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Structural Analysis and Design of RCC Slab for IRC Class AA Loading

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Abstract: The bridge is a structure that will be built where the canal crosses the main road. Bridge plays an important role in the flow of traffic without interference from crossing the channel and increasing road safety. The design of the bridge must follow the standard design practices mentioned in IRC and are the codes. The selling plate bridges horizontal beams are maintained at each end of the sub-structure units and can be either simply maintained when the beams are only connected through a single gap, or continuous, when the rays are connected through two or more spans. Reinforced concrete bridge of reinforced concrete is designed with the use of Indian Roads (IRC) Bridge code: IRC 21 -1987. The bridge deck is designed to load the IRC class car crawler. Design curves are used to obtain time coefficients in two directions for a columnar plate. Therefore, in the present work the analysis and design shall be carried out for IRC class AA loading, the specification according to code shall be followed.
Keywords: Bridge, IRC, class A loading, prestressing & Bridge deck

I. INTRODUCTION

The bridge is a life line of road network, both in urban and rural areas. With the rapid growth of technology, the traditional bridge was replaced by an innovative profitable structural system. One of these solutions is the structural system of PAT, which is the T-beam. The design of the bridge is important as well as a comprehensive approach of structural engineer. As with bridges, the SPAN and Live Load durations are always an important factor. These factors influence the stage of conceptualization of design. The effect of a live load for different spans are varied. For shorter spans, load tracking is regulated when the larger SPAN load wheel is administered. Selection of structural system for SPAN is always a sphere for research. Approved system structures affect factors such as economics and complexity in construction. 24 m SPAN as selected for this study, these two factors are important aspects.

The massive slab of bridges is basically concrete, in which the internal voltage of the appropriate magnitude and distribution is introduced so that emphasizes the result of external loads counteracted to the desired degree. In reinforced concrete members, pre-stress is usually injected by tensioning steel rebar. The earliest examples of the construction of wooden barrels by force-fitting metal strips and metal tires on wooden wheels indicate that the art of the previous one was emphasized from ancient times. The tensile strength of simple concrete is only part of its compressive strength and the problem in its lack of tensile strength appears to have been an immersion factor in the development of composite material known as ' reinforced concrete '.

The development of early cracks in reinforced concrete due to incompatibilities in the strains of steel and concrete, apparently, the starting point in the development of new material as the use of constant tension in the compression to the material as concrete, which is strong in compression, but weak in tension, increases the apparent strength of the rupture of this material, because the further use of stress should initially negate compressive strength

II. REVIEW OF LITERATURE

Currently, engineering technologies are strong and resistant bridges play an important role for the socio-economic development of the nation. Owners and designers have long recognized the low initial cost, low maintenance needs and a long life span of concrete bridges.. This growth is very fast, not only for bridges in short range spans, but for long spans exceeding the length that is here, therefore, was almost the exclusive domain of structural steel. A lot of the bridge designers are surprised to find that prefabricated, pre-stressed bridges are usually lower in the first value than all other types of bridges combined with savings in service, prefabricated bridges offer the highest economy. The system of prefabricated cities has offered two main advantages: it is economical and provides a minimum downtime for the construction (G. Krishna et al., 2015).

There are various studies that have been undertaken to perform (RC) box bridges in the previous with a variety of load combinations. Analysis and Development (RC) bridges box is a different assignment. The box bridge consists of the upper plate, the bottom (the raft) of the plate, two exterior walls. Easy to construct do not need any complex foundation.

Research contract using frame design – Work RC BOX BRIDGE, like 2D and 3D analysis in various load combinations, SPAN/height proportions. Interaction of soil in which B M & S F expands without soil interaction in comparison with the method of soil interaction, method of effective width, moment of distribution of method and genetic method of algorithm is used. It is parallel and comparable to a pillow and without pillows on the box bridge with a pillow of over B M & S F occurred compared to without pillows (MD. Salman Apacabani et al. 2019).

III. MODELING

The modeling is carried out by the CSI Bridge software and the procedure adopted includes some of the following parts.

