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March 17, 2021

Ms. Debra Hilmerson
Hilmerson Safety Services, Inc
16228 Main Ave SE, Suite 108
Prior Lake, MN 55372

DHG Job No.: 2021-122 MS 01

Subject: Engineering Review of Hilmerson Safety Rail Guardrail System for Canadian Compliance

References:

1. "OSHA Compliance Review of Safety Rail System," by DH Glabe & Associates, DHG Job Number 2018-301 MS 07, dated June 7, 2019.
2. "Ontario Regulation 213/91 Construction Projects," dated January 1, 2020.
3. "CSA Z259.18:19: Counterweighted Guardrail Systems," by Standards Council of Canada, dated March 2019.
4. "Hilmerson Railing System & Accessories Structural Calculations," by Larson Engineering, by Thomas Renick, Minnesota PE License #25310, prepared for Hilmerson Safety Services, dated August 24, 2018.

Dear Ms. Hilmerson:

As requested, DH Glabe & Associates has performed an engineering review of the subject guardrail system for Canadian code compliance; it has previously been determined that the guardrail system meets OSHA compliance. The following presents DH Glabe & Associates' scope of work, analysis summary, and conclusion.

SCOPE OF WORK

DH Glabe & Associates' scope is limited to a review of the Hilmerson Safety Rail system for Canadian code compliance for guardrails. The requirements for guardrails in Canada were determined, and then compared to the OSHA requirements for guardrails. The scope of work did not include a review of components that are not part of the Hilmerson Safety Rail system or modifications that have been implemented after the referenced report has been issued.

ANALYSIS SUMMARY

Per Reference 1, the Hilmerson Safety Rail system is based on using a weighted base and 10' long rails. The Hilmerson Safety Rail system complies with OSHA 1910.29 and29.CFR.1926.501.

The requirements for guardrails per the Construction Projects regulation (reference #2) section 26.3(4) are:

1. It shall have a top rail, an intermediate rail and a toe board.
2. Subject to subsection 116 (8), the top of the guardrail system shall be located at least 0.9 metres (35.4 inches) but not more than 1.1 metres (43.3 inches) above the surface on which the system is installed.
3. The intermediate rail shall be located midway between the top rail and the toe board.
4. The toe board shall extend from the surface to which the guardrail system is attached to a height of at least 89 millimetres (3.5 inches).

The requirements for guardrails per the Construction Projects regulation (reference #2) section 26.3(5) are:

1. Loads shall be applied independently
2. A point load of 675 newtons (151.8 pounds) applied in a lateral direction to the top rail.
3. A point load of 450 newtons (101.2 pounds) applied in a vertical downward direction to the top rail.
4. A point load of 450 newtons (101.2 pounds) applied in a lateral or vertical downward direction to the intermediate rail, or midway between the toprail and the toe board.
5. A point load of 225 newtons (50.6 pounds) applied in a lateral direction to the toe board.

The requirements for guardrails per the Construction Projects regulation (reference #2) section 26.3(6) are:

1. The distance between any two adjacent posts of the guardrail system may be greater than 2.4 metres (7.87 ft) only if the system is capable of resisting the loads specified in subsection (5) increased in proportion to the greater distance between the posts.
    a. Since your system uses 10' base spacings, the way I interpret this is the loads would have to be increased by 27% on your system.
2. Adjusted top rail lateral load: 193 lbs
3. Adjusted top or mid rail downward vertical load: 129 lbs
4. Adjusted toe board lateral load: 64 lbs
    a. This is greater than OSHA requirements.

5. Additional analysis has determined that the Hilmerson Safety Rail system is compliant with the requirements of the Construction Projects regulation.

The requirements for guardrails per the Counterweighted Guardrail Systems standard (reference #3) chapter 6 are:

1. The top rail height shall be between 990 and 1143 mm (38.9 and 45 in) from the top of the rail to the walking surface.
2. Intermediate rails shall be located so that the gap between any two rails shall not exceed 480 mm (18.9 in).
3. The gap between the lowest intermediate rail and the walking surface shall not exceed 530 mm (20.8 in).
4. Cantilevered sections of railing at the ends or corner shall not extend more than 500 mm (19.7 in) beyond the vertical post.
5. The materials of counterweight shall be as follows:
    a. for a Class I CGS, the counterweight shall not be granular or fluid materials such as sand or water. Each counterweight shall be capable of being secured against accidental displacement (see Annex A); and
    b. for a Class II CGS, it may be solid, granular, or fluid. A counterweight composed of granular or fluid materials shall be securely contained in such a way that the mass of the counterweight is maintained over the duration of the intended use.
6. Loads shall be applied independently
    a. A point load of 1000 newtons (225 pounds) applied in a lateral direction to the top rail.
    b. A point load of 1000 newtons (225 pounds) applied in a vertical downward direction to the top rail.
    c. A point load of 450 newtons (101 pounds) applied in a vertical upward direction to the top rail.
    d. A point load of 670 newtons (151 pounds) applied in a lateral or vertical downward direction to the intermediate rail.
    e. The loads specified here are based on the static and dynamic test criteria of the counterweight guardrail system and are greater than OSHA requirements.
7. Additional analysis has determined that the Hilmerson Safety Rail system is compliant with the Counterweighted Guardrail Systems standard provided the following criteria are met:
    a. 5' sections shall be located at the end where there is a return section oriented perpendicular to the main run of the guardrail.
    b. A minimum of two (2) sections must be joined and utilize the baseplates in order to resist the upward load condition.

CONCLUSION

Based on the conditions of our review, DH Glabe and Associates has determined that the Hilmerson Safety Rail system is in compliance with the Canadian standards for guardrails referenced herein with the following additional requirements:

1. **5' sections must be placed at the end of the guardrail so there is a perpendicular return section for counterweight base plate conditions.**
2. **A minimum of two (2) sections must be joined when using counterweight base plates in order to resist the upward load.**

This conclusion is based on the previous analysis performed to comply with OSHA standards and additional analysis to determine compliance with Canadian standards for Construction Projects and Cantilevered Guardrail Systems. Please contact DH Glabe & Associates if further analysis is needed based on site specific conditions.

Limitations: DH Glabe & Associates was limited to the scope of work provided herein. DH Glabe & Associates has not reviewed the specific applications of the guardrail system. All safety requirements shall be met when working near exposed slab edges. DH Glabe & Associates cannot assume liability from any damage to the slab concrete or associated with unknown conditions or inaccurate documentation. DH Glabe & Associates cannot assume liability from any injuries resulting from improper use of the guardrail system. Please call with any questions or concerns.

Thank you for this opportunity to provide our engineering services.

Respectfully Submitted,

DH GLABE & ASSOCIATES

Michael Klein, PE, P.Eng., LEED AP

Digitally signed by Michael Klein, PE, P.Eng., LEED AP
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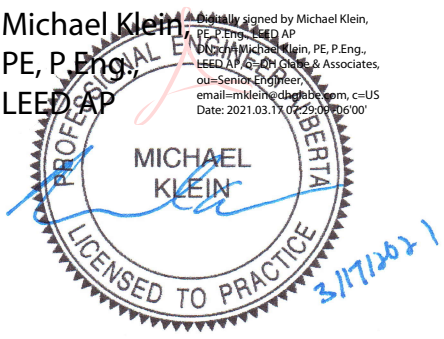

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