$SampleNo := \text{“B2–24”}$

$Treatment = \text{“AD”}$

$S = 3.067$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.615 \\ 2.566 \\ 2.561 \\ 4.616 \\ 4.584 \\ 4.587 \\ 9.615 \\ 9.640 \\ 9.604 \\ 14.640 \\ 14.660 \\ 14.640 \\ 19.710 \\ 19.680 \\ 19.670 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.124 \\ 6.071 \\ 9.052 \\ 5.188 \\ 10.050 \\ 14.640 \\ 10.020 \\ 19.680 \\ 29.770 \\ 10.030 \\ 14.640 \\ 30.170 \\ 14.660 \\ 20.000 \\ 40.160 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.970 \\ 13.770 \\ 16.730 \\ 19.040 \\ 23.800 \\ 28.410 \\ 38.860 \\ 48.600 \\ 58.580 \\ 53.940 \\ 58.620 \\ 74.100 \\ 73.800 \\ 79.040 \\ 99.170 \end{bmatrix} \quad M_R = \begin{bmatrix} 19420.4 \\ 21627.8 \\ 24330.6 \\ 28095.0 \\ 28541.0 \\ 33735.6 \\ 41972.8 \\ 44077.2 \\ 44842.0 \\ 47415.4 \\ 39935.4 \\ 45952.4 \\ 36155.2 \\ 40127.2 \\ 53498.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–24”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 9277.355$

$K_2 = 0.3698$

Equation 1 fitting parameters

$R_1^2 = 0.8064$ Coefficient of determination

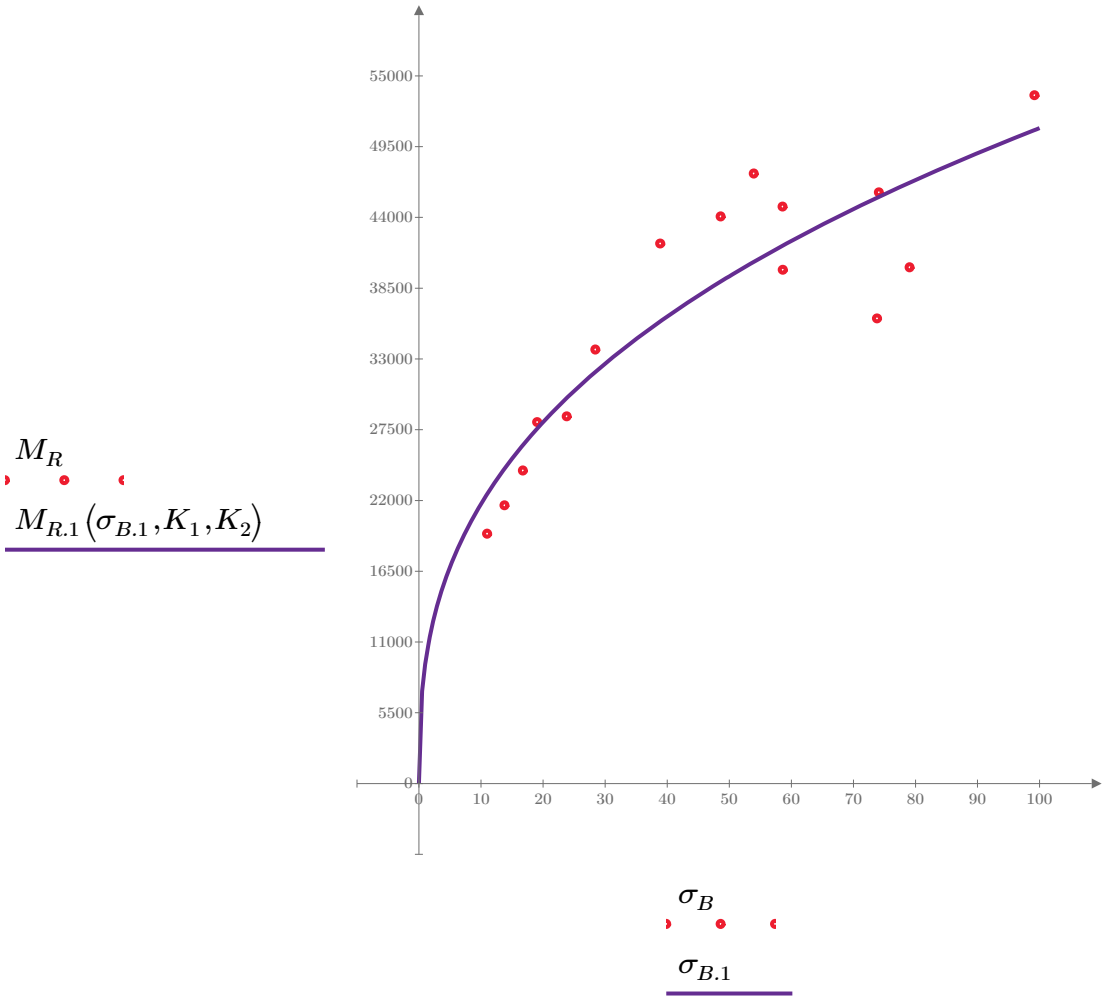

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–24”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 15201.358$

$K_4 = 0.3357$ Equation 2 fitting parameters

${R_2}^2 = 0.6908$ Coefficient of determination

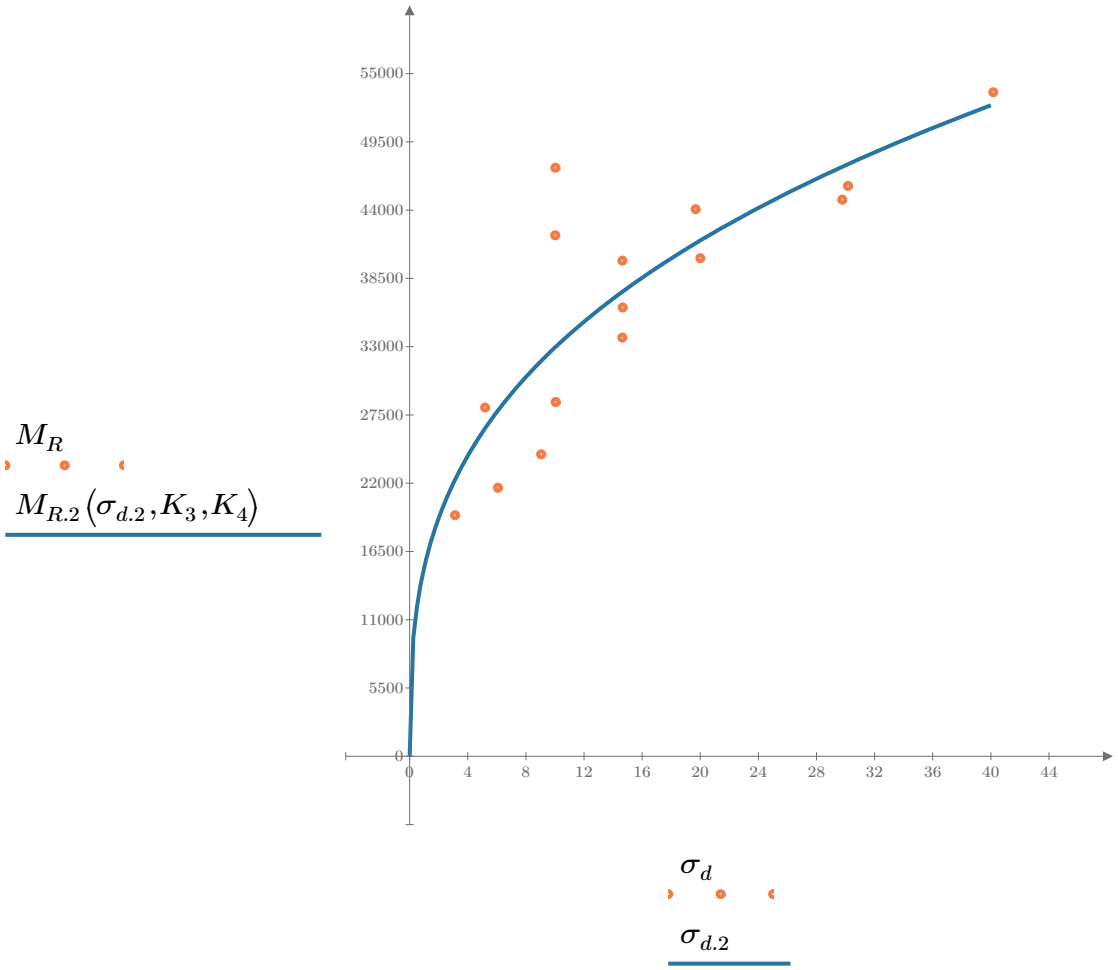

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–24”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 13574.578$

$K_6 = 0.1941$ Equation 3 fitting parameters

$K_7 = 0.2109$

${R_3}^2 = 0.8093$ Coefficient of determination

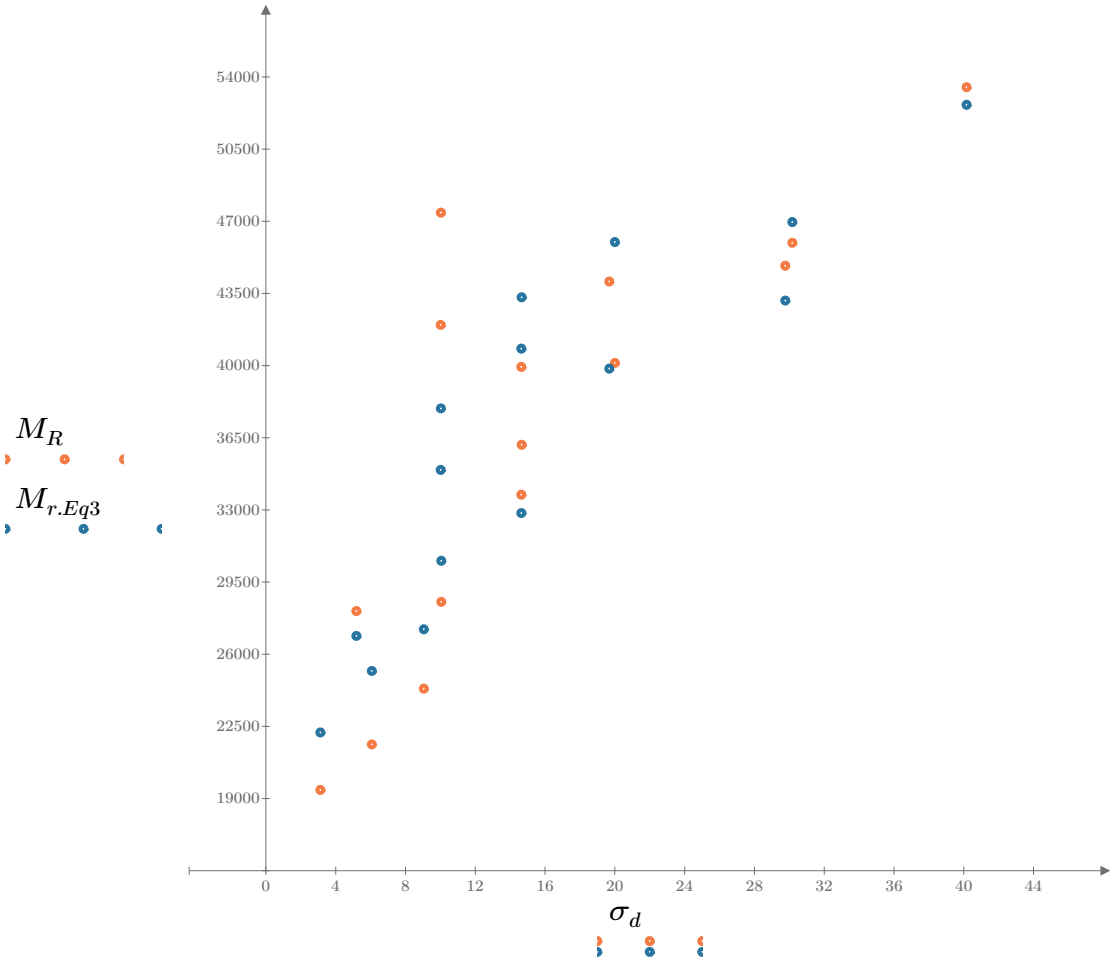

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–24”}$

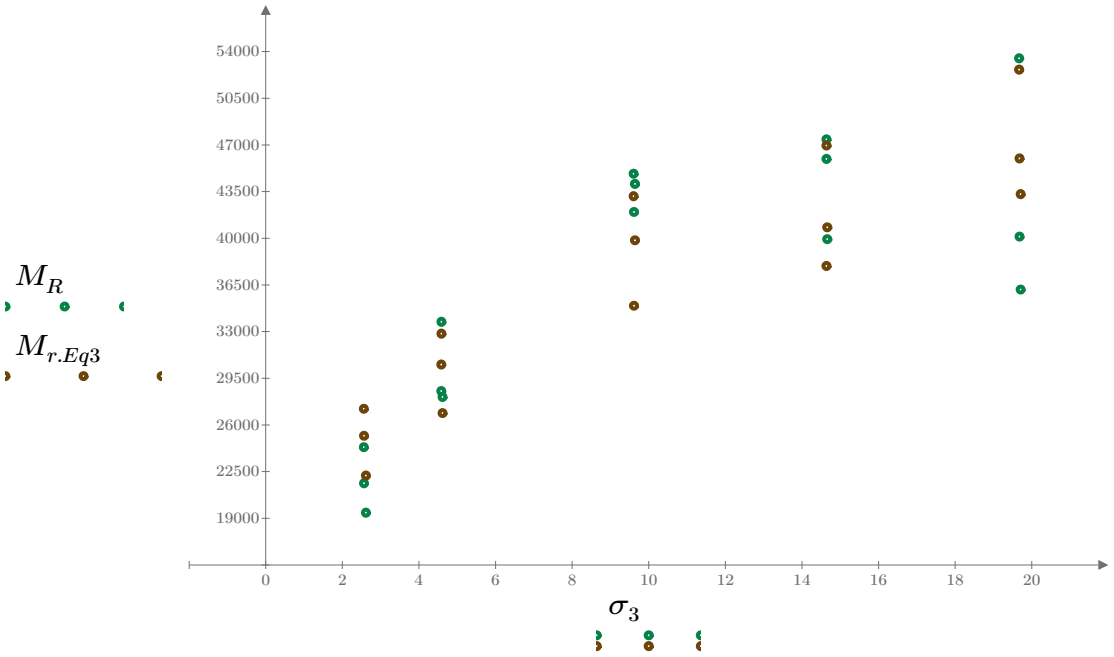

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

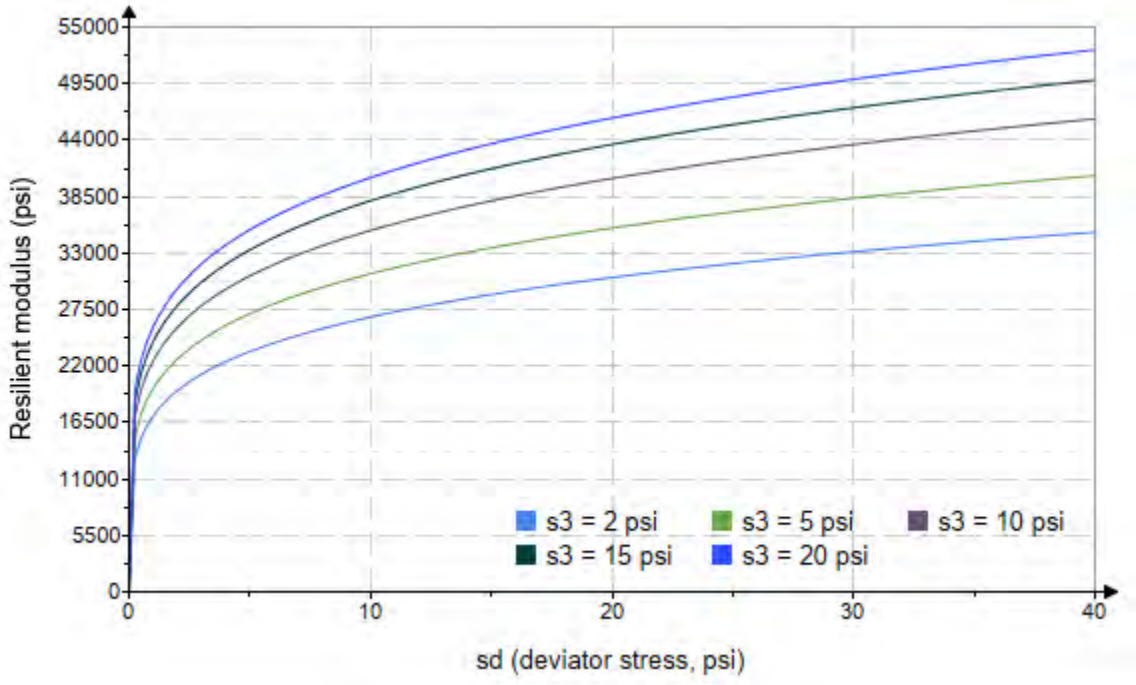

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–24”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1854.439$

$K_9 = 0.2939$ Equation 4 fitting parameters

$K_{10} = 0.0883$

$R_4^{\,2} = 0.8187$ Coefficient of determination

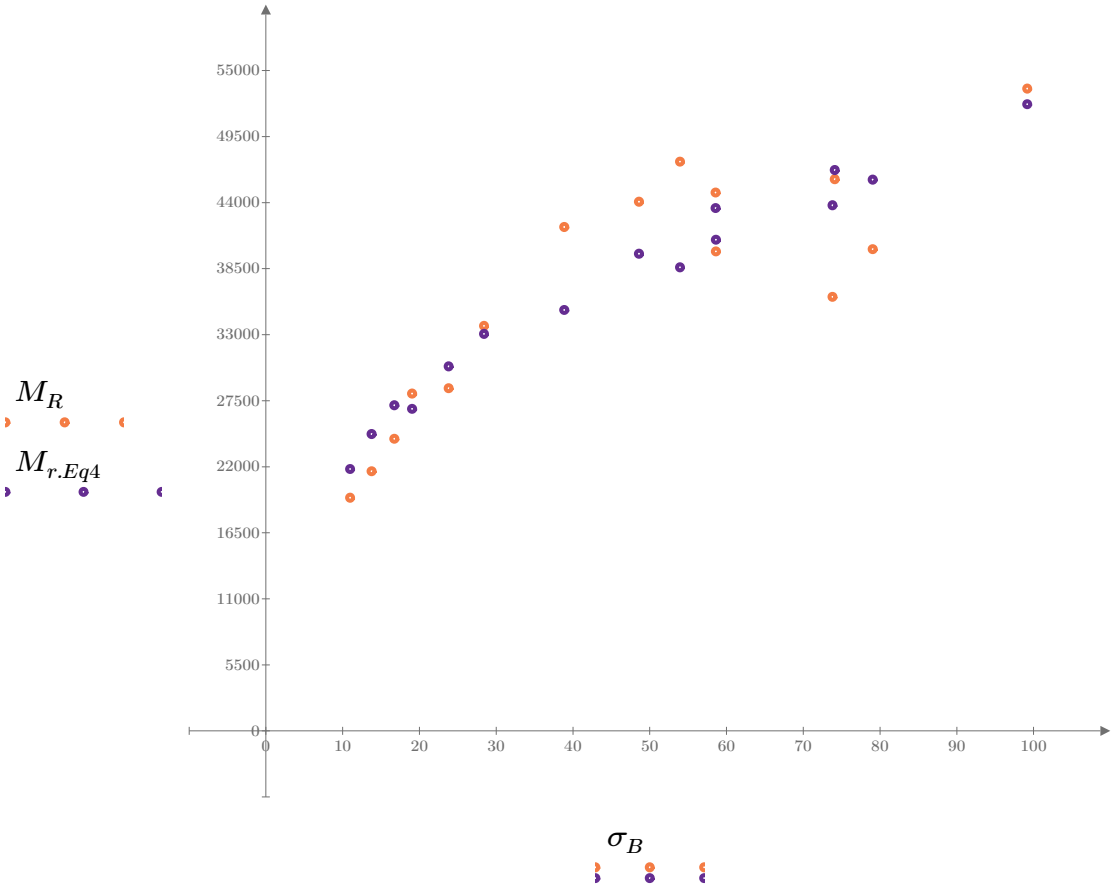

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

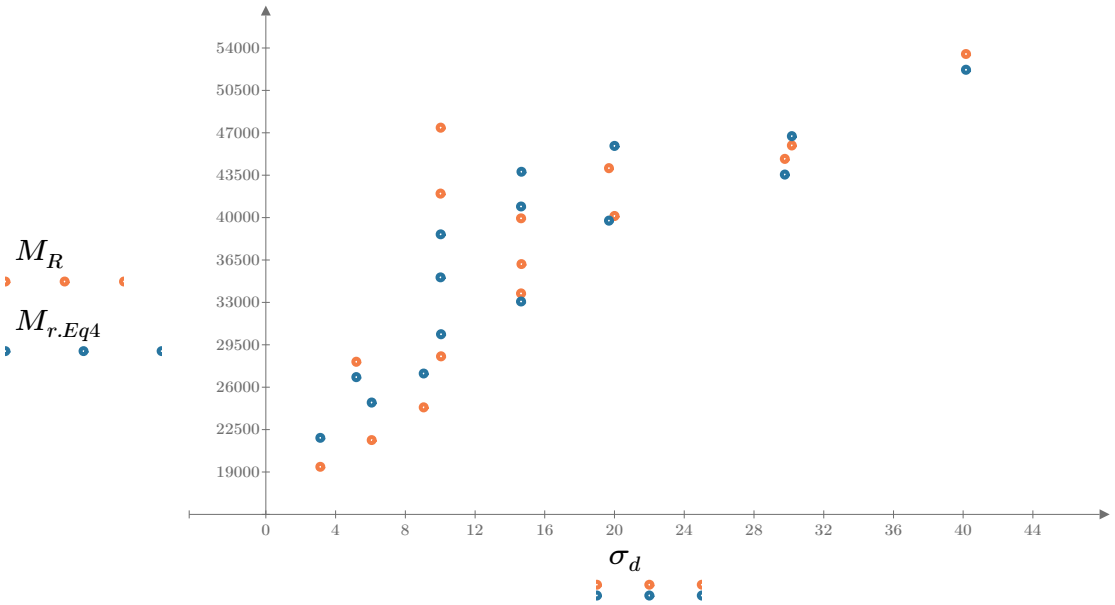

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

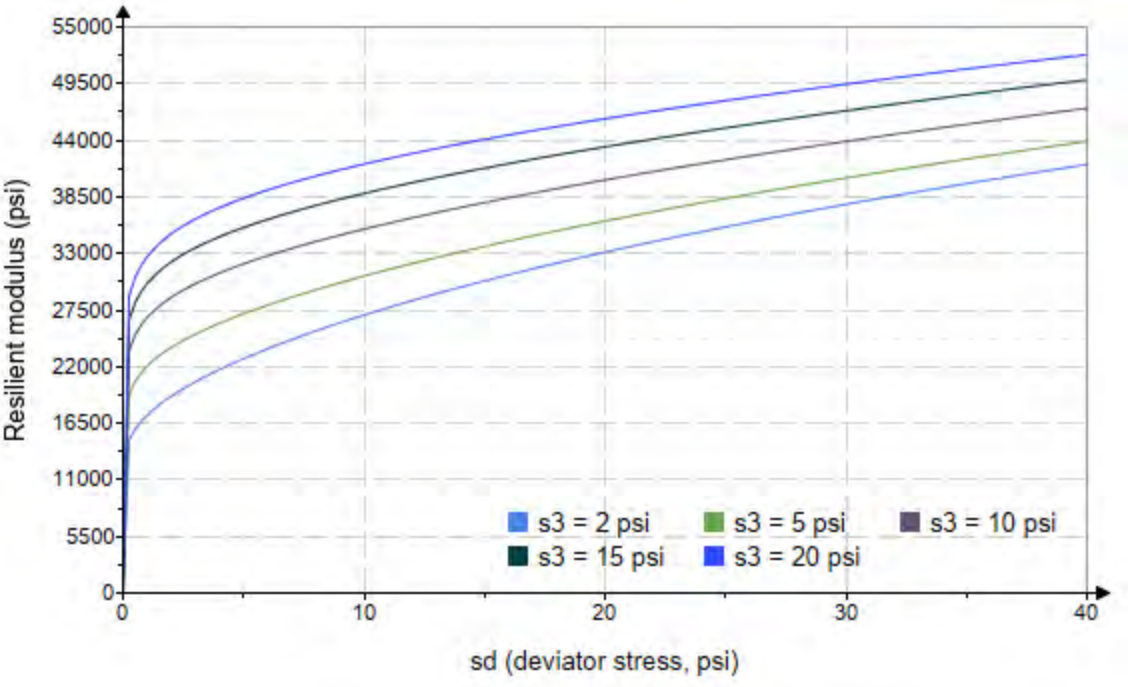

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2–25”}$

$Treatment = \text{“AD”}$

$S = 3.122$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.137 \\ 2.010 \\ 1.843 \\ 3.726 \\ 3.851 \\ 4.080 \\ 9.257 \\ 8.953 \\ 9.449 \\ 14.440 \\ 14.260 \\ 14.300 \\ 19.360 \\ 19.150 \\ 19.430 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.296 \\ 6.251 \\ 9.159 \\ 5.311 \\ 10.030 \\ 14.640 \\ 9.919 \\ 19.740 \\ 30.260 \\ 10.020 \\ 14.770 \\ 30.060 \\ 14.780 \\ 20.150 \\ 40.620 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 9.706 \\ 12.280 \\ 14.690 \\ 16.490 \\ 21.580 \\ 26.880 \\ 37.690 \\ 46.600 \\ 58.610 \\ 53.340 \\ 57.550 \\ 72.950 \\ 72.870 \\ 77.600 \\ 98.910 \end{bmatrix} \quad M_R = \begin{bmatrix} 57748.3 \\ 46032.8 \\ 37091.0 \\ 42374.2 \\ 33169.0 \\ 36626.8 \\ 42037.6 \\ 52130.2 \\ 54378.6 \\ 56467.0 \\ 58700.6 \\ 58495.4 \\ 60163.2 \\ 57753.2 \\ 64028.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–25”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 25527.182$

$K_2 = 0.1876$

Equation 1 fitting parameters

$R_1^2 = 0.4382$ Coefficient of determination

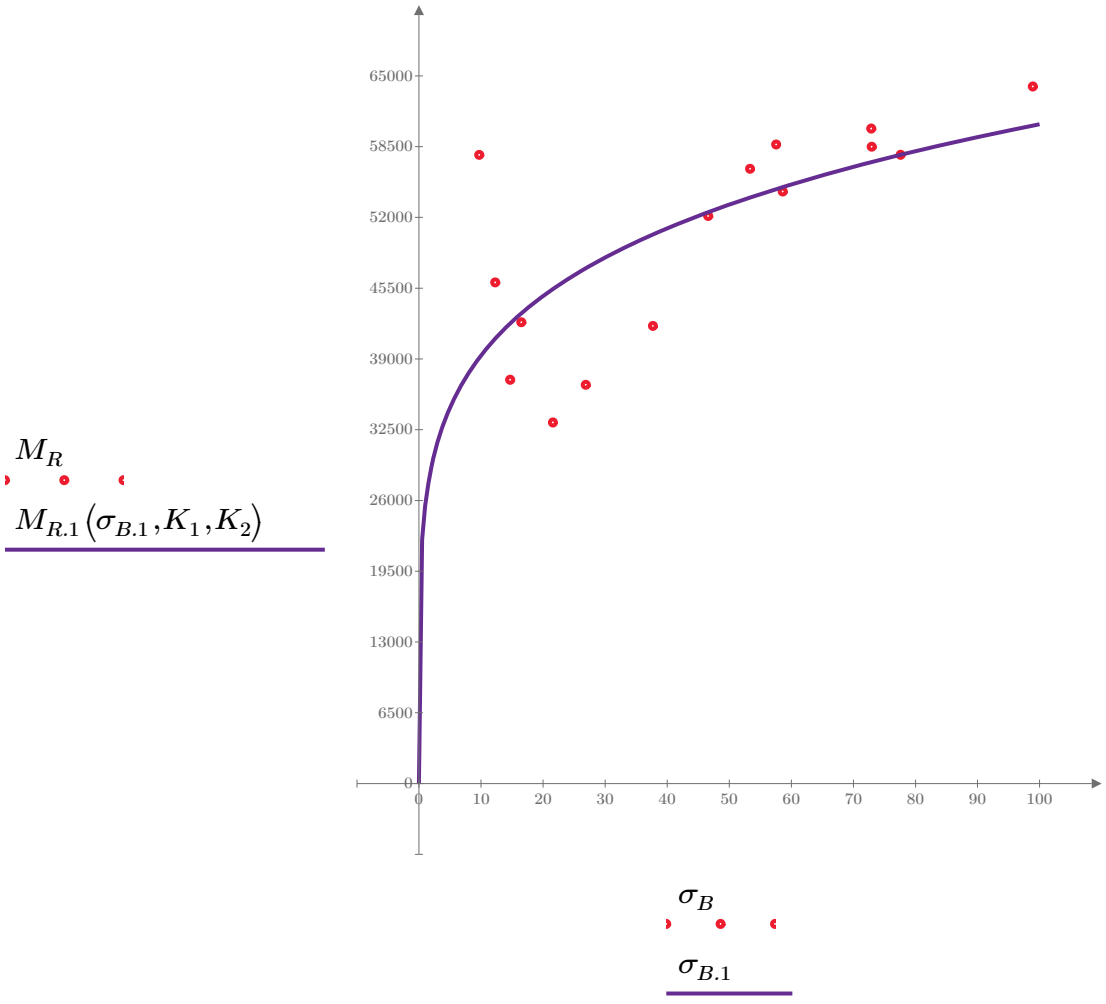

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–25”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 35677.427$

$K_4 = 0.1339$ Equation 2 fitting parameters

${R_2}^2 = 0.1951$ Coefficient of determination

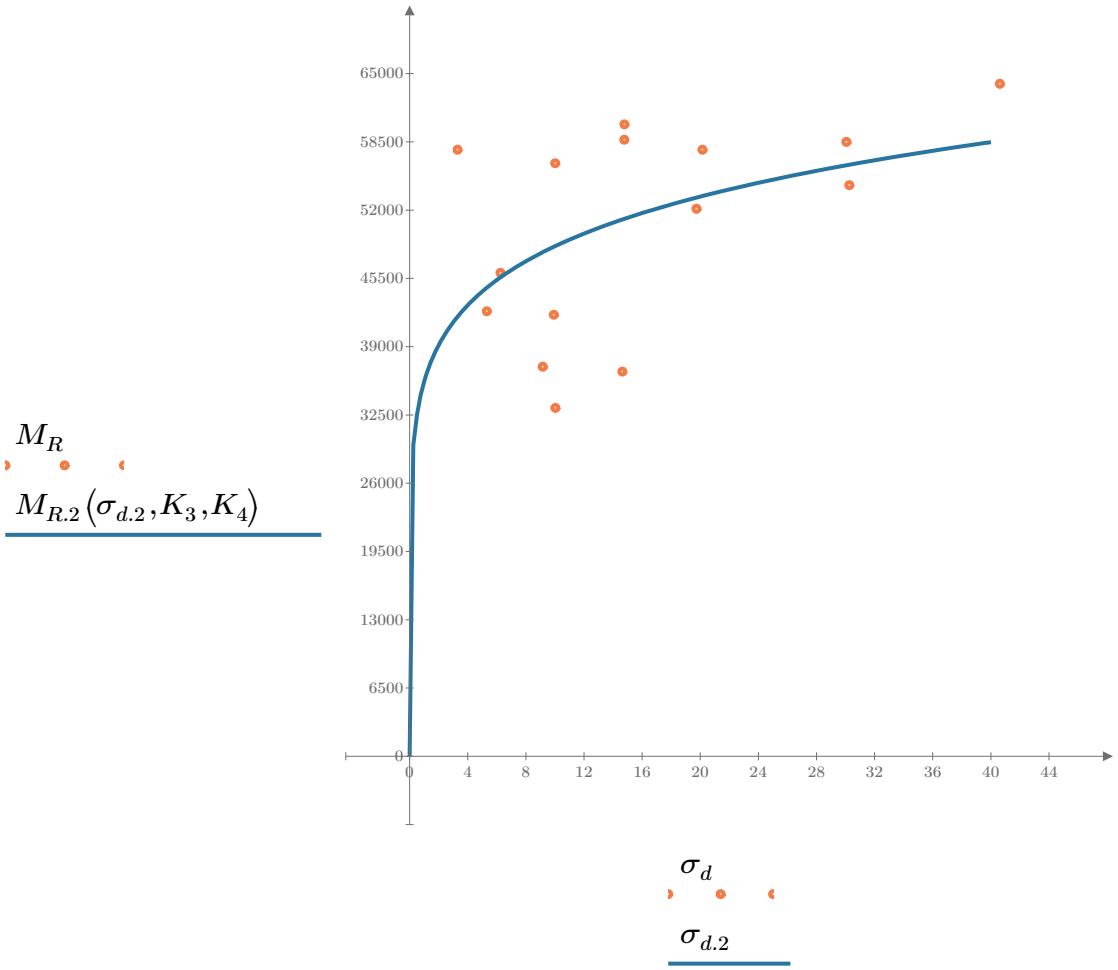

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–25”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 33731.323$

$K_6 = -0.0354$ Equation 3 fitting parameters

$K_7 = 0.2249$

${R_3}^2 = 0.5298$ Coefficient of determination

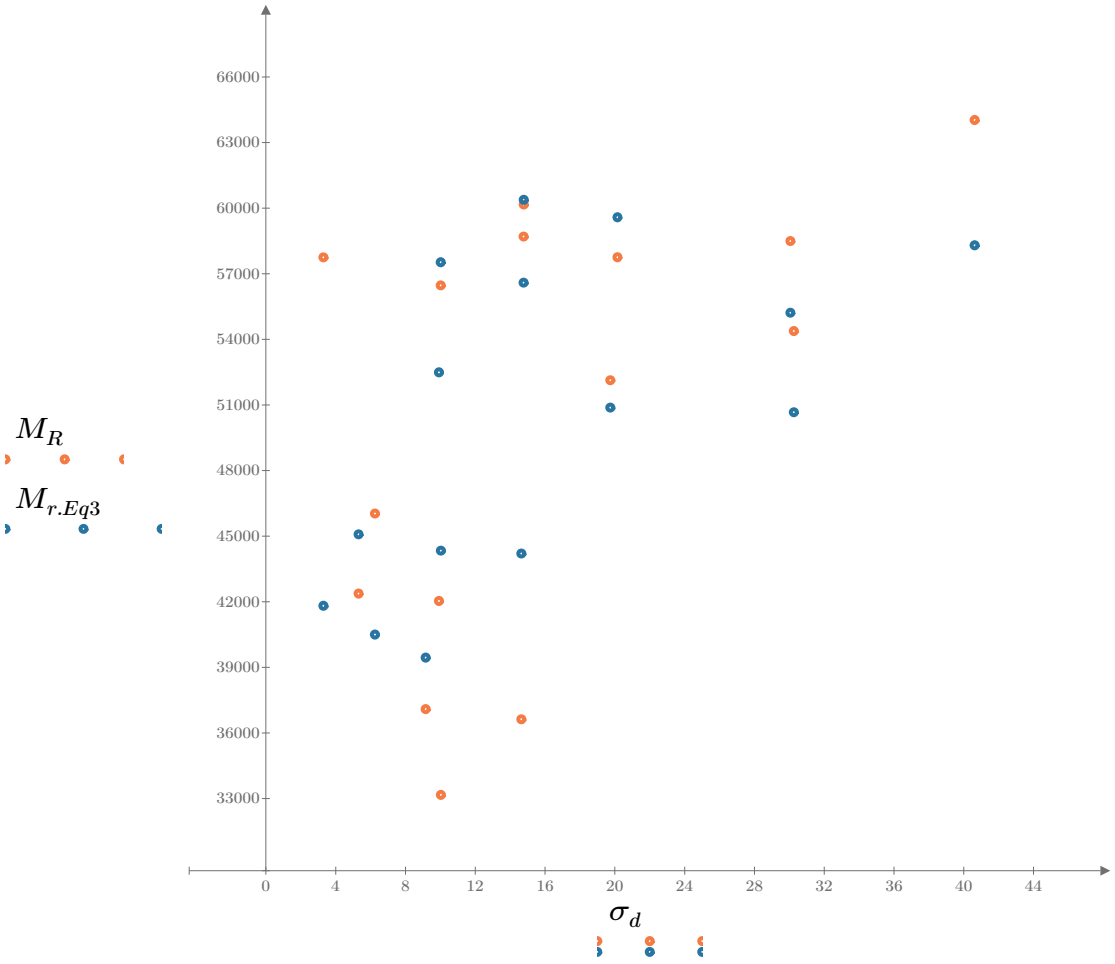

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–25”}$

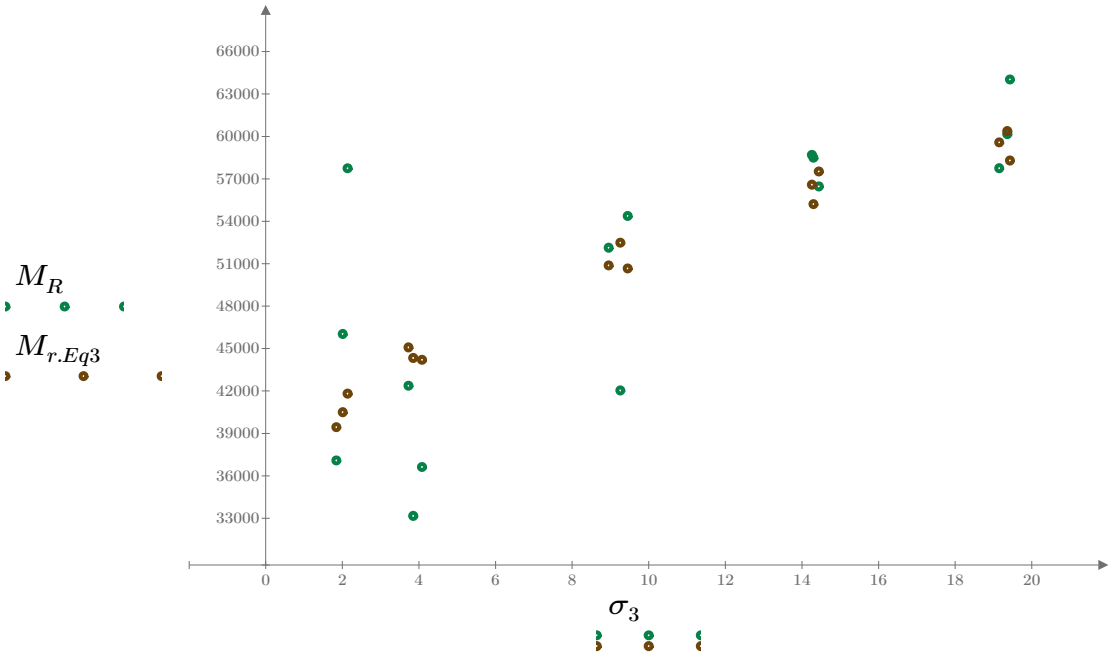

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

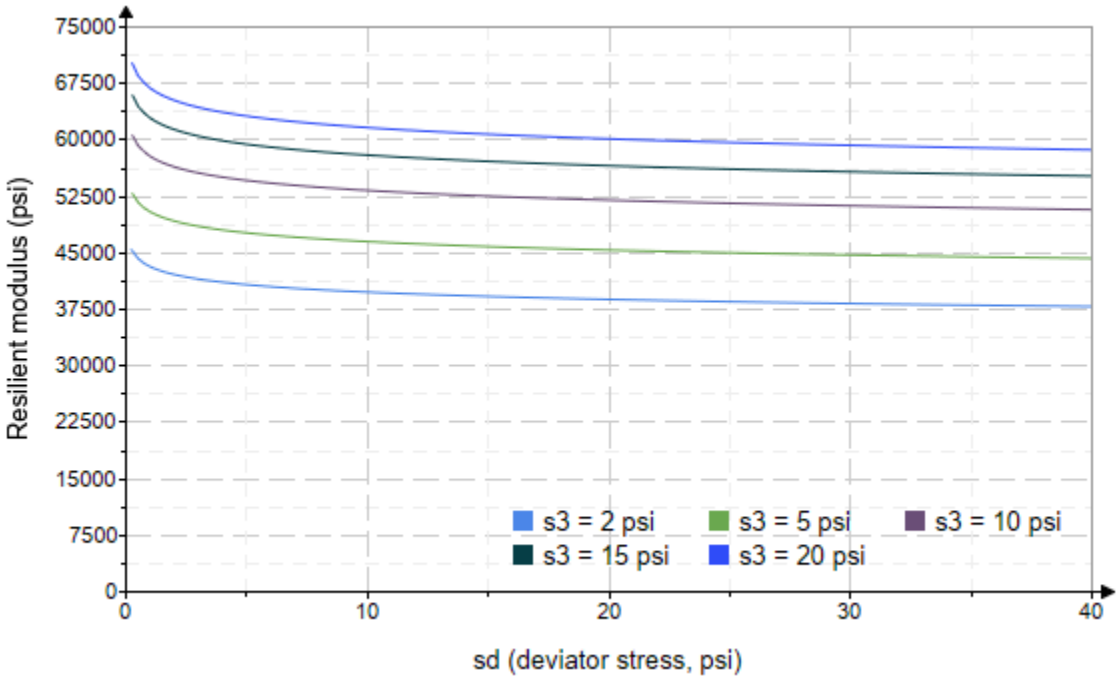

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–25”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2597.540$

$K_9 = 0.2833$ Equation 4 fitting parameters

$K_{10} = -0.1251$

$R_4^{\,2} = 0.4866$ Coefficient of determination

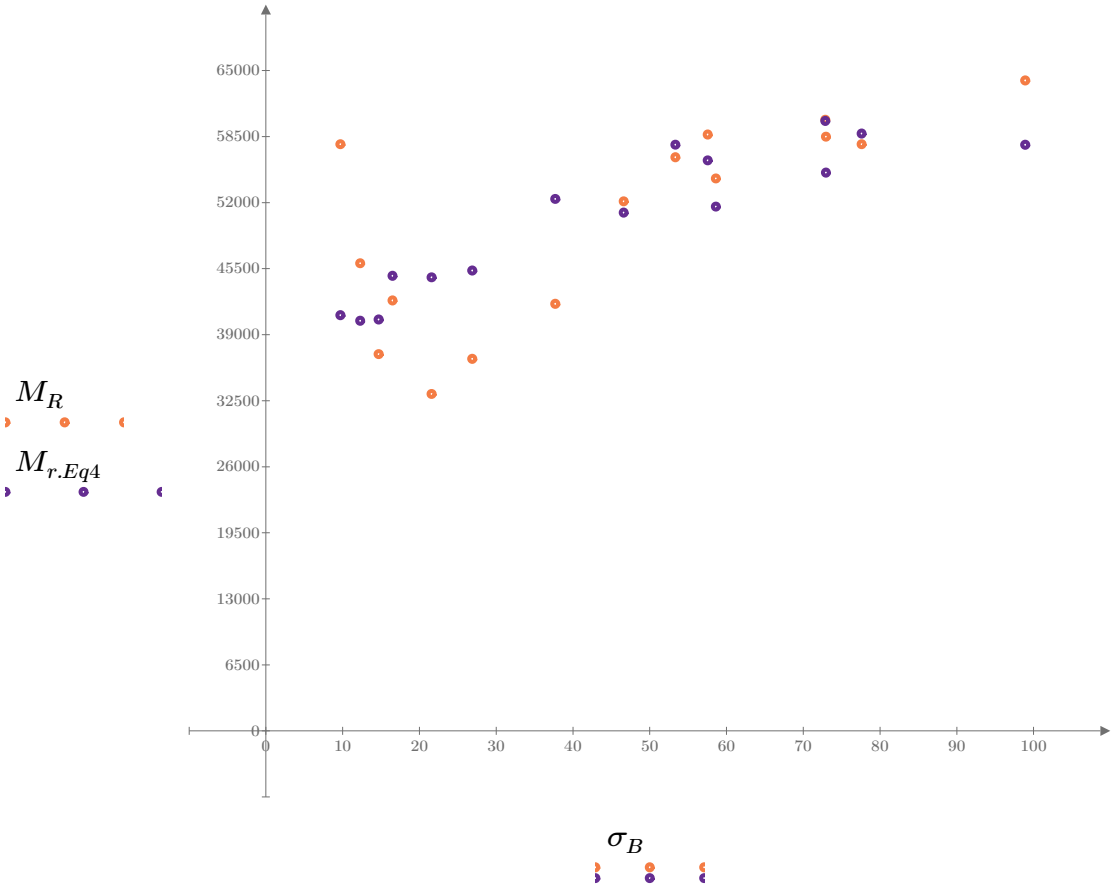

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

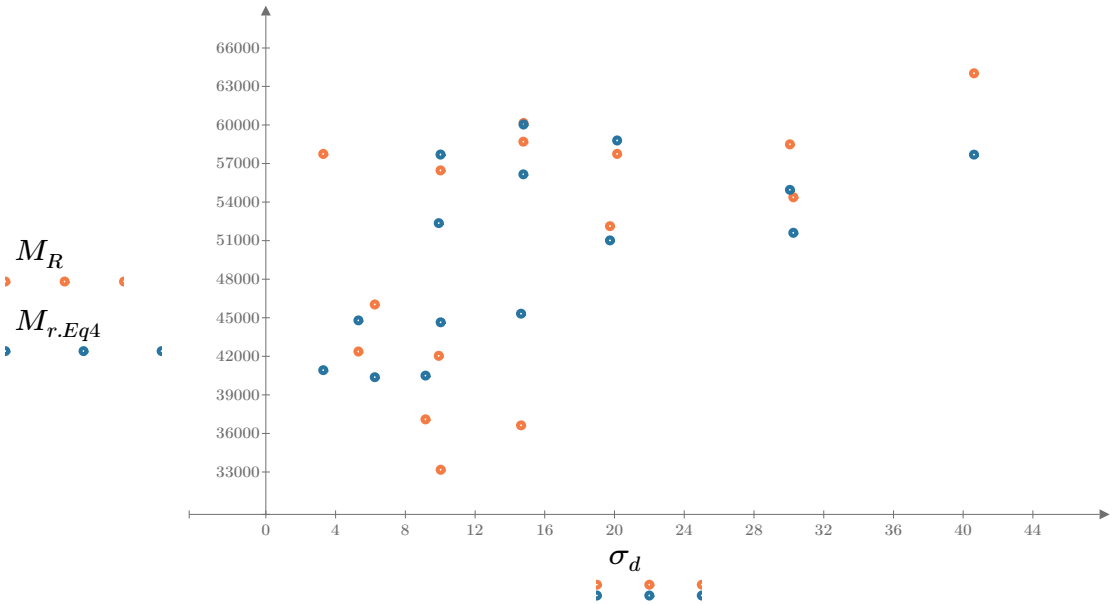

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

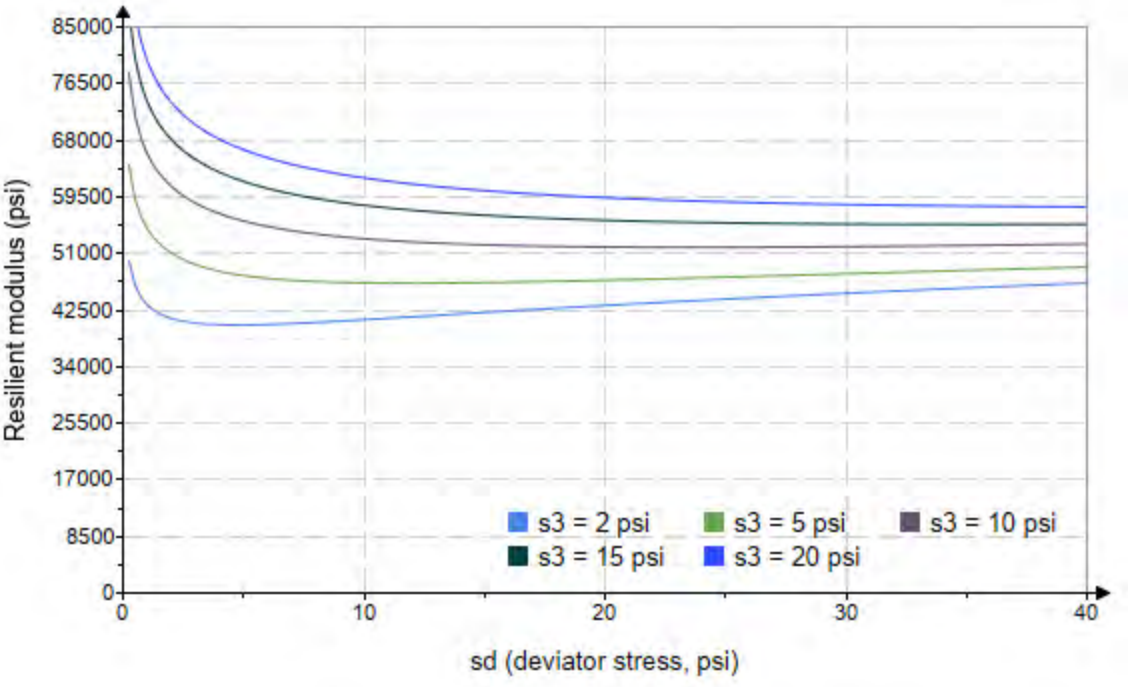

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−26"

$Treatment =$ "AD"

$S = 3.62$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.790 \\ 2.778 \\ 2.759 \\ 4.557 \\ 4.585 \\ 4.573 \\ 9.615 \\ 9.597 \\ 9.595 \\ 14.650 \\ 14.630 \\ 14.630 \\ 19.650 \\ 19.640 \\ 19.640 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.148 \\ 6.008 \\ 8.844 \\ 5.089 \\ 9.692 \\ 14.270 \\ 9.697 \\ 19.380 \\ 29.570 \\ 9.735 \\ 14.440 \\ 29.600 \\ 14.290 \\ 19.610 \\ 40.020 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.520 \\ 14.340 \\ 17.120 \\ 18.760 \\ 23.450 \\ 27.990 \\ 38.540 \\ 48.170 \\ 58.350 \\ 53.680 \\ 58.320 \\ 73.490 \\ 73.250 \\ 78.540 \\ 98.950 \end{bmatrix} \quad M_R = \begin{bmatrix} 39839.8 \\ 46321.2 \\ 45306.8 \\ 45914.2 \\ 51544.0 \\ 53961.8 \\ 53829.6 \\ 69377.2 \\ 68868.6 \\ 46547.0 \\ 64757.8 \\ 73187.6 \\ 85386.2 \\ 88371.0 \\ 81176.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–26”}$

$M_{R.1}\left(\sigma_B, K_1, K_2\right) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 16046.691$

$K_2 = 0.3591$

Equation 1 fitting parameters

${R_1}^2 = 0.7846$ Coefficient of determination

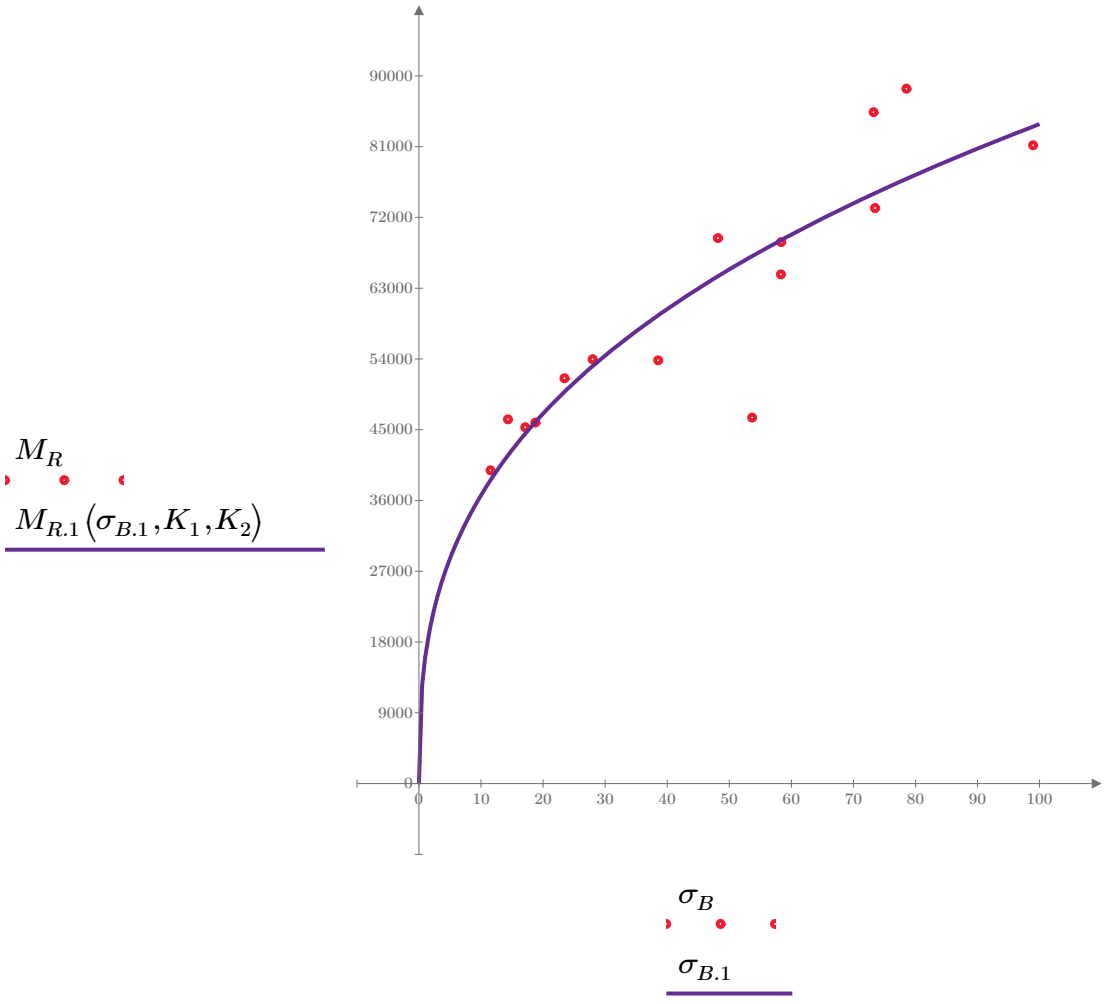

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–26”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 27966.567$

$K_4 = 0.3002$

Equation 2 fitting parameters

${R_2}^2 = 0.6413$ Coefficient of determination

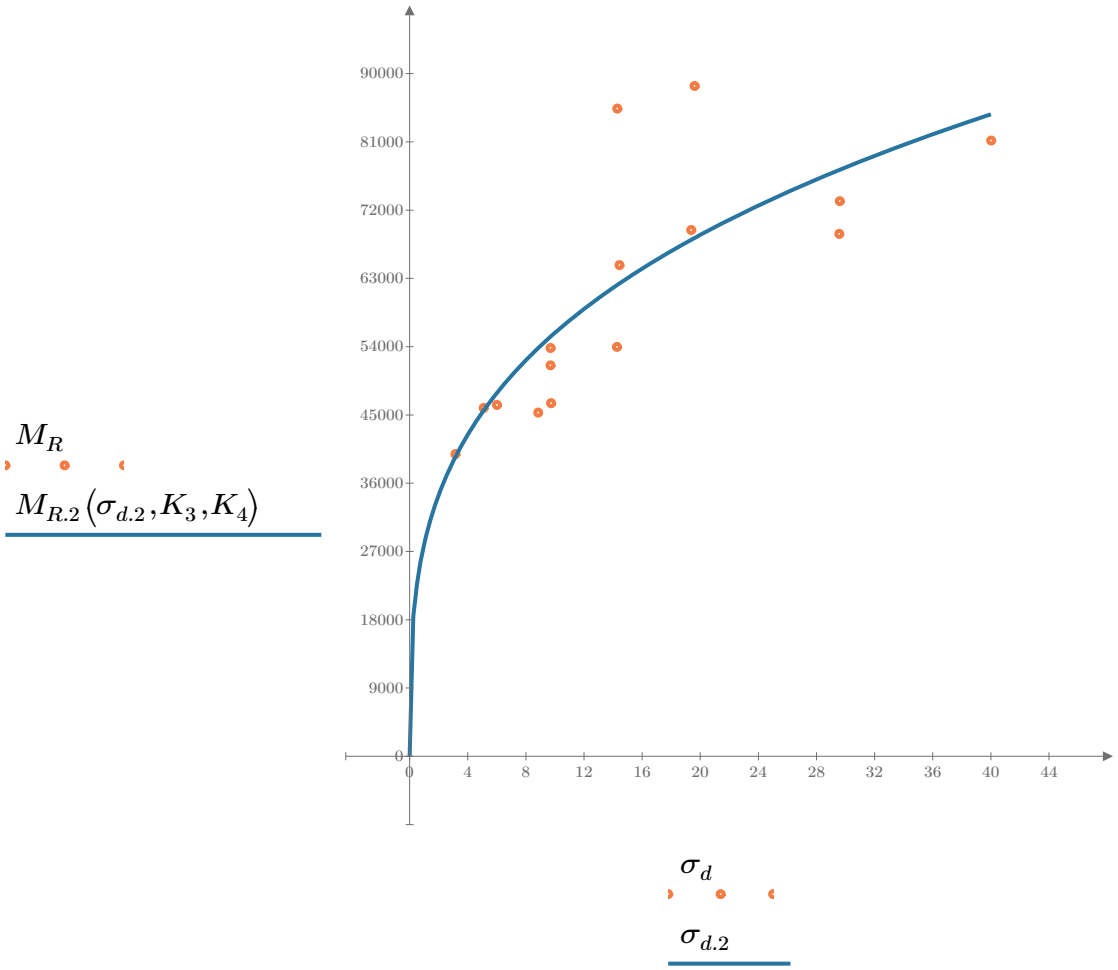

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–26”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1+\sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 23425.962$

$K_6 = 0.1571$ Equation 3 fitting parameters

$K_7 = 0.2373$

${R_3}^2 = 0.8015$ Coefficient of determination

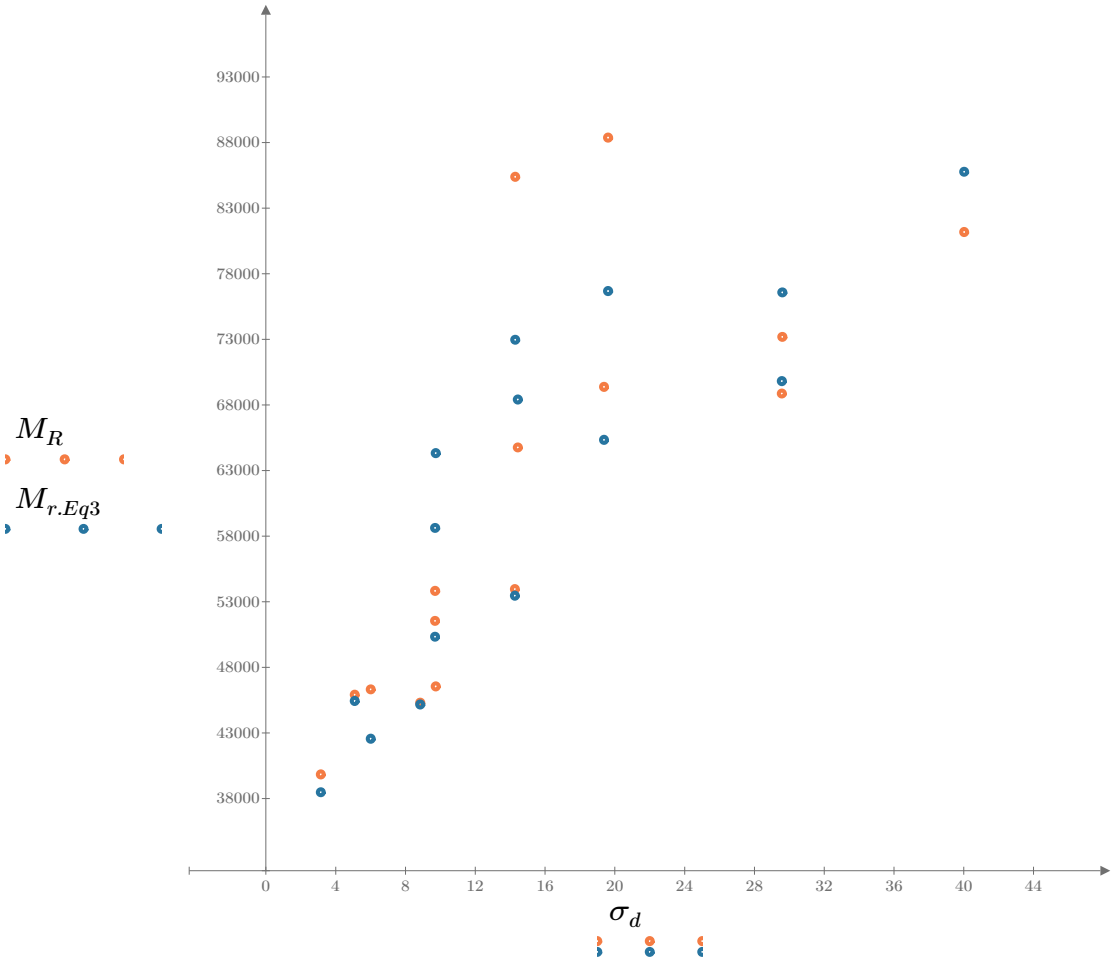

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-26\text{”}$

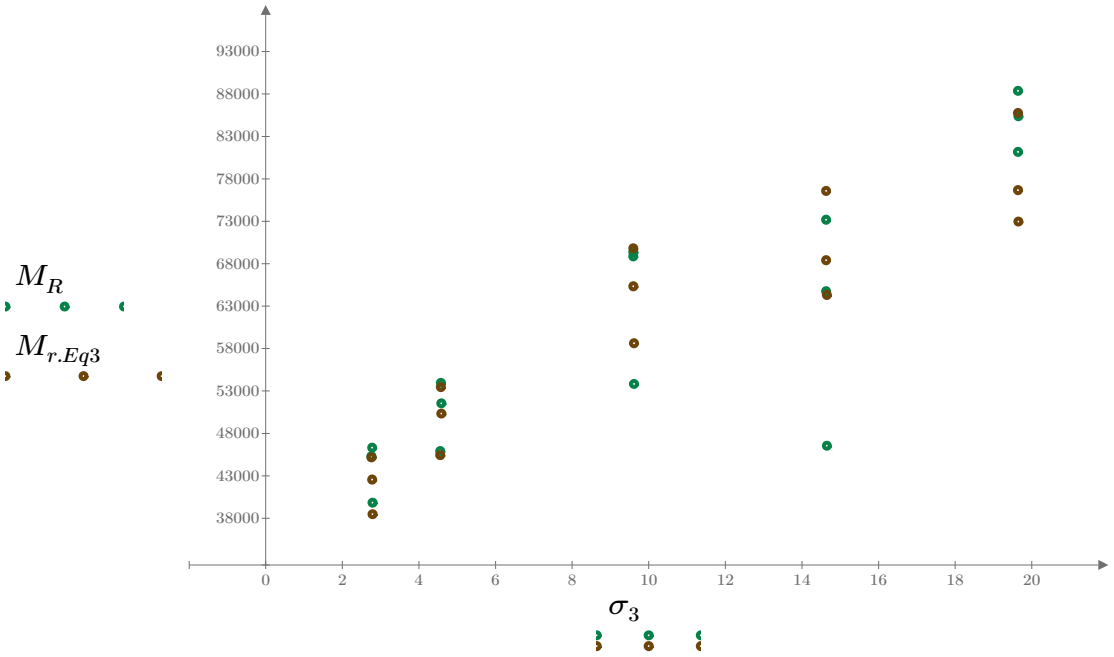

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

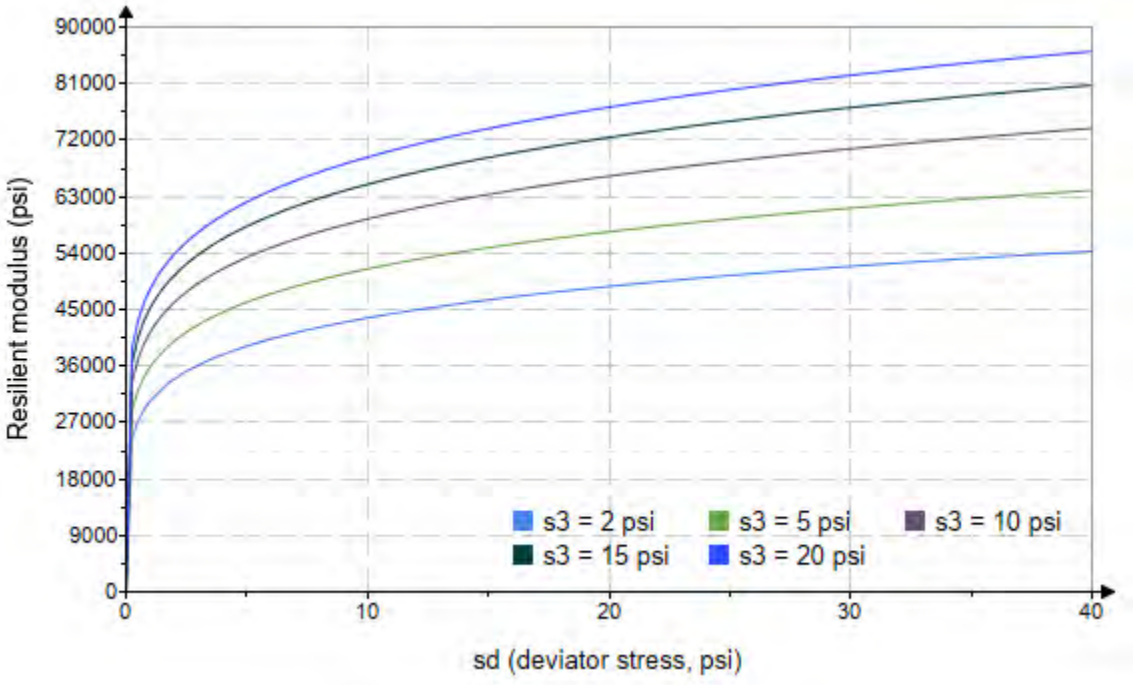

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–26”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 3048.626$

$K_9 = 0.3044$ Equation 4 fitting parameters

$K_{10} = 0.0603$

$R_4^{\,2} = 0.7917$ Coefficient of determination

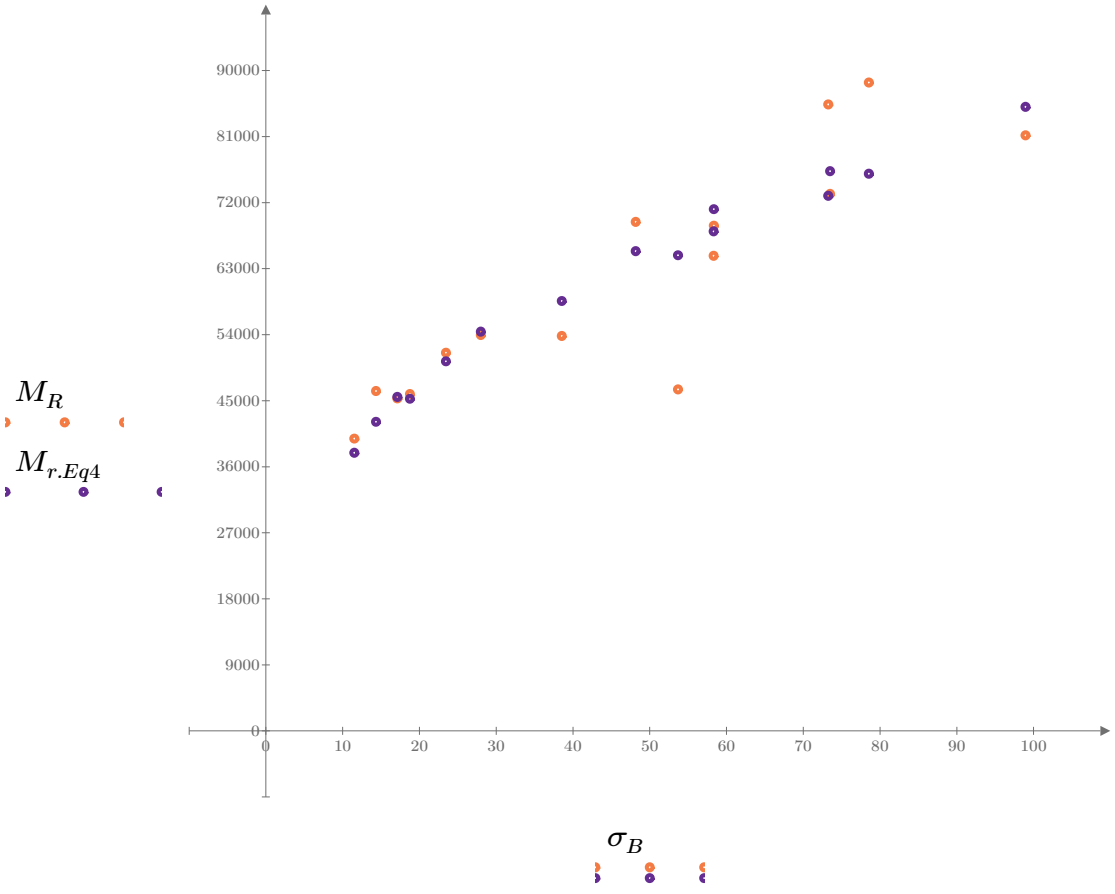

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

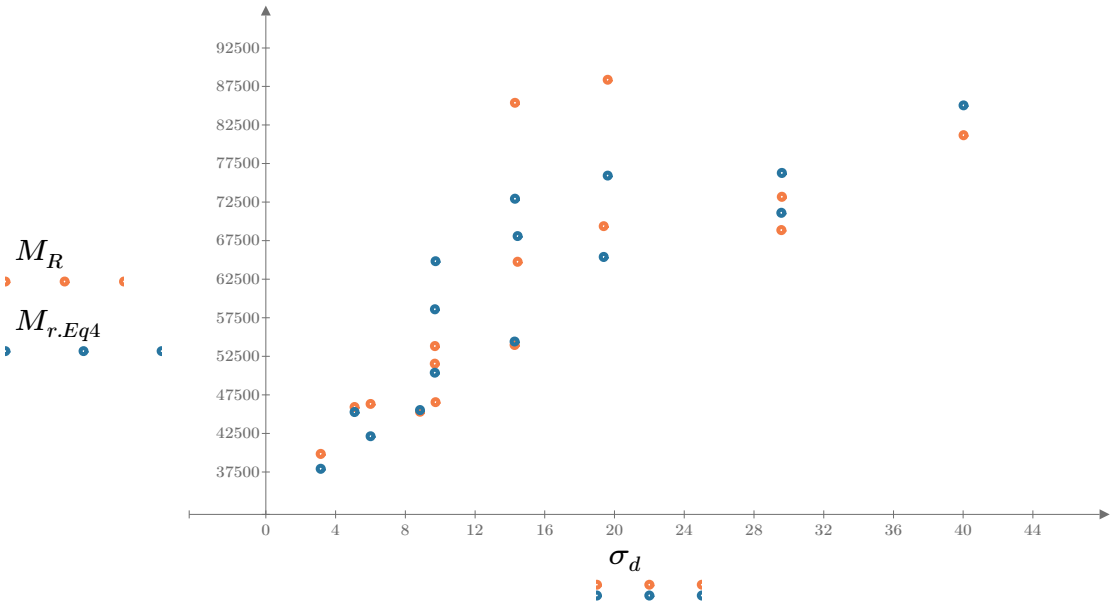

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

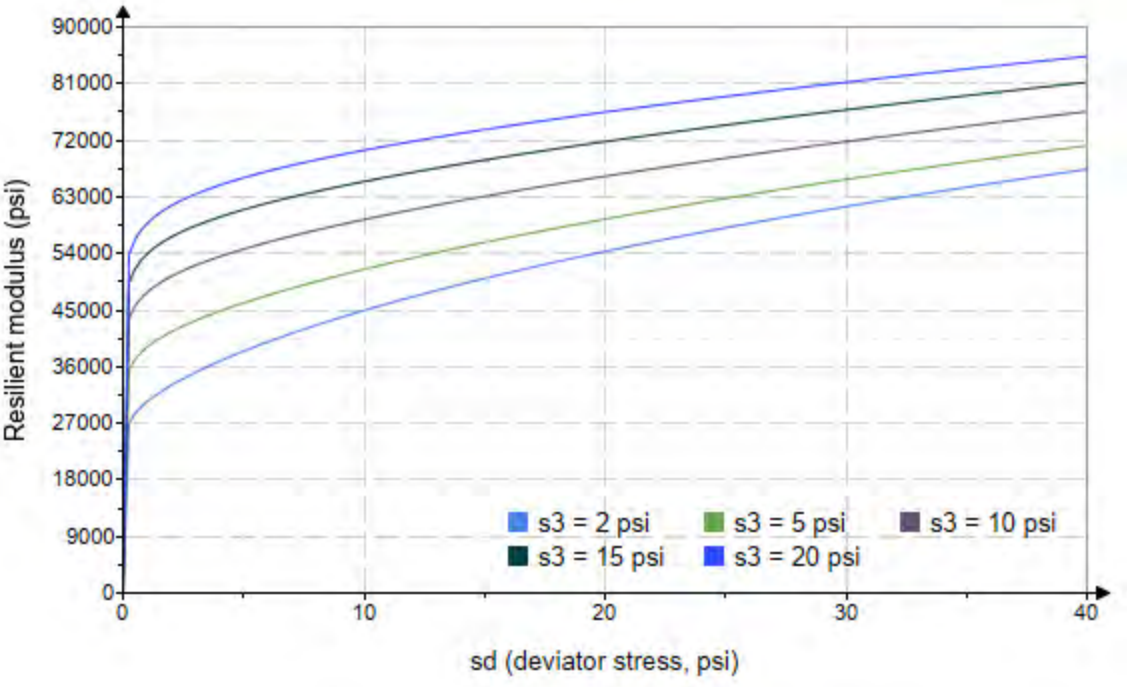

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2–27”}$

$Treatment = \text{“H100”}$

$S = 4.449$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.714 \\ 2.762 \\ 2.796 \\ 4.604 \\ 4.641 \\ 4.636 \\ 9.701 \\ 9.632 \\ 9.627 \\ 14.650 \\ 14.620 \\ 14.560 \\ 19.640 \\ 19.590 \\ 19.640 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.195 \\ 6.113 \\ 8.936 \\ 5.064 \\ 9.879 \\ 14.580 \\ 9.852 \\ 19.670 \\ 29.910 \\ 9.923 \\ 14.670 \\ 30.050 \\ 14.610 \\ 19.940 \\ 40.190 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.340 \\ 14.400 \\ 17.320 \\ 18.880 \\ 23.800 \\ 28.490 \\ 38.950 \\ 48.570 \\ 58.790 \\ 53.870 \\ 58.520 \\ 73.720 \\ 73.510 \\ 78.710 \\ 99.100 \end{bmatrix} \quad M_R = \begin{bmatrix} 47618.8 \\ 50045.2 \\ 52726.6 \\ 57001.4 \\ 67192.2 \\ 71901.4 \\ 87922.6 \\ 61075.4 \\ 64057.0 \\ 65550.2 \\ 54213.2 \\ 67509.0 \\ 58583.2 \\ 66273.0 \\ 77090.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–27”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 40598.849$

$K_2 = 0.1209$

Equation 1 fitting parameters

$R_1^2 = 0.2473$ Coefficient of determination

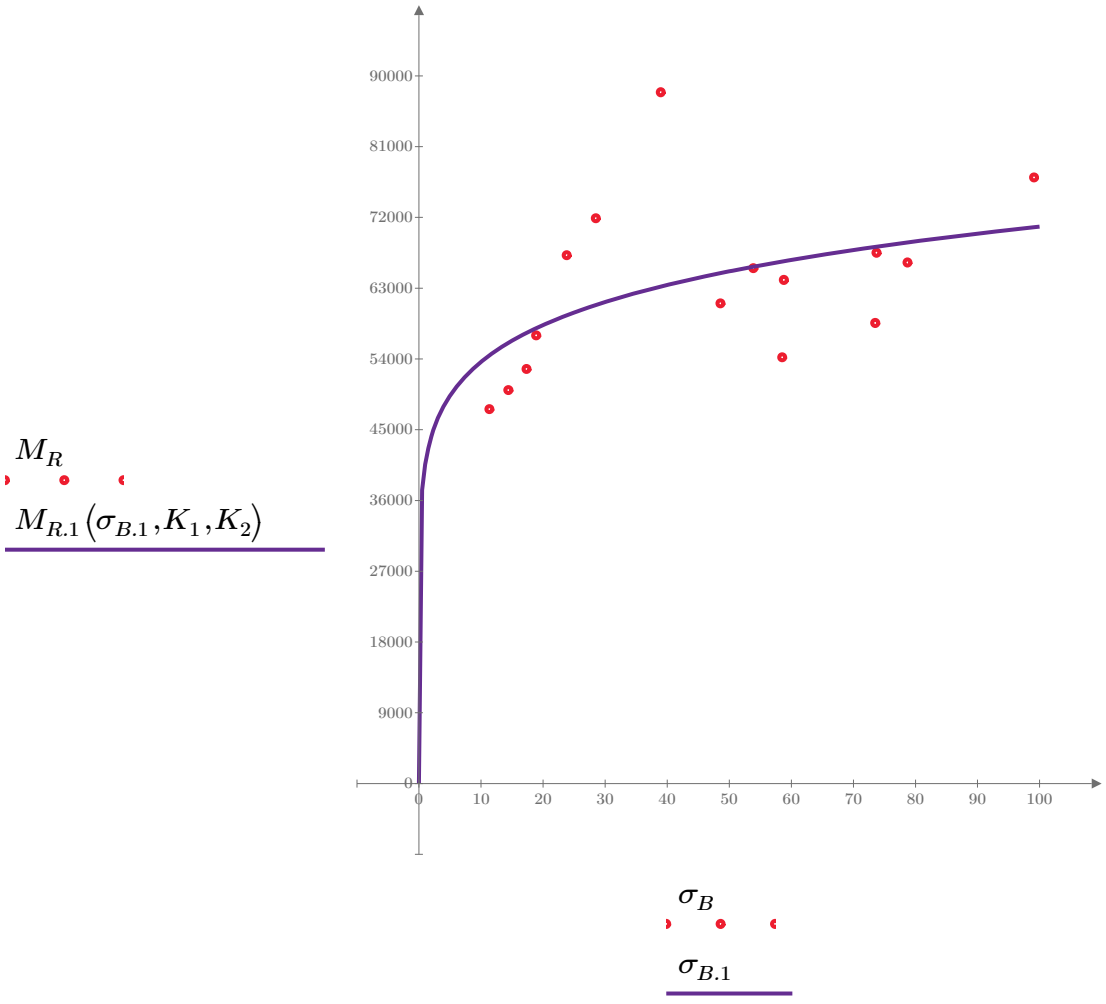

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–27”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 46548.067$

$K_4 = 0.1193$ Equation 2 fitting parameters

${R_2}^2 = 0.2471$ Coefficient of determination

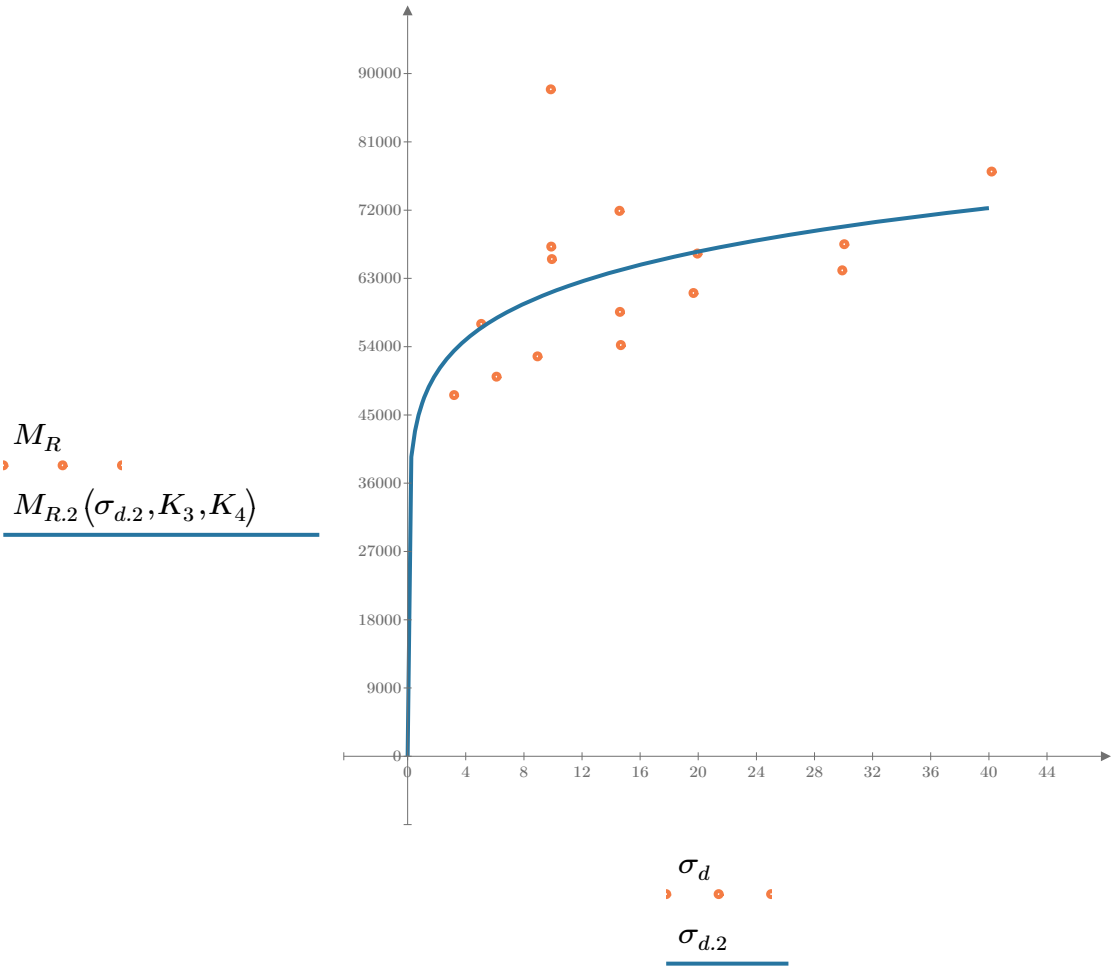

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–27”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 45508.854$

$K_6 = 0.0897$ Equation 3 fitting parameters

$K_7 = 0.0436$

${R_3}^2 = 0.2605$ Coefficient of determination

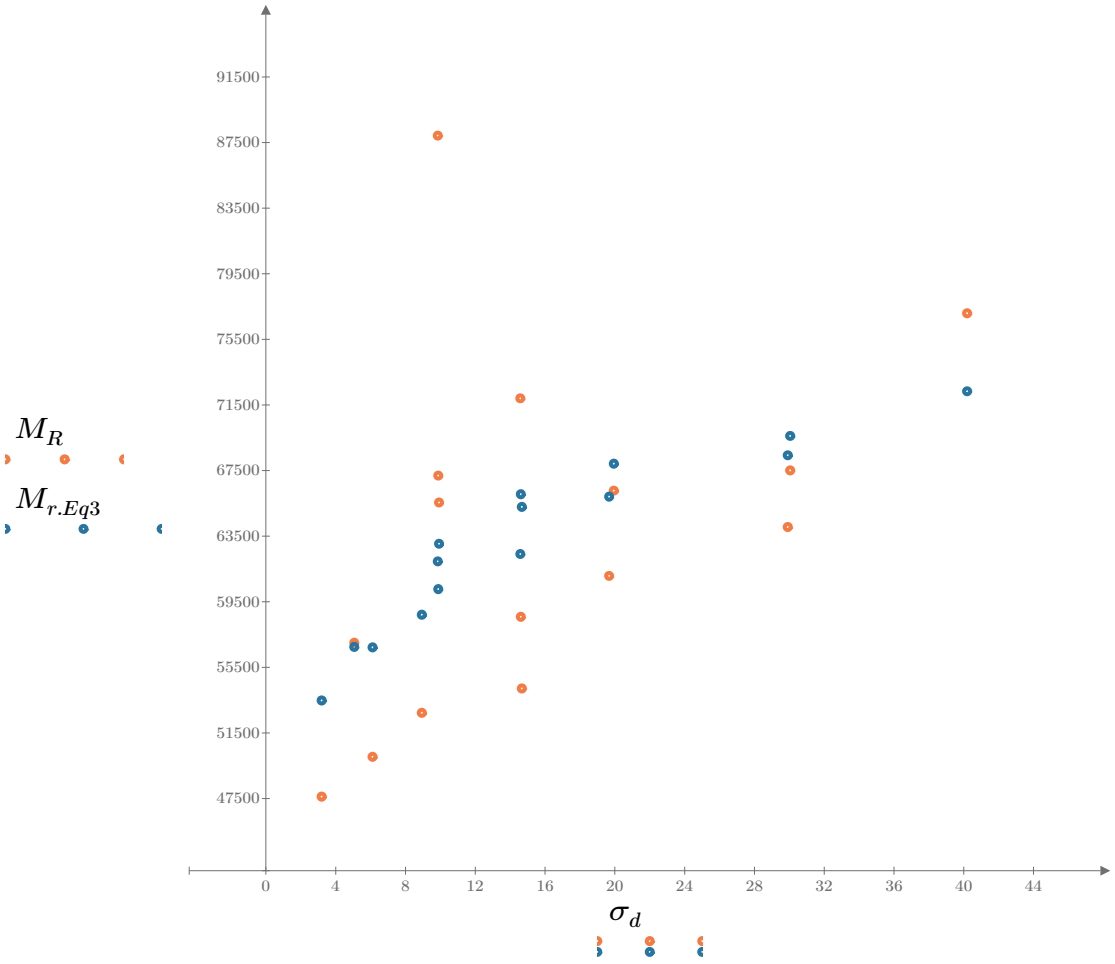

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo =$ "B2−27"

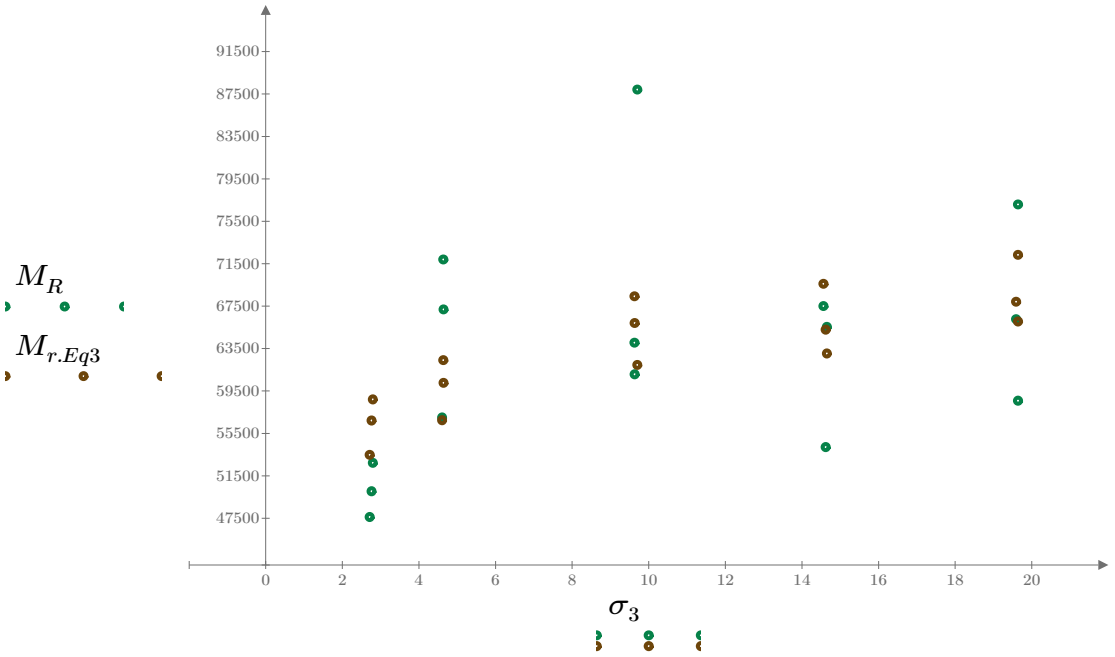

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

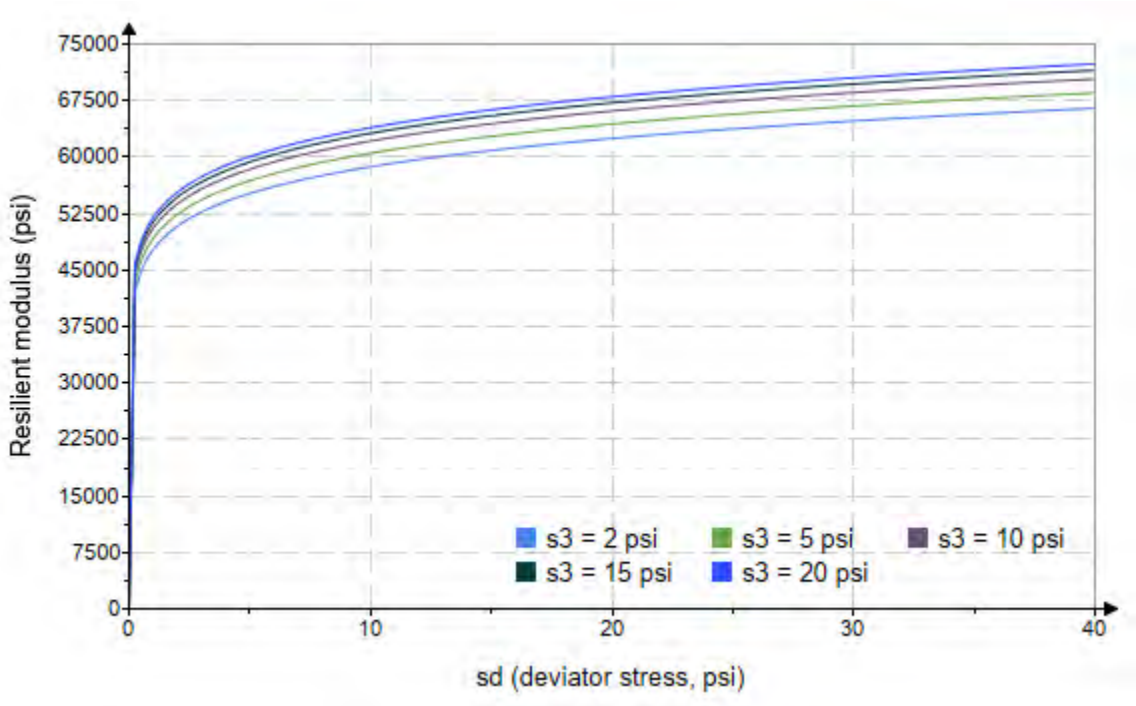

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–27”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 4067.799$

$K_9 = 0.0651$ Equation 4 fitting parameters

$K_{10} = 0.0635$

$R_4^{\,2} = 0.2640$ Coefficient of determination

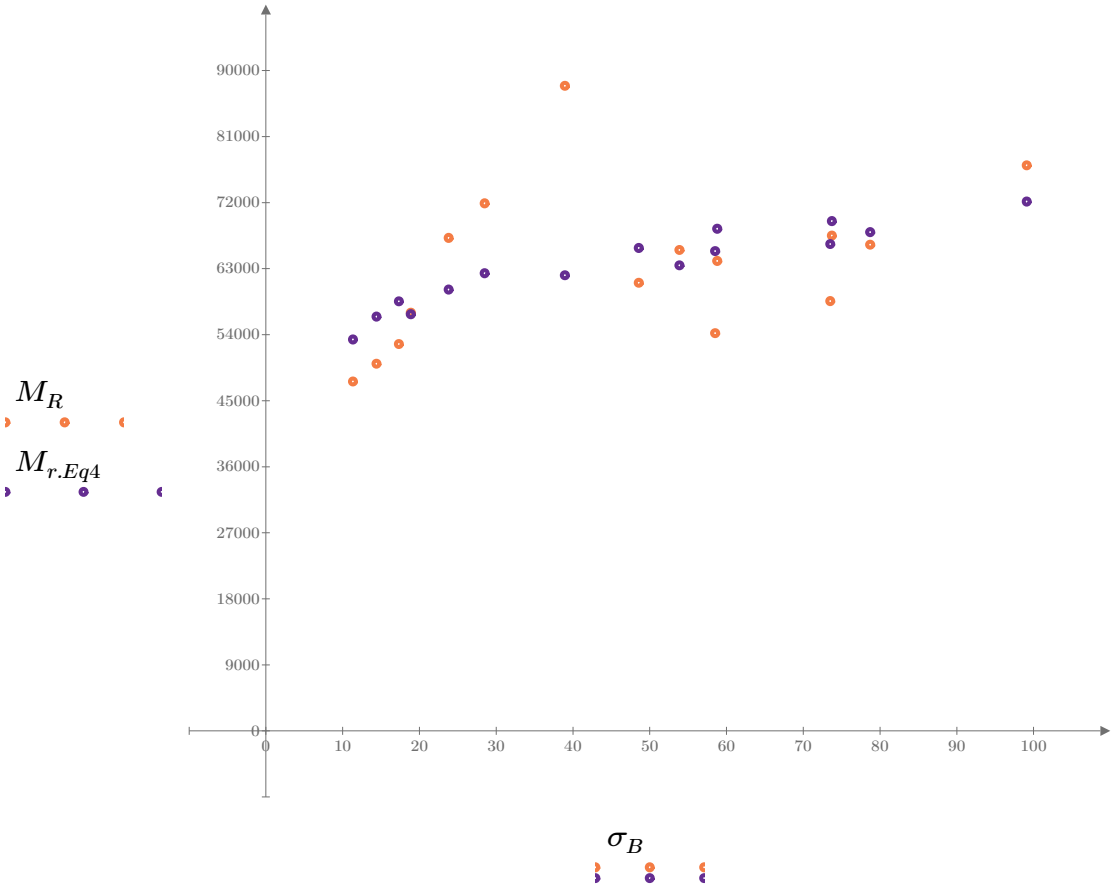

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

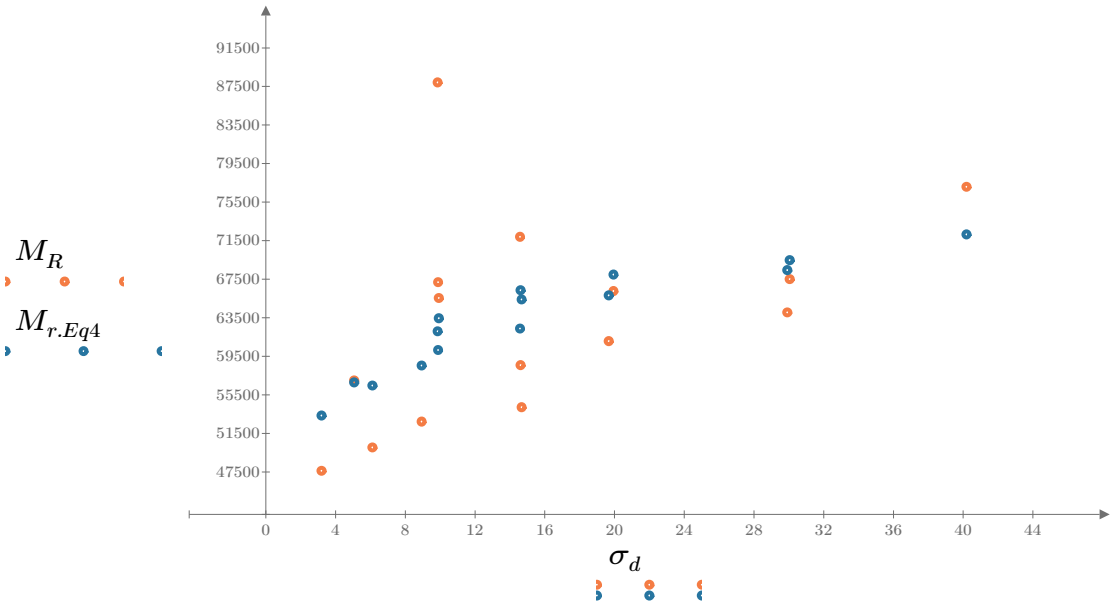

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

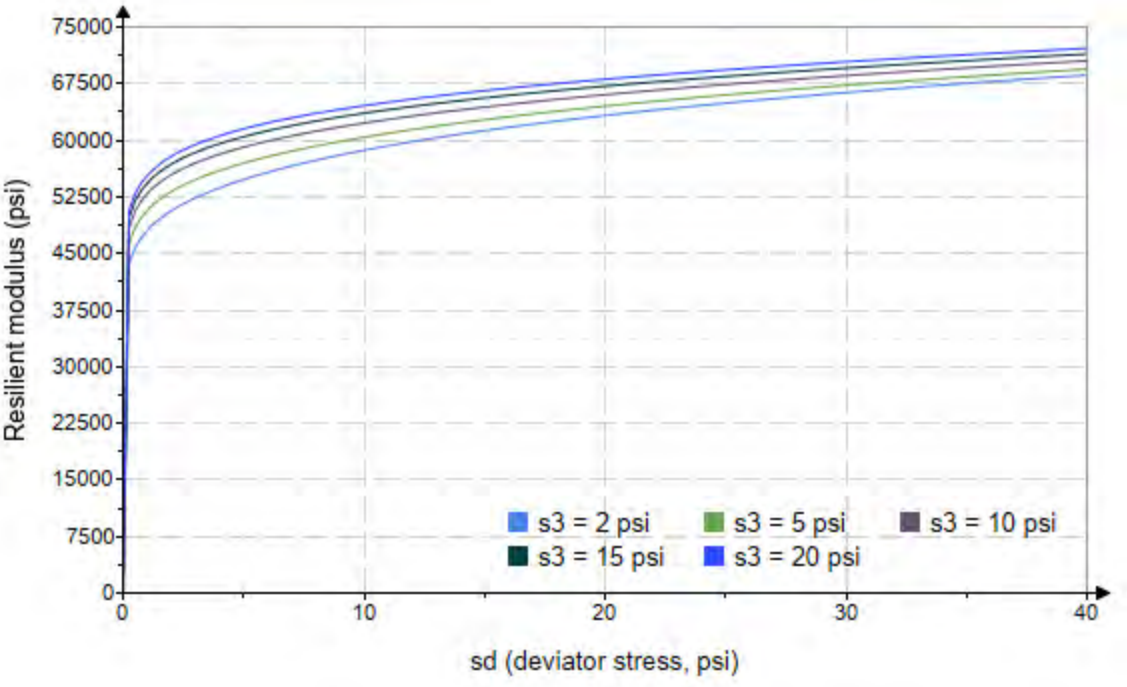

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{28”}$

$Treatment = \text{“H100”}$

$S = 4.441$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.165 \\ 2.264 \\ 2.444 \\ 4.081 \\ 4.161 \\ 4.438 \\ 9.308 \\ 9.202 \\ 9.031 \\ 14.830 \\ 14.710 \\ 14.180 \\ 19.420 \\ 19.490 \\ 19.540 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.234 \\ 6.239 \\ 9.087 \\ 5.187 \\ 9.972 \\ 14.590 \\ 10.110 \\ 19.800 \\ 30.200 \\ 10.140 \\ 14.790 \\ 30.280 \\ 14.780 \\ 20.060 \\ 40.350 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 9.730 \\ 13.030 \\ 16.420 \\ 17.430 \\ 22.460 \\ 27.910 \\ 38.030 \\ 47.410 \\ 57.290 \\ 54.620 \\ 58.910 \\ 72.810 \\ 73.050 \\ 78.520 \\ 98.980 \end{bmatrix} \quad M_R = \begin{bmatrix} 115067.5 \\ 93785.5 \\ 69081.4 \\ 73085.4 \\ 77089.4 \\ 56722.4 \\ 94632.6 \\ 82732.4 \\ 83761.8 \\ 184680.0 \\ 127474.0 \\ 89247.4 \\ 160236.0 \\ 118162.0 \\ 97209.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–28”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 50174.193$

$K_2 = 0.1928$

Equation 1 fitting parameters

$R_1^2 = 0.1513$ Coefficient of determination

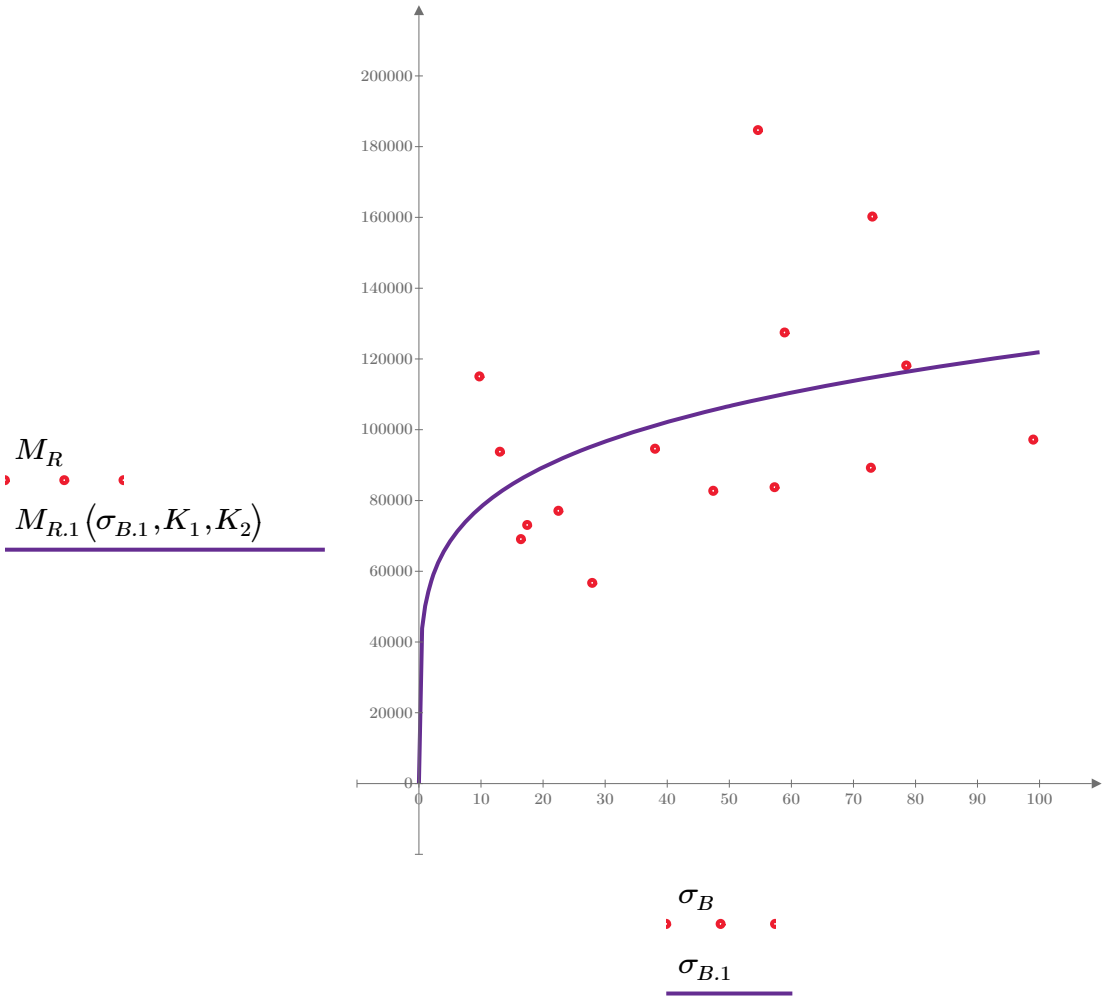

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–28”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 106358.709$

$K_4 = -0.0182$ Equation 2 fitting parameters

${R_2}^2 = 0.0014$ Coefficient of determination

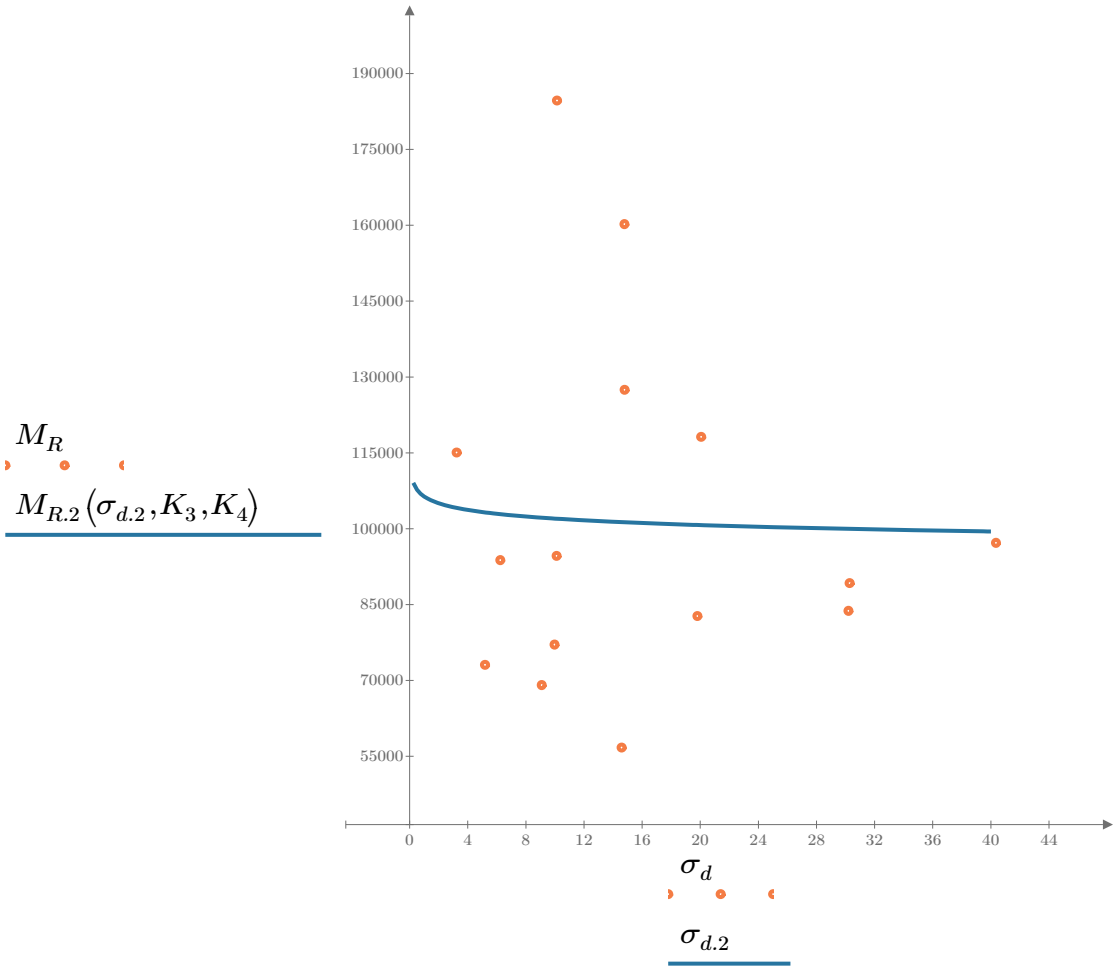

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–28”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 85434.053$

$K_6 = -0.5042$ Equation 3 fitting parameters

$K_7 = 0.647$

${R_3}^2 = 0.7768$ Coefficient of determination

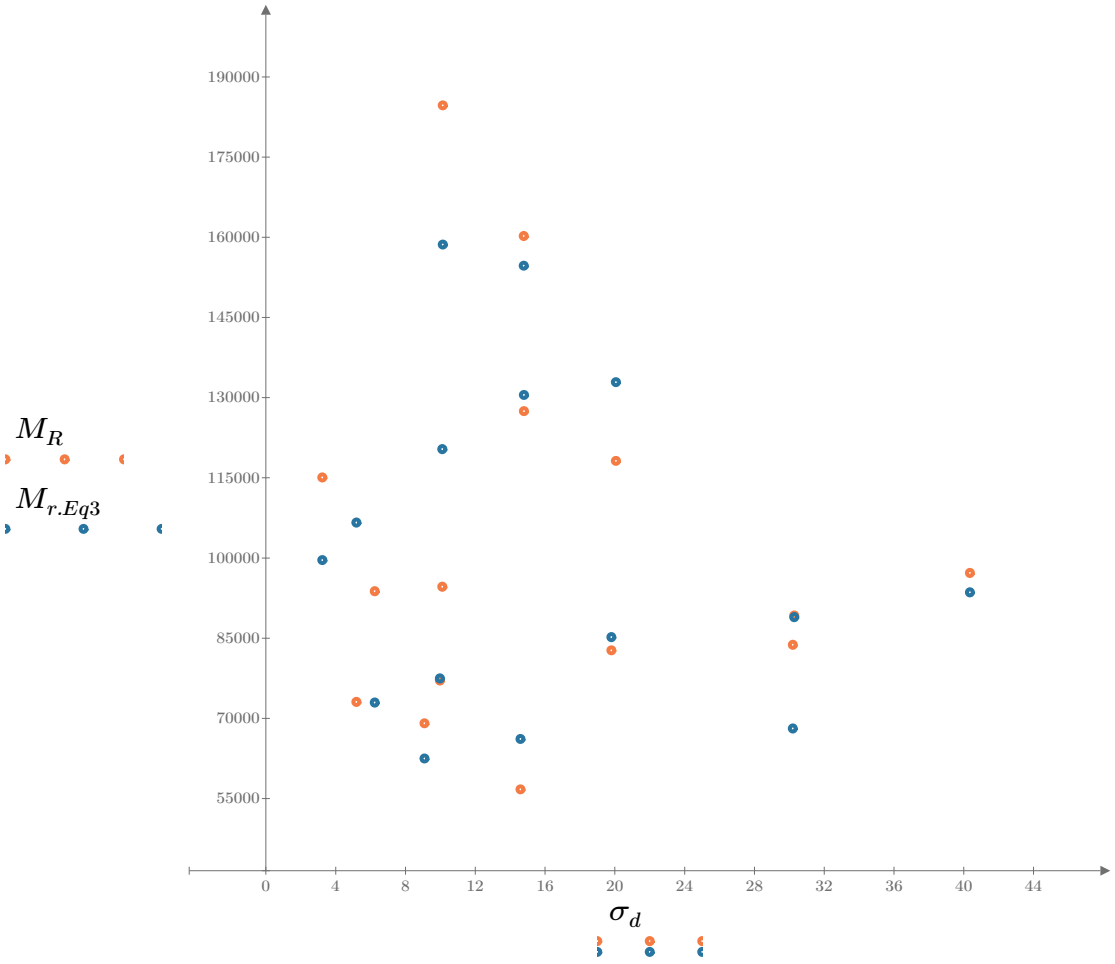

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–28”}$

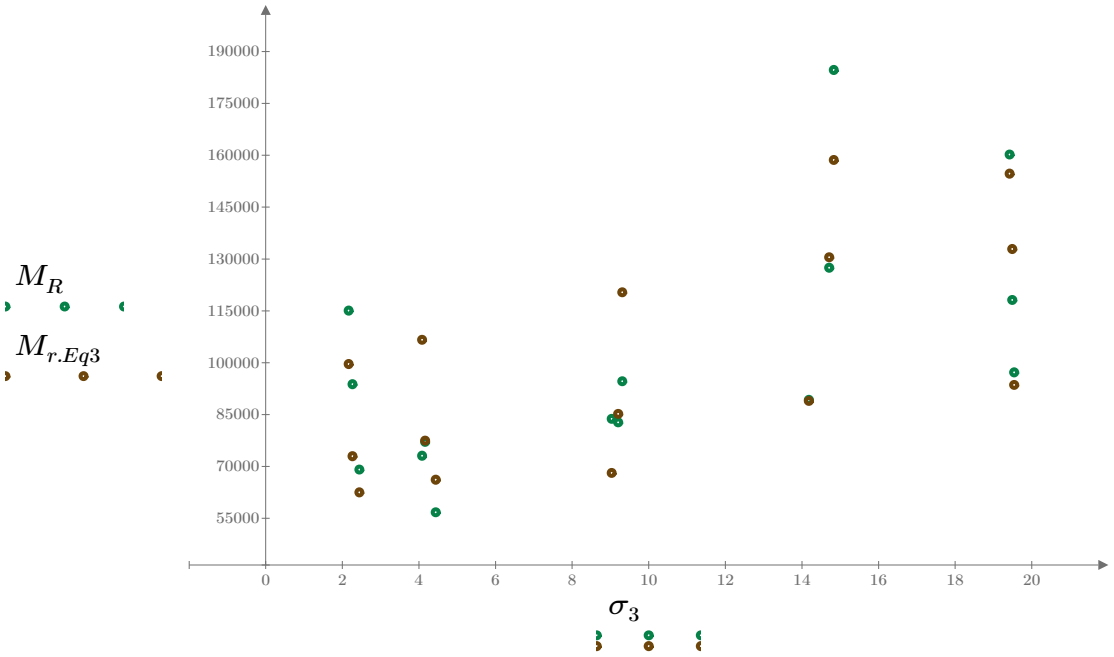

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

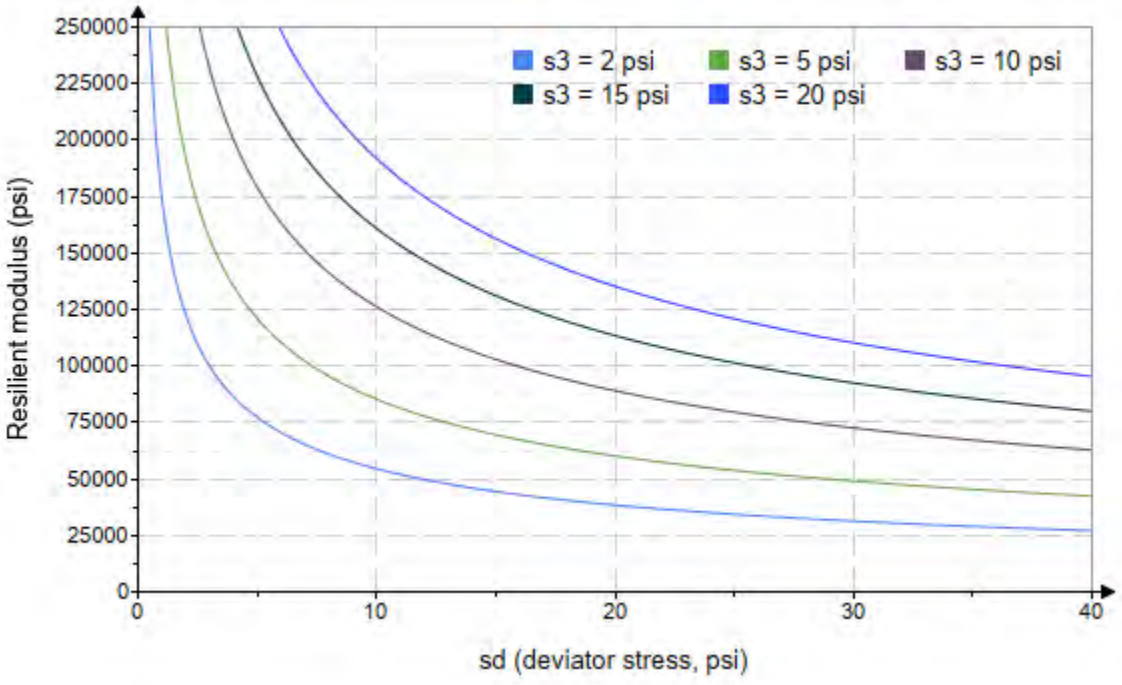

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–28”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2731.515$

$K_9 = 0.8468$ Equation 4 fitting parameters

$K_{10} = -0.7953$

$R_4^{\,2} = 0.7832$ Coefficient of determination

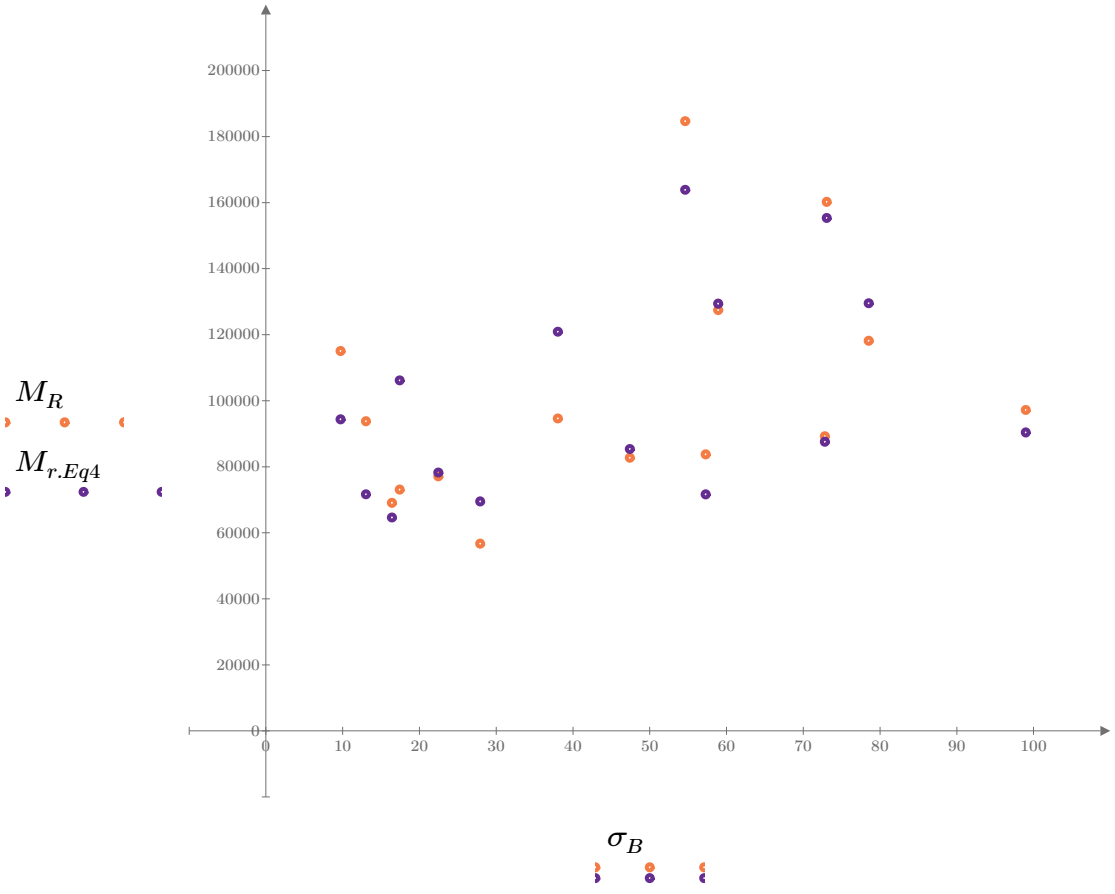

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

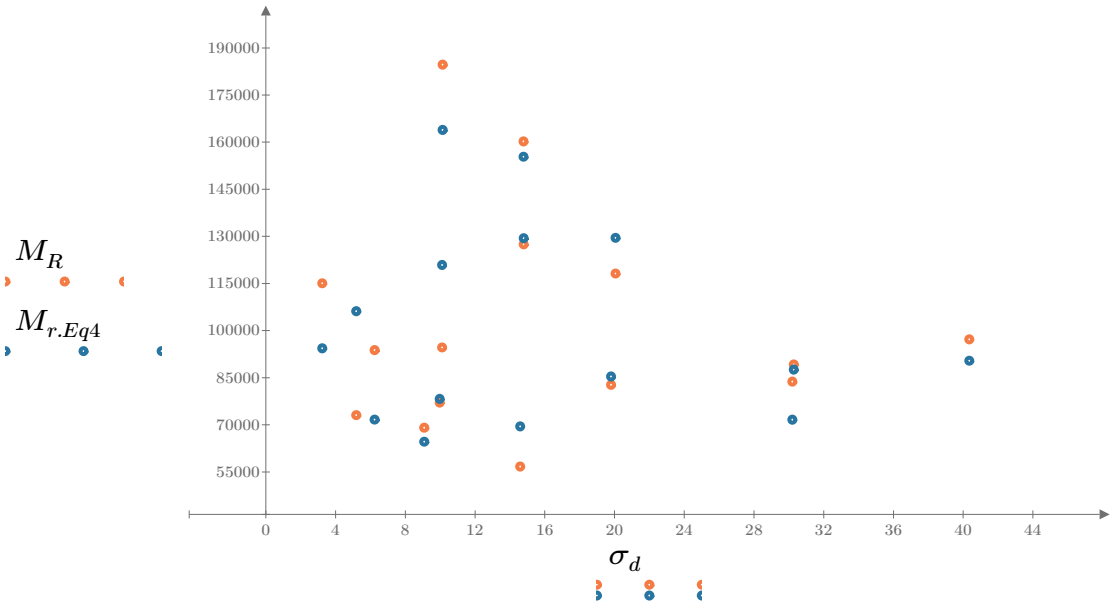

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

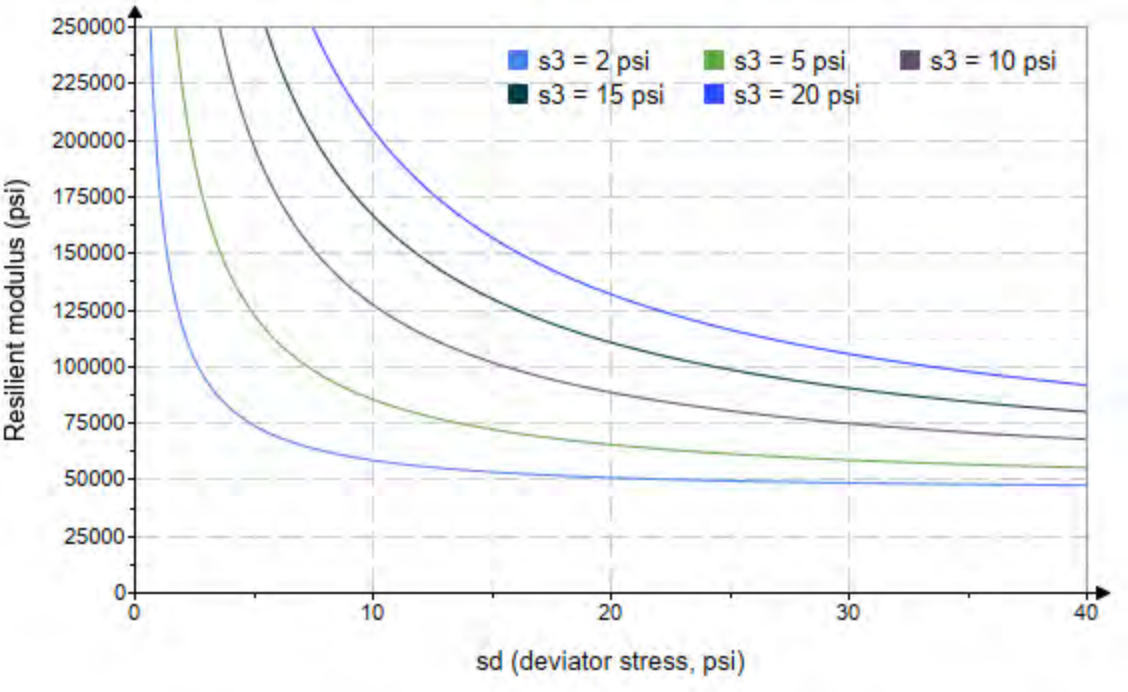

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{29”}$

$Treatment = \text{“H100”}$

$S = 4.275$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.625 \\ 2.624 \\ 2.601 \\ 4.628 \\ 4.616 \\ 4.618 \\ 9.662 \\ 9.646 \\ 9.616 \\ 14.680 \\ 14.690 \\ 14.640 \\ 19.690 \\ 19.690 \\ 19.700 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.306 \\ 6.168 \\ 8.998 \\ 5.178 \\ 9.940 \\ 14.700 \\ 9.978 \\ 19.850 \\ 30.390 \\ 10.050 \\ 14.790 \\ 30.480 \\ 14.870 \\ 19.950 \\ 40.560 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.180 \\ 14.040 \\ 16.800 \\ 19.060 \\ 23.790 \\ 28.560 \\ 38.970 \\ 48.780 \\ 59.240 \\ 54.090 \\ 58.860 \\ 74.410 \\ 73.950 \\ 79.030 \\ 99.660 \end{bmatrix} \quad M_R = \begin{bmatrix} 30640.2 \\ 37771.6 \\ 39532.8 \\ 43540.2 \\ 48502.0 \\ 51839.0 \\ 68995.0 \\ 74354.2 \\ 71655.4 \\ 74371.8 \\ 77149.8 \\ 65796.0 \\ 70989.8 \\ 67185.2 \\ 71093.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–29”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 16845.622$

$K_2 = 0.3403$

Equation 1 fitting parameters

$R_1^2 = 0.7947$ Coefficient of determination

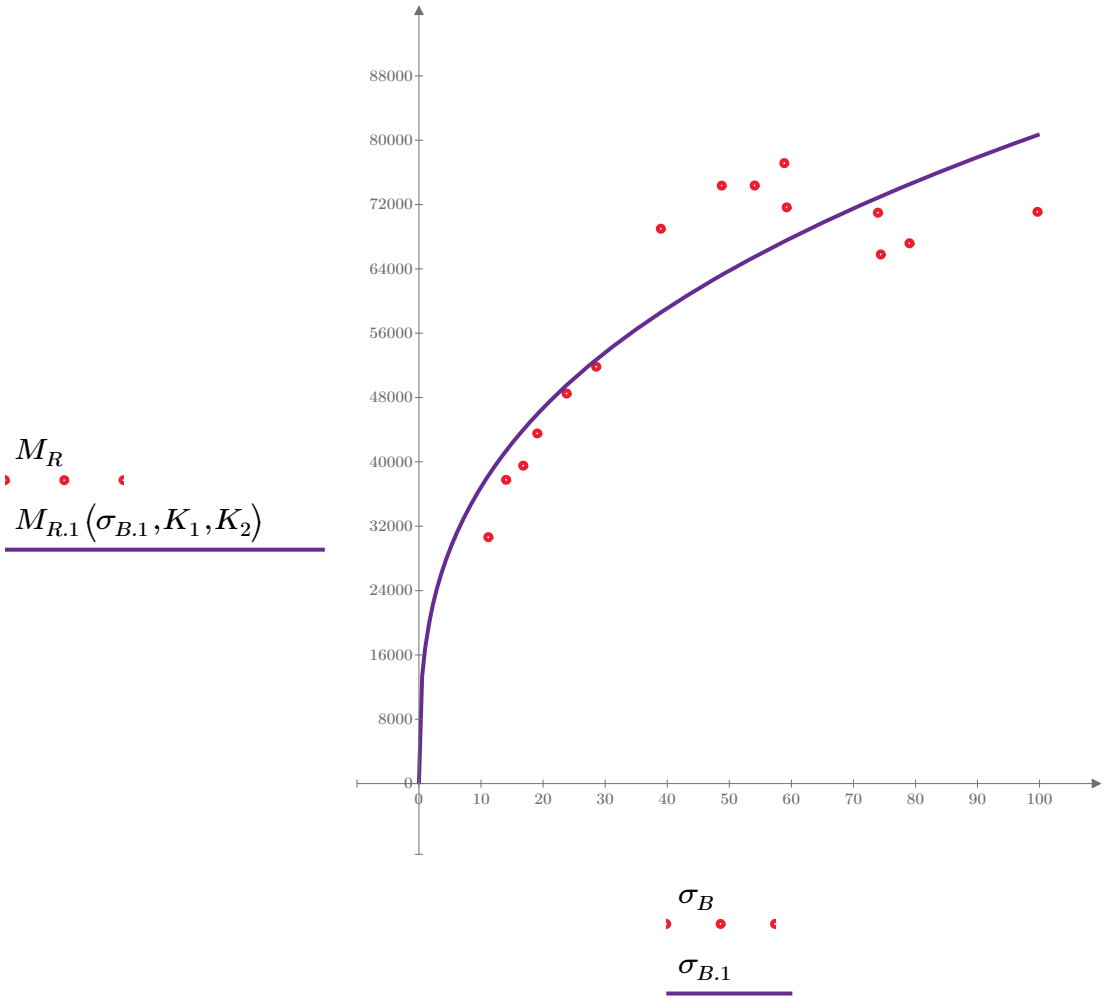

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–29”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 29911.980$

$K_4 = 0.2639$

Equation 2 fitting parameters

${R_2}^2 = 0.5180$ Coefficient of determination

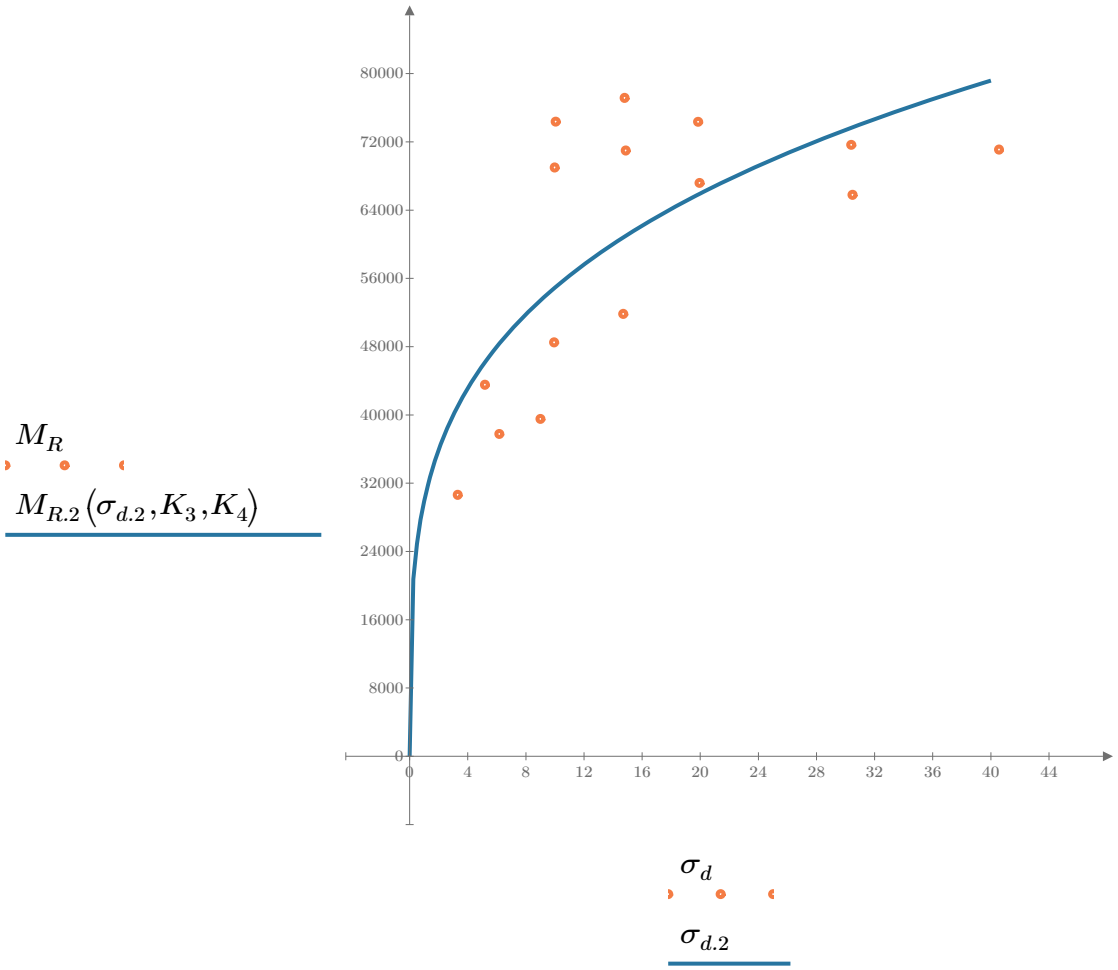

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–29”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 25382.207$

$K_6 = 0.0596$ Equation 3 fitting parameters

$K_7 = 0.3036$

${R_3}^2 = 0.7855$ Coefficient of determination

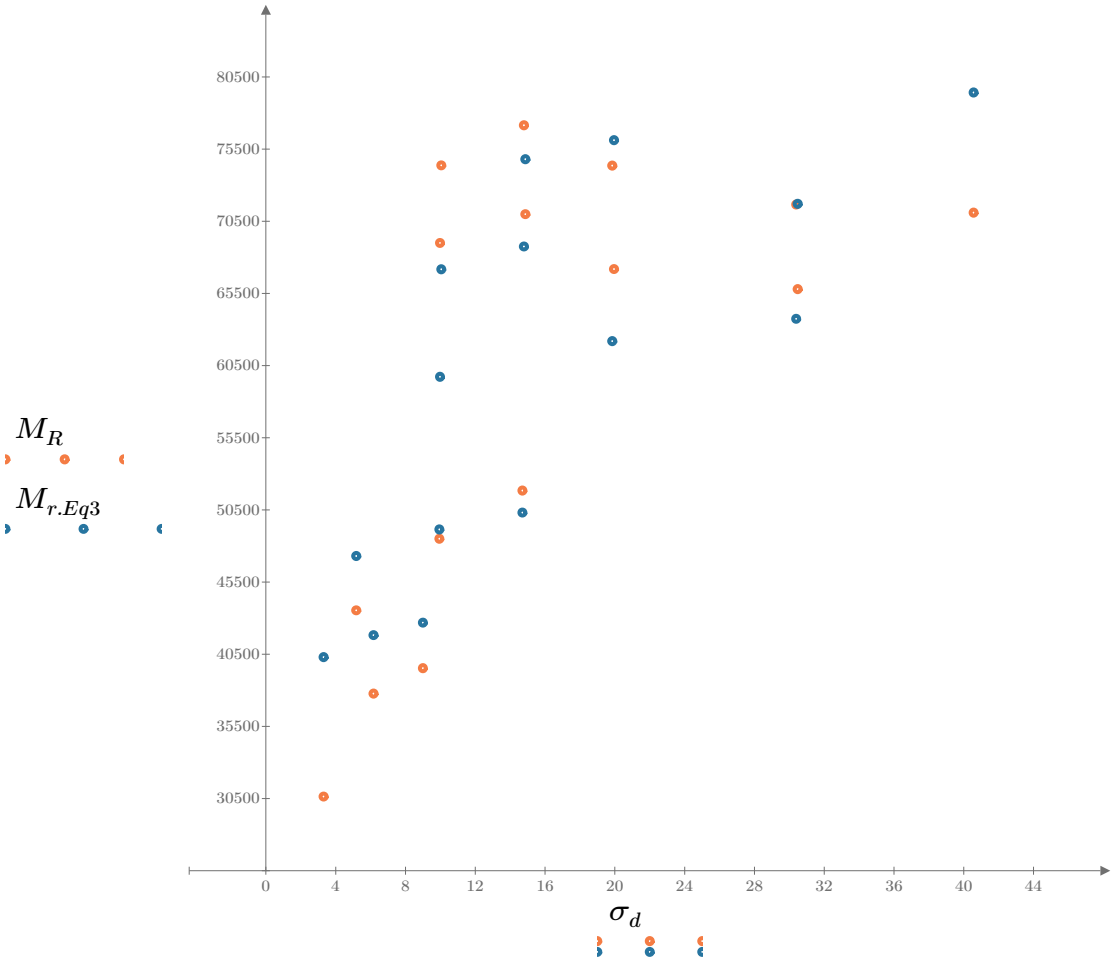

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo =$ "B2−29"

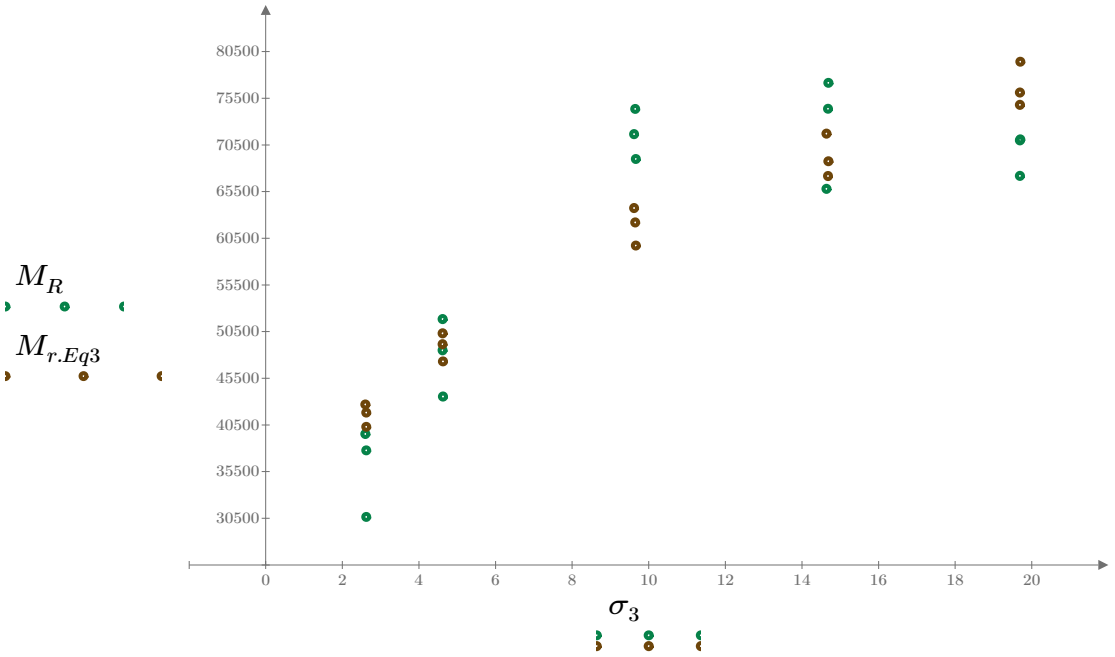

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

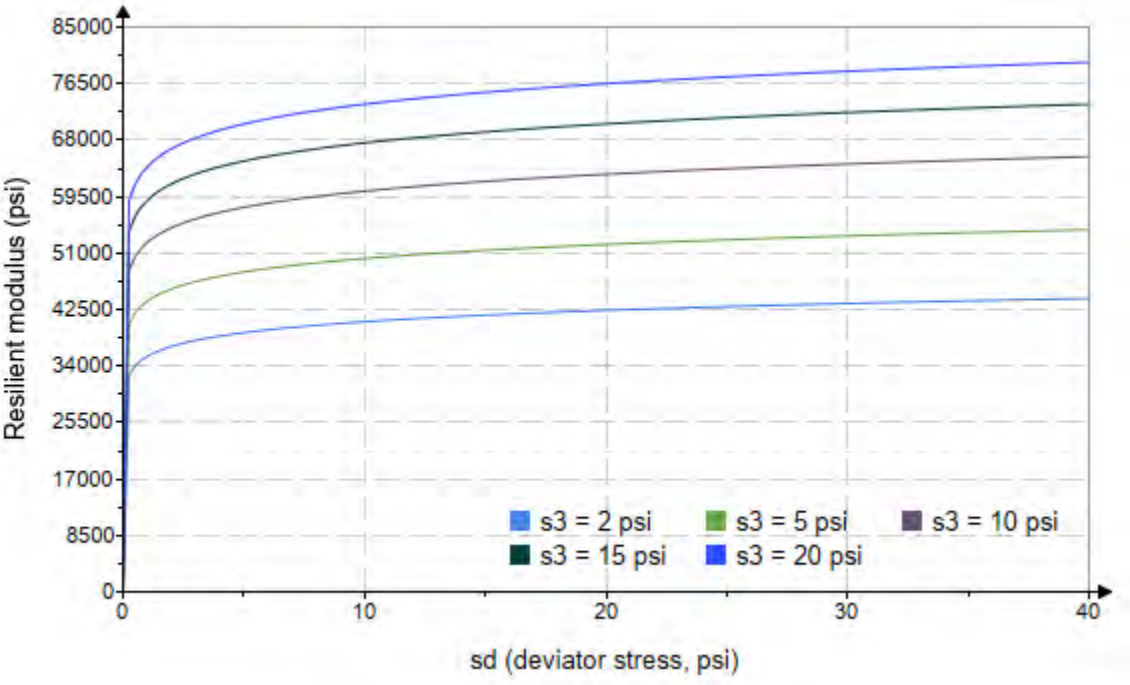

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–29”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2613.978$

$K_9 = 0.4214$ Equation 4 fitting parameters

$K_{10} = -0.0917$

$R_4^{\,2} = 0.8096$ Coefficient of determination

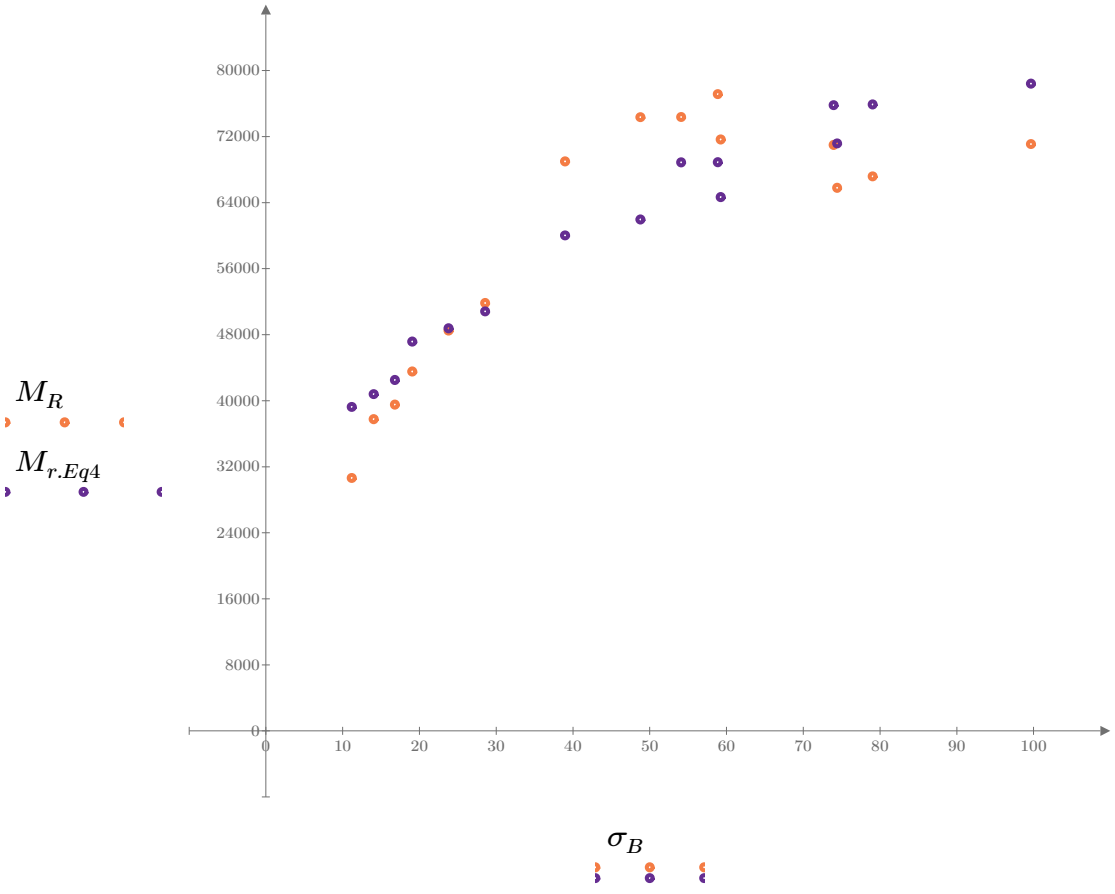

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

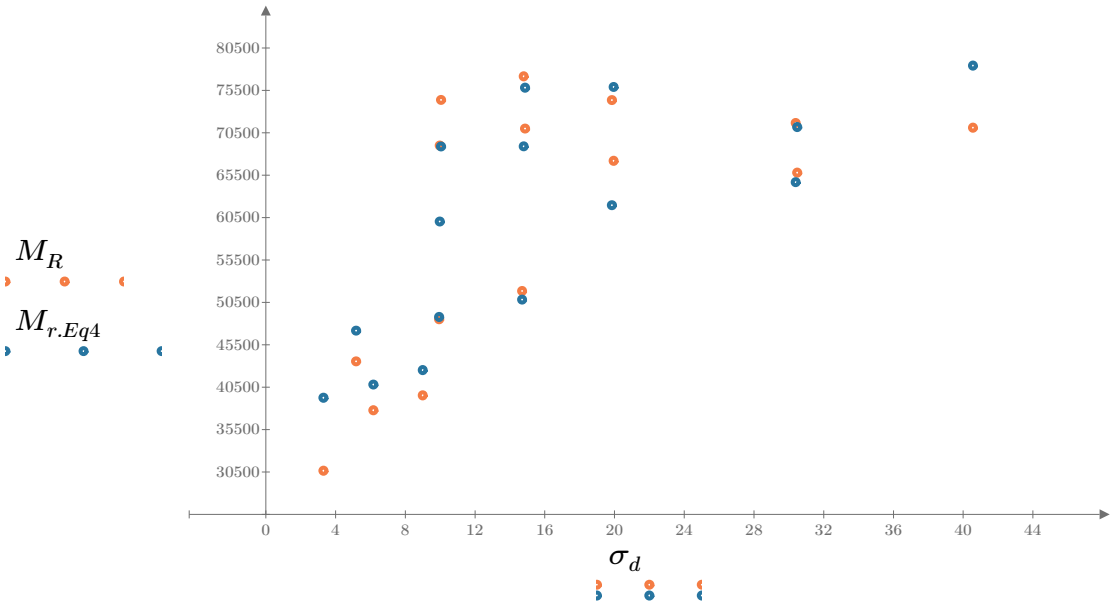

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

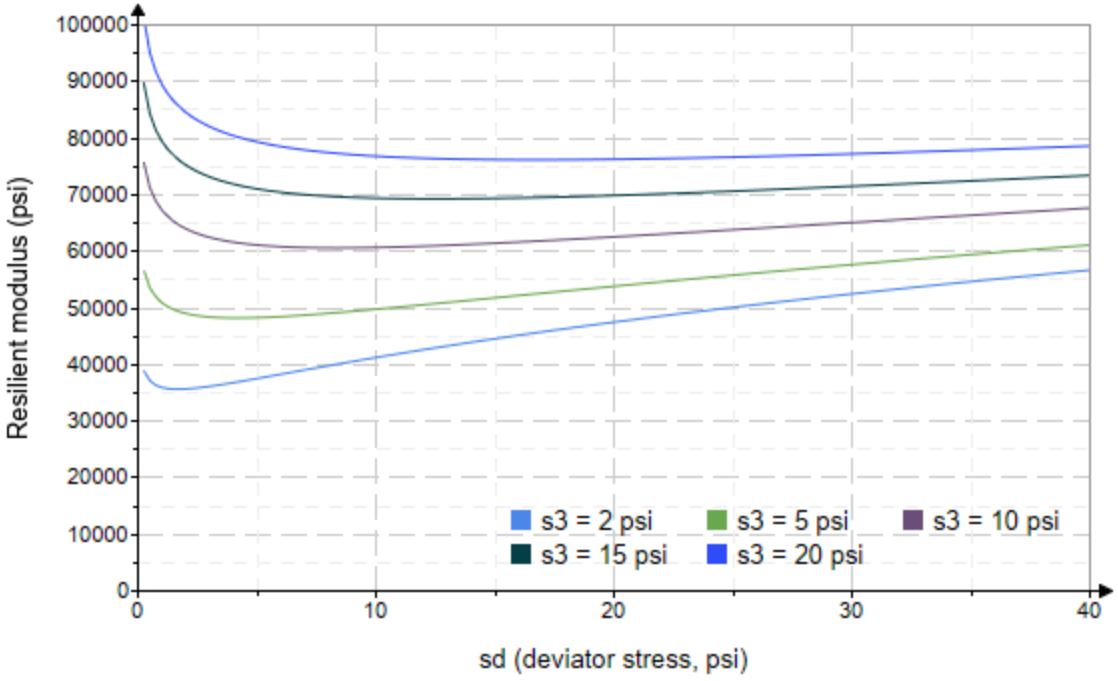

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−30"

$Treatment =$ "H100"

$S = 4.227$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 1.926 \\ 1.829 \\ 1.939 \\ 4.106 \\ 4.132 \\ 4.241 \\ 9.239 \\ 8.975 \\ 9.045 \\ 14.720 \\ 14.640 \\ 14.430 \\ 19.710 \\ 19.460 \\ 19.310 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.143 \\ 6.159 \\ 8.900 \\ 5.191 \\ 9.926 \\ 14.560 \\ 9.961 \\ 19.730 \\ 30.050 \\ 9.941 \\ 14.780 \\ 30.110 \\ 14.810 \\ 19.940 \\ 40.210 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 8.920 \\ 11.650 \\ 14.720 \\ 17.510 \\ 22.320 \\ 27.280 \\ 37.680 \\ 46.660 \\ 57.190 \\ 54.100 \\ 58.690 \\ 73.390 \\ 73.940 \\ 78.330 \\ 98.130 \end{bmatrix} \quad M_R = \begin{bmatrix} 79587.0 \\ 55471.6 \\ 52498.6 \\ 50342.6 \\ 48186.6 \\ 42758.8 \\ 51725.0 \\ 53107.6 \\ 59975.6 \\ 79515.2 \\ 77226.6 \\ 72441.2 \\ 110518.0 \\ 90905.6 \\ 62919.2 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–30”}$

$M_{R.1}\left(\sigma_B, K_1, K_2\right) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 32797.589$

$K_2 = 0.1914$

Equation 1 fitting parameters

${R_1}^2 = 0.2180$ Coefficient of determination

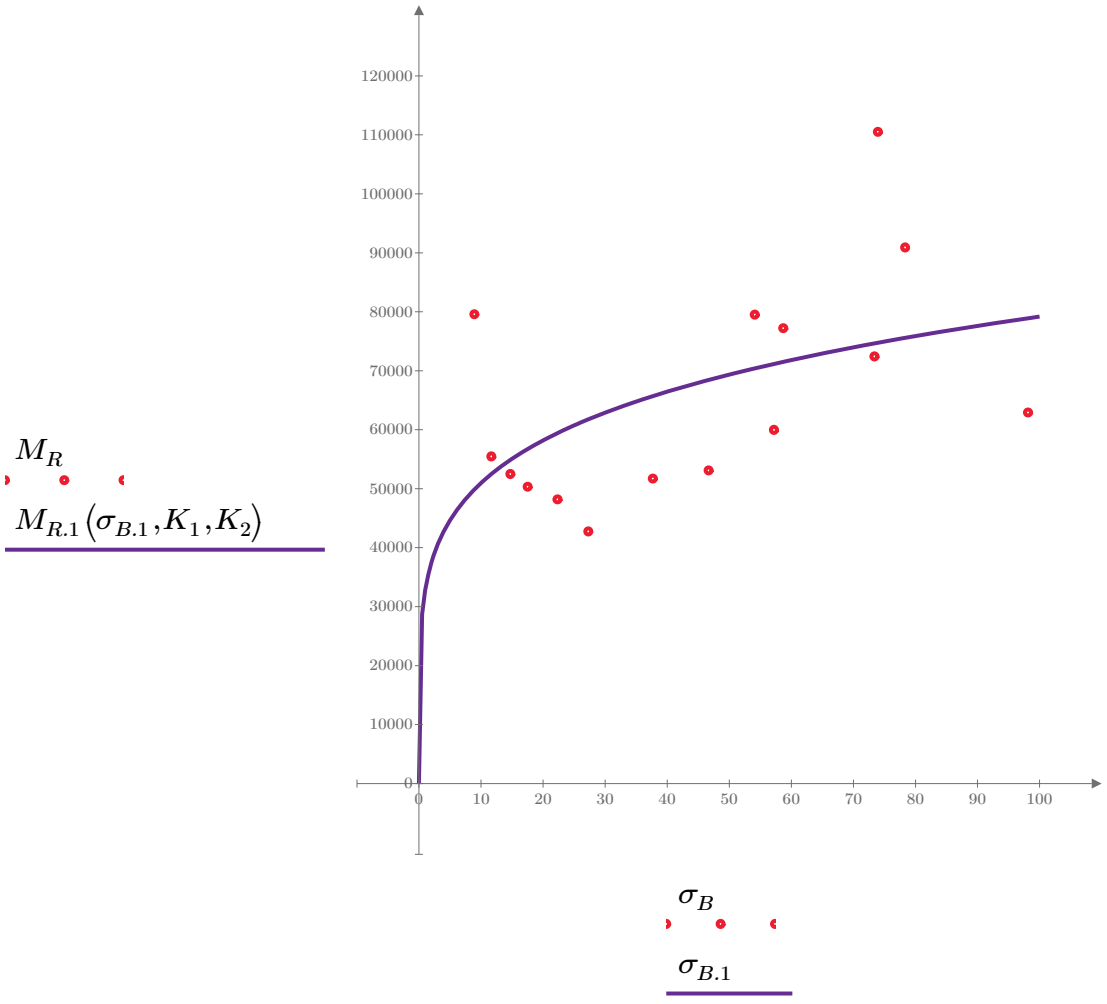

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–30”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 58689.308$

$K_4 = 0.0448$ Equation 2 fitting parameters

${R_2}^2 = 0.0117$ Coefficient of determination

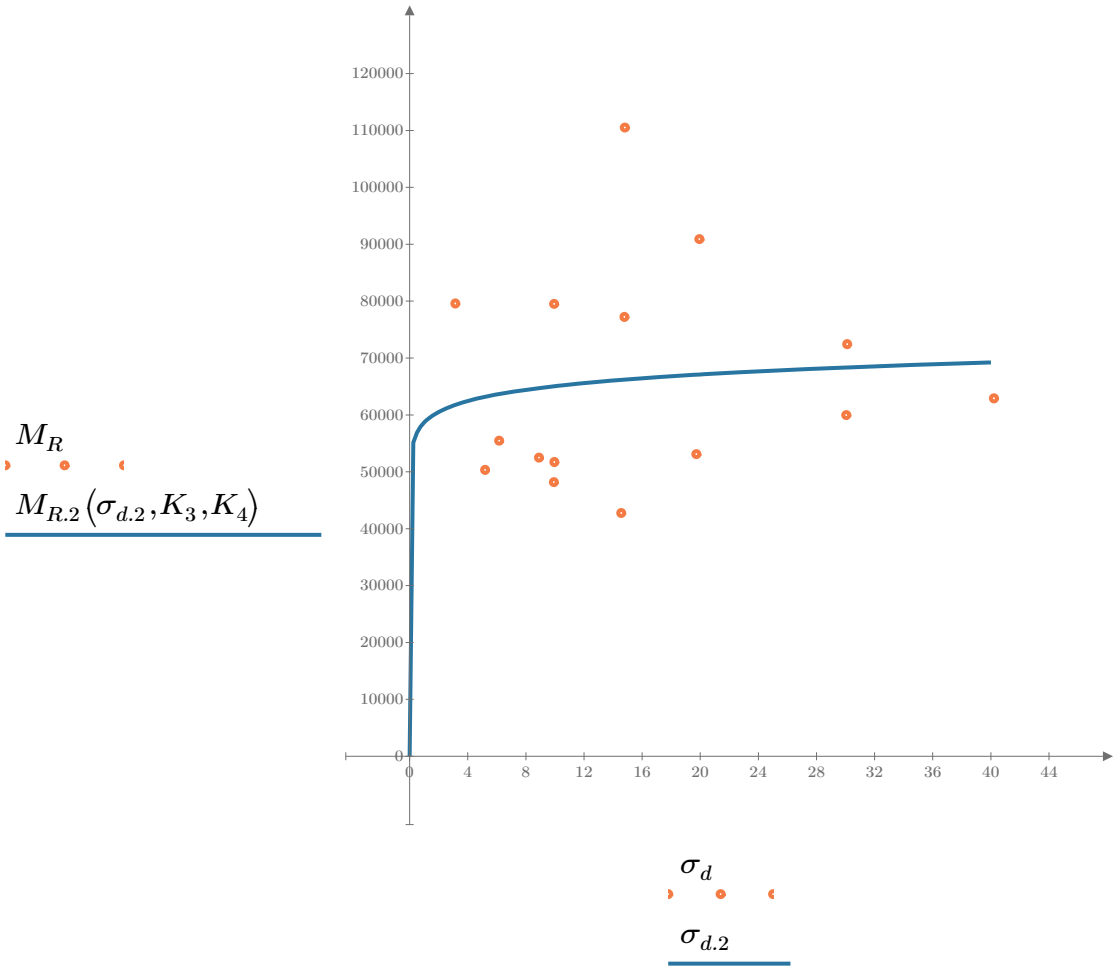

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–30”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 50193.104$

$K_6 = -0.2688$ Equation 3 fitting parameters

$K_7 = 0.4319$

${R_3}^2 = 0.5735$ Coefficient of determination

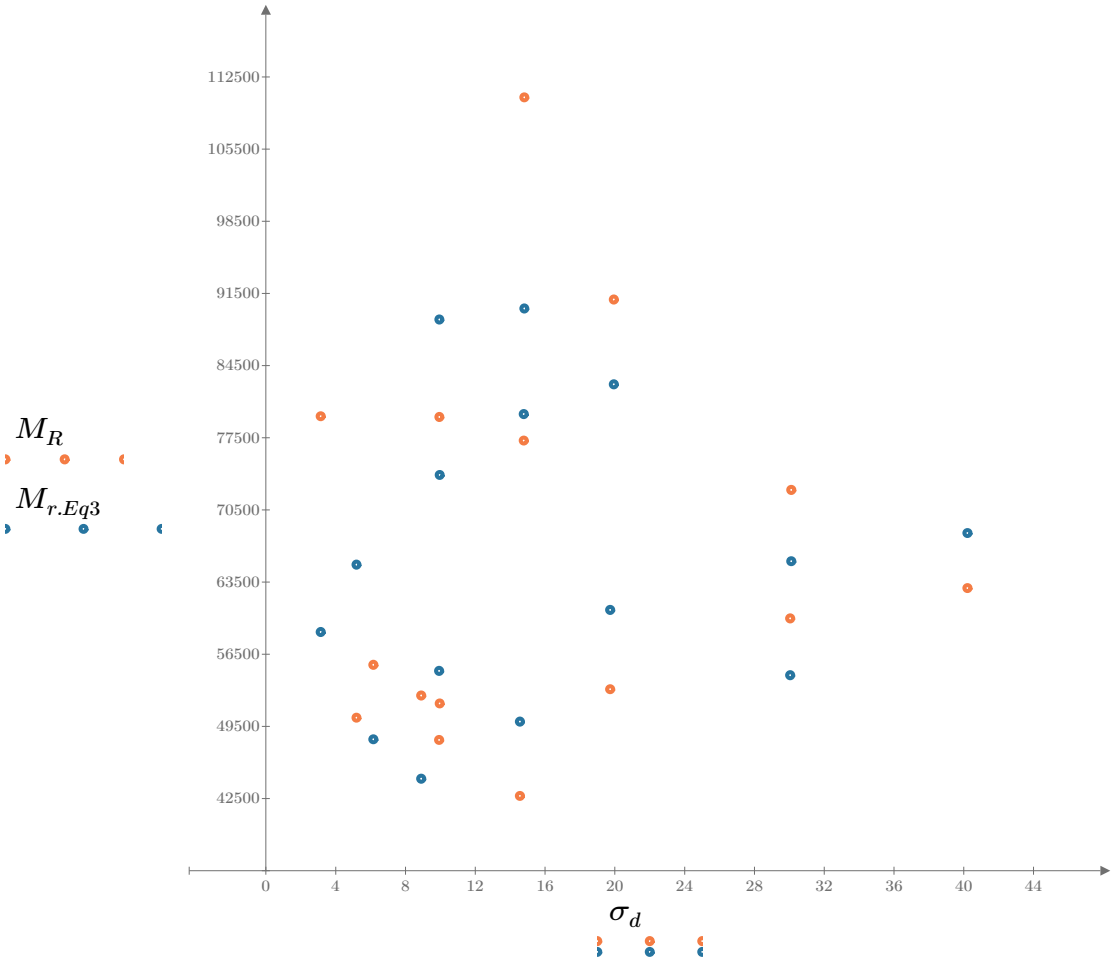

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-30\text{”}$

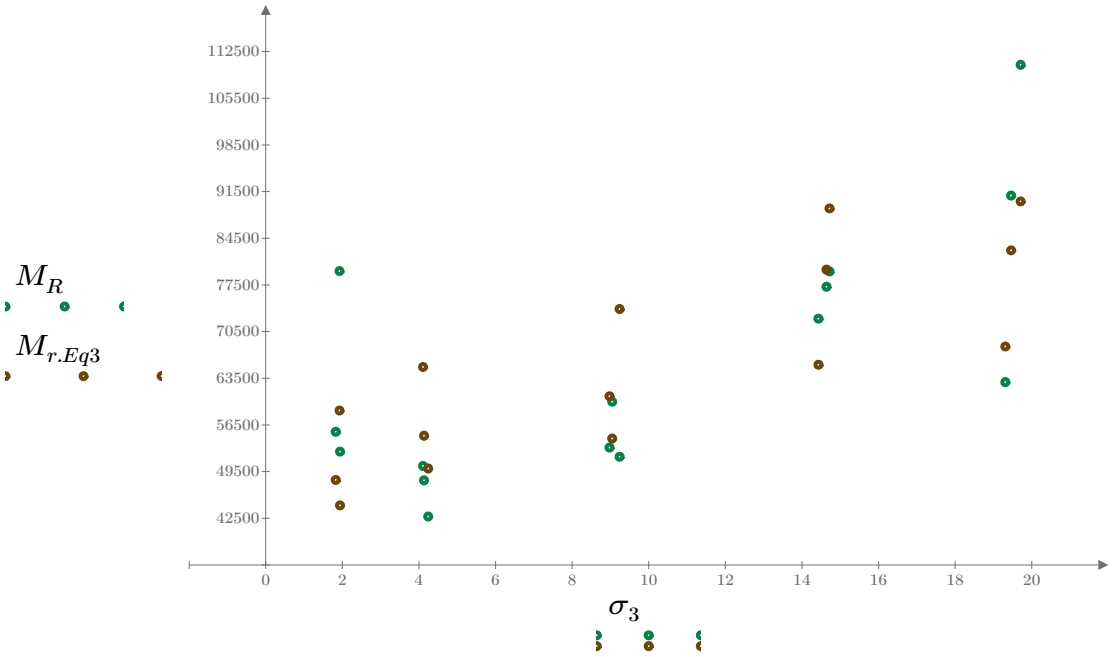

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

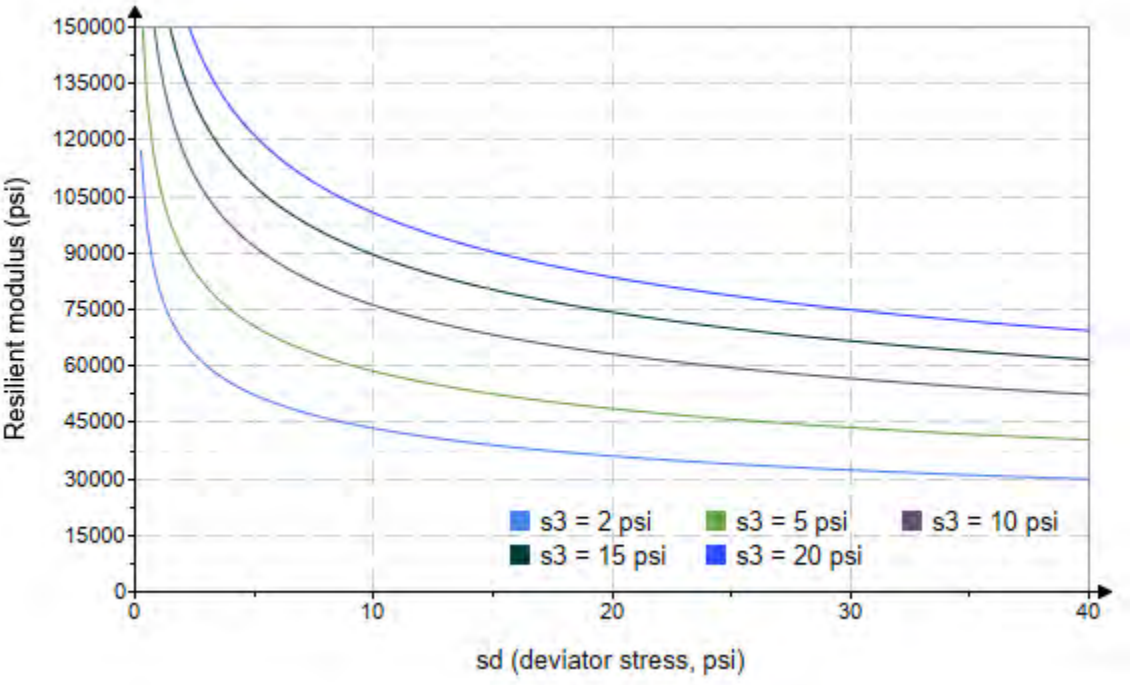

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–30”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2516.448$

$K_9 = 0.5495$ Equation 4 fitting parameters

$K_{10} = -0.4477$

$R_4^{\,2} = 0.5371$ Coefficient of determination

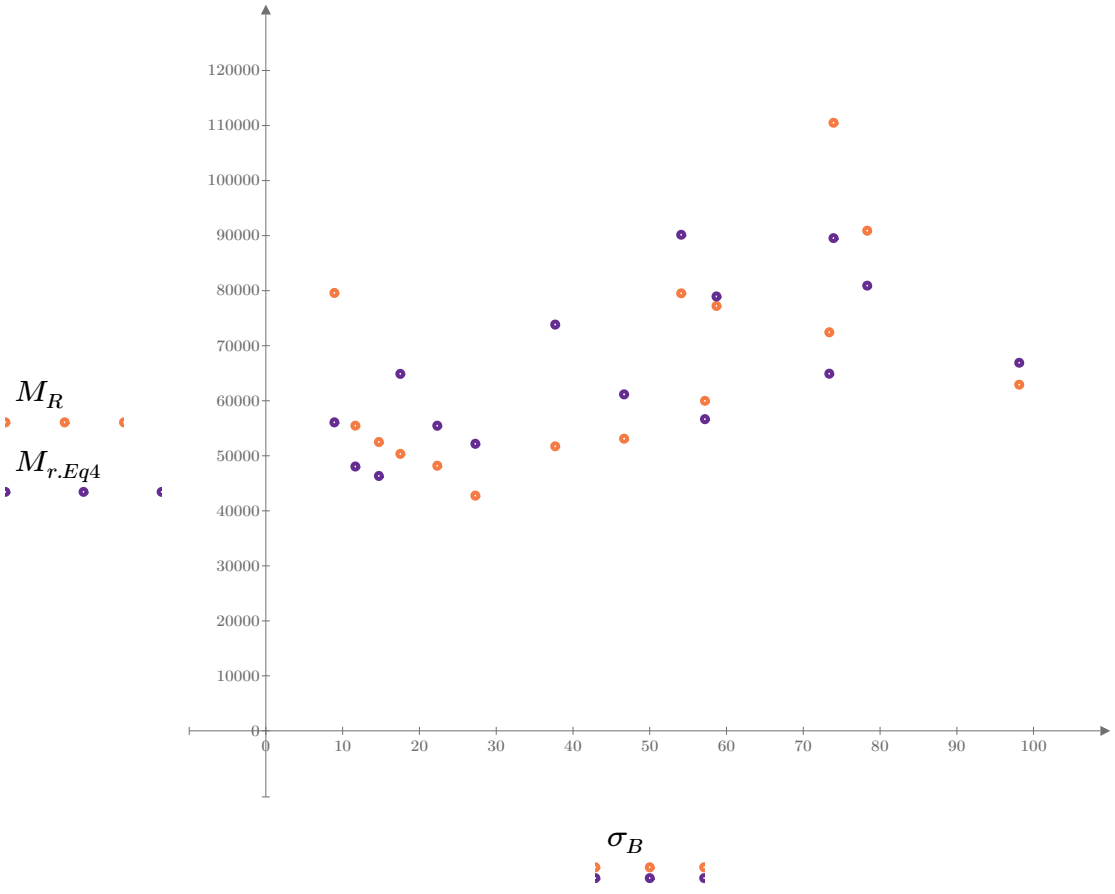

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

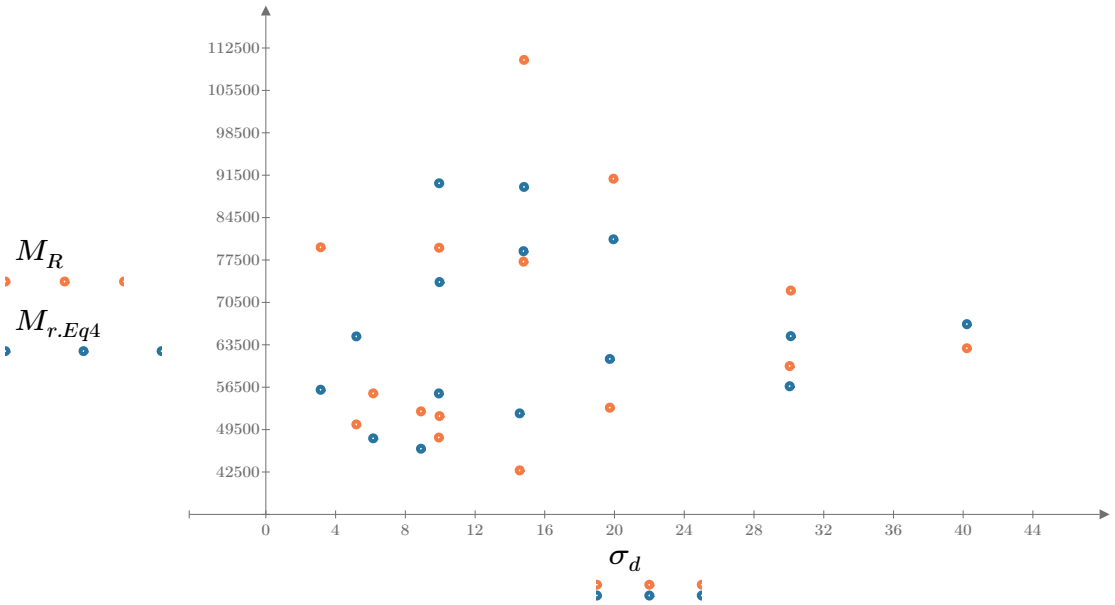

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

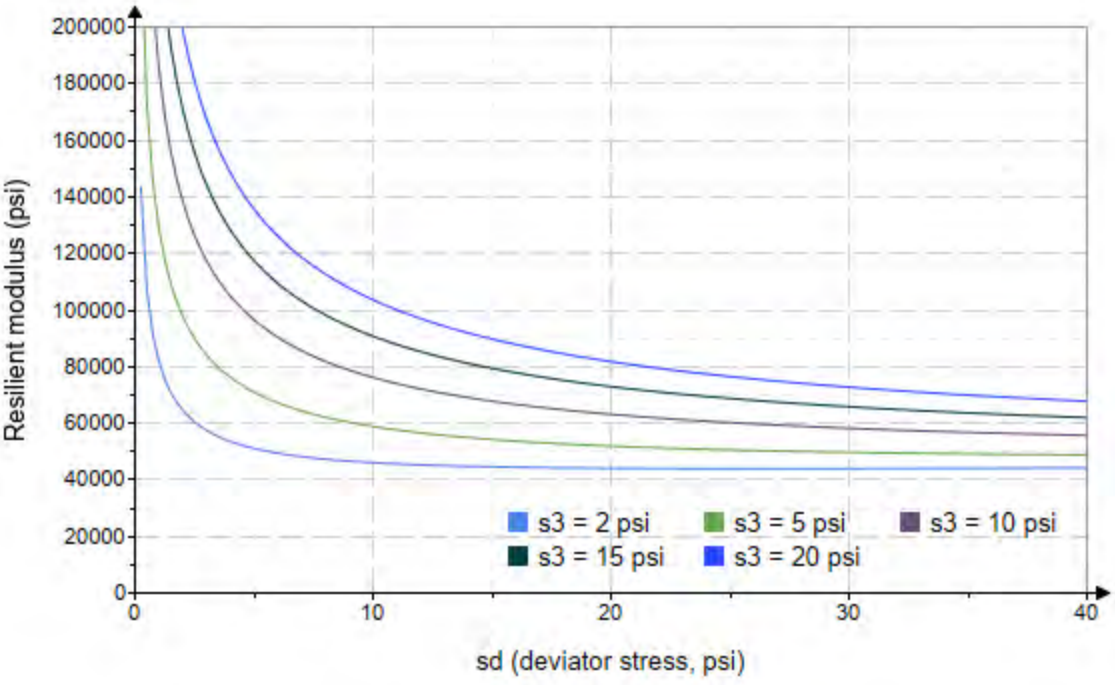

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−31"

$Treatment =$ "H100"

$S = 4.981$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.743 \\ 2.680 \\ 2.623 \\ 4.565 \\ 4.576 \\ 4.555 \\ 9.600 \\ 9.593 \\ 9.576 \\ 14.620 \\ 14.620 \\ 14.620 \\ 19.660 \\ 19.640 \\ 19.630 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.147 \\ 6.079 \\ 9.065 \\ 5.162 \\ 10.020 \\ 14.620 \\ 9.929 \\ 19.510 \\ 30.420 \\ 9.823 \\ 14.690 \\ 30.240 \\ 14.700 \\ 20.110 \\ 40.460 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.380 \\ 14.120 \\ 16.930 \\ 18.860 \\ 23.750 \\ 28.280 \\ 38.730 \\ 48.280 \\ 59.150 \\ 53.690 \\ 58.560 \\ 74.110 \\ 73.660 \\ 79.030 \\ 99.340 \end{bmatrix} \quad M_R = \begin{bmatrix} 21880.8 \\ 22747.2 \\ 22682.0 \\ 24107.2 \\ 26853.8 \\ 29129.6 \\ 34106.4 \\ 35364.8 \\ 39419.0 \\ 30885.2 \\ 31699.8 \\ 45017.2 \\ 44033.0 \\ 50227.4 \\ 53361.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–31”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 6368.515$

$K_2 = 0.4485$

Equation 1 fitting parameters

$R_1^2 = 0.8896$ Coefficient of determination

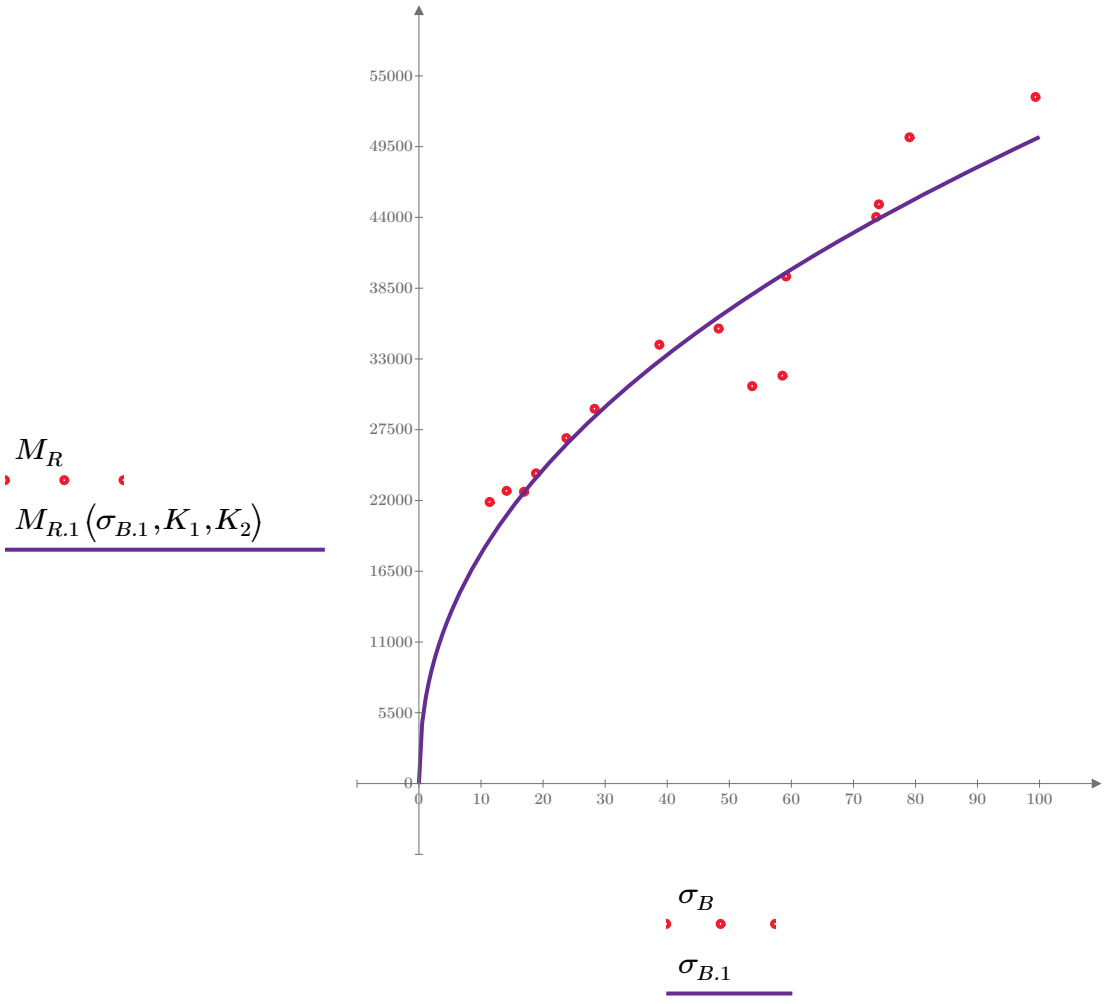

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–31”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 12553.450$

$K_4 = 0.3792$

Equation 2 fitting parameters

${R_2}^2 = 0.7395$ Coefficient of determination

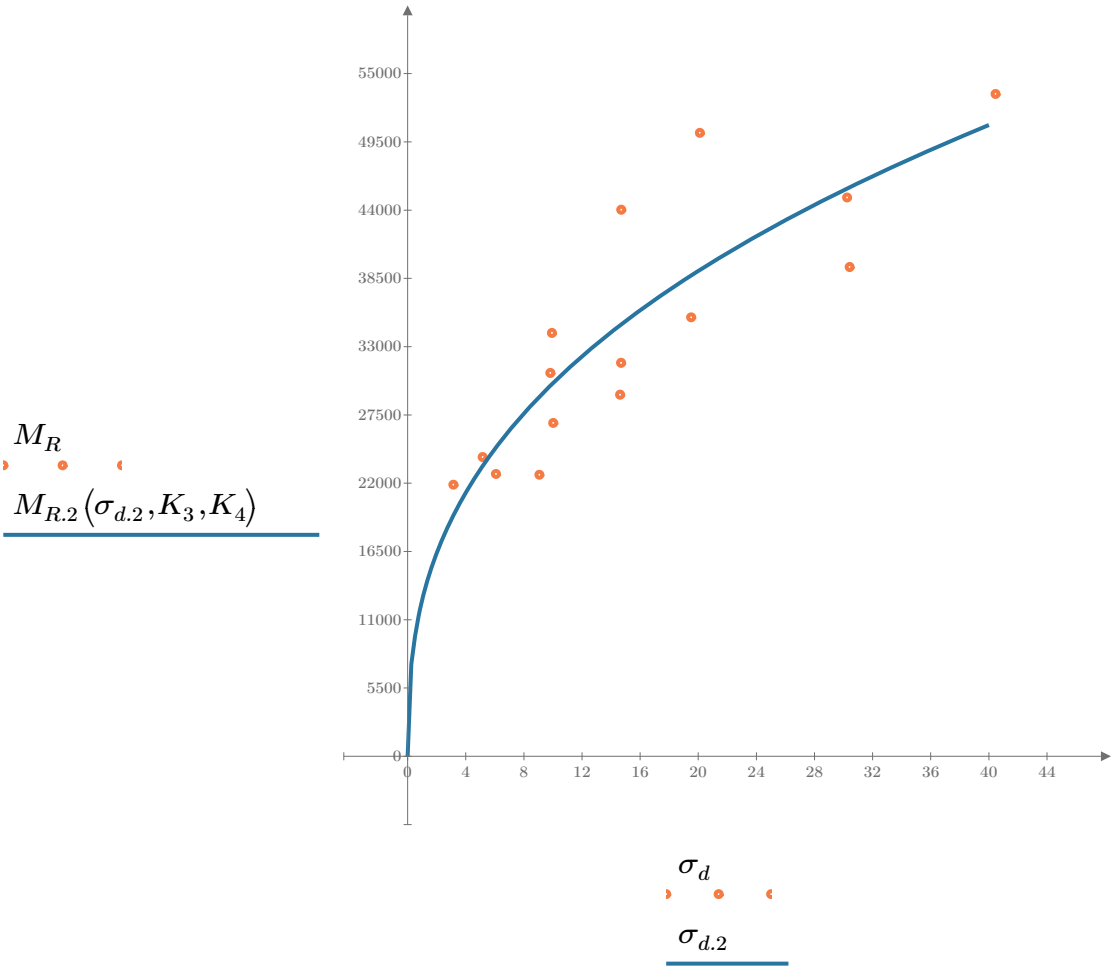

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–31”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 10159.115$

