.} \\
\text{Density } \text{NO}_x &= 54.16 & \text{Density is grams per cubic foot, at 68°F and 760 mm Hg pressure.} \\
\text{Density } \text{CO} &= 32.97 & \text{Density is grams per cubic foot, at 68°F and 760 mm Hg pressure.} \\
\text{Density } \text{CO}_2 &= 51.81 & \text{Density is grams per cubic foot, at 68°F and 760 mm Hg pressure.}
\end{align*}
\]

DERIVED DENSITIES

\[
\begin{align*}
\text{Density } \text{HC} &= 1.1771 \cdot (12.011 + y \times \text{HC} \times 1.008) \\
\text{Density } \text{NMHC} &= 1.1771 \cdot (12.011 + y \times \text{NMHC} \times 1.008) \\
\end{align*}
\]

Density HC = 18.849
Density NMHC = 17.218
§86.144 Calculations; exhaust emissions

EPA and CARB - Non-methane hydrocarbon concentration of the dilute exhaust sample as measured, in ppm carbon equivalent.

\[ \text{NMHC}_{\text{ct.e}} = \text{FIDHC}_{\text{ct.e}} - r \text{CH}_4\text{ct.e} \]
\[ \text{NMHC}_{\text{s.e}} = \text{FIDHC}_{\text{s.e}} - r \text{CH}_4\text{s.e} \]
\[ \text{NMHC}_{\text{ht.e}} = \text{FIDHC}_{\text{ht.e}} - r \text{CH}_4\text{ht.e} \]

\[ \text{NMHC}_{\text{ct.e}} = 5.826 \]
\[ \text{NMHC}_{\text{s.e}} = 1.643 \]
\[ \text{NMHC}_{\text{ht.e}} = 1.305 \]

EPA and CARB - Non-methane hydrocarbon concentration of the dilution air as measured, in ppm carbon equivalent.

\[ \text{NMHC}_{\text{ct.d}} = \text{FIDHC}_{\text{ct.d}} - r \text{CH}_4\text{ct.d} \]
\[ \text{NMHC}_{\text{s.d}} = \text{FIDHC}_{\text{s.d}} - r \text{CH}_4\text{s.d} \]
\[ \text{NMHC}_{\text{ht.d}} = \text{FIDHC}_{\text{ht.d}} - r \text{CH}_4\text{ht.d} \]

\[ \text{NMHC}_{\text{ct.d}} = 1.74 \]
\[ \text{NMHC}_{\text{s.d}} = 1.516 \]
\[ \text{NMHC}_{\text{ht.d}} = 1.516 \]

Total hydrocarbon (non-methanol) concentration of the dilute exhaust sample as measured, ppm carbon equivalent, i.e., equivalent propane X 3.

\[ \text{HC}_{\text{ct.e}} = \text{FIDHC}_{\text{ct.e}} \]
\[ \text{HC}_{\text{s.e}} = \text{FIDHC}_{\text{s.e}} \]
\[ \text{HC}_{\text{ht.e}} = \text{FIDHC}_{\text{ht.e}} \]

\[ \text{HC}_{\text{ct.e}} = 71.917 \]
\[ \text{HC}_{\text{s.e}} = 20.257 \]
\[ \text{HC}_{\text{ht.e}} = 45.516 \]

Total hydrocarbon (non-methanol) concentration of the dilution air as measured, in ppm carbon equivalent.

\[ \text{HC}_{\text{ct.d}} = \text{FIDHC}_{\text{ct.d}} \]
\[ \text{HC}_{\text{s.d}} = \text{FIDHC}_{\text{s.d}} \]
\[ \text{HC}_{\text{ht.d}} = \text{FIDHC}_{\text{ht.d}} \]

\[ \text{HC}_{\text{ct.d}} = 3.434 \]
\[ \text{HC}_{\text{s.d}} = 3.21 \]
\[ \text{HC}_{\text{ht.d}} = 3.21 \]
§86.144 Calculations; exhaust emissions

Test number = 199701

Dilution factor for Natural Gas fueled vehicles where fuel composition is CxHyOz as measured for the fuel used.

\[
\text{DF}_{ct} = \frac{100 \cdot \left( \frac{x}{x + \frac{y}{2} + 3.76 \cdot \frac{x}{4}} \right)}{\text{CO}_{2} + \text{NMHC} + \text{CH}_{4} + \text{CO}} \cdot 10^{-4}
\]

