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Experimental Analysis: Cable Stayed Bridge

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Abstract

During the beyond decade cable-stayed bridges have discovered extensive software, particularly in Western Europe, and to a lesser volume in different components of the world. The renewal of cable stayed bridge device in contemporary-day bridge engineering turned into because of the tendency of bridge engineers in Europe, generally Germany, to acquire choicest structural overall performance from fabric which turned into in brief deliver in the course of the post-battle years. When a shape is subjected to outside masses, the corresponding structural reaction might also additionally show off fabric nonlinearity to a sure volume. However, in maximum structural analyses for layout purposes, systems behave nearly linearly supplied that the member stresses stay in the limits of layout codes. Material nonlinearity as a consequence is hardly ever taken into consideration in practice. MIDAS/Civil is formulated on the premise of linear evaluation, however it's also able to wearing out geometric nonlinear analyses. It implements nonlinear factors (anxiety or compression-best), P-Delta and huge displacement analyses, etc

Keyword- Cable Bridge, MIDAS Software, Design

Introduction

Cable-stayed bridges are built alongside a structural device which accommodates an orthotropic deck and non-stop girders which can be supported with the aid of using stays, i.e. willing cables passing over or connected to towers placed at the principle piers. The concept of the use of cables to guide bridge spans is in no way new, and some of examples of this kind of creation have been recorded a long term ago. Unfortunately, the device in trendy met with little success, because of the truth that the statics have been now no longer absolutely understood and that fallacious substances inclusive of bars and chains have been used to shape the willing helps or stays. Stays made on this way couldn't be absolutely tensioned and in a slack situation allowed huge deformations of the deck earlier than they may take part in taking the tensile masses for which they have been intended. Wide and a success software of cable-stayed structures turned into found out best recently, with the advent of high-energy steels, orthotropic kind decks, improvement of welding strategies and development in structural evaluation. The improvement and alertness of digital computer systems unfolded new and almost limitless opportunities for the precise answer of those fairly statically indeterminate structures and for unique static evaluation in their 3-dimensional overall performance.

Material and Methodology

MIDAS/Civil is the last Integrated Civil Engineering Solution for designing bridges and trendy civil systems. It keeps creation level evaluation competencies for Prestressed/Posttensioned concrete, Suspension, Cable Stayed, Specialty and Conventional bridges and Heat of hydration. MIDAS/Civil, advanced withinside the object-orientated programming language Visual C++, absolutely exploits the blessings and the traits of the 32bit Windows surroundings for technical computations. The person-orientated input/output features are primarily based totally on state-of-the-art and intuitive User Interface and updated Computer Graphics strategies. They provide top notch centers and productiveness for the modelling and evaluation of complex, huge-scale systems. The technical components of structural evaluation features vital in a realistic layout technique are considerably strengthened. Nonlinear factors inclusive of Cable, Hook, Gap, Visco-elastic Damper, Hysteretic System, Lead Rubber Bearing Isolator and Friction Pendulum System Isolator are covered withinside the Finite Element Library, that allows you to absolutely enhance the accuracy and the fine of results. Construction stages, time based fabric houses and geometric/boundary nonlinear analyses are a number of the brand new inclusions. The MIDAS in-residence researchers have advanced an green CAD modelling technique, that is a completely new concept. Powerful automated modelling features inclusive of Auto Mesh Generation (to be had as a separate module) and Bridge Wizards are introduced. Once the simple segment and bridge facts and tendon placement statistics for the case of a PSC bridge are supplied, the Wizard creates the finished bridge version in addition to the development level models. Also, a brand new Multi-frontal Sparse Gaussian solver has been delivered lately, which has extended the evaluation pace dramatically. 3. Result The most response is highlighted in purple colour (fig.3.1 & fig.3.2). The most response because of self-weight is taking area at node 148 as proven in fig.3.1; whereas, fig.3.2 suggests the most response because of (self-weight + extra weight + pretension load) taking area at node 29. The most response is at node 70 because of the impact of the shifting masses as proven in fig.3.3. The role of the automobile on the immediately of most response is proven in determine 3.4. MIDAS/civil has a completely unique characteristic called “Moving load tracer” which allows the person to become aware of the location of the automobile for required loading at required area.