$K_6 = 0.2129$ Equation 3 fitting parameters

$K_7 = 0.2793$

${R_3}^2 = 0.9135$ Coefficient of determination

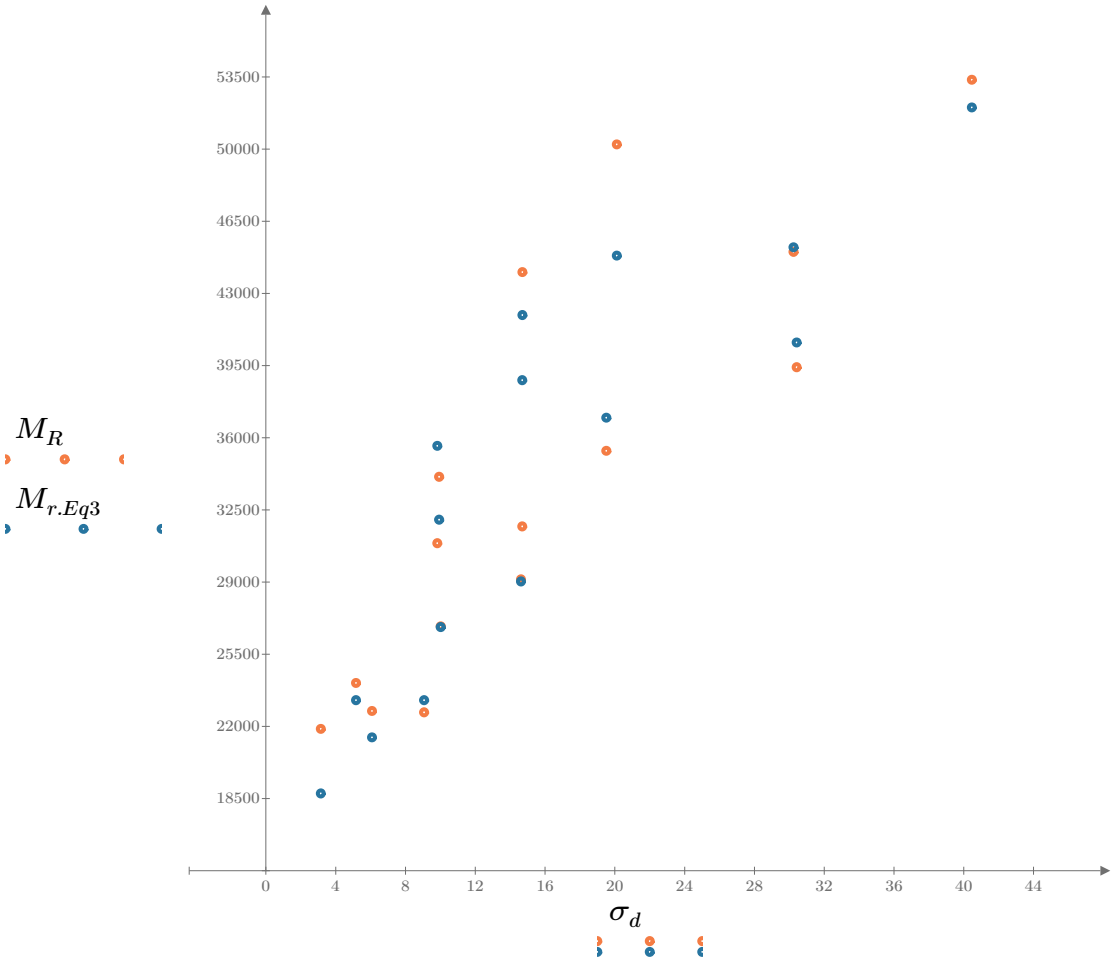

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–31”}$

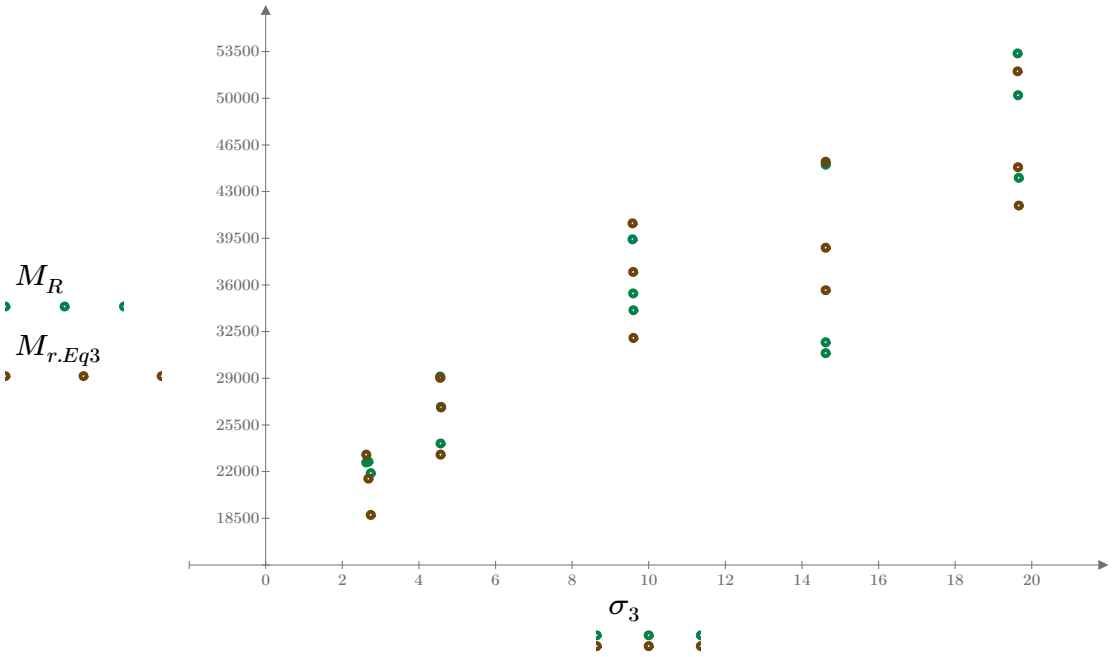

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

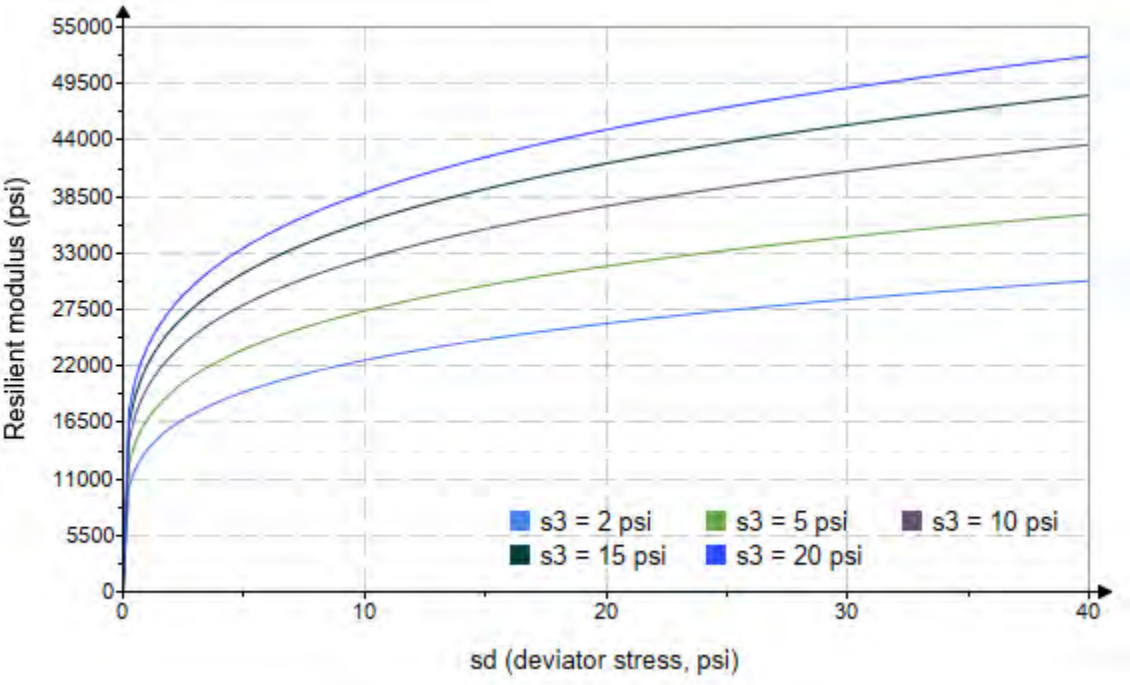

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–31”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1588.980$

$K_9 = 0.3636$ Equation 4 fitting parameters

$K_{10} = 0.0954$

$R_4^{\,2} = 0.9033$ Coefficient of determination

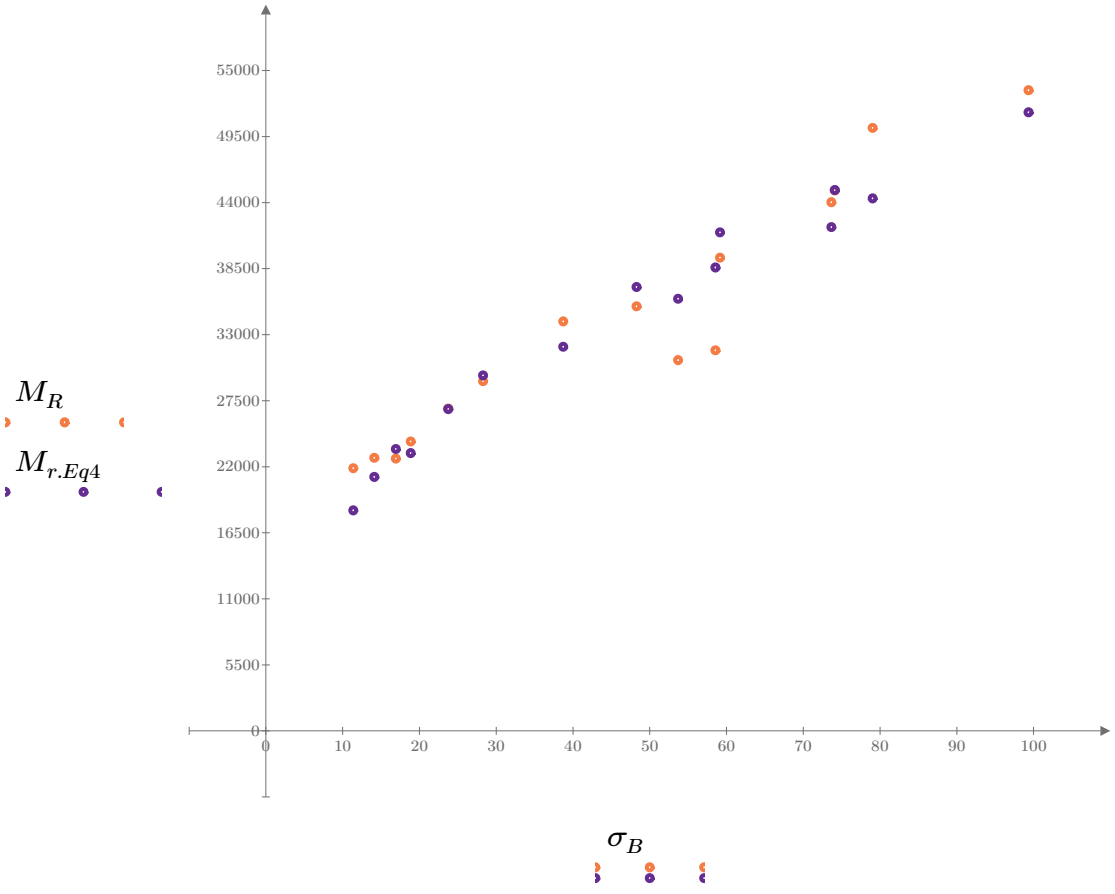

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

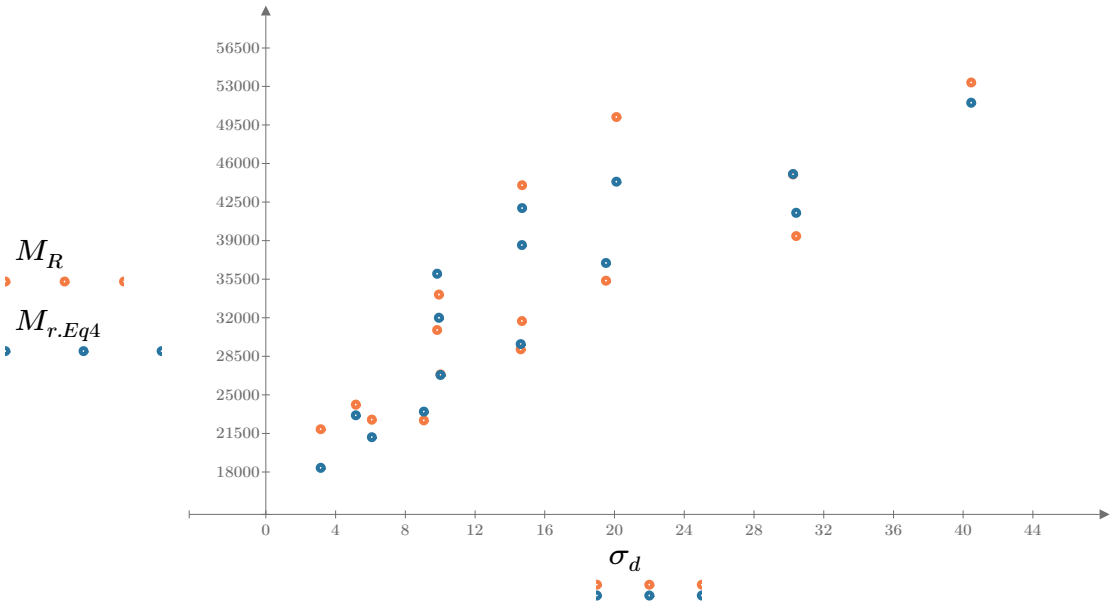

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

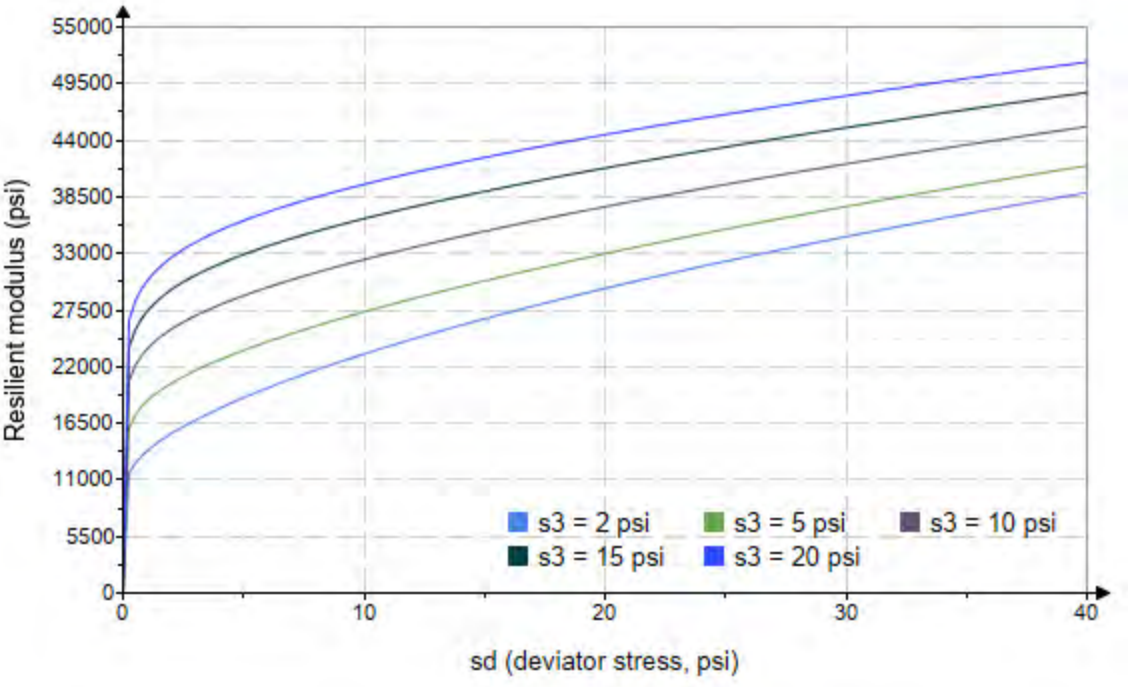

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−32"

$Treatment =$ "D1"

$S = 15.986$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.627 \\ 2.275 \\ 2.239 \\ 4.183 \\ 4.155 \\ 4.263 \\ 9.255 \\ 8.928 \\ 8.798 \\ 14.310 \\ 14.430 \\ 13.880 \\ 19.640 \\ 19.550 \\ 19.510 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.167 \\ 6.166 \\ 9.112 \\ 5.239 \\ 9.997 \\ 14.340 \\ 10.050 \\ 19.430 \\ 29.660 \\ 10.150 \\ 14.520 \\ 29.890 \\ 14.600 \\ 19.740 \\ 39.990 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.050 \\ 12.990 \\ 15.830 \\ 17.790 \\ 22.460 \\ 27.130 \\ 37.820 \\ 46.220 \\ 56.060 \\ 53.080 \\ 57.810 \\ 71.530 \\ 73.520 \\ 78.390 \\ 98.520 \end{bmatrix} \quad M_R = \begin{bmatrix} 48621.0 \\ 39778.0 \\ 34574.0 \\ 60817.2 \\ 31980.8 \\ 30846.4 \\ 47726.0 \\ 58447.8 \\ 62450.6 \\ 145708.0 \\ 109638.0 \\ 61797.0 \\ 88392.2 \\ 78146.0 \\ 57394.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–32”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 16909.755$

$K_2 = 0.3605$

Equation 1 fitting parameters

$R_1^2 = 0.2658$ Coefficient of determination

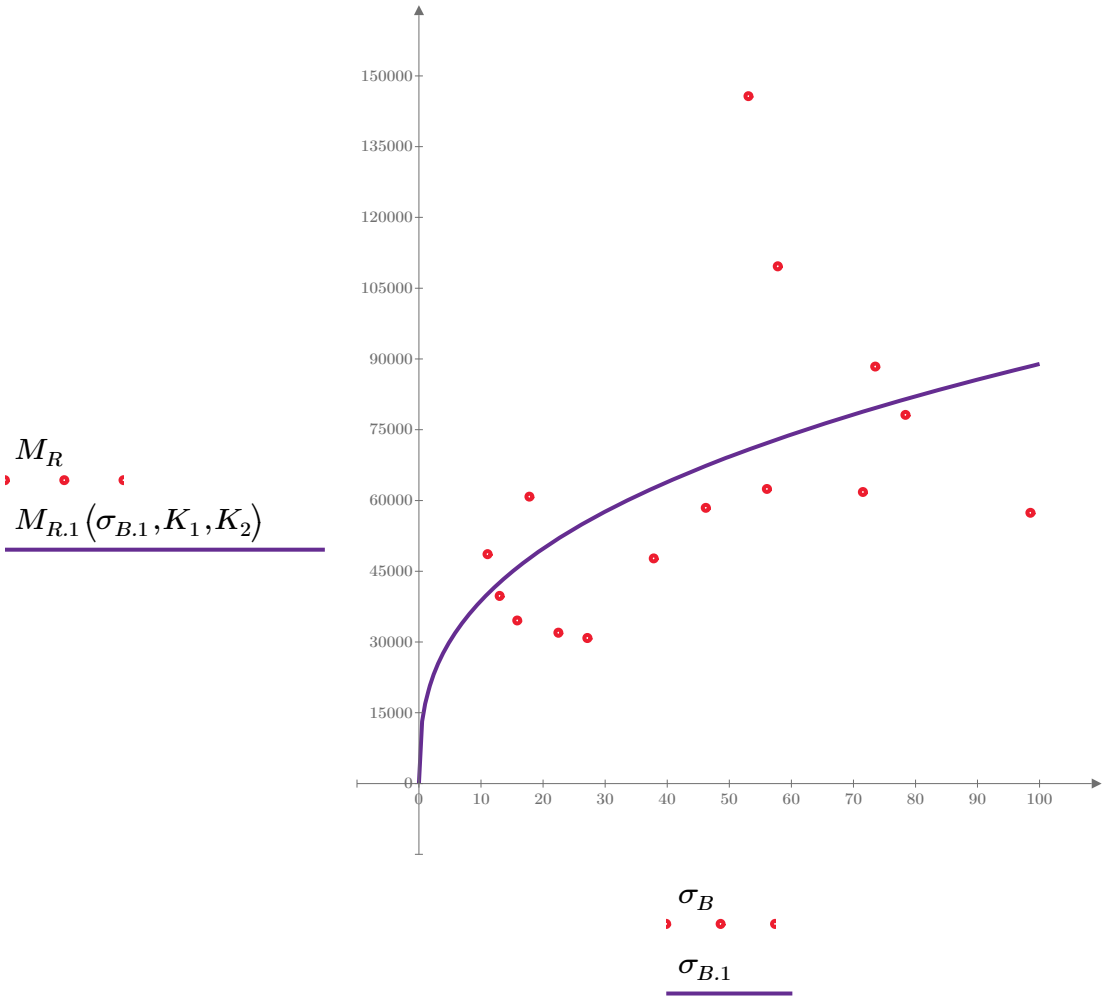

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–32”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 50461.281$

$K_4 = 0.0912$ Equation 2 fitting parameters

${R_2}^2 = 0.0183$ Coefficient of determination

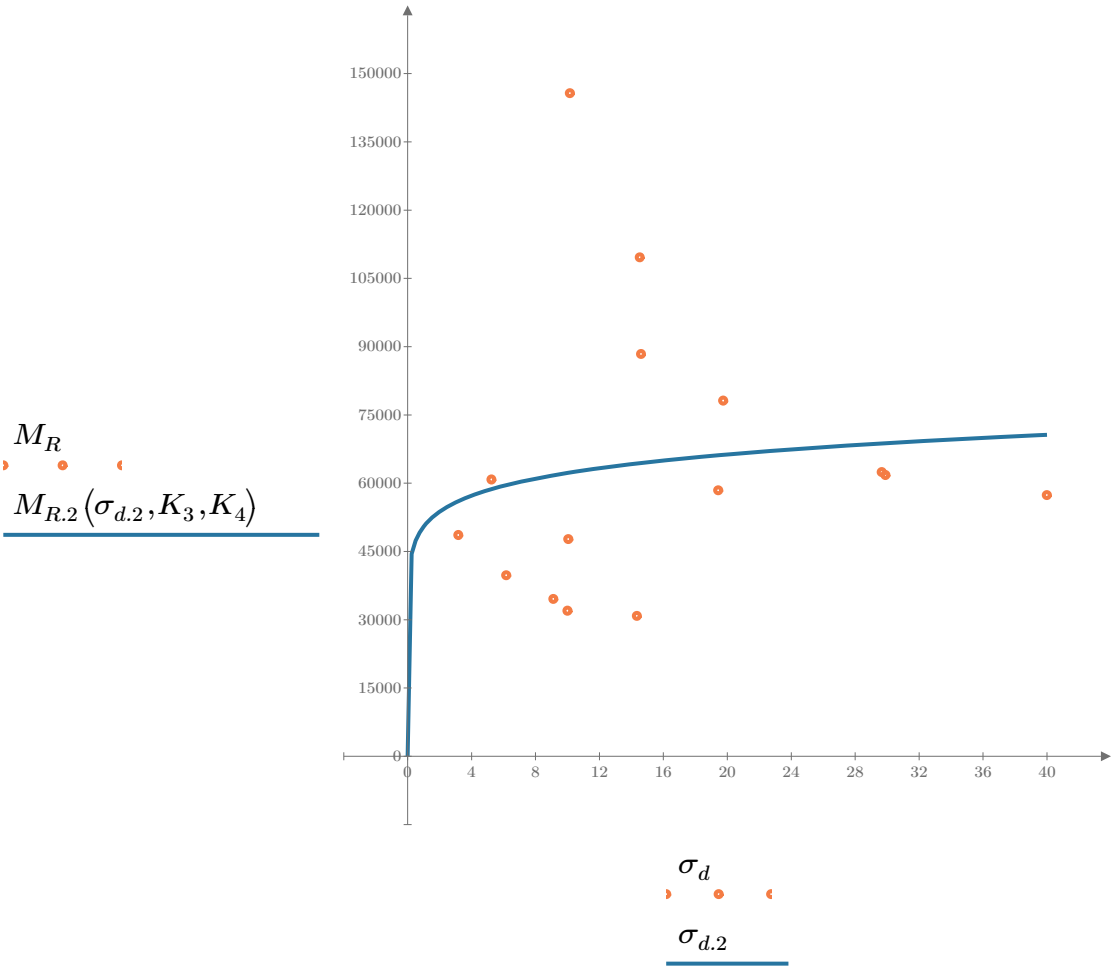

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–32”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1+\sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 36314.323$

$K_6 = -0.5337$ Equation 3 fitting parameters

$K_7 = 0.8436$

${R_3}^2 = 0.6696$ Coefficient of determination

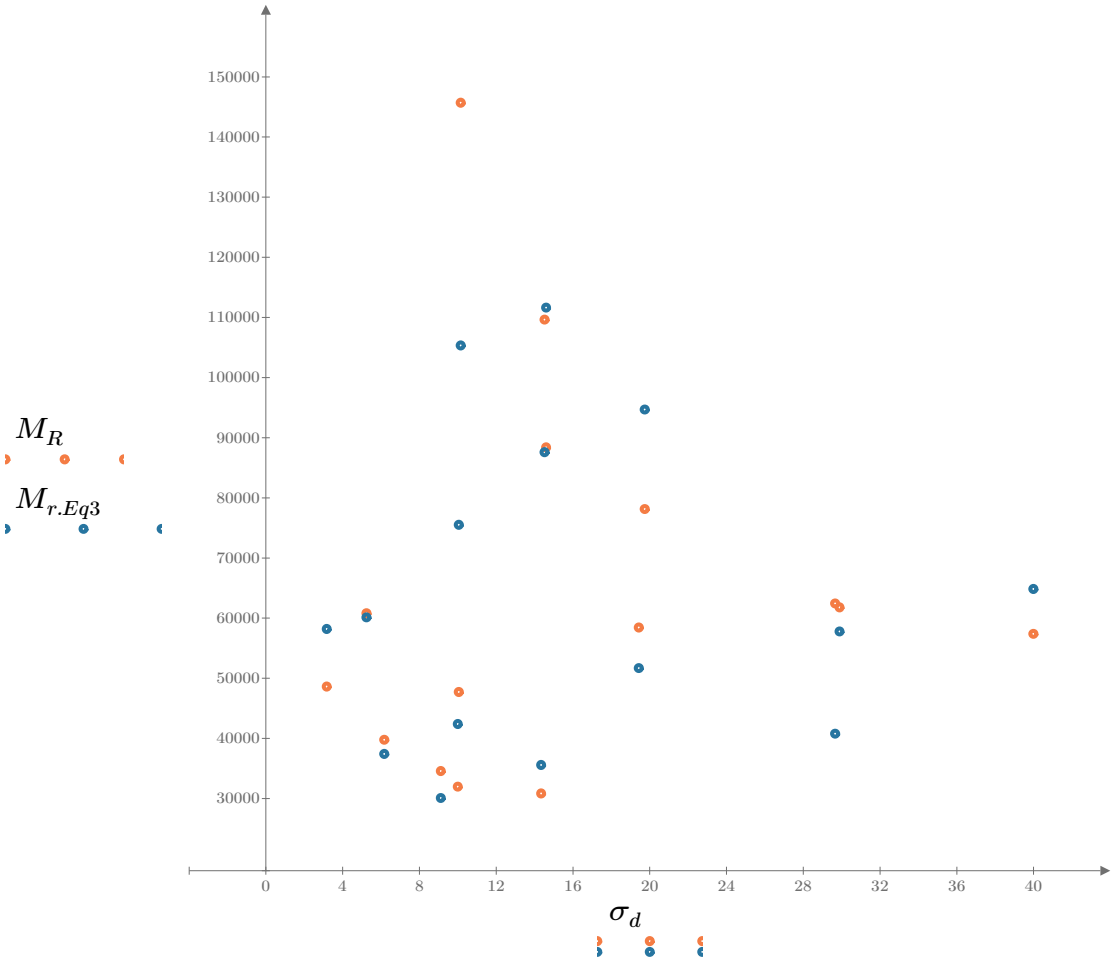

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-\text{32”}$

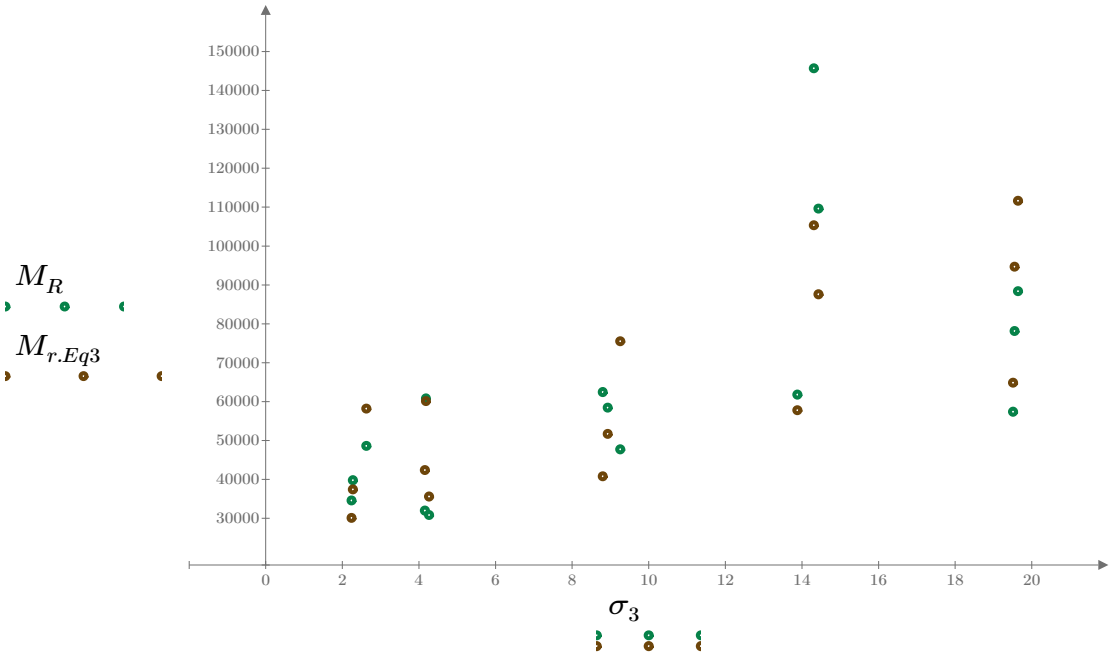

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

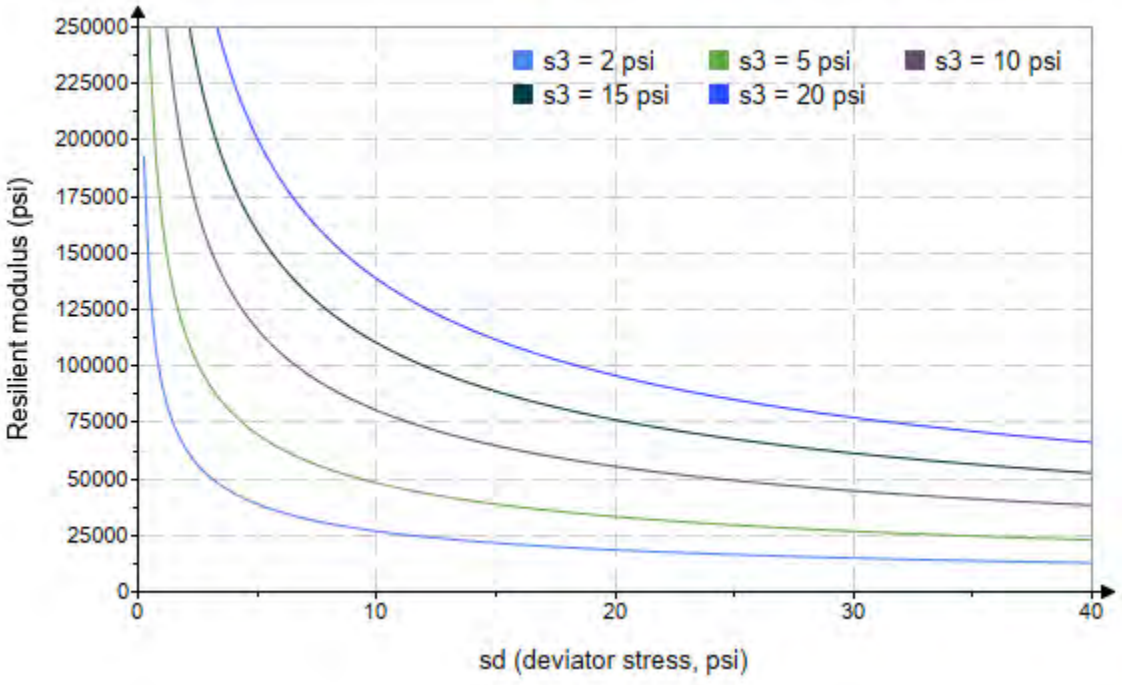

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–32”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1248.189$

$K_9 = 1.1295$ Equation 4 fitting parameters

$K_{10} = -0.9268$

$R_4^{\,2} = 0.7024$ Coefficient of determination

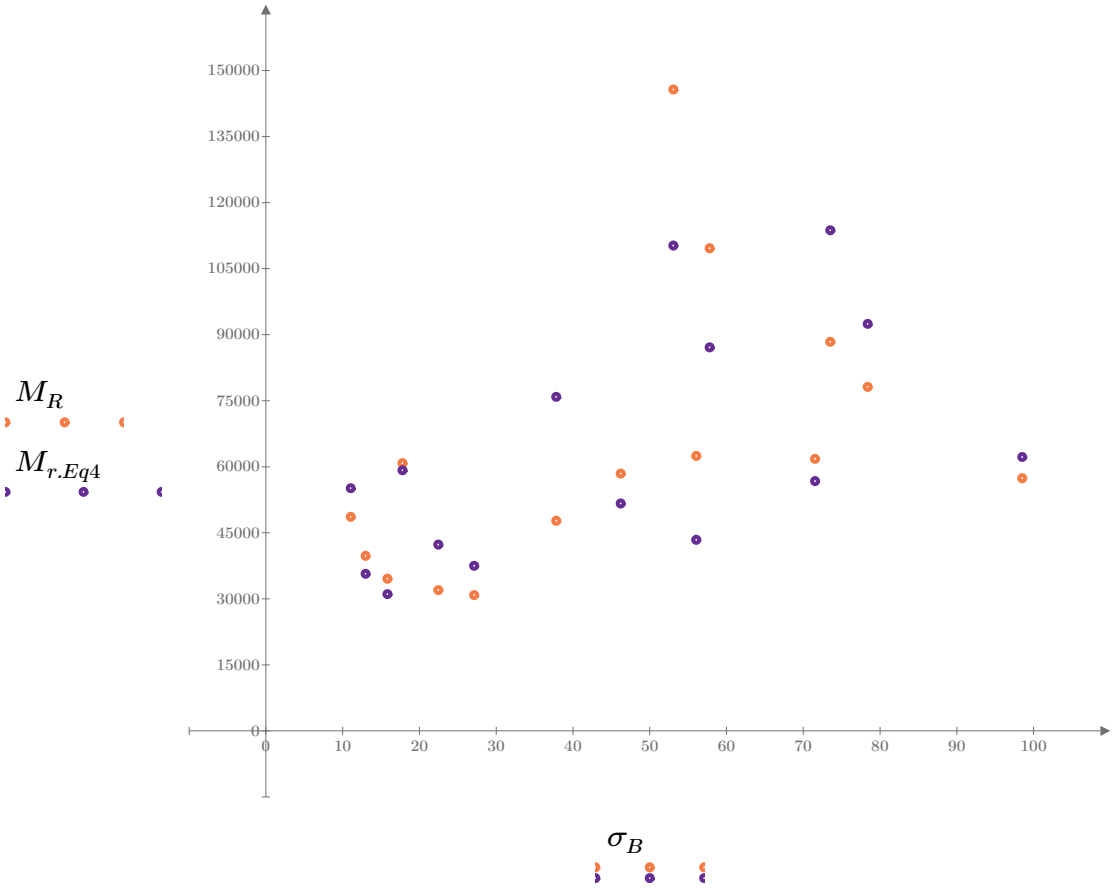

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

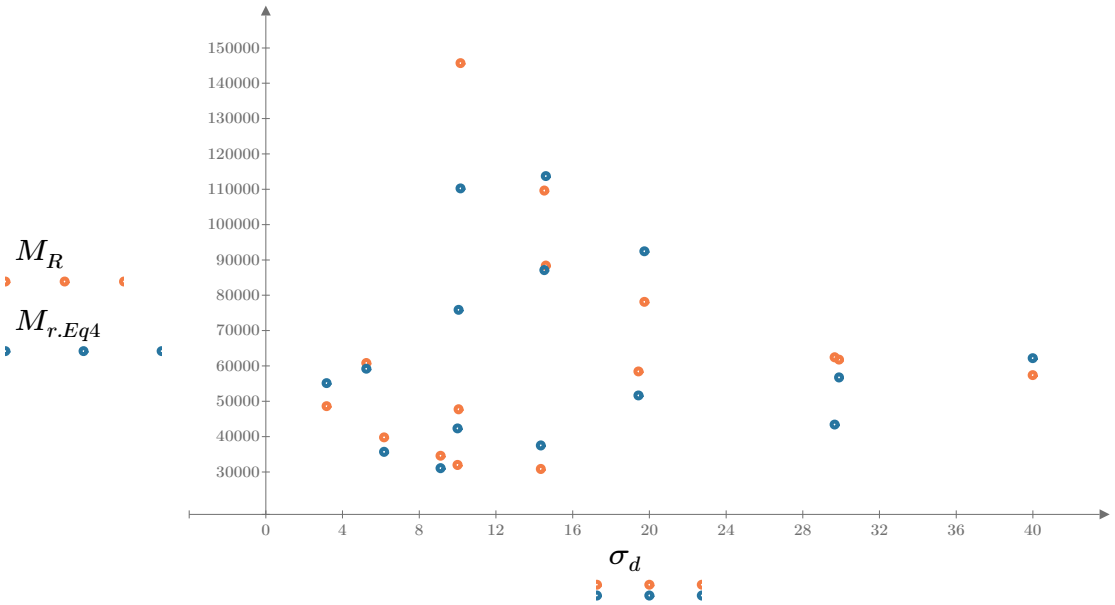

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

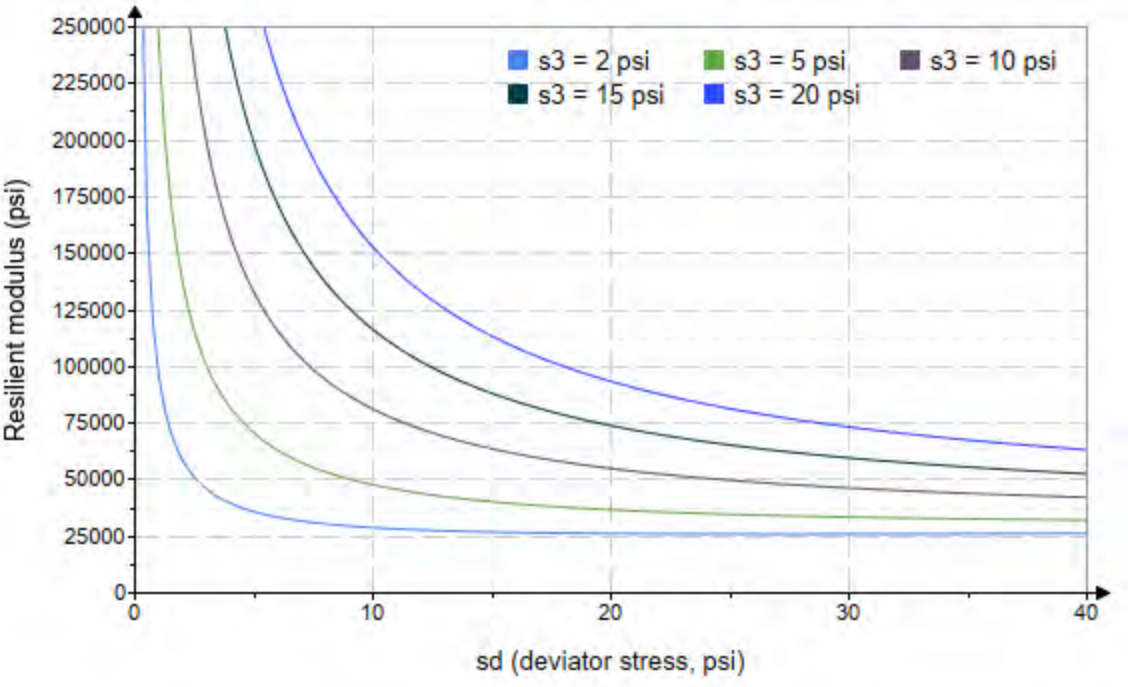

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{33”}$

$Treatment = \text{“D1”}$

$S = 15.504$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.910 \\ 2.909 \\ 2.797 \\ 4.665 \\ 4.625 \\ 4.593 \\ 9.630 \\ 9.649 \\ 9.612 \\ 14.630 \\ 14.660 \\ 14.630 \\ 19.680 \\ 19.690 \\ 19.680 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.110 \\ 6.152 \\ 9.129 \\ 5.175 \\ 10.020 \\ 14.550 \\ 10.110 \\ 19.250 \\ 29.520 \\ 10.160 \\ 14.480 \\ 29.650 \\ 14.520 \\ 19.560 \\ 40.190 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.840 \\ 14.880 \\ 17.520 \\ 19.170 \\ 23.890 \\ 28.330 \\ 39.000 \\ 48.200 \\ 58.350 \\ 54.040 \\ 58.450 \\ 73.550 \\ 73.570 \\ 78.620 \\ 99.230 \end{bmatrix} \quad M_R = \begin{bmatrix} 22008.0 \\ 22779.8 \\ 24797.6 \\ 30282.2 \\ 31116.6 \\ 29135.2 \\ 30501.8 \\ 33120.4 \\ 39905.4 \\ 51824.6 \\ 51727.6 \\ 47174.6 \\ 62331.4 \\ 58987.8 \\ 60574.2 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–33”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 5261.696$

$K_2 = 0.5376$

Equation 1 fitting parameters

$R_1^2 = 0.8511$ Coefficient of determination

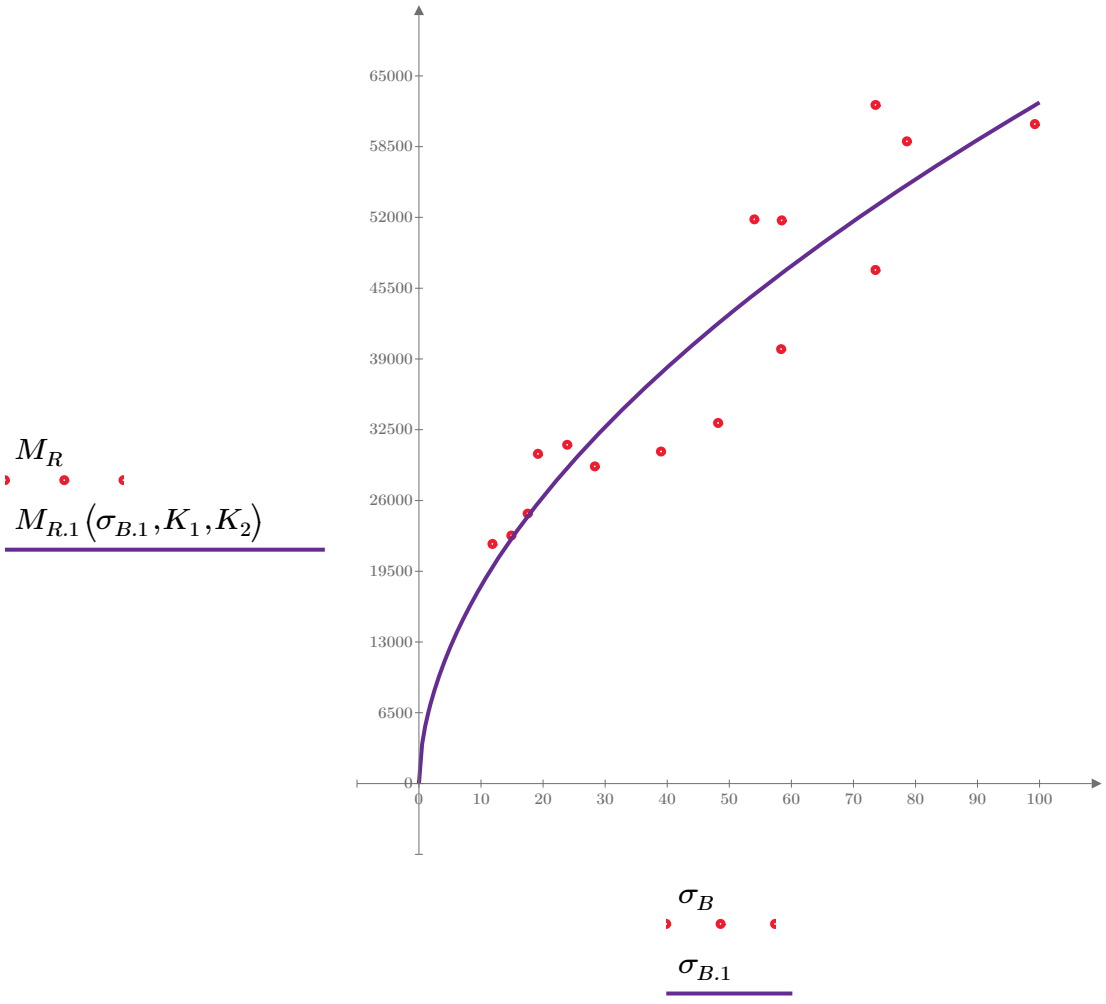

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–33”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 16594.673$

$K_4 = 0.3341$ Equation 2 fitting parameters

${R_2}^2 = 0.4143$ Coefficient of determination

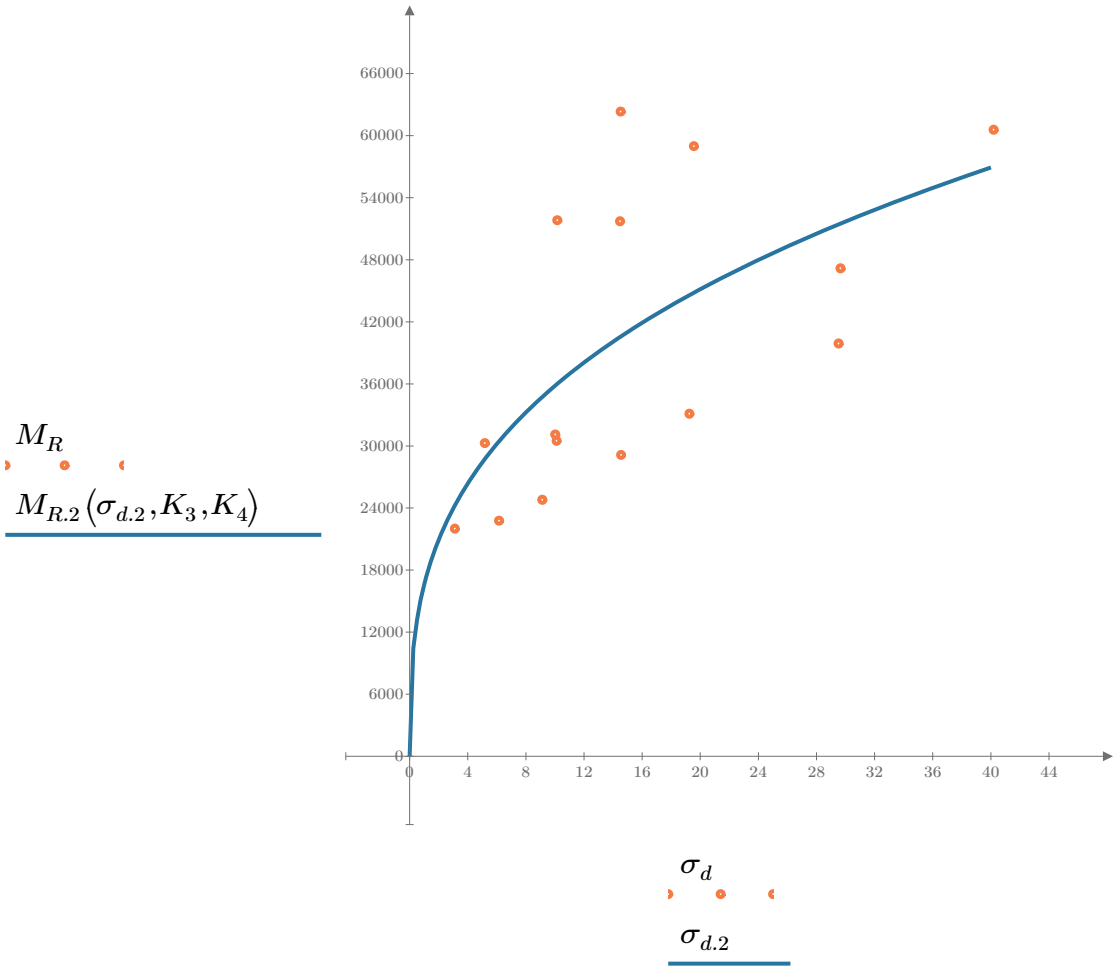

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–33”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 10193.405$

$K_6 = -0.0220$ Equation 3 fitting parameters

$K_7 = 0.6016$

${R_3}^2 = 0.9335$ Coefficient of determination

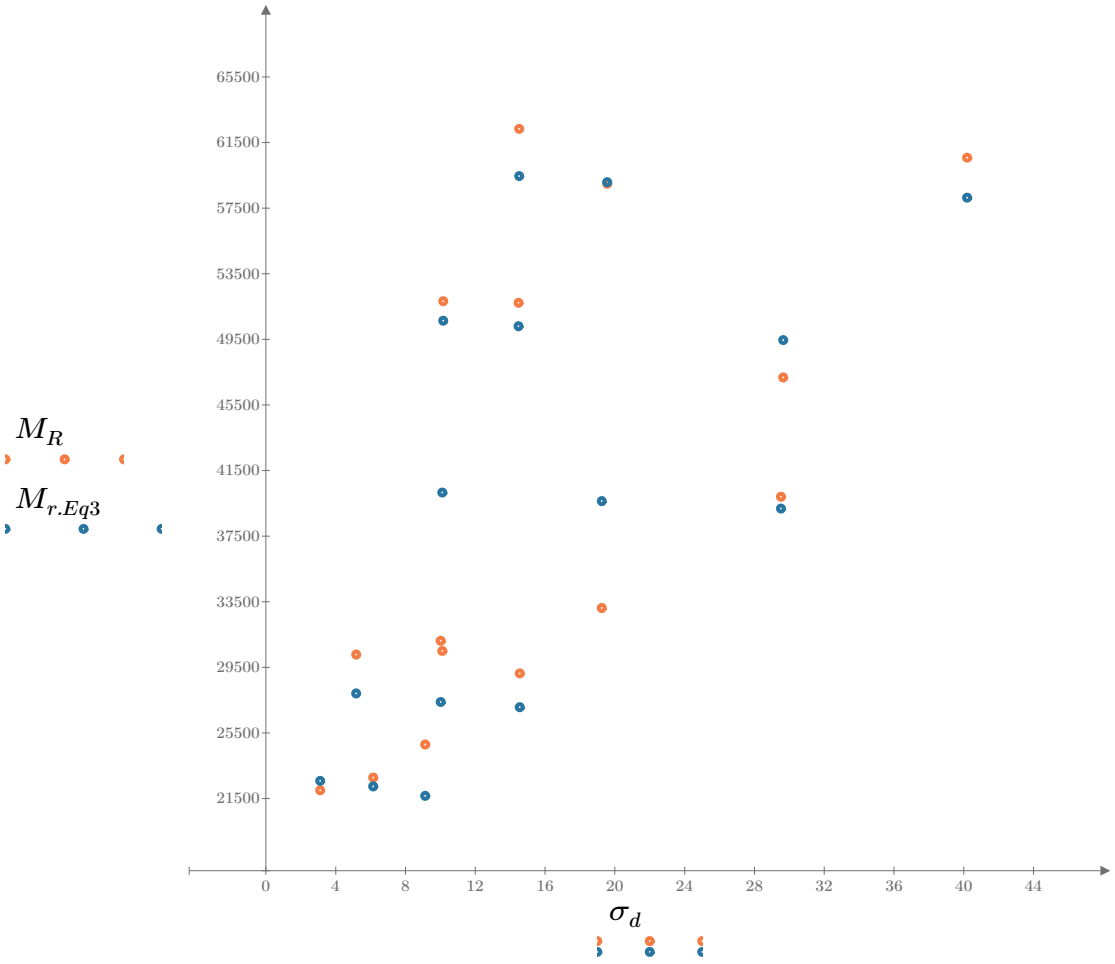

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–33”}$

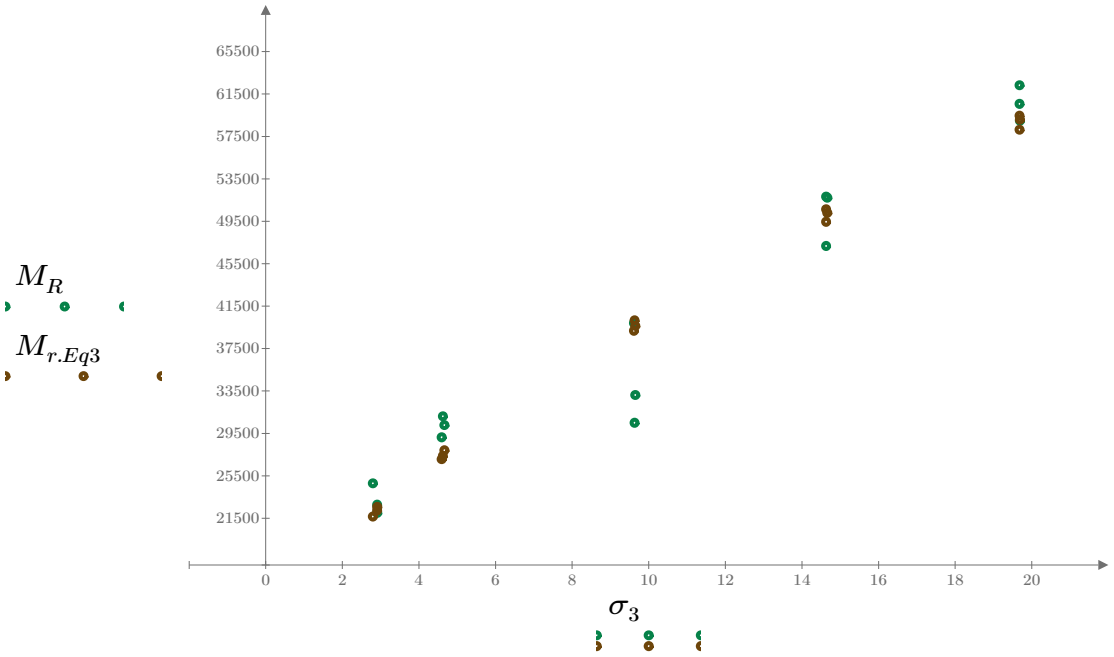

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

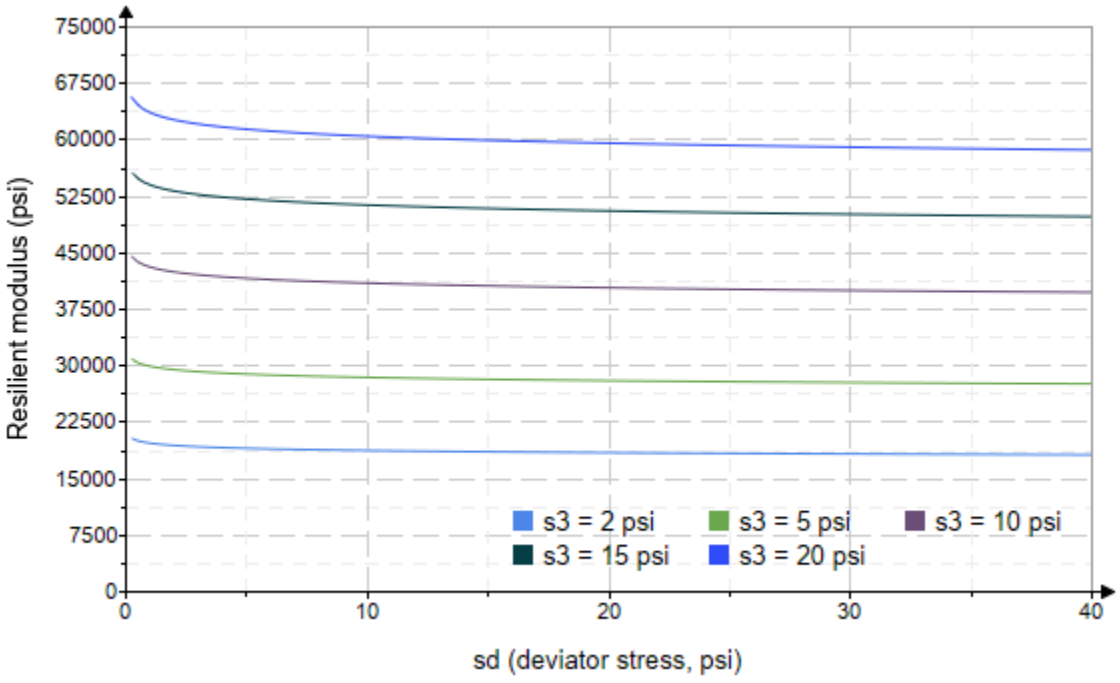

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–33”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1129.208$

$K_9 = 0.7961$ Equation 4 fitting parameters

$K_{10} = -0.2817$

$R_4^{\,2} = 0.9335$ Coefficient of determination

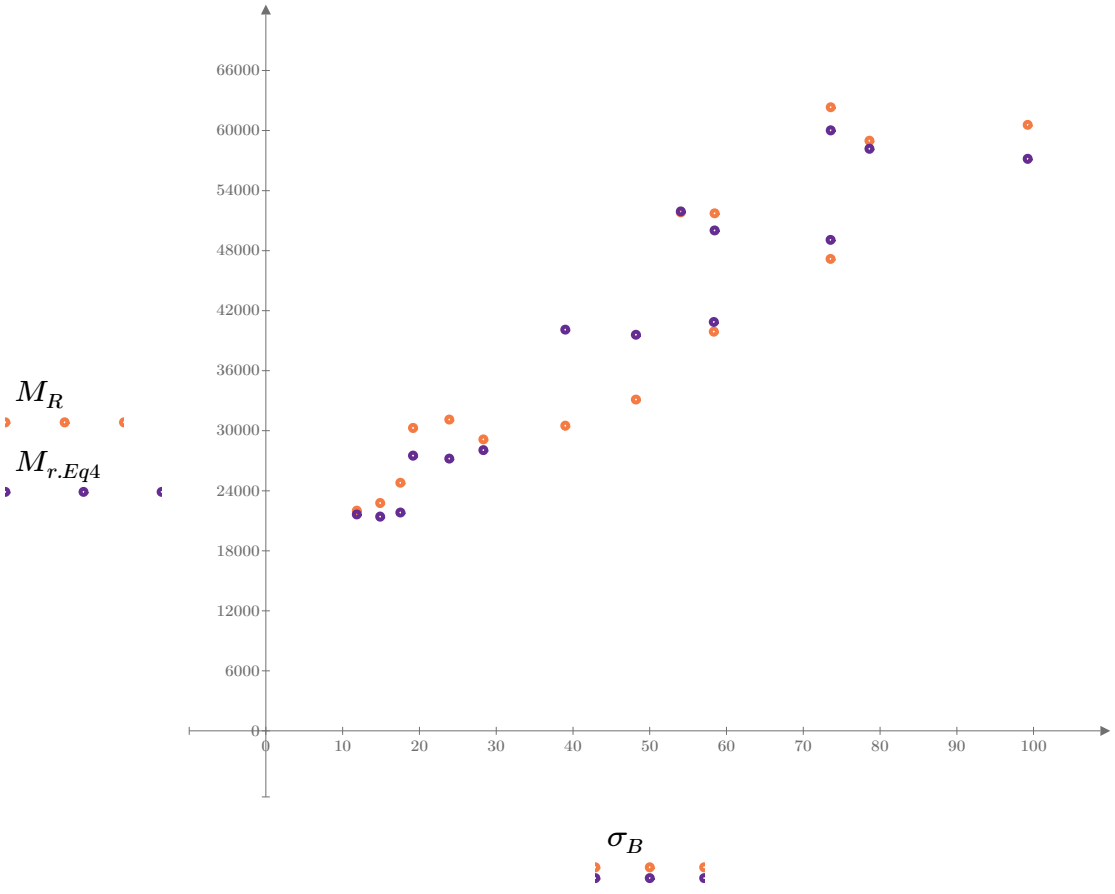

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

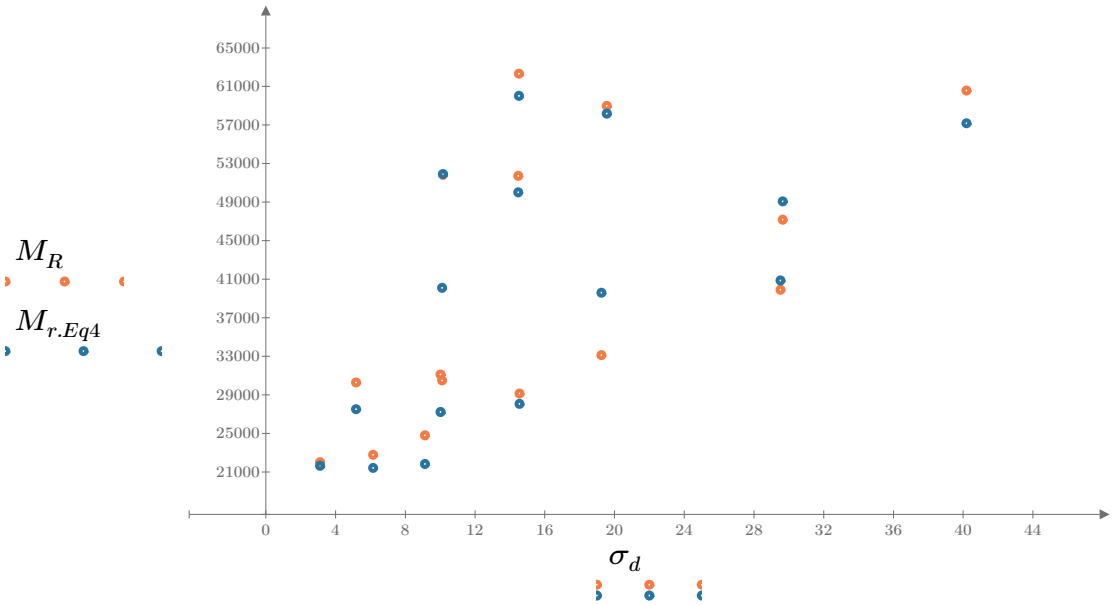

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

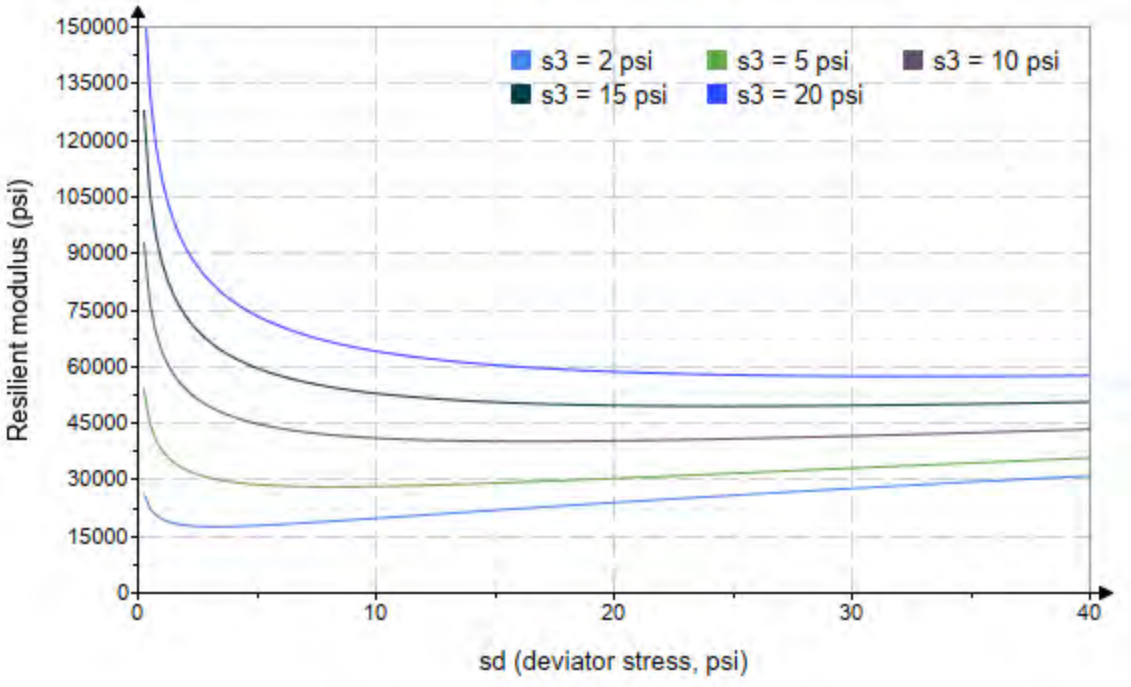

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{34”}$

$Treatment = \text{“D1”}$

$S = 15.48$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.788 \\ 2.394 \\ 2.345 \\ 4.317 \\ 4.335 \\ 4.135 \\ 9.051 \\ 9.312 \\ 9.041 \\ 14.320 \\ 14.510 \\ 14.030 \\ 19.520 \\ 19.530 \\ 19.560 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.090 \\ 6.146 \\ 9.105 \\ 5.213 \\ 10.020 \\ 14.460 \\ 10.040 \\ 19.480 \\ 29.620 \\ 9.897 \\ 14.570 \\ 29.900 \\ 14.650 \\ 19.850 \\ 39.870 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.450 \\ 13.330 \\ 16.140 \\ 18.160 \\ 23.030 \\ 26.860 \\ 37.200 \\ 47.420 \\ 56.740 \\ 52.860 \\ 58.090 \\ 72.000 \\ 73.200 \\ 78.440 \\ 98.550 \end{bmatrix} \quad M_R = \begin{bmatrix} 53131.2 \\ 30341.6 \\ 29247.2 \\ 114486.2 \\ 51200.4 \\ 46256.8 \\ 132424.0 \\ 55838.8 \\ 50287.2 \\ 176180.0 \\ 75114.2 \\ 61787.8 \\ 143570.0 \\ 101239.6 \\ 61202.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–34”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 27883.965$

$K_2 = 0.2831$

Equation 1 fitting parameters

$R_1^2 = 0.1316$ Coefficient of determination

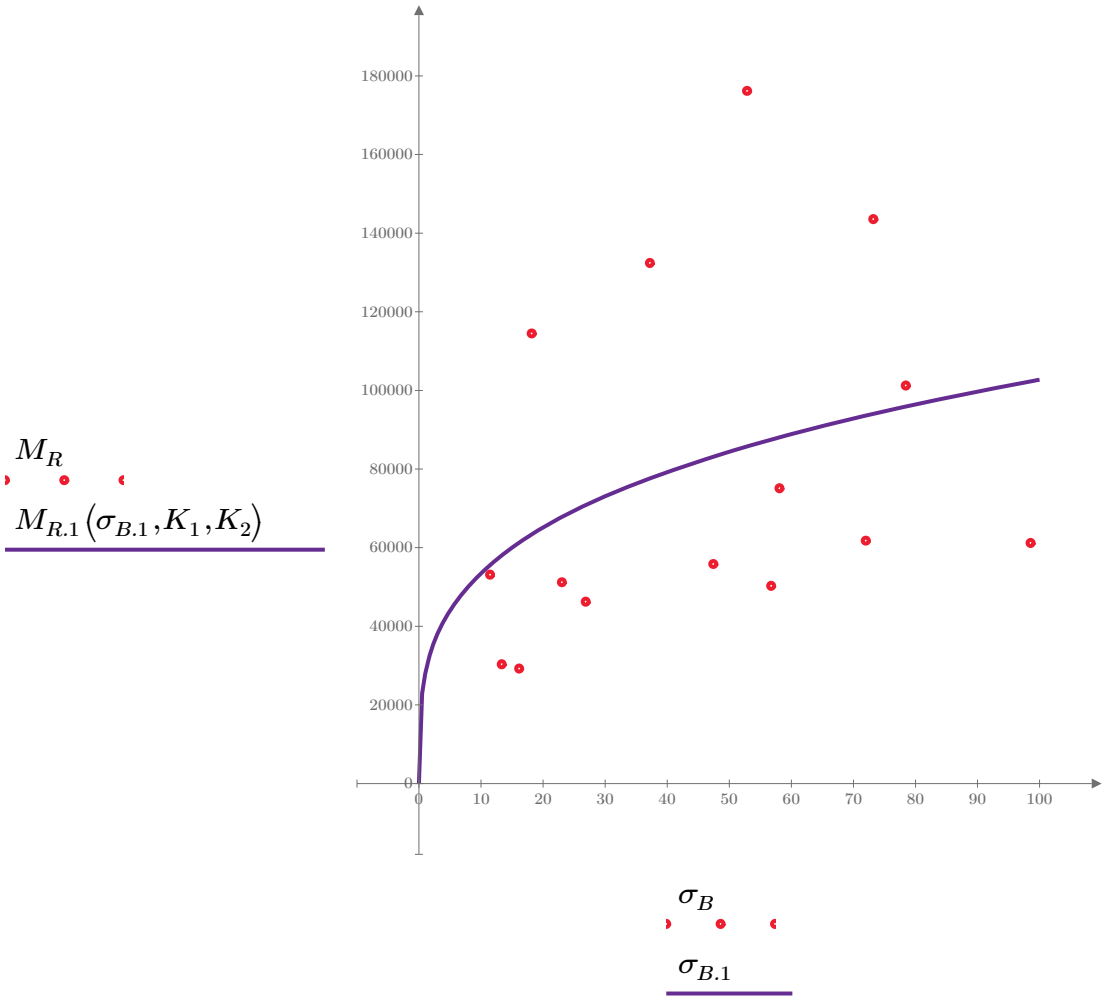

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–34”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 88106.659$

$K_4 = -0.0439$ Equation 2 fitting parameters

${R_2}^2 = 0.0036$ Coefficient of determination

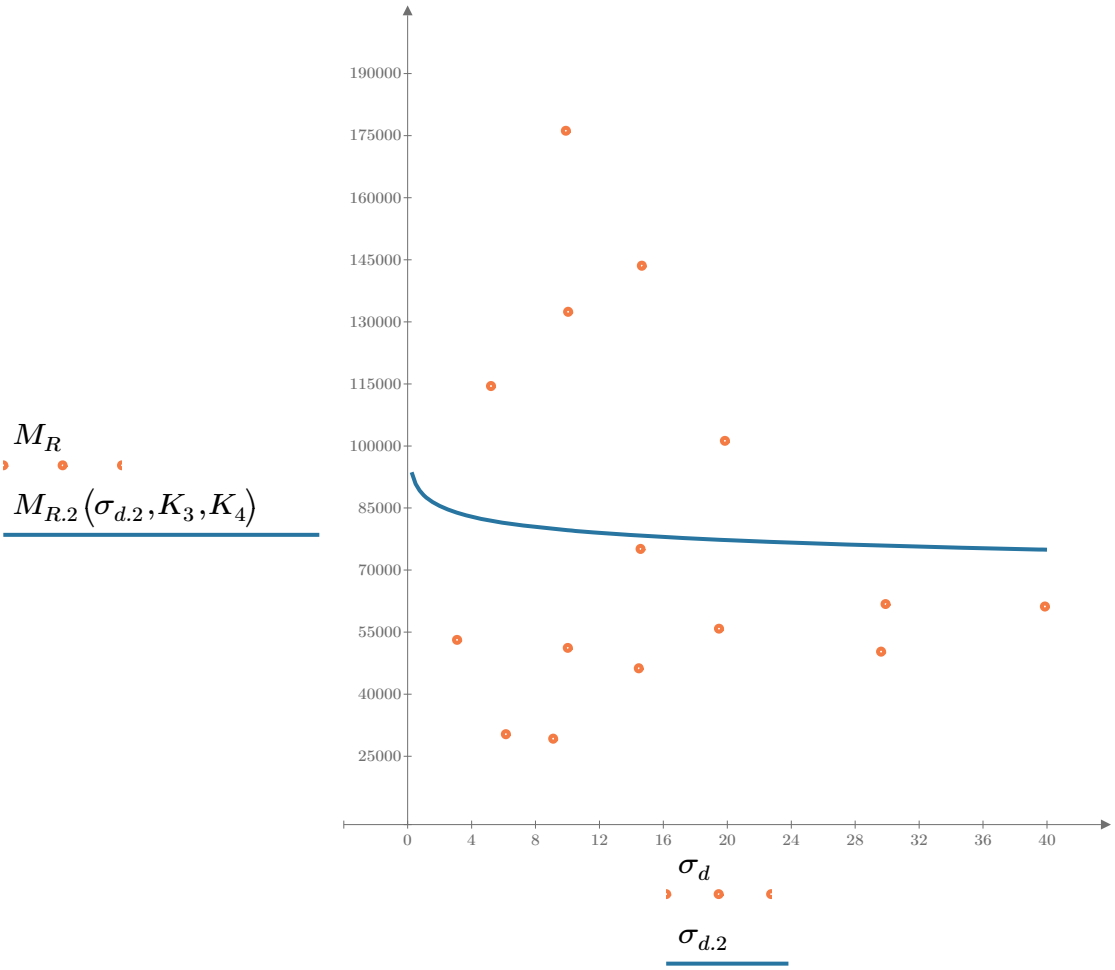

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–34”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 55847.465$

$K_6 = -0.8332$ Equation 3 fitting parameters

$K_7 = 1.0656$

${R_3}^2 = 0.7693$ Coefficient of determination

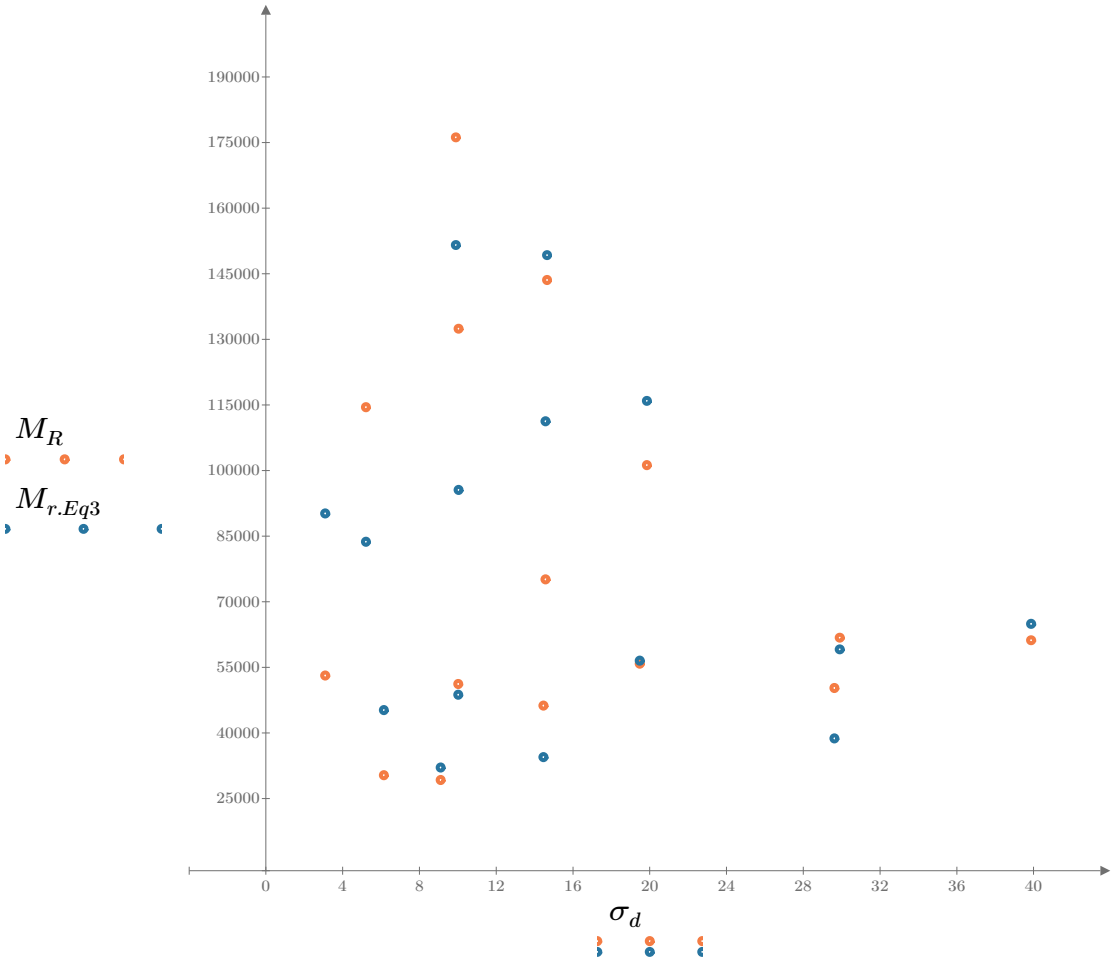

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–34”}$

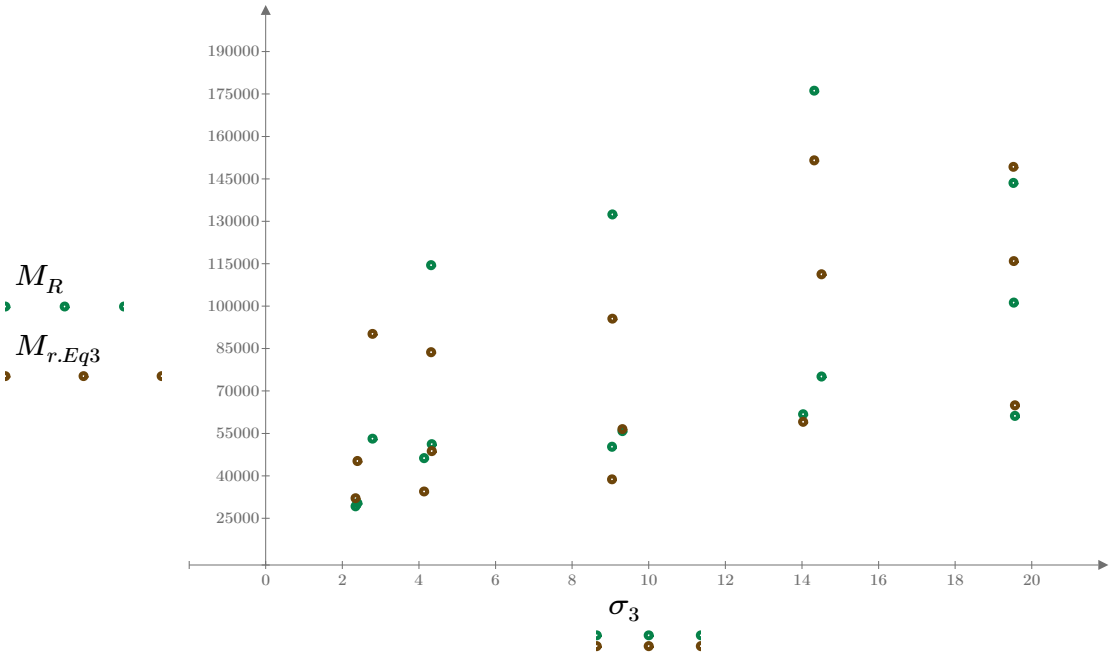

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

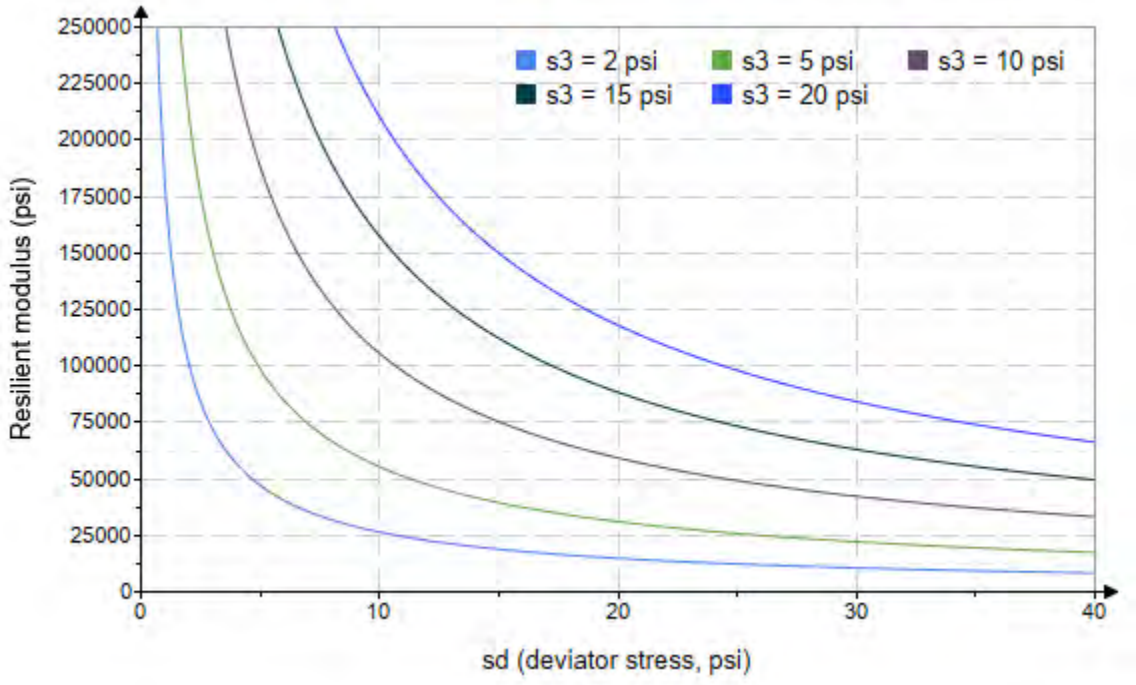

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–34”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1086.436$

$K_9 = 1.3953$ Equation 4 fitting parameters

$K_{10} = -1.3065$

$R_4^{\,2} = 0.8036$ Coefficient of determination

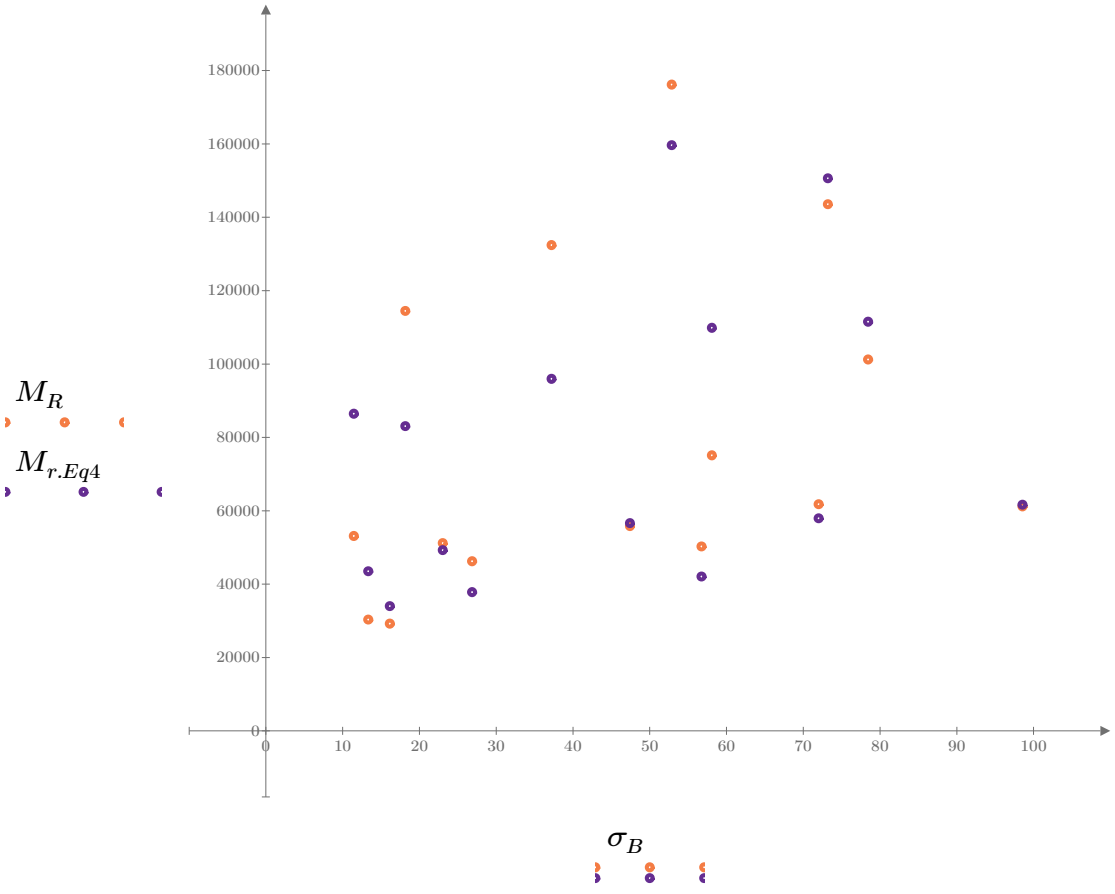

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

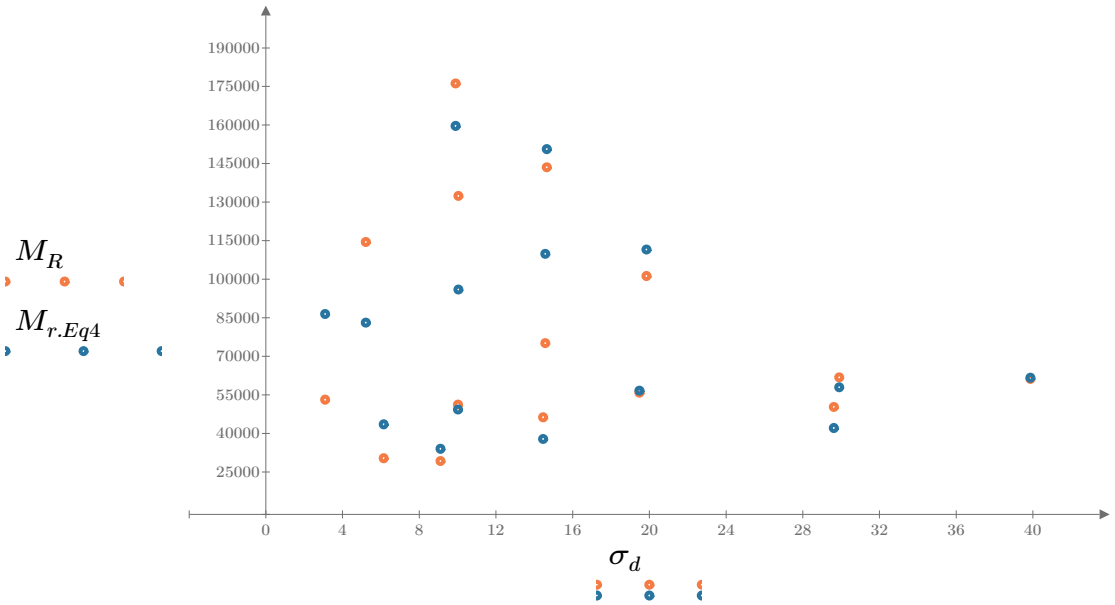

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

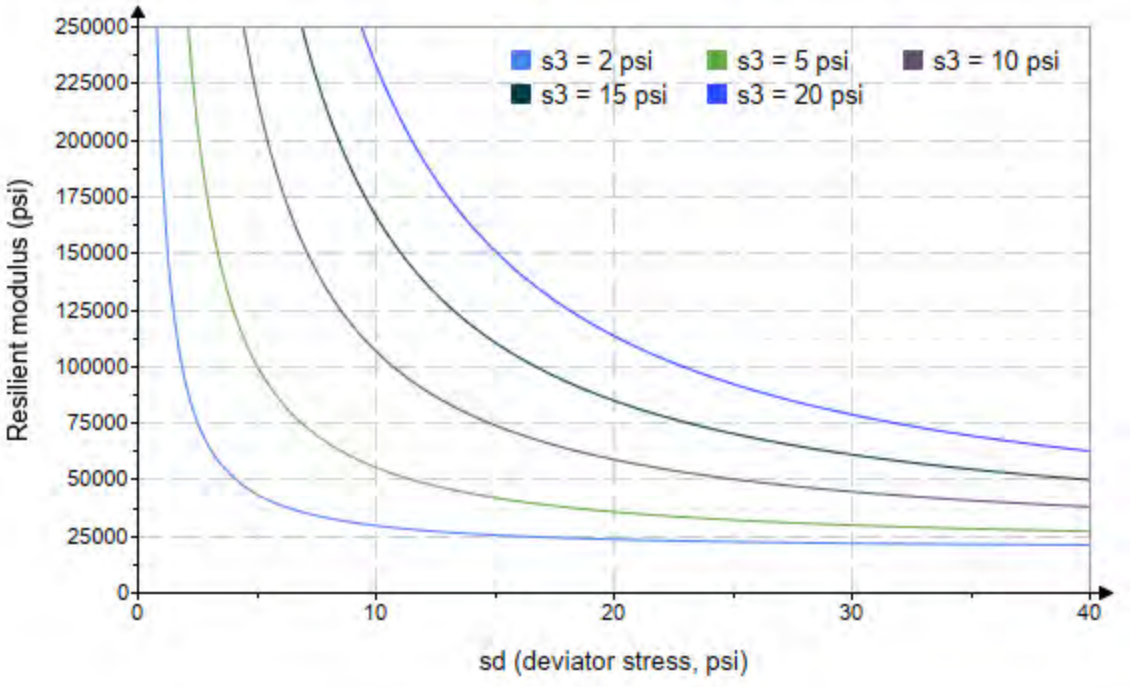

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{35”}$

$Treatment = \text{“D1”}$

$S = 15.802$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.886 \\ 2.902 \\ 2.897 \\ 4.607 \\ 4.611 \\ 4.580 \\ 9.628 \\ 9.601 \\ 9.622 \\ 14.630 \\ 14.620 \\ 14.630 \\ 19.640 \\ 19.650 \\ 19.640 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.148 \\ 6.117 \\ 9.080 \\ 5.092 \\ 10.010 \\ 14.550 \\ 9.949 \\ 19.320 \\ 29.370 \\ 10.050 \\ 14.490 \\ 29.550 \\ 14.450 \\ 19.390 \\ 40.130 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.810 \\ 14.820 \\ 17.770 \\ 18.910 \\ 23.840 \\ 28.290 \\ 38.830 \\ 48.120 \\ 58.230 \\ 53.930 \\ 58.360 \\ 73.460 \\ 73.360 \\ 78.350 \\ 99.060 \end{bmatrix} \quad M_R = \begin{bmatrix} 23941.6 \\ 23858.6 \\ 24658.8 \\ 26292.8 \\ 27955.2 \\ 29742.8 \\ 38912.4 \\ 47150.6 \\ 52840.4 \\ 49233.0 \\ 51699.8 \\ 51197.6 \\ 61295.6 \\ 59452.0 \\ 47448.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–35”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 7051.343$

$K_2 = 0.4711$

Equation 1 fitting parameters

$R_1^2 = 0.8523$ Coefficient of determination

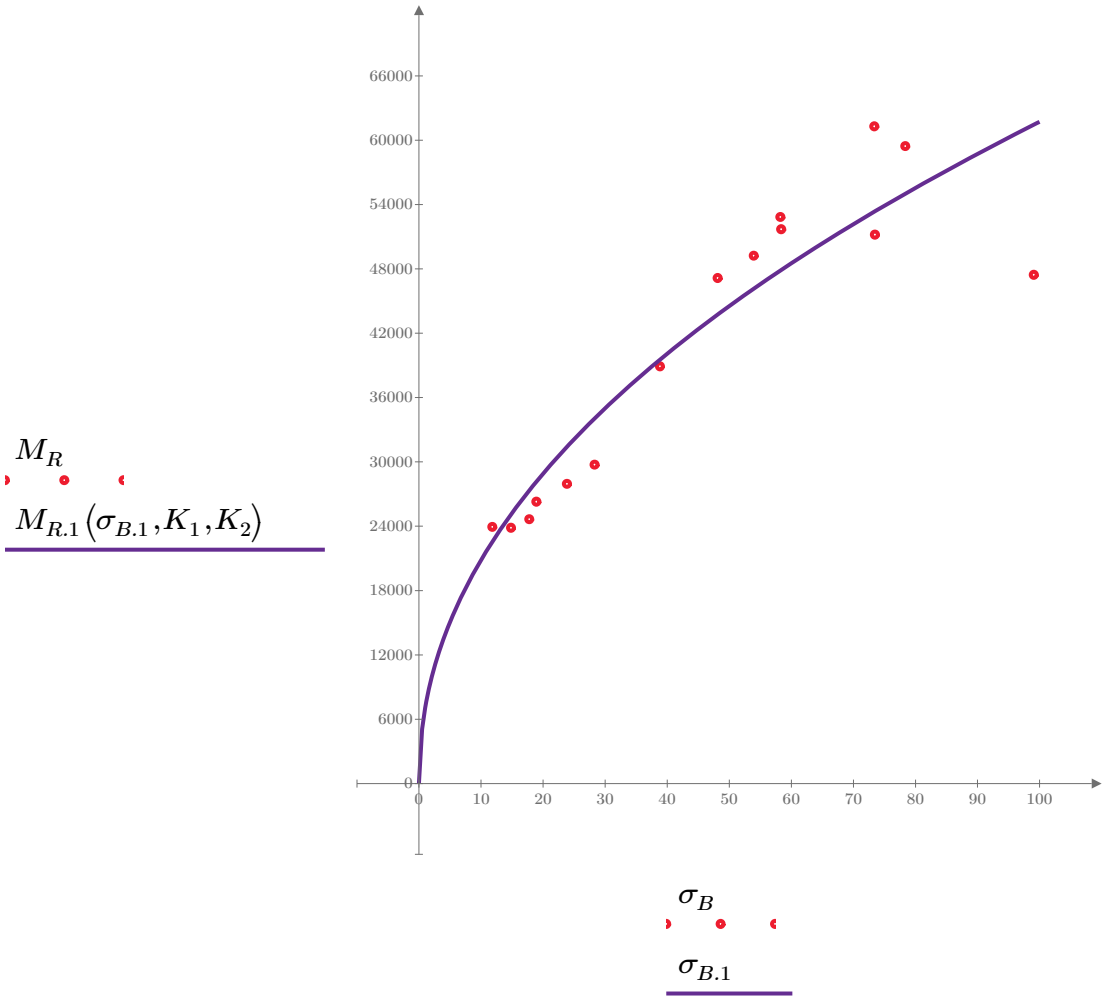

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–35”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 17630.262$

$K_4 = 0.3244$

Equation 2 fitting parameters

${R_2}^2 = 0.4829$ Coefficient of determination

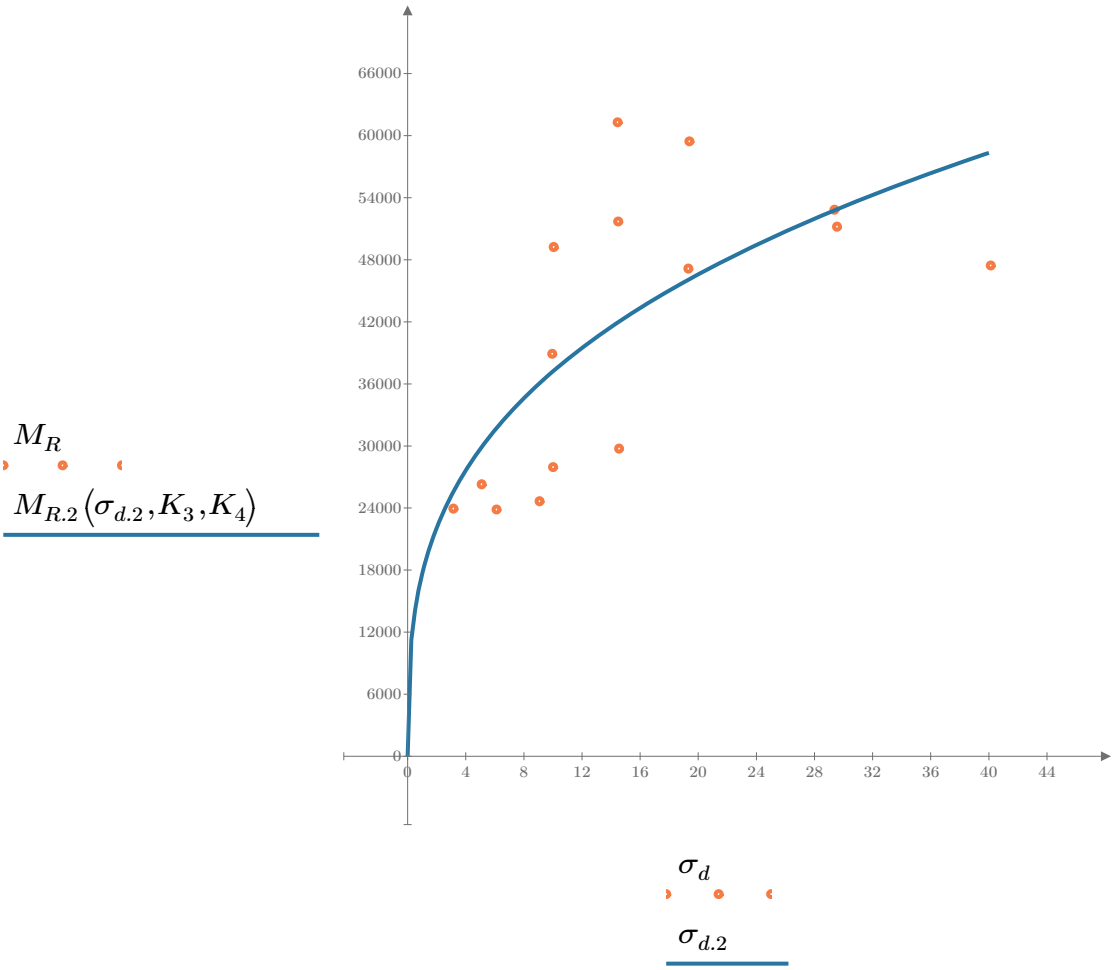

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–35”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 12560.402$

$K_6 = 0.0215$ Equation 3 fitting parameters

$K_7 = 0.4831$

${R_3}^2 = 0.8807$ Coefficient of determination

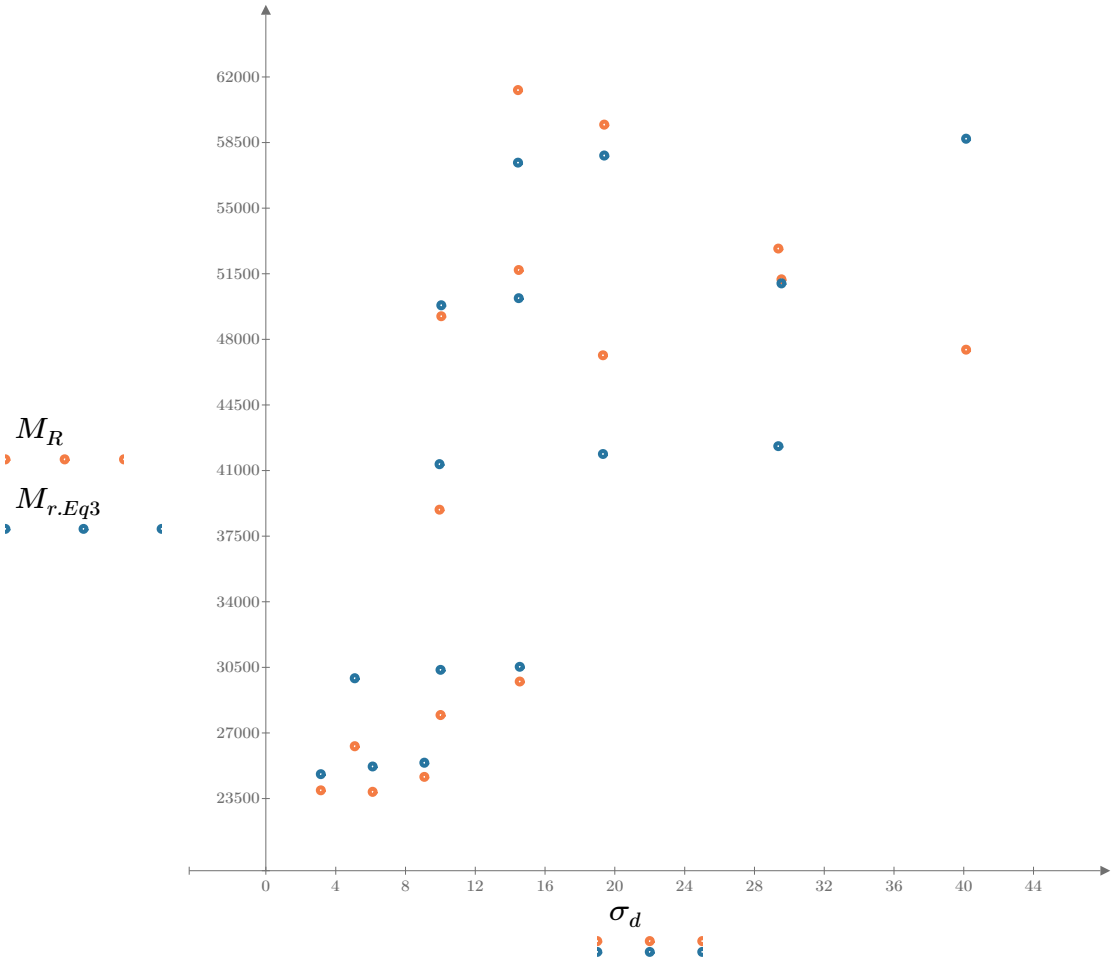

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–35”}$

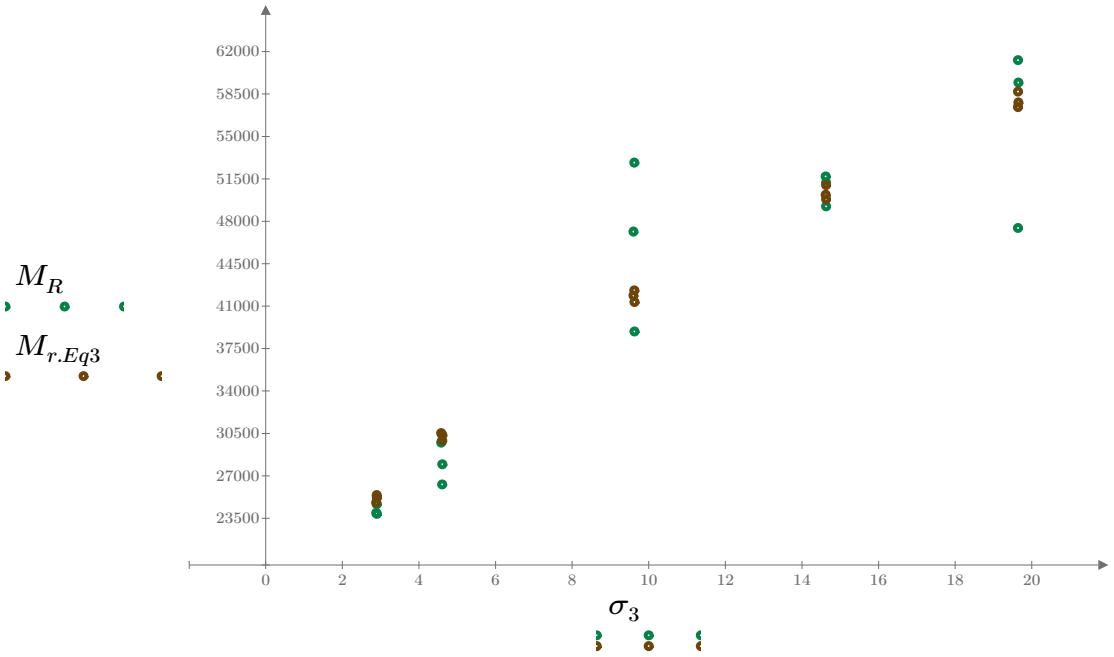

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

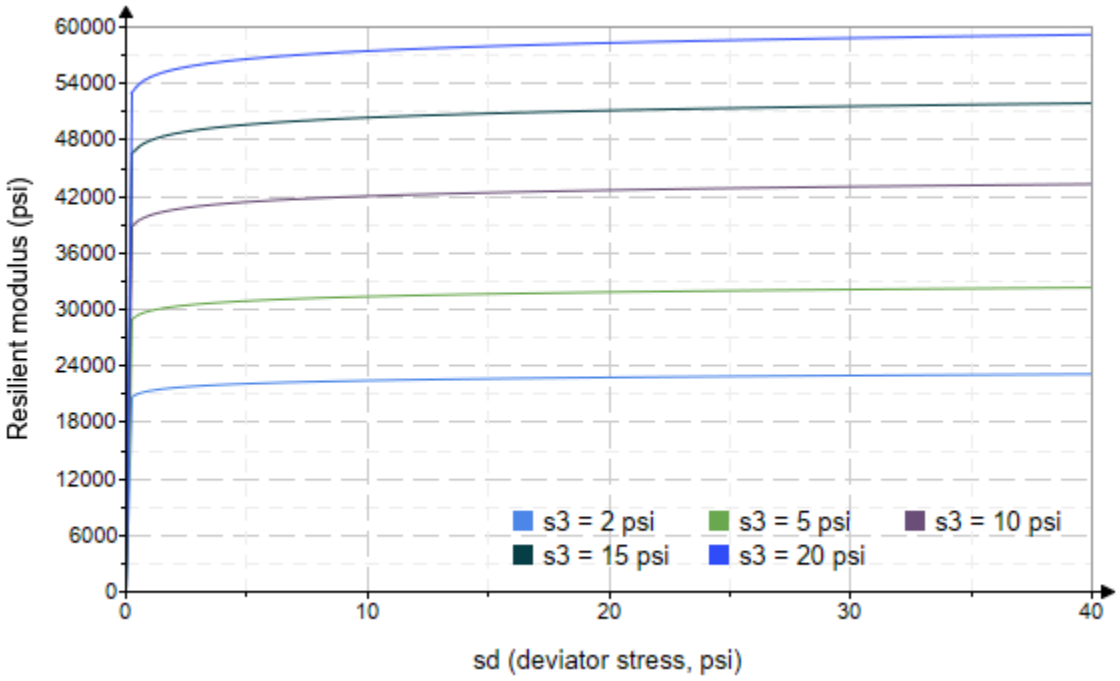

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–35”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1385.842$

$K_9 = 0.6509$ Equation 4 fitting parameters

$K_{10} = -0.1958$

$R_4^{\,2} = 0.8977$ Coefficient of determination

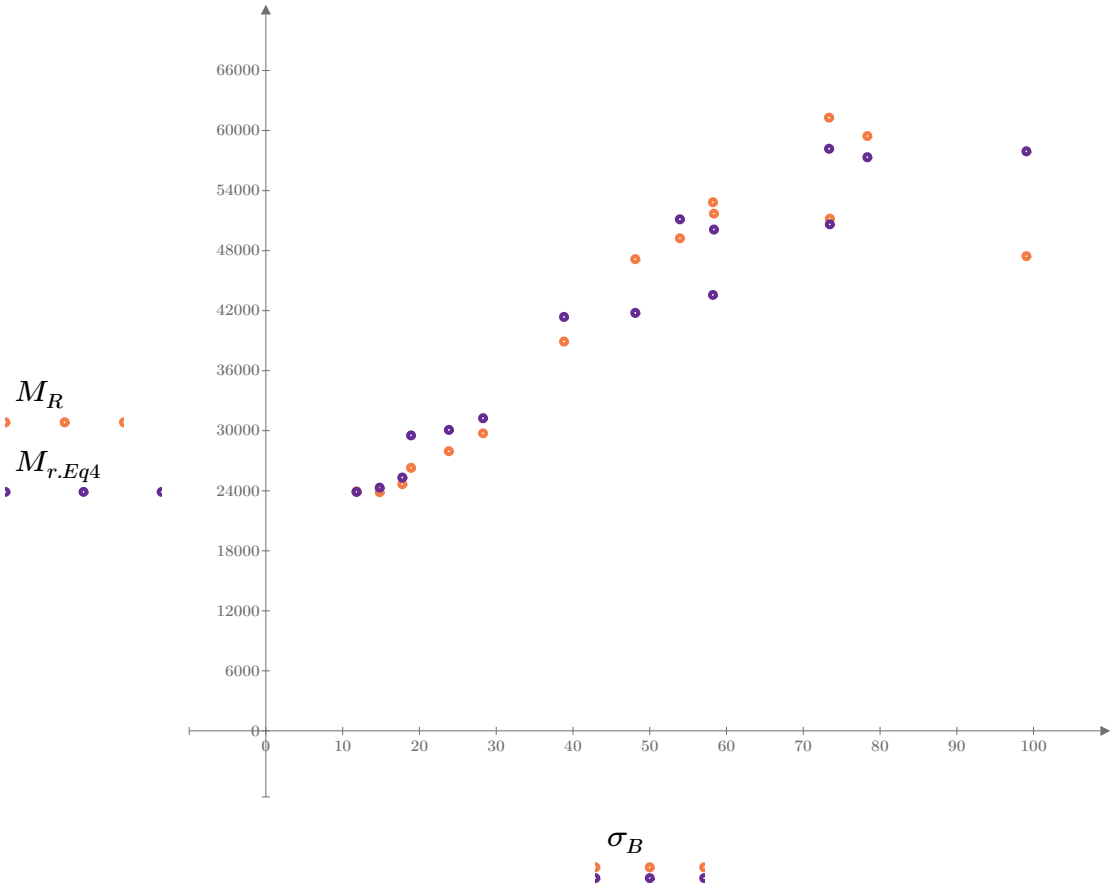

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

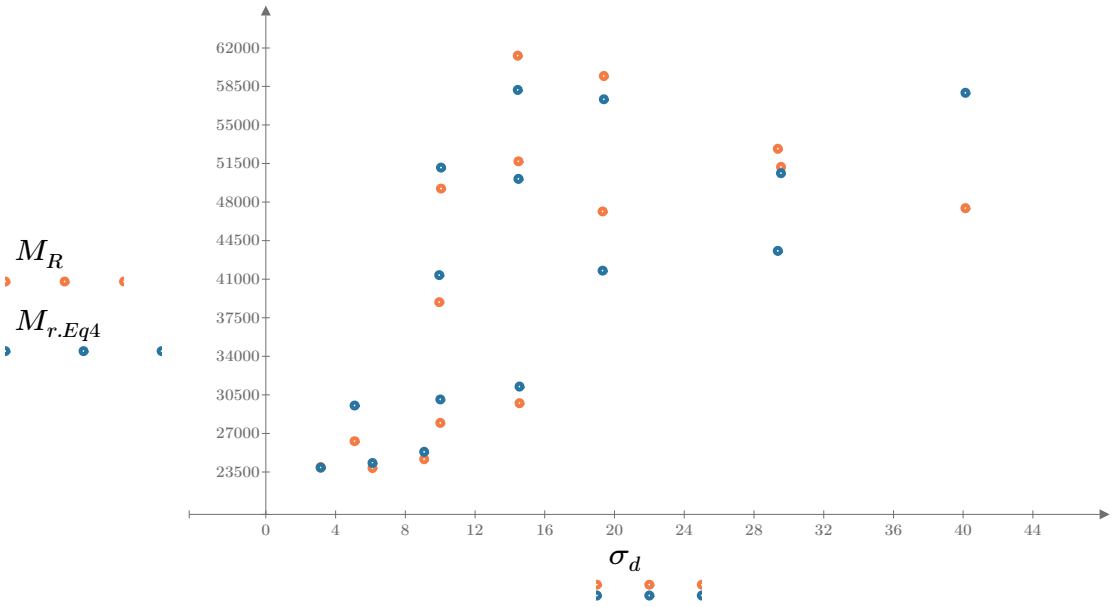

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

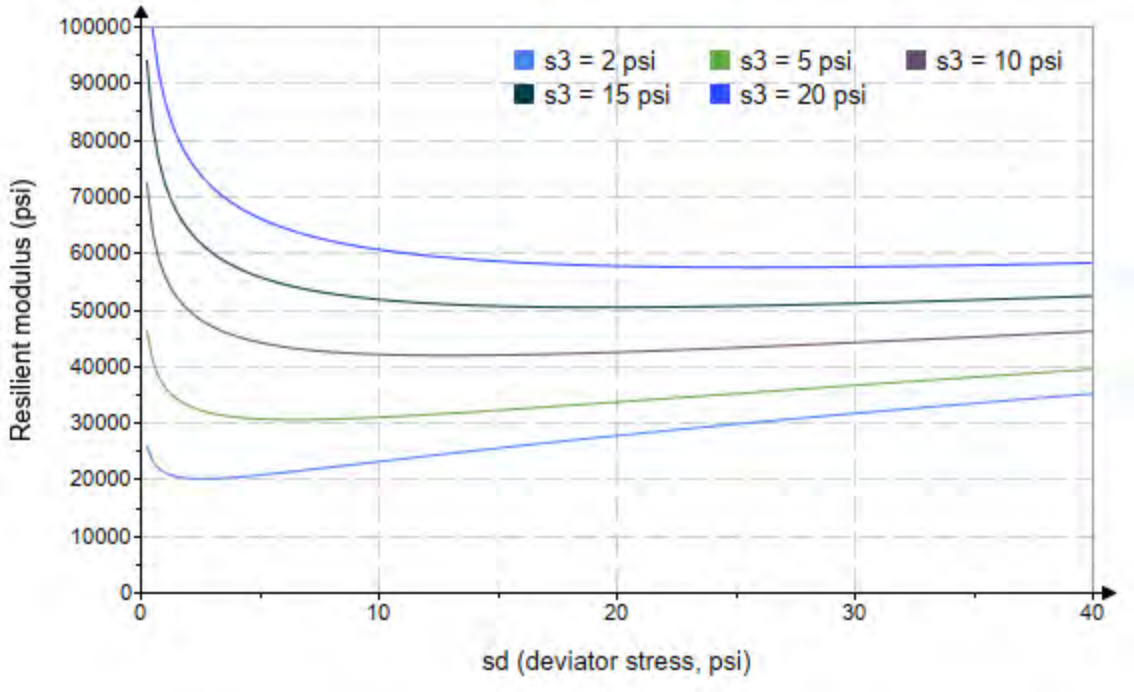

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{36”}$

$Treatment = \text{“D1”}$

$S = 17.123$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.840 \\ 2.829 \\ 2.828 \\ 4.574 \\ 4.581 \\ 4.609 \\ 9.589 \\ 9.644 \\ 9.616 \\ 14.670 \\ 14.680 \\ 14.640 \\ 19.700 \\ 19.670 \\ 19.650 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.178 \\ 6.179 \\ 8.988 \\ 5.163 \\ 9.838 \\ 14.270 \\ 9.813 \\ 19.280 \\ 29.650 \\ 9.849 \\ 14.340 \\ 29.830 \\ 14.400 \\ 19.560 \\ 40.120 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.700 \\ 14.670 \\ 17.470 \\ 18.880 \\ 23.580 \\ 28.100 \\ 38.580 \\ 48.210 \\ 58.500 \\ 53.870 \\ 58.390 \\ 73.740 \\ 73.500 \\ 78.570 \\ 99.060 \end{bmatrix} \quad M_R = \begin{bmatrix} 24082.6 \\ 22891.6 \\ 25137.2 \\ 23149.0 \\ 28131.8 \\ 30553.0 \\ 38791.0 \\ 51580.2 \\ 56467.0 \\ 59020.0 \\ 54669.4 \\ 56509.0 \\ 57530.6 \\ 64036.4 \\ 56569.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–36”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 5904.861$

$K_2 = 0.5313$

Equation 1 fitting parameters

$R_1^2 = 0.8923$ Coefficient of determination

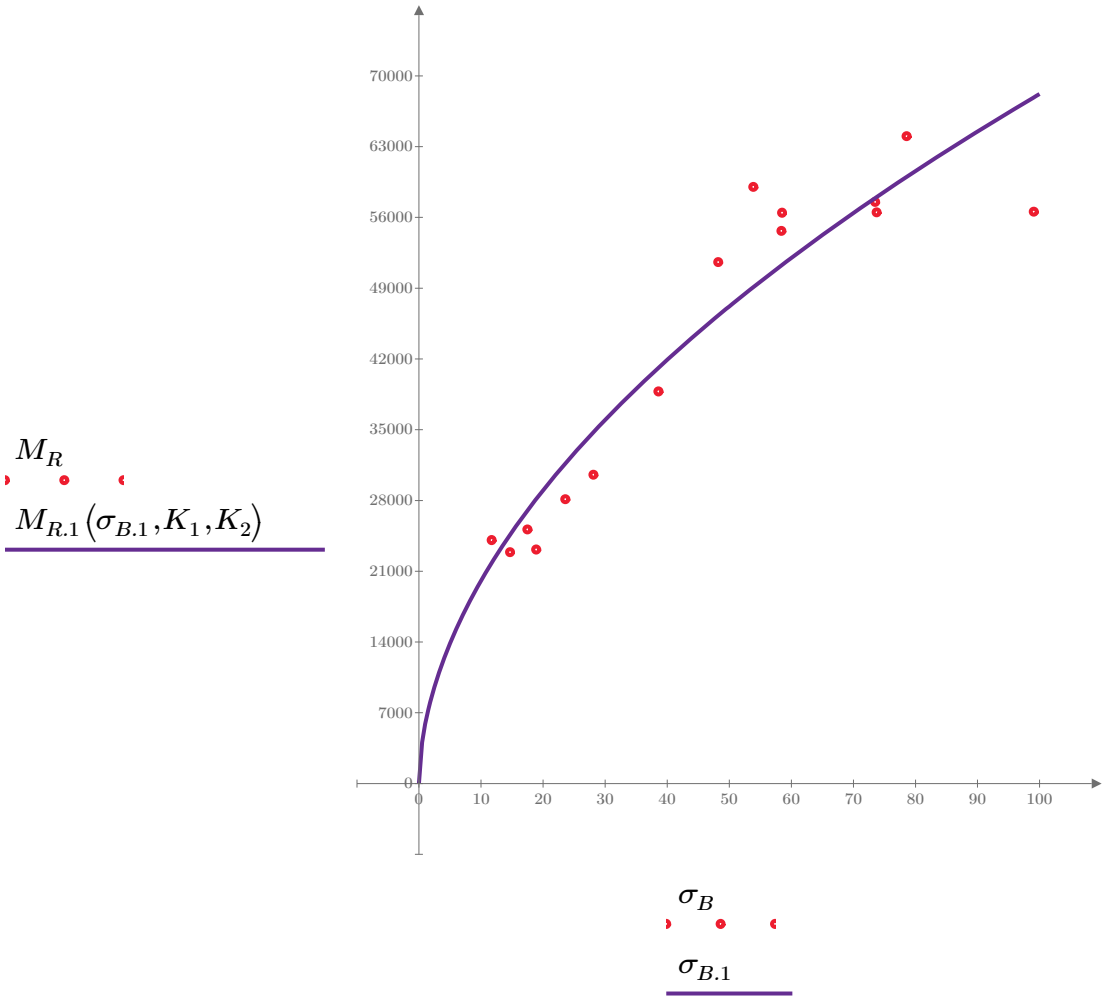

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–36”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 15823.649$

$K_4 = 0.3847$ Equation 2 fitting parameters

${R_2}^2 = 0.5579$ Coefficient of determination

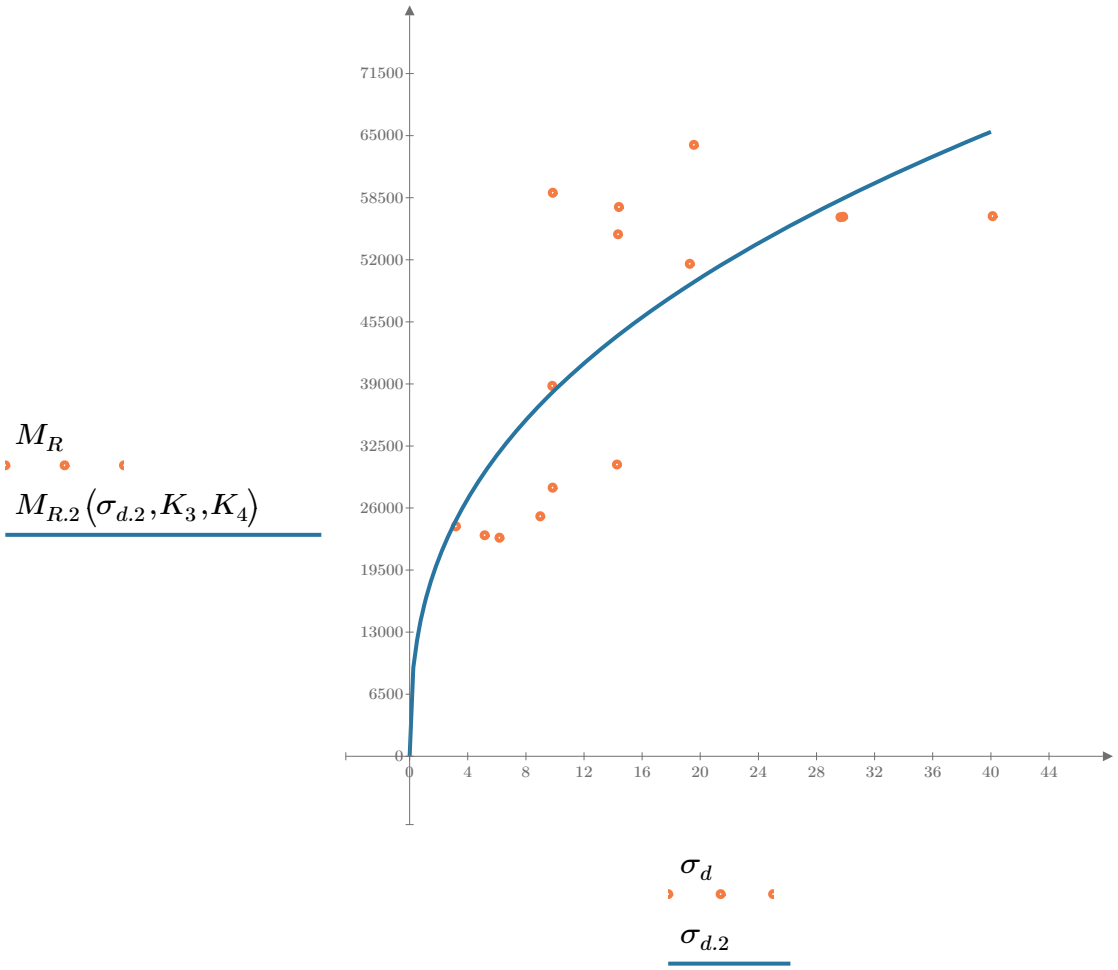

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–36”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 11191.382$

$K_6 = 0.0829$ Equation 3 fitting parameters

$K_7 = 0.485$

${R_3}^2 = 0.8949$ Coefficient of determination

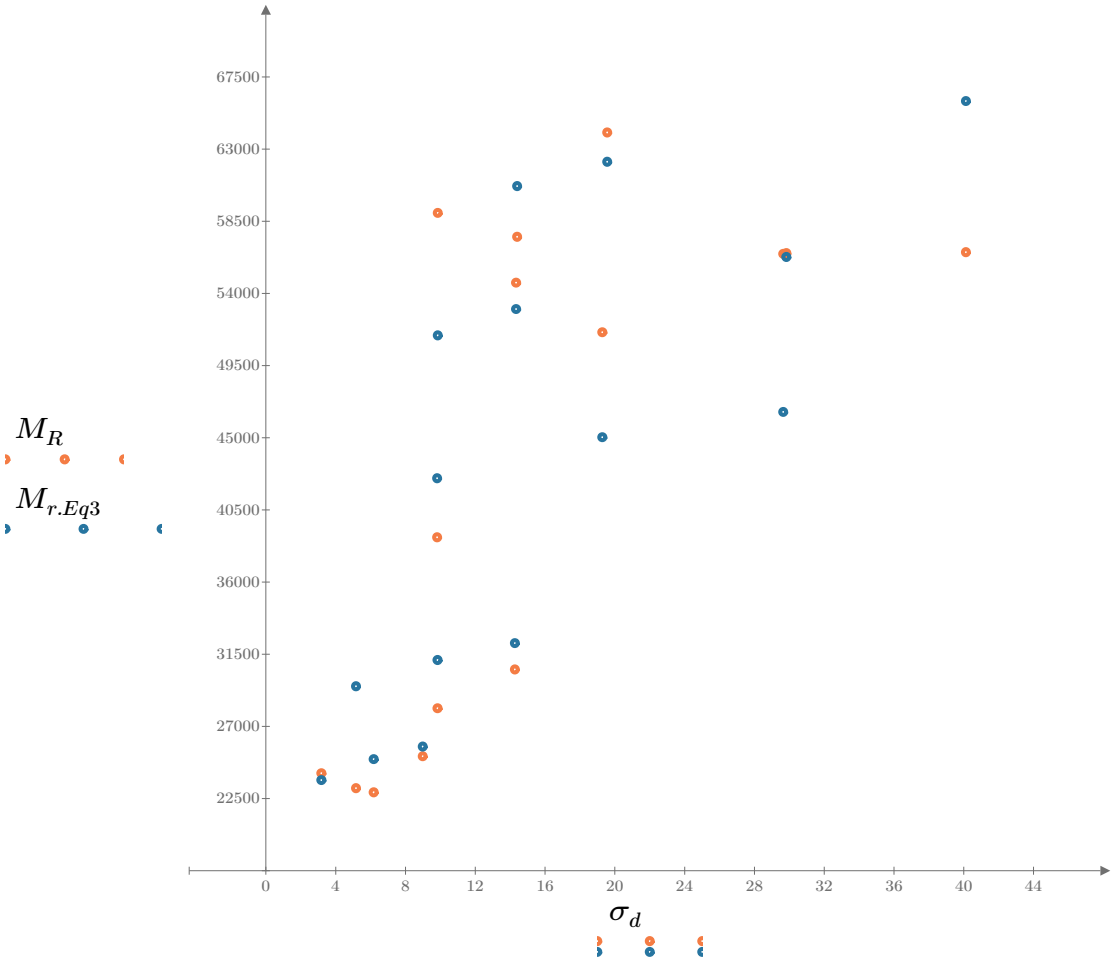

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–36”}$

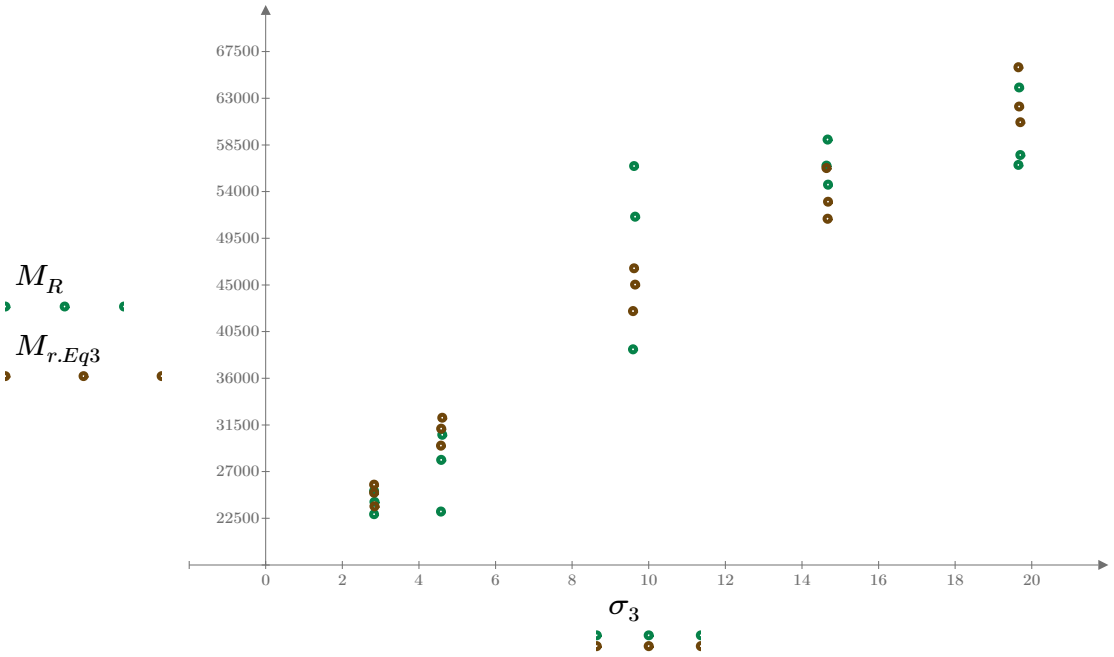

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

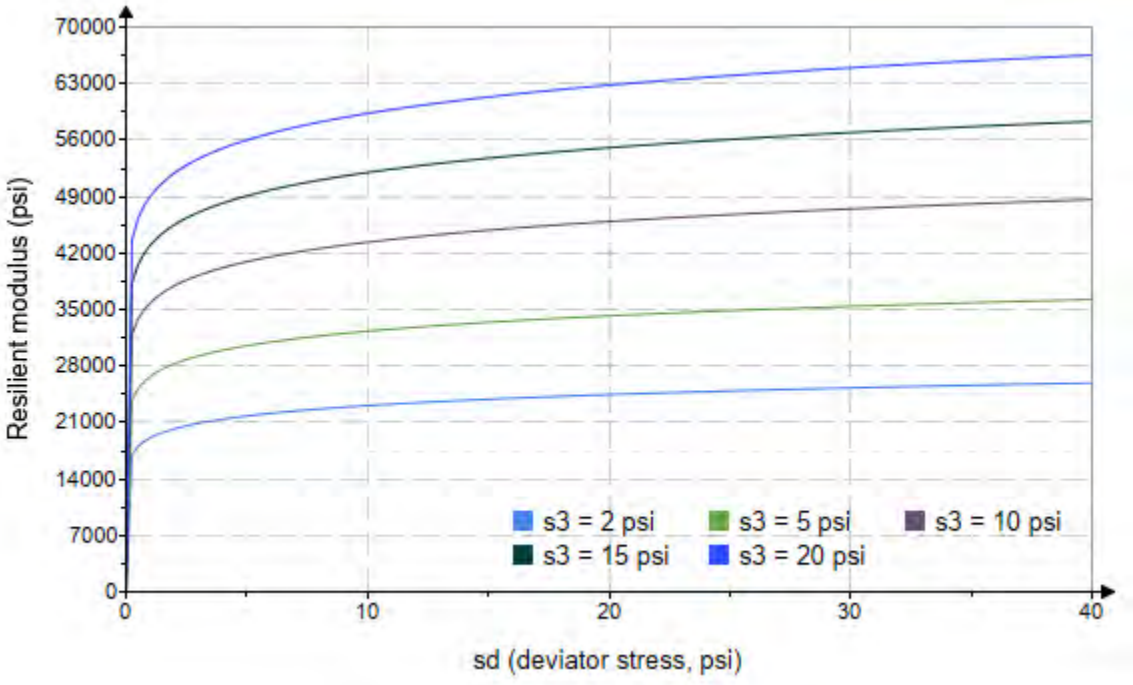

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–36”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1453.508$

$K_9 = 0.6560$ Equation 4 fitting parameters

$K_{10} = -0.1362$

$R_4^{\,2} = 0.9110$ Coefficient of determination

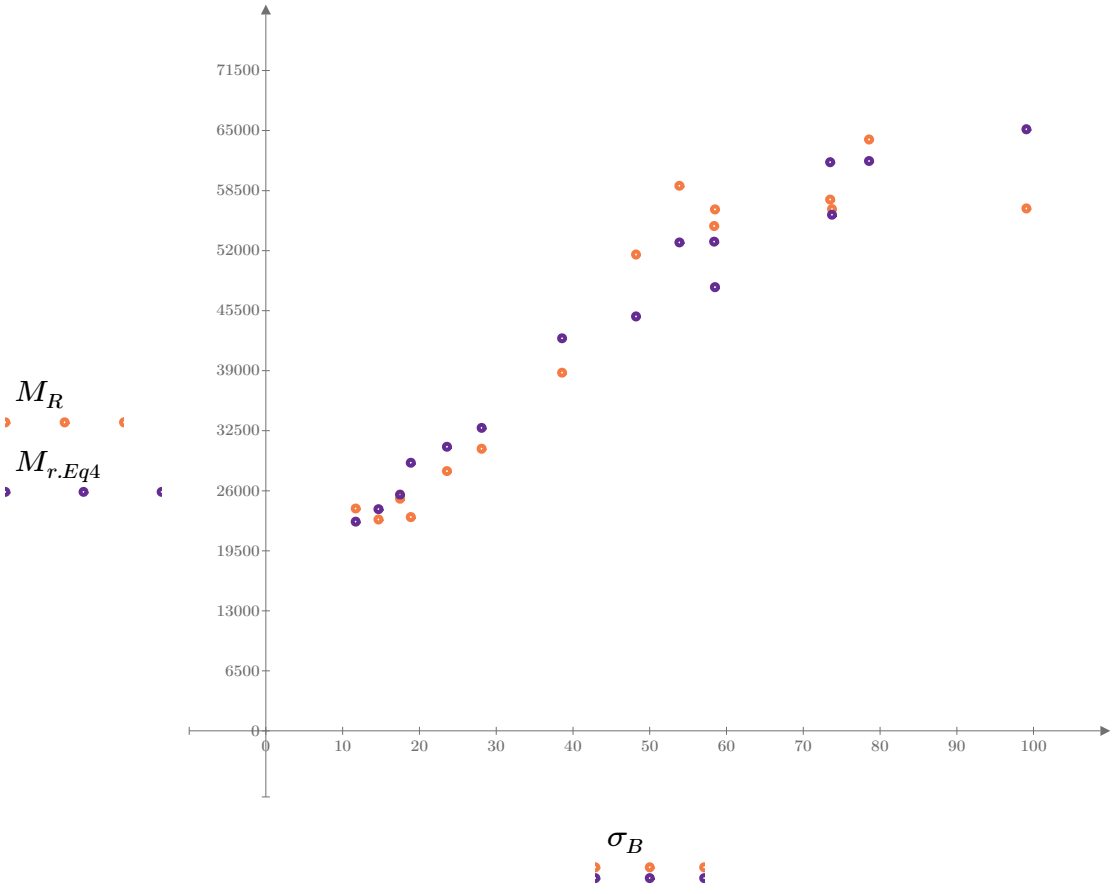

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

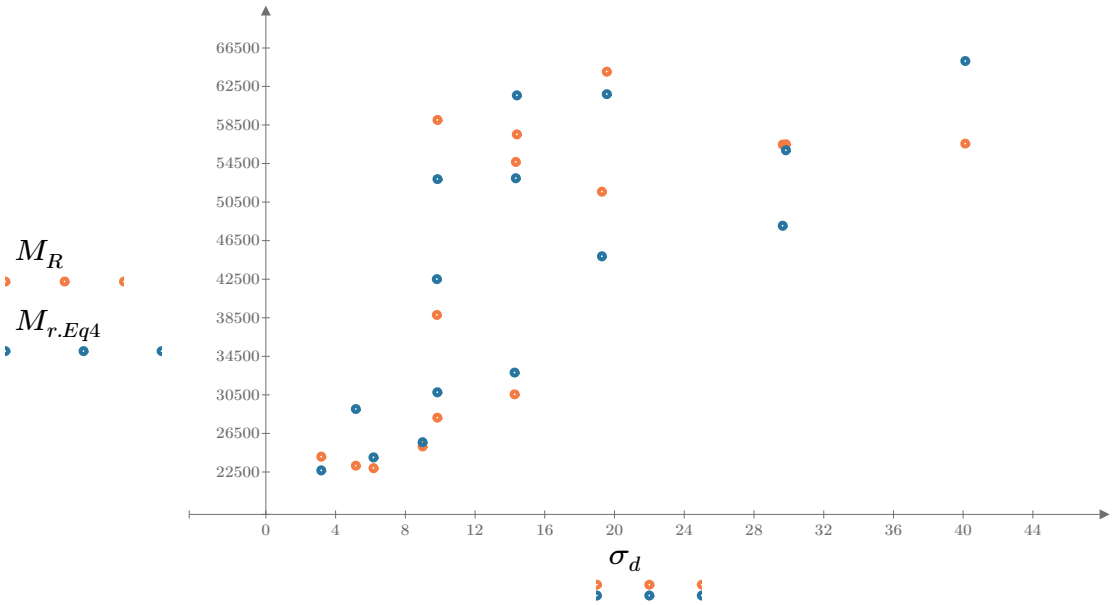

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

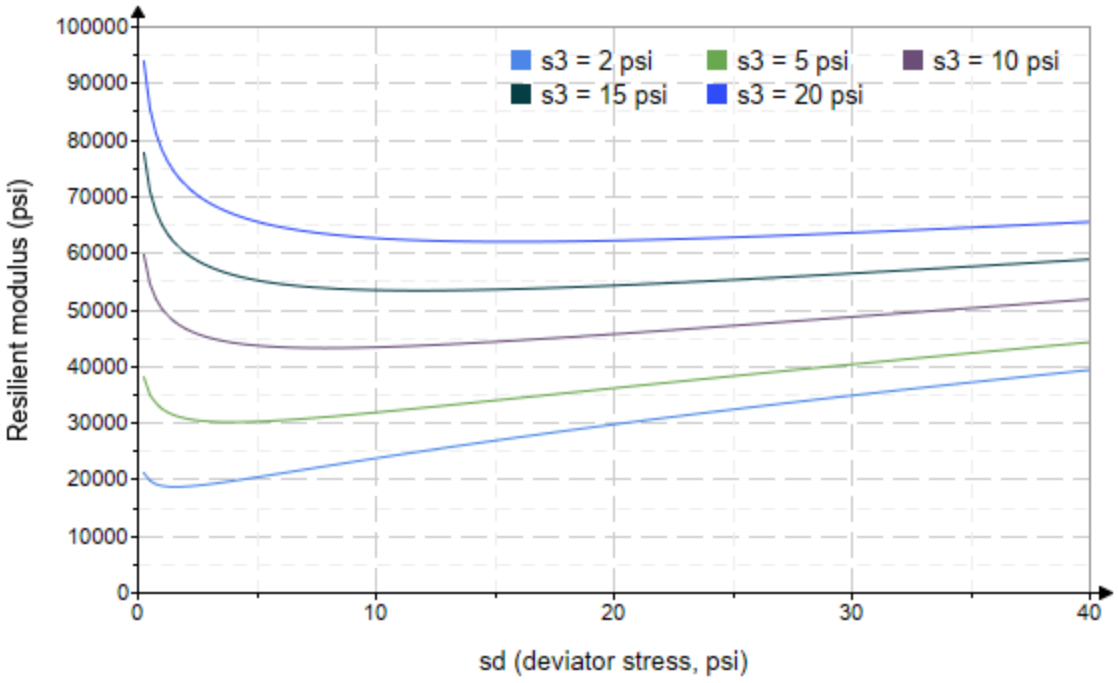

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2–37”}$

$Treatment = \text{“W1”}$

$S = 17.531$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.819 \\ 2.804 \\ 2.740 \\ 4.739 \\ 4.683 \\ 4.642 \\ 9.646 \\ 9.699 \\ 9.704 \\ 14.660 \\ 14.680 \\ 14.720 \\ 19.720 \\ 19.740 \\ 19.670 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.230 \\ 6.150 \\ 9.163 \\ 5.108 \\ 10.130 \\ 14.630 \\ 10.250 \\ 19.370 \\ 29.450 \\ 10.310 \\ 14.460 \\ 29.660 \\ 14.580 \\ 19.400 \\ 40.280 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.690 \\ 14.560 \\ 17.380 \\ 19.330 \\ 24.180 \\ 28.550 \\ 39.190 \\ 48.470 \\ 58.560 \\ 54.290 \\ 58.490 \\ 73.810 \\ 73.730 \\ 78.620 \\ 99.300 \end{bmatrix} \quad M_R = \begin{bmatrix} 22305.4 \\ 23671.0 \\ 25384.6 \\ 29025.6 \\ 31966.0 \\ 36158.0 \\ 49020.0 \\ 55733.4 \\ 57378.6 \\ 54382.6 \\ 62882.2 \\ 63626.0 \\ 61899.6 \\ 65816.4 \\ 70515.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–37”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 5812.098$

$K_2 = 0.5577$

Equation 1 fitting parameters

$R_1^2 = 0.9662$ Coefficient of determination

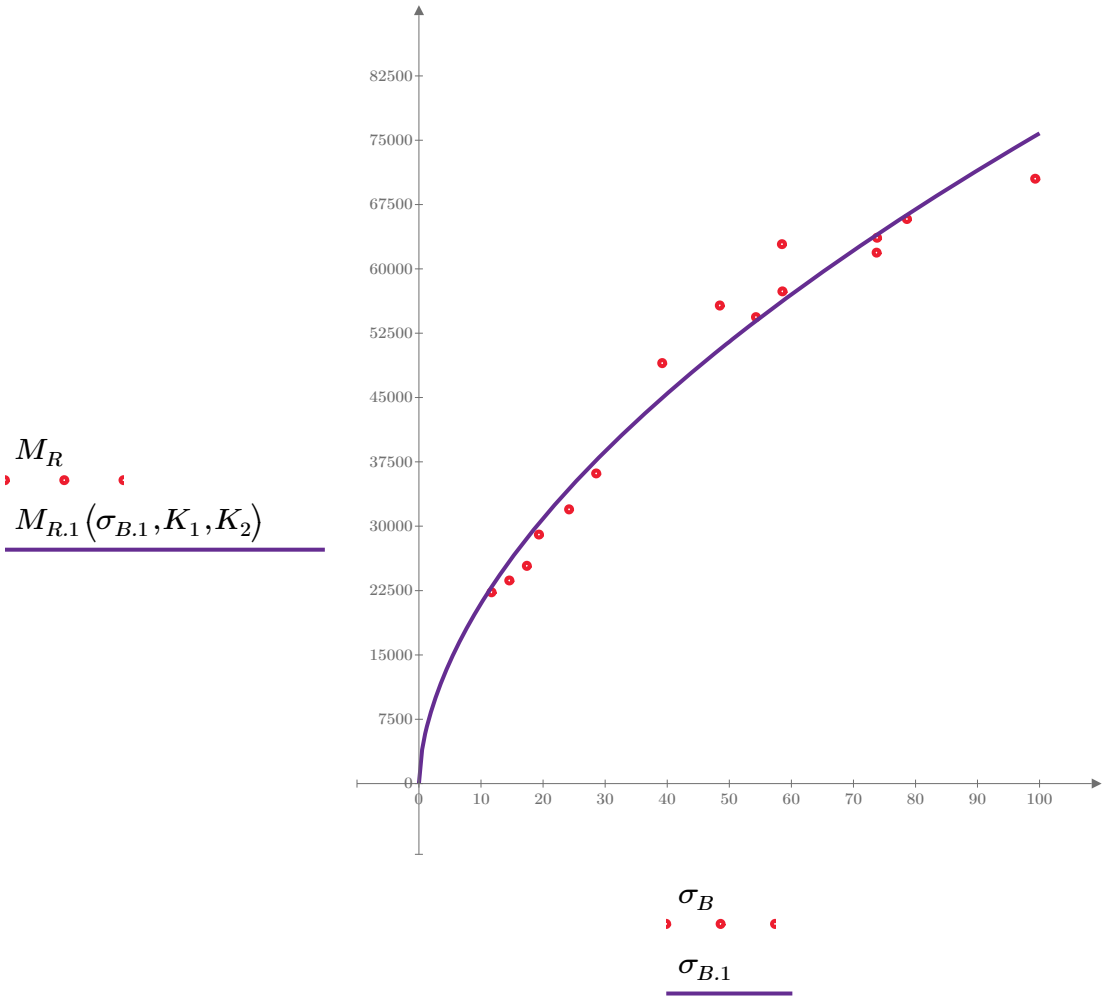

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–37”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 15313.772$

$K_4 = 0.4281$

Equation 2 fitting parameters

${R_2}^2 = 0.6723$ Coefficient of determination

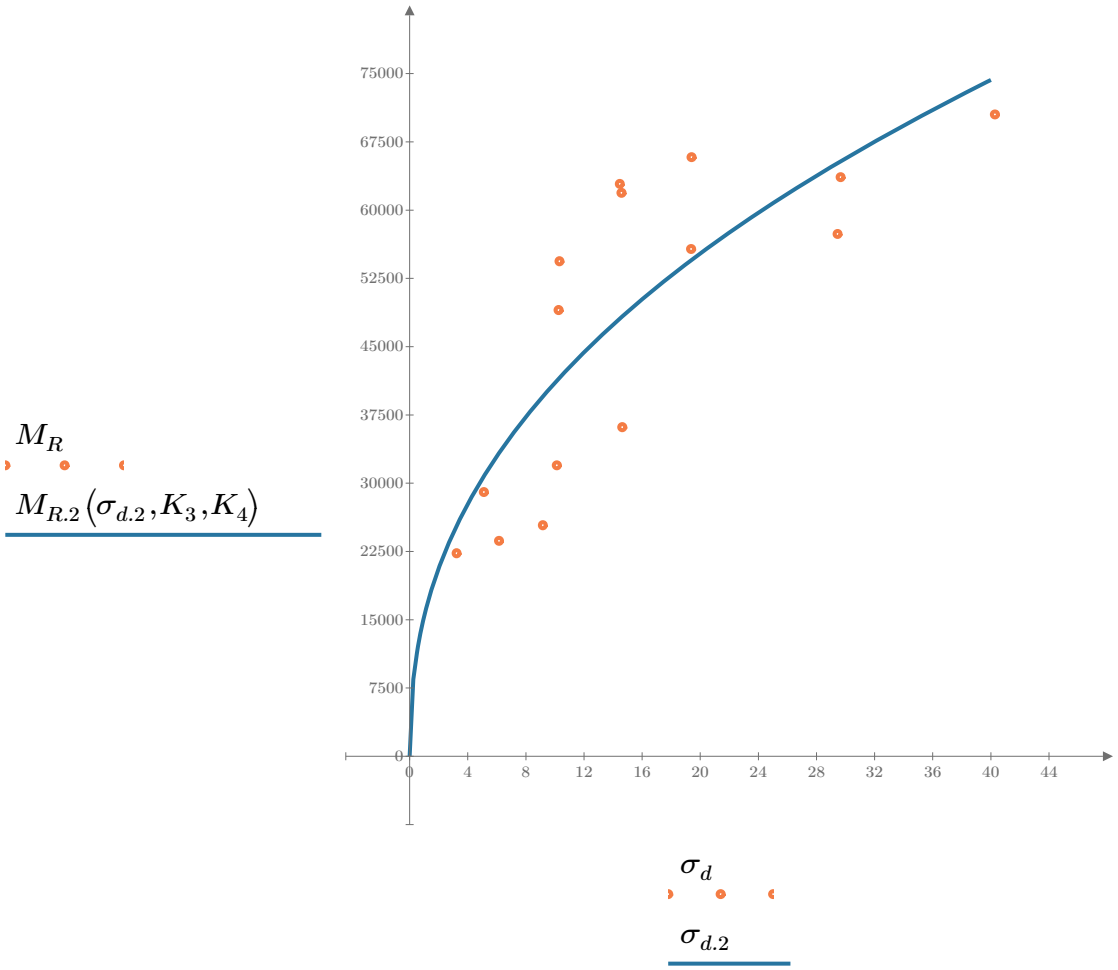

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–37”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 11083.875$

$K_6 = 0.1549$ Equation 3 fitting parameters

$K_7 = 0.4442$

${R_3}^2 = 0.9637$ Coefficient of determination

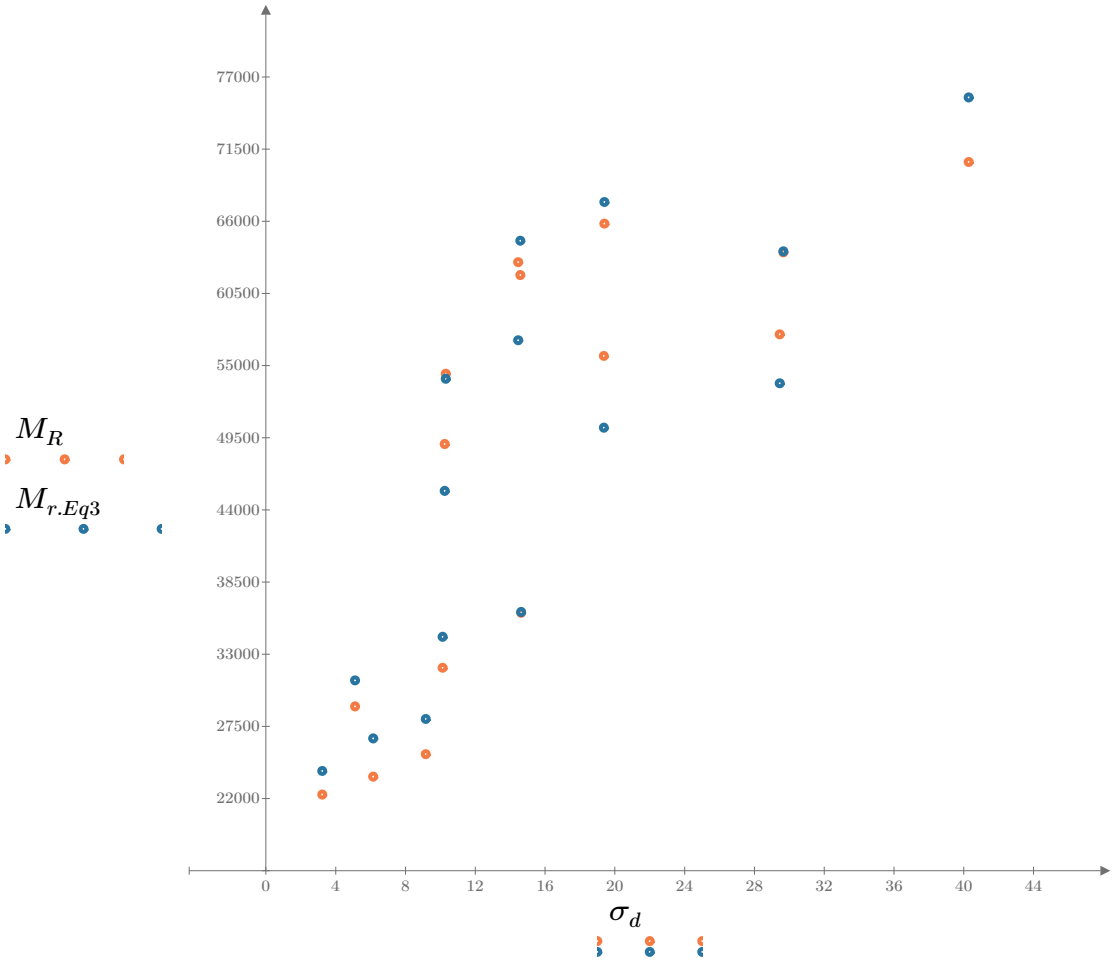

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-37\text{”}$

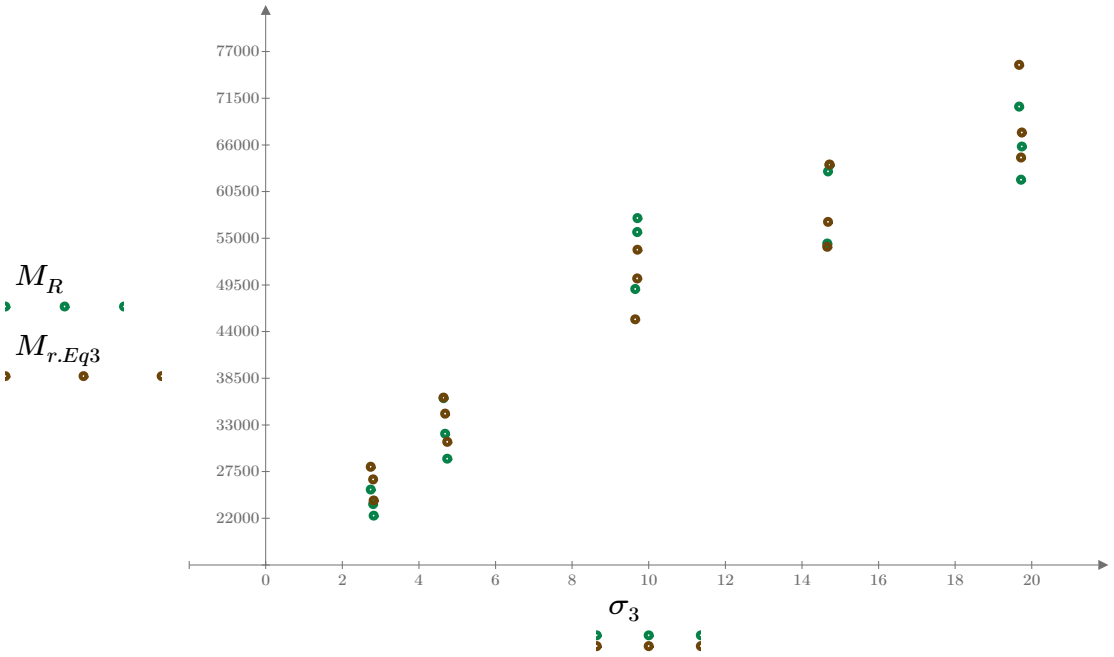

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

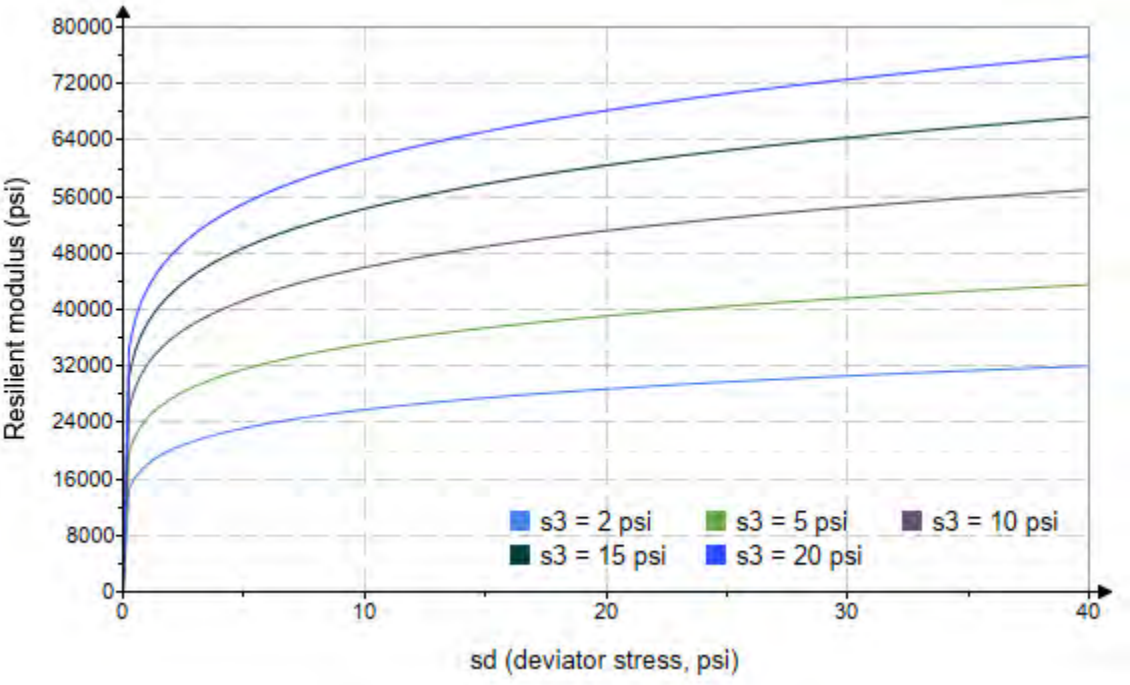

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–37”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1694.787$

$K_9 = 0.5965$ Equation 4 fitting parameters

$K_{10} = -0.0429$

$R_4^{\,2} = 0.9681$ Coefficient of determination

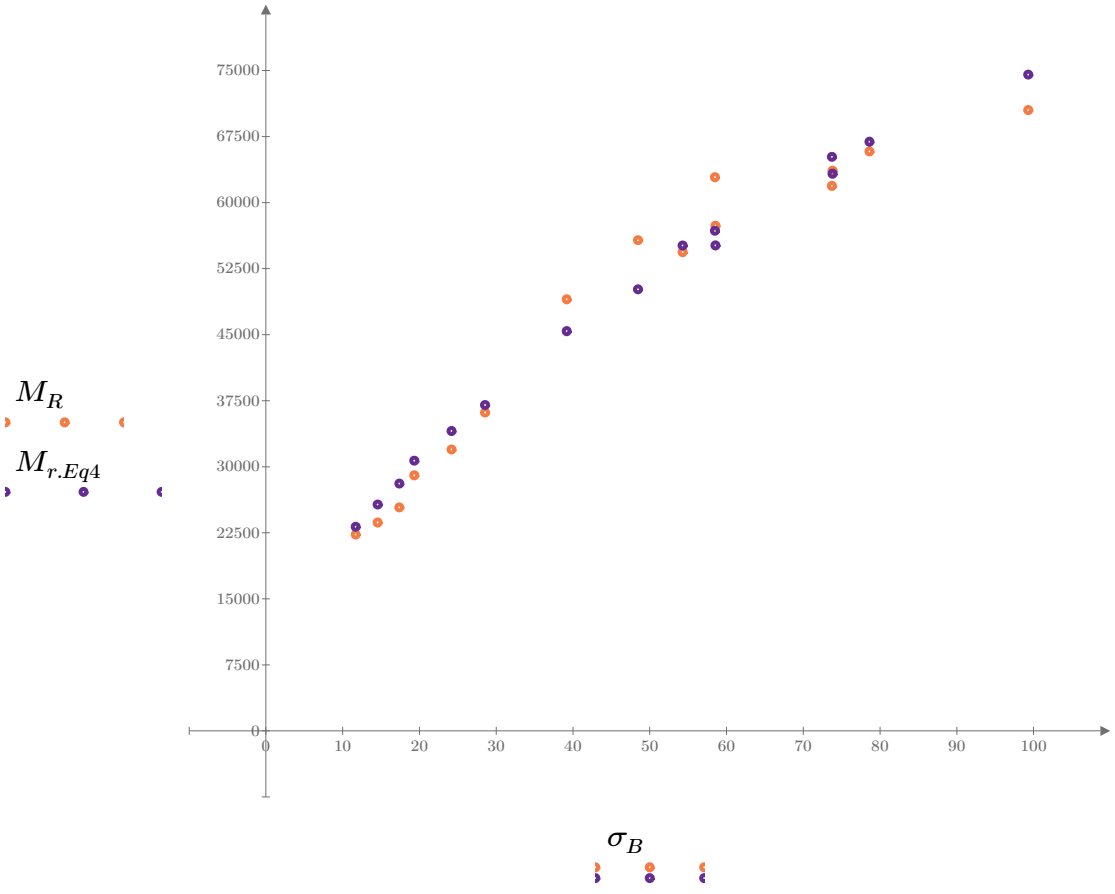

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

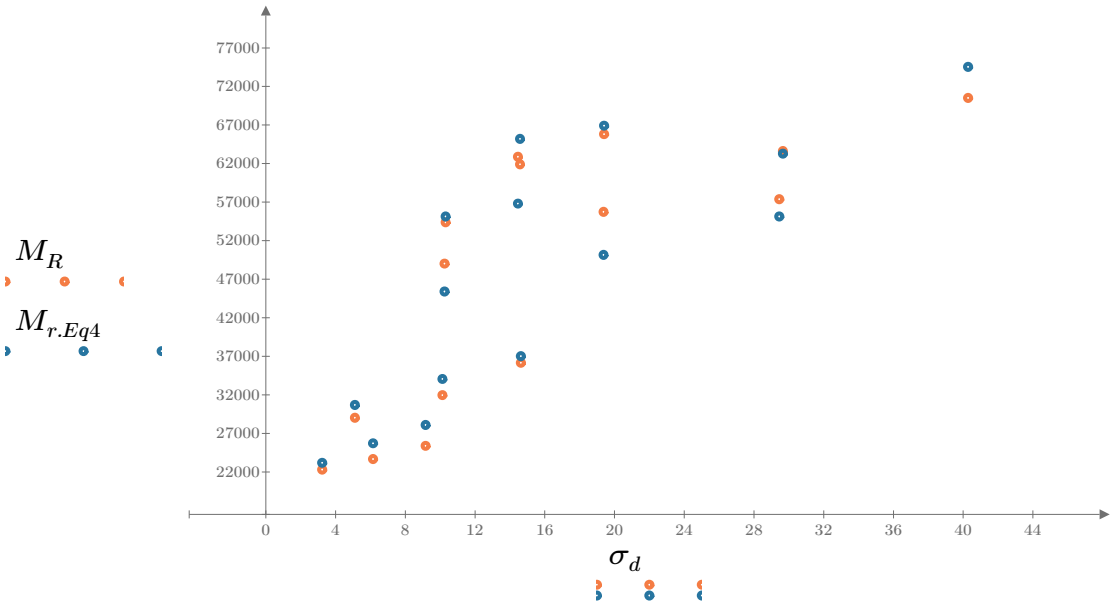

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

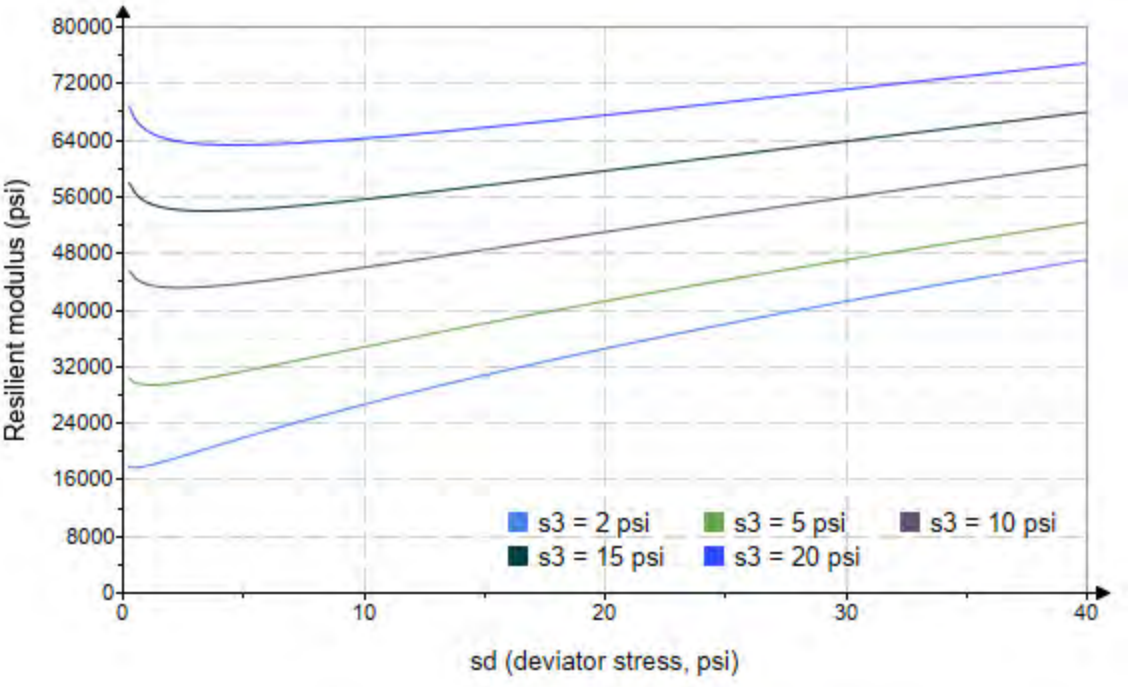

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2–38”}$

$Treatment = \text{“W1”}$

$S = 18.374$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 1.757 \\ 2.213 \\ 2.196 \\ 3.518 \\ 3.460 \\ 4.310 \\ 9.280 \\ 9.032 \\ 8.727 \\ 14.560 \\ 14.140 \\ 13.600 \\ 19.030 \\ 18.520 \\ 18.570 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.498 \\ 6.077 \\ 8.966 \\ 5.330 \\ 9.951 \\ 14.440 \\ 10.010 \\ 19.400 \\ 29.460 \\ 10.370 \\ 14.340 \\ 29.670 \\ 14.430 \\ 19.660 \\ 39.980 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 8.768 \\ 12.720 \\ 15.550 \\ 15.880 \\ 20.330 \\ 27.370 \\ 37.850 \\ 46.500 \\ 55.640 \\ 54.050 \\ 56.750 \\ 70.460 \\ 71.530 \\ 75.230 \\ 95.680 \end{bmatrix} \quad M_R = \begin{bmatrix} 298838.0 \\ 73173.0 \\ 57382.6 \\ 266094.0 \\ 83559.2 \\ 48422.0 \\ 168572.0 \\ 64701.2 \\ 61450.6 \\ 228946.0 \\ 152390.0 \\ 87443.2 \\ 244658.0 \\ 157838.0 \\ 88756.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–38”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 237914.018$

$K_2 = -0.1532$

Equation 1 fitting parameters

$R_1^2 = 0.0308$ Coefficient of determination

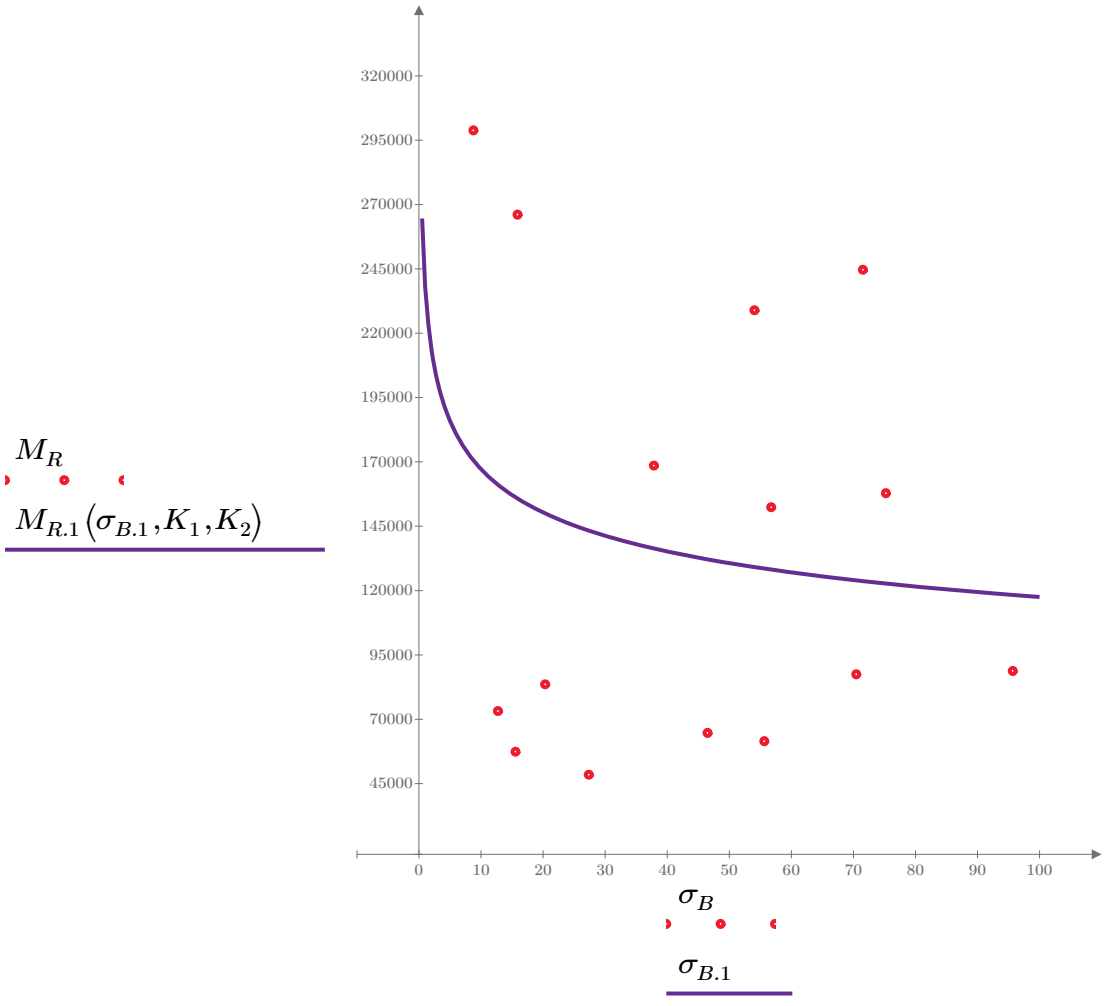

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–38”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 504209.829$

$K_4 = -0.5315$ Equation 2 fitting parameters

${R_2}^2 = 0.3326$ Coefficient of determination

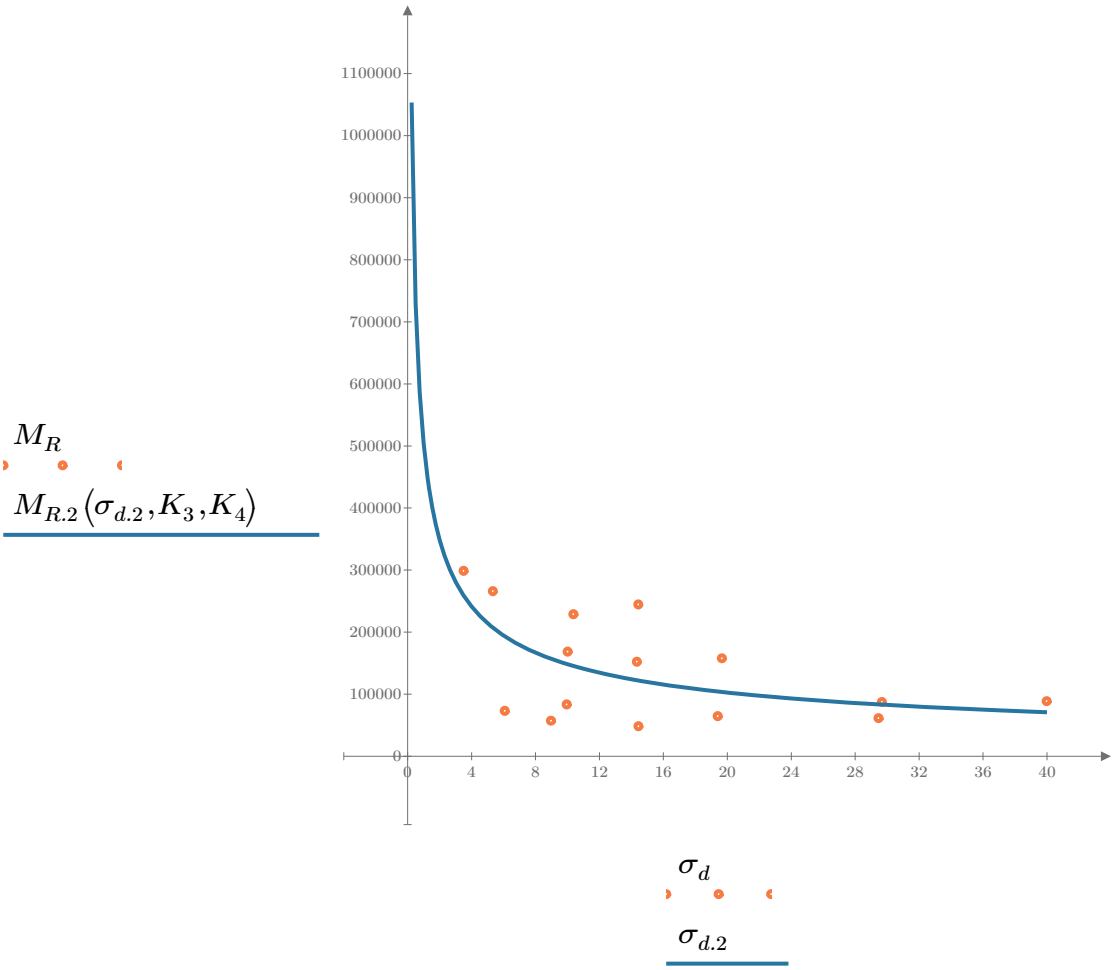

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–38”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 659695.918$

$K_6 = -1.4553$ Equation 3 fitting parameters

$K_7 = 0.9155$

${R_3}^2 = 0.8536$ Coefficient of determination

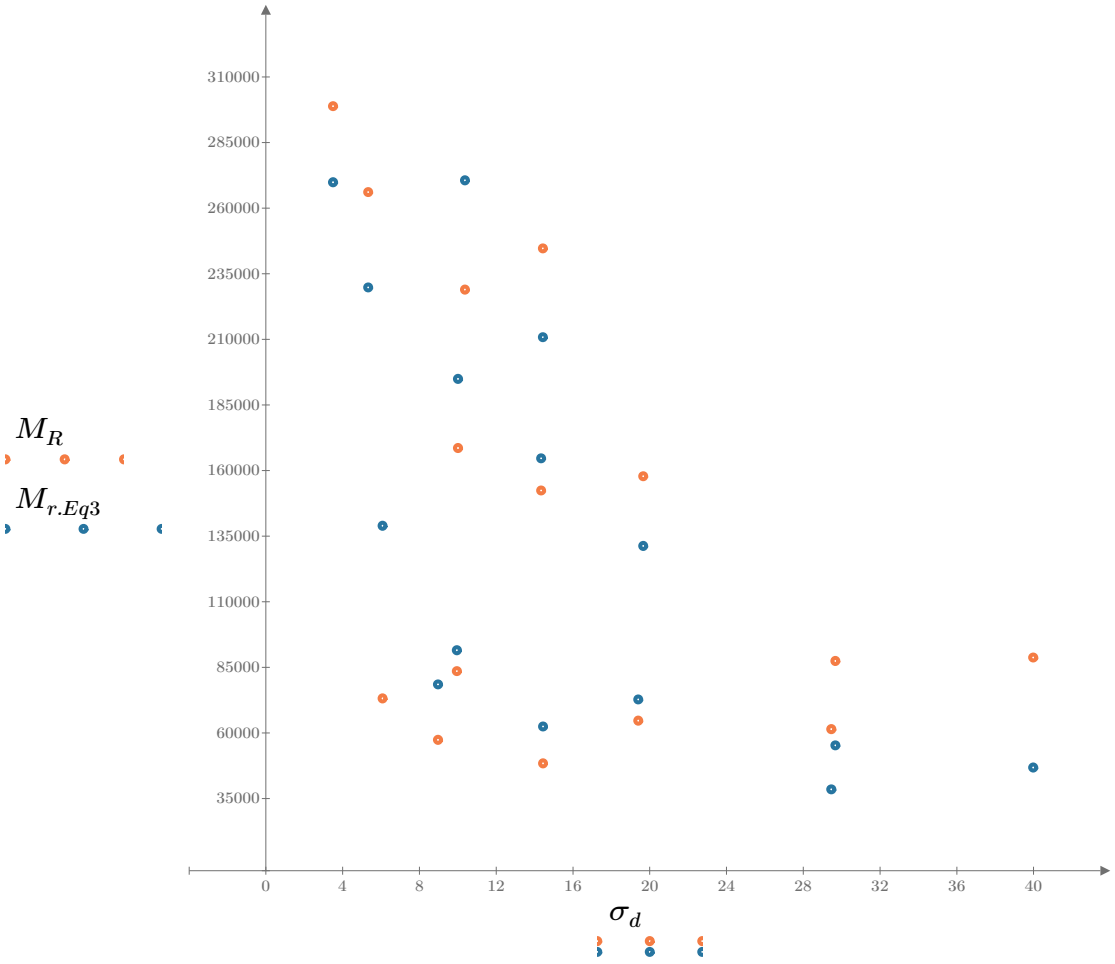

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

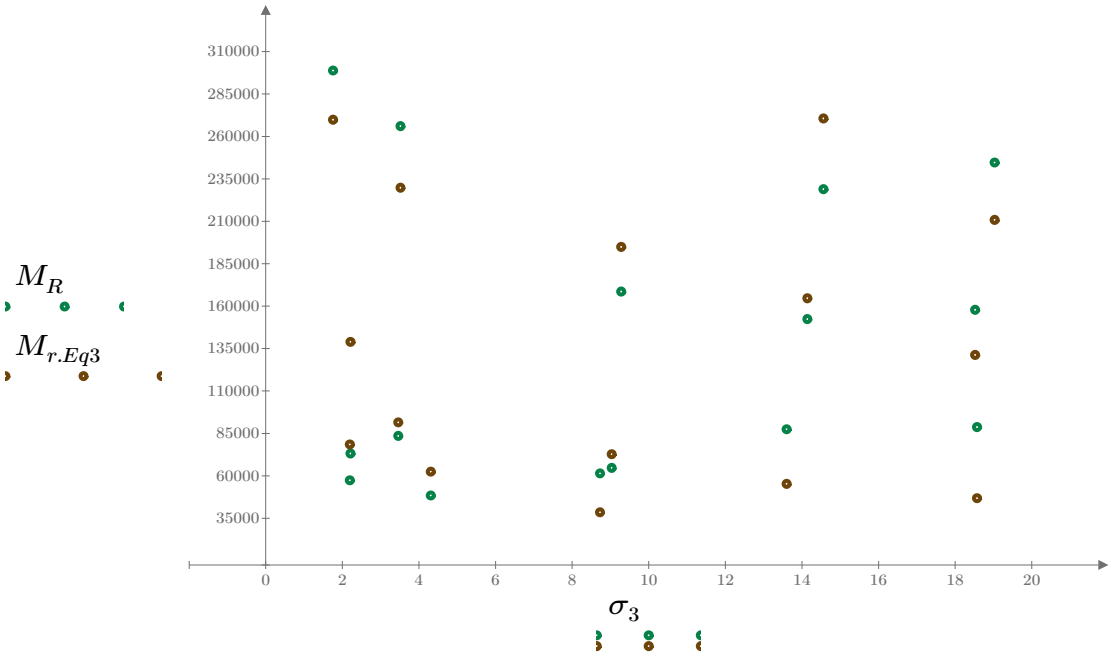

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

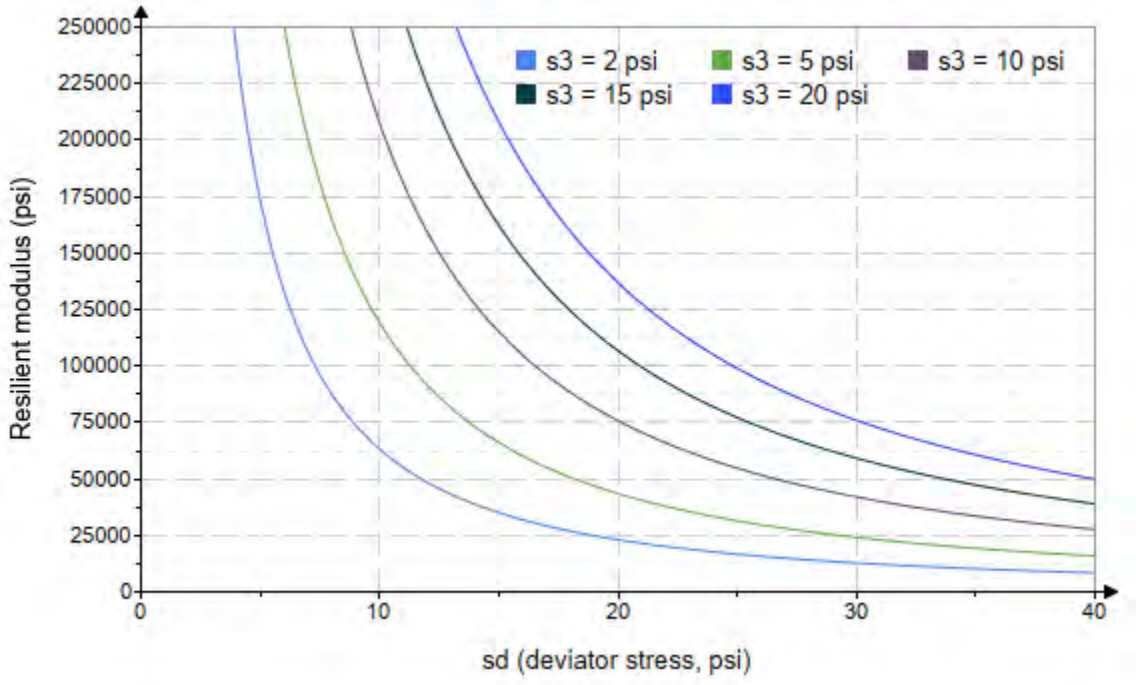

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–38”}$

$$M_{R.4}(\sigma_B, \sigma_d, K_8, K_9, K_{10}) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2227.866$

$K_9 = 1.1360$ Equation 4 fitting parameters

$K_{10} = -1.854$

$R_4^{\,2} = 0.8212$ Coefficient of determination

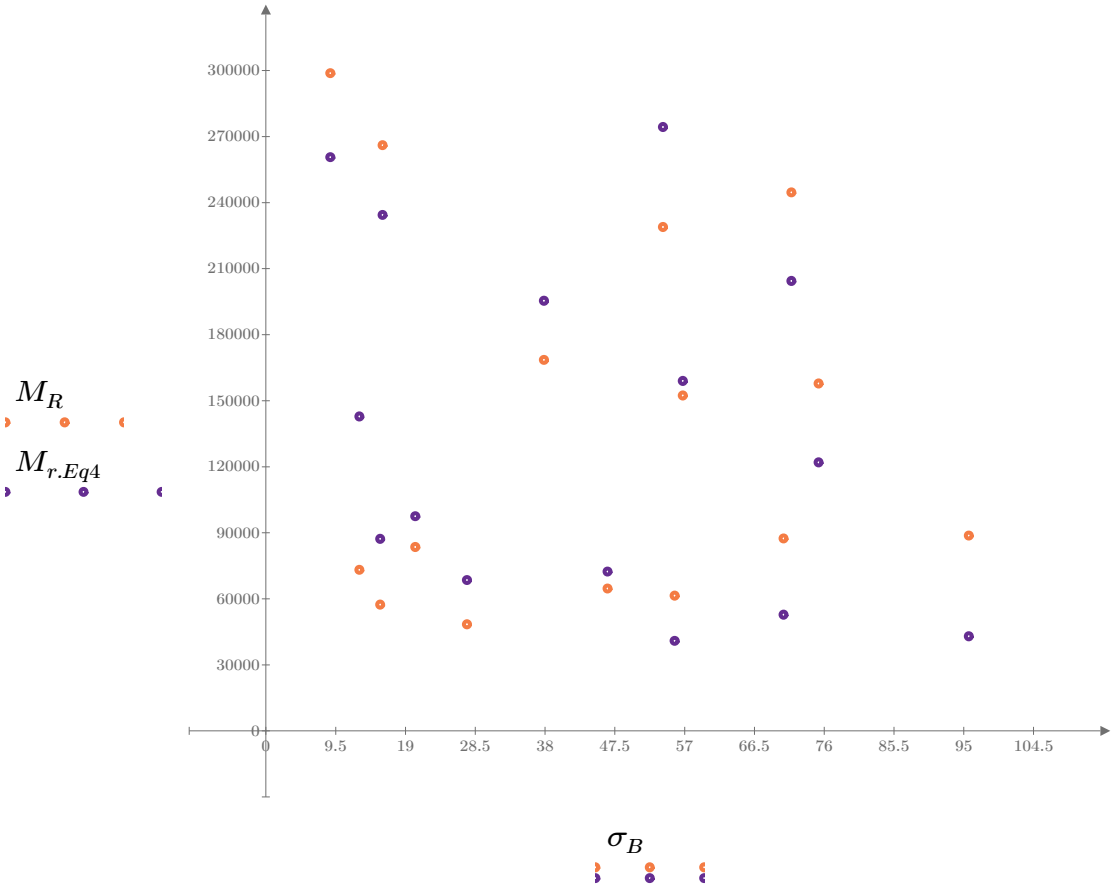

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

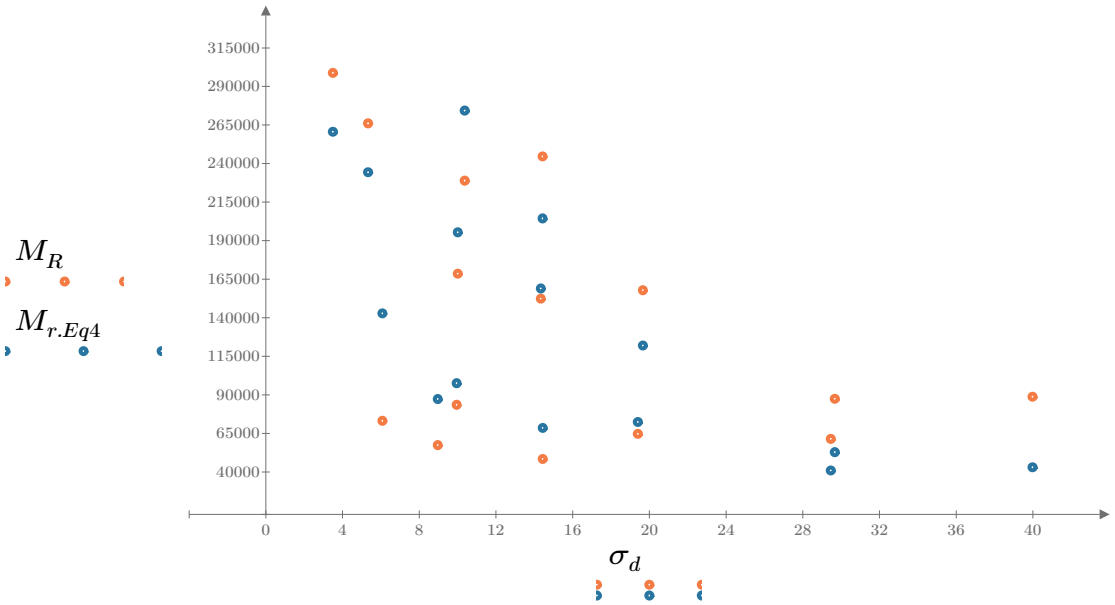

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

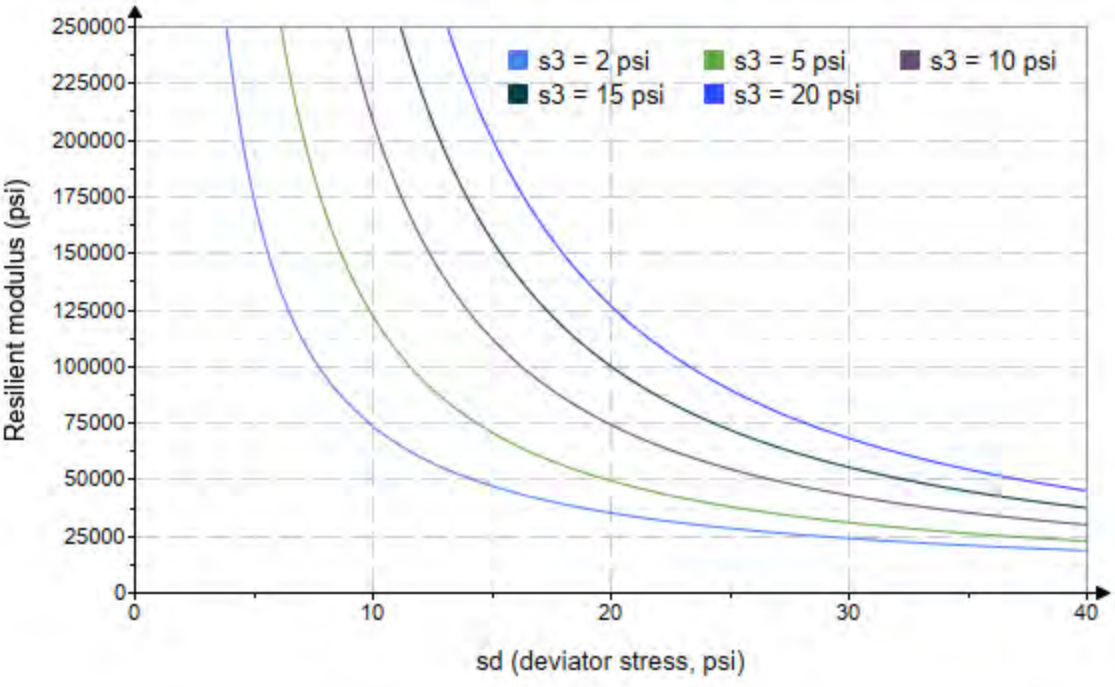

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−39"

$Treatment =$ "W1"