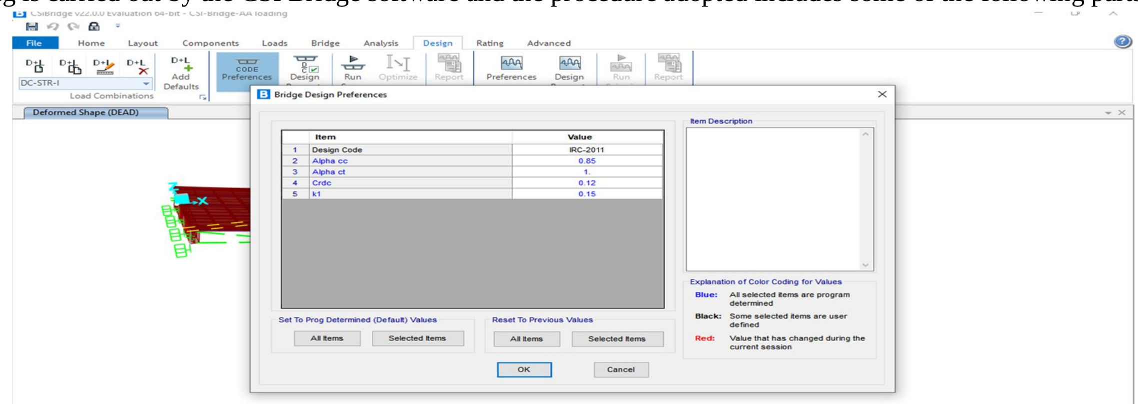

Fig.1: Preferences for IRC Class A loading

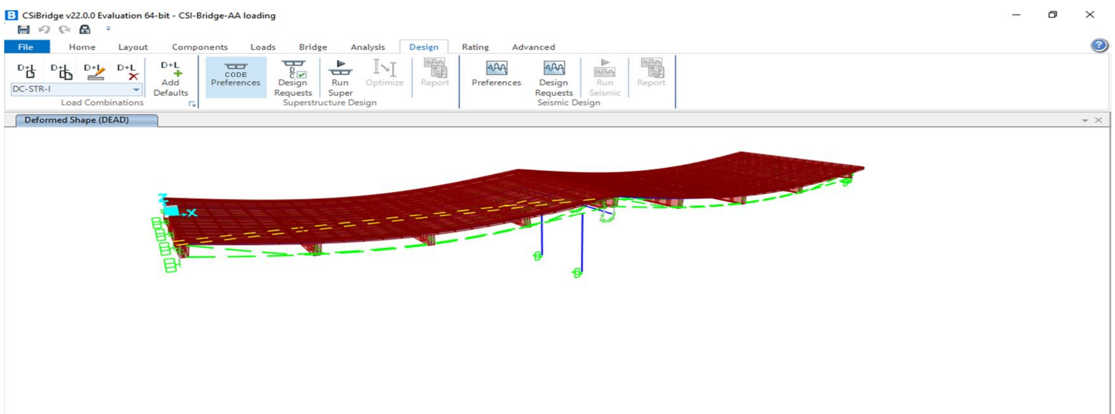

Fig.2: Modeling of the Bridge

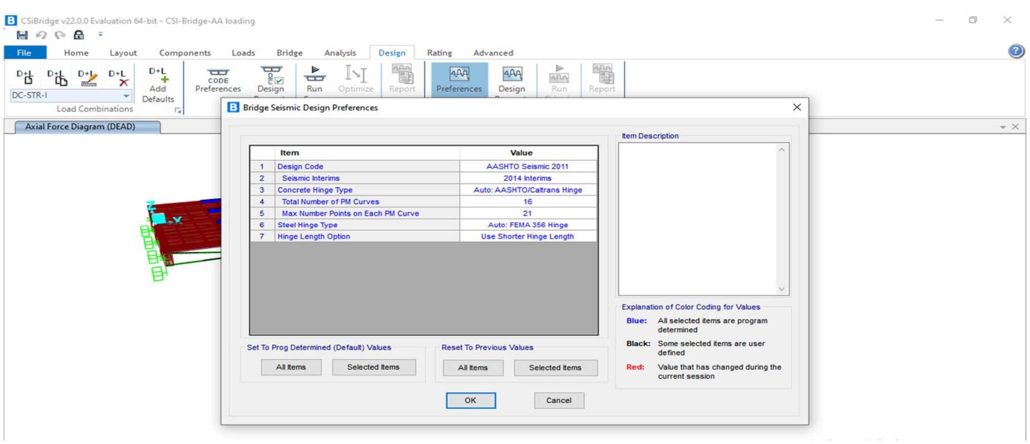

Fig. 3: Design preference for IRC Bridge

The modeling is carried out and the analysis is done CSI Bridge software, the analysis is carried out using IRC code.

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IV. RESULTS

The following results are obtained in terms of forces and stresses, they are presented below.

