

Robert Maillart and the Origins of Reinforced Concrete

New materials and new structural forms

The scientific function of reinforced concrete

The scientific function of the 3-hinged arch

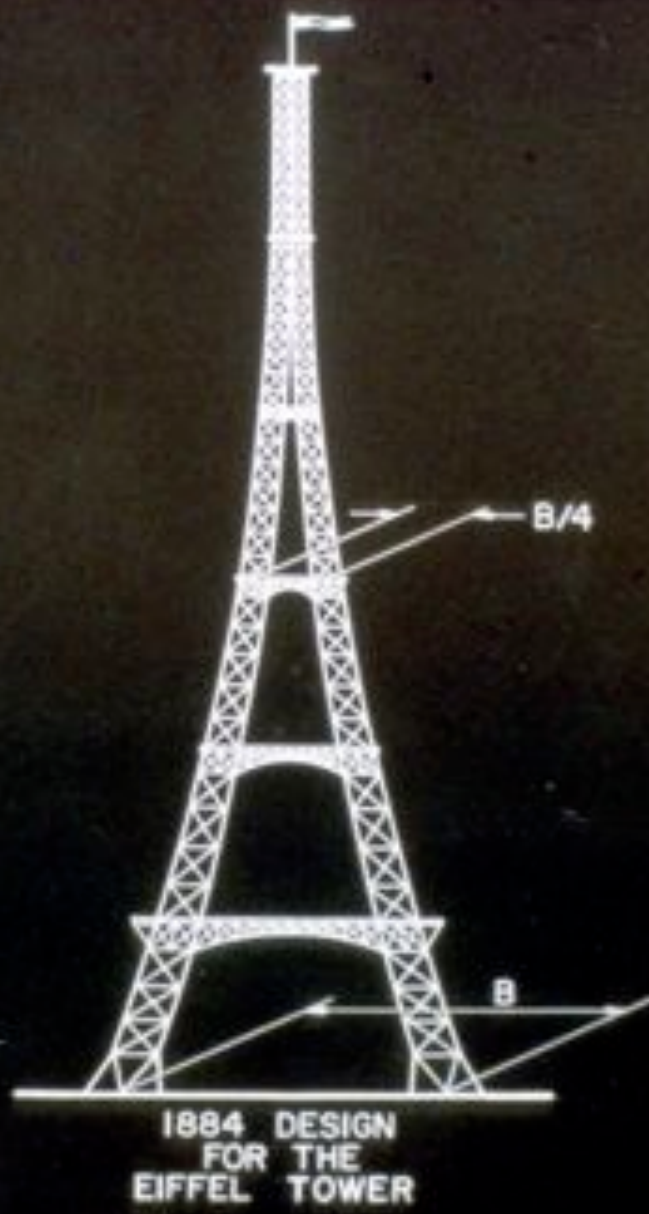
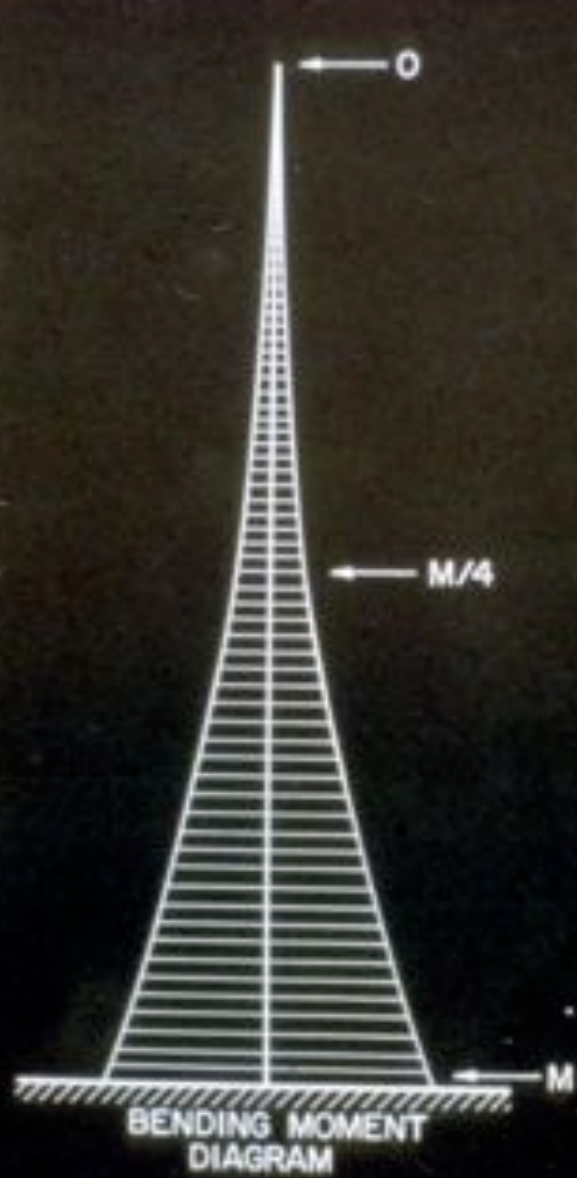
Evolution of form in the concrete hollow box arches of Robert Maillart