$S = 20.368$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.770 \\ 2.814 \\ 2.787 \\ 4.733 \\ 4.702 \\ 4.655 \\ 9.725 \\ 9.645 \\ 9.688 \\ 14.700 \\ 14.670 \\ 14.700 \\ 19.680 \\ 19.720 \\ 19.680 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.142 \\ 6.140 \\ 9.031 \\ 5.089 \\ 10.020 \\ 14.540 \\ 10.110 \\ 19.380 \\ 29.630 \\ 9.930 \\ 14.480 \\ 29.860 \\ 14.650 \\ 19.460 \\ 40.330 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.450 \\ 14.580 \\ 17.390 \\ 19.290 \\ 24.120 \\ 28.510 \\ 39.280 \\ 48.310 \\ 58.690 \\ 54.040 \\ 58.490 \\ 73.970 \\ 73.700 \\ 78.610 \\ 99.360 \end{bmatrix} \quad M_R = \begin{bmatrix} 36435.6 \\ 32917.4 \\ 35084.8 \\ 37438.8 \\ 36983.6 \\ 40088.4 \\ 42016.0 \\ 45775.8 \\ 50982.2 \\ 60913.8 \\ 51542.8 \\ 54494.4 \\ 53639.4 \\ 58849.4 \\ 57514.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–39”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 15664.270$

$K_2 = 0.2921$

Equation 1 fitting parameters

${R_1}^2 = 0.8563$ Coefficient of determination

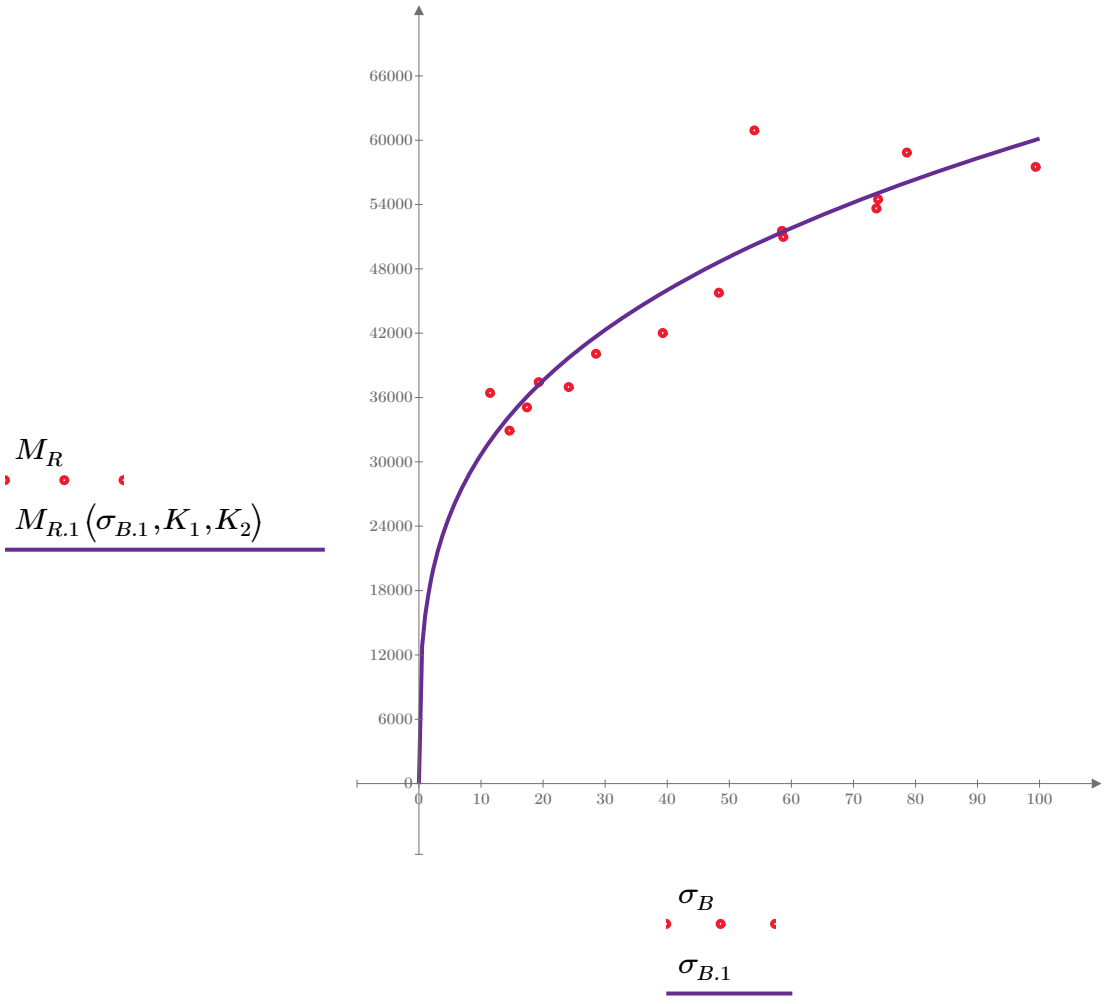

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–39”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot \sigma_d^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 27055.894$

$K_4 = 0.2076$ Equation 2 fitting parameters

$R_2^2 = 0.4788$ Coefficient of determination

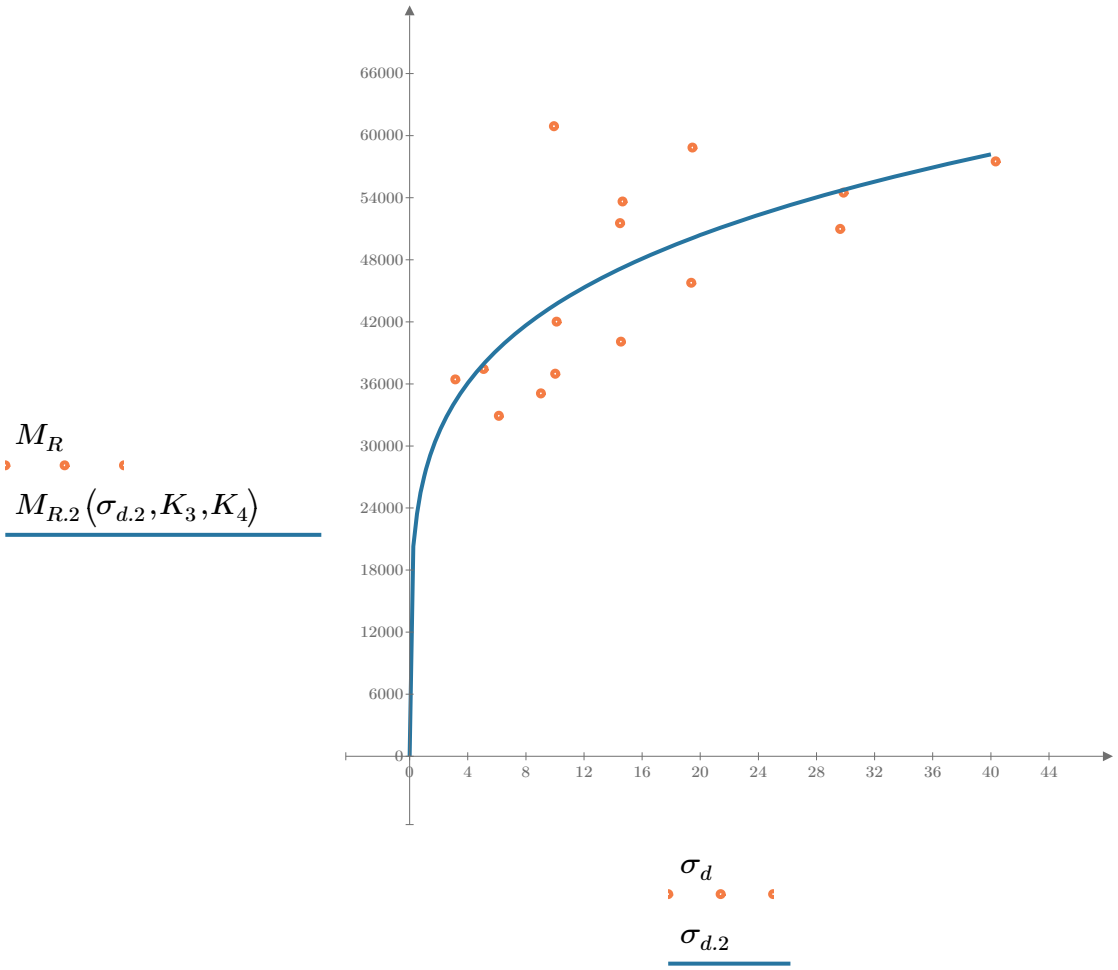

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–39”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 22469.869$

$K_6 = 0.0121$ Equation 3 fitting parameters

$K_7 = 0.3002$

${R_3}^2 = 0.8907$ Coefficient of determination

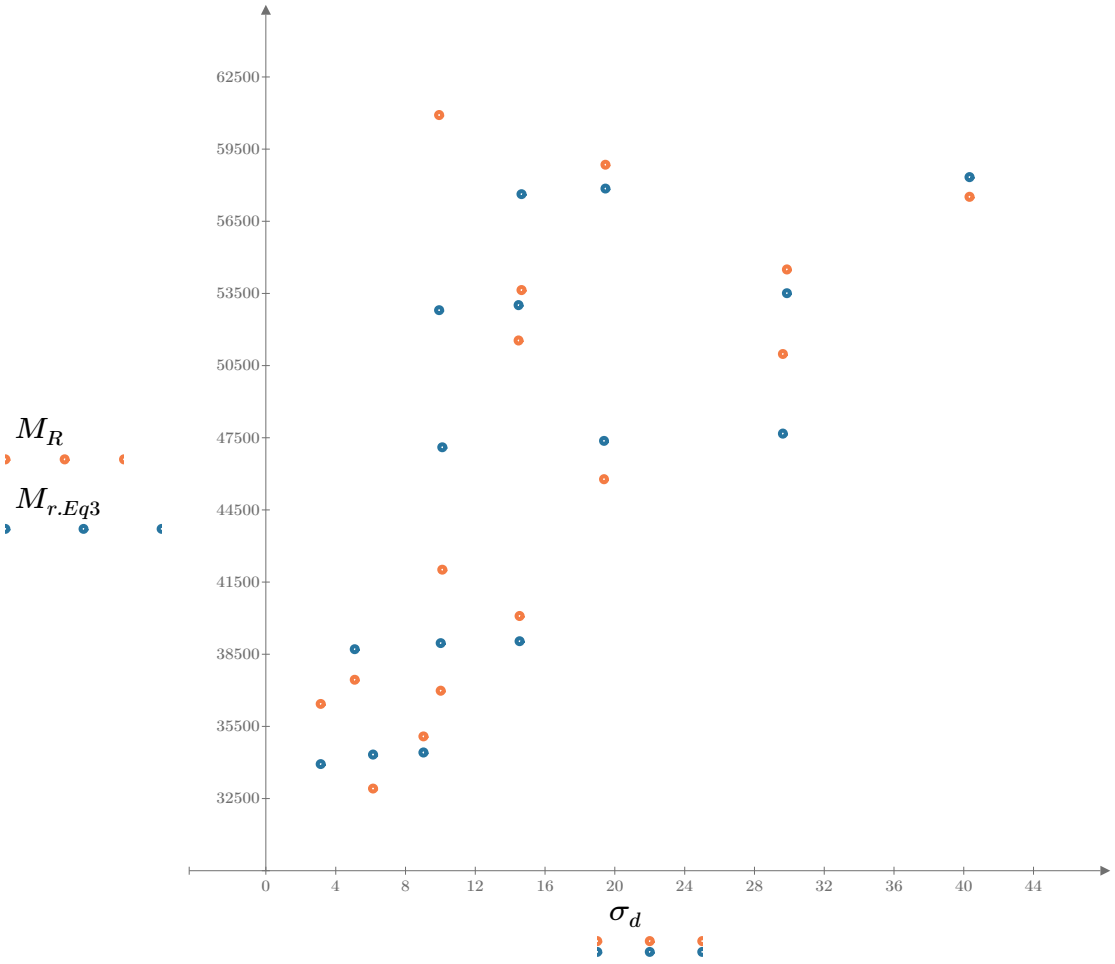

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-39\text{”}$

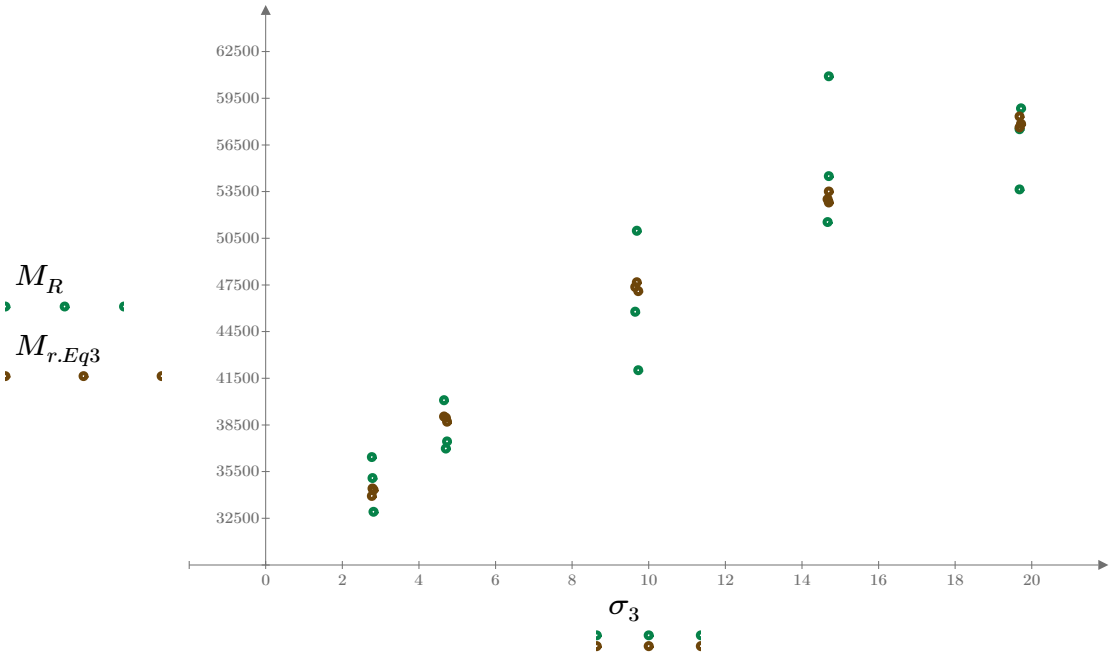

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

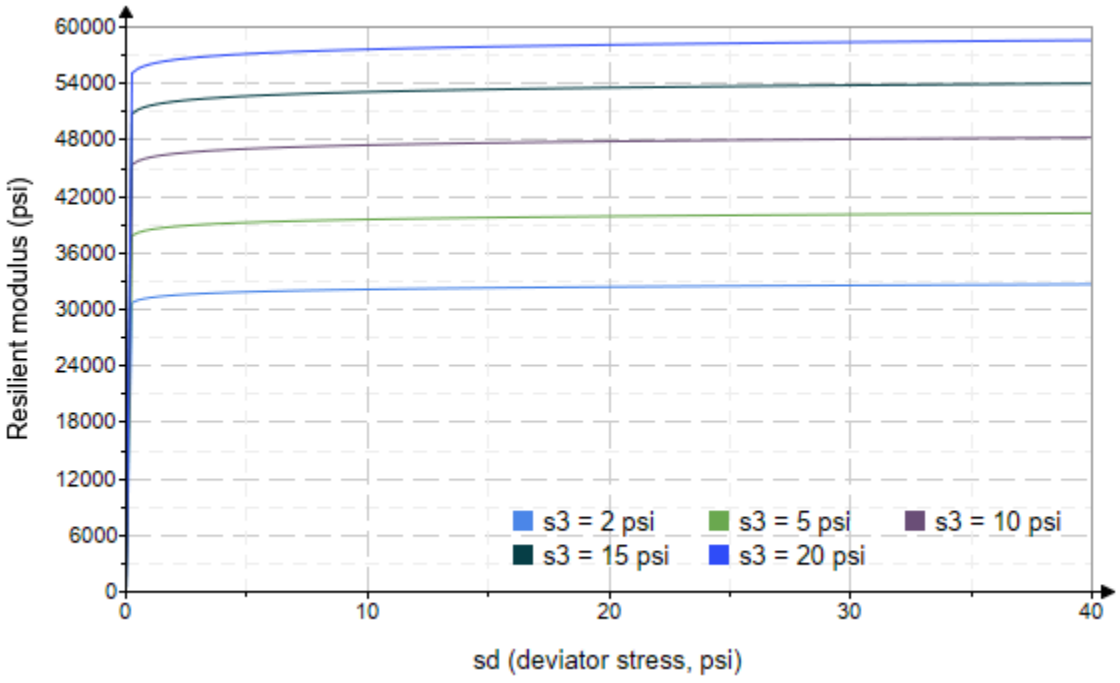

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–39”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2062.977$

$K_9 = 0.4025$ Equation 4 fitting parameters

$K_{10} = -0.1254$

$R_4^{\,2} = 0.9015$ Coefficient of determination

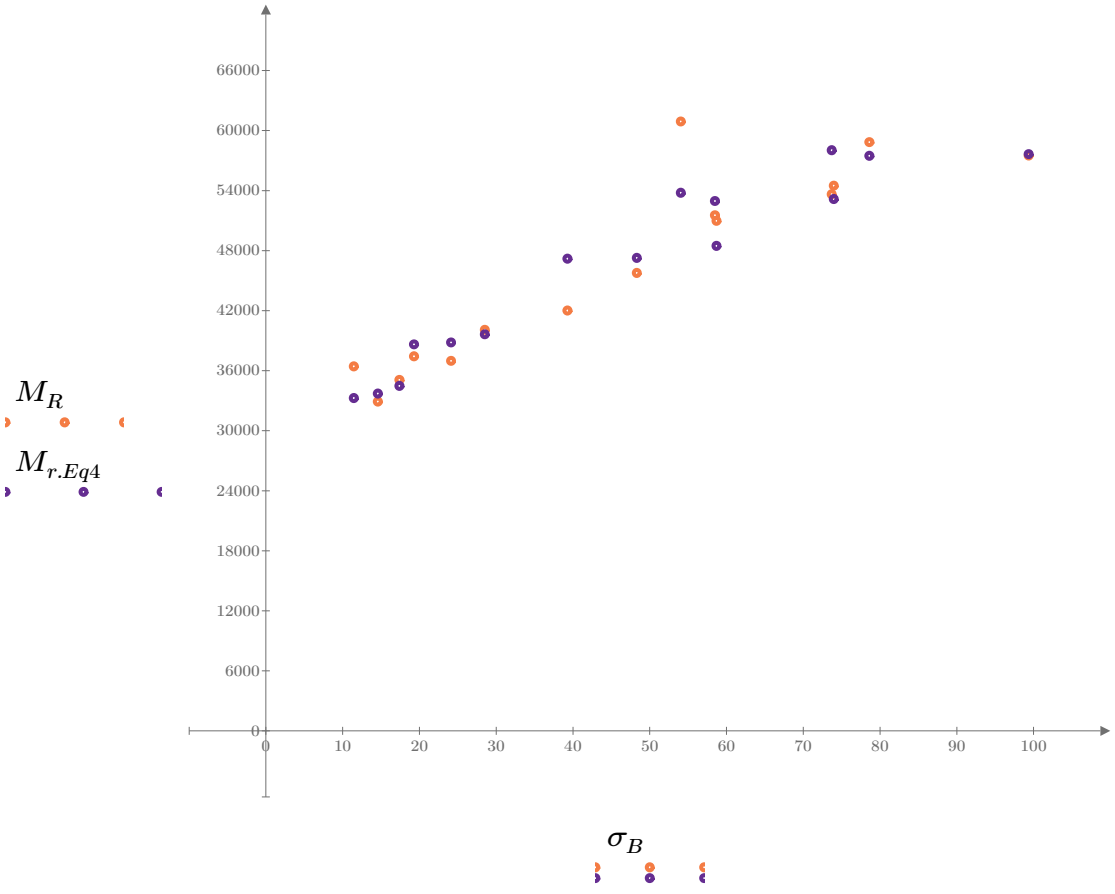

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

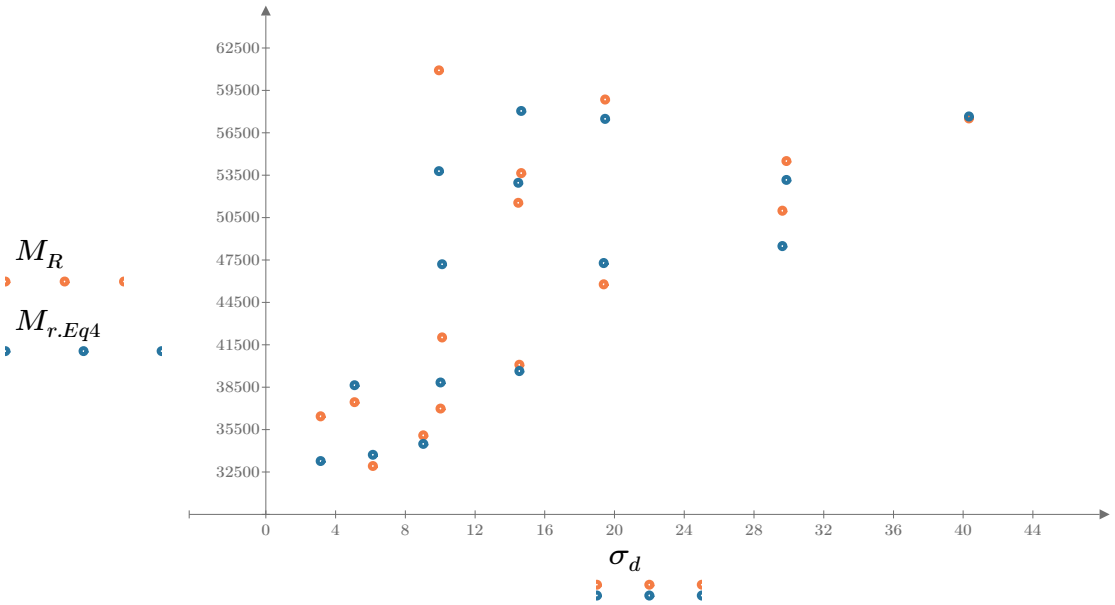

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

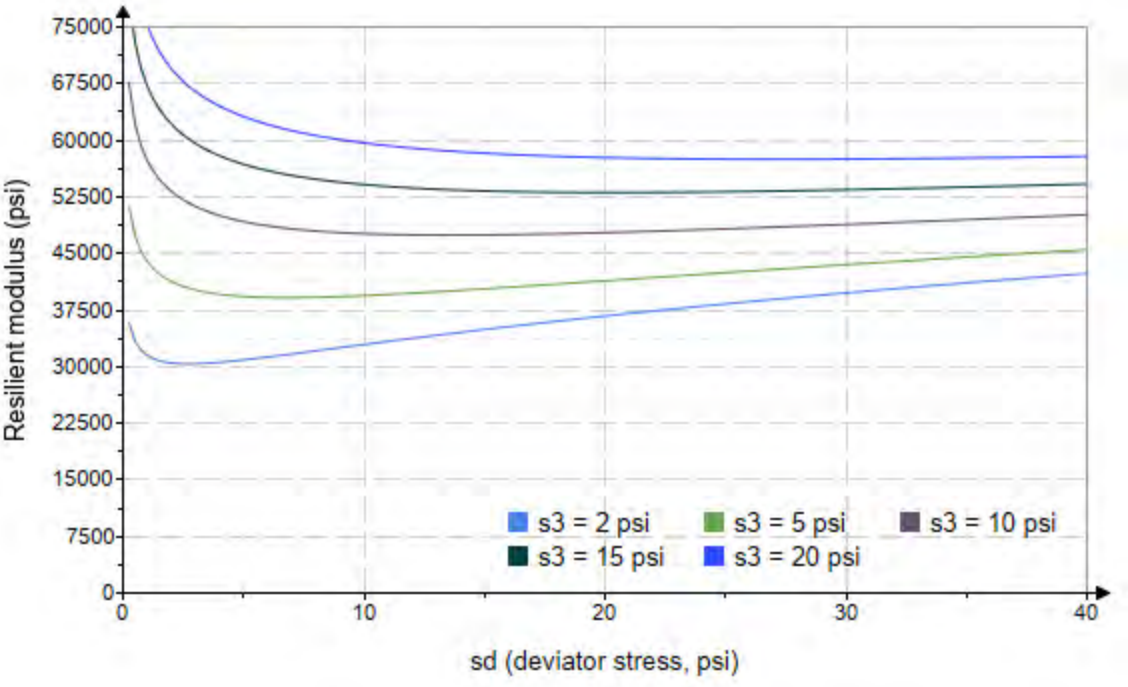

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{40”}$

$Treatment = \text{“W1”}$

$S = 19.438$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.193 \\ 2.391 \\ 2.402 \\ 3.935 \\ 4.131 \\ 4.413 \\ 9.117 \\ 9.327 \\ 8.729 \\ 14.430 \\ 14.770 \\ 13.990 \\ 19.370 \\ 19.120 \\ 19.280 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.160 \\ 6.235 \\ 9.079 \\ 5.186 \\ 9.994 \\ 14.480 \\ 10.100 \\ 19.260 \\ 29.490 \\ 10.210 \\ 14.440 \\ 29.770 \\ 14.610 \\ 19.600 \\ 39.850 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 9.740 \\ 13.410 \\ 16.290 \\ 16.990 \\ 22.390 \\ 27.720 \\ 37.450 \\ 47.240 \\ 55.680 \\ 53.490 \\ 58.750 \\ 71.730 \\ 72.710 \\ 76.950 \\ 97.700 \end{bmatrix} \quad M_R = \begin{bmatrix} 46049.8 \\ 34415.6 \\ 36513.2 \\ 51752.0 \\ 44696.2 \\ 43596.0 \\ 50220.0 \\ 49867.6 \\ 49710.6 \\ 60581.8 \\ 58453.4 \\ 54938.2 \\ 58227.0 \\ 58918.6 \\ 57557.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–40”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 25729.834$

$K_2 = 0.1844$

Equation 1 fitting parameters

$R_1^2 = 0.6438$ Coefficient of determination

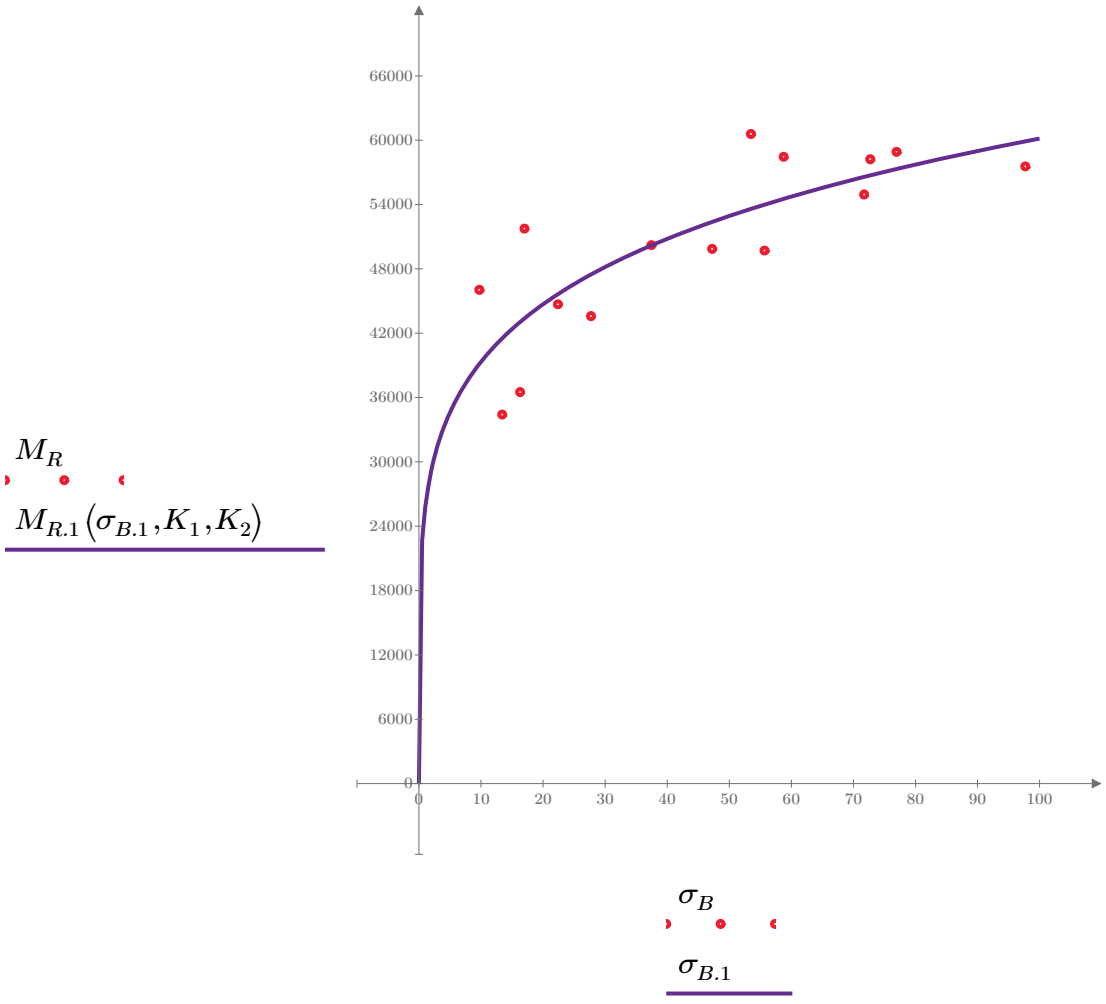

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–40”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot \sigma_d^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 38045.445$

$K_4 = 0.1091$

Equation 2 fitting parameters

$R_2^2 = 0.2145$ Coefficient of determination

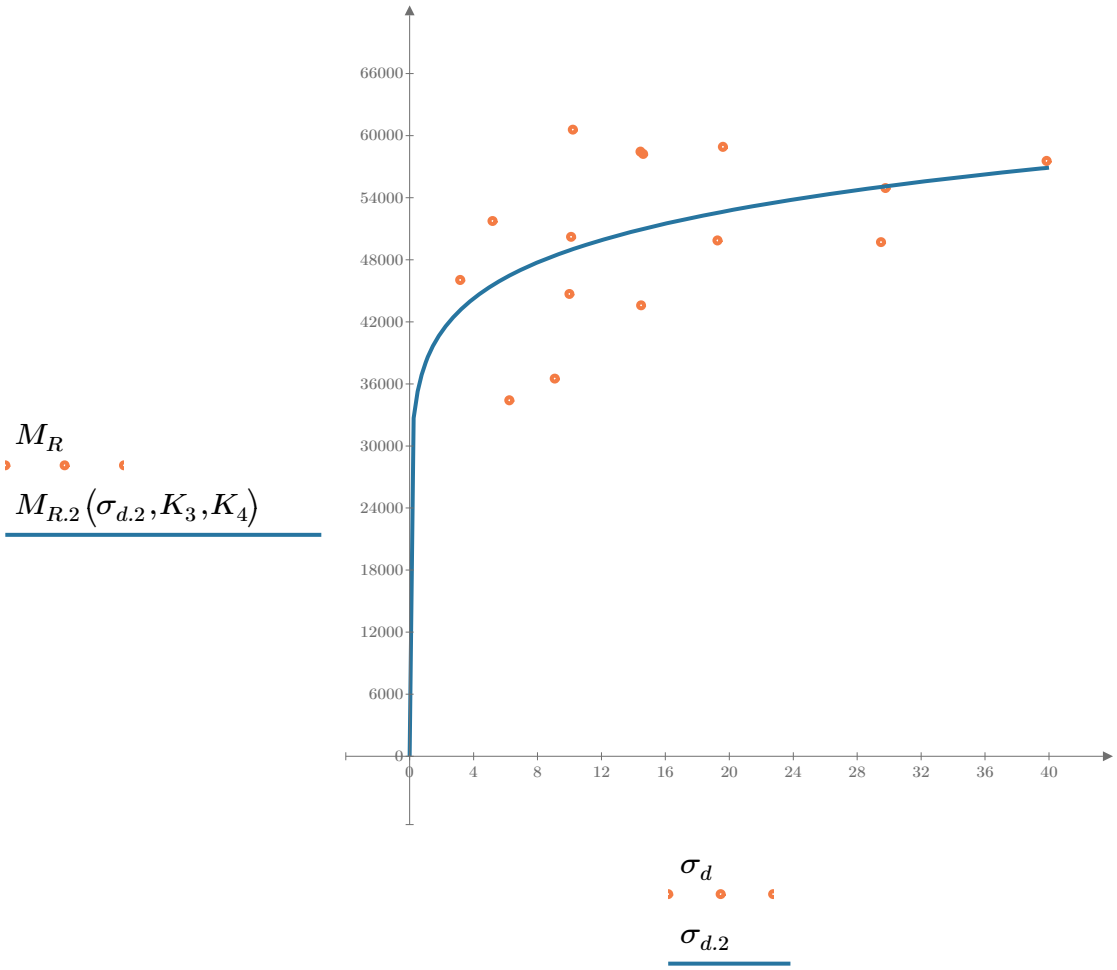

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–40”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 34712.965$

$K_6 = -0.0886$ Equation 3 fitting parameters

$K_7 = 0.2698$

${R_3}^2 = 0.8619$ Coefficient of determination

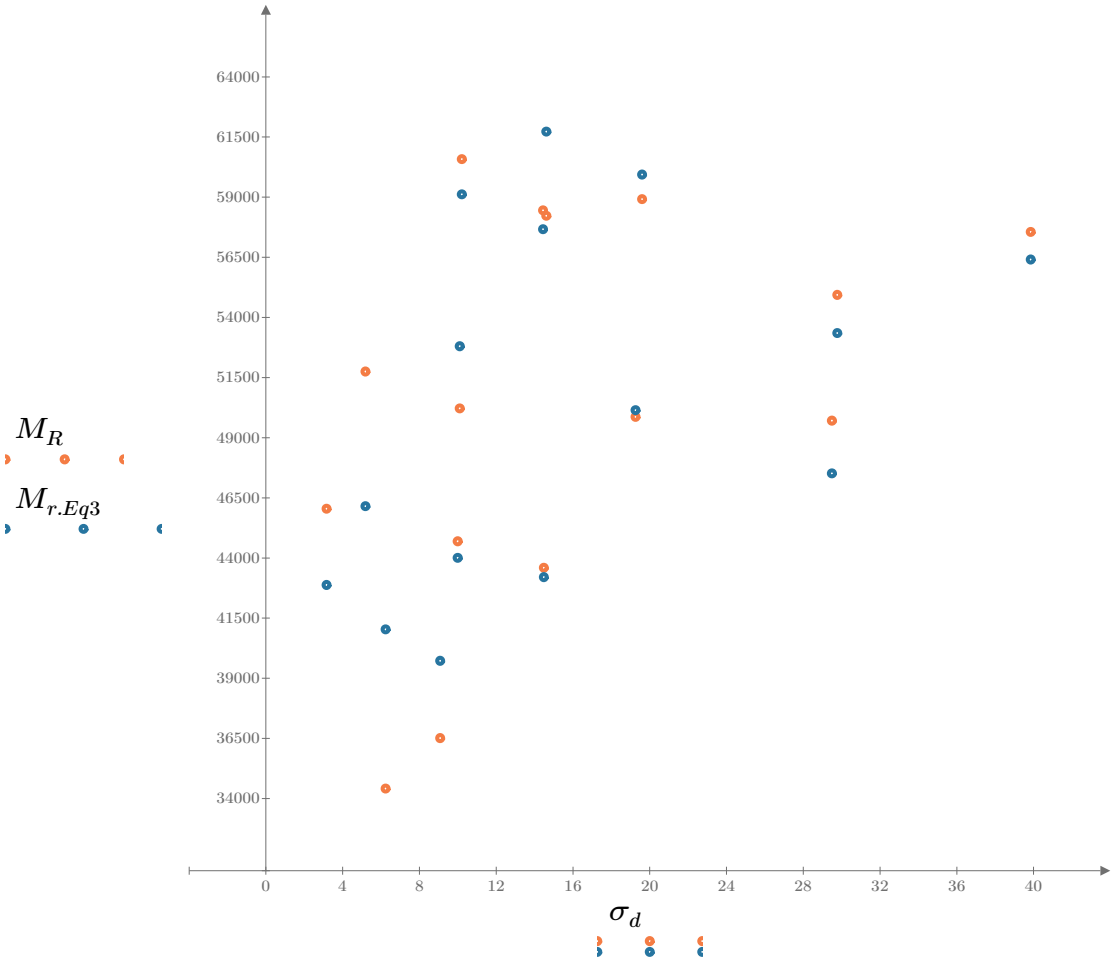

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-\text{40”}$

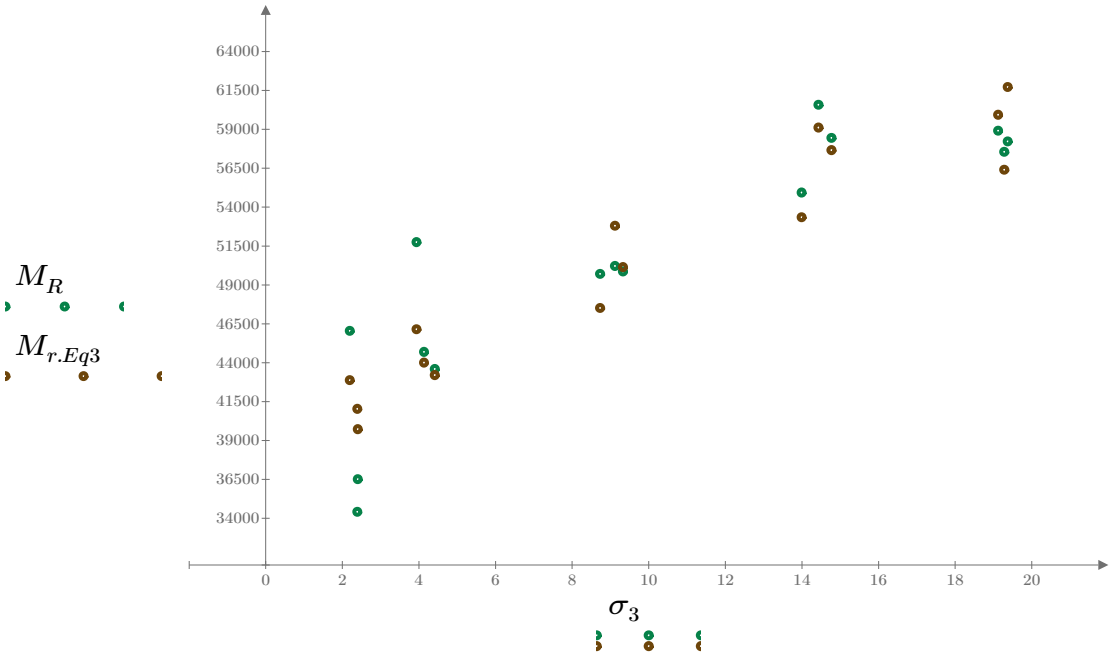

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

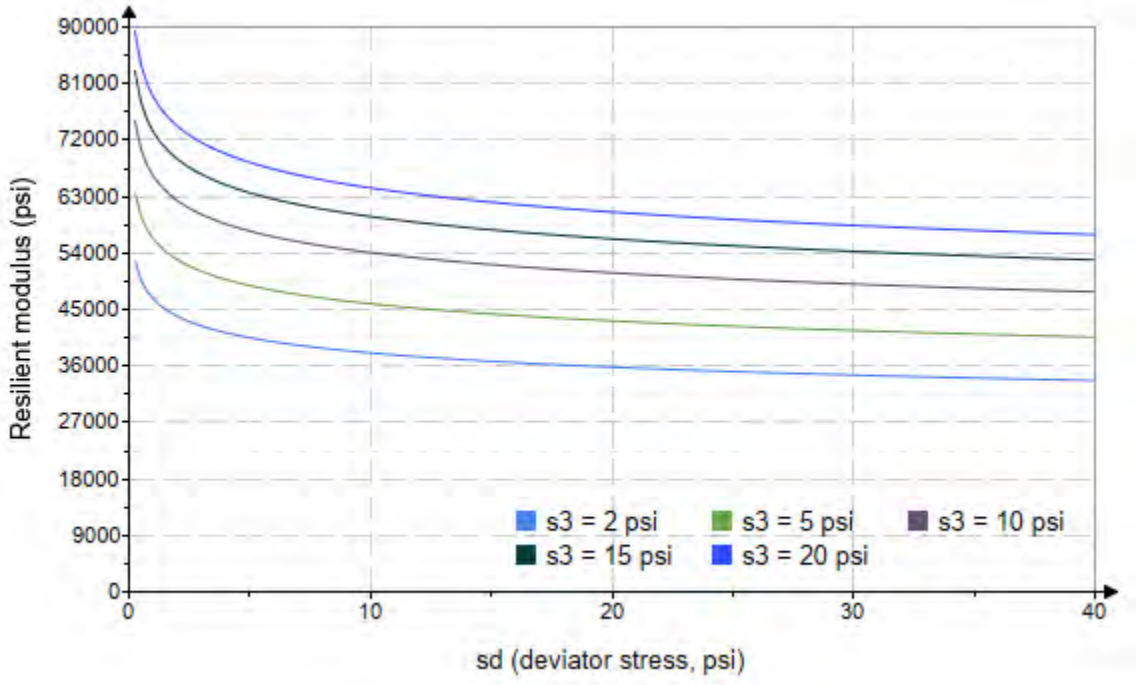

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–40”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2379.033$

$K_9 = 0.3570$ Equation 4 fitting parameters

$K_{10} = -0.2141$

$R_4^{\,2} = 0.8539$ Coefficient of determination

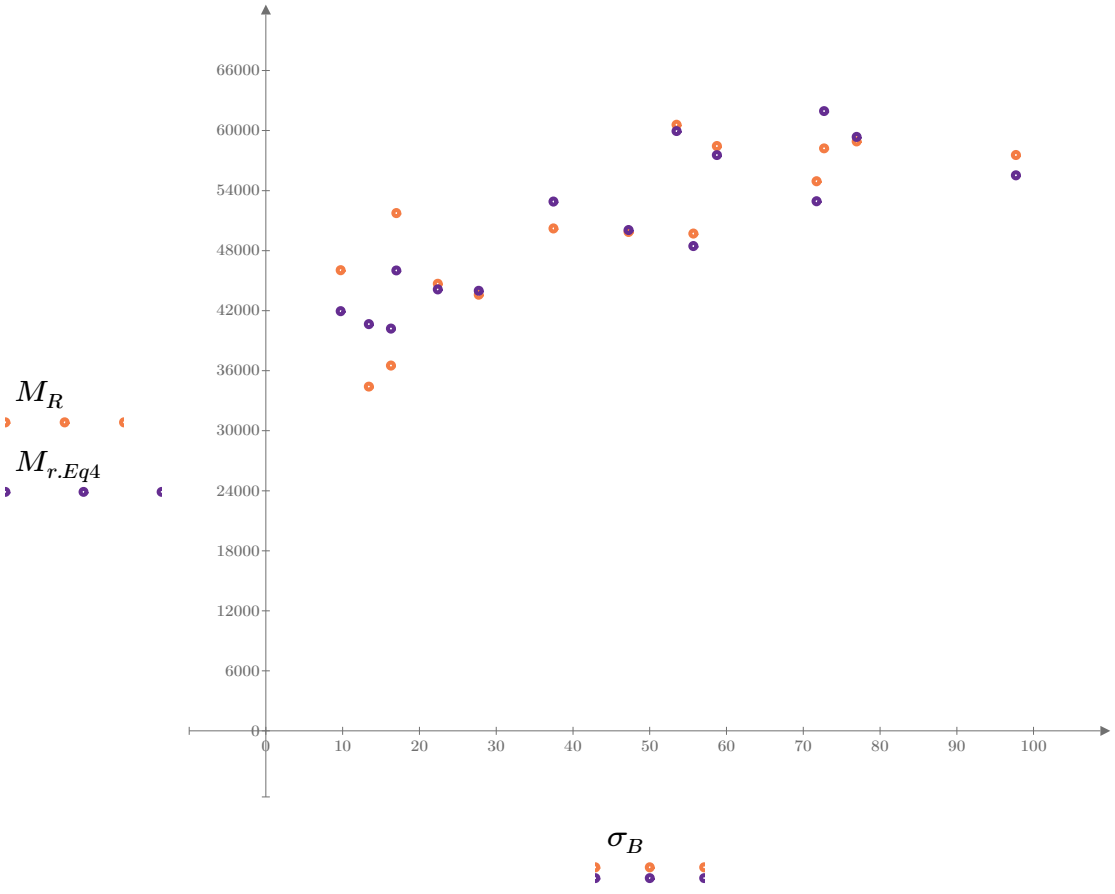

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

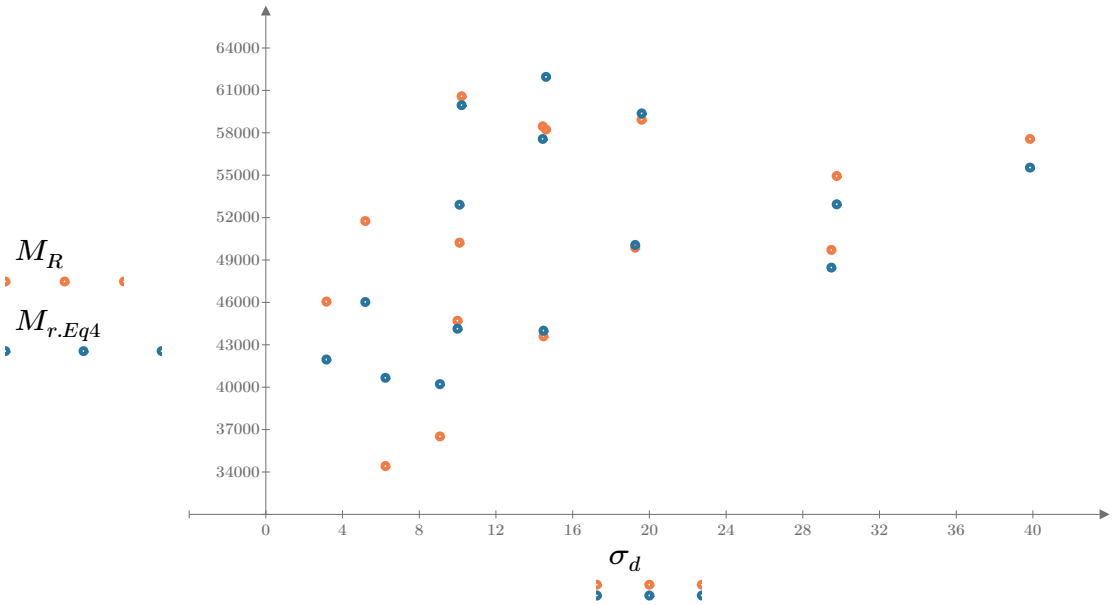

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

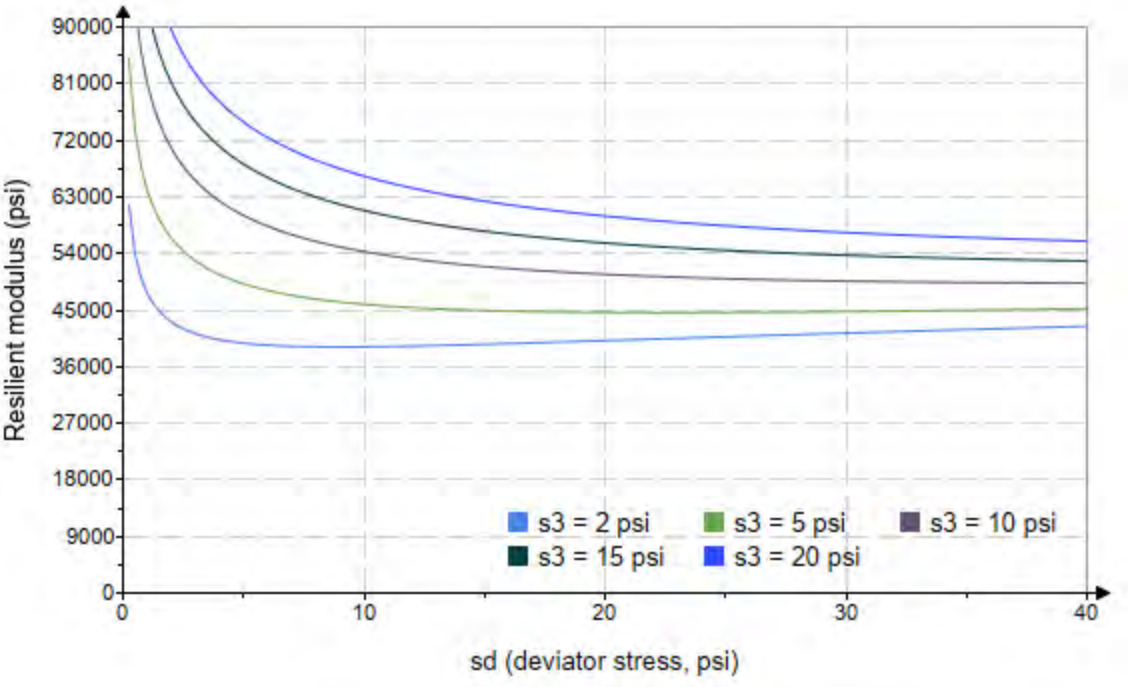

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−41"

$Treatment =$ "W1"

$S = 18.652$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.927 \\ 2.456 \\ 2.157 \\ 4.423 \\ 3.775 \\ 3.637 \\ 8.826 \\ 8.360 \\ 8.519 \\ 13.870 \\ 13.450 \\ 13.800 \\ 18.480 \\ 18.980 \\ 19.080 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.132 \\ 6.086 \\ 9.059 \\ 5.147 \\ 9.966 \\ 14.350 \\ 9.906 \\ 19.200 \\ 29.490 \\ 9.756 \\ 14.410 \\ 29.720 \\ 14.420 \\ 19.590 \\ 40.000 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.910 \\ 13.450 \\ 15.530 \\ 18.420 \\ 21.290 \\ 25.260 \\ 36.380 \\ 44.280 \\ 55.050 \\ 51.370 \\ 54.750 \\ 71.110 \\ 69.860 \\ 76.530 \\ 97.240 \end{bmatrix} \quad M_R = \begin{bmatrix} 64764.6 \\ 45436.4 \\ 44088.8 \\ 49284.2 \\ 54479.6 \\ 44670.6 \\ 98009.2 \\ 76863.6 \\ 54638.8 \\ 76952.9 \\ 99267.0 \\ 64500.6 \\ 83885.2 \\ 70602.8 \\ 65817.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–41”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 31479.017$

$K_2 = 0.2050$

Equation 1 fitting parameters

$R_1^2 = 0.2738$ Coefficient of determination

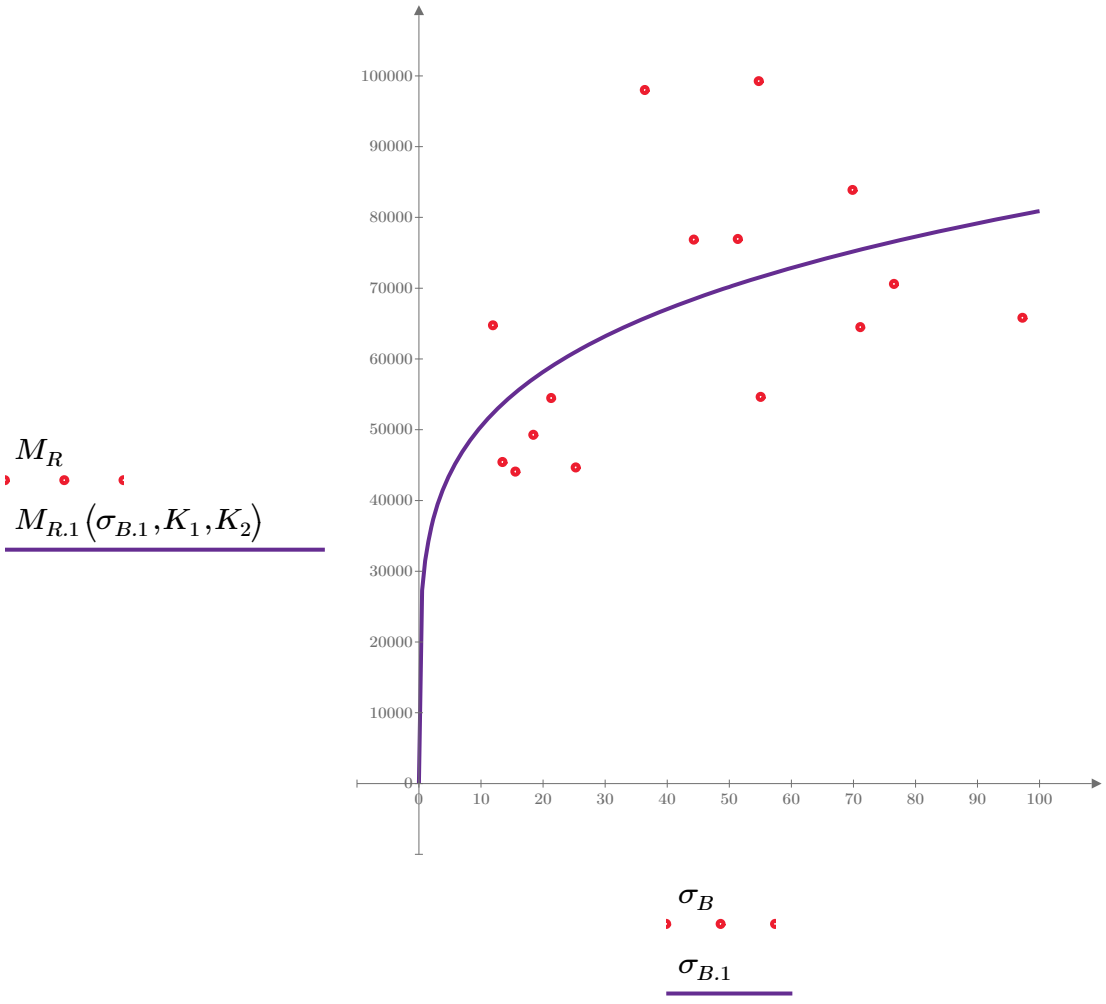

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–41”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot \sigma_d^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 56244.149$

$K_4 = 0.0640$

Equation 2 fitting parameters

$R_2^2 = 0.0281$ Coefficient of determination

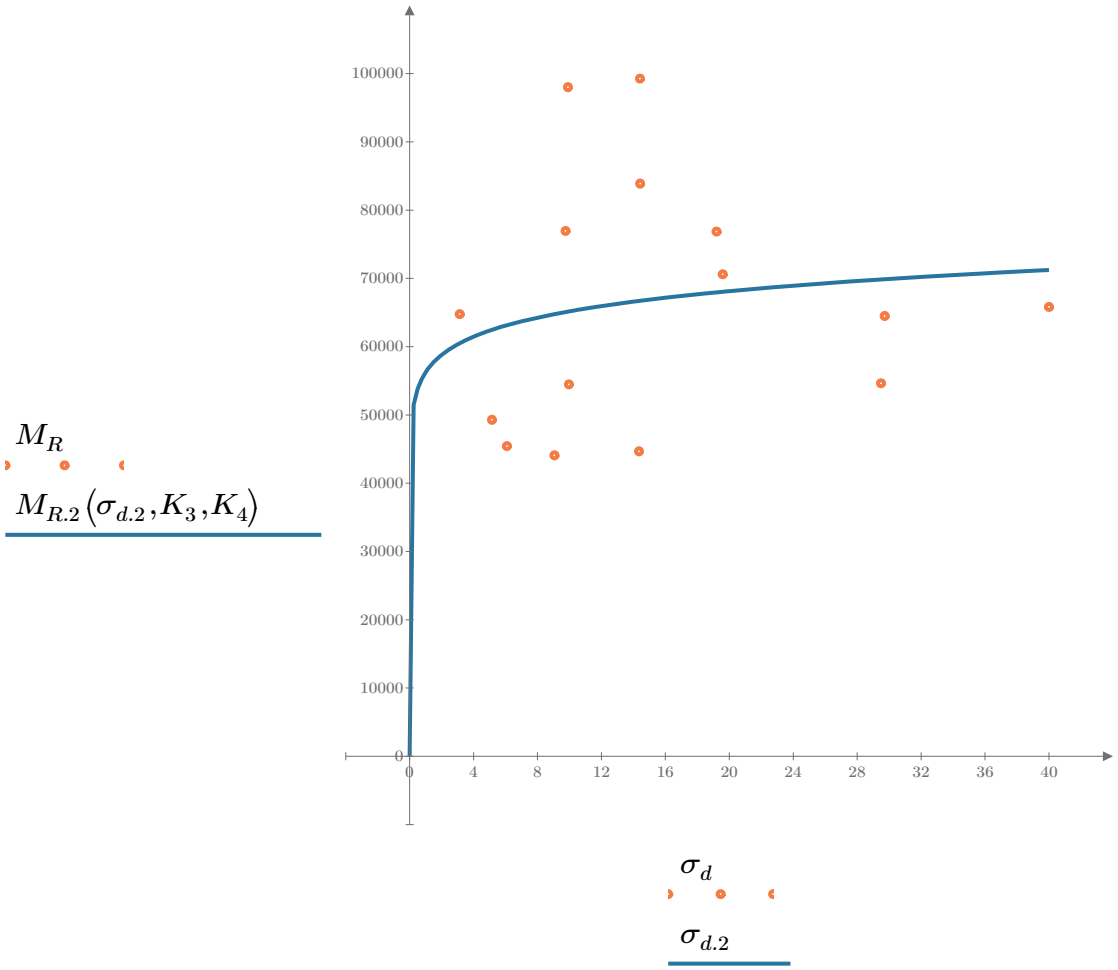

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–41”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 45786.731$

$K_6 = -0.2055$ Equation 3 fitting parameters

$K_7 = 0.4044$

${R_3}^2 = 0.5697$ Coefficient of determination

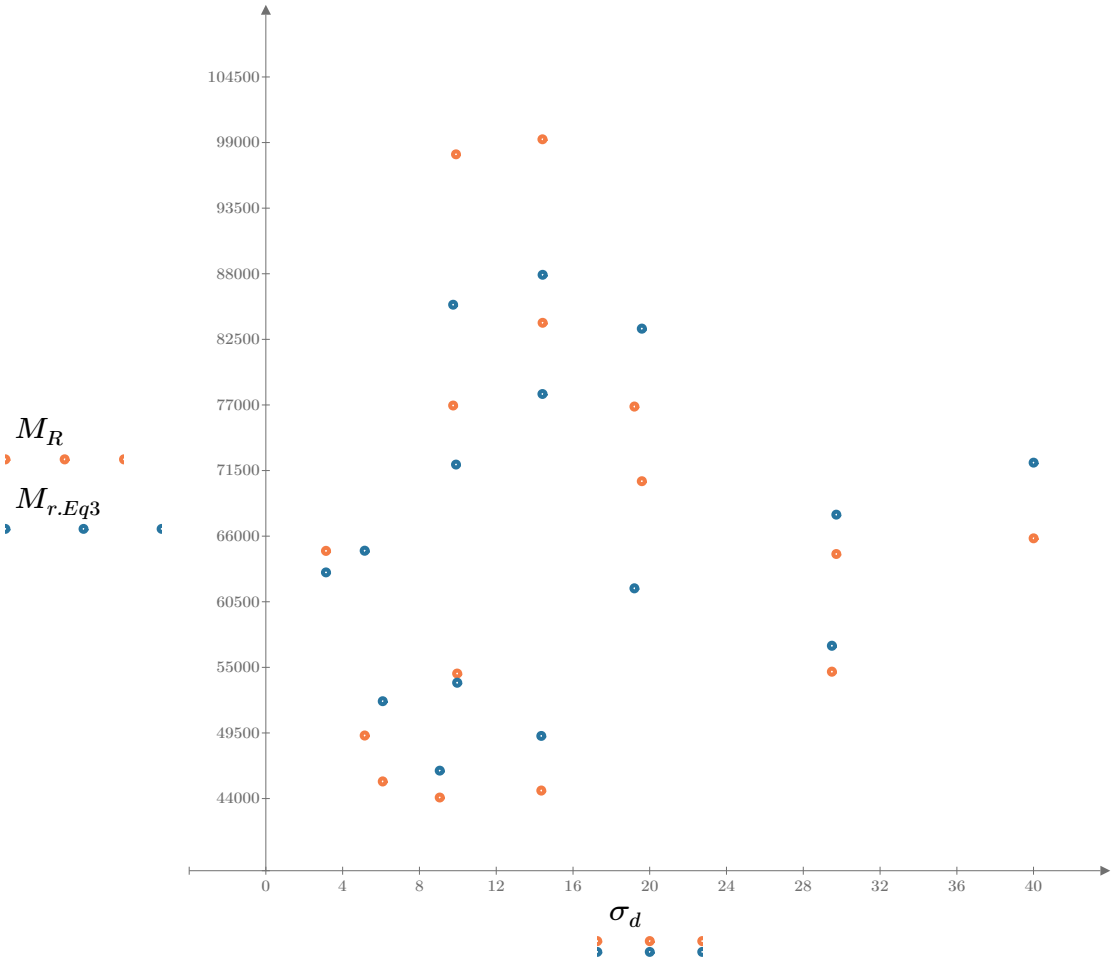

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–41”}$

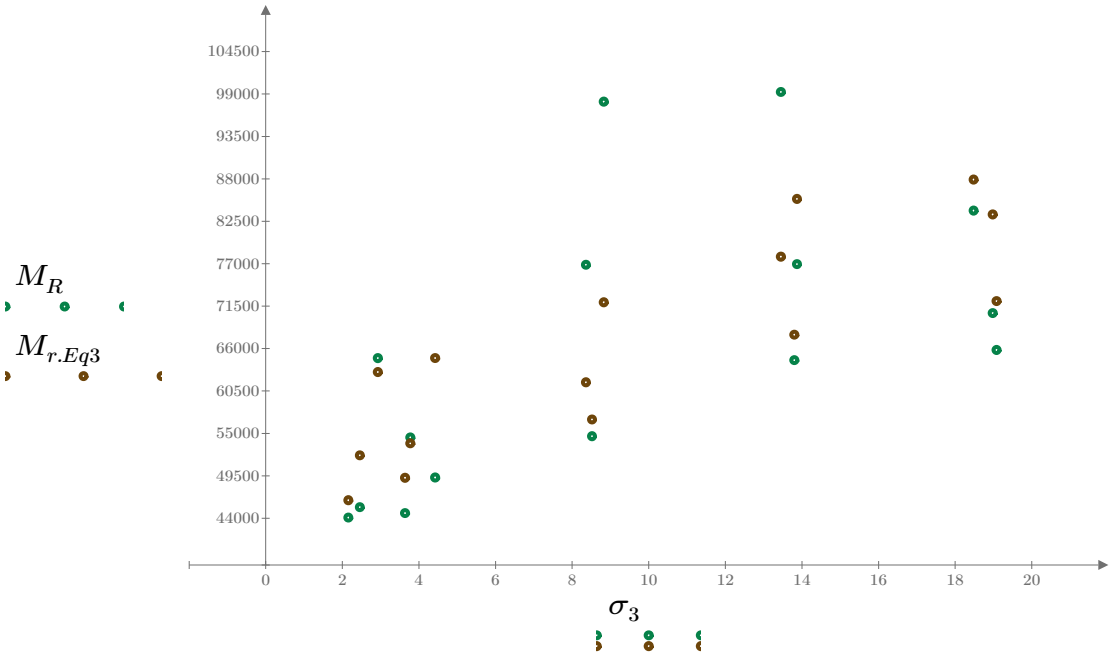

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

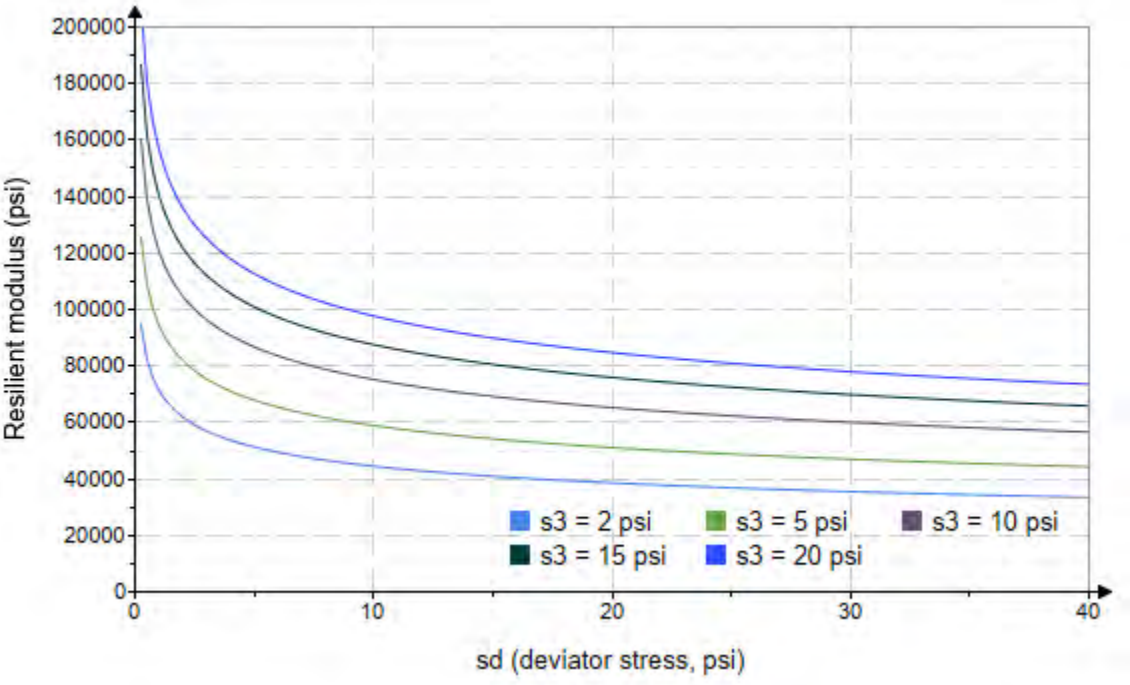

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–41”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2567.767$

$K_9 = 0.5408$ Equation 4 fitting parameters

$K_{10} = -0.3936$

$R_4^{\,2} = 0.5645$ Coefficient of determination

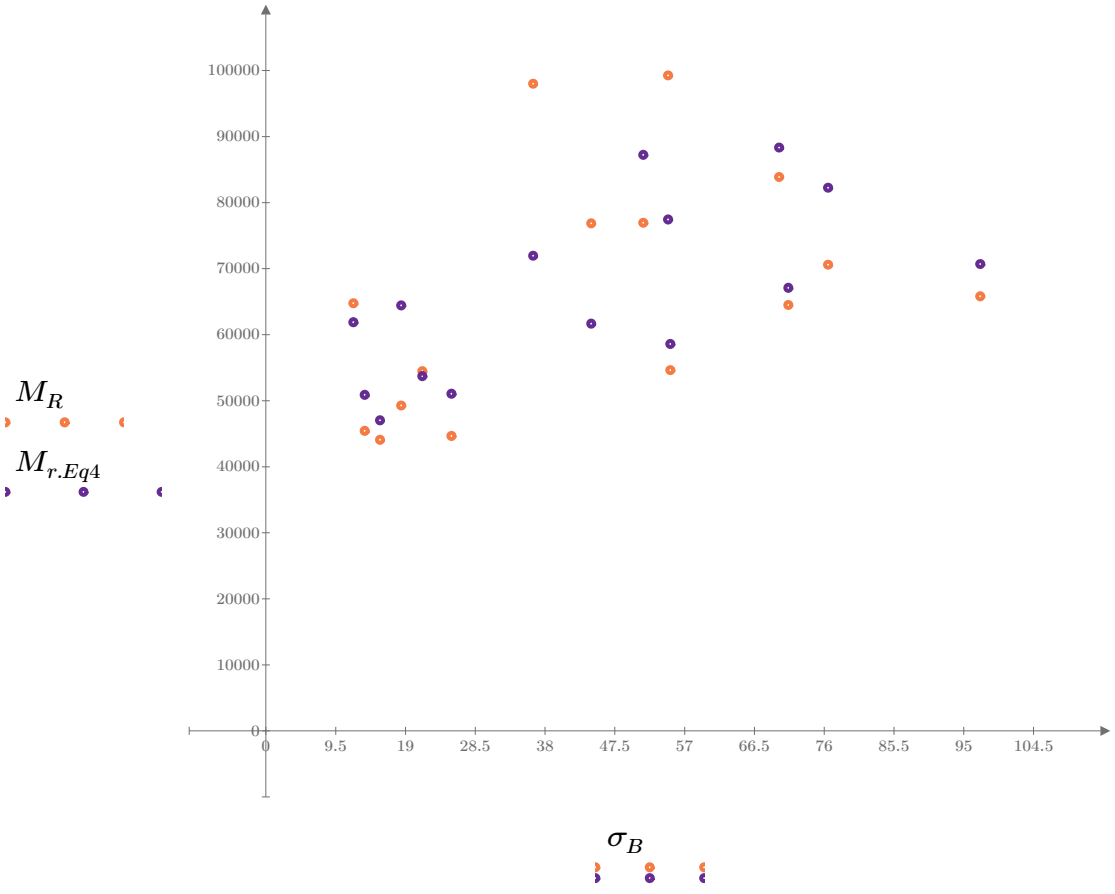

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

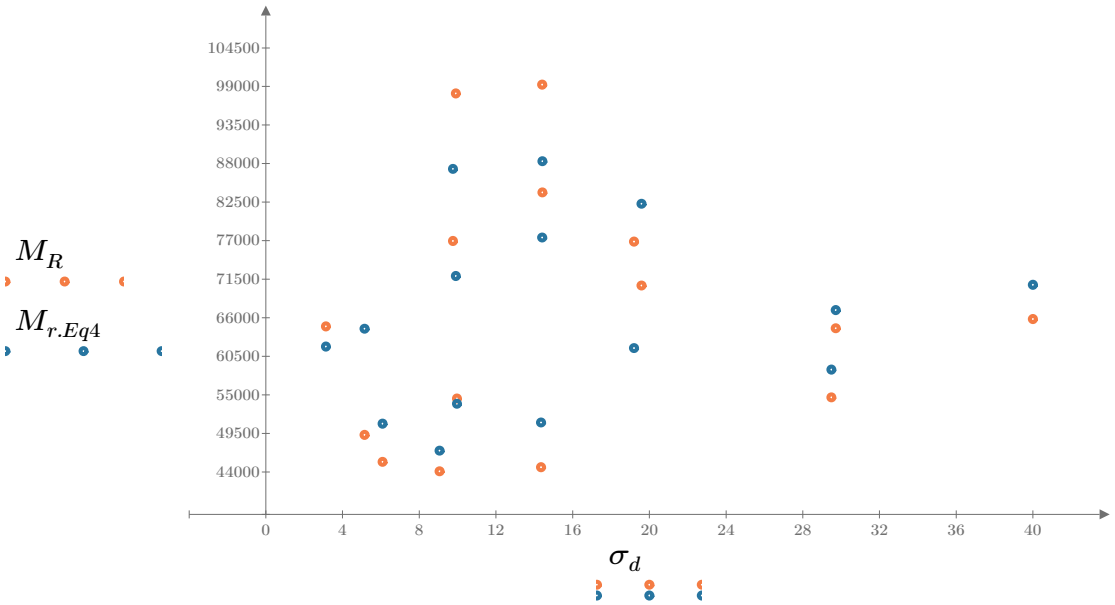

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

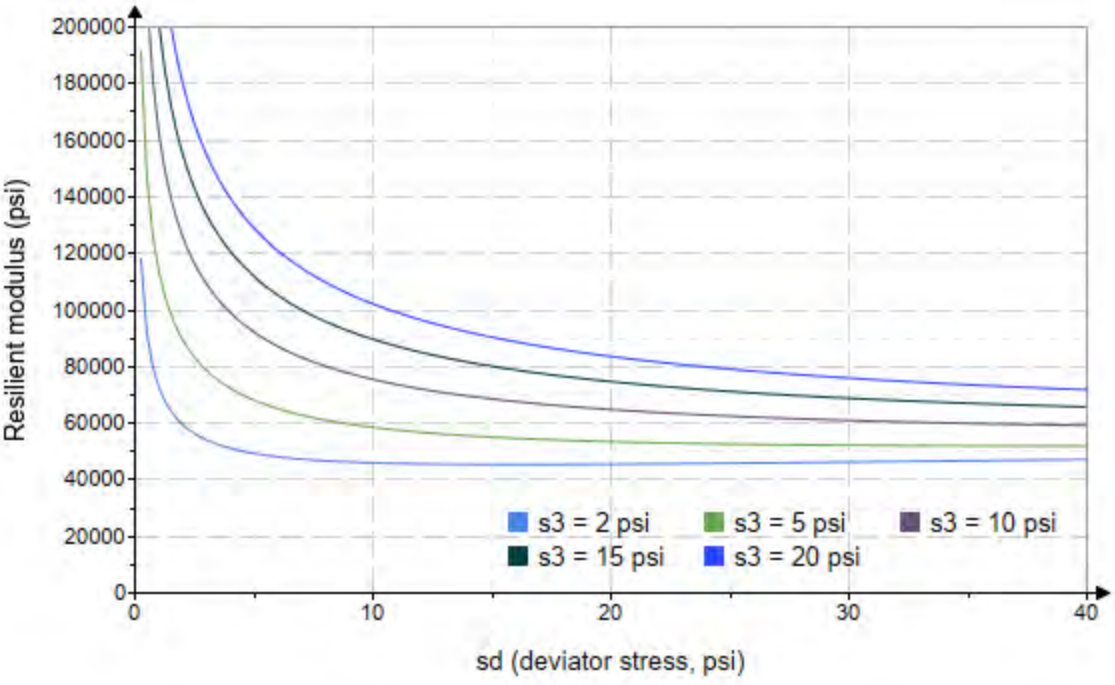

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−42"

$Treatment =$ "AD"

$S = 3.716$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.318 \\ 2.385 \\ 2.430 \\ 4.137 \\ 4.700 \\ 4.457 \\ 9.689 \\ 9.298 \\ 9.363 \\ 14.800 \\ 14.370 \\ 14.420 \\ 19.490 \\ 19.670 \\ 19.580 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.140 \\ 6.163 \\ 9.009 \\ 5.167 \\ 10.020 \\ 14.600 \\ 10.030 \\ 19.670 \\ 30.000 \\ 10.020 \\ 14.630 \\ 29.990 \\ 14.760 \\ 19.760 \\ 40.360 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.090 \\ 13.320 \\ 16.300 \\ 17.580 \\ 24.120 \\ 27.970 \\ 39.090 \\ 47.570 \\ 58.090 \\ 54.430 \\ 57.730 \\ 73.250 \\ 73.220 \\ 78.770 \\ 99.110 \end{bmatrix} \quad M_R = \begin{bmatrix} 40259.4 \\ 38319.0 \\ 38086.8 \\ 46267.4 \\ 50298.6 \\ 59793.2 \\ 79378.6 \\ 78820.4 \\ 52826.2 \\ 106848.0 \\ 85619.6 \\ 48790.2 \\ 60201.2 \\ 46223.4 \\ 51072.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–42”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 30706.190$

$K_2 = 0.1781$

Equation 1 fitting parameters

$R_1^2 = 0.1566$ Coefficient of determination

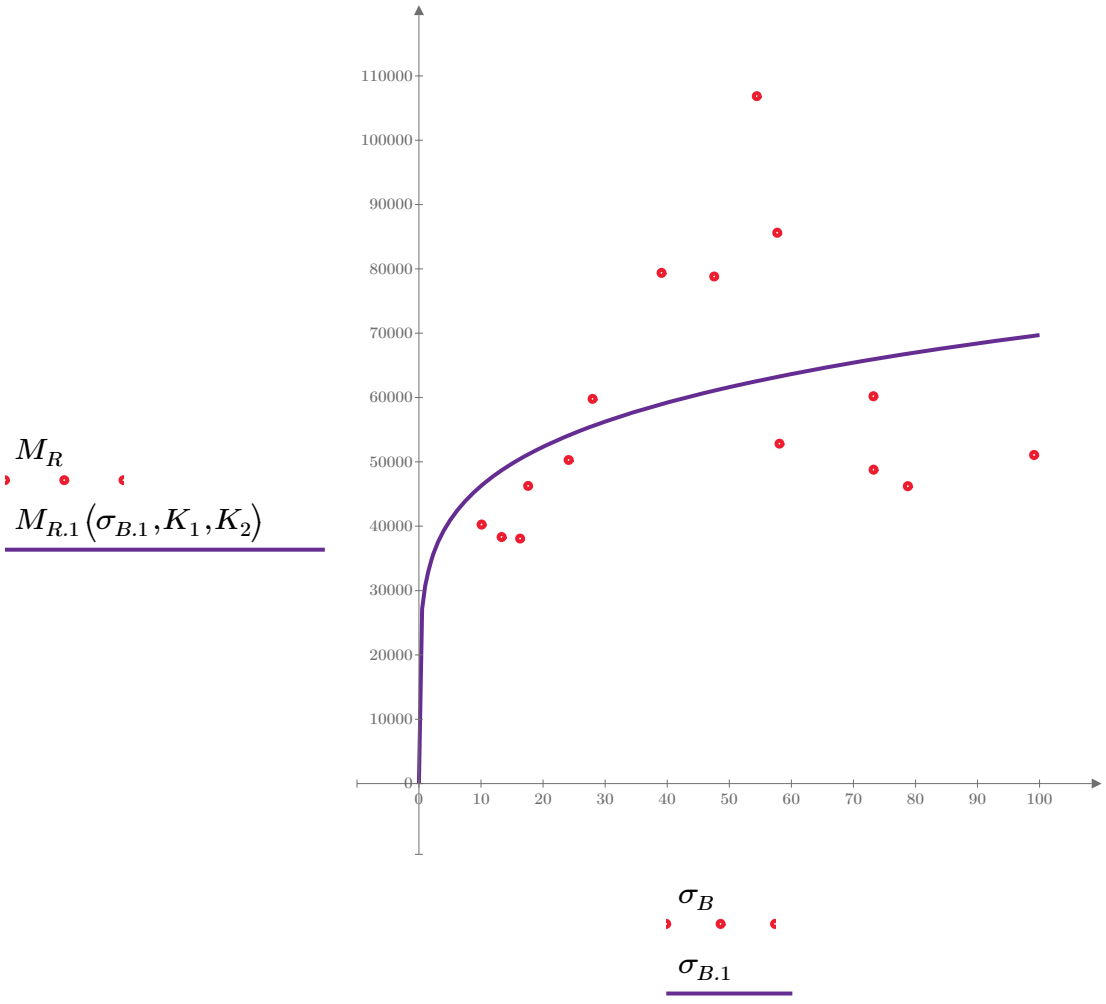

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–42”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 50162.760$

$K_4 = 0.0624$

Equation 2 fitting parameters

${R_2}^2 = 0.0193$ Coefficient of determination

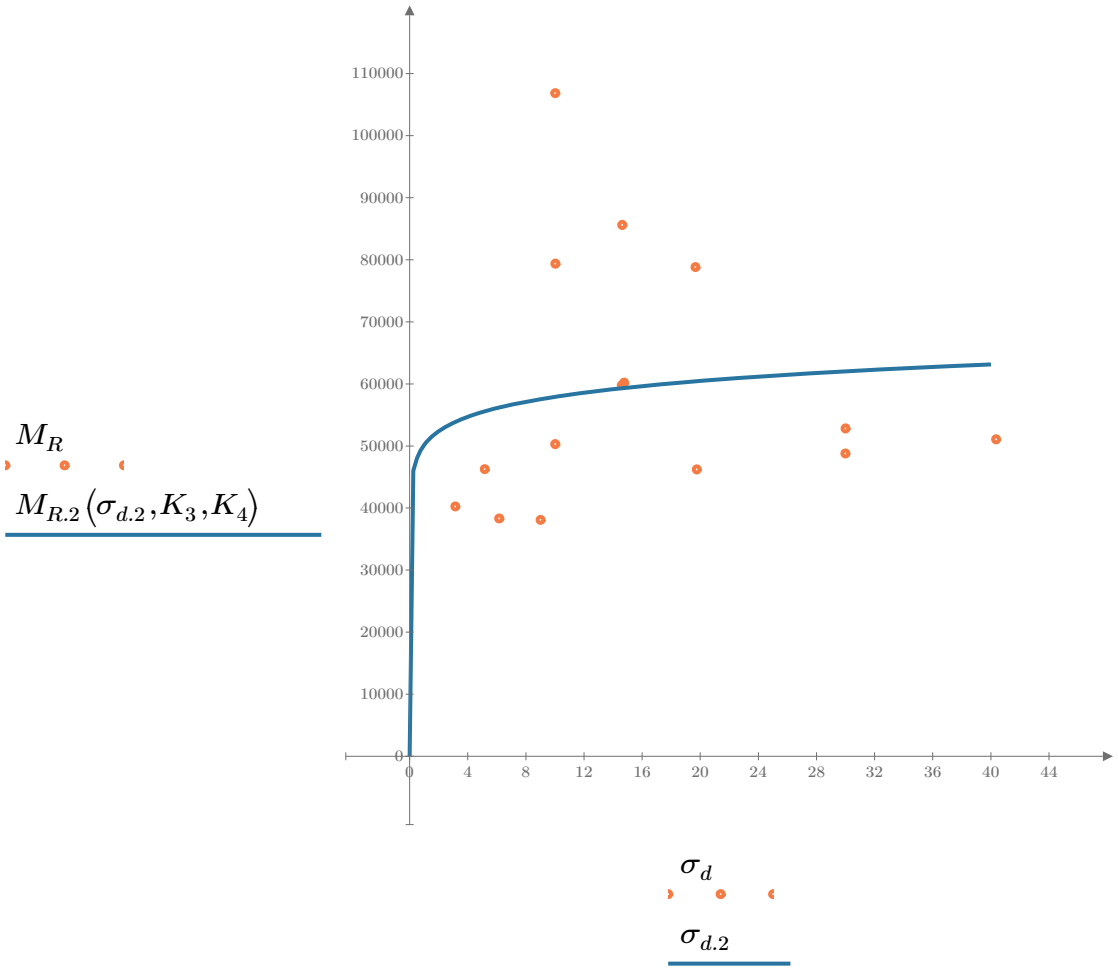

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–42”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 44133.644$

$K_6 = -0.2551$ Equation 3 fitting parameters

$K_7 = 0.4172$

${R_3}^2 = 0.3372$ Coefficient of determination

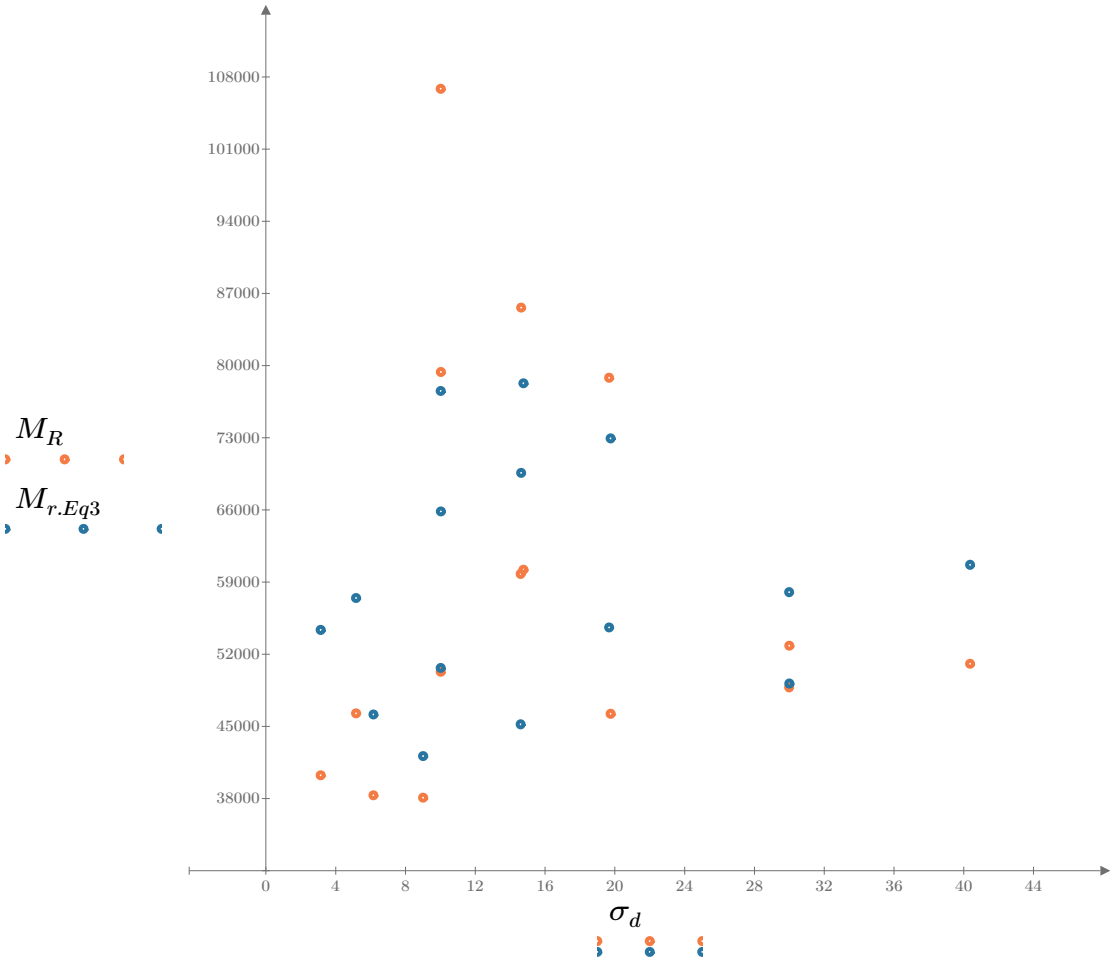

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–42”}$

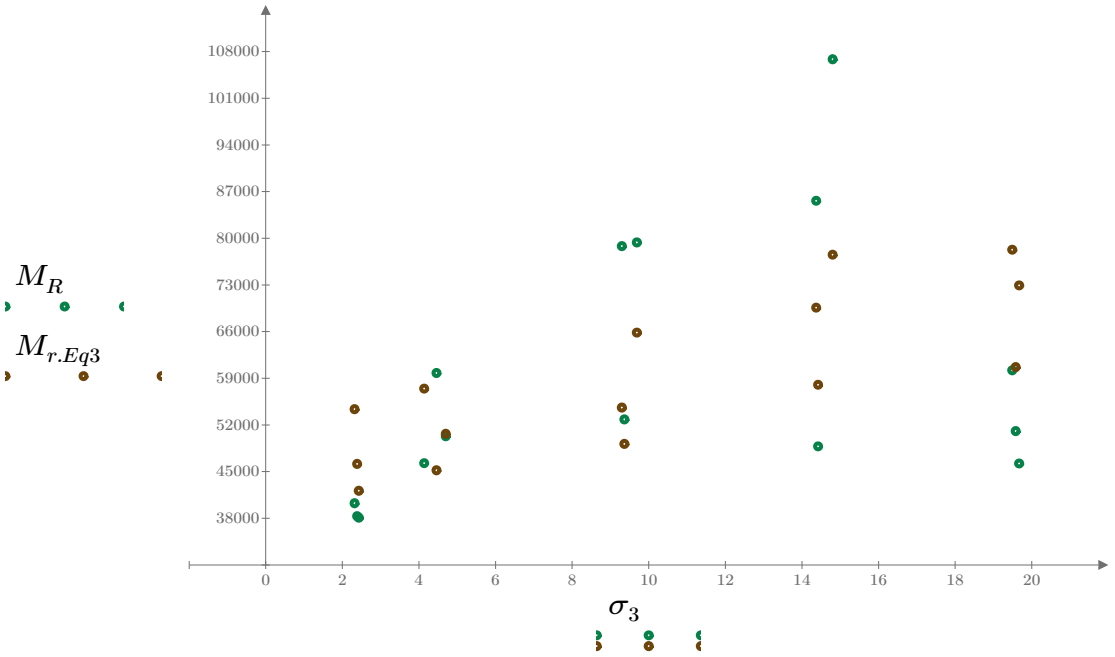

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

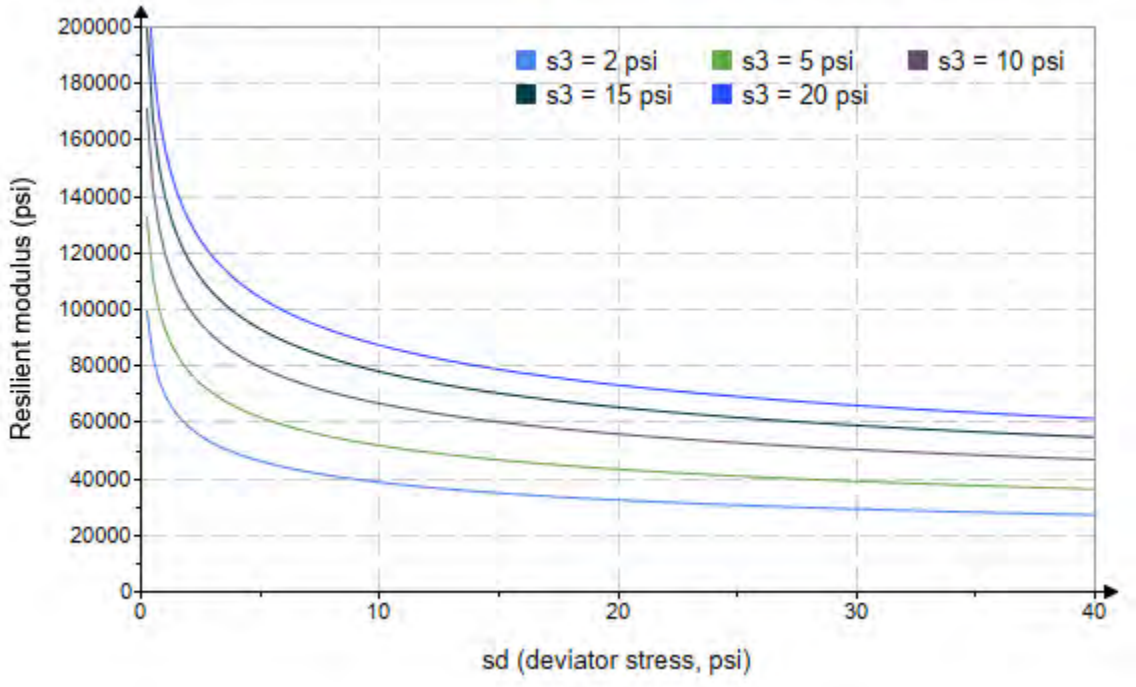

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–42”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2118.807$

$K_9 = 0.5899$ Equation 4 fitting parameters

$K_{10} = -0.4837$

$R_4^{\,2} = 0.3882$ Coefficient of determination

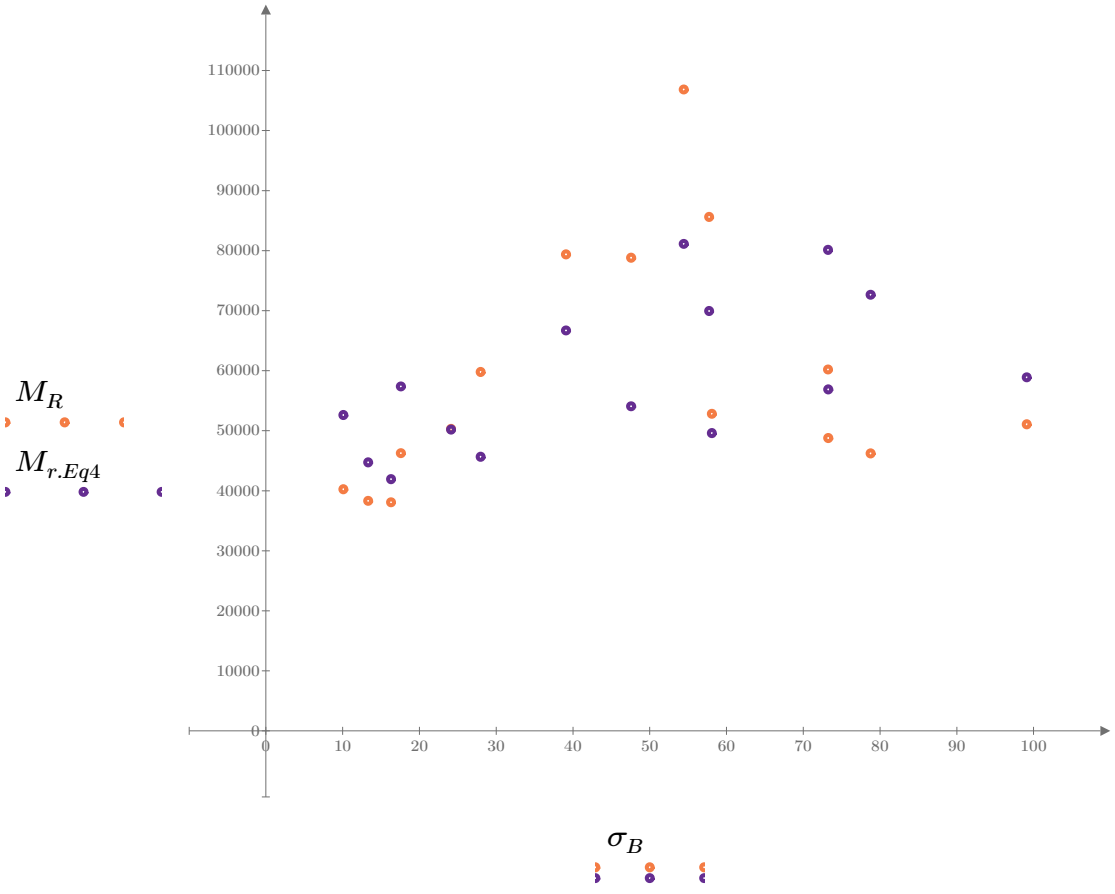

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

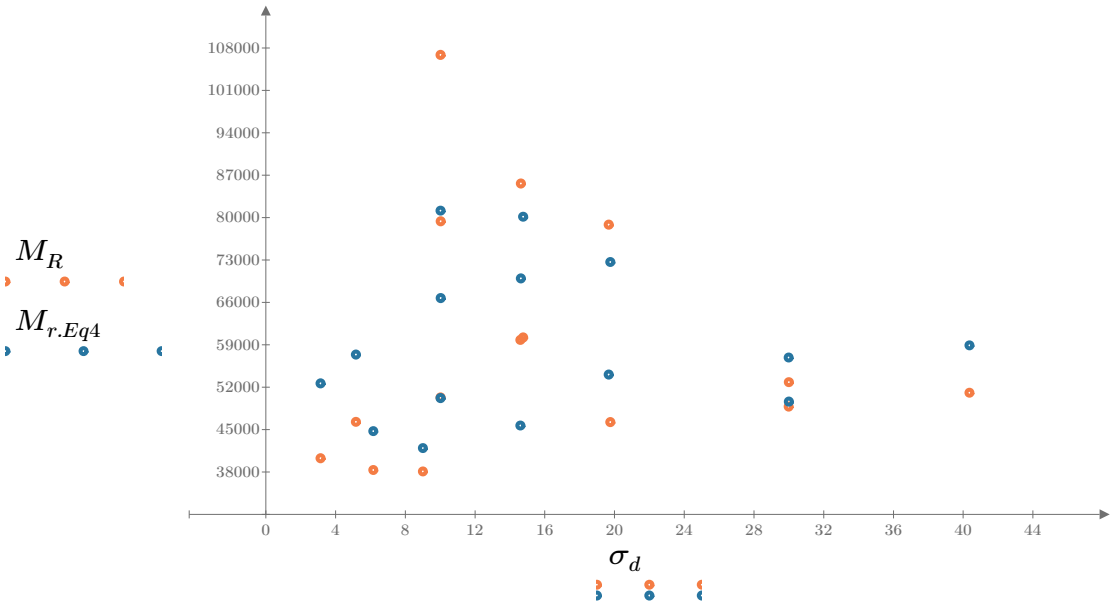

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

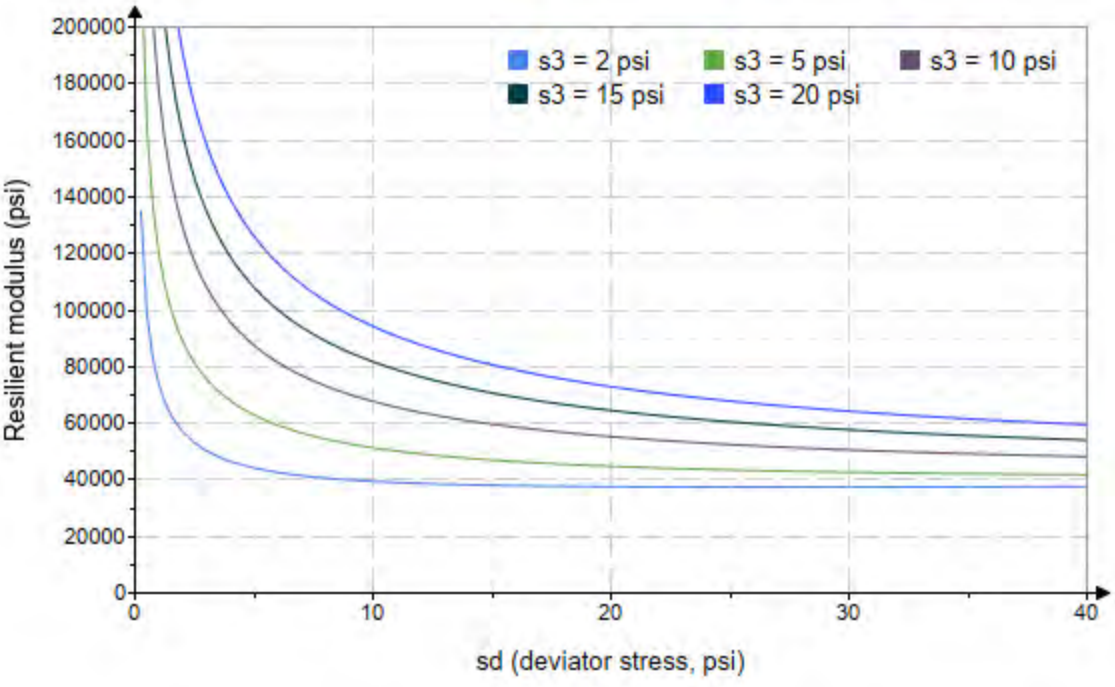

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{43”}$

$Treatment = \text{“AD”}$

$S = 3.541$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.875 \\ 2.884 \\ 2.874 \\ 4.595 \\ 4.591 \\ 4.616 \\ 9.631 \\ 9.616 \\ 9.626 \\ 14.660 \\ 14.660 \\ 14.640 \\ 19.670 \\ 19.660 \\ 19.670 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.185 \\ 6.079 \\ 8.966 \\ 5.084 \\ 9.828 \\ 14.450 \\ 9.985 \\ 19.830 \\ 30.350 \\ 9.911 \\ 14.850 \\ 30.190 \\ 14.830 \\ 20.010 \\ 40.080 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.810 \\ 14.730 \\ 17.590 \\ 18.870 \\ 23.600 \\ 28.300 \\ 38.880 \\ 48.680 \\ 59.220 \\ 53.900 \\ 58.820 \\ 74.110 \\ 73.830 \\ 78.980 \\ 99.100 \end{bmatrix} \quad M_R = \begin{bmatrix} 29894.4 \\ 31584.4 \\ 35110.0 \\ 30912.8 \\ 39503.2 \\ 44259.6 \\ 55853.2 \\ 62883.2 \\ 55355.4 \\ 52950.0 \\ 54826.0 \\ 55479.6 \\ 49500.0 \\ 52954.2 \\ 68352.2 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–43”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 13747.084$

$K_2 = 0.3361$

Equation 1 fitting parameters

${R_1}^2 = 0.7930$ Coefficient of determination

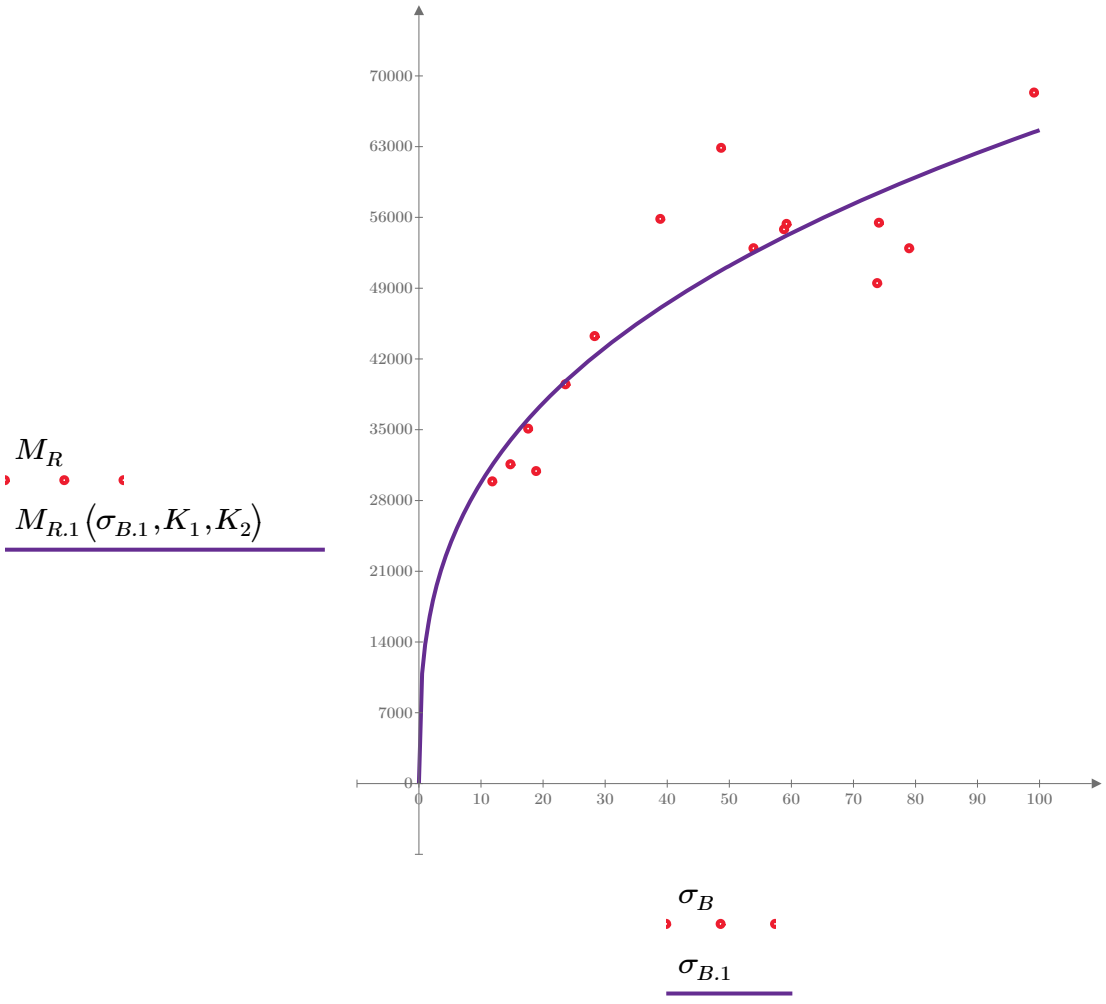

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–43”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 21590.123$

$K_4 = 0.3053$ Equation 2 fitting parameters

${R_2}^2 = 0.7236$ Coefficient of determination

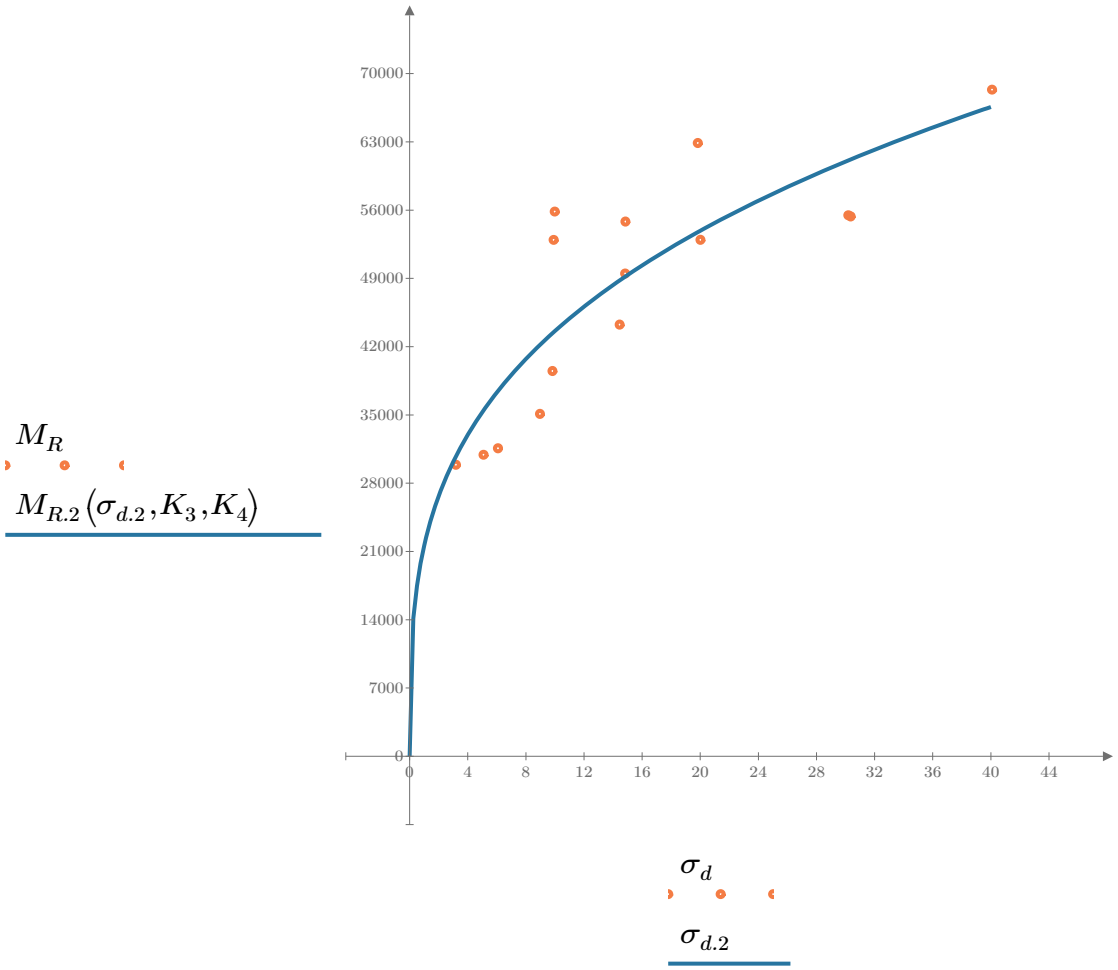

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–43”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 19350.683$

$K_6 = 0.1959$ Equation 3 fitting parameters

$K_7 = 0.1716$

${R_3}^2 = 0.8154$ Coefficient of determination

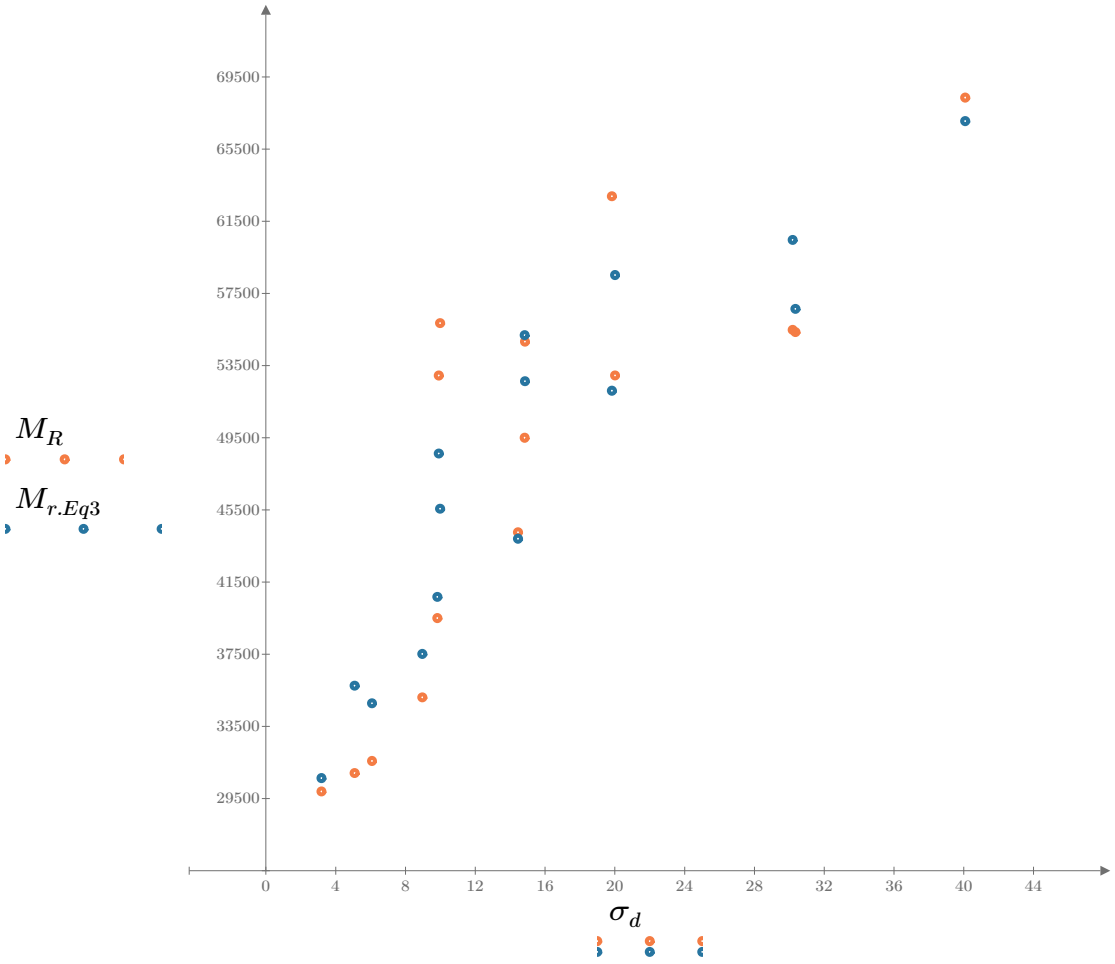

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–43”}$

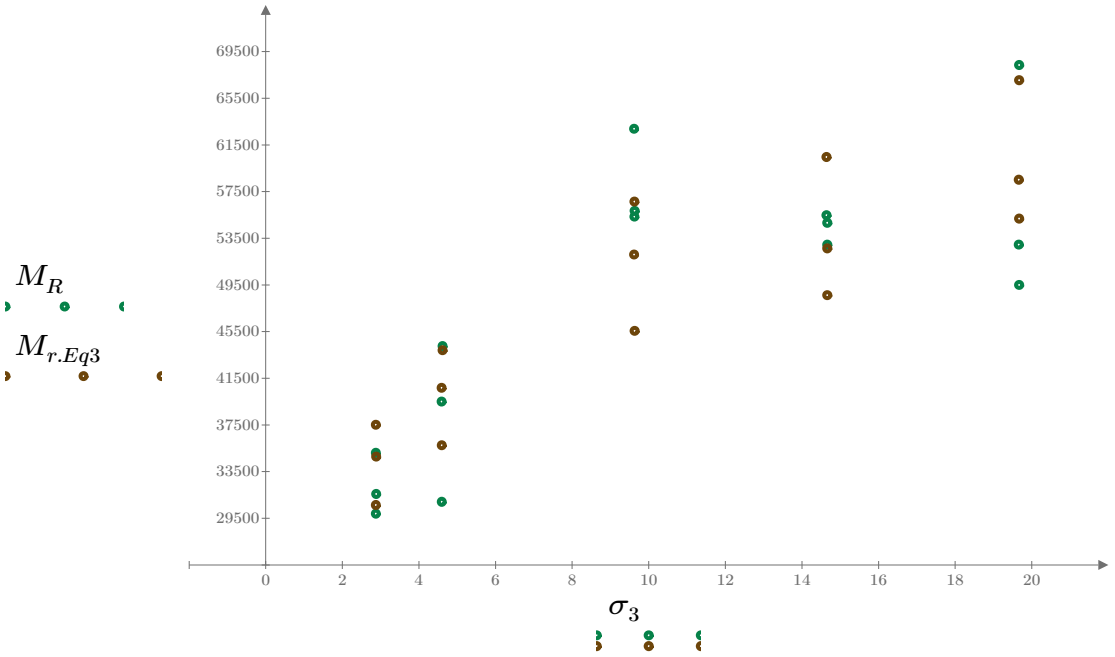

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

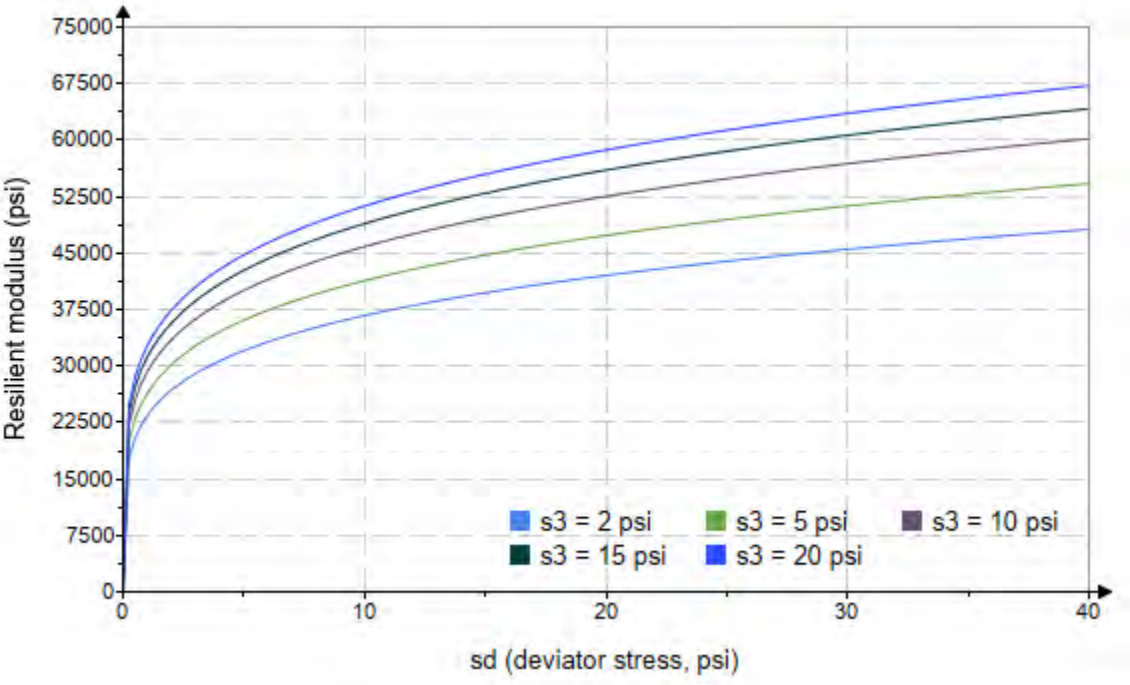

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–43”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2584.284$

$K_9 = 0.2344$ Equation 4 fitting parameters

$K_{10} = 0.1137$

$R_4^{\,2} = 0.8187$ Coefficient of determination

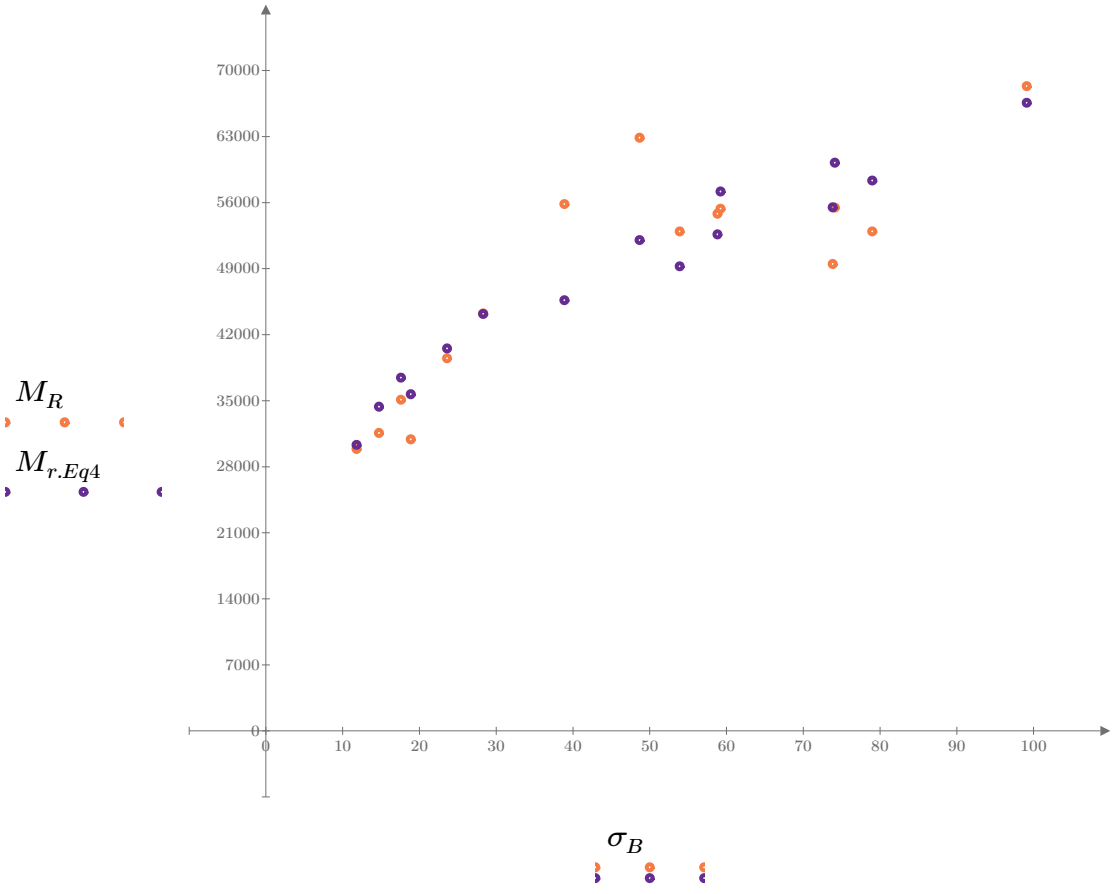

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

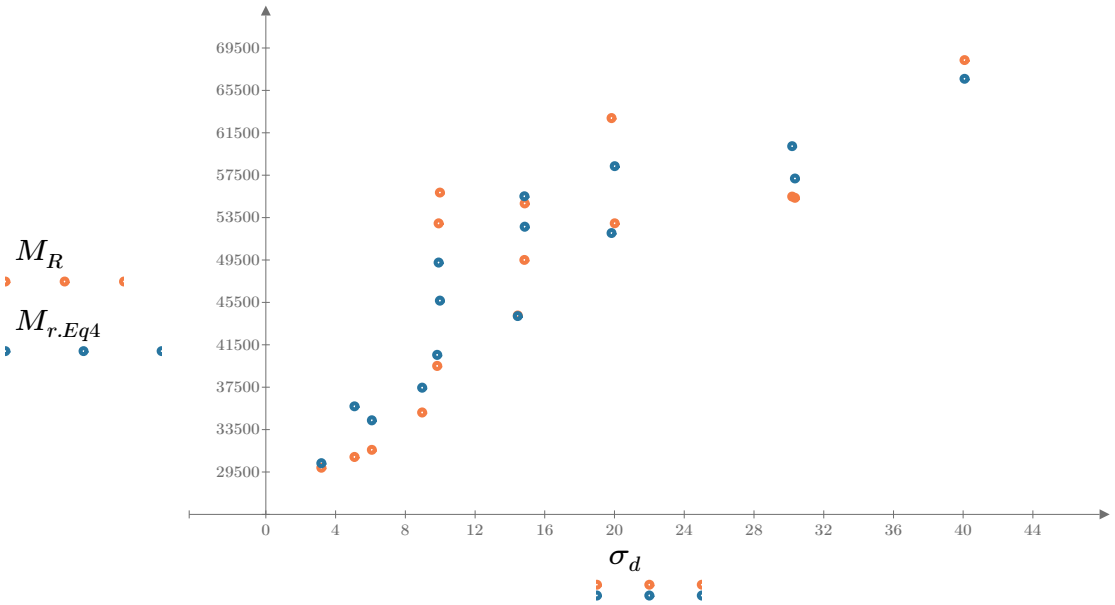

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

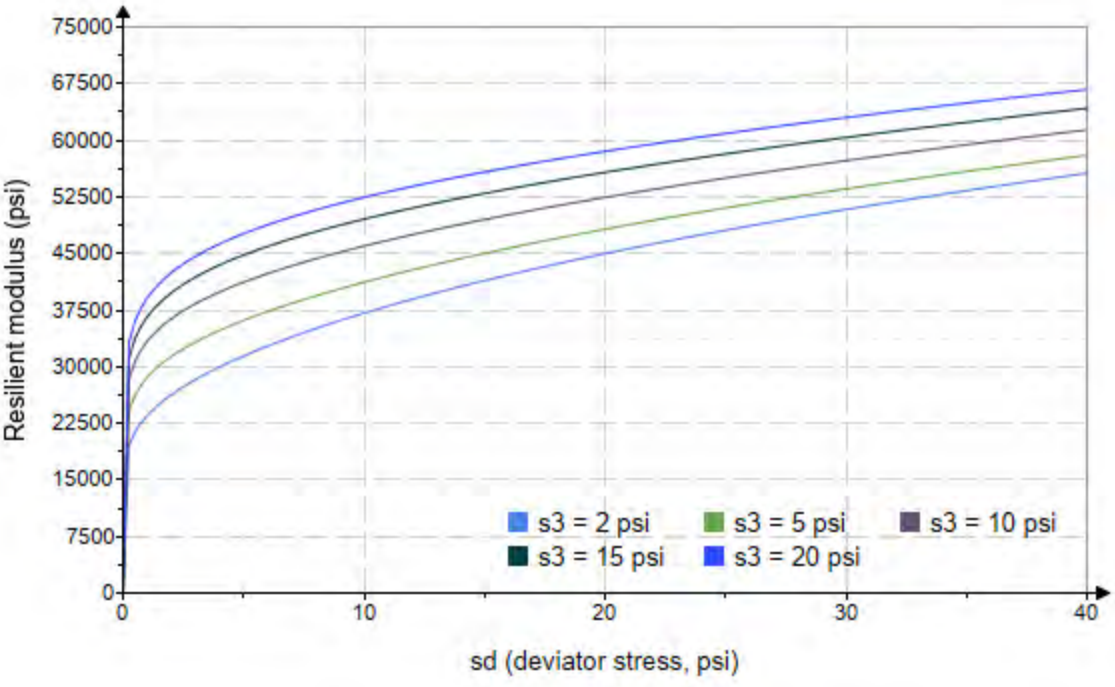

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−44"

$Treatment =$ "AD"

$S = 3.455$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.738 \\ 2.733 \\ 2.690 \\ 4.603 \\ 4.580 \\ 4.596 \\ 9.580 \\ 9.612 \\ 9.576 \\ 14.620 \\ 14.640 \\ 14.600 \\ 19.680 \\ 19.670 \\ 19.670 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.238 \\ 6.115 \\ 8.935 \\ 5.124 \\ 9.785 \\ 14.660 \\ 9.903 \\ 19.520 \\ 30.020 \\ 9.956 \\ 14.520 \\ 30.200 \\ 14.490 \\ 19.690 \\ 40.260 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.450 \\ 14.320 \\ 17.010 \\ 18.930 \\ 23.520 \\ 28.440 \\ 38.640 \\ 48.350 \\ 58.750 \\ 53.800 \\ 58.450 \\ 74.000 \\ 73.530 \\ 78.690 \\ 99.270 \end{bmatrix} \quad M_R = \begin{bmatrix} 52603.0 \\ 49173.2 \\ 50368.4 \\ 58768.8 \\ 58381.0 \\ 57373.4 \\ 67365.6 \\ 53109.0 \\ 59636.8 \\ 56293.8 \\ 55443.8 \\ 70300.4 \\ 55107.2 \\ 66377.8 \\ 65113.2 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–44”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 40790.097$

$K_2 = 0.0978$

Equation 1 fitting parameters

$R_1^2 = 0.3757$ Coefficient of determination

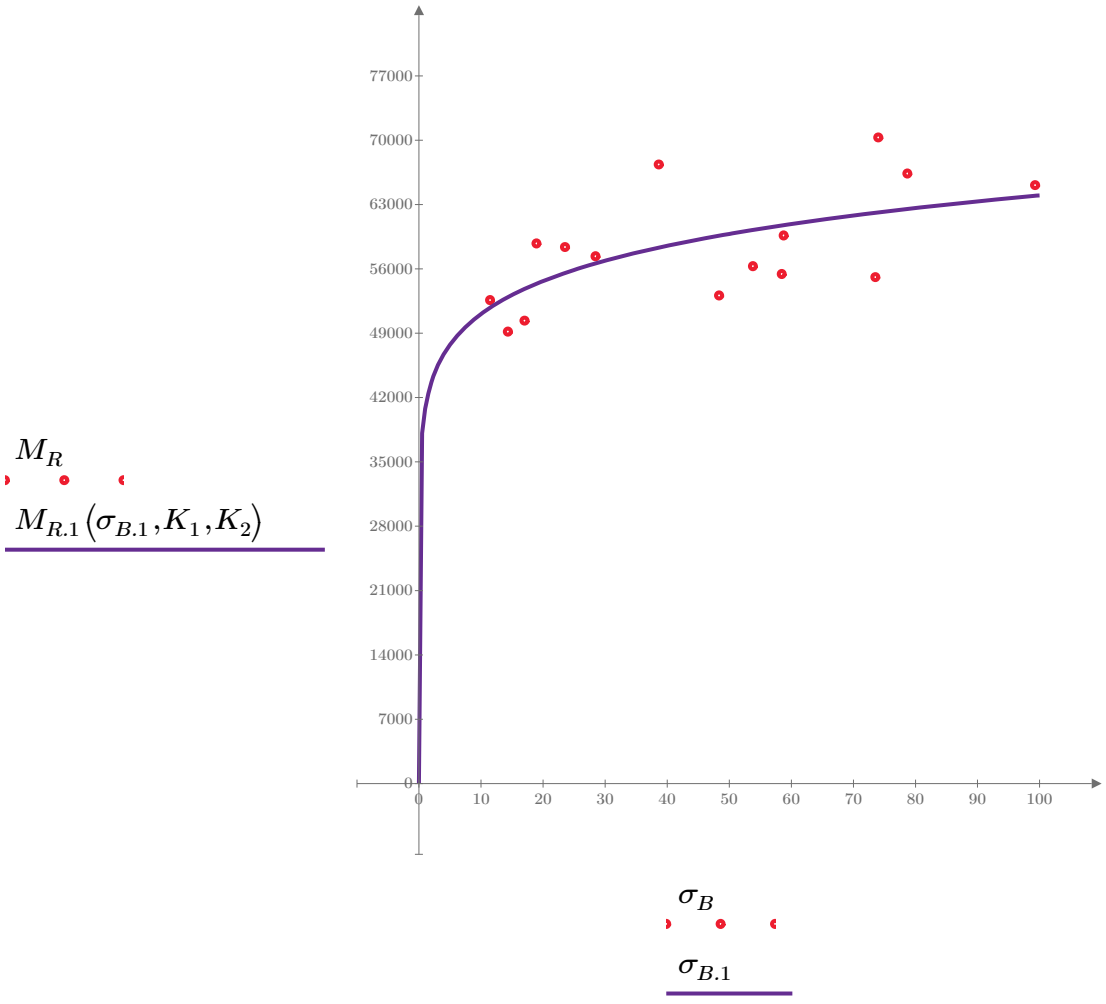

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–44”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 46345.947$

$K_4 = 0.0899$ Equation 2 fitting parameters

${R_2}^2 = 0.3195$ Coefficient of determination

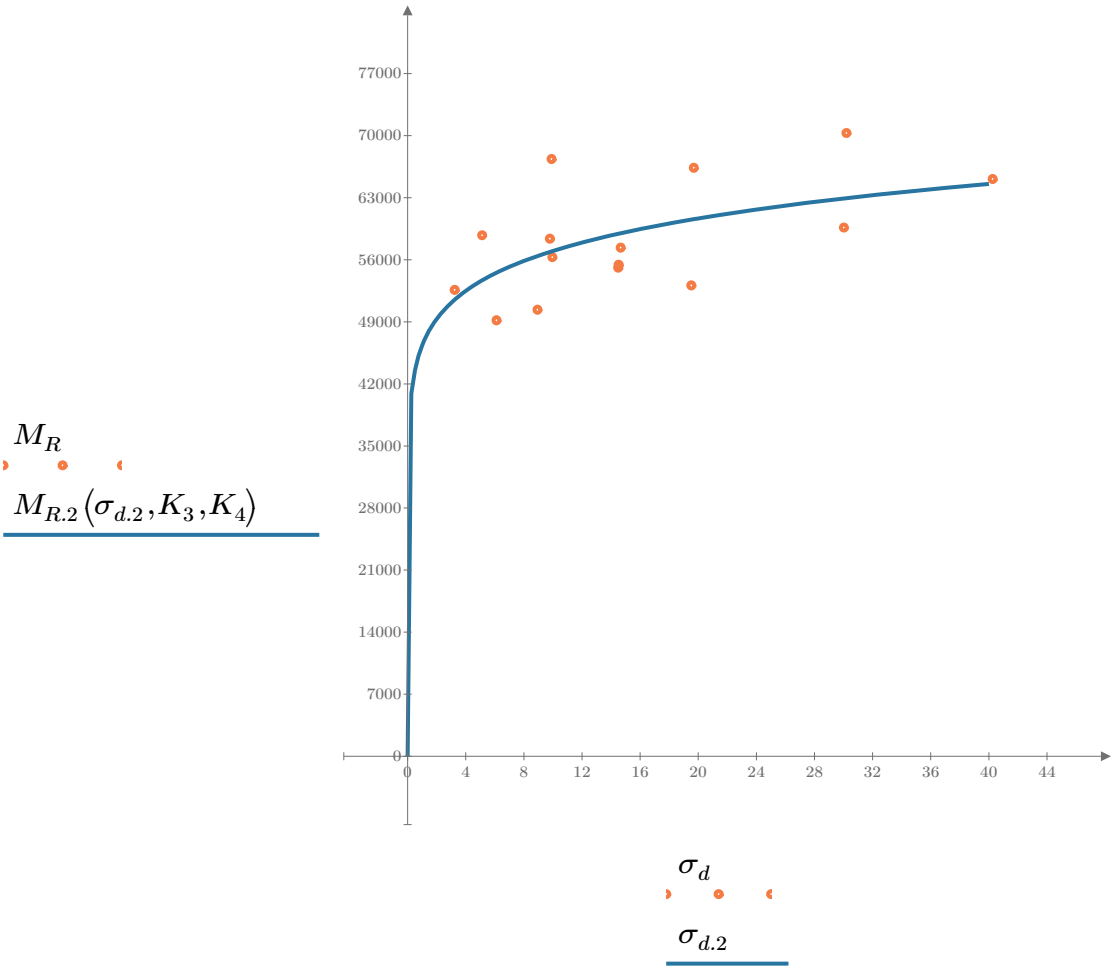

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–44”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 44880.187$

$K_6 = 0.0478$ Equation 3 fitting parameters

$K_7 = 0.0621$

${R_3}^2 = 0.3882$ Coefficient of determination

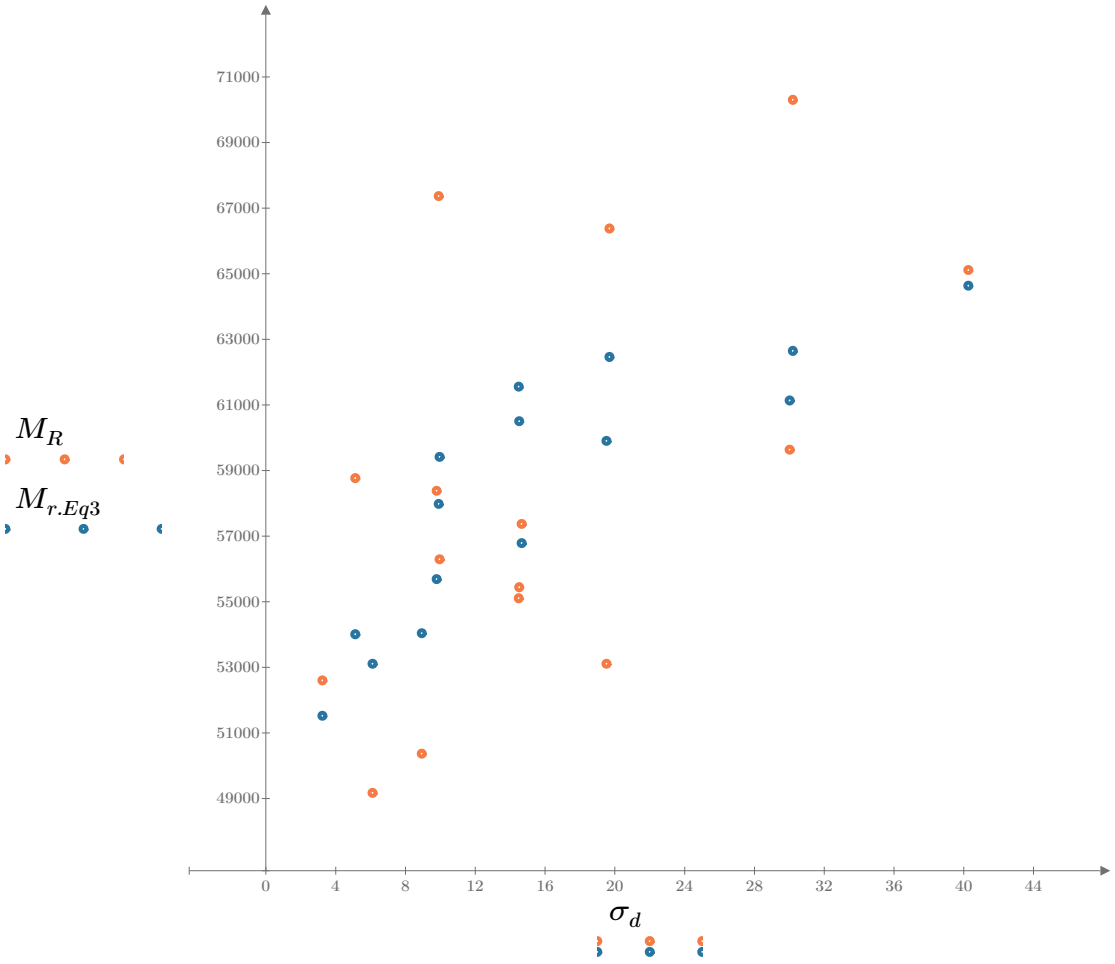

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-44\text{”}$

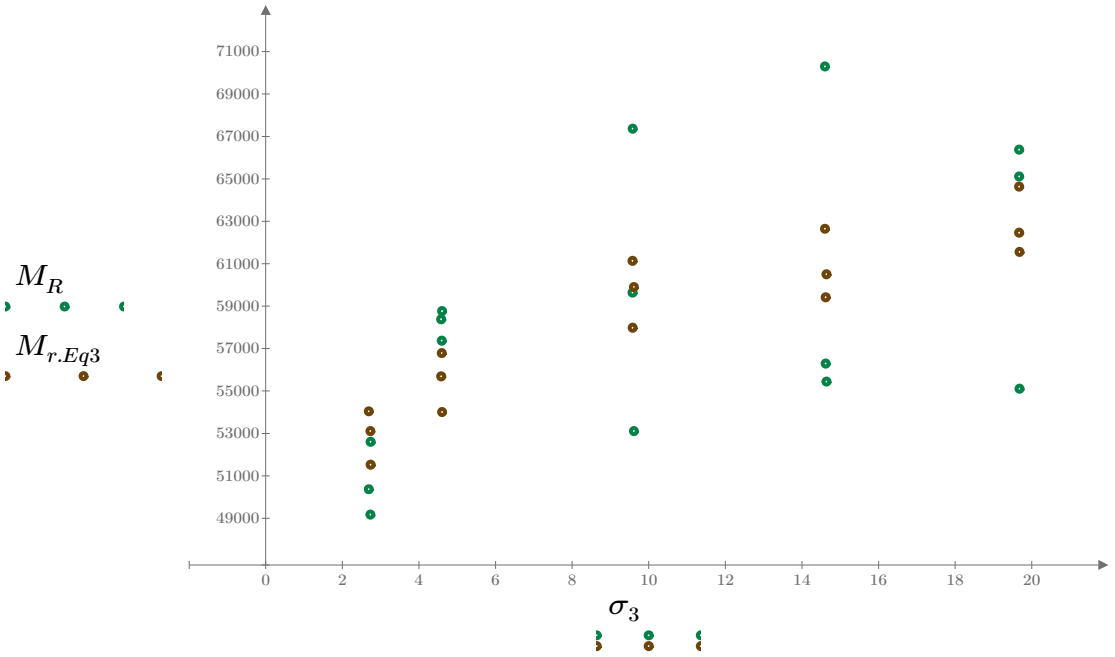

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

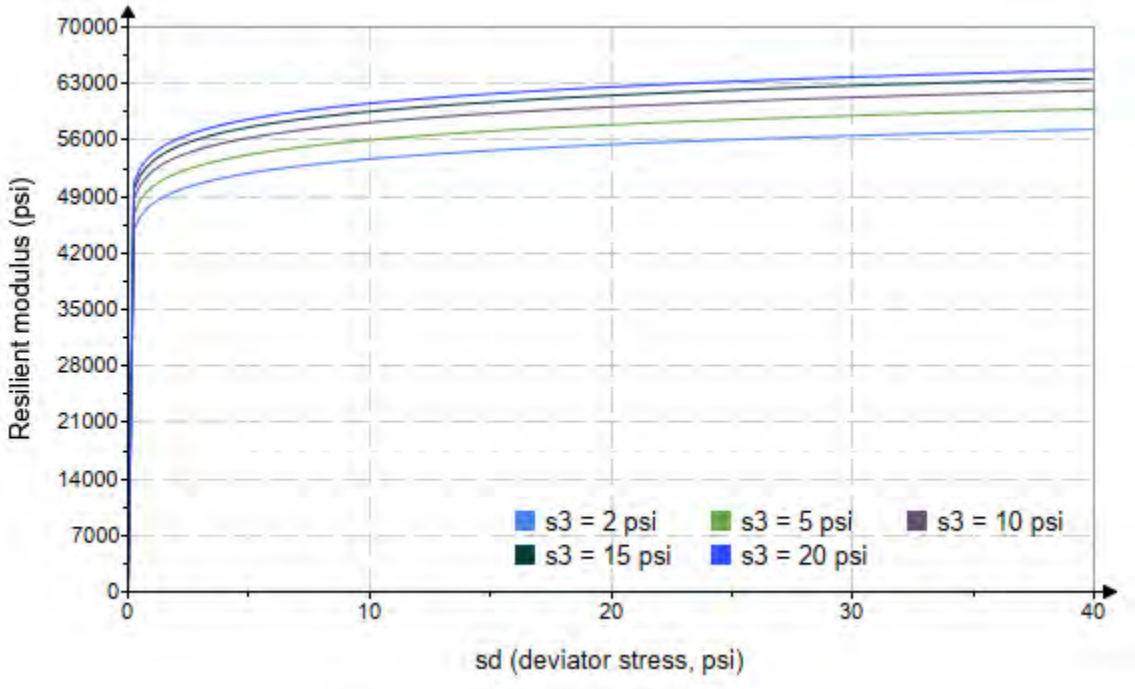

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–44”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 3689.912$

$K_9 = 0.0782$ Equation 4 fitting parameters

$K_{10} = 0.0228$

$R_4^{\,2} = 0.3810$ Coefficient of determination

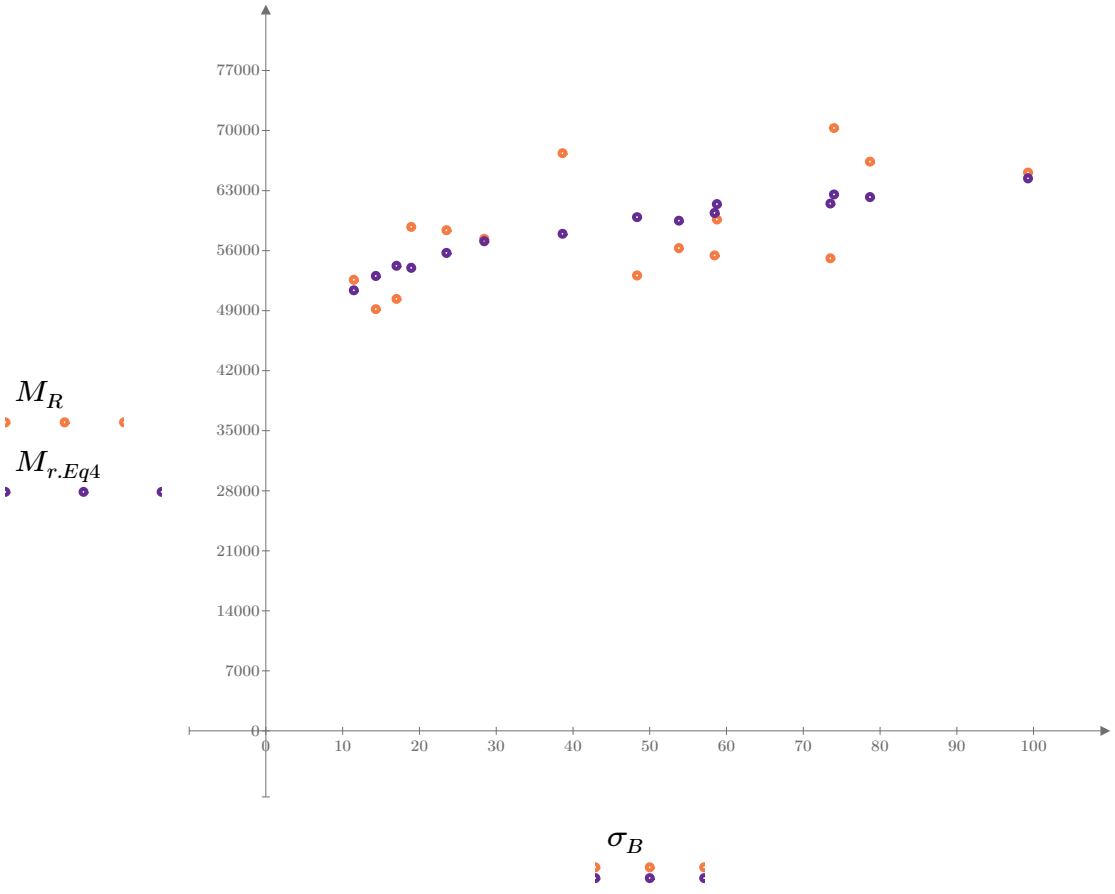

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

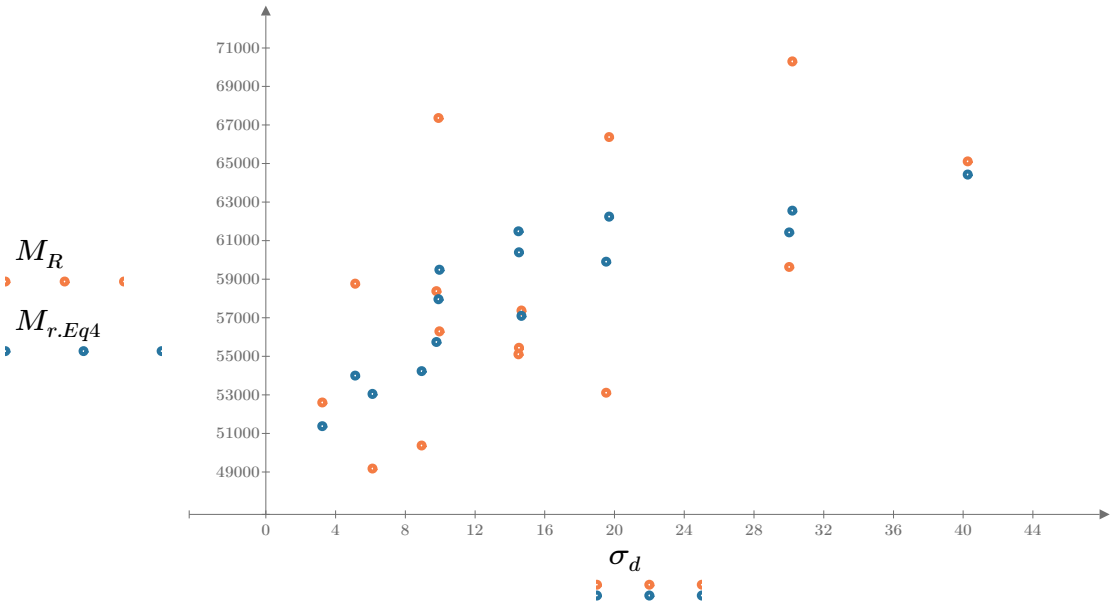

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

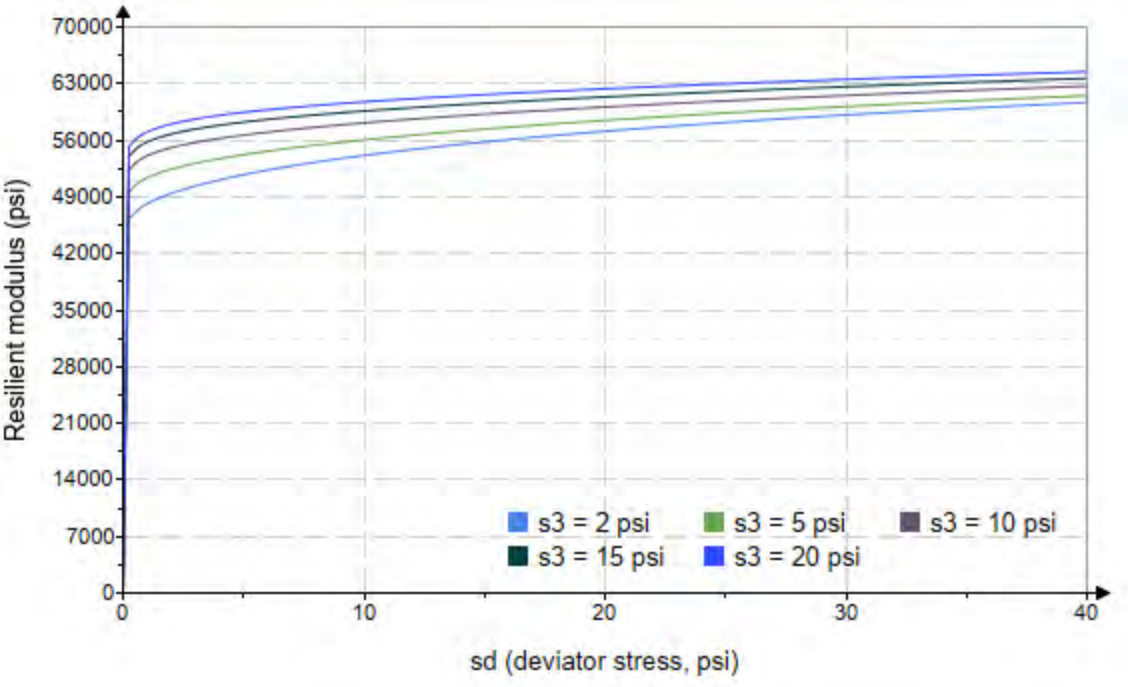

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−45"

$Treatment =$ "AD"

$S = 3.449$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.526 \\ 2.154 \\ 2.071 \\ 4.406 \\ 3.647 \\ 3.802 \\ 9.120 \\ 9.525 \\ 9.365 \\ 14.290 \\ 14.450 \\ 14.330 \\ 19.280 \\ 19.460 \\ 19.460 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.169 \\ 6.075 \\ 9.164 \\ 5.153 \\ 10.060 \\ 14.750 \\ 9.989 \\ 19.740 \\ 30.160 \\ 9.950 \\ 14.700 \\ 30.250 \\ 14.790 \\ 19.880 \\ 40.530 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.750 \\ 12.540 \\ 15.380 \\ 18.370 \\ 21.000 \\ 26.160 \\ 37.350 \\ 48.320 \\ 58.250 \\ 52.820 \\ 58.060 \\ 73.250 \\ 72.630 \\ 78.250 \\ 98.910 \end{bmatrix} \quad M_R = \begin{bmatrix} 26364.6 \\ 25646.2 \\ 29064.0 \\ 30109.0 \\ 33518.0 \\ 40432.6 \\ 48354.0 \\ 58668.0 \\ 54044.8 \\ 62202.2 \\ 65191.8 \\ 56925.6 \\ 51372.8 \\ 53292.4 \\ 52606.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–45”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 12212.604$

$K_2 = 0.3597$

Equation 1 fitting parameters

$R_1^2 = 0.7565$ Coefficient of determination

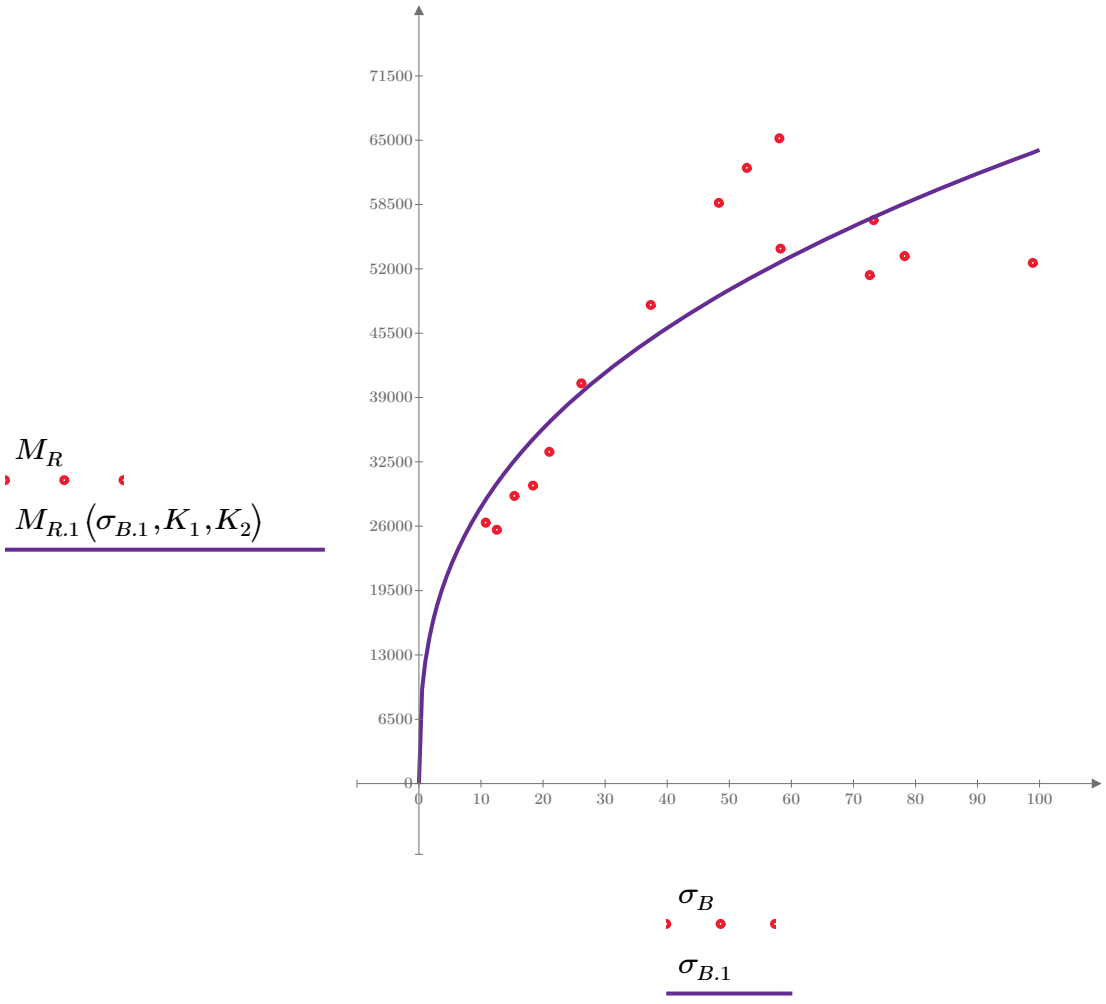

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–45”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 21889.199$

$K_4 = 0.2834$

Equation 2 fitting parameters

${R_2}^2 = 0.4722$ Coefficient of determination

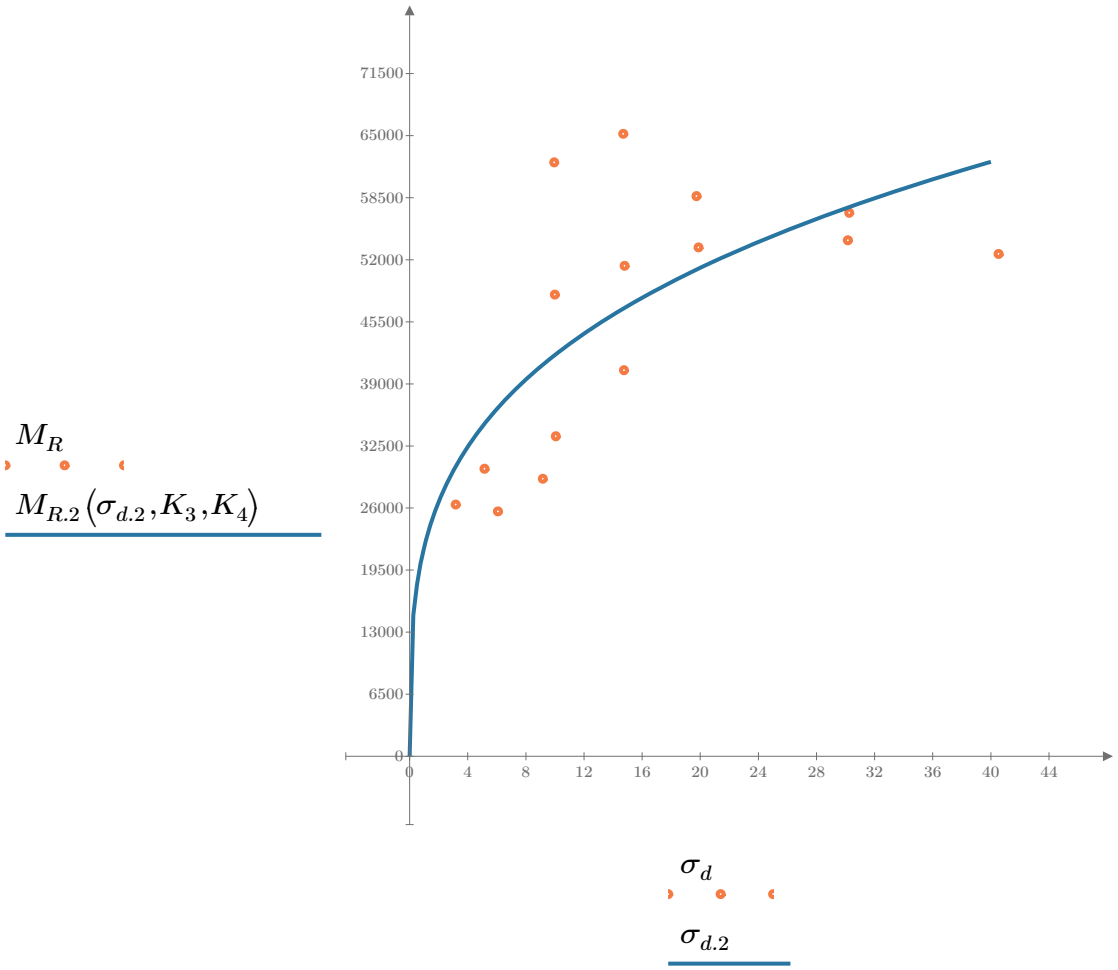

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–45”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 19188.623$

$K_6 = 0.0563$ Equation 3 fitting parameters

$K_7 = 0.3221$

${R_3}^2 = 0.7520$ Coefficient of determination

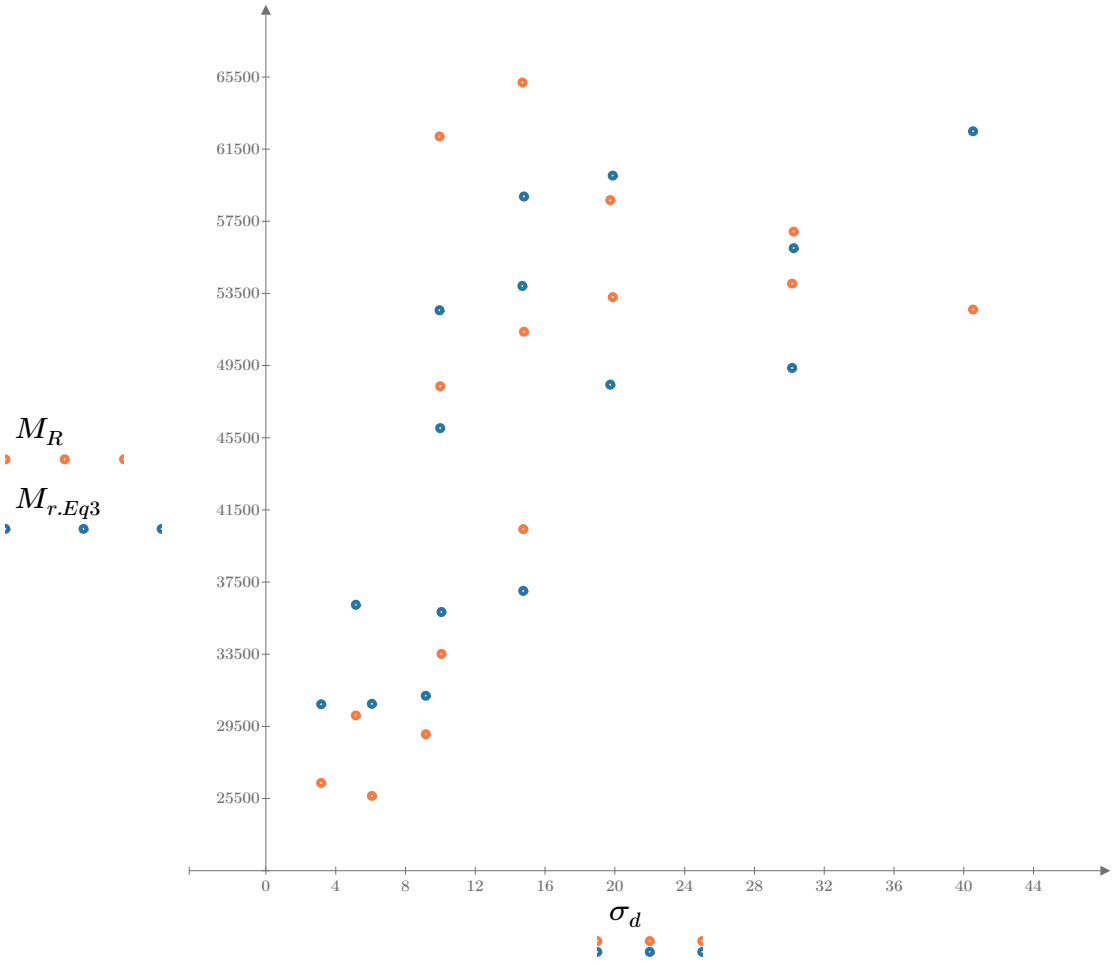

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–45”}$

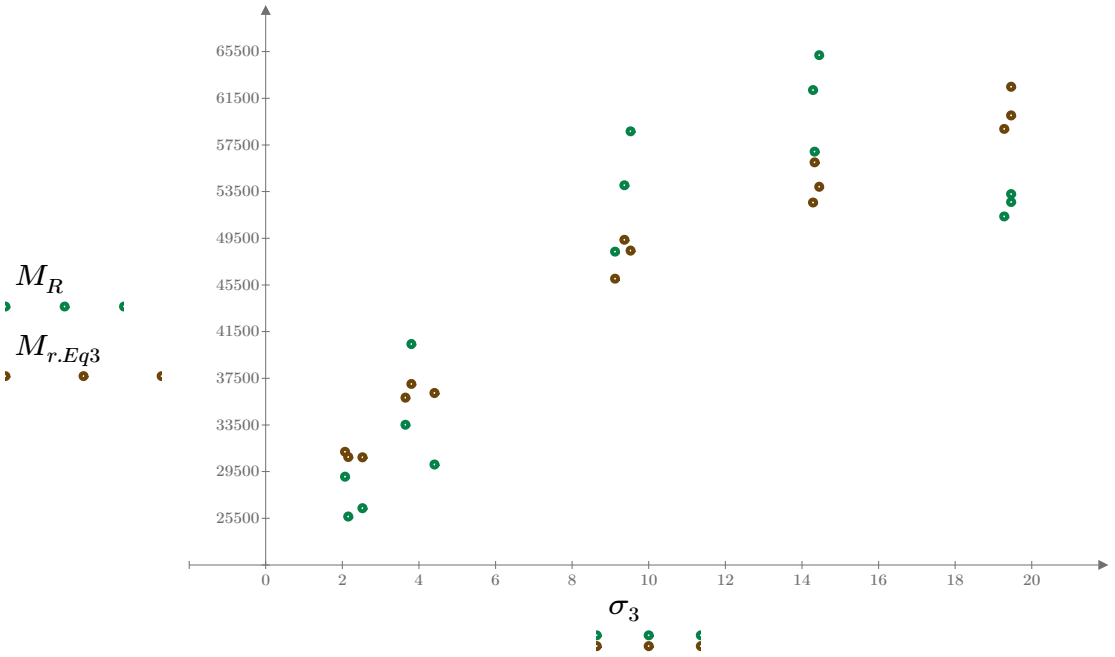

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

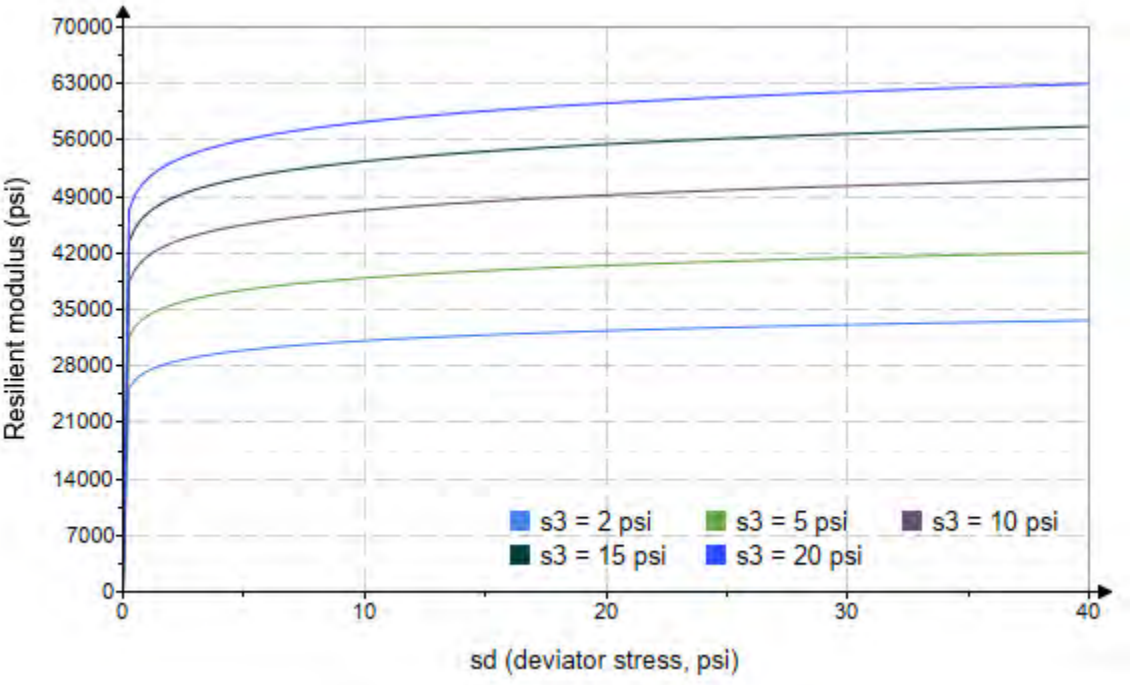

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–45”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1976.816$

$K_9 = 0.4520$ Equation 4 fitting parameters

$K_{10} = -0.1086$

$R_4^{\,2} = 0.7740$ Coefficient of determination

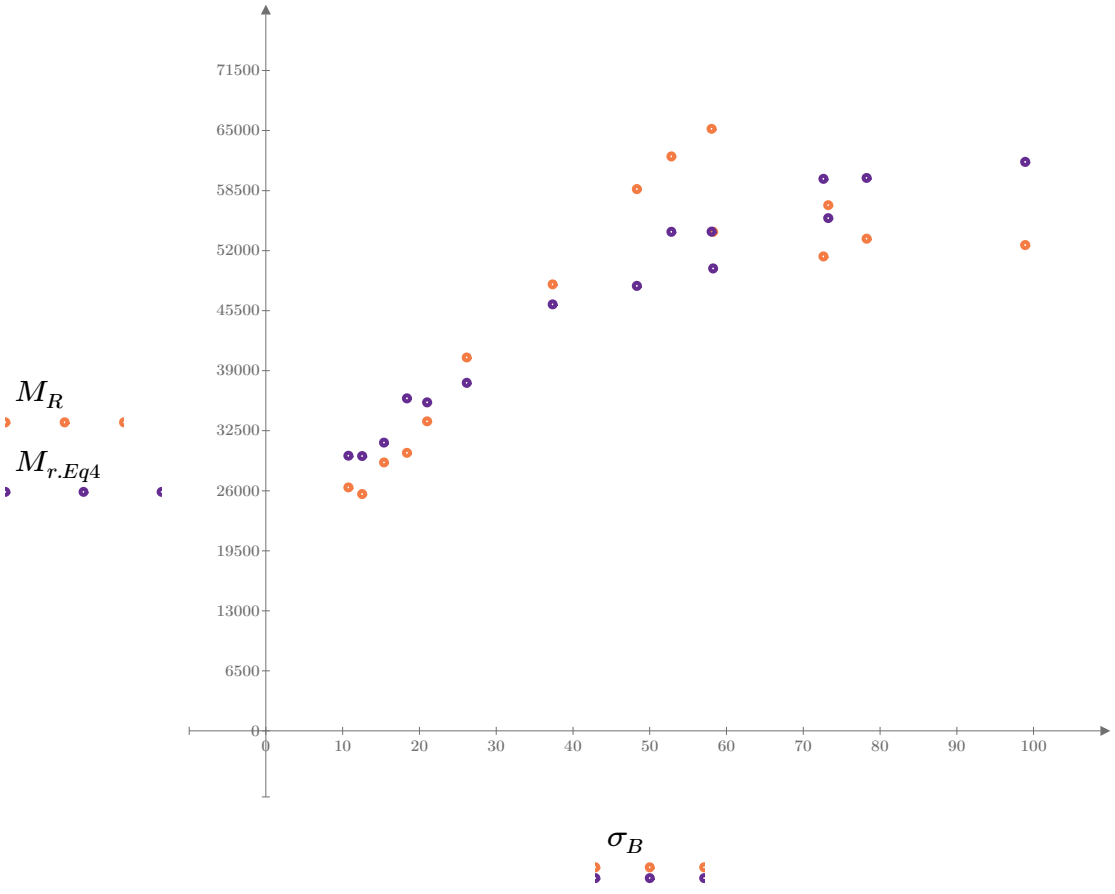

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

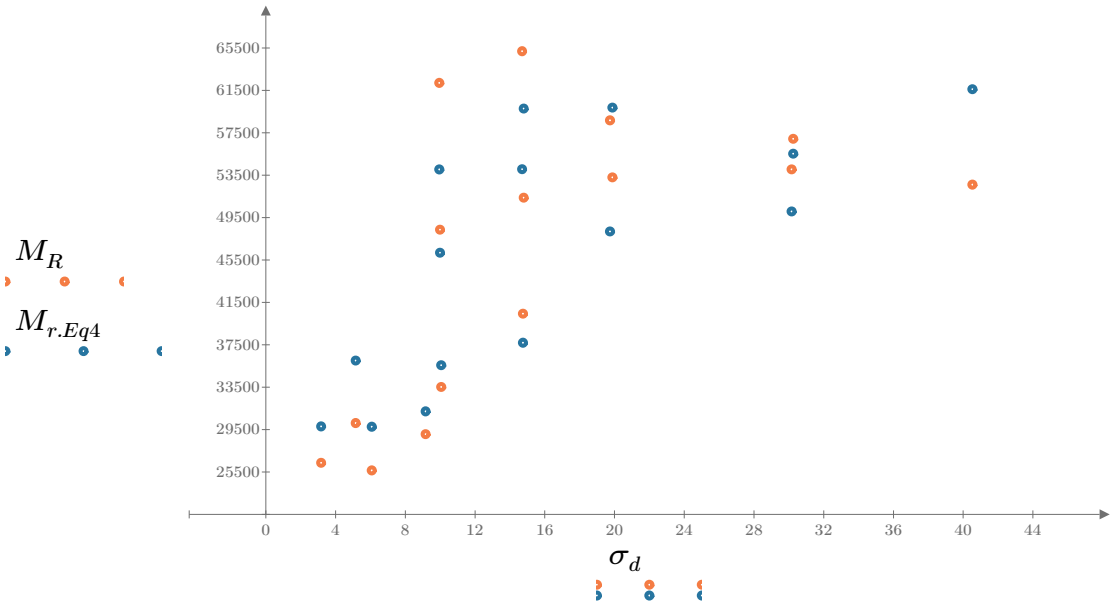

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

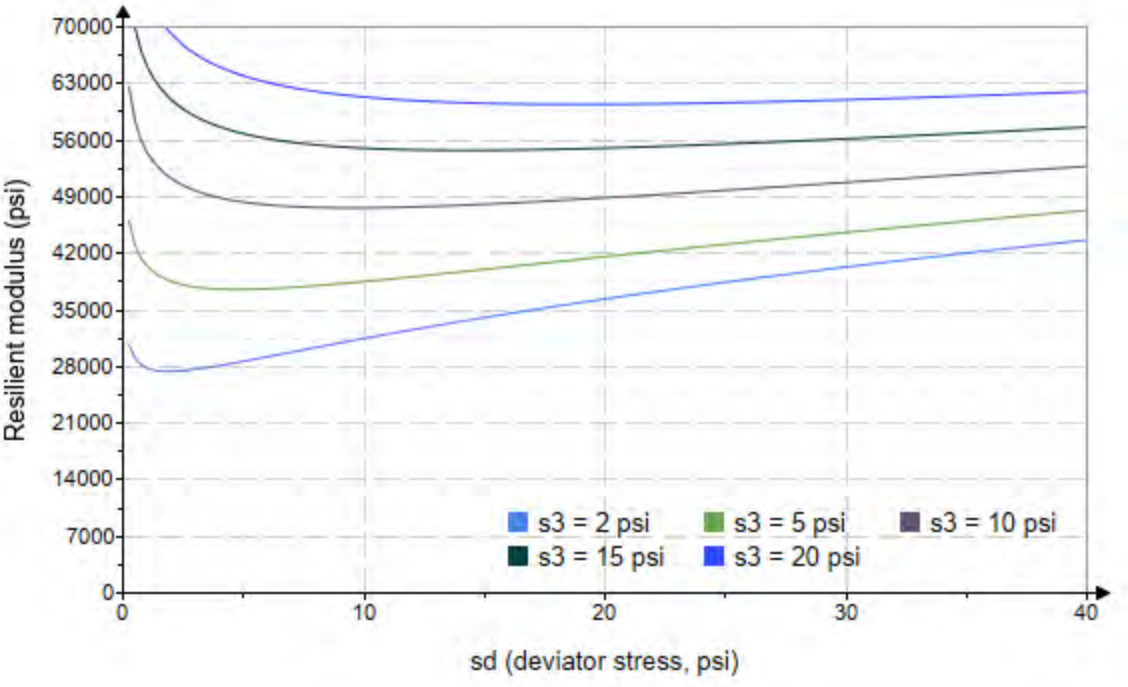

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−46"

$Treatment =$ "AD"

$S = 3.329$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.682 \\ 2.635 \\ 2.657 \\ 4.606 \\ 4.668 \\ 4.688 \\ 9.710 \\ 9.644 \\ 9.671 \\ 14.770 \\ 14.700 \\ 14.690 \\ 19.670 \\ 19.680 \\ 19.680 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.115 \\ 6.093 \\ 8.926 \\ 5.125 \\ 9.798 \\ 14.600 \\ 9.822 \\ 19.490 \\ 29.880 \\ 9.758 \\ 14.570 \\ 30.080 \\ 14.620 \\ 19.660 \\ 40.240 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.160 \\ 14.000 \\ 16.900 \\ 18.940 \\ 23.800 \\ 28.670 \\ 38.950 \\ 48.420 \\ 58.890 \\ 54.060 \\ 58.650 \\ 74.150 \\ 73.630 \\ 78.690 \\ 99.270 \end{bmatrix} \quad M_R = \begin{bmatrix} 45390.4 \\ 36808.6 \\ 35861.0 \\ 32097.0 \\ 31492.2 \\ 33950.2 \\ 32110.8 \\ 45629.4 \\ 58545.2 \\ 51655.6 \\ 62738.0 \\ 73967.8 \\ 78218.0 \\ 81508.8 \\ 58175.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–46”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 9722.310$

$K_2 = 0.4405$

Equation 1 fitting parameters

$R_1^2 = 0.6302$ Coefficient of determination

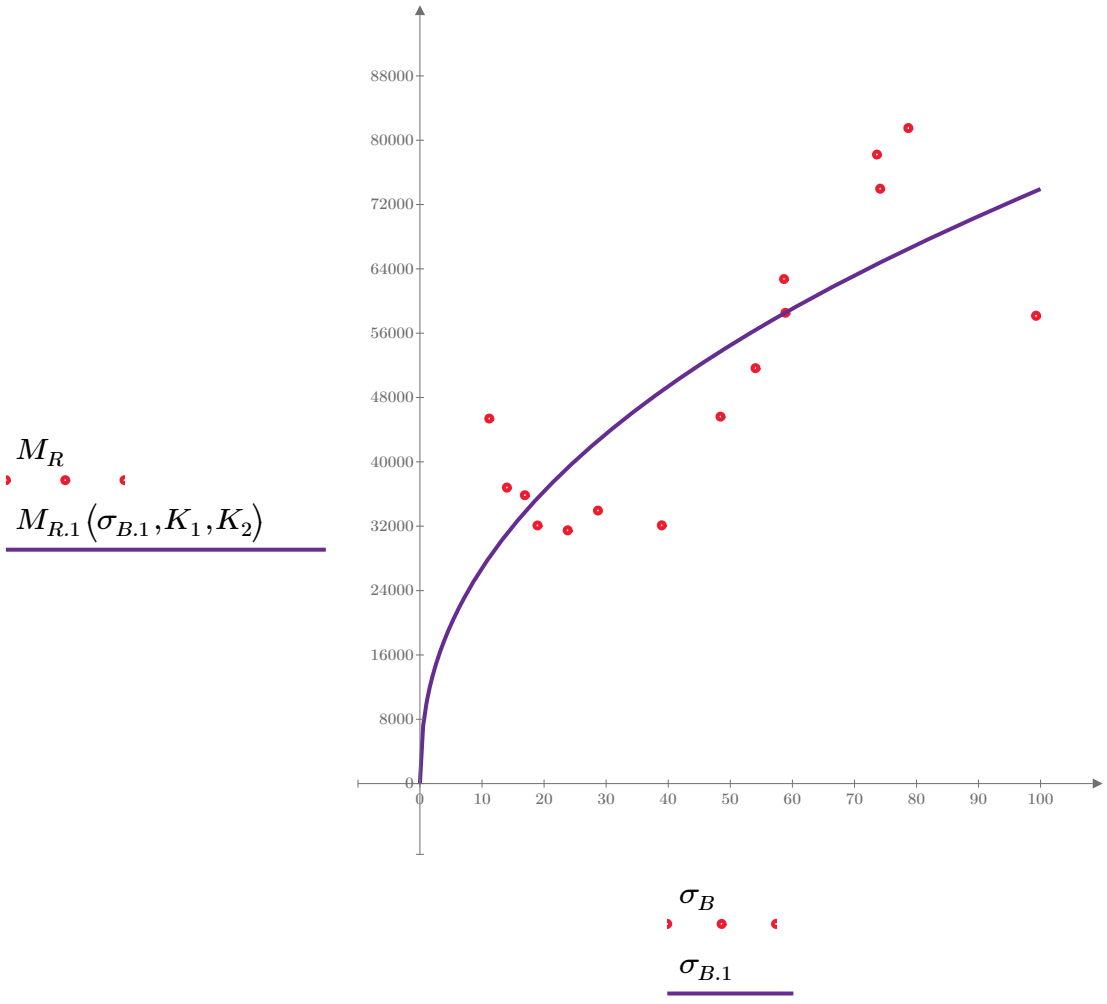

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–46”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 23559.147$

$K_4 = 0.2929$ Equation 2 fitting parameters

${R_2}^2 = 0.3378$ Coefficient of determination

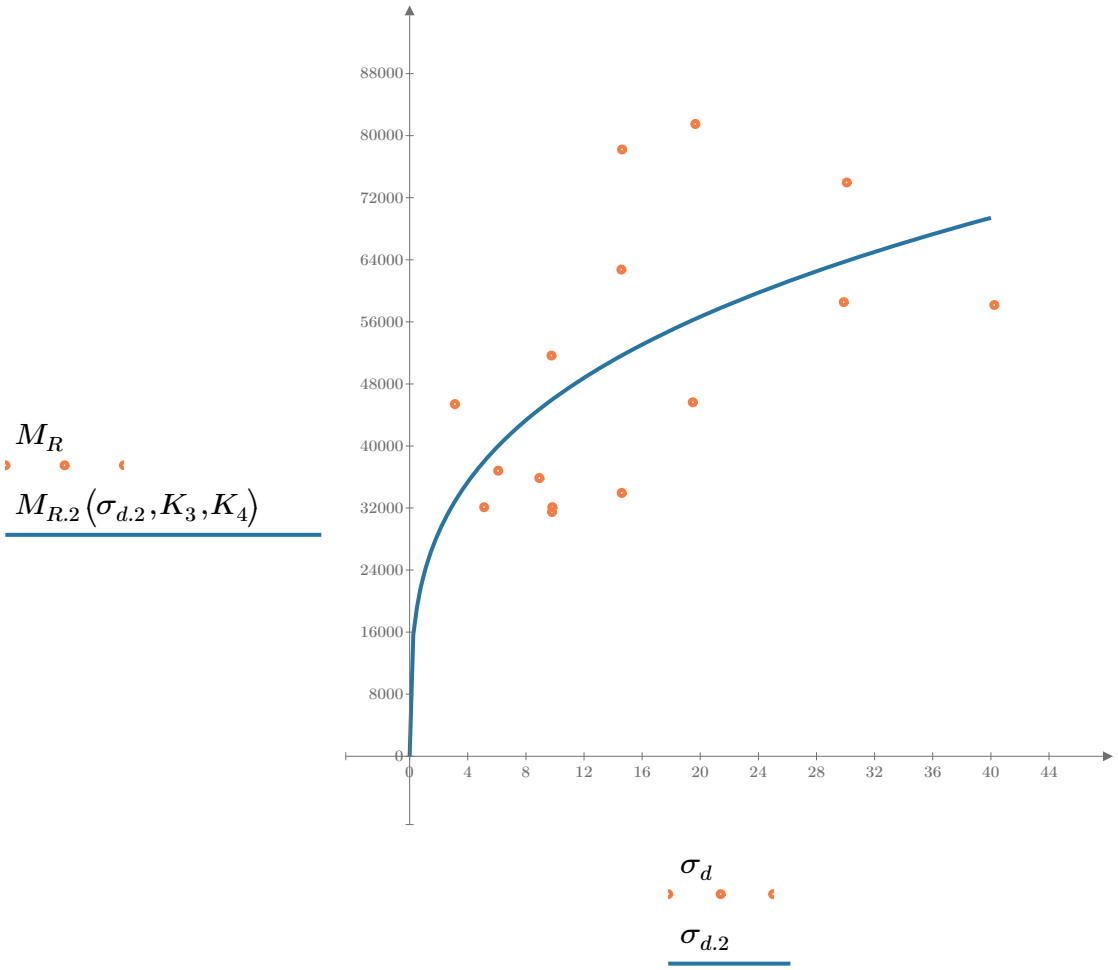

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–46”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 16480.444$

$K_6 = 0.0198$ Equation 3 fitting parameters

$K_7 = 0.4575$

${R_3}^2 = 0.6755$ Coefficient of determination

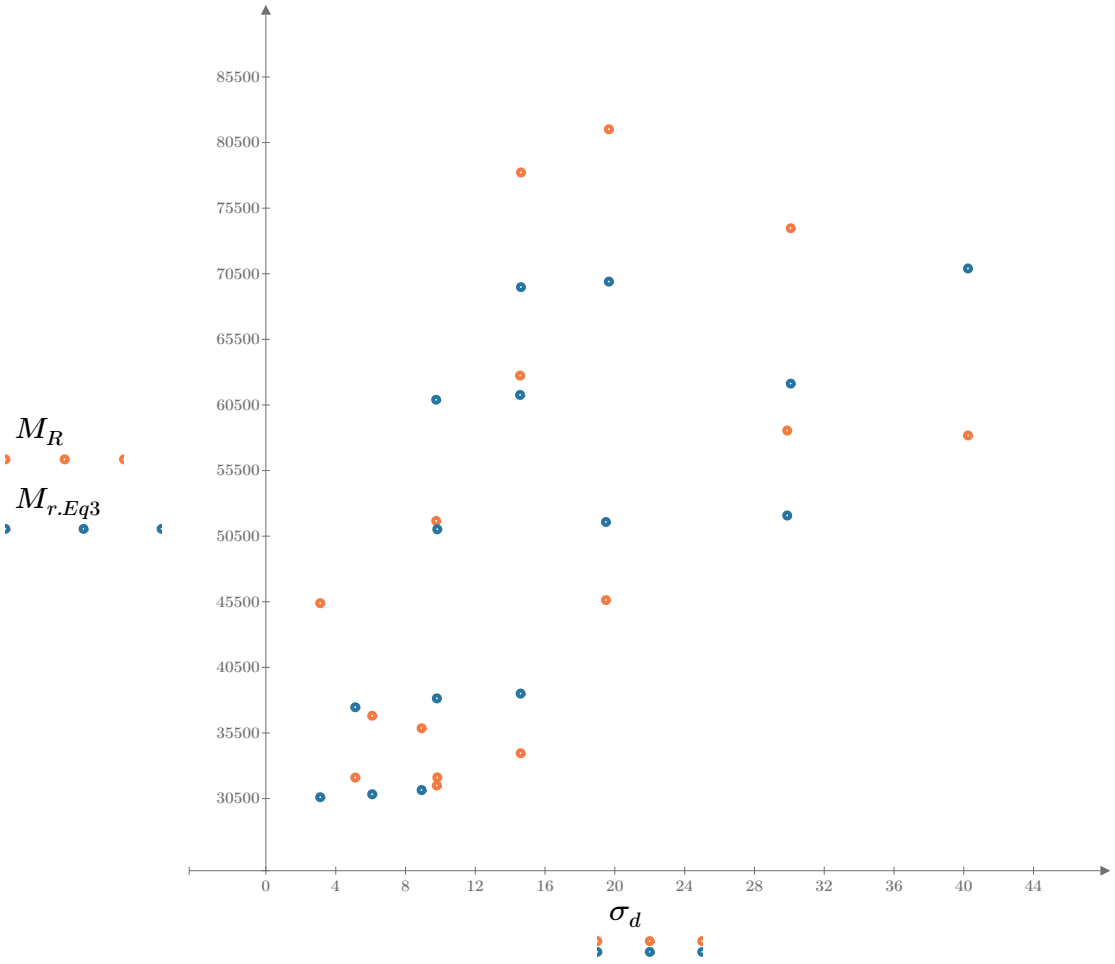

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–46”}$

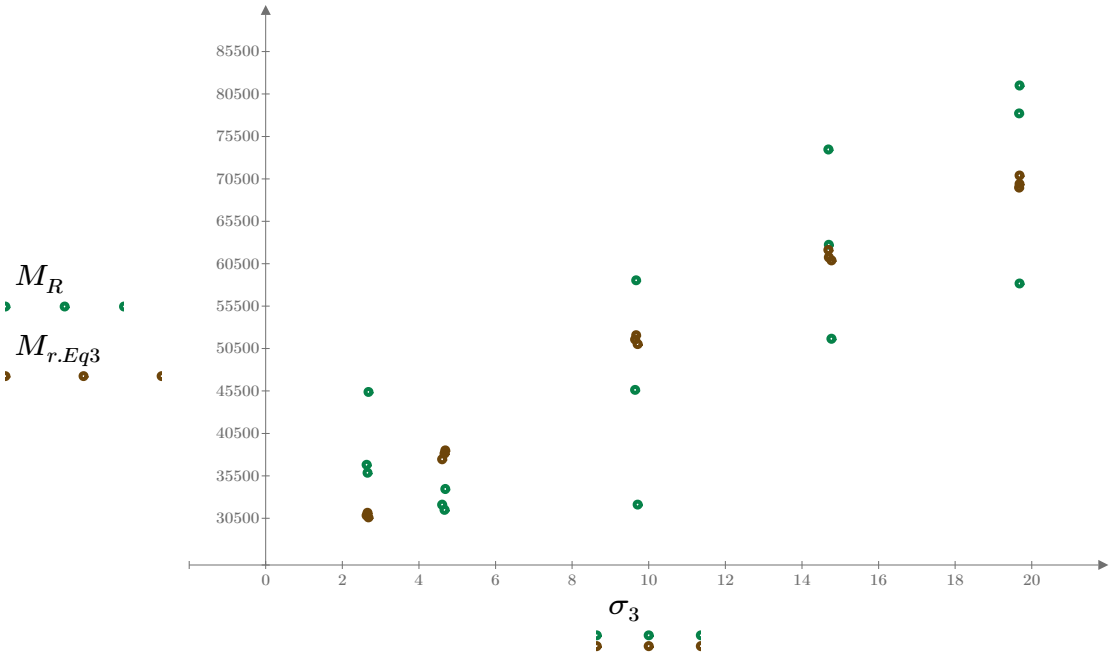

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

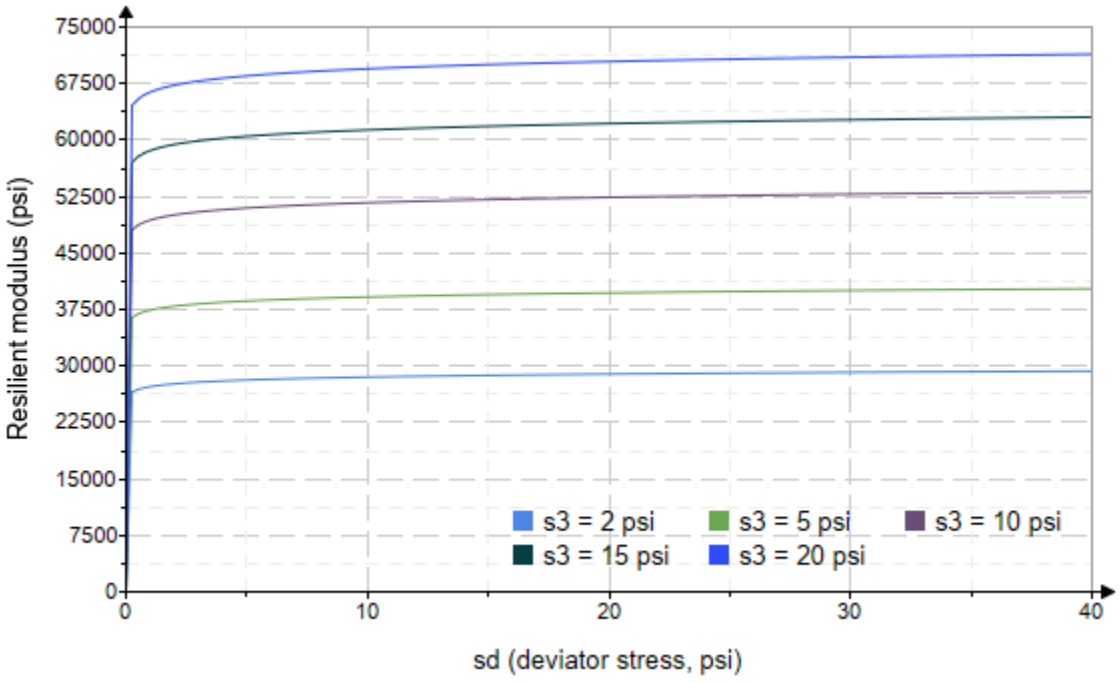

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–46”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1821.027$