Fig. 3.1 Maximum reaction due to self-weight under static loads

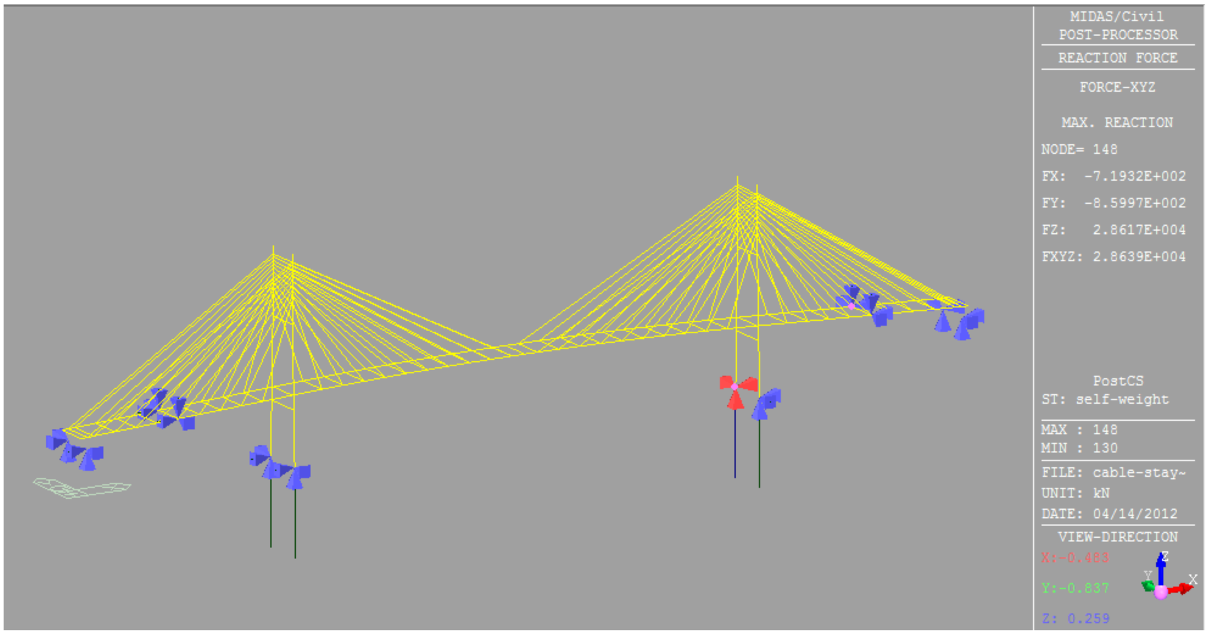
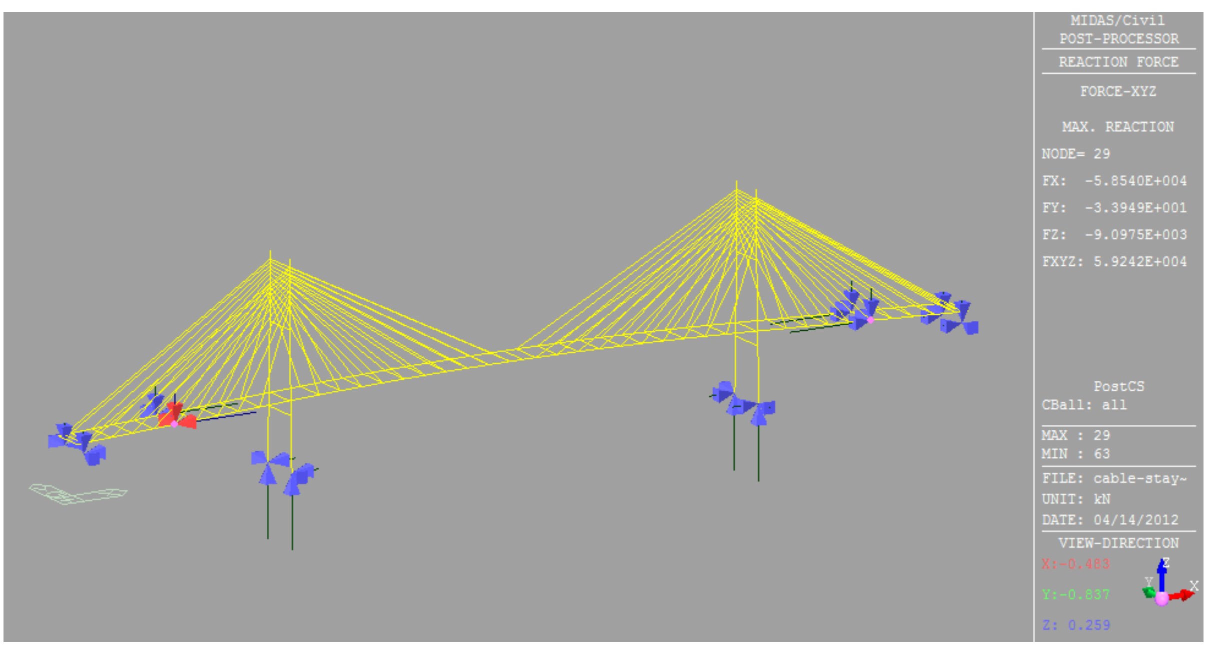