Bending moments and the form of the Salginatobel Bridge

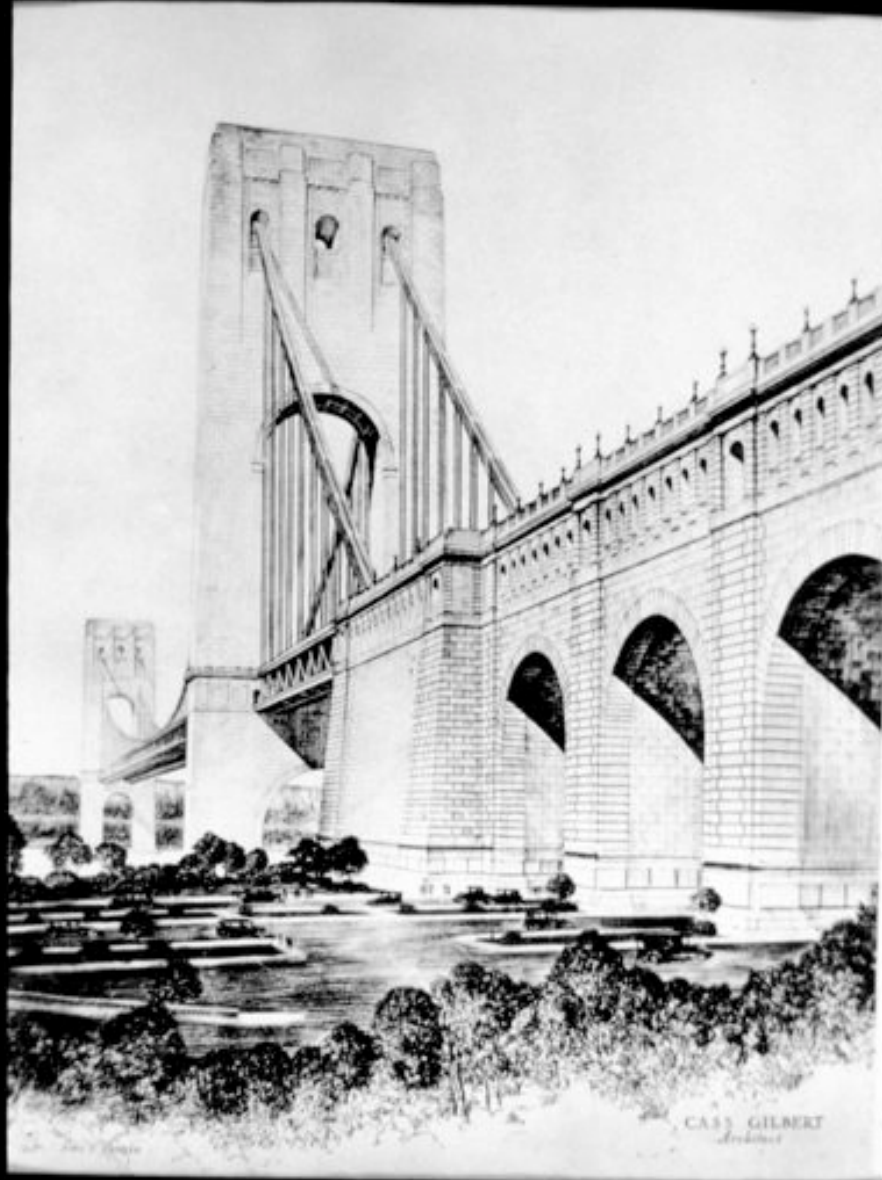
iron

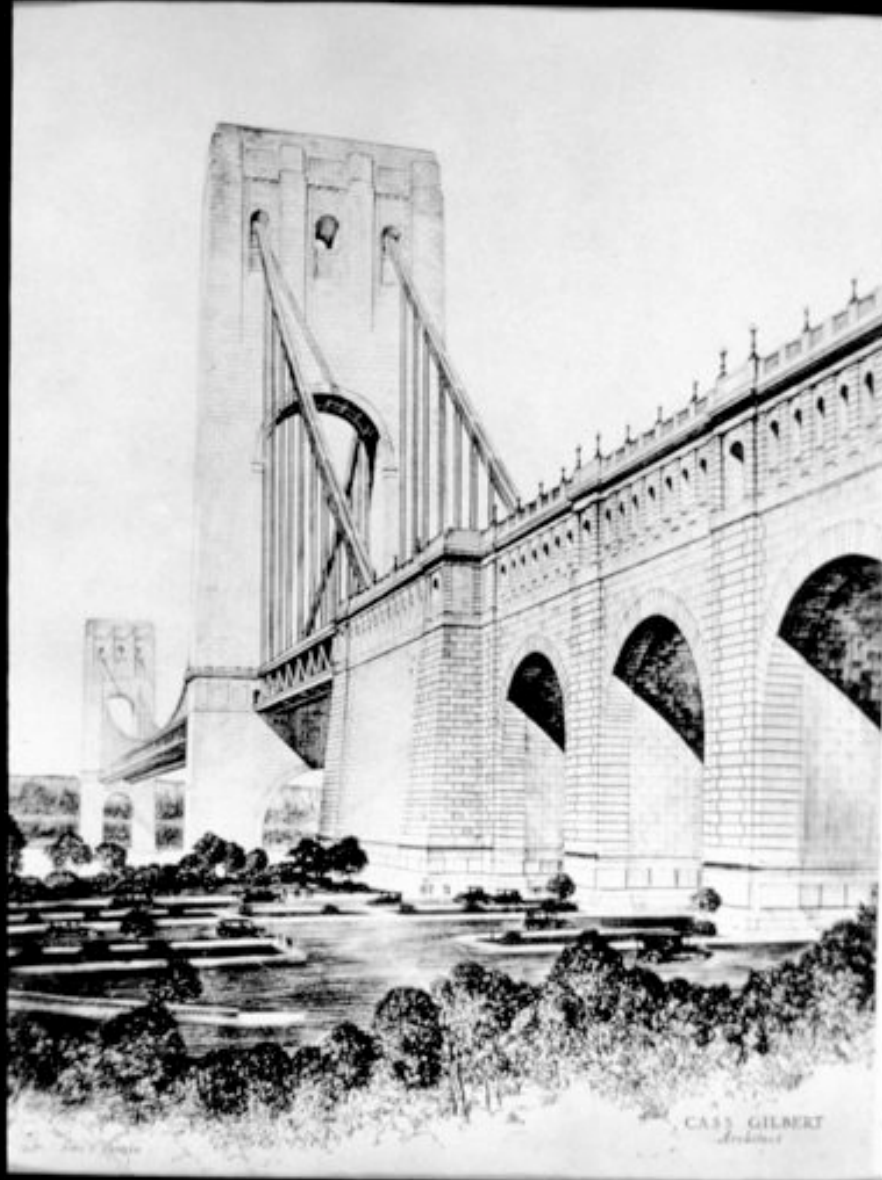


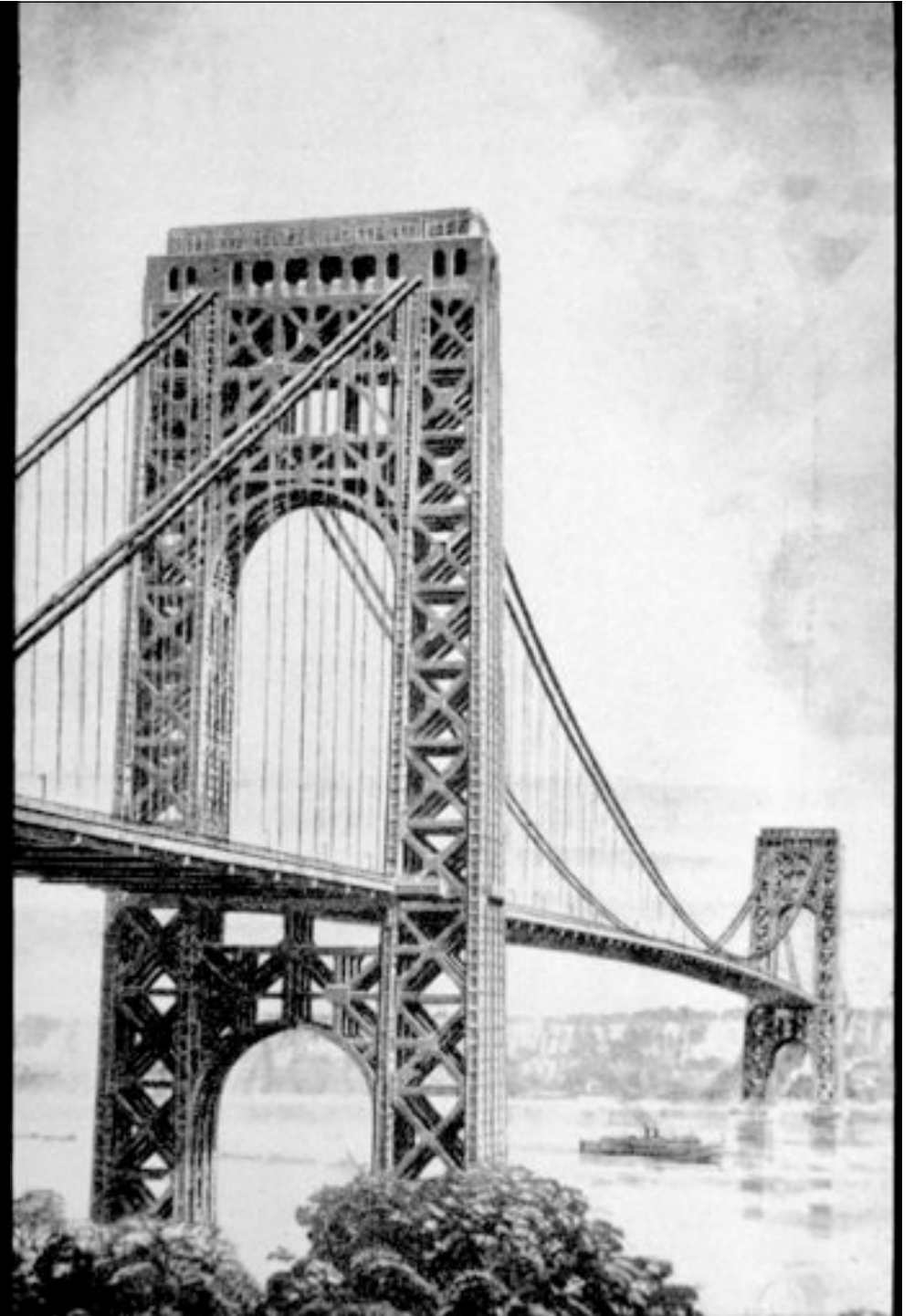
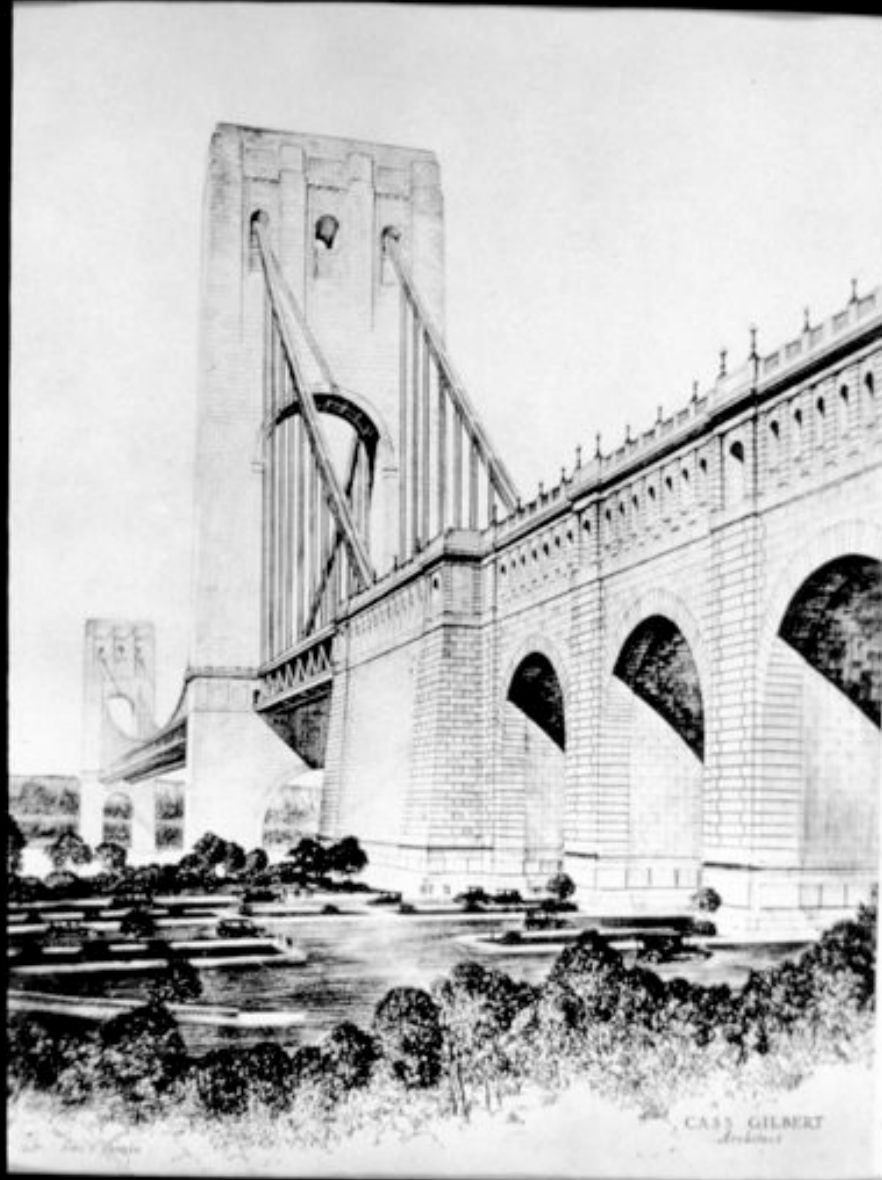