$K_9 = 0.5914$ Equation 4 fitting parameters

$K_{10} = -0.1662$

$R_4^{\,2} = 0.6622$ Coefficient of determination

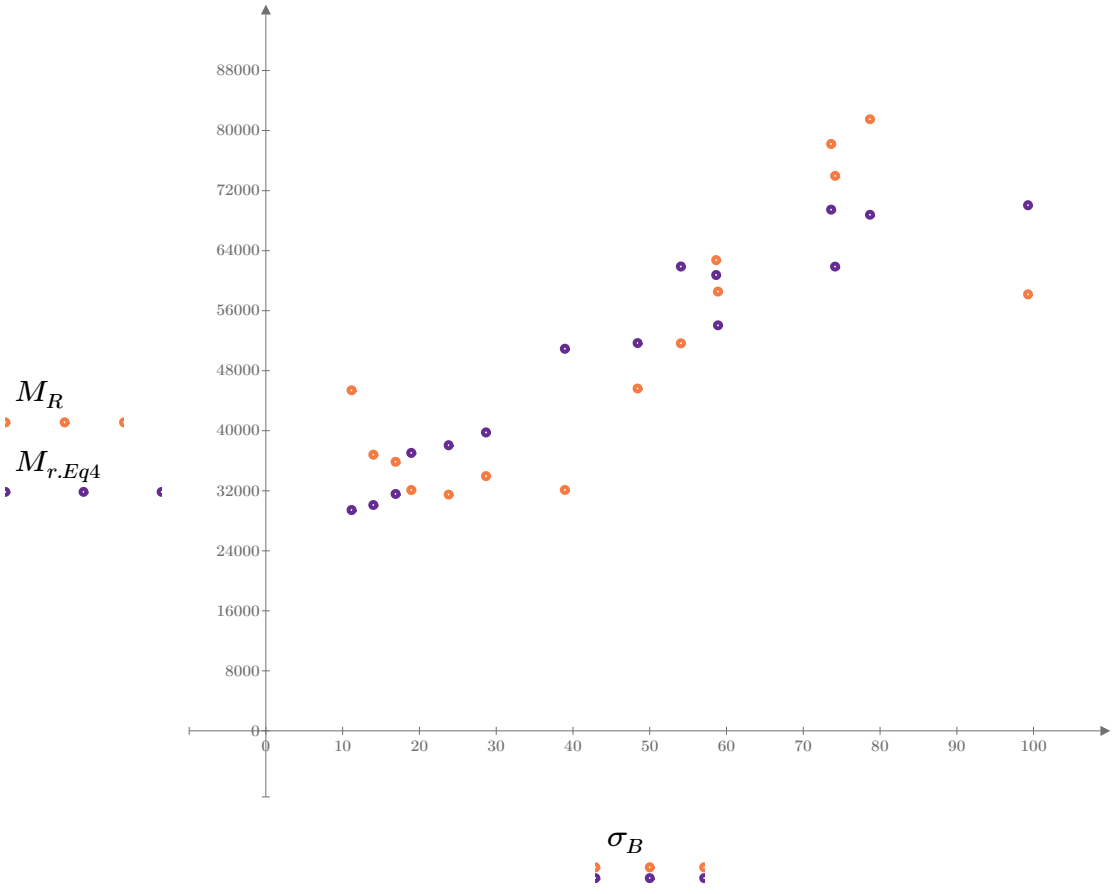

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

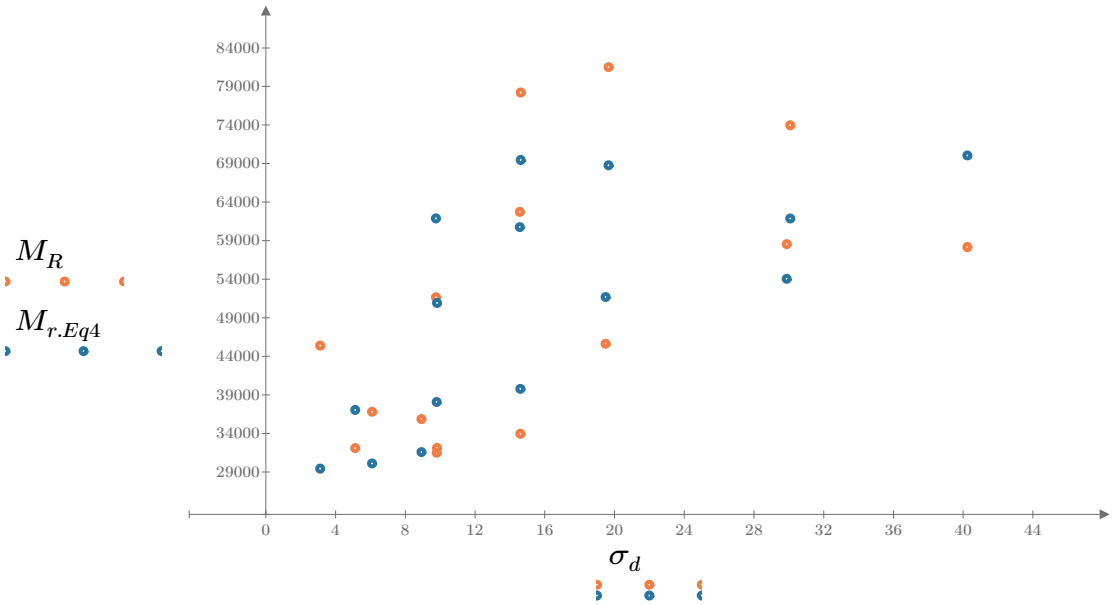

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

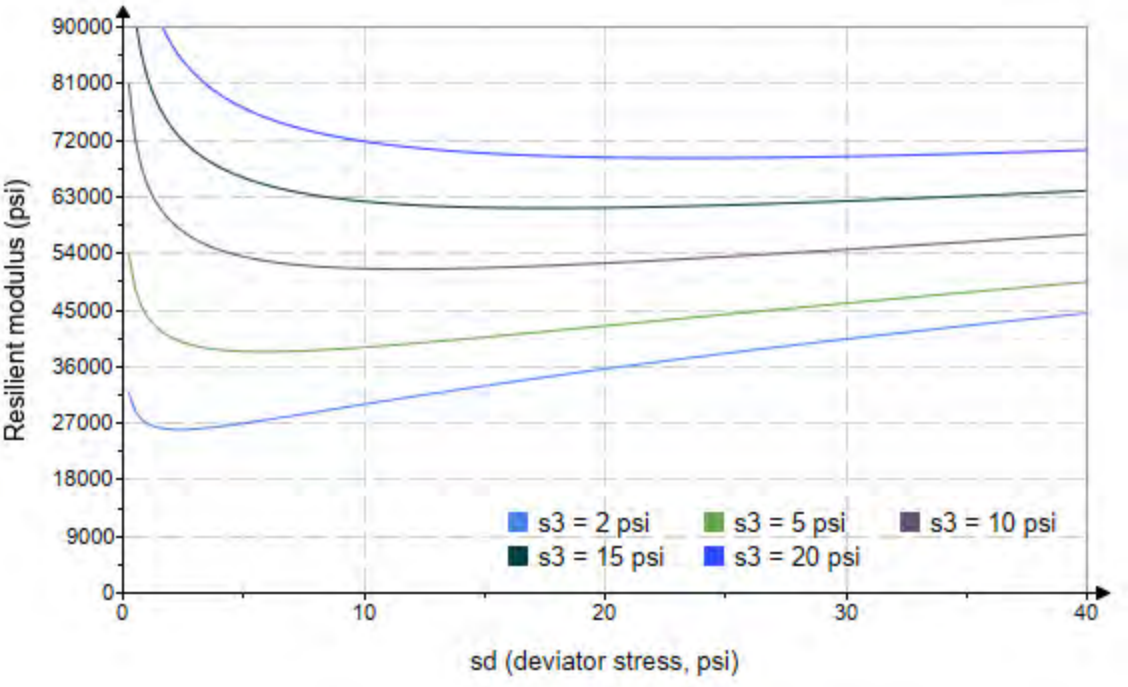

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−47"

$Treatment =$ "H100"

$S = 4.647$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.250 \\ 2.409 \\ 2.395 \\ 4.237 \\ 4.361 \\ 4.459 \\ 9.331 \\ 9.137 \\ 9.070 \\ 14.680 \\ 14.310 \\ 14.550 \\ 19.600 \\ 19.410 \\ 19.360 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.189 \\ 6.132 \\ 8.948 \\ 5.146 \\ 9.943 \\ 14.700 \\ 10.070 \\ 19.760 \\ 30.030 \\ 10.070 \\ 14.850 \\ 29.970 \\ 14.940 \\ 20.020 \\ 40.380 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 9.937 \\ 13.360 \\ 16.130 \\ 17.860 \\ 23.030 \\ 28.080 \\ 38.070 \\ 47.170 \\ 57.240 \\ 54.120 \\ 57.780 \\ 73.610 \\ 73.750 \\ 78.250 \\ 98.450 \end{bmatrix} \quad M_R = \begin{bmatrix} 61174.2 \\ 49191.4 \\ 44366.2 \\ 52657.0 \\ 60947.8 \\ 54183.4 \\ 60126.9 \\ 66070.4 \\ 54771.0 \\ 94586.2 \\ 80672.4 \\ 56544.2 \\ 89131.6 \\ 74373.4 \\ 58135.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–47”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 34708.101$

$K_2 = 0.1668$

Equation 1 fitting parameters

${R_1}^2 = 0.2680$ Coefficient of determination

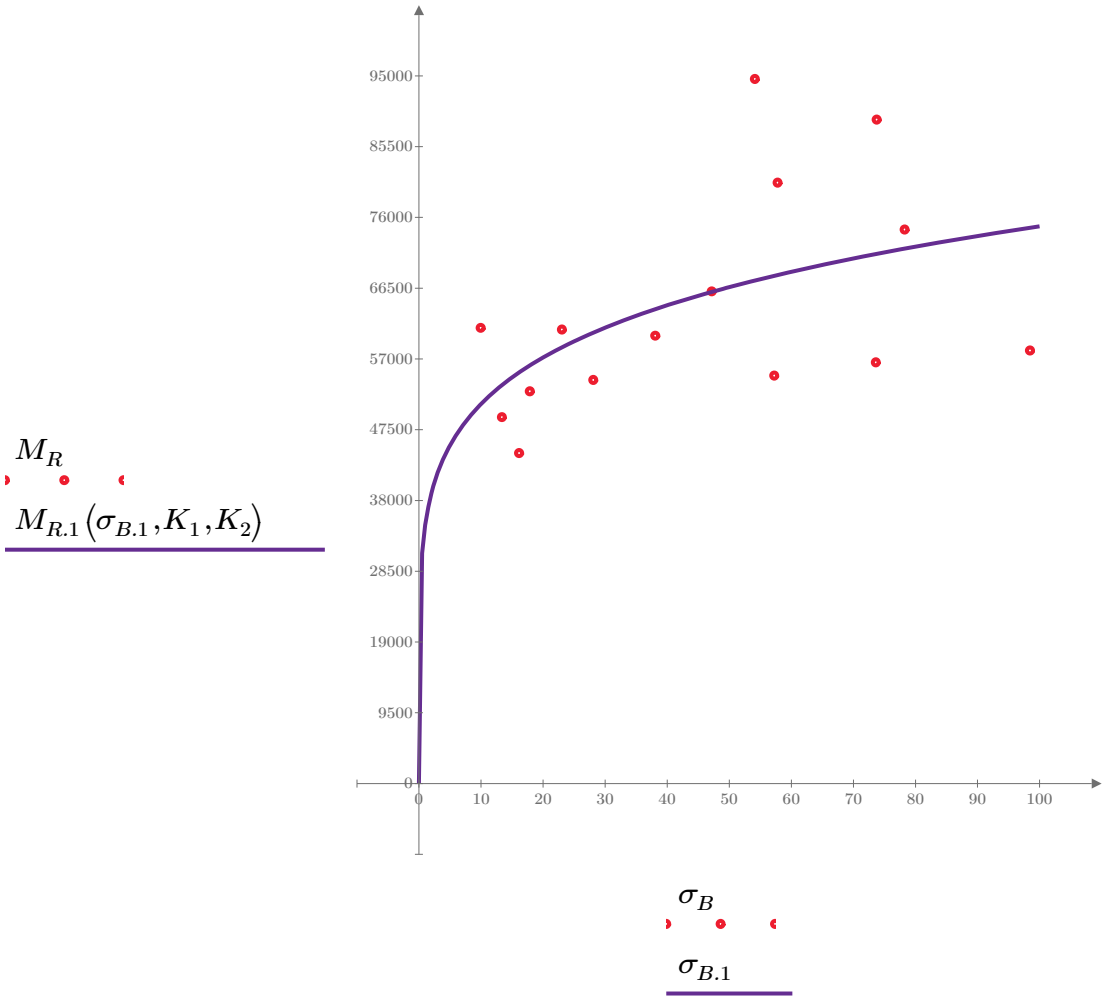

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–47”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 58447.455$

$K_4 = 0.0342$ Equation 2 fitting parameters

${R_2}^2 = 0.0118$ Coefficient of determination

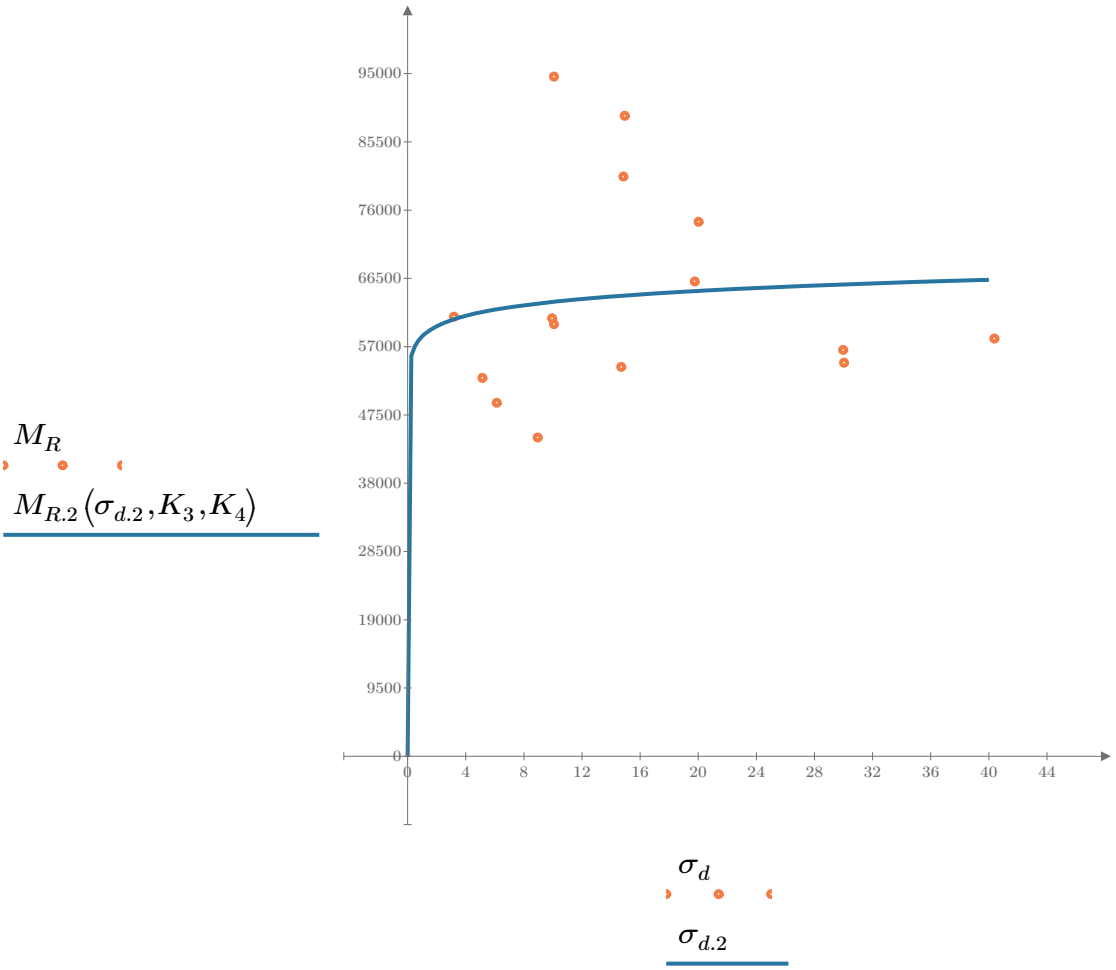

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–47”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 49368.938$

$K_6 = -0.2848$ Equation 3 fitting parameters

$K_7 = 0.4388$

${R_3}^2 = 0.7906$ Coefficient of determination

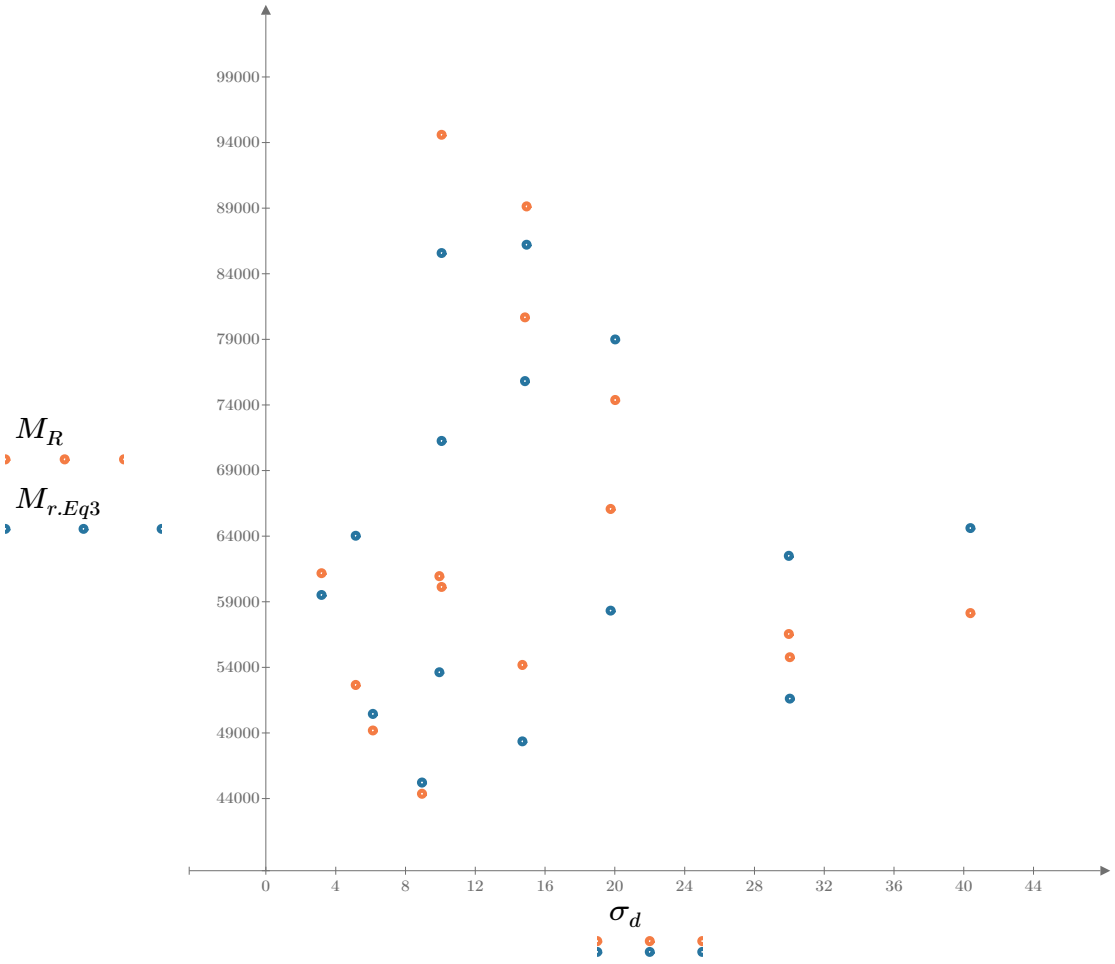

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–47”}$

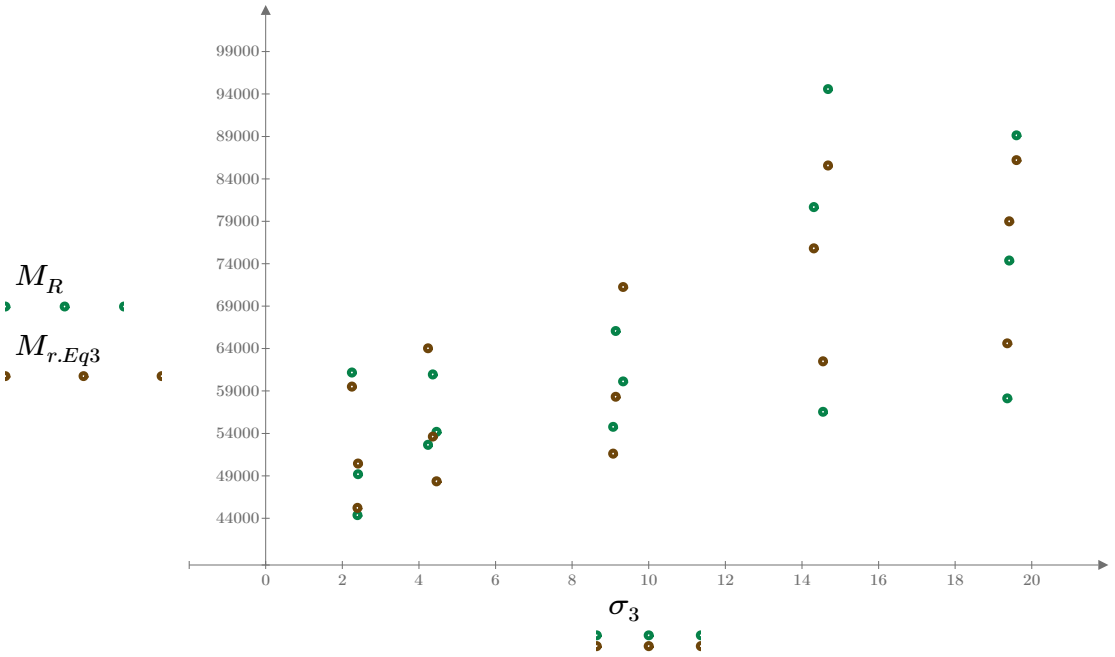

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

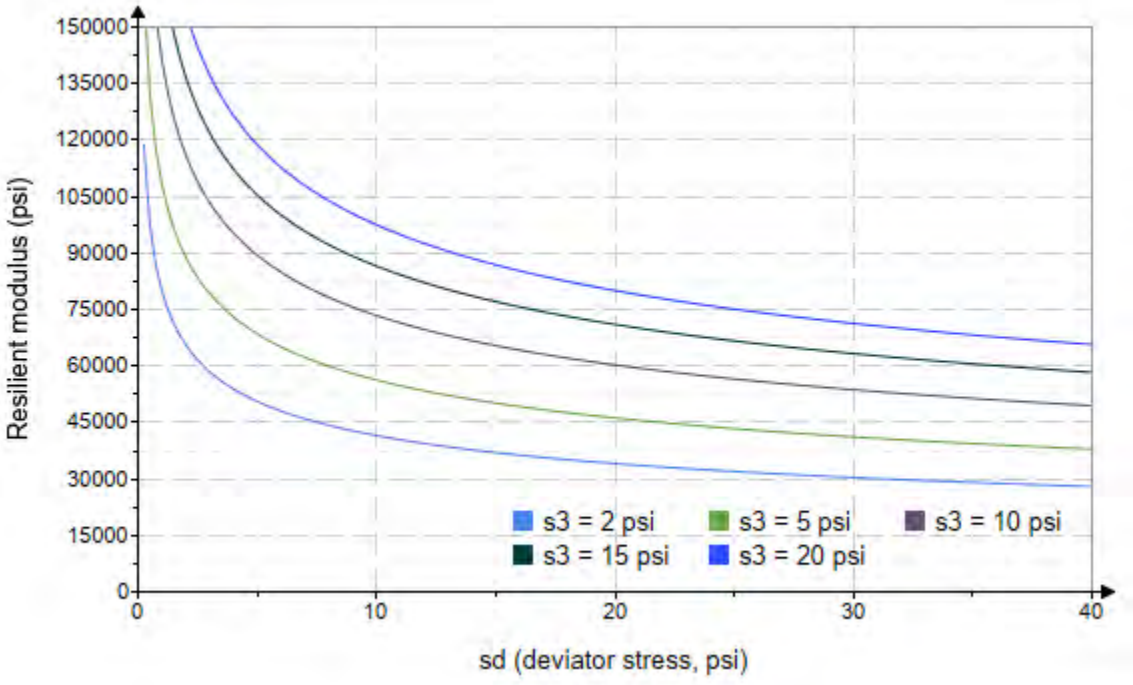

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–47”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2316.892$

$K_9 = 0.5857$ Equation 4 fitting parameters

$K_{10} = -0.4921$

$R_4^{\,2} = 0.8166$ Coefficient of determination

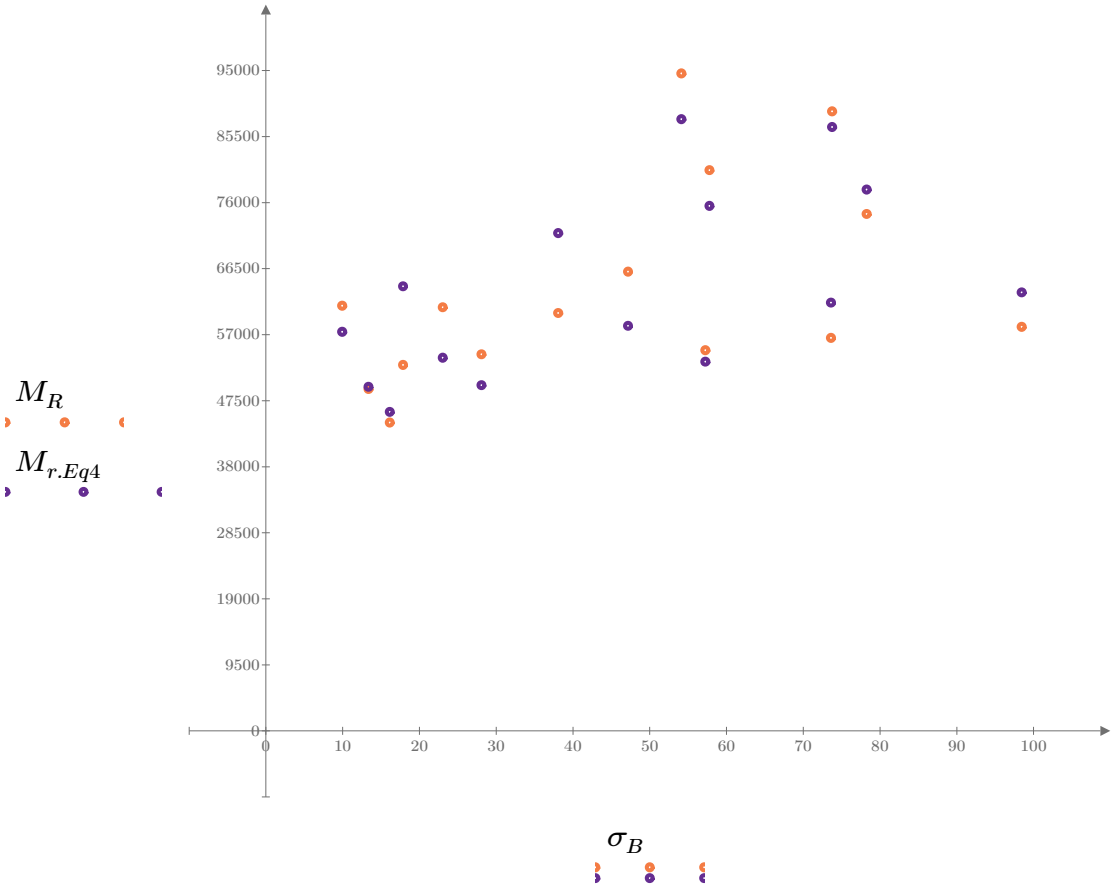

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

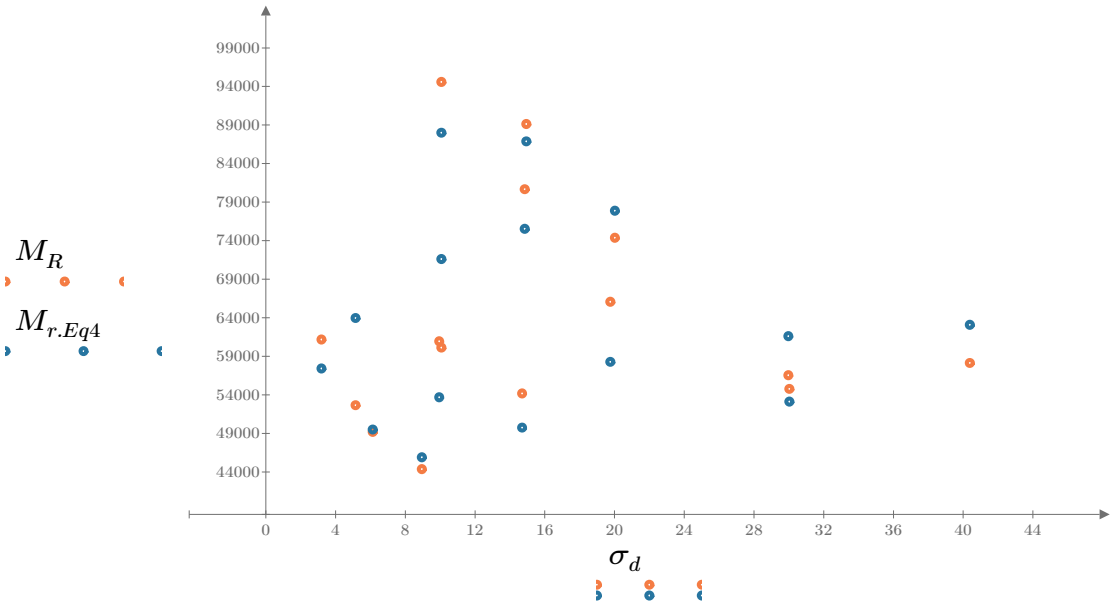

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

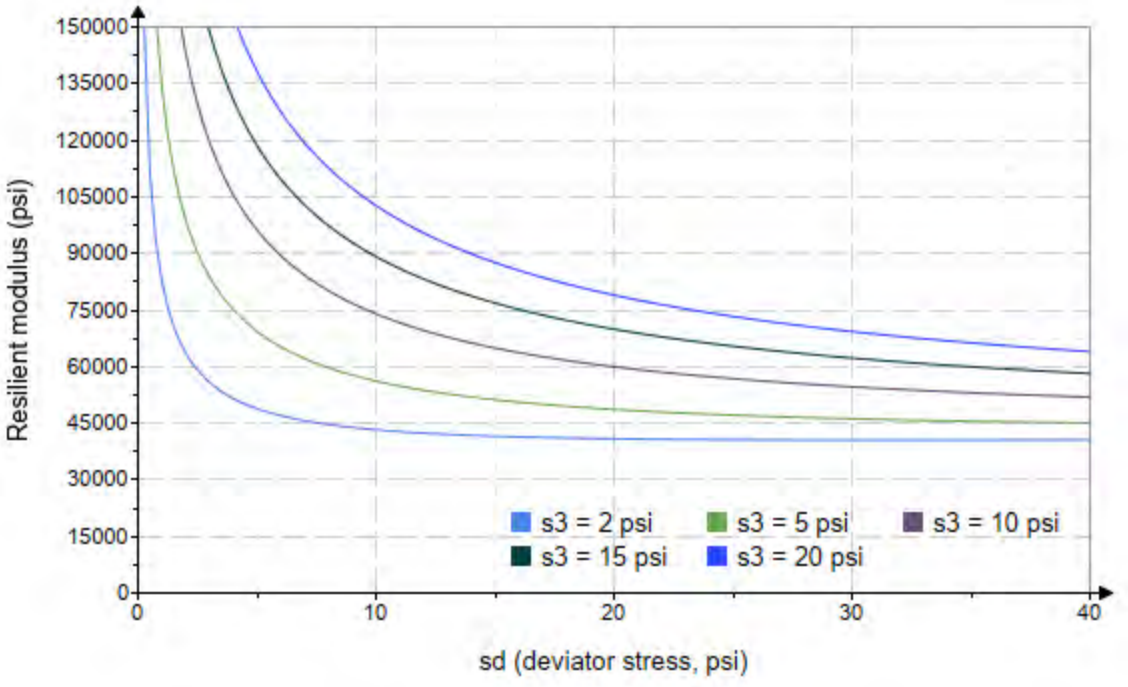

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−48"

$Treatment =$ "H100"

$S = 4.967$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.833 \\ 2.823 \\ 2.822 \\ 4.560 \\ 4.564 \\ 4.632 \\ 9.623 \\ 9.620 \\ 9.612 \\ 14.680 \\ 14.660 \\ 14.600 \\ 19.630 \\ 19.640 \\ 19.610 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.114 \\ 6.176 \\ 8.910 \\ 5.083 \\ 9.820 \\ 14.550 \\ 9.773 \\ 19.730 \\ 30.060 \\ 9.705 \\ 14.730 \\ 30.140 \\ 14.770 \\ 20.010 \\ 40.370 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.610 \\ 14.640 \\ 17.380 \\ 18.760 \\ 23.510 \\ 28.450 \\ 38.640 \\ 48.590 \\ 58.890 \\ 53.750 \\ 58.700 \\ 73.930 \\ 73.670 \\ 78.920 \\ 99.190 \end{bmatrix} \quad M_R = \begin{bmatrix} 45676.8 \\ 47303.6 \\ 48767.8 \\ 45534.4 \\ 53554.2 \\ 47073.0 \\ 42118.0 \\ 43215.0 \\ 48613.2 \\ 49007.4 \\ 48701.8 \\ 54963.6 \\ 54483.4 \\ 59124.8 \\ 58257.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–48”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 35665.194$

$K_2 = 0.0909$

Equation 1 fitting parameters

$R_1^2 = 0.3386$ Coefficient of determination

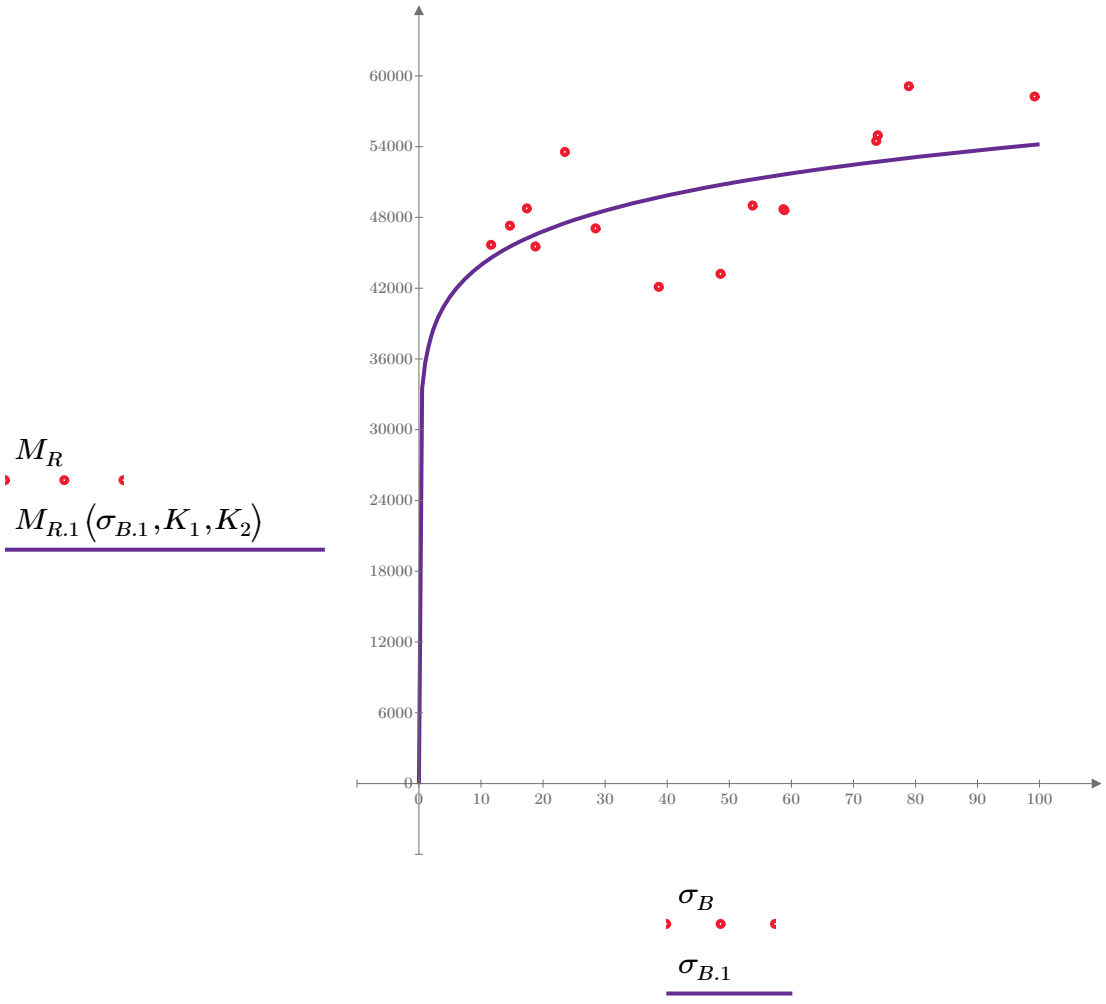

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–48”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 40305.071$

$K_4 = 0.0822$ Equation 2 fitting parameters

${R_2}^2 = 0.3010$ Coefficient of determination

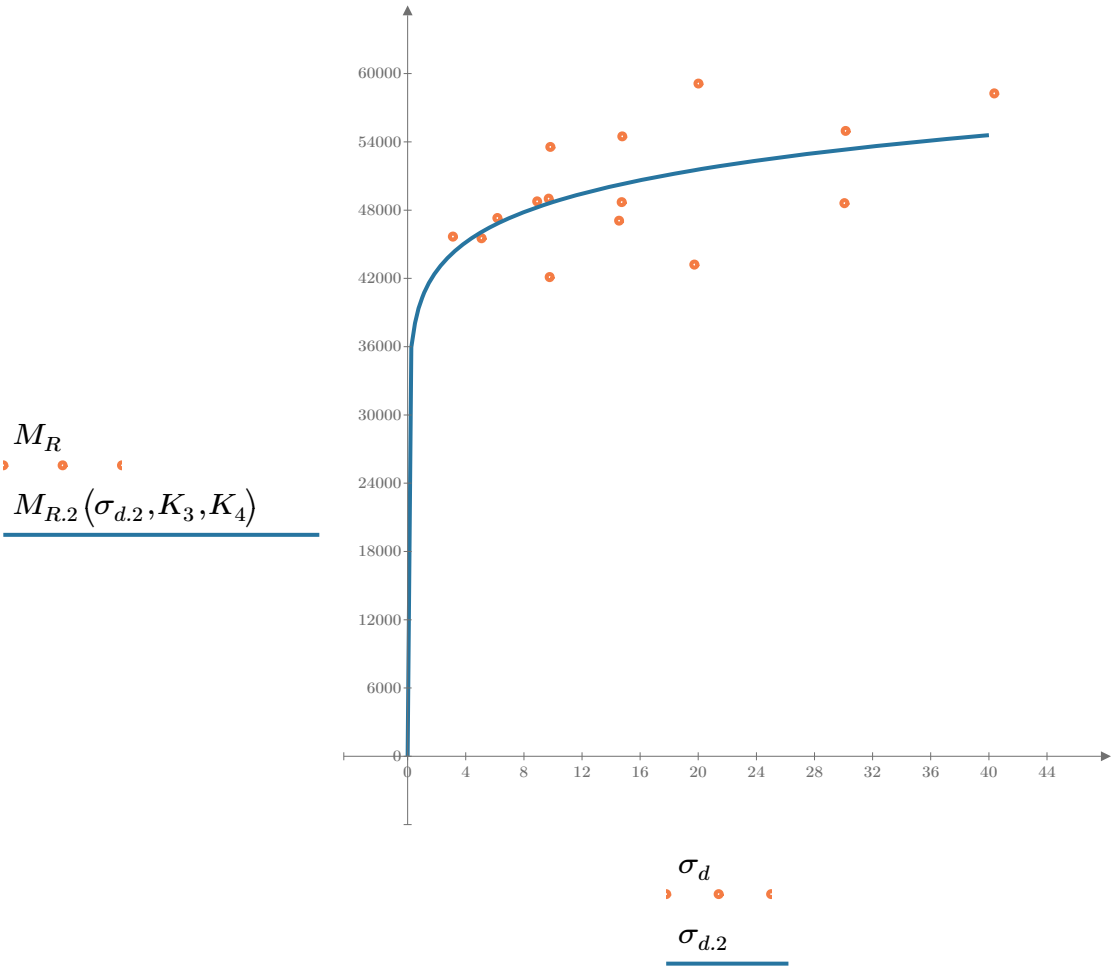

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–48”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 38913.864$

$K_6 = 0.0456$ Equation 3 fitting parameters

$K_7 = 0.057$

${R_3}^2 = 0.3602$ Coefficient of determination

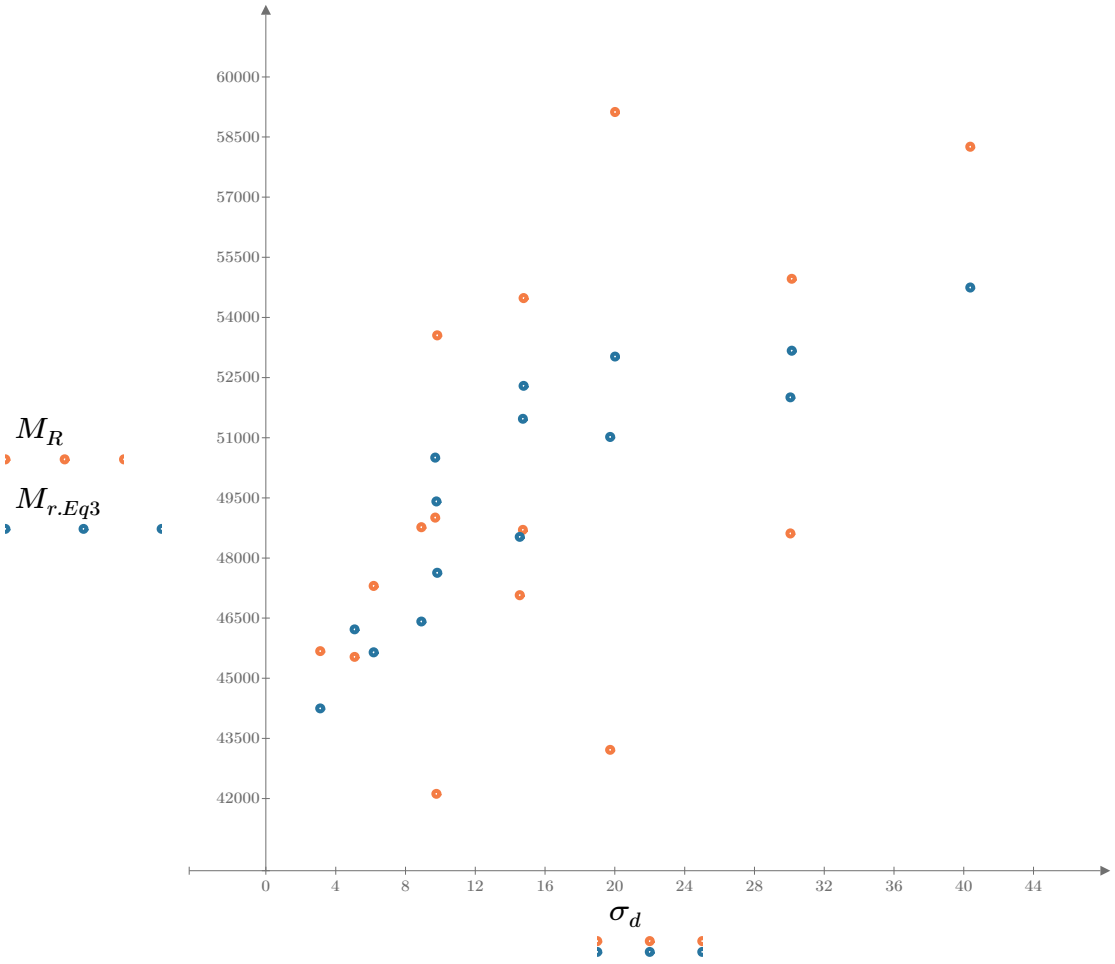

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–48”}$

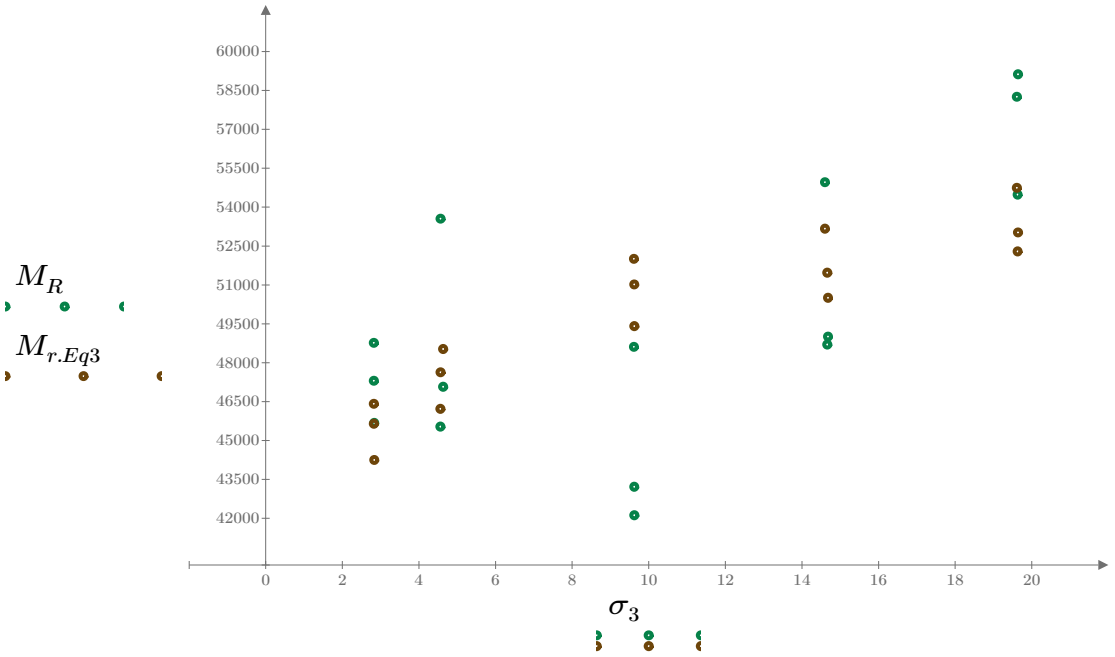

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

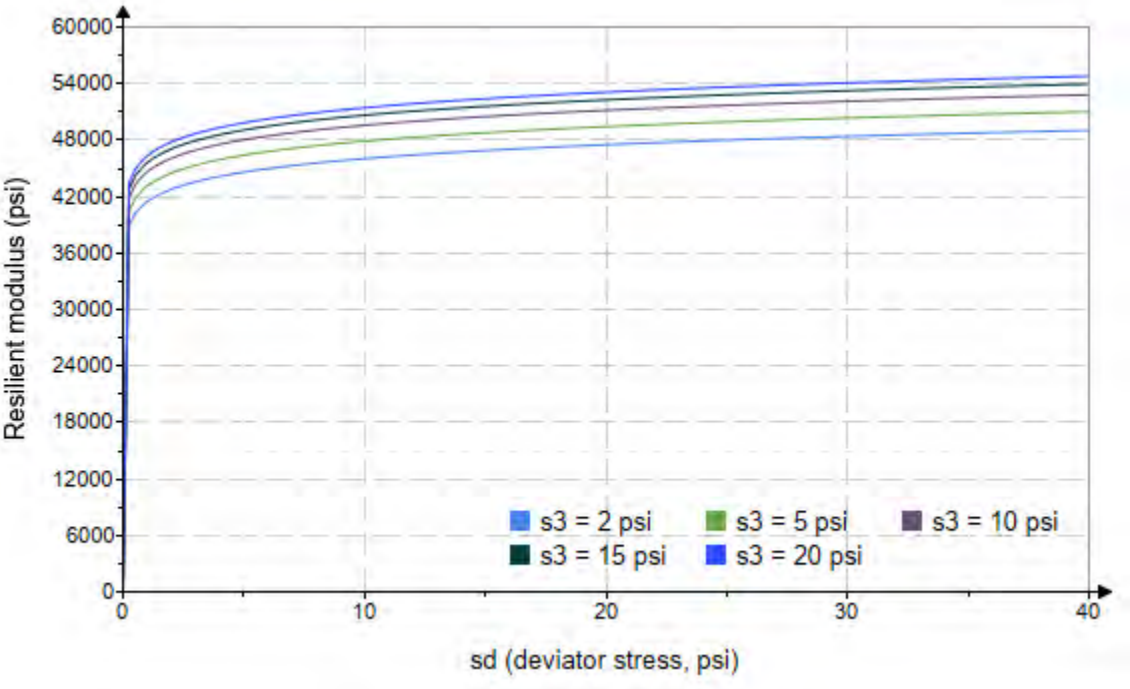

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–48”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 3182.797$

$K_9 = 0.0667$ Equation 4 fitting parameters

$K_{10} = 0.0269$

$R_4^{\,2} = 0.3467$ Coefficient of determination

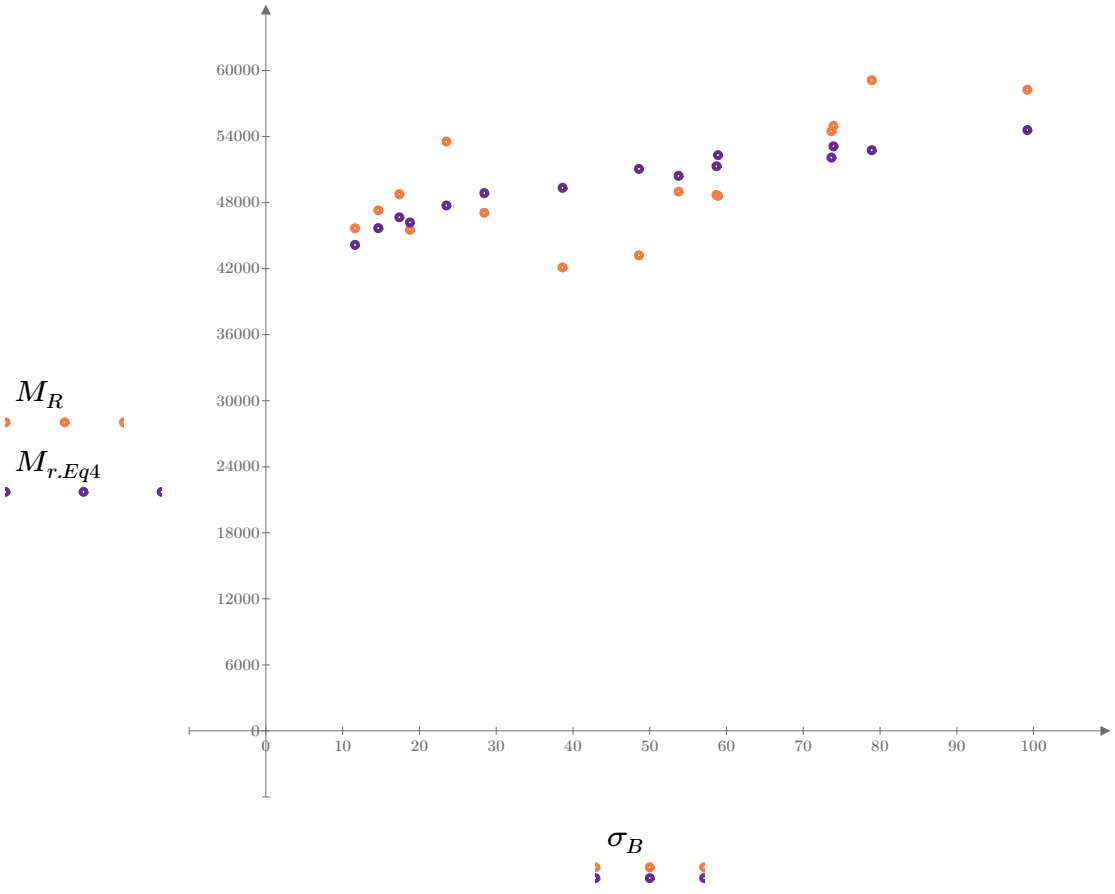

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

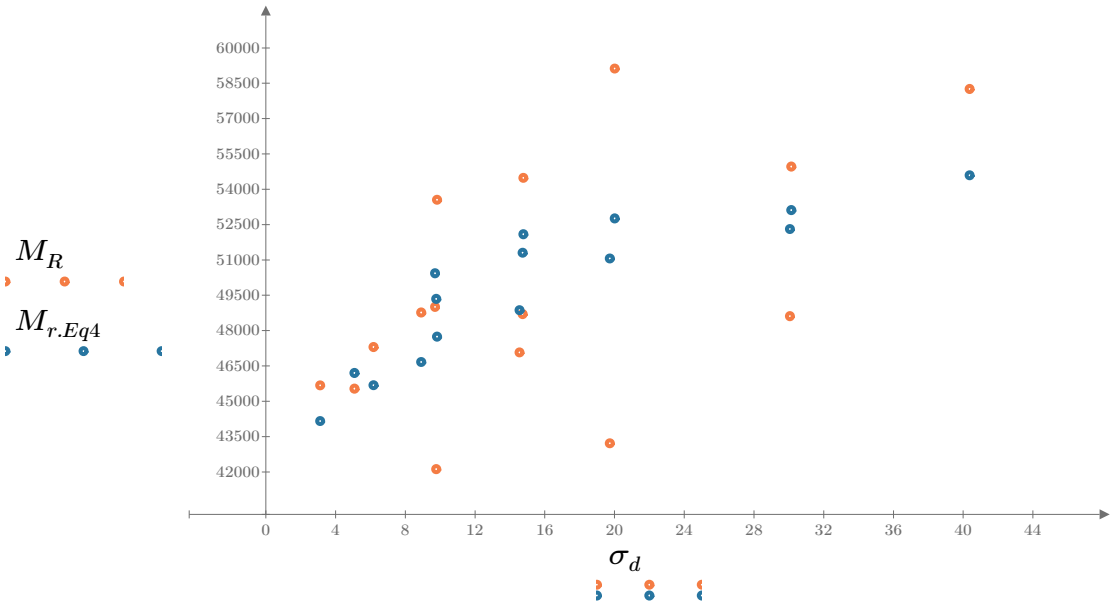

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

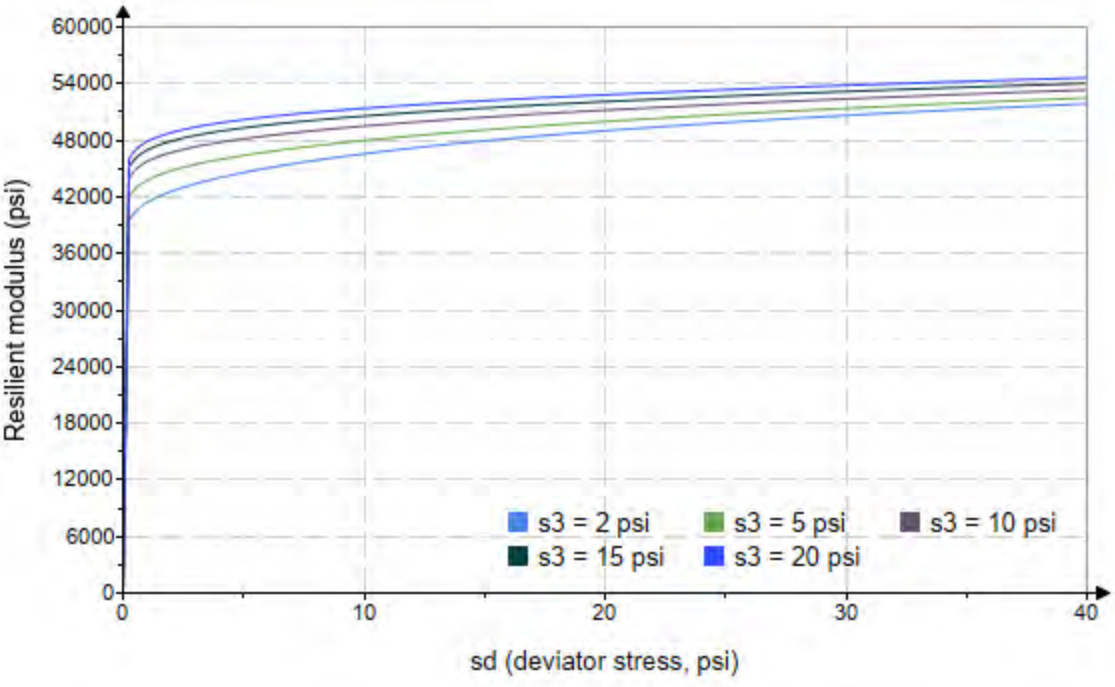

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−49"

$Treatment =$ "H100"

$S = 4.996$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.569 \\ 2.503 \\ 2.576 \\ 4.597 \\ 4.582 \\ 4.579 \\ 9.619 \\ 9.650 \\ 9.621 \\ 14.610 \\ 14.660 \\ 14.630 \\ 19.700 \\ 19.680 \\ 19.680 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.200 \\ 6.239 \\ 9.025 \\ 5.176 \\ 10.020 \\ 14.510 \\ 9.998 \\ 19.600 \\ 30.200 \\ 9.938 \\ 14.730 \\ 30.300 \\ 14.660 \\ 19.880 \\ 40.440 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.910 \\ 13.750 \\ 16.750 \\ 18.970 \\ 23.760 \\ 28.250 \\ 38.850 \\ 48.550 \\ 59.060 \\ 53.780 \\ 58.700 \\ 74.170 \\ 73.760 \\ 78.910 \\ 99.480 \end{bmatrix} \quad M_R = \begin{bmatrix} 43041.6 \\ 45952.0 \\ 46697.6 \\ 52948.6 \\ 39978.6 \\ 43245.2 \\ 42608.6 \\ 53184.8 \\ 53289.6 \\ 53085.4 \\ 53778.6 \\ 53935.4 \\ 51775.4 \\ 53430.2 \\ 55776.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–49”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 33057.260$

$K_2 = 0.1103$

Equation 1 fitting parameters

$R_1^2 = 0.5078$ Coefficient of determination

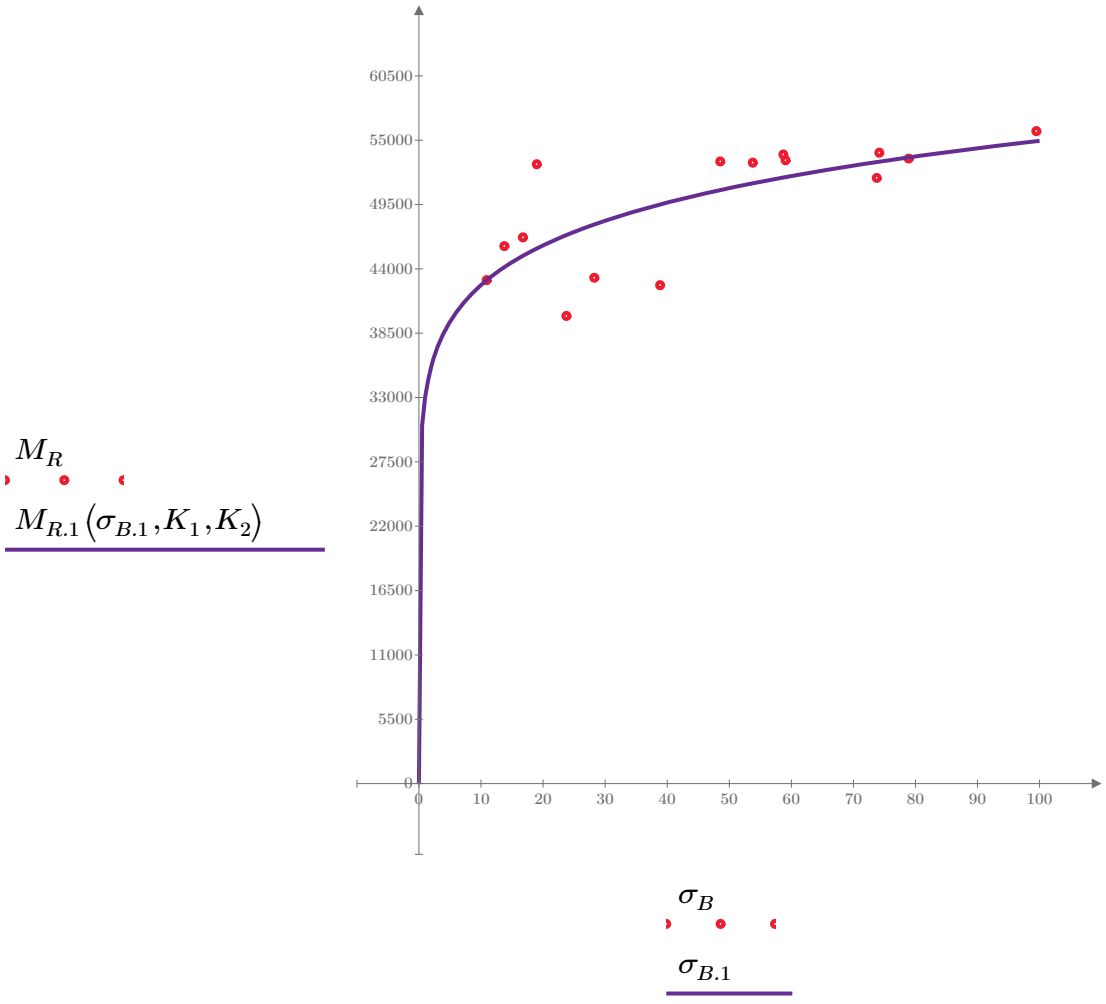

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–49”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 39066.194$

$K_4 = 0.0921$ Equation 2 fitting parameters

${R_2}^2 = 0.3513$ Coefficient of determination

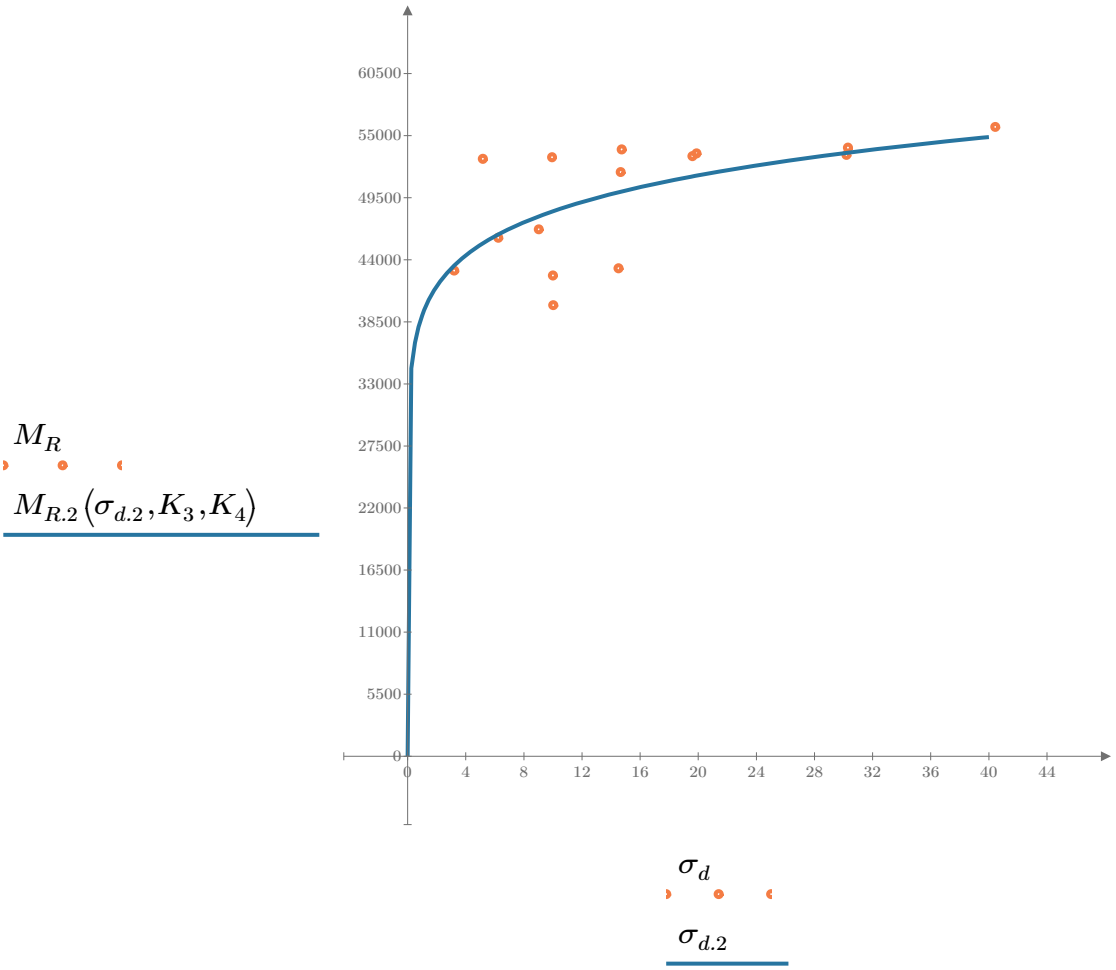

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–49”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 37393.558$

$K_6 = 0.0272$ Equation 3 fitting parameters

$K_7 = 0.0937$

${R_3}^2 = 0.5153$ Coefficient of determination

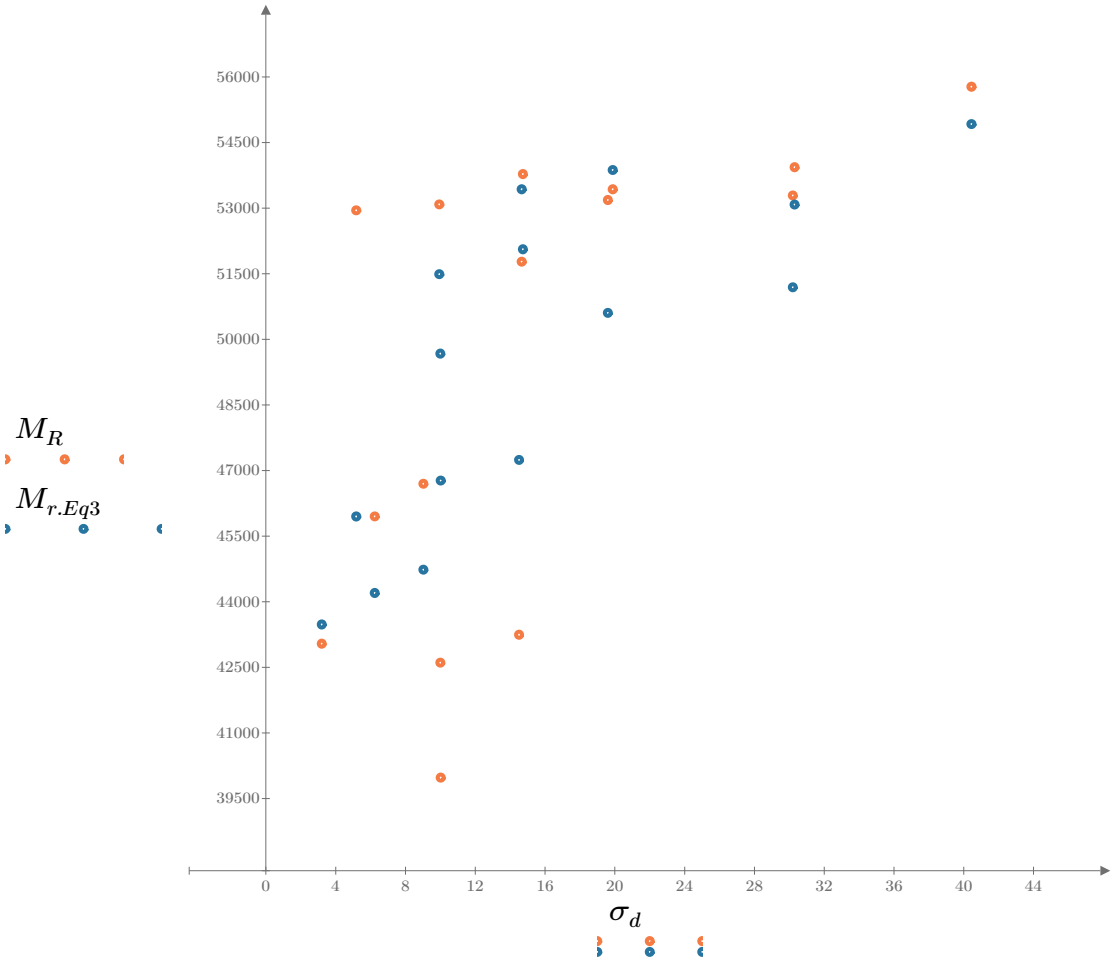

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-\text{49”}$

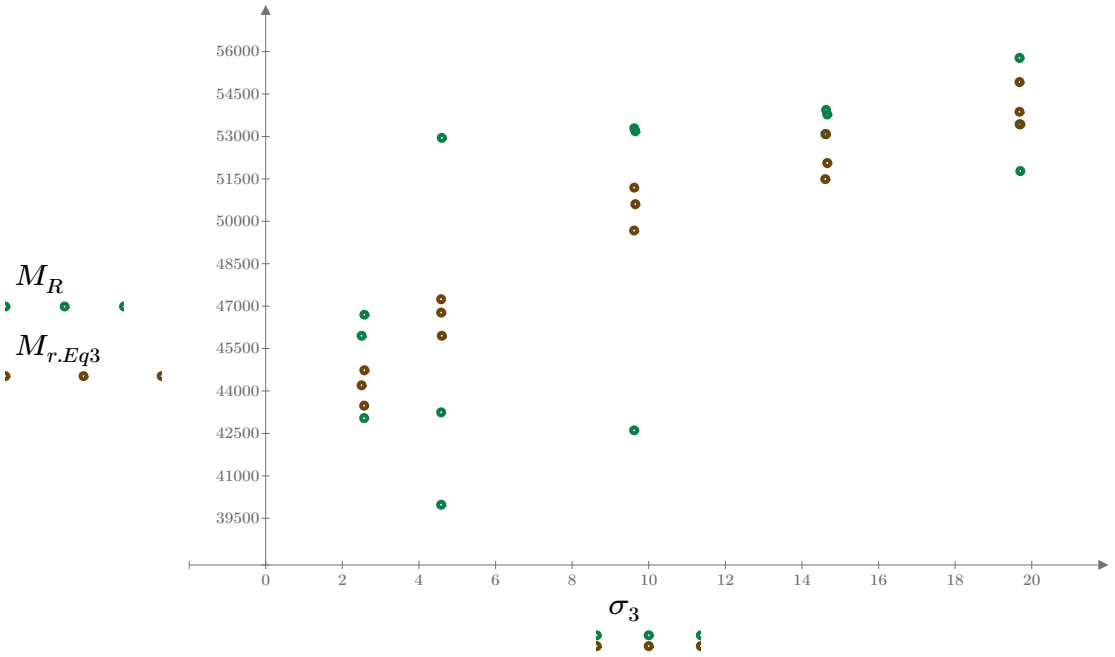

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

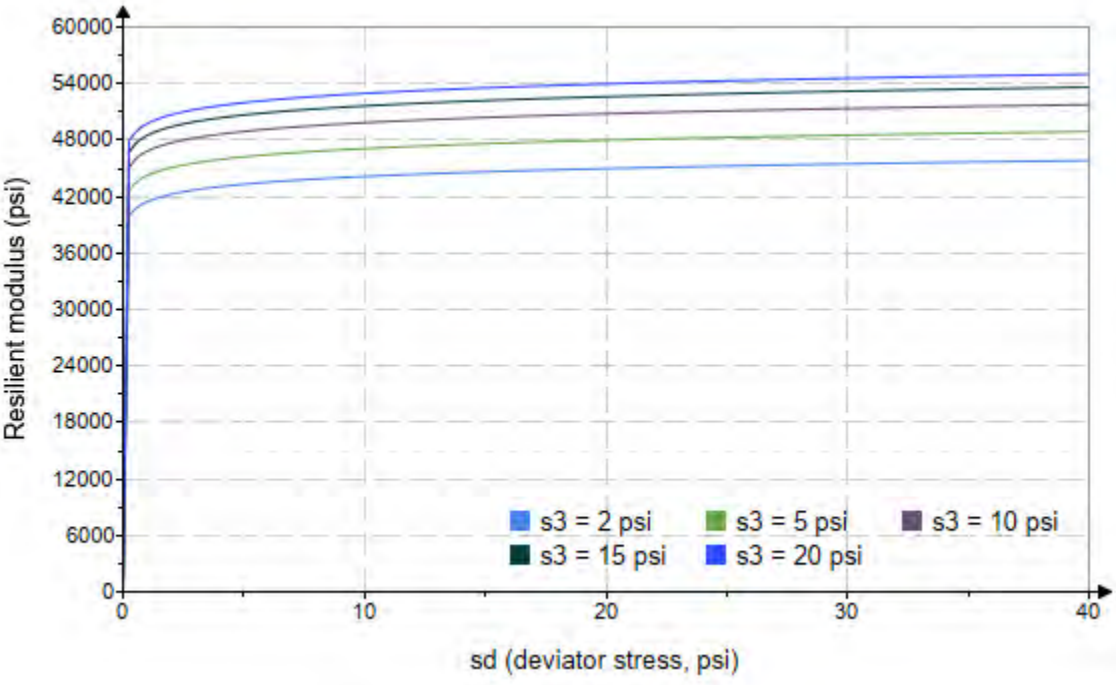

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–49”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2984.771$

$K_9 = 0.1227$ Equation 4 fitting parameters

$K_{10} = -0.0145$

$R_4^{\,2} = 0.5100$ Coefficient of determination

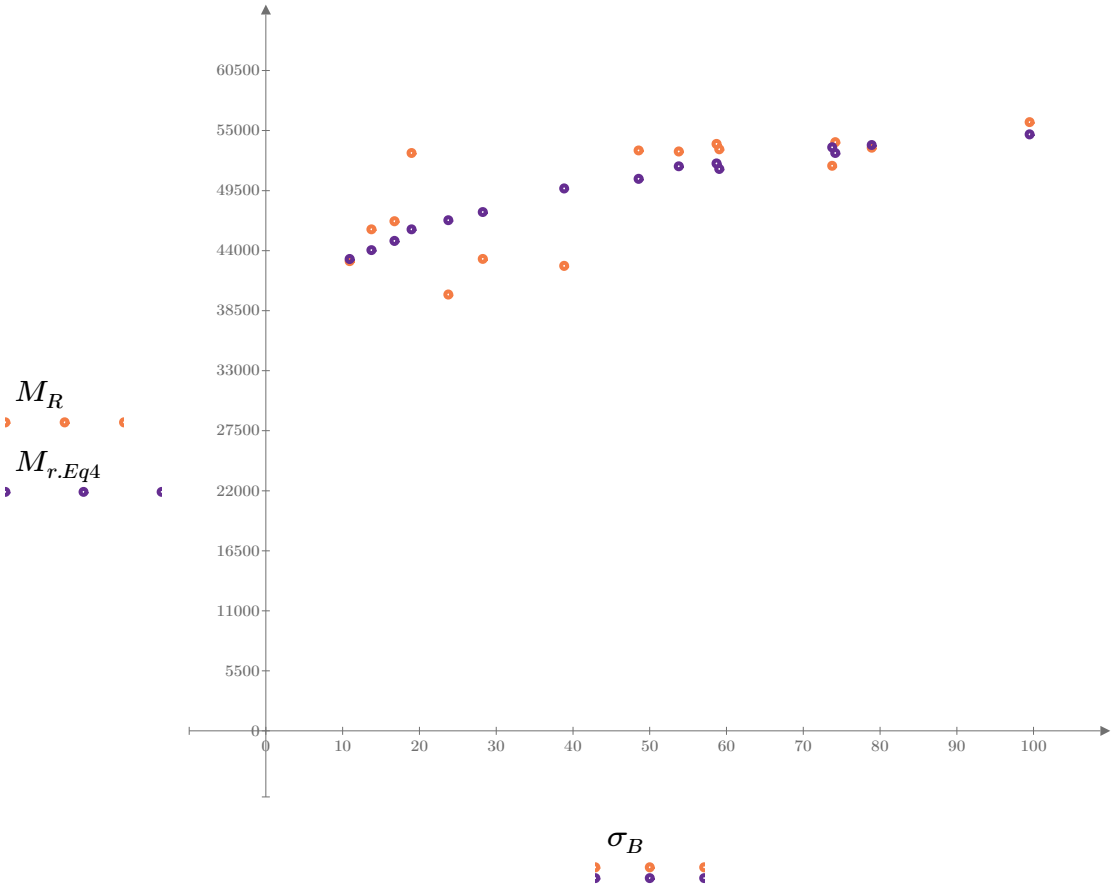

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

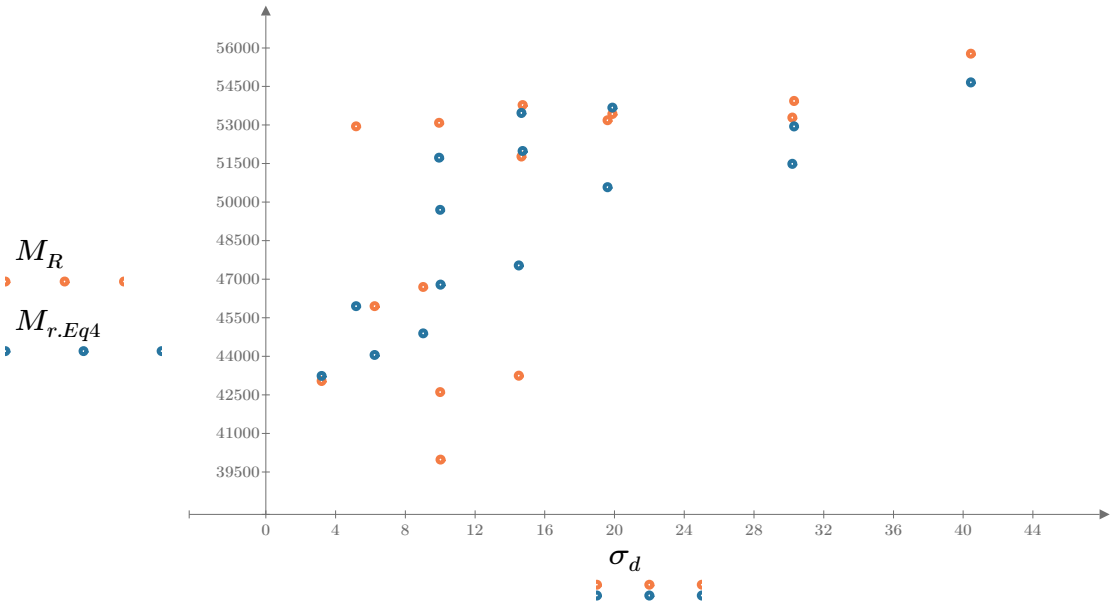

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

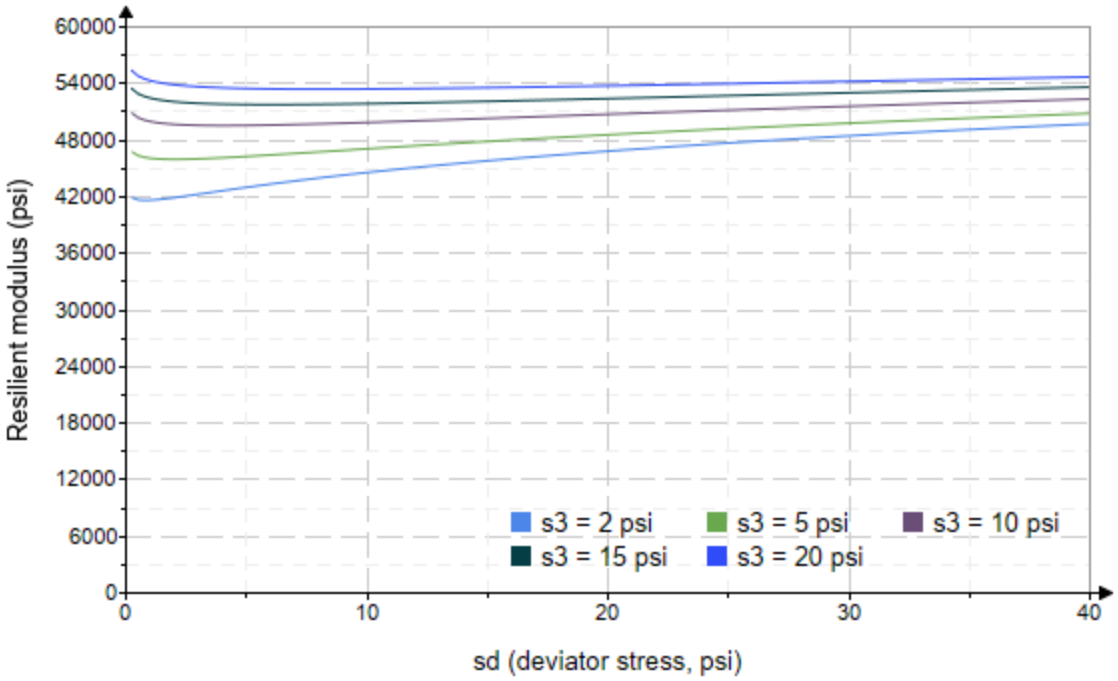

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−50"

$Treatment =$ "H100"

$S = 5.033$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.219 \\ 2.233 \\ 2.202 \\ 3.977 \\ 4.372 \\ 4.211 \\ 9.103 \\ 8.917 \\ 8.909 \\ 14.490 \\ 14.320 \\ 13.930 \\ 19.500 \\ 19.350 \\ 19.460 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.184 \\ 6.175 \\ 9.156 \\ 5.192 \\ 10.070 \\ 14.600 \\ 9.955 \\ 19.610 \\ 29.600 \\ 9.953 \\ 14.720 \\ 29.800 \\ 14.850 \\ 19.730 \\ 40.150 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 9.842 \\ 12.870 \\ 15.760 \\ 17.120 \\ 23.180 \\ 27.230 \\ 37.260 \\ 46.360 \\ 56.320 \\ 53.410 \\ 57.660 \\ 71.590 \\ 73.340 \\ 77.780 \\ 98.530 \end{bmatrix} \quad M_R = \begin{bmatrix} 56156.7 \\ 52556.4 \\ 53400.0 \\ 61327.2 \\ 55913.4 \\ 54867.4 \\ 60946.2 \\ 59466.6 \\ 55986.2 \\ 58146.4 \\ 60638.2 \\ 54454.8 \\ 62868.4 \\ 58271.0 \\ 61999.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–50”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 49988.698$

$K_2 = 0.0403$

Equation 1 fitting parameters

${R_1}^2 = 0.2613$ Coefficient of determination

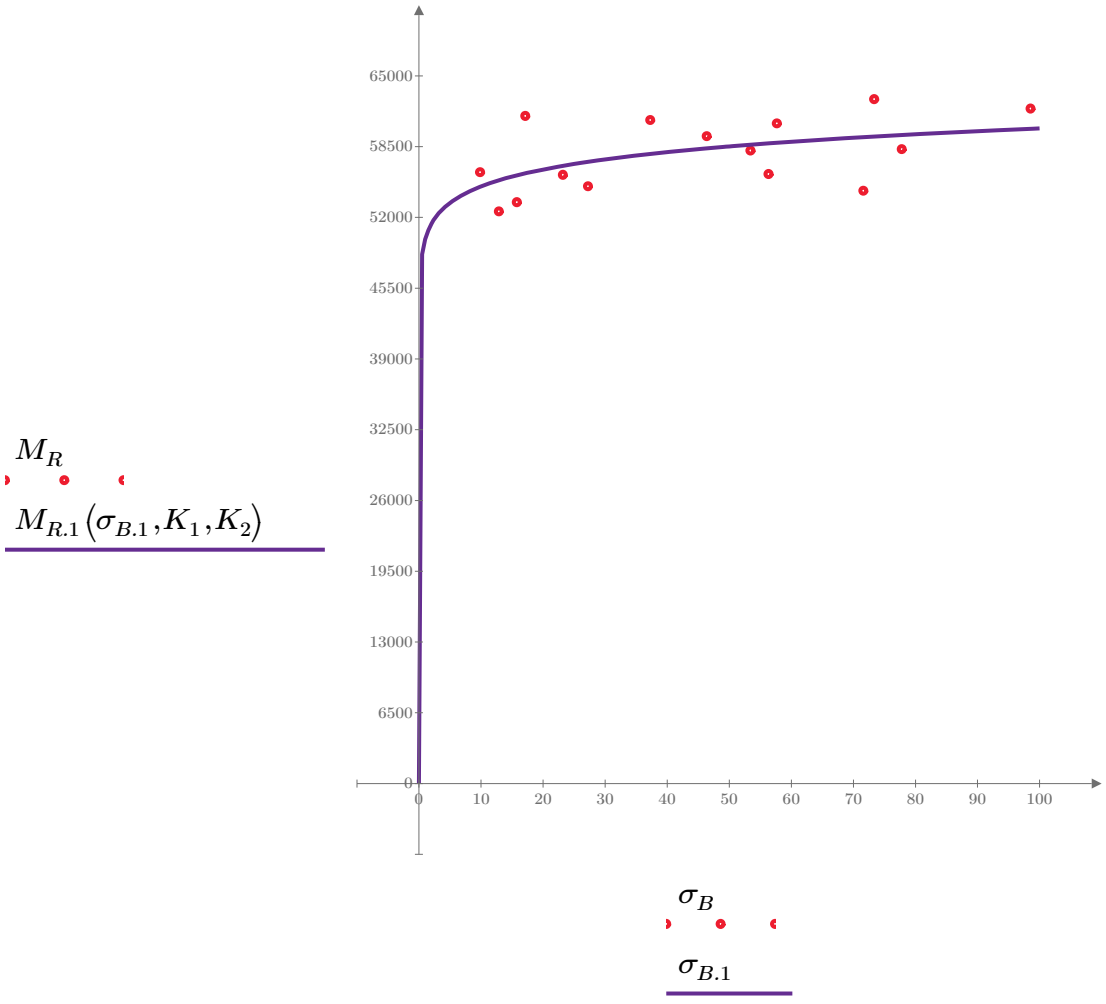

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–50”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 55527.325$

$K_4 = 0.0157$ Equation 2 fitting parameters

${R_2}^2 = 0.0362$ Coefficient of determination

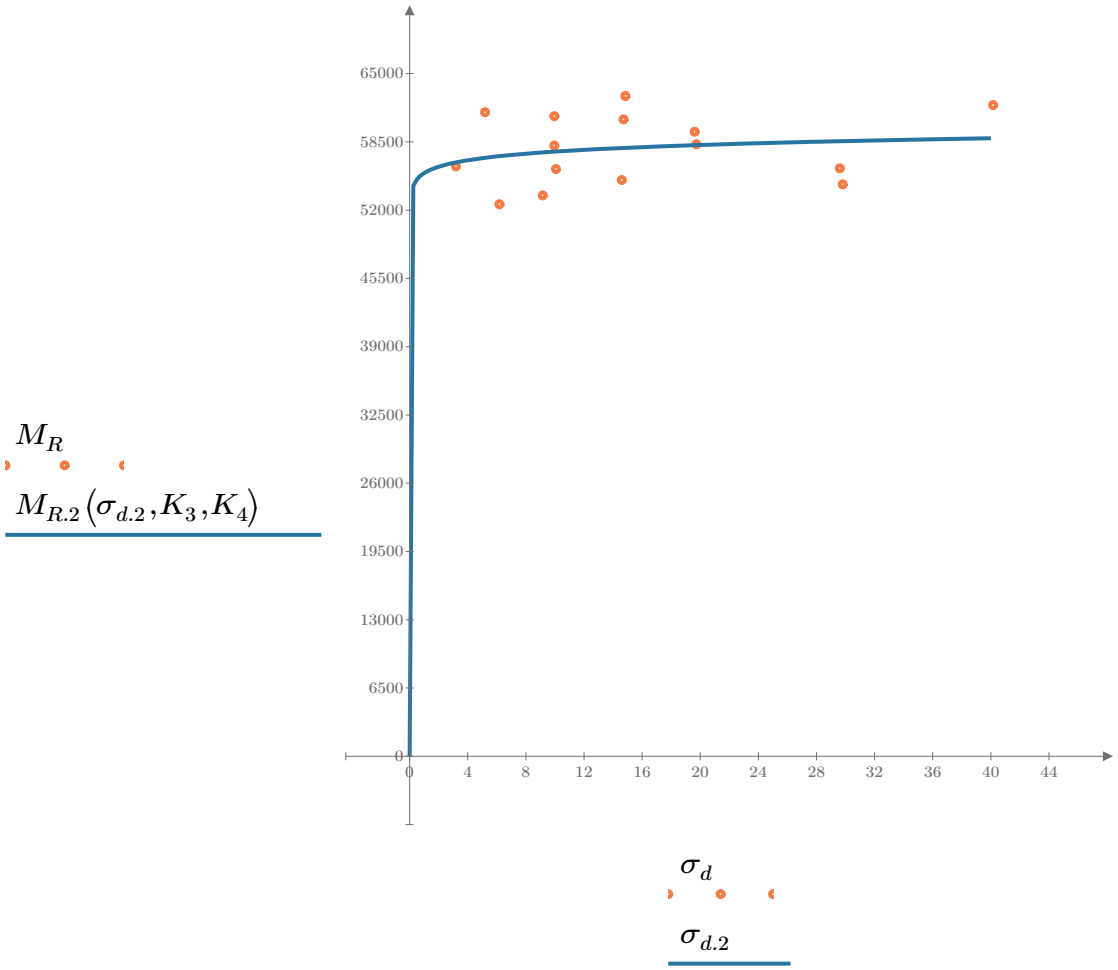

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–50”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 54195.134$

$K_6 = -0.0457$ Equation 3 fitting parameters

$K_7 = 0.083$

${R_3}^2 = 0.5362$ Coefficient of determination

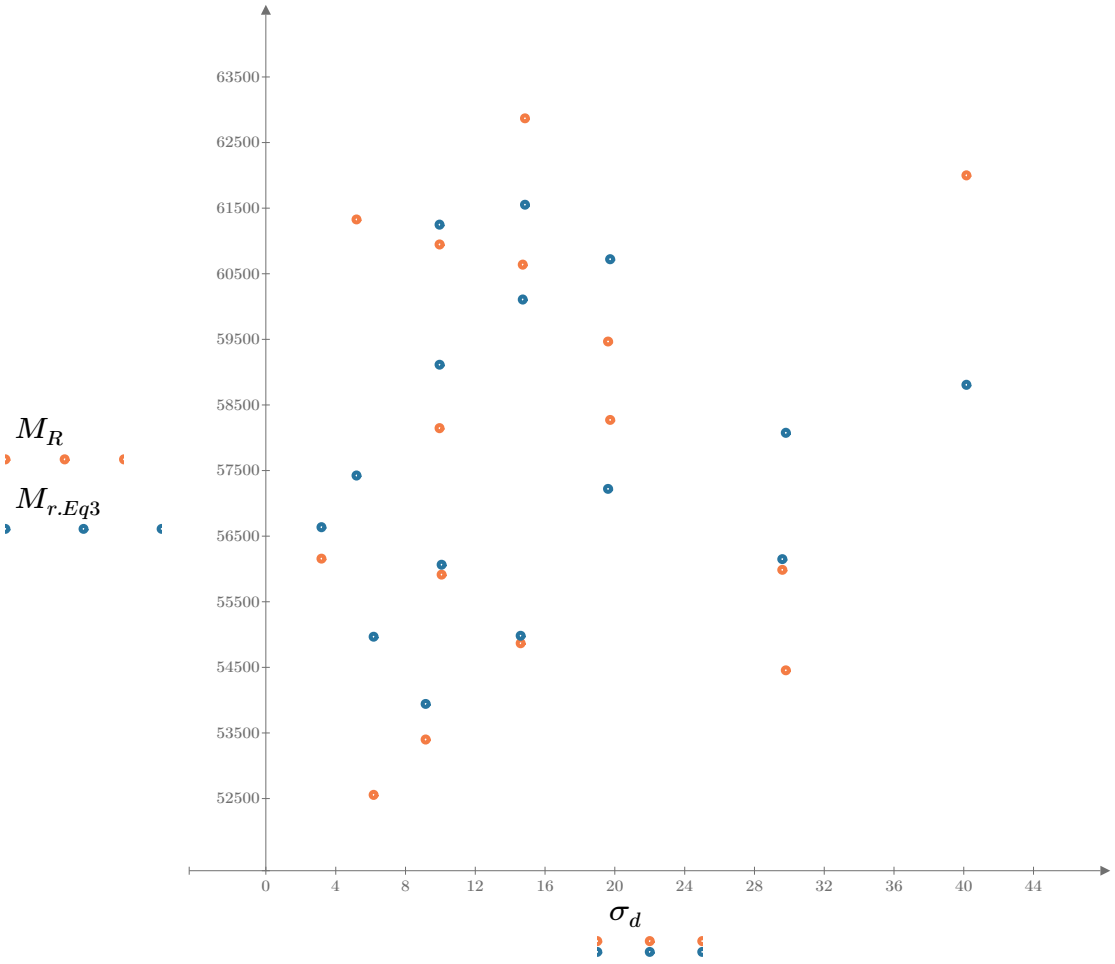

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-\text{50”}$

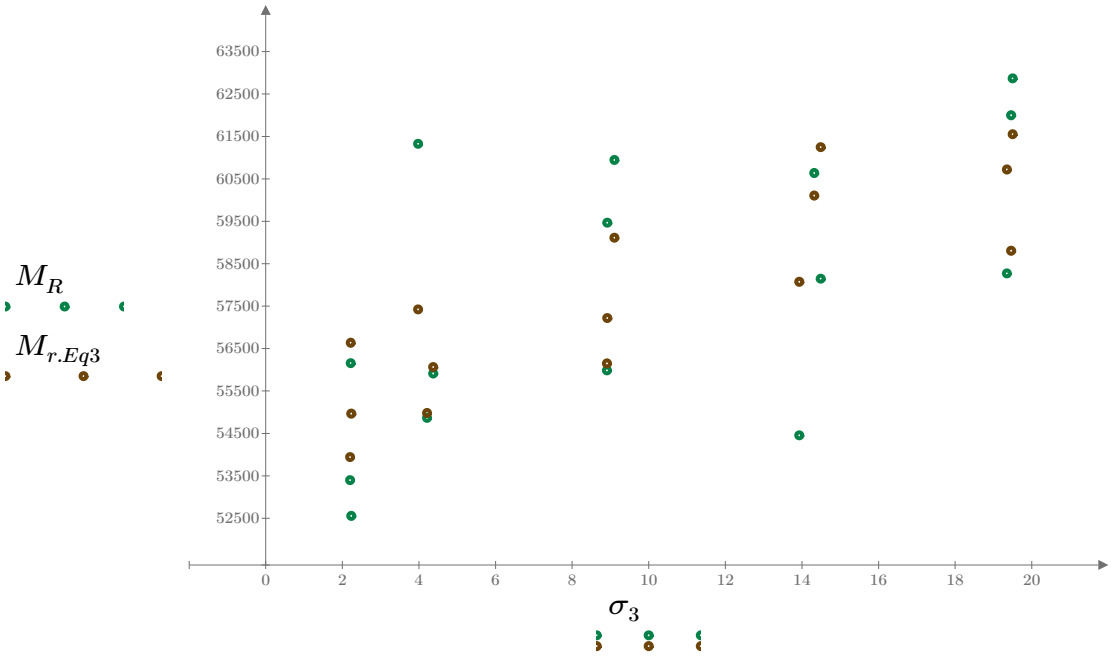

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

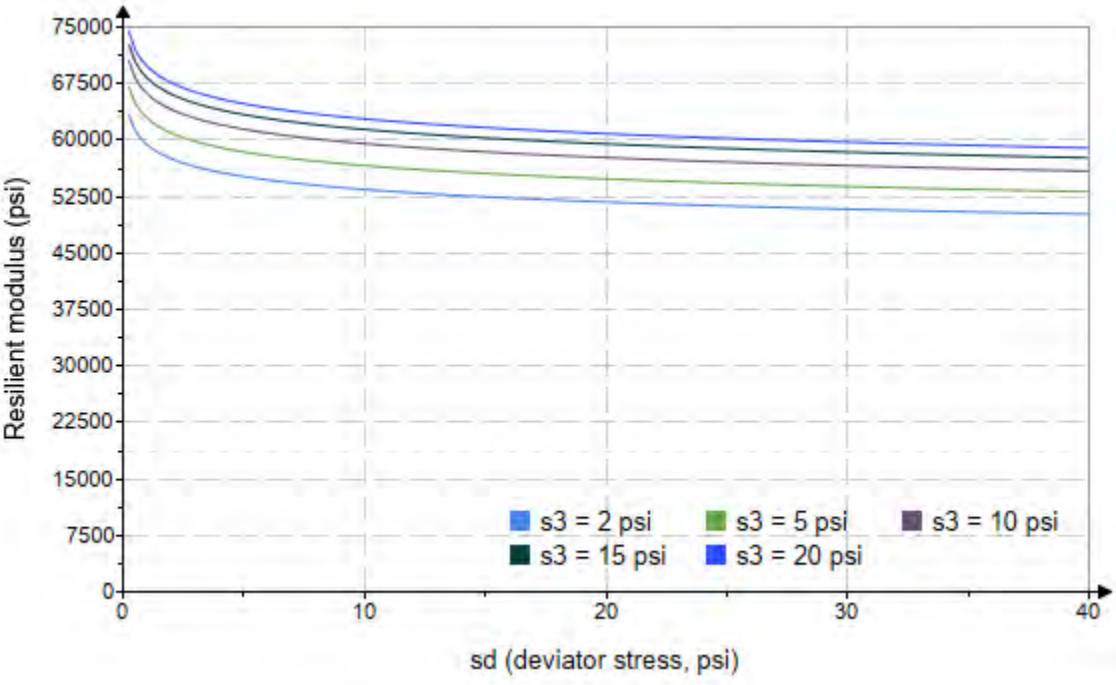

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–50”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 3514.899$

$K_9 = 0.1101$ Equation 4 fitting parameters

$K_{10} = -0.0853$

$R_4^{\,2} = 0.5239$ Coefficient of determination

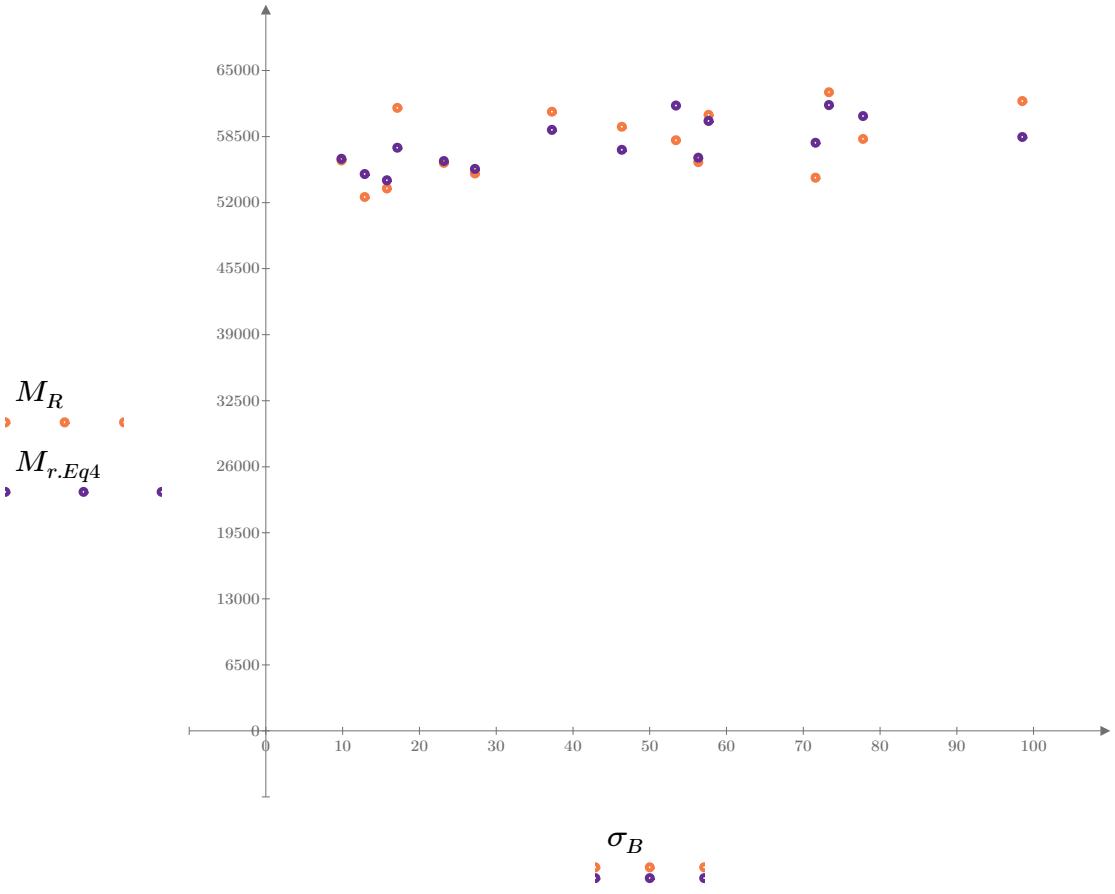

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

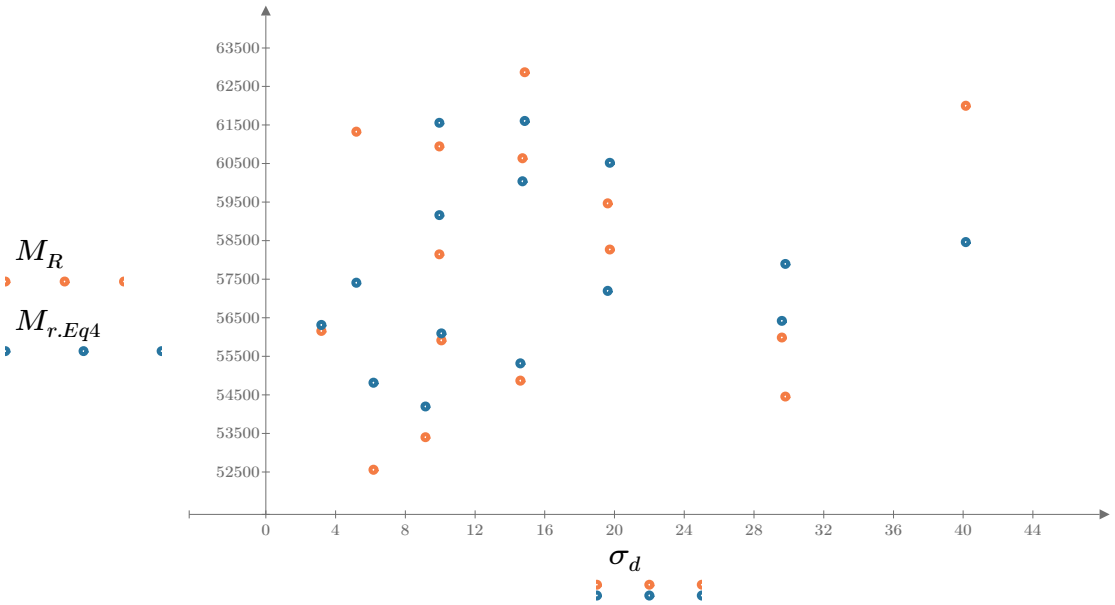

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

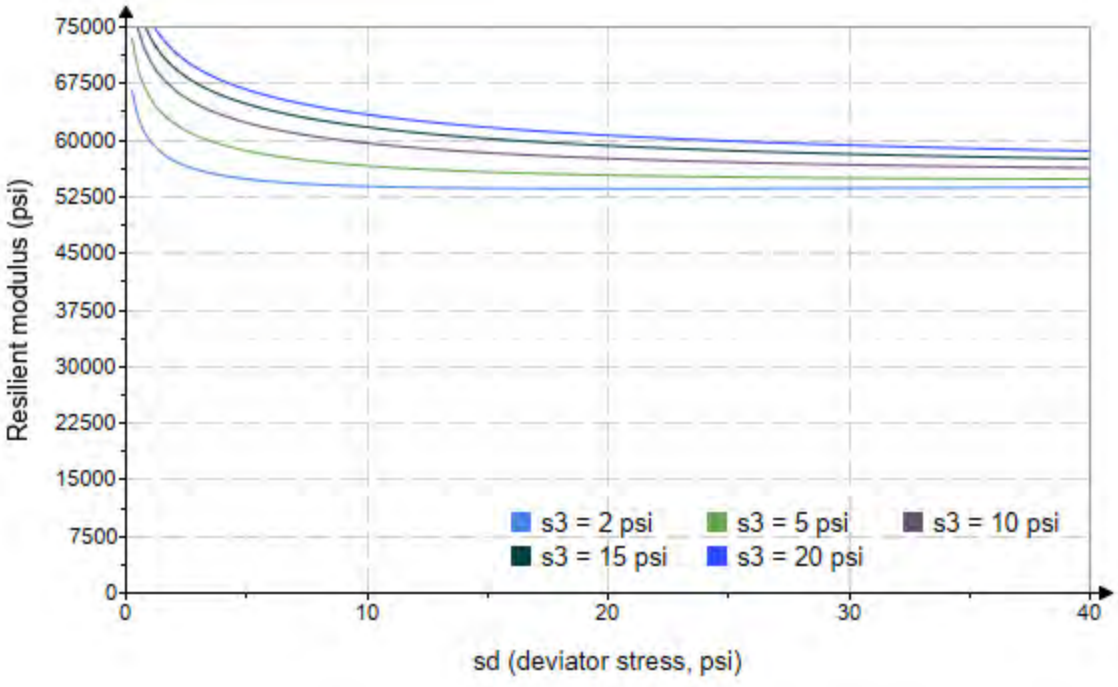

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−51"

$Treatment =$ "H100"

$S = 5.1$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.792 \\ 2.729 \\ 2.665 \\ 4.749 \\ 4.666 \\ 4.621 \\ 9.668 \\ 9.706 \\ 9.668 \\ 14.630 \\ 14.740 \\ 14.670 \\ 19.780 \\ 19.760 \\ 19.700 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.191 \\ 6.090 \\ 9.323 \\ 5.102 \\ 10.170 \\ 14.650 \\ 10.120 \\ 19.570 \\ 29.590 \\ 9.936 \\ 14.900 \\ 29.940 \\ 14.790 \\ 19.700 \\ 40.340 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.570 \\ 14.280 \\ 17.320 \\ 19.350 \\ 24.160 \\ 28.510 \\ 39.120 \\ 48.690 \\ 58.590 \\ 53.820 \\ 59.120 \\ 73.950 \\ 74.110 \\ 78.990 \\ 99.440 \end{bmatrix} \quad M_R = \begin{bmatrix} 39105.2 \\ 40213.4 \\ 40693.0 \\ 43692.2 \\ 42966.6 \\ 42926.4 \\ 44921.2 \\ 52928.8 \\ 64112.8 \\ 64282.6 \\ 63175.0 \\ 69411.0 \\ 70800.6 \\ 71595.0 \\ 69900.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–51”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 14840.261$

$K_2 = 0.3503$

Equation 1 fitting parameters

$R_1^2 = 0.9030$ Coefficient of determination

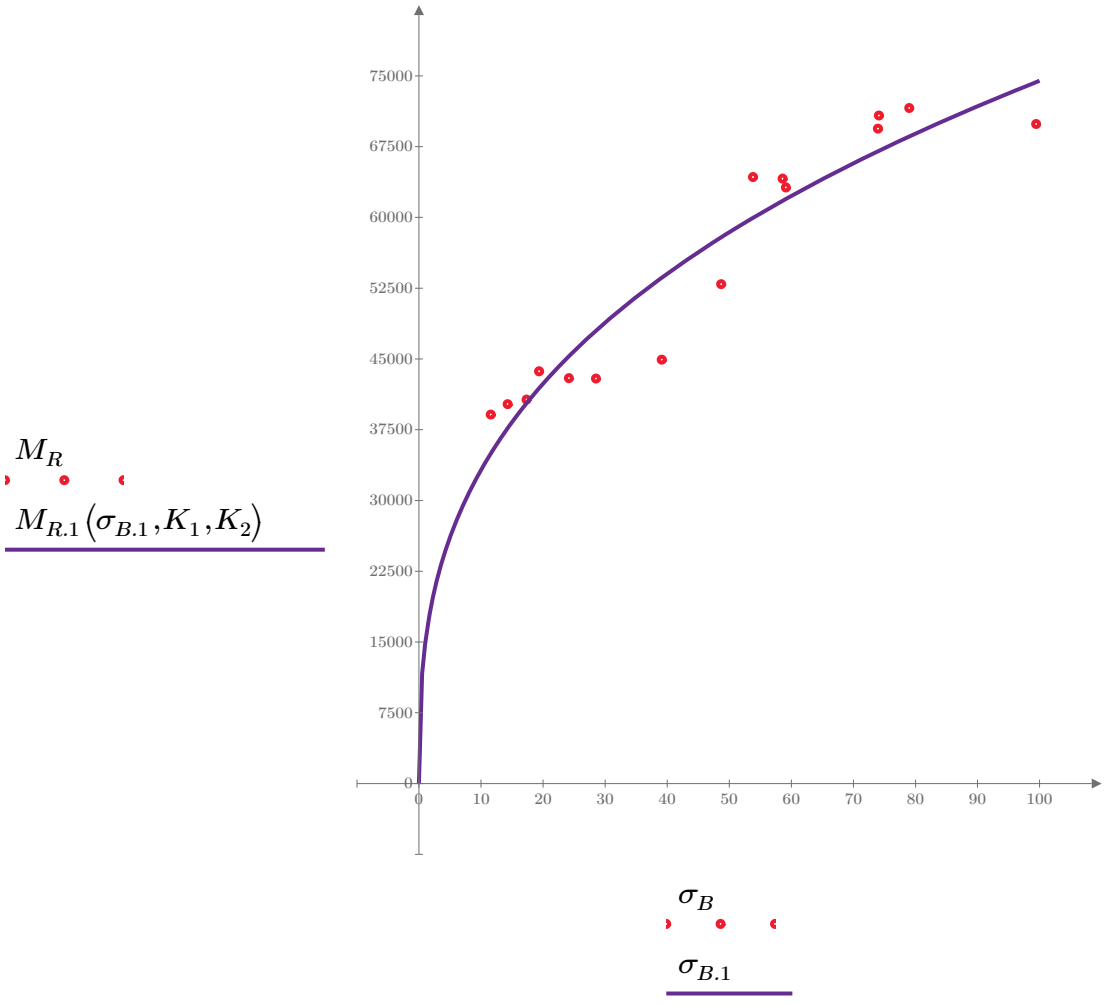

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–51”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 27531.676$

$K_4 = 0.2632$ Equation 2 fitting parameters

${R_2}^2 = 0.5711$ Coefficient of determination

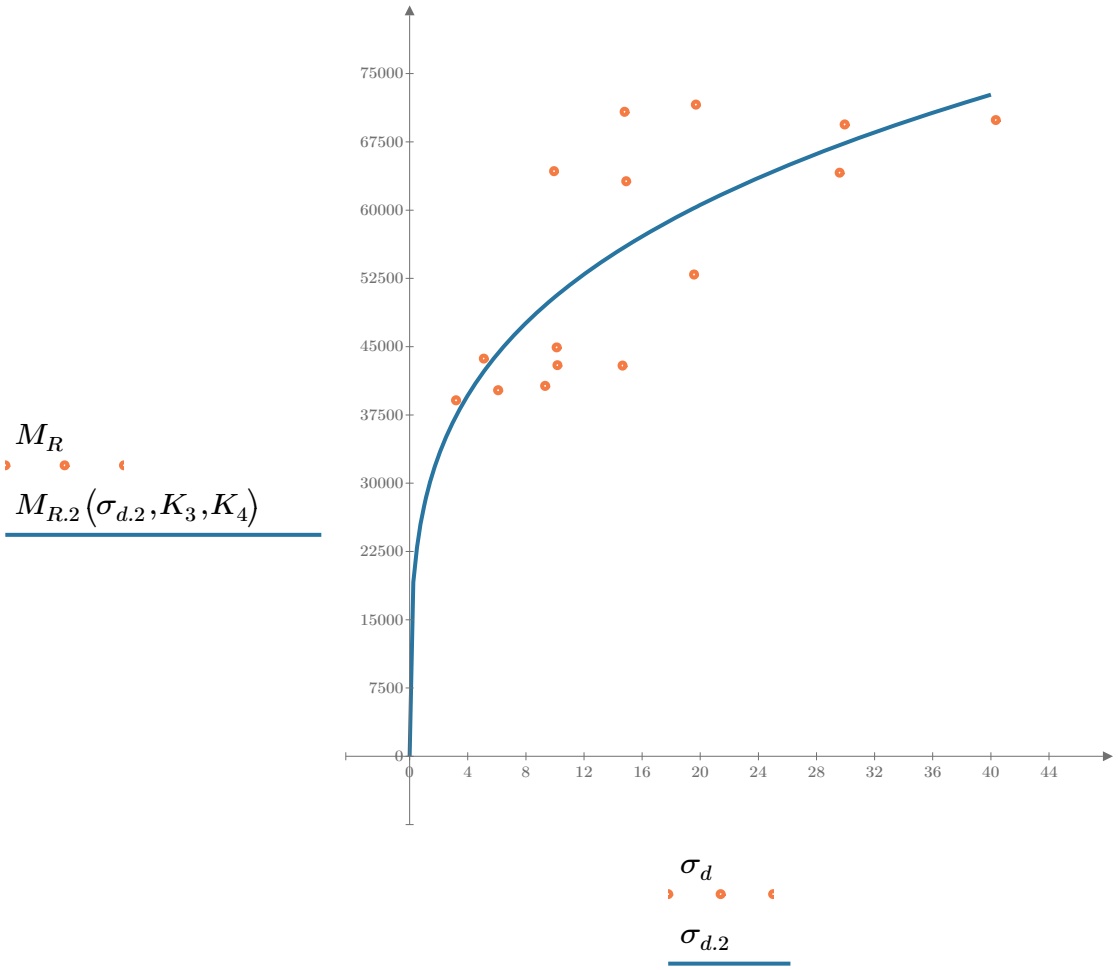

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–51”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 22478.189$

$K_6 = 0.0627$ Equation 3 fitting parameters

$K_7 = 0.3138$

${R_3}^2 = 0.9143$ Coefficient of determination

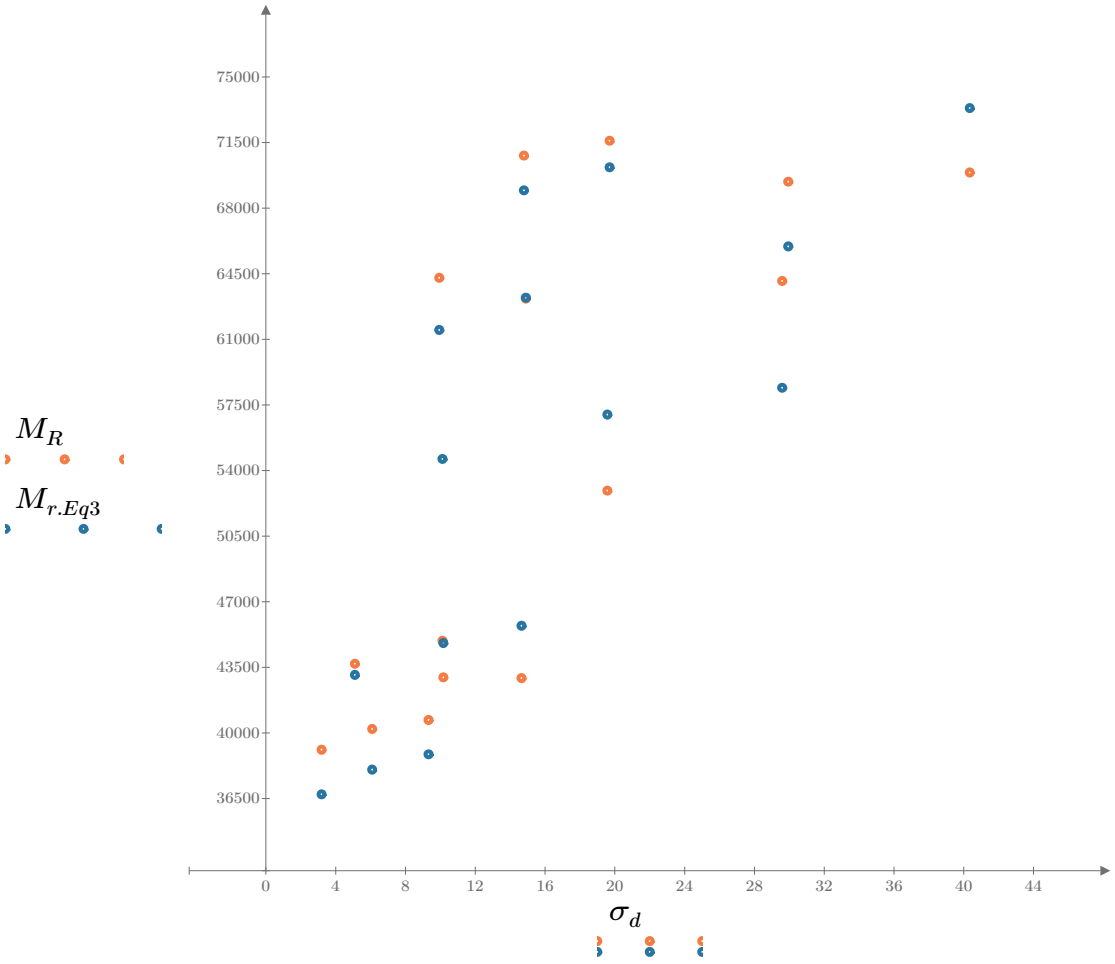

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–51”}$

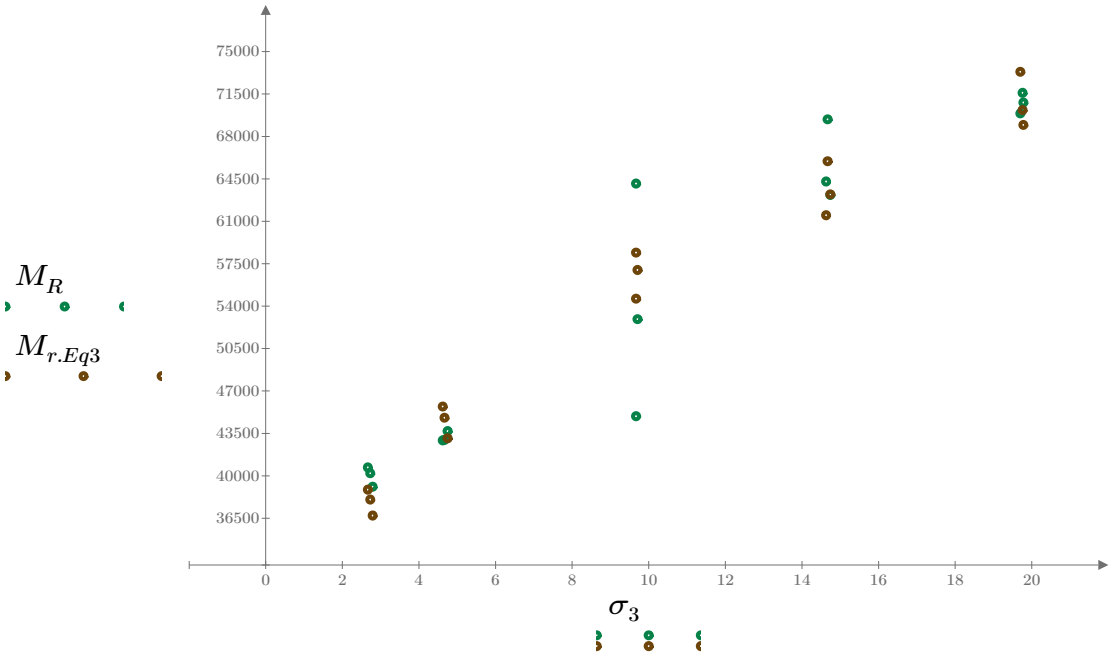

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

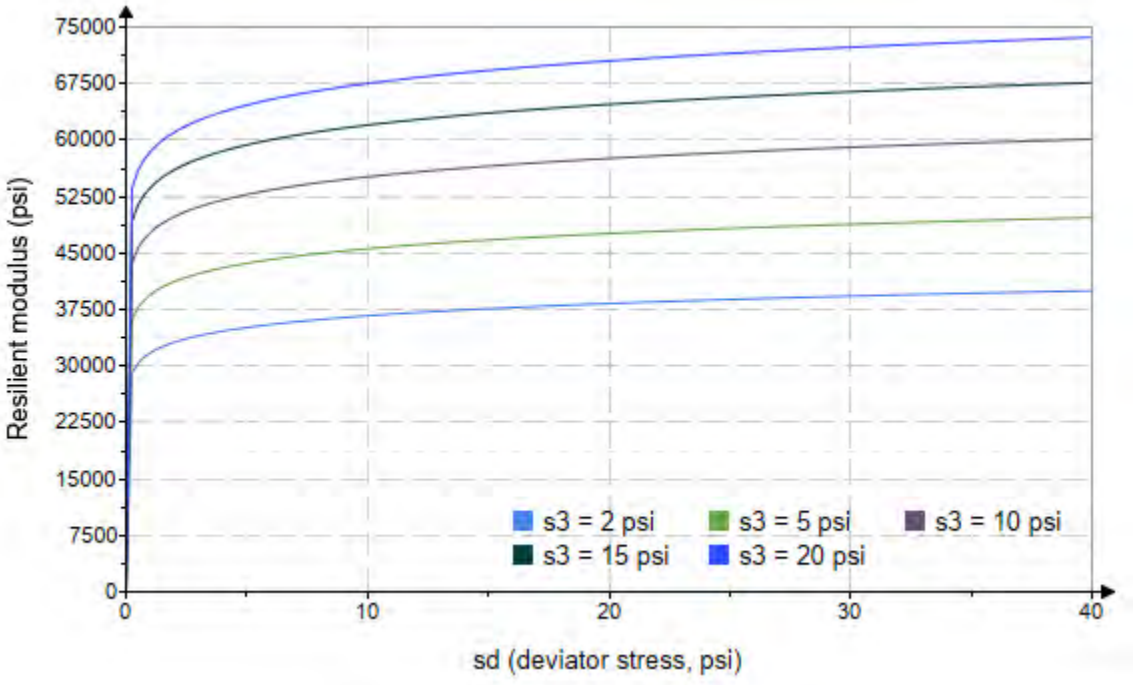

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–51”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2395.959$

$K_9 = 0.4194$ Equation 4 fitting parameters

$K_{10} = -0.0783$

$R_4^{\,2} = 0.9166$ Coefficient of determination

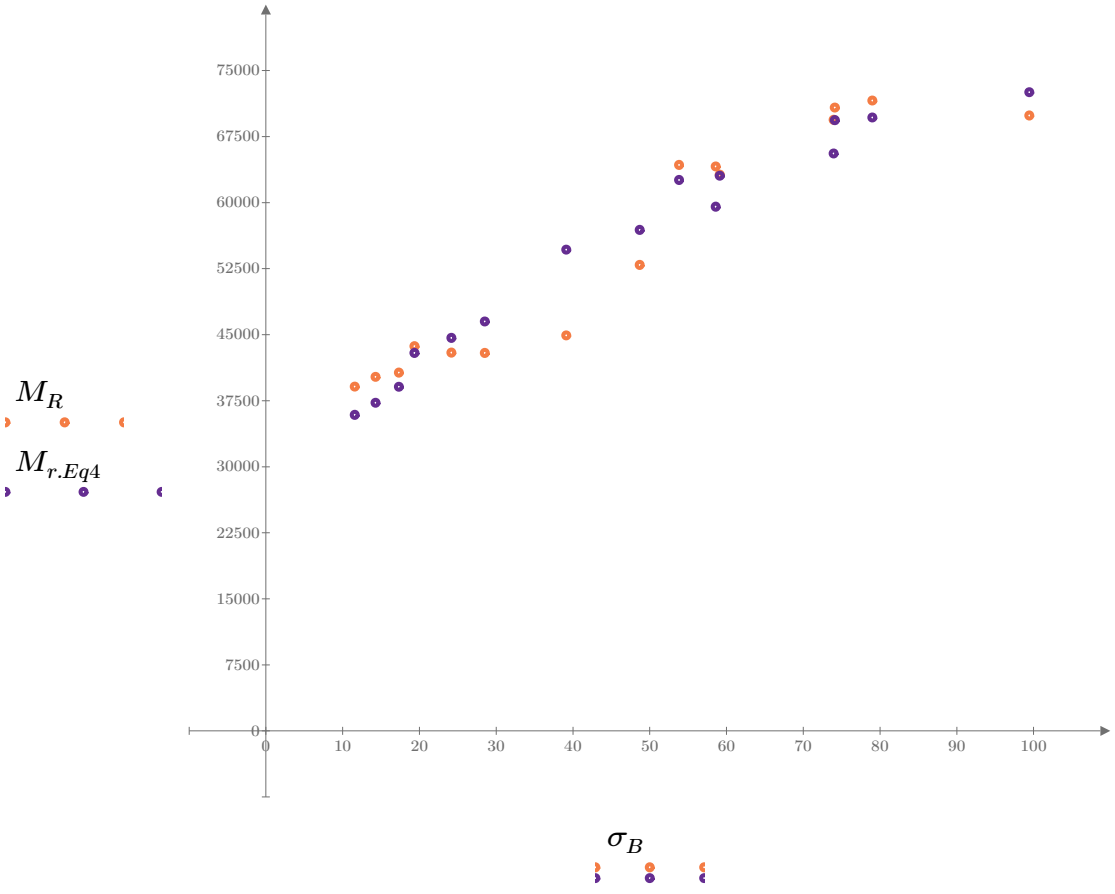

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

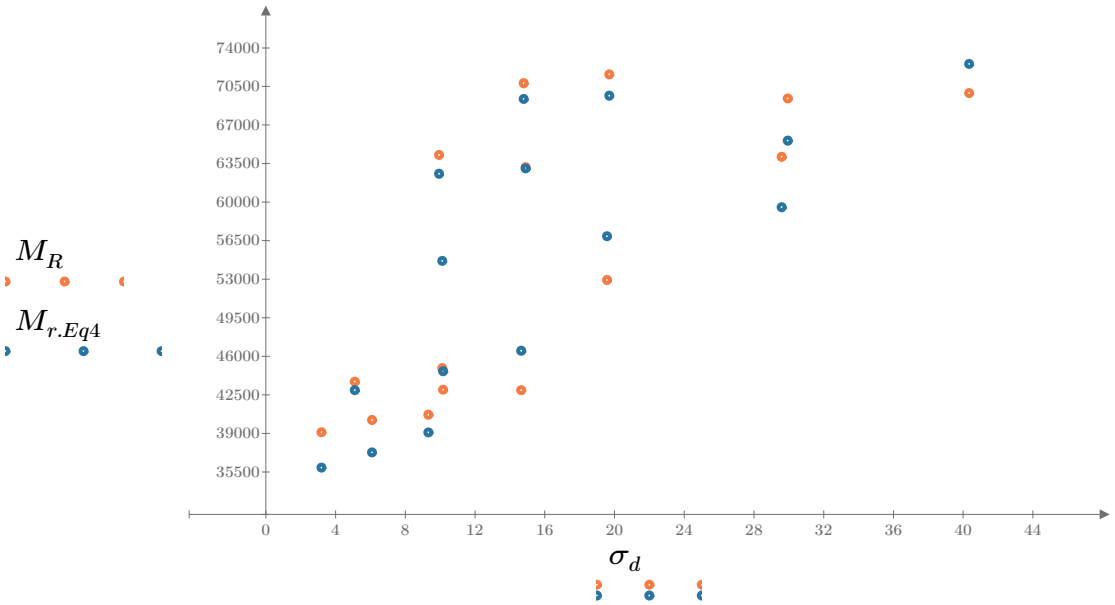

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

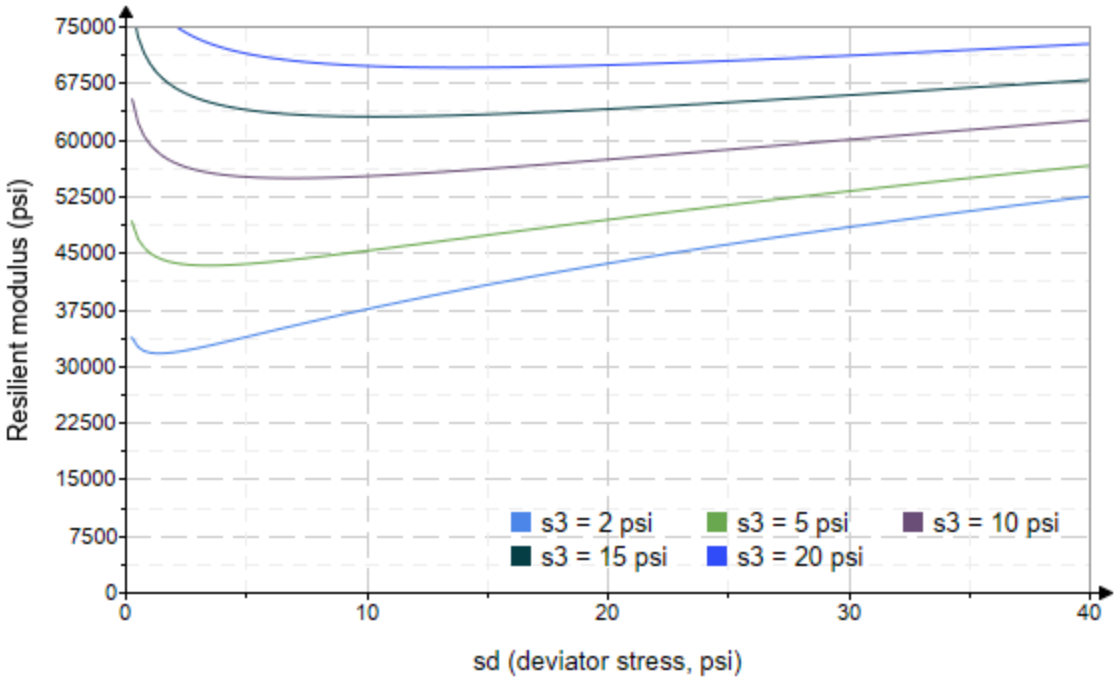

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{52”}$

$Treatment = \text{“D1”}$

$S = 17.533$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.556 \\ 2.605 \\ 2.325 \\ 4.399 \\ 4.021 \\ 3.774 \\ 9.203 \\ 8.969 \\ 8.613 \\ 13.830 \\ 13.570 \\ 14.160 \\ 18.940 \\ 19.240 \\ 19.220 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 2.992 \\ 6.084 \\ 9.031 \\ 5.179 \\ 10.070 \\ 14.530 \\ 9.923 \\ 19.230 \\ 29.400 \\ 9.887 \\ 14.420 \\ 29.730 \\ 14.470 \\ 19.510 \\ 39.910 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.660 \\ 13.900 \\ 16.010 \\ 18.380 \\ 22.130 \\ 25.850 \\ 37.530 \\ 46.130 \\ 55.240 \\ 51.380 \\ 55.110 \\ 72.210 \\ 71.300 \\ 77.240 \\ 97.570 \end{bmatrix} \quad M_R = \begin{bmatrix} 30204.2 \\ 19426.6 \\ 19123.0 \\ 35576.2 \\ 27825.4 \\ 27801.4 \\ 62629.4 \\ 45084.8 \\ 47477.0 \\ 67659.9 \\ 87842.8 \\ 57992.8 \\ 96284.0 \\ 86778.8 \\ 63263.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–52”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 5662.368$

$K_2 = 0.5950$

Equation 1 fitting parameters

${R_1}^2 = 0.6536$ Coefficient of determination

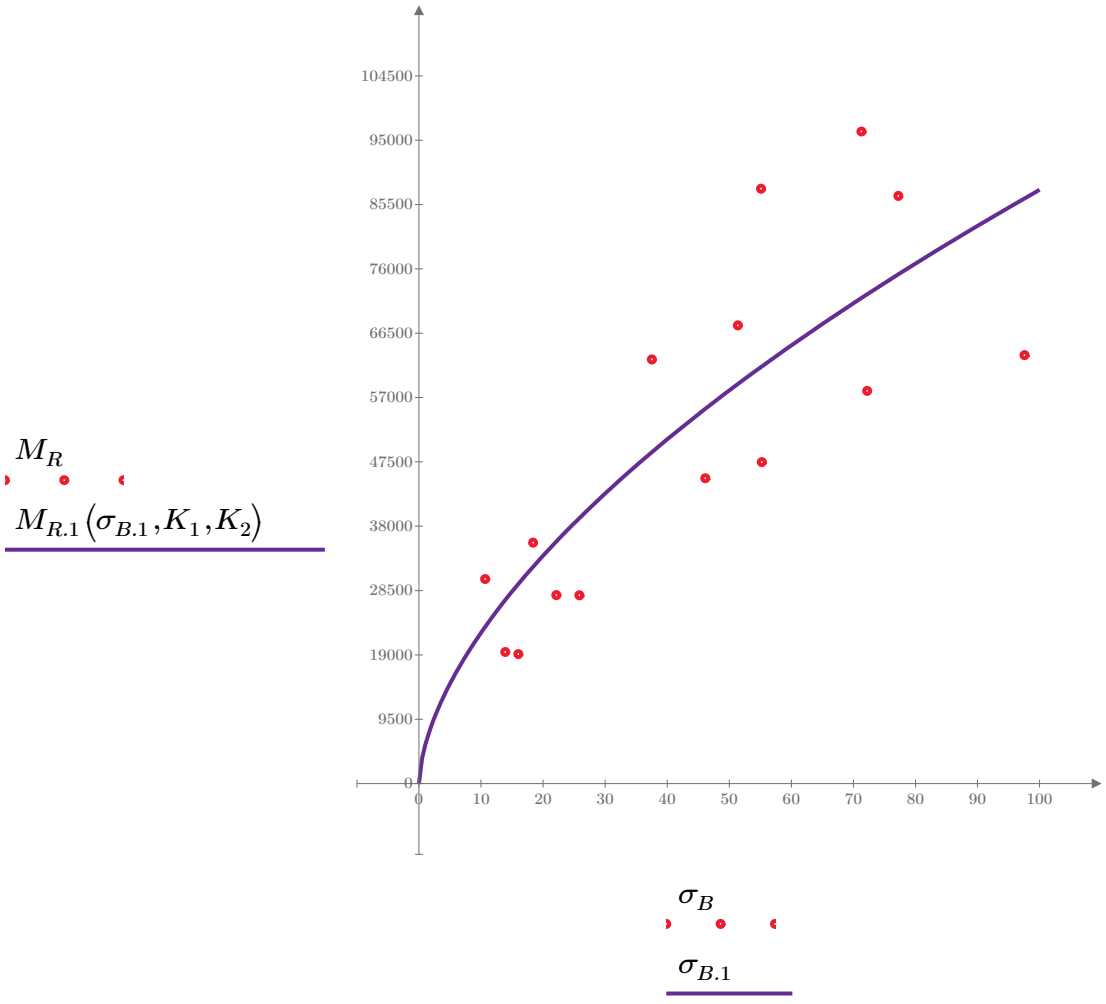

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–52”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 24431.041$

$K_4 = 0.2889$ Equation 2 fitting parameters

${R_2}^2 = 0.1857$ Coefficient of determination

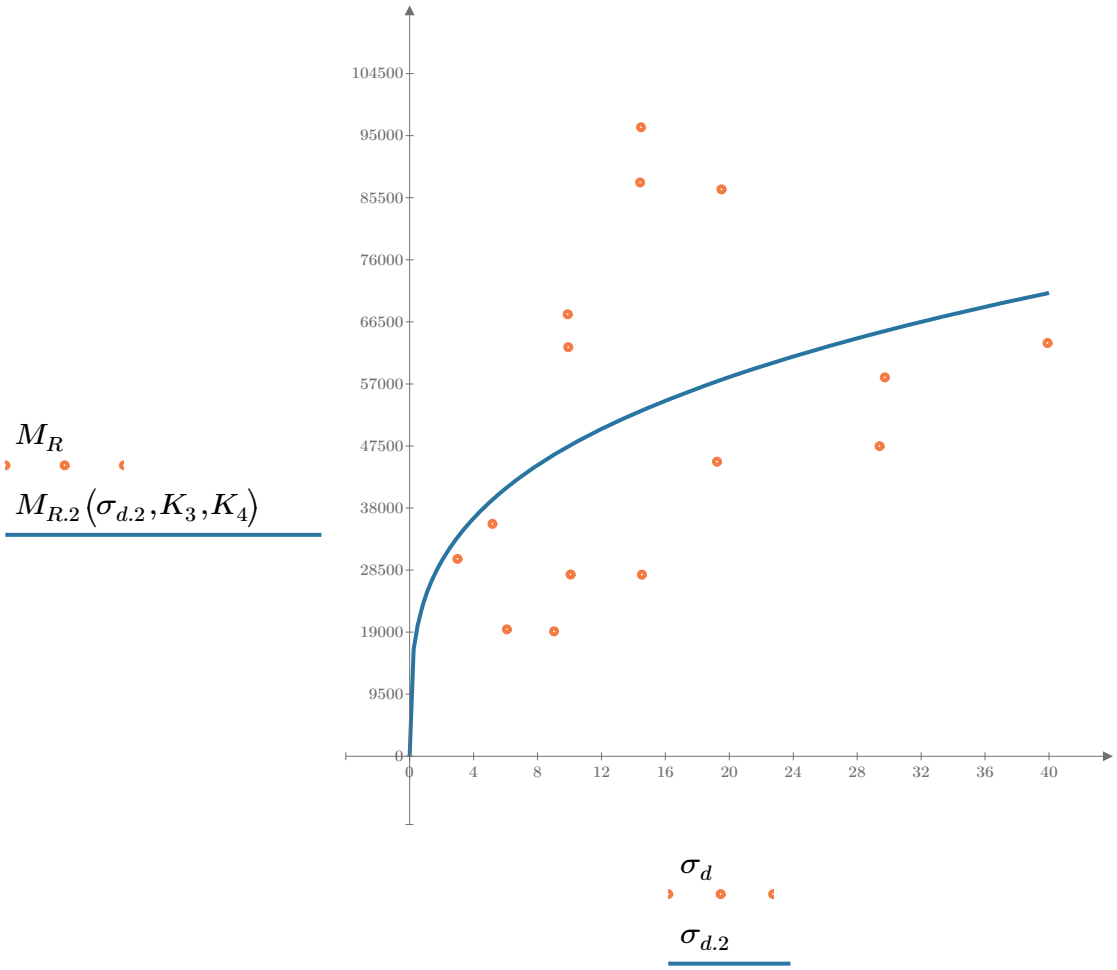

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–52”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 13099.160$

$K_6 = -0.2755$ Equation 3 fitting parameters

$K_7 = 0.9033$

${R_3}^2 = 0.9264$ Coefficient of determination

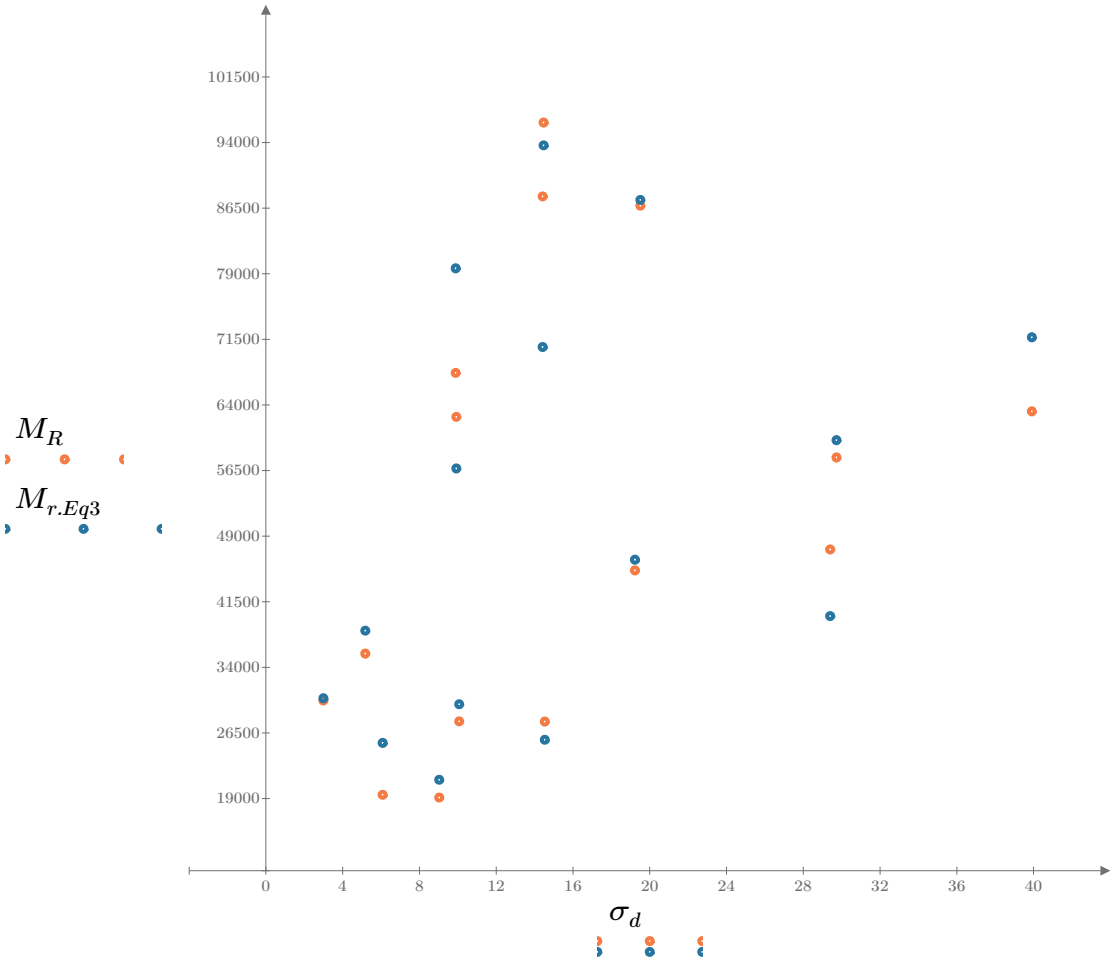

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–52”}$

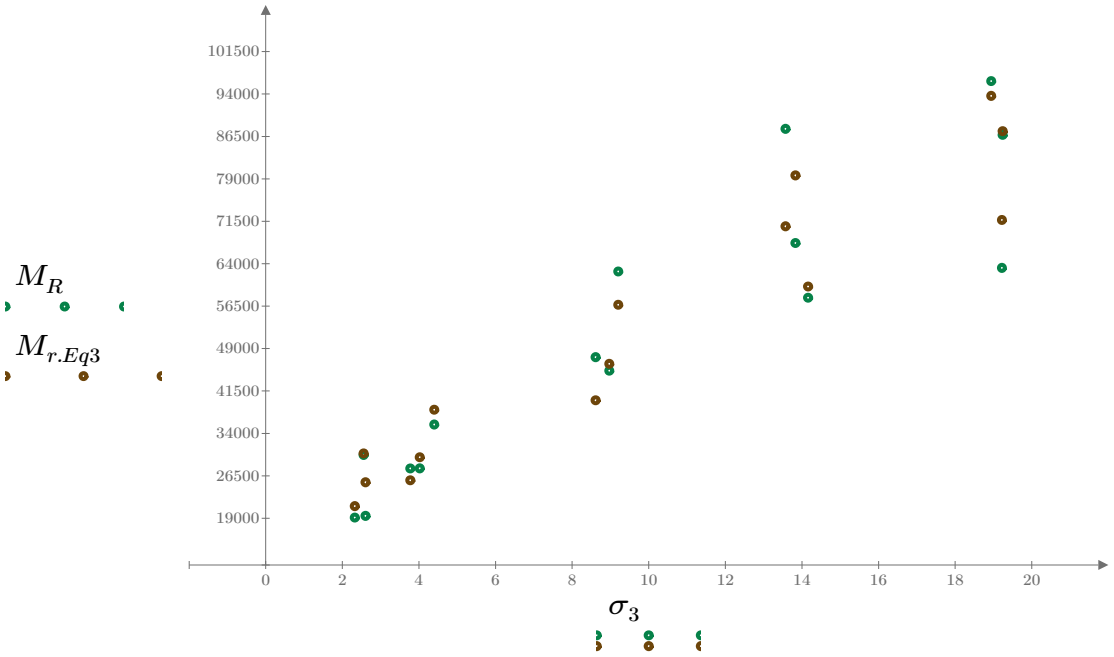

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

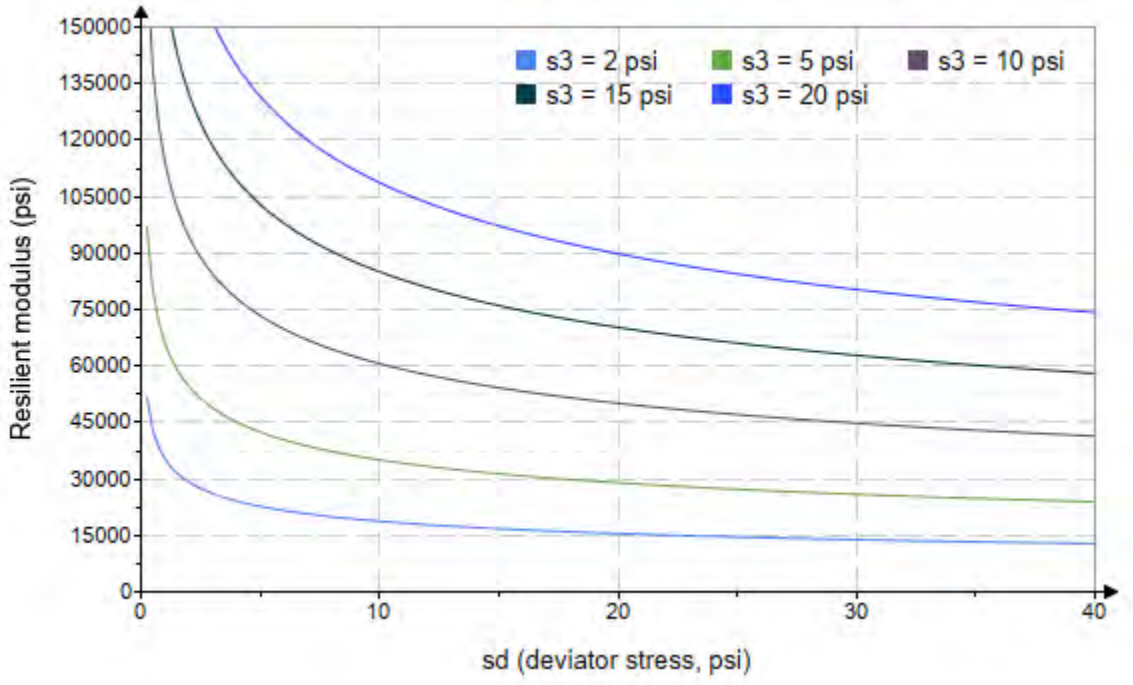

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–52”}$

$$M_{R.4}(\sigma_B, \sigma_d, K_8, K_9, K_{10}) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 974.453$

$K_9 = 1.1875$ Equation 4 fitting parameters

$K_{10} = -0.6593$

$R_4^{\,2} = 0.9240$ Coefficient of determination

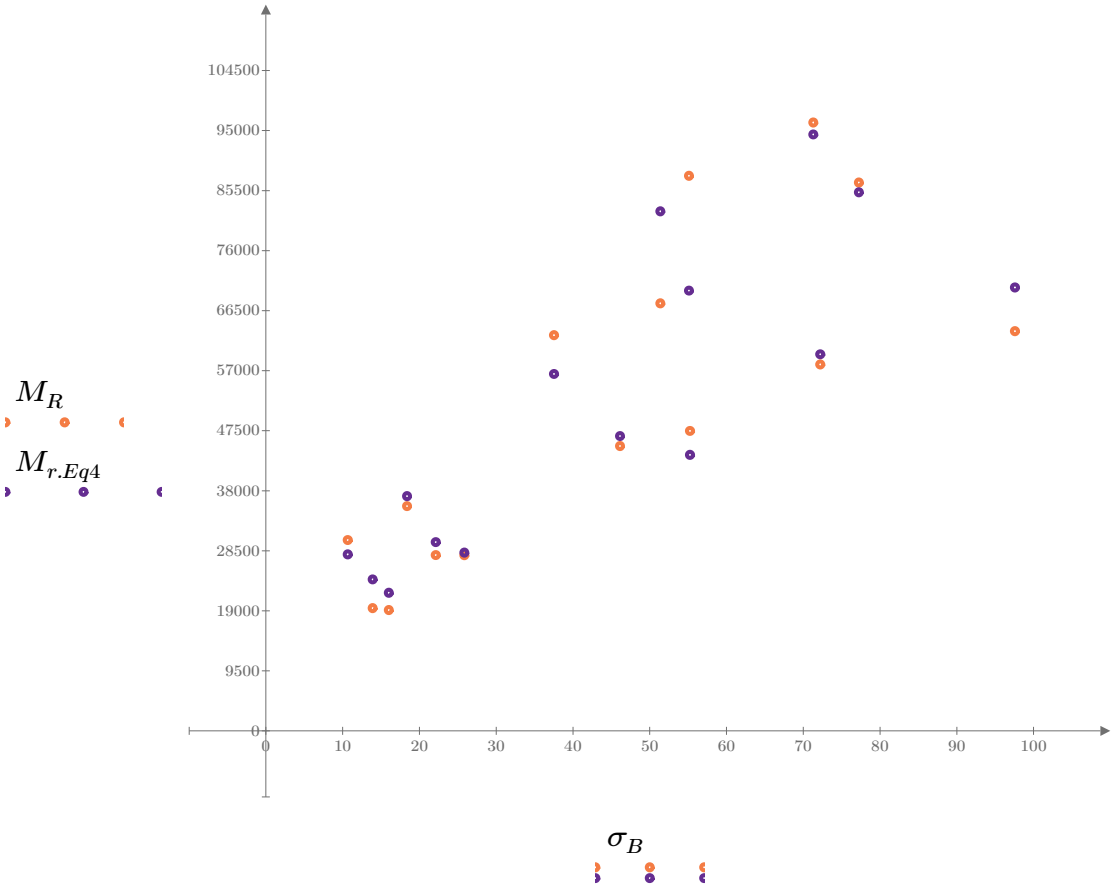

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

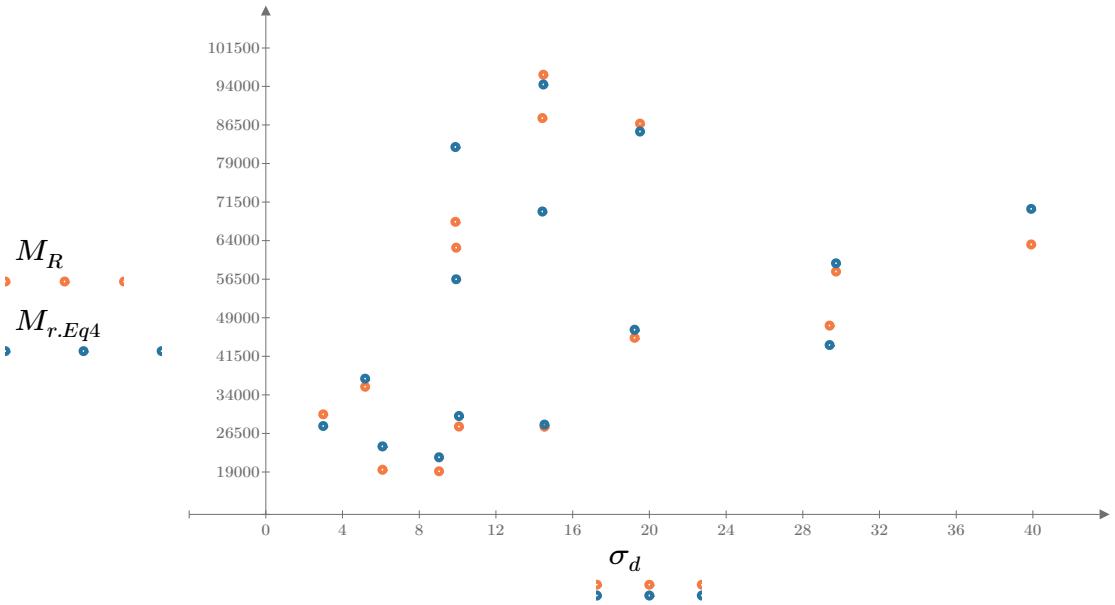

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

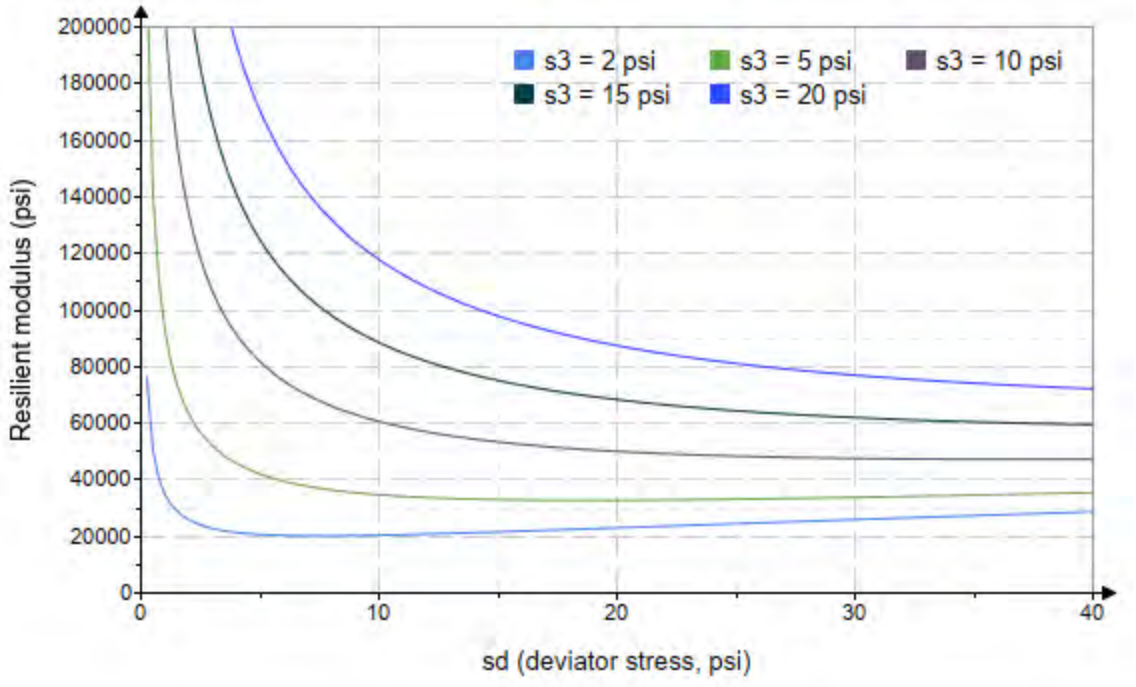

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{53”}$

$Treatment = \text{“D1”}$

$S = 15.493$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.606 \\ 2.602 \\ 2.578 \\ 4.581 \\ 4.584 \\ 4.554 \\ 9.611 \\ 9.595 \\ 9.588 \\ 14.610 \\ 14.620 \\ 14.610 \\ 19.640 \\ 19.650 \\ 19.630 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.217 \\ 6.107 \\ 9.108 \\ 5.187 \\ 10.160 \\ 14.580 \\ 10.190 \\ 19.180 \\ 29.460 \\ 10.230 \\ 14.500 \\ 29.720 \\ 14.490 \\ 19.660 \\ 40.180 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.040 \\ 13.910 \\ 16.840 \\ 18.930 \\ 23.920 \\ 28.240 \\ 39.020 \\ 47.960 \\ 58.220 \\ 54.050 \\ 58.350 \\ 73.560 \\ 73.420 \\ 78.610 \\ 99.080 \end{bmatrix} \quad M_R = \begin{bmatrix} 41930.4 \\ 46501.4 \\ 50622.2 \\ 58938.8 \\ 50397.6 \\ 47599.2 \\ 58666.4 \\ 54151.4 \\ 54481.8 \\ 47876.0 \\ 57989.0 \\ 56170.8 \\ 71311.4 \\ 58969.2 \\ 56056.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–53”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 35051.775$

$K_2 = 0.1186$

Equation 1 fitting parameters

$R_1^2 = 0.3939$ Coefficient of determination

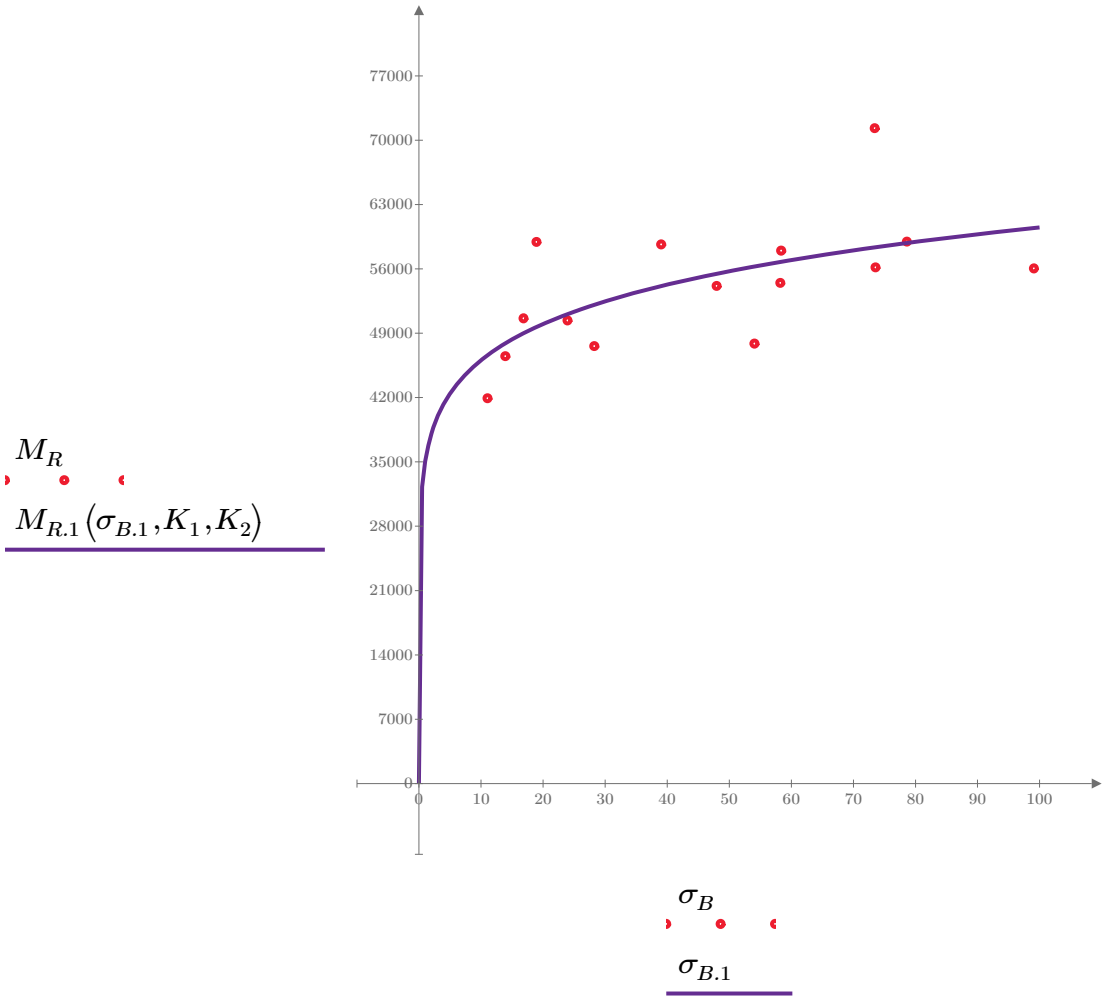

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–53”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 44434.620$

$K_4 = 0.0768$

Equation 2 fitting parameters

${R_2}^2 = 0.1692$ Coefficient of determination

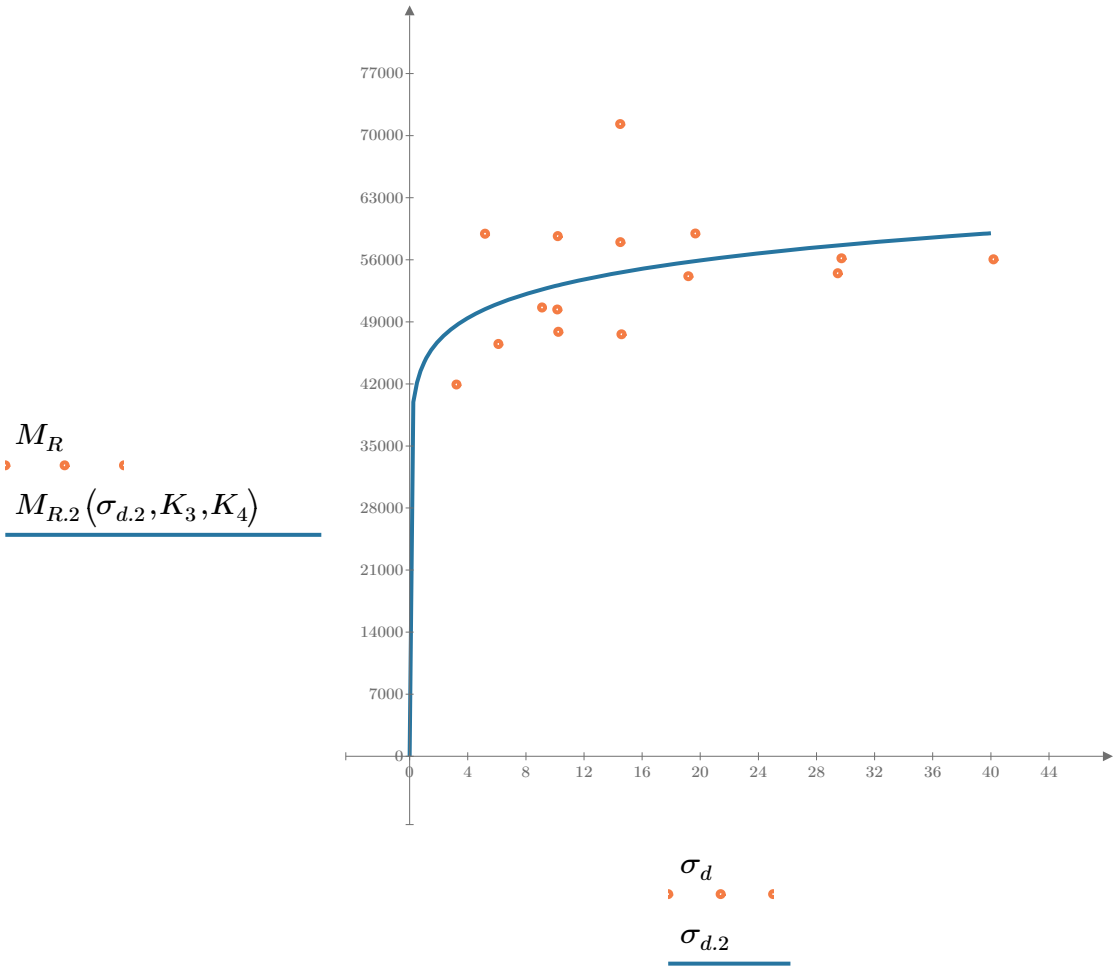

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–53”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 41210.435$

$K_6 = -0.0312$ Equation 3 fitting parameters

$K_7 = 0.1563$

${R_3}^2 = 0.4650$ Coefficient of determination

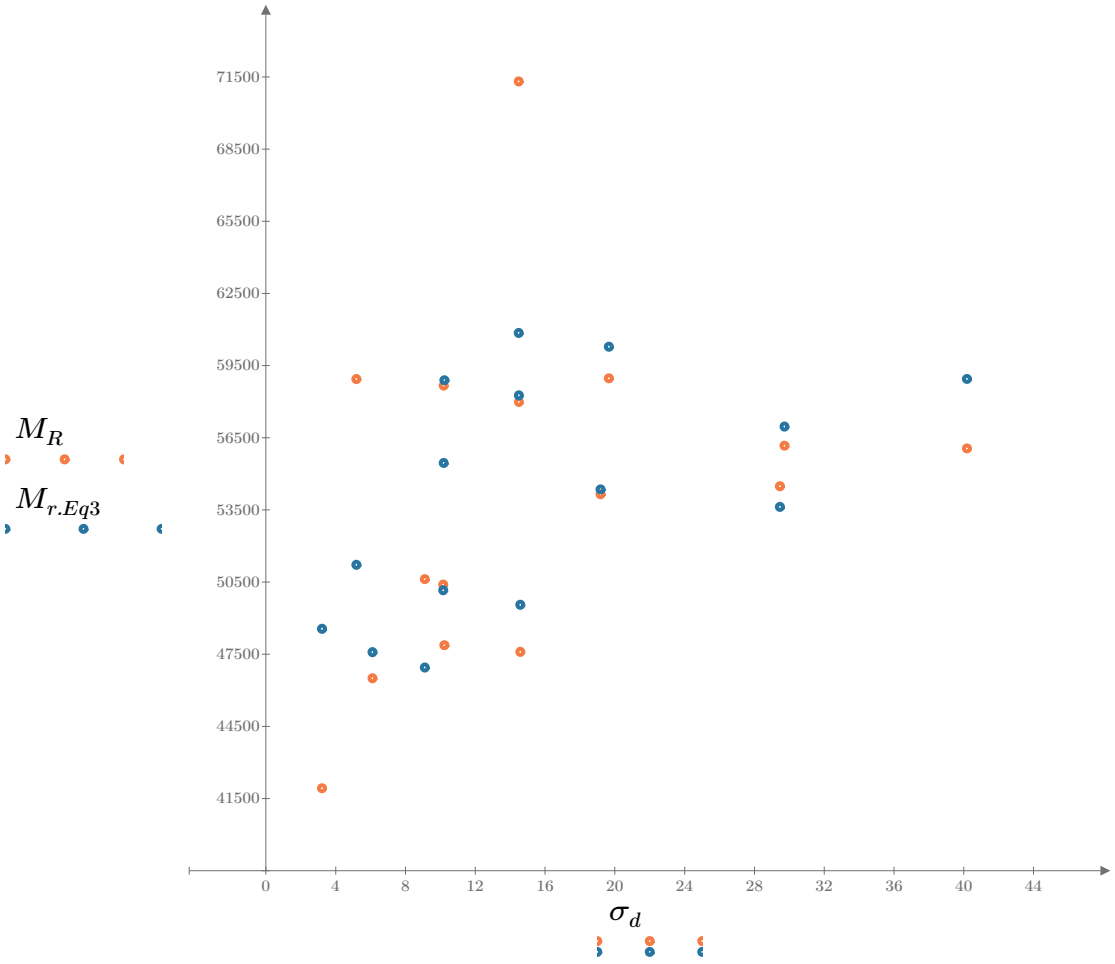

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–53”}$

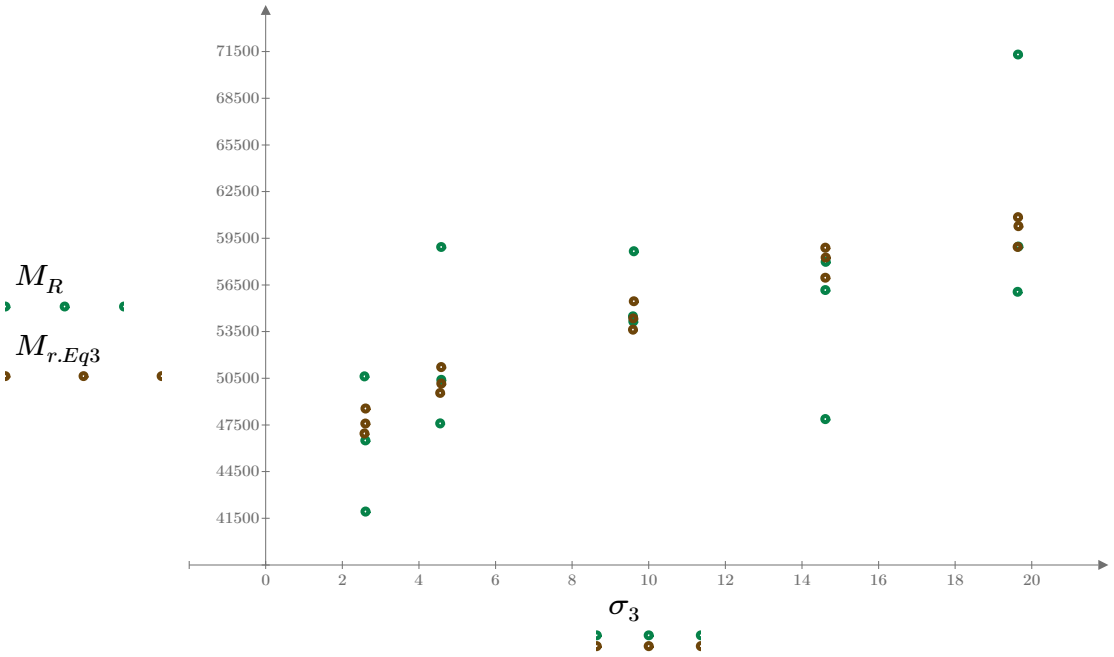

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

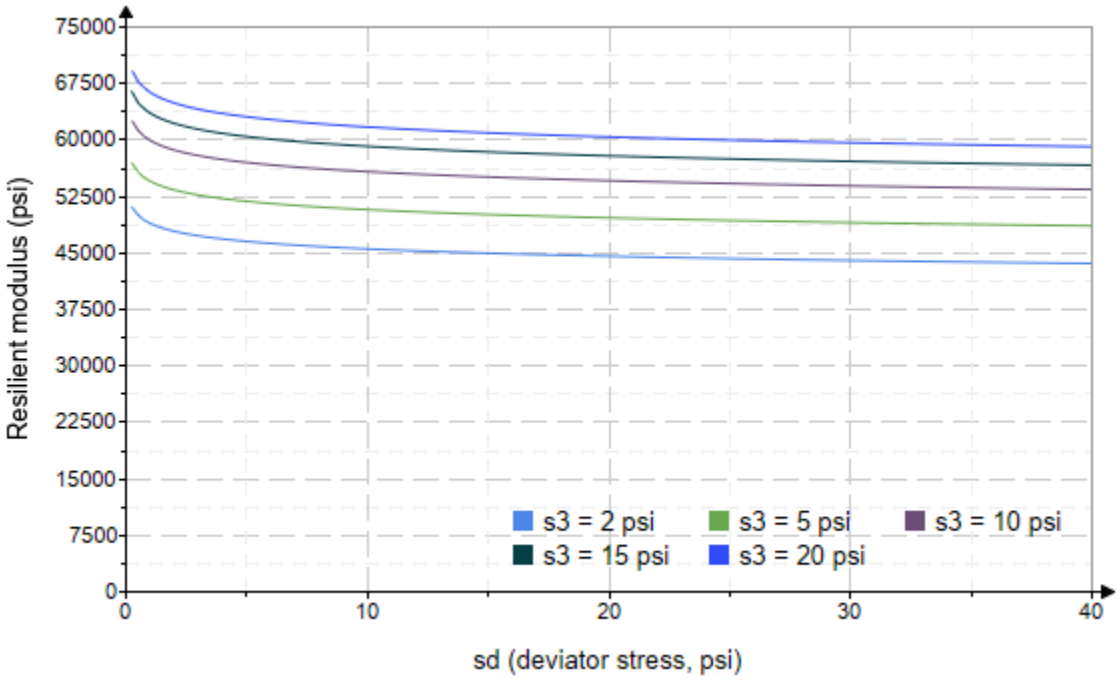

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–53”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2965.467$

$K_9 = 0.2091$ Equation 4 fitting parameters

$K_{10} = -0.1046$

$R_4^{\,2} = 0.4699$ Coefficient of determination

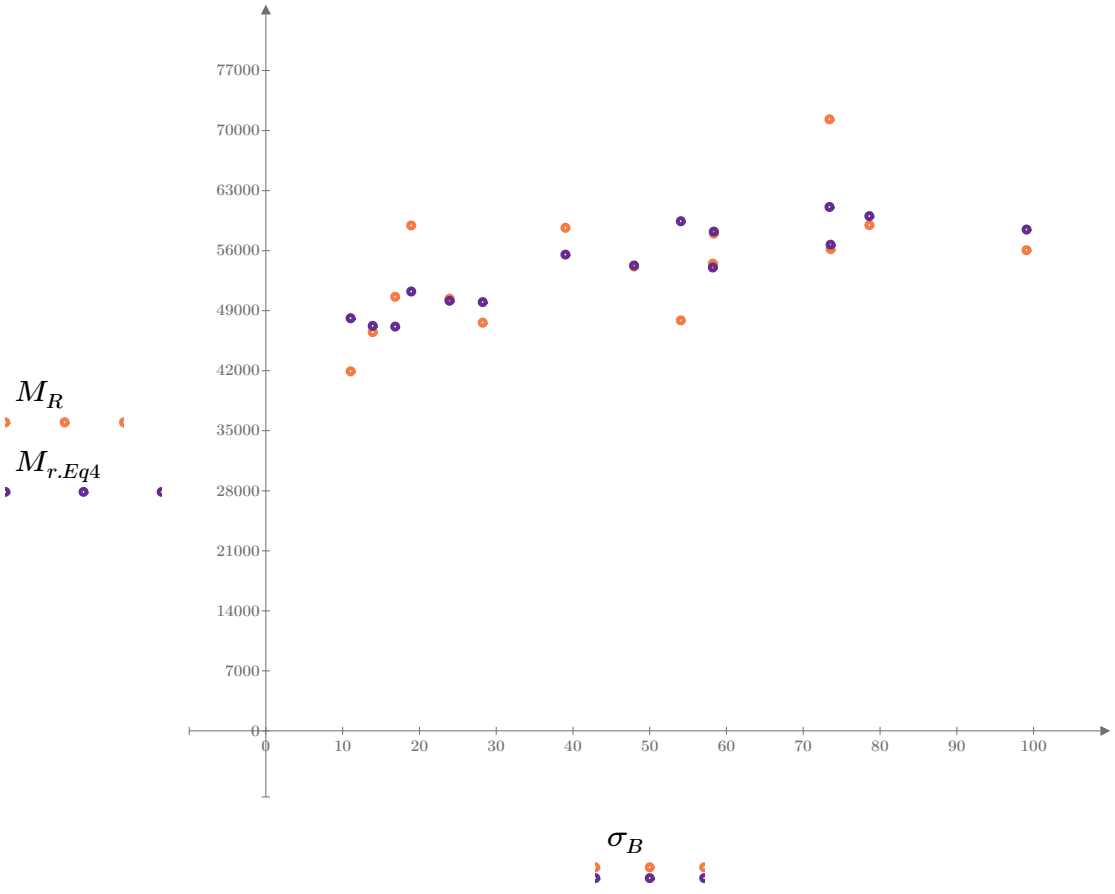

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

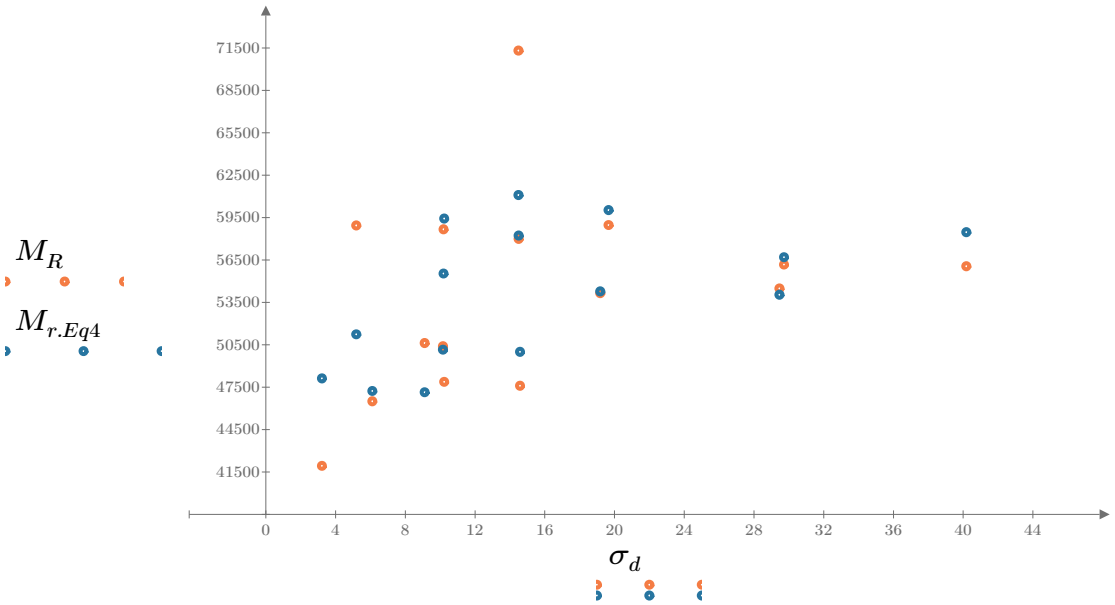

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

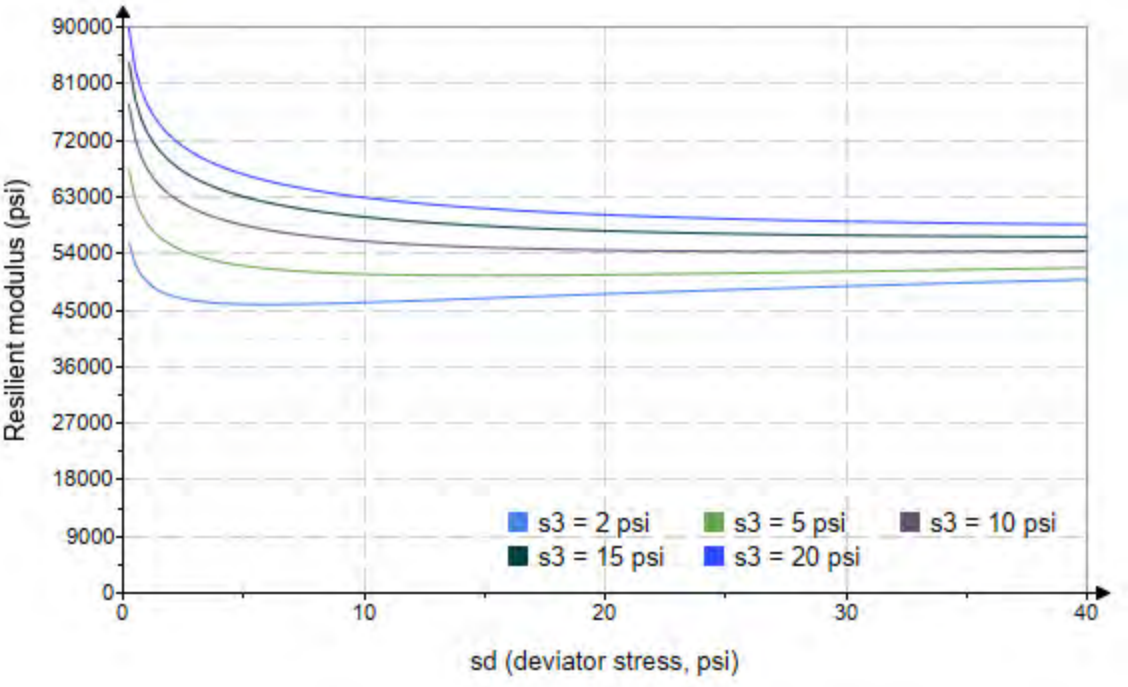

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−54"

$Treatment =$ "D1"

$S = 15.764$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.482 \\ 2.020 \\ 1.703 \\ 4.029 \\ 3.784 \\ 3.617 \\ 8.526 \\ 9.549 \\ 9.806 \\ 15.000 \\ 15.310 \\ 14.750 \\ 19.170 \\ 19.540 \\ 18.920 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.415 \\ 6.123 \\ 9.108 \\ 5.238 \\ 10.020 \\ 14.460 \\ 10.100 \\ 19.330 \\ 29.720 \\ 9.945 \\ 14.490 \\ 30.010 \\ 14.730 \\ 19.590 \\ 40.060 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.860 \\ 12.180 \\ 14.220 \\ 17.320 \\ 21.370 \\ 25.310 \\ 35.680 \\ 47.970 \\ 59.140 \\ 54.940 \\ 60.420 \\ 74.270 \\ 72.230 \\ 78.200 \\ 96.810 \end{bmatrix} \quad M_R = \begin{bmatrix} 72935.3 \\ 48073.0 \\ 42196.8 \\ 61479.1 \\ 80761.4 \\ 57912.4 \\ 62631.7 \\ 67351.0 \\ 69008.8 \\ 141608.4 \\ 214208.0 \\ 78917.0 \\ 109588.5 \\ 140260.0 \\ 60775.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–54”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 24821.552$

