

July 14, 2026

How to install the posted update?

Replace your earlier version of **MSEW+.exe** with the one included in this download. After downloading and unzipping the posted update, use **File Explorer** to copy and paste the executable file (i.e., MSEW+.exe). The default directory of MSEW+ where MSEW+.exe is residing: **C:\Program Files (x86)\ADAMA\MSEW+**

List of changes in each Update:

Update 2026.10 (2026-07-12)

Coherent Gravity Method (CGM): When Live Load (LL) is considered, AASHTO 2020 suggests calculating Tmax twice. Consider LL for rupture and connection; however, when assessing pullout, ignore LL in calculating Tmax. Previously MSEW+ included LL in assessing CDR for pullout in *both* static and seismic potentially resulting in smaller CDR values than rendered by AASHTO, typically in upper layers of reinforcement. The current update considers AASHTO's recommendation if the user invokes it using the toggle in specified surcharge.

Update 2026.01 (2026-04-04)

Bearing Capacity near Slope: In the bearing capacity dialogue, where the base of the wall is specified next to a slope, a text was added suggesting the input of an Hs which possibly increases CDR for BC while staying consistent with AASHTO 2020. The judgement which Hs to use is left up to the user.

Update 2025.20 (2025-12-08):

Coherent Gravity Method (CGM): In a release on Feb. 1st, 2025, the Tmax and Tmd values under seismicity in Option A were accidentally set to zero. While this is obviously wrong, rather than fixing it, the current update removes Option A enabling only Option B in AASHTO 2020. The reason is that Option A unnecessarily oversimplifies the statics indicated in AASHTO 2020. Option B is statically correct, consistent with AASHTO's Load Factors (LF), and there is no need for an approach, Option A, that is inherently statically incorrect. Note that when all relevant LF are set to one, the nominal value of Tmax is rendered, providing a less convoluted process for checking the results by hand calculations.

Background: Option A was coded first using ASD (around 2002) and later implemented in LRFD in AASHTO 2007-2010. However, AASHTO at that time was silent about the CGM; i.e., it did not provide any formulation. Therefore, Option A in ASD followed an industry accepted procedure which was restricted to cases for which $\delta=0$. Switching to LRFD, the LF were not given nor 'calibrated' but with $\delta=0$ the 'errors' were small. CGM was accepted by AASHTO for inextensible reinforcement only in 2020 while allowing for $\delta>0$. Therefore, to avoid confusion and to allow for tractable reproduction of numbers, Option A was removed and the only option available now is Option B. Note that compared to SM, the CGM considers the impact of the

lateral resultant forces in external stability on Tmax through Meyerhof stress distribution (i.e., on internal stability), not an intuitive coupling.

Tip: To avoid the complexities associated with CGM, the Simplified Method (SM) might be used by a click of a button. Alternatively, SM can be used as a benchmark assessing the CGM outcome.

Update 2025.12 (2025-10-19):

Stiffness Method – Printout: The *printed* table associated with connection (static and seismic) was rearranged to be more concise and compatible with the variables in the tabulated displayed *screen* values in results.

Update 2025.11 (2025-05-22):

Two modifications in this update:

1. Bearing capacity on or near a slope: Tables in AASHTO for bearing capacity factor are limited to foundation soil $\phi \leq 40^\circ$. This update input cannot exceed 40 degrees. In previous versions, larger value than 40 degrees could be input but the bearing capacity then was zero for cohesionless soil.
2. FHWA-NHI-10-024 Option (Main Menu): The computed CDR value at the connection for the “Consider *traffic impact*” option for *metallic* reinforcement (upon clicking on Flexible Barrier/Post button in results) might be lower than should be. This has been fixed.