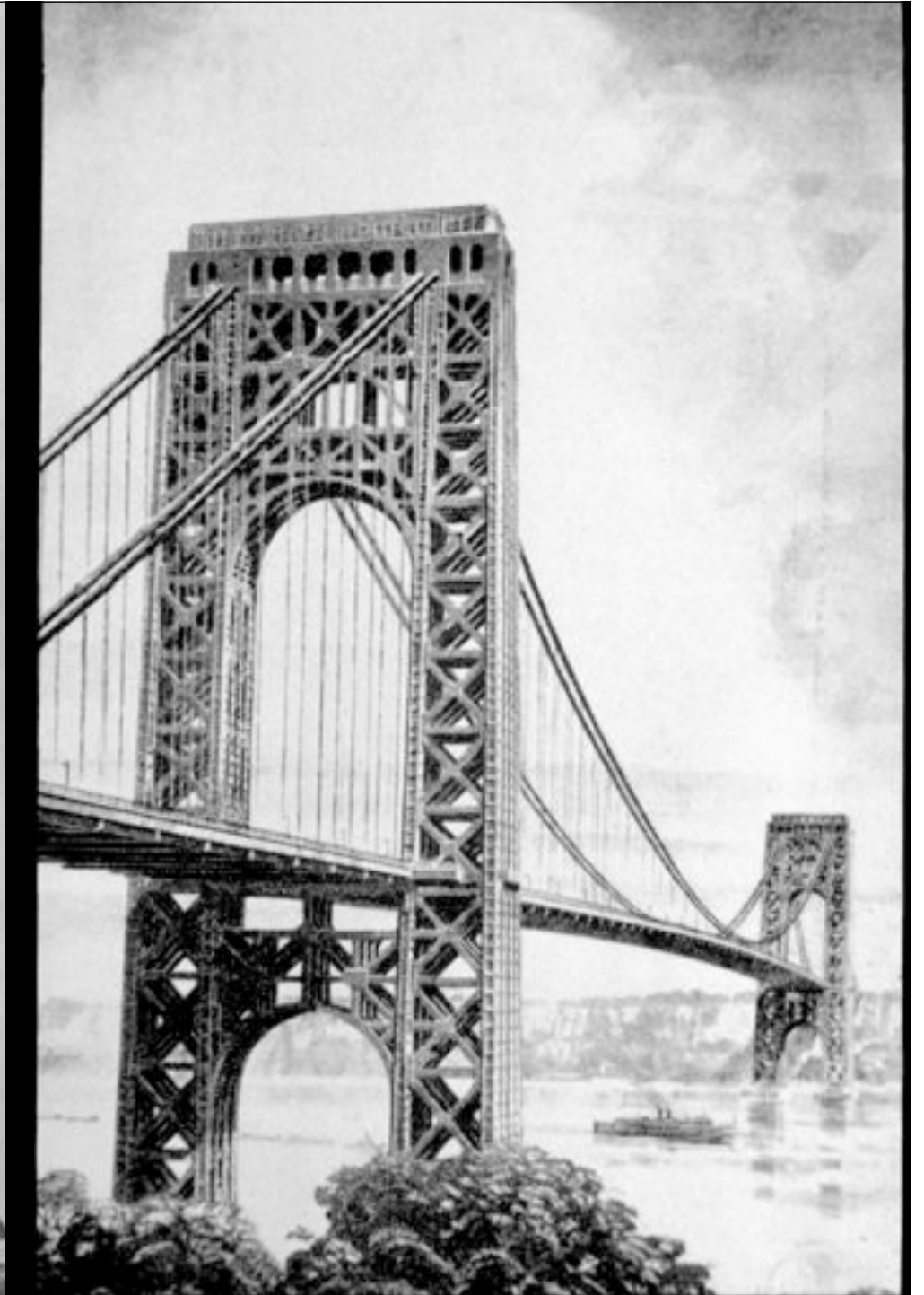


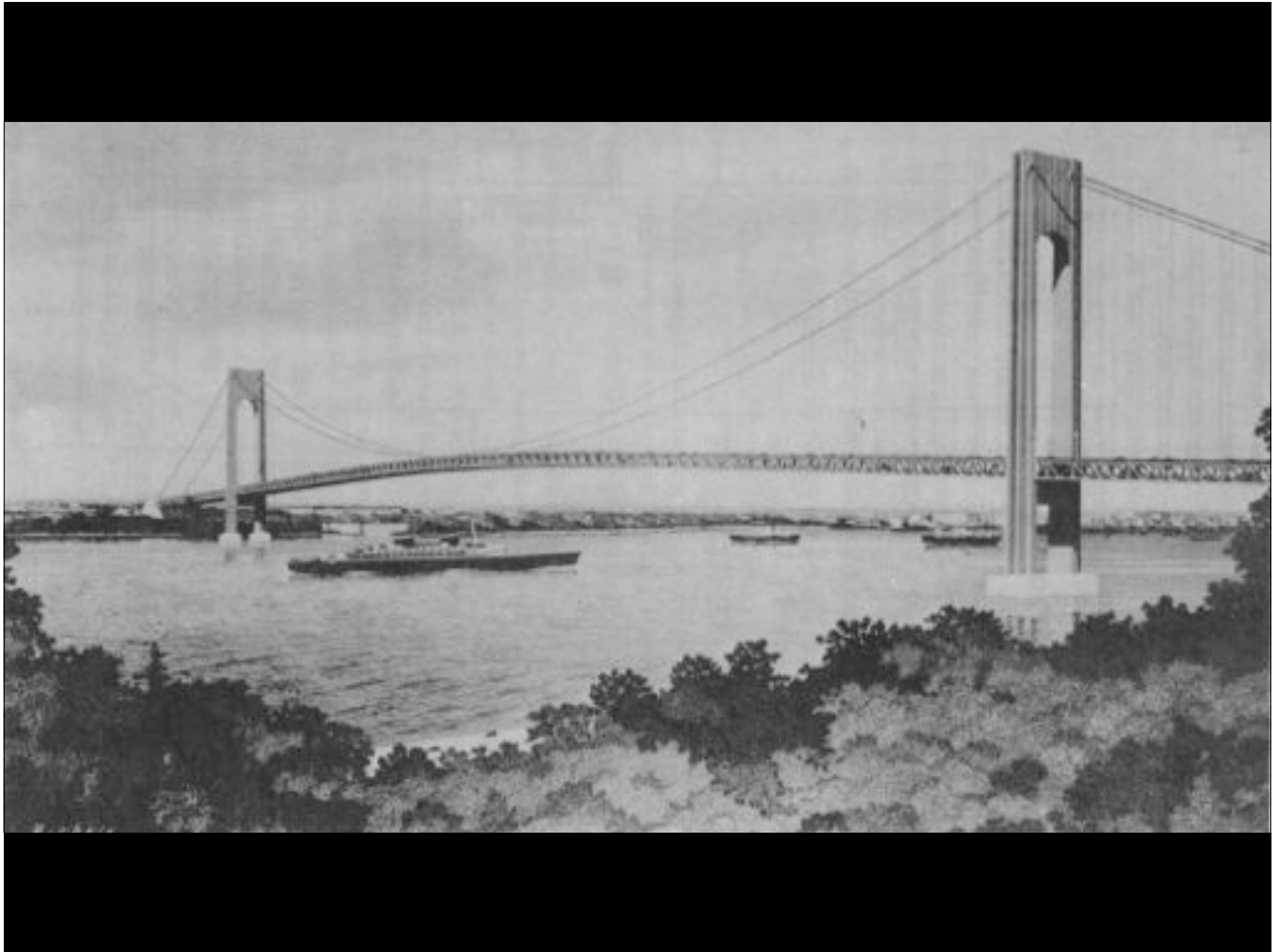
steel

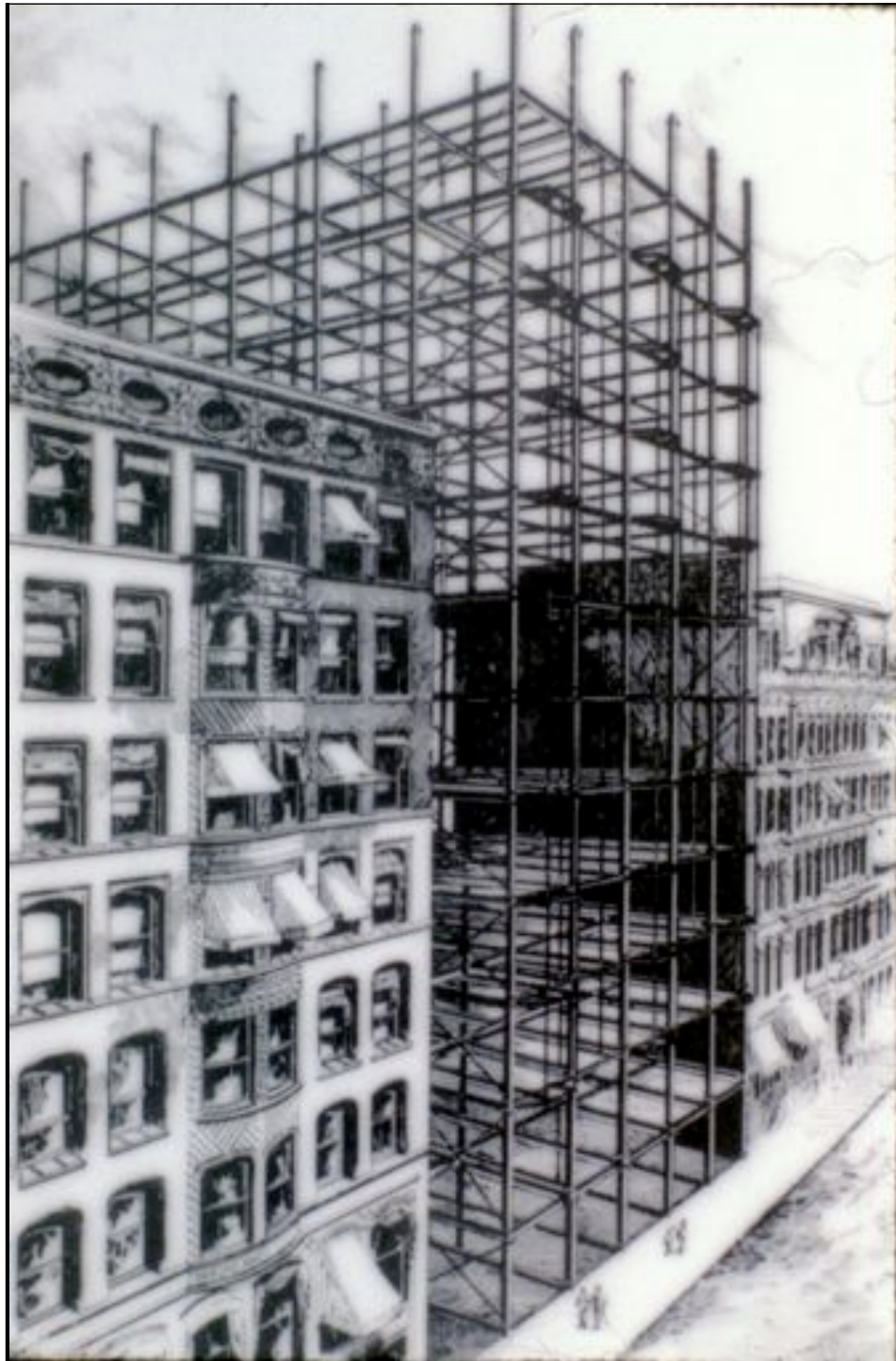


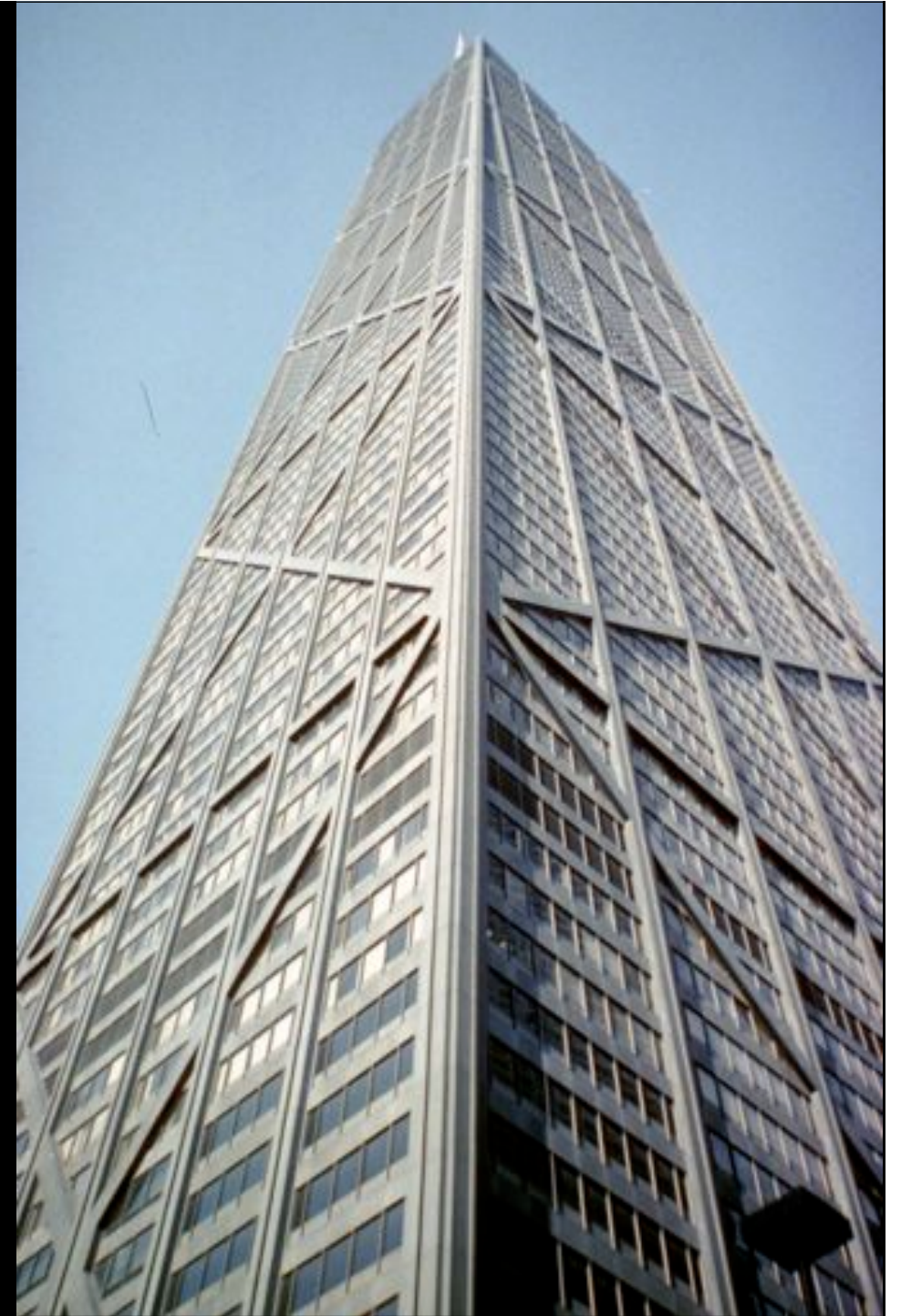
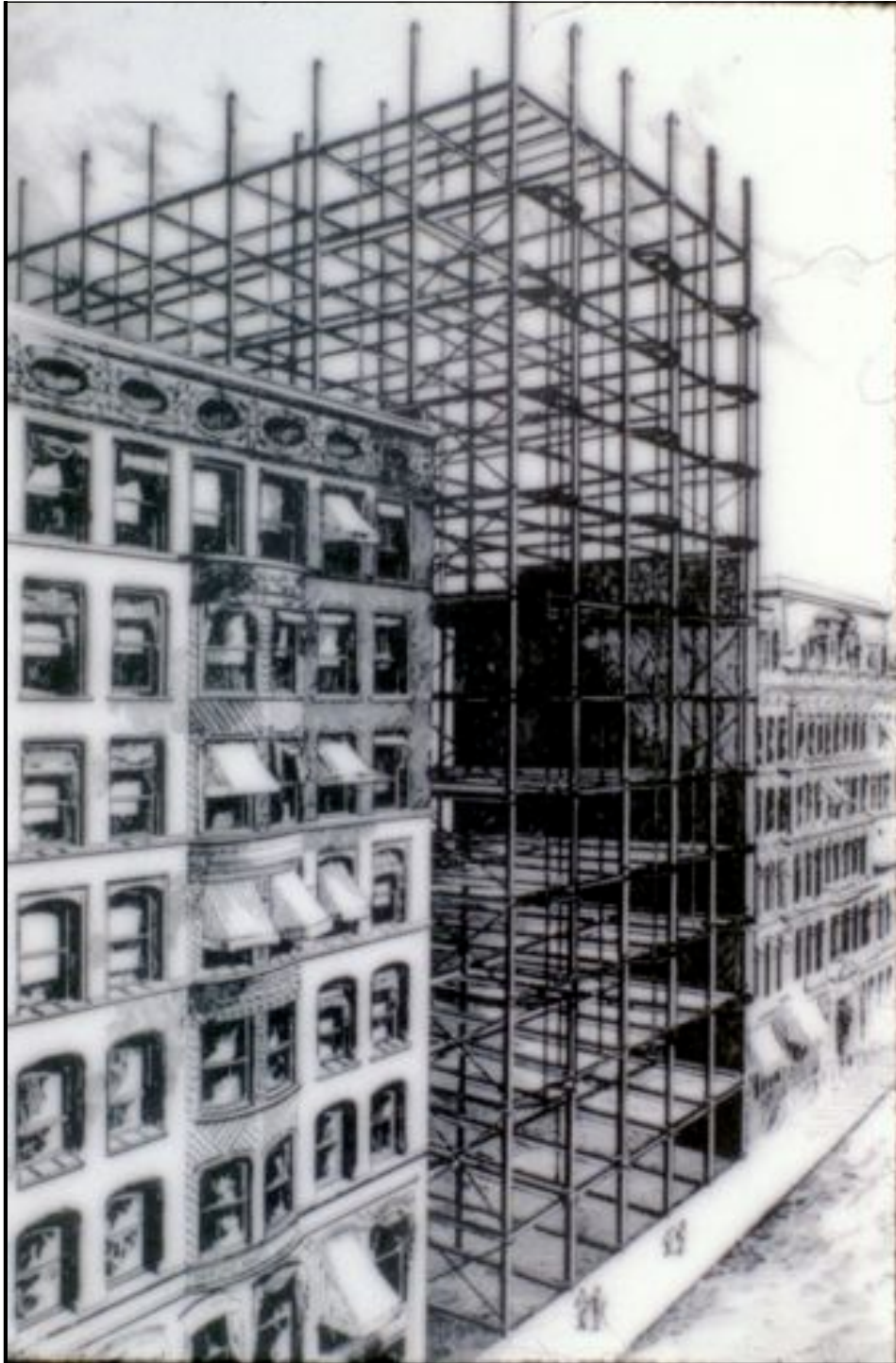