DF\text{ct} = 6.268

\[
\text{DF}_{s} = \frac{100 \cdot \left( \frac{x}{x + \frac{y}{2} + 3.76 \cdot \frac{x}{4}} \right)}{\text{CO}_{2} + \text{NMHC} + \text{CH}_{4} + \text{CO}} \cdot 10^{-4}
\]

DF\text{s} = 9.714

\[
\text{DF}_{ht} = \frac{100 \cdot \left( \frac{x}{x + \frac{y}{2} + 3.76 \cdot \frac{x}{4}} \right)}{\text{CO}_{2} + \text{NMHC} + \text{CH}_{4} + \text{CO}} \cdot 10^{-4}
\]

DF\text{ht} = 7.207

Non-methane concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent.

\[
\text{NMHC}_{ct, \text{conc}} = \text{NMHC}_{ct, \text{e}} - \text{NMHC}_{ct, \text{d}} \cdot \left[ 1 - \frac{1}{\text{DF}_{ct}} \right]
\]

NMHC\text{ct,conc} = 4.36

\[
\text{NMHC}_{s, \text{conc}} = \text{NMHC}_{s, \text{e}} - \text{NMHC}_{s, \text{d}} \cdot \left[ 1 - \frac{1}{\text{DF}_{s}} \right]
\]

NMHC\text{s,conc} = 0.28

\[
\text{NMHC}_{ht, \text{conc}} = \text{NMHC}_{ht, \text{e}} - \text{NMHC}_{ht, \text{d}} \cdot \left[ 1 - \frac{1}{\text{DF}_{ht}} \right]
\]

NMHC\text{ht,conc} = -5.29 \cdot 10^{-4}

Non-methane hydrocarbon mass, in grams per test phase.

\[
\text{NMHC}_{ct, \text{mass}} = \frac{\text{V}_{\text{mix}, \text{ct}} \cdot \text{Density} \cdot \text{NMHC} \cdot \text{NMHC}_{ct, \text{conc}}}{10^{6}}
\]

NMHC\text{ct,mass} = 0.21

\[
\text{NMHC}_{s, \text{mass}} = \frac{\text{V}_{\text{mix}, \text{s}} \cdot \text{Density} \cdot \text{NMHC} \cdot \text{NMHC}_{s, \text{conc}}}{10^{6}}
\]

NMHC\text{s,mass} = 0.023

\[
\text{NMHC}_{ht, \text{mass}} = \frac{\text{V}_{\text{mix}, \text{ht}} \cdot \text{Density} \cdot \text{NMHC} \cdot \text{NMHC}_{ht, \text{conc}}}{10^{6}}
\]

NMHC\text{ht,mass} = 0
§86.144 Calculations; exhaust emissions

Methane concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent.

\[
\begin{align*}
\text{CH}_4_{\text{ct.conc}} &= \text{CH}_4_{\text{ct.e}} - \text{CH}_4_{\text{ct.d}} \left( 1 - \frac{1}{\text{DF}_{\text{ct}}} \right) \\
\text{CH}_4_{\text{s.conc}} &= \text{CH}_4_{\text{s.e}} - \text{CH}_4_{\text{s.d}} \left( 1 - \frac{1}{\text{DF}_{\text{s}}} \right) \\
\text{CH}_4_{\text{ht.conc}} &= \text{CH}_4_{\text{ht.e}} - \text{CH}_4_{\text{ht.d}} \left( 1 - \frac{1}{\text{DF}_{\text{ht}}} \right)
\end{align*}
\]

Methane hydrocarbon mass, in grams per test phase.

\[
\begin{align*}
\text{CH}_4_{\text{ct.mass}} &= \frac{V_{\text{mix.ct}} \cdot \text{Density}_{\text{CH}_4} \cdot \text{CH}_4_{\text{ct.conc}}}{10^6} \\
\text{CH}_4_{\text{s.mass}} &= \frac{V_{\text{mix.s}} \cdot \text{Density}_{\text{CH}_4} \cdot \text{CH}_4_{\text{s.conc}}}{10^6} \\
\text{CH}_4_{\text{ht.mass}} &= \frac{V_{\text{mix.ht}} \cdot \text{Density}_{\text{CH}_4} \cdot \text{CH}_4_{\text{ht.conc}}}{10^6}
\end{align*}
\]

Hydrocarbon concentration of the dilute exhaust sample, in ppm carbon equivalent.