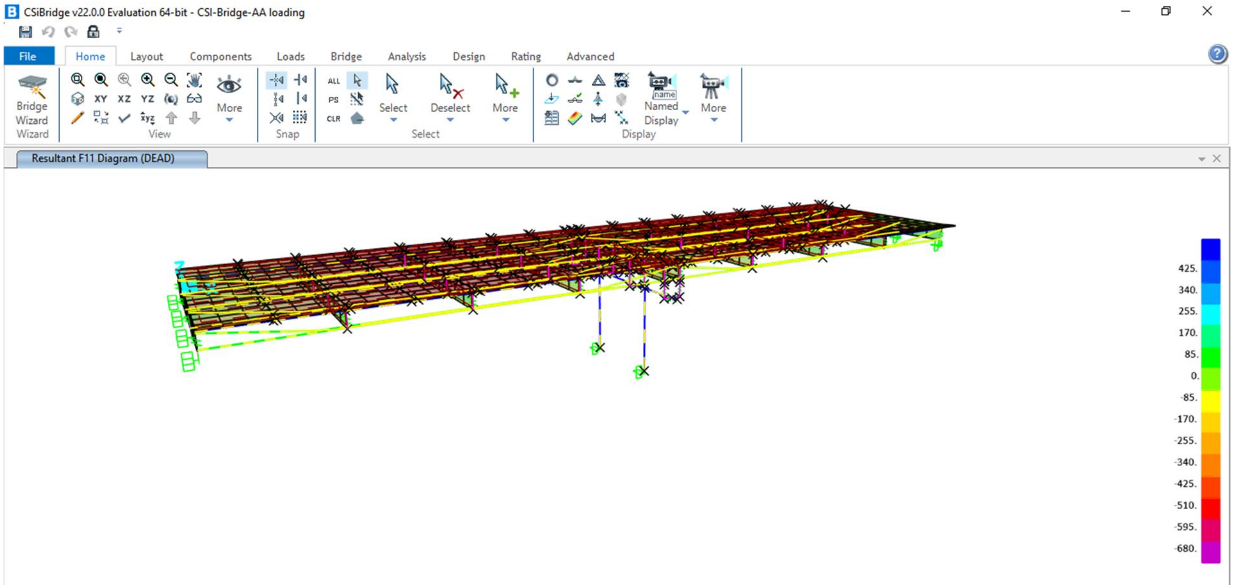

Fig.4: Resultant Forces

Bridge Super Design - Design Result Status

File View Edit Format-Filter-Sort Select Options

Units: As Noted

Filter:

DesReqName	BridgeObj Text	BridgeCut Unitless	Station m	Location Text	BridgeSect Text	Status Unitless	Message Text
Strength-PC...	BOBJ1	1	0	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	2	2.5	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	3	2.5	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	4	5	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	5	5	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	6	7.5	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	7	7.5	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	8	10	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	9	10	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	10	12.5	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	11	12.5	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	12	15	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	13	15	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	14	17.275	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	15	17.275	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	16	19.55	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	17	19.55	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	18	20	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	19	20	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	20	20.45	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	21	20.45	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	22	22.725	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	23	22.725	After	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	24	25	Before	All Girders	0	Design was performed and results ...
Strength-PC...	BOBJ1	25	25	After	All Girders	0	Design was performed and results ...

Fig.5: Design parameters

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Units: As Noted
Filter:

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DesReqName	BridgeObj Text	Station m	Location Text	Girder Text	GirderDist m	ResistPos KN-m	DemandMax	ComboMax Text	DSetMax Text	ResistNeg KN-m	DemandMin	ComboMin Text	DSetMin Text	LLDFactM Unitless	DepthGirder
Strength-PC...	BOBJ1	0	After	Left Exterior Girder	0	2626.082	512.7654	STRB_L-4	DSet-4	683.2059	-549.4836	STRB_L-1	DSet-1	1	1.0912
Strength-PC...	BOBJ1	0	After	Interior Girder 1	0	2672.1059	227.8417	STRB_L-2	DSet-2	683.2059	-246.449	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	0	After	Interior Girder 2	0	2672.1059	229.0175	STRB_L-2	DSet-2	683.2059	-246.7967	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	0	After	Right Exterior Girder	0	2626.082	522.089	STRB_L-4	DSet-4	683.2059	-535.8702	STRB_L-1	DSet-1	1	1.0912
Strength-PC...	BOBJ1	2.5	Before	Left Exterior Girder	2.5	3321.3197	904.8247	STRB_L-2	DSet-2	142.2604	8.7732	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	2.5	Before	Interior Girder 1	2.5	3367.3436	930.1425	STRB_L-2	DSet-2	142.2604	50.3728	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	2.5	Before	Interior Girder 2	2.5	3367.3436	932.3171	STRB_L-2	DSet-2	142.2604	53.0728	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	2.5	Before	Right Exterior Girder	2.5	3321.3197	913.7087	STRB_L-2	DSet-2	142.2604	13.0914	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	2.5	After	Left Exterior Girder	2.5	3321.3197	876.1297	STRB_L-2	DSet-2	142.2604	-9.3109	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	2.5	After	Interior Girder 1	2.5	3367.3436	899.3471	STRB_L-2	DSet-2	142.2604	48.4228	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	2.5	After	Interior Girder 2	2.5	3367.3436	901.5177	STRB_L-2	DSet-2	142.2604	51.254	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	2.5	After	Right Exterior Girder	2.5	3321.3197	885.1233	STRB_L-2	DSet-2	142.2604	-4.9644	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	5	Before	Left Exterior Girder	5	3668.9386	1520.8188	STRB_L-2	DSet-2	-27.4427	70.3186	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	5	Before	Interior Girder 1	5	3714.9625	1464.3679	STRB_L-2	DSet-2	-27.4427	91.4959	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	5	Before	Interior Girder 2	5	3714.9625	1466.6979	STRB_L-2	DSet-2	-27.4427	93.3088	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	5	Before	Right Exterior Girder	5	3668.9386	1527.8323	STRB_L-2	DSet-2	-27.4427	75.9665	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	5	After	Left Exterior Girder	5	3668.9386	1475.5116	STRB_L-2	DSet-2	-27.4427	67.3652	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	5	After	Interior Girder 1	5	3714.9625	1440.4995	STRB_L-2	DSet-2	-27.4427	90.943	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	5	After	Interior Girder 2	5	3714.9625	1442.948	STRB_L-2	DSet-2	-27.4427	92.8134	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	5	After	Right Exterior Girder	5	3668.9386	1482.4504	STRB_L-2	DSet-2	-27.4427	73.0035	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	7.5	Before	Left Exterior Girder	7.5	3668.9386	1914.8121	STRB_L-2	DSet-2	-27.4427	95.9229	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	7.5	Before	Interior Girder 1	7.5	3714.9625	1878.5917	STRB_L-2	DSet-2	-27.4427	106.2682	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	7.5	Before	Interior Girder 2	7.5	3714.9625	1881.2191	STRB_L-2	DSet-2	-27.4427	107.5707	STRB_L-3	DSet-3	1	1.0912
Strength-PC...	BOBJ1	7.5	Before	Right Exterior Girder	7.5	3668.9386	1919.424	STRB_L-2	DSet-2	-27.4427	99.9939	STRB_L-3	DSet-3	1	1.0912