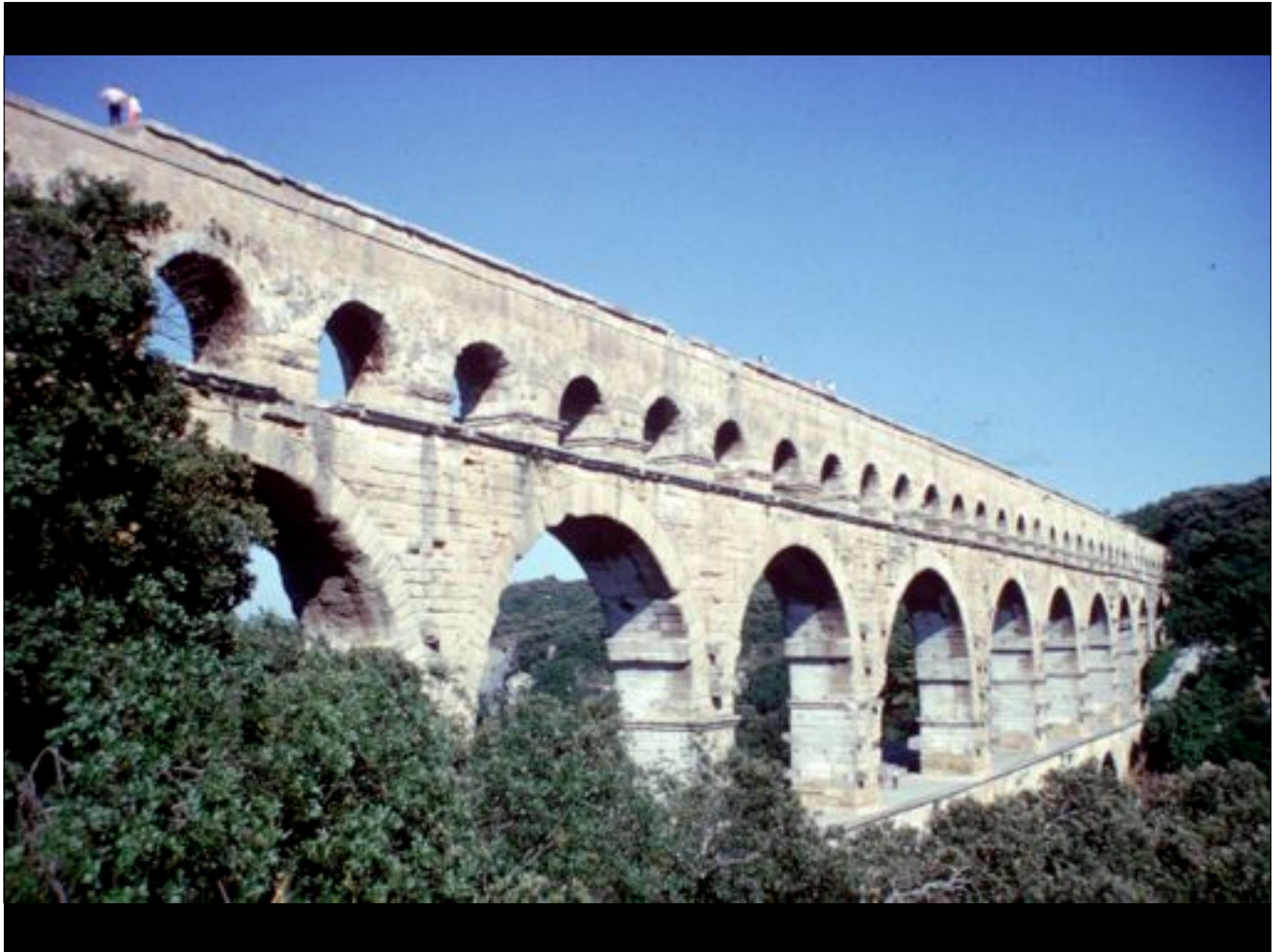




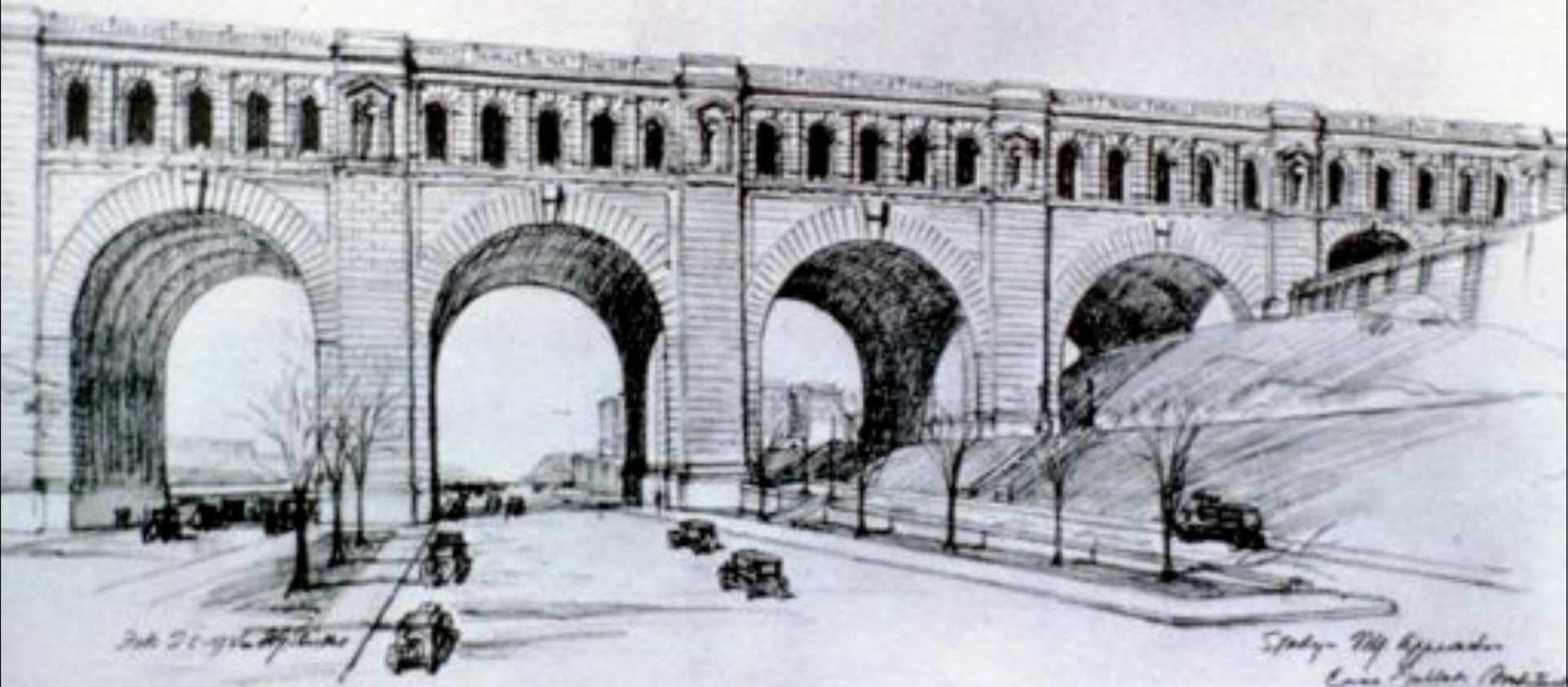
iron structures
steel structures

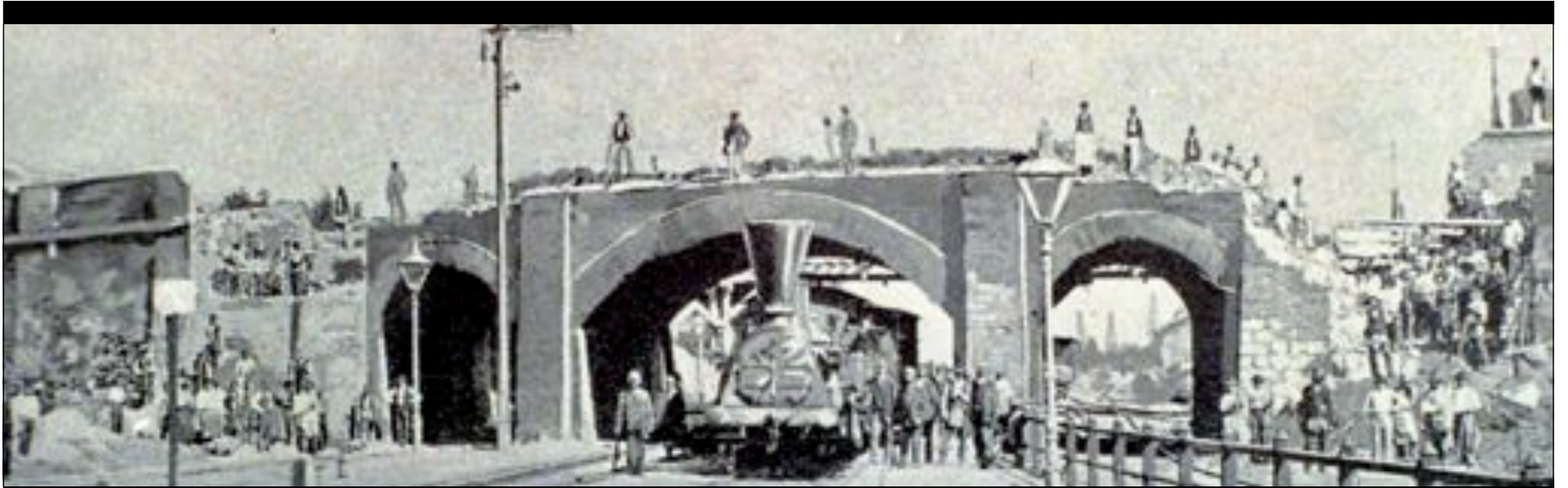
...

understanding the origins of reinforced concrete...



GWB approaches





stone-like ↑



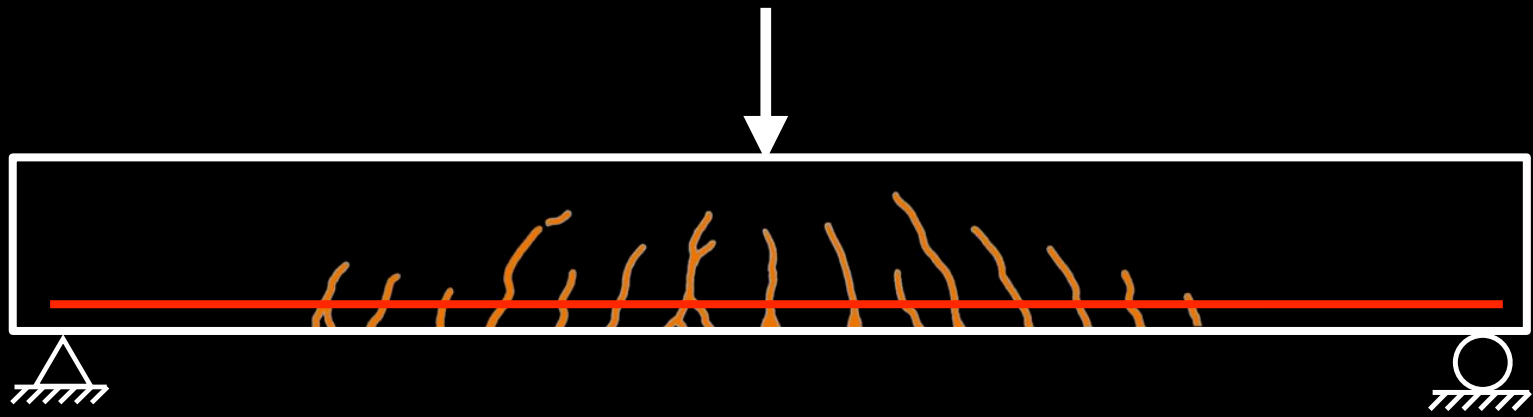
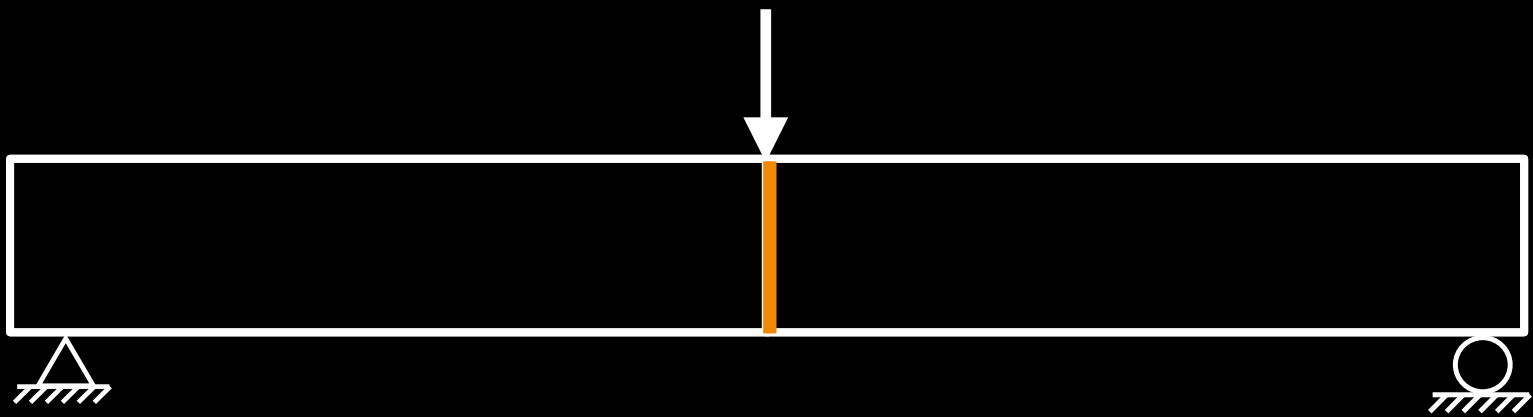
stone-like ↑

