Spanish Suspension Bridge Fixing Method



Overview

One method of construction that we have used successfully for bridges of large spans is to make use of a temporary auxiliary cable equipped with short loops all along its length.

Key Takeaways

Spanish suspension bridges, particularly self-anchored types, fix their main cables to the ends of the bridge deck rather than to external ground anchors, using temporary supports and tensioning during construction.

Self-

Anchored Suspension Bridge Concept

In a self-anchored suspension bridge, the main cables are attached to the ends of the bridge deck itself, rather than to large earth anchorages. This design is ideal for sites with unstable soils or where constructing traditional anchorages is impractical. The vertical loads from the deck are converted into tension in the main cables, which are countered by compressive forces in the towers and deck, balancing forces internally without external anchors.

Construction and Fixing Method

Temporary Anchoring: During construction, the bridge deck cannot initially provide the required anchoring force. Temporary structures or preexisting permanent structures are used to anchor the main cables. These may include temporary tensioning cables or post-tensioned (PT) bars.

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Deck Segment Placement: The bridge deck segments are lifted into place and secured on end supports. Temporary supports ensure stability while the main cables are erected. Cable and Suspender Installation: Once the deck segments are in position, the main suspension cables are installed, followed by the suspenders that connect the deck to the cables.

The gravity load of the deck is gradually transferred to the cables by adjusting the suspenders' lengths. Release of Temporary Supports: After the deck and cables are fully integrated, temporary PT bars, cables, and supporting structures are gradually released. This transfers the anchoring force from the temporary supports to the bridge deck itself, completing the self-anchoring mechanism.

Final Tensioning and Adjustment: The main cables are tensioned according to design specifications, ensuring proper load distribution and sag. The final cable lengths are calculated based on the maximum expected deck weight and sag at mid-span.

Key Considerations

Load Management: During construction, concentrated or uniformly distributed loads are applied to test cable tensions and ensure equilibrium. This helps in adjusting suspender lengths and verifying theoretical tension calculations. Flexibility and Dynamics: Suspension bridges are flexible structures, so the fixing method must account for vertical vibrations and geometric non-linearities, especially for long spans.

Material Strength: High-strength steel cables are used to withstand tensile forces, while the deck and towers handle compressive forces, ensuring structural efficiency. This method allows Spanish suspension bridges, particularly self-anchored types, to be constructed efficiently in challenging sites without relying on massive external anchorages, while maintaining structural stability and proper load distribution.

Article Content

Notes on Suspension Bridges

One method of construction that we have used successfully for bridges of large spans is to make use of a temporary auxiliary cable equipped with short loops all along its length.

Suspension bridge

OverviewHistoryStructureVariationsForcesConstruction sequence (wire strand cable type)Other examplesNotable collapses

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A suspension bridge is a type of bridge in which the deck is hung below suspension cables on vertical suspenders. The first modern examples of this type of bridge were built in the early 19th century. Simple suspension bridges, which lack vertical suspenders, have a long history in many mountainous regions worldwide. Besides the bridge type most commonly called suspension bridges, covered in this a

The Art of Spanish Bridge Design

The necessity for improved walkable connections was evident and several pedestrian bridges were built, among which a set of twin pedestrian suspension bridges, one over the M-40 highway and one over

Fasstbridge methodology and strengthening system: The Jarama

Having this in mind, in November 2015, the ERA-NET Plus project FASSTBRIDGE was launched aiming at developing a complete methodology including a calculation method for assessing the remaining

Suspension Bridges: History, Components, Analysis,

This article explores suspension bridges, their components, analysis, and design. It details the procedures used to design, & construct them.

Bridge Rehabilitation and Strengthening Manual PART-1 Method

This Bridge Rehabilitation/Strengthening Manual includes rehabilitation and strengthening methods to cater to the defects commonly found in bridges and culverts owned and maintained by RHD, and is

Suspension Bridges

Suspended bridges without any stiffening girder were presumably among the first bridges mankind used. The stiffness of such bridges essentially corresponds to that of the main cables: very flexible

Evolution of suspension bridge structural systems, design theories,

This literary survey systematically analyzes the research progress and state-of-the-art status quo in the structural systems and design theories of suspension bridges, focusing on the

How suspension bridges are built: a step-by-step guide

Once the bridge towers are completed, the main cables can be installed. From a distance, the main cables may look thin, but they are actually incredibly thick and strong.

Determining Tensions in Suspension Bridge Anchor Span Strands at

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During suspension bridge erection, tensions in its anchor span strands undergo continuous changes until the completed bridge state is attained. Calculating the precise tension

Suspension bridge | Definition, Mechanics, History,

Suspension bridge, bridge with overhead cables supporting its roadway. Modern suspension bridges are light and aesthetically pleasing and

Spanning the Impossible: The Art and Science of

Explore the evolution, design, and complexities of suspension bridges in this detailed blog. Learn about MIDAS CIVIL''s role in revolutionizing

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How suspension bridge is made

By the eighth century, Chinese bridge builders were constructing suspension bridges by laying planks between pairs of iron chains, essentially providing a flexible deck resting on cables. Similar bridges

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(PDF) The Construction of a Suspension Bridge

The paper details the construction process of a suspension bridge, highlighting six main stages including the setting of anchors, constructing tower foundations, erecting towers, stretching main cables,

Repair and Rehabilitation of Bridges: Choosing the

Structurally deficient bridges must be inspected by accredited experts or engineers, who can then determine the properly required repair

Bridge i Repair i Manual

Bridge repair is conducted by designated repair staffs belonging to each Road and Bridge Unit, DPWT regardless of the presence or absence of damages, Repair workers must register and input the

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