Fig. 3.2 Maximum reaction due to self-weight, additional weight and pretension loads under static loads



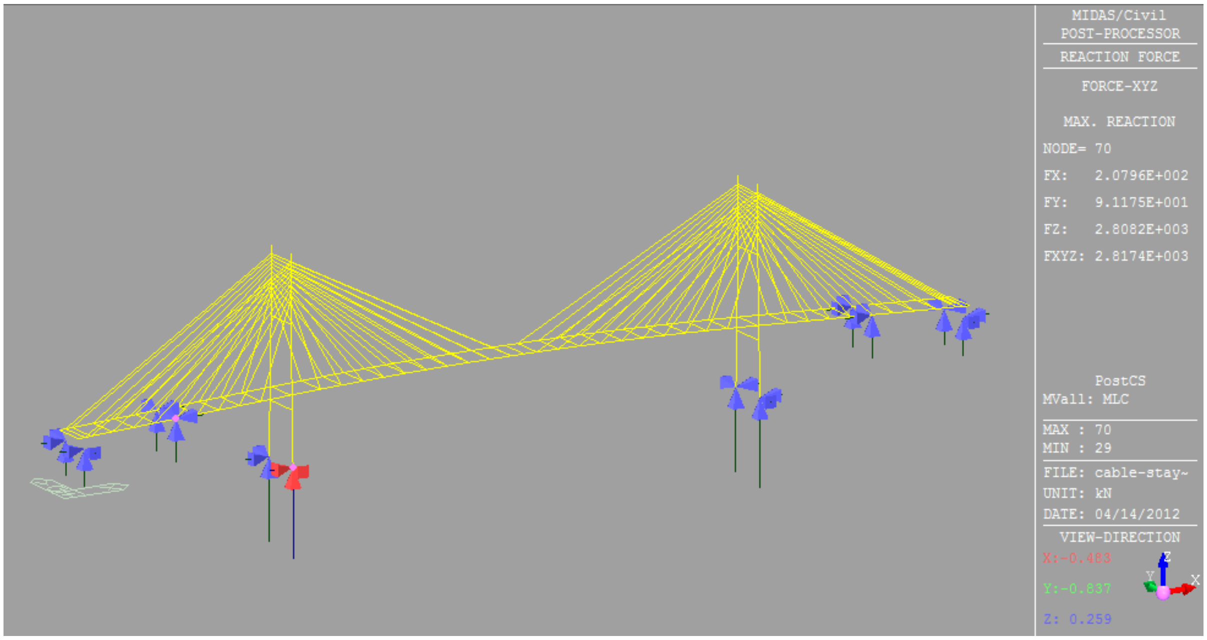


Fig. 3.3 Maximum reaction due to moving loads

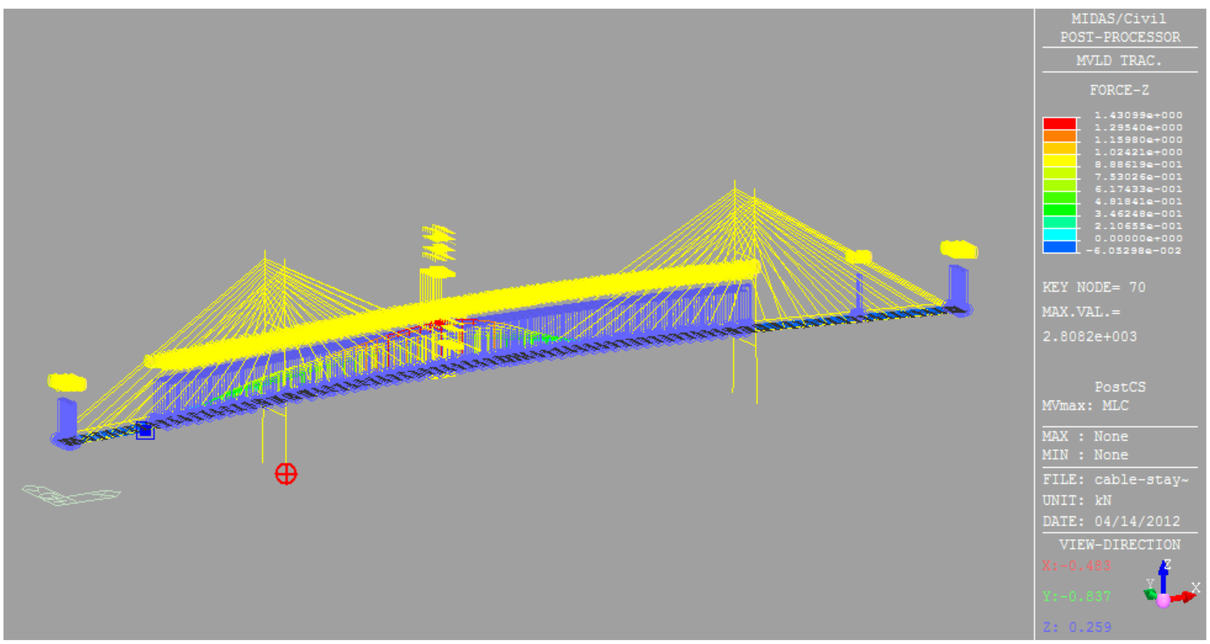


Fig. 3.4 Moving load tracer at maximum reaction

Conclusions

1. 1.A complete analysis has been done for static loads, moving loads, dynamic loads and construction stages.
2. To develop the "ideal state" system by an appropriate cable pre-stressing, unknown load factors
3. Are applied in the analysis. With the restriction of the vertical displacement and moment, a continuous beam condition for the main girder can be achieved.
4. The ideal cable forces are determined to achieve an optimal structural performance due to its permanent loads.
5. For all dead load stages, the minimal and the maximal moments are controlled.
6. The stresses in the cables are in the allowable limits.
7. Construction stage analysis shows considerable increase in displacements, bending moments and cable forces as the construction proceeds.
8. Need of detailed study of the bridge is required to understand the behaviour of the structure.

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