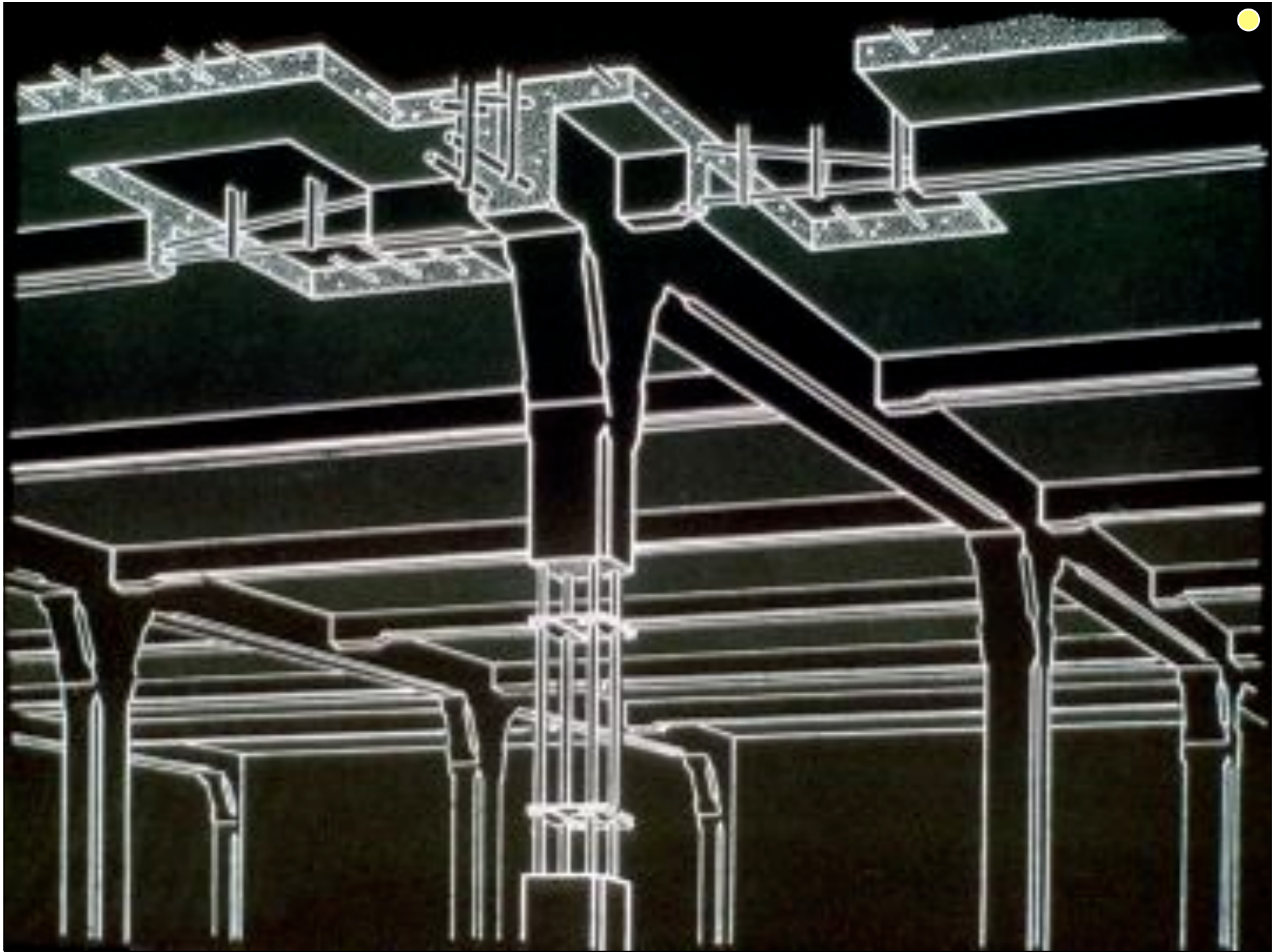
↓ reinforced concrete















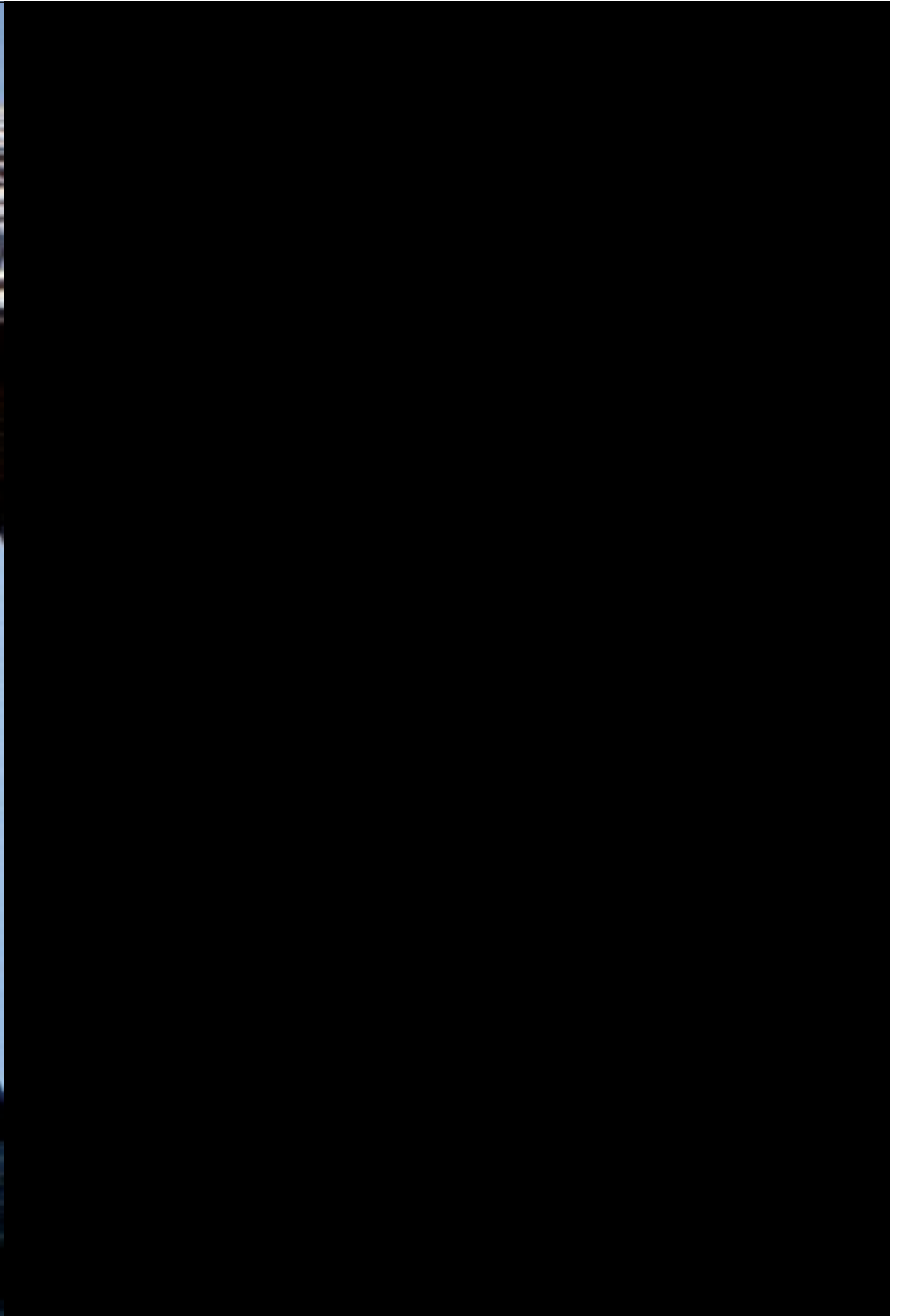
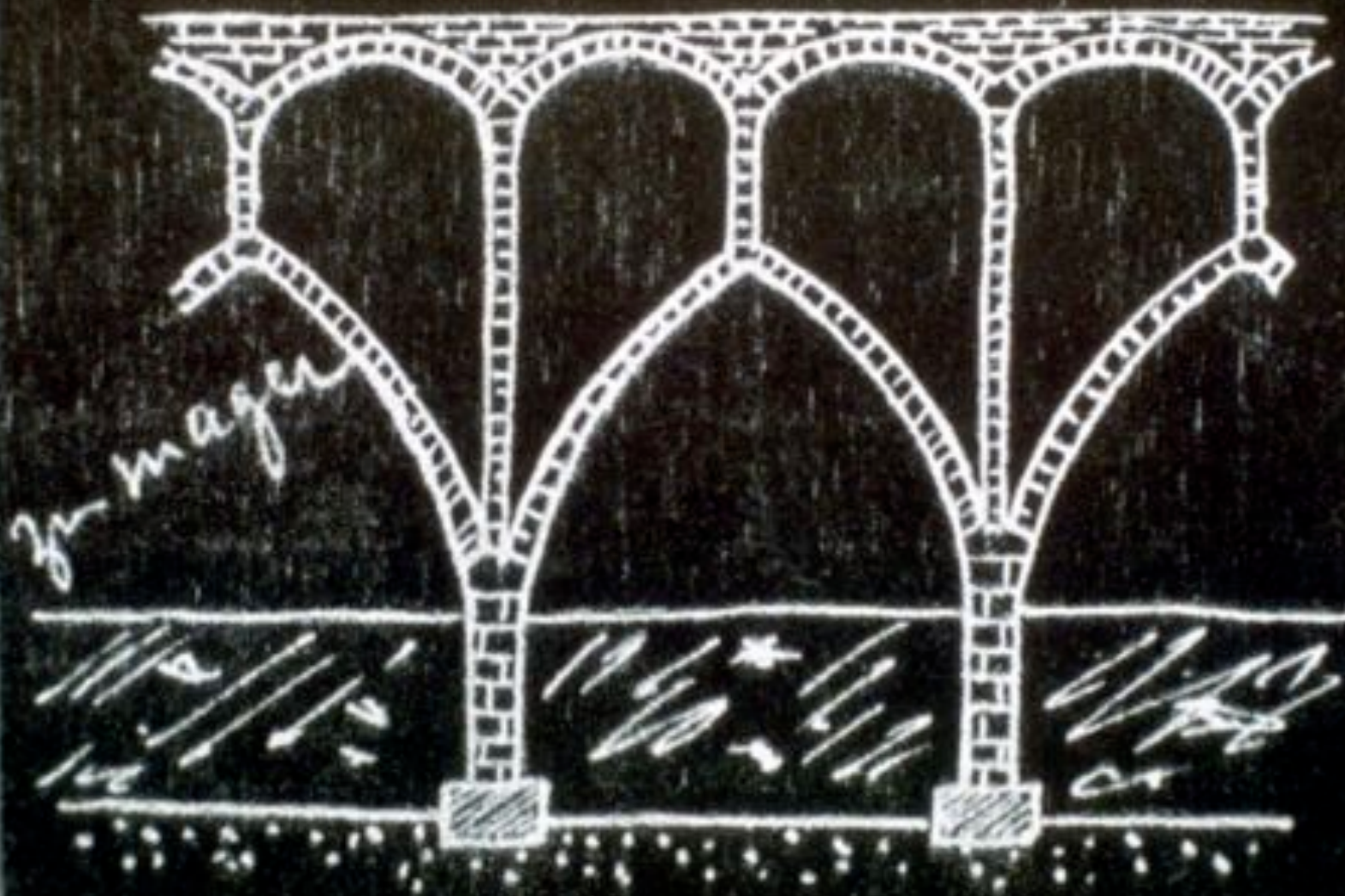








Fig 107.