$K_2 = 0.3424$

Equation 1 fitting parameters

$R_1^2 = 0.2237$ Coefficient of determination

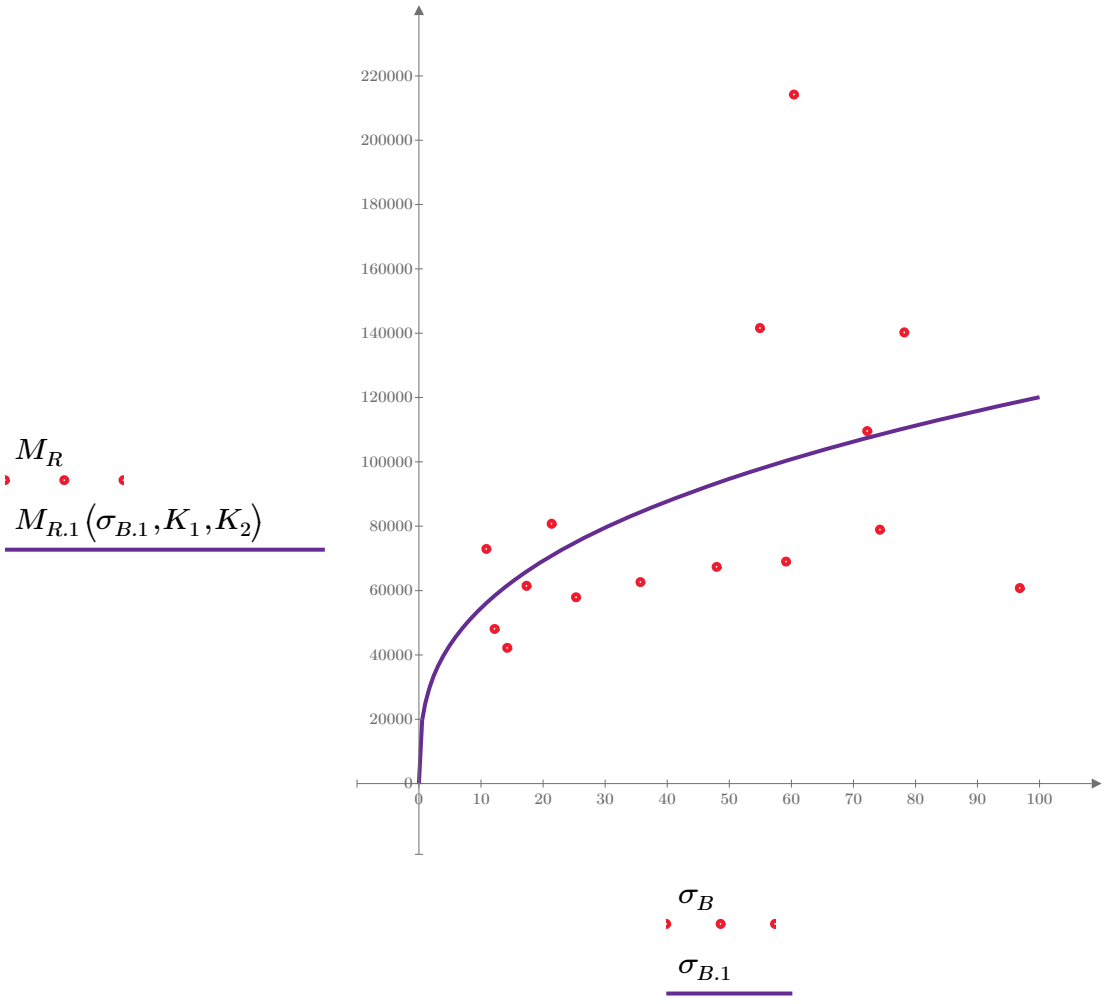

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–54”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 70331.286$

$K_4 = 0.0837$ Equation 2 fitting parameters

${R_2}^2 = 0.0140$ Coefficient of determination

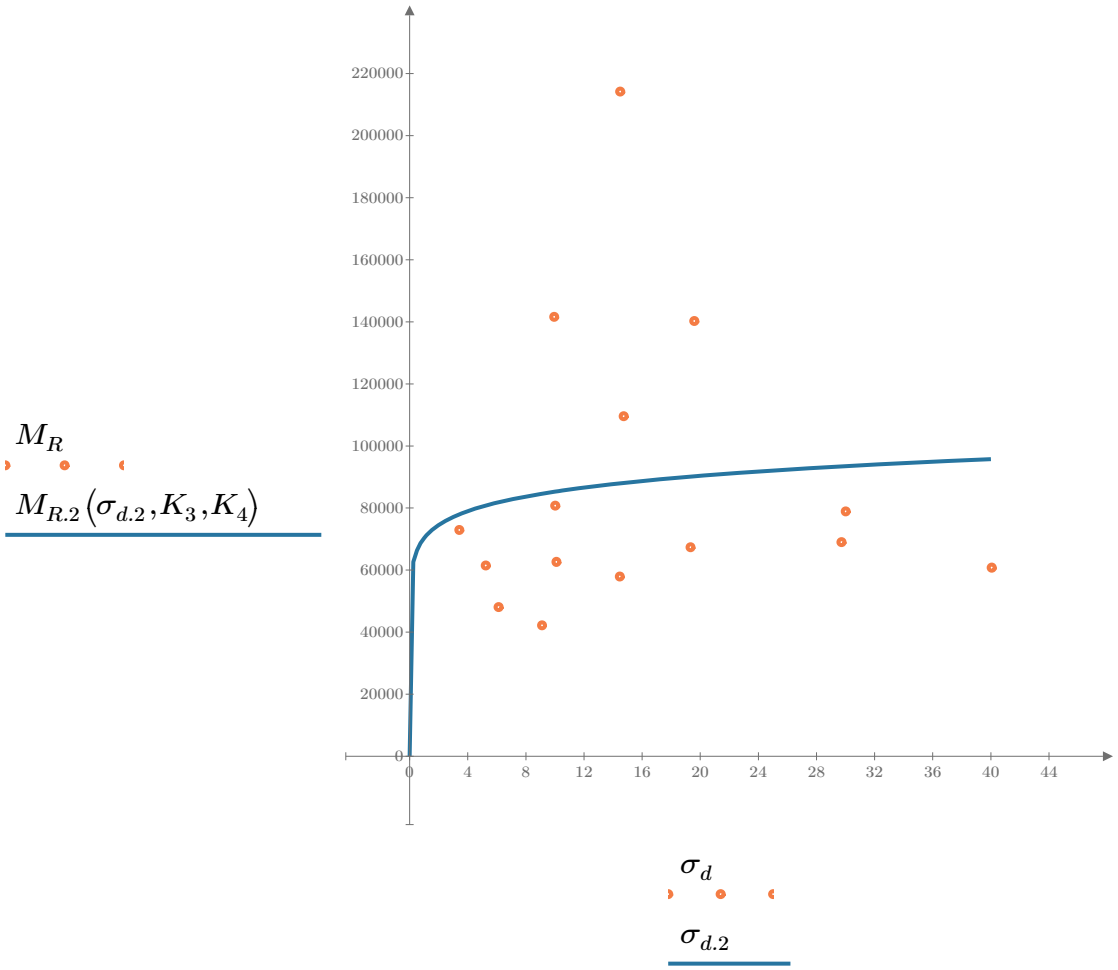

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–54”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 49737.547$

$K_6 = -0.4827$ Equation 3 fitting parameters

$K_7 = 0.7913$

${R_3}^2 = 0.5715$ Coefficient of determination

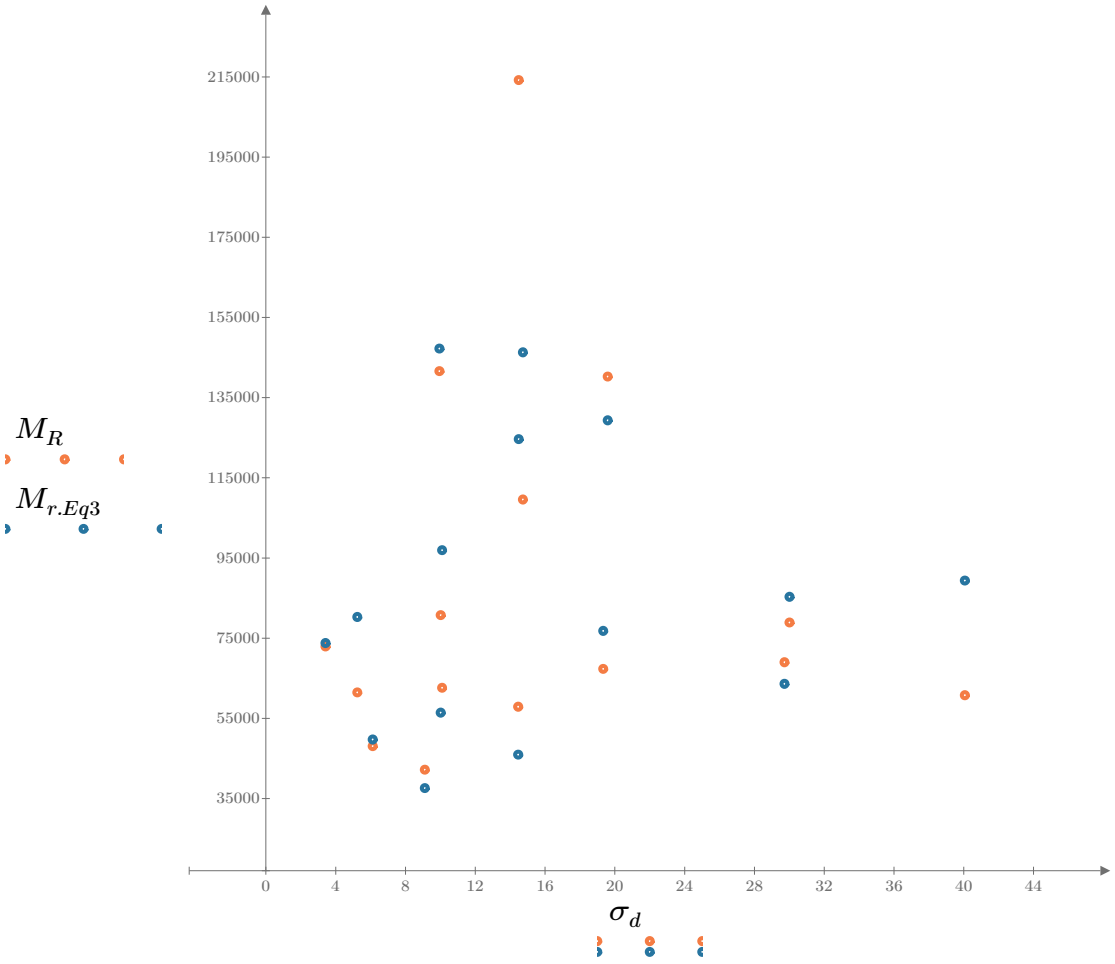

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–54”}$

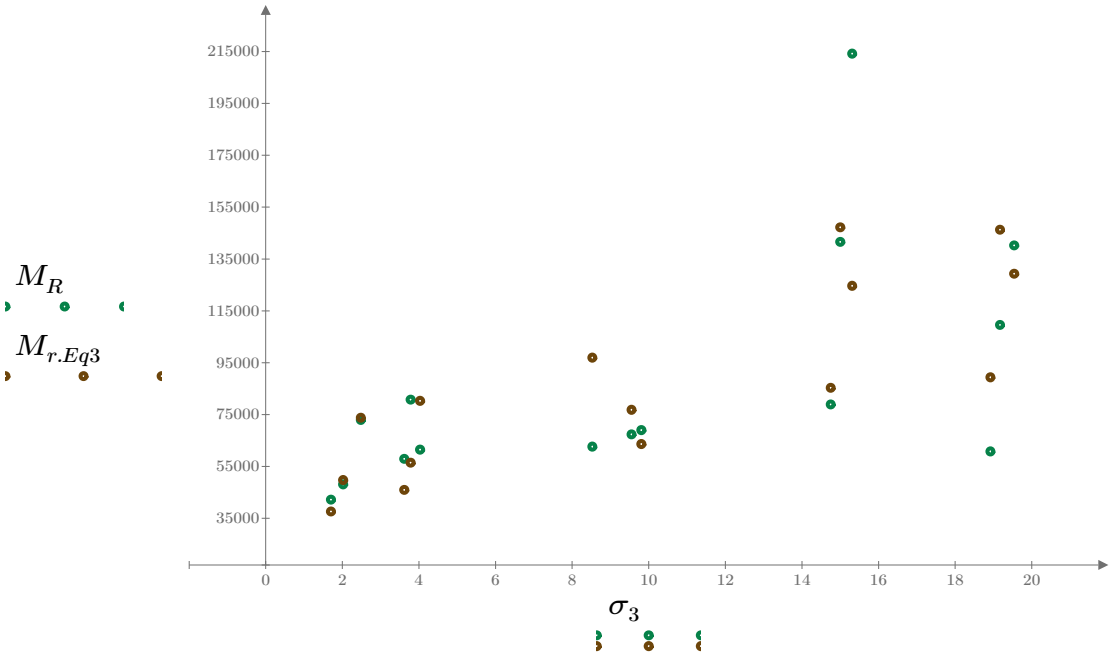

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

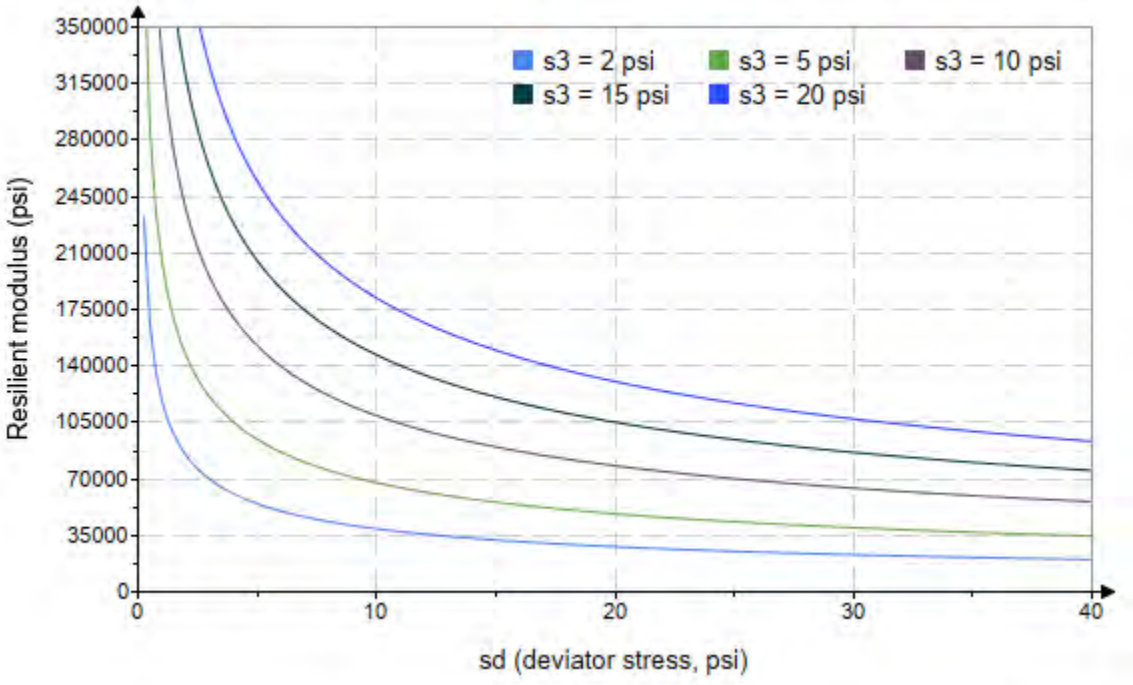

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–54”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1965.747$

$K_9 = 1.0188$ Equation 4 fitting parameters

$K_{10} = -0.8123$

$R_4^{\,2} = 0.5711$ Coefficient of determination

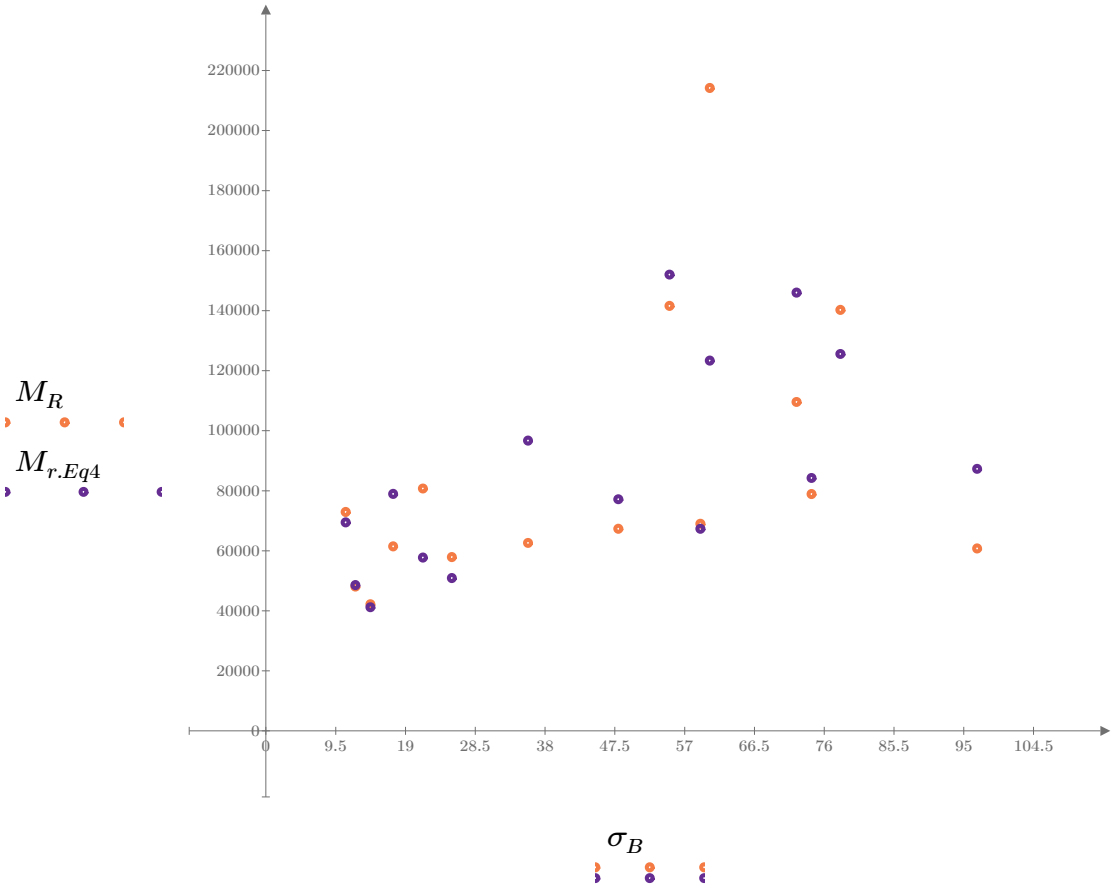

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

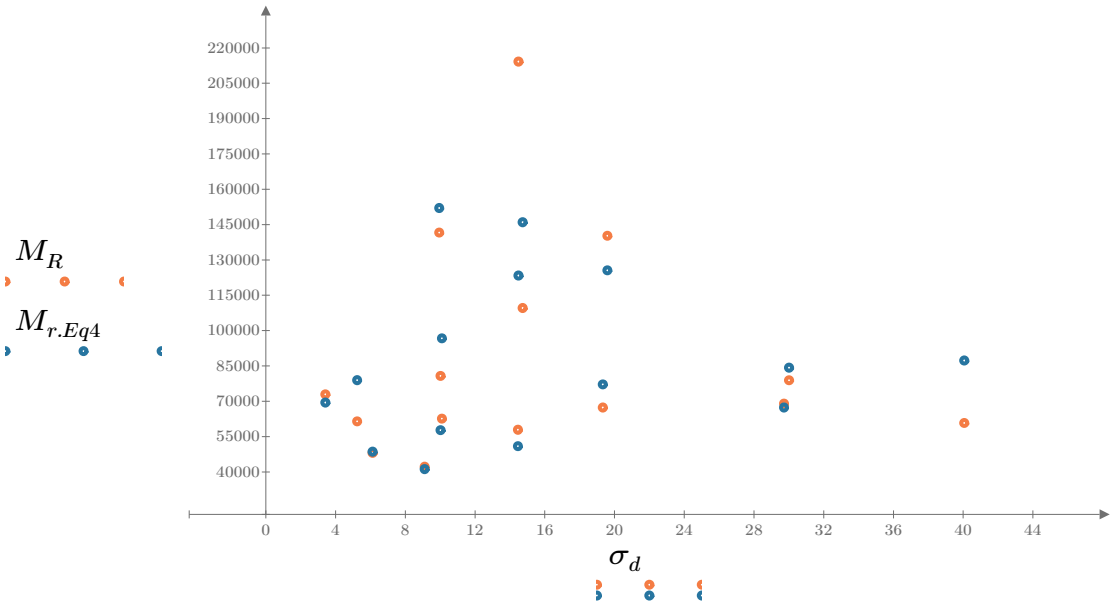

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

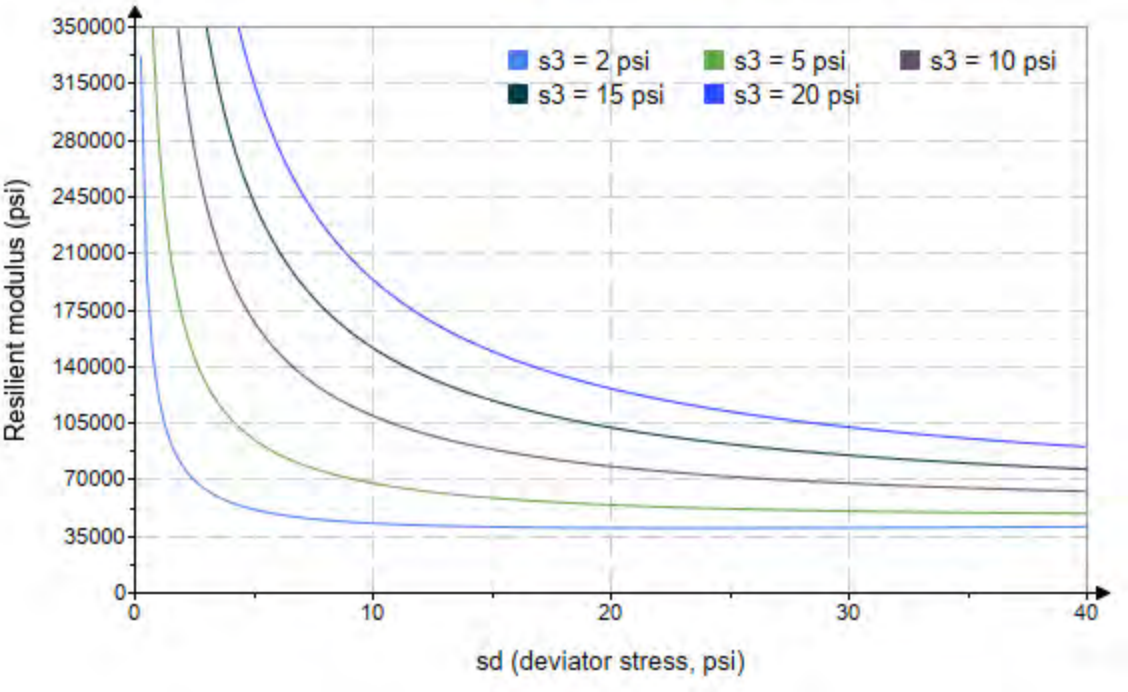

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{55”}$

$Treatment = \text{“D1”}$

$S = 17.973$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.743 \\ 2.752 \\ 2.733 \\ 4.731 \\ 4.699 \\ 4.663 \\ 9.542 \\ 9.495 \\ 9.473 \\ 14.670 \\ 14.650 \\ 14.660 \\ 19.650 \\ 19.650 \\ 19.640 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.193 \\ 6.075 \\ 9.021 \\ 5.069 \\ 10.040 \\ 14.440 \\ 10.150 \\ 19.330 \\ 29.490 \\ 10.270 \\ 14.460 \\ 29.720 \\ 14.520 \\ 19.470 \\ 40.190 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.420 \\ 14.330 \\ 17.220 \\ 19.260 \\ 24.140 \\ 28.430 \\ 38.770 \\ 47.820 \\ 57.910 \\ 54.290 \\ 58.420 \\ 73.690 \\ 73.480 \\ 78.420 \\ 99.120 \end{bmatrix} \quad M_R = \begin{bmatrix} 39076.4 \\ 36102.4 \\ 33660.0 \\ 34628.2 \\ 36103.0 \\ 39976.2 \\ 59097.4 \\ 61756.6 \\ 51722.6 \\ 58754.8 \\ 62456.8 \\ 51916.4 \\ 52135.2 \\ 54622.2 \\ 54468.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–55”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 18968.696$

$K_2 = 0.2537$

Equation 1 fitting parameters

$R_1^2 = 0.6188$ Coefficient of determination

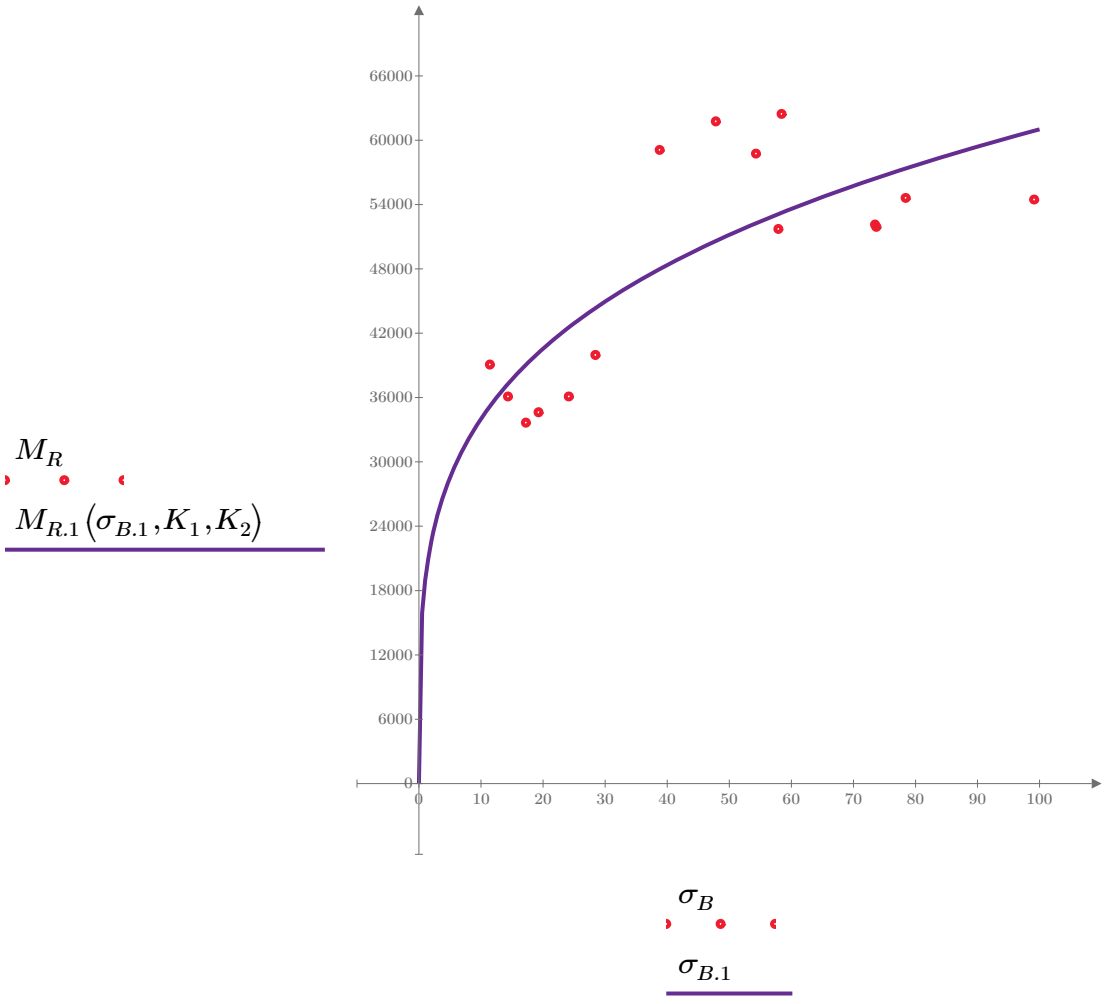

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–55”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 30579.087$

$K_4 = 0.1781$ Equation 2 fitting parameters

${R_2}^2 = 0.3268$ Coefficient of determination

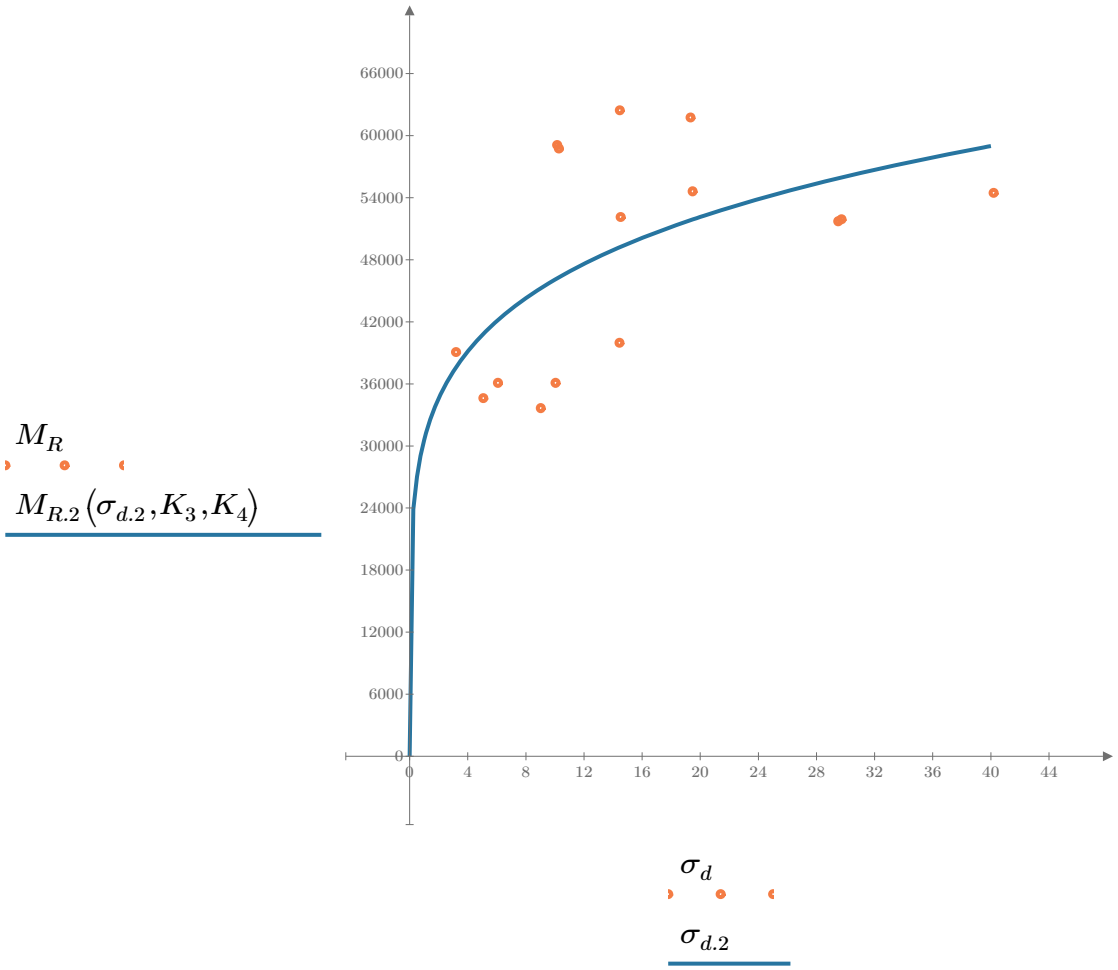

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–55”}$

$M_{R.3}(\sigma_d, \sigma_3, K_5, K_6, K_7) := K_5 \cdot {\sigma_d}^{K_6} \cdot (1 + \sigma_3)^{K_7}$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 26203.522$

$K_6 = -0.0097$ Equation 3 fitting parameters

$K_7 = 0.2793$

${R_3}^2 = 0.6618$ Coefficient of determination

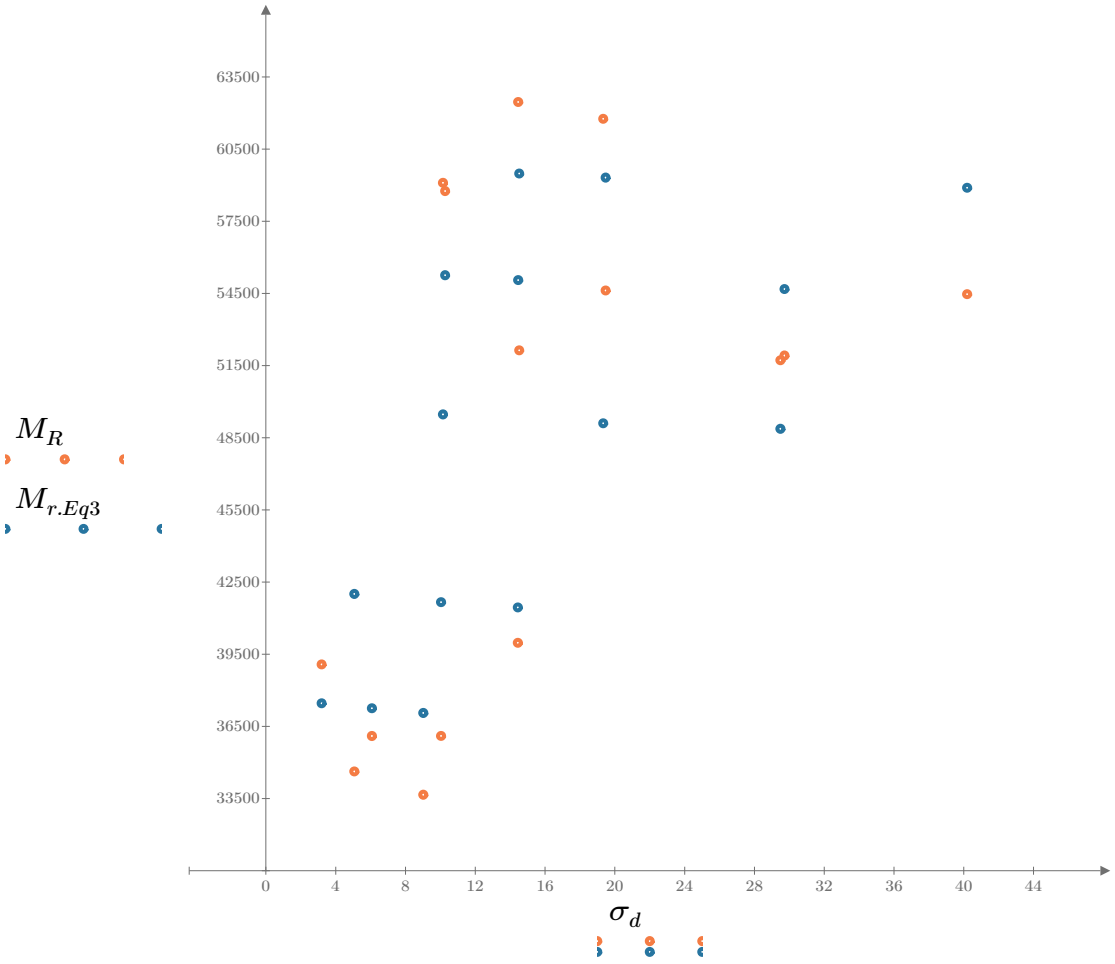

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–55”}$

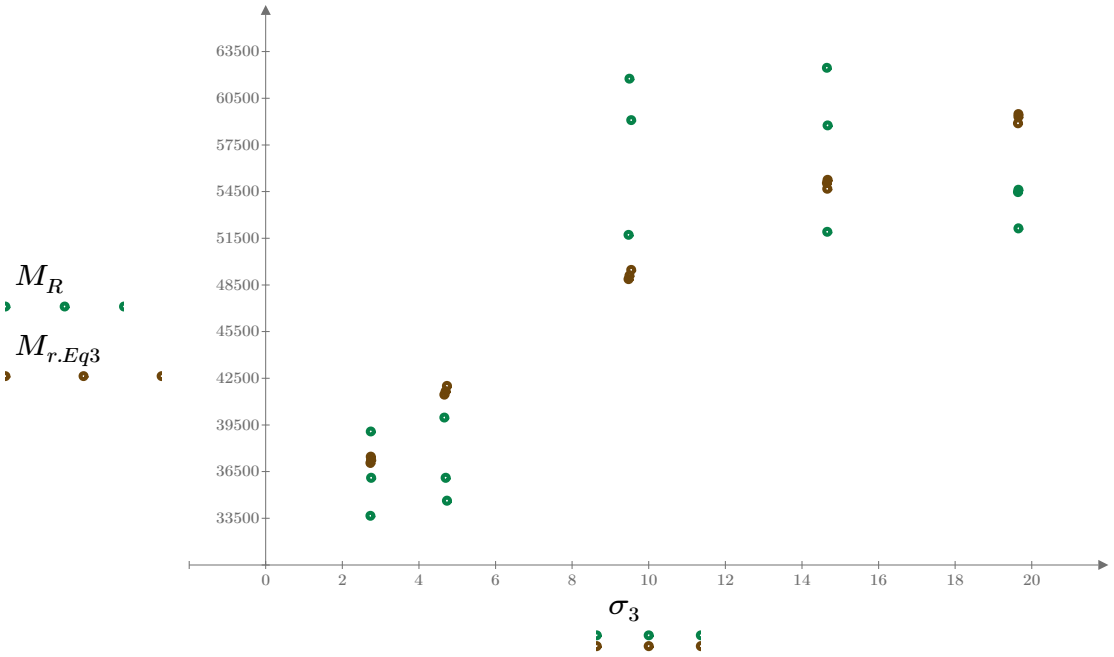

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

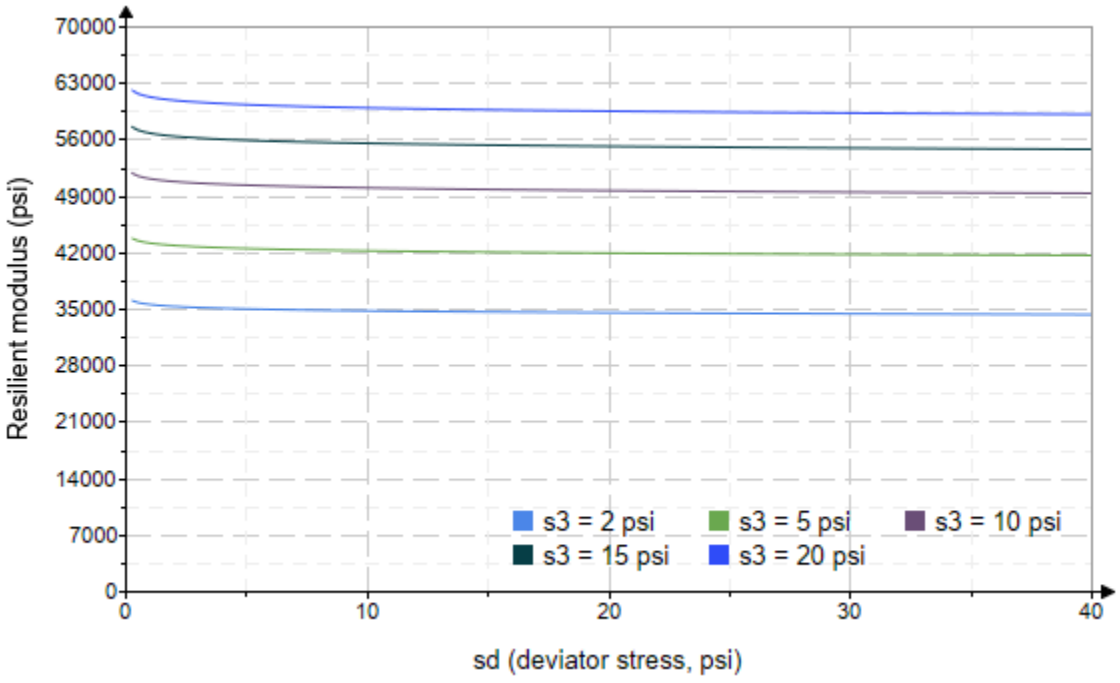

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–55”}$

$$M_{R.4}(\sigma_B, \sigma_d, K_8, K_9, K_{10}) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2229.454$

$K_9 = 0.3738$ Equation 4 fitting parameters

$K_{10} = -0.1379$

$R_4^{\,2} = 0.6680$ Coefficient of determination

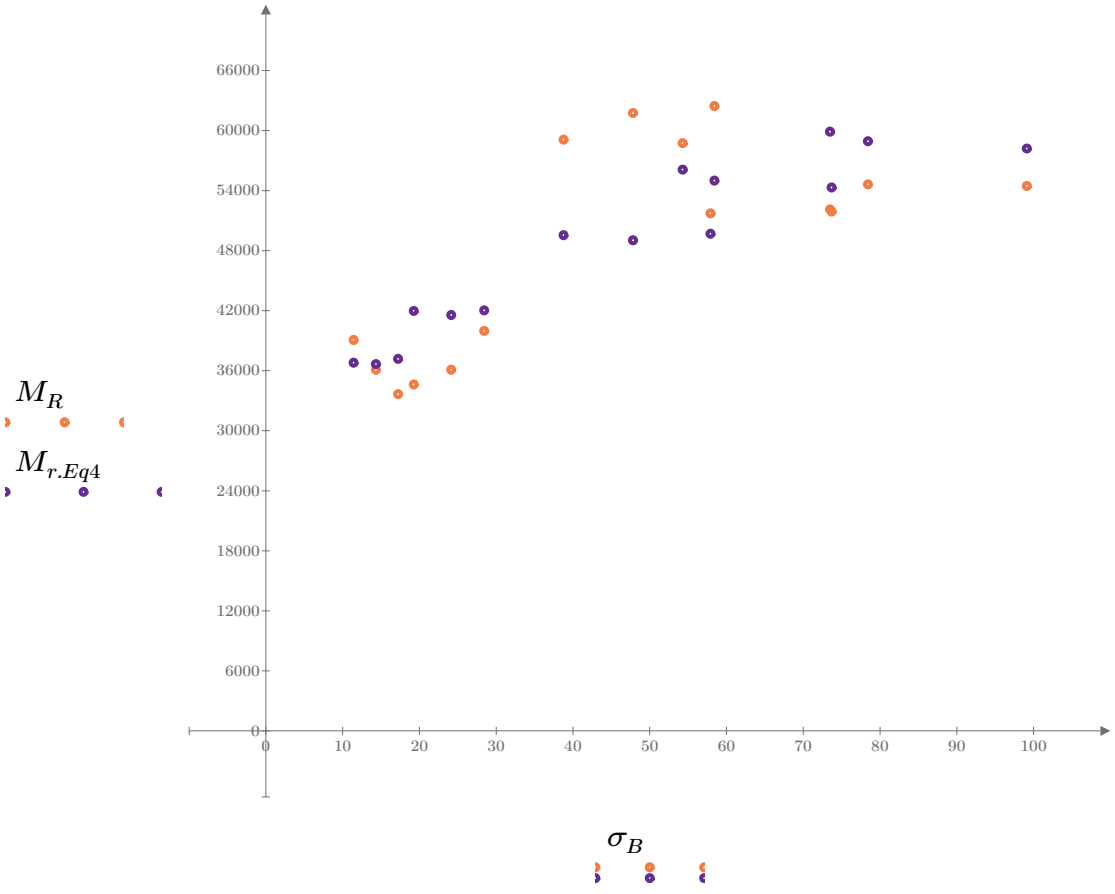

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

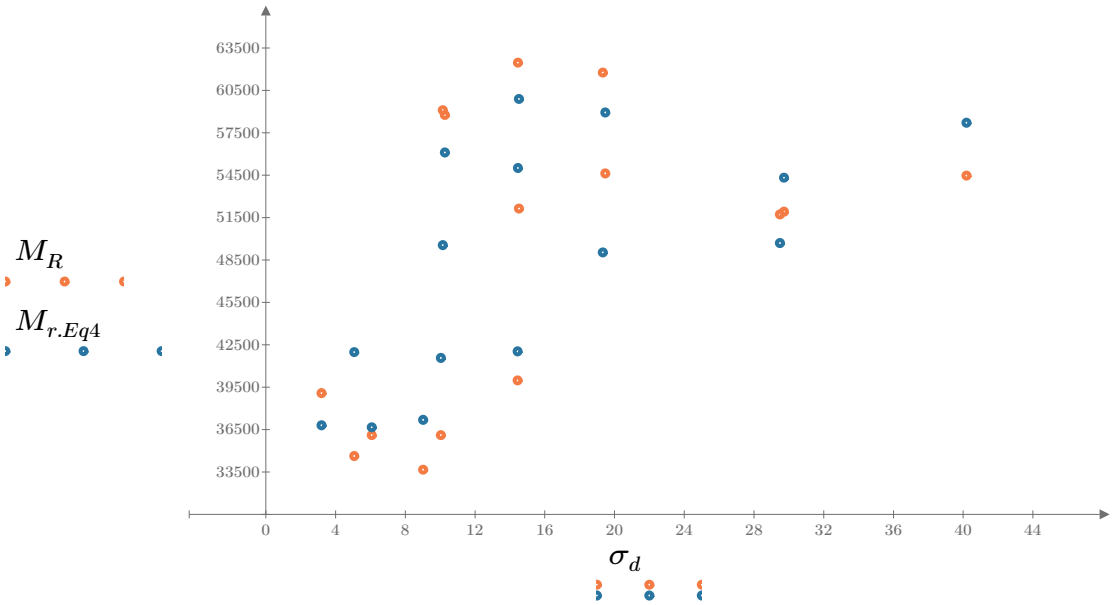

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

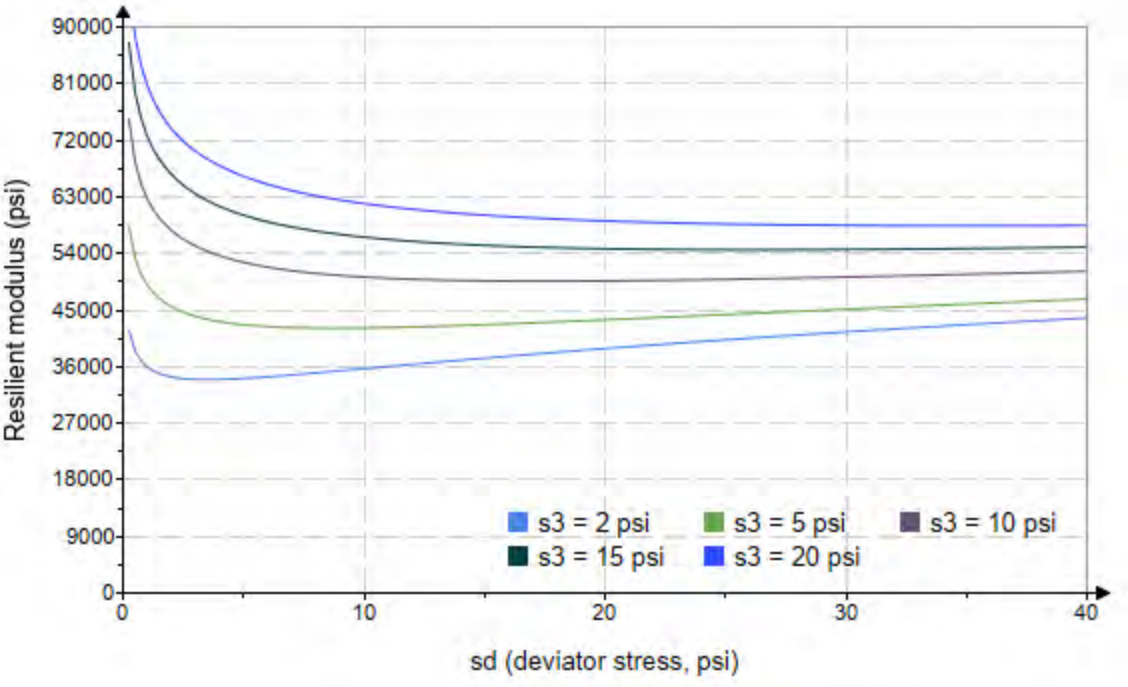

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{56”}$

$Treatment = \text{“D1”}$

$S = 15.708$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.514 \\ 1.995 \\ 2.113 \\ 4.240 \\ 4.044 \\ 3.553 \\ 8.864 \\ 8.886 \\ 8.991 \\ 13.970 \\ 13.630 \\ 14.080 \\ 19.490 \\ 18.870 \\ 19.470 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.179 \\ 6.166 \\ 9.203 \\ 5.136 \\ 10.120 \\ 14.550 \\ 10.190 \\ 19.250 \\ 29.460 \\ 10.220 \\ 14.660 \\ 29.750 \\ 14.490 \\ 19.640 \\ 39.760 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.720 \\ 12.150 \\ 15.540 \\ 17.860 \\ 22.250 \\ 25.210 \\ 36.780 \\ 45.900 \\ 56.440 \\ 52.140 \\ 55.530 \\ 71.990 \\ 72.970 \\ 76.240 \\ 98.170 \end{bmatrix} \quad M_R = \begin{bmatrix} 51916.4 \\ 26379.8 \\ 26883.8 \\ 36659.2 \\ 46434.6 \\ 42431.6 \\ 65119.8 \\ 46431.6 \\ 51532.2 \\ 90952.8 \\ 72947.6 \\ 55711.2 \\ 71247.2 \\ 73335.4 \\ 60003.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–56”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 16693.319$

$K_2 = 0.3237$

Equation 1 fitting parameters

${R_1}^2 = 0.4735$ Coefficient of determination

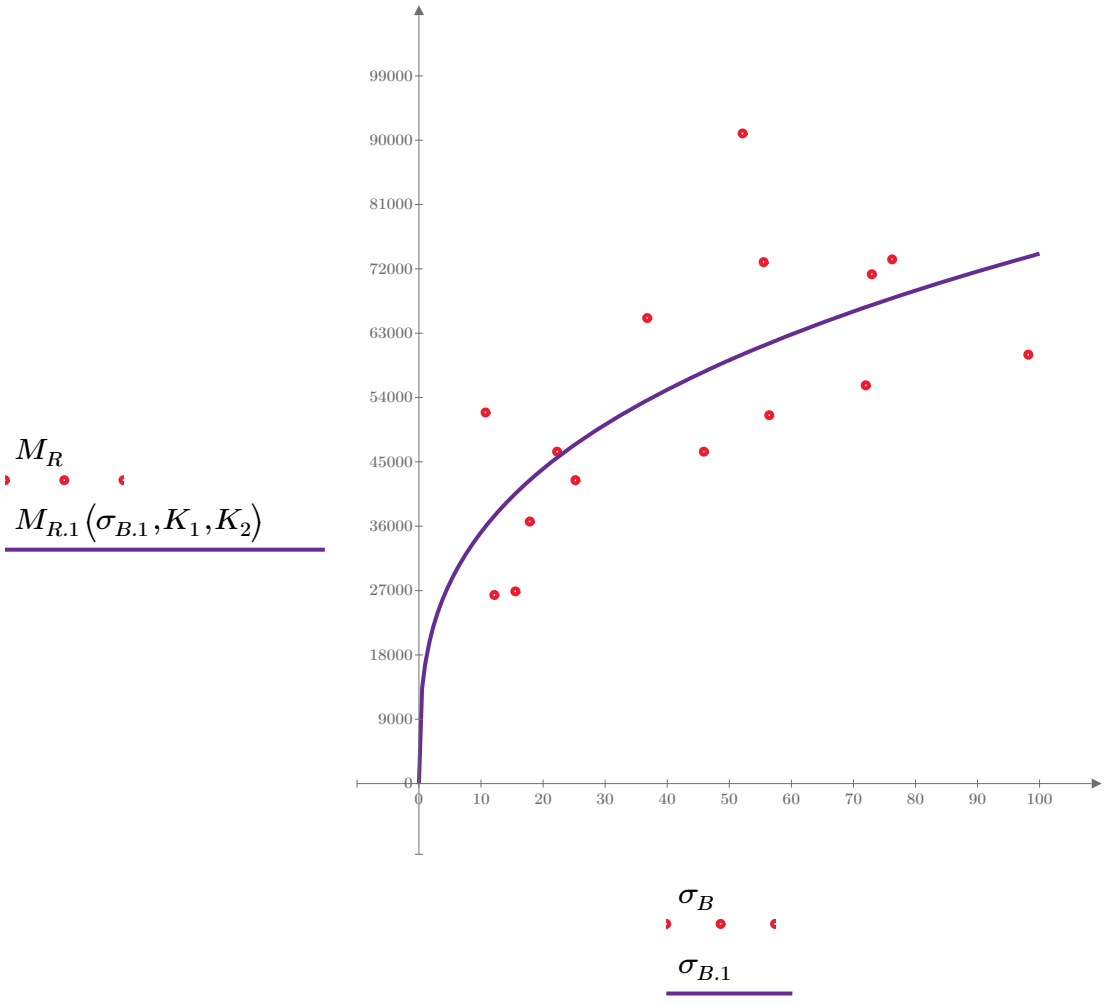

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–56”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 38029.805$

$K_4 = 0.1399$ Equation 2 fitting parameters

${R_2}^2 = 0.0877$ Coefficient of determination

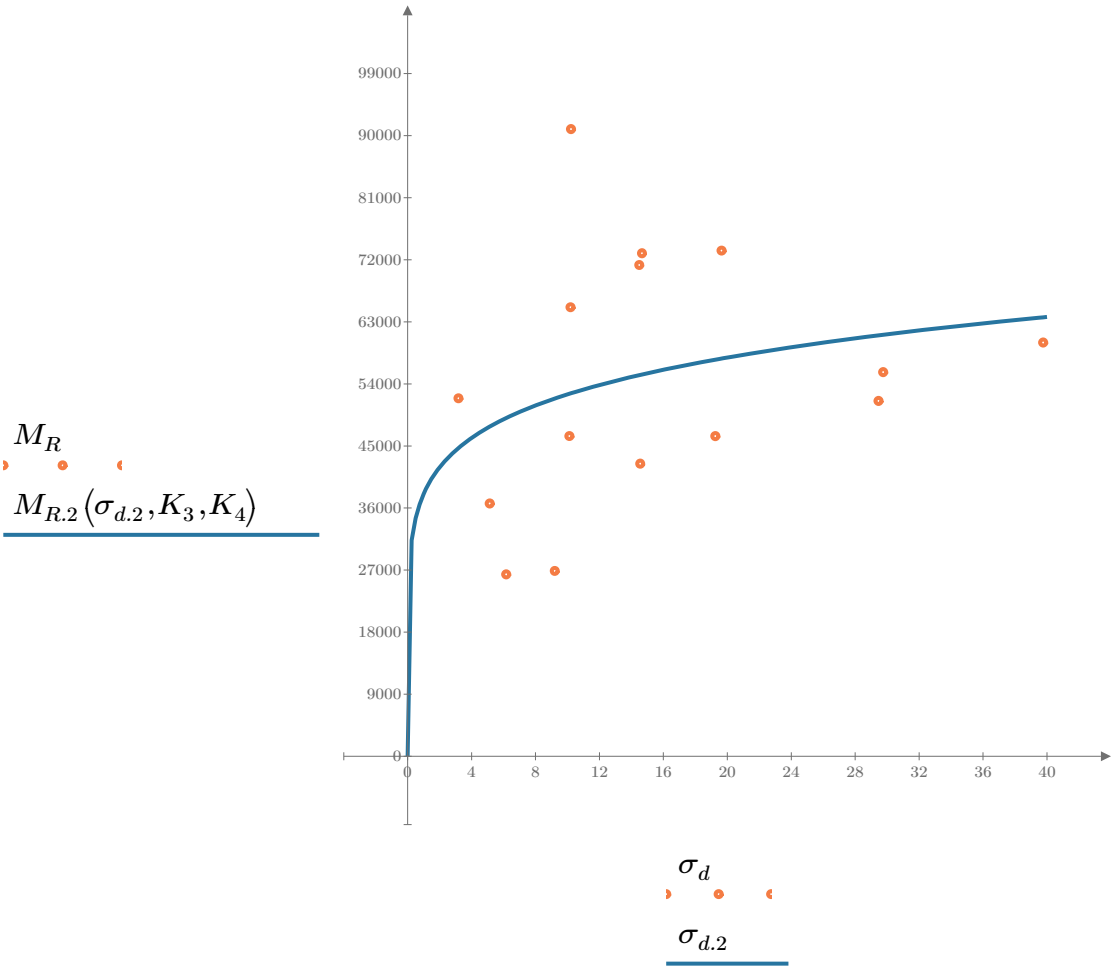

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–56”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 31000.587$

$K_6 = -0.2802$ Equation 3 fitting parameters

$K_7 = 0.5748$

${R_3}^2 = 0.8093$ Coefficient of determination

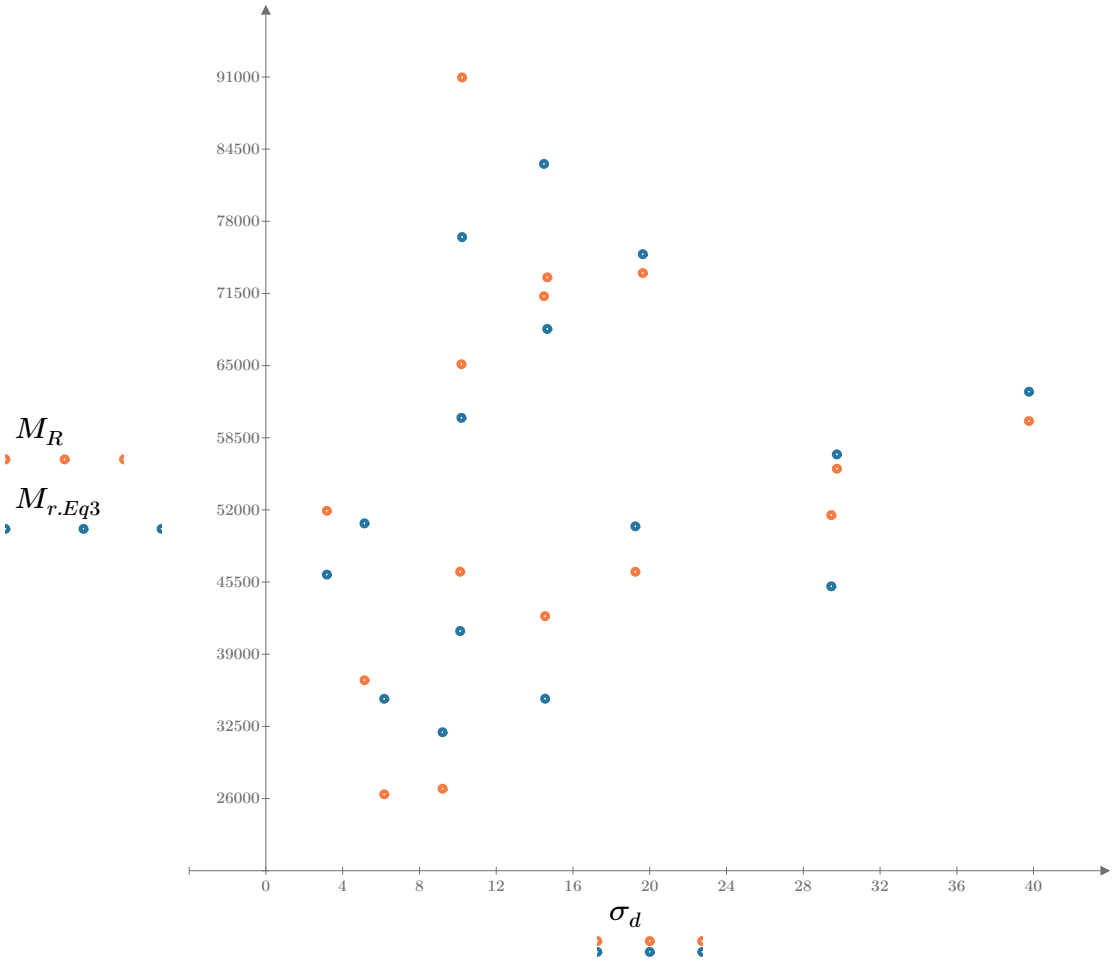

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–56”}$

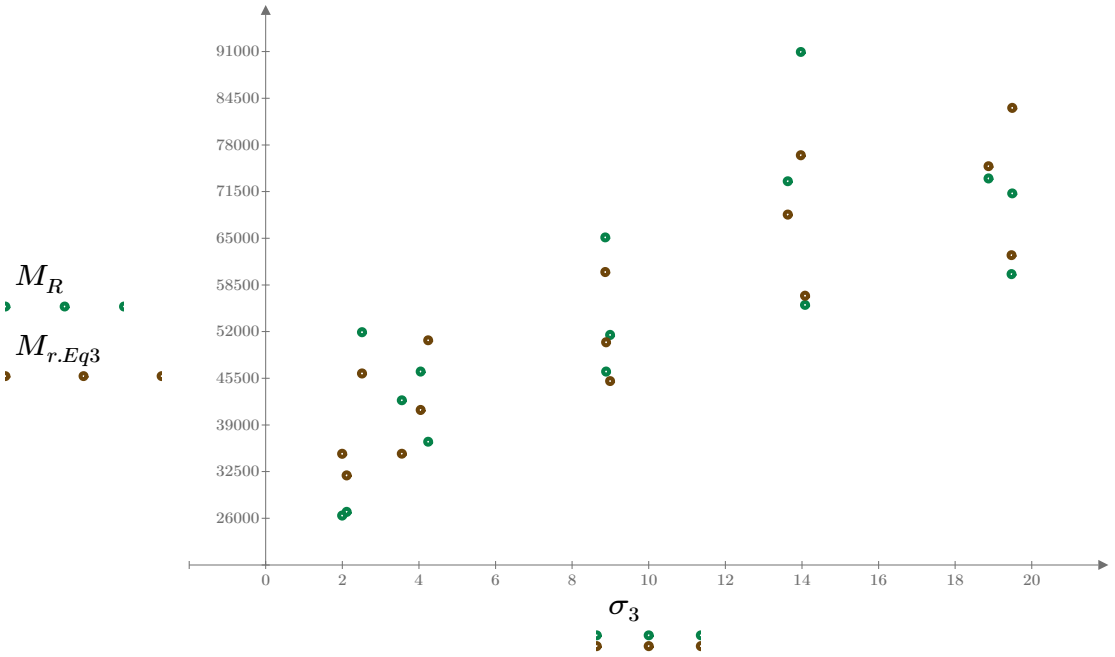

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

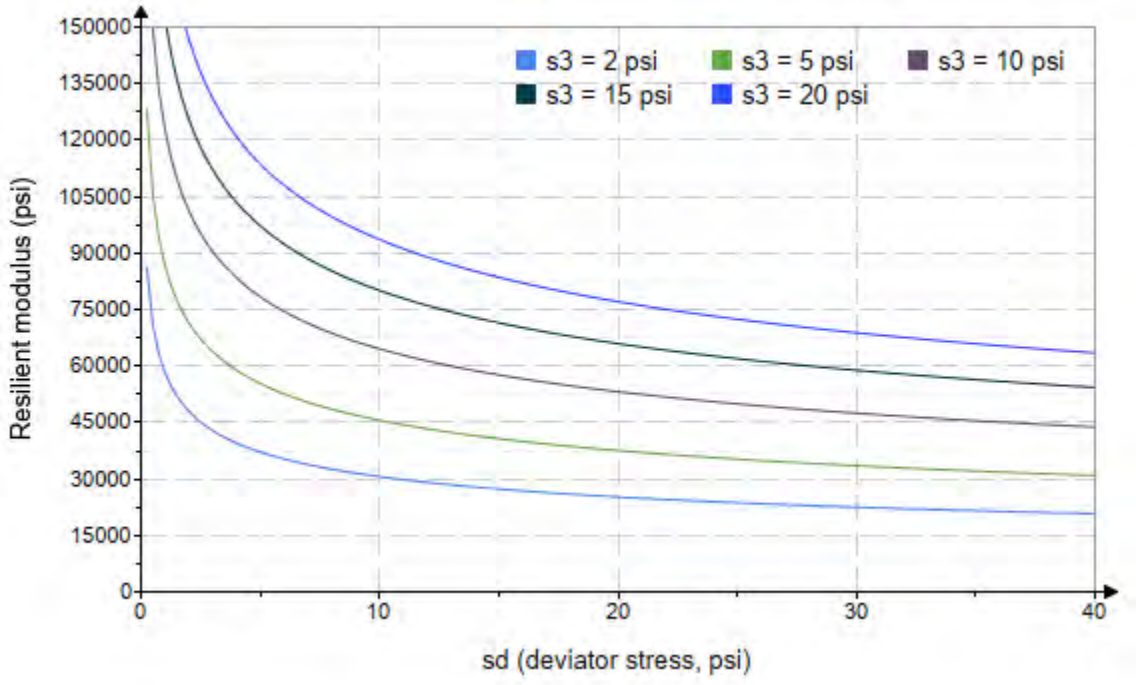

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–56”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1653.261$

$K_9 = 0.7720$ Equation 4 fitting parameters

$K_{10} = -0.5497$

$R_4^{\,2} = 0.8264$ Coefficient of determination

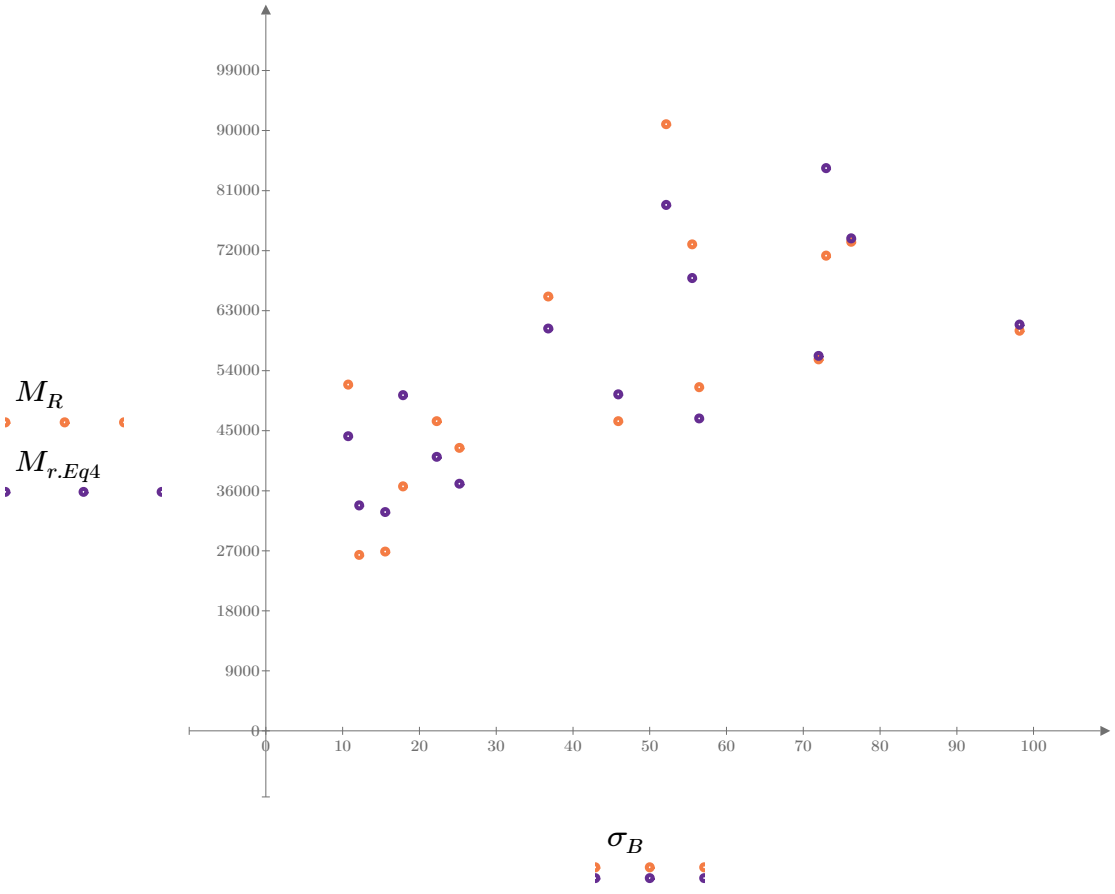

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

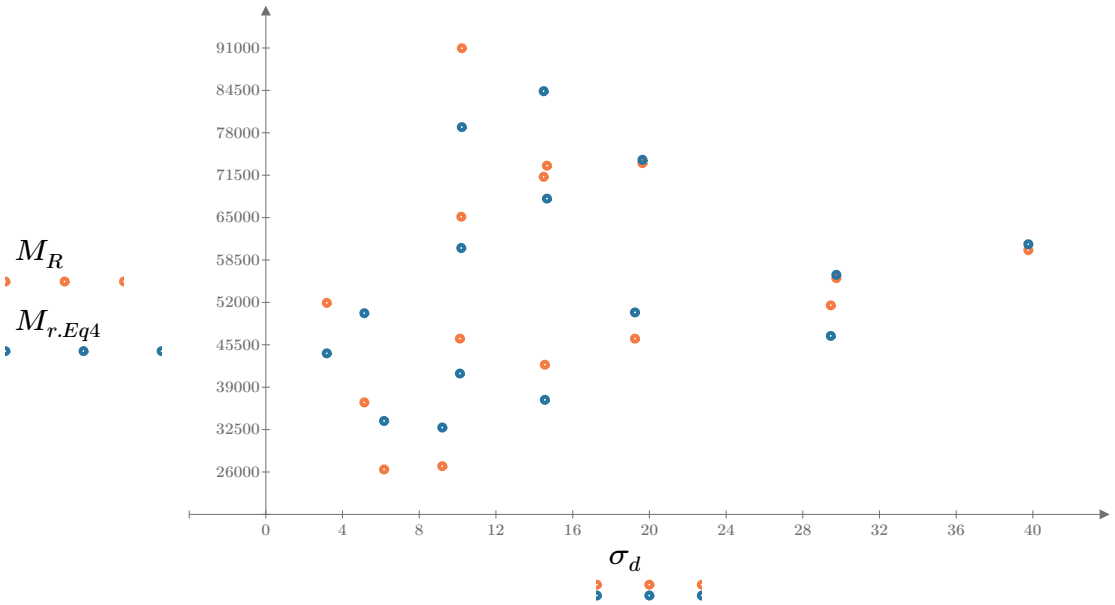

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

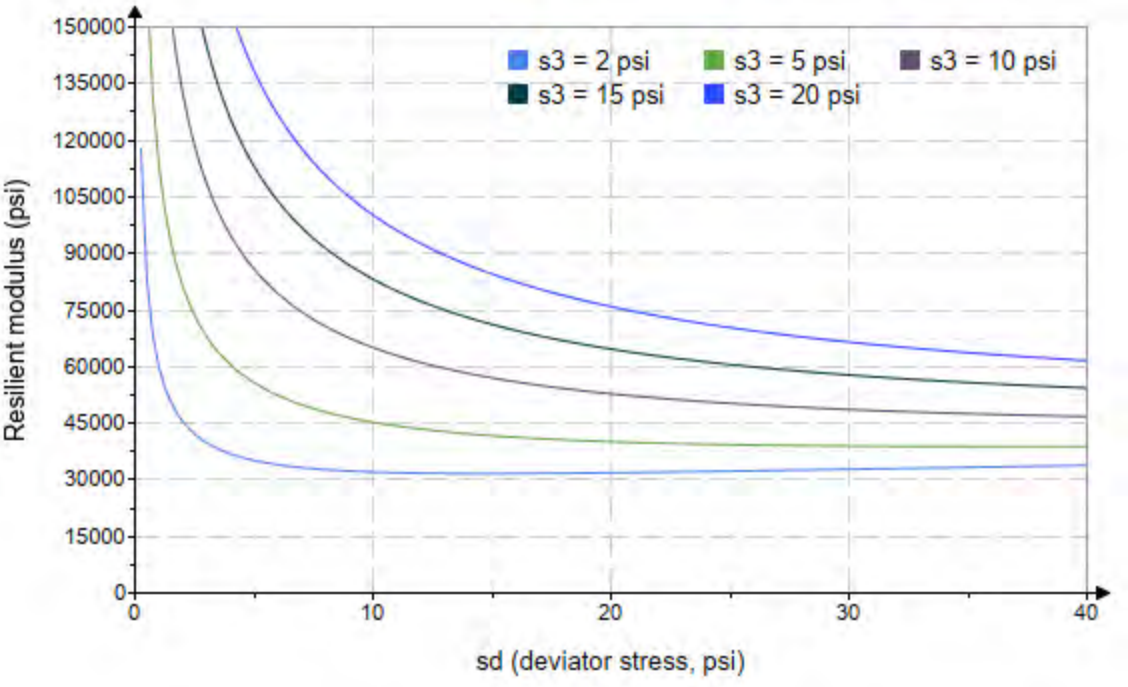

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{57”}$

$Treatment = \text{“W1”}$

$S = 16.078$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.783 \\ 2.699 \\ 2.644 \\ 4.546 \\ 4.580 \\ 4.571 \\ 9.602 \\ 9.604 \\ 9.589 \\ 14.640 \\ 14.630 \\ 14.610 \\ 19.650 \\ 19.640 \\ 19.640 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.172 \\ 6.271 \\ 9.035 \\ 5.270 \\ 9.995 \\ 14.560 \\ 10.060 \\ 19.280 \\ 29.340 \\ 10.220 \\ 14.600 \\ 29.580 \\ 14.510 \\ 19.330 \\ 39.890 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.520 \\ 14.370 \\ 16.970 \\ 18.910 \\ 23.740 \\ 28.270 \\ 38.870 \\ 48.090 \\ 58.100 \\ 54.150 \\ 58.470 \\ 73.410 \\ 73.450 \\ 78.260 \\ 98.820 \end{bmatrix} \quad M_R = \begin{bmatrix} 67941.0 \\ 57785.8 \\ 58109.2 \\ 61818.0 \\ 64566.8 \\ 52199.8 \\ 53854.0 \\ 43024.4 \\ 45460.6 \\ 42993.4 \\ 41448.6 \\ 54200.2 \\ 55561.2 \\ 59868.0 \\ 72492.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–57”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 72969.918$

$K_2 = -0.0760$

Equation 1 fitting parameters

$R_1^2 = 0.0907$ Coefficient of determination

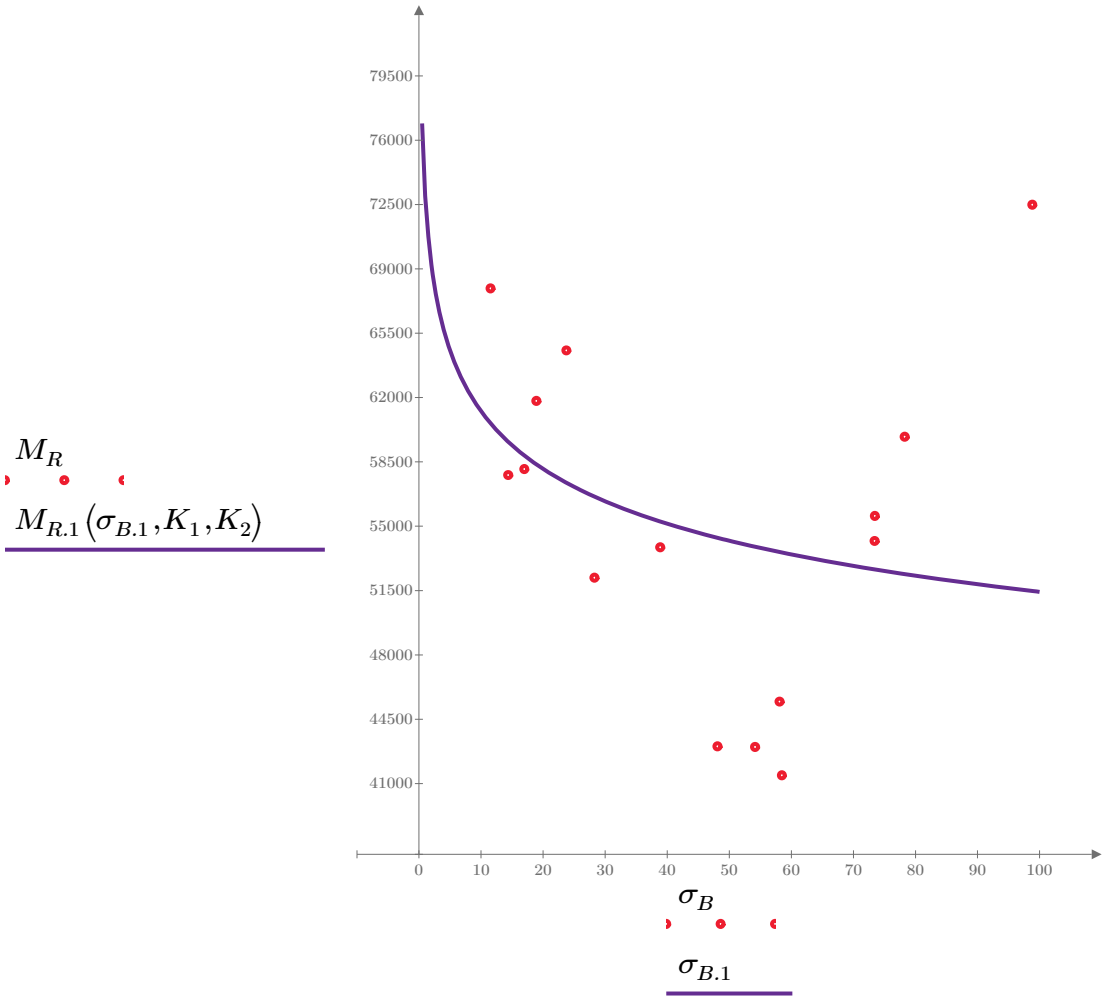

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–57”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 64769.600$

$K_4 = -0.0616$

Equation 2 fitting parameters

${R_2}^2 = 0.0570$ Coefficient of determination

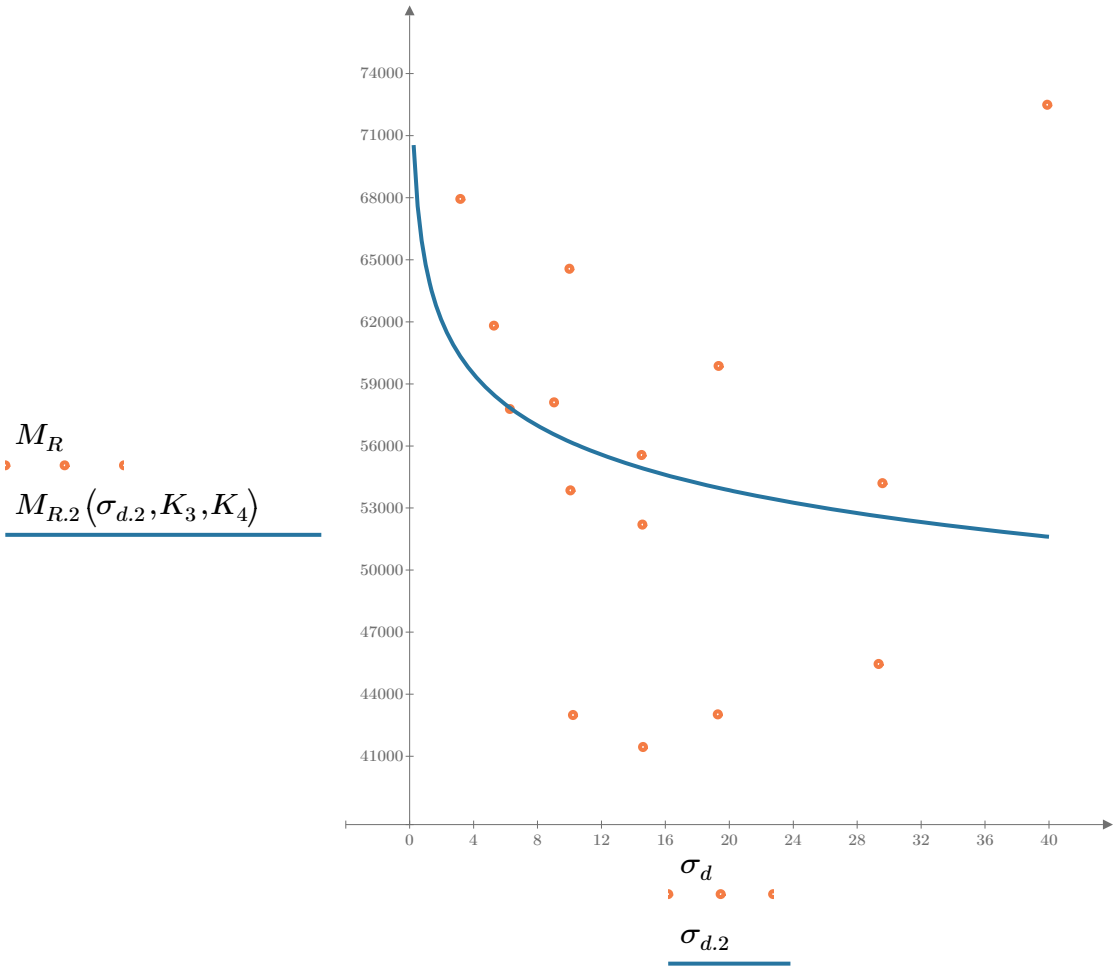

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–57”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 66403.783$

$K_6 = -0.0257$ Equation 3 fitting parameters

$K_7 = -0.0522$

${R_3}^2 = 0.0776$ Coefficient of determination

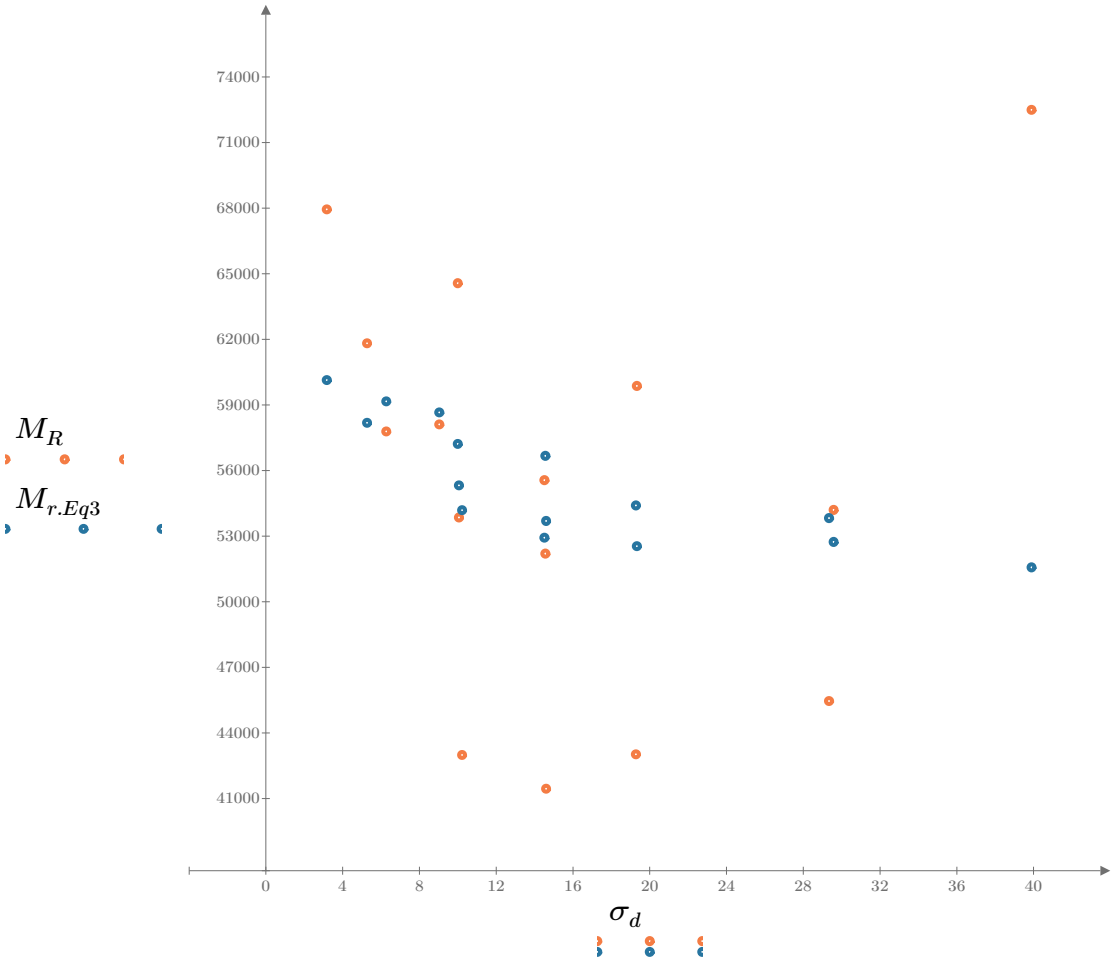

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–57”}$

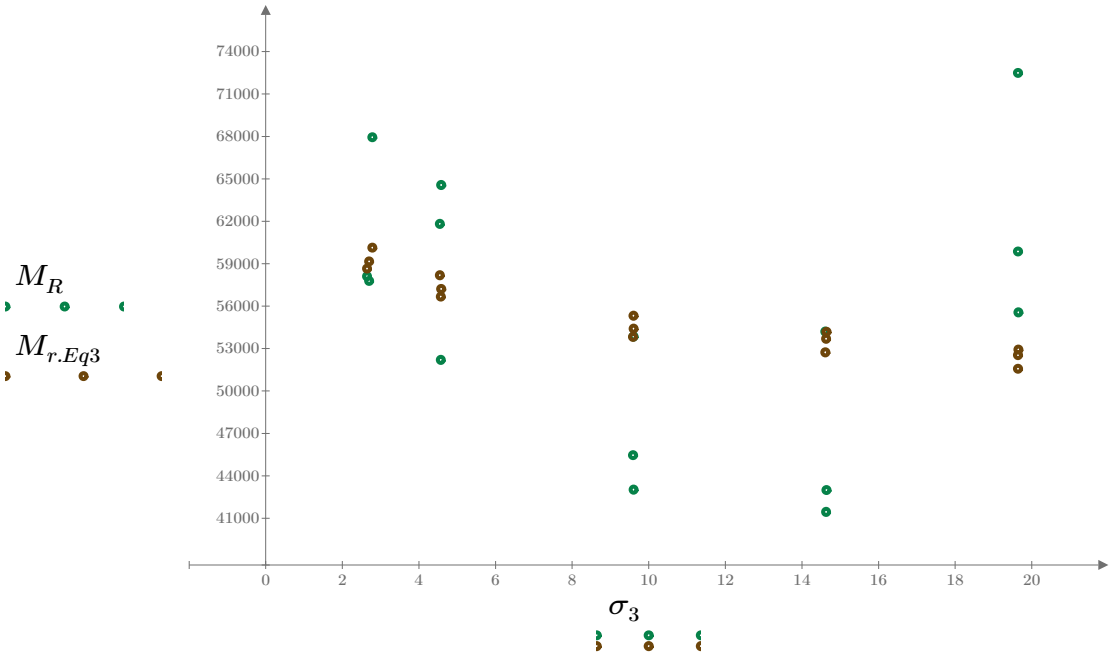

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

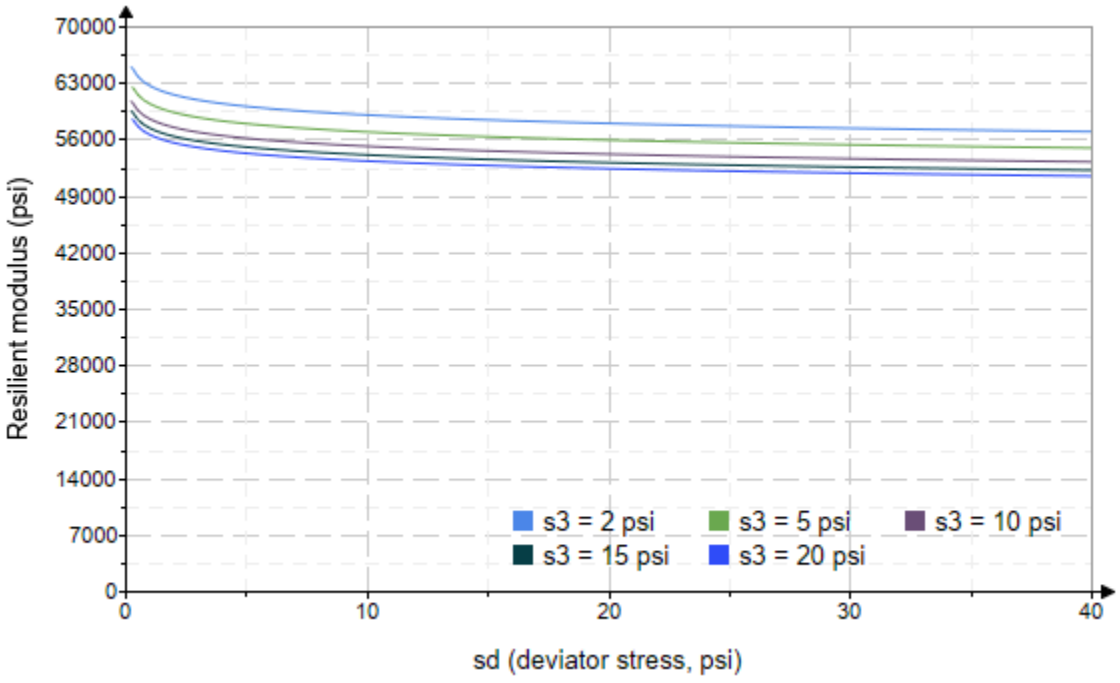

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–57”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 4116.909$

$K_9 = -0.0910$ Equation 4 fitting parameters

$K_{10} = 0.0178$

$R_4^{\,2} = 0.0919$ Coefficient of determination

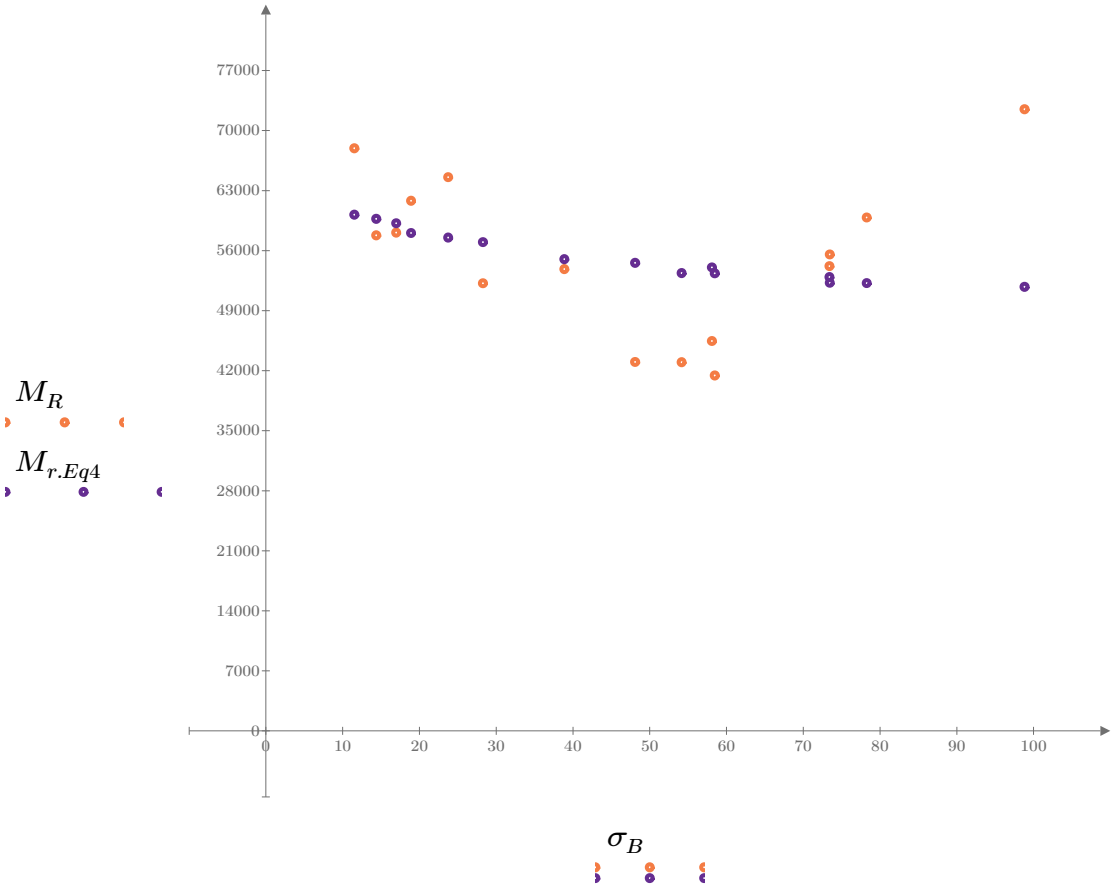

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

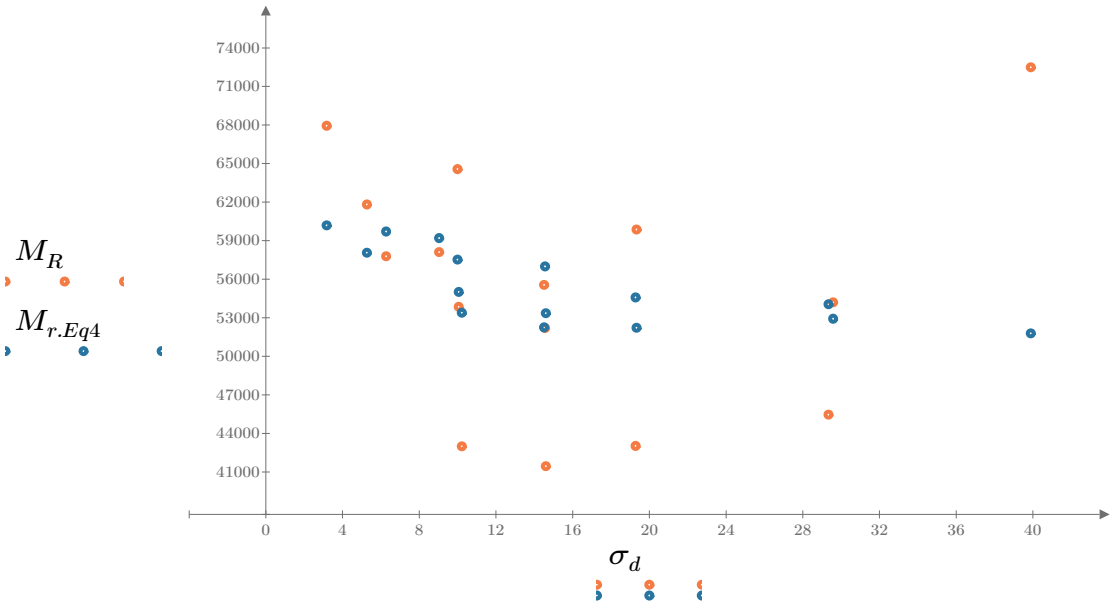

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

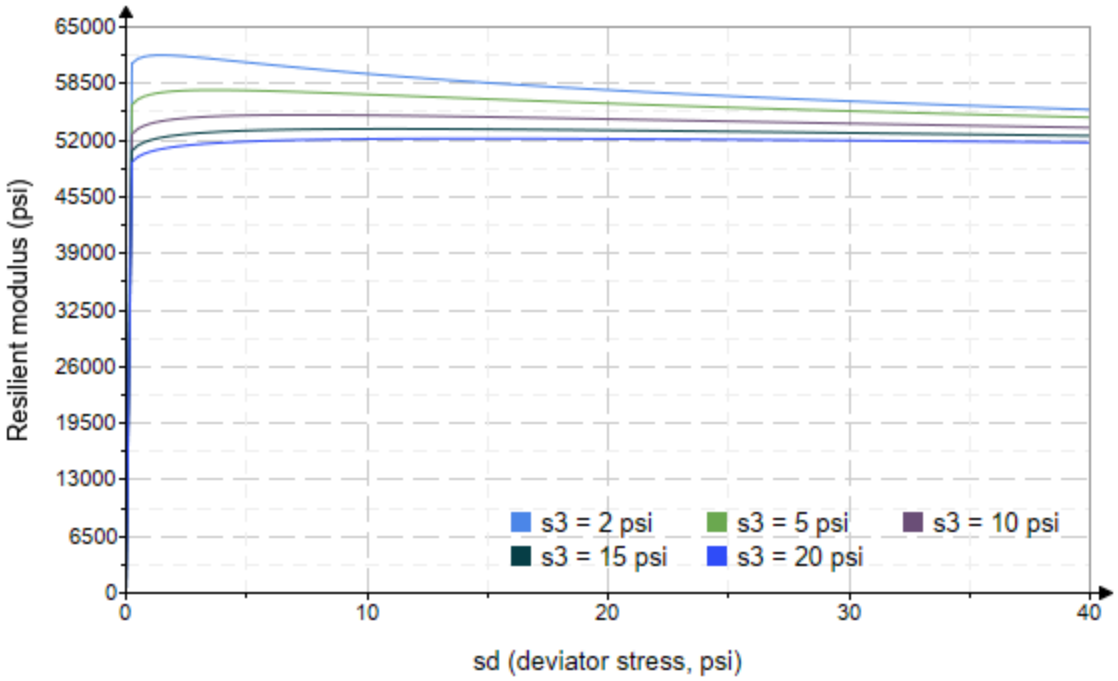

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−58"

$Treatment =$ "W1"

$S = 15.842$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.400 \\ 2.738 \\ 2.306 \\ 4.371 \\ 3.819 \\ 3.964 \\ 8.642 \\ 8.669 \\ 8.753 \\ 13.580 \\ 13.840 \\ 13.860 \\ 18.680 \\ 18.990 \\ 19.250 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.311 \\ 6.089 \\ 9.145 \\ 5.164 \\ 10.160 \\ 14.430 \\ 10.220 \\ 19.210 \\ 29.370 \\ 10.150 \\ 14.480 \\ 29.580 \\ 14.570 \\ 19.610 \\ 39.930 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.510 \\ 14.300 \\ 16.060 \\ 18.280 \\ 21.620 \\ 26.320 \\ 36.150 \\ 45.210 \\ 55.630 \\ 50.890 \\ 56.010 \\ 71.170 \\ 70.620 \\ 76.600 \\ 97.670 \end{bmatrix} \quad M_R = \begin{bmatrix} 56168.2 \\ 44676.6 \\ 42806.8 \\ 59237.9 \\ 75669.0 \\ 65240.8 \\ 104606.2 \\ 60457.0 \\ 62738.4 \\ 126880.0 \\ 86395.8 \\ 77331.4 \\ 119860.0 \\ 92410.2 \\ 66634.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–58”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 29698.305$

$K_2 = 0.2582$

Equation 1 fitting parameters

${R_1}^2 = 0.2987$ Coefficient of determination

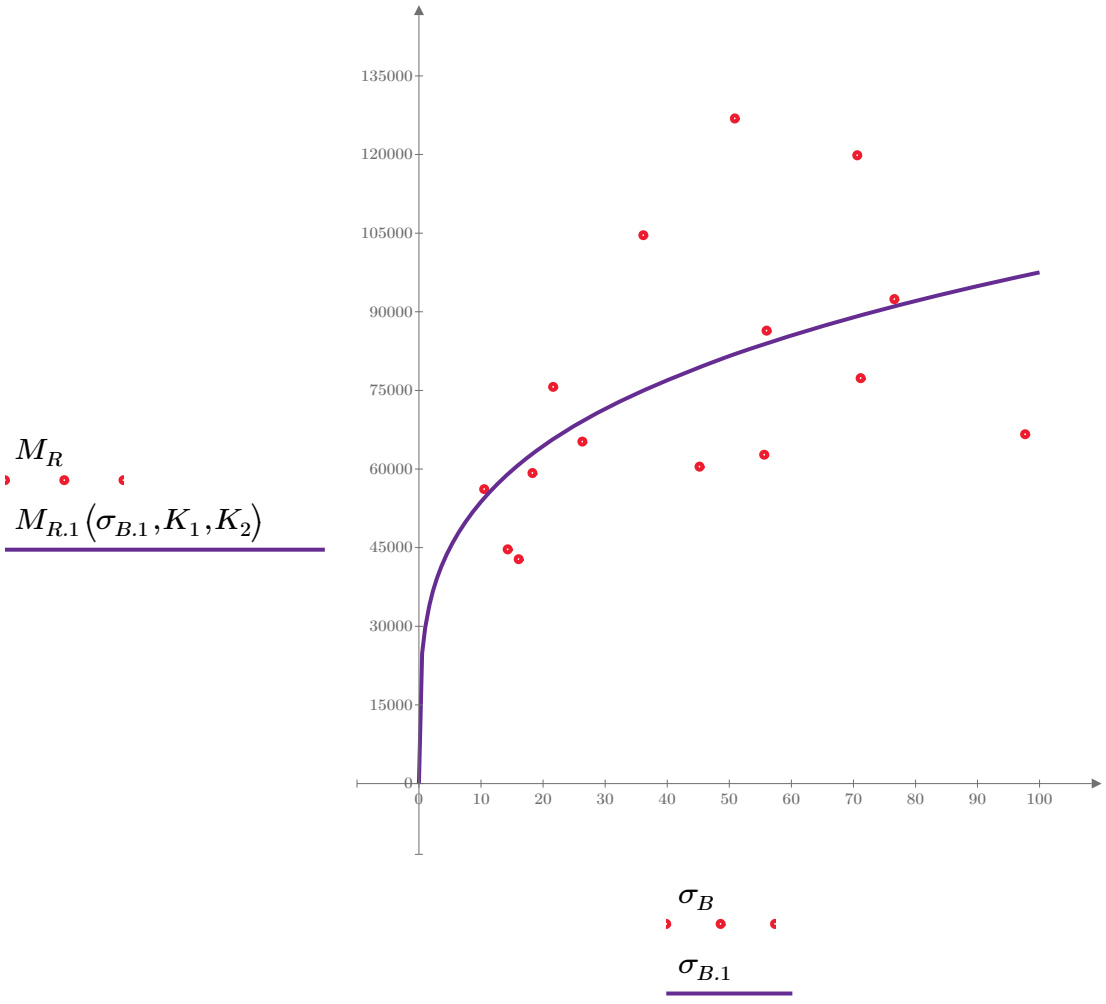

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–58”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 62559.811$

$K_4 = 0.0763$ Equation 2 fitting parameters

${R_2}^2 = 0.0282$ Coefficient of determination

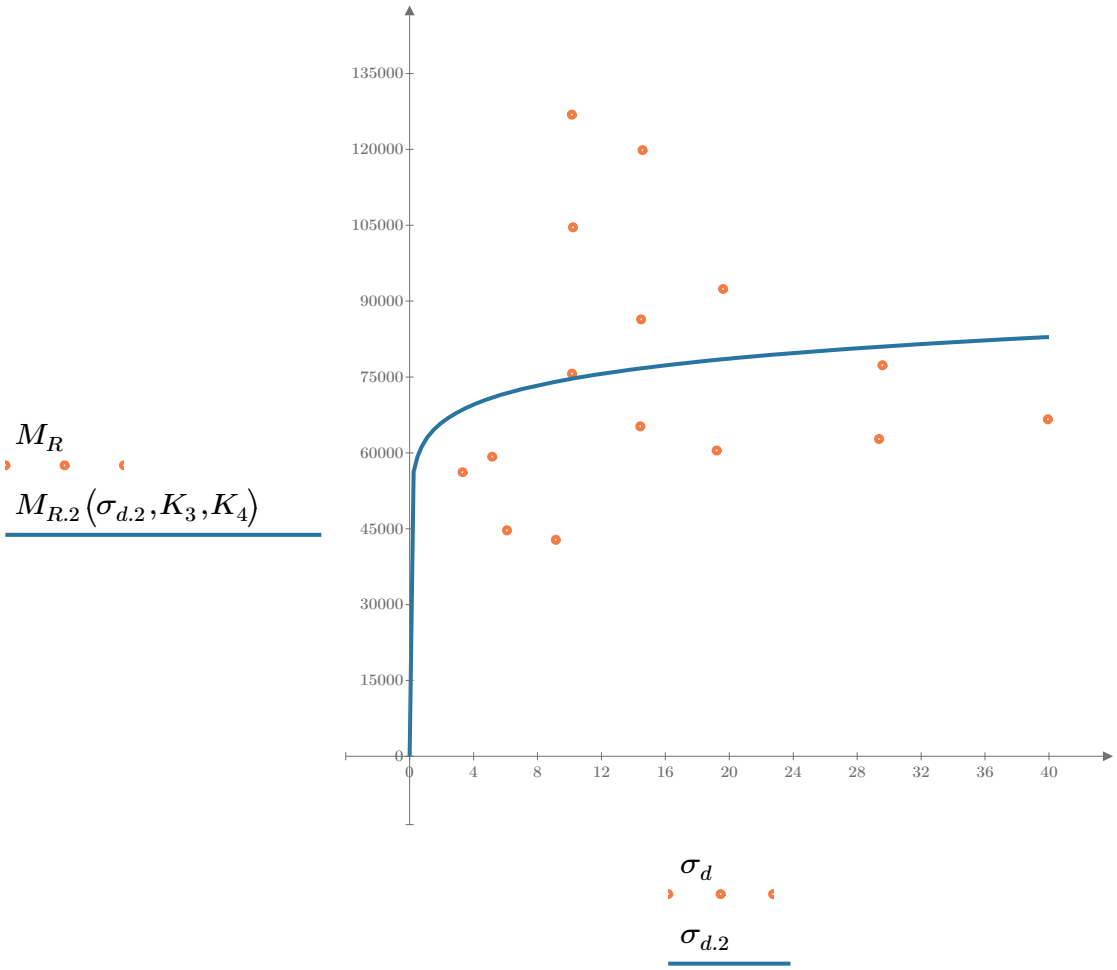

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–58”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 48784.393$

$K_6 = -0.3693$ Equation 3 fitting parameters

$K_7 = 0.6205$

${R_3}^2 = 0.7268$ Coefficient of determination

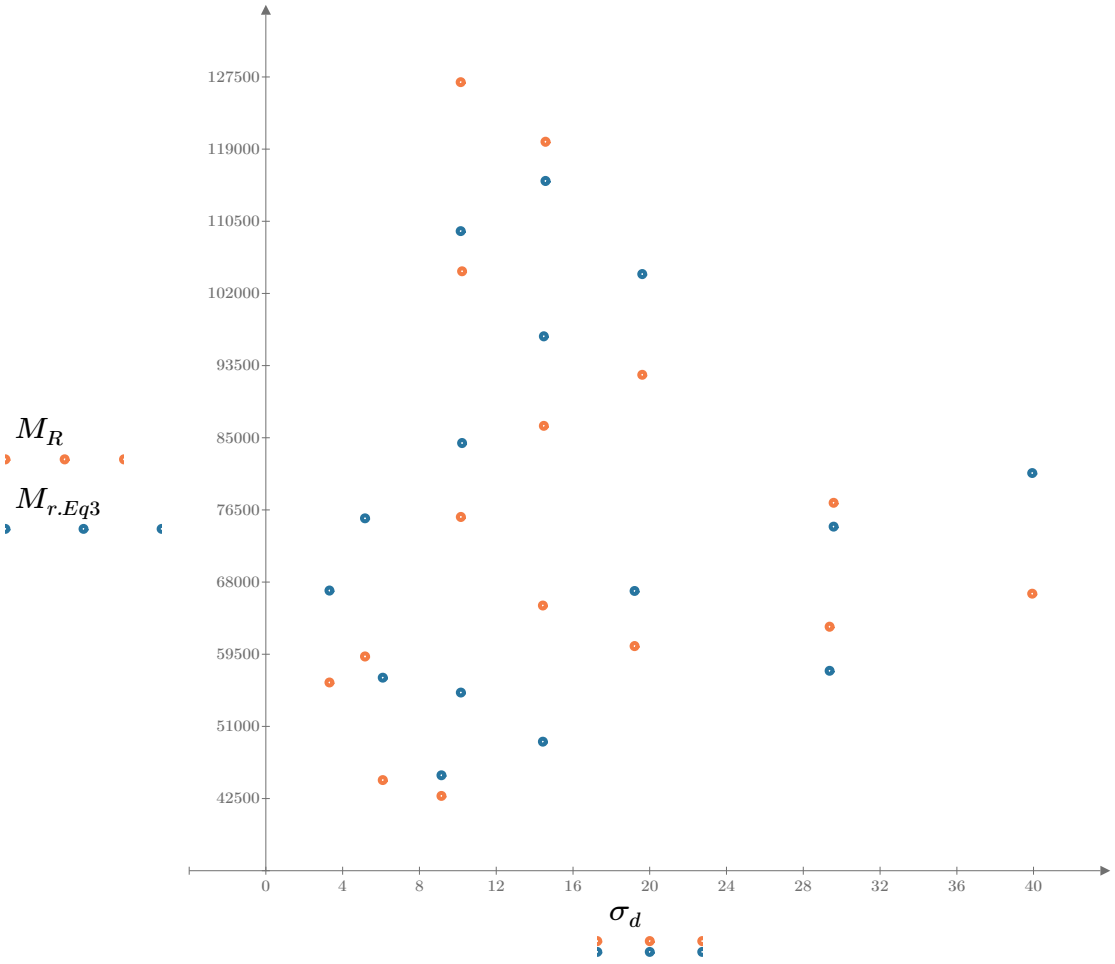

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–58”}$

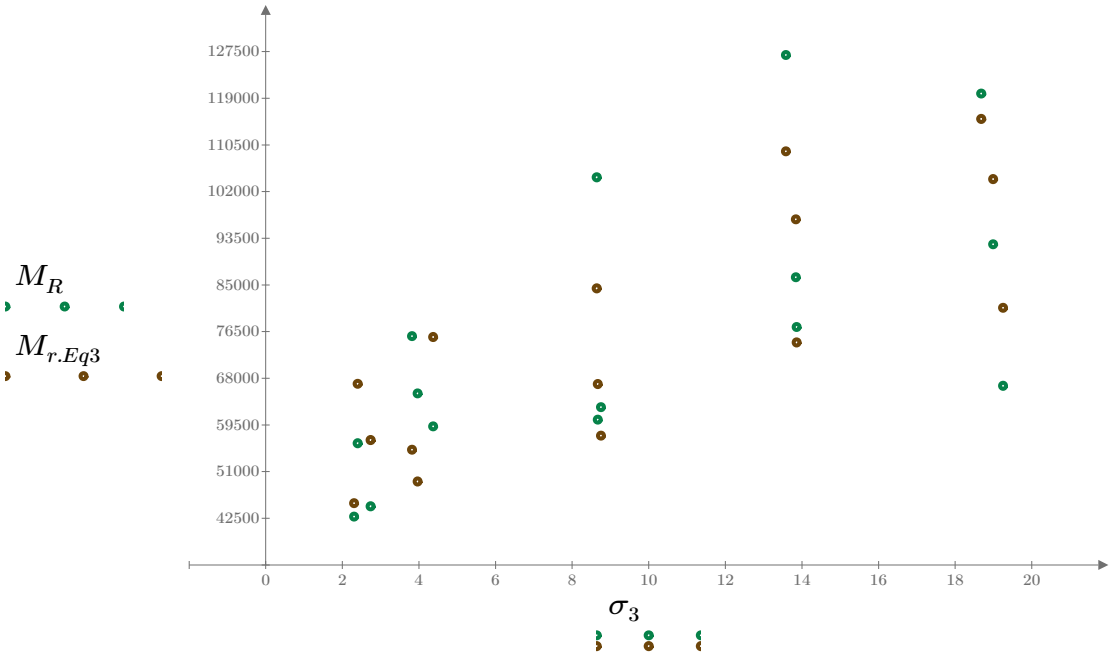

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

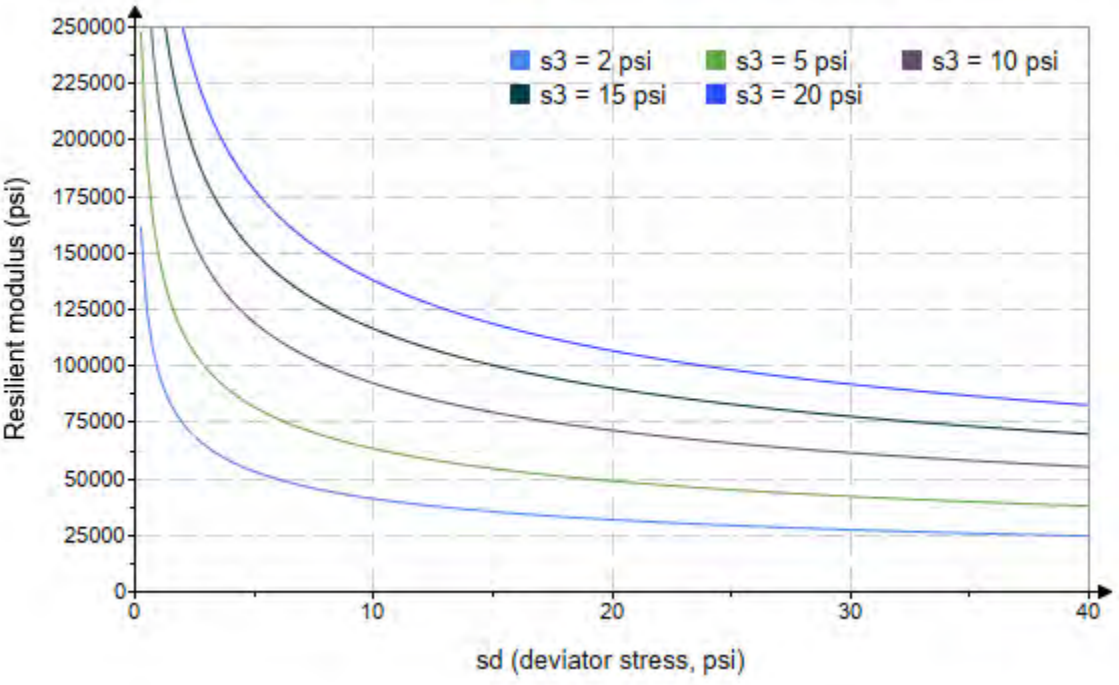

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–58”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2098.551$

$K_9 = 0.8483$ Equation 4 fitting parameters

$K_{10} = -0.6785$

$R_4^{\,2} = 0.7745$ Coefficient of determination

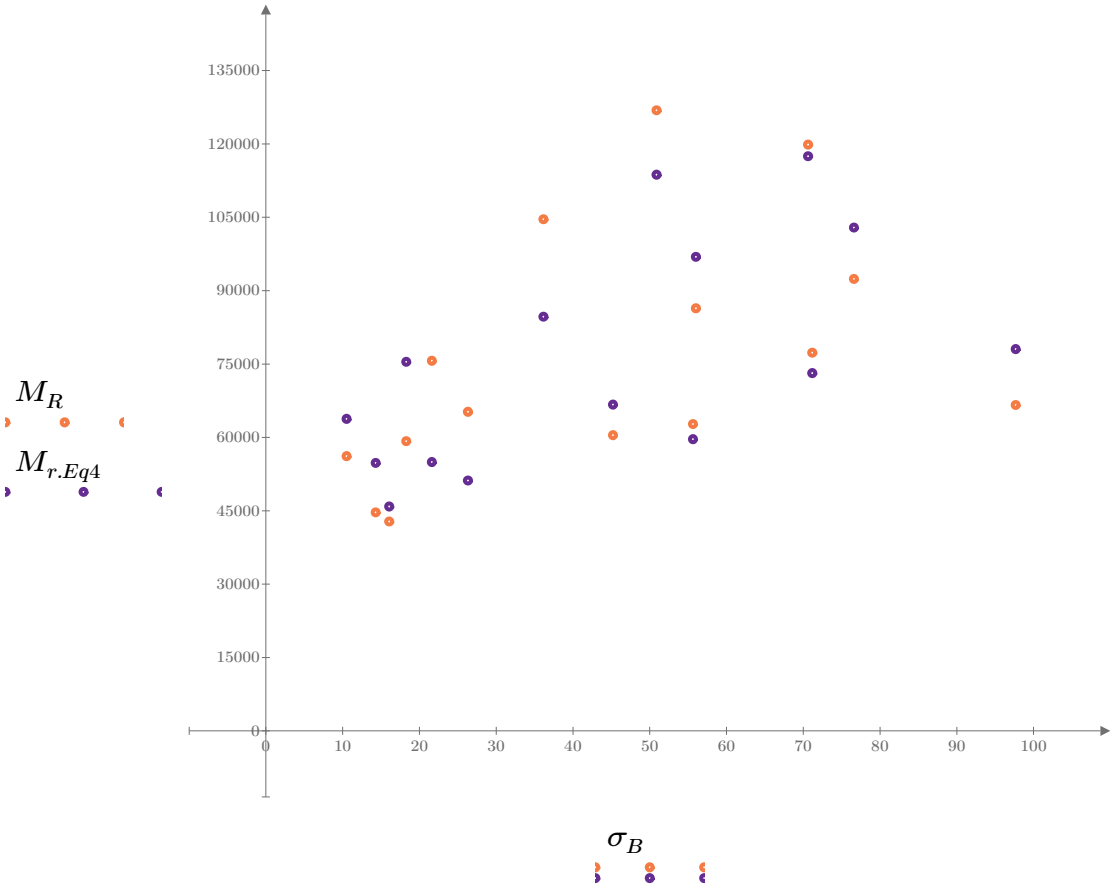

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

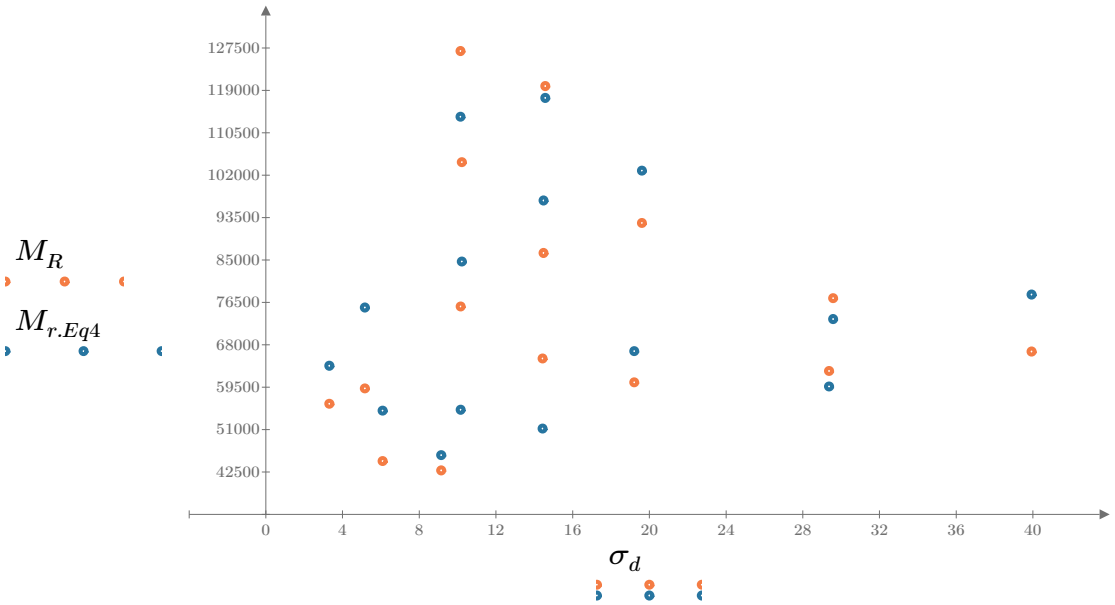

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

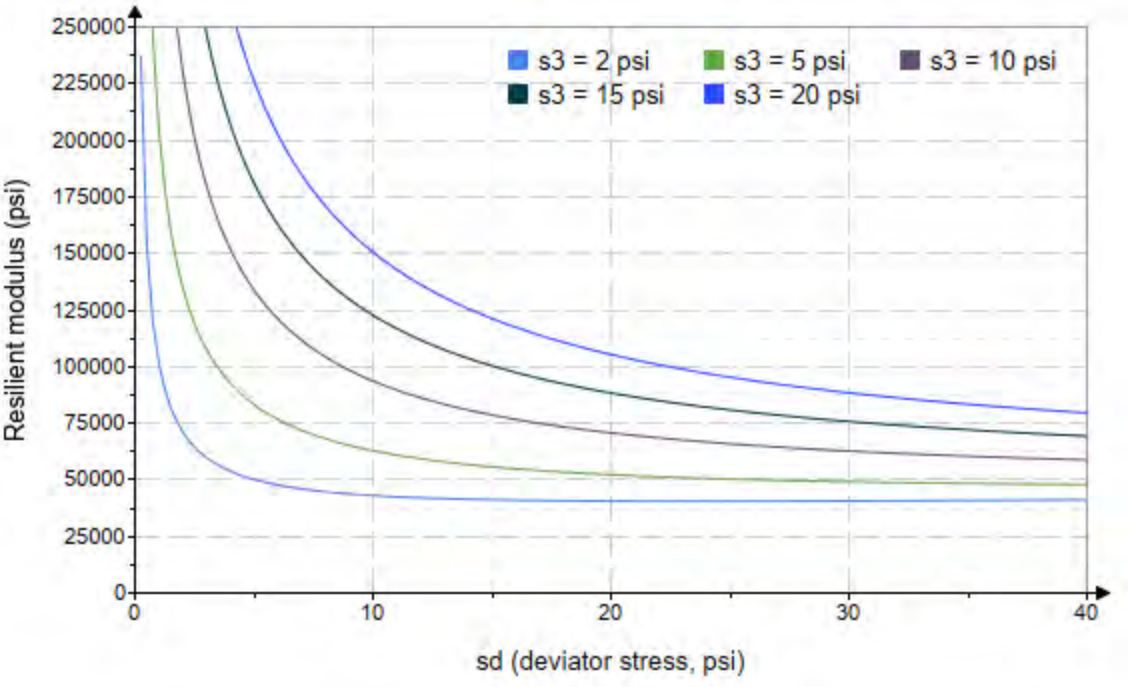

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{59”}$

$Treatment = \text{“W1”}$

$S = 17.084$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.595 \\ 2.568 \\ 2.545 \\ 4.592 \\ 4.536 \\ 4.572 \\ 9.562 \\ 9.575 \\ 9.579 \\ 14.610 \\ 14.610 \\ 14.590 \\ 19.630 \\ 19.660 \\ 19.630 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.208 \\ 6.286 \\ 9.169 \\ 5.291 \\ 10.040 \\ 14.480 \\ 10.050 \\ 19.090 \\ 29.440 \\ 10.220 \\ 14.420 \\ 29.500 \\ 14.470 \\ 19.420 \\ 40.000 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.990 \\ 13.990 \\ 16.800 \\ 19.070 \\ 23.650 \\ 28.190 \\ 38.740 \\ 47.810 \\ 58.170 \\ 54.050 \\ 58.250 \\ 73.270 \\ 73.360 \\ 78.390 \\ 98.880 \end{bmatrix} \quad M_R = \begin{bmatrix} 41488.2 \\ 39403.6 \\ 38748.6 \\ 46304.0 \\ 46990.0 \\ 43753.4 \\ 52691.0 \\ 50438.0 \\ 52561.2 \\ 55008.0 \\ 49793.6 \\ 59996.2 \\ 59670.4 \\ 64354.6 \\ 75807.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–59”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 19153.740$

$K_2 = 0.2692$

Equation 1 fitting parameters

$R_1^2 = 0.8190$ Coefficient of determination

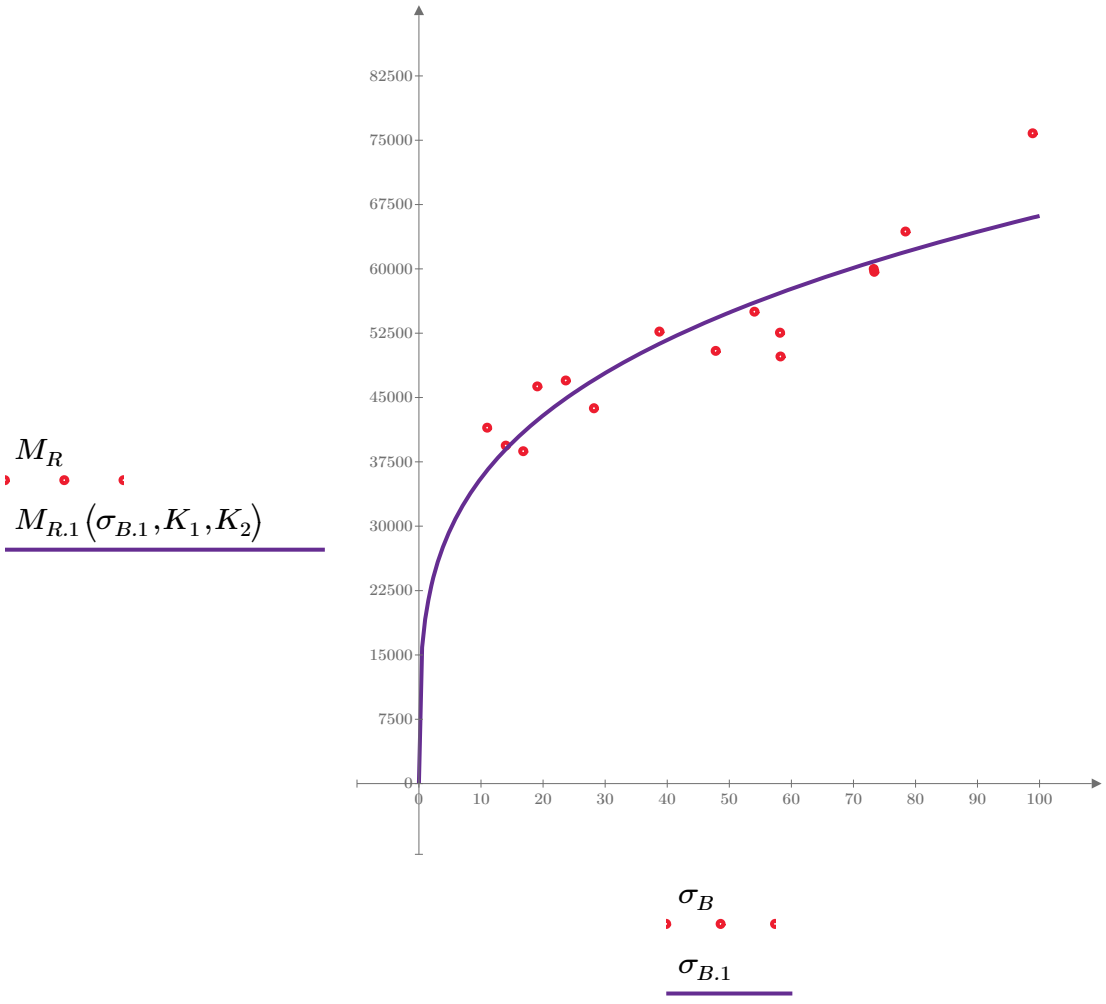

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–59”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 28907.244$

$K_4 = 0.2246$ Equation 2 fitting parameters

${R_2}^2 = 0.5782$ Coefficient of determination

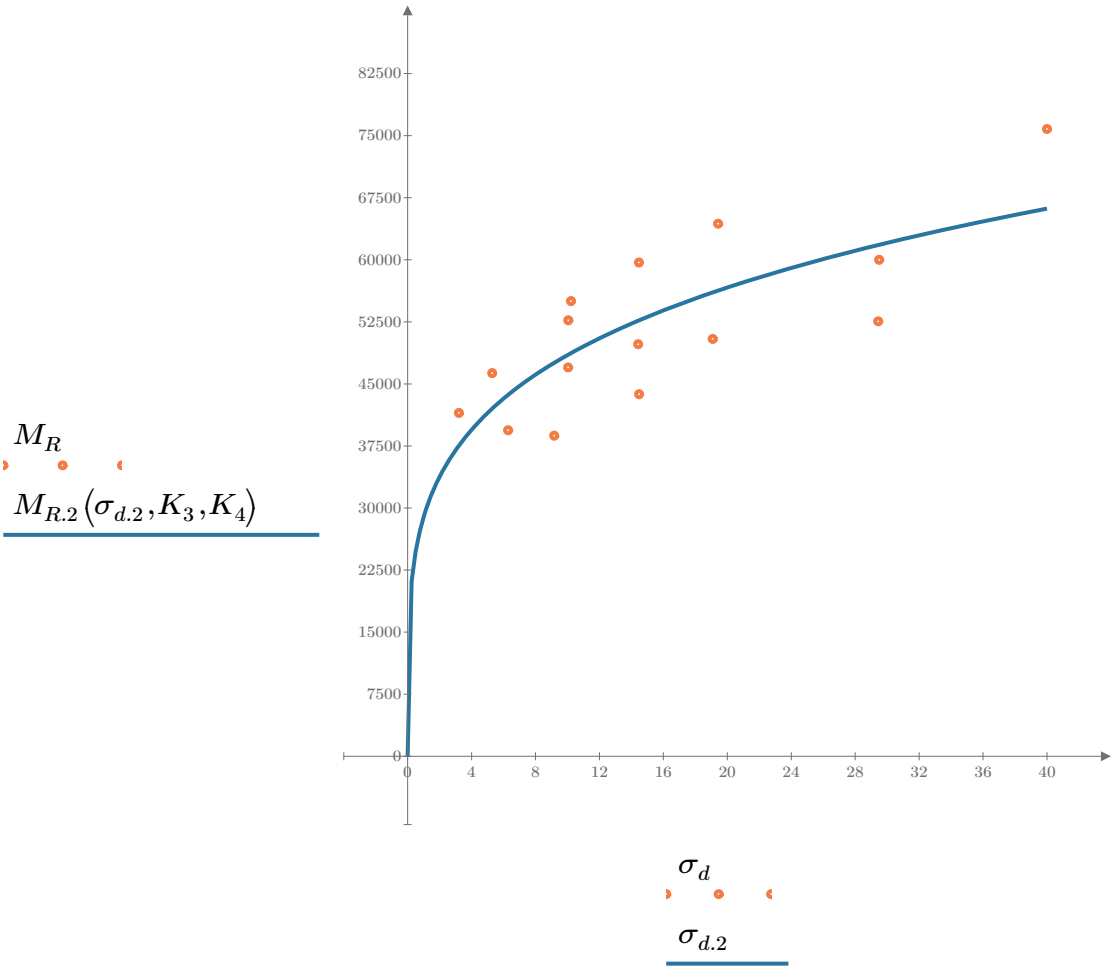

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–59”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 25655.740$

$K_6 = 0.0817$ Equation 3 fitting parameters

$K_7 = 0.2148$

${R_3}^2 = 0.8393$ Coefficient of determination

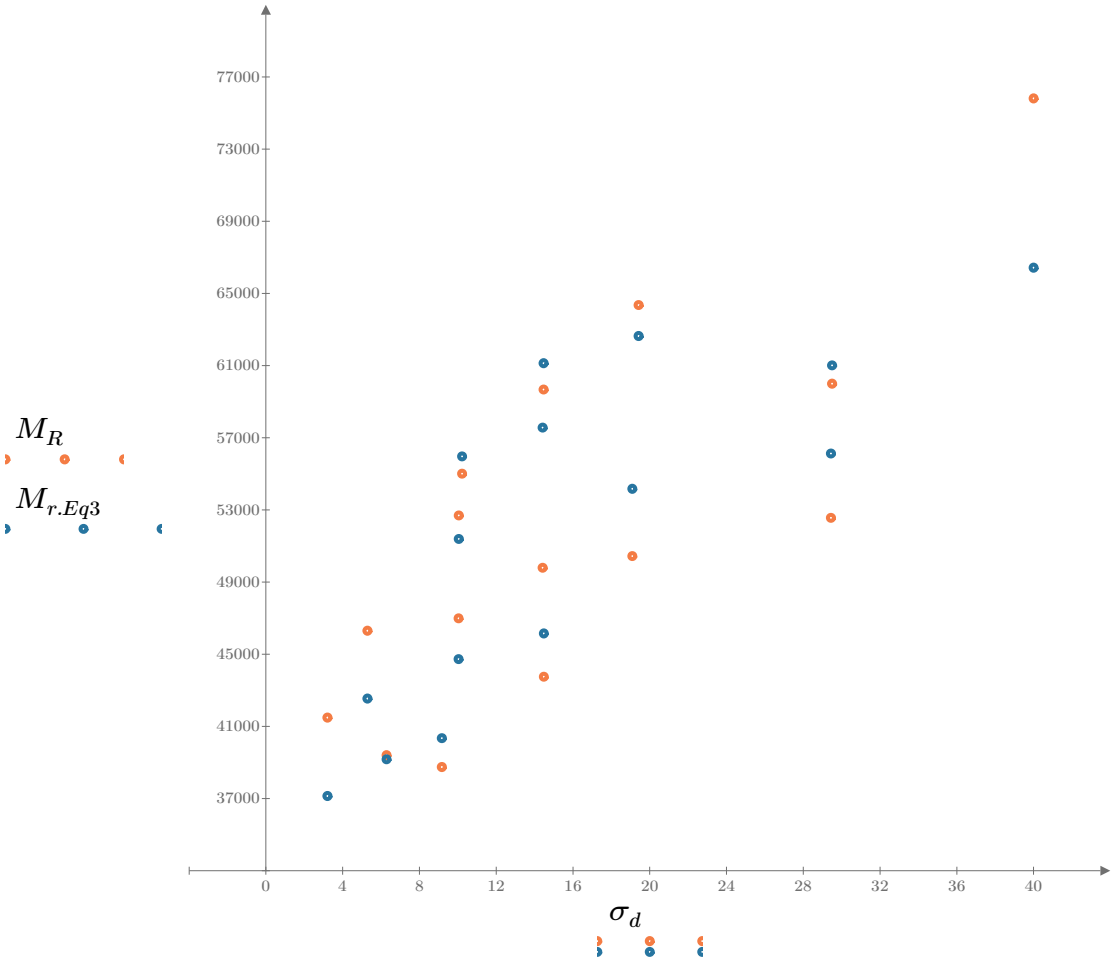

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–59”}$

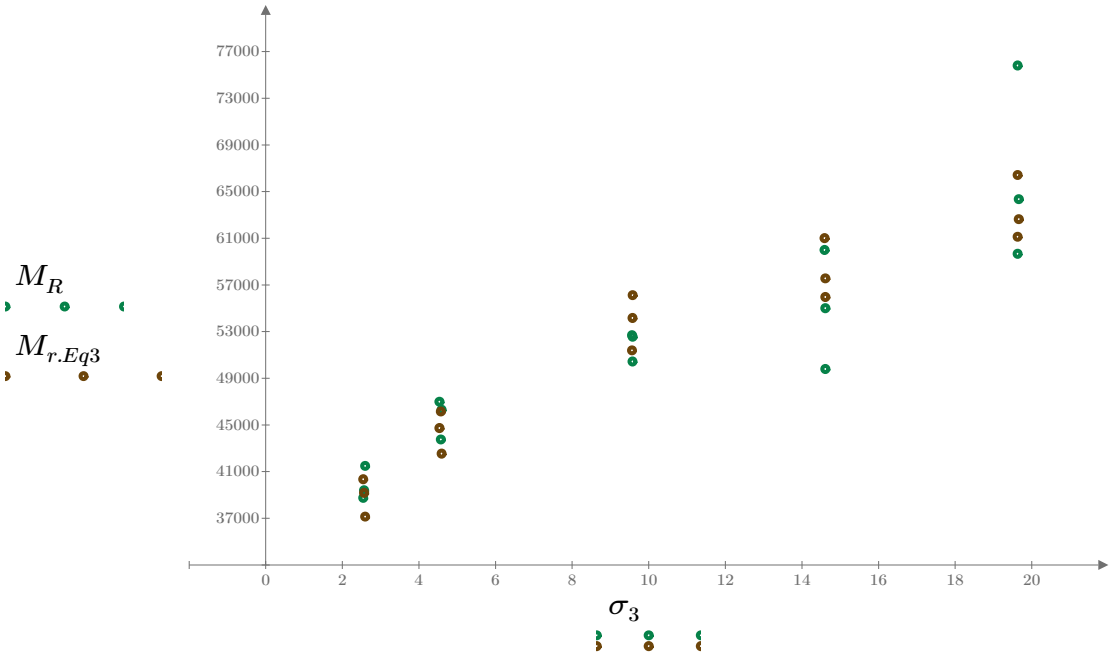

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

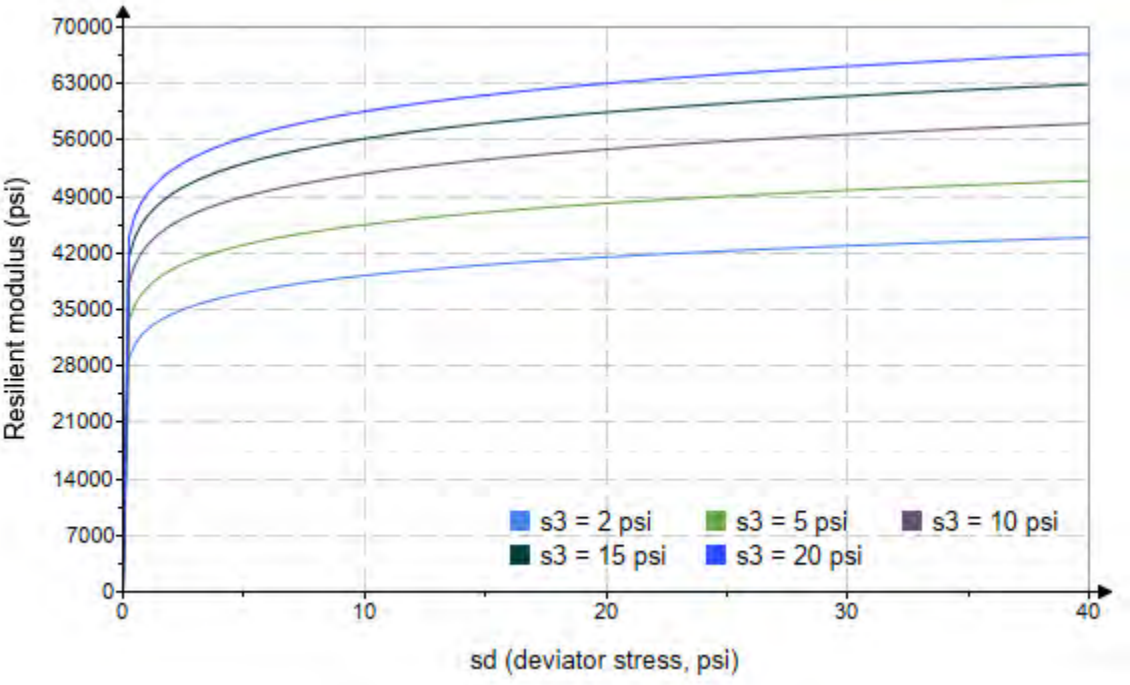

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–59”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2669.204$

$K_9 = 0.2753$ Equation 4 fitting parameters

$K_{10} = -0.0073$

$R_4^{\,2} = 0.8191$ Coefficient of determination

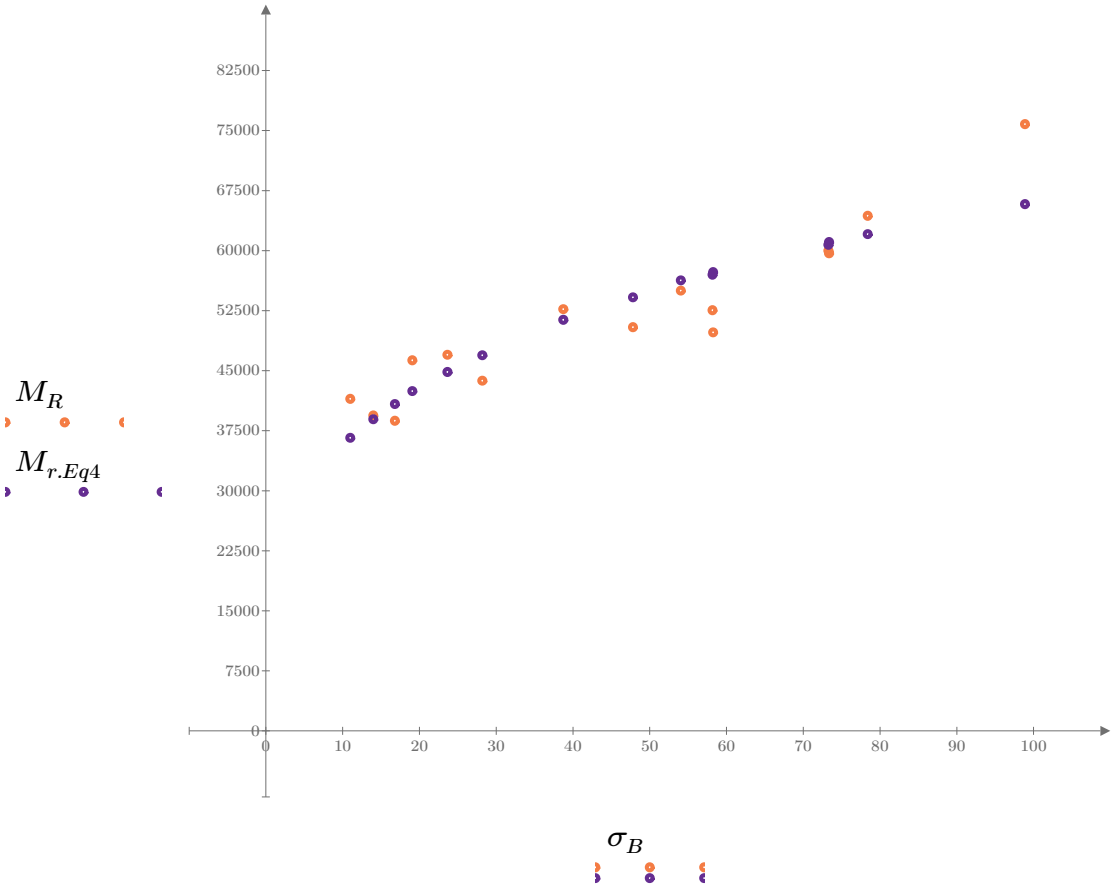

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

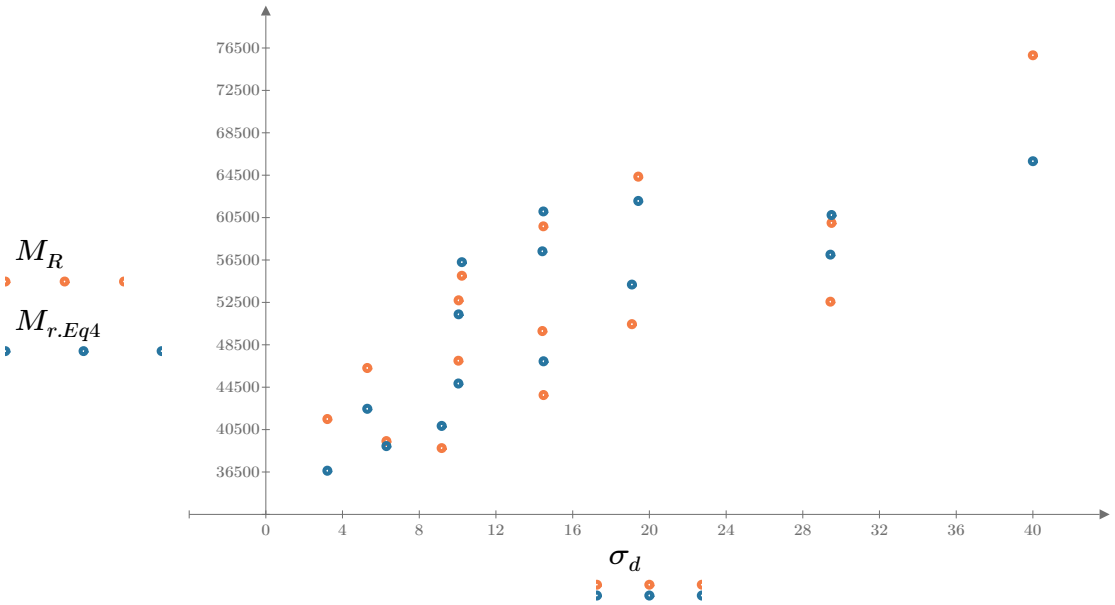

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

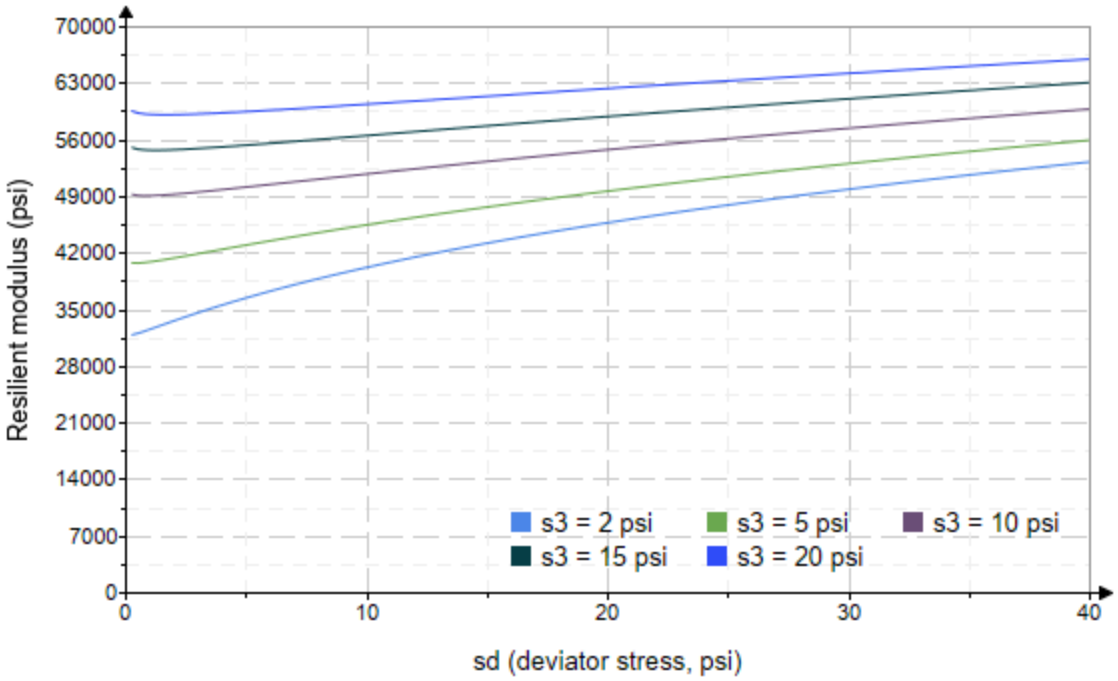

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{60”}$

$Treatment = \text{“W1”}$

$S = 18.536$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.256 \\ 1.969 \\ 2.529 \\ 3.625 \\ 4.021 \\ 4.125 \\ 9.553 \\ 9.081 \\ 9.031 \\ 14.570 \\ 14.380 \\ 14.250 \\ 18.850 \\ 18.900 \\ 19.120 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.221 \\ 6.082 \\ 9.041 \\ 5.238 \\ 10.080 \\ 14.530 \\ 10.140 \\ 19.390 \\ 29.390 \\ 10.200 \\ 14.580 \\ 29.500 \\ 14.580 \\ 19.570 \\ 39.920 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 9.990 \\ 11.990 \\ 16.630 \\ 16.110 \\ 22.150 \\ 26.910 \\ 38.800 \\ 46.630 \\ 56.490 \\ 53.910 \\ 57.720 \\ 72.260 \\ 71.120 \\ 76.280 \\ 97.270 \end{bmatrix} \quad M_R = \begin{bmatrix} 57314.2 \\ 46507.2 \\ 43344.2 \\ 46575.4 \\ 49806.6 \\ 47632.8 \\ 83543.4 \\ 59629.6 \\ 56031.6 \\ 150252.0 \\ 74902.8 \\ 62833.4 \\ 79367.2 \\ 83041.6 \\ 67132.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–60”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 25815.118$

$K_2 = 0.2622$

Equation 1 fitting parameters

${R_1}^2 = 0.2255$ Coefficient of determination

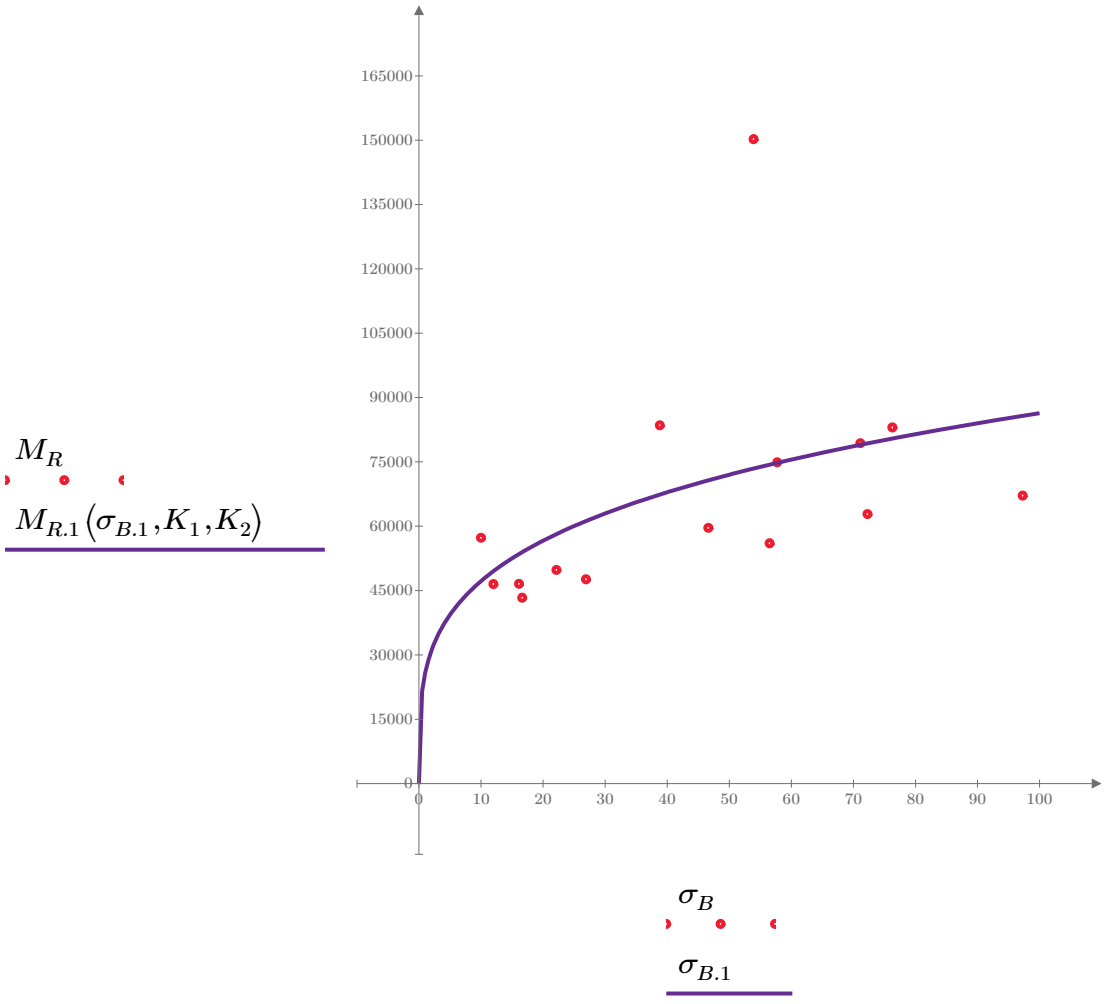

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–60”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 58146.062$

$K_4 = 0.0565$ Equation 2 fitting parameters

${R_2}^2 = 0.0106$ Coefficient of determination

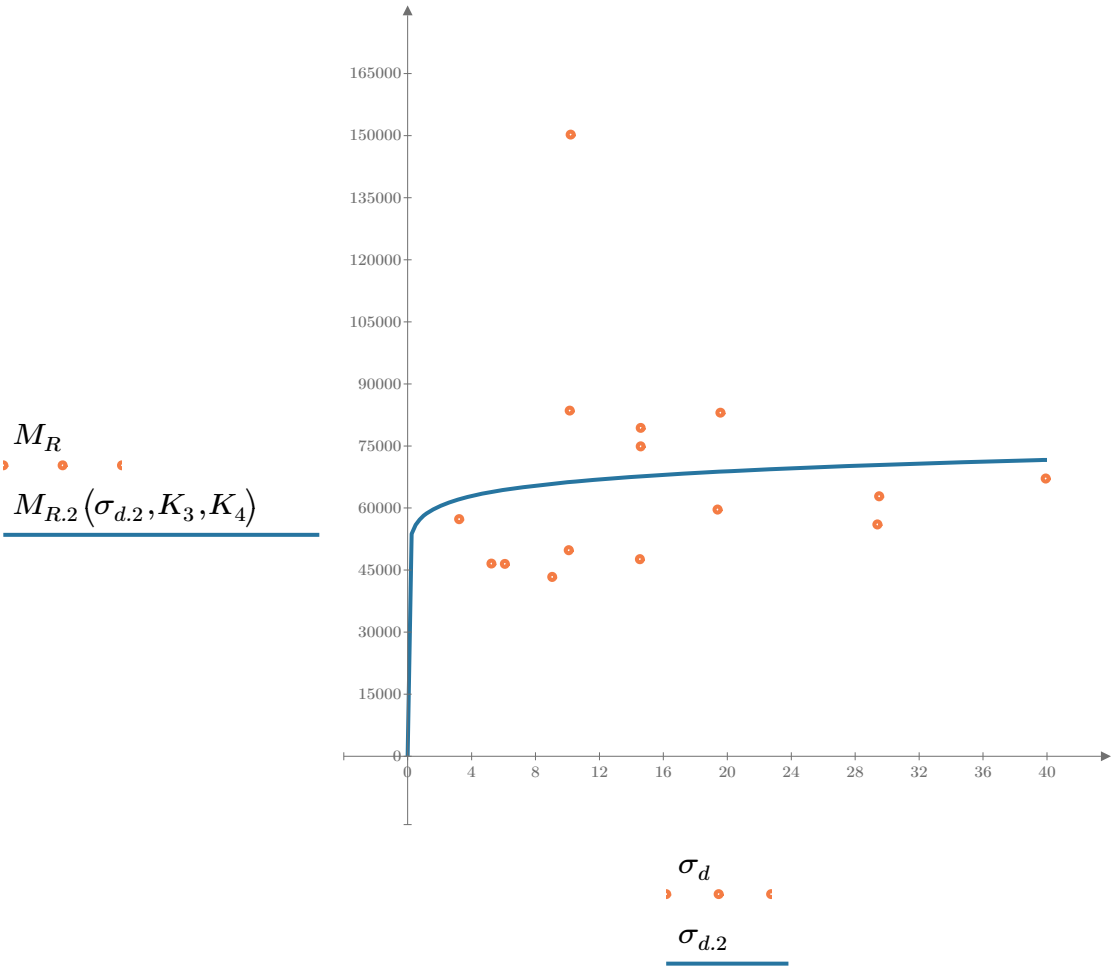

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–60”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 49416.772$

$K_6 = -0.4893$ Equation 3 fitting parameters

$K_7 = 0.6926$

${R_3}^2 = 0.6658$ Coefficient of determination

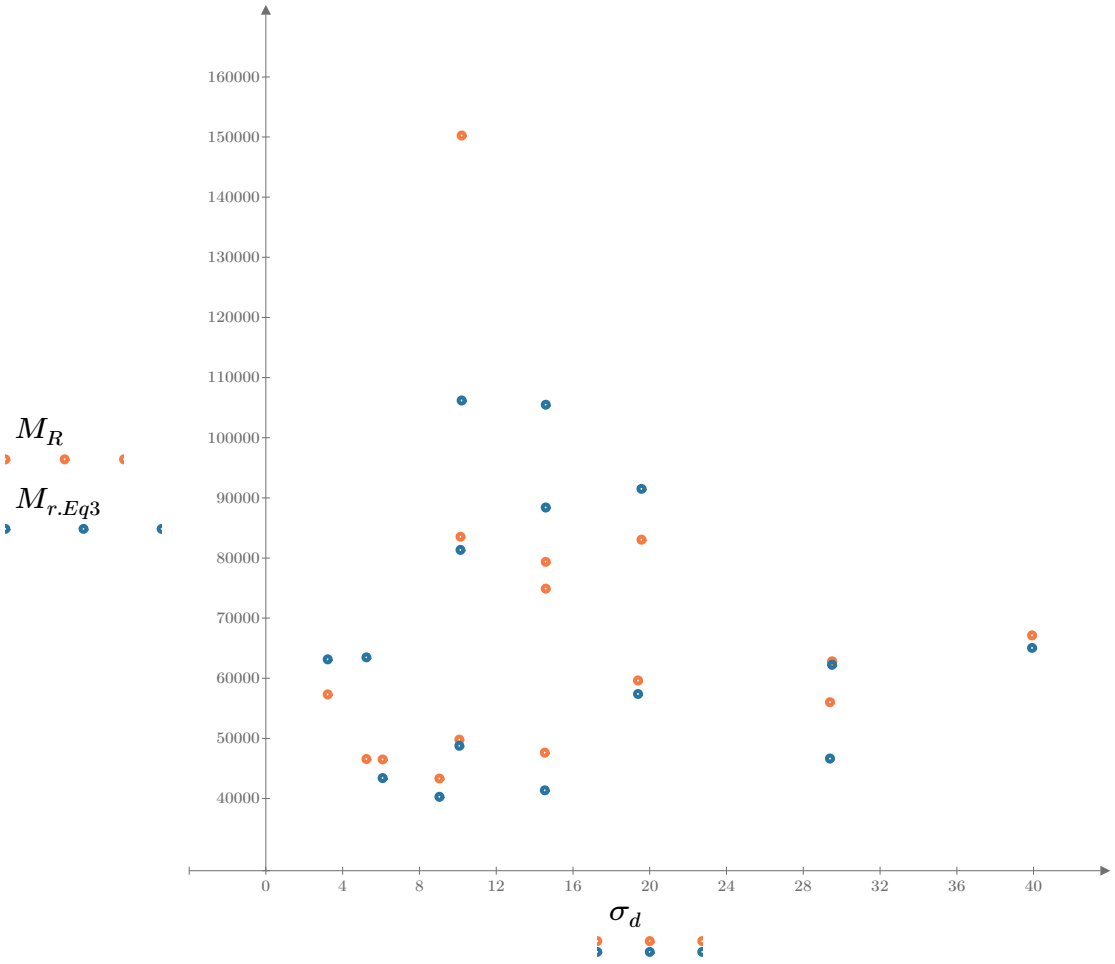

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–60”}$

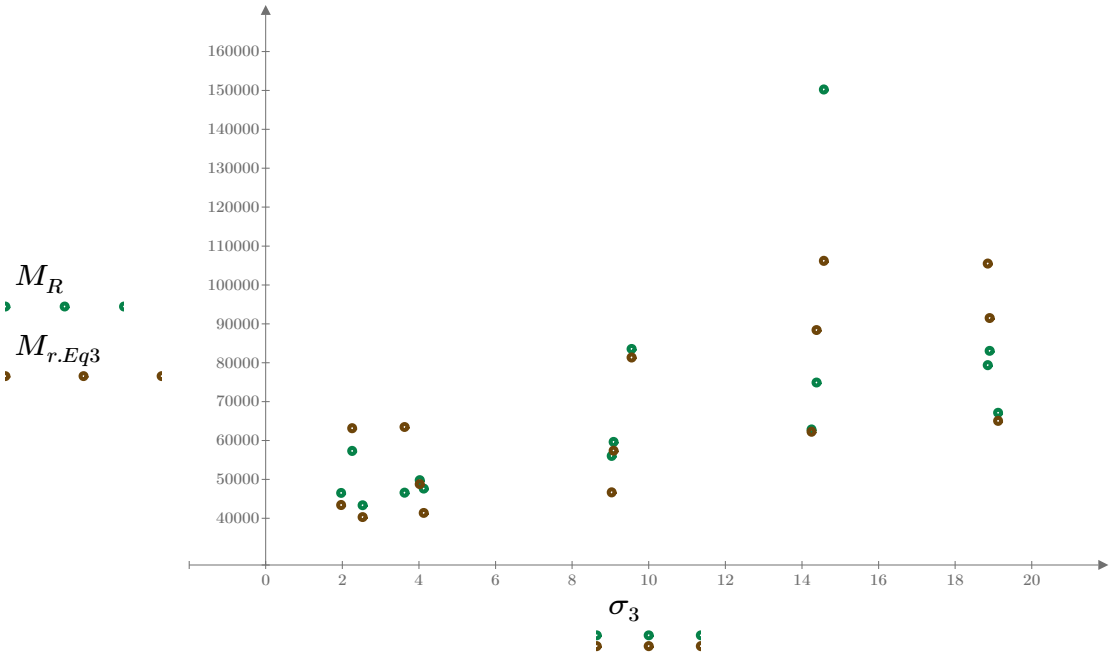

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

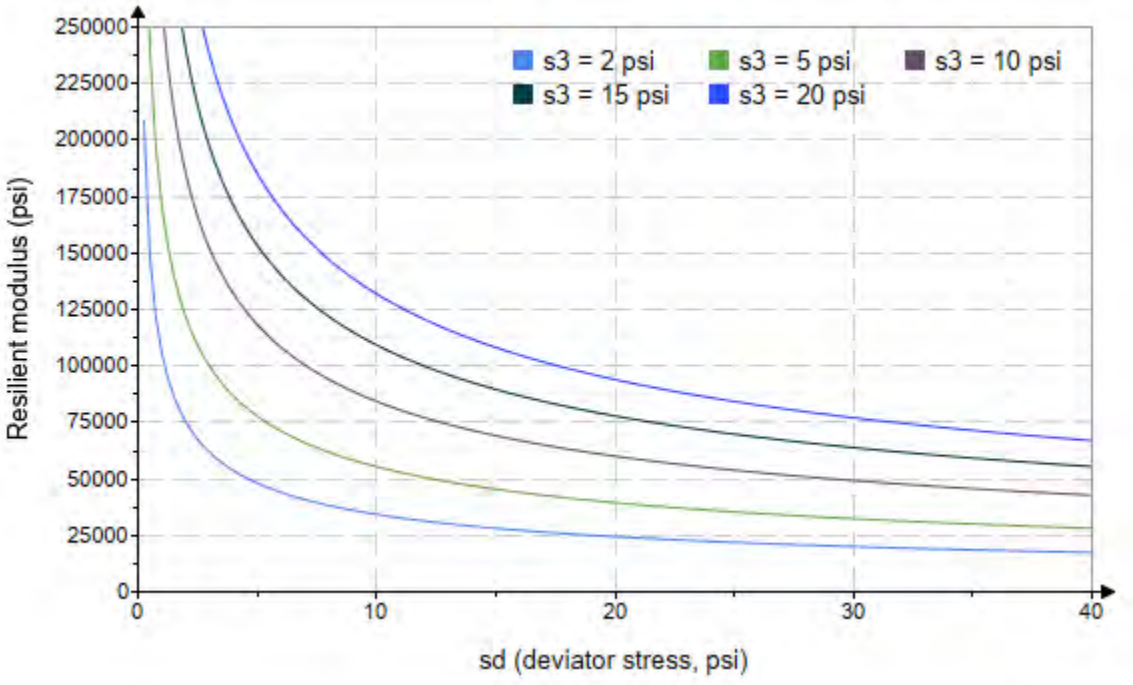

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–60”}$

$$M_{R.4}(\sigma_B, \sigma_d, K_8, K_9, K_{10}) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1660.553$

$K_9 = 0.9344$ Equation 4 fitting parameters

$K_{10} = -0.8307$

$R_4^{\,2} = 0.7098$ Coefficient of determination

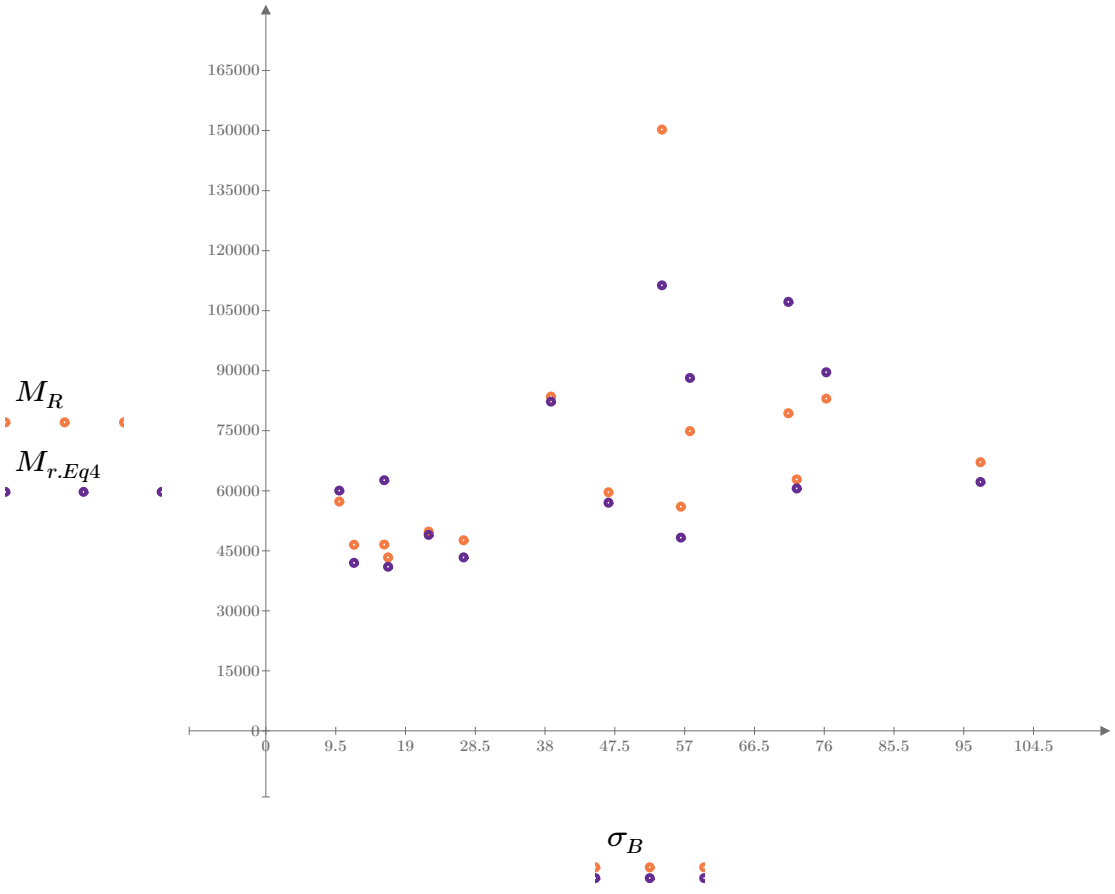

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

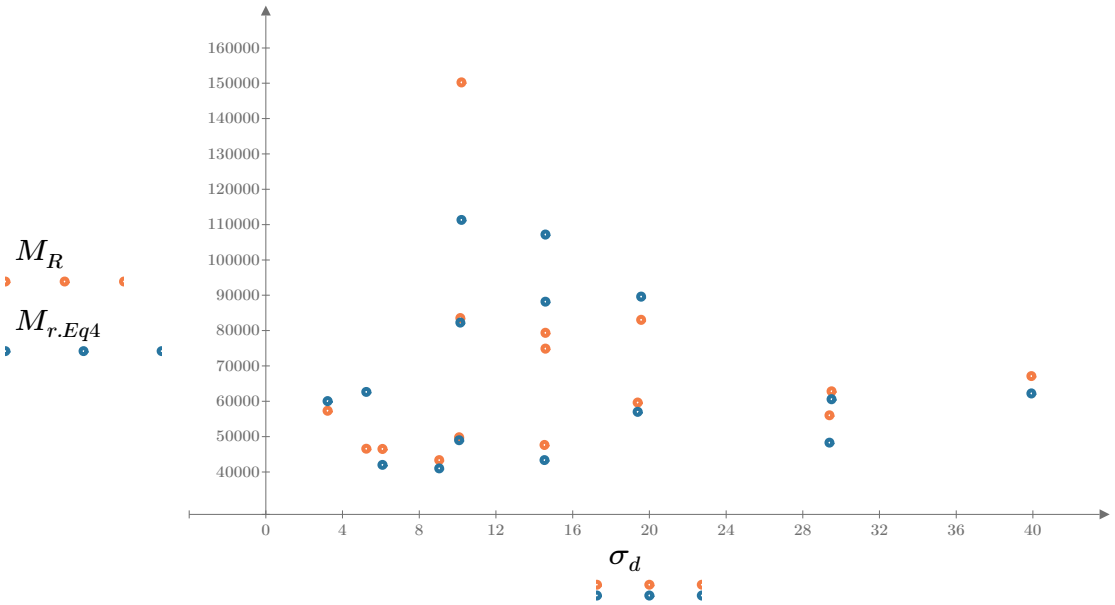

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

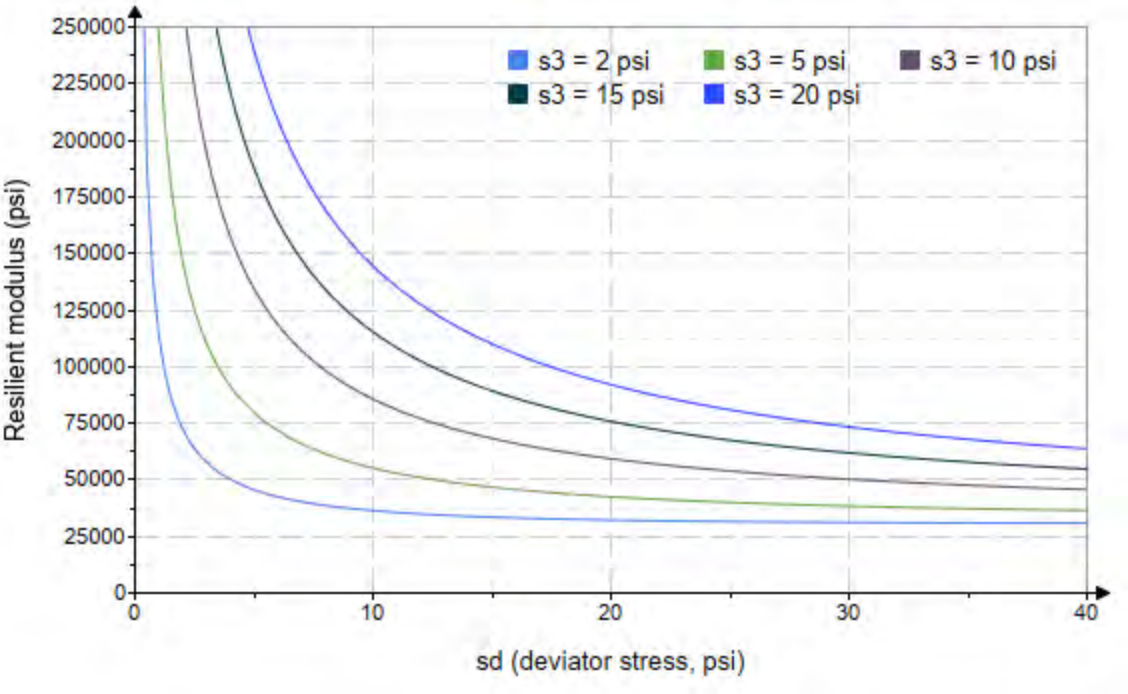

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2–61”}$

$Treatment = \text{“W1”}$

$S = 18.283$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.059 \\ 2.066 \\ 2.280 \\ 3.893 \\ 4.192 \\ 4.494 \\ 9.600 \\ 9.190 \\ 9.044 \\ 15.000 \\ 14.260 \\ 14.020 \\ 19.480 \\ 19.080 \\ 19.160 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.362 \\ 6.151 \\ 8.848 \\ 5.359 \\ 9.909 \\ 14.470 \\ 9.988 \\ 19.540 \\ 29.730 \\ 9.997 \\ 14.500 \\ 29.800 \\ 14.710 \\ 19.360 \\ 40.090 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 9.540 \\ 12.350 \\ 15.690 \\ 17.040 \\ 22.480 \\ 27.950 \\ 38.790 \\ 47.110 \\ 56.860 \\ 54.990 \\ 57.290 \\ 71.850 \\ 73.130 \\ 76.610 \\ 97.580 \end{bmatrix} \quad M_R = \begin{bmatrix} 148031.3 \\ 110074.7 \\ 72118.0 \\ 89814.0 \\ 107510.0 \\ 67066.2 \\ 93305.1 \\ 119544.0 \\ 81230.0 \\ 173607.0 \\ 265984.0 \\ 82348.4 \\ 164483.2 \\ 246618.0 \\ 92464.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–61”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 56604.083$

$K_2 = 0.2227$

Equation 1 fitting parameters

$R_1^2 = 0.1033$ Coefficient of determination

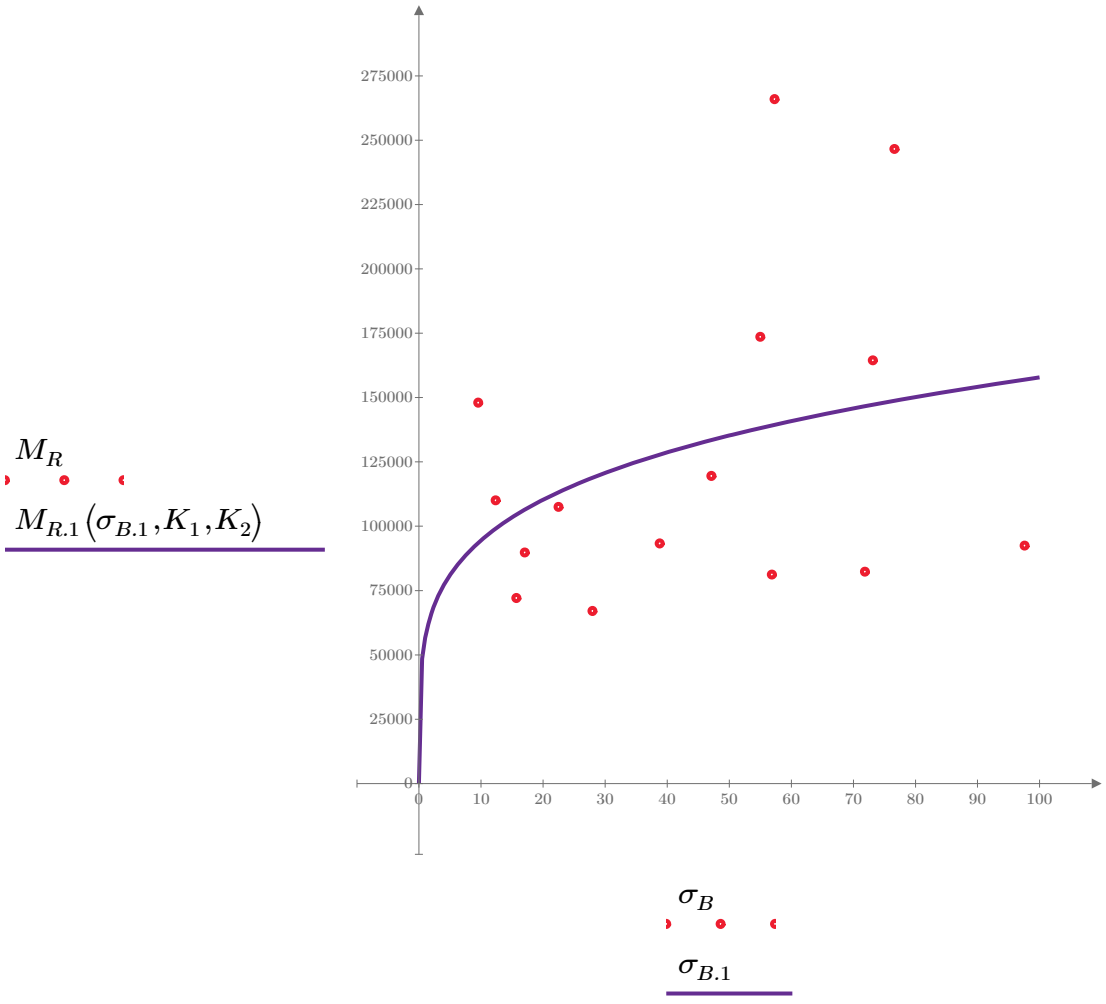

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–61”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 133088.957$

$K_4 = -0.0165$ Equation 2 fitting parameters

${R_2}^2 = 0.0006$ Coefficient of determination

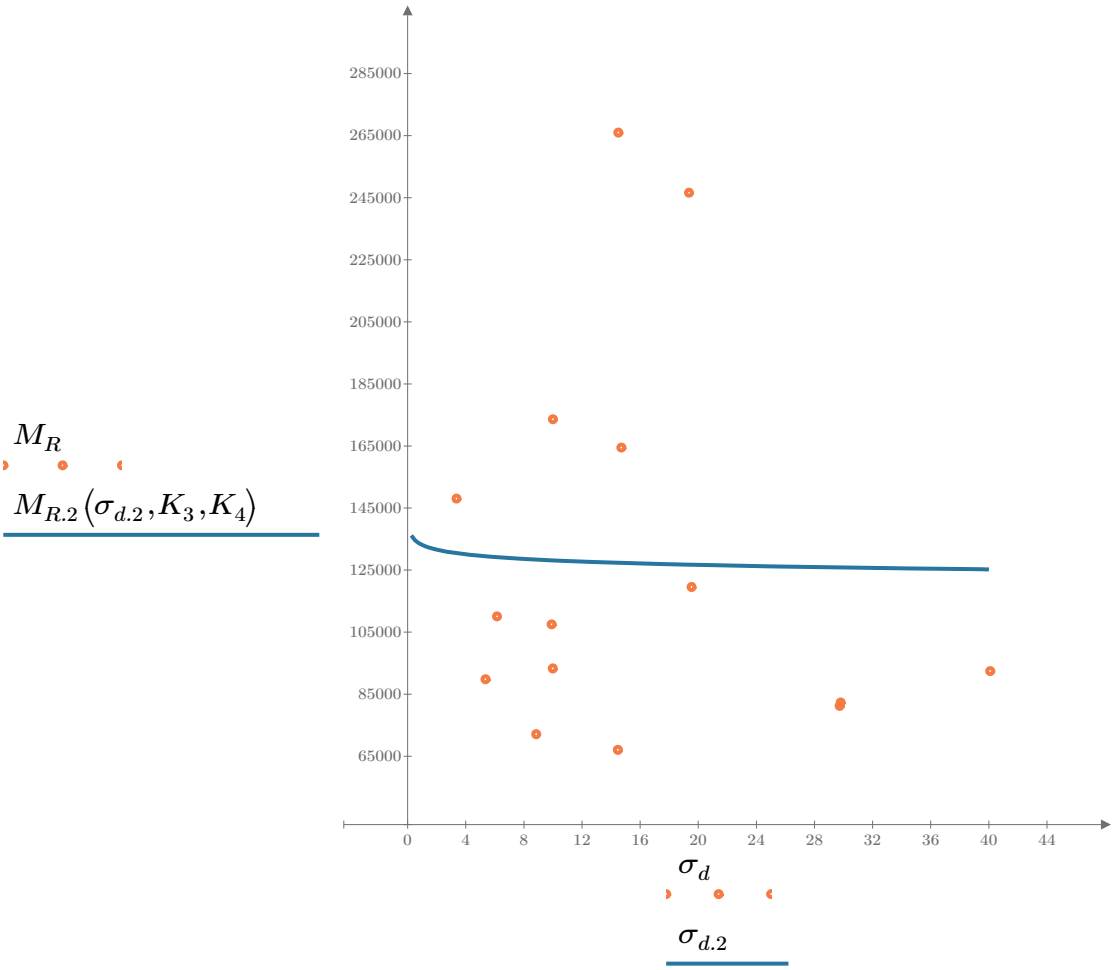

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–61”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 98474.361$

$K_6 = -0.4854$ Equation 3 fitting parameters

$K_7 = 0.6669$

${R_3}^2 = 0.4866$ Coefficient of determination

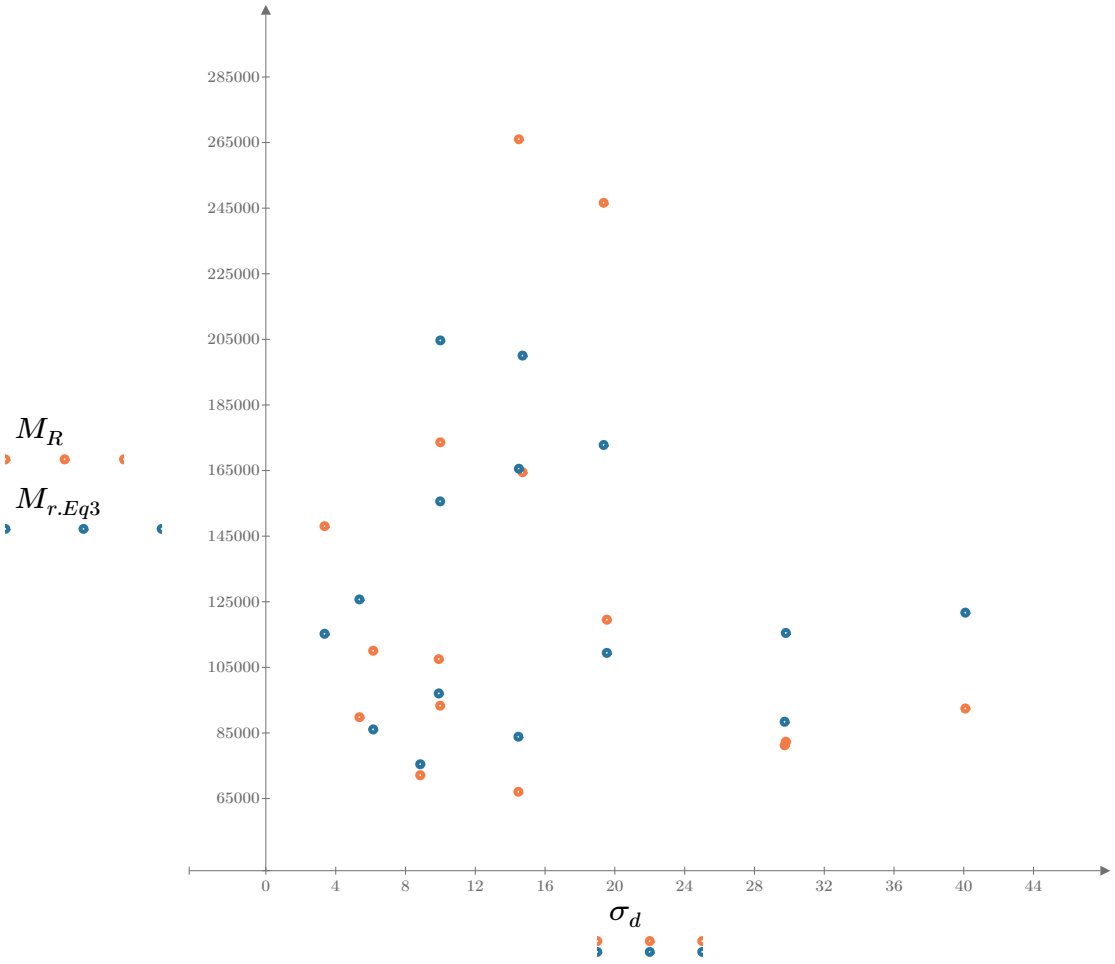

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–61”}$

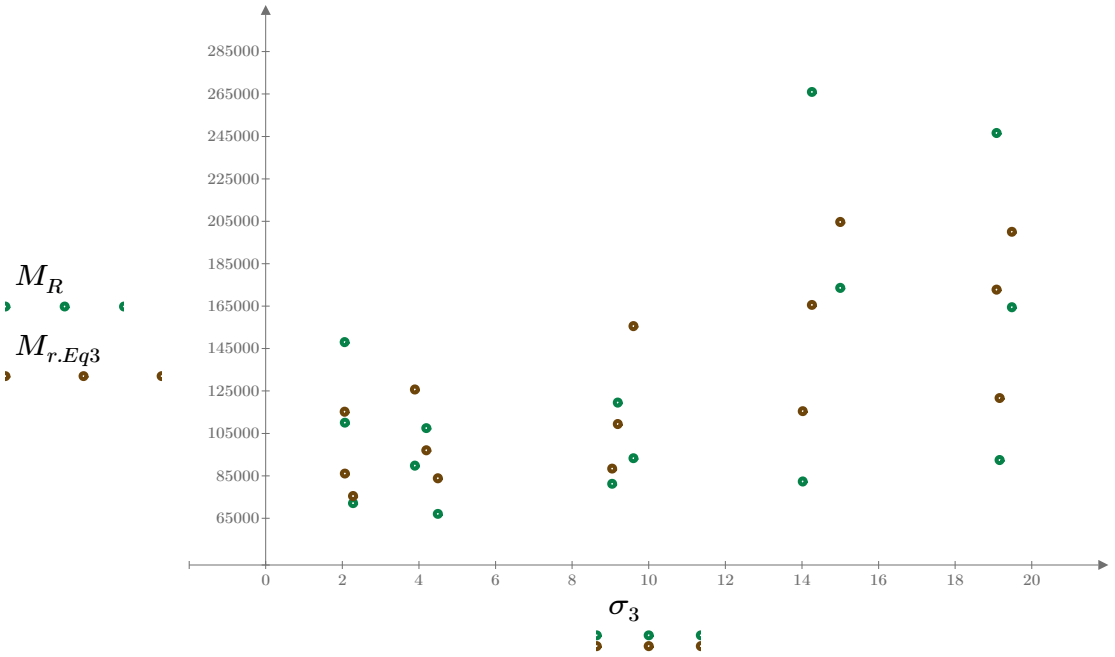

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

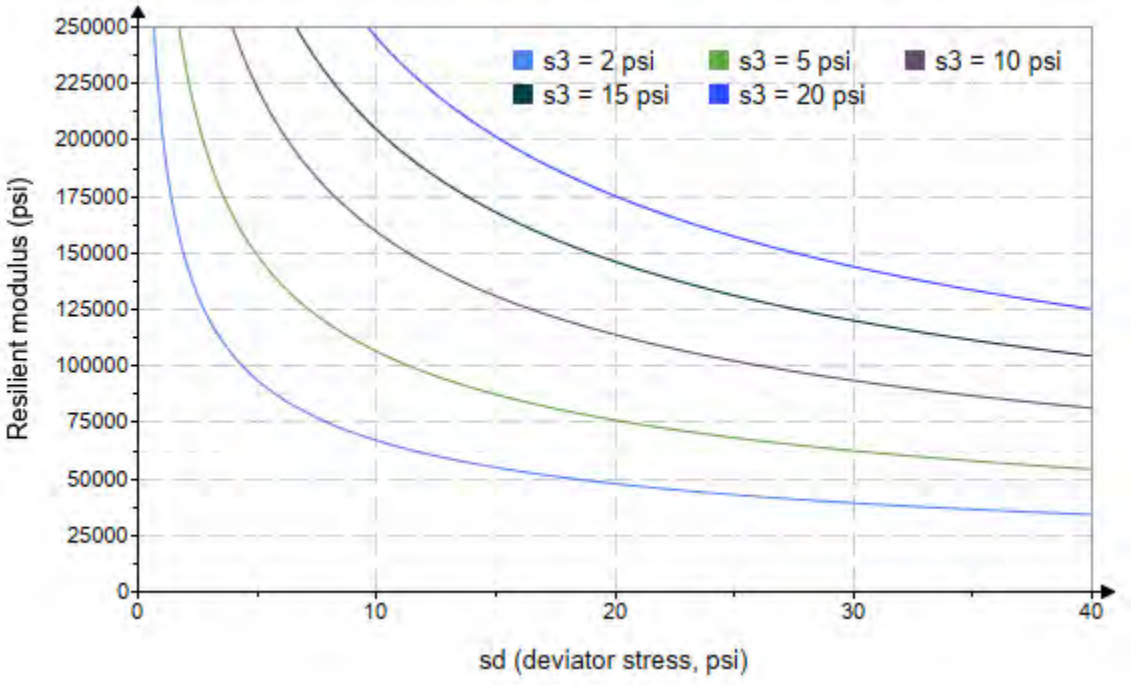

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–61”}$

$$M_{R.4}(\sigma_B, \sigma_d, K_8, K_9, K_{10}) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 3562.412$