\[
\begin{align*}
\text{HC}_{\text{ct.conc}} &= \text{HC}_{\text{ct.e}} - \text{HC}_{\text{ct.d}} \left( 1 - \frac{1}{\text{DF}_{\text{ct}}} \right) \\
\text{HC}_{\text{s.conc}} &= \text{HC}_{\text{s.e}} - \text{HC}_{\text{s.d}} \left( 1 - \frac{1}{\text{DF}_{\text{s}}} \right) \\
\text{HC}_{\text{ht.conc}} &= \text{HC}_{\text{ht.e}} - \text{HC}_{\text{ht.d}} \left( 1 - \frac{1}{\text{DF}_{\text{ht}}} \right)
\end{align*}
\]

Total hydrocarbon emissions, in grams per test phase.

\[
\begin{align*}
\text{HC}_{\text{ct.mass}} &= \frac{V_{\text{mix.ct}} \cdot \text{Density}_{\text{HC}} \cdot \text{HC}_{\text{ct.conc}}}{10^6} \\
\text{HC}_{\text{s.mass}} &= \frac{V_{\text{mix.s}} \cdot \text{Density}_{\text{HC}} \cdot \text{HC}_{\text{s.conc}}}{10^6} \\
\text{HC}_{\text{ht.mass}} &= \frac{V_{\text{mix.ht}} \cdot \text{Density}_{\text{HC}} \cdot \text{HC}_{\text{ht.conc}}}{10^6}
\end{align*}
\]

Test number = 199701

\begin{align*}
\text{CH}_4_{\text{ct.conc}} &= 58.05 \\
\text{CH}_4_{\text{s.conc}} &= 15.34 \\
\text{CH}_4_{\text{ht.conc}} &= 38.38 \\
\text{CH}_4_{\text{ct.mass}} &= 3.059 \\
\text{CH}_4_{\text{s.mass}} &= 1.373 \\
\text{CH}_4_{\text{ht.mass}} &= 1.996 \\
\text{HC}_{\text{ct.conc}} &= 69.031 \\
\text{HC}_{\text{s.conc}} &= 17.378 \\
\text{HC}_{\text{ht.conc}} &= 42.752 \\
\text{HC}_{\text{ct.mass}} &= 3.63 \\
\text{HC}_{\text{s.mass}} &= 1.552 \\
\text{HC}_{\text{ht.mass}} &= 2.218
\end{align*}
§86.144 Calculations; exhaust emissions

Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, ppm.

\[ \text{NOx}_{\text{ct.conc}} = \text{NOx}_{\text{ct.e}} - \text{NOx}_{\text{ct.d}} \left[ 1 - \frac{1}{\text{DF}_{\text{ct}}} \right] \]

\[ \text{NOx}_{\text{s.conc}} = \text{NOx}_{\text{s.e}} - \text{NOx}_{\text{s.d}} \left[ 1 - \frac{1}{\text{DF}_{\text{s}}} \right] \]

\[ \text{NOx}_{\text{ht.conc}} = \text{NOx}_{\text{ht.e}} - \text{NOx}_{\text{ht.d}} \left[ 1 - \frac{1}{\text{DF}_{\text{ht}}} \right] \]

Oxides of nitrogen emissions, in grams per test phase.

\[ \text{NOx}_{\text{ct.mass}} = \frac{V_{\text{mix.ct}} \cdot \text{Density} \cdot \text{NOx}_{\text{K.H.ct}} \cdot \text{NOx}_{\text{ct.conc}}}{10^6} \]

\[ \text{NOx}_{\text{s.mass}} = \frac{V_{\text{mix.s}} \cdot \text{Density} \cdot \text{NOx}_{\text{K.H.s}} \cdot \text{NOx}_{\text{s.conc}}}{10^6} \]

\[ \text{NOx}_{\text{ht.mass}} = \frac{V_{\text{mix.ht}} \cdot \text{Density} \cdot \text{NOx}_{\text{K.H.ht}} \cdot \text{NOx}_{\text{ht.conc}}}{10^6} \]

Carbon monoxide concentration of the dilute exhaust sample corrected for background, ppm.

\[ \text{CO}_{\text{ct.conc}} = \text{CO}_{\text{ct.e}} - \text{CO}_{\text{ct.d}} \left[ 1 - \frac{1}{\text{DF}_{\text{ct}}} \right] \]

\[ \text{CO}_{\text{s.conc}} = \text{CO}_{\text{s.e}} - \text{CO}_{\text{s.d}} \left[ 1 - \frac{1}{\text{DF}_{\text{s}}} \right] \]

\[ \text{CO}_{\text{ht.conc}} = \text{CO}_{\text{ht.e}} - \text{CO}_{\text{ht.d}} \left[ 1 - \frac{1}{\text{DF}_{\text{ht}}} \right] \]