Update 2025.10 (2025-02-01):

Three issues related to seismicity were addressed in this update:

1. When in **CGM**, for $\delta > 0$ the reported eccentricity under seismic loading is larger than should be. This was due to not fully accounting for the $P_{ae-v} = P_{ae} \sin(\delta)$ in moments equilibrium. Subsequently, in External Stability, the correct eccentricity is smaller than reported; i.e., the current reported result is ‘conservative’. However, it is noted that the seismic eccentricity reported in bearing capacity is correctly calculated and reported.
2. Regardless of the method used, MSEW+ *adds* in seismicity the inertia of the facing to that of linear or bilinear active wedge. That is, P_{ir} now is a summation of the inertias of wedge of reinforced soil along which Tmax is developing *and* the facing. This procedure is employed by WSDOT (see their GDM 2020); it makes an engineering sense as *facia* is an integral part of the reinforced mass and during an earthquake its potential inertia must be restrained by the reinforcement thus increasing Tmax and To. Its relative impact depends on the dimension of the facing as well as the height of the wall. For typical 20-30 ft high wall, it may increase Tmax by about 10%. However, it seems that AASHTO ignores the impact of facing’s inertia on Internal Stability. Oddly, AASHTO recommends considering it in External Stability where inertia of a fraction of the reinforced mass is taken using somewhat arbitrary dimensions. The user now may invoke or not the impact of facing’s inertia in Internal Stability. A toggle has been added in the input, under *Seismic Parameters* in 2017-2020, whether inertia of the facing should be considered. Also, an explanation button was added. It is now up to the user to invoke it. Hint: Best would be to run the program twice to realize the potential impact of the inertia of facing; this may help in judgement.

3. When in **CGM**, the reported value of Tmax under seismic loading, to which Tmd is added, was underestimated. Since the resistance factors under seismic loading are larger while the load factors are smaller than under static loading, this difference may not impact the design outcome (this needs to be ascertained). It has been corrected now. The *corrected* value of Tmax employed in seismic mode is reported in the Strength Table in results. Also reported is its corresponding eccentricity, e. The Tmax used under static and seismic loading is consistent with the approach in the Simplified and Stiffness Methods; i.e., the Tmax displayed when clicking on seismic button reflects the static *nominal* value; its associated e and Tmd enable the assessment of seismicity.

Update 2025.01 (2024-12-12):

Two modifications:

1. Saving results as text in AASHTO 2007-2010, *Design Mode*, is no longer available. Alternatively, it is possible to save results as text in *Analysis Mode*. Simply, *Design Mode* is not detailed or explicit and its purpose is to provide the designer with an initial assessment of the needed reinforcement layout. However, upon switching to *Analysis*, the data generated in *Design* is preserved, thus enabling the user to modify the layout and explicitly check *actual* CDR values corresponding to the given layout.
2. In AASHTO 2020, *Simplified Metal Mat*, the user can now choose Kr/Ka distribution for pullout which is different than the one used for calculating Tmax in Strength. Although this option is irrational, it is permissible by AASHTO. This option is same as was in AASHTO 2007-2010. The rational option of using the same Kr/Ka for Tmax in Strength and Pullout remains as the default choice.

Update 2024.01 (2024-02-18):

The verbiage in the dialog, as well as in the printed report, explaining the Ka and Kae values has been simplified to improve clarity. Also, while AASHTO limits $\delta \leq (2/3)\phi$, the user now may explore δ values up to ϕ . The δ value is used to calculate Ka and Kae in assessing external stability.

Update 2023.31 (2023-11-25):

When in the seismicity dialogue, the user selects Kh as specified in input **AND**, possibly, impose an empirically displacement-based approach to adjust Kh in calculating Kae using M-O equation **OR** calculate values of Ka and Kae numerically based on Coulomb's constrained wedge using either the specified or the adjusted Kh **OR** directly input Ka and Kae based on judgement. When selecting adjusted Kh based on displacement combined with Coulomb's constrained wedge, the resulted Ka and Kae are inconsistent. This inconsistency has been fixed in the current update.