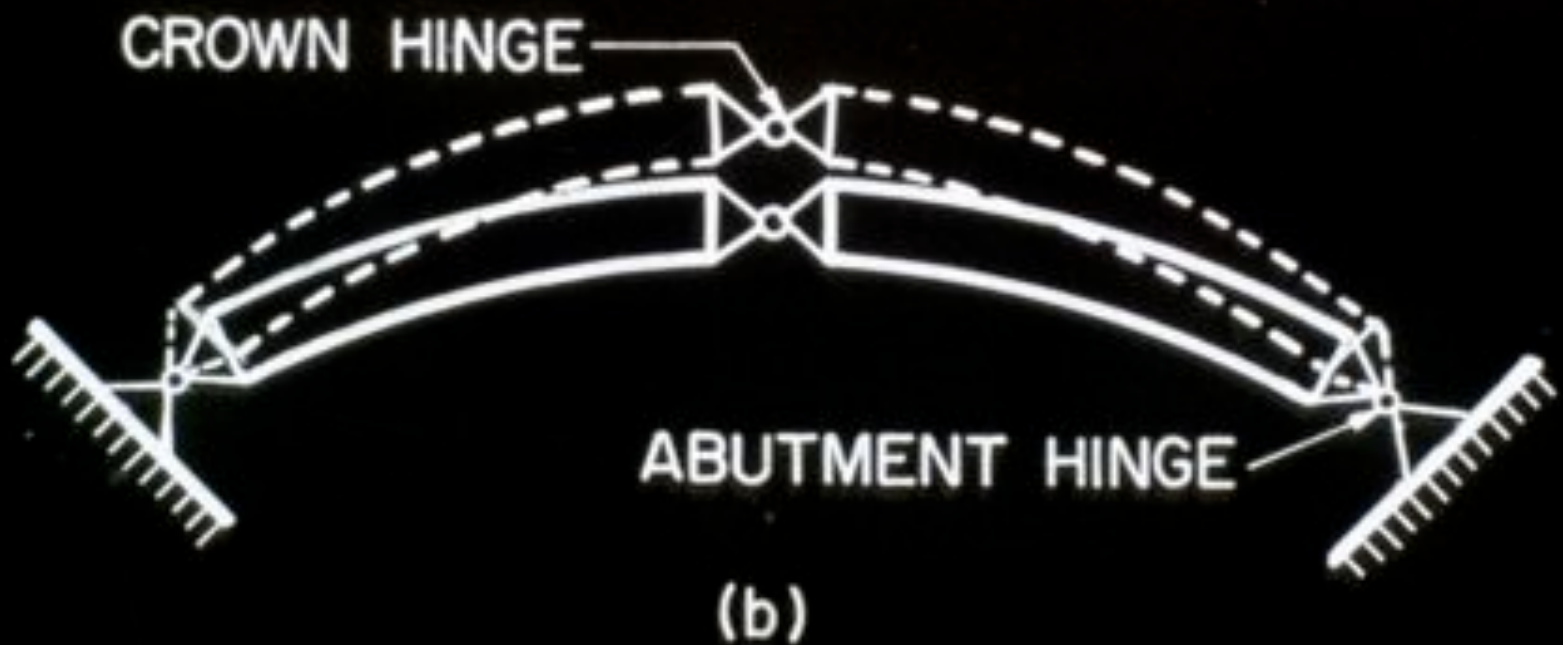
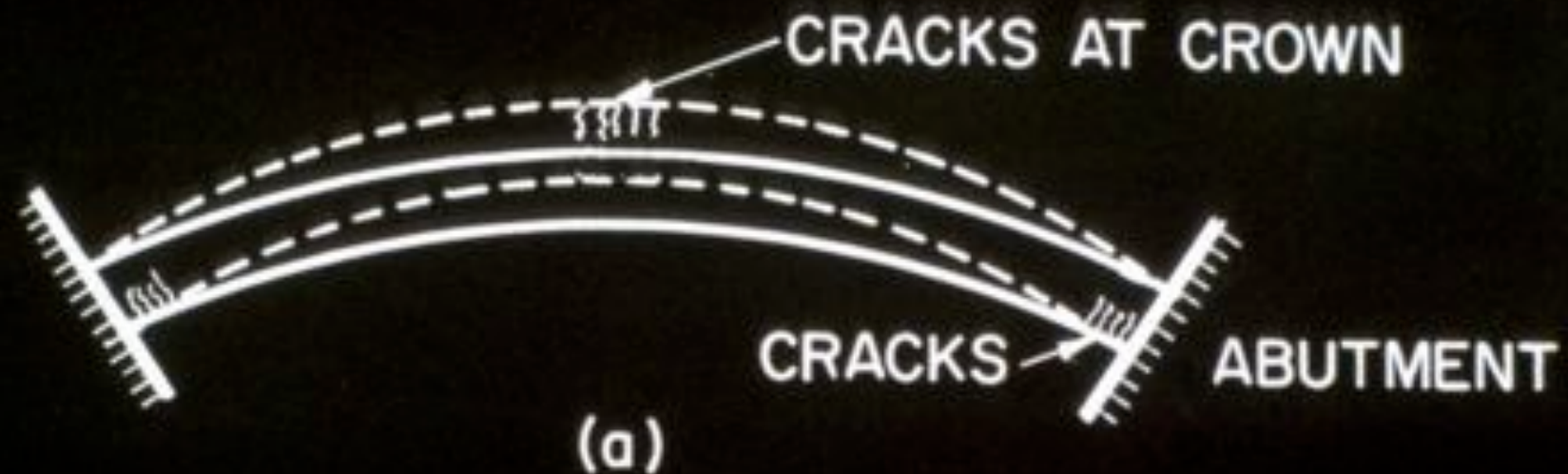


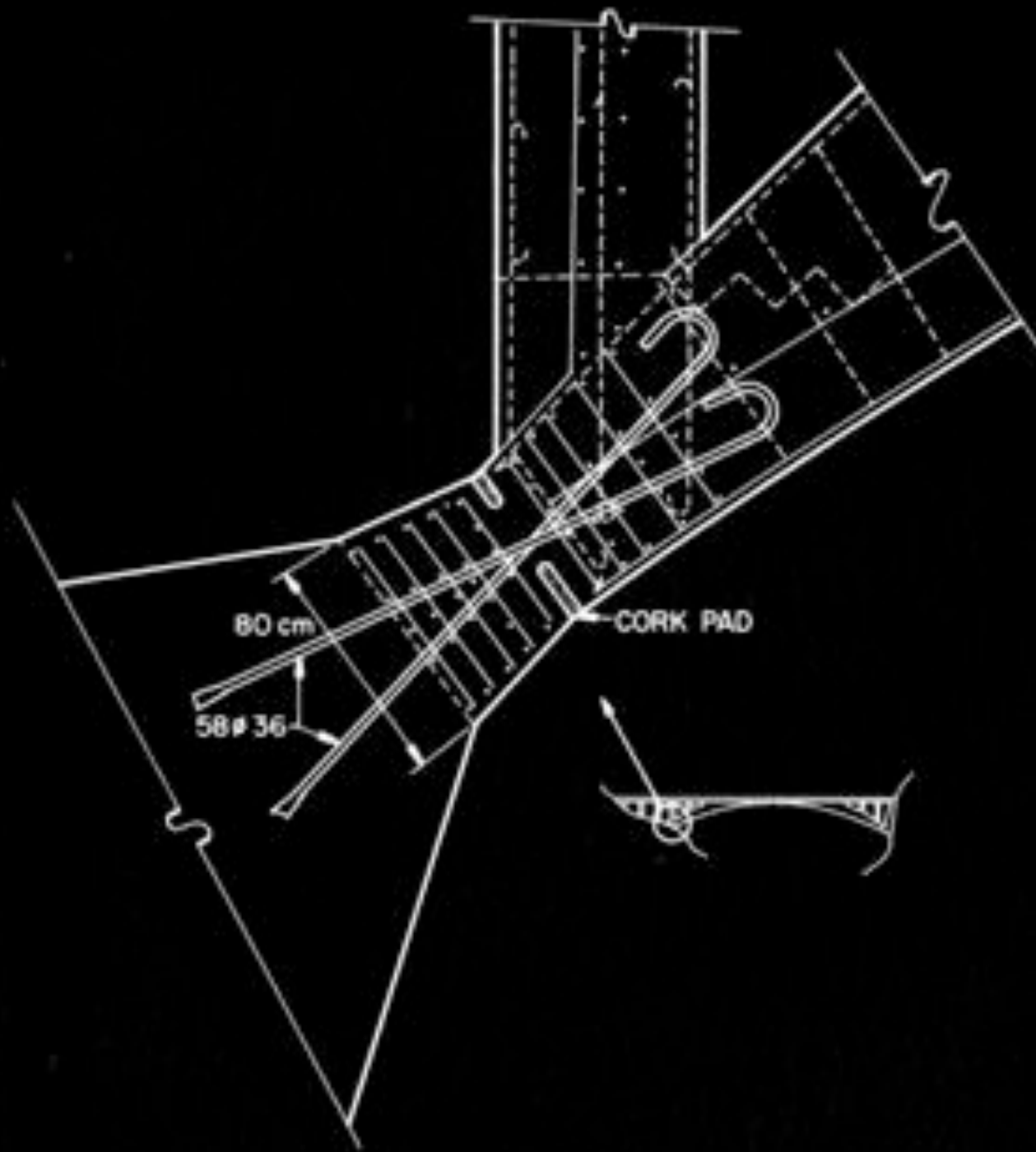
Samaden 1900
Albula-Bahn, Eisenbahnbrücke bei Solis, 90 m über
dem Wasserspiegel
Ecco un bel ponte. J'y suis passé pour
venir à l'Engadine. J'en ai fait les
calculs. Rob
Engadin Press Co. Verl. No. 463

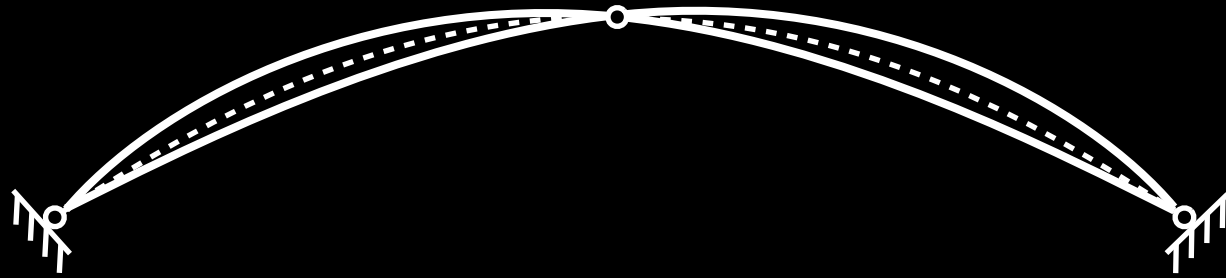
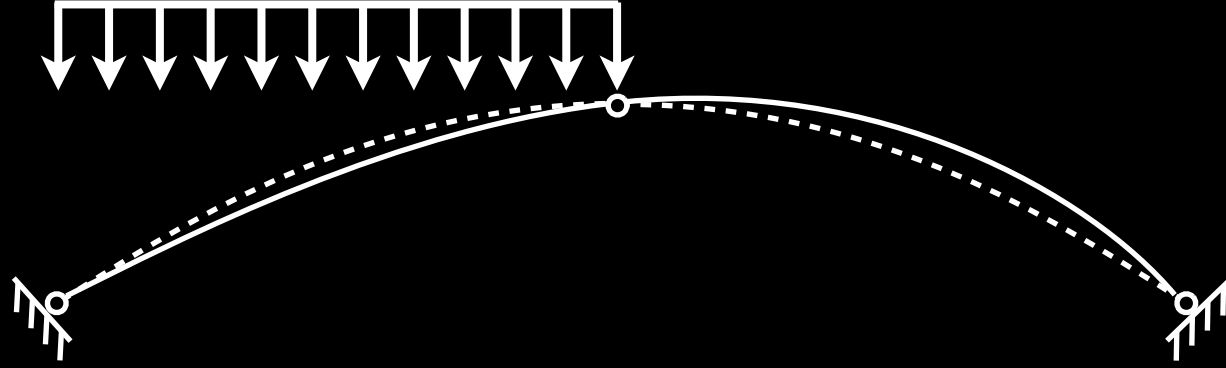
Why can forms be made of reinforced concrete that cannot be made of plain masonry?

