Verification of Horizontal Moving Loads

Program: CSiBridge
Version: 17.2.0 Build 1133
Date: 5/7/2015
Author: ok

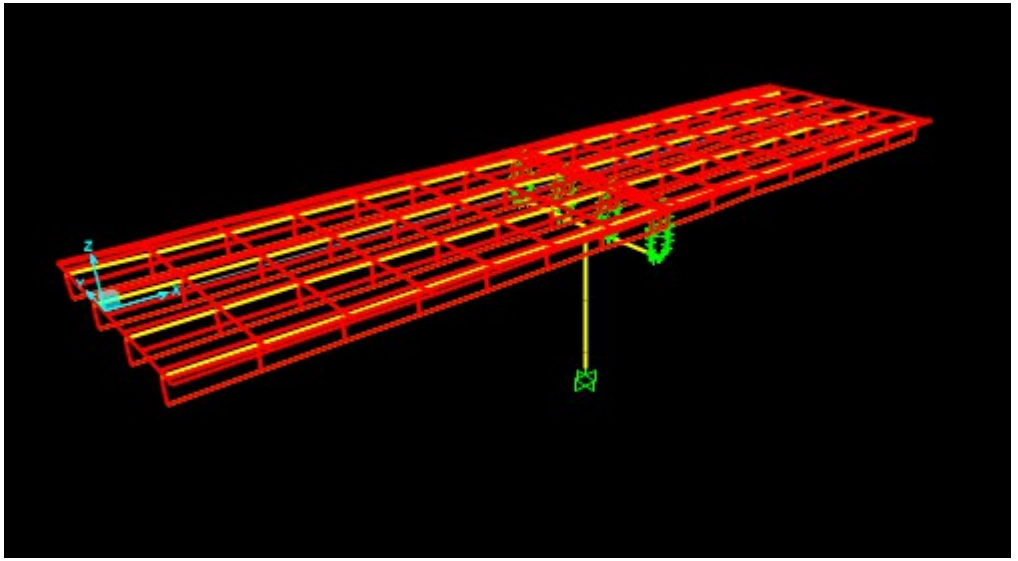
Model version: run1

Purpose

- Verify horizontal moving loads newly implemented for CSiBridge V17.2.0.

Model Description

- The model is a fictitious bridge structure with two 20m long spans and one 3m wide lane centered on the bridge.
- Bridge bridge has no supports at the abutments and cantilevers from the middle bent, supported by a single column (this setup was used to easily check the reactions).
- The top of deck is at elevation Z=0m and the base of the column is at elevation Z=-10m.



Bridge Object Data

Bridge Object Name: BOBJ1

Layout Line Name: BLL1

Coordinate System: GLOBAL

Units: KN, m, C

Define Bridge Spans

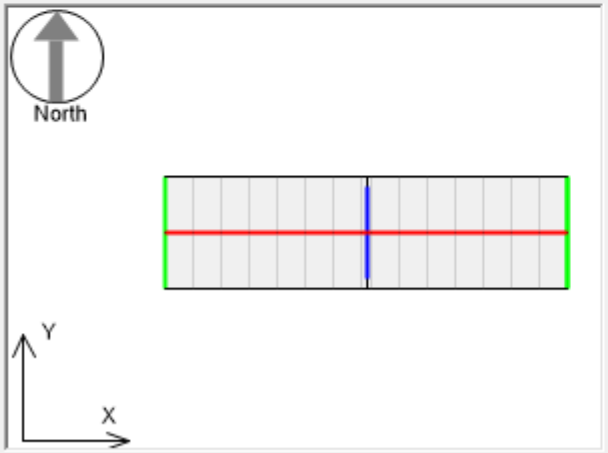
Span Label	Start Station m	Length m	End Station m	Start Support	End Support
Span 1	0.	20.	20.	Free	BENT1
Span 2	20.	20.	40.	BENT1	Free

By Station / By Length

Add / Modify / Delete / Delete All

Note: 1. Bridge object location is based on bridge section insertion point following specified layout line.

Bridge Object Plan View (X-Y Projection)



Show Enlarged Sketch...

Modify/Show Assignments

- Spans
- User Discretization Points
- Abutments
- Bents
- In-Span Hinges (Expansion Jts)
- In-Span Cross Diaphragms
- Superelevation
- Prestress Tendons
- Girder Rebar
- Staged Construction Groups
- Point Load Assigns
- Line Load Assigns

Modify/Show...

Lock to Prevent Updating the Linked Model

OK Cancel

Discussion of Results

CSiBridge 2015 - model 3 V17.2.0

Joint Reactions

File View Format-Filter-Sort Select Options

Units: As Noted

Filter:

Joint Reactions

	Joint Text	OutputCase Text	CaseType Text	StepType Text	F1 KN	F2 KN	F3 KN	M1 KN-m	M2 KN-m	M3 KN-m
▶	21	a. ALL	LinMoving	Max	0.25	4.158E-09	1	4.5177	22.4625	8.2827
	21	a. ALL	LinMoving	Min	-0.25	-0.408	0	-0.75	-22.4625	-8.2827
	21	a. VERT	LinMoving	Max	1.508E-07	4.061E-09	1	0.75	20	8.035E-08
	21	a. VERT	LinMoving	Min	-1.509E-07	-4.085E-09	0	-0.75	-20	-8.149E-08
	21	a. CENTRIFUGAL	LinMoving	Max	1.321E-08	0	0	4.0177	9.64E-08	8.1577
	21	a. CENTRIFUGAL	LinMoving	Min	-1.347E-08	-0.408	-2.873E-09	0	-1.003E-07	-8.1577
	21	a. BRAKING	LinMoving	Max	0.25	0	1.061E-10	1.448E-09	2.4625	0.1875
	21	a. BRAKING	LinMoving	Min	-0.25	0	-1.061E-10	-1.448E-09	-2.4625	-0.1875
	21	b. ALL	LinMoving	Max	0.25	5.544E-09	1	5.0177	21.9625	8.2038
	21	b. ALL	LinMoving	Min	-0.25	-0.408	0	-1	-21.9625	-8.2038
	21	b. VERT	LinMoving	Max	1.471E-07	5.415E-09	1	1	19.5	7.839E-08
	21	b. VERT	LinMoving	Min	-1.471E-07	-5.445E-09	0	-1	-19.5	-8.054E-08
	21	b. CENTRIFUGAL	LinMoving	Max	1.288E-08	0	0	4.0177	9.394E-08	7.9538
	21	b. CENTRIFUGAL	LinMoving	Min	-1.314E-08	-0.408	-2.856E-09	0	-9.789E-08	-7.9538
	21	b. BRAKING	LinMoving	Max	0.25	1.312E-10	1.327E-10	1.879E-09	2.4625	0.25
	21	b. BRAKING	LinMoving	Min	-0.25	-1.312E-10	-1.327E-10	-1.879E-09	-2.4625	-0.25
	21	c. ALL	LinMoving	Max	0.75	1.386E-08	3	15.9346	65.8875	24.8317
	21	c. ALL	LinMoving	Min	-0.75	-1.224	0	-2.5	-65.8875	-24.8317
	21	c. VERT	LinMoving	Max	4.412E-07	1.354E-08	3	2.5	58.5	2.351E-07
	21	c. VERT	LinMoving	Min	-4.414E-07	-1.361E-08	0	-2.5	-58.5	-2.395E-07
	21	c. BRAKING	LinMoving	Max	0.75	1.312E-10	3.45E-10	4.775E-09	7.3875	0.625
	21	c. BRAKING	LinMoving	Min	-0.75	-1.312E-10	-3.45E-10	-4.775E-09	-7.3875	-0.625
	21	c. CENTRIFUGAL	LinMoving	Max	3.864E-08	0	0	12.053	2.818E-07	23.8614
	21	c. CENTRIFUGAL	LinMoving	Min	-3.942E-08	-1.224	-8.568E-09	0	-2.937E-07	-23.8614
	21	d. CENTRIFUGAL	LinMoving	Max	1.894E-08	0	0	5.91	1.382E-07	11.7
	21	d. CENTRIFUGAL	LinMoving	Min	-1.932E-08	-0.6	-4.201E-09	0	-1.44E-07	-11.7
	21	c. VERT+CENTR	LinMoving	Max	4.414E-07	4.878E-08	3	23.5004	58.5	23.8614
	21	c. VERT+CENTR	LinMoving	Min	-4.415E-07	-1.224	0	-9	-58.5	-23.8614

Record: << < 1 > >> of 28

Add Tables... Done

The features described below were tested on model 3. (Program output is for Build 1133a)

ID	Case (Load Case Prefix)	Feature Tested	Loading Details				Reactions at Joint 21	
			Direction	Axle or Uniform	Vehicle CG	Other	Expected Results	Program Output
1.1	a	Numerically verify vertical, longitudinal and transverse moving loads for axle loads. Check independent directions overall response.	all	axle	at deck			
1.2			vert	axle	at deck		F1 = F2 = 0 F3 = 1 M1 = 0.75 M2 = 20	F1 = F2 = 0 F3 = 1 M1 = 0.75 M2 = 20
1.3			centrifugal	axle	at deck		F2 = 0.4079 M1 = 4.0178	F2 = 0.408 M1 = 4.0177
1.4			braking	axle	at deck		F1 = 0.25 M2 = 2.4625	F1 = 0.25 M2 = 2.4625
2.1	b	Numerically verify centrifugral and braking loads for uniform loads	all	unif	at deck			
2.2			vert	unif	at deck		F1 = F2 = 0 F3 = 1 M1 = 1 M2 = 19.5	F1 = F2 = 0 F3 = 1 M1 = 1 M2 = 19.5
2.3			centrifugal	unif	at deck		F2 = 0.4079 M1 = 4.0178	F2 = 0.408 M1 = 4.0177
2.4			braking	unif	at deck		F1 = 0.25 M2 = 2.4625	F1 = 0.25 M2 = 2.4625
3.1	c	Numerically verify centrifugal and braking loads for combined axle and uniform loads with vehicle cg 2m above lane.	all	unif+axle	2m above deck			
3.2			vert	unif+axle	2m above deck		F1 = F2 = 0 F3 = 3 M1 = 2.5 M2 = 58.5	F1 = F2 = 0 F3 = 3 M1 = 2.5 M2 = 58.5
3.3			centrifugal	unif+axle	2m above deck	Overturning not considered due to insufficient vertical load.	F2 = 1.2237 M1 = 12.053	F2 = 1.224 M1 = 12.053
3.4			braking	unif+axle	2m above deck	cg above deck not considered	F1 = 1.5 M2 = 14.775	F1 = 0.75 M2 = 7.3875
3.5			vert + cent	unif+axle	2m above deck	10m wide lane	F1 = 0 F2 = 1.2237 F3 = 3 M1 = 23.5008	F1 = 0 F2 = 1.224 F3 = 3 M1 = 23.5004
4.1	d	Numerically verify centrifugal loads defined using distance	centrifugral	unif+axle	2m above deck		F2 = 0.6 M1 = 5.91	F2 = 0.6 M1 = 5.91