Update 2023.30 (2023-11-05):

Two modifications: 1. The notation in Bearing Load was changed from q-n to q-r as it is factored resistance bearing load and not nominal resistance bearing load. The numbers and verbiage were correct. It has been corrected in Results, as displayed, and in printout. 2. Global stability (Bishop Analysis considering compound and deep-seated failures) is inherently ASD. Hence, when invoking seismic Bishop analysis, PGA was taken as was input in ASD – Seismic input dialogue. The A (or PGA) value used in calculations appears in the displayed tabulated results of Bishop as well as in the printout. However, with the evolution of MSEW and the addition of design methods over more than 25 years, this input became unnecessarily confusing. Consequently, the current update takes the A value as specified in the Seismic input dialogue for each design version of

LRFD selected – it is now straightforward input. For clarity, the A value used in calculating global stability is displayed in the tabulated results as well as in the printout.

Update 2023.21 (2023-08-01):

AASHTO 2020 provides guidelines for design Bridge Abutment. However, the details related to external stability, especially under seismic conditions, are not complete. Update 2023.21 provides the user with an option to consider or ignore the height of the foundation wall for the bridge seat (h') in calculating P_{ae} . The impact of including h' on the design outcome can easily be verified upon running the program. Also, the text associated with selecting complex geometry was edited for clarity.

Update 2023.20 (2023-06-29):

In the previous update, 2023.13, one algorithm for calculating CDR-pullout was accidentally changed. Consequently, while the respective CDR-pullout values in the Pullout table and in the printout are correct, the values in the first Summary Table in Analysis are incorrect, not corresponding to the values in printout or the Pullout table. Also, the name of exported data file from MSEW+ to ReSSA+ was changed to *.RSA from *.RSA. This has no effects on results or ability to export a file to ReSSA+.

Update 2023.13 (2023-04-27):

MSEW+ has 3 options for using LL. The third option considers LL in assessing reinforcement and connection rupture but ignores in calculating T_{max} for pullout assessment. This option is now allowed in AASHTO 2020 and it could have a significant impact on reinforcement length for metallic strips. While under static loading LL was ignored in the 3rd option, it was considered to act under seismic conditions. This was rectified in update 2023.13 and when option three is selected, LL in *pullout* is consistently ignored under both static and seismic loadings. Also, the verbiage in the dialog allowing the user to select the desired option for LL was modified clarity.

Update 2023.12 (2023-03-27):

1. A parameter input for connection strength of geosynthetic type #3, was printed in incorrectly; calculations and results used the actual input parameter. The typographical error was corrected.
2. When dealing with geosynthetic walls having a batter greater than 10 deg., AASHTO recommends to establish the inclination of the failure plane for internal stability, ψ , using Coulomb's closed-form trigonometric equation. In this equation, the backslope angle, β , the reinforced soil internal friction angle, ϕ , the wall batter, ω , and an imaginary "interface" friction angle, δ , are used to compute ψ . It recommends using $\delta=\beta$. In-house parametric studies by ADAMA indicate that for many relevant problems, the actual value of δ has small effect. However, β is considered as an angle of an infinite slope. As β gets closer to ϕ , the stability of this 'infinite' slope drops dramatically. It reaches the 'angle of repose' when $\beta=\phi$ resulting in a failure plane - assuming planar surface as in Coulomb's force limit equilibrium formulation - that is parallel to the slope surface. Theoretically, this entails a need for infinitely long reinforcement. While infinite backslope is not practically feasible, in MSE walls often broken backslope is used. When using AASHTO as is, for a small backslope rise and large β , the end result could be deep failure planes necessitating unreasonably long reinforcement to generate pullout resistance. To realize this problem and consider a potential remedy, the current update allows the user to explore the impact of using an *equivalent* backslope due to broken backslope. This equivalent infinite backslope angle, I , is adopted from External Stability used for many years by AASHTO. It may result in significantly steeper slip planes thus requiring shorter reinforcement. If this exploratory option is

selected, MSEW uses instead of β the 'equivalent' angle I while setting δ to equal to I . AASHTO has clearly oversimplified the problem by using planar surface following Coulomb while employing β as the angle of an infinite slope for a broken backslope. Using this option in MSEW could be one approach for the designer BUT it is not explicitly suggested by AASHTO. Global stability analysis (such as in ReSSA+) could add confidence in the outcome of your design.