Fig. 6: Maximum and Moments on the Girders

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Units: As Noted
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Bridge Super Design IRC-112-2011 12 - PCCompFlexure-Check

CGFibTop m	CGFibBot m	ASlabTriTop	ThSlabTop m	WSlabTrib m	ThBeamTop	WBeamTop m	WebWidth m	WebHeight m	ThBeamBot m	WBeamBot m	AreaRebTop	AreaRebBot	AreaPTTop m2	AreaPTBot m2	AlphaCC Unitless
0.272596	0.818604	0.69845	0.305	2.29	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.251939	0.839261	0.93025	0.305	3.05	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.251939	0.839261	0.93025	0.305	3.05	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.272596	0.818604	0.69845	0.305	2.29	0.15875	0.3048	0.1524	0.338138	0.214312	0.4064	0	0	0.002581	0.002581	0.85
0.272596	0.818604	0.69845	0.305	2.29	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.251939	0.839261	0.93025	0.305	3.05	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.251939	0.839261	0.93025	0.305	3.05	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
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0.251939	0.839261	0.93025	0.305	3.05	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.272596	0.818604	0.69845	0.305	2.29	0.15875	0.3048	0.1524	0.338138	0.214312	0.4064	0	0	0.002581	0.002581	0.85
0.272596	0.818604	0.69845	0.305	2.29	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.251939	0.839261	0.93025	0.305	3.05	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.251939	0.839261	0.93025	0.305	3.05	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.272596	0.818604	0.69845	0.305	2.29	0.15875	0.3048	0.1524	0.338138	0.214312	0.4064	0	0	0.002581	0.002581	0.85
0.272596	0.818604	0.69845	0.305	2.29	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.251939	0.839261	0.93025	0.305	3.05	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.251939	0.839261	0.93025	0.305	3.05	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.272596	0.818604	0.69845	0.305	2.29	0.15875	0.3048	0.1524	0.338138	0.214312	0.4064	0	0	0.002581	0.002581	0.85
0.272596	0.818604	0.69845	0.305	2.29	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
0.251939	0.839261	0.93025	0.305	3.05	0.15875	0.3048	0.1524	0.338138	0.214313	0.4064	0	0	0.002581	0.002581	0.85
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0.272596	0.818604	0.69845	0.305	2.29	0.15875	0.3048	0.1524	0.338138	0.214312	0.4064	0	0	0.002581	0.002581	0.85

Fig. 7: Thickness Obtained as per the Design

Bridge Super Design IRC-112-2011 12 - PCCompFlexure-Check

File View Edit Format-Filter-Sort Select Options

Units: As Noted
Filter:

Bridge Super Design IRC-112-2011 12 - PCCompFlexure-Check

	fcdSlab KN/m2	FactEtaS Unitless	FactLambdaS	EpsCU3S Unitless	GammaRebar	fydLRebar KN/m2	GammaPT Unitless	fpd KN/m2	PrestrainPT	TSectForPos	TSectForNeg	xDistForPos	xDistForNeg	xLamdaPos m	xLambdaNeg	xLocPos Text	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.12176	0.52244	0.09741	0.41795	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.09142	0.52244	0.07314	0.41795	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.09142	0.52244	0.07314	0.41795	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.12176	0.52244	0.09741	0.41795	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.12176	0.35279	0.09741	0.28223	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.09142	0.35279	0.07314	0.28223	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.09142	0.35279	0.07314	0.28223	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.12176	0.35279	0.09741	0.28223	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.12176	0.35279	0.09741	0.28223	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.09142	0.35279	0.07314	0.28223	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.09142	0.35279	0.07314	0.28223	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	Yes	0.12176	0.35279	0.09741	0.28223	Within Web	
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.12176	0.24623	0.09741	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.09142	0.24623	0.07314	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.09142	0.24623	0.07314	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.12176	0.24623	0.09741	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.12176	0.24623	0.09741	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.09142	0.24623	0.07314	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.09142	0.24623	0.07314	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.12176	0.24623	0.09741	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.12176	0.24623	0.09741	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.09142	0.24623	0.07314	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.09142	0.24623	0.07314	0.19698		V
35	17000	1	0.8	0.0035	1.15	360869.57	1.15	1469482.75	0.005116	No	No	0.12176	0.24623	0.09741	0.19698		V