Carbon monoxide emissions, in grams per test phase.

\[ \text{CO}_{\text{ct.mass}} = \frac{V_{\text{mix.ct}} \cdot \text{Density} \cdot \text{CO} \cdot \text{CO}_{\text{ct.conc}}}{10^6} \]

\[ \text{CO}_{\text{s.mass}} = \frac{V_{\text{mix.s}} \cdot \text{Density} \cdot \text{CO} \cdot \text{CO}_{\text{s.conc}}}{10^6} \]

\[ \text{CO}_{\text{ht.mass}} = \frac{V_{\text{mix.ht}} \cdot \text{Density} \cdot \text{CO} \cdot \text{CO}_{\text{ht.conc}}}{10^6} \]
§86.144 Calculations; exhaust emissions

Carbon dioxide concentration of the dilute exhaust sample corrected for background, percent.

\[
\text{CO}_2\text{ct.conc} := \text{CO}_2\text{ct.e} - \text{CO}_2\text{ct.d} \left[ 1 - \frac{1}{\text{DF}_{\text{ct}}} \right]
\]

\[
\text{CO}_2\text{s.conc} := \text{CO}_2\text{s.e} - \text{CO}_2\text{s.d} \left[ 1 - \frac{1}{\text{DF}_{\text{s}}} \right]
\]

\[
\text{CO}_2\text{ht.conc} := \text{CO}_2\text{ht.e} - \text{CO}_2\text{ht.d} \left[ 1 - \frac{1}{\text{DF}_{\text{ht}}} \right]
\]

Carbon dioxide emissions, in grams per test phase.

\[
\text{CO}_2\text{ct.mass} := \frac{V_{\text{mix.ct}} \cdot \text{Density}_{\text{CO}_2} \cdot \text{CO}_2\text{ct.conc}}{10^2}
\]

\[
\text{CO}_2\text{s.mass} := \frac{V_{\text{mix.s}} \cdot \text{Density}_{\text{CO}_2} \cdot \text{CO}_2\text{s.conc}}{10^2}
\]

\[
\text{CO}_2\text{ht.mass} := \frac{V_{\text{mix.ht}} \cdot \text{Density}_{\text{CO}_2} \cdot \text{CO}_2\text{ht.conc}}{10^2}
\]

Testnumber = 199701

\[
\text{CO}_2\text{ct.conc} = 1.469
\]

\[
\text{CO}_2\text{s.conc} = 0.941
\]

\[
\text{CO}_2\text{ht.conc} = 1.282
\]

\[
\text{CO}_2\text{ct.mass} = 2124
\]

\[
\text{CO}_2\text{s.mass} = 2310
\]

\[
\text{CO}_2\text{ht.mass} = 1829
\]
§86.144 Calculations; exhaust emissions

(1) For the "transient" portion of the cold start test the above calculations resulted in the following:

\[ \text{HC}_{ct} = \text{HC}_{ct,\text{mass}} \] Total hydrocarbon equivalent, in grams per test phase.  \[ \text{HC}_{ct} = 3.63 \]
\[ \text{CH}_4_{ct} = \text{CH}_4_{ct,\text{mass}} \] Total hydrocarbon equivalent, in grams per test phase.  \[ \text{CH}_4_{ct} = 3.059 \]
\[ \text{NMHC}_{ct} = \text{NMHC}_{ct,\text{mass}} \] Total hydrocarbon equivalent, in grams per test phase.  \[ \text{NMHC}_{ct} = 0.21 \]
\[ \text{NOx}_{ct} = \text{NOx}_{ct,\text{mass}} \] Oxides of nitrogen, in grams per test phase.  \[ \text{NOx}_{ct} = 2.716 \]
\[ \text{CO}_{ct} = \text{CO}_{ct,\text{mass}} \] Carbon monoxide, in grams per test phase.  \[ \text{CO}_{ct} = 11.117 \]
\[ \text{CO}_2_{ct} = \text{CO}_2_{ct,\text{mass}} \] Carbon dioxide in grams per test phase.  \[ \text{CO}_2_{ct} = 2124 \]

