

### SABRE Version 5.24/6.05 Addendum Release Notes

November, 2022

1. Add deformation table (Table 3.4) for the un-factored dead load case for LRFD.
2. Fix Shield ID 1, 2, 3 & 4 overridden by users in Data type 0612 for both ASD and LRFD versions.

June 6, 2021

3. Revised Fatigue Truck Gust Loading for overhead case in both ASD and LRFD.
4. Reviewed all Fatigue Limit States with list of joints loads in Tables 19.1-19.3 and verified in Tables 10.11-13 in both ASD and LRFD.
5. Implemented capabilities for one, two and three-arm signal poles with descriptions and tutorials in Appendix E of the User s Manual.
6. Fully implemented and verified the AASHTO LRFD Specifications in 2020 and briefed in Appendix F of the User’s Manual. The report on calibration “The Calibration of the AASHTO ASD and LRFD for Maryland Sign and High Mast Lighting Structure Design” is available from link: <https://trid.trb.org/view/1718429>

### SABRE Version 5.23/6.01 Addendum Release Notes

February 23, 2020

1. Released SABRE/LRFD version for beta testing in 2019.
2. Released ASD V5.23 and LRFD V6.01 simultaneously. (For V5.xx will be following ASD format and V6.xx and on will be following LRFD format.)
3. Implemented the latest AASHTO (2015) “LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals,” AASHTO LRFD LTS-1, w/2019 Interim,
4. Appendix F of the User’s Manual shows the difference between ASD and LRFD (attached)

### SABRE Version 5.22 Addendum Release Notes

May 28, 2019

1. Updated to the latest AASHTO “Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals,” 6<sup>th</sup> Edition, 2/2015 Interim.

### SABRE Version 5.10 & 5.11 Release Notes

February 15, 2017

1. Implemented the latest fatigue criteria
2. Expanded program feature to handle signal pools with latest fatigue considerations.

### SABRE Version 5.1 Addendum Release Notes

January 26, 2015

1. Consider AASHTO “Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals,” 6<sup>th</sup> Edition, 2013 with footnotes shown at the bottom of Tables 20.1, 20.2 and 20.3

### SABRE Version 5.1 Release Notes

January 26, 2010

1. Implement AASHTO “Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals,” 5<sup>th</sup> Edition, 2009
2. Add post-processor for “Fatigue Detail Check” spreadsheet

SABRE Version 4.22 Release Notes

22 July 2009

1. Add “Max2” for CSR of secondary members
2. Check both ends of members for maximum CSR, especially at columns ends.

SABRE Version 4.21 Release Notes

17 February 2009

A. Modifications for SABRE Interface

1. Add footnotes to screens for Data Types 04012 and 05012
2. Fix default Gust Factor on screen for “Parameters” (Data Type 01042)
3. SABRE post-processor on Fatigue Details is added to the system.

B. Modifications for SABRE analysis and output

1. Footnotes are added to Tables 2.1 & 2.2 for wind height coefficients and tapered tubes
2. Local or global coordinate system is added to the headings of Tables 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, & 10.9
3. “Max” was added to the greatest CSR of tower members or chords in Tables 11.4 and 12.4
4. Headings of which axis loading for fatigue are added to Tables 20.1, 20.2, 20.3
5. Monotube case was fixed
6. Fatigue analysis for planar truss system, including monotube case, was fixed
7. Cases for sign on the +Z or -Z coordinates are allowed.

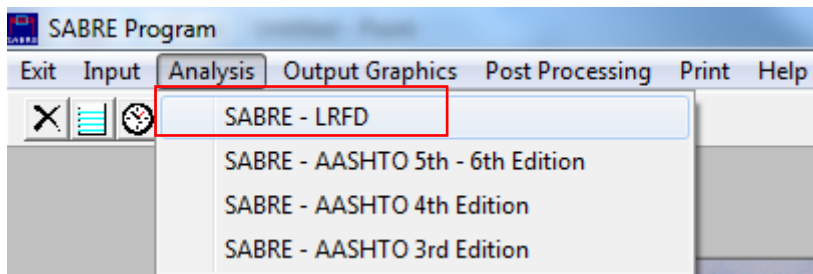
# Appendix F – SABRE Program with AASHTO LRFD Specifications

## 1. SABRE Input Module for LRFD

Use the same entry Wind Importance Factor for ASD and Directionality Factor for LRFD