Fig.8: Area of Rebars for Bridge

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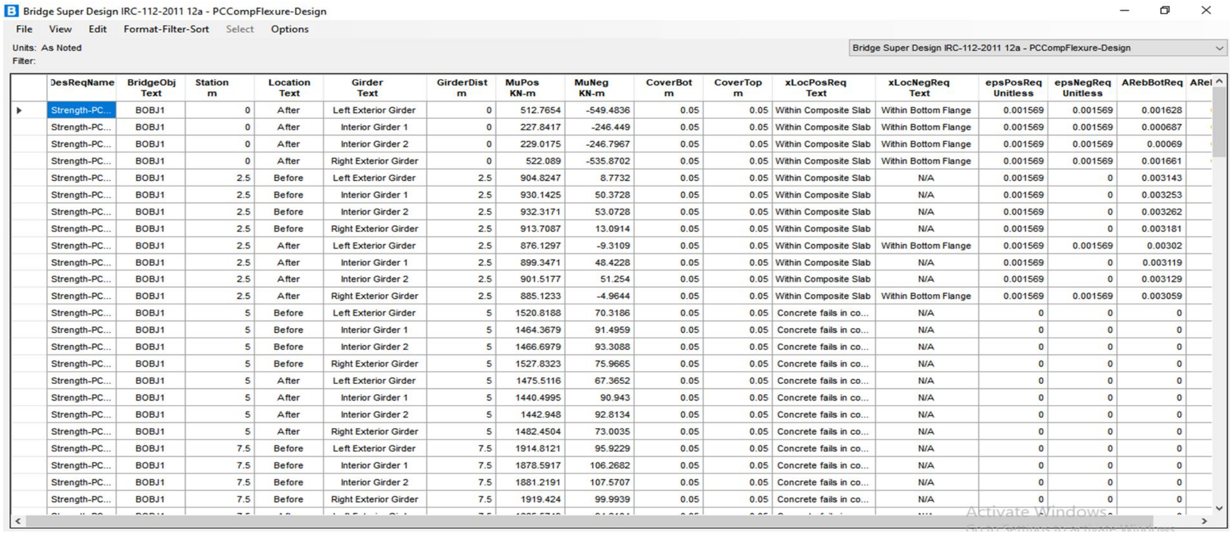
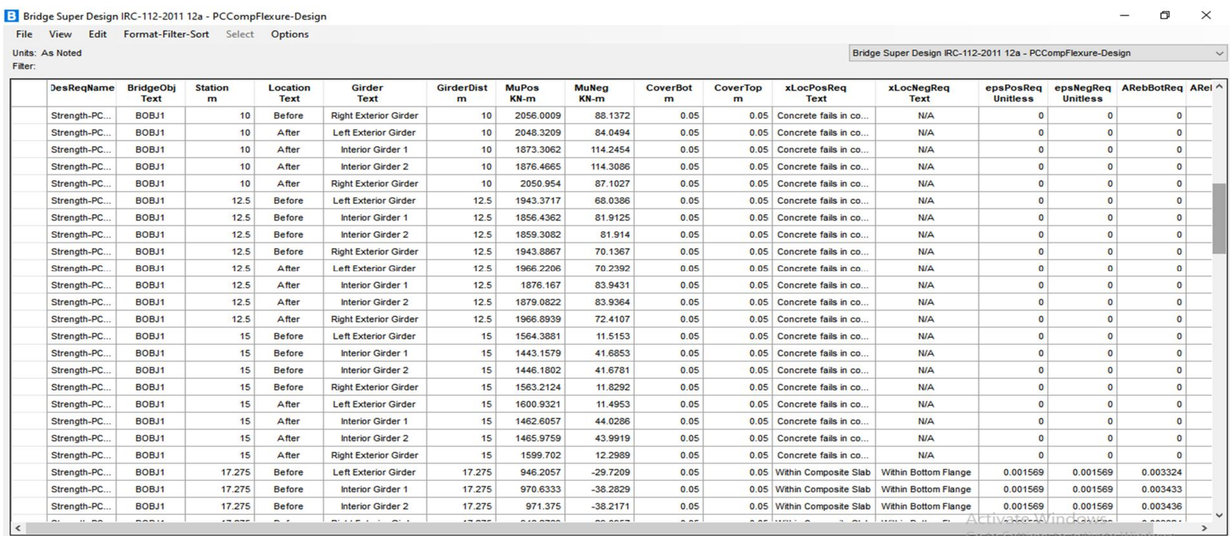