Update 2023.11 (2023-01-07): The issue fixed in this update is relevant to seismic internal stability of metallic reinforced walls when subjected to surcharge loads only. T_{max} is a function of factored soil horizontal pressure and loads induced by factored surcharge loads. Under seismic loading, the load factor is 1.0. The **display** of T_{max} , under seismic conditions, included the effect of surcharge using static load factor on this surcharge (e.g., 1.5 and not 1.0). This has been corrected. Note that the reported seismic CDR is actually based on the correct factored surcharge in calculating T_{max} thus leading to the correct presented value in Pullout and Connection. However, in Strength, the reported CDR was calculated based on static load factor applied to surcharge thus yielding seismic CDR that is somewhat smaller than should be. On screens and printed results, all tabulated displayed values of T_{max} and the seismic CDR in Strength have been corrected.

Update 2023.10 (2023-01-01): AASHTO allows seismic load factor on live load to be as low as 0.5. MSEW+ has been modified to include two user specified load factors under seismic conditions: one for live surcharge and one for dead surcharge. While in internal stability these load factors are preset to 1.0, the user can now change these factors in external stability to even be less than 1.0 (default is 1.0). Generally, this change may render slightly less conservative outcome in external stability (i.e., smaller eccentricity and larger CDR values for sliding and bearing capacity) as compared to values produced by prior versions of MSEW+. The difference in outcome will depend on the specified values of load factors and magnitude of surcharges loads. Also, the displayed values of graphically presented force vectors have been adjusted to show the factored forces.

Update 2023.00 (2022-12-07): The file MSEW+ is creating for a database associated with NCMA design could not save the data correctly due to a formatting error. This issue was obvious and it has been fixed.

Update 2022.30 (2022-09-24): In calculations associated with external stability related to AASHTO 2017-2020, if $\delta > 0.67\phi$ a redundant message appears that the limit should be $\delta \leq \phi$ and that $\delta \leq 0.67\phi$. Only one message appears now: $\delta \leq 0.67\phi$.

Update 2022.20 (2022-06-08): This update is applicable only to geosynthetic reinforcement in the AASHTO 2017-2020 option. It includes an *important* correction and an added feature:

- a. This fix is relevant only to seismic CDR values at the *connection*. The seismic CDR values are displayed in three different tables (in Results) as well as in the printout. In some cases, the displayed tabulated seismic CDR values were inconsistent across the tables thus indicating that some were improperly displayed. This bug has been fixed and now the respective CDR values are consistent in all tables and printout.
- b. Use of strip geosynthetic reinforcement (e.g., high-strength polyester strips) may require Coverage Ratio, R_c , values that change with elevation to render more economical, yet

safe, structure. You can now specify different R_c value at each elevation, regardless of designated geosynthetic type.

Update 2022.10 (2022-04-01): Currently, specified F^* follows AASHTO default values possibly allowing for minor adaptation related to specific reinforcement type. In the current update, the user has another option. If experimental evidence indicates that F^* is dependent on embedment overburden pressure for the same type of reinforcement, the user can bypass AASHTO default values. Specified F^* values should be carefully considered based on experimental verification. Values depend on backfill properties such as dilatency, gradation and relative density. If laboratory study is conducted to establish F^* values, the testing technique should faithfully simulate field conditions such as similar boundary effects and similar type of soil. User specified F^* values could have significant economic impact when $R_c \ll 1.0$ (e.g., metallic strips and or polyester straps), allowing for shorter pullout resistive length of upper layers; i.e., possibly shorter reinforcement and less volume of select reinforced soil.