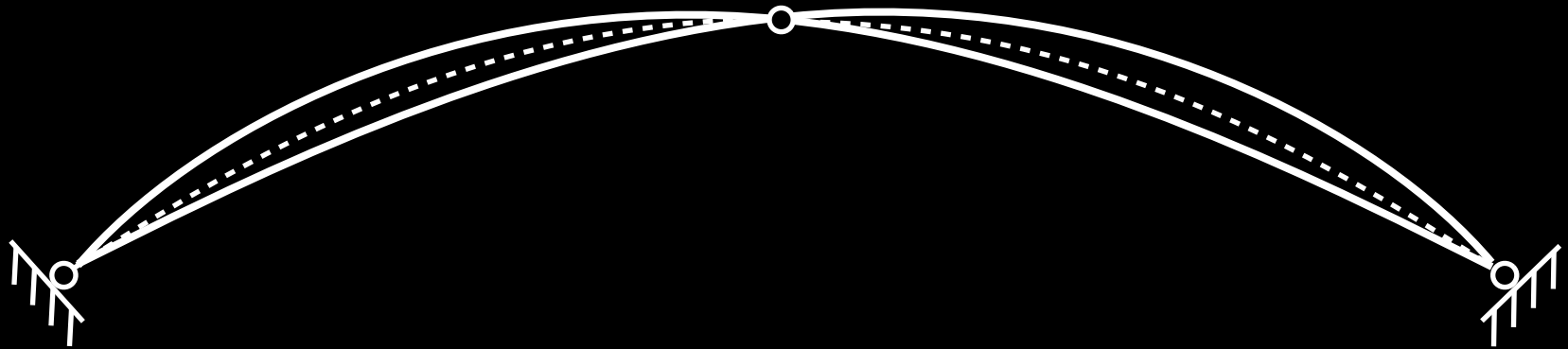
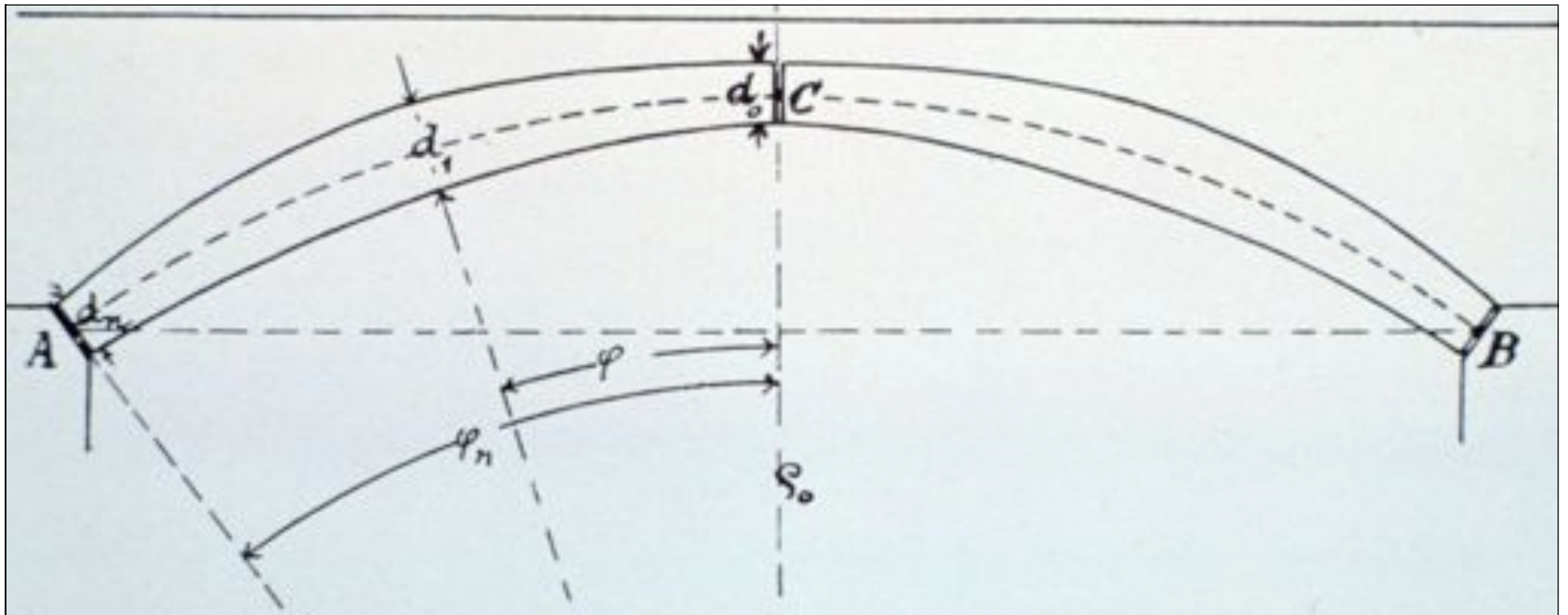








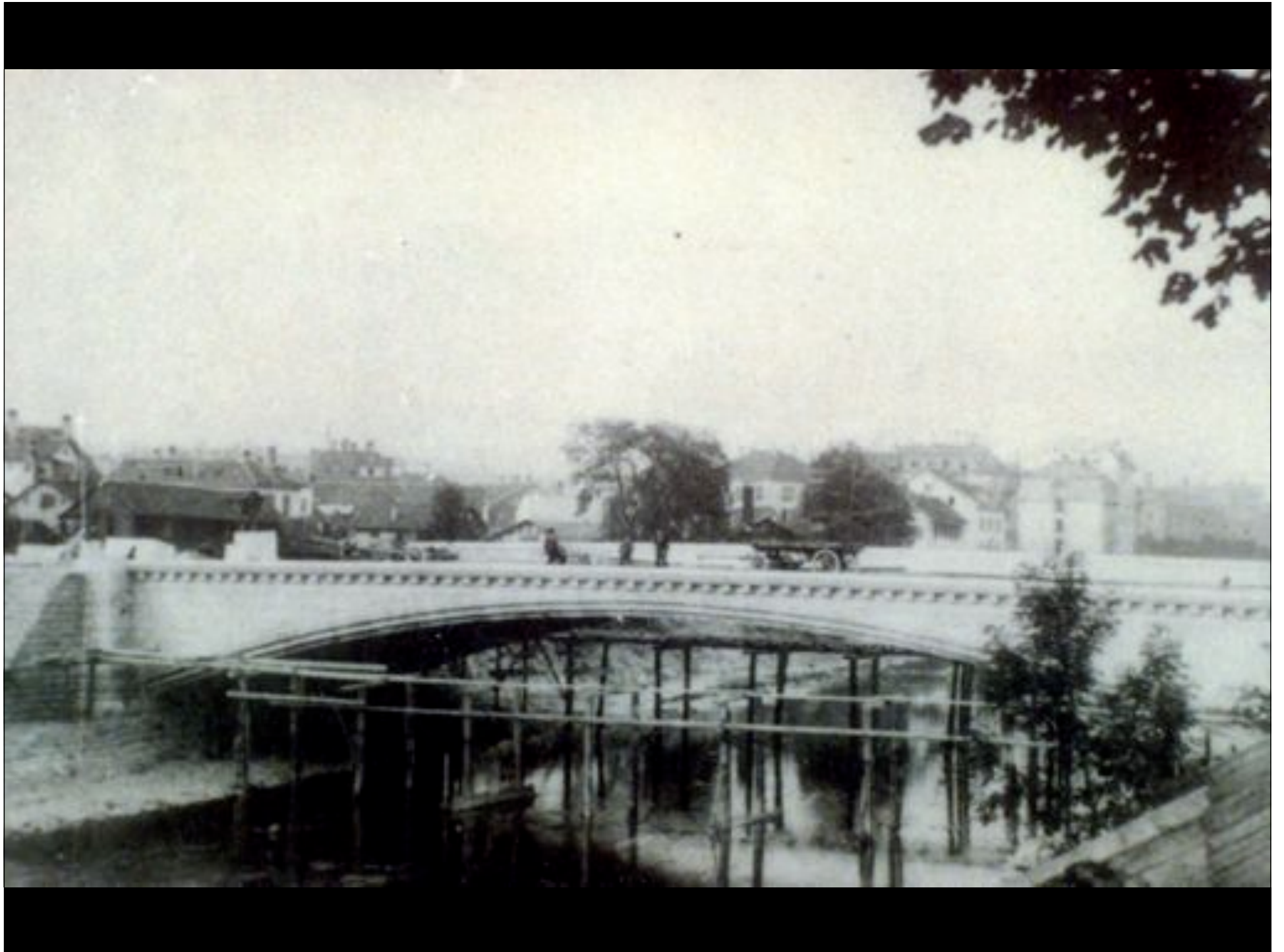






Stauffacher Bridge (1899)