Bridge Super Design IRC-112-2011 12a - PCCompFlexure-Design

DesReqName	BridgeObj Text	Station m	Location Text	Girder Text	GirderDist m	MuPos KN-m	MuNeg KN-m	CoverBot m	CoverTop m	xLocPosReq Text	xLocNegReq Text	epsPosReq Unitless	epsNegReq Unitless	ARebBotReq	ARel
Strength-PC...	BOBJ1	0	After	Left Exterior Girder	0	512.7654	-549.4836	0.05	0.05	Within Composite Slab	Within Bottom Flange	0.001569	0.001569	0.001628	
Strength-PC...	BOBJ1	0	After	Interior Girder 1	0	227.8417	-246.449	0.05	0.05	Within Composite Slab	Within Bottom Flange	0.001569	0.001569	0.000687	
Strength-PC...	BOBJ1	0	After	Interior Girder 2	0	229.0175	-246.7967	0.05	0.05	Within Composite Slab	Within Bottom Flange	0.001569	0.001569	0.00069	
Strength-PC...	BOBJ1	0	After	Right Exterior Girder	0	522.089	-535.8702	0.05	0.05	Within Composite Slab	Within Bottom Flange	0.001569	0.001569	0.001661	
Strength-PC...	BOBJ1	2.5	Before	Left Exterior Girder	2.5	904.8247	8.7732	0.05	0.05	Within Composite Slab	N/A	0.001569	0	0.003143	
Strength-PC...	BOBJ1	2.5	Before	Interior Girder 1	2.5	930.1425	50.3728	0.05	0.05	Within Composite Slab	N/A	0.001569	0	0.003253	
Strength-PC...	BOBJ1	2.5	Before	Interior Girder 2	2.5	932.3171	53.0728	0.05	0.05	Within Composite Slab	N/A	0.001569	0	0.003262	
Strength-PC...	BOBJ1	2.5	Before	Right Exterior Girder	2.5	913.7087	13.0914	0.05	0.05	Within Composite Slab	N/A	0.001569	0	0.003181	
Strength-PC...	BOBJ1	2.5	After	Left Exterior Girder	2.5	876.1297	-9.3109	0.05	0.05	Within Composite Slab	Within Bottom Flange	0.001569	0.001569	0.00302	
Strength-PC...	BOBJ1	2.5	After	Interior Girder 1	2.5	899.3471	48.4228	0.05	0.05	Within Composite Slab	N/A	0.001569	0	0.003119	
Strength-PC...	BOBJ1	2.5	After	Interior Girder 2	2.5	901.5177	51.254	0.05	0.05	Within Composite Slab	N/A	0.001569	0	0.003129	
Strength-PC...	BOBJ1	2.5	After	Right Exterior Girder	2.5	885.1233	-4.9644	0.05	0.05	Within Composite Slab	Within Bottom Flange	0.001569	0.001569	0.003059	
Strength-PC...	BOBJ1	5	Before	Left Exterior Girder	5	1520.8188	70.3186	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	5	Before	Interior Girder 1	5	1464.3679	91.4959	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	5	Before	Interior Girder 2	5	1466.6979	93.3088	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	5	Before	Right Exterior Girder	5	1527.8323	75.9665	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	5	After	Left Exterior Girder	5	1475.5116	67.3652	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	5	After	Interior Girder 1	5	1440.4995	90.943	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	5	After	Interior Girder 2	5	1442.948	92.8134	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	5	After	Right Exterior Girder	5	1482.4504	73.0035	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	7.5	Before	Left Exterior Girder	7.5	1914.8121	95.9229	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	7.5	Before	Interior Girder 1	7.5	1878.5917	106.2682	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	7.5	Before	Interior Girder 2	7.5	1881.2191	107.5707	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	7.5	Before	Right Exterior Girder	7.5	1919.424	99.9939	0.05	0.05	Concrete fails in co...	N/A	0	0	0	