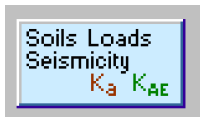
Update 2022.03 (2022-03-01): Three updates. First, in the About MSEW, the description of MSEW+ was revised to reflect the essence of the current version. Second, in the Stiffness Method, the header in the table for geosynthetic data describing the input of secant stiffness, J , was modified to clearly convey the required value, accounting for coverage ratio R_c . That is, the input J should equal to R_c times $J_{2\%}$ where $J_{2\%}$ is determined in laboratory testing measuring the secant stiffness at 2% strain, considering unit length of the wall ($R_c=1.0$). A 'calculator' assisting in the conversion to J was added. Third, the value of the specified J was added to reinforcement data in the printout.

Update 2022.02 (2022-01-27): When running in the *Design Mode*, the checkmarks for Strength in the summary table are not v-checked even if the CDR values are acceptable. This has been fixed. Switching to *Analysis Mode* recalculates and shows the actual CDR values. **Note:** *Design Mode* is a tool intended to assist in the initial setting of the reinforcement layout; however, the *Analysis Mode* for the same problem will present in details the actual calculated parameters relevant to design. The problem in the *Analysis Mode* can be modified (e.g., layout, strength, connection) to meet the specific requirements.

Update 2022.01 (2021-12-01): FHWA has released report FHWA-HIN-21-002 providing a framework for using local reinforced backfill. It suggests a modification for sliding resistance factors as a function of amount of fines when this amount is greater than AASHTO's limitation of max 15%. The option of larger amount of fines is now available in MSEW+ (LRFD mode, Simplified AASHTO method) when considering the factors for external stability. To enable access to FHWA-HIN-21-002 from within the program, download this manual at <https://geoprograms.com/downloads-adama/>, Miscellaneous Downloads, and paste it in the same directory where MSEW+ is residing, typically in C:\Program Files (x86)\ADAMA\MSEW+ as FHWA-HIN-21-002.pdf. Note that FHWA-HIN-21-002, MSE-LASR, provides guidelines for extending the Simplified Method; the added option in MSEW+ is just one element in the design process. Use of high amount of fines in design requires consideration of the MSE-LASR manual in its entirety.

Update 2021.20 (2021-10-10): The updates below are *applicable only* to AASHTO 2017-2020 including Stiffness Method. In external stability, static and seismic, the following modifications were made:

1. K_a and K_{ae} are calculated using $\omega=0$ (zero 'batter'). This may have an impact for walls with $\omega \geq 10^\circ$ as the lateral earth pressure coefficients might be greater now. The logic for this change is explained in MSEW in relevant dialogues called by click of buttons. This approach is consistent with 2-part wedge (Coulomb's LE), a viable option in MSEW that is particularly useful when actual broken backslope is considered instead of infinite backslope. However, to be consistent with MSEW(3.0), the user can select to use the actual ω to calculate K_a (note that K_{ae} has always been calculated using $\omega=0$ in M-O equation for infinite backslope).
2. When Coulomb wedge is selected to assess K_a and K_{ae} , these numerically-derived values now are used in external stability. In previous updates, K_a from closed-form solution for infinite slope was used while K_{ae} based on Coulomb wedge was used. For near vertical walls, K_a in previous editions of MSEW+ might be somewhat larger, depending on the broken backslope geometry.
3. **Summary:** Now you have several options to invoke K_a and K_{ae} in *external stability*:
 - a. Use the closed-form expression for infinite backslope – you can choose backslope angle β or equivalent backslope angle I for this infinite slope. A button in MSEW explains angle I – it was suggested by FHWA and older AASHTO editions as an equivalent infinite backslope providing a simplified alternative to actual use of broken backslope which requires a numerical process.
 - b. Use Coulomb wedge (LE analysis for planar surface of limited extent) to numerically render the values. This approach is useful for broken backslope and/or when it is not feasible for the active wedge in the retained soil to be deep due to stratigraphy (e.g., high seismicity may require deep critical wedge which often is not physically feasible).
 - c. Specify your own values of K_a and K_{ae} . This option is particularly useful if the retained soil has high long-term cohesion value (e.g., rock or native cemented soil) thus exerting little lateral pressure. Alternatively, if the retained soil is made up of layers (for which Coulomb option in *a* or *b* is not valid), you may use a more complex LE approach than Coulomb to find the P_a and P_{ae} for $F_s=1.0$ and then configure the corresponding K_a and K_{ae} suitable for your problem so that external stability could be assessed following AASHTO procedure for MSE walls. Note that (AASHTO suggests the GLE approach which implies LE analysis, preferably rigorous, with general shaped slip surface).
4. You can realize the changes in MSEW+ by selecting Seismicity in input data; you can also specify your desired selection for strictly static problems by going to Soils in input menu and then selecting *external stability* options. The actual K_a and K_{ae} values as well as Coulomb wedges (should this option be selected) can be seen in Results when clicking on *Soil, Loads, Seismicity, Ka, Kae* button:



Several notes, activated by clicking on relevant buttons, were added for clarity (in Input Data menu, in Seismicity or in Soils then selecting the External Stability options), explaining the approach used.

5. MSEW+ has the option to specify seismic coefficient K_h that is adjusted for allowable displacement – an empirically-based value as suggested in AASHTO Article 11.6.5.1 or as suggested in Appendix A.11.5.1. Your selected option for K_h now is stated in the report as well as in the window in results, accessed through Soils, Loads, Seismicity, K_a , K_{ae} button.

Update 2021.14 (2021-07-30): When inputting data for bearing capacity in Imperial Units considering a sloping toe, the displayed N_s is erroneous. However, it is correct in SI Units. It does not affect the bearing capacity calculations and results, either in Imperial or SI Units. The displayed N_s in the input data screen have been corrected.

Update 2021.13 (2021-03-30): When placing an *embedded* footing in the reinforced soil zone (i.e., footing located below upper reinforcement layers), the embedment depth was ignored in calculating eccentricity. While this has no effects on eccentricity calculated below the footing, it would typically result in larger eccentricity along layers above the embedded footing. This has been corrected in update 2021.13.

Update 2021.12 (2021-02-14): A calculator to assess the facing stiffness factor, Φ_{fs} , factor has been added – see Stiffness Method, Internal Stability LR Factors.

Update 2021.11 (2021-02-01): When calculating the factored connection capacity for extensible reinforcement in Simplified AASHTO (2017-2020), MSEW+ used a reduction factor for durability, R_{fd} , which is likely higher than the specified value. Consequently, the computed long-term CDR for the connection was smaller than should be. The connection values were corrected in Analysis and Design Modes.

Update 2021.10 (2021-01-24): The Coherent Gravity Analysis (CGA) was modified to include two options. Option A is the same as currently implemented [i.e., vertical force component of resultant lateral earth pressure on the reinforced mass, $F_T \sin(\delta)$, is ignored in calculating R and, subsequently, σ_v , while it is considered in calculating eccentricity, e]. Option B considers rigorously all force components. In addition, $K_r(Z)$ distribution (K_o at $Z=0$ varies linearly to K_a at $Z=6$ m) in Option B starts at the soil surface whereas in Option A it starts at the elevation of the top of the wall. Therefore, for horizontal crest K_r distribution is the same. The updated program includes detailed explanation and tips.

Update 2020.21 (2020-12-20): In Strength results of the Coherent Gravity Method, a column was added to the displayed table showing the eccentricity associated with the calculations of T_{max} at each reinforcement level. This eccentricity considers the factored loads within the reinforced zone.

Update 2020.2 (2020-11-25): When surcharge load is specified, CDR in Strength (AASHTO 2017-2020 Simplified) was inaccurate; this bug has been fixed. A simple, uniform format of all tables was implemented. Printout of some data was corrected/modified.