Parameters	Additional Joint Loads	Walkways
<b>DATA TYPE: 01042</b>		
WIND VELOCITY	<input type="text" value="120"/> (mph or m/s)	<input type="text"/> (mph or m/s) (SERVICE I, LRFD only)
MEAN REGULAR INTERVAL	<input type="text" value="50"/> (years)	
GUST FACTOR	<input type="text" value="1.14"/> <b>Regular Method - 1.14 (4th or 5th ed.)</b>	
ICE LOADS	<input type="text" value="3.0"/> (psf or KPa)	ICE LOAD OPTIONS <input type="text" value="0"/> <b>0- One Side</b>
TRUSS BRACING OPTIONS	<input type="checkbox"/> <b>0- Moment Bracing (default)</b>	
D. L. DETAIL FACTOR	<input type="text" value="1.0"/>	
<div style="border: 1px solid red; padding: 5px;">           ASD: WIND IMPORTANCE FACTOR or <input type="text"/> (default = 1.0; see AASHTO Table 3-2)            LRFD: DIRECTIONALITY FACTOR, Kd <input type="text"/> (post) <input type="text"/> (others) (post default = 0.95, others = 0.85, see AASHTO LRFD Table 3.8.5-1)         </div>		
<b>For Fatigue Design Only</b>		
YEARLY MEAN VELOCITY FOR NATURAL WIND GUST	<input type="text"/>	(default = 11.2 mph or 5 m/s)
VEHICLE SPEED FOR TRUCK-INDUCED GUST	<input type="text"/>	(default = 65 mph or 30 m/s)
FATIGUE IMPORTANCE FACTOR OPTIONS	<input type="text"/>	
GALLOPING (default = 1.0)	NATURAL WIND (default = 1.0)	TRUCK - INDUCED GUST (default = 1.0)
<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Overall Effective Length K (Table 7.4.1 of the User's Manual)</b>		
CASE 1: VERTICAL (POLE TYPE)	<input type="text"/>	(default = 2.0)
CASE 2: VERTICAL (TRUSS TYPE)	<input type="text"/>	(default = 1.2)
CASE 3: HORIZONTAL (POLE AND TRUSS)	<input type="text"/>	(default = 0.65)

## 2. SABRE Analysis Module for LRFD



## 3. SABRE Load Combinations for LRFD

Current Load Combinations

### A. Strength Limit State

1. Group 1 – 1.25DL + 1.6LL (T8.1, check for T10.1 & T13.1)

## B. Extreme Limit State

2. Group 2 – 1.1DC+W (Comb 1 +Z) (T8.2, check for T10.2, T13.2)
3. Group 2 – 1.1DC+W (Comb 2 +Z) (T8.3, check for T10.3, T13.3)
4. Group 2 – 1.1DC+W (Comb 3 +Z) (T8.4, check for T10.4, T13.4)
5. Group 2 – 1.1DC+W (Comb 1 -Z) (T8.5, check for T10.5, T13.5)
6. Group 2 – 1.1DC+W (Comb 2 -Z) (T8.6, check for T10.6, T13.6)
7. Group 2 – 1.1DC+W (Comb 3 -Z) (T8.7, check for T10.7, T13.7)
8. Group 3 – 0.9DC+W (Comb 1 +Z) (T8.8, check for T10.8, T13.8)
9. Group 3 – 0.9DC+W (Comb 2 +Z) (T8.9, check for T10.9, T13.9)
10. Group 3 – 0.9DC+W (Comb 3 +Z) (T8.10, check for T10.10, T13.10)
11. Group 3 – 0.9DC+W (Comb 1 -Z) (T8.11, check for T10.11, T13.11)
12. Group 3 – 0.9DC+W (Comb 2 -Z) (T8.12, check for T10.12, T13.12)
13. Group 3 – 0.9DC+W (Comb 3 -Z) (T8.13, check for T10.13, T13.13)

## C. LRFD Strength/Extreme Limit State Combination Checks

- a. Tower and Truss Member Capacities (T11.2 & T12.2)
- b. Tower and Truss Member Maximum Combined Force Ratios (CSR) (T11.4 & T12.4)

## D. Service I Limit State

14. Group 4 – 1.0DC+  $W_{SE}$  (Comb 1 +Z) (T8.14, check for T9.14)
15. Group 4 – 1.0DC+  $W_{SE}$  (Comb 2 +Z) (T8.15, check for T9.15)
16. Group 4 – 1.0DC+  $W_{SE}$  (Comb 3 +Z) (T8.16, check for T9.16)
17. Group 4 – 1.0DC+  $W_{SE}$  (Comb 1 -Z) (T8.17, check for T9.17)
18. Group 4 – 1.0DC+  $W_{SE}$  (Comb 2 -Z) (T8.18, check for T9.18)
19. Group 4 – 1.0DC+  $W_{SE}$  (Comb 3 -Z) (T8.19, check for T9.19)

## E. LRFD Service Limit State Deflection Checks

- c. Maximum Joint Deflection tables (T9.10)

## F. LRFD Fatigue Limit State Checks

20. Group 5 – Galloping (T19.1, T9.11, T10.11, check for T20.1)
21. Group 5 – Natural Wind Gust (T19.2, T9.12, T10.12, check for T20.2)
22. Group 5 – Truck Gust (T19.3, T9.13, T10.13, check for T20.3)