

Reduced Zinc Loss Rate for Design of MSE Structures

A White Paper by the Association for Metallically Stabilized Earth

EXECUTIVE SUMMARY

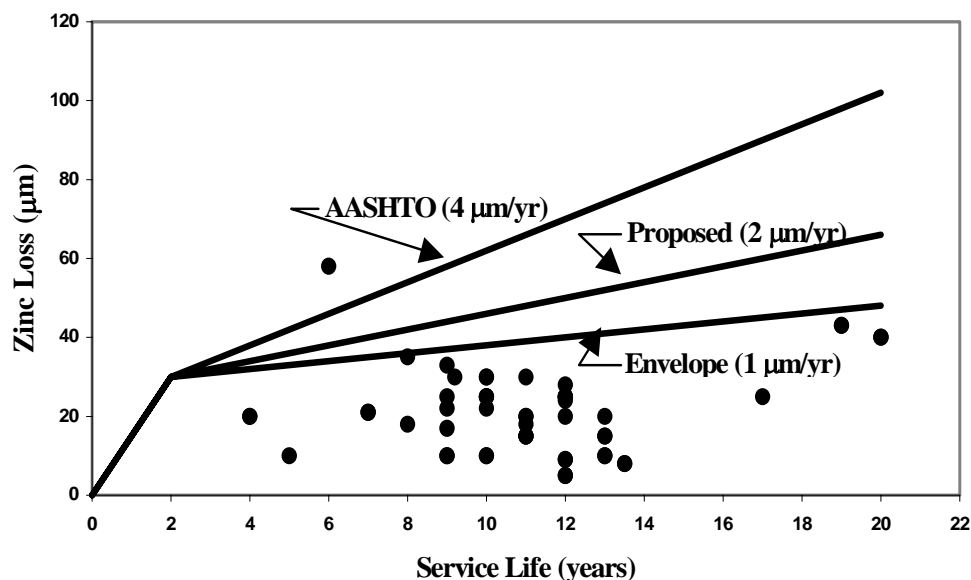
The purpose of this White Paper is to propose the following revision to the AASHTO specifications for Mechanically Stabilized Earth (MSE) walls: the rate at which zinc is consumed from galvanized steel MSE reinforcements should be changed from 4 $\mu\text{m}/\text{yr}$ to 2 $\mu\text{m}/\text{yr}$. The proposed zinc loss rate was documented by a major university study over 25 years ago but, when the original AASHTO specification for MSE walls was written several years later, *the zinc loss rate was arbitrarily changed to a value twice that recommended by the study*. This White Paper synthesizes and analyzes data from that study and from many other sources. The data overwhelmingly support the proposal to reduce the zinc loss rate from 4 $\mu\text{m}/\text{yr}$ to 2 $\mu\text{m}/\text{yr}$.

The Association for Metallically Stabilized Earth (AMSE) has compiled a database documenting 780 MSE walls constructed in the United States since 1972, including information pertinent to metal loss such as location, age and backfill electrochemical conditions. Most walls are owned by DOTs and were, therefore, designed and constructed based on some form of the AASHTO specifications.

Zinc loss is determined from weight loss measurements. The figure shows the zinc loss determined from specimens listed in the paper. With one exception, the points lie below the bilinear envelope defined by

$$V_1 = 15 \mu\text{m}/\text{yr} \text{ for } t < 2 \text{ years}$$

$$V_2 = 1 \mu\text{m}/\text{yr} \text{ for } t > 2 \text{ years.}$$



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It is clear that no loss of steel has begun. On the contrary, approximately half the original zinc thickness remains after 20 years in service, making the linear loss model proposed by AMSE the model that should be adopted. The existing AASHTO linear loss model ($V_1 = 15 \mu\text{m/yr}$, $V_2 = 4 \mu\text{m/yr}$) is clearly overly conservative, while the proposed zinc loss rate of $2 \mu\text{m/yr}$ is double the rate that envelops the data.

MSE wall performance data collected during 34 years of service and presented in this White Paper support the proposed revision of the zinc loss rate from $4 \mu\text{m/yr}$ to $2 \mu\text{m/yr}$. Revising the AASHTO specification to incorporate the proposed zinc loss rate contributes to meeting Grand Challenge 2, Optimizing Structural Systems, and Grand Challenge 4, Advancing the AASHTO Specifications, of the AASHTO *Strategic Plan for Bridge Engineering*. The Association for Metallically Stabilized Earth requests that this revision be adopted by the AASHTO T-15 Subcommittee on Substructures and Retaining Walls for incorporation into the AASHTO LRFD Bridge Design and other applicable Specifications.