EUROPEAN ACADEMIC RESEARCH
Vol. II, Issue 8/ November 2014

Impact Factor: 3.1 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

Comparative Study between BNBC 93 and AASHTO LRFD 2007 on Wind Load for Bridge

A.M. JUBARY
R.K. BISWAS
Lecturer
Dept. of Civil & Env. Engineering
Uttara University, Dhaka
Bangladesh

Abstract:

The specific objective of the study was to conduct an introduction of the various types of loads and bridges. The study also to conduct a literature review that briefly discussion on bridge design by BNBC code -1993 gadget-2006 and AASHTO LRFD Bridge design code-2007. The study was mainly aimed at identifying the comparative study between BNBC-1993 and AASHTO-2007 on wind load for various type of bridge in Bangladesh likes-mohakhali fly over bridge, kanchpur bridge in narayangonj and jamuna bridge. Wind load shall be assumed to be uniformly distributed on the area exposed to the wind. The exposed area shall be the sum of areas of all components, including floor system and railing, as seen in elevation taken perpendicular to the assumed wind direction. This direction shall be varied to determine the extreme force effect in the structure or in its components. Areas that do not contribute to the extreme force effect under consideration may be neglected in the analysis. Base design wind velocity varies significantly due to local conditions. For small and/or low structures, wind usually does not govern. For large and/or tall bridges, however, the local conditions should be investigated. Based on the above results to comparison by table and graph and conclusions were made and some suggestions of the study were made.

Key words: BNBC, AASHTO, Wind Load for Bridge, Exposure

Introduction

A bridge has always offered man the satisfaction of successfully crossing an obstruction be a primitive bridge of the ancient or a bewildering modern bridge of immense spans. A good bridge is one that is simple in order, functional in performance, graceful in view, balanced in distribution of mass, harmonious in proportion, orderly in lines. Integral with the environment and serene in character.Wind loading offers a complicated set of loading condition, which must be idealized in order to provide a workable design the modeling of wind forces is dynamic one, with winds action over a given time interval. These forces can be approximated to a static load uniformly distributed over the exposed region of the bridge. The exposed region of a bridge is talked as the aggregate surface areas of all element both superstructure substructure as seen in elevation – perpendicular to the longitudinal axis of the bridge.

Methodology

Finite Element calculation more and more replace analytical methods especially if problems to be solved which are adjusted to specific tasks. In many countries, a lot of efforts are carried out to get many codes for the calculation of bridge design on wind load calculation . . We have sleeted city area (exposure-A) bridge like- Mohakhali fly over bridge in Dhaka city. It is concreted one side Banani bazaar old Airport road and other side Mohakhali DOHS on Zahangir gate. And 2nd choice study of bridge on suburban area like Kanchpur bridge in Narayangonj. It is connected Chittagong high way road in Kanch pur. And our 3rd choice study or bridge on open cauntry area likes that Jamuna Bridge. It is stand on Jamuna, River, it one side connected Tangail Jella. And other side connected Sirajgonj Jella, It is the longest bridge, in our country. There are various methods for designing bridge. We are uses to codes for wind

load calculation: Wind load analysis of this three bridges by Bangladesh National Building Code (BNBC), 1993 gadget 2006 and Wind load analysis of this three bridge by America Association of State Highway and Transportation Officials (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS- 2007

Fig 01:Mahakhali Flyover(Exposure-A)

Fig 02:Kanchpur Bridge(Exposure B)

Fig 03:Jamuna Bridge(Exposure C)

Results and Discussions

In the ongoing Design wind loads shall be calculated according to AASHTO LRFD 2007 with meteorological information taken from BNBC. Furthermore, considerations have been given to assess the applicability of BNBC on bridge structures, as well as to provide comparisons between calculations of wind loads using AASHTO and BNBC codes. The results are presented in tables and supporting graphs are also provided for convenience

to justify the results from various aspects and for making comments and suggestions and for further recommendation.