$K_9 = 0.8252$ Equation 4 fitting parameters

$K_{10} = -0.7424$

$R_4^{\,2} = 0.4501$ Coefficient of determination

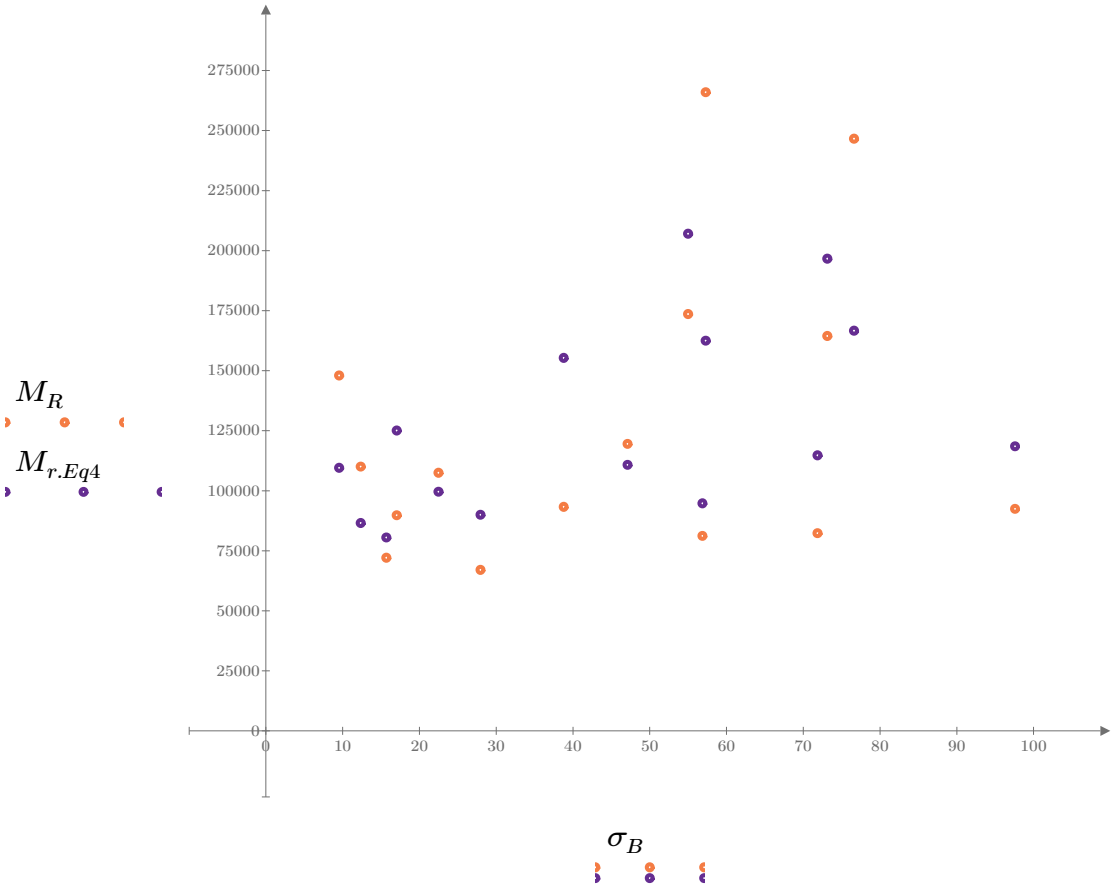

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

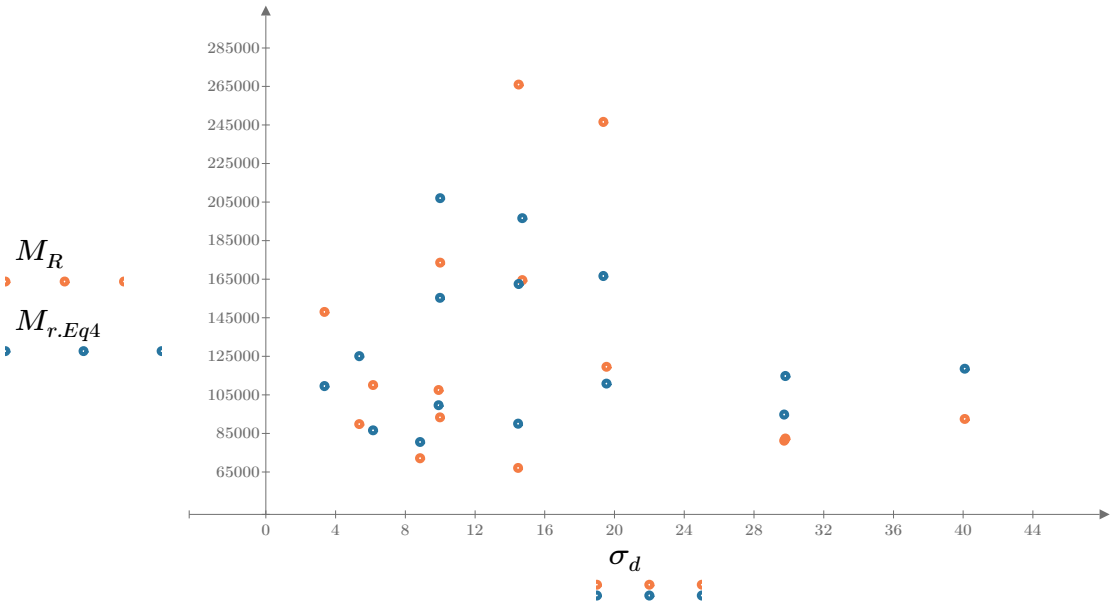

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

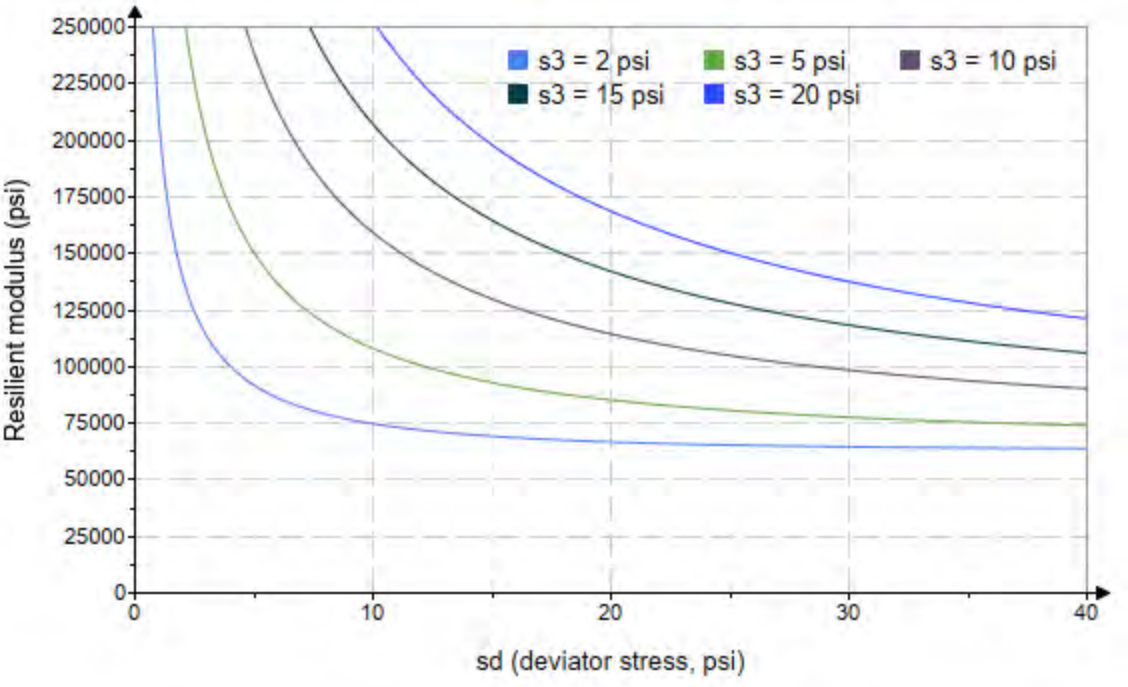

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−62"

$Treatment =$ "AD"

$S = 4.014$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.861 \\ 2.884 \\ 2.819 \\ 4.861 \\ 4.823 \\ 4.512 \\ 9.445 \\ 9.297 \\ 9.238 \\ 14.140 \\ 14.260 \\ 14.400 \\ 19.370 \\ 19.150 \\ 19.150 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.089 \\ 6.094 \\ 8.991 \\ 5.107 \\ 9.870 \\ 14.760 \\ 9.955 \\ 19.790 \\ 30.200 \\ 10.010 \\ 14.700 \\ 30.220 \\ 14.780 \\ 19.910 \\ 40.650 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.670 \\ 14.750 \\ 17.450 \\ 19.690 \\ 24.340 \\ 28.290 \\ 38.290 \\ 47.680 \\ 57.910 \\ 52.430 \\ 57.470 \\ 73.420 \\ 72.900 \\ 77.370 \\ 98.110 \end{bmatrix} \quad M_R = \begin{bmatrix} 41461.6 \\ 28981.2 \\ 29560.6 \\ 32085.8 \\ 34949.6 \\ 40895.8 \\ 48546.6 \\ 52995.0 \\ 52561.6 \\ 60447.6 \\ 60584.2 \\ 52273.6 \\ 65100.8 \\ 55866.0 \\ 52699.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–62”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 14381.742$

$K_2 = 0.3211$

Equation 1 fitting parameters

$R_1^2 = 0.7074$ Coefficient of determination

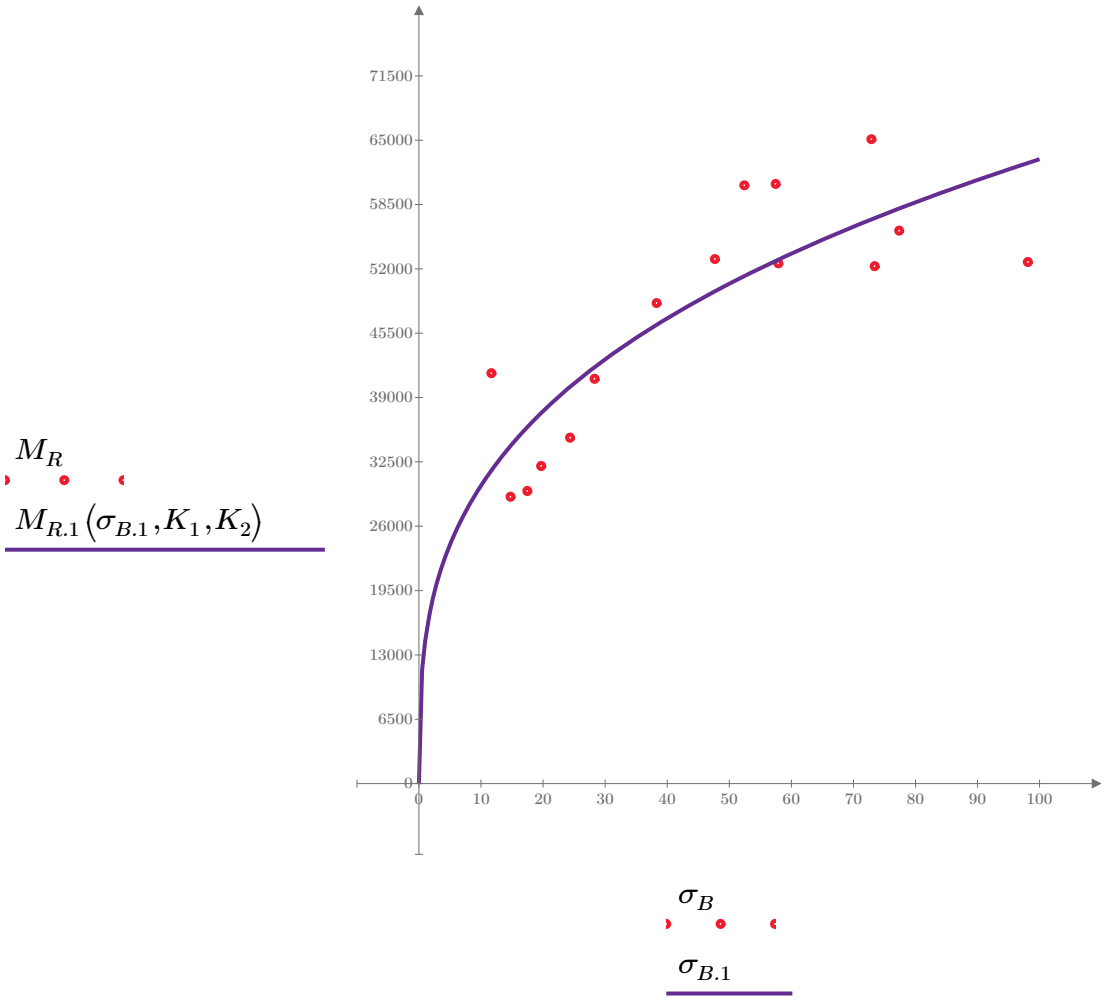

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–62”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 28407.740$

$K_4 = 0.1965$

Equation 2 fitting parameters

${R_2}^2 = 0.3122$ Coefficient of determination

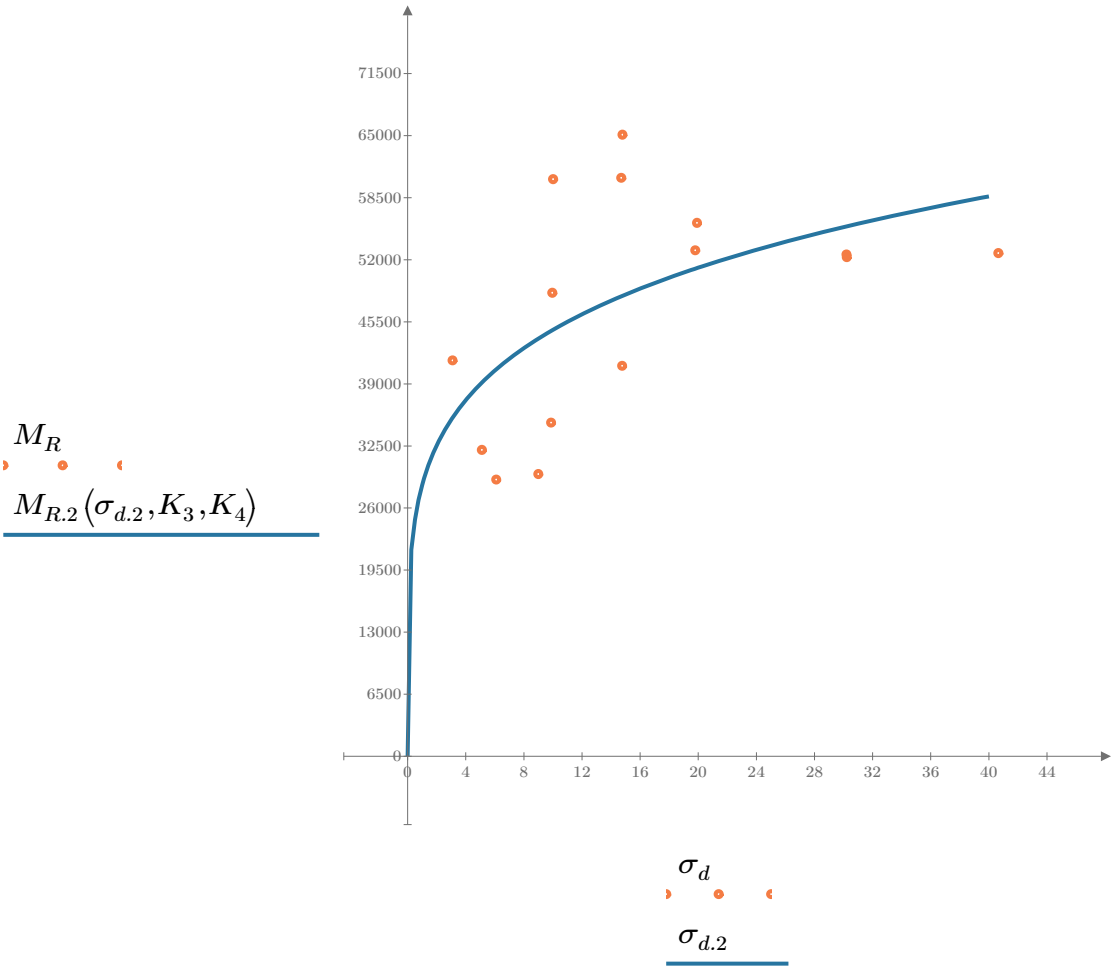

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–62”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 21792.188$

$K_6 = -0.0614$ Equation 3 fitting parameters

$K_7 = 0.4065$

${R_3}^2 = 0.8114$ Coefficient of determination

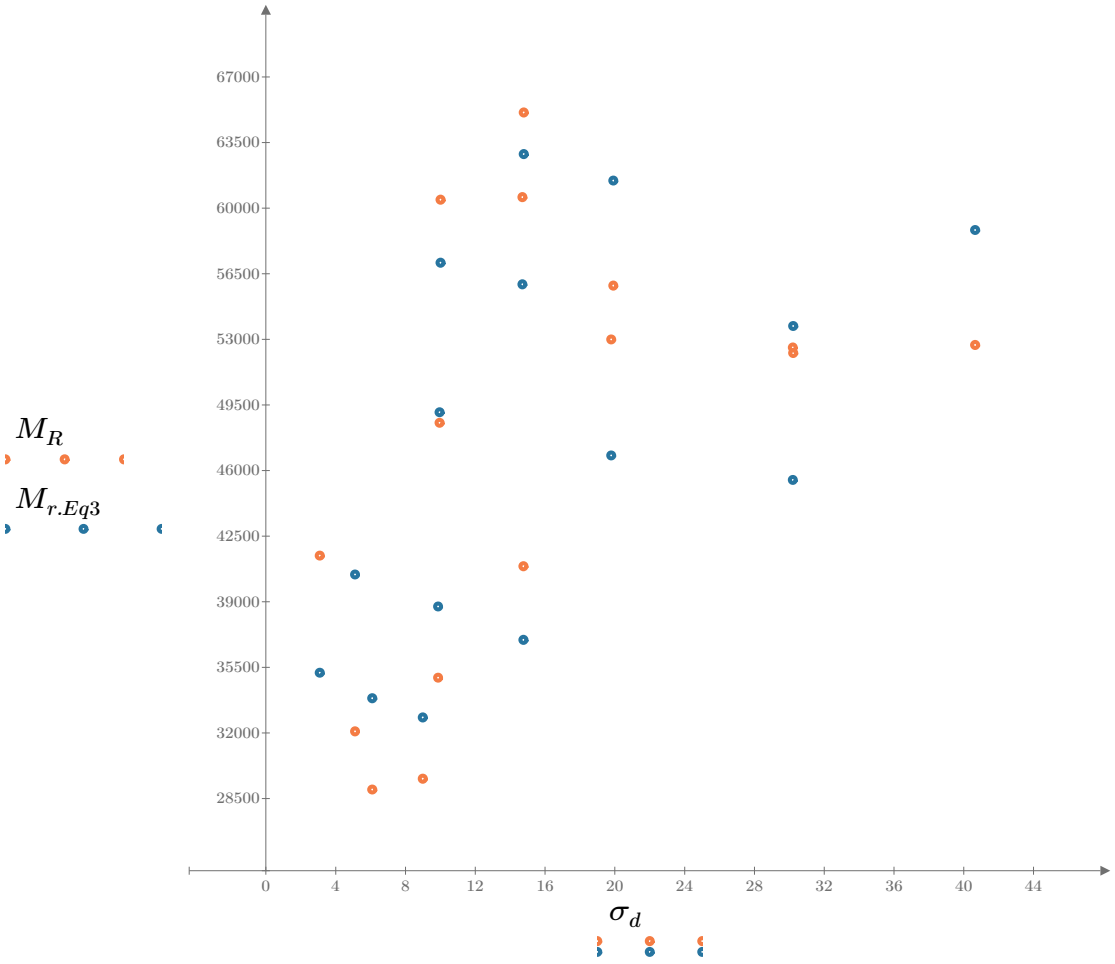

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–62”}$

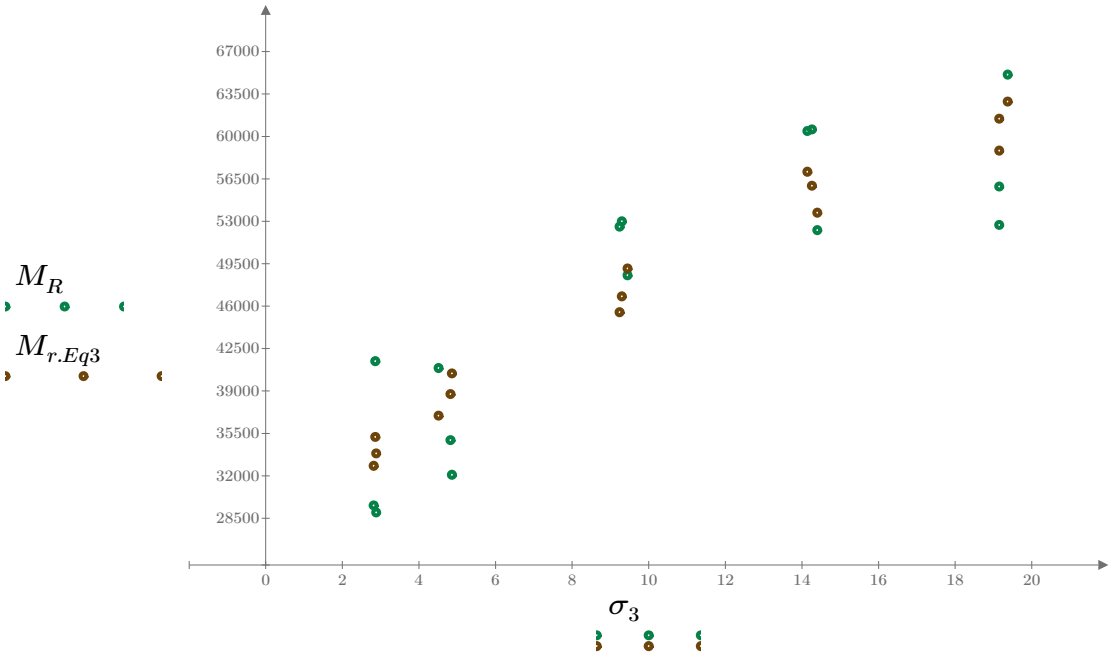

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

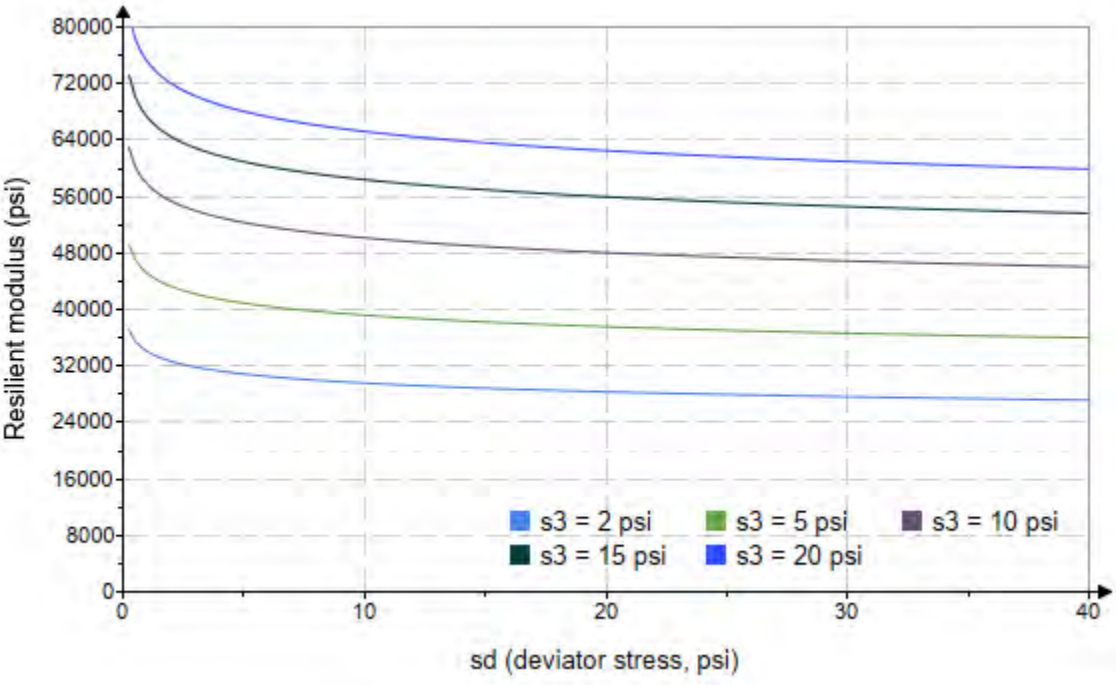

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–62”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1787.302$

$K_9 = 0.5532$ Equation 4 fitting parameters

$K_{10} = -0.2537$

$R_4^{\,2} = 0.8349$ Coefficient of determination

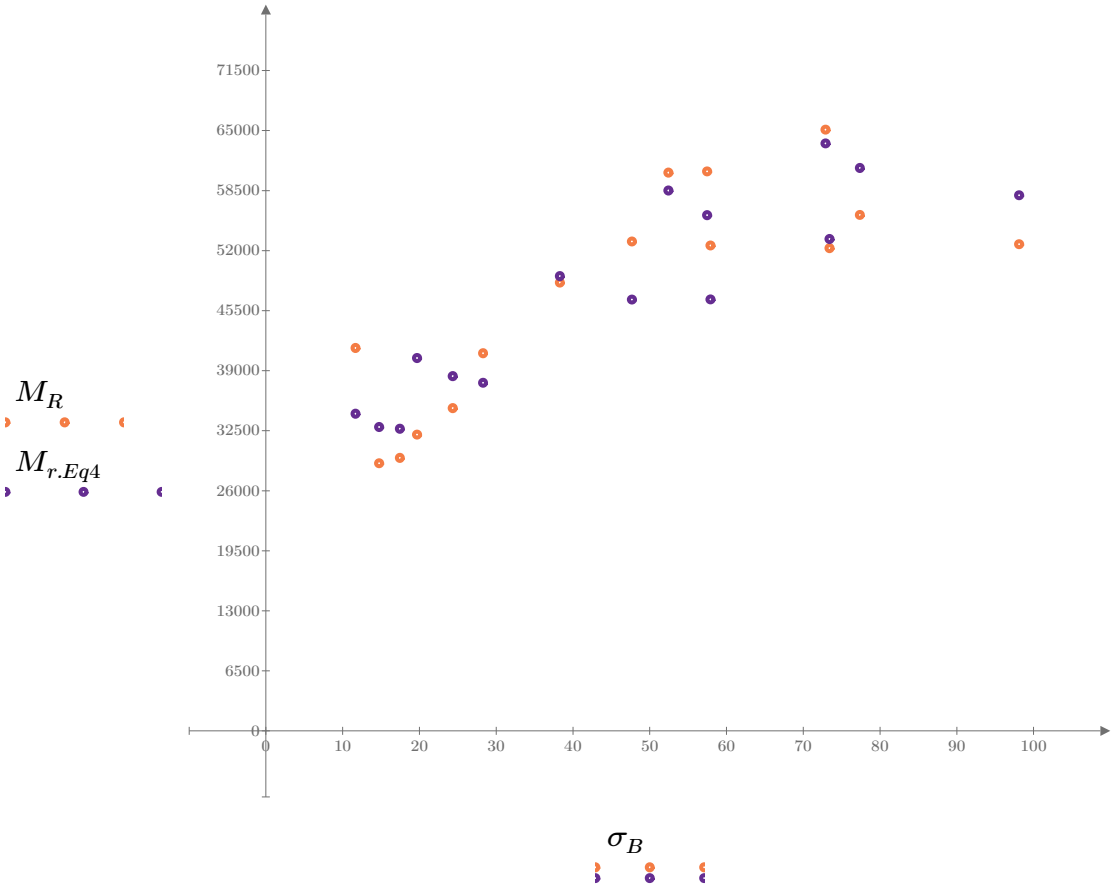

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

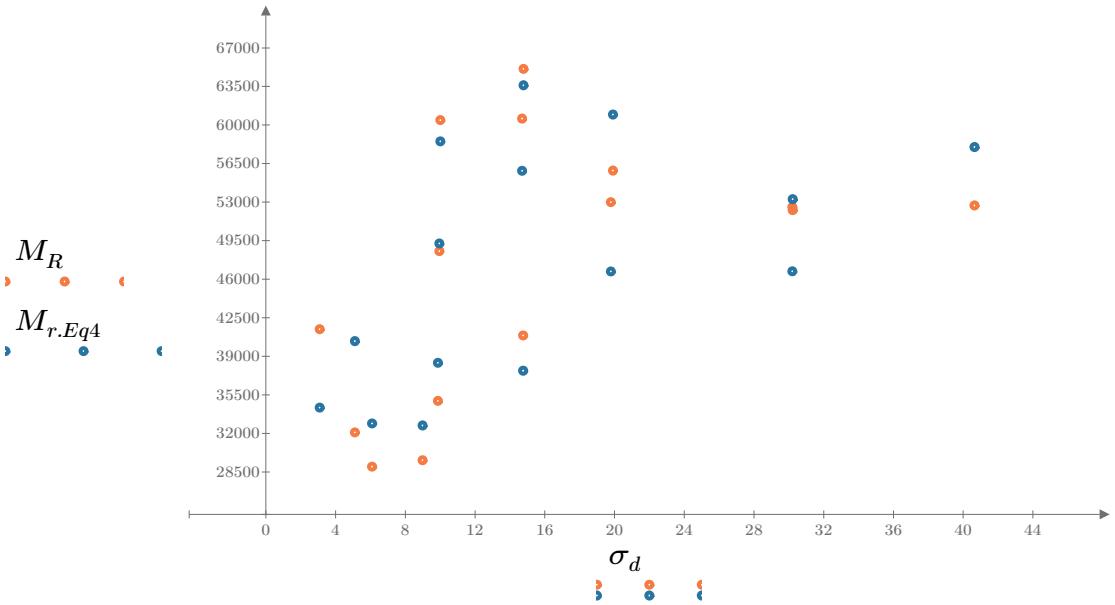

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

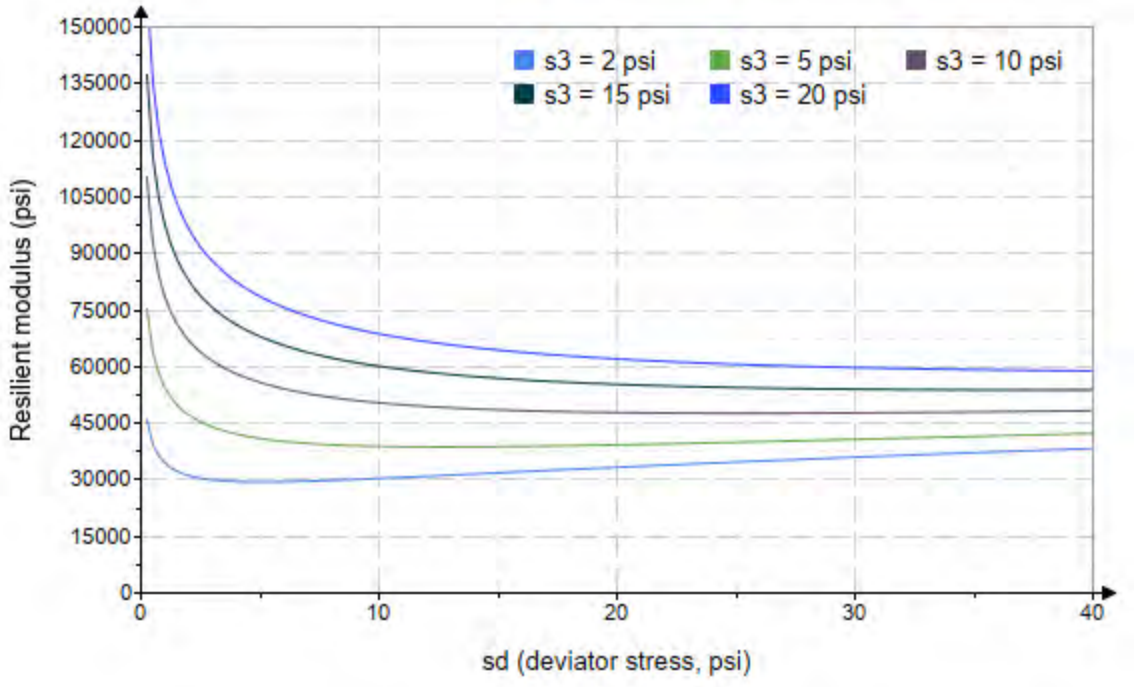

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{63”}$

$Treatment = \text{“AD”}$

$S = 3.825$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.800 \\ 2.780 \\ 2.783 \\ 4.564 \\ 4.593 \\ 4.603 \\ 9.624 \\ 9.587 \\ 9.604 \\ 14.660 \\ 14.660 \\ 14.640 \\ 19.650 \\ 19.640 \\ 19.640 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.284 \\ 6.167 \\ 8.978 \\ 5.232 \\ 9.756 \\ 14.660 \\ 9.804 \\ 19.750 \\ 30.020 \\ 9.850 \\ 14.780 \\ 30.140 \\ 14.740 \\ 19.970 \\ 40.470 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.690 \\ 14.510 \\ 17.330 \\ 18.920 \\ 23.530 \\ 28.470 \\ 38.680 \\ 48.510 \\ 58.830 \\ 53.820 \\ 58.750 \\ 74.050 \\ 73.690 \\ 78.890 \\ 99.380 \end{bmatrix} \quad M_R = \begin{bmatrix} 36685.0 \\ 43321.4 \\ 44283.8 \\ 49831.8 \\ 44433.6 \\ 49111.4 \\ 43993.0 \\ 53513.6 \\ 53057.2 \\ 53923.6 \\ 58890.8 \\ 55963.6 \\ 56312.4 \\ 58080.8 \\ 59697.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–63”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 25860.219$

$K_2 = 0.1829$

Equation 1 fitting parameters

${R_1}^2 = 0.8226$ Coefficient of determination

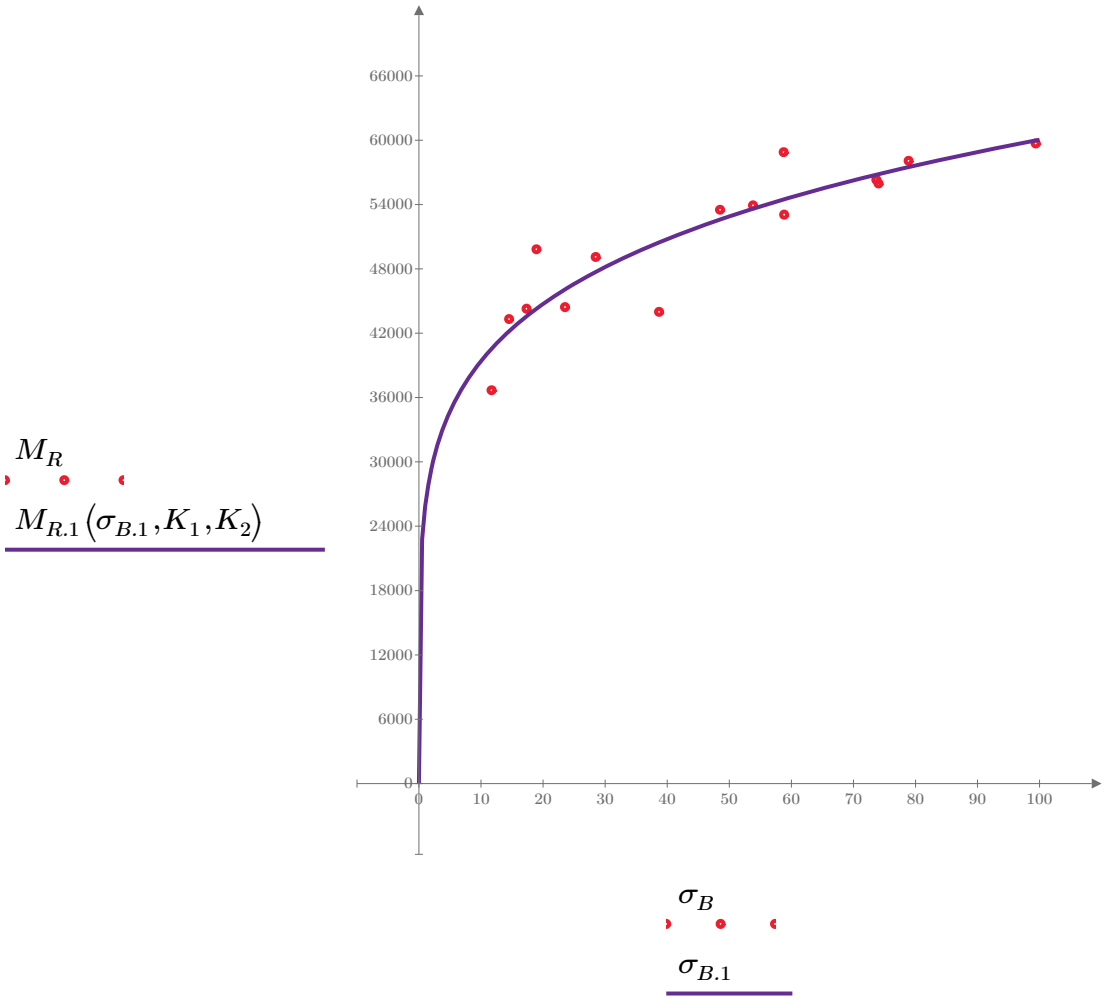

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–63”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 34165.492$

$K_4 = 0.1531$

Equation 2 fitting parameters

${R_2}^2 = 0.6182$ Coefficient of determination

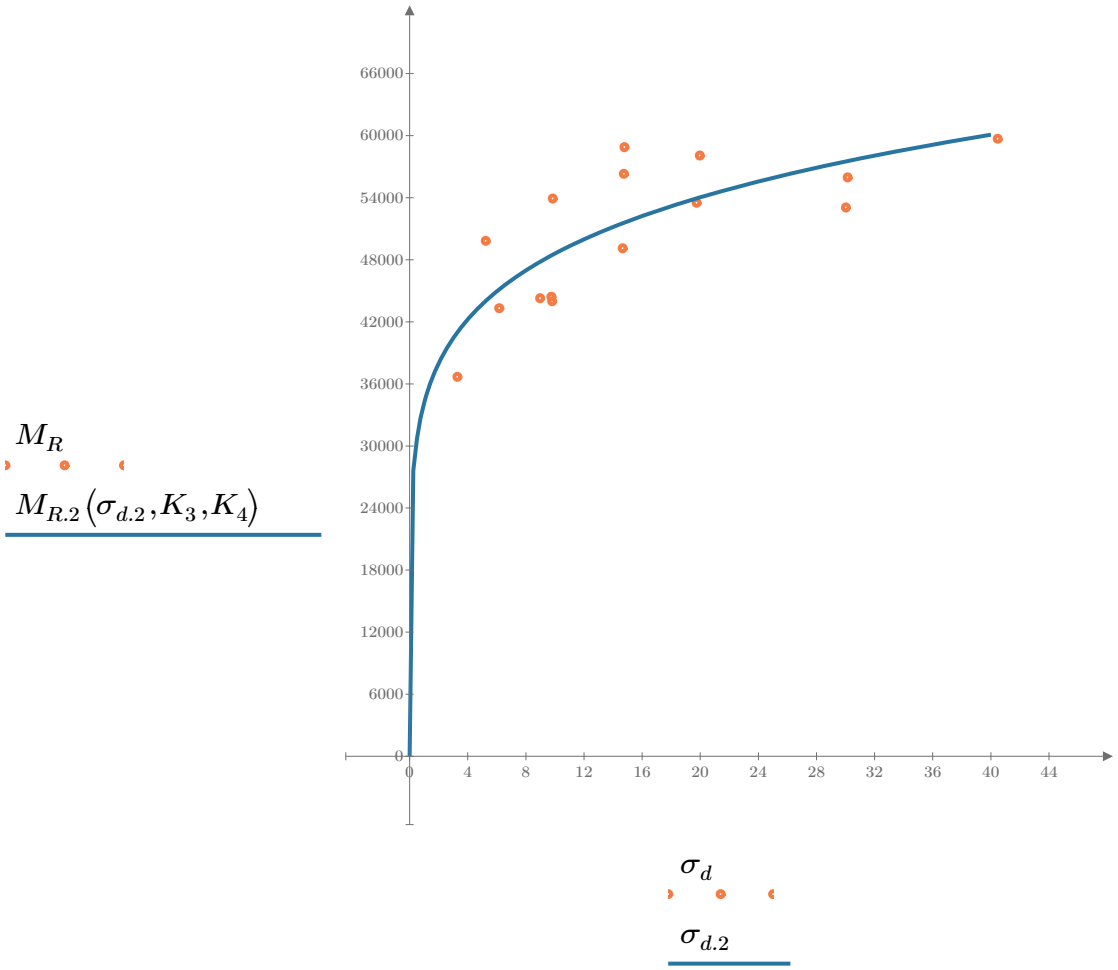

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–63”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 31559.574$

$K_6 = 0.0629$ Equation 3 fitting parameters

$K_7 = 0.1373$

${R_3}^2 = 0.8210$ Coefficient of determination

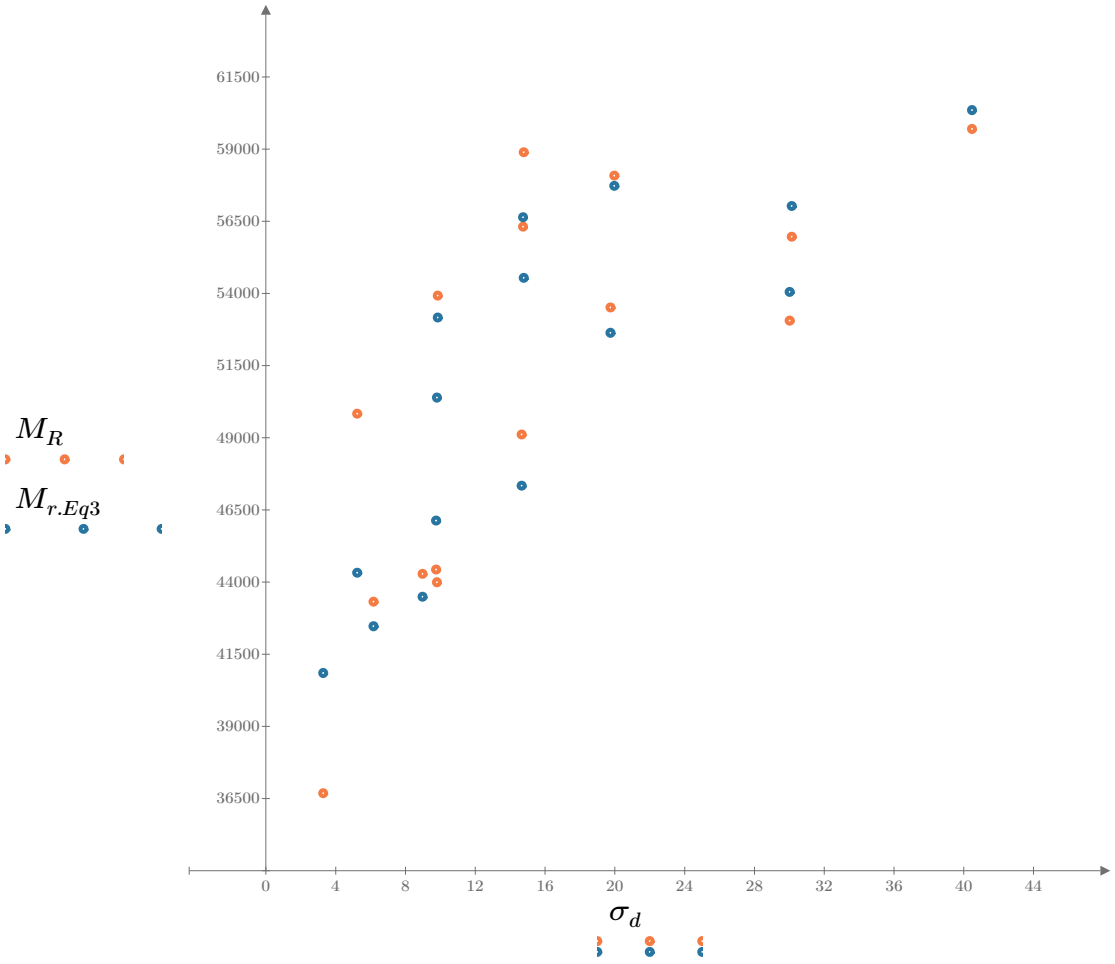

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–63”}$

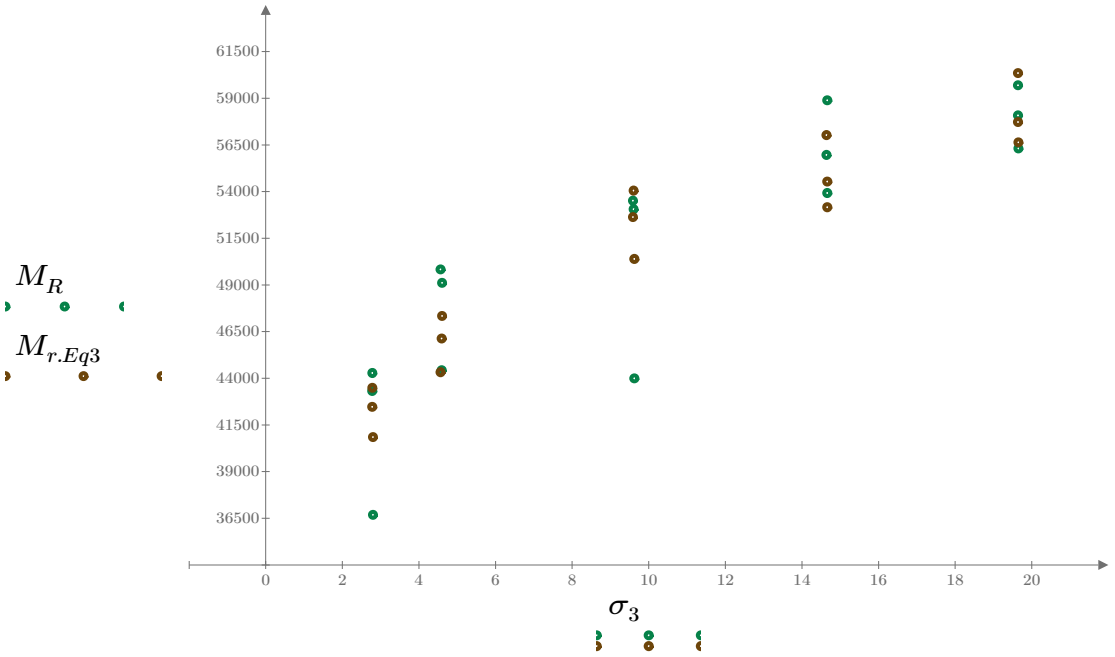

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

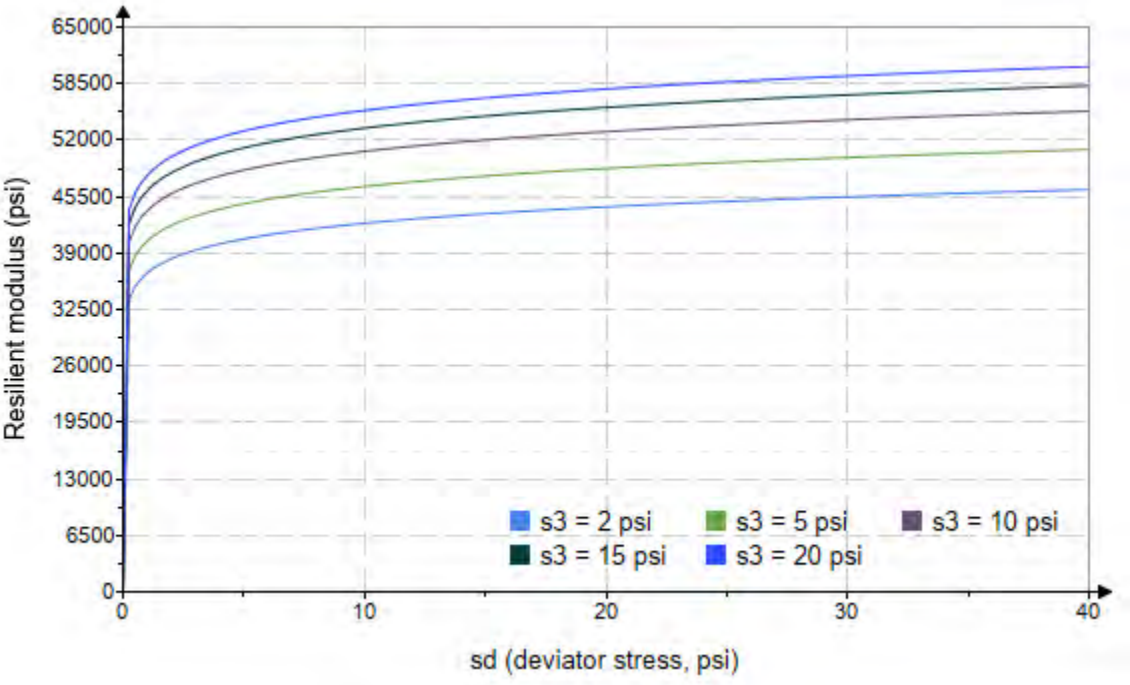

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–63”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2875.574$

$K_9 = 0.1834$ Equation 4 fitting parameters

$K_{10} = -0.0005$

$R_4^{\,2} = 0.8226$ Coefficient of determination

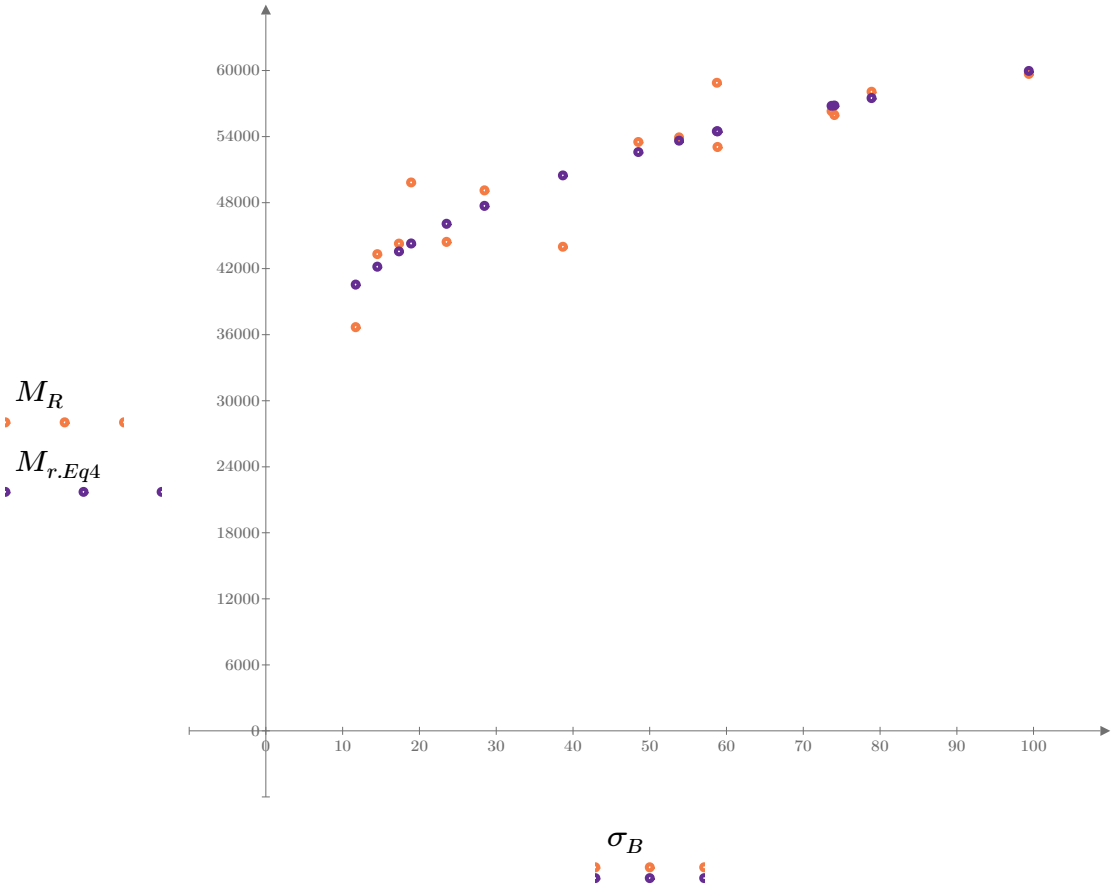

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

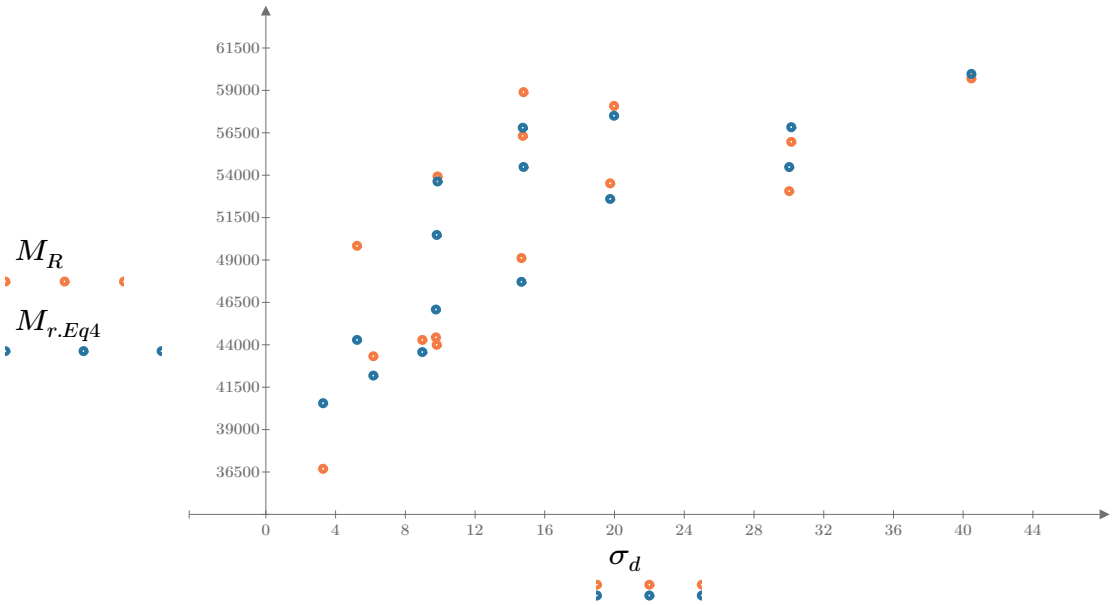

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

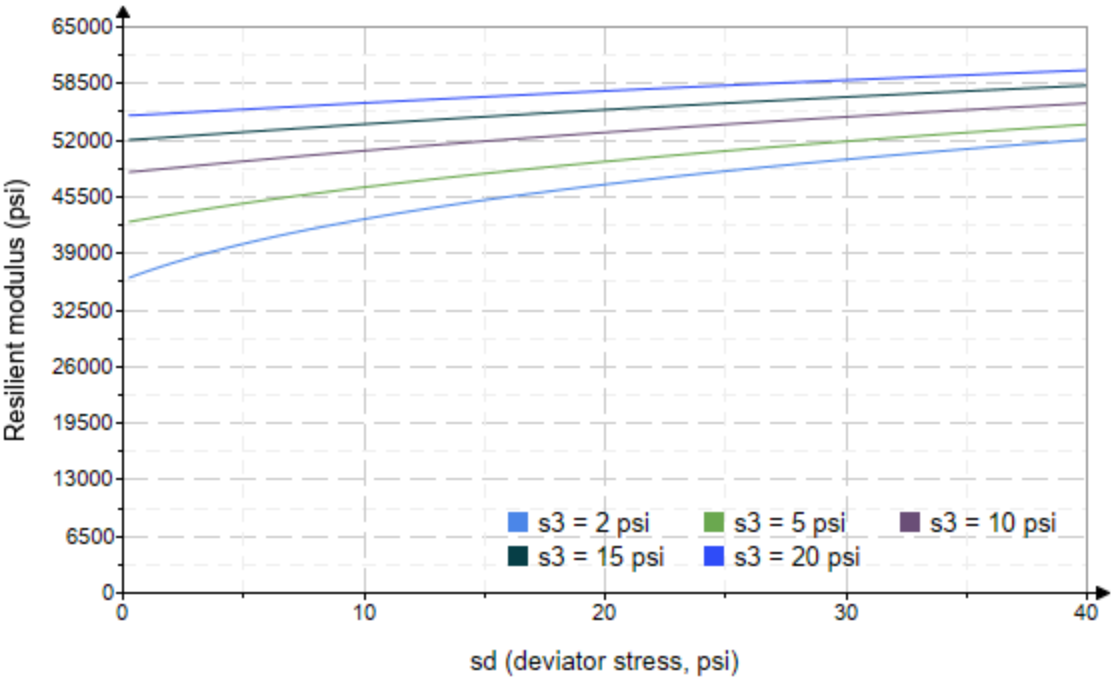

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−64"

$Treatment =$ "H100"

$S = 5.288$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.687 \\ 2.698 \\ 2.697 \\ 4.701 \\ 4.686 \\ 4.628 \\ 9.669 \\ 9.641 \\ 9.622 \\ 14.640 \\ 14.610 \\ 14.640 \\ 19.630 \\ 19.650 \\ 19.600 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.164 \\ 6.121 \\ 9.157 \\ 5.193 \\ 10.090 \\ 14.590 \\ 10.030 \\ 19.210 \\ 29.390 \\ 10.250 \\ 14.530 \\ 29.540 \\ 14.520 \\ 19.470 \\ 40.120 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.230 \\ 14.210 \\ 17.250 \\ 19.300 \\ 24.140 \\ 28.470 \\ 39.040 \\ 48.130 \\ 58.260 \\ 54.160 \\ 58.360 \\ 73.470 \\ 73.420 \\ 78.410 \\ 98.920 \end{bmatrix} \quad M_R = \begin{bmatrix} 30723.6 \\ 34321.8 \\ 36037.8 \\ 48906.4 \\ 44059.6 \\ 41884.2 \\ 49052.4 \\ 47535.2 \\ 44317.6 \\ 44314.6 \\ 48405.0 \\ 49533.2 \\ 50082.4 \\ 51122.8 \\ 56803.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–64”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 22210.292$

$K_2 = 0.1926$

Equation 1 fitting parameters

${R_1}^2 = 0.7119$ Coefficient of determination

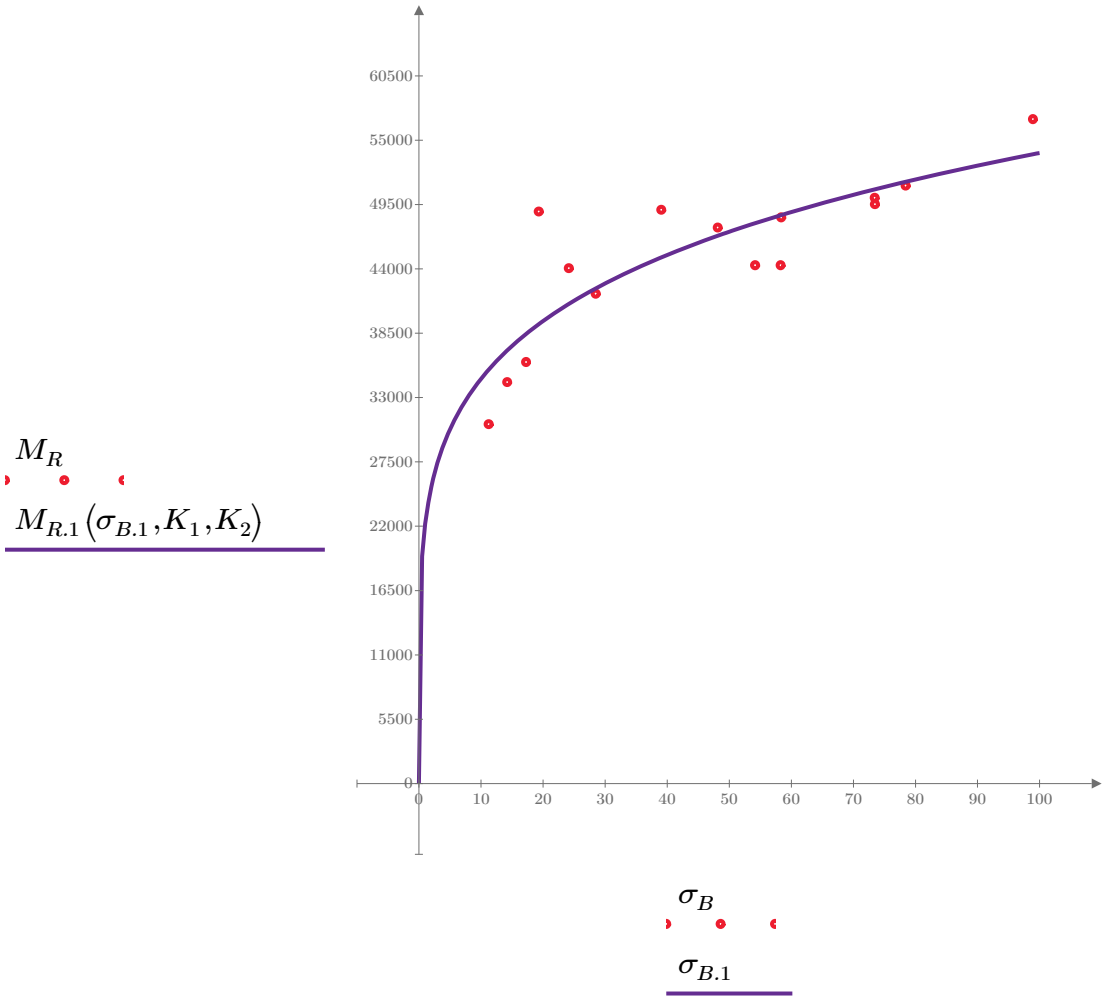

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–64”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 30112.633$

$K_4 = 0.1569$ Equation 2 fitting parameters

${R_2}^2 = 0.4902$ Coefficient of determination

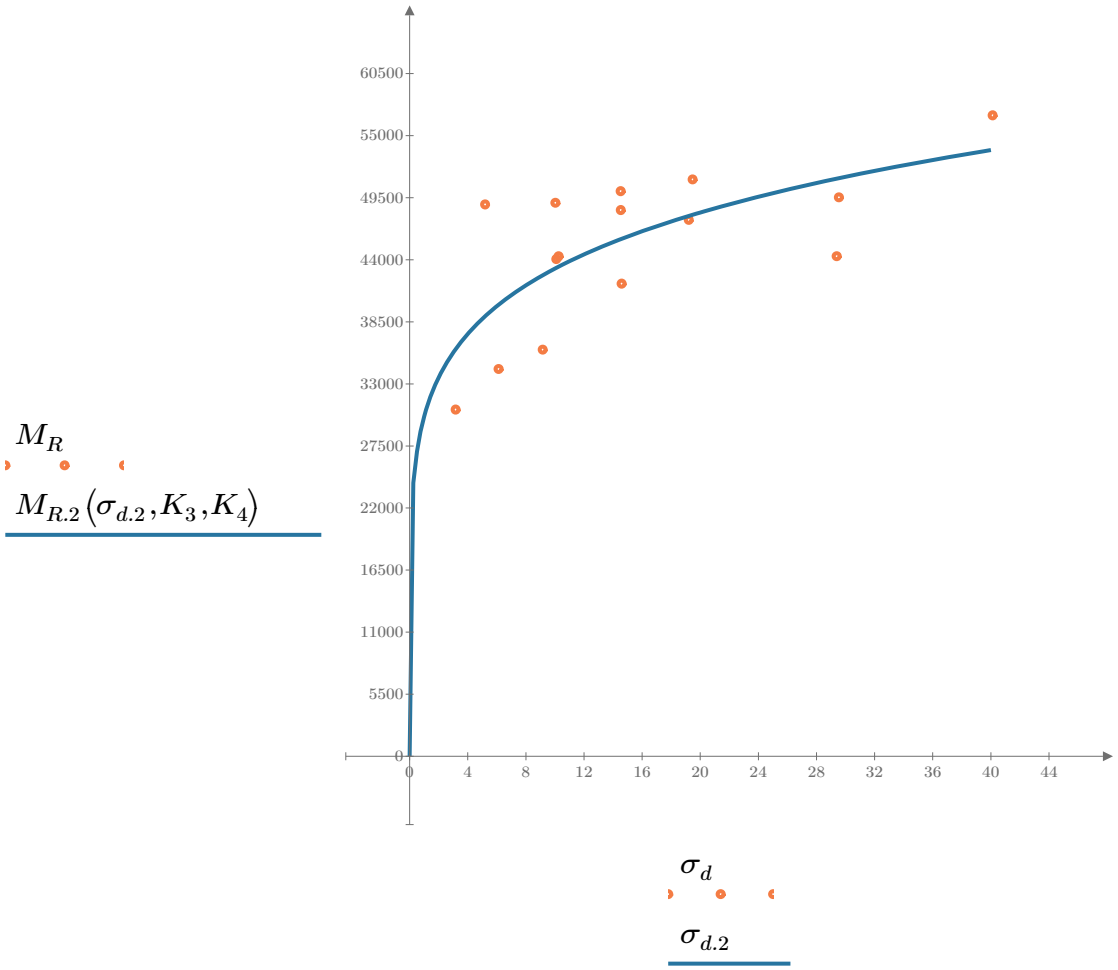

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–64”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 27555.593$

$K_6 = 0.0479$ Equation 3 fitting parameters

$K_7 = 0.1625$

${R_3}^2 = 0.7202$ Coefficient of determination

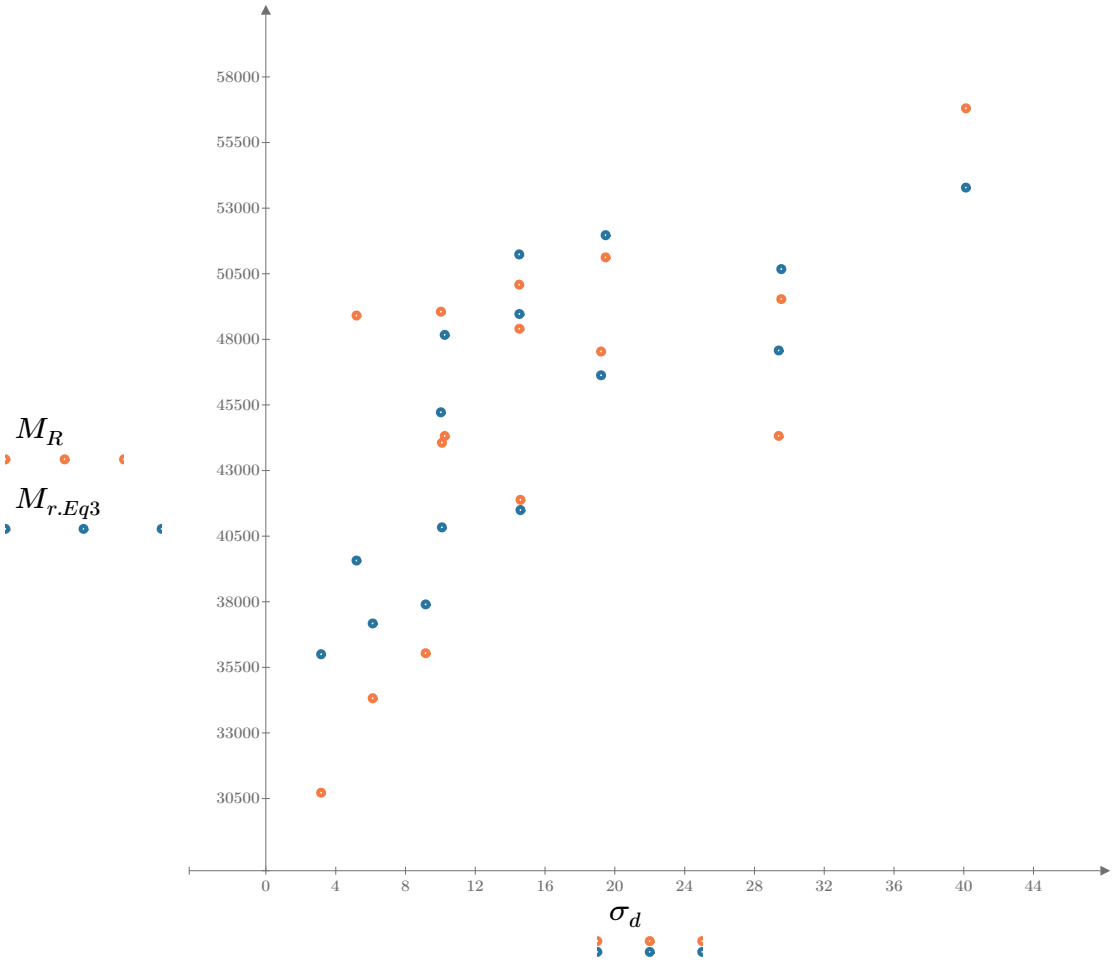

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–64”}$

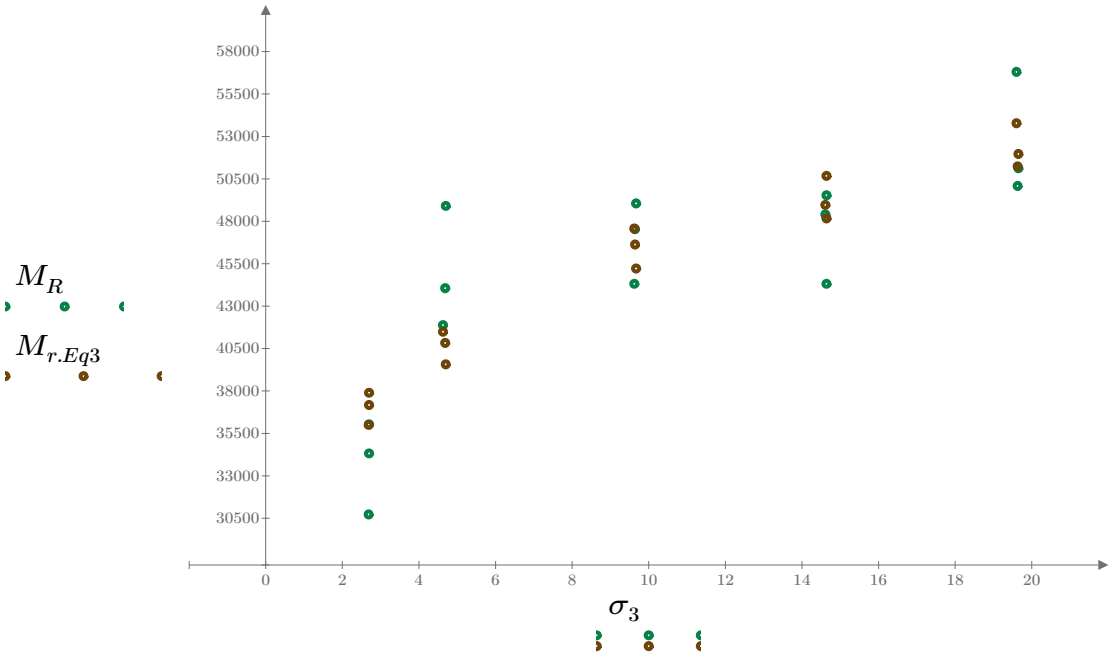

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

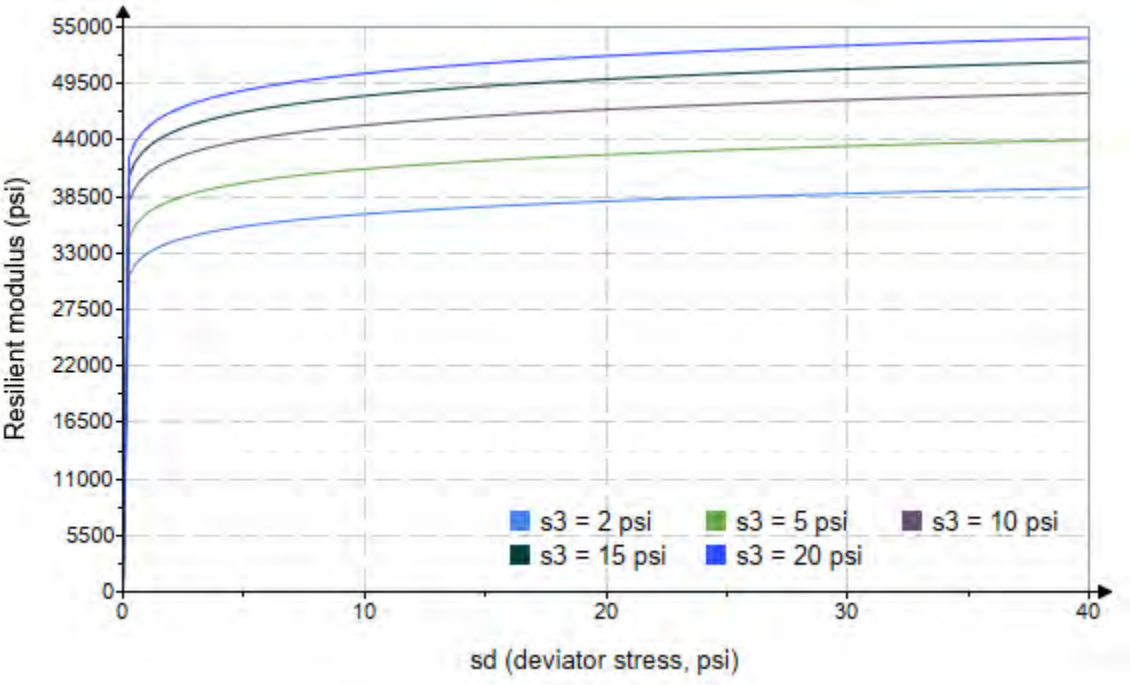

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–64”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2476.407$

$K_9 = 0.2137$ Equation 4 fitting parameters

$K_{10} = -0.0246$

$R_4^{\,2} = 0.7150$ Coefficient of determination

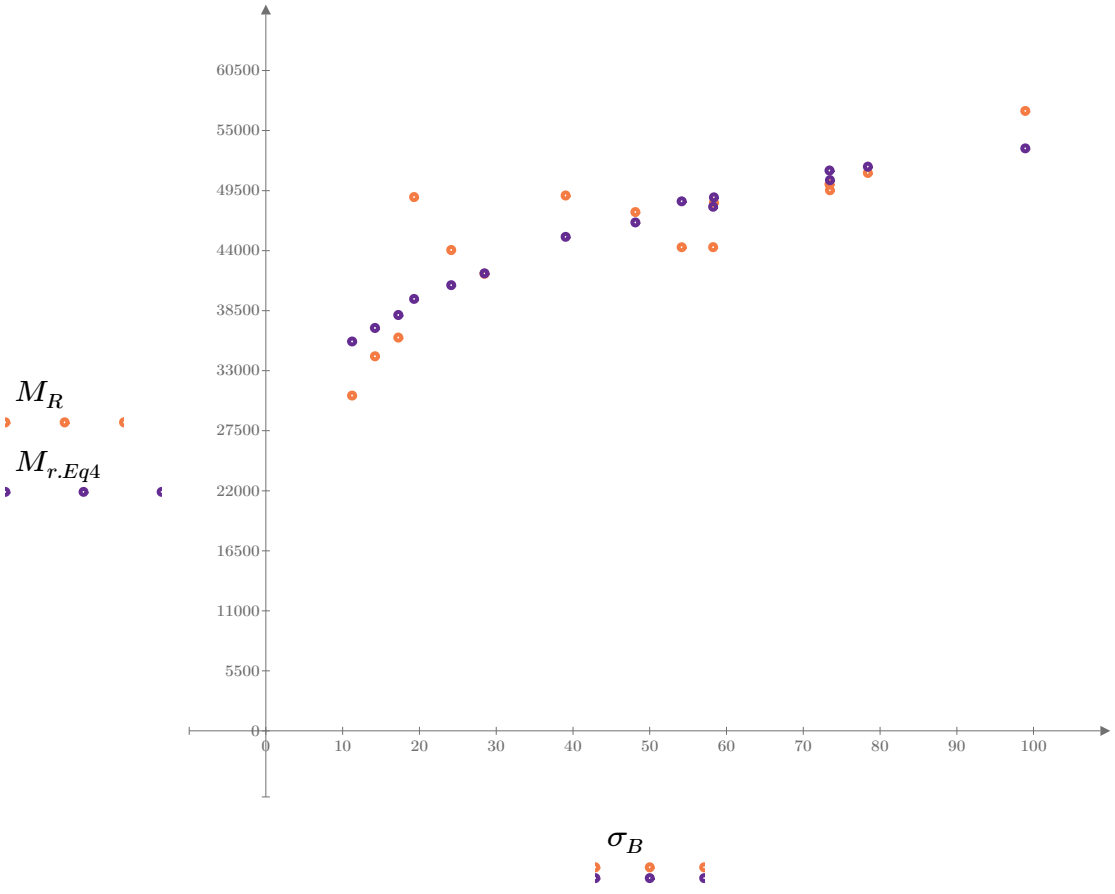

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

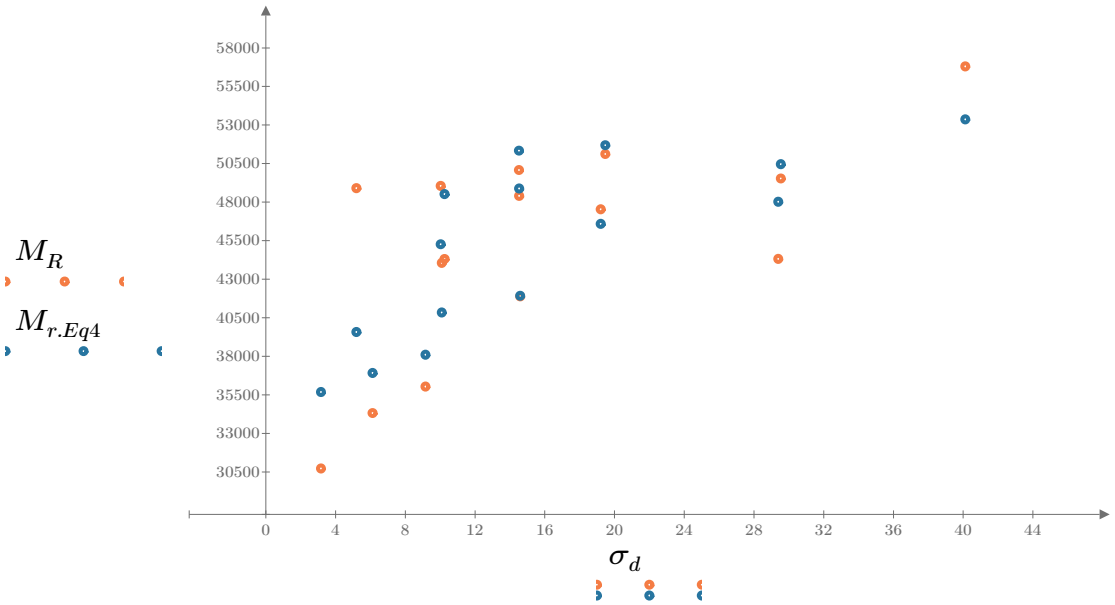

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

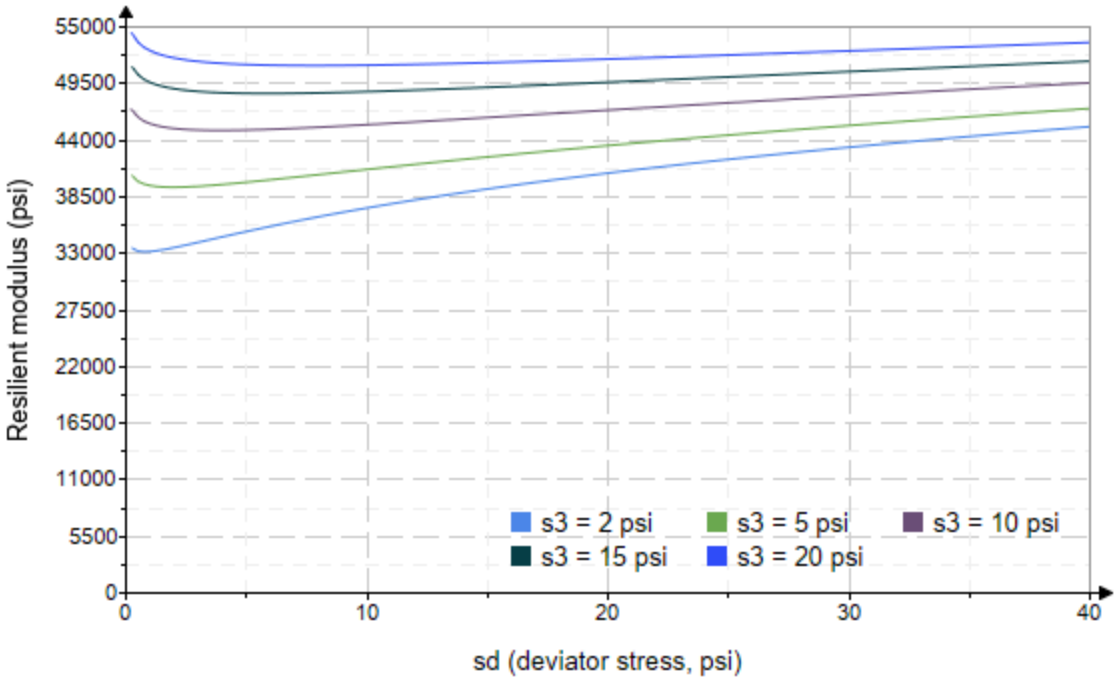

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−65"

$Treatment =$ "H100"

$S = 5.112$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 3.048 \\ 2.833 \\ 2.460 \\ 5.127 \\ 4.806 \\ 3.450 \\ 9.463 \\ 8.925 \\ 9.217 \\ 14.050 \\ 13.610 \\ 13.740 \\ 18.820 \\ 18.690 \\ 19.110 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.186 \\ 6.231 \\ 9.255 \\ 5.115 \\ 10.090 \\ 14.370 \\ 9.978 \\ 19.370 \\ 29.640 \\ 9.763 \\ 14.520 \\ 29.830 \\ 14.550 \\ 19.530 \\ 40.220 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 12.330 \\ 14.730 \\ 16.630 \\ 20.490 \\ 24.510 \\ 24.720 \\ 38.370 \\ 46.150 \\ 57.300 \\ 51.920 \\ 55.350 \\ 71.050 \\ 71.010 \\ 75.600 \\ 97.560 \end{bmatrix} \quad M_R = \begin{bmatrix} 86621.5 \\ 64431.0 \\ 49404.6 \\ 56537.9 \\ 63671.2 \\ 58066.2 \\ 94452.8 \\ 78487.6 \\ 64877.0 \\ 89337.5 \\ 113798.0 \\ 62734.6 \\ 116916.0 \\ 81946.2 \\ 65981.2 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–65”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 43797.400$

$K_2 = 0.1525$

Equation 1 fitting parameters

$R_1^2 = 0.1426$ Coefficient of determination

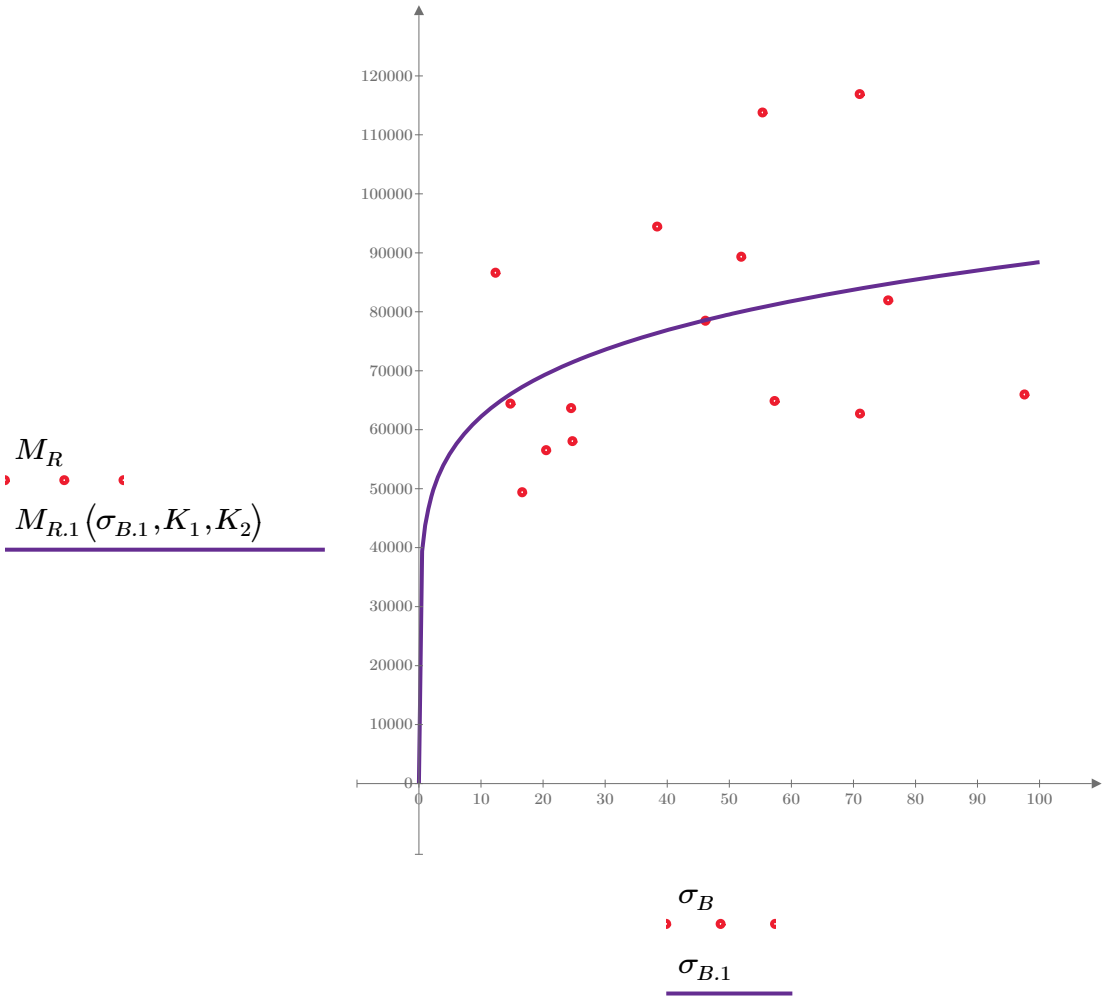

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–65”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 78551.929$

$K_4 = -0.0105$

Equation 2 fitting parameters

${R_2}^2 = 0.0008$ Coefficient of determination

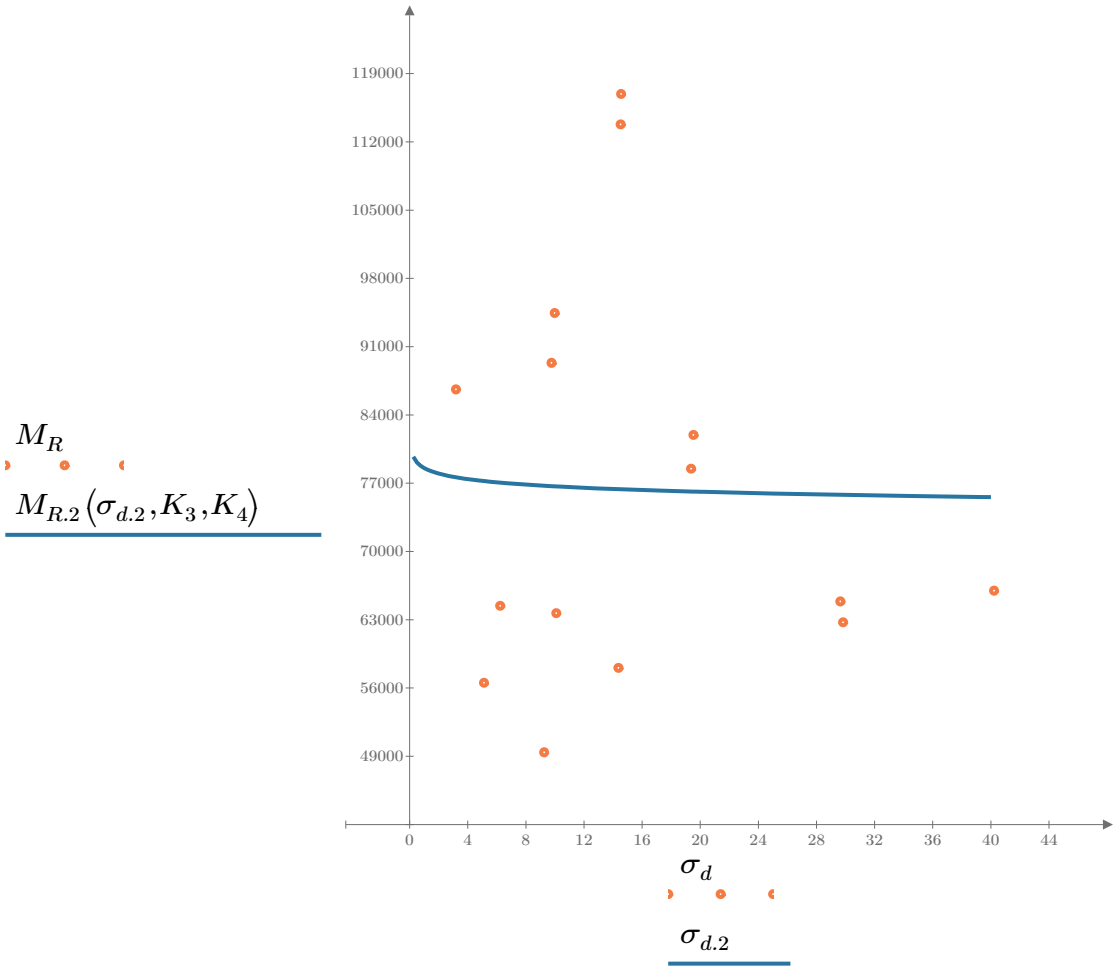

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–65”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 57883.189$

$K_6 = -0.2932$ Equation 3 fitting parameters

$K_7 = 0.4549$

${R_3}^2 = 0.6153$ Coefficient of determination

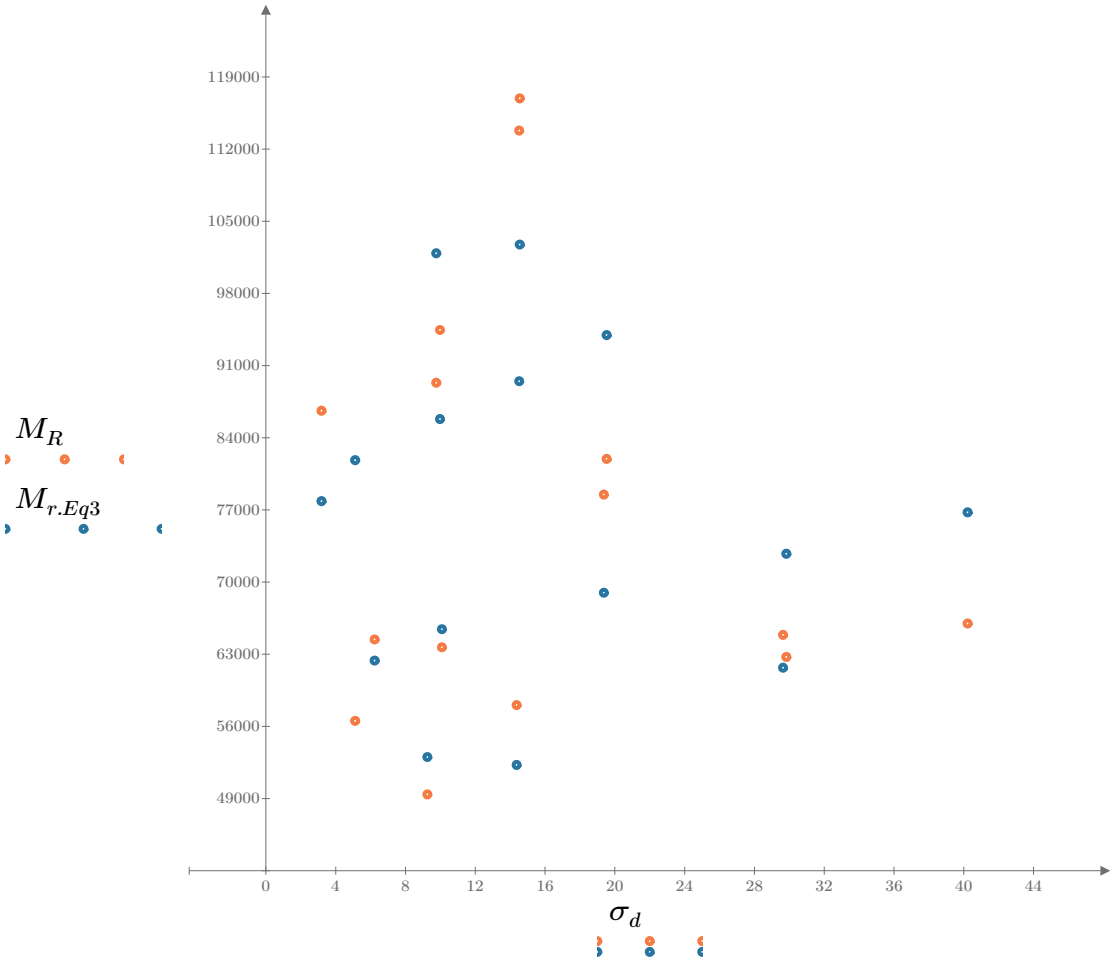

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–65”}$

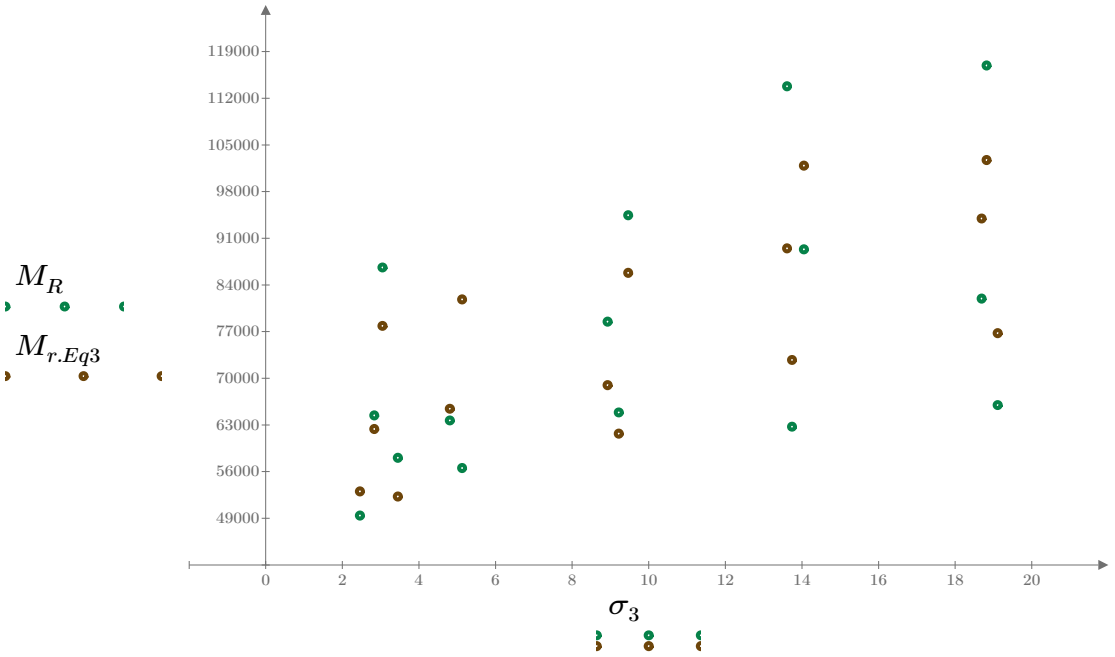

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

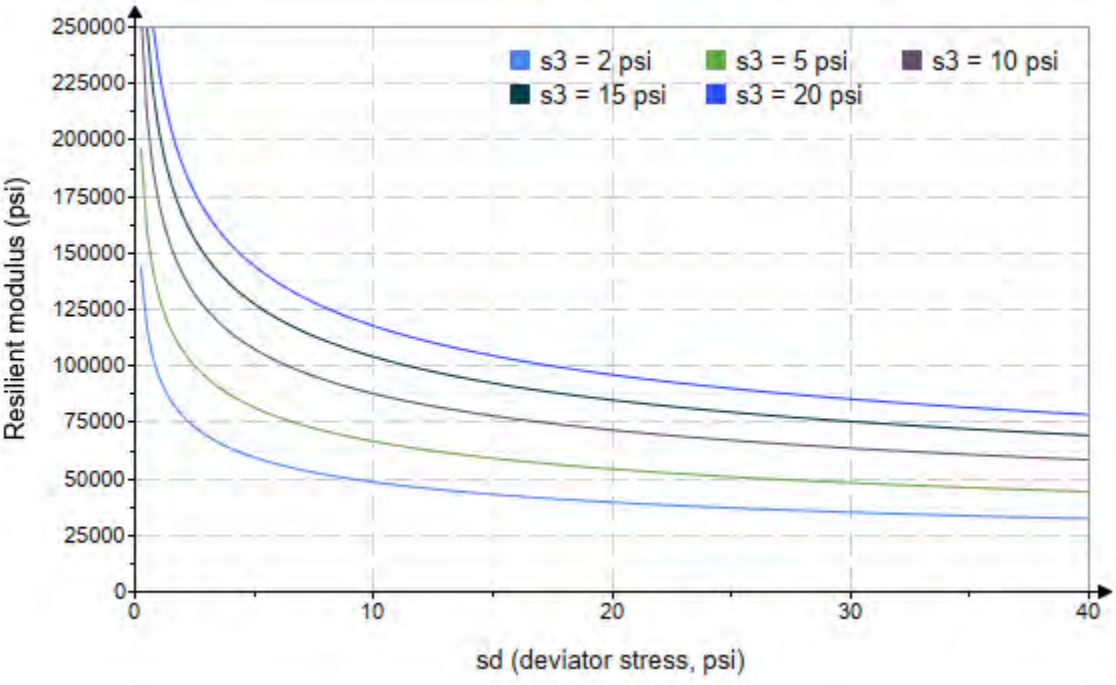

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–65”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2700.947$

$K_9 = 0.6027$ Equation 4 fitting parameters

$K_{10} = -0.4964$

$R_4^{\,2} = 0.6108$ Coefficient of determination

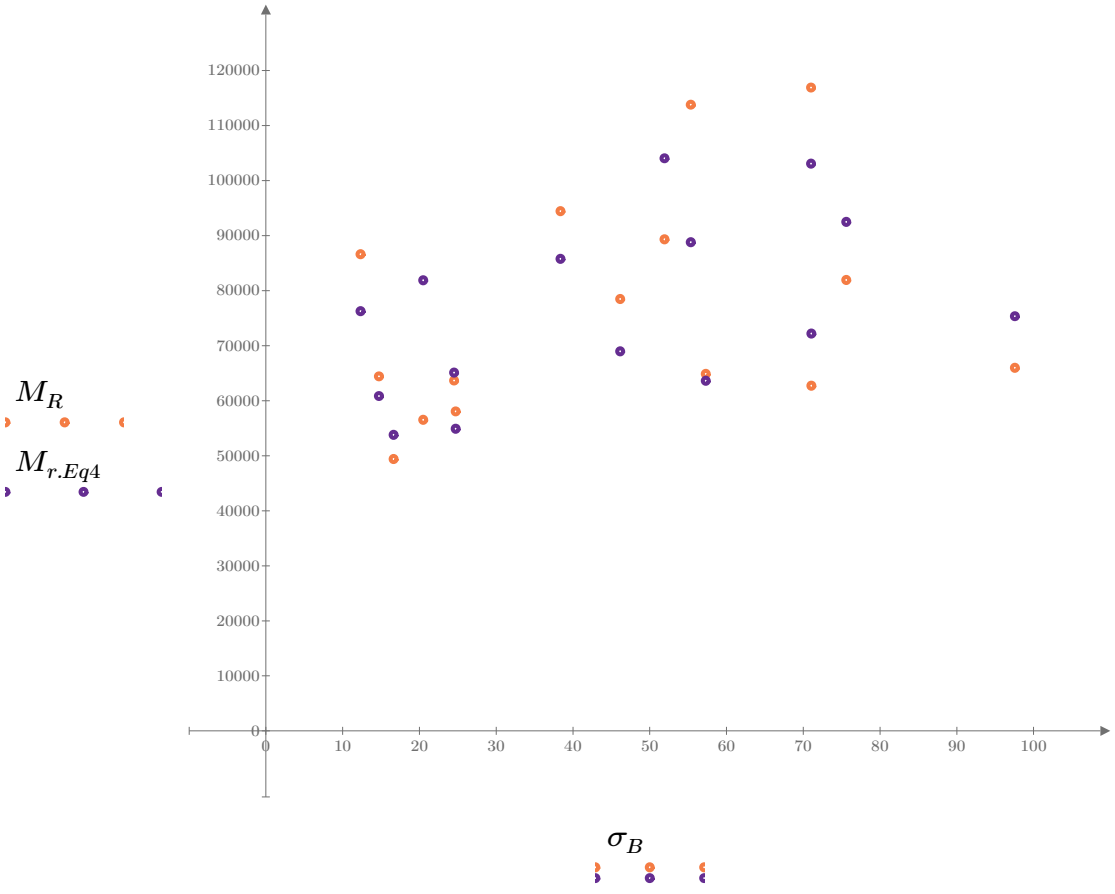

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

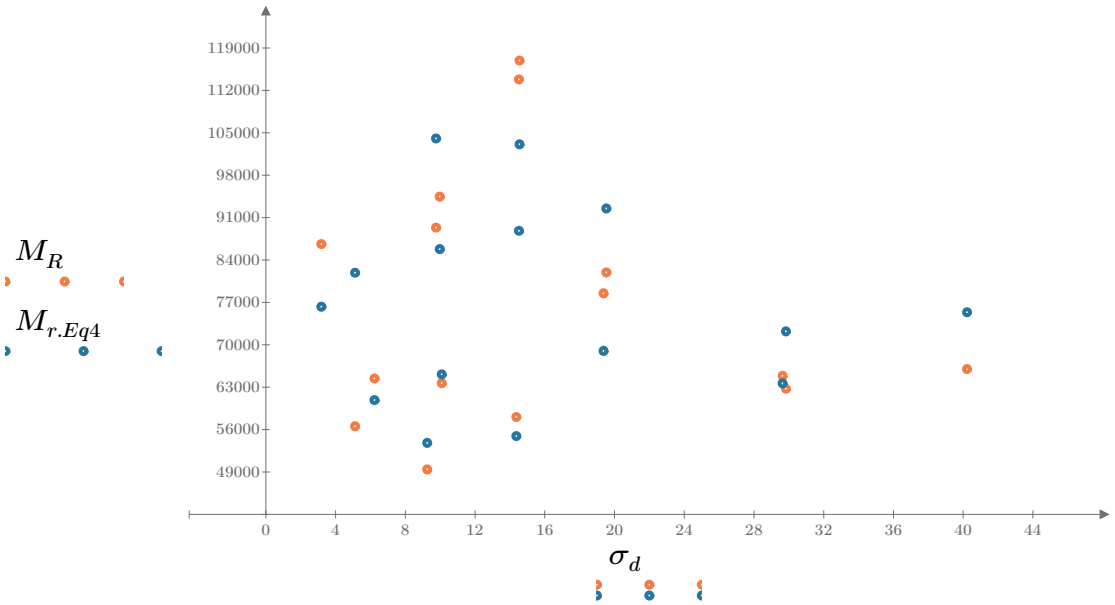

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

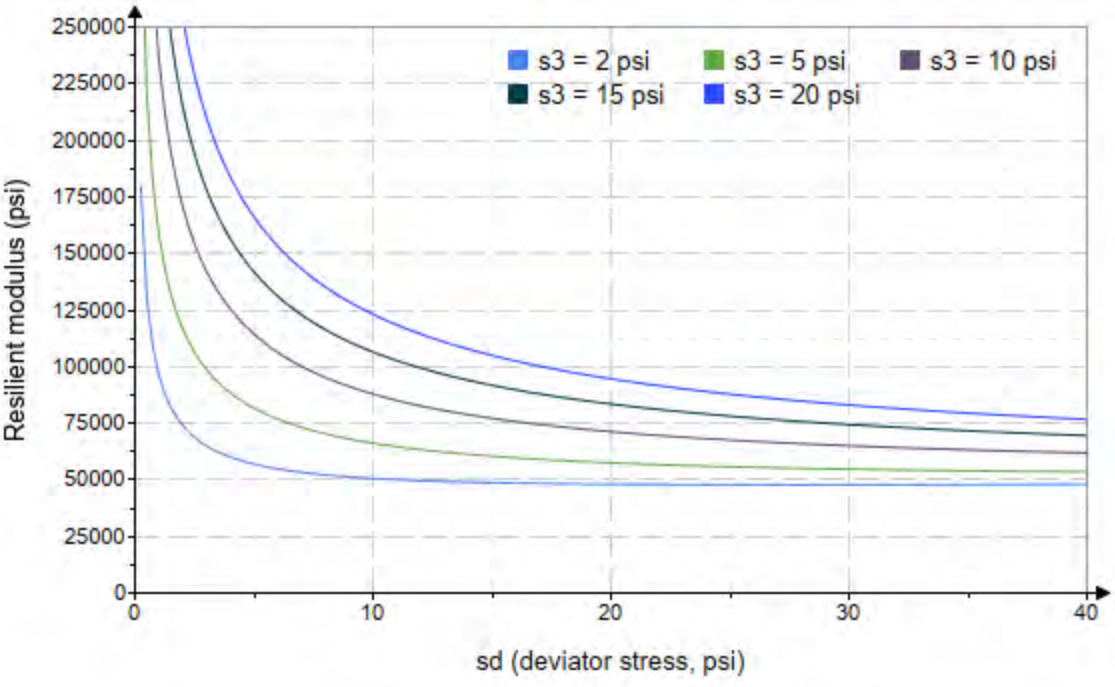

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−66"

$Treatment =$ "D1"

$S = 15.832$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.590 \\ 2.503 \\ 2.488 \\ 4.497 \\ 4.519 \\ 4.478 \\ 9.537 \\ 9.530 \\ 9.543 \\ 14.630 \\ 14.600 \\ 14.630 \\ 19.660 \\ 19.650 \\ 19.650 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.156 \\ 6.211 \\ 9.132 \\ 5.020 \\ 10.050 \\ 14.510 \\ 10.160 \\ 19.140 \\ 29.250 \\ 10.060 \\ 14.460 \\ 29.490 \\ 14.400 \\ 19.510 \\ 39.970 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.930 \\ 13.720 \\ 16.590 \\ 18.510 \\ 23.600 \\ 27.950 \\ 38.770 \\ 47.730 \\ 57.880 \\ 53.950 \\ 58.250 \\ 73.380 \\ 73.370 \\ 78.460 \\ 98.910 \end{bmatrix} \quad M_R = \begin{bmatrix} 39338.6 \\ 30639.0 \\ 28894.8 \\ 31220.8 \\ 32471.2 \\ 36887.8 \\ 61911.4 \\ 56151.8 \\ 55233.6 \\ 67674.4 \\ 60362.4 \\ 60285.8 \\ 55433.4 \\ 59748.2 \\ 62901.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–66”}$

$M_{R.1}\left(\sigma_B, K_1, K_2\right) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 12771.996$

$K_2 = 0.3643$

Equation 1 fitting parameters

${R_1}^2 = 0.7429$ Coefficient of determination

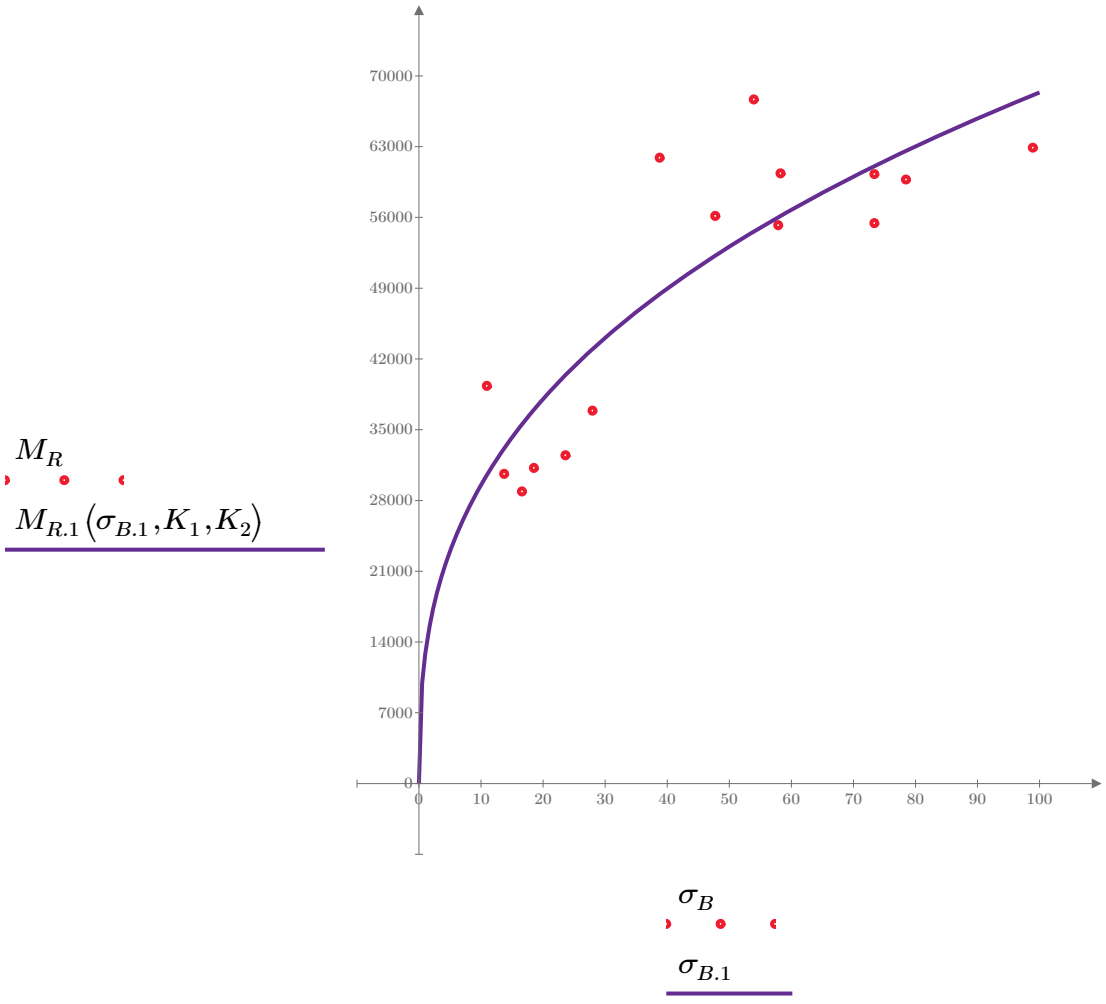

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–66”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 25224.051$

$K_4 = 0.2579$

Equation 2 fitting parameters

${R_2}^2 = 0.3852$ Coefficient of determination

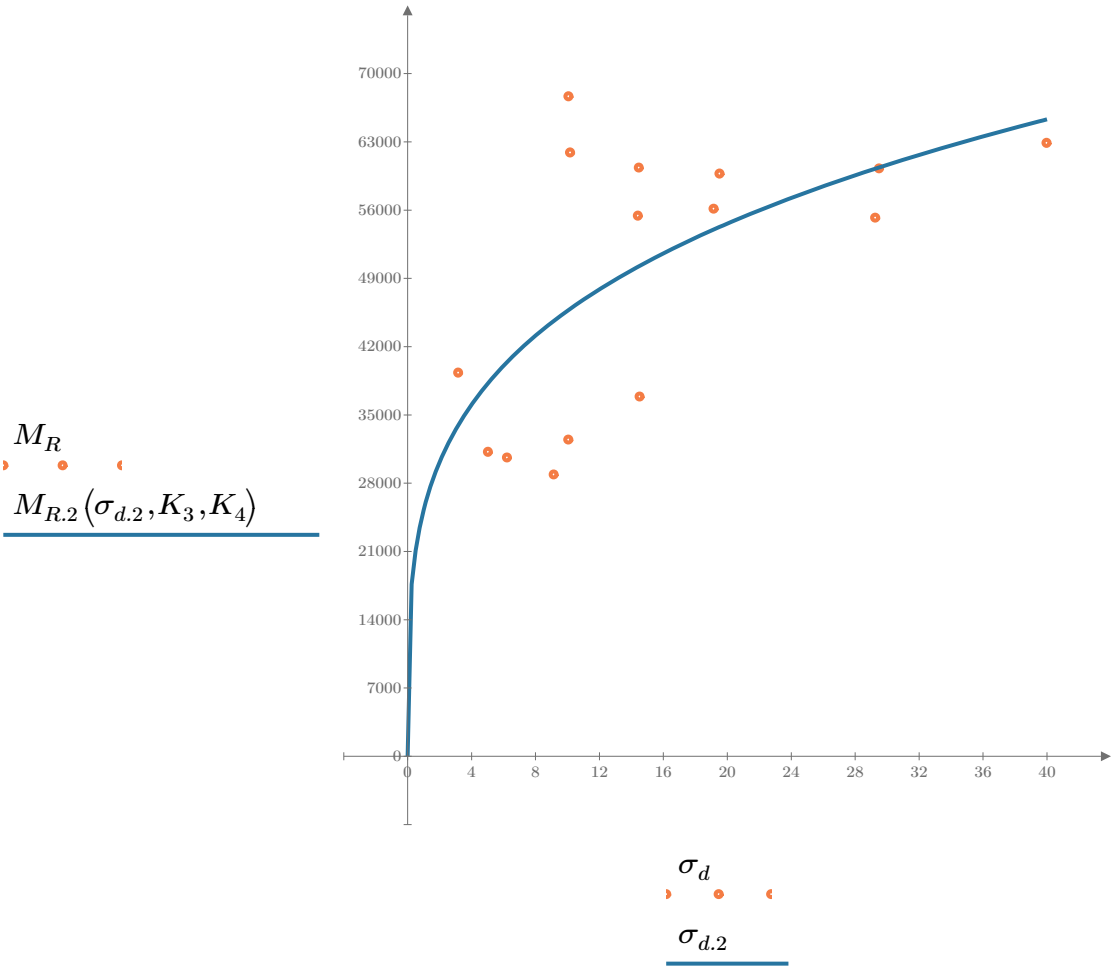

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–66”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 20695.090$

$K_6 = -0.0077$ Equation 3 fitting parameters

$K_7 = 0.3868$

${R_3}^2 = 0.7907$ Coefficient of determination

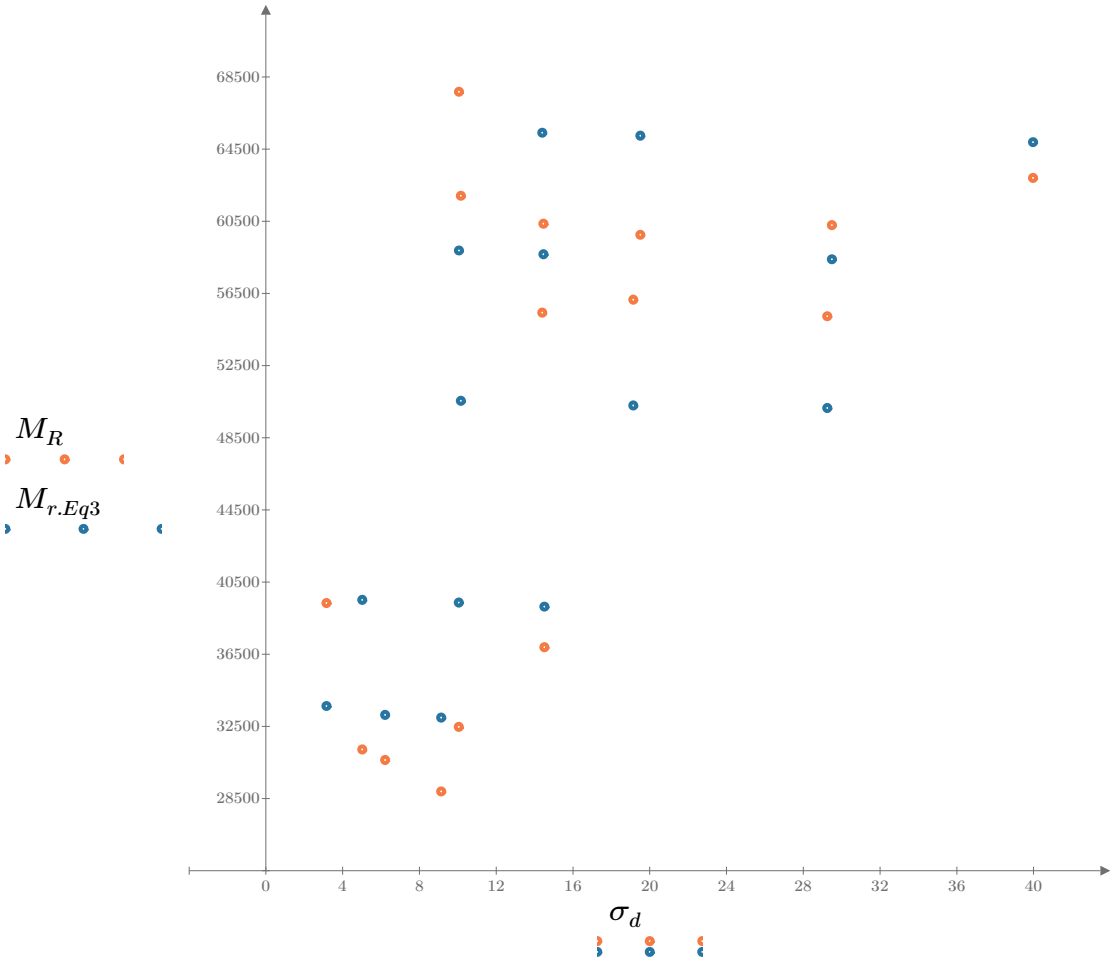

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–66”}$

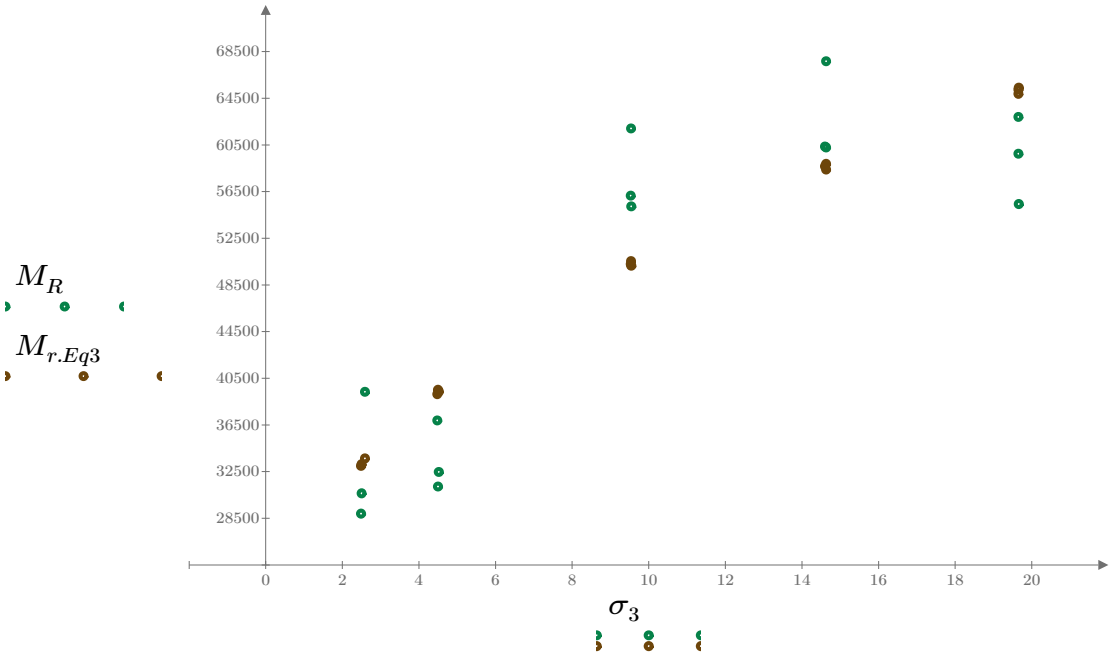

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

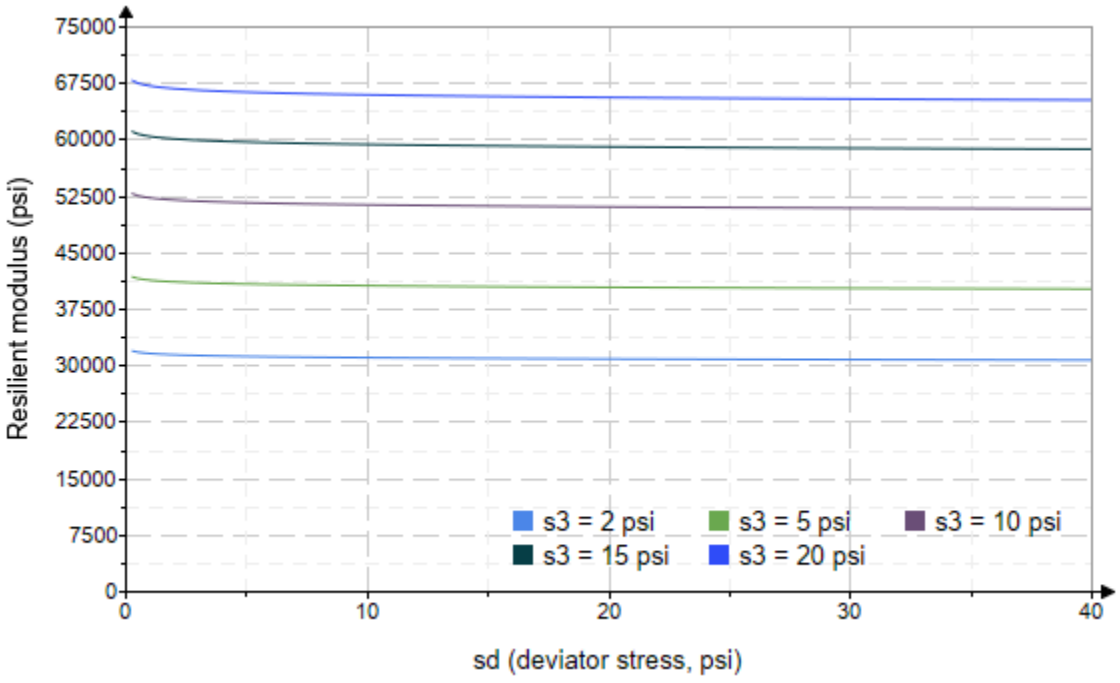

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–66”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1951.689$

$K_9 = 0.5159$ Equation 4 fitting parameters

$K_{10} = -0.1814$

$R_4^{\,2} = 0.7953$ Coefficient of determination

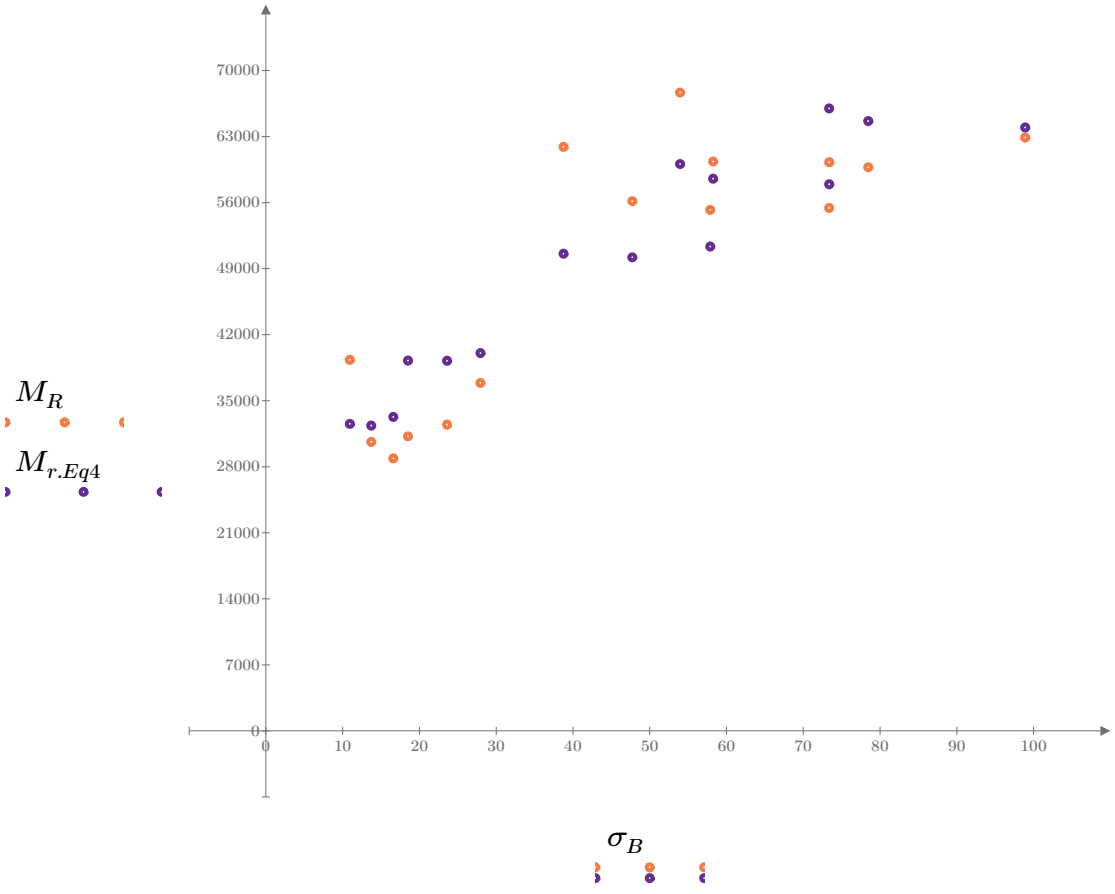

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

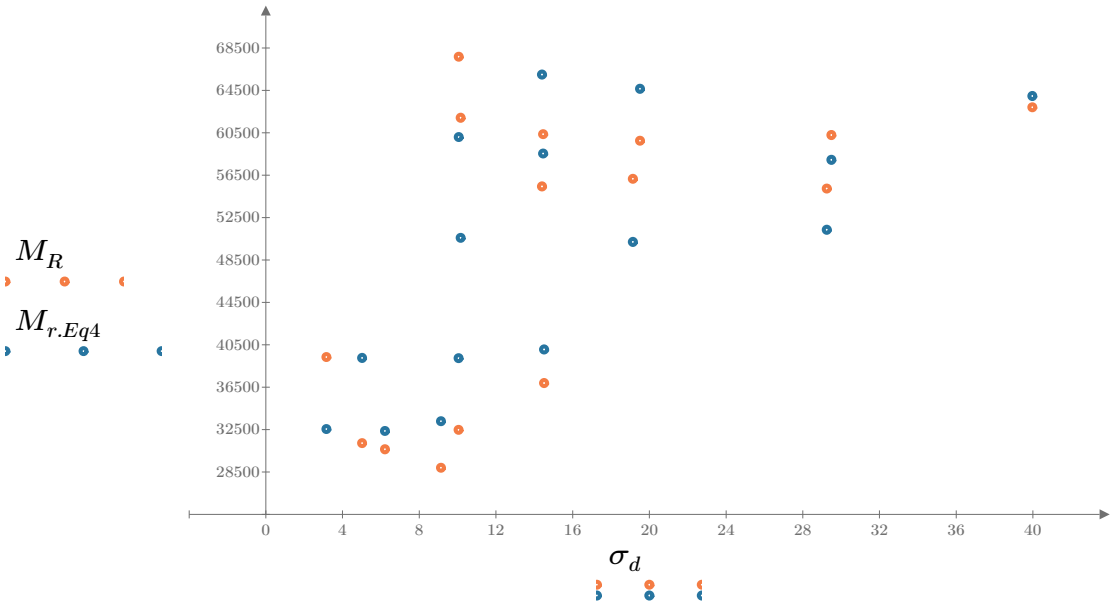

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

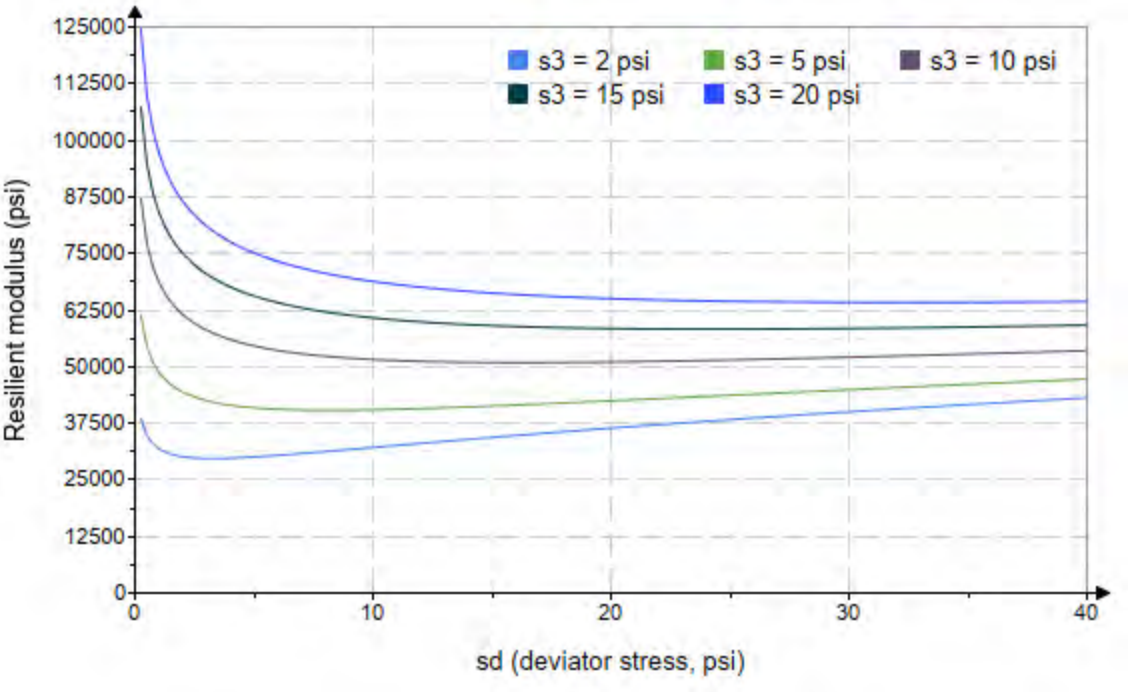

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2–67”}$

$Treatment = \text{“D1”}$

$S = 17.547$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.587 \\ 2.603 \\ 2.602 \\ 4.641 \\ 4.623 \\ 4.582 \\ 9.664 \\ 9.641 \\ 9.582 \\ 14.590 \\ 14.610 \\ 14.570 \\ 19.600 \\ 19.610 \\ 19.610 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.115 \\ 6.081 \\ 9.084 \\ 5.087 \\ 10.030 \\ 14.650 \\ 10.050 \\ 19.360 \\ 29.560 \\ 9.844 \\ 14.380 \\ 29.840 \\ 14.460 \\ 19.560 \\ 40.190 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.880 \\ 13.890 \\ 16.890 \\ 19.010 \\ 23.900 \\ 28.390 \\ 39.040 \\ 48.280 \\ 58.310 \\ 53.620 \\ 58.210 \\ 73.550 \\ 73.260 \\ 78.390 \\ 99.010 \end{bmatrix} \quad M_R = \begin{bmatrix} 60856.0 \\ 31357.6 \\ 26111.0 \\ 27987.2 \\ 29863.4 \\ 29161.0 \\ 69331.6 \\ 47711.4 \\ 43250.0 \\ 90911.6 \\ 58780.0 \\ 59931.8 \\ 80991.2 \\ 73880.4 \\ 53364.2 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–67”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 13875.191$

$K_2 = 0.3569$

Equation 1 fitting parameters

$R_1^2 = 0.3441$ Coefficient of determination

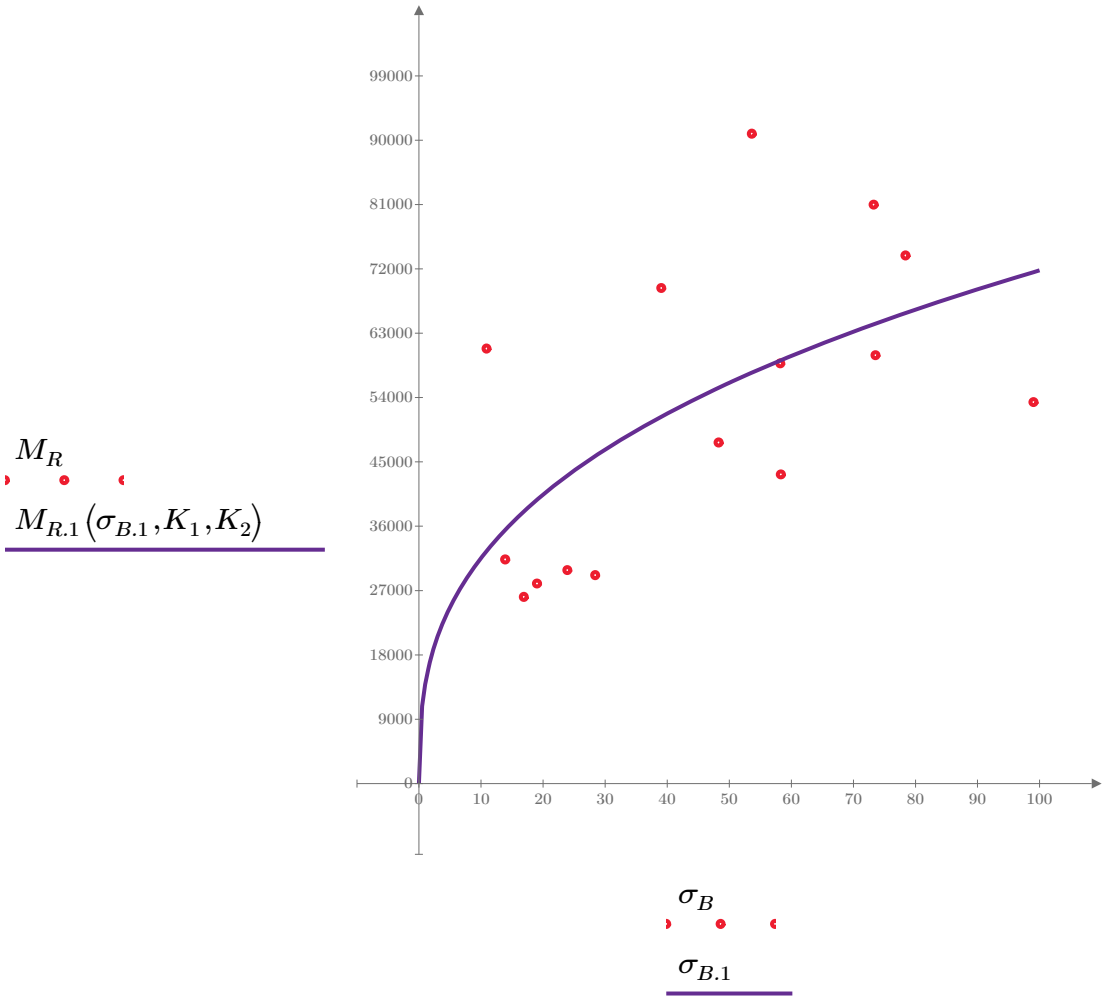

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–67”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 40898.498$

$K_4 = 0.0955$ Equation 2 fitting parameters

${R_2}^2 = 0.0281$ Coefficient of determination

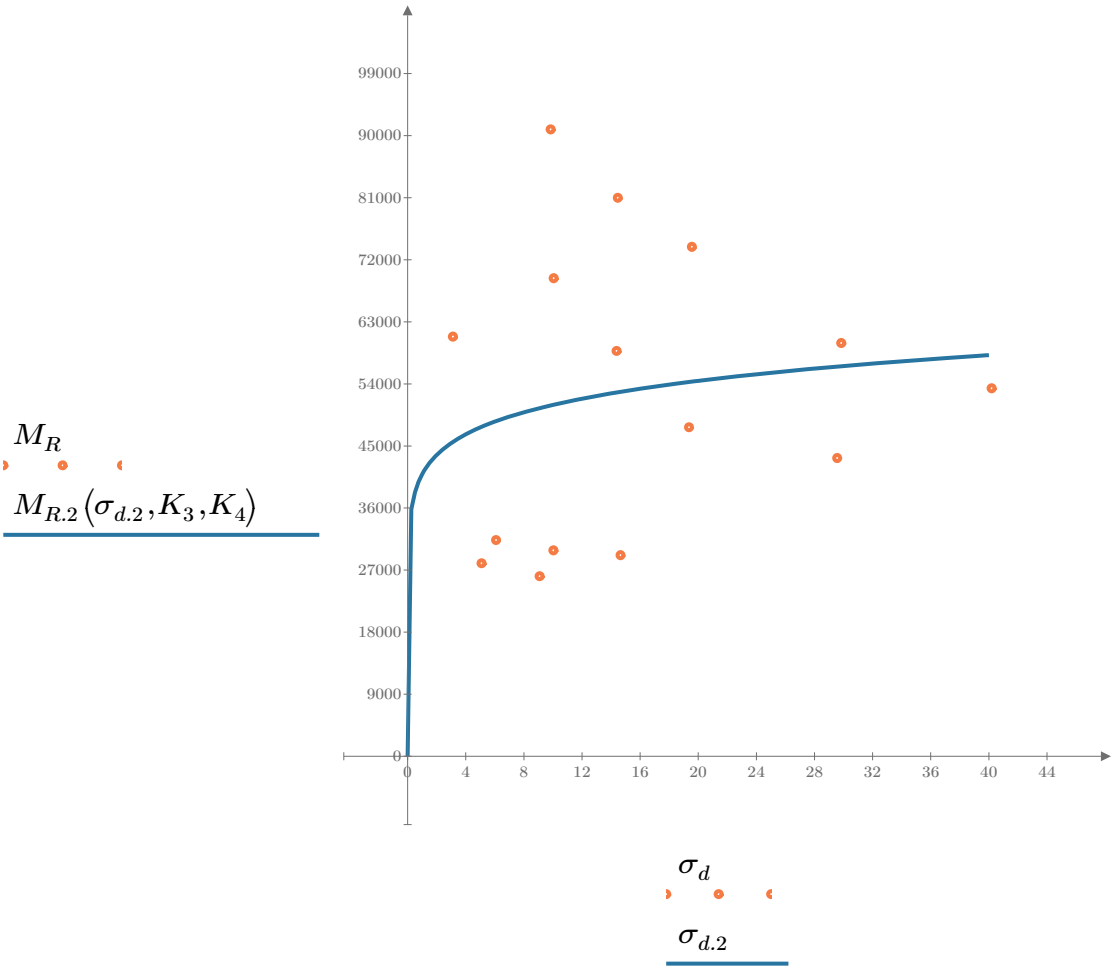

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–67”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 26669.590$

$K_6 = -0.4234$ Equation 3 fitting parameters

$K_7 = 0.7584$

${R_3}^2 = 0.7930$ Coefficient of determination

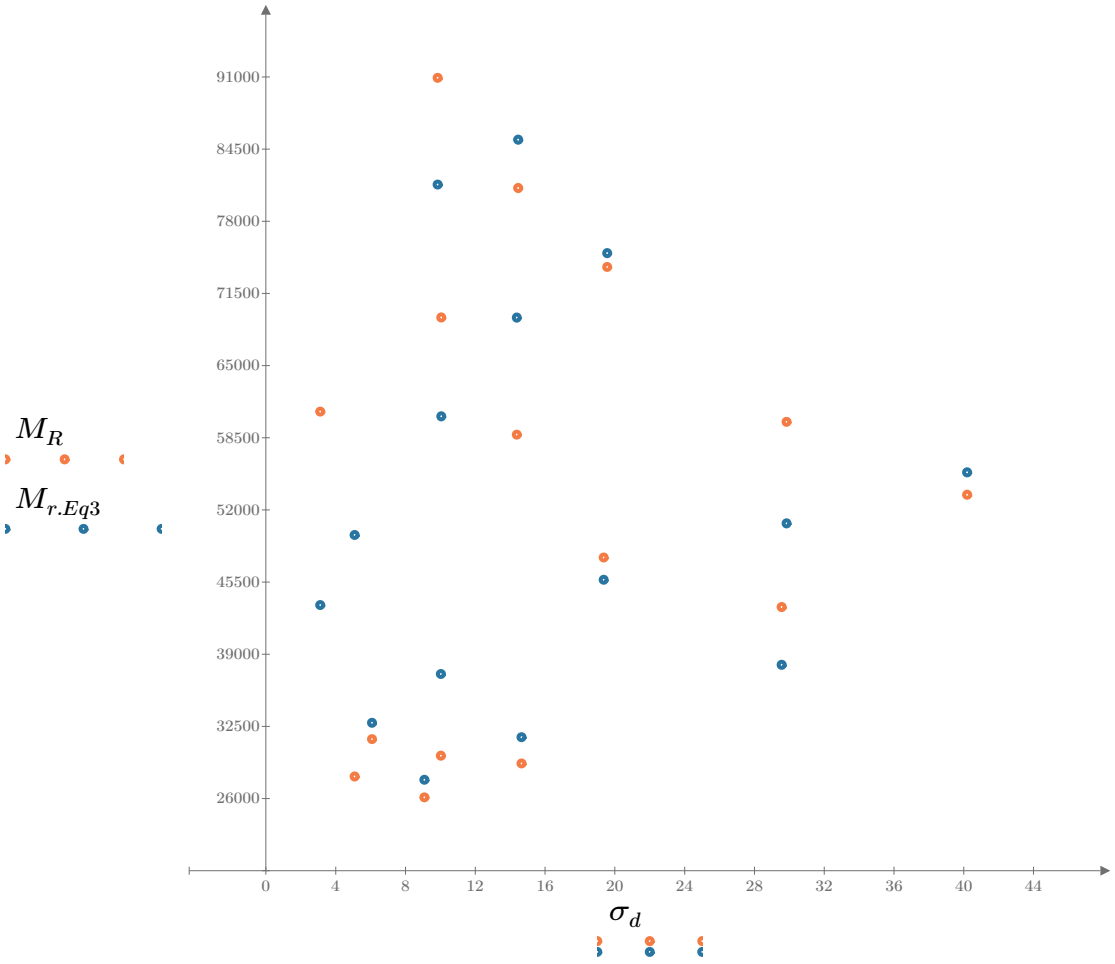

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–67”}$

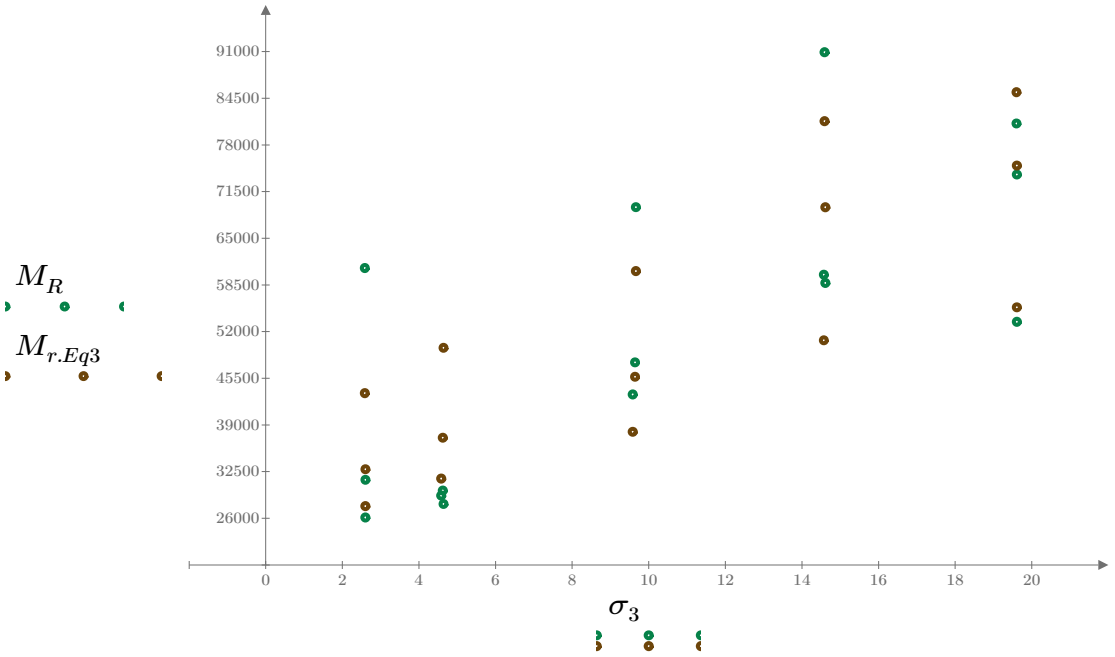

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

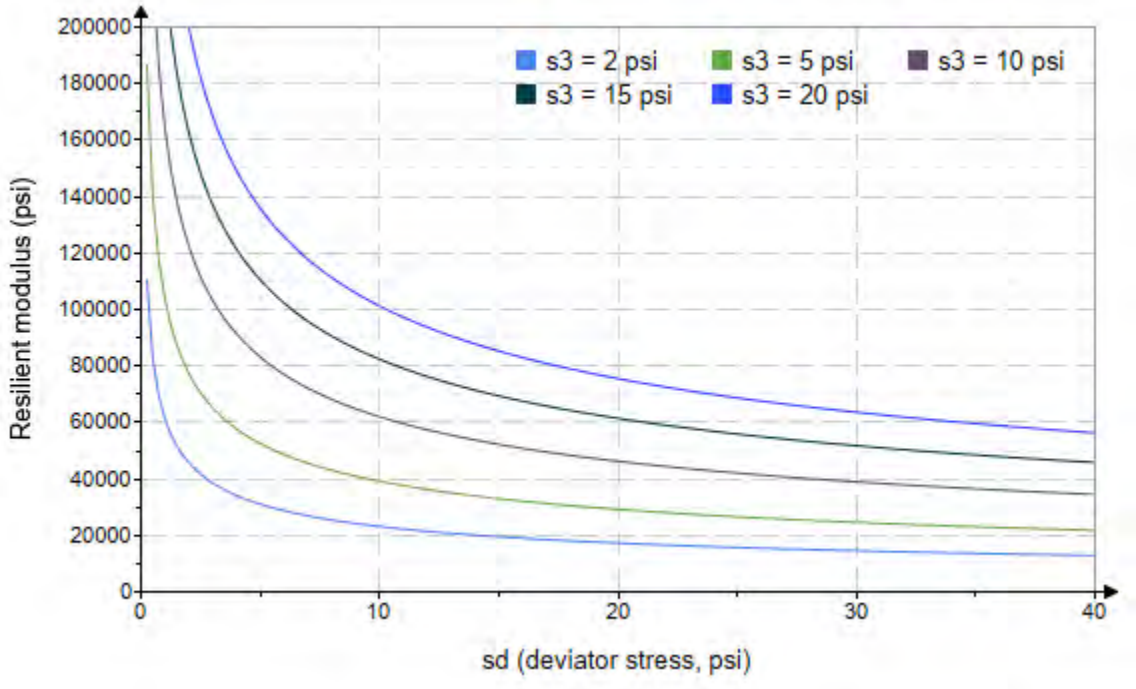

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–67”}$

$$M_{R.4}(\sigma_B, \sigma_d, K_8, K_9, K_{10}) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1189.254$

$K_9 = 0.9822$ Equation 4 fitting parameters

$K_{10} = -0.7392$

$R_4^{\,2} = 0.7894$ Coefficient of determination

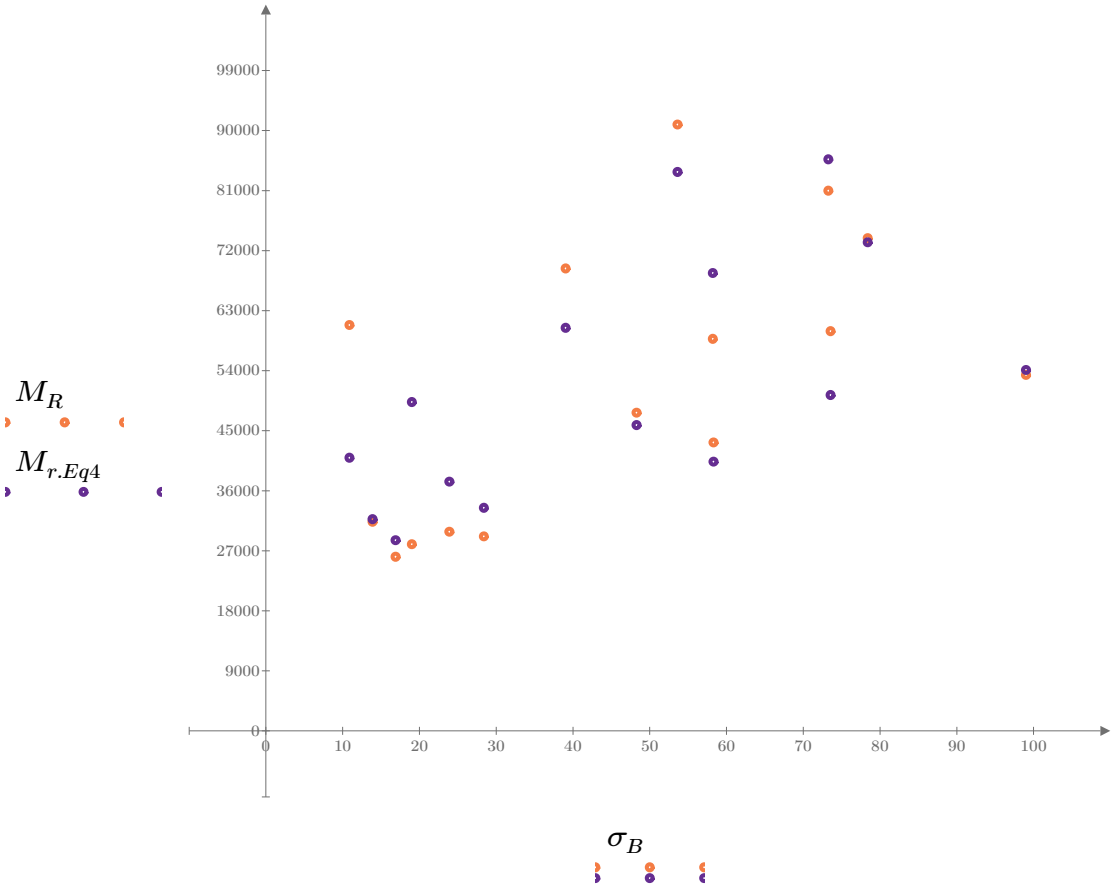

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

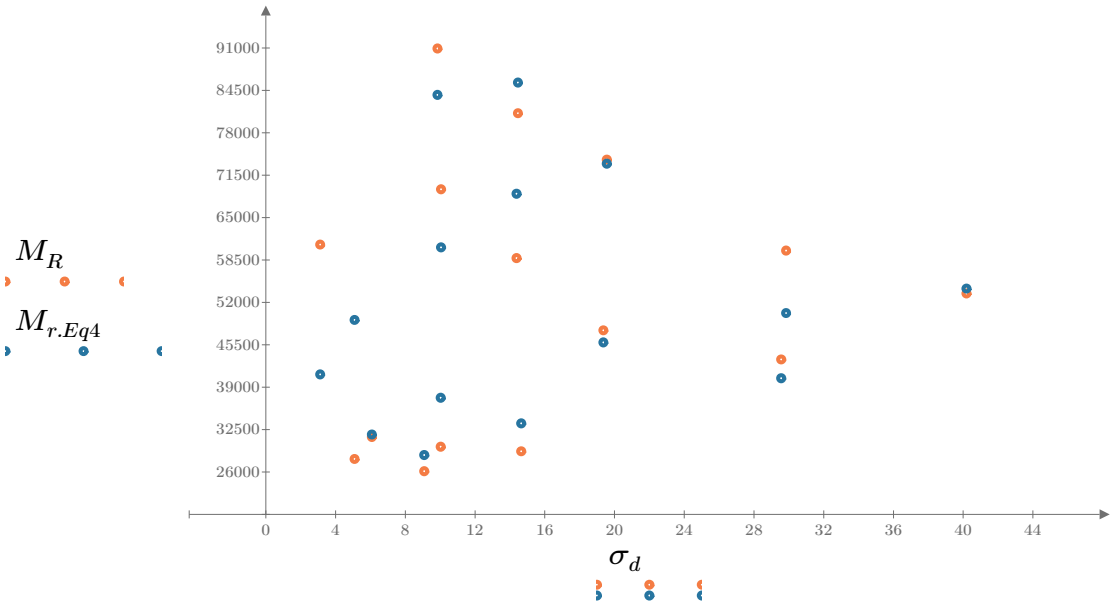

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

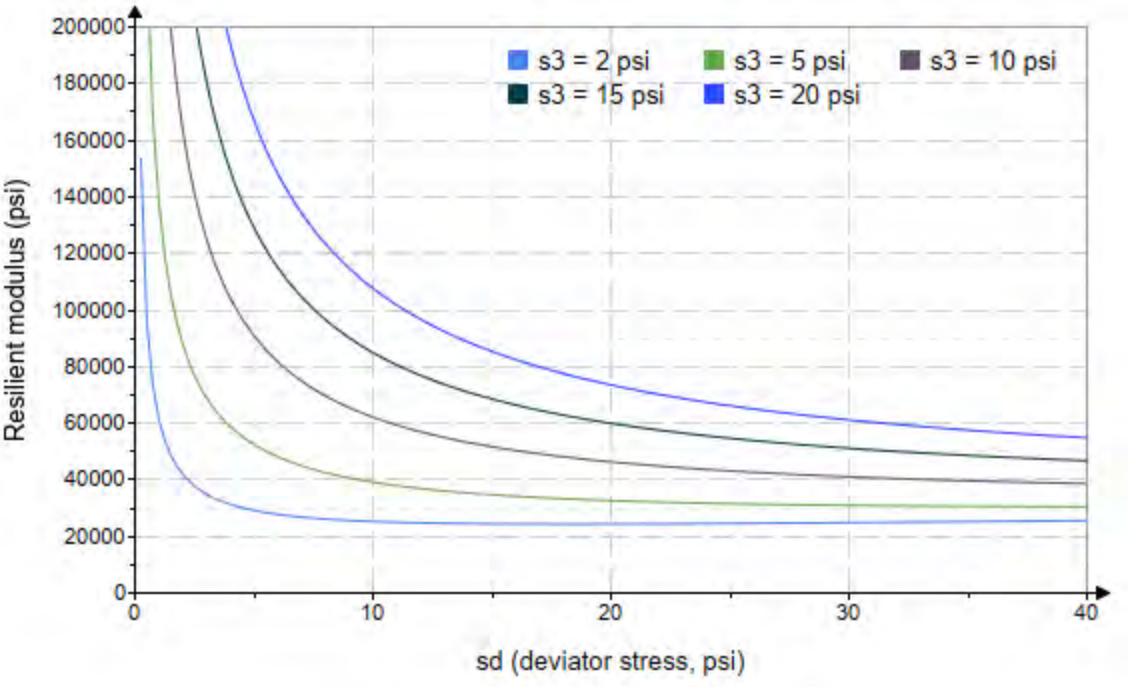

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2–68”}$

$Treatment = \text{“W1”}$

$S = 17.781$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.857 \\ 2.865 \\ 2.677 \\ 4.615 \\ 4.638 \\ 4.595 \\ 9.653 \\ 9.599 \\ 9.626 \\ 14.630 \\ 14.620 \\ 14.650 \\ 19.630 \\ 19.670 \\ 19.670 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.145 \\ 6.069 \\ 9.075 \\ 5.214 \\ 10.040 \\ 14.620 \\ 10.090 \\ 19.270 \\ 29.110 \\ 10.280 \\ 14.540 \\ 29.300 \\ 14.580 \\ 19.360 \\ 39.720 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.720 \\ 14.660 \\ 17.110 \\ 19.060 \\ 23.950 \\ 28.400 \\ 39.050 \\ 48.070 \\ 57.990 \\ 54.180 \\ 58.410 \\ 73.270 \\ 73.470 \\ 78.360 \\ 98.710 \end{bmatrix} \quad M_R = \begin{bmatrix} 31701.4 \\ 32391.2 \\ 31721.8 \\ 57206.4 \\ 41539.8 \\ 42078.6 \\ 58614.8 \\ 49536.4 \\ 49642.2 \\ 77194.6 \\ 62634.2 \\ 56159.8 \\ 75238.6 \\ 65912.0 \\ 59838.2 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–68”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 16055.255$

$K_2 = 0.3208$

Equation 1 fitting parameters

${R_1}^2 = 0.5910$ Coefficient of determination

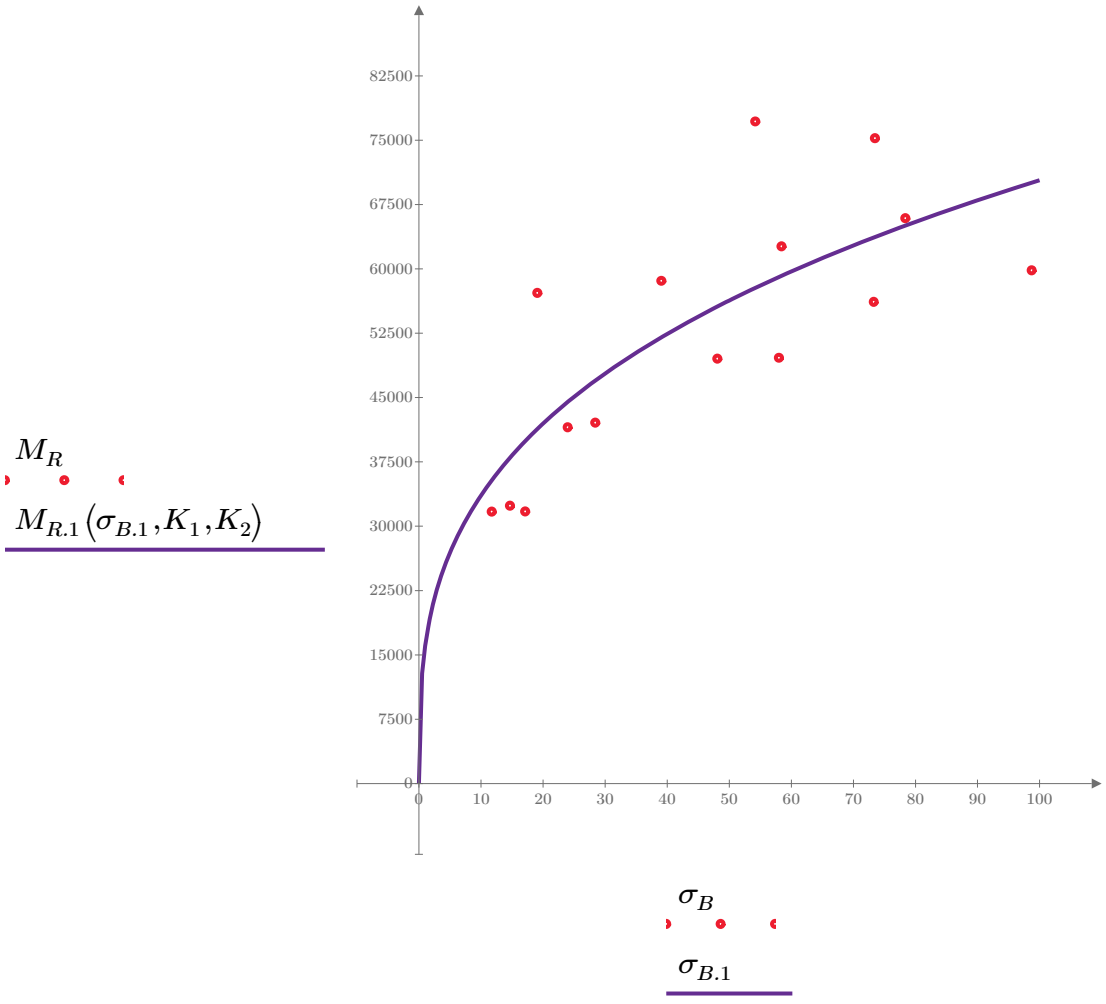

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–68”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 35246.863$

$K_4 = 0.1567$ Equation 2 fitting parameters

${R_2}^2 = 0.1591$ Coefficient of determination

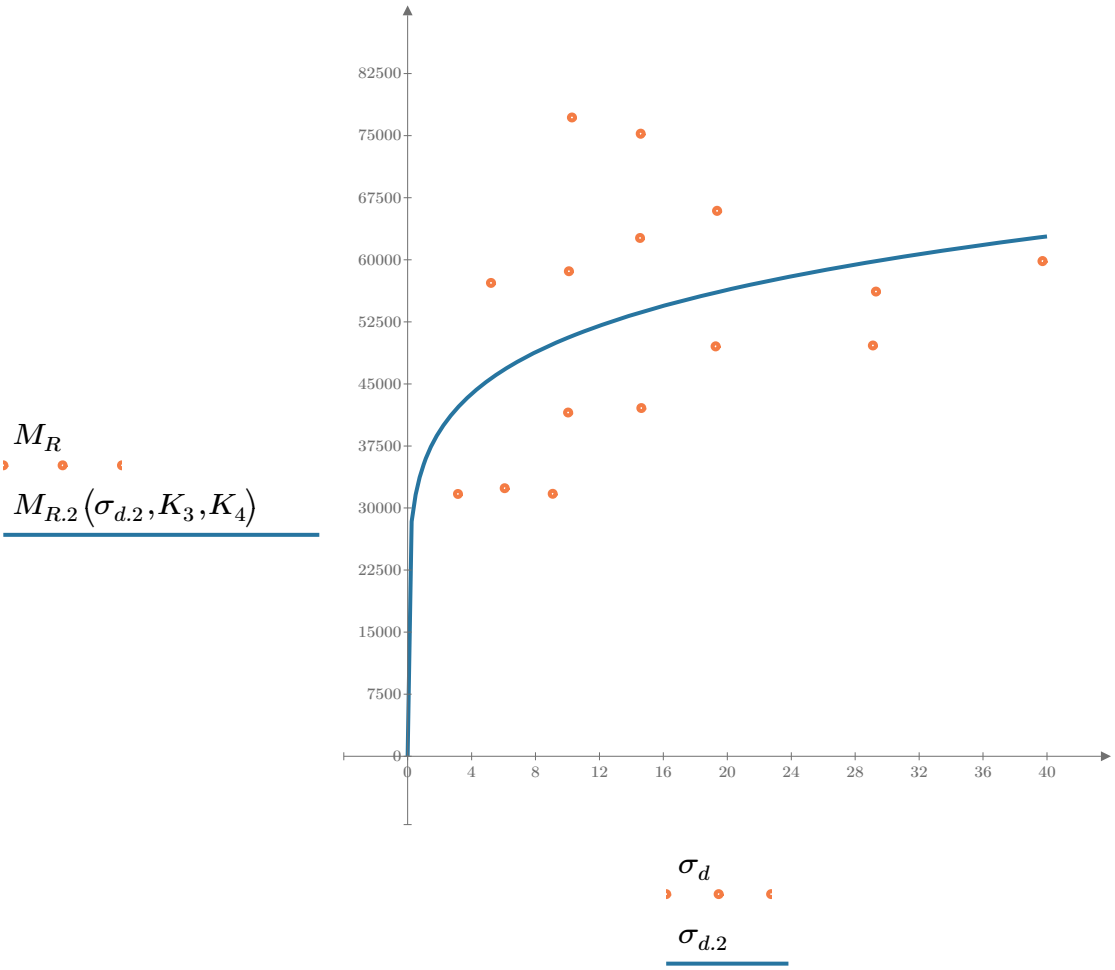

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–68”}$

$$M_{R.3}(\sigma_d, \sigma_3, K_5, K_6, K_7) := K_5 \cdot {\sigma_d}^{K_6} \cdot (1 + \sigma_3)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 26004.577$

$K_6 = -0.2041$ Equation 3 fitting parameters

$K_7 = 0.5333$

${R_3}^2 = 0.8771$ Coefficient of determination

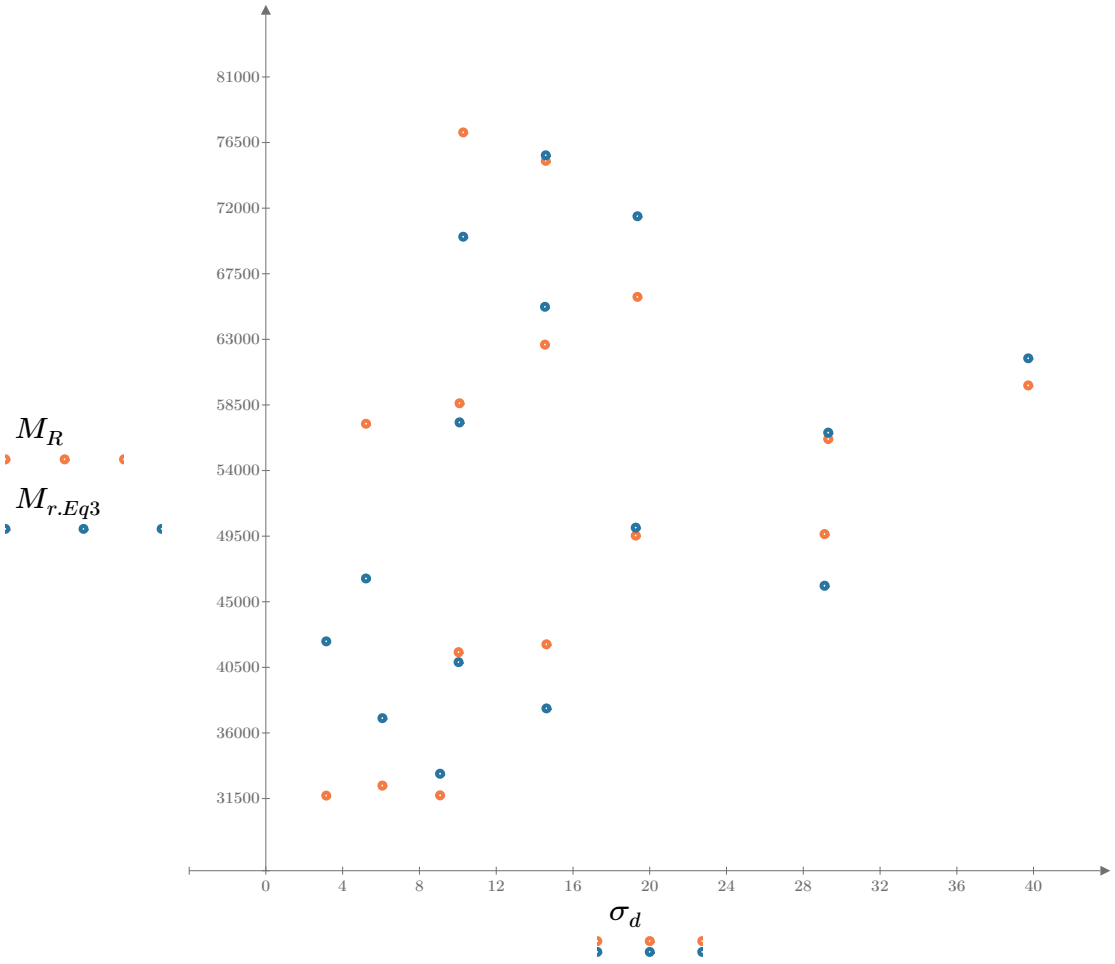

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–68”}$

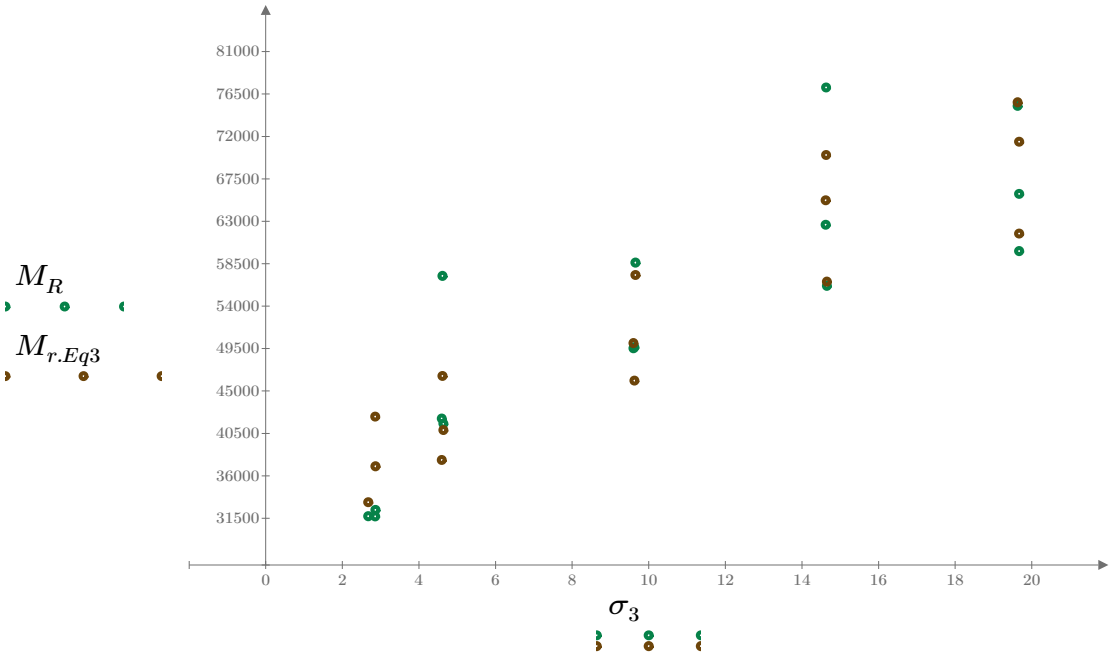

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

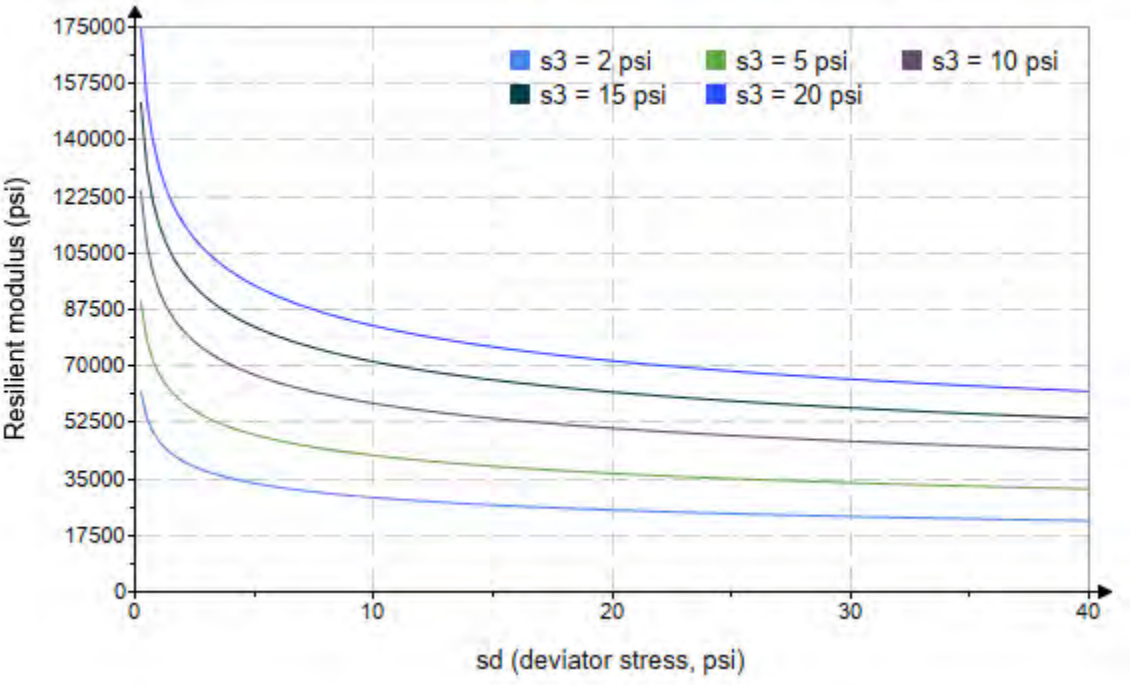

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–68”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1648.461$

$K_9 = 0.7128$ Equation 4 fitting parameters

$K_{10} = -0.4474$

$R_4^{\,2} = 0.9032$ Coefficient of determination

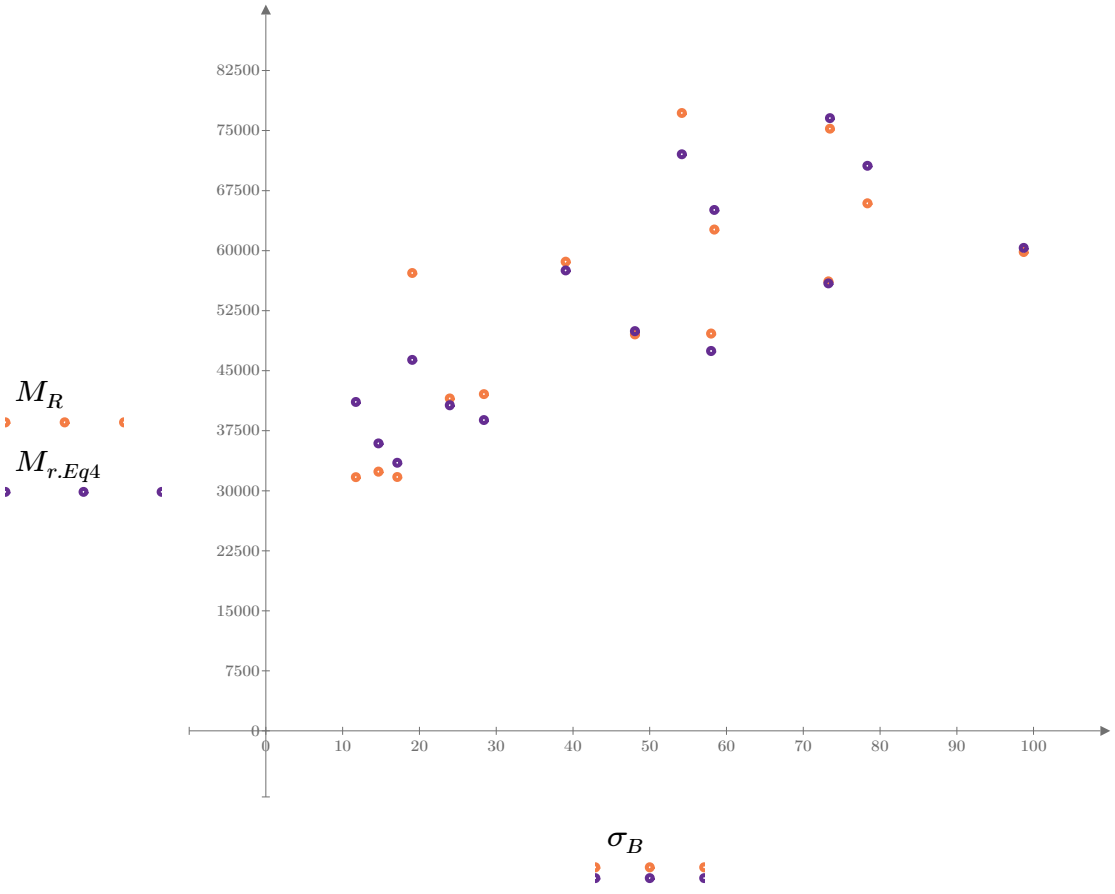

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

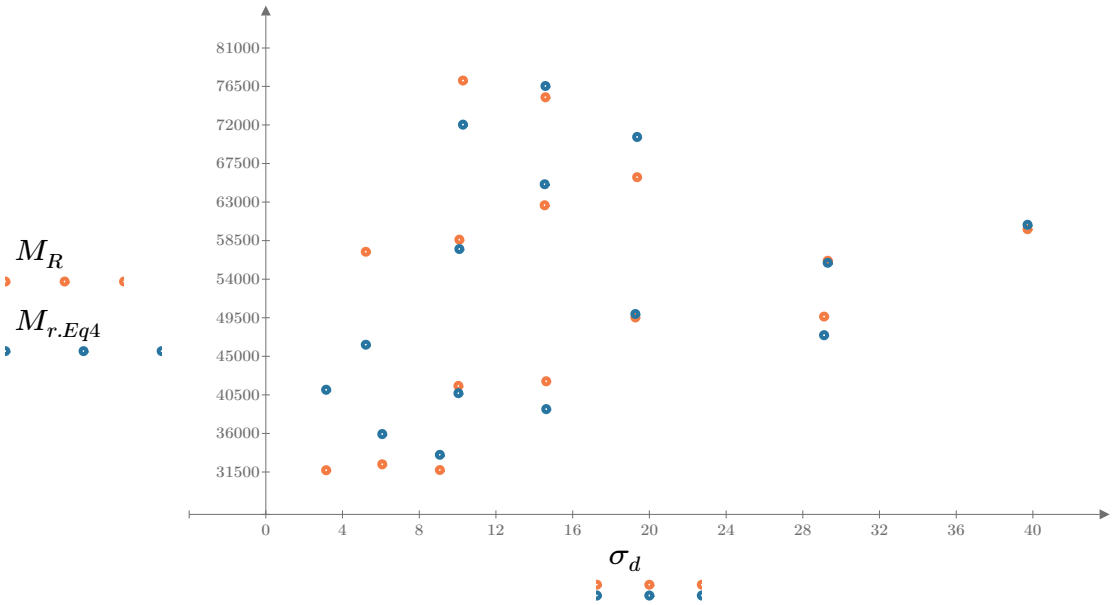

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

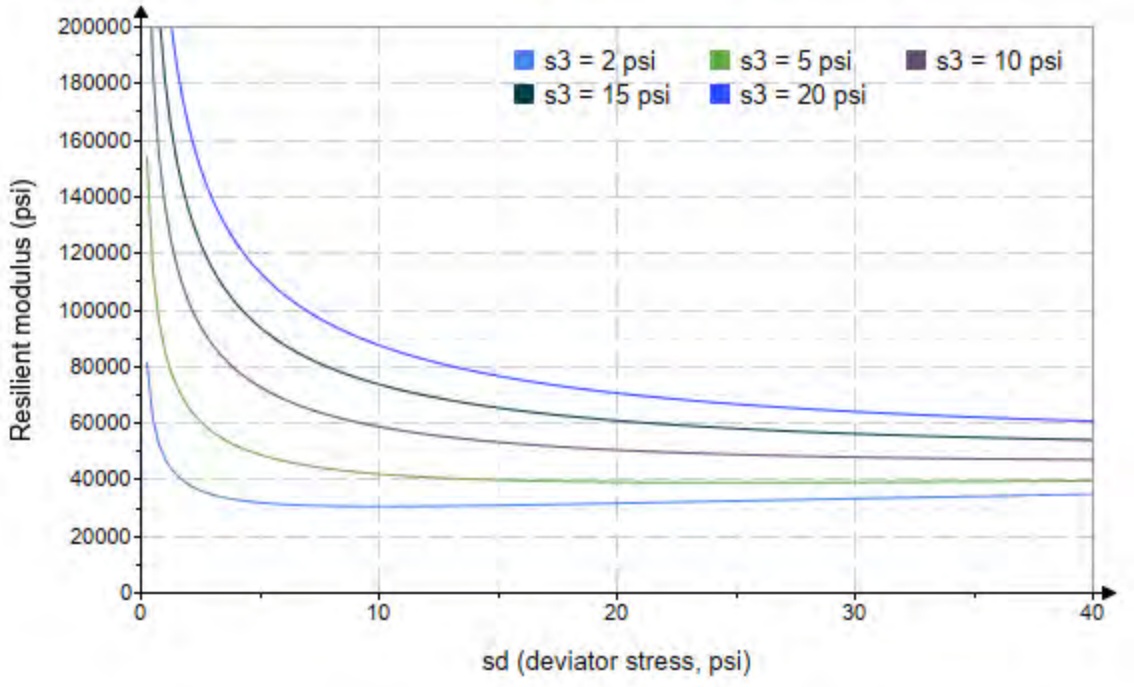

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−69"

$Treatment =$ "W1"

$S = 18.503$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.322 \\ 1.935 \\ 2.266 \\ 3.954 \\ 4.222 \\ 4.264 \\ 9.465 \\ 8.992 \\ 8.864 \\ 15.120 \\ 14.240 \\ 14.500 \\ 19.140 \\ 19.040 \\ 19.400 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.390 \\ 6.060 \\ 9.045 \\ 5.382 \\ 9.981 \\ 14.380 \\ 9.908 \\ 19.460 \\ 29.500 \\ 10.070 \\ 14.380 \\ 29.640 \\ 14.580 \\ 19.570 \\ 39.910 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.350 \\ 11.860 \\ 15.840 \\ 17.240 \\ 22.650 \\ 27.170 \\ 38.300 \\ 46.440 \\ 56.090 \\ 55.420 \\ 57.100 \\ 73.150 \\ 72.010 \\ 76.680 \\ 98.100 \end{bmatrix} \quad M_R = \begin{bmatrix} 71820.6 \\ 49482.0 \\ 37849.0 \\ 49614.5 \\ 61380.0 \\ 45652.4 \\ 109965.6 \\ 54615.4 \\ 58759.2 \\ 96059.6 \\ 133360.0 \\ 81189.4 \\ 254558.0 \\ 157348.0 \\ 57492.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–69”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 14792.009$