Fig.9: Moments at different Locations



Bridge Super Design IRC-112-2011 12a - PCCompFlexure-Design

DesReqName	BridgeObj Text	Station m	Location Text	Girder Text	GirderDist m	MuPos KN-m	MuNeg KN-m	CoverBot m	CoverTop m	xLocPosReq Text	xLocNegReq Text	epsPosReq Unitless	epsNegReq Unitless	ARebBotReq	ARel
Strength-PC...	BOBJ1	10	Before	Right Exterior Girder	10	2056.0009	88.1372	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	10	After	Left Exterior Girder	10	2048.3209	84.0494	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	10	After	Interior Girder 1	10	1873.3062	114.2454	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	10	After	Interior Girder 2	10	1876.4665	114.3086	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	10	After	Right Exterior Girder	10	2050.954	87.1027	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	12.5	Before	Left Exterior Girder	12.5	1943.3717	68.0386	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	12.5	Before	Interior Girder 1	12.5	1856.4362	81.9125	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	12.5	Before	Interior Girder 2	12.5	1859.3082	81.914	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	12.5	Before	Right Exterior Girder	12.5	1943.8867	70.1367	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	12.5	After	Left Exterior Girder	12.5	1966.2206	70.2392	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	12.5	After	Interior Girder 1	12.5	1876.167	83.9431	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	12.5	After	Interior Girder 2	12.5	1879.0822	83.9364	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	12.5	After	Right Exterior Girder	12.5	1966.8939	72.4107	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	15	Before	Left Exterior Girder	15	1564.3881	11.5153	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	15	Before	Interior Girder 1	15	1443.1579	41.6853	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	15	Before	Interior Girder 2	15	1446.1802	41.6781	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	15	Before	Right Exterior Girder	15	1563.2124	11.8292	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	15	After	Left Exterior Girder	15	1600.9321	11.4953	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	15	After	Interior Girder 1	15	1462.6057	44.0286	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	15	After	Interior Girder 2	15	1465.9759	43.9919	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	15	After	Right Exterior Girder	15	1599.702	12.2989	0.05	0.05	Concrete fails in co...	N/A	0	0	0	
Strength-PC...	BOBJ1	17.275	Before	Left Exterior Girder	17.275	946.2057	-29.7209	0.05	0.05	Within Composite Slab	Within Bottom Flange	0.001569	0.001569	0.003324	
Strength-PC...	BOBJ1	17.275	Before	Interior Girder 1	17.275	970.6333	-38.2829	0.05	0.05	Within Composite Slab	Within Bottom Flange	0.001569	0.001569	0.003433	
Strength-PC...	BOBJ1	17.275	Before	Interior Girder 2	17.275	971.375	-38.2171	0.05	0.05	Within Composite Slab	Within Bottom Flange	0.001569	0.001569	0.003436	