Table 01: OUTPUT ANALYSIS, Mohakhali Fly over Bridge (Exposure-A)

Height, z (m)	Design pressure P_D (Kpa)	
	AASHTO	BNBC
10	0. 73	1. 60
12	0.93	1.72
15	1.20	1.84
18	1.47	1.95
21	1.70	2.052
24	1.92	2.148
27	2.32	2.23
30	2.62	2.31

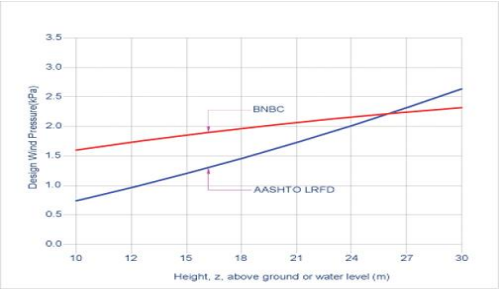

Fig 04: Design Pressure Vs Height

Table 02: OUTPUT ANALYSIS, Kanchpur Bridge (Exposure B)

Exposure B Analysis Result

Height, z (m)	Design pressure P_D (kPa)	
	AASHTO	BNBC
12	1. 58	2.22
15	1.88	2.33
18	2.14	2.42
21	2.37	2.51
24	2.59	2.58
27	2.78	2.65
30	2.96	2.71

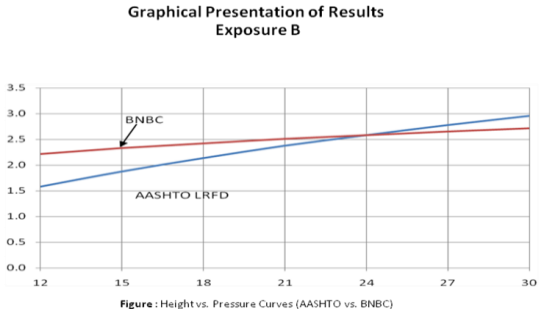

Fig 05: Design Pressure Vs Height

Table 03: OUTPUT ANALYSIS, Jamuna Bridge (Exposure C)

Height, Z (m)	Design pressure (Kpa)	
	AASHTO	BNBC
12	2.70	1.94
15	2.94	2.01
18	3.14	2.06
21	3.32	2.12
24	3.47	2.16
27	3.62	2.20
30	3.74	2.24
35	3.94	2.30
40	4.11	2.35
45	4.26	2.40
50	4.40	2.43
60	4.65	2.51
70	4.87	2.57
80	5.06	2.63
90	5.23	2.68
100	5.38	2.73
110	5.52	2.77

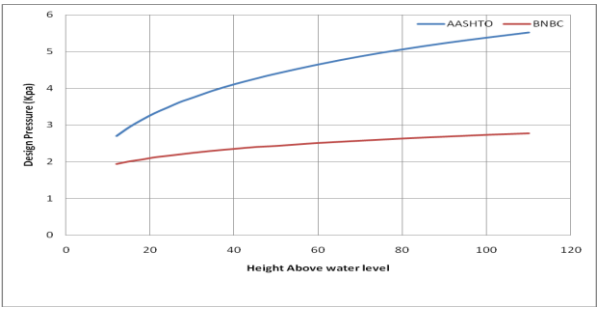

Fig 06: Design Pressure Vs Height

Discussion on Result

From the case study on all exposure category, it has been generally observed that slope of height vs. design pressure curves are steeper for AASHTO Code. Because it is depended that the meteorological data in local context. BNBC-1993, the G_h and C_z values is low but AASHTO-2007 code the effect of terrain exposure is incorporated with design wind speed by Vo and Z_o is higher.

For exposure A, which is applicable for most flyovers with regular height up to 15 m, BNBC design pressure value is higher. AASHTO value surpasses that of BNBC at 26 m height For exposure C, which is applicable for a few major bridges like Jamuna Bridge and proposed Padma Bridge, AASHTO design wind pressure is always higher.

Conclusion and Recommendations:

- Although the scope of BNBC does not include bridges, yet its applicability may be considered for such structures
- Important category of a bridge may be based on the impact assessment on infrastructure. For most highway bridges, the important category as essential structure is reasonable

- For BNBC code, value of pressure coefficient can be taken as those specified fall walls in single storey portal frame-like structures. The value 0.8 is deemed adequate.
- From case study, BNBC code is found to be more conservative for wind pressure on bridges in city area. And AASHTO code is more conservative for bridges in open country.
- For bridges in sub-urban areas, BNBC code yields higher values up to height 26 m from lowest ground or water level.

Recommendations are given as follows:

- More research work is required to decide the relative appropriateness of two codes for bridge structures in Bangladesh. Study should be focused on meteorological data in local context.
- Similar comparative study of BNBC code with other popularly used codes in Bangladesh such as BS and IRC codes can be done.

REFERENCES

1. Wind load analysis of this three bridge by Bangladesh National Building Code (BNBC), 1993 gadget 2006
2. And Wind load analysis of this three bridge by America Association of State Highway and Transportation Officials (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS- 2007.
3. Highway Engineering- P.H. Right.