$K_2 = 0.4811$

Equation 1 fitting parameters

$R_1^2 = 0.2515$ Coefficient of determination

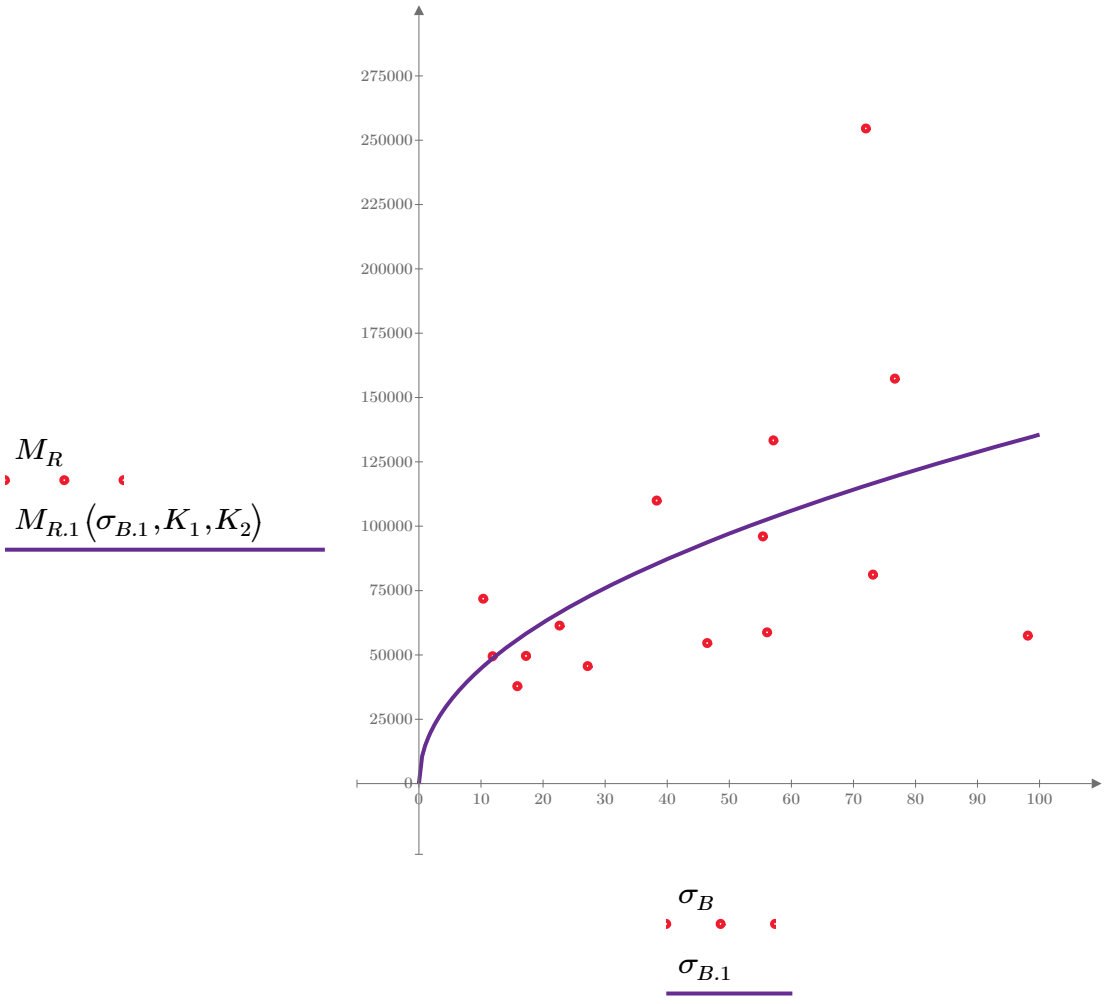

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–69”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 67482.483$

$K_4 = 0.1032$

Equation 2 fitting parameters

${R_2}^2 = 0.0144$ Coefficient of determination

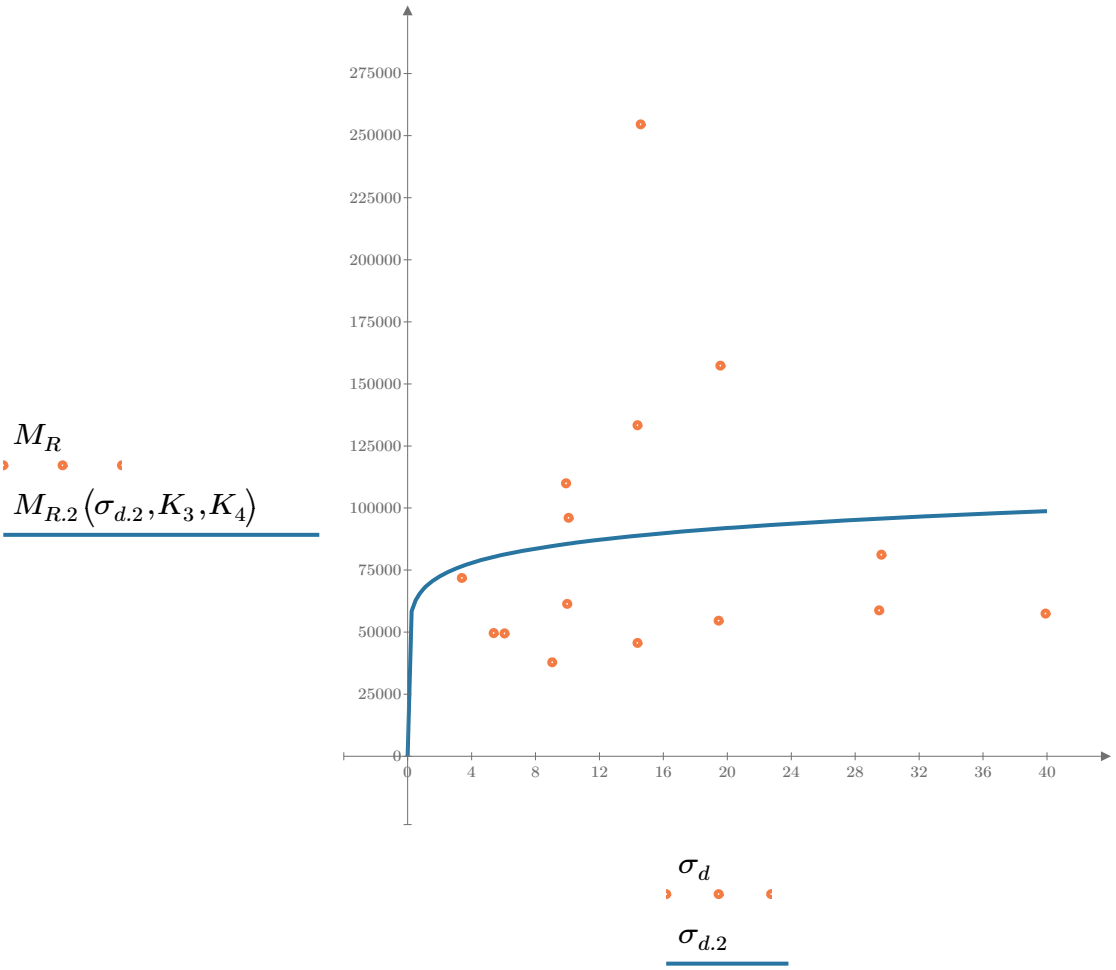

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–69”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 29745.993$

$K_6 = -0.6115$ Equation 3 fitting parameters

$K_7 = 1.1394$

${R_3}^2 = 0.6820$ Coefficient of determination

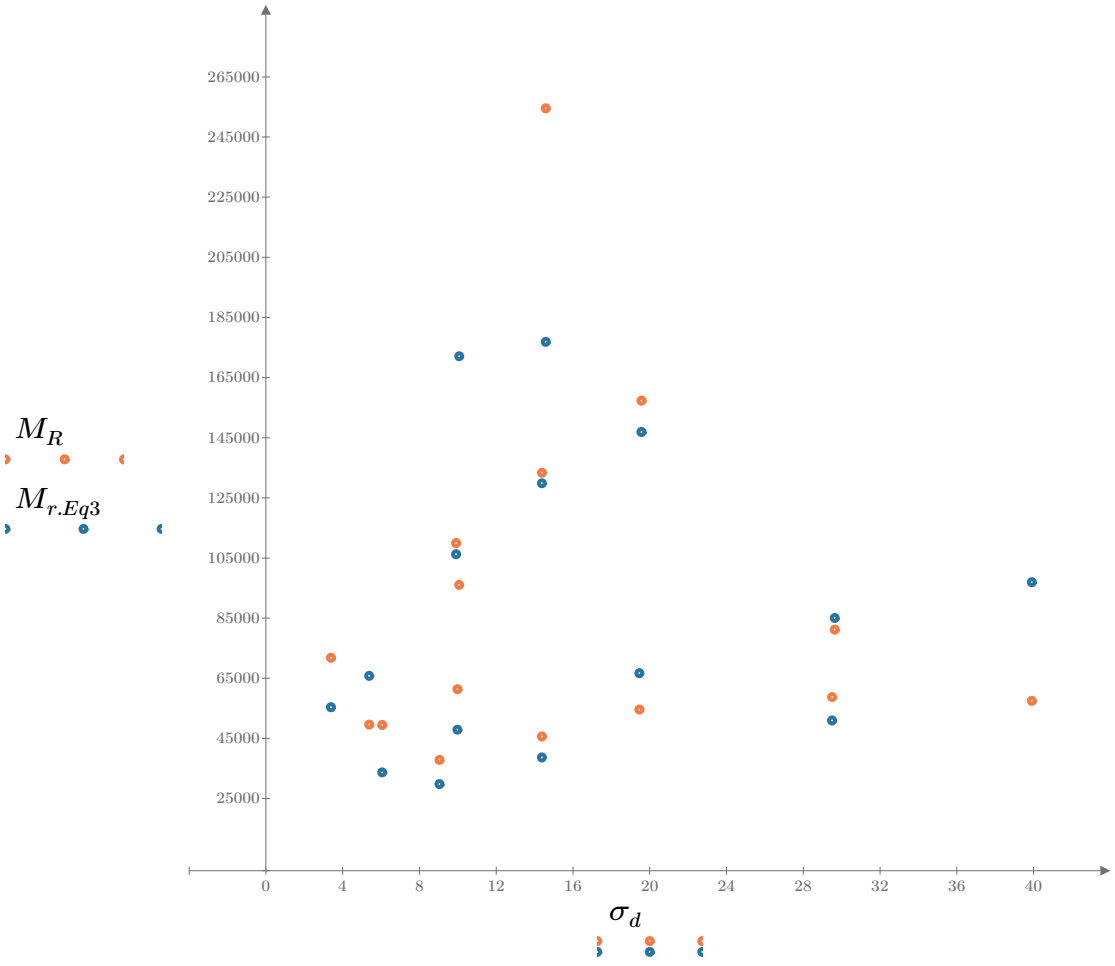

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–69”}$

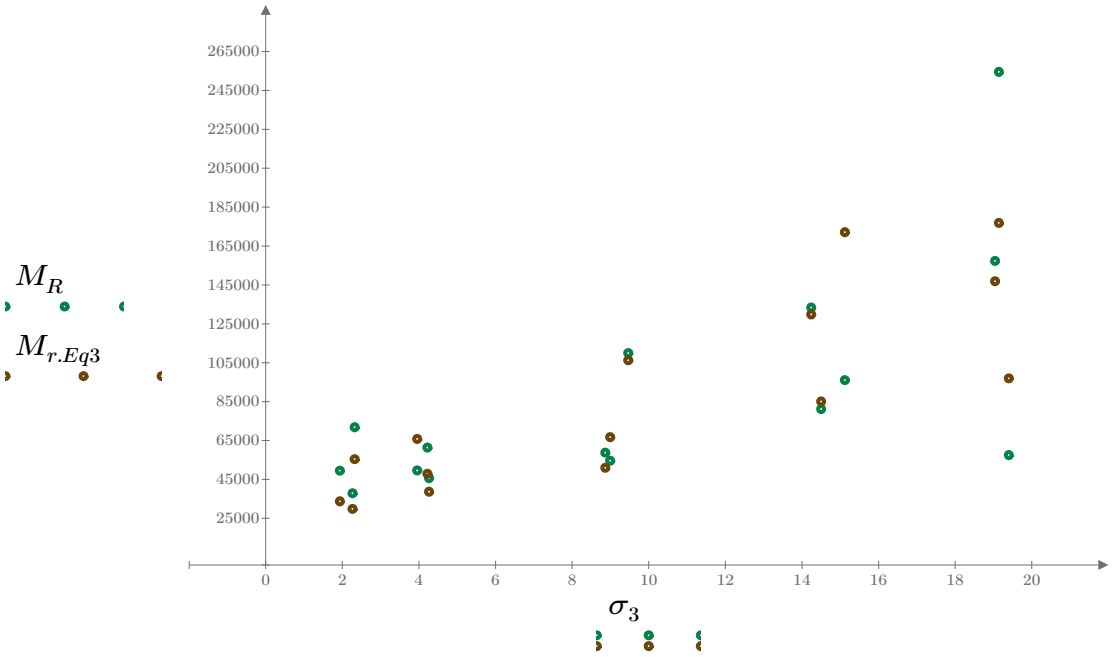

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

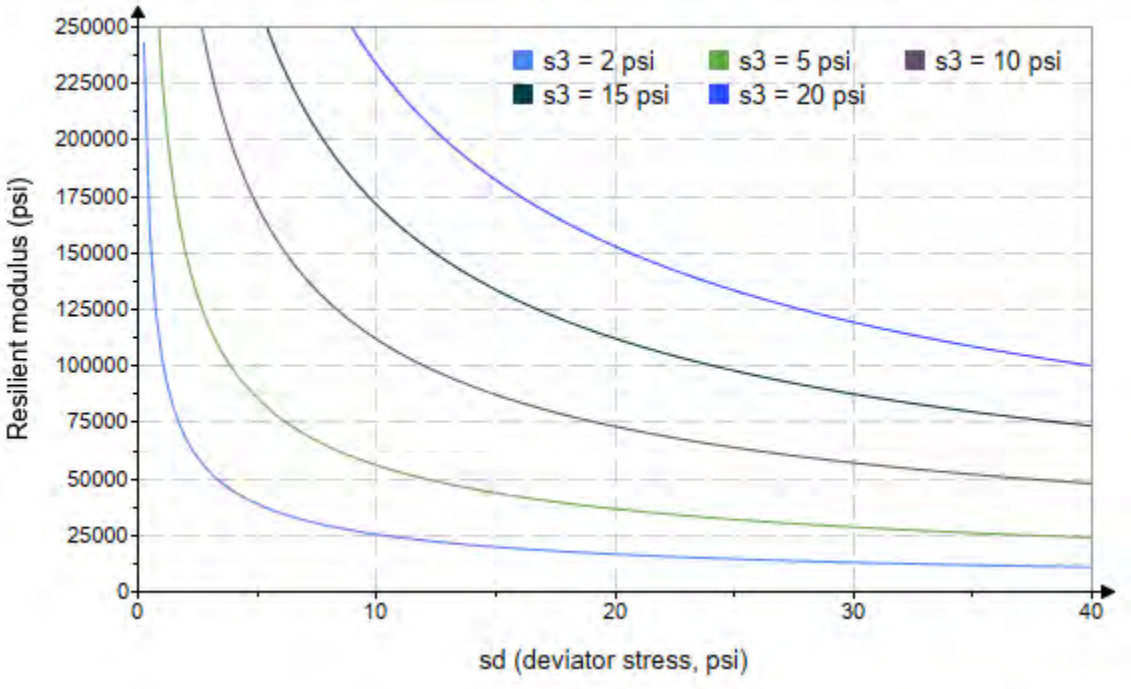

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–69”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1241.035$

$K_9 = 1.4138$ Equation 4 fitting parameters

$K_{10} = -1.0273$

$R_4^{\,2} = 0.6560$ Coefficient of determination

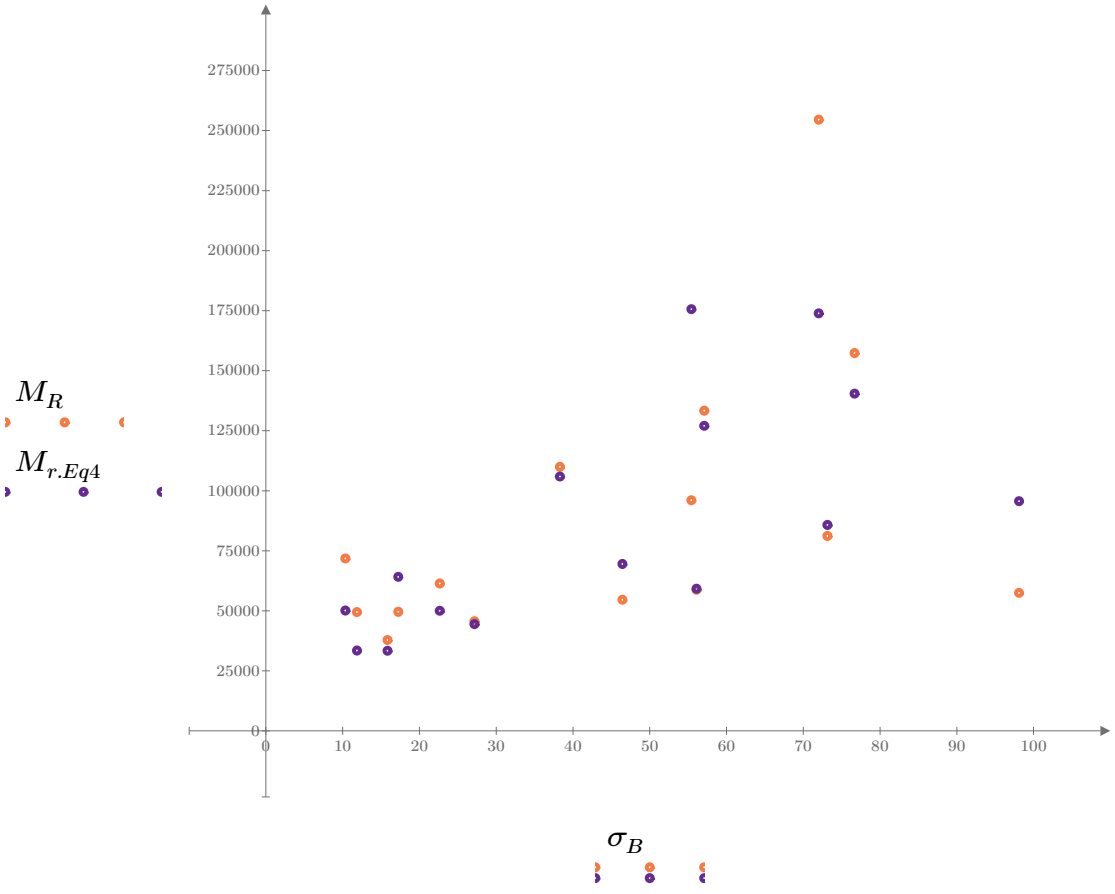

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

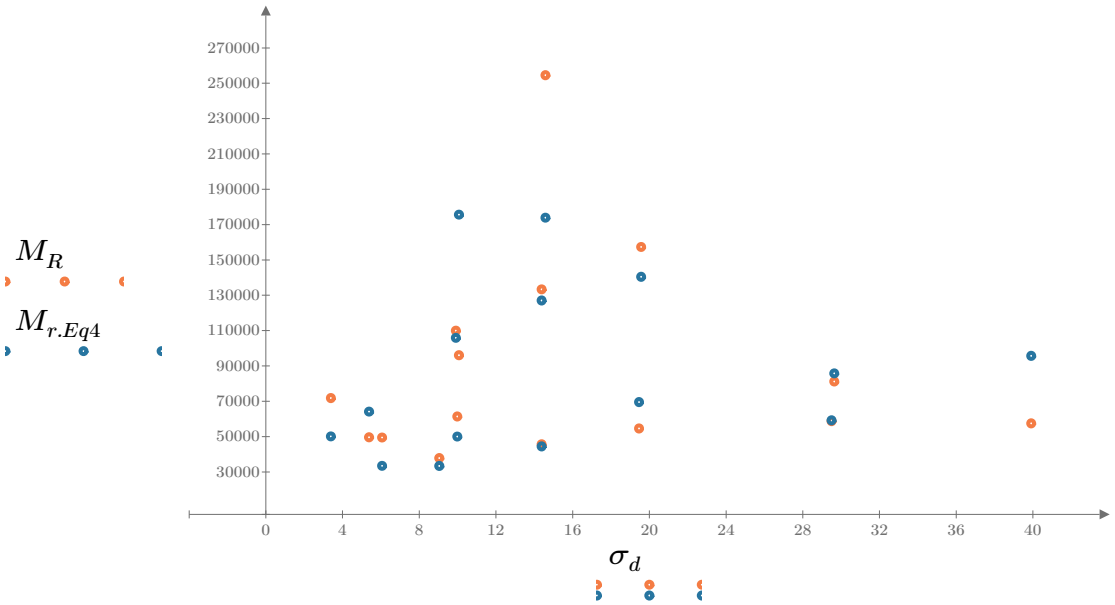

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

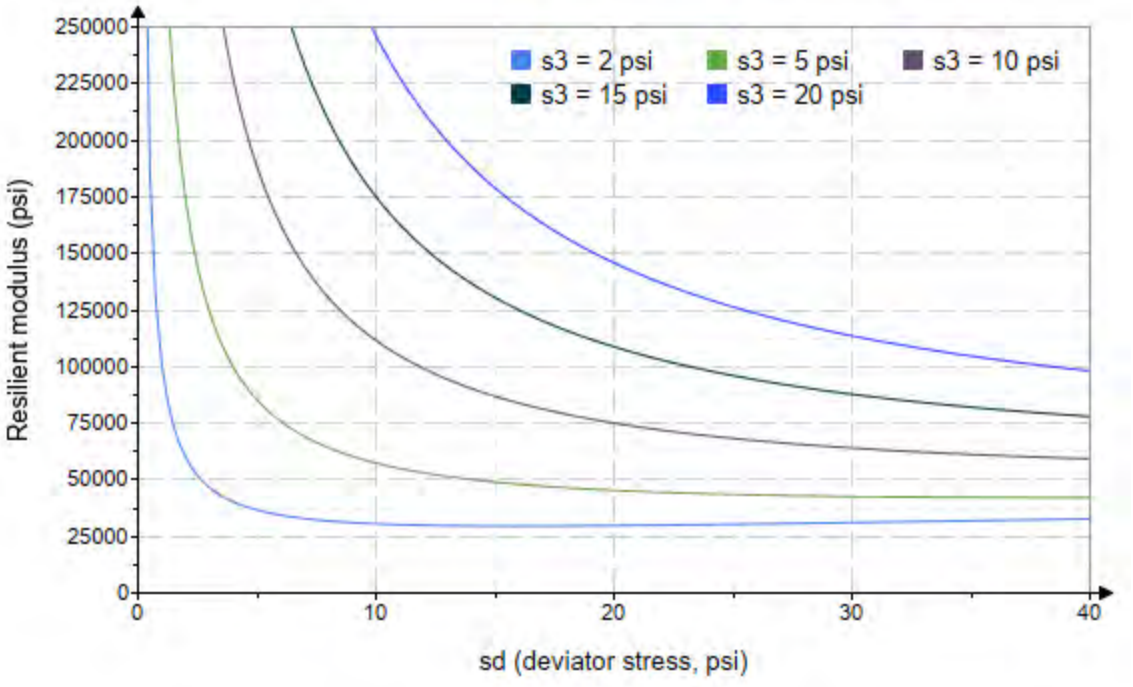

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−70"

$Treatment =$ "M5"

$S = 11.907$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.760 \\ 2.757 \\ 2.756 \\ 4.514 \\ 4.505 \\ 4.550 \\ 9.529 \\ 9.579 \\ 9.541 \\ 14.630 \\ 14.620 \\ 14.570 \\ 19.620 \\ 19.630 \\ 19.580 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.224 \\ 6.151 \\ 9.082 \\ 5.166 \\ 10.040 \\ 14.350 \\ 10.140 \\ 19.340 \\ 29.720 \\ 10.140 \\ 14.410 \\ 29.960 \\ 14.560 \\ 19.780 \\ 40.290 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.500 \\ 14.420 \\ 17.350 \\ 18.710 \\ 23.560 \\ 28.000 \\ 38.730 \\ 48.070 \\ 58.340 \\ 54.030 \\ 58.270 \\ 73.660 \\ 73.400 \\ 78.670 \\ 99.020 \end{bmatrix} \quad M_R = \begin{bmatrix} 30680.2 \\ 34382.4 \\ 39249.4 \\ 47183.2 \\ 58251.4 \\ 63162.0 \\ 85506.0 \\ 64157.8 \\ 53011.2 \\ 61395.8 \\ 53622.2 \\ 54193.4 \\ 52853.6 \\ 55647.8 \\ 64553.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–70”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 27287.101$

$K_2 = 0.1883$

Equation 1 fitting parameters

$R_1^2 = 0.2919$ Coefficient of determination

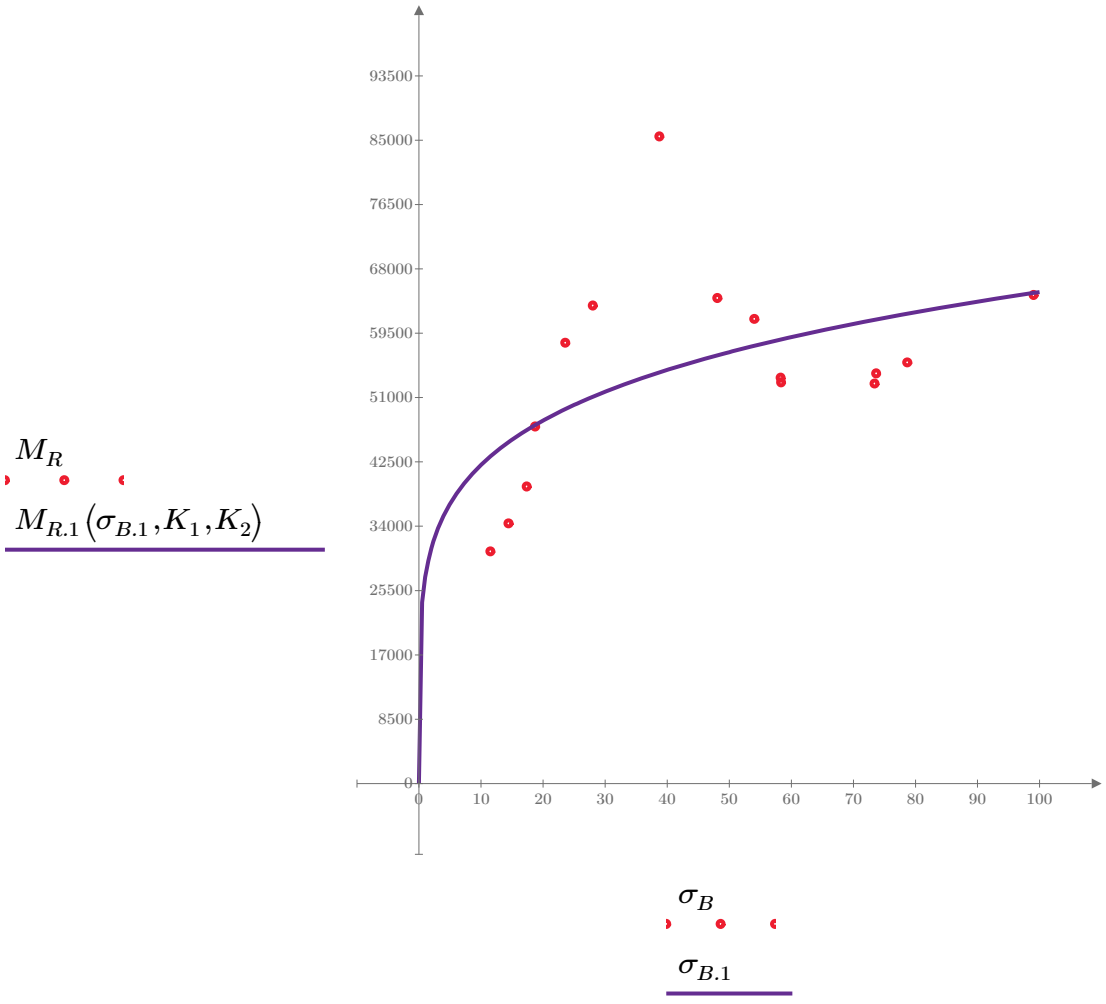

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–70”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 35946.766$

$K_4 = 0.1615$

Equation 2 fitting parameters

${R_2}^2 = 0.2222$ Coefficient of determination

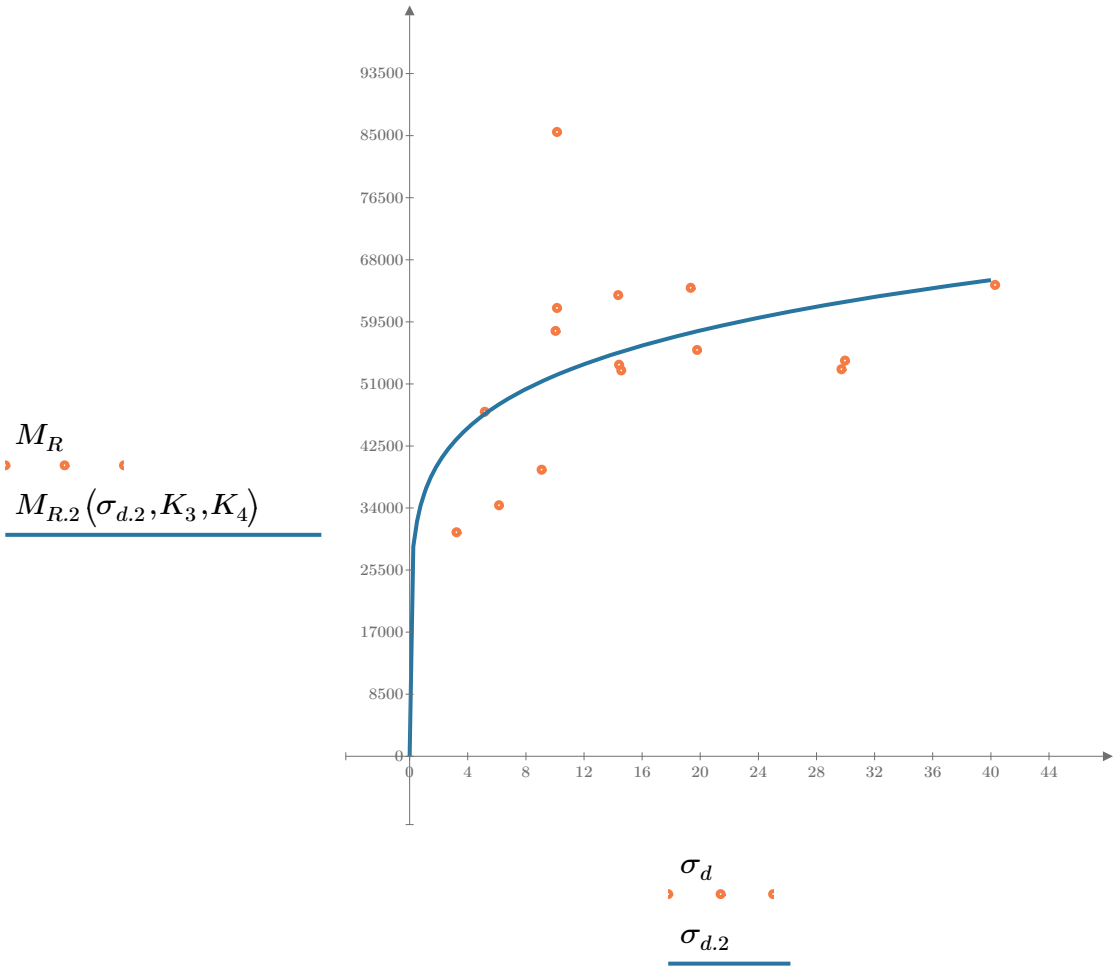

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2}-70\text{”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1+\sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 33673.001$

$K_6 = 0.0706$ Equation 3 fitting parameters

$K_7 = 0.1323$

${R_3}^2 = 0.2811$ Coefficient of determination

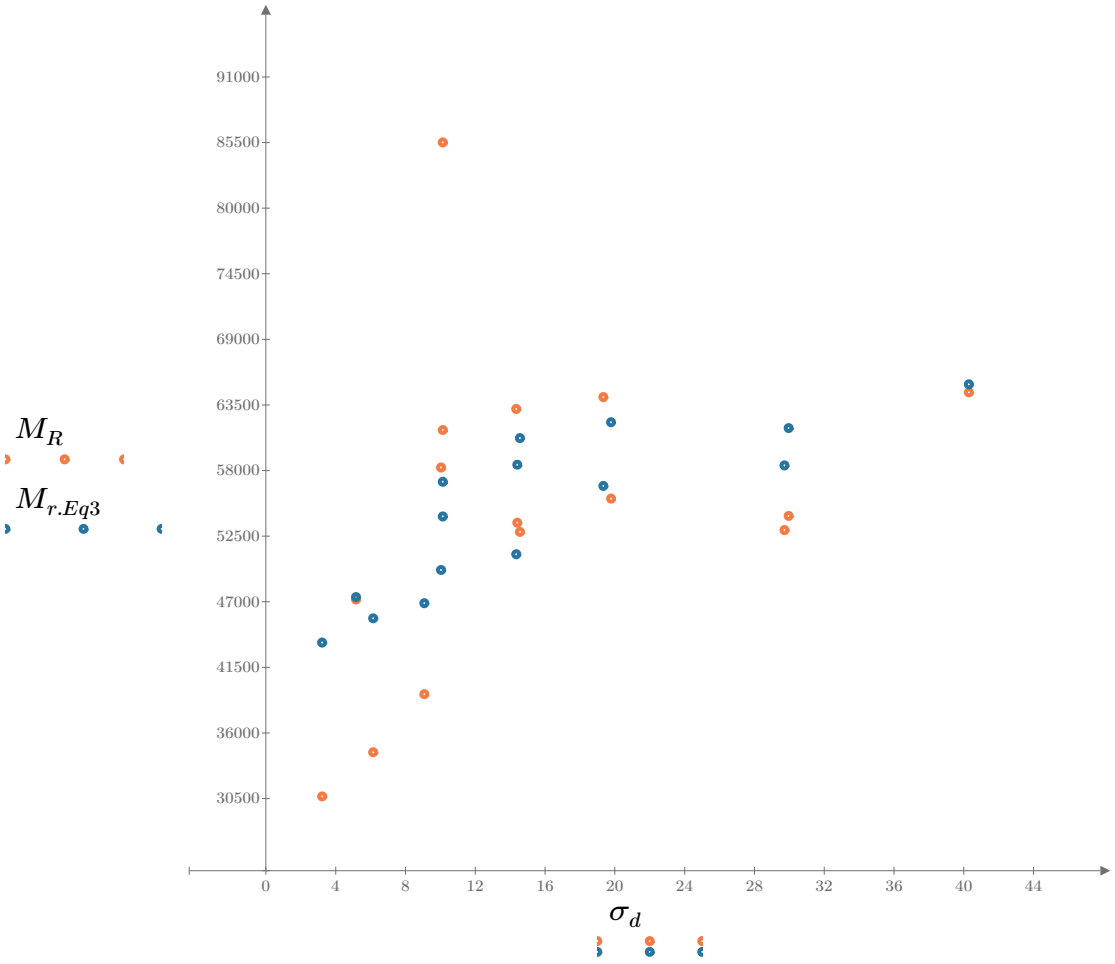

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-\text{70”}$

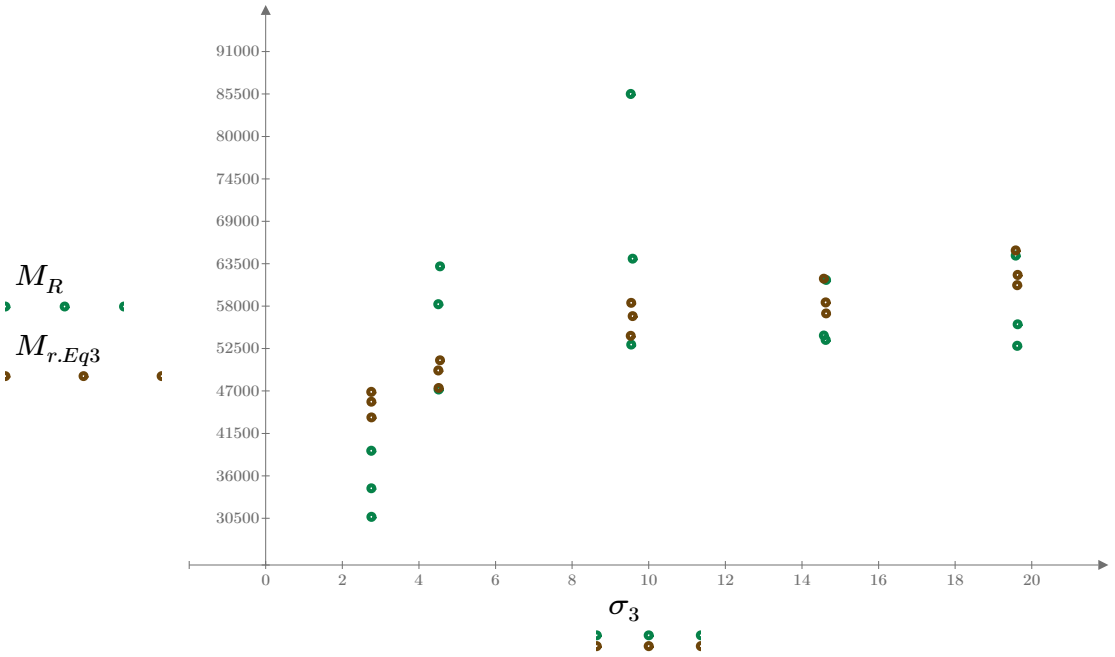

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

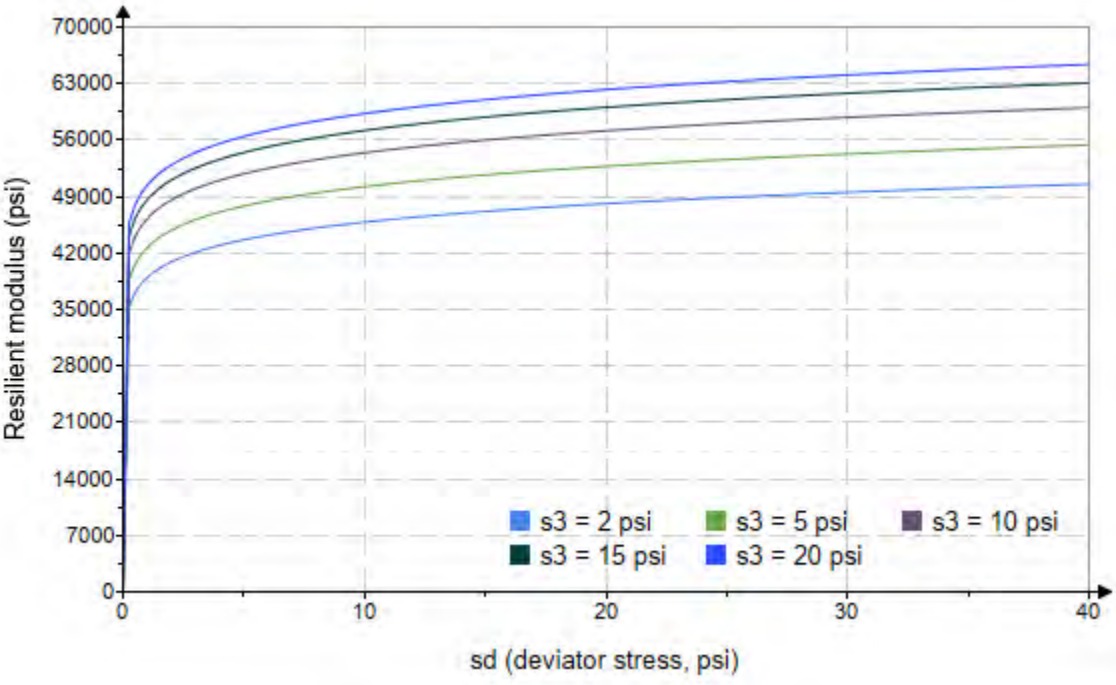

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2}-70\text{”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 3068.918$

$K_9 = 0.1915$ Equation 4 fitting parameters

$K_{10} = -0.0037$

$R_4^{\,2} = 0.2919$ Coefficient of determination

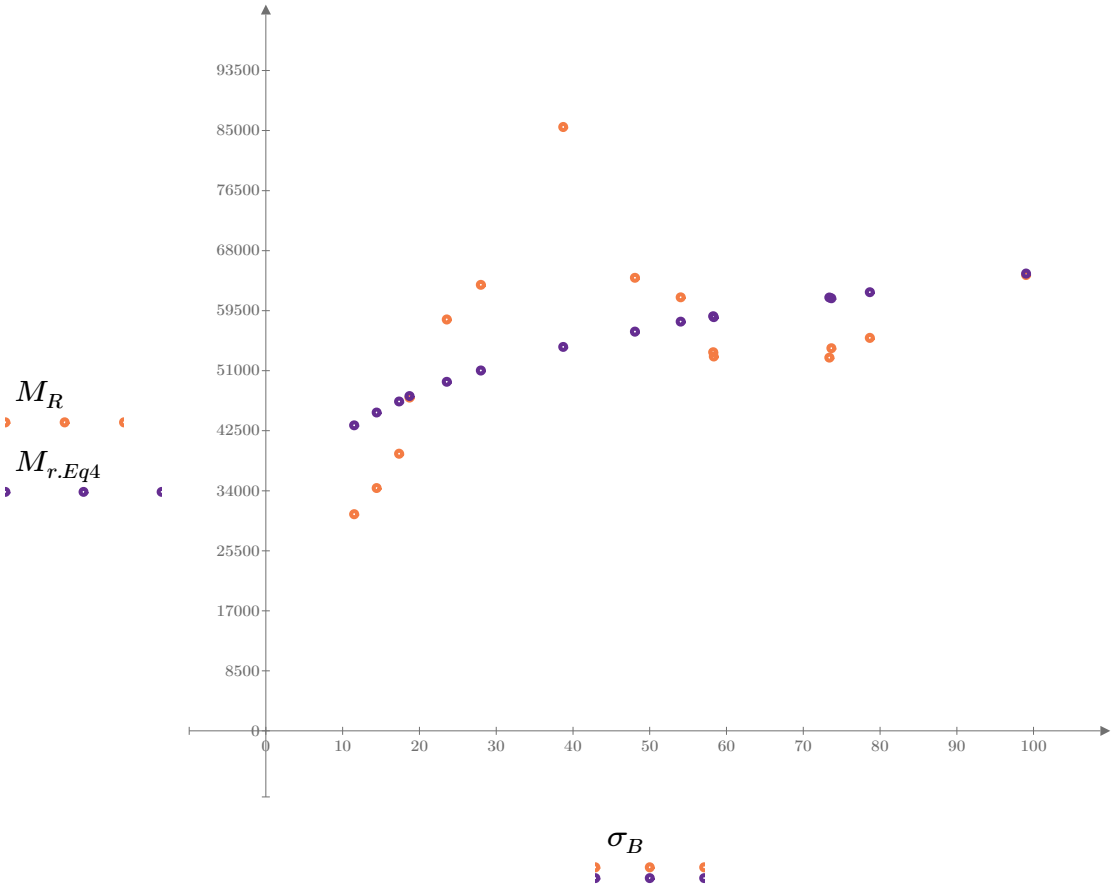

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

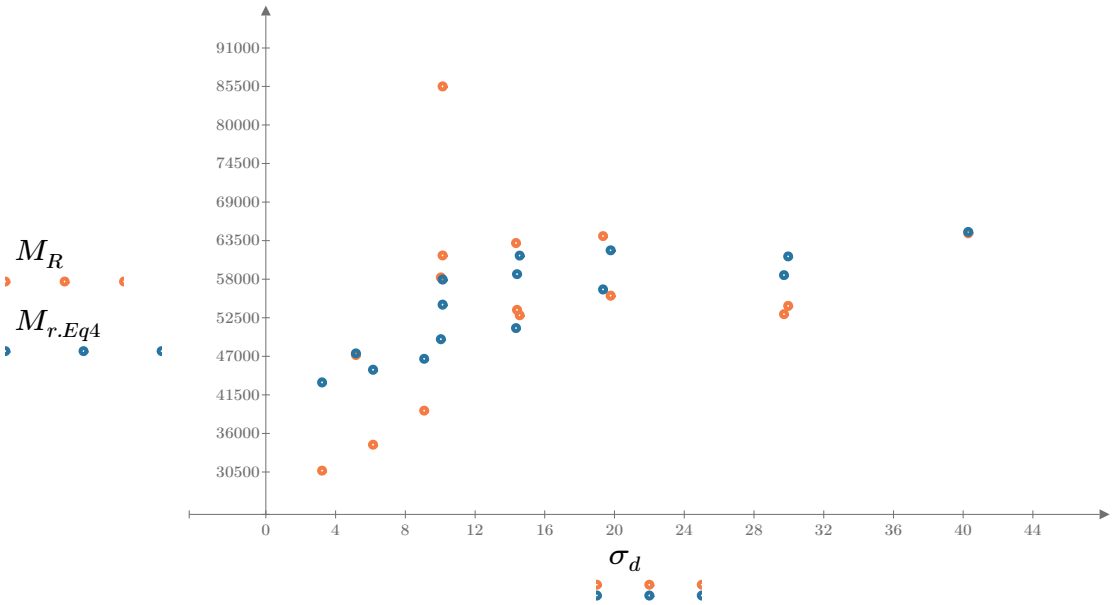

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

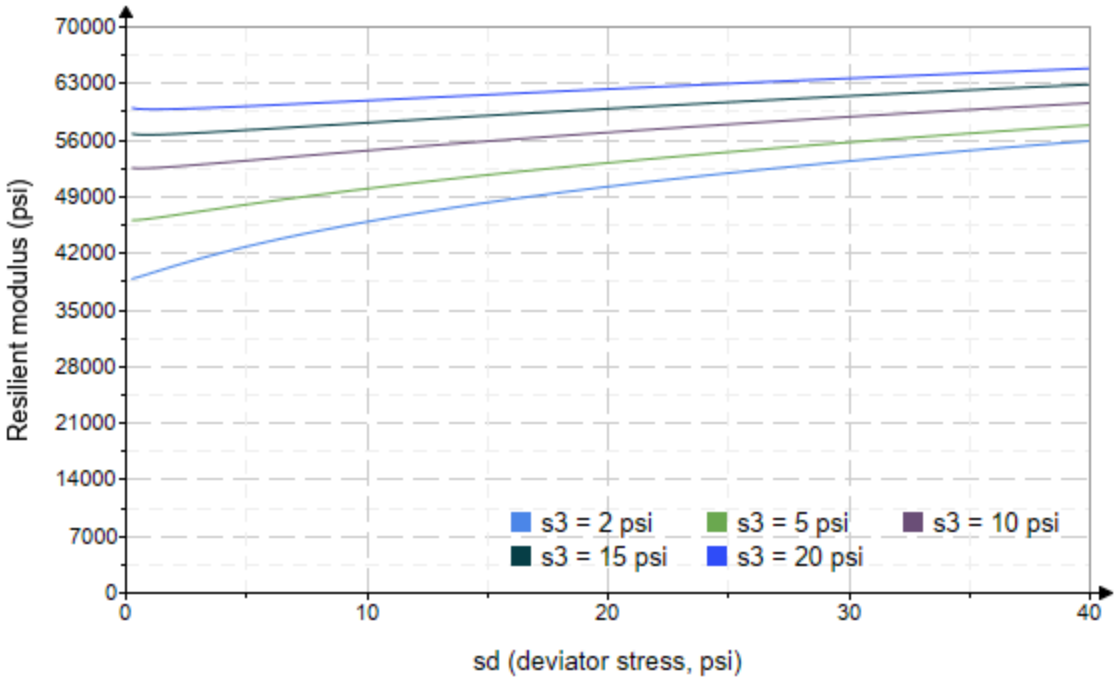

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−71"

$Treatment =$ "M5"

$S = 9.783$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.317 \\ 2.329 \\ 2.196 \\ 4.387 \\ 3.988 \\ 4.193 \\ 9.139 \\ 9.125 \\ 9.201 \\ 14.110 \\ 14.210 \\ 13.940 \\ 19.660 \\ 19.030 \\ 19.090 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.463 \\ 6.127 \\ 9.221 \\ 5.308 \\ 10.160 \\ 14.390 \\ 10.100 \\ 19.240 \\ 29.580 \\ 10.290 \\ 14.410 \\ 29.740 \\ 14.520 \\ 19.470 \\ 39.990 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.410 \\ 13.110 \\ 15.810 \\ 18.470 \\ 22.130 \\ 26.970 \\ 37.520 \\ 46.620 \\ 57.180 \\ 52.610 \\ 57.040 \\ 71.550 \\ 73.520 \\ 76.550 \\ 97.270 \end{bmatrix} \quad M_R = \begin{bmatrix} 135160.0 \\ 51827.2 \\ 57894.2 \\ 71036.7 \\ 84179.2 \\ 72927.4 \\ 153568.0 \\ 69557.2 \\ 61901.4 \\ 311692.0 \\ 106637.2 \\ 76812.4 \\ 188984.0 \\ 114570.0 \\ 77089.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–71”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 50530.451$

$K_2 = 0.2107$

Equation 1 fitting parameters

$R_1^2 = 0.0579$ Coefficient of determination

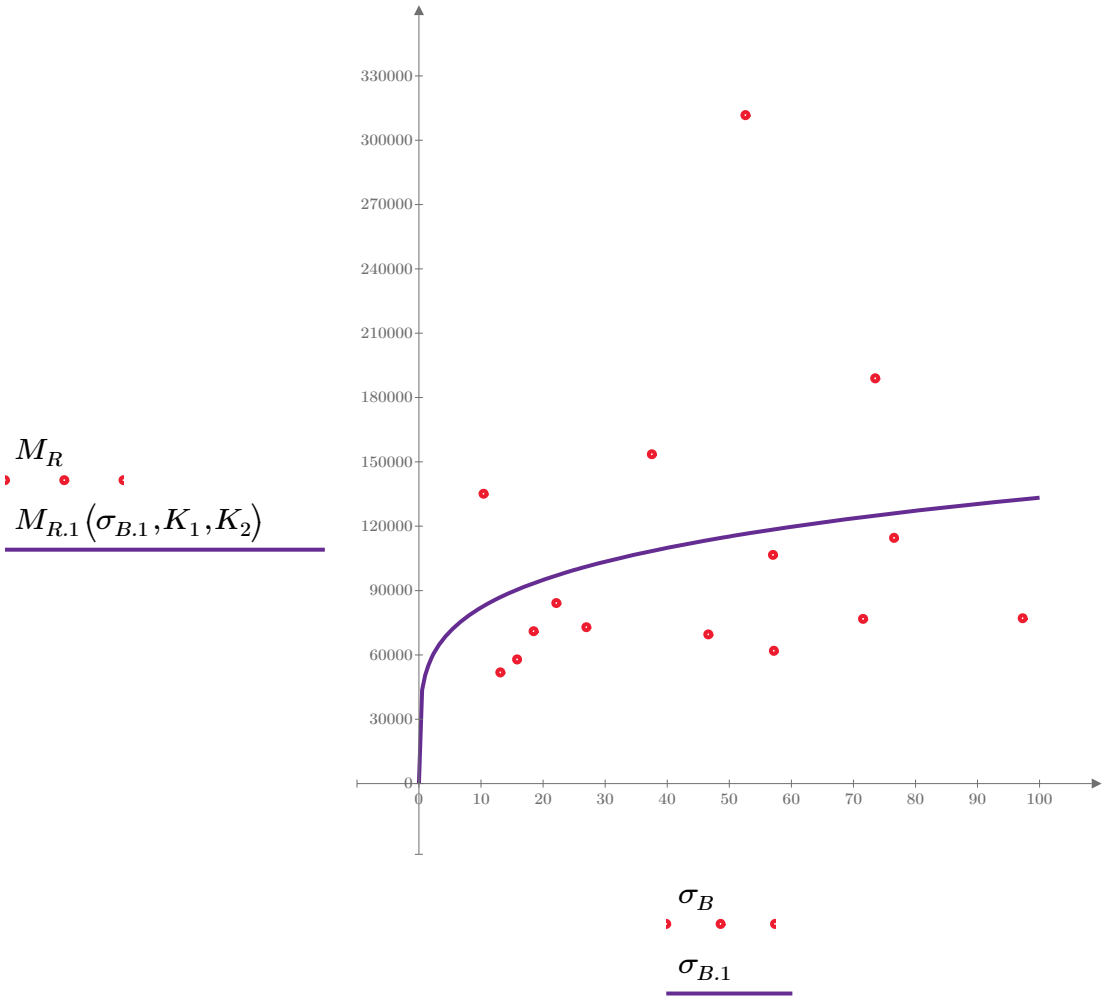

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–71”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 149096.052$

$K_4 = -0.1240$

Equation 2 fitting parameters

${R_2}^2 = 0.0214$ Coefficient of determination

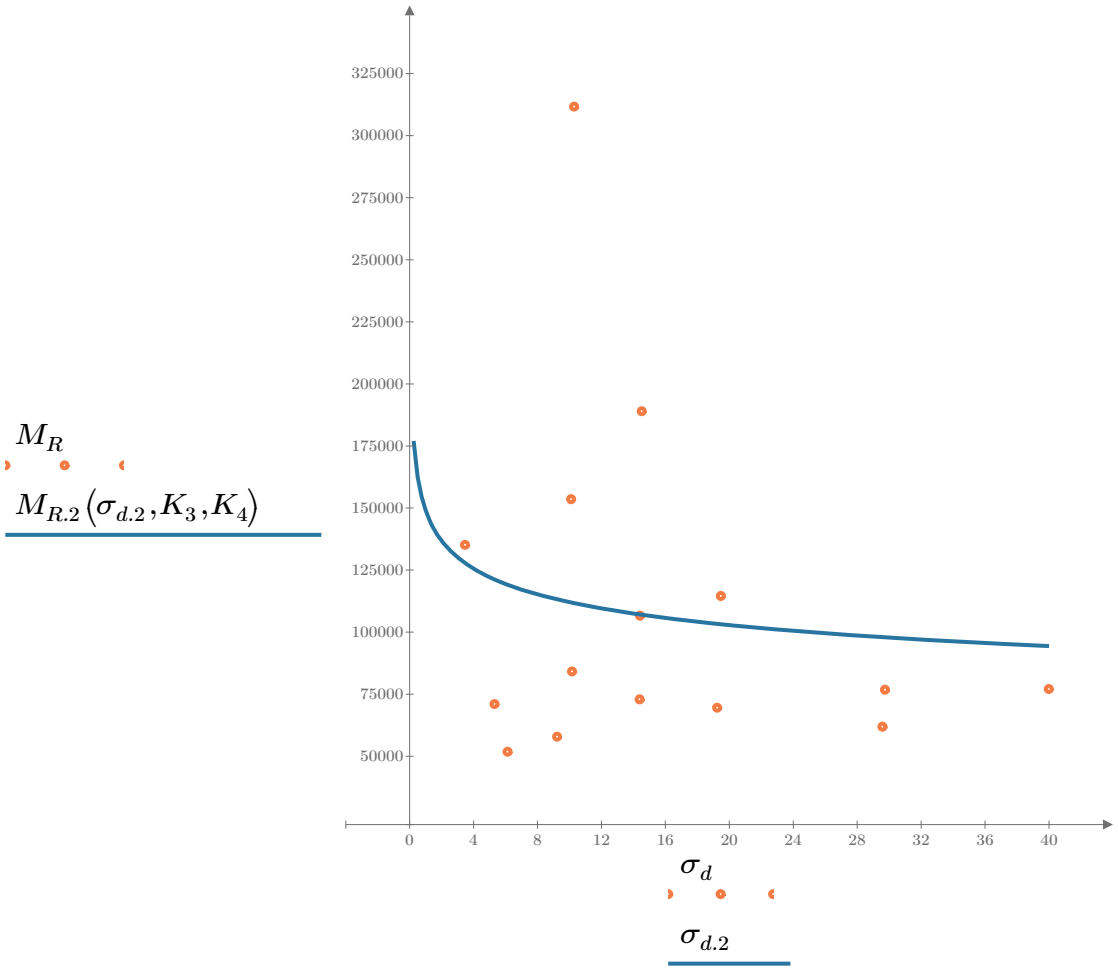

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2}-71\text{”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1+\sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 121872.085$

$K_6 = -1.1421$ Equation 3 fitting parameters

$K_7 = 1.2022$

${R_3}^2 = 0.7053$ Coefficient of determination

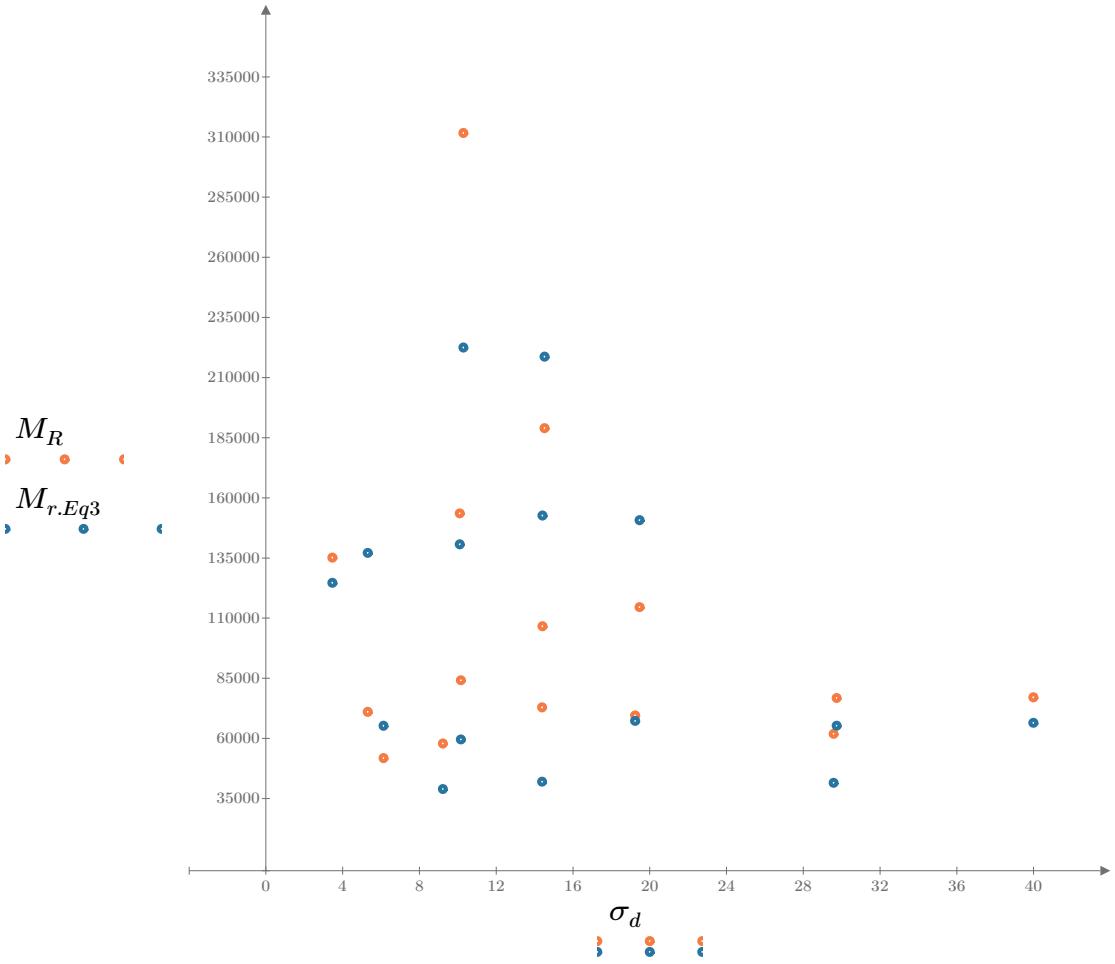

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-71\text{”}$

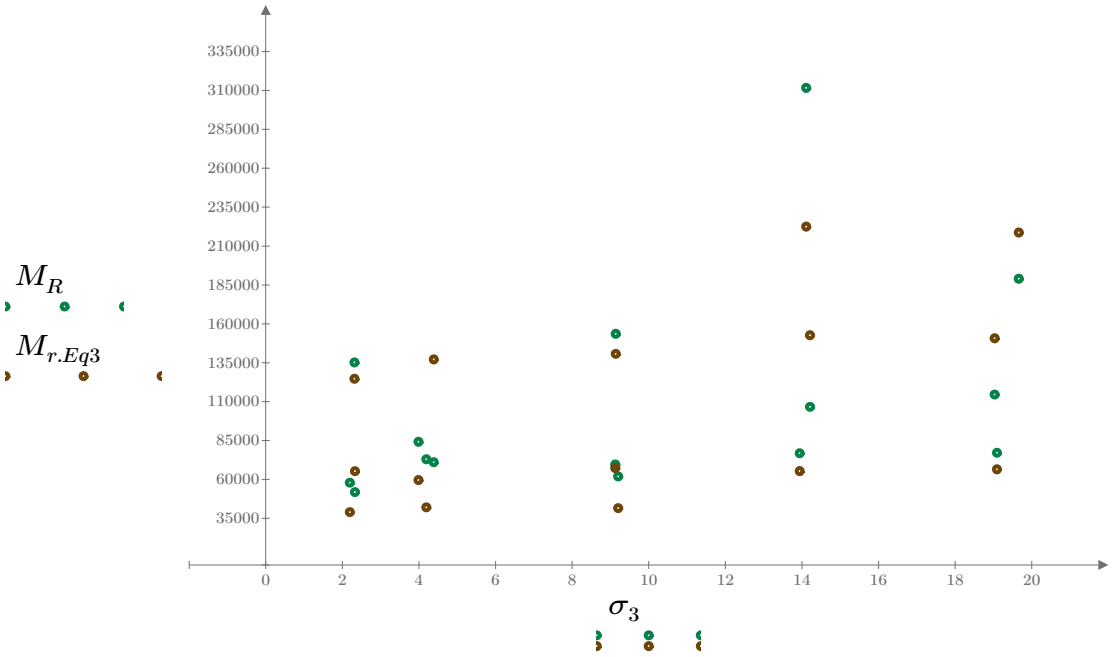

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

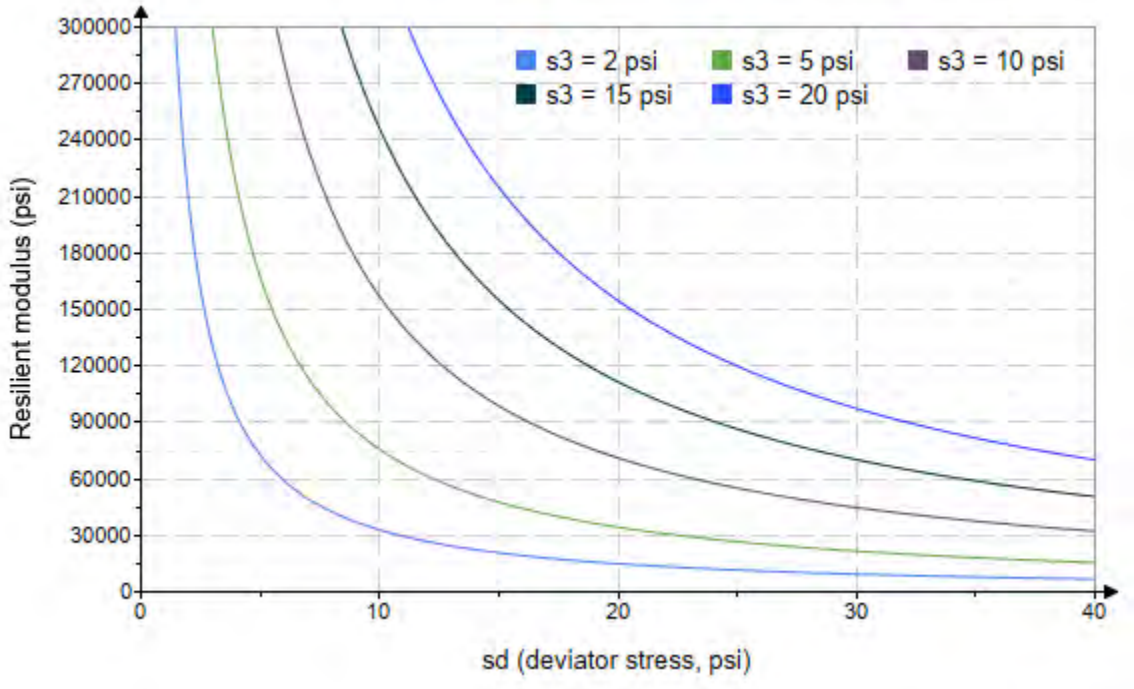

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–71”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1175.165$

$K_9 = 1.5723$ Equation 4 fitting parameters

$K_{10} = -1.6892$

$R_4^{\,2} = 0.7424$ Coefficient of determination

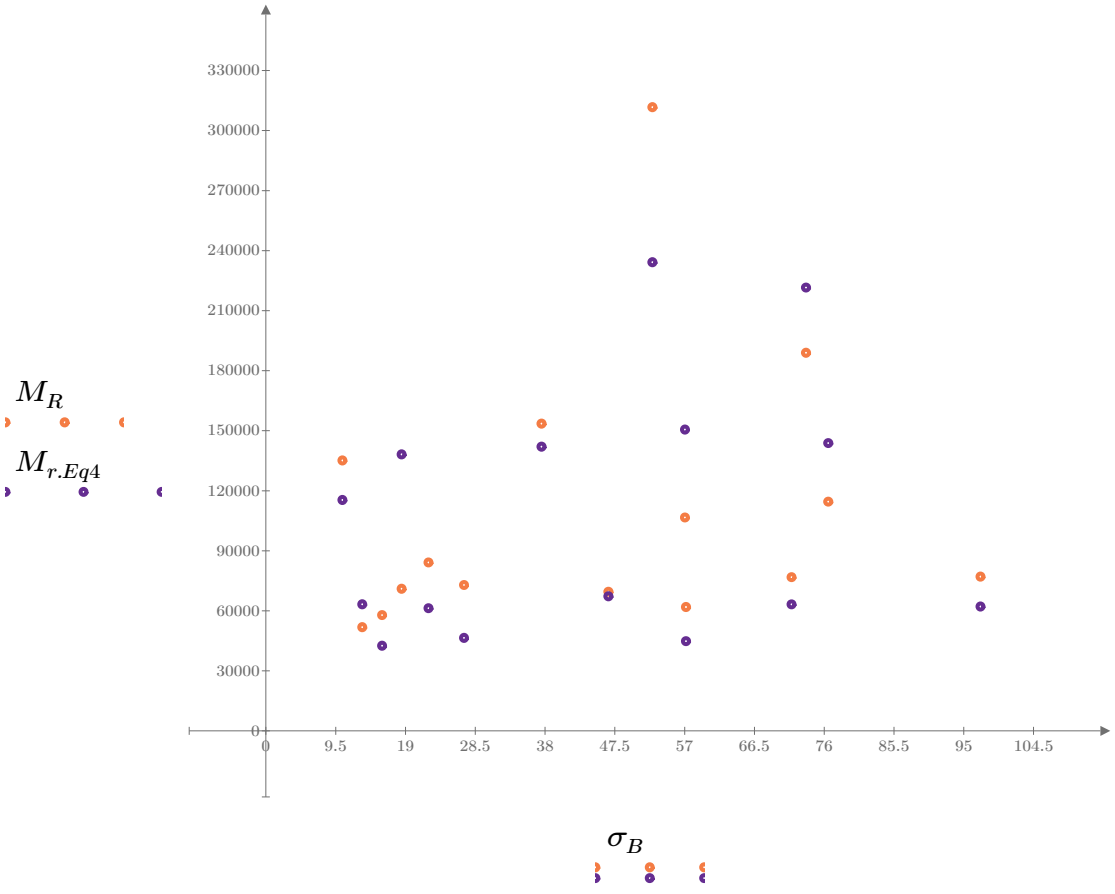

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

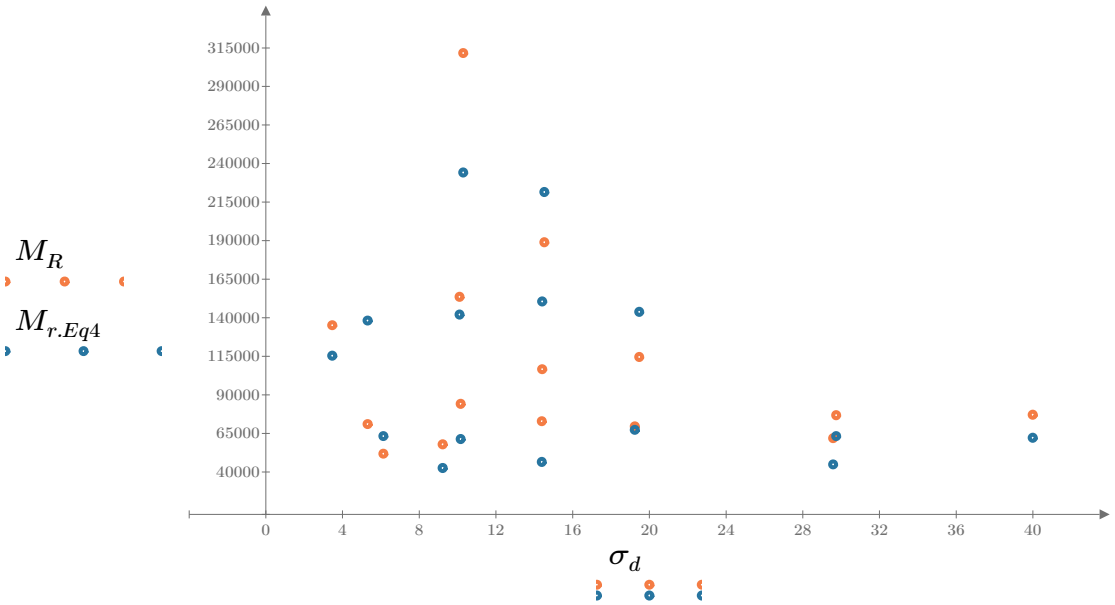

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

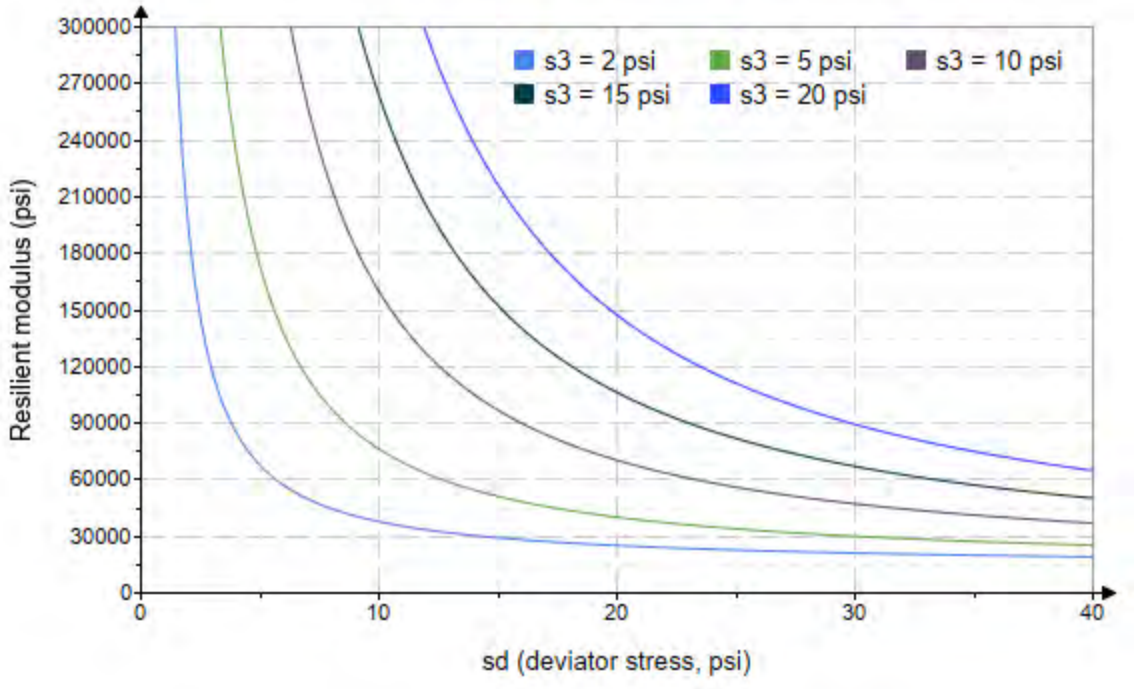

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−72"

$Treatment =$ "M5"

$S = 10.281$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.782 \\ 2.797 \\ 2.796 \\ 4.556 \\ 4.591 \\ 4.543 \\ 9.595 \\ 9.560 \\ 9.588 \\ 14.600 \\ 14.600 \\ 14.590 \\ 19.600 \\ 19.610 \\ 19.600 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.137 \\ 6.239 \\ 9.111 \\ 5.234 \\ 10.140 \\ 14.690 \\ 10.290 \\ 19.330 \\ 29.250 \\ 10.270 \\ 14.660 \\ 29.450 \\ 14.560 \\ 19.460 \\ 40.030 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.480 \\ 14.630 \\ 17.500 \\ 18.900 \\ 23.920 \\ 28.320 \\ 39.070 \\ 48.010 \\ 58.010 \\ 54.080 \\ 58.450 \\ 73.230 \\ 73.370 \\ 78.300 \\ 98.820 \end{bmatrix} \quad M_R = \begin{bmatrix} 21739.2 \\ 22209.4 \\ 23791.8 \\ 48178.0 \\ 39685.0 \\ 38174.2 \\ 51258.6 \\ 46935.6 \\ 44844.8 \\ 87588.4 \\ 61580.8 \\ 55367.2 \\ 60879.8 \\ 59128.6 \\ 61328.2 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–72”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 10236.832$

$K_2 = 0.4160$

Equation 1 fitting parameters

$R_1^2 = 0.5822$ Coefficient of determination

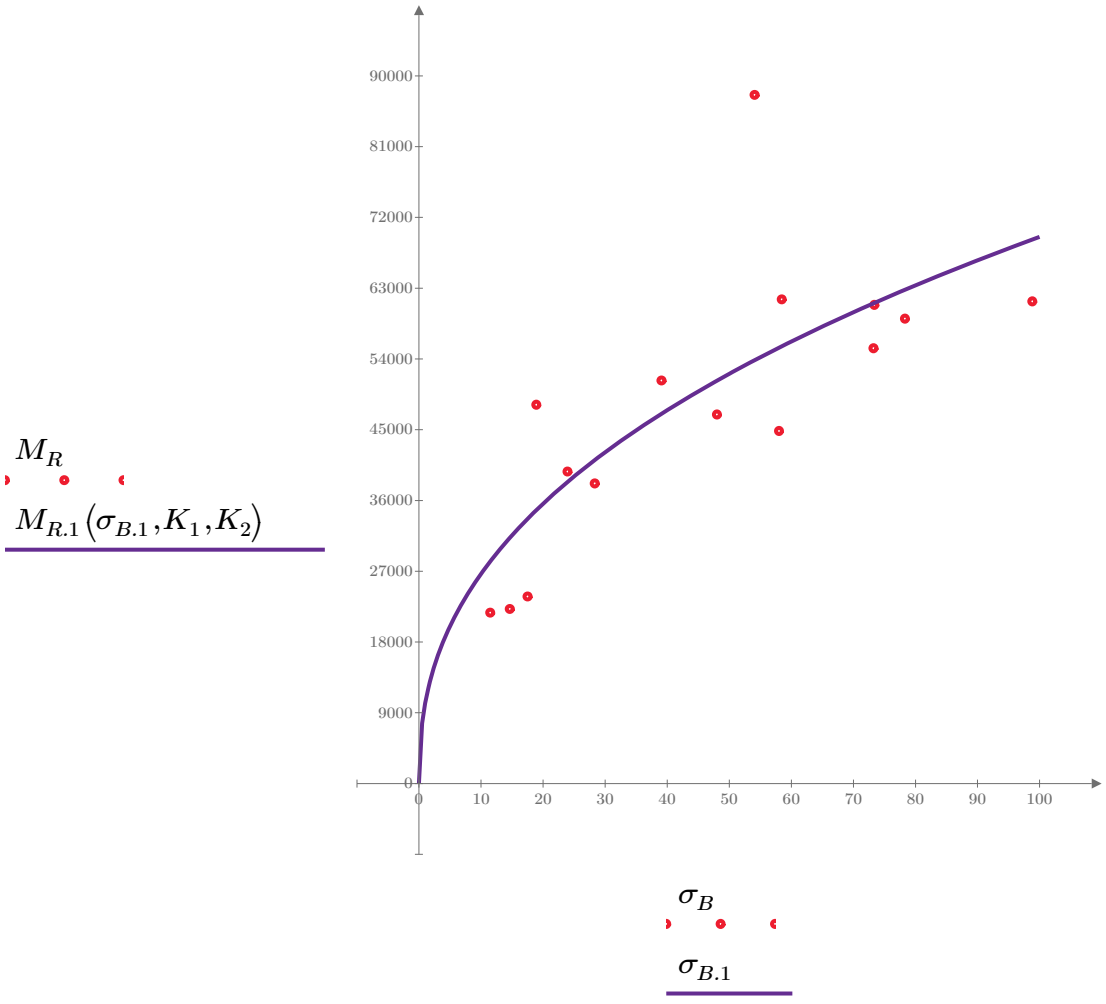

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–72”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 26351.287$

$K_4 = 0.2326$ Equation 2 fitting parameters

${R_2}^2 = 0.2045$ Coefficient of determination

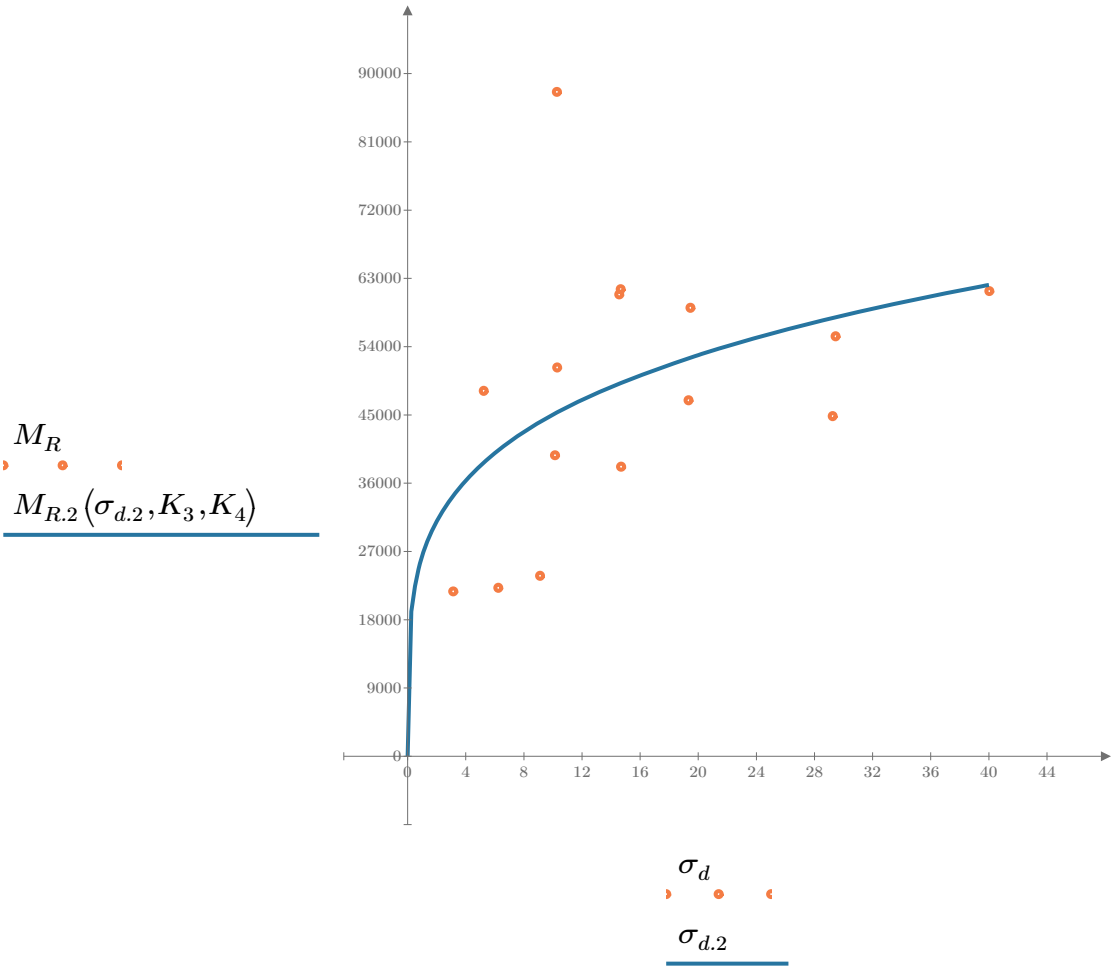

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2}-72\text{”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1+\sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 18854.771$

$K_6 = -0.1798$ Equation 3 fitting parameters

$K_7 = 0.6051$

${R_3}^2 = 0.7490$ Coefficient of determination

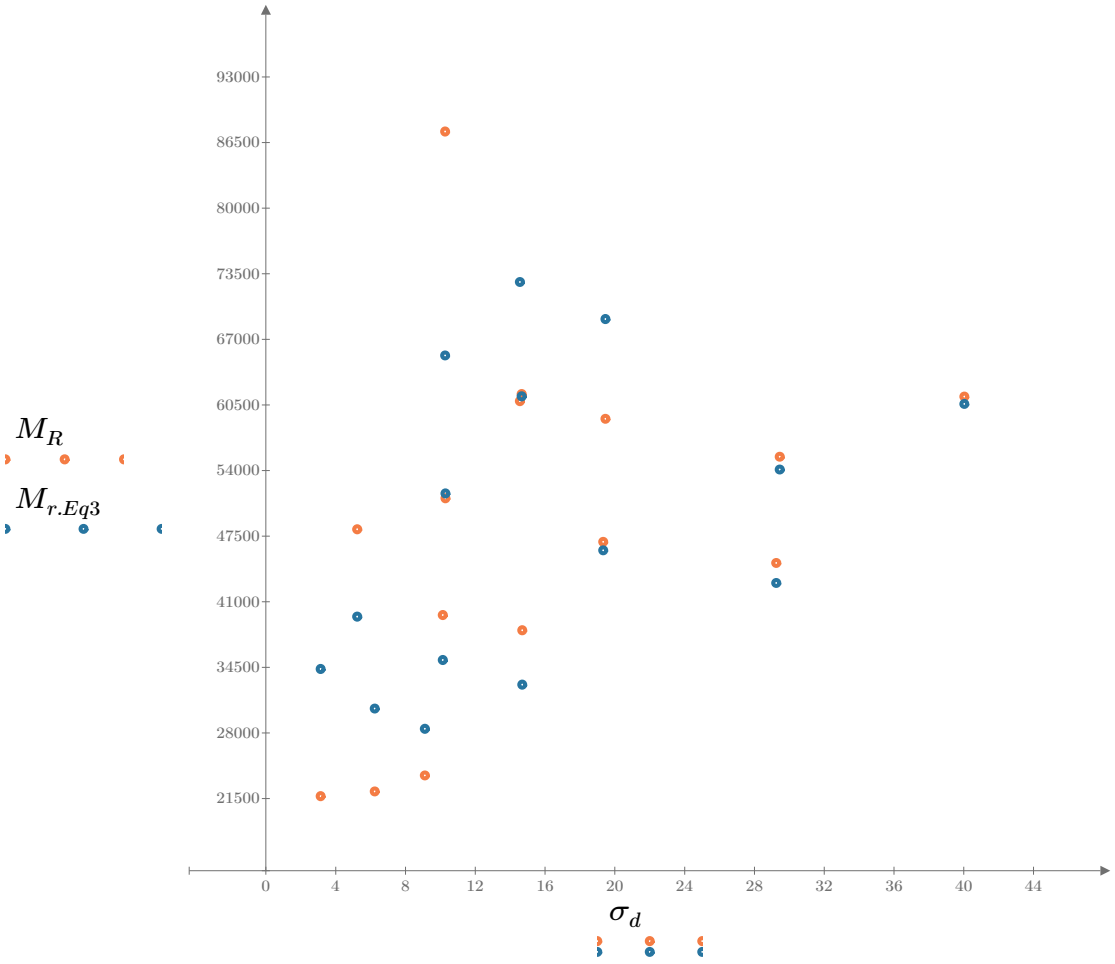

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-72\text{”}$

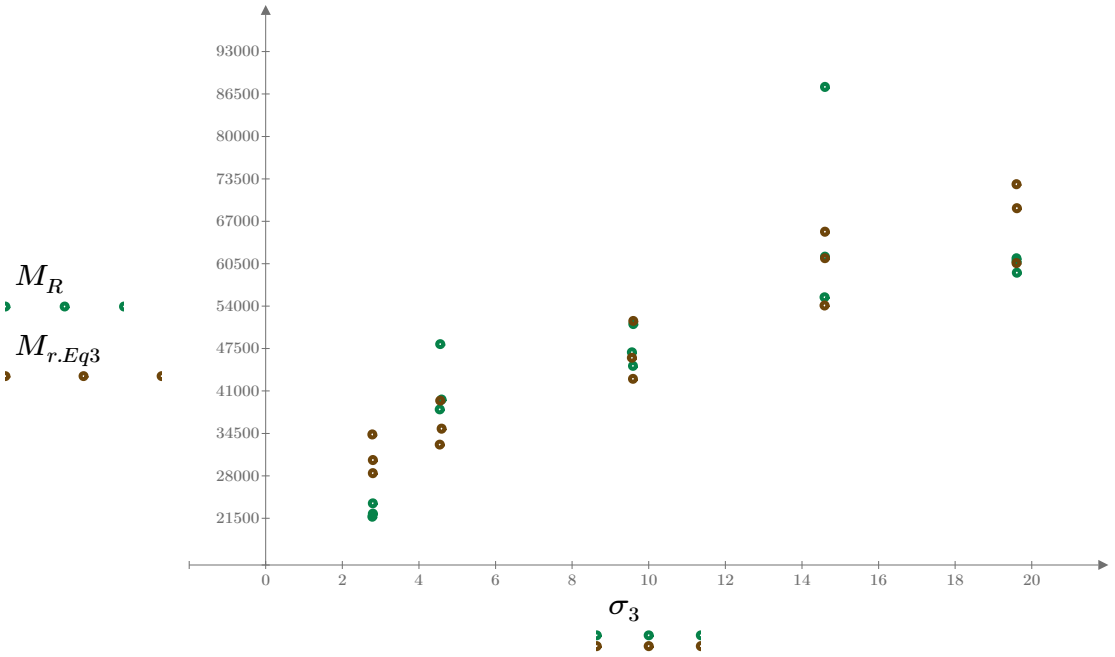

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

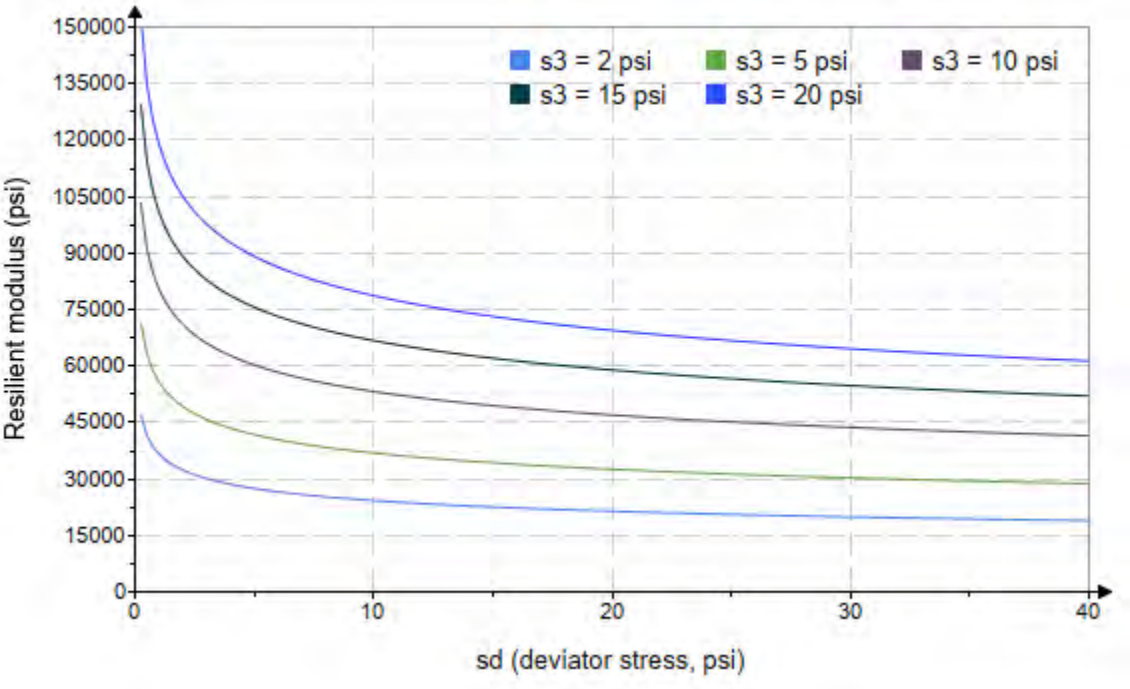

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–72”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1347.375$

$K_9 = 0.8171$ Equation 4 fitting parameters

$K_{10} = -0.4625$

$R_4^{\,2} = 0.7779$ Coefficient of determination

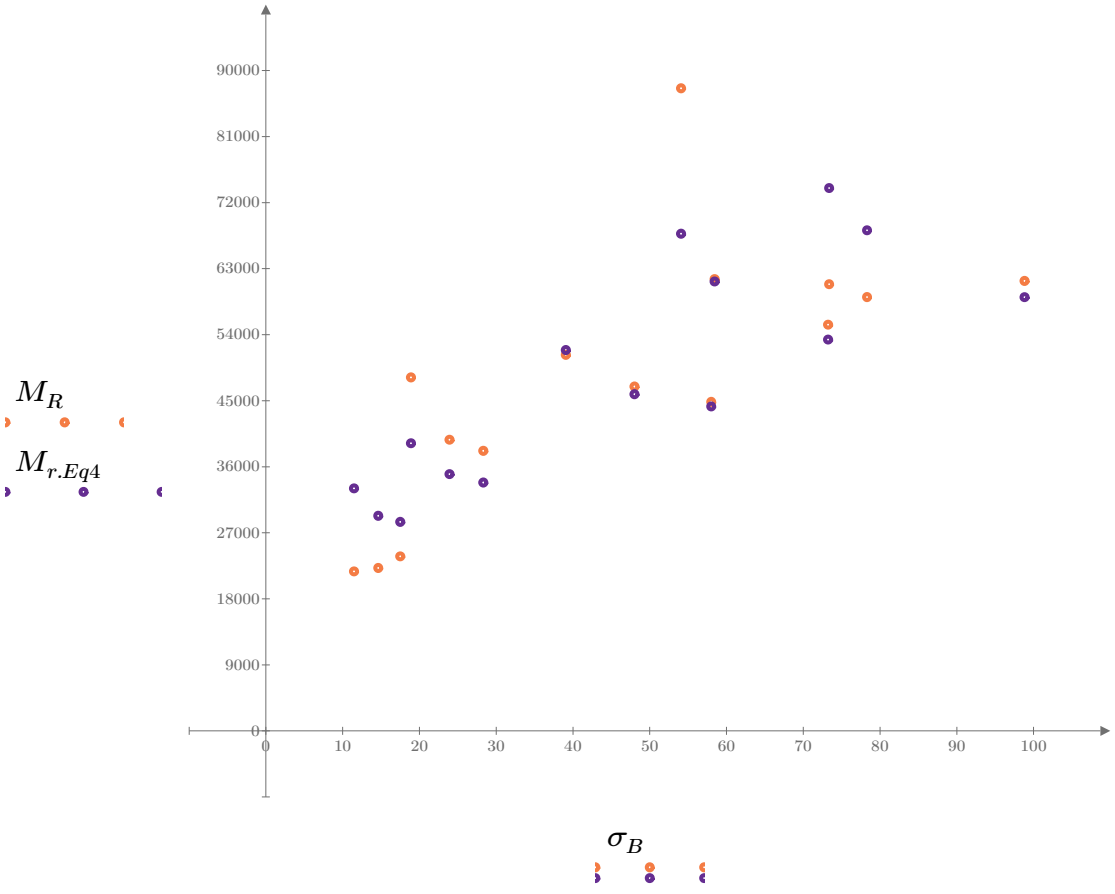

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

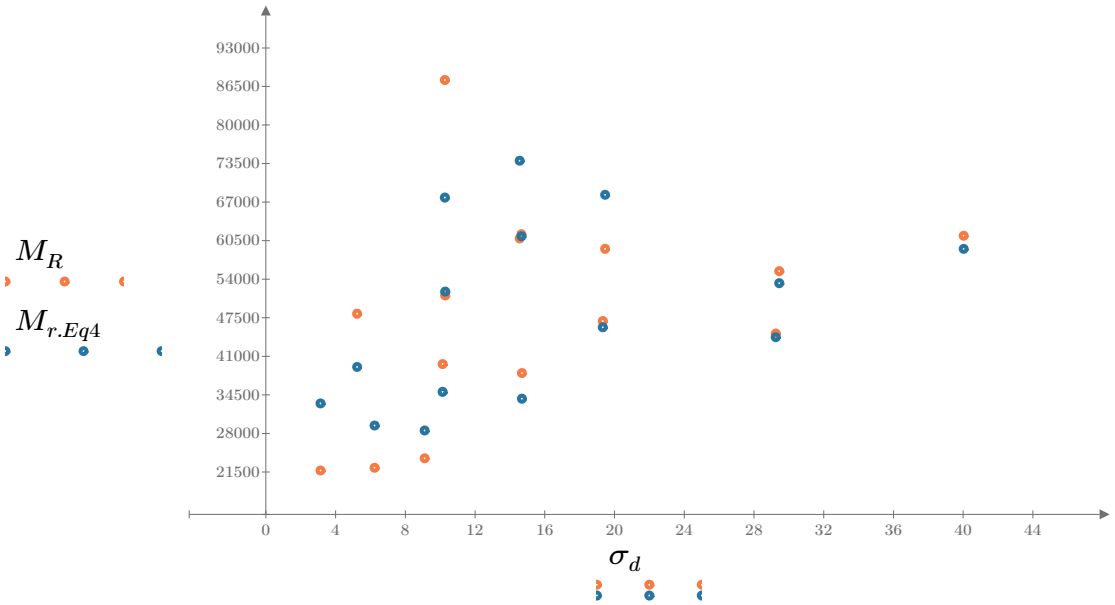

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

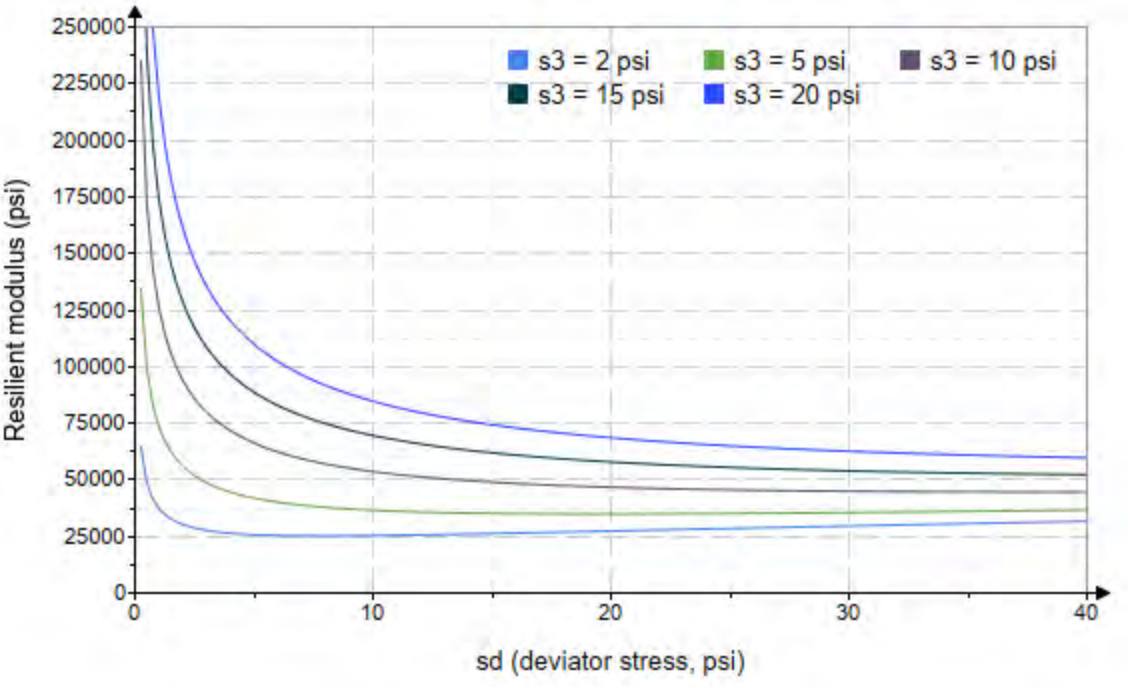

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−73"

$Treatment =$ "M5"

$S = 9.679$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.129 \\ 2.227 \\ 2.215 \\ 4.118 \\ 4.228 \\ 4.351 \\ 8.810 \\ 8.872 \\ 8.738 \\ 14.330 \\ 14.350 \\ 13.740 \\ 19.570 \\ 19.340 \\ 19.470 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.213 \\ 6.179 \\ 9.113 \\ 5.164 \\ 10.010 \\ 14.370 \\ 10.180 \\ 19.400 \\ 29.610 \\ 10.140 \\ 14.560 \\ 29.850 \\ 14.630 \\ 19.690 \\ 40.010 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 9.600 \\ 12.860 \\ 15.760 \\ 17.520 \\ 22.690 \\ 27.420 \\ 36.610 \\ 46.020 \\ 55.830 \\ 53.130 \\ 57.600 \\ 71.070 \\ 73.350 \\ 77.710 \\ 98.420 \end{bmatrix} \quad M_R = \begin{bmatrix} 37052.6 \\ 32723.6 \\ 35880.6 \\ 69836.6 \\ 46518.6 \\ 41950.8 \\ 60368.2 \\ 51768.6 \\ 65877.8 \\ 119070.0 \\ 97136.0 \\ 83375.6 \\ 118506.0 \\ 107358.0 \\ 59981.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–73”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 13869.989$

$K_2 = 0.4331$

Equation 1 fitting parameters

${R_1}^2 = 0.4843$ Coefficient of determination

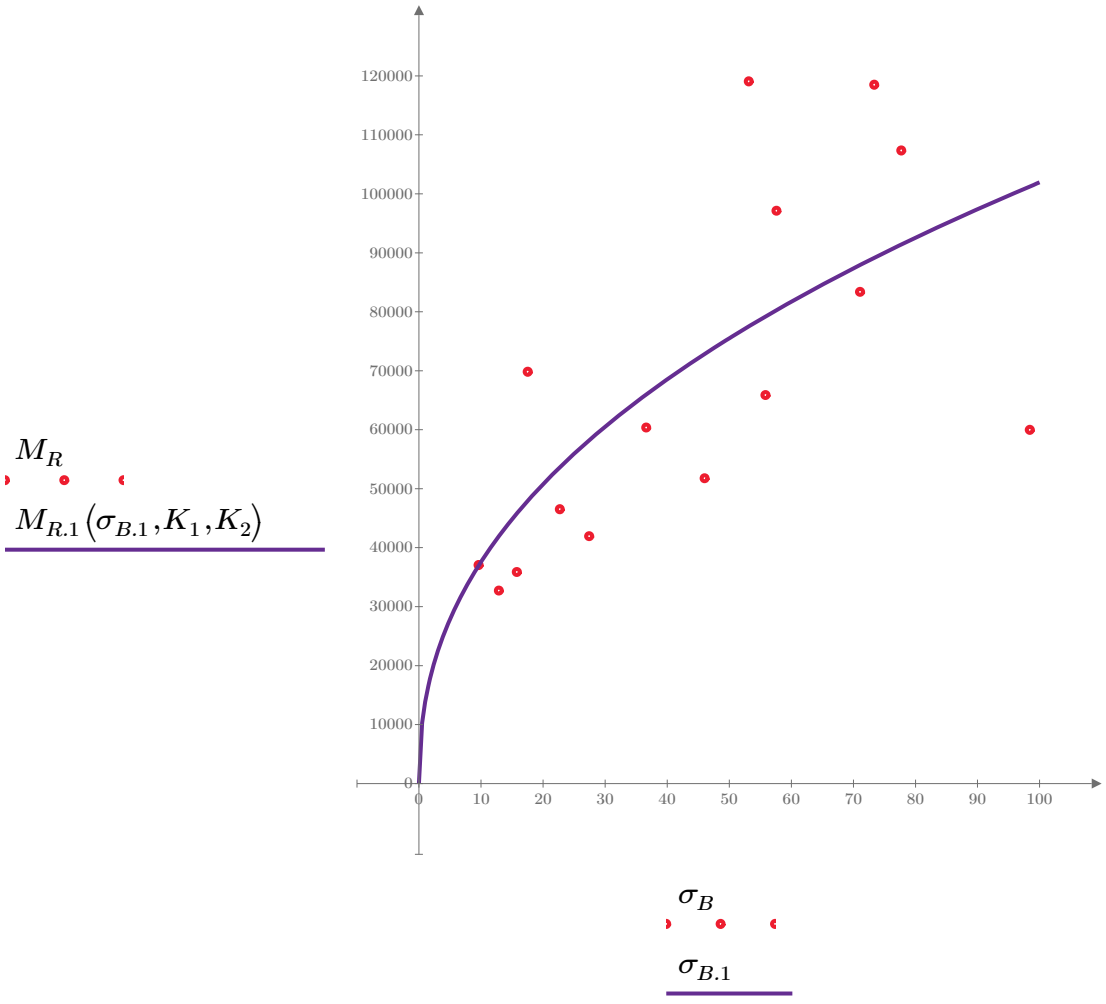

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–73”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 43294.759$

$K_4 = 0.1777$ Equation 2 fitting parameters

${R_2}^2 = 0.0896$ Coefficient of determination

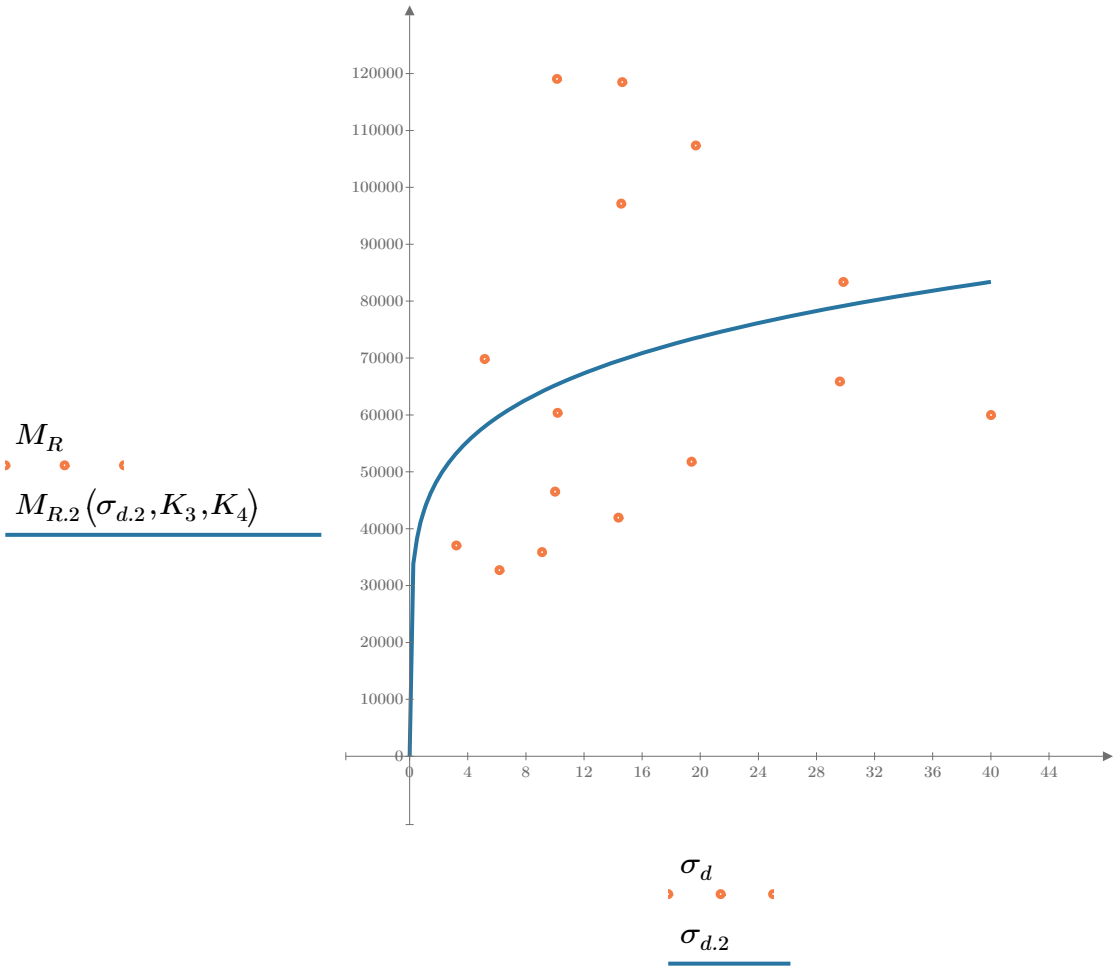

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2}-73\text{”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 30502.397$

$K_6 = -0.4089$ Equation 3 fitting parameters

$K_7 = 0.8166$

${R_3}^2 = 0.8758$ Coefficient of determination

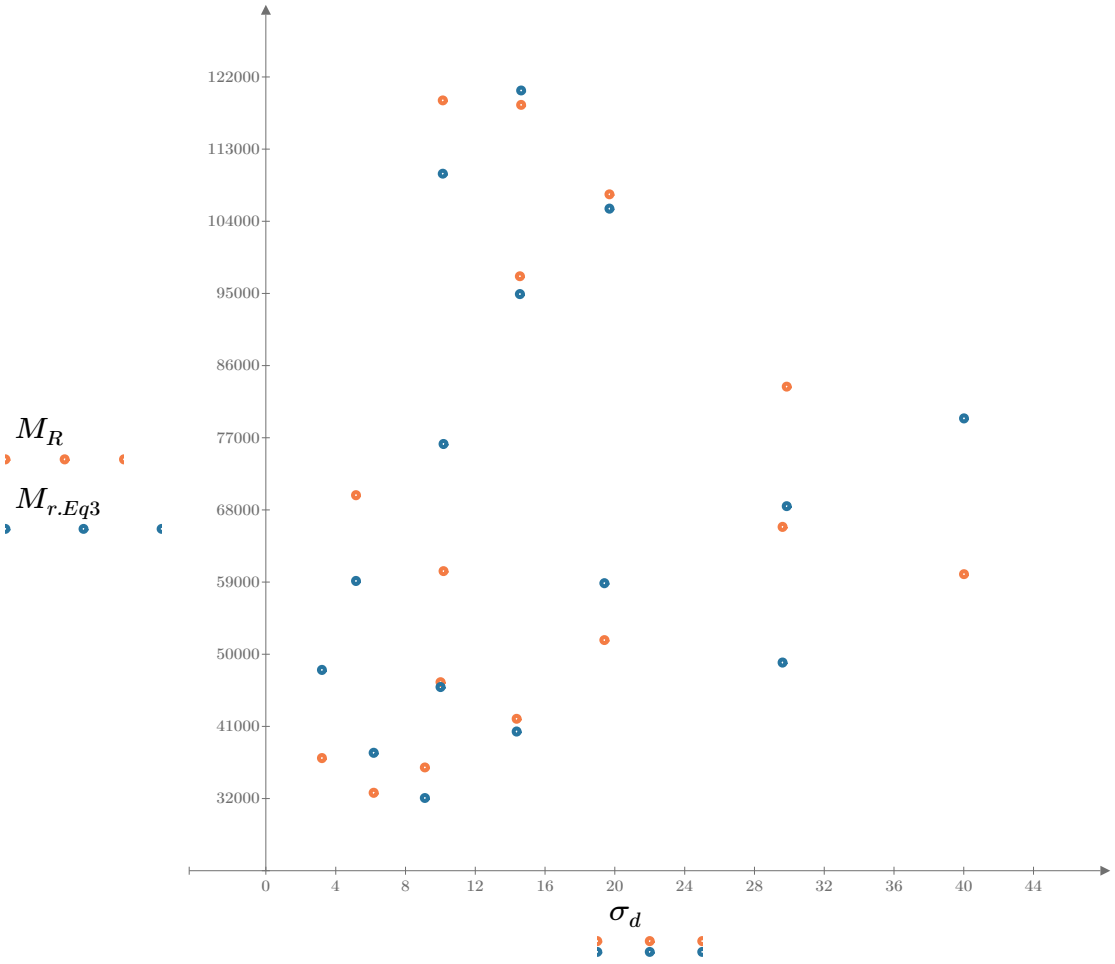

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-73\text{”}$

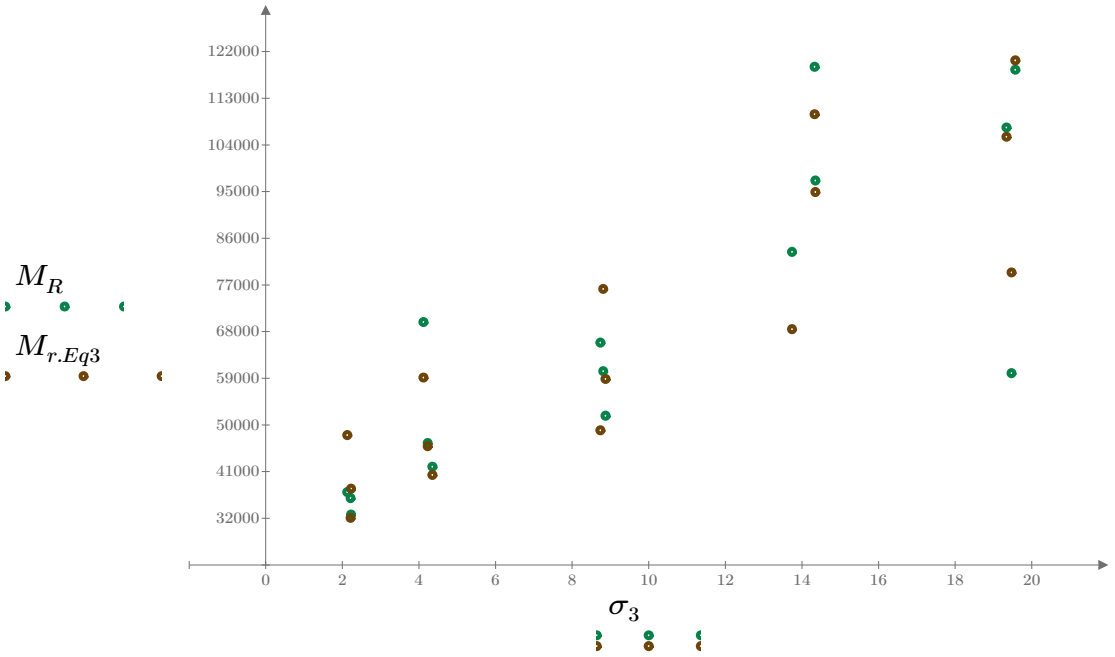

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

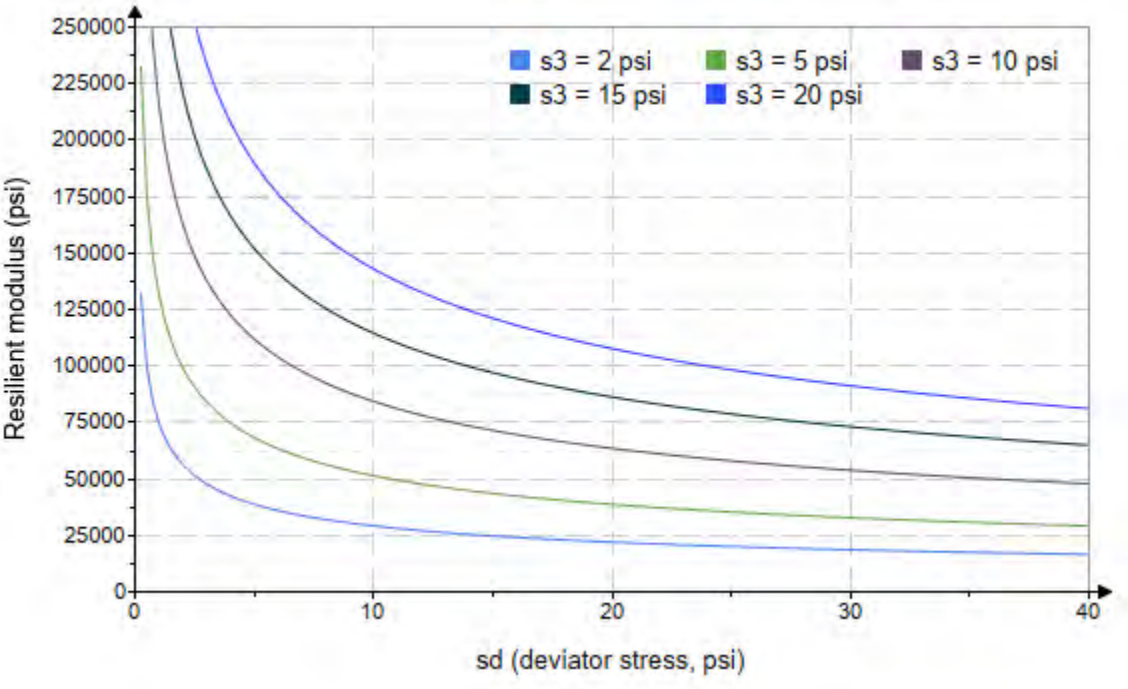

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–73”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1465.279$

$K_9 = 1.0750$ Equation 4 fitting parameters

$K_{10} = -0.7706$

$R_4^{\,2} = 0.8987$ Coefficient of determination

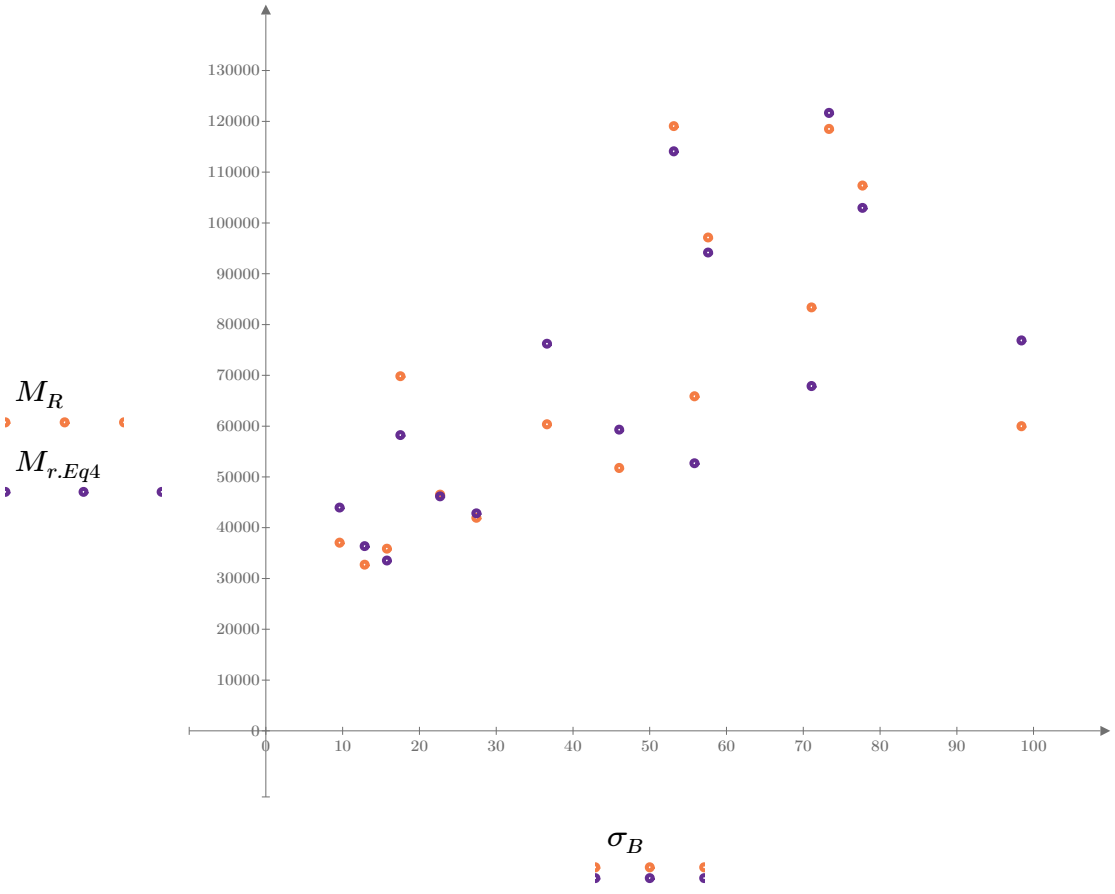

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

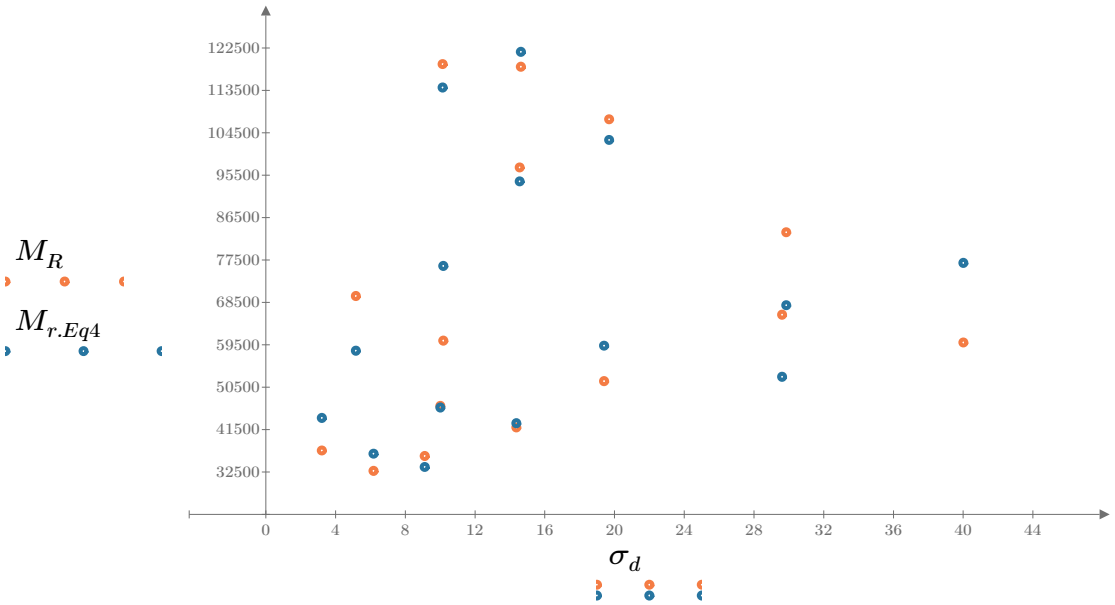

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

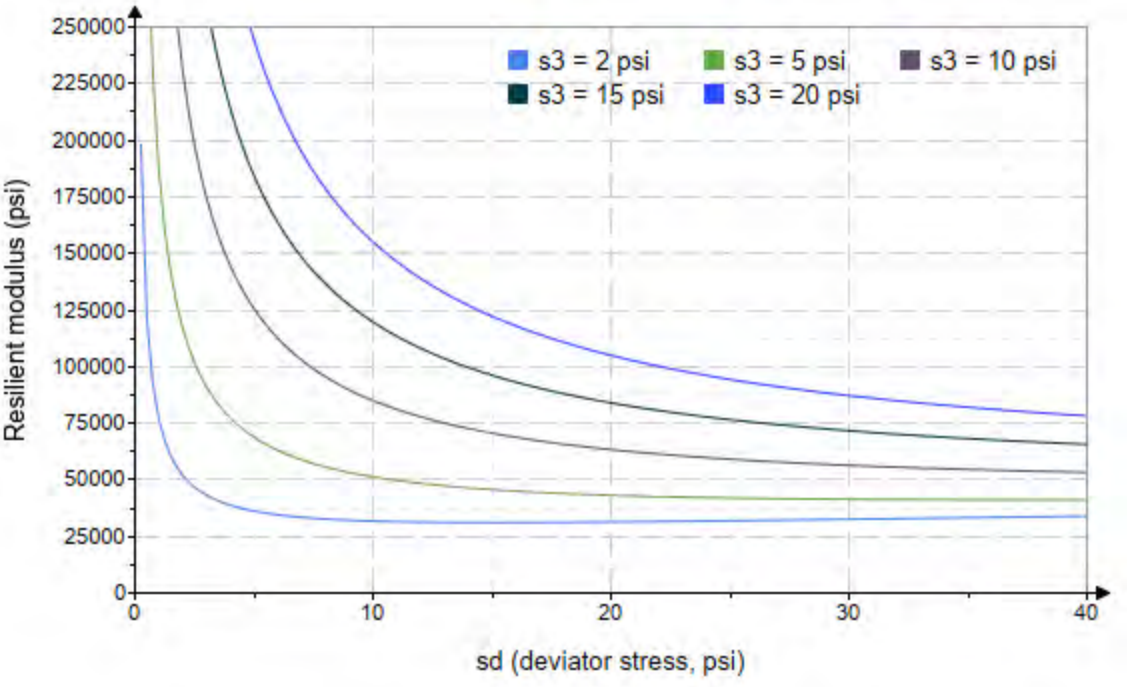

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−74"

$Treatment =$ "M5"

$S = 10.444$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.723 \\ 2.692 \\ 2.634 \\ 4.535 \\ 4.549 \\ 4.559 \\ 9.591 \\ 9.559 \\ 9.531 \\ 14.620 \\ 14.600 \\ 14.580 \\ 19.600 \\ 19.620 \\ 19.610 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.318 \\ 6.208 \\ 9.163 \\ 5.281 \\ 10.110 \\ 14.520 \\ 10.090 \\ 19.330 \\ 29.400 \\ 10.180 \\ 14.510 \\ 29.610 \\ 14.460 \\ 19.390 \\ 40.280 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.490 \\ 14.280 \\ 17.060 \\ 18.890 \\ 23.760 \\ 28.200 \\ 38.860 \\ 48.010 \\ 57.990 \\ 54.030 \\ 58.310 \\ 73.340 \\ 73.270 \\ 78.240 \\ 99.110 \end{bmatrix} \quad M_R = \begin{bmatrix} 33955.8 \\ 36100.4 \\ 38472.8 \\ 51254.8 \\ 57660.0 \\ 51675.8 \\ 62387.8 \\ 67846.2 \\ 60964.6 \\ 74647.2 \\ 80018.2 \\ 60581.6 \\ 71811.2 \\ 65142.2 \\ 60352.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–74”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 21467.813$

$K_2 = 0.2701$

Equation 1 fitting parameters

${R_1}^2 = 0.6287$ Coefficient of determination

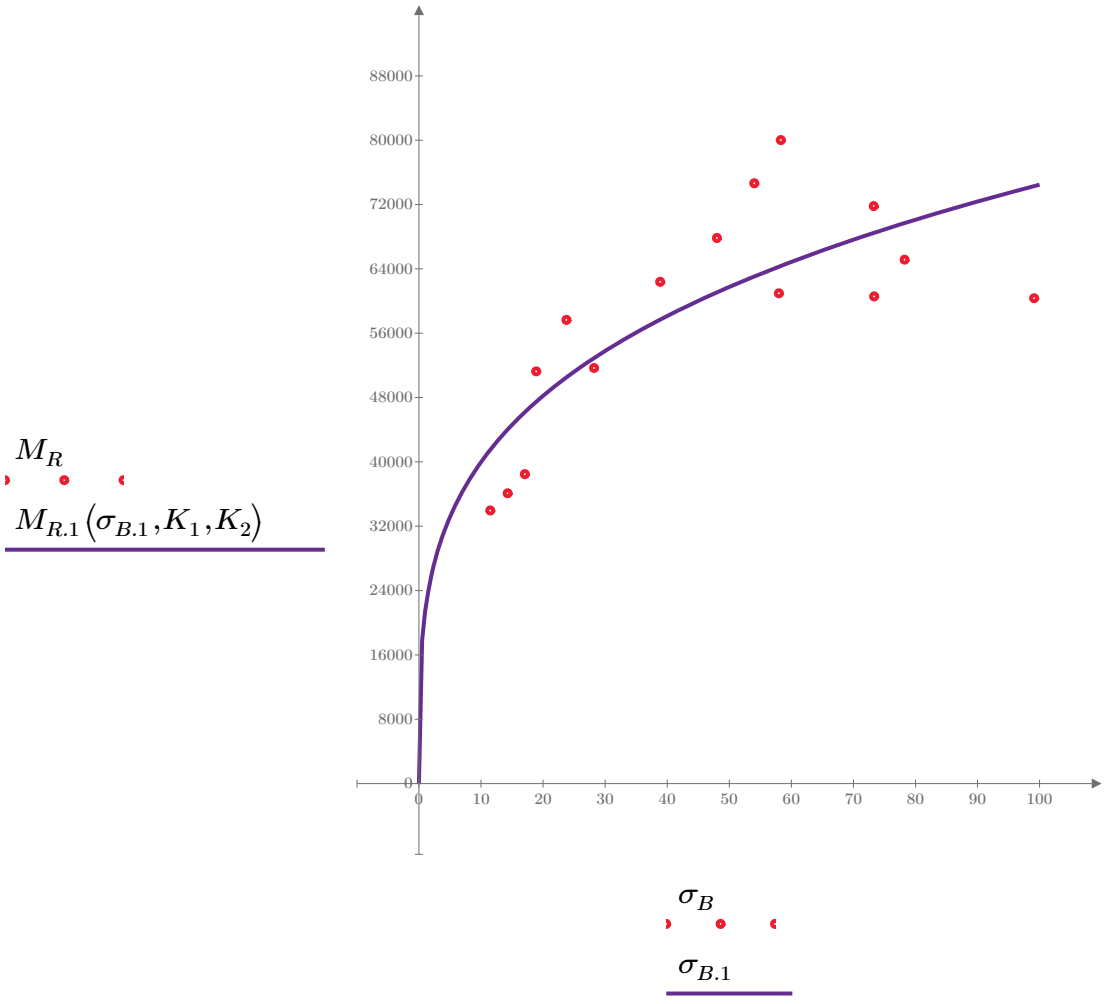

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–74”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 36983.239$

$K_4 = 0.1754$ Equation 2 fitting parameters

${R_2}^2 = 0.2828$ Coefficient of determination

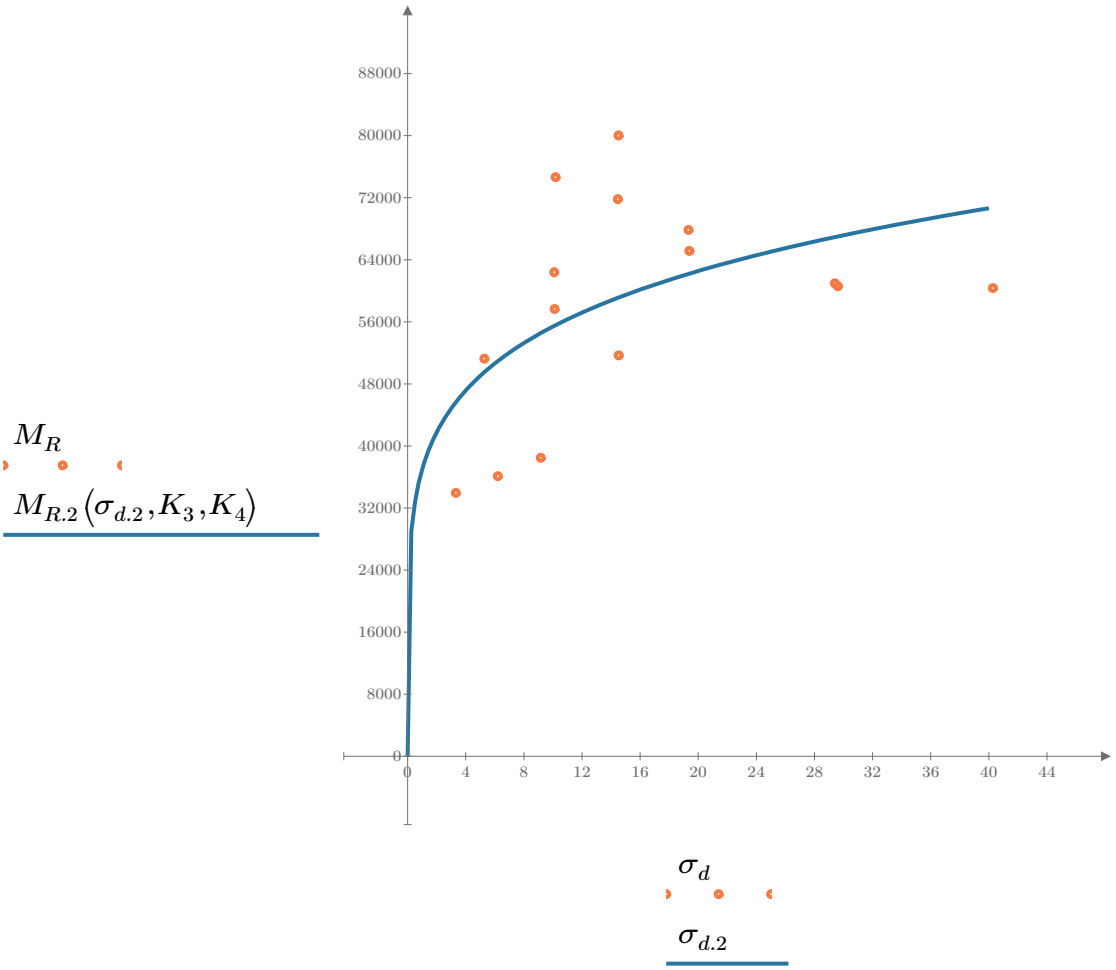

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–74”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 31099.959$

$K_6 = -0.0591$ Equation 3 fitting parameters

$K_7 = 0.3409$

${R_3}^2 = 0.7088$ Coefficient of determination

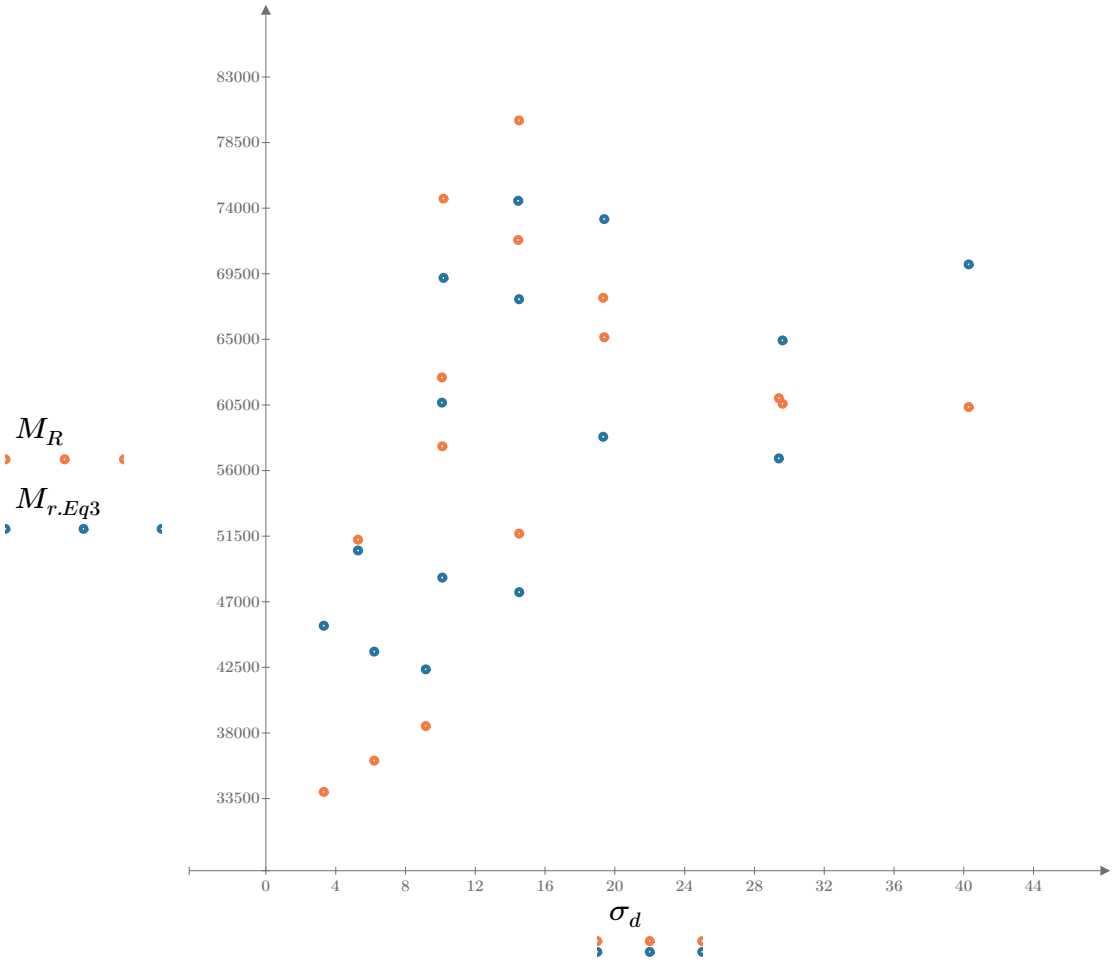

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-74\text{”}$

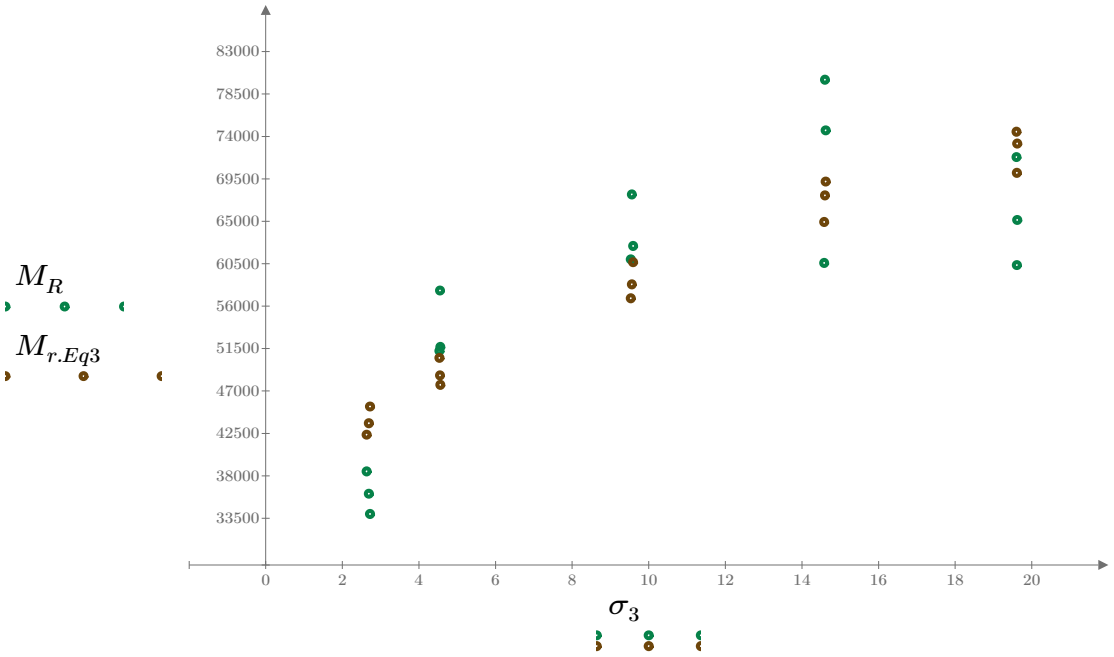

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

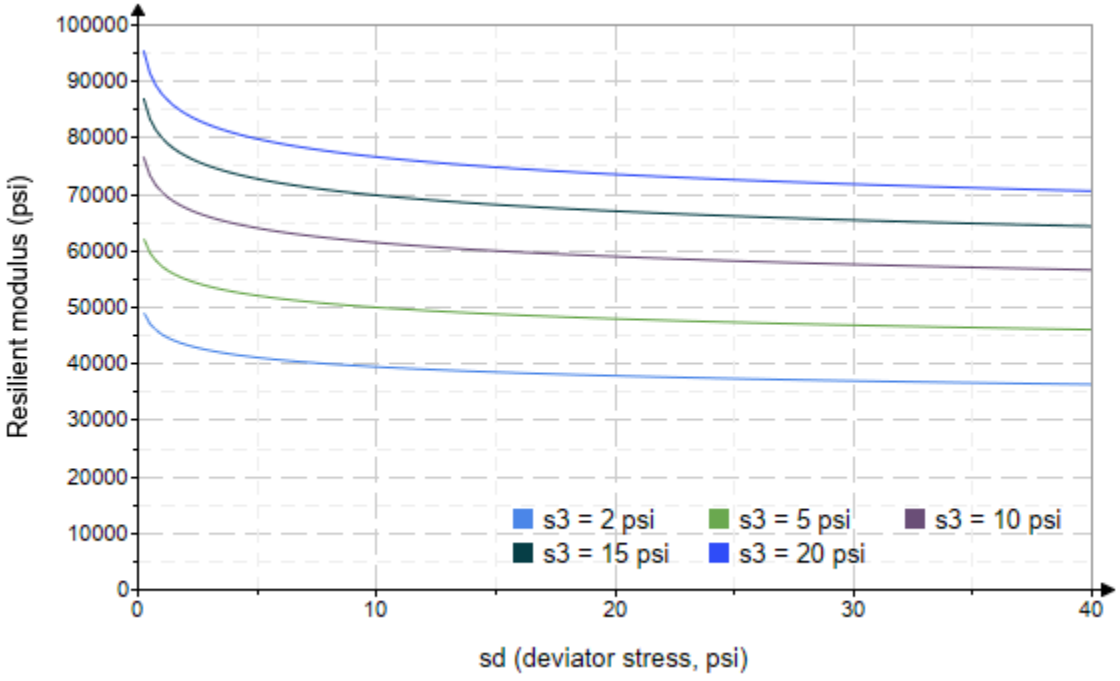

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–74”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2422.107$

$K_9 = 0.4658$ Equation 4 fitting parameters

$K_{10} = -0.2243$

$R_4^{\,2} = 0.7392$ Coefficient of determination

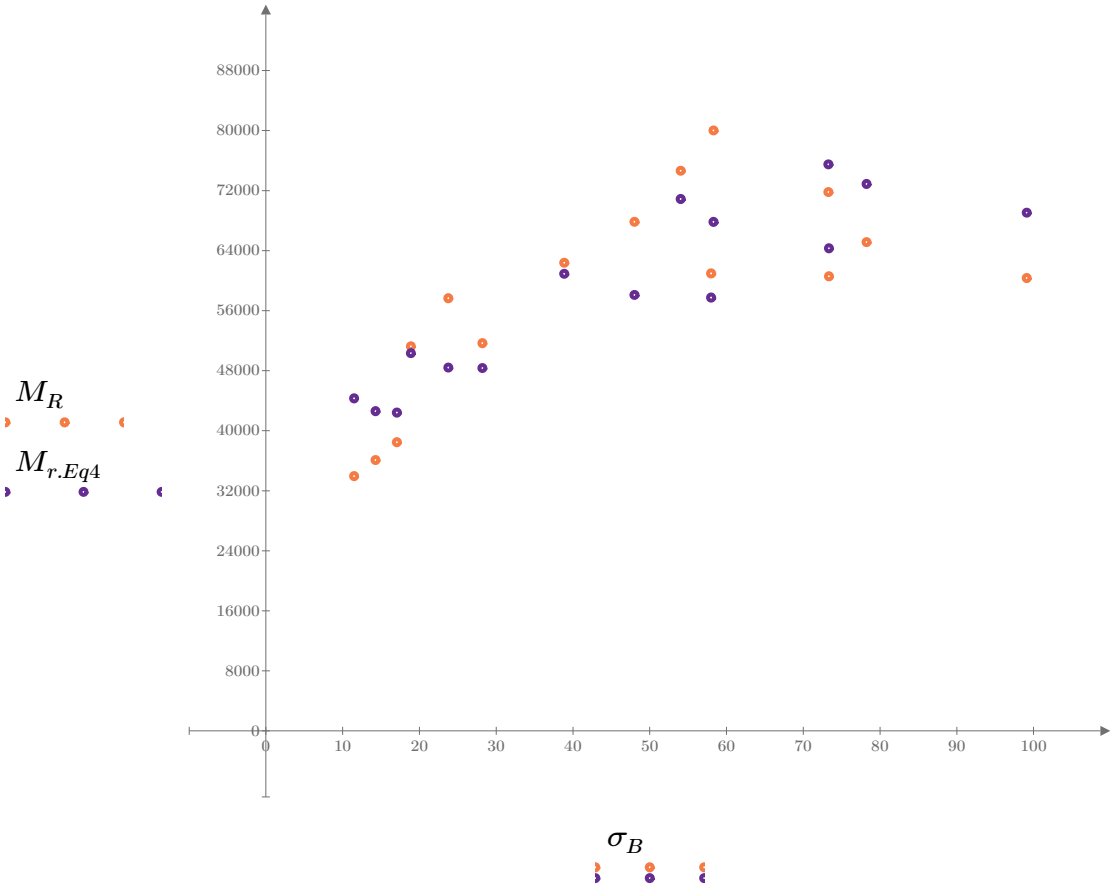

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

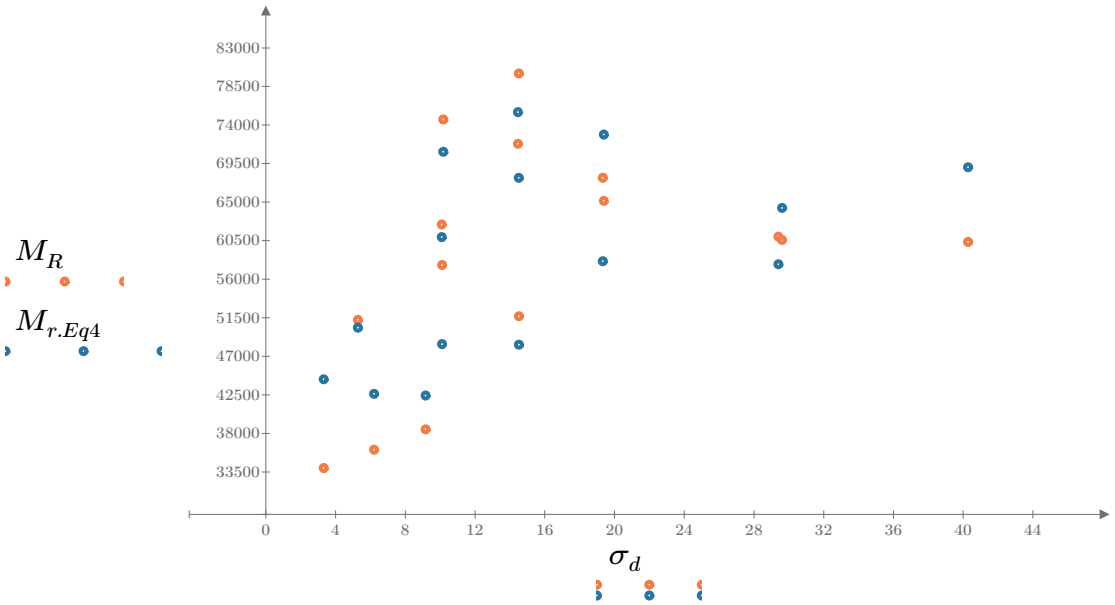

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

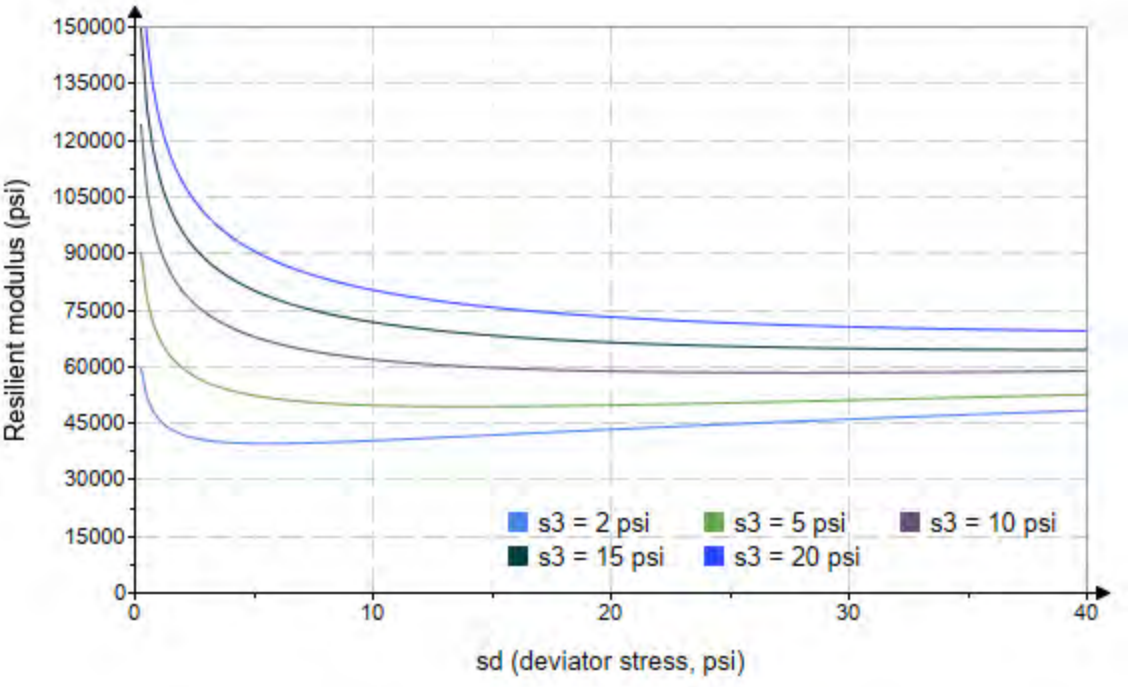

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−75"

$Treatment =$ "M5"

$S = 10.055$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.789 \\ 2.204 \\ 1.978 \\ 4.052 \\ 3.682 \\ 3.148 \\ 8.571 \\ 8.712 \\ 8.707 \\ 13.560 \\ 13.160 \\ 13.820 \\ 18.770 \\ 18.390 \\ 19.270 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.108 \\ 6.300 \\ 9.240 \\ 5.212 \\ 10.210 \\ 14.610 \\ 10.240 \\ 19.360 \\ 29.660 \\ 10.170 \\ 14.600 \\ 29.880 \\ 14.580 \\ 19.750 \\ 40.250 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.470 \\ 12.910 \\ 15.170 \\ 17.370 \\ 21.250 \\ 24.050 \\ 35.950 \\ 45.490 \\ 55.780 \\ 50.850 \\ 54.090 \\ 71.360 \\ 70.870 \\ 74.920 \\ 98.060 \end{bmatrix} \quad M_R = \begin{bmatrix} 33593.2 \\ 26456.8 \\ 28727.2 \\ 46165.2 \\ 44385.8 \\ 41021.6 \\ 75104.8 \\ 66216.4 \\ 76302.2 \\ 193686.0 \\ 94895.8 \\ 87337.2 \\ 188624.0 \\ 147176.0 \\ 68962.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–75”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 8716.605$

$K_2 = 0.6055$

Equation 1 fitting parameters

$R_1^2 = 0.4238$ Coefficient of determination

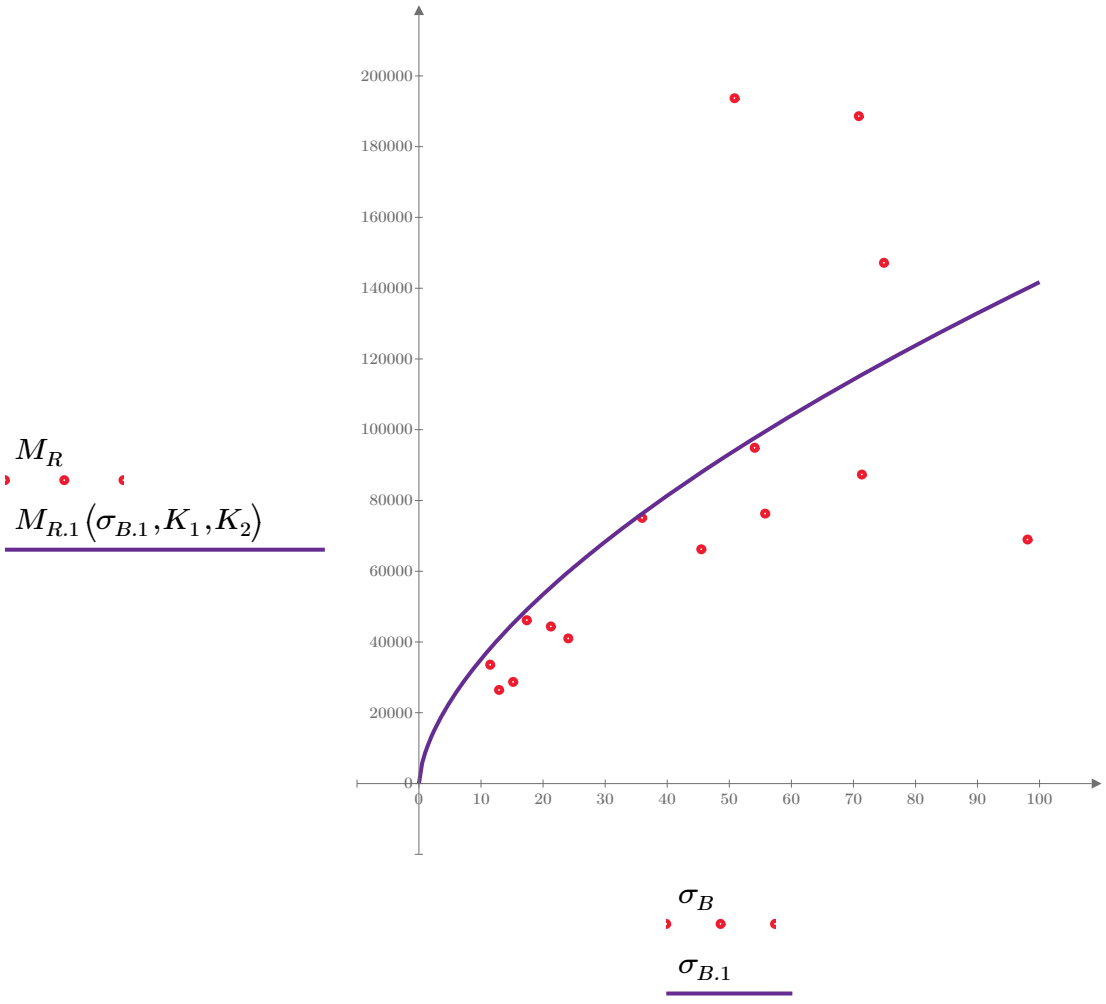

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–75”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 44483.561$

$K_4 = 0.2326$ Equation 2 fitting parameters

${R_2}^2 = 0.0728$ Coefficient of determination

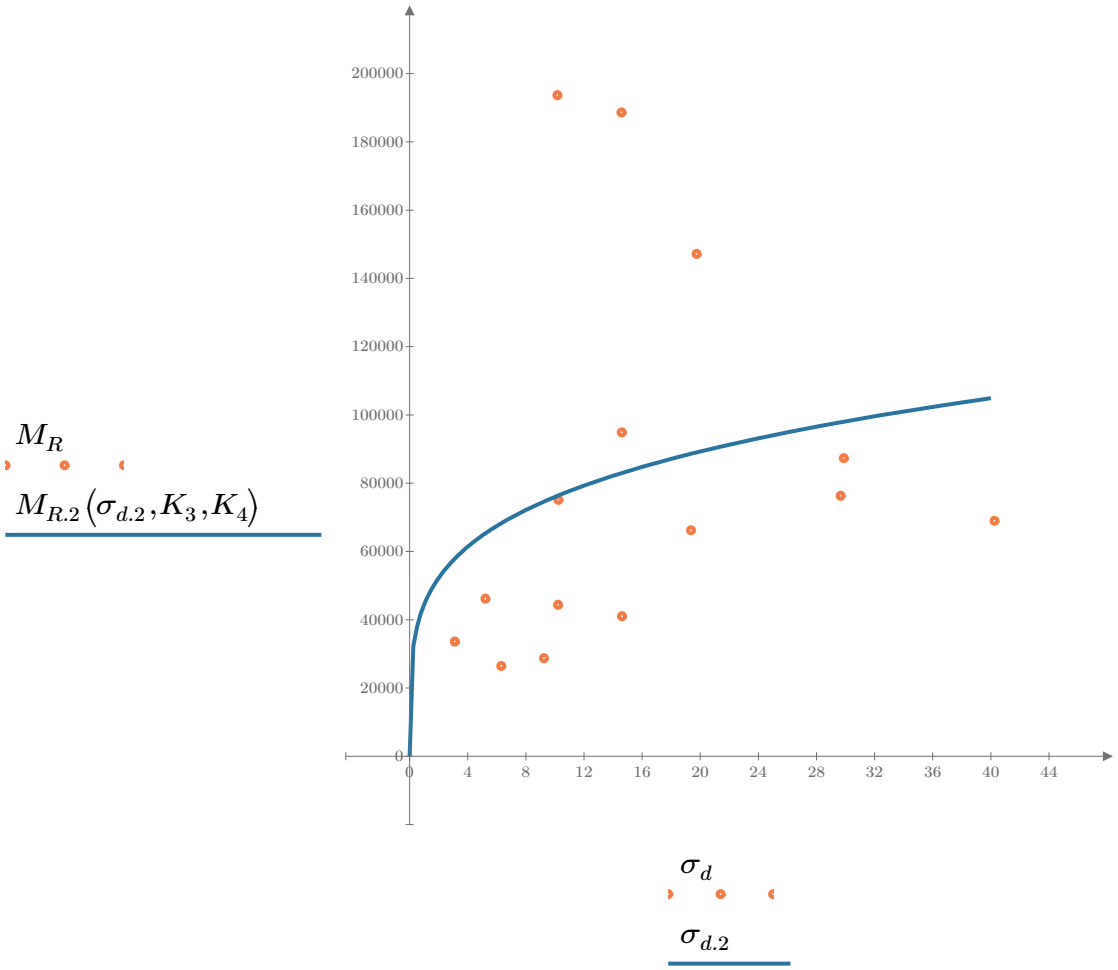

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–75”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 19445.777$

$K_6 = -0.7082$ Equation 3 fitting parameters

$K_7 = 1.3998$

${R_3}^2 = 0.8765$ Coefficient of determination

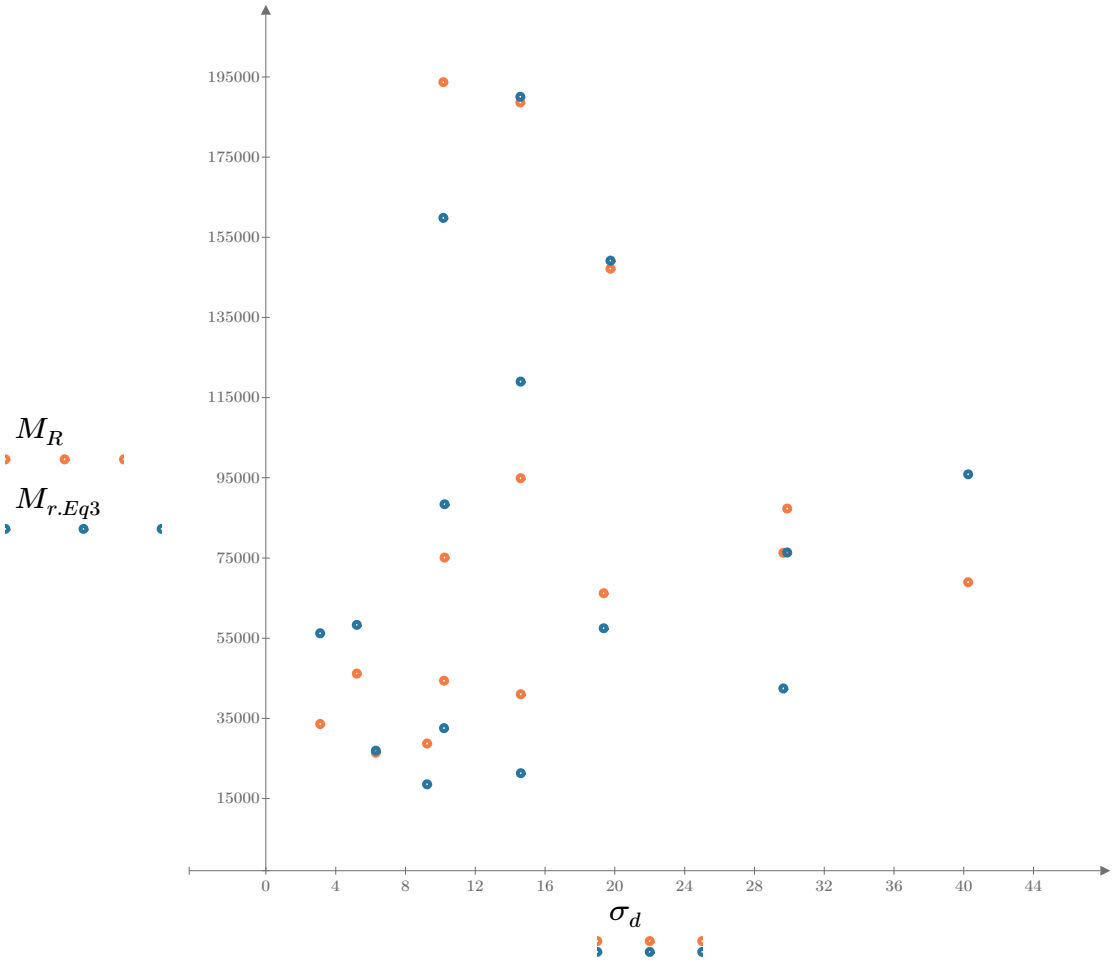

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-75\text{”}$

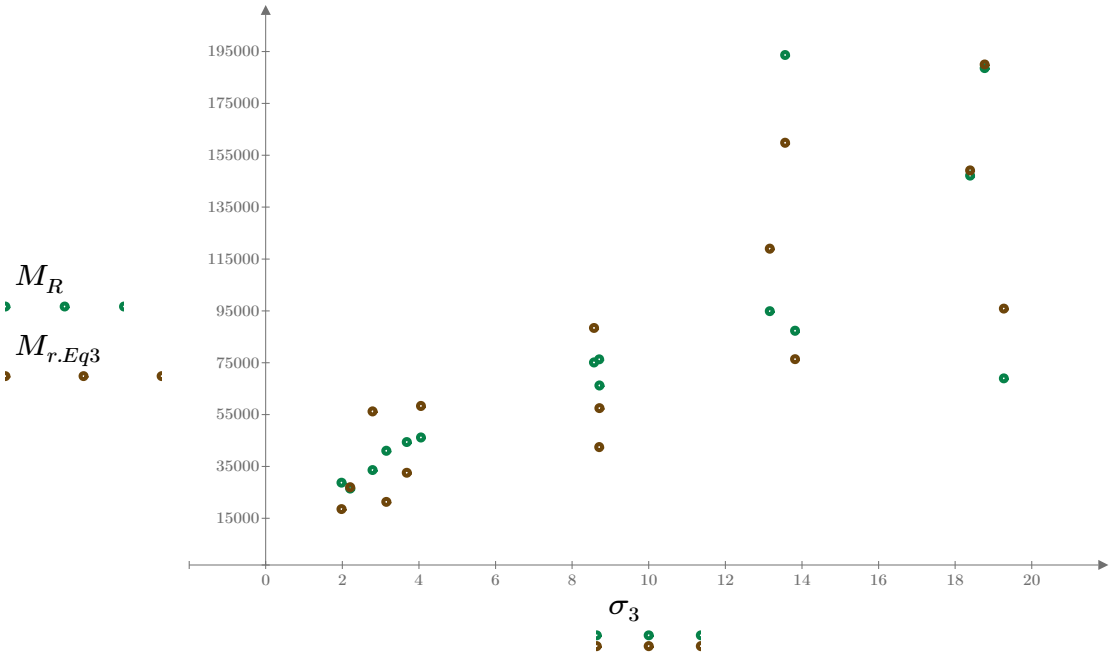

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

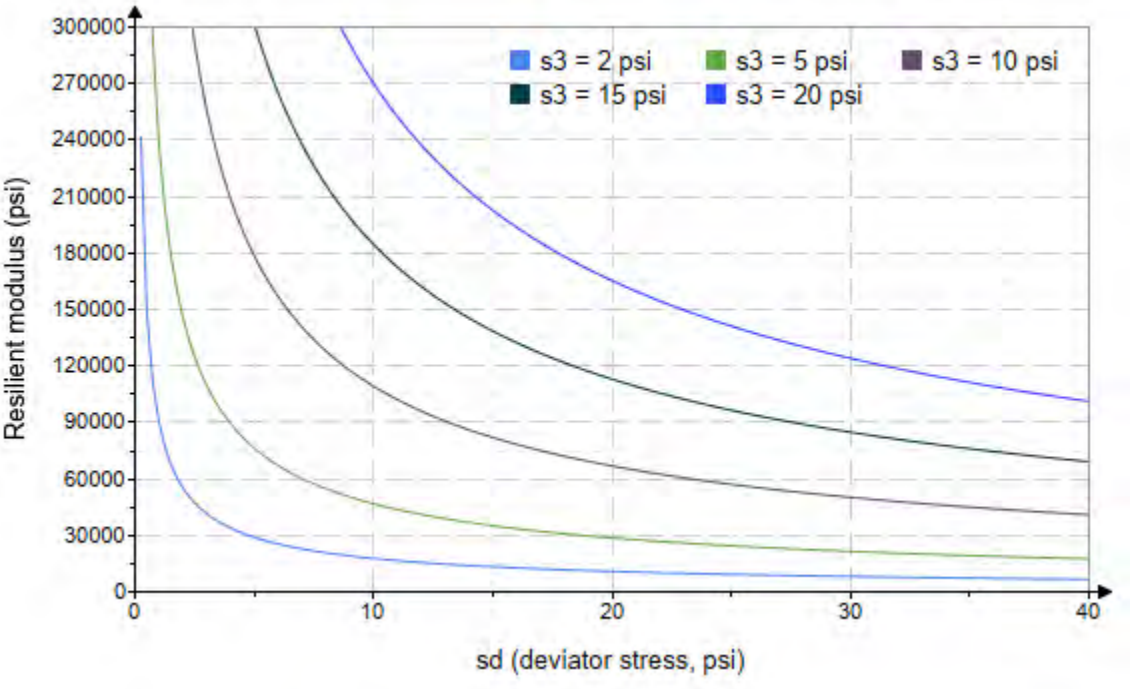

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–75”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 718.899$

$K_9 = 1.8408$ Equation 4 fitting parameters

$K_{10} = -1.306$

$R_4^{\,2} = 0.9137$ Coefficient of determination

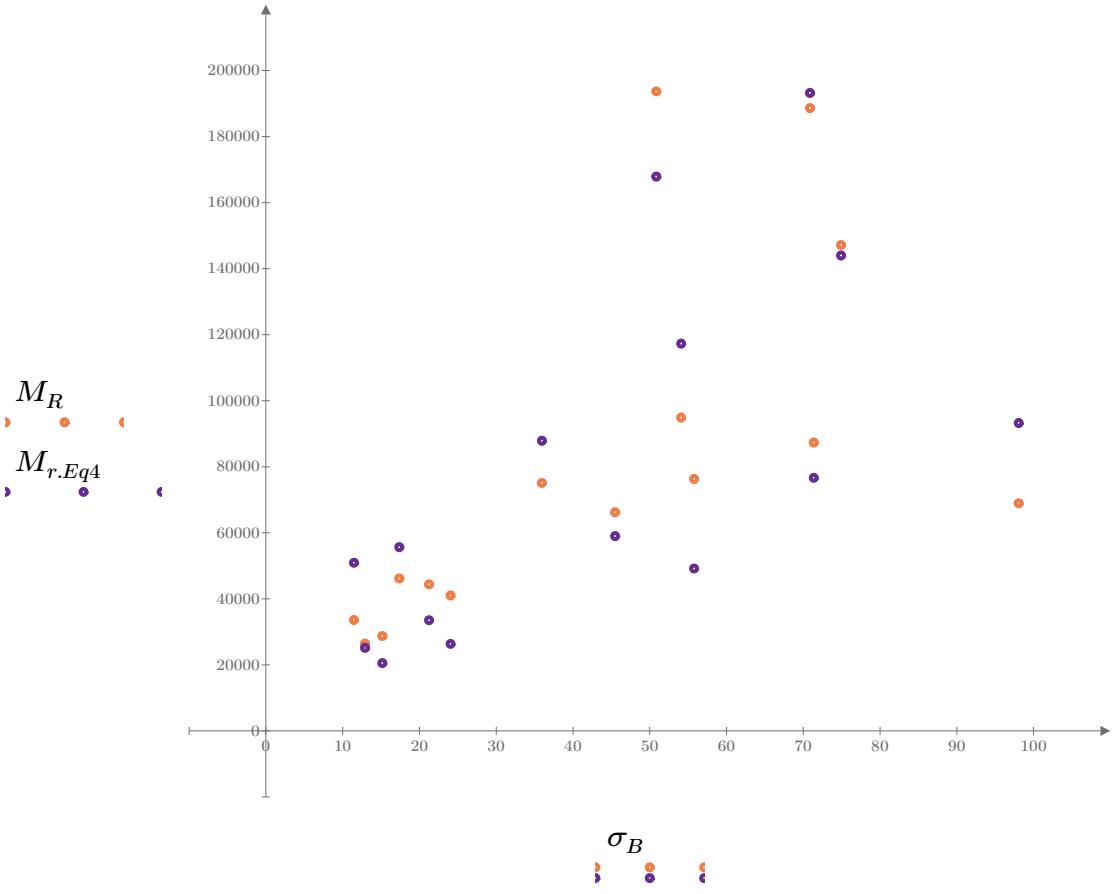

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

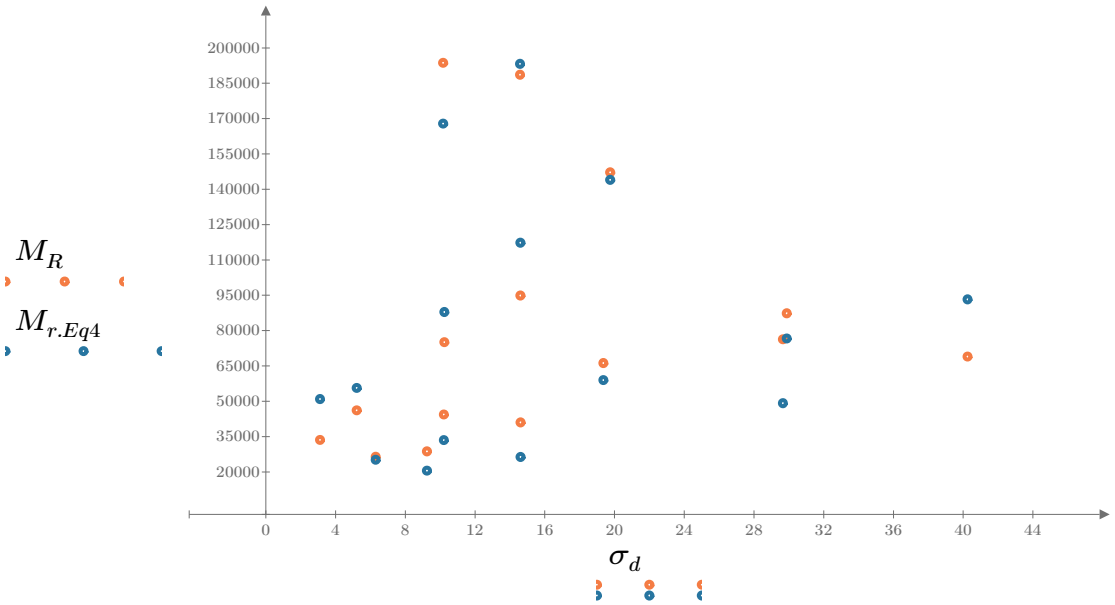

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

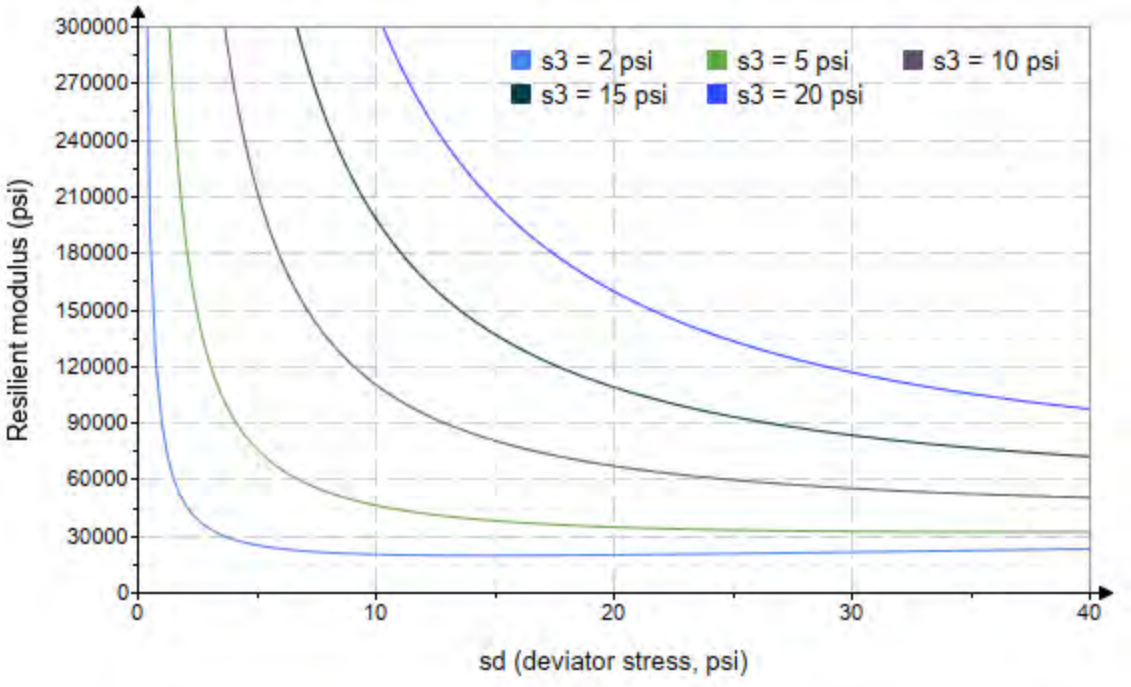

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo := \text{“B2}-\text{76”}$

$Treatment = \text{“M5”}$

$S = 9.884$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.572 \\ 2.570 \\ 2.545 \\ 4.580 \\ 4.531 \\ 4.510 \\ 9.560 \\ 9.554 \\ 9.547 \\ 14.590 \\ 14.580 \\ 14.570 \\ 19.620 \\ 19.610 \\ 19.610 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.156 \\ 6.201 \\ 9.177 \\ 5.246 \\ 10.100 \\ 14.480 \\ 10.040 \\ 19.300 \\ 29.710 \\ 10.200 \\ 14.520 \\ 29.880 \\ 14.540 \\ 19.510 \\ 40.200 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.870 \\ 13.910 \\ 16.810 \\ 18.990 \\ 23.700 \\ 28.010 \\ 38.720 \\ 47.960 \\ 58.350 \\ 53.970 \\ 58.270 \\ 73.600 \\ 73.410 \\ 78.340 \\ 99.020 \end{bmatrix} \quad M_R = \begin{bmatrix} 31077.6 \\ 25273.2 \\ 26699.8 \\ 25163.8 \\ 30091.8 \\ 30948.0 \\ 41707.6 \\ 42680.6 \\ 48636.6 \\ 71910.0 \\ 72675.0 \\ 55817.6 \\ 72918.0 \\ 64033.6 \\ 63560.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–76”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 6491.671$

$K_2 = 0.5279$

Equation 1 fitting parameters

$R_1^2 = 0.7559$ Coefficient of determination

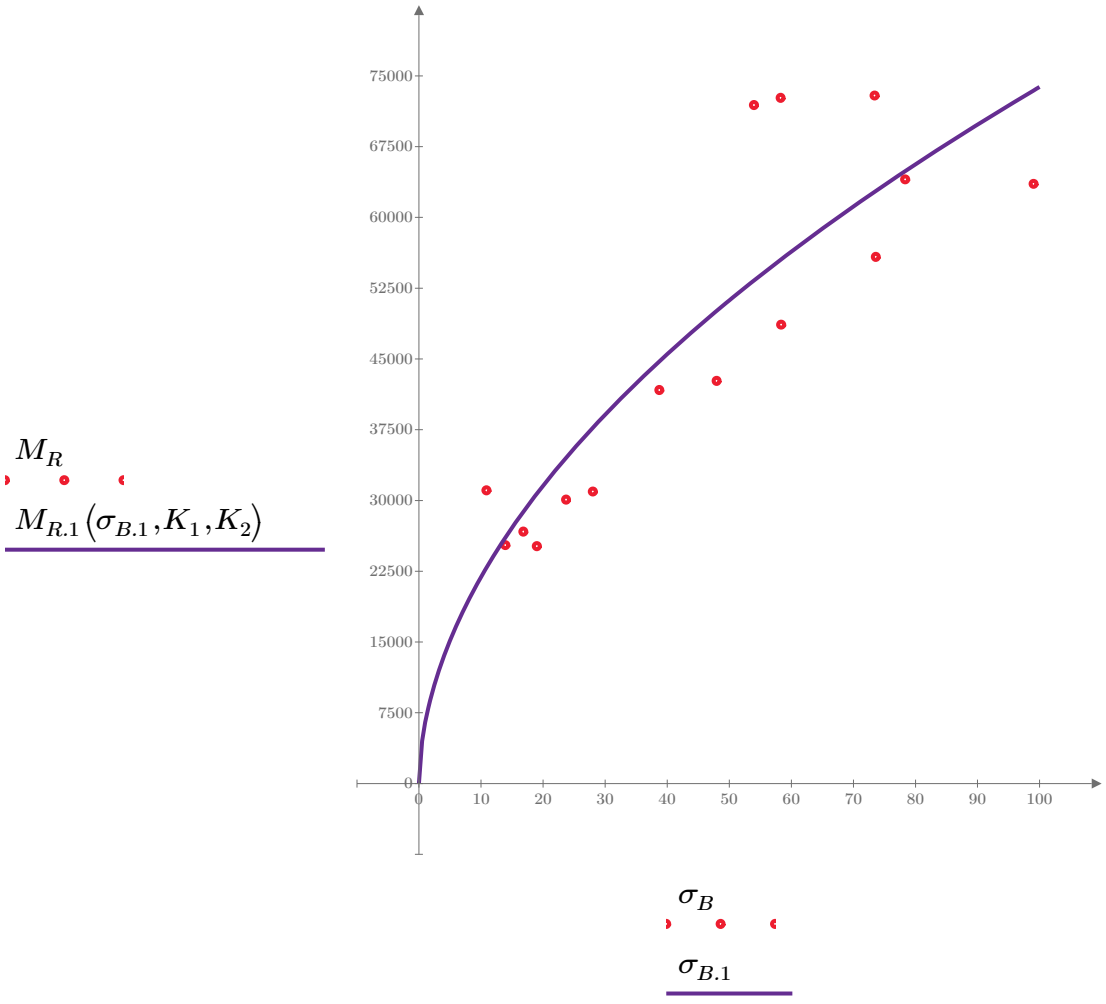

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–76”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 21019.545$

$K_4 = 0.3073$ Equation 2 fitting parameters

${R_2}^2 = 0.3029$ Coefficient of determination

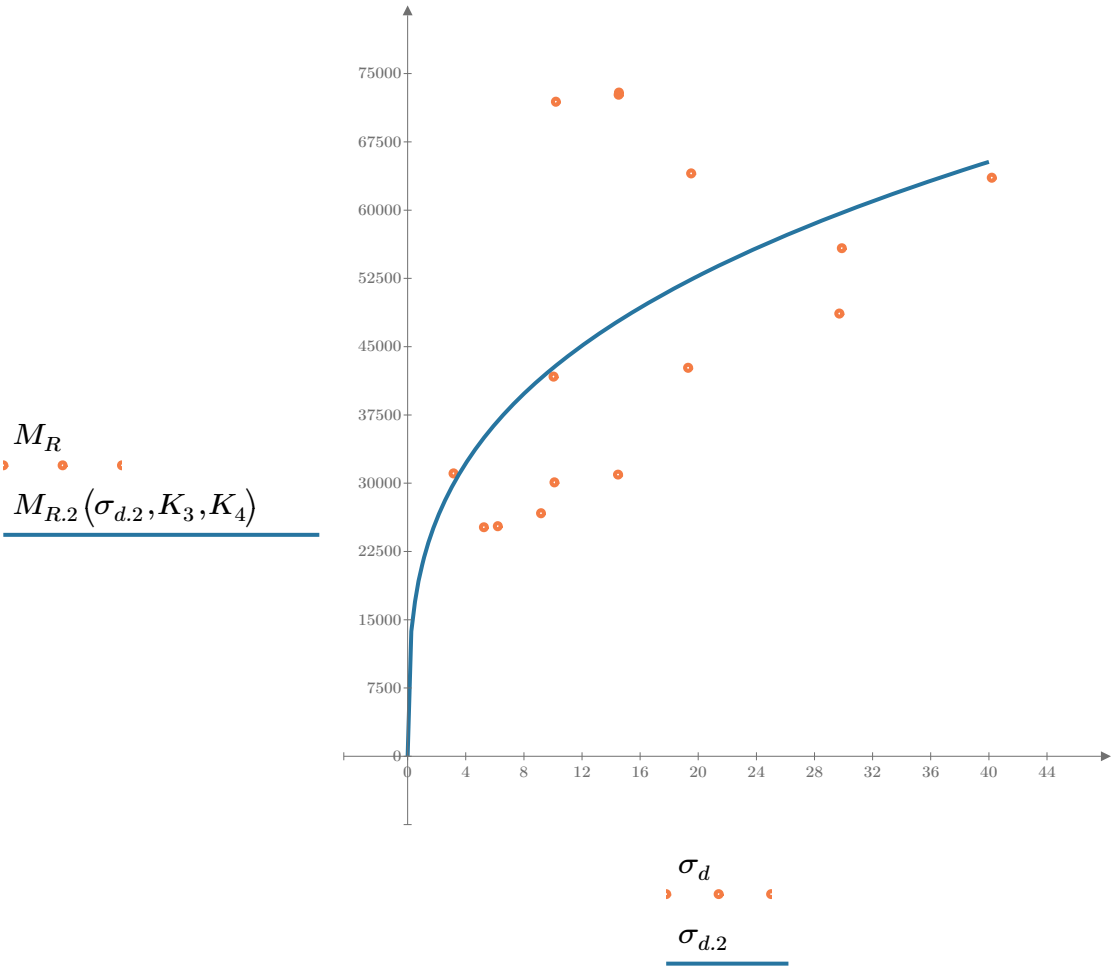

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–76”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 13297.090$

$K_6 = -0.1282$ Equation 3 fitting parameters

$K_7 = 0.6819$

${R_3}^2 = 0.9036$ Coefficient of determination

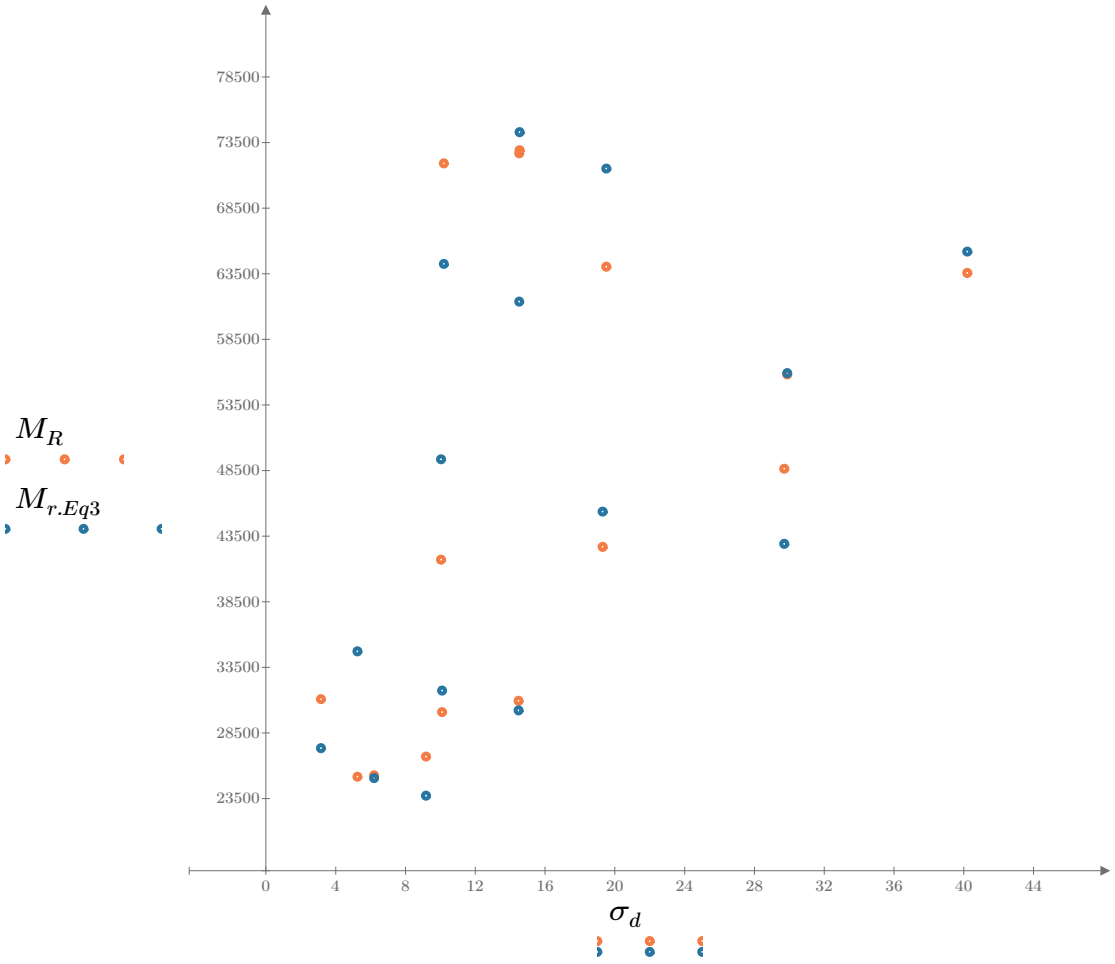

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2–76”}$

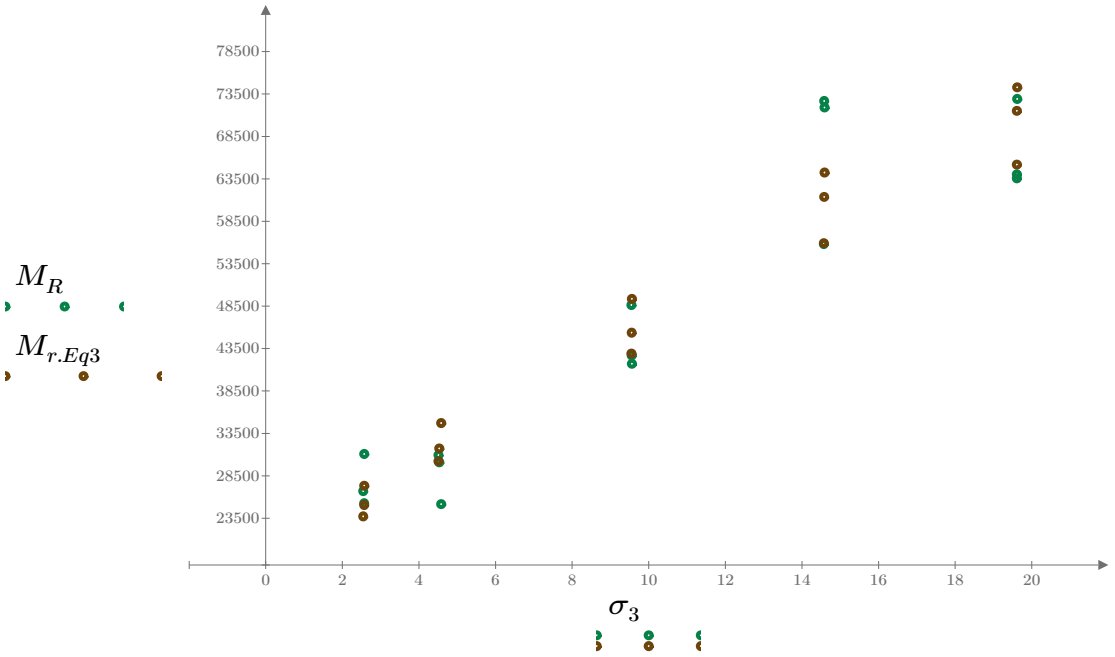

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

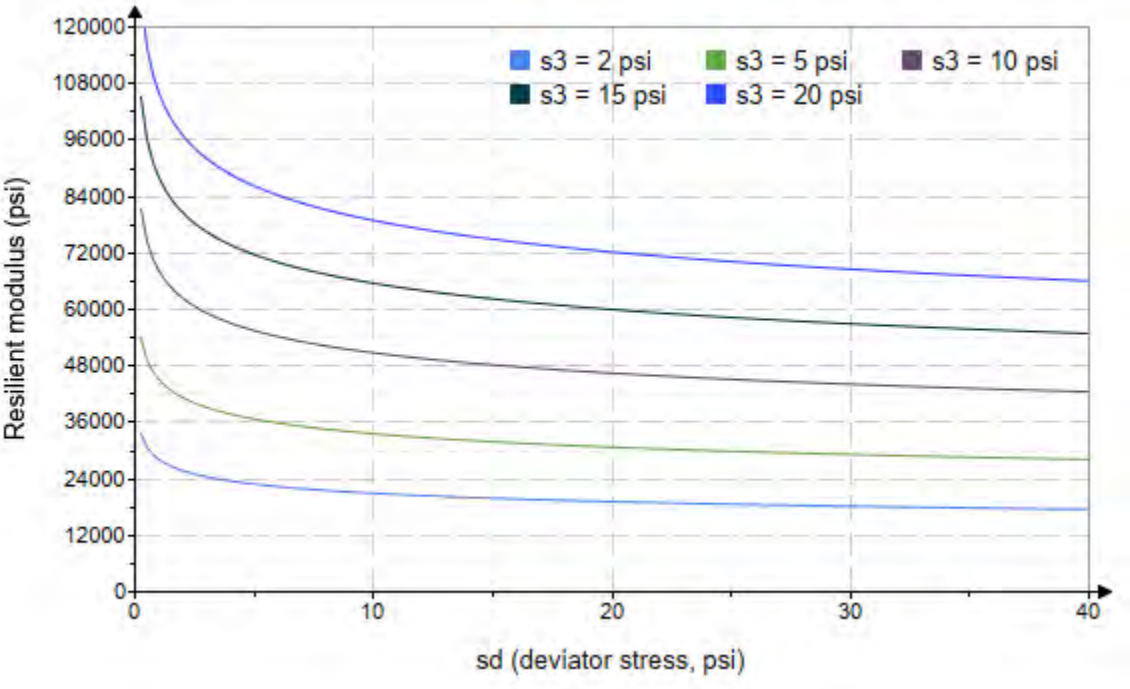

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–76”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1185.262$