Fig.10 Moments at different location

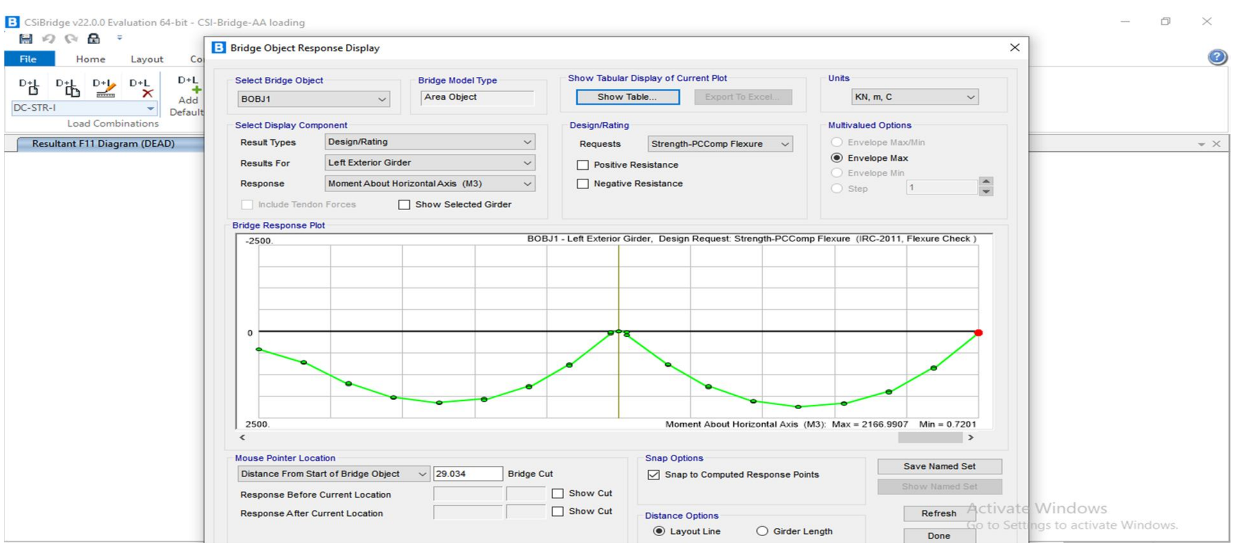


Fig. 11: Prestressing Tendon

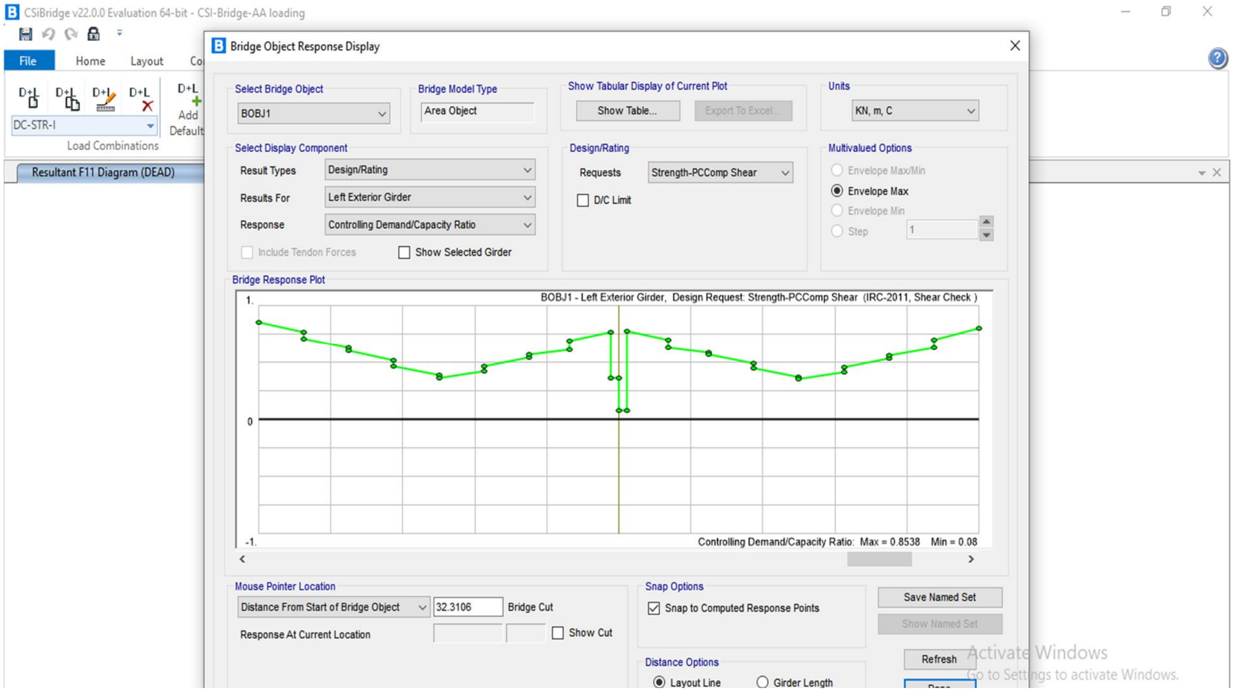


Fig. 12: Shear Check according to IRC

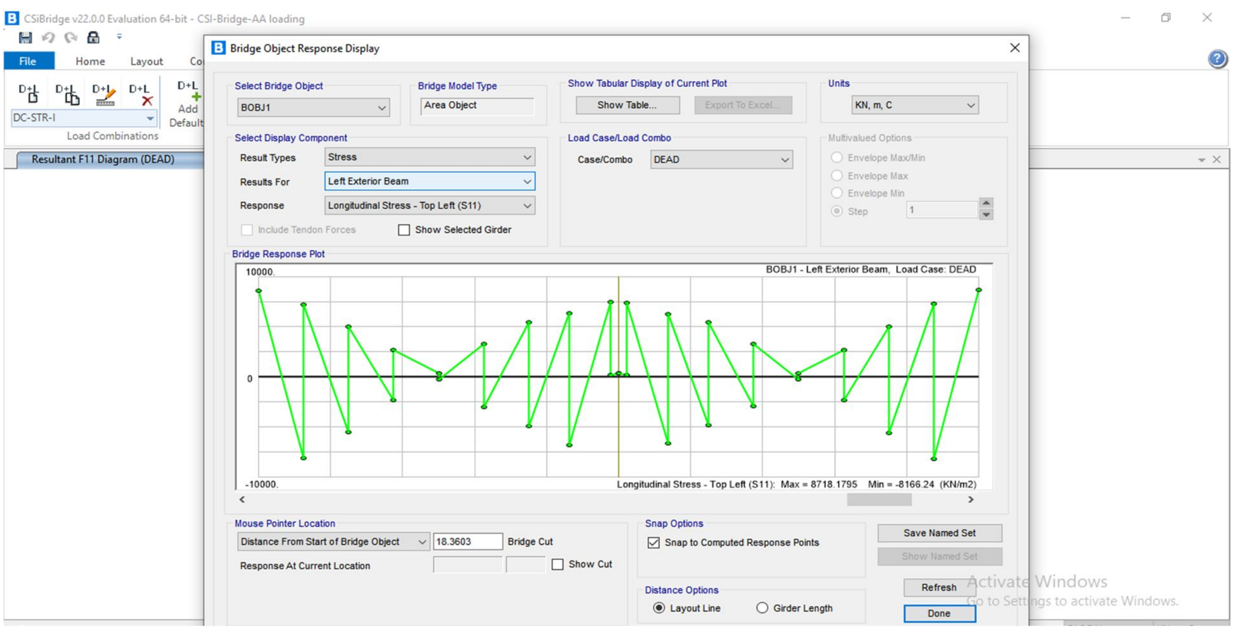


Fig.13: Longitudinal stress on Beam

The above analysis and design is obtained for the IRC class A loading bridge, the forces and stresses obtained are presented diagrammatically.

V. CONCLUSION

The following conclusions can be drawn from the above study:

A. The CSI Bridge software is user friendly for the Bridge design.
B. The Bridge through prestressing construction is possible
C. The parabolic shape stresses are obtained through this analysis

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