(2) For the stabilized portion of the cold start test similar calculations resulted in the following:

\[ \text{HC}_s = \text{HC}_s,\text{mass} \] Total hydrocarbon equivalent, in grams per test phase.  \[ \text{HC}_s = 1.552 \]
\[ \text{CH}_4_s = \text{CH}_4_s,\text{mass} \] Total hydrocarbon equivalent, in grams per test phase.  \[ \text{CH}_4_s = 1.373 \]
\[ \text{NMHC}_s = \text{NMHC}_s,\text{mass} \] Total hydrocarbon equivalent, in grams per test phase.  \[ \text{NMHC}_s = 0.023 \]
\[ \text{NOx}_s = \text{NOx}_s,\text{mass} \] Oxides of nitrogen, in grams per test phase.  \[ \text{NOx}_s = 1.508 \]
\[ \text{CO}_s = \text{CO}_s,\text{mass} \] Carbon monoxide, in grams per test phase.  \[ \text{CO}_s = 2.584 \]
\[ \text{CO}_2_s = \text{CO}_2_s,\text{mass} \] Carbon dioxide in grams per test phase.  \[ \text{CO}_2_s = 2310 \]

(3) For the "transient" portion of the hot start similar calculations resulted in the following:

\[ \text{HC}_{ht} = \text{HC}_{ht,\text{mass}} \] Total hydrocarbon equivalent, in grams per test phase.  \[ \text{HC}_{ht} = 2.218 \]
\[ \text{CH}_4_{ht} = \text{CH}_4_{ht,\text{mass}} \] Total hydrocarbon equivalent, in grams per test phase.  \[ \text{CH}_4_{ht} = 1.996 \]
\[ \text{NMHC}_{ht} = \text{NMHC}_{ht,\text{mass}} \] Total hydrocarbon equivalent, in grams per test phase.  \[ \text{NMHC}_{ht} = 0 \]
\[ \text{NOx}_{ht} = \text{NOx}_{ht,\text{mass}} \] Oxides of nitrogen, in grams per test phase.  \[ \text{NOx}_{ht} = 1.891 \]
\[ \text{CO}_{ht} = \text{CO}_{ht,\text{mass}} \] Carbon monoxide, in grams per test phase.  \[ \text{CO}_{ht} = 1.397 \]
\[ \text{CO}_2_{ht} = \text{CO}_2_{ht,\text{mass}} \] Carbon dioxide in grams per test phase.  \[ \text{CO}_2_{ht} = 1829 \]
§86.144 Calculations; exhaust emissions

(4) Weighted emission results:

Total hydrocarbon, in grams per vehicle mile.

\[
HC_{wm} = 0.43 \times \left( \frac{HC_{ct} + HC_s}{D_{ct} + D_s} \right) + 0.57 \times \left( \frac{HC_{ht} + HC_s}{D_{ht} + D_s} \right)
\]

\[HC_{wm} = 0.5854\]

Methane hydrocarbon, in grams per vehicle mile.

\[
CH4_{wm} = 0.43 \times \left( \frac{CH4_{ct} + CH4_s}{D_{ct} + D_s} \right) + 0.57 \times \left( \frac{CH4_{ht} + CH4_s}{D_{ht} + D_s} \right)
\]

\[CH4_{wm} = 0.5118\]

Non-methane hydrocarbon, in grams per vehicle mile.

\[
NMHC_{wm} = 0.43 \times \left( \frac{NMHC_{ct} + NMHC_s}{D_{ct} + D_s} \right) + 0.57 \times \left( \frac{NMHC_{ht} + NMHC_s}{D_{ht} + D_s} \right)
\]

\[NMHC_{wm} = 0.0152\]

Oxides of nitrogen, in grams per vehicle mile.

\[
NOx_{wm} = 0.43 \times \left( \frac{NOx_{ct} + NOx_s}{D_{ct} + D_s} \right) + 0.57 \times \left( \frac{NOx_{ht} + NOx_s}{D_{ht} + D_s} \right)
\]

\[NOx_{wm} = 0.5019\]

Carbon monoxide, in grams per vehicle mile.

\[
CO_{wm} = 0.43 \times \left( \frac{CO_{ct} + CO_s}{D_{ct} + D_s} \right) + 0.57 \times \left( \frac{CO_{ht} + CO_s}{D_{ht} + D_s} \right)
\]

\[CO_{wm} = 1.0916\]

Carbon dioxide, in grams per vehicle mile.

\[
CO2_{wm} = 0.43 \times \left( \frac{CO2_{ct} + CO2_s}{D_{ct} + D_s} \right) + 0.57 \times \left( \frac{CO2_{ht} + CO2_s}{D_{ht} + D_s} \right)
\]

\[CO2_{wm} = 570.4742\]