

2017 AASHTO T4 Committee

Wind Load Risk - Philosophical Design Discrepancy

Between

Guide Specifications for Wind loads on Bridges during
Construction 2017

&

Guide Design Specifications for Bridge Temporary
Works 2nd Edition 2017

- *Guide Specifications for Wind Loads on Bridge during Construction* addresses:
 - Bridge superstructure before deck is cast
 - Permanent bridge substructure
 - **But defers to *Guide Design Specifications for Bridge Temporary Works* for design of temporary falsework**
- *Guide Design Specifications for Bridge Temporary Works* addresses wind load on temporary works only
- Therefore no direct conflict between scope of guide documents

*Guide Specifications for Wind Loads on Bridge during Construction
&
Guide Design Specifications for Bridge Temporary Works*

Share Same:

- Windspeed charts based on 3 second wind gust with 7% probability of exceedance in 50 years
- Similar wind pressure formula methodology

But differ with respect to wind speed Reduction factor “R”

- *2016 Interim Revisions to LRFD Bridge Design Specifications*
- Basic wind pressure equation: $P_z = 2.56 \times 10^{-6} V^2 K_z G C_D$ (3.8.1.2.1-1)

- *Guide Specifications for Wind Loads on Bridge during Construction*

- Basic wind pressure equation: $P_z = 2.56 \times 10^{-6} V^2 R^2 K_z G C_D$ (4.2.1-1)
- pressure equation shares formula with LRFD Bridge specifications
 - **BUT with addition of wind speed reduction “R”**
- “R” factor ranges from a minimum of .65 to 1
(dependent on construction duration and bridge importance)
- Exposure and elevation coefficient “ K_z ” based on logarithmic wind profiles

- *Guide Design Specifications for Bridge Temporary Works*

- Wind pressure equation terminology differs from LRFD Bridge Specifications
 - Basic wind Force equation for trussed towers and lattice framework

$$F = q_z G C_f A_f \quad (C-1)$$
 where wind pressure q_z (psf) = $0.00256 K_z K_{zt} K_d V^2$
 - (Basic wind Force equation for solid surfaces similar)
 - Terminology based on ASCE 7 Wind Provisions
 - Developed prior to 2016 LRFD Bridge specification wind load total rewrite
 - Exposure and elevation coefficient “ K_z ” based on power law wind profiles

Guide Specifications for Wind loads on Bridge During Construction

Wind speed reduction factors “ R”

- Table based on inactive work site. For active work site “R”=1.0 with 20mph max wind speed
- “R” based 7⁰% probability of return over the construction durations indicated. For durations longer than 7 years “R” =1

Table 4.2.1-1— Wind Speed Reduction Factor during Construction, R	
Superstructure Construction Duration	<u>Wind Speed Reduction Factor during Construction</u> <u>R</u>
0-6 weeks	0.65
6 weeks to 1 year	0.73
>1-2 years	0.75
>2-3 years	0.77
>3-7years	0.84

Revision Warranted in wind load design criteria
Design Specifications for Bridge Temporary Works

- Should not need more demanding wind load design criteria than *Guide Specifications for Wind Loads on Bridge during Construction*. Result in unnecessary construction cost.
- Wind design load risk philosophy accepted in *Guide Specifications for Wind Loads on Bridge during Construction* should be sufficient

Revise Guide Design Specifications for Bridge Temporary Works to correlate with wind design risk philosophy of Guide Specifications for Wind Loads on Bridge during Construction

- **Option 1 – Self-contained wind design load provisions**
 - Section 2.2.5.2 and Appendix C – Delete existing and meld LRFD Bridge Design specifications for wind load and *Guide Specifications for Wind Loads on Bridge during Construction* including wind speed reduction factor “R” to wind pressure equation
- **Option 2 – Piggy back on LRFD Bridge Design specifications**
 - Rewrite Section 2.2.5.2 directing reader to requirements of LRFD 3.8.1.2 “Wind Load on Structures”, but with amended wind pressure equation 3.8.1.2-1 including wind speed reduction factor “R”

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