$K_9 = 0.9067$ Equation 4 fitting parameters

$K_{10} = -0.4266$

$R_4^{\,2} = 0.9140$ Coefficient of determination

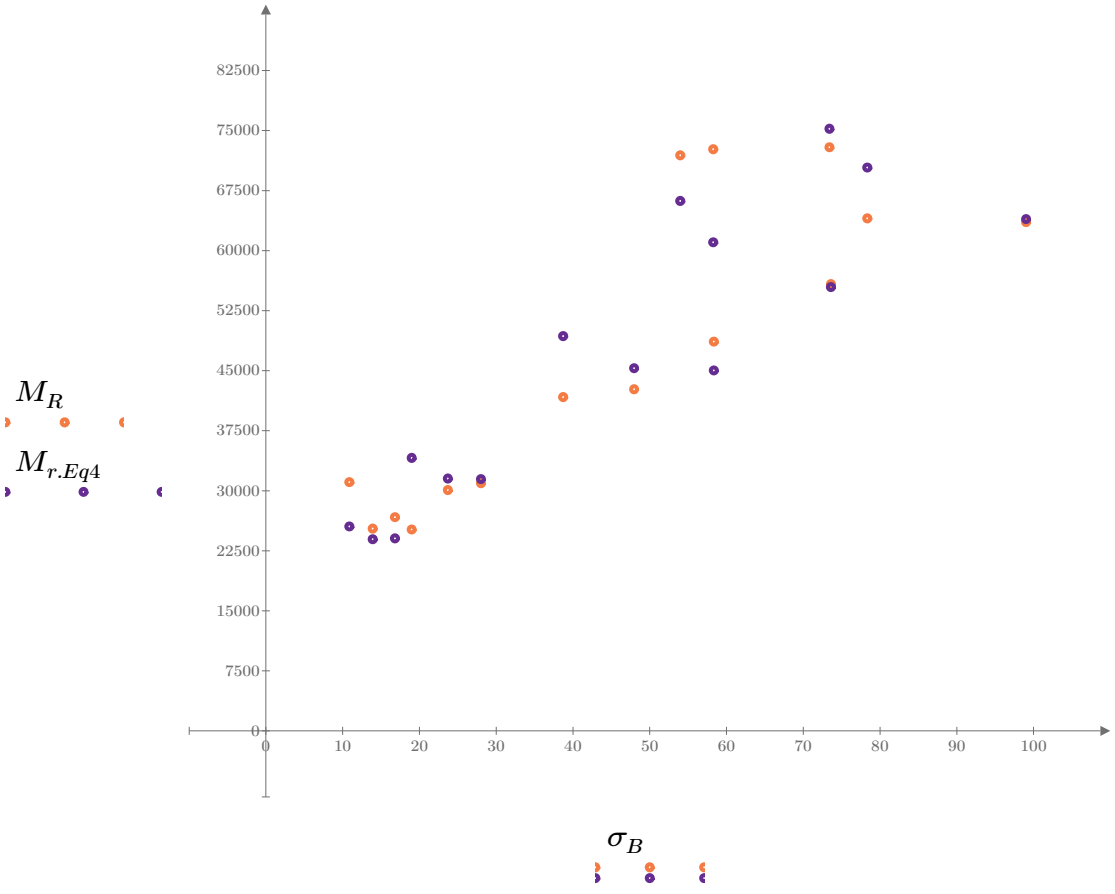

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

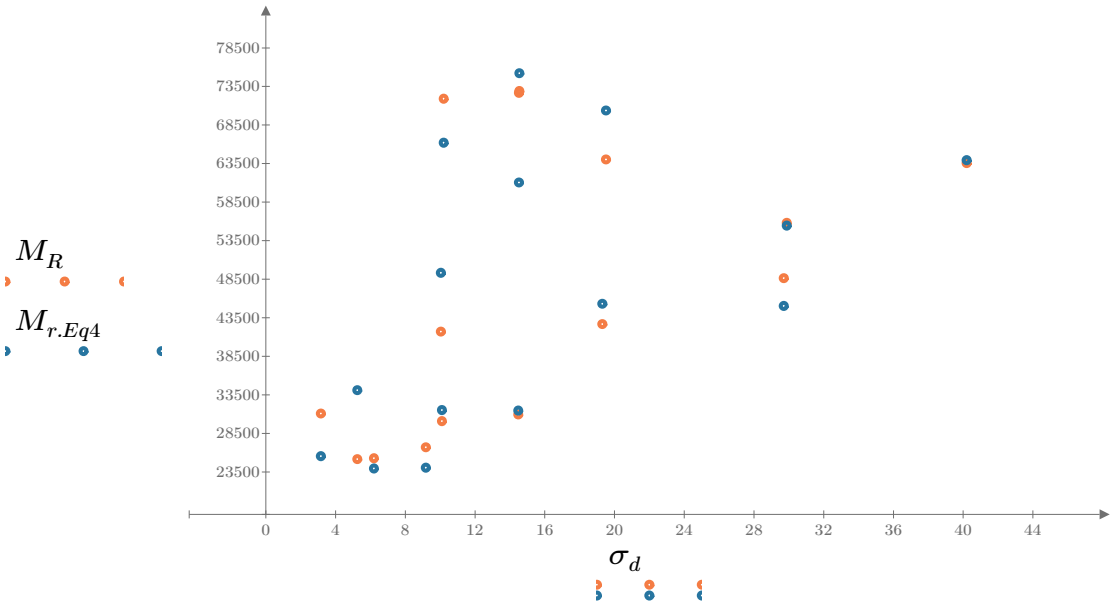

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

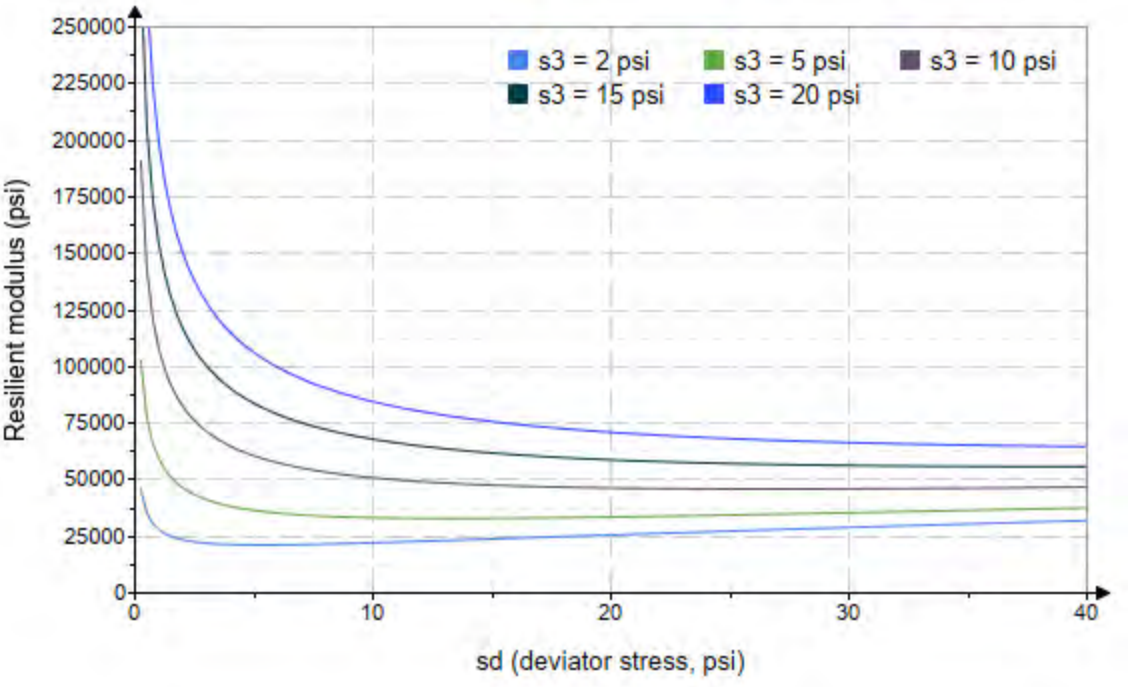

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B2−77"

$Treatment =$ "M5"

$S = 9.86$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.443 \\ 2.387 \\ 2.568 \\ 4.410 \\ 4.564 \\ 5.307 \\ 9.458 \\ 8.614 \\ 8.420 \\ 14.310 \\ 13.940 \\ 13.410 \\ 18.820 \\ 18.430 \\ 18.400 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.178 \\ 6.112 \\ 9.077 \\ 5.100 \\ 10.020 \\ 14.420 \\ 10.180 \\ 19.270 \\ 29.460 \\ 10.200 \\ 14.520 \\ 29.520 \\ 14.650 \\ 19.500 \\ 40.020 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 10.510 \\ 13.270 \\ 16.780 \\ 18.330 \\ 23.710 \\ 30.340 \\ 38.560 \\ 45.120 \\ 54.720 \\ 53.120 \\ 56.340 \\ 69.740 \\ 71.120 \\ 74.800 \\ 95.220 \end{bmatrix} \quad M_R = \begin{bmatrix} 56428.7 \\ 47779.0 \\ 39456.2 \\ 77299.2 \\ 49891.8 \\ 41676.4 \\ 56985.8 \\ 53295.4 \\ 58701.8 \\ 98750.0 \\ 91249.8 \\ 71704.4 \\ 113352.0 \\ 84663.2 \\ 62806.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B2–77”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 24034.862$

$K_2 = 0.2793$

Equation 1 fitting parameters

$R_1^2 = 0.3126$ Coefficient of determination

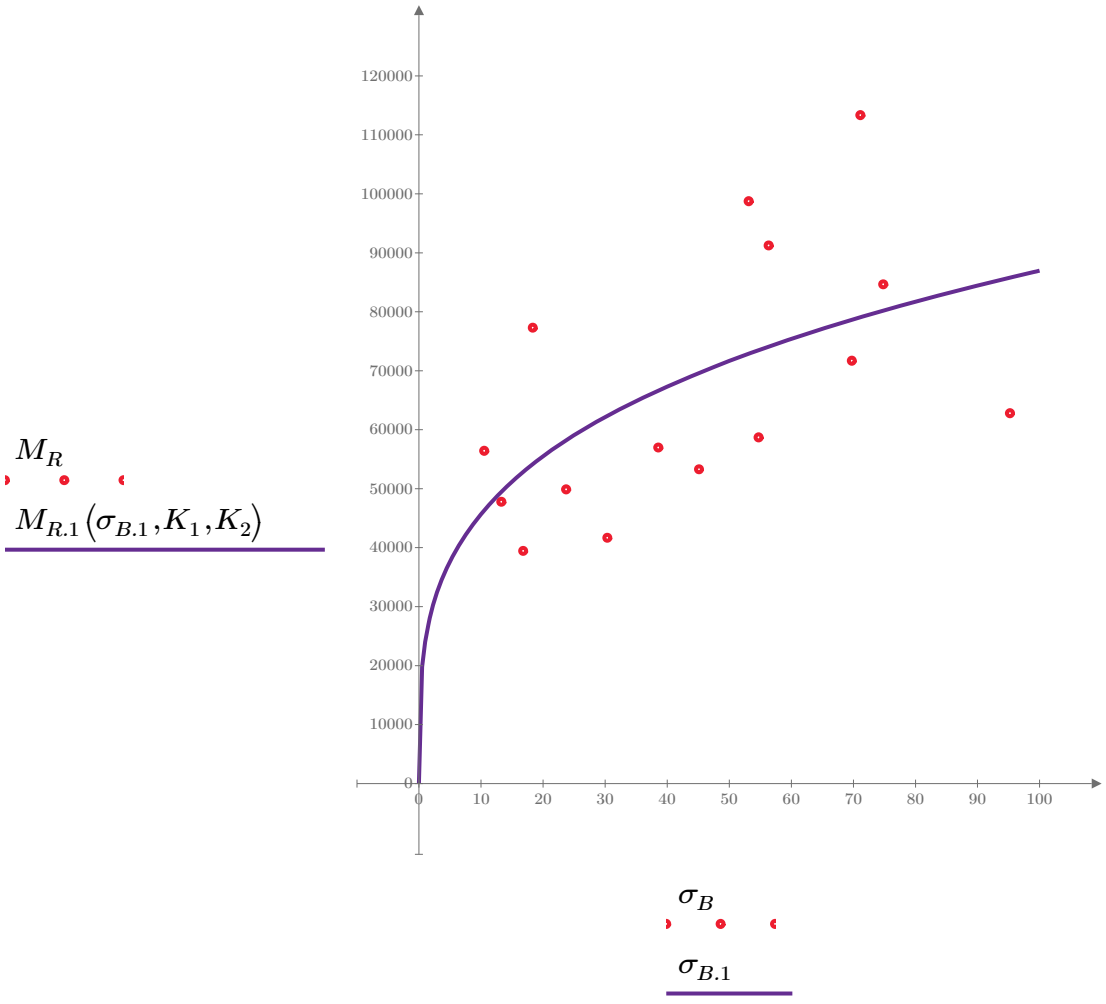

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B2–77”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 57378.786$

$K_4 = 0.0603$

Equation 2 fitting parameters

${R_2}^2 = 0.0171$ Coefficient of determination

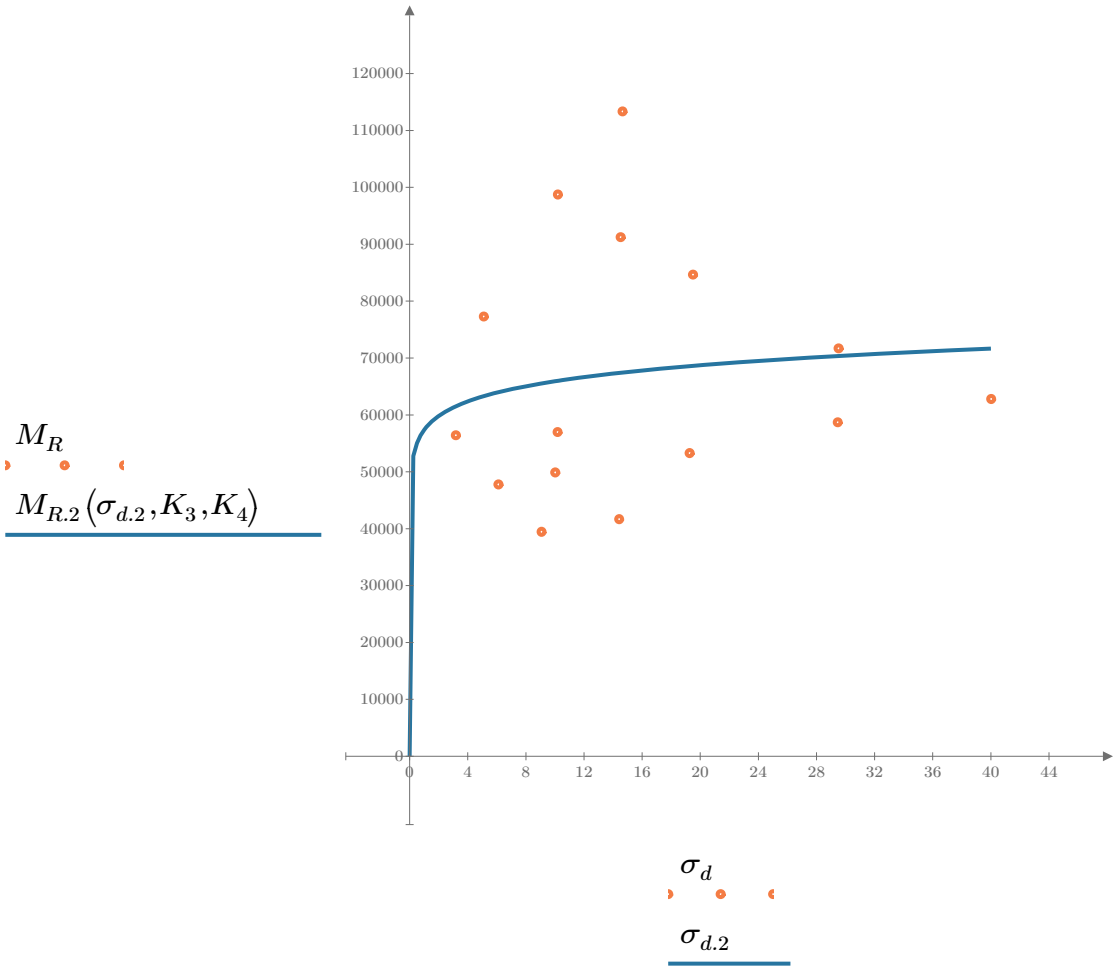

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B2–77”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 40224.011$

$K_6 = -0.3902$ Equation 3 fitting parameters

$K_7 = 0.666$

${R_3}^2 = 0.8459$ Coefficient of determination

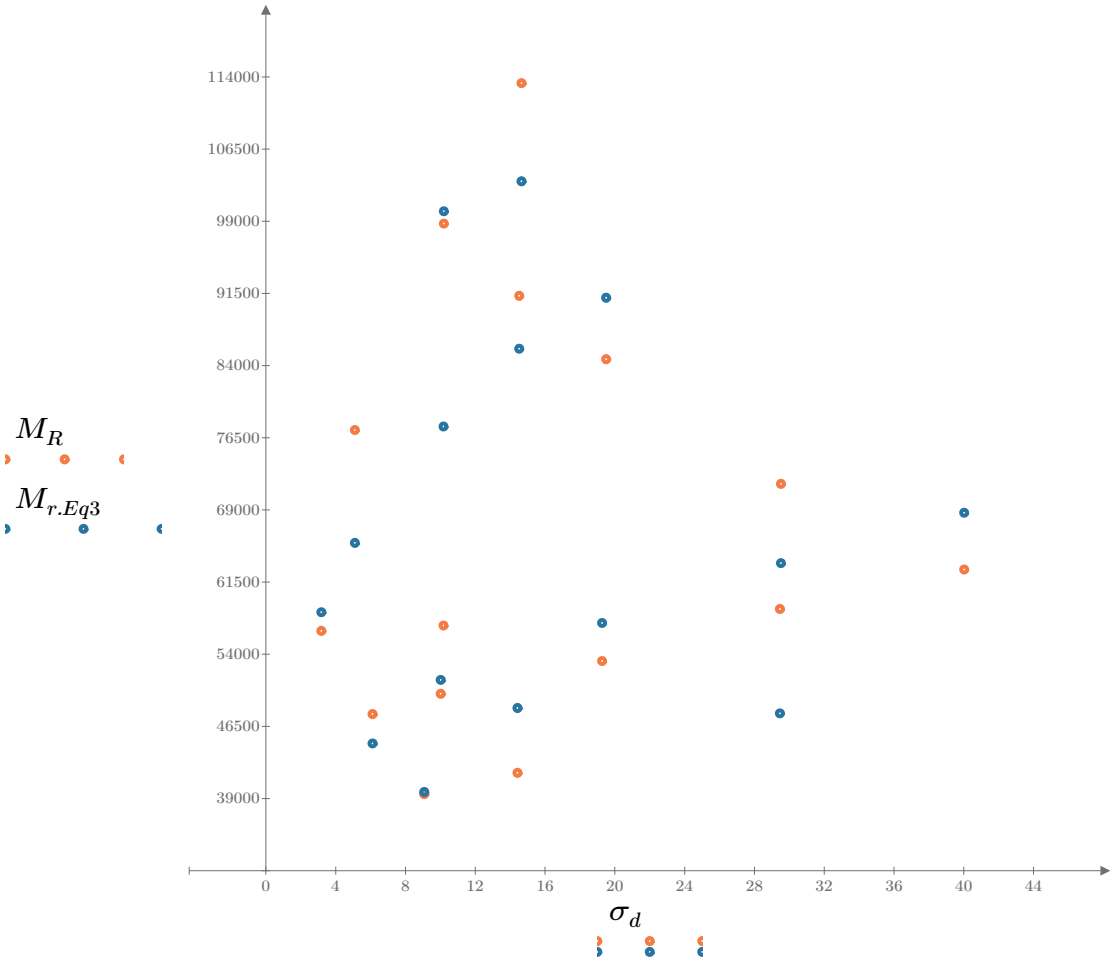

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B2}-77\text{”}$

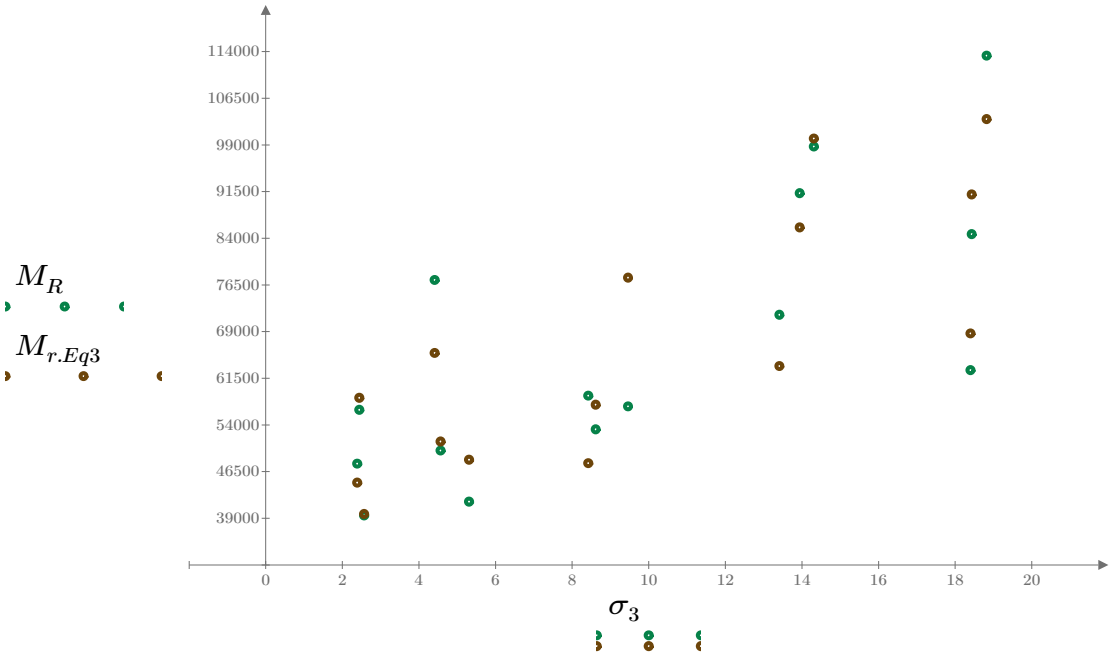

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

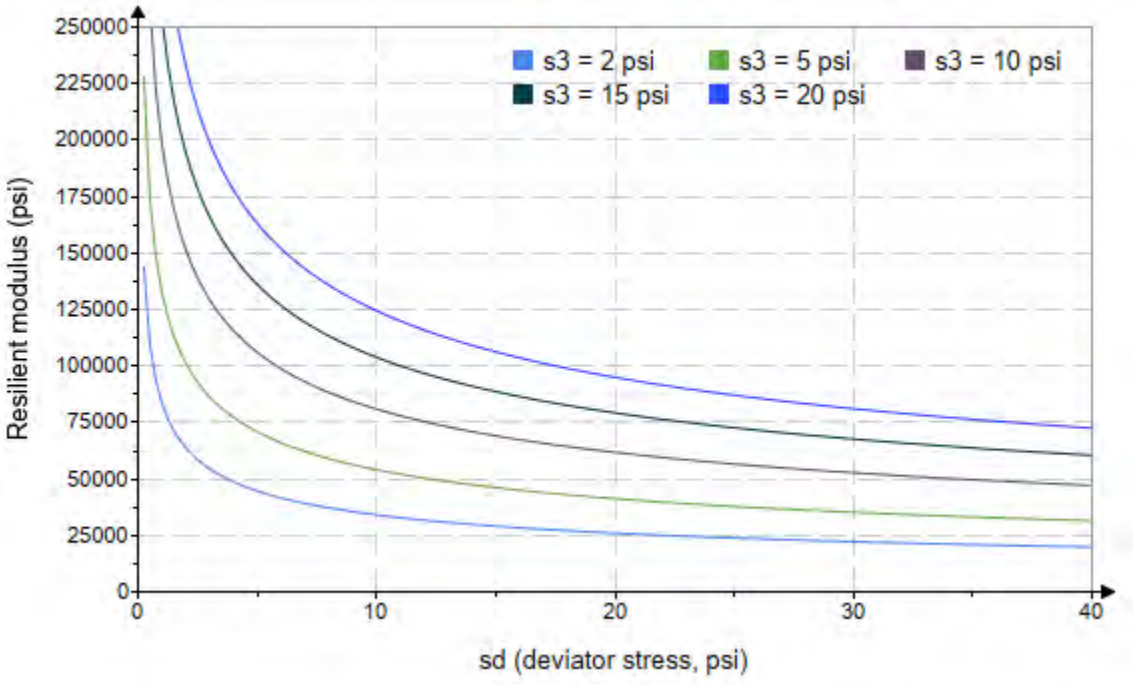

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B2–77”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1776.344$

$K_9 = 0.8721$ Equation 4 fitting parameters

$K_{10} = -0.6872$

$R_4^{\,2} = 0.8500$ Coefficient of determination

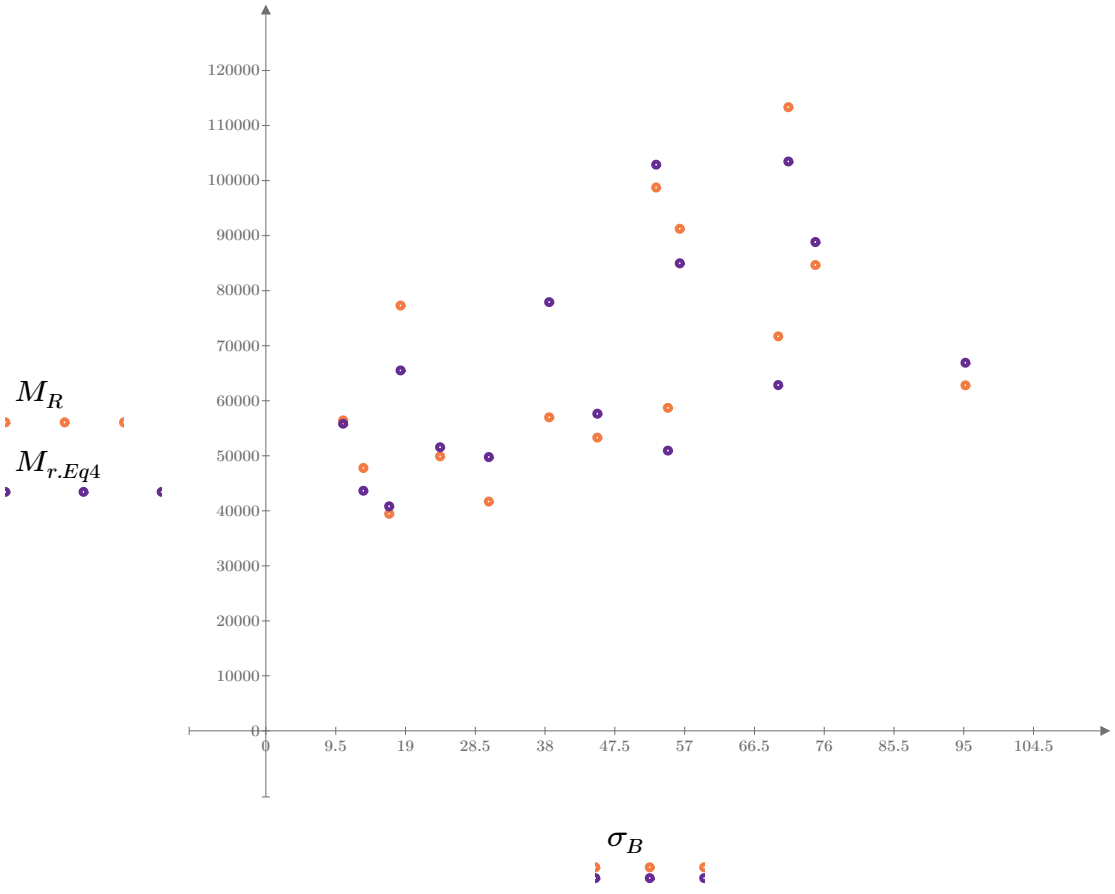

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

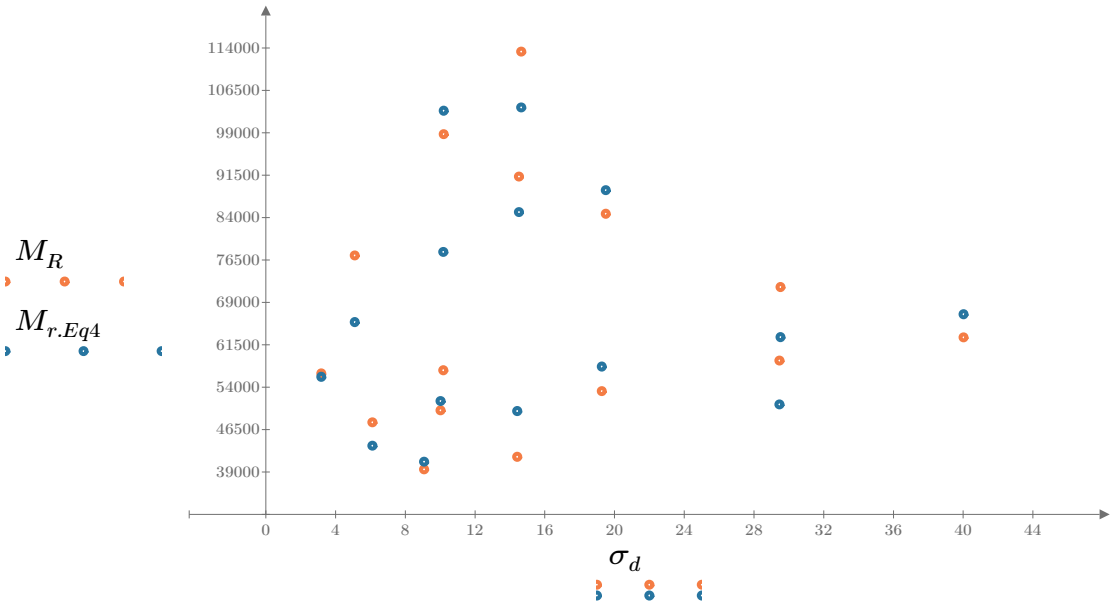

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

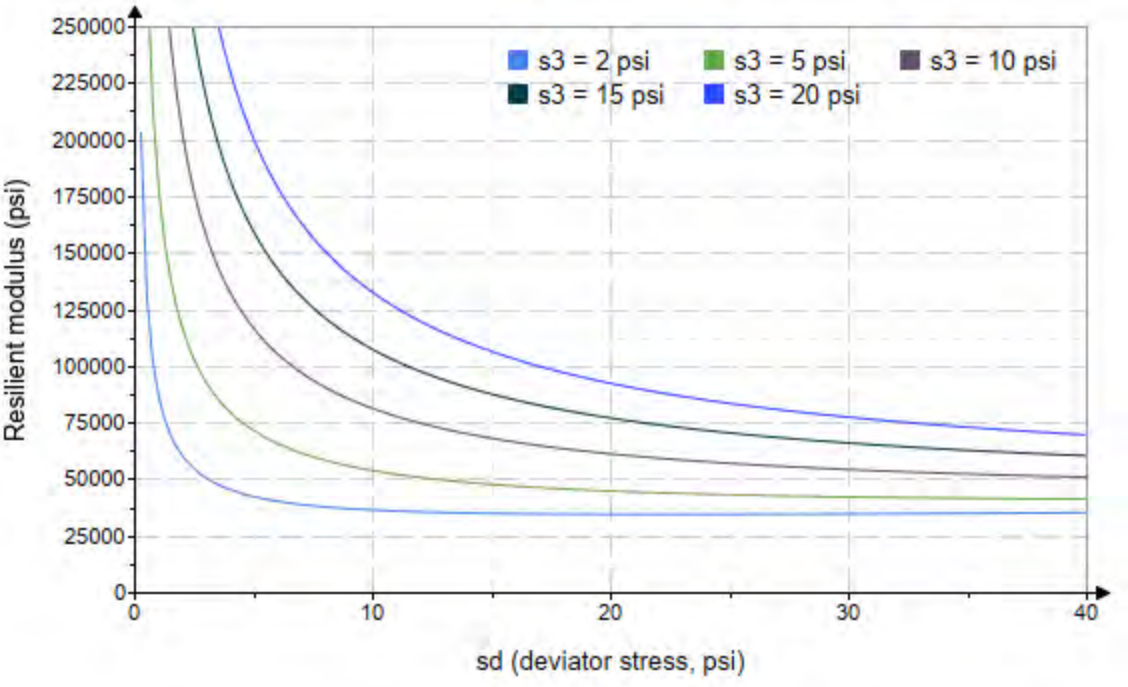

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B3−23"

$Treatment =$ "AD"

$S = 2.955$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.231 \\ 2.262 \\ 2.029 \\ 4.128 \\ 4.097 \\ 4.178 \\ 8.943 \\ 9.282 \\ 9.197 \\ 14.000 \\ 15.050 \\ 14.880 \\ 20.130 \\ 19.330 \\ 19.070 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.194 \\ 6.103 \\ 9.080 \\ 5.112 \\ 9.949 \\ 14.520 \\ 9.961 \\ 19.290 \\ 29.710 \\ 10.010 \\ 14.470 \\ 29.930 \\ 14.310 \\ 19.680 \\ 40.010 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 9.885 \\ 12.890 \\ 15.170 \\ 17.500 \\ 22.240 \\ 27.050 \\ 36.790 \\ 47.130 \\ 57.310 \\ 52.000 \\ 59.630 \\ 74.570 \\ 74.710 \\ 77.680 \\ 97.230 \end{bmatrix} \quad M_R = \begin{bmatrix} 52499.4 \\ 32610.4 \\ 30695.6 \\ 39986.0 \\ 43478.8 \\ 41376.8 \\ 61053.8 \\ 45962.6 \\ 53431.2 \\ 54300.2 \\ 52026.2 \\ 70811.8 \\ 73377.0 \\ 84704.4 \\ 81646.6 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B3–23”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 12978.611$

$K_2 = 0.3882$

Equation 1 fitting parameters

$R_1^2 = 0.6907$ Coefficient of determination

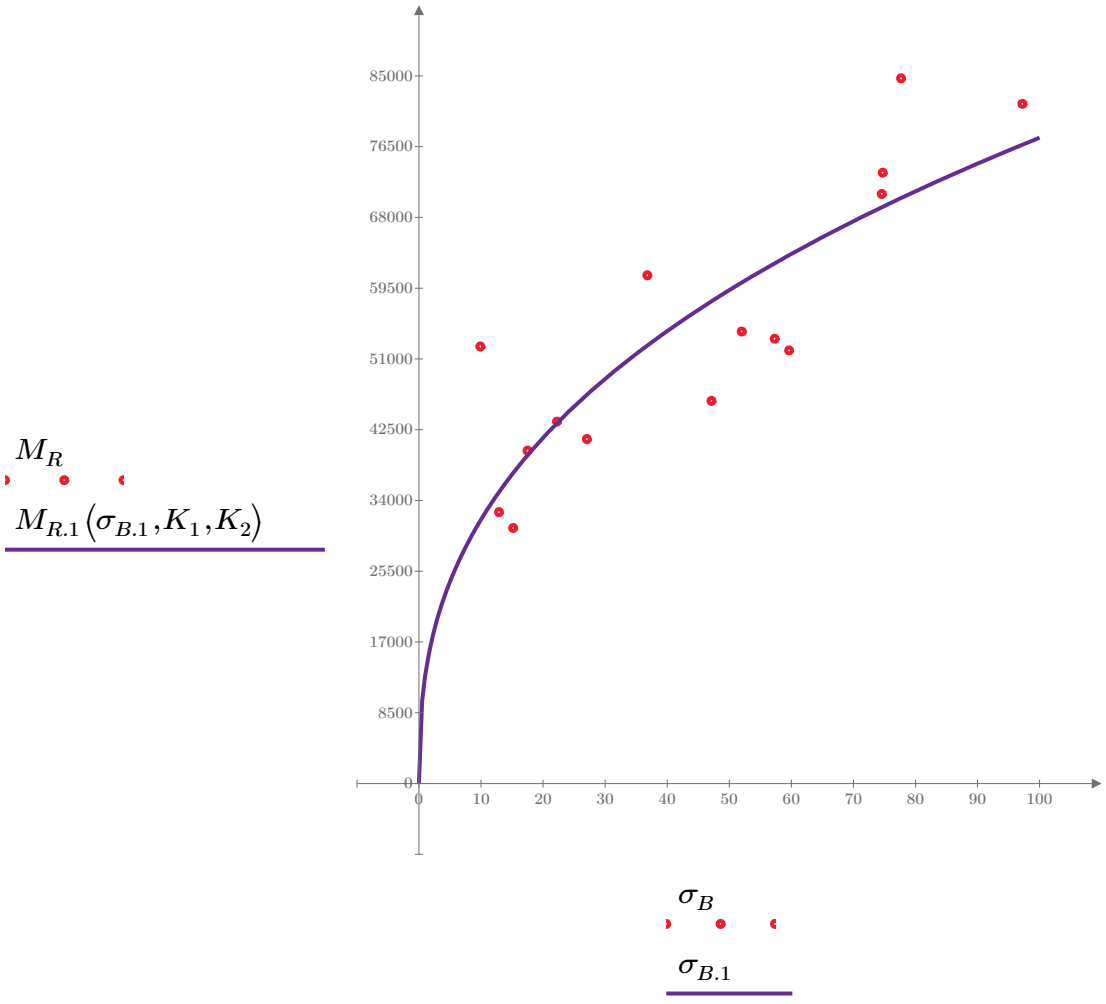

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B3–23”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 26087.130$

$K_4 = 0.2826$

Equation 2 fitting parameters

${R_2}^2 = 0.3685$ Coefficient of determination

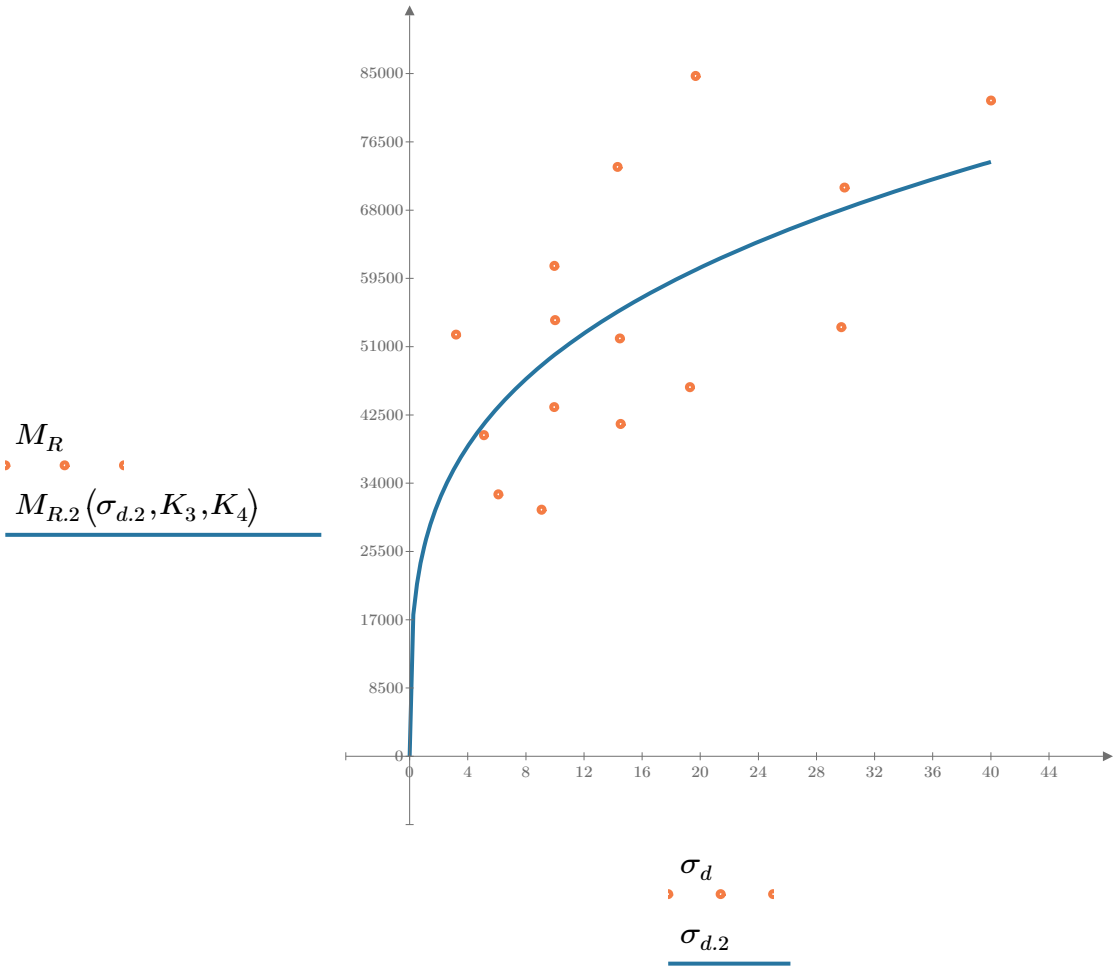

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B3–23”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 21179.305$

$K_6 = 0.0319$ Equation 3 fitting parameters

$K_7 = 0.3793$

${R_3}^2 = 0.7447$ Coefficient of determination

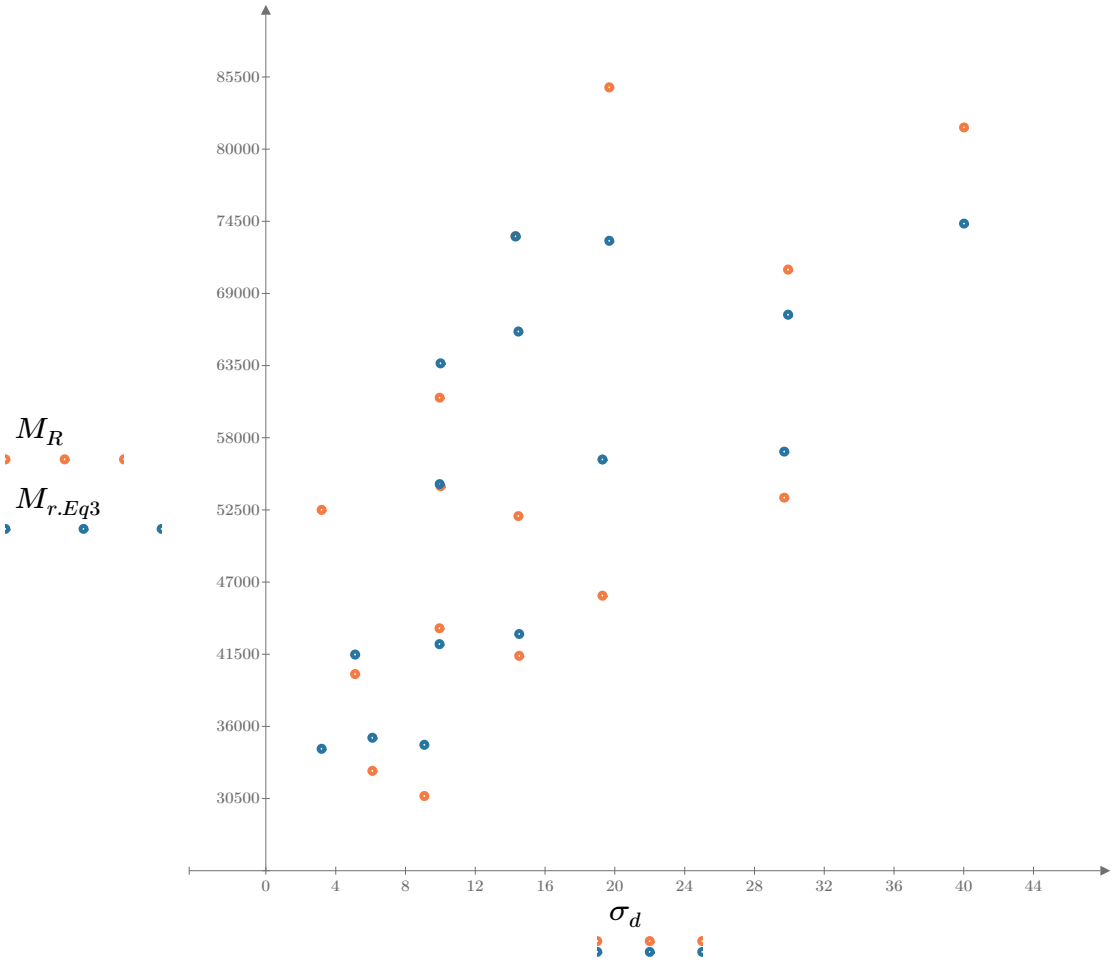

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B3}-23\text{”}$

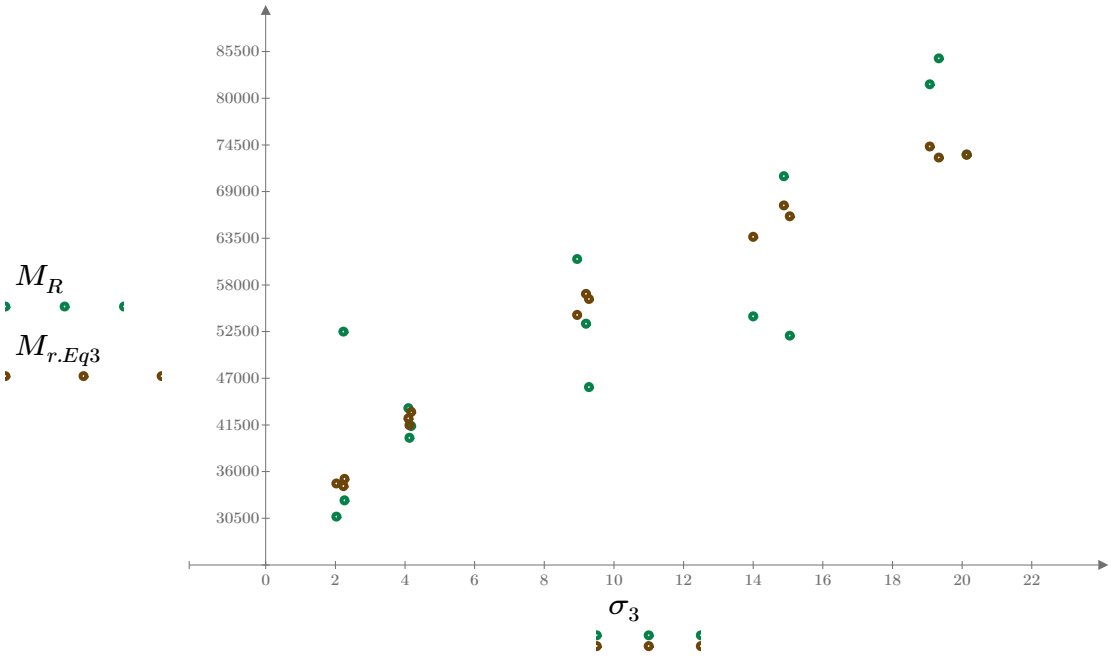

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

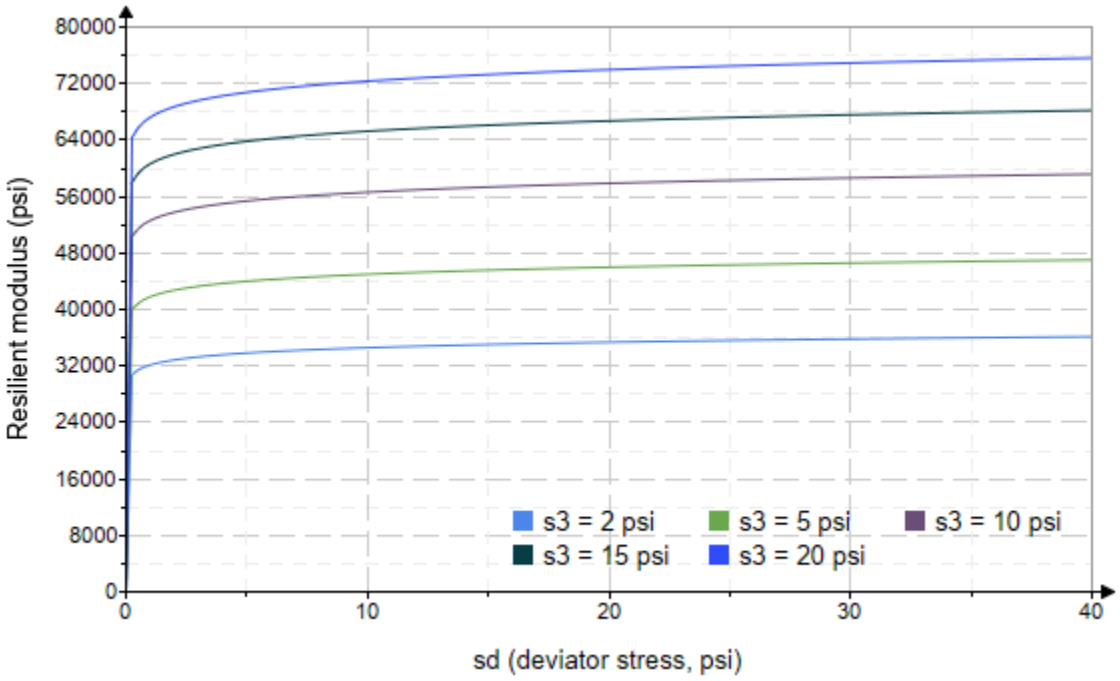

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B3–23”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2258.224$

$K_9 = 0.4844$ Equation 4 fitting parameters

$K_{10} = -0.1221$

$R_4^{\,2} = 0.7121$ Coefficient of determination

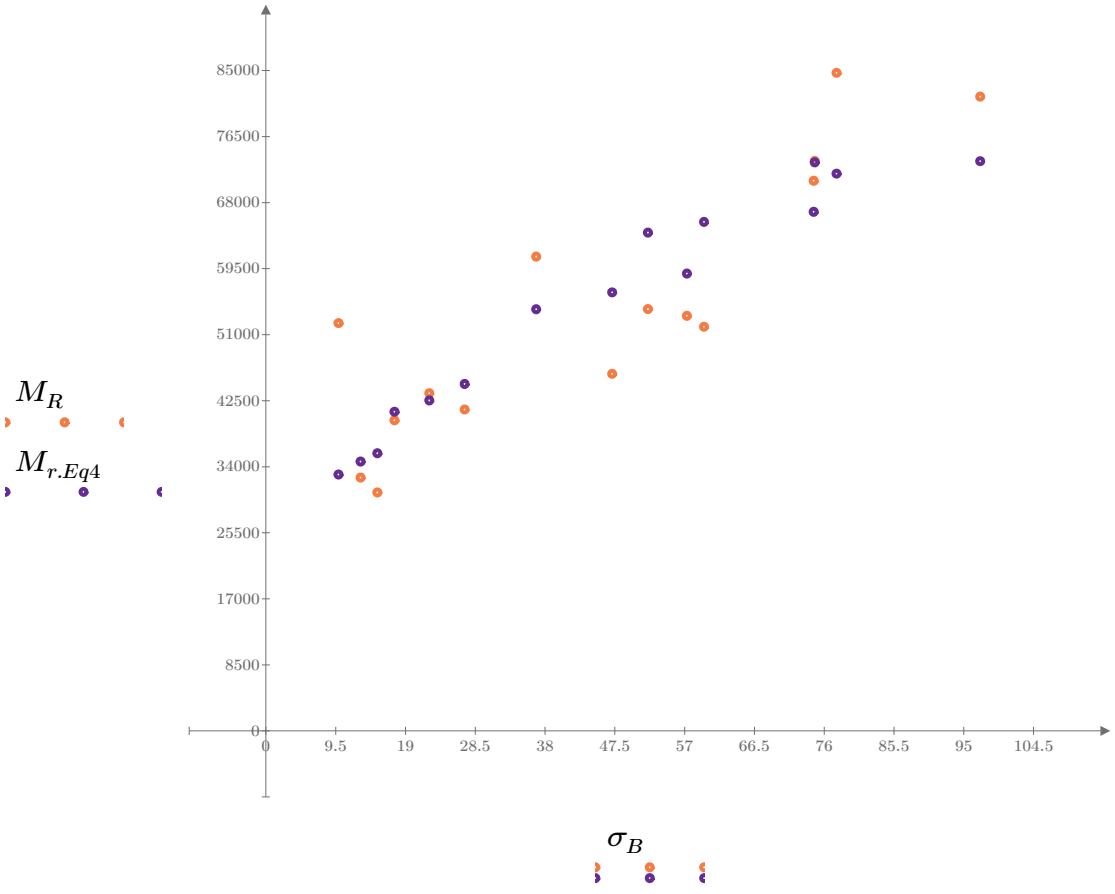

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

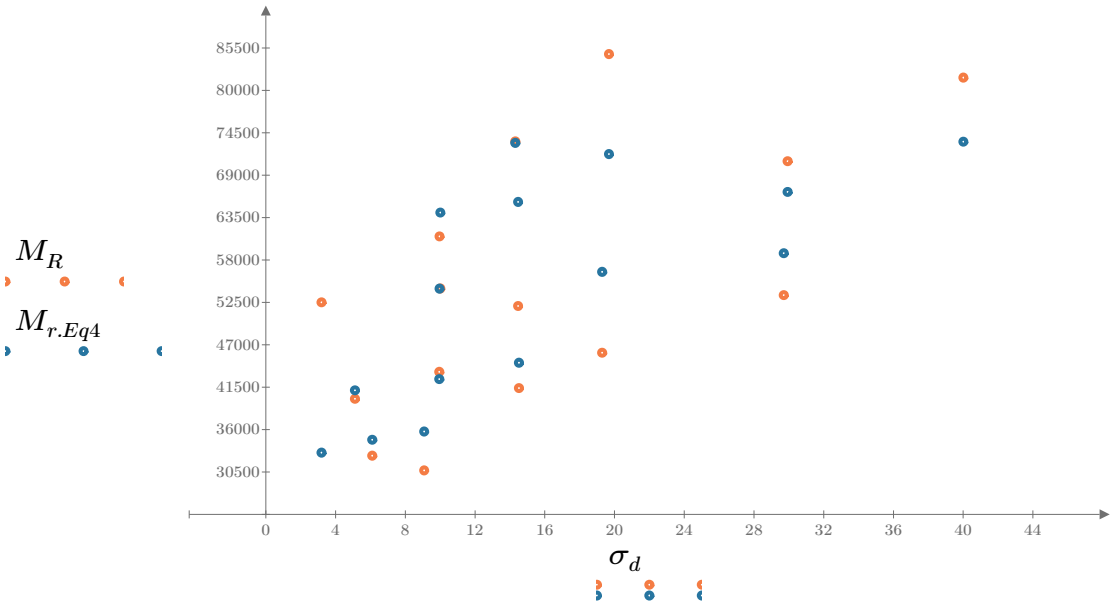

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

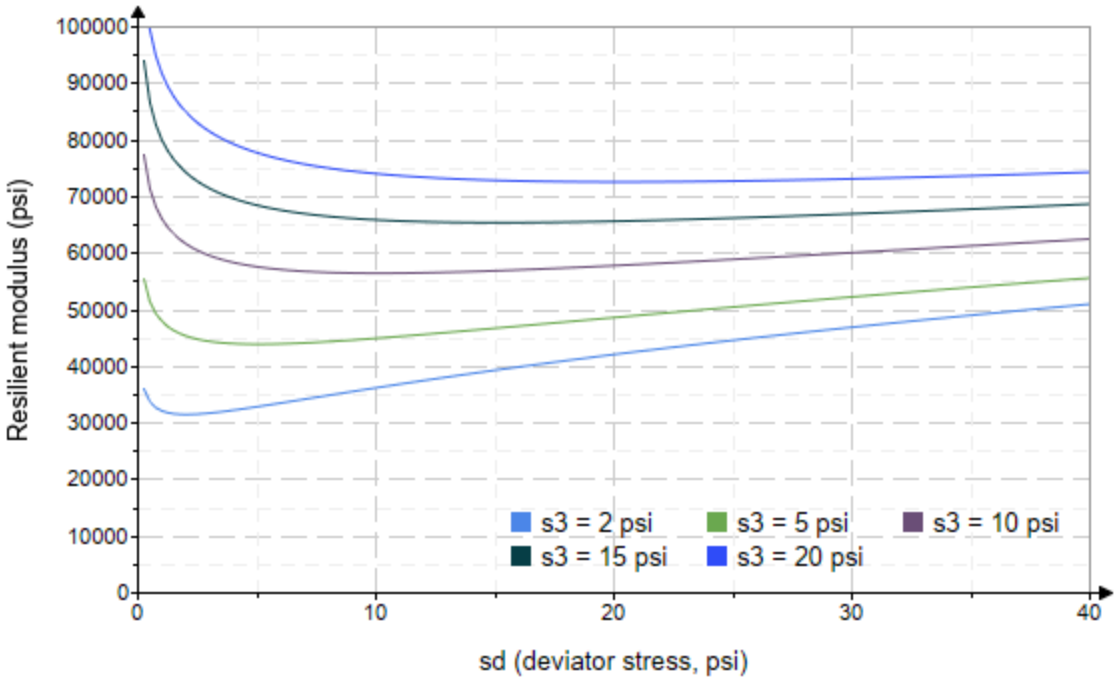

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B3−25"

$Treatment =$ "AD"

$S = 3.091$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.829 \\ 2.838 \\ 2.828 \\ 4.657 \\ 4.663 \\ 4.614 \\ 9.596 \\ 9.570 \\ 9.579 \\ 14.620 \\ 14.600 \\ 14.610 \\ 19.650 \\ 19.650 \\ 19.640 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.185 \\ 6.045 \\ 9.093 \\ 5.026 \\ 9.820 \\ 14.520 \\ 9.806 \\ 19.250 \\ 29.650 \\ 9.933 \\ 14.460 \\ 29.740 \\ 14.330 \\ 19.500 \\ 40.270 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.670 \\ 14.560 \\ 17.580 \\ 19.000 \\ 23.810 \\ 28.360 \\ 38.590 \\ 47.960 \\ 58.390 \\ 53.790 \\ 58.250 \\ 73.570 \\ 73.300 \\ 78.440 \\ 99.200 \end{bmatrix} \quad M_R = \begin{bmatrix} 32720.8 \\ 29654.8 \\ 29510.4 \\ 27083.4 \\ 31064.2 \\ 34353.4 \\ 41055.6 \\ 57242.2 \\ 58350.4 \\ 69492.0 \\ 73961.4 \\ 63657.6 \\ 72484.4 \\ 64841.0 \\ 60472.8 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B3–25”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 8085.279$

$K_2 = 0.4856$

Equation 1 fitting parameters

${R_1}^2 = 0.7848$ Coefficient of determination

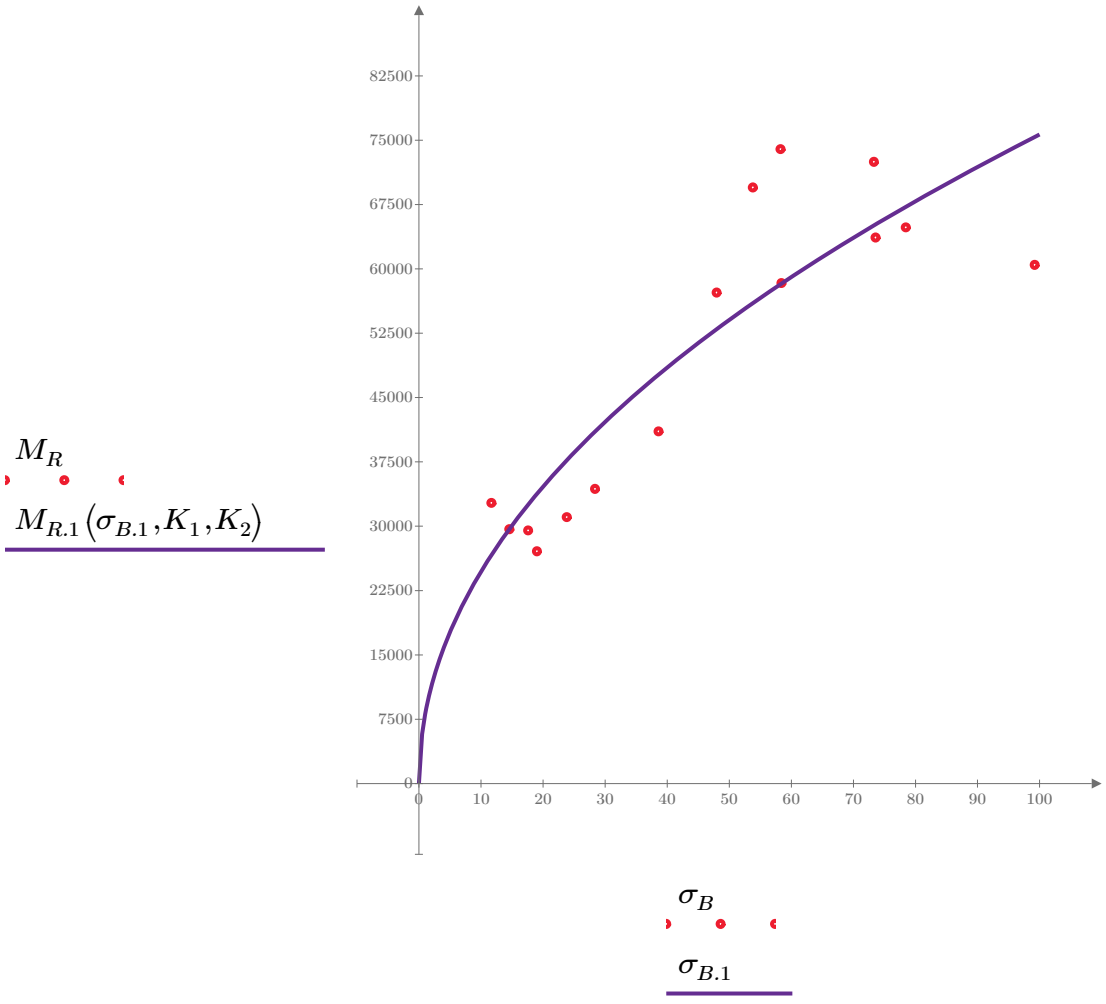

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B3–25”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 21882.925$

$K_4 = 0.3156$

Equation 2 fitting parameters

${R_2}^2 = 0.3994$ Coefficient of determination

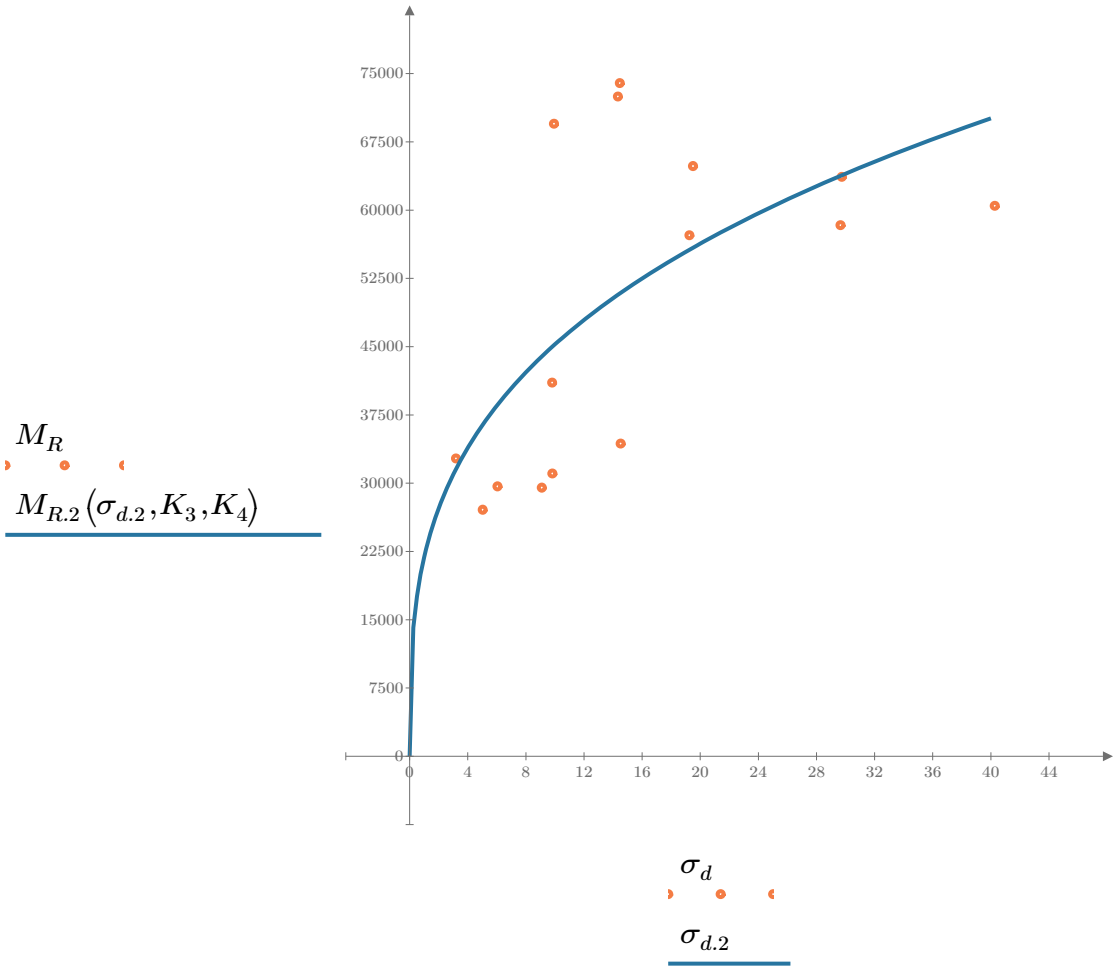

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B3–25”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 14843.624$

$K_6 = -0.0221$ Equation 3 fitting parameters

$K_7 = 0.5417$

${R_3}^2 = 0.8427$ Coefficient of determination

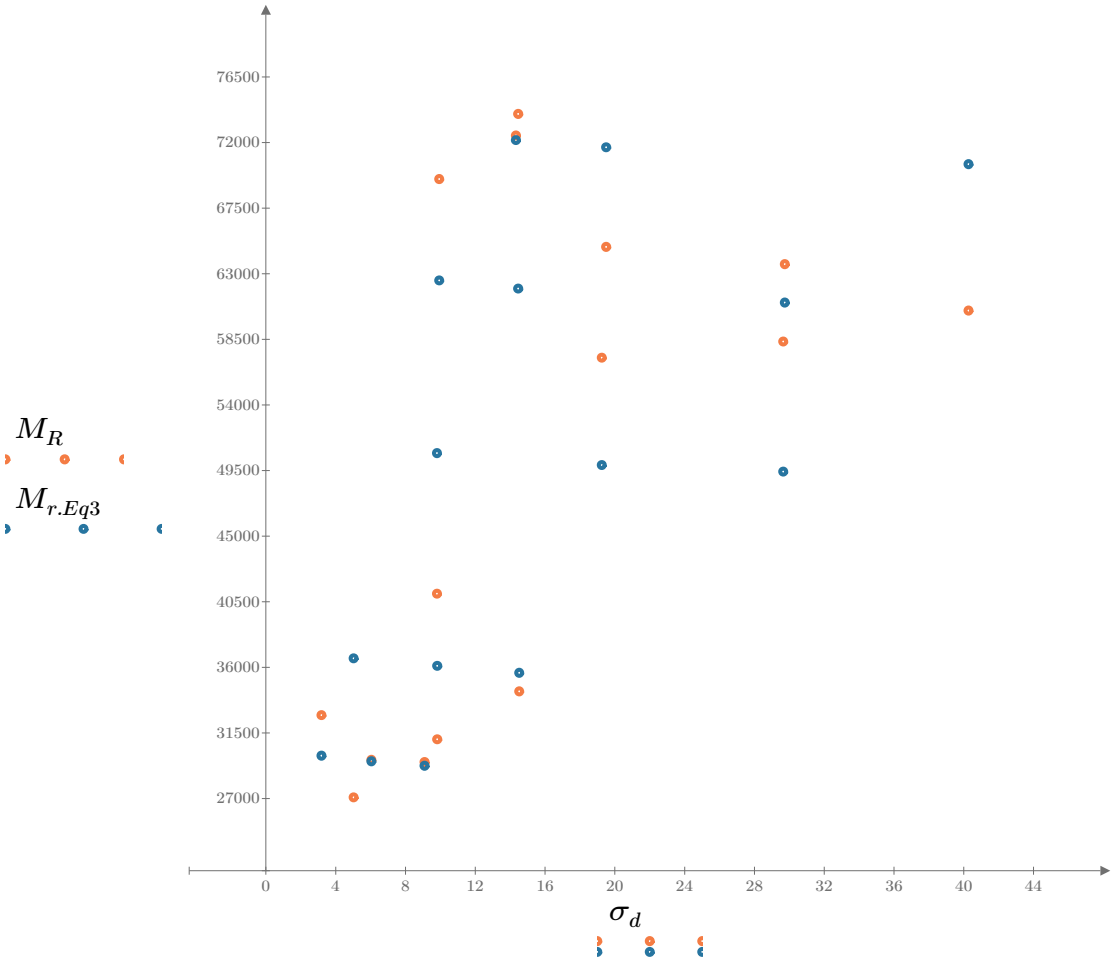

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B3–25”}$

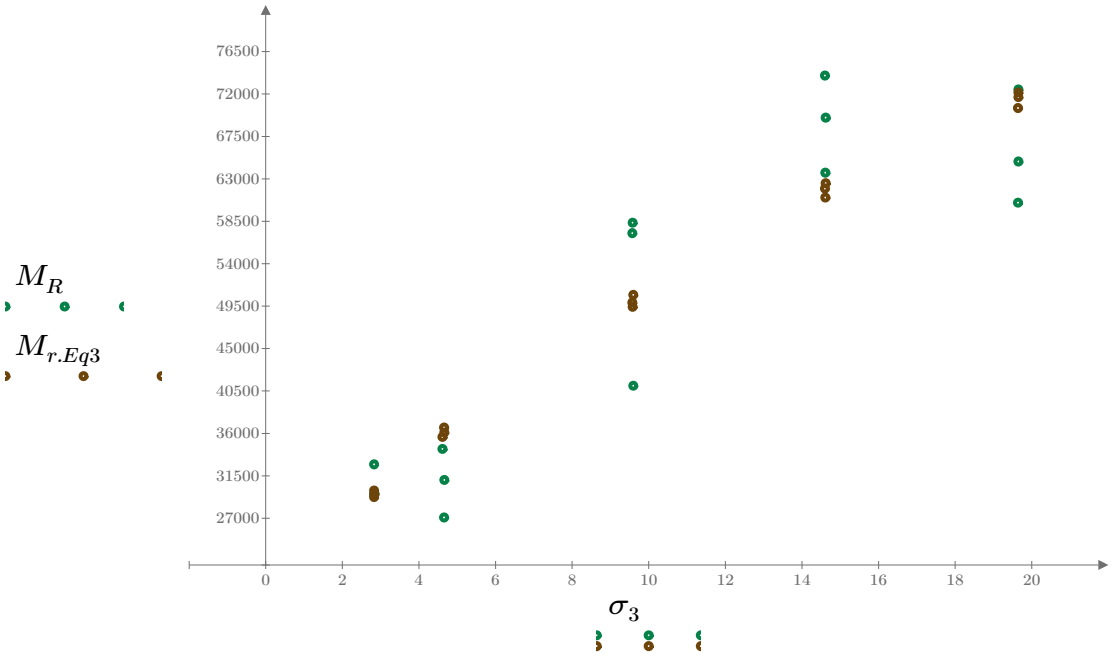

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

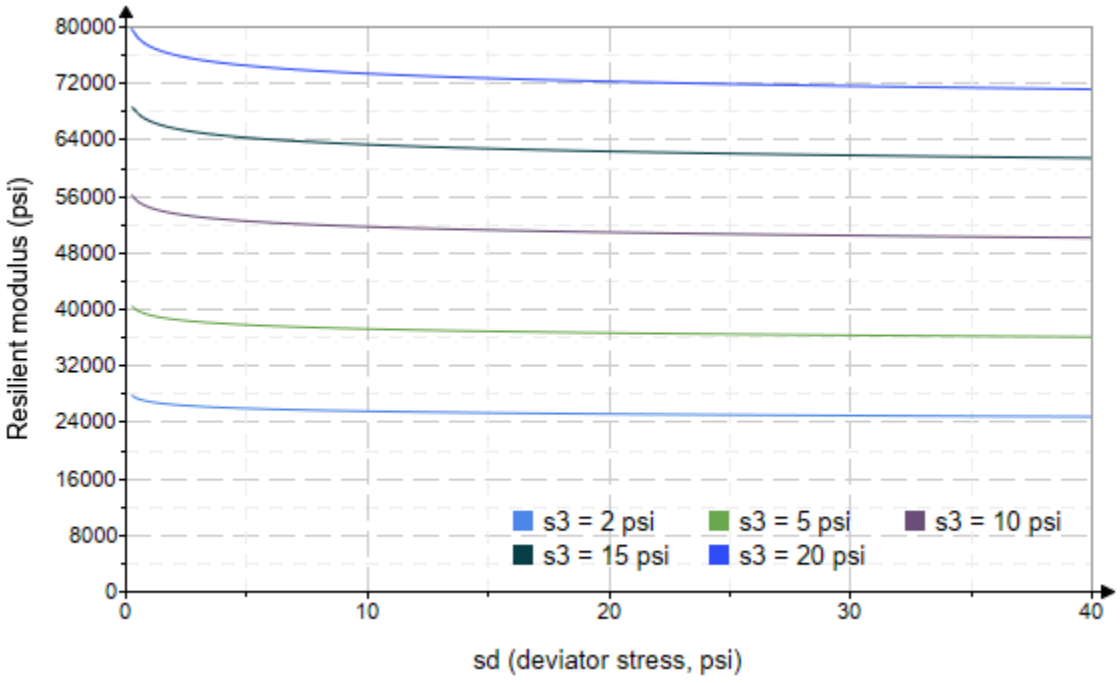

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B3–25”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 1538.324$

$K_9 = 0.7269$ Equation 4 fitting parameters

$K_{10} = -0.2634$

$R_4^{\,2} = 0.8581$ Coefficient of determination

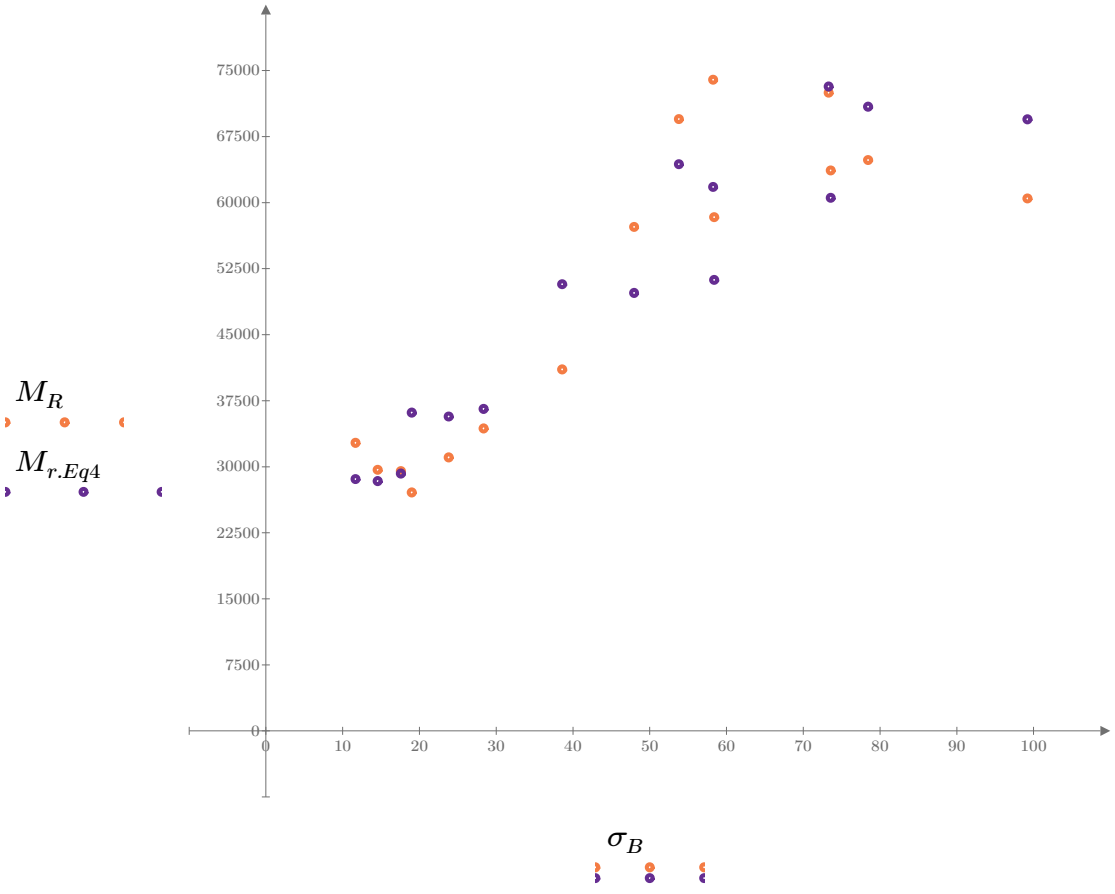

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

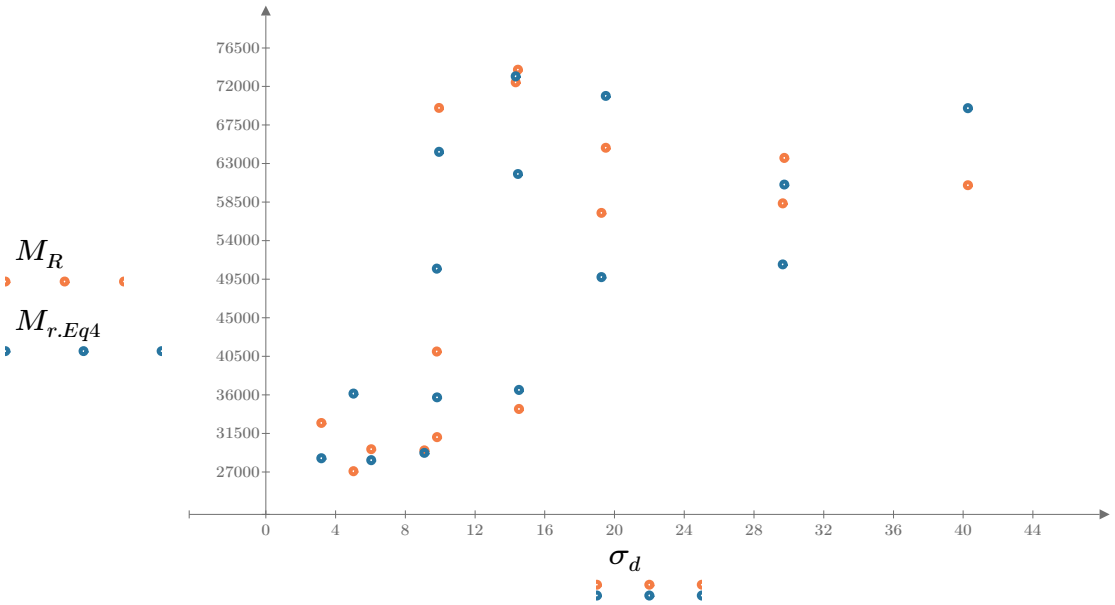

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

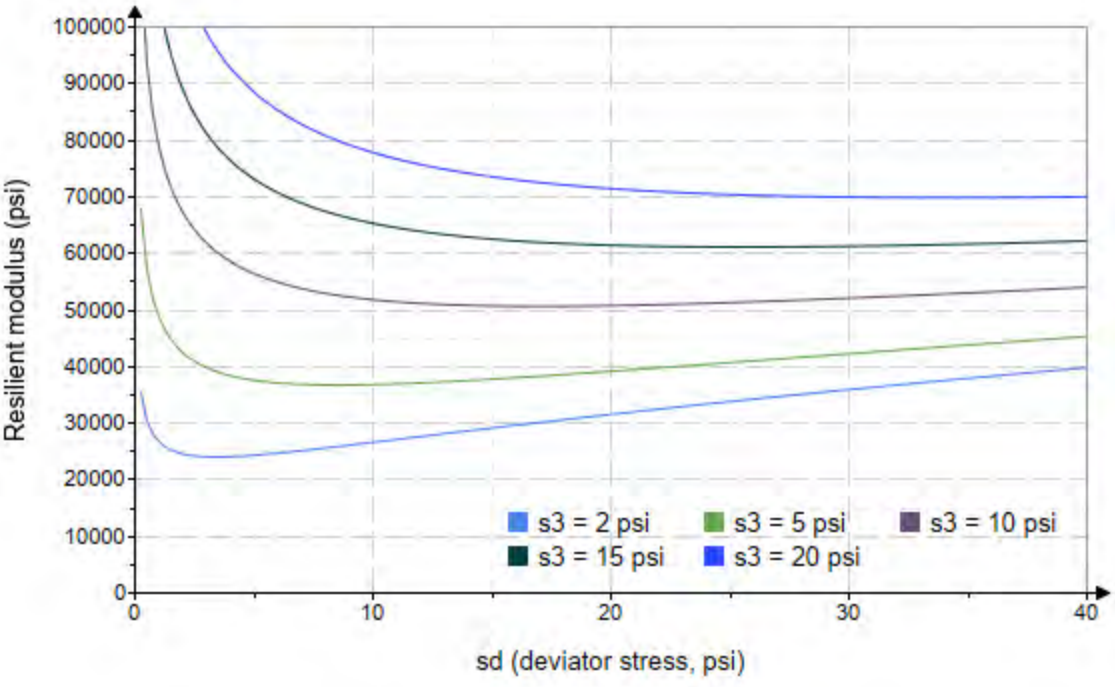

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B3−26"

$Treatment =$ "M5"

$S = 9.889$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.804 \\ 2.787 \\ 2.778 \\ 4.545 \\ 4.532 \\ 4.507 \\ 9.544 \\ 9.530 \\ 9.555 \\ 14.550 \\ 14.550 \\ 14.570 \\ 19.580 \\ 19.600 \\ 19.580 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.166 \\ 6.167 \\ 9.121 \\ 5.258 \\ 10.160 \\ 14.590 \\ 10.180 \\ 19.180 \\ 29.200 \\ 10.090 \\ 14.450 \\ 29.370 \\ 14.380 \\ 19.340 \\ 39.920 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.580 \\ 14.530 \\ 17.460 \\ 18.890 \\ 23.750 \\ 28.110 \\ 38.820 \\ 47.770 \\ 57.870 \\ 53.730 \\ 58.090 \\ 73.080 \\ 73.110 \\ 78.140 \\ 98.660 \end{bmatrix} \quad M_R = \begin{bmatrix} 45342.6 \\ 36021.0 \\ 32625.2 \\ 37320.6 \\ 34019.6 \\ 41563.0 \\ 69701.6 \\ 65338.4 \\ 57141.2 \\ 64678.2 \\ 59149.6 \\ 50070.0 \\ 61270.0 \\ 58154.4 \\ 54074.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B3–26”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 20393.359$

$K_2 = 0.2489$

Equation 1 fitting parameters

$R_1^2 = 0.4819$ Coefficient of determination

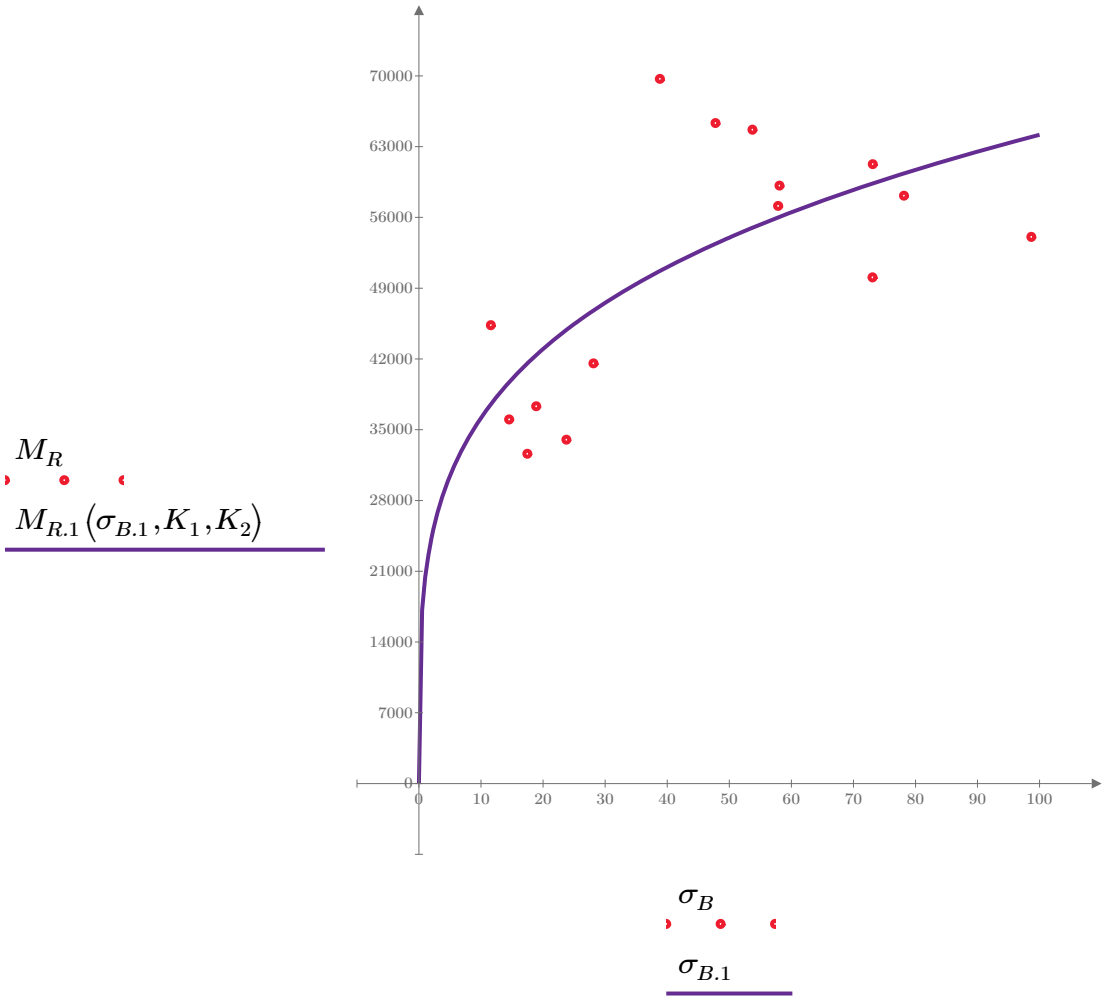

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B3–26”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 35032.439$

$K_4 = 0.1466$ Equation 2 fitting parameters

${R_2}^2 = 0.1751$ Coefficient of determination

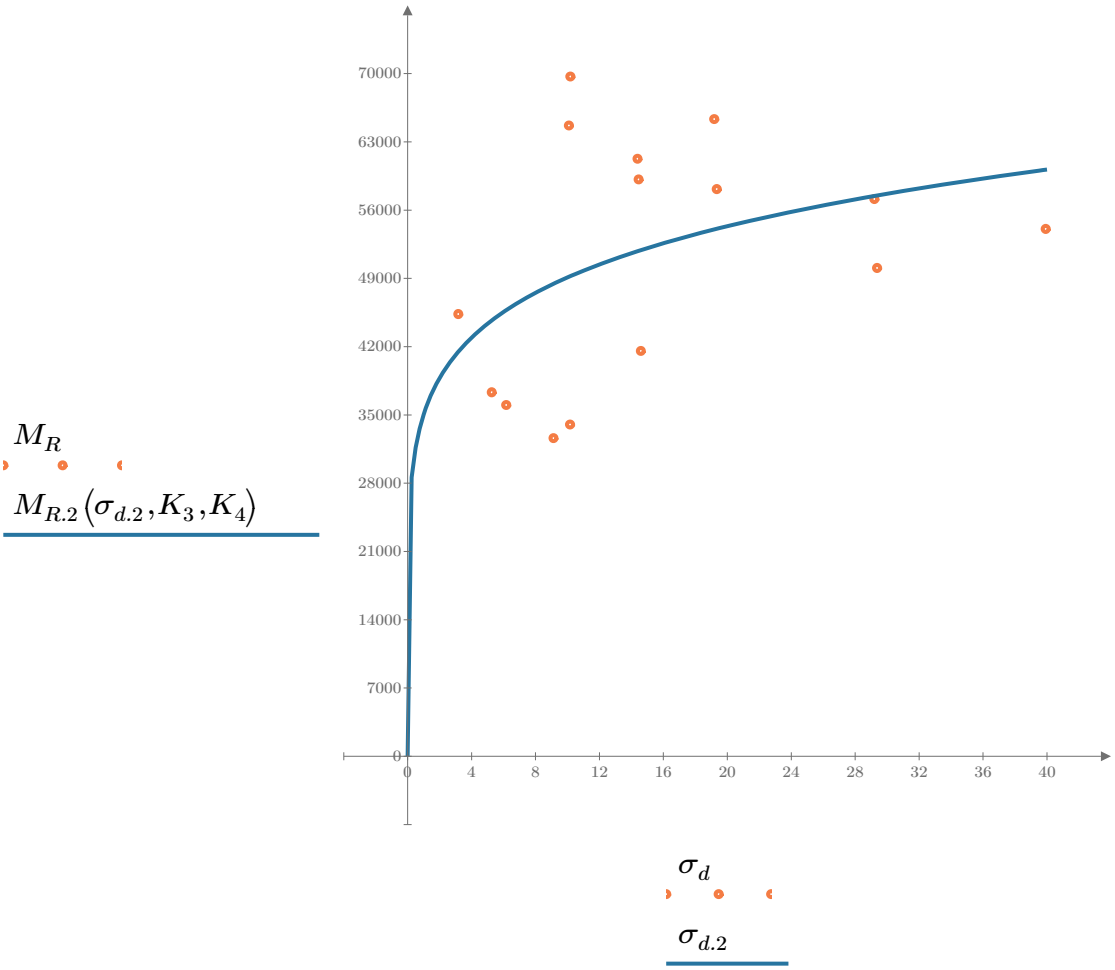

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B3–26”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 29458.543$

$K_6 = -0.0944$ Equation 3 fitting parameters

$K_7 = 0.3475$

${R_3}^2 = 0.6004$ Coefficient of determination

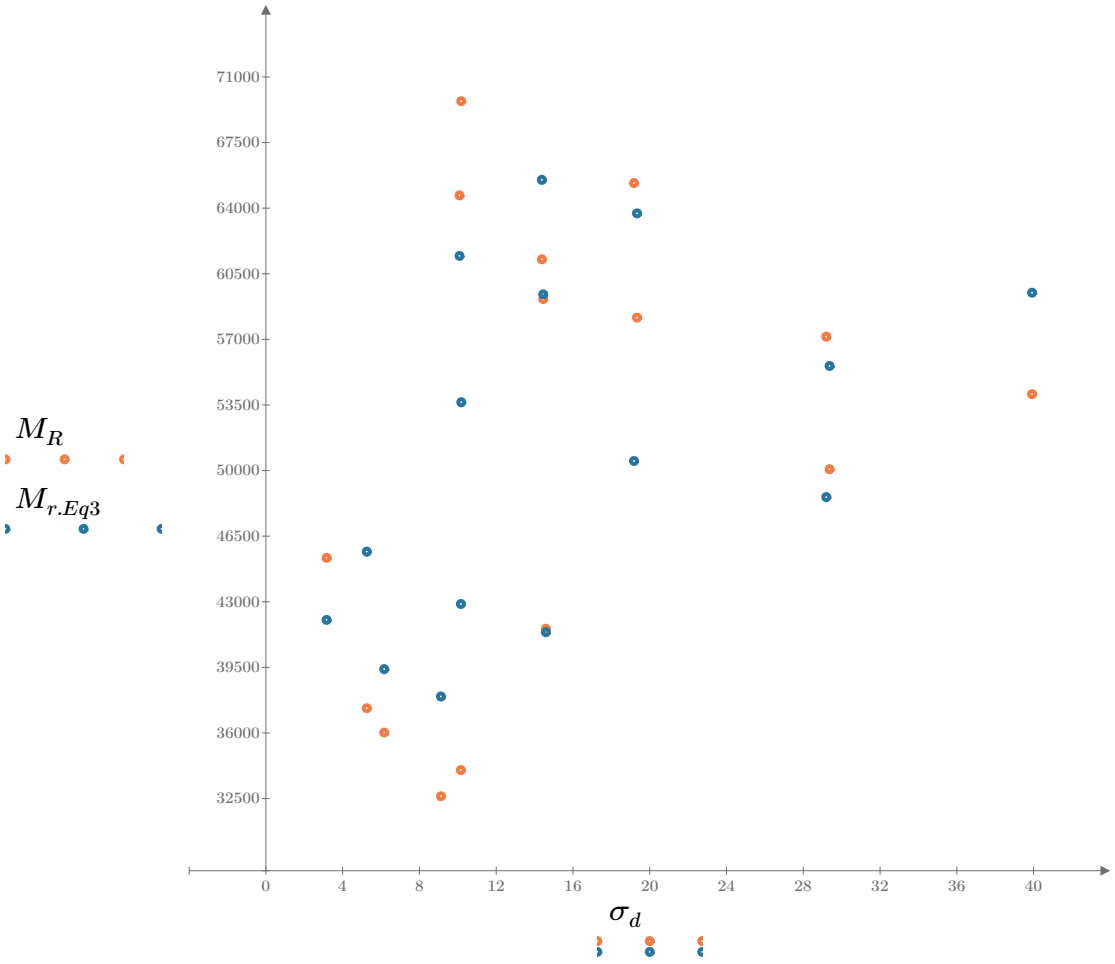

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B3}-26\text{”}$

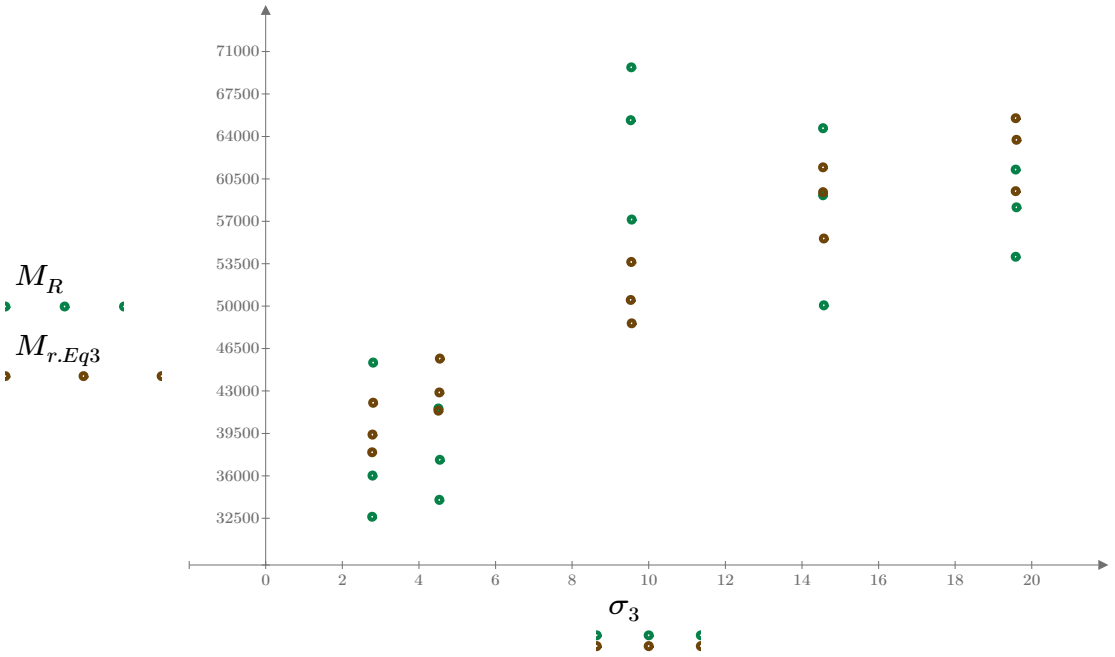

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

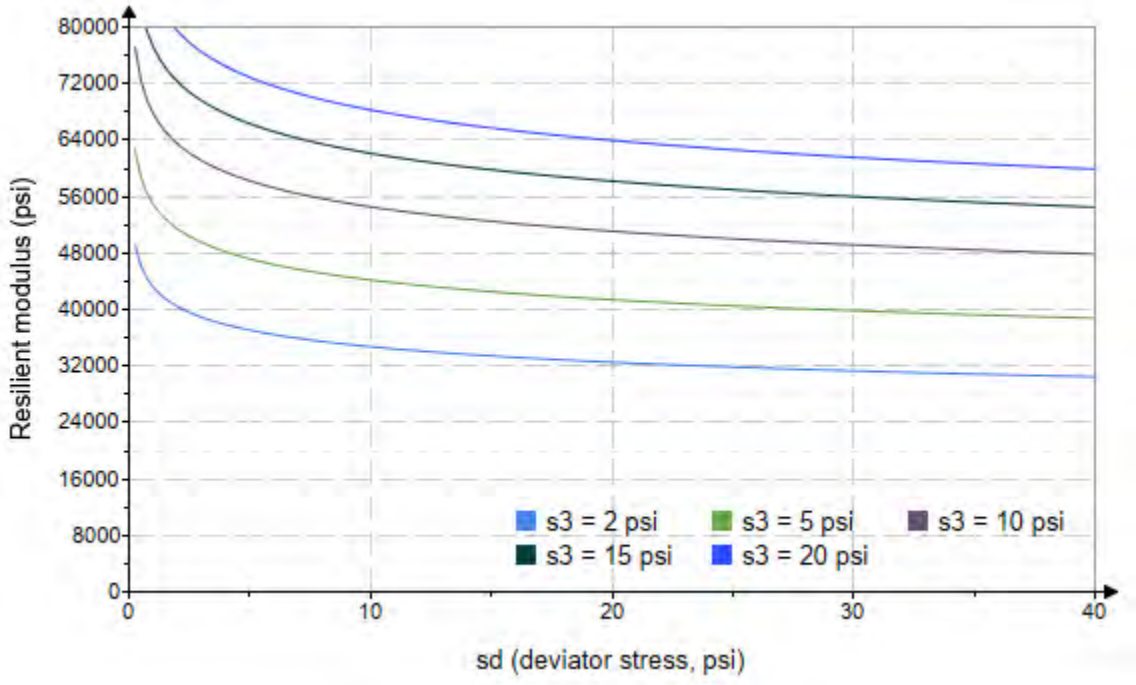

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B3–26”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2115.268$

$K_9 = 0.4674$ Equation 4 fitting parameters

$K_{10} = -0.2557$

$R_4^{\,2} = 0.6170$ Coefficient of determination

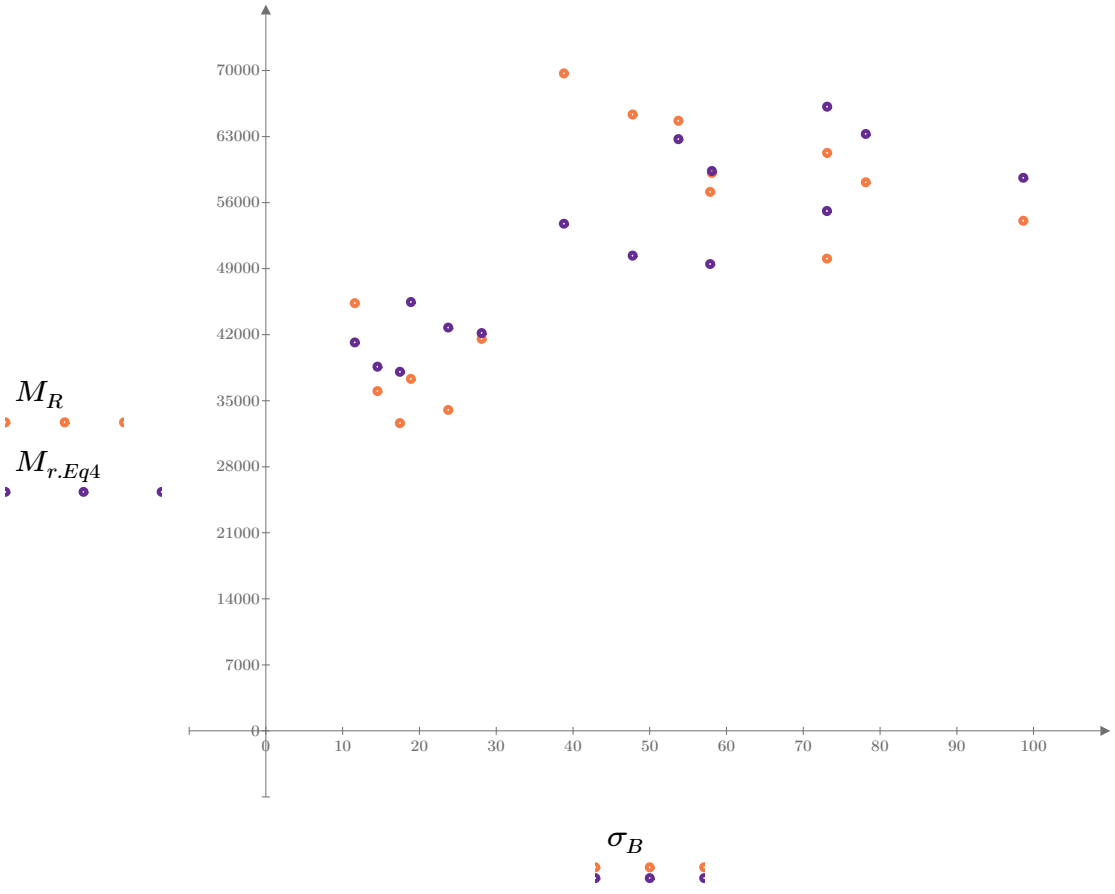

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

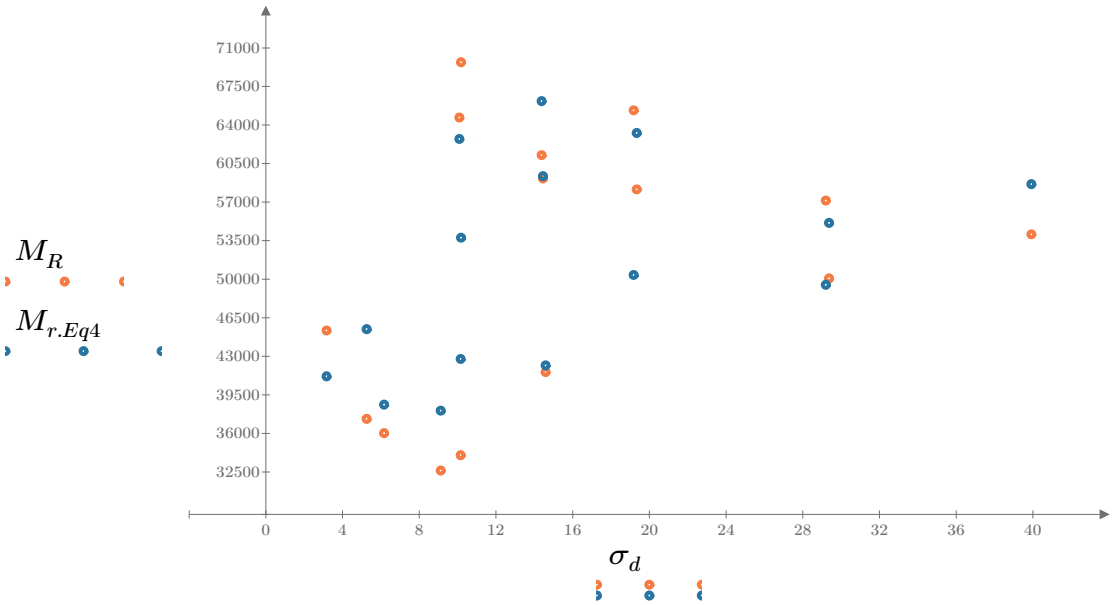

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

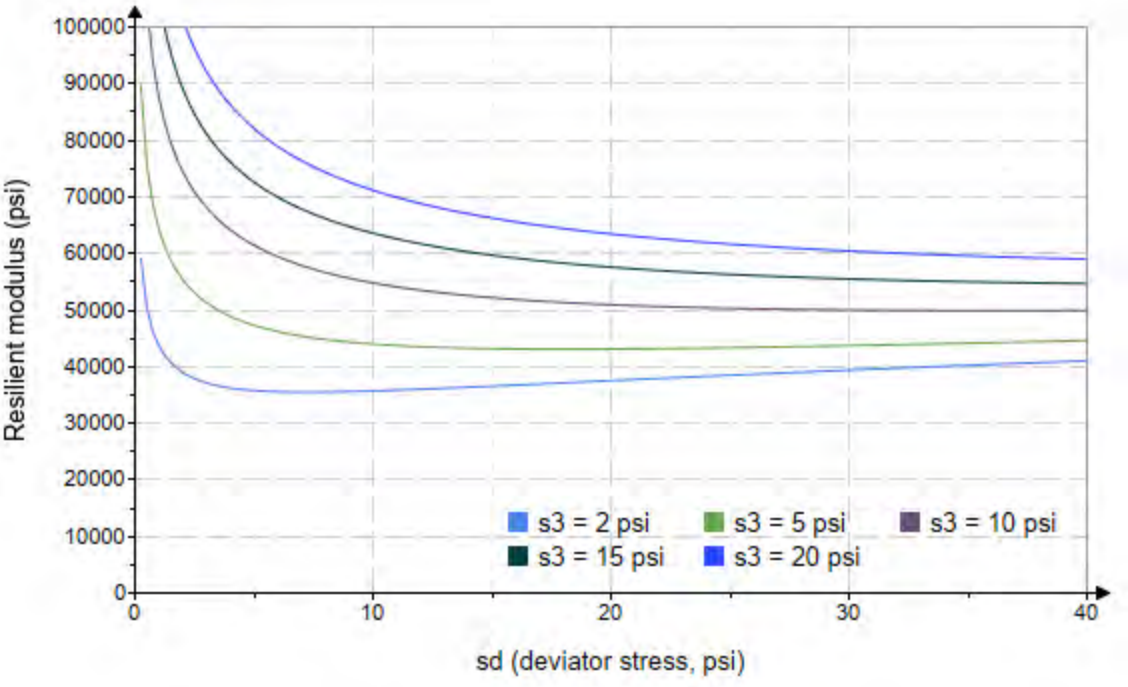

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B3−27"

$Treatment =$ "M5"

$S = 9.389$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 3.311 \\ 2.792 \\ 2.733 \\ 4.490 \\ 4.313 \\ 3.653 \\ 8.479 \\ 8.682 \\ 9.010 \\ 13.810 \\ 14.130 \\ 13.810 \\ 19.210 \\ 19.060 \\ 19.070 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.448 \\ 6.290 \\ 8.977 \\ 5.538 \\ 10.030 \\ 14.820 \\ 10.450 \\ 19.220 \\ 29.130 \\ 10.450 \\ 14.720 \\ 29.270 \\ 14.650 \\ 19.210 \\ 39.930 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 13.380 \\ 14.670 \\ 17.180 \\ 19.010 \\ 22.970 \\ 25.780 \\ 35.890 \\ 45.260 \\ 56.160 \\ 51.890 \\ 57.110 \\ 70.690 \\ 72.290 \\ 76.380 \\ 97.130 \end{bmatrix} \quad M_R = \begin{bmatrix} 189550.0 \\ 334710.0 \\ 129096.0 \\ 241378.0 \\ 216774.0 \\ 132284.0 \\ 423262.0 \\ 115180.0 \\ 86426.8 \\ 271134.0 \\ 235390.0 \\ 113866.0 \\ 316280.0 \\ 233904.0 \\ 141942.0 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B3–27”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 287636.701$

$K_2 = -0.0845$

Equation 1 fitting parameters

$R_1^2 = 0.0159$ Coefficient of determination

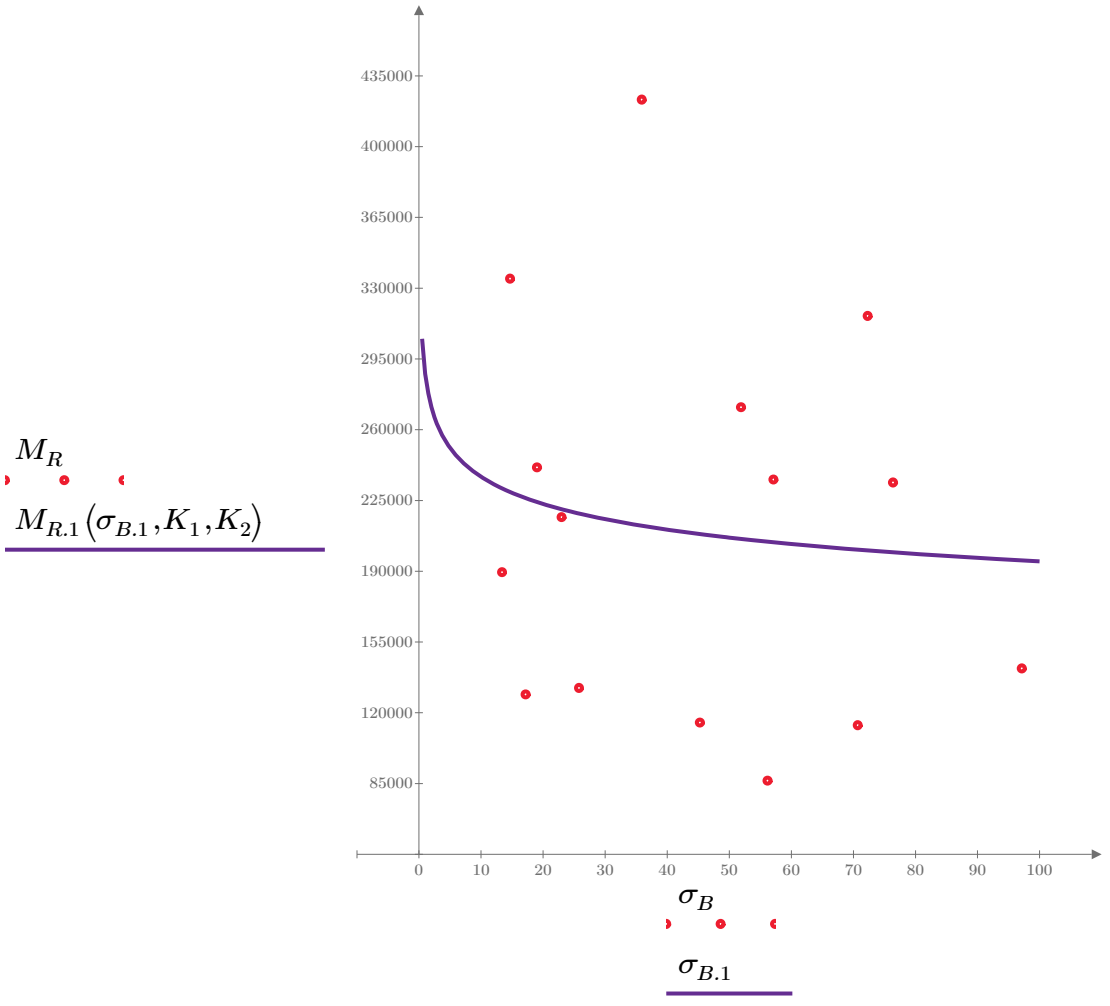

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B3–27”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 392579.681$

$K_4 = -0.2444$ Equation 2 fitting parameters

${R_2}^2 = 0.1648$ Coefficient of determination

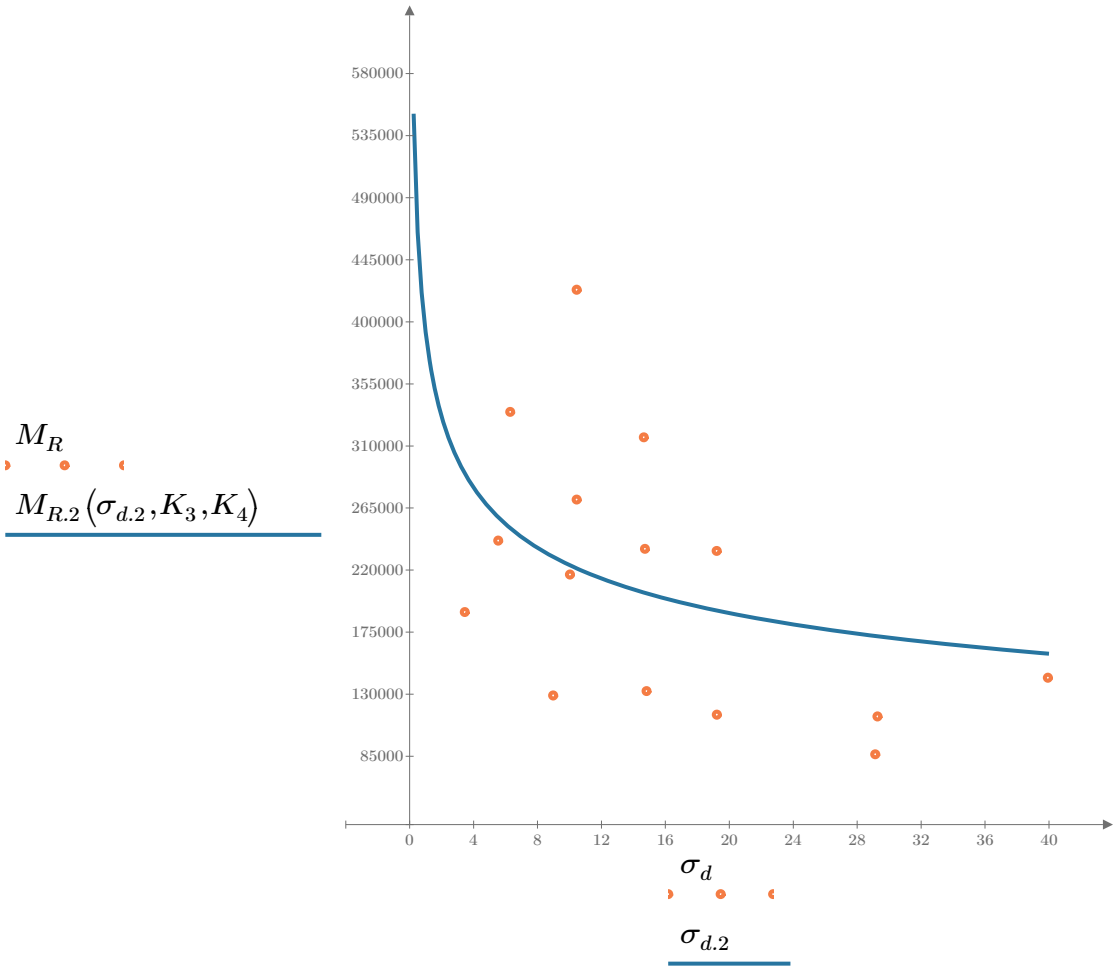

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B3–27”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1 + \sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 293073.361$

$K_6 = -0.5537$ Equation 3 fitting parameters

$K_7 = 0.4848$

${R_3}^2 = 0.4004$ Coefficient of determination

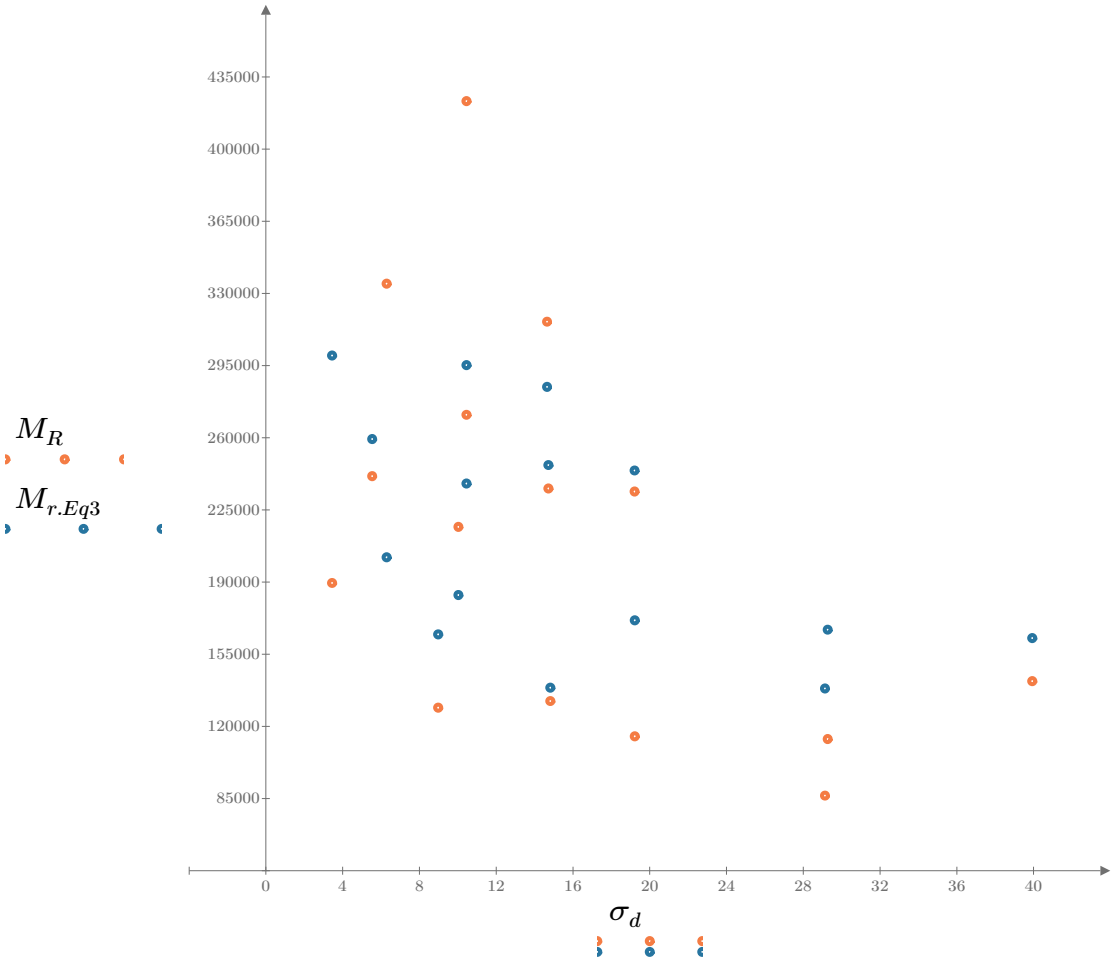

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B3–27”}$

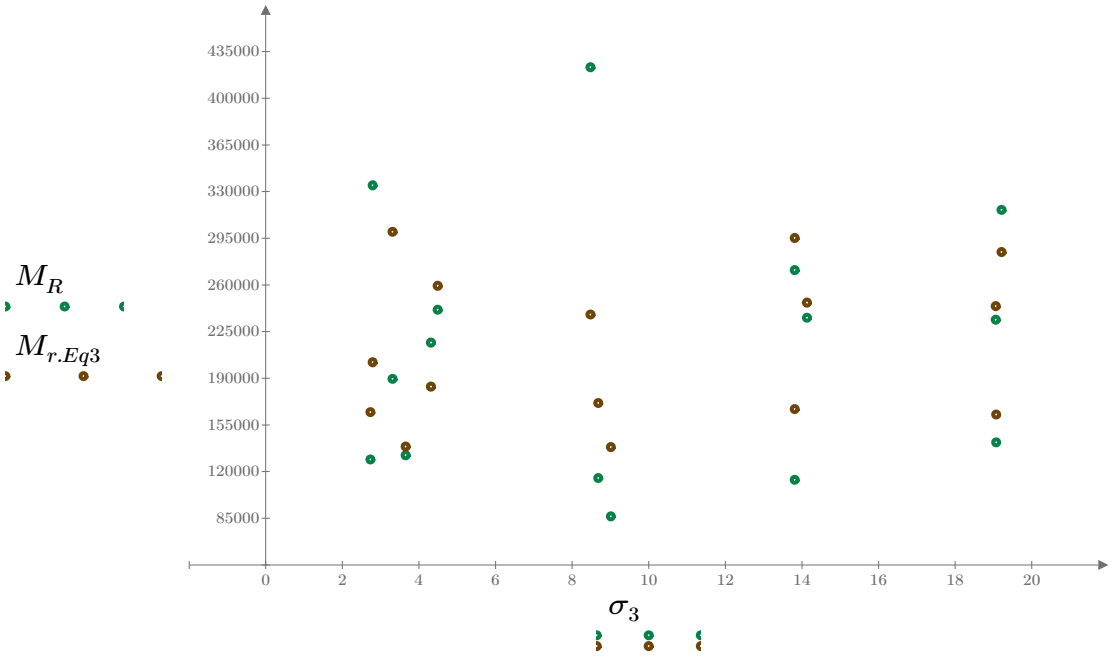

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

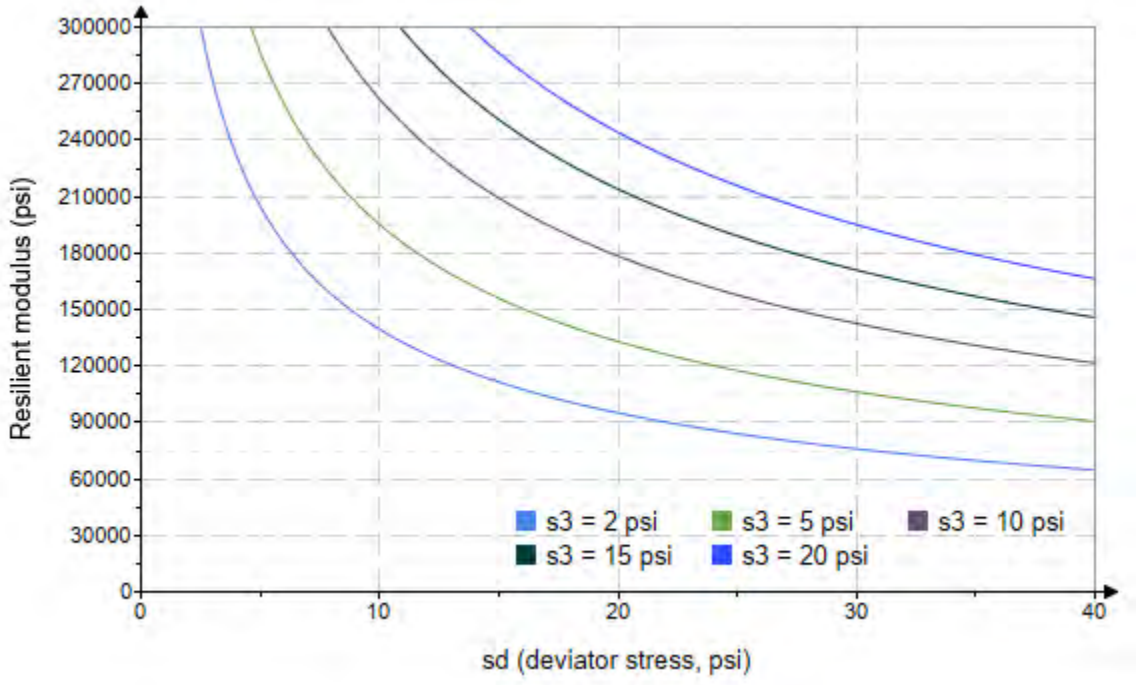

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B3–27”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 7021.319$

$K_9 = 0.6366$ Equation 4 fitting parameters

$K_{10} = -0.7728$

$R_4^{\,2} = 0.3909$ Coefficient of determination

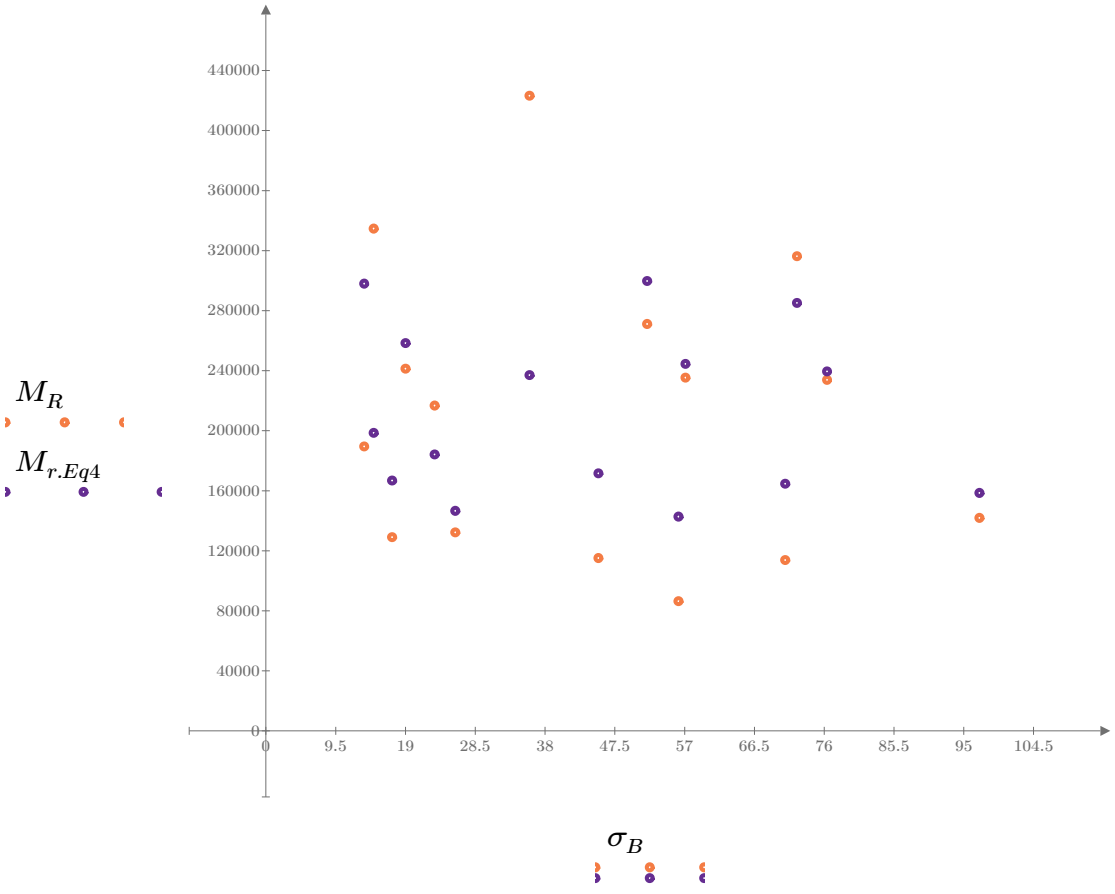

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

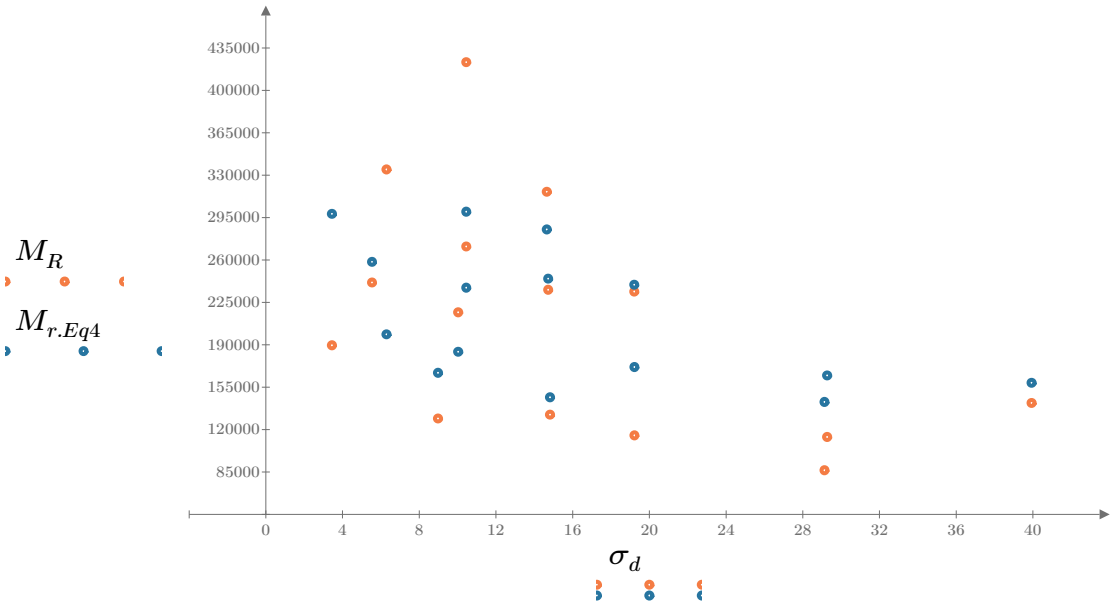

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

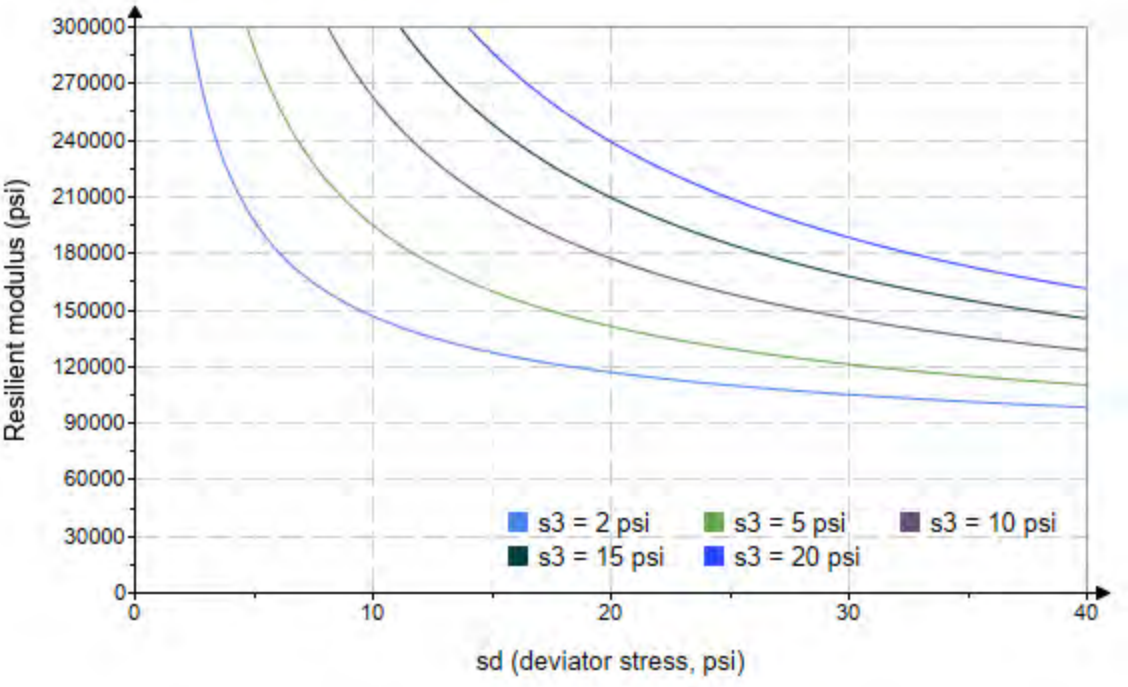

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B3−28"

$Treatment =$ "M5"

$S = 9.142$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.709 \\ 2.688 \\ 2.555 \\ 4.565 \\ 4.544 \\ 4.538 \\ 9.577 \\ 9.559 \\ 9.543 \\ 14.620 \\ 14.590 \\ 14.580 \\ 19.600 \\ 19.590 \\ 19.590 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.318 \\ 6.140 \\ 9.065 \\ 5.157 \\ 10.060 \\ 14.430 \\ 10.100 \\ 19.210 \\ 29.340 \\ 10.150 \\ 14.510 \\ 29.440 \\ 14.370 \\ 19.490 \\ 39.970 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 11.440 \\ 14.200 \\ 16.730 \\ 18.850 \\ 23.700 \\ 28.040 \\ 38.830 \\ 47.880 \\ 57.970 \\ 54.010 \\ 58.280 \\ 73.190 \\ 73.170 \\ 78.260 \\ 98.730 \end{bmatrix} \quad M_R = \begin{bmatrix} 34013.4 \\ 32758.4 \\ 34414.0 \\ 44168.6 \\ 47846.0 \\ 53451.8 \\ 76953.4 \\ 69327.4 \\ 67114.6 \\ 74304.6 \\ 86631.4 \\ 82974.8 \\ 81322.6 \\ 83316.0 \\ 88077.4 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B3–28”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot {\sigma_B}^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 11391.589$

$K_2 = 0.4619$

Equation 1 fitting parameters

${R_1}^2 = 0.9019$ Coefficient of determination

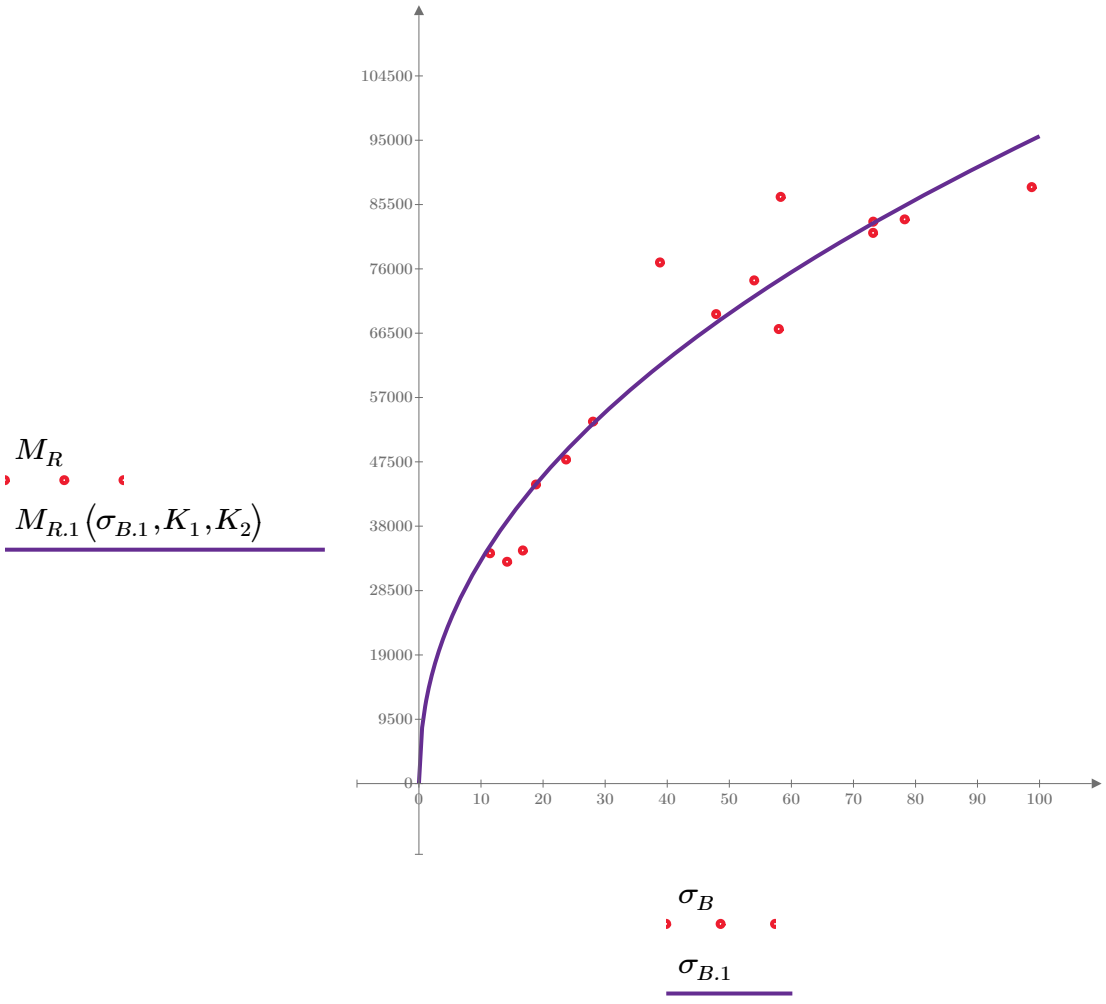

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B3–28”}$

$M_{R.2}(\sigma_d, K_3, K_4) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 26269.114$

$K_4 = 0.3396$

Equation 2 fitting parameters

${R_2}^2 = 0.5421$ Coefficient of determination

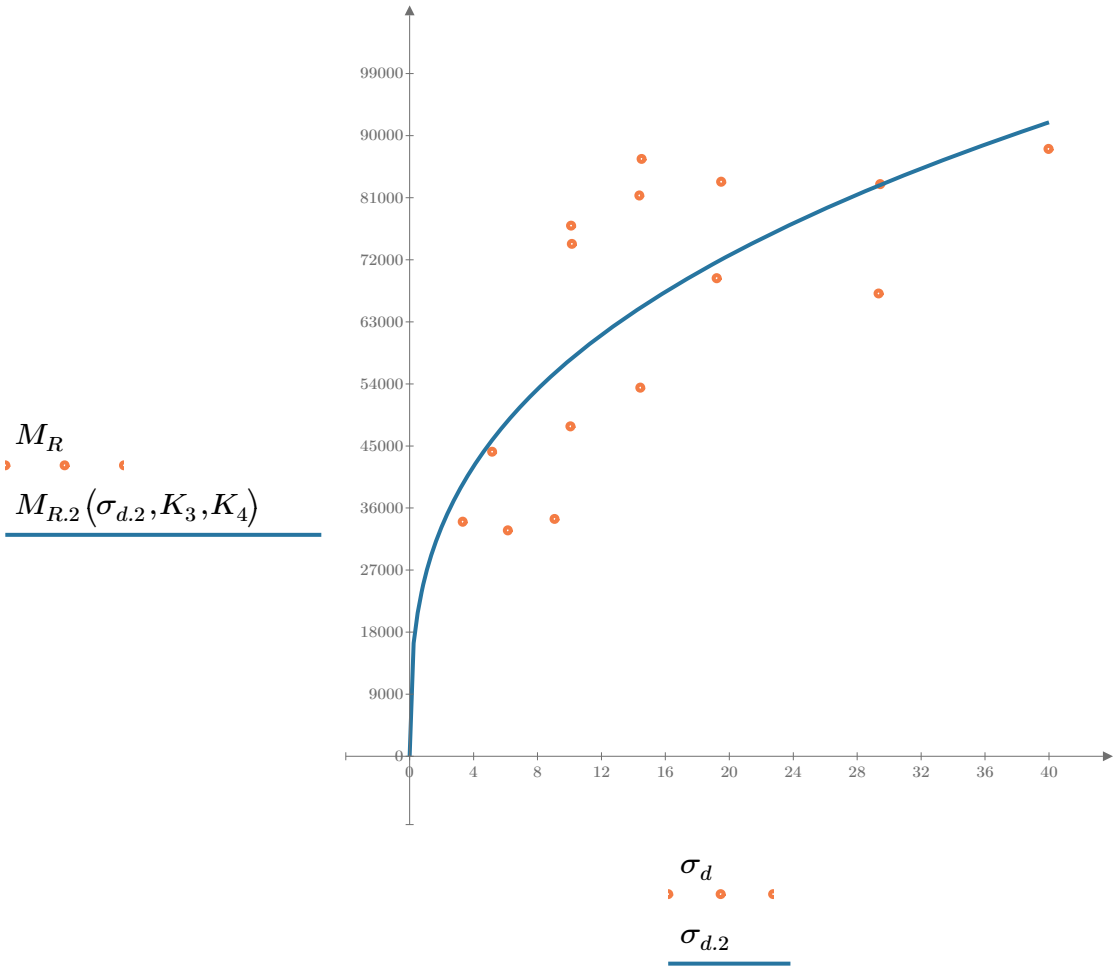

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B3–28”}$

$$M_{R.3}(\sigma_d, \sigma_3, K_5, K_6, K_7) := K_5 \cdot {\sigma_d}^{K_6} \cdot (1 + \sigma_3)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 19953.745$

$K_6 = 0.0592$ Equation 3 fitting parameters

$K_7 = 0.4345$

${R_3}^2 = 0.9224$ Coefficient of determination

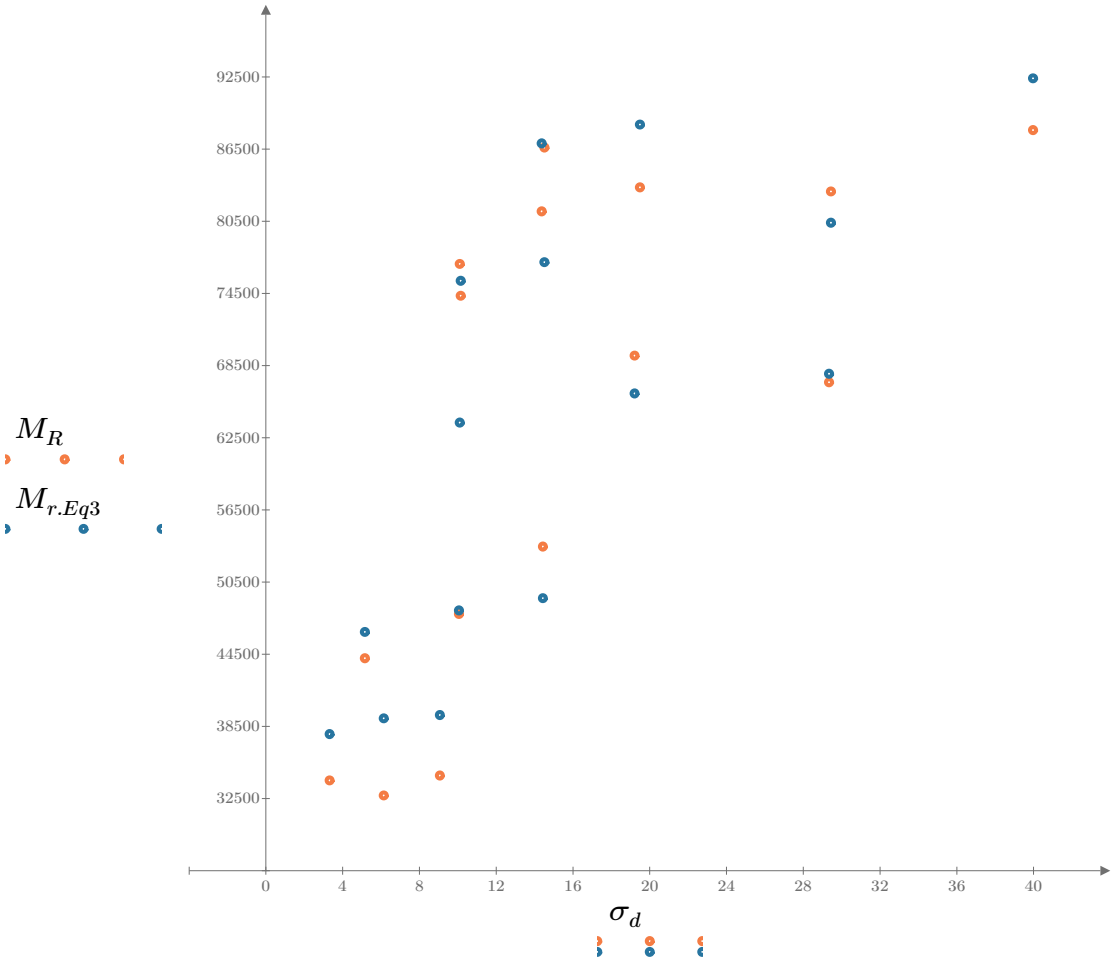

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B3–28”}$

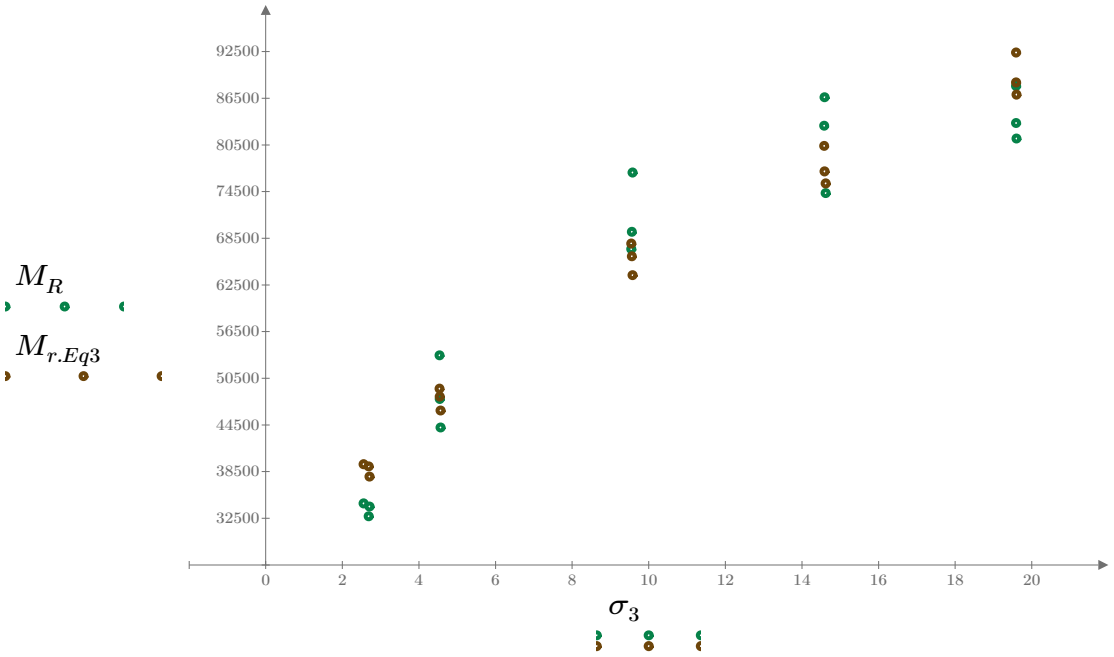

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

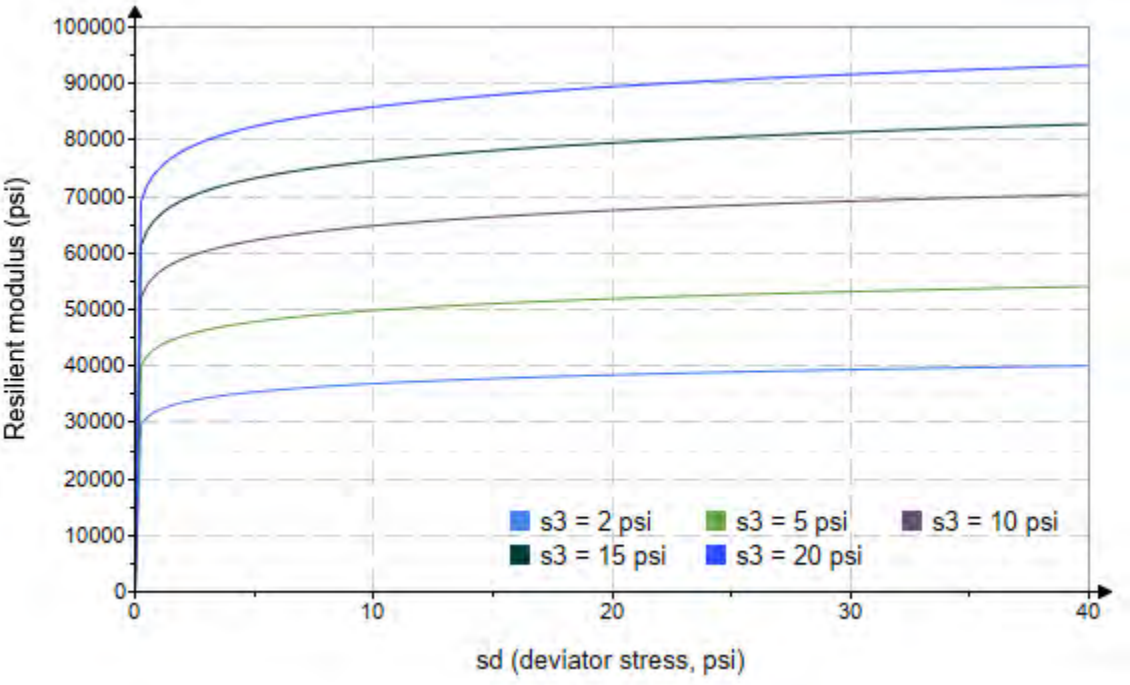

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B3–28”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2355.784$

$K_9 = 0.5776$ Equation 4 fitting parameters

$K_{10} = -0.133$

$R_4^{\,2} = 0.9250$ Coefficient of determination

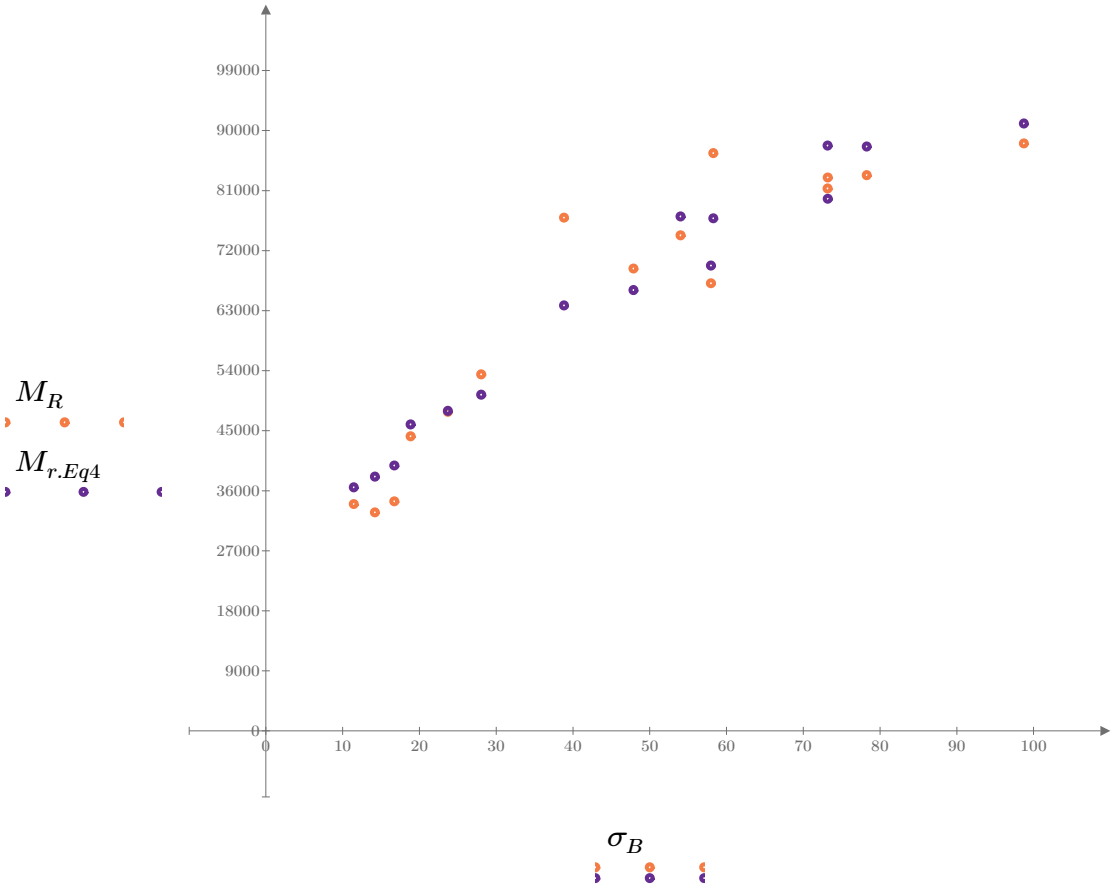

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

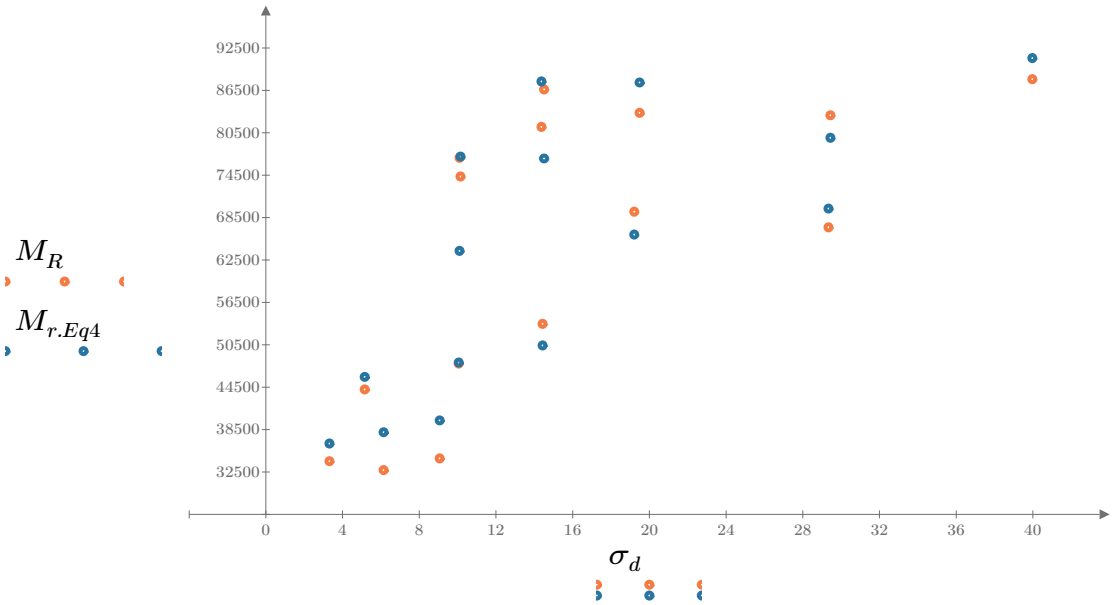

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

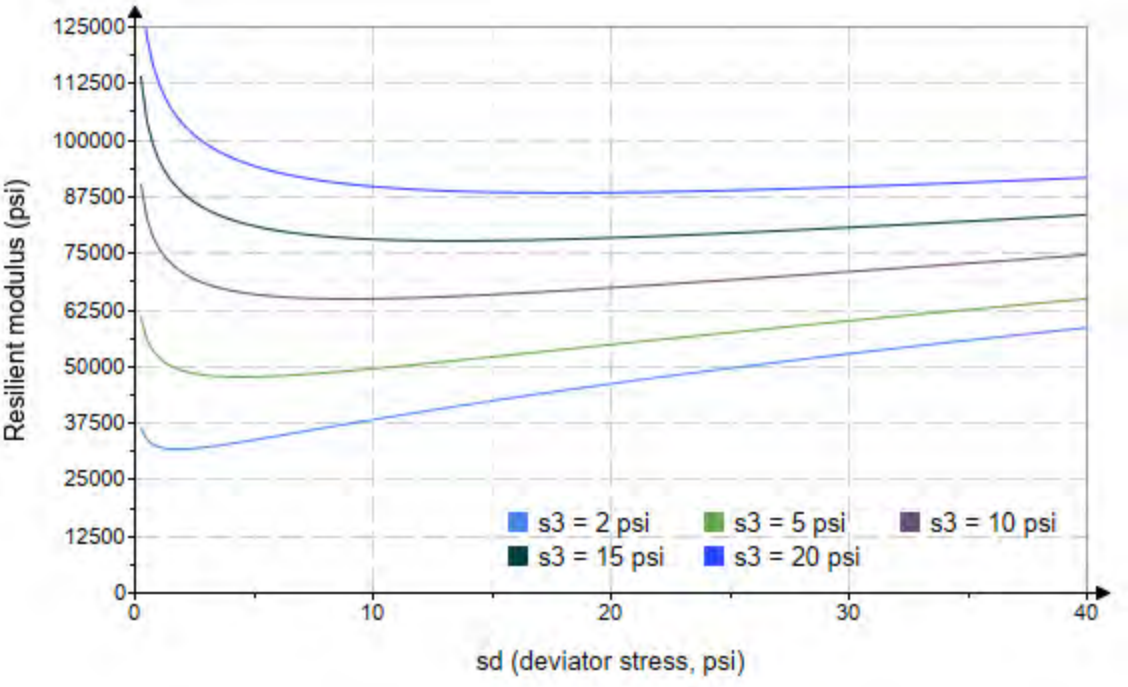

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.

$SampleNo :=$ "B3−29"

$Treatment =$ "M5"

$S = 9.293$ Degree of Saturation (%)

Test Sequence : Base/Subbase

Test summary data (psi) :

$$\sigma_3 = \begin{bmatrix} 2.122 \\ 1.948 \\ 1.917 \\ 3.690 \\ 3.845 \\ 3.502 \\ 8.646 \\ 9.098 \\ 9.670 \\ 15.200 \\ 15.220 \\ 15.200 \\ 19.630 \\ 20.060 \\ 19.060 \end{bmatrix} \quad \sigma_d = \begin{bmatrix} 3.623 \\ 6.310 \\ 9.166 \\ 5.213 \\ 9.773 \\ 14.320 \\ 9.871 \\ 19.310 \\ 29.810 \\ 9.800 \\ 14.300 \\ 30.010 \\ 14.610 \\ 19.500 \\ 40.220 \end{bmatrix} \quad \sigma_B = \begin{bmatrix} 9.989 \\ 12.150 \\ 14.920 \\ 16.280 \\ 21.310 \\ 24.830 \\ 35.810 \\ 46.600 \\ 58.820 \\ 55.410 \\ 59.960 \\ 75.610 \\ 73.500 \\ 79.680 \\ 97.410 \end{bmatrix} \quad M_R = \begin{bmatrix} 265800.0 \\ 340194.0 \\ 146196.0 \\ 400430.0 \\ 198440.0 \\ 99298.6 \\ 427118.0 \\ 84406.2 \\ 74829.6 \\ 671128.0 \\ 148850.0 \\ 89644.0 \\ 269240.0 \\ 135368.0 \\ 98370.2 \end{bmatrix}$$

σ_3 = mean confining stress
σ_d = mean deviator stress
σ_B = mean bulk stress
M_R = resilient modulus
p_a = atmospheric pressure = 14.6959 psi

$SampleNo = \text{“B3–29”}$

$M_{R.1}(\sigma_B, K_1, K_2) := K_1 \cdot \sigma_B^{K_2}$ Equation 1

AASHTO Publication No. FHWA-RD-97-083

$K_1 = 468800.625$

$K_2 = -0.2017$

Equation 1 fitting parameters

$R_1^2 = 0.0486$ Coefficient of determination

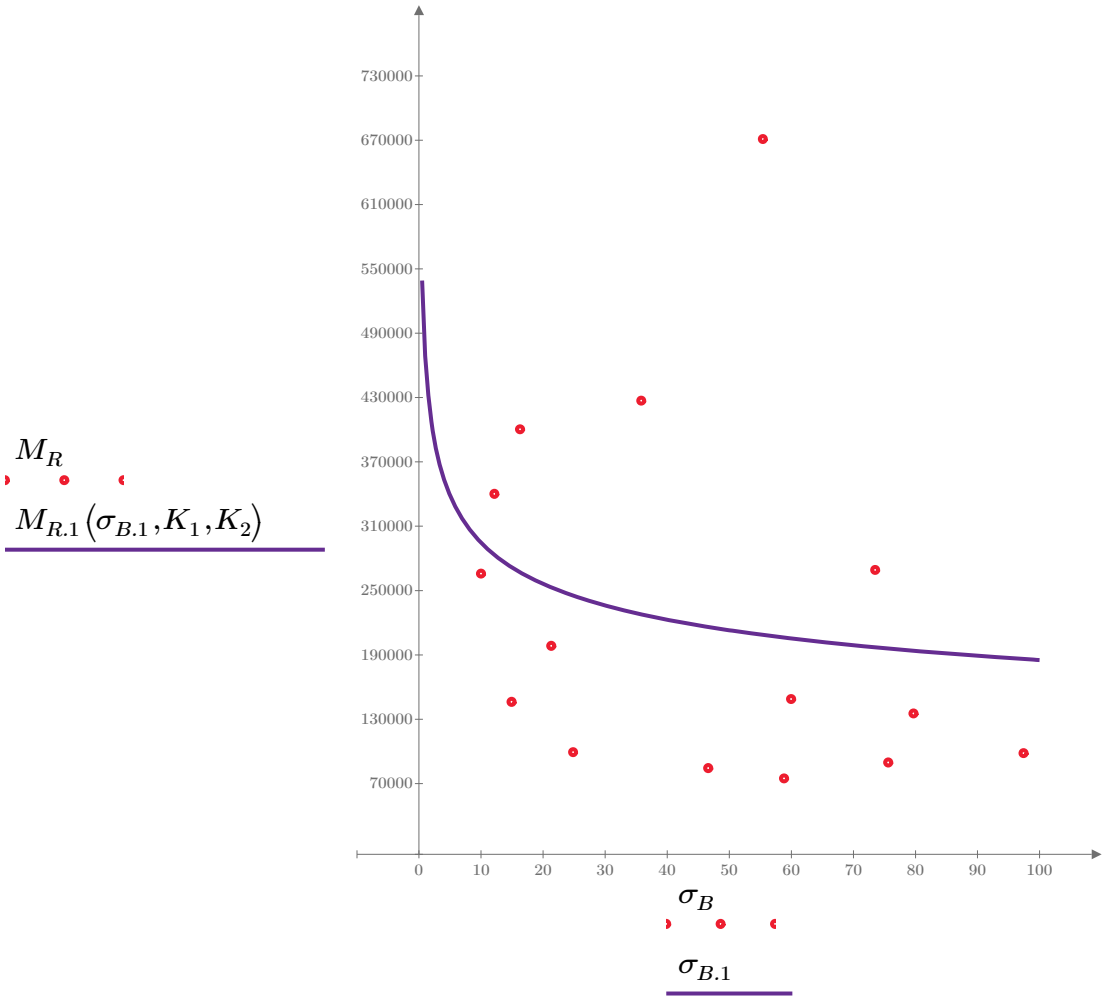

Figure 1. Plot of the test data (red points) vs. the fitted Equation 1 model (purple line).

$SampleNo = \text{“B3–29”}$

$M_{R.2}\left(\sigma_d, K_3, K_4\right) := K_3 \cdot {\sigma_d}^{K_4}$ Equation 2
AASHTO Publication No. FHWA-RD-97-083

$K_3 = 795881.674$

$K_4 = -0.5022$ Equation 2 fitting parameters

${R_2}^2 = 0.2865$ Coefficient of determination

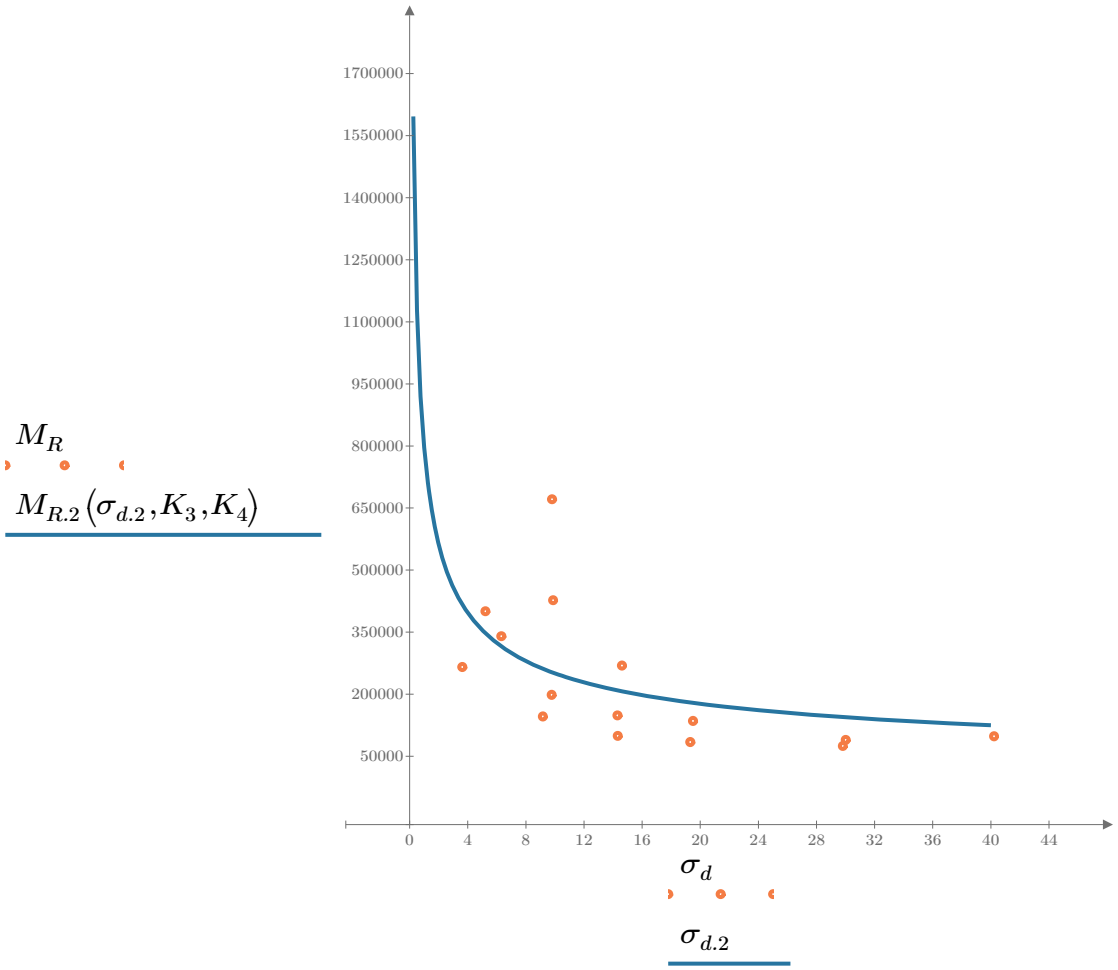

Figure 2. Plot of the test data (orange points) vs. the fitted Equation 2 model (blue line).

$SampleNo = \text{“B3}-29\text{”}$

$$M_{R.3}\left(\sigma_d, \sigma_3, K_5, K_6, K_7\right) := K_5 \cdot {\sigma_d}^{K_6} \cdot \left(1+\sigma_3\right)^{K_7}$$

Equation 3 AASHTO Publication No. FHWA-RD-97-083

$K_5 = 893568.075$

$K_6 = -1.4455$ Equation 3 fitting parameters

$K_7 = 0.9809$

${R_3}^2 = 0.6502$ Coefficient of determination

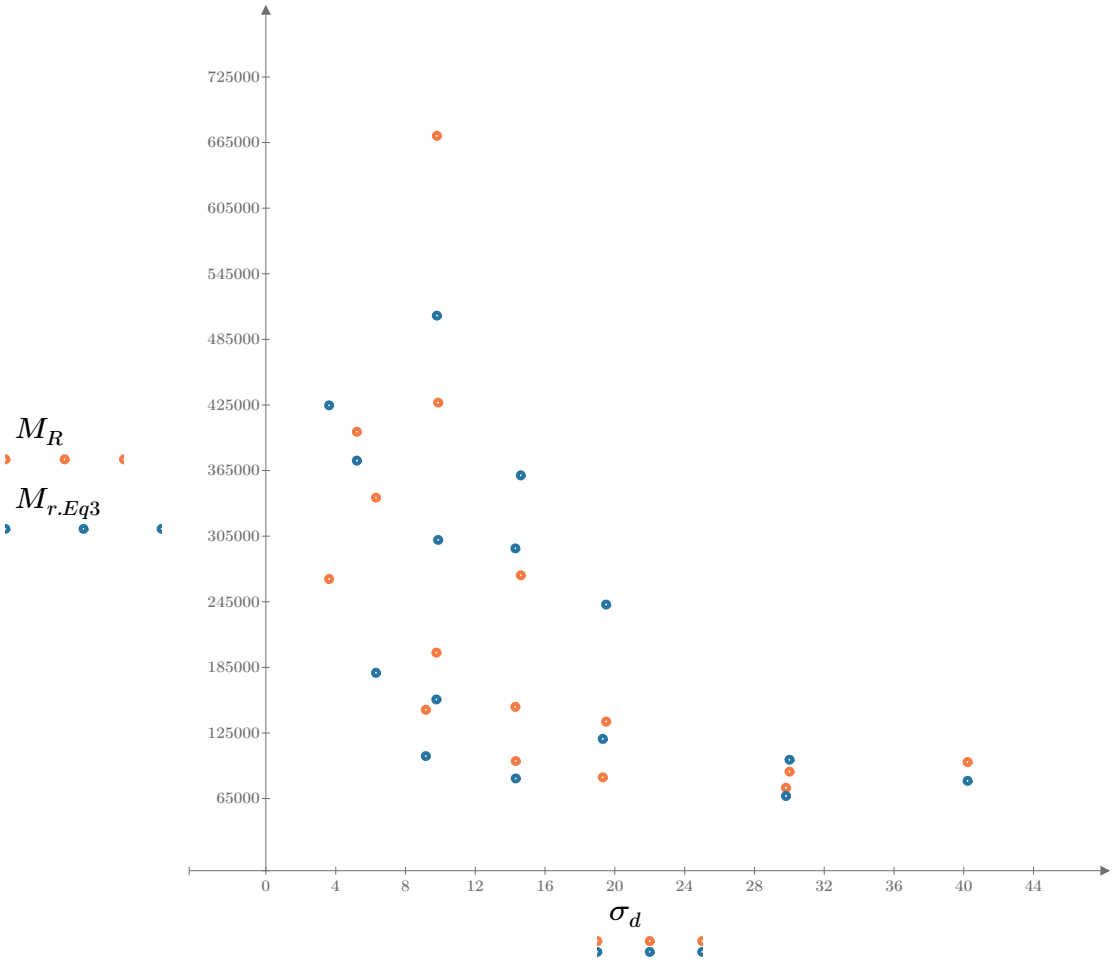

Figure 3. Plot of the test data (orange points) vs. the fitted Equation 3 model (blue points).

$SampleNo = \text{“B3–29”}$

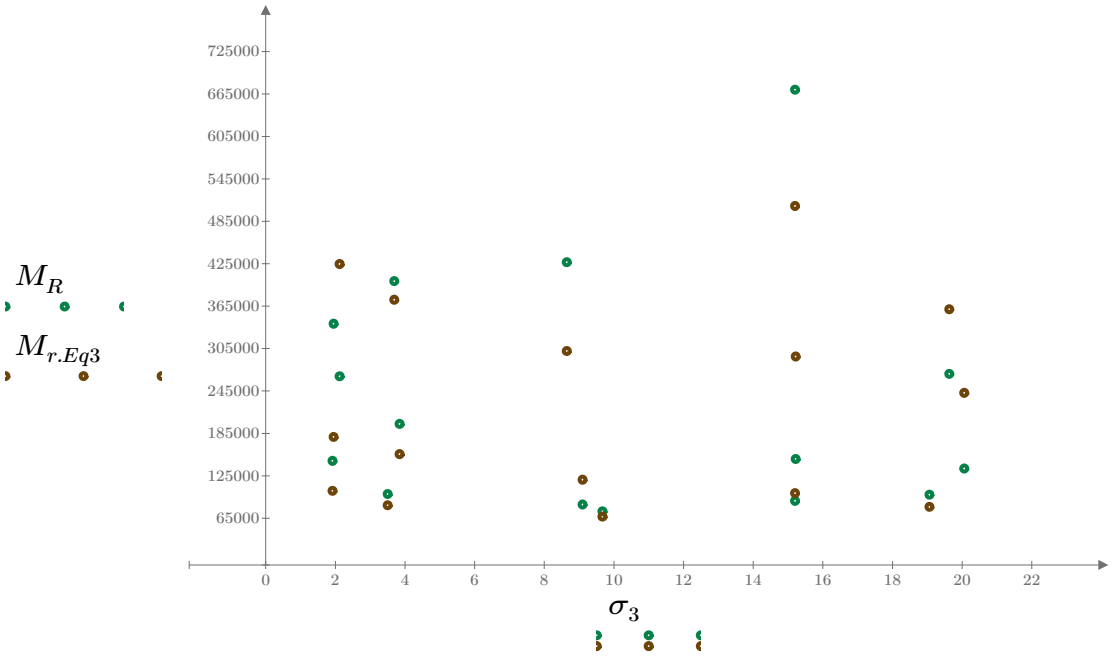

Figure 4. Plot of the test data (green points) vs. the fitted Equation 3 model (brown points).

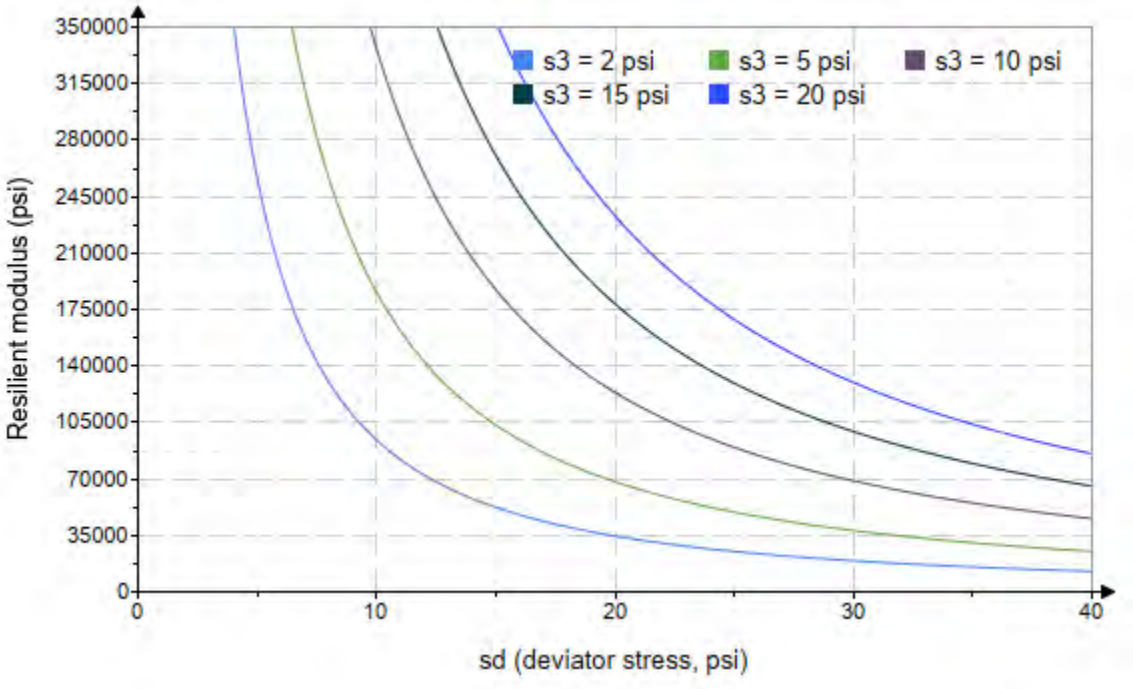

Figure 5. Plot of the fitted Equation 3 model for various confining stresses.

$SampleNo = \text{“B3–29”}$

$$M_{R.4}\left(\sigma_B, \sigma_d, K_8, K_9, K_{10}\right) := K_8 \cdot p_a \left(\frac{\sigma_B}{p_a}\right)^{K_9} \cdot \left(\frac{\sigma_d}{p_a}\right)^{K_{10}}$$

Equation 4 AASHTO Publication No. FHWA-RD-97-083

$K_8 = 2857.514$

$K_9 = 1.3294$ Equation 4 fitting parameters

$K_{10} = -1.9926$

$R_4^{\,2} = 0.7051$ Coefficient of determination

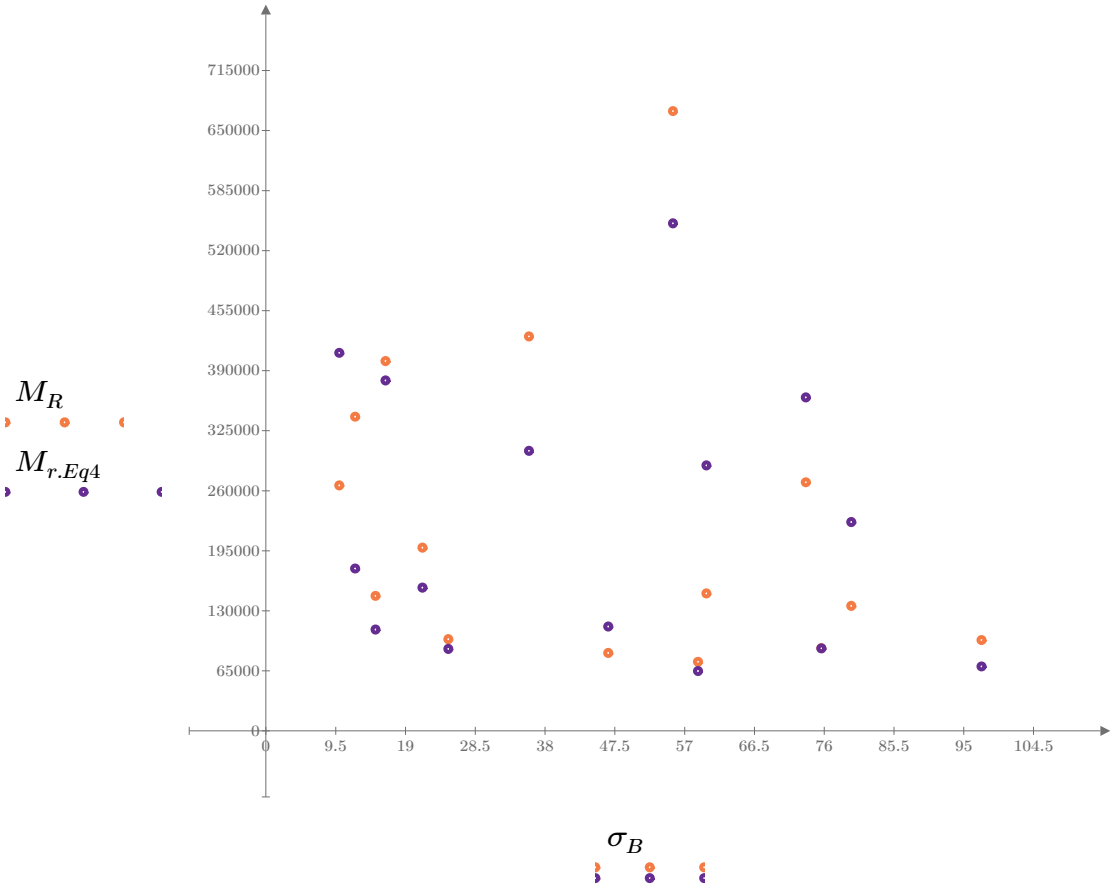

Figure 6. Plot of the test data (orange points) vs. the fitted Equation 4 model (purple points).

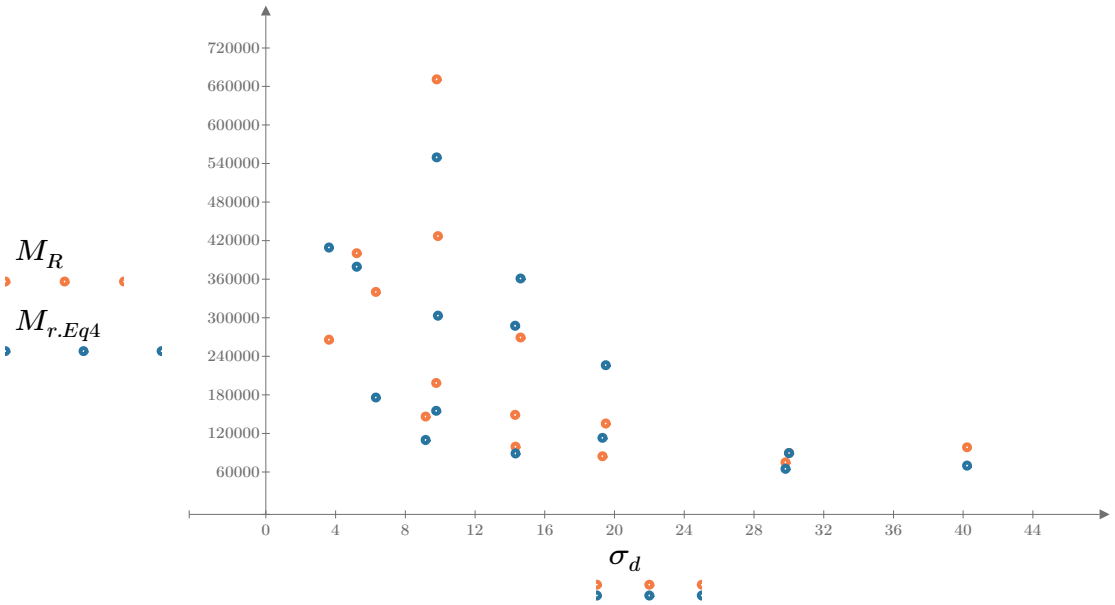

Figure 7. Plot of the test data (orange points) vs. the fitted Equation 4 model (blue points).

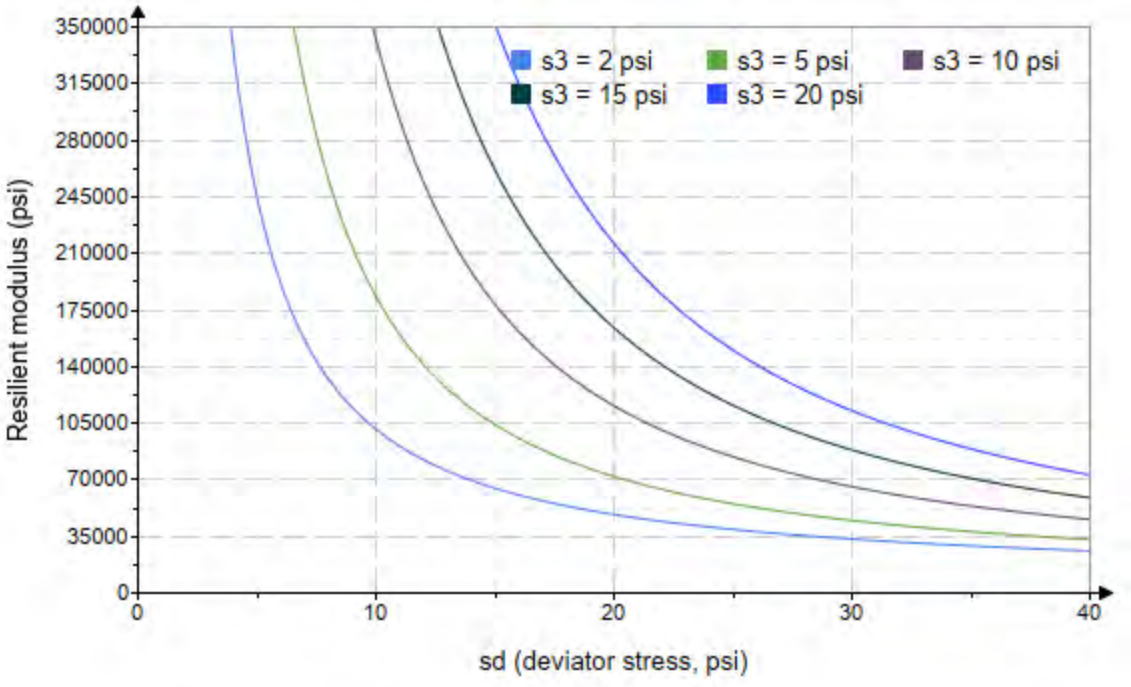

Figure 8. Plot of the fitted Equation 4 model for various confining stresses.