39.6 m span

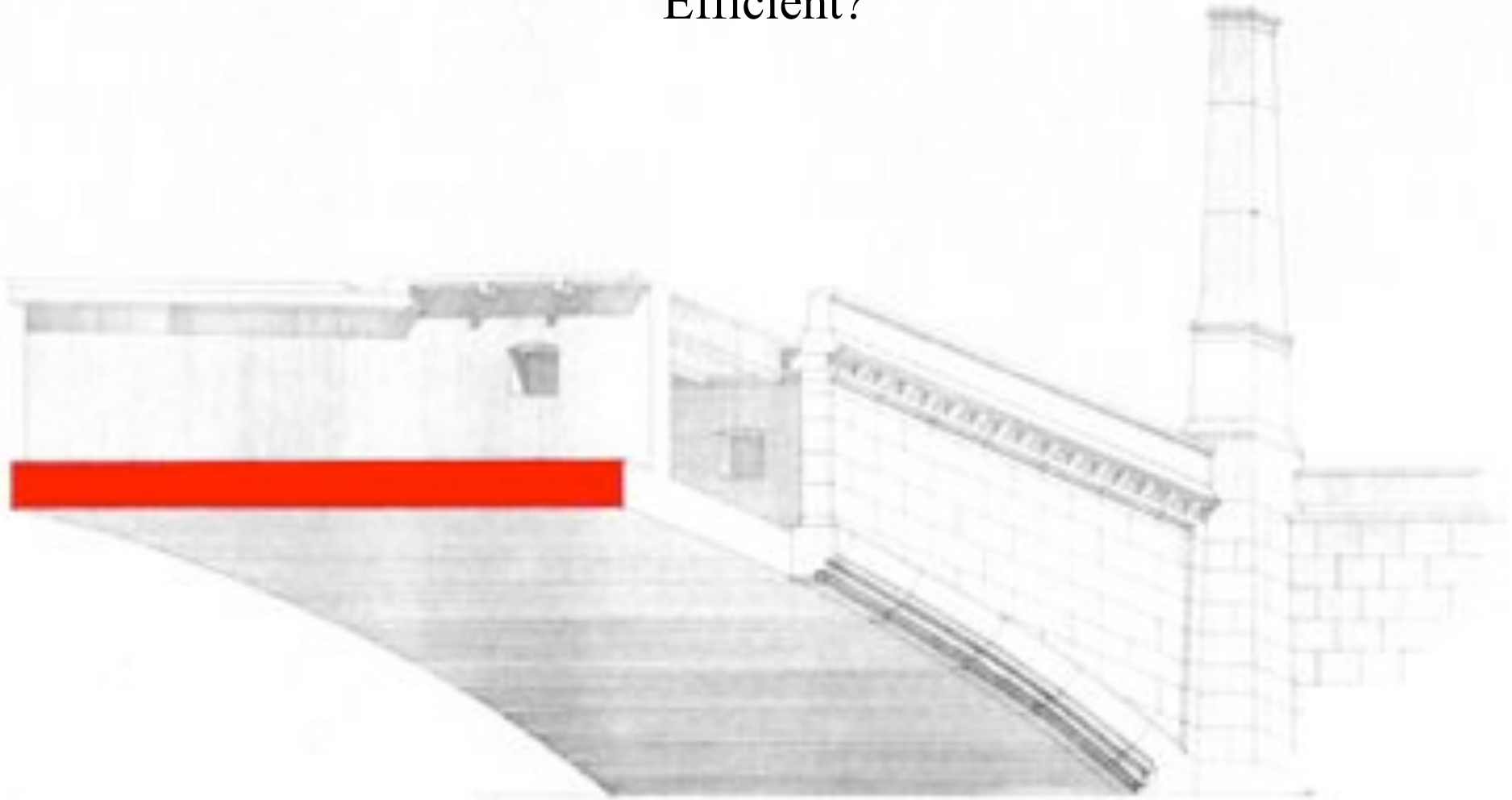




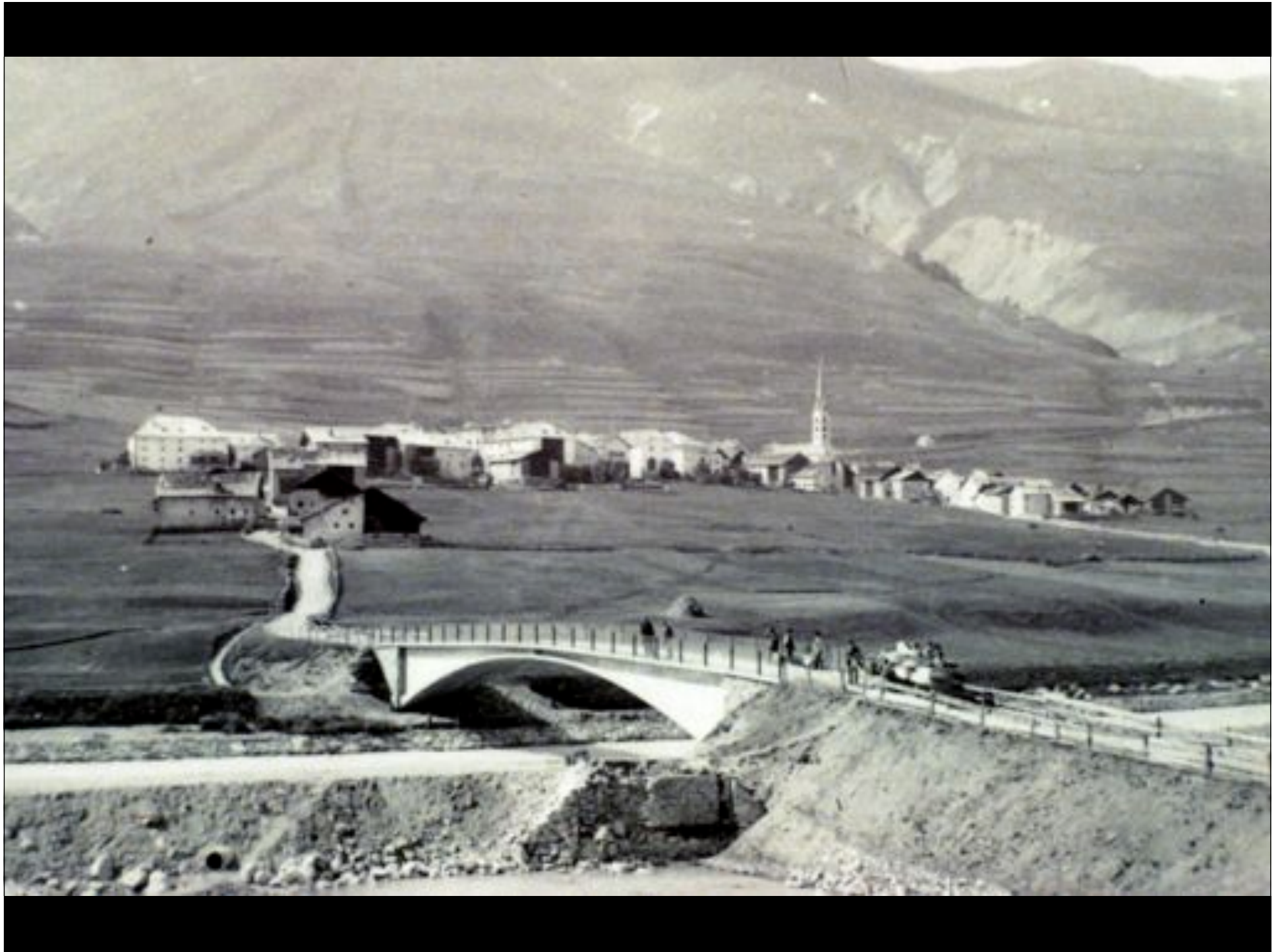
Stone facade

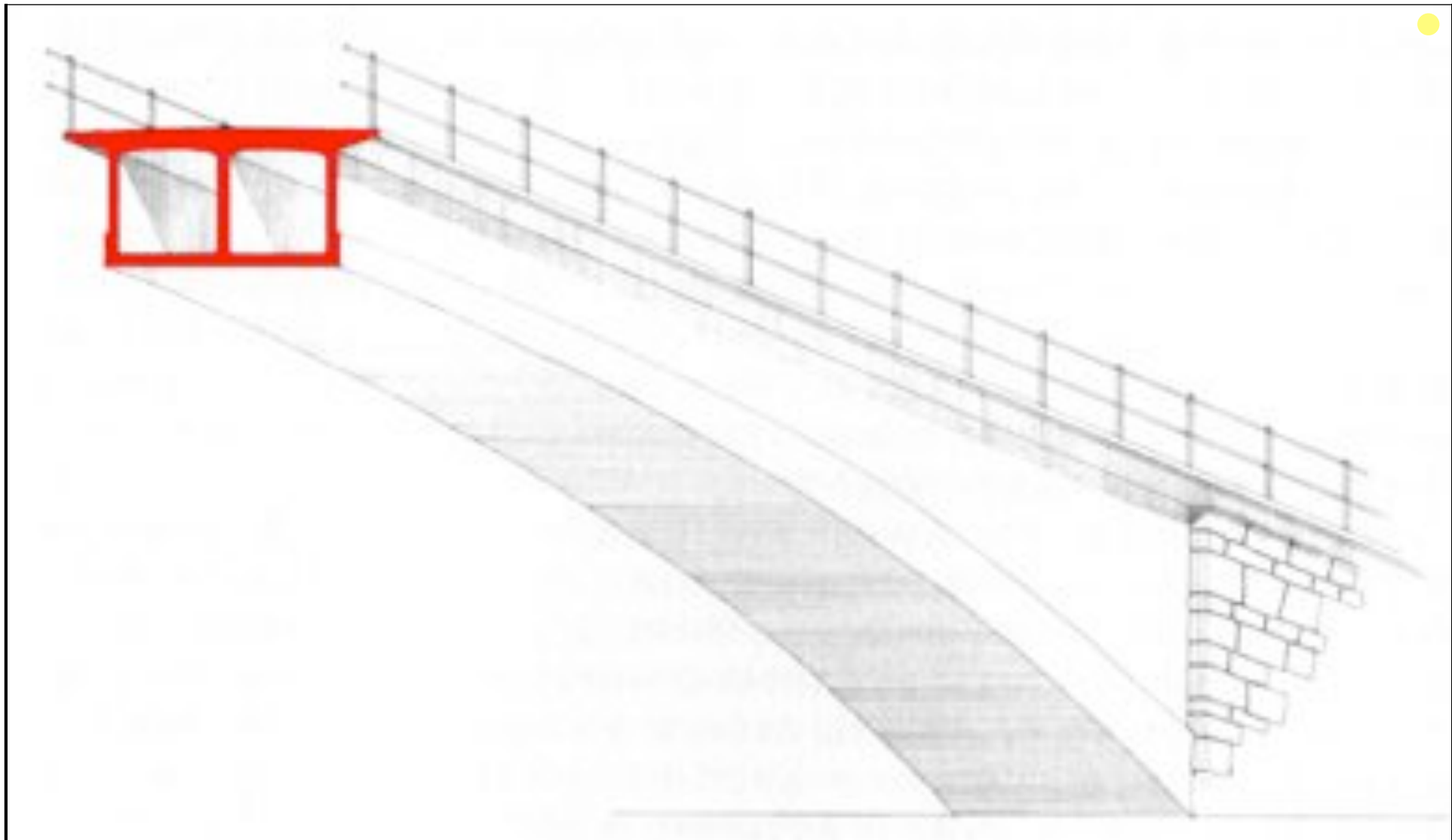
R/C arch

Efficient?



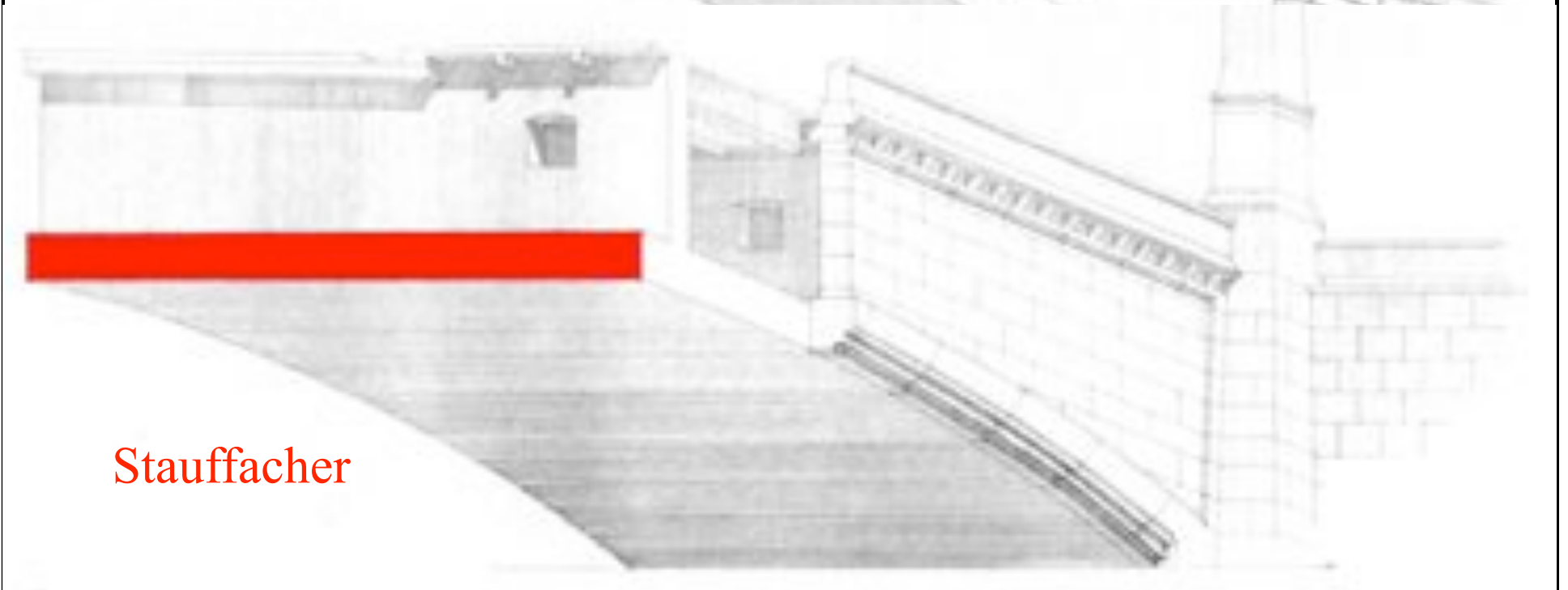








Zuoz



Stauffacher



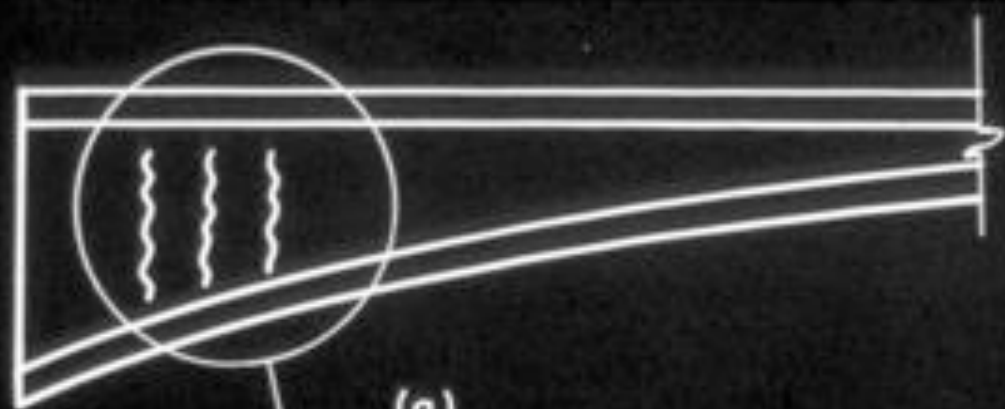
Zuoz Bridge (1901)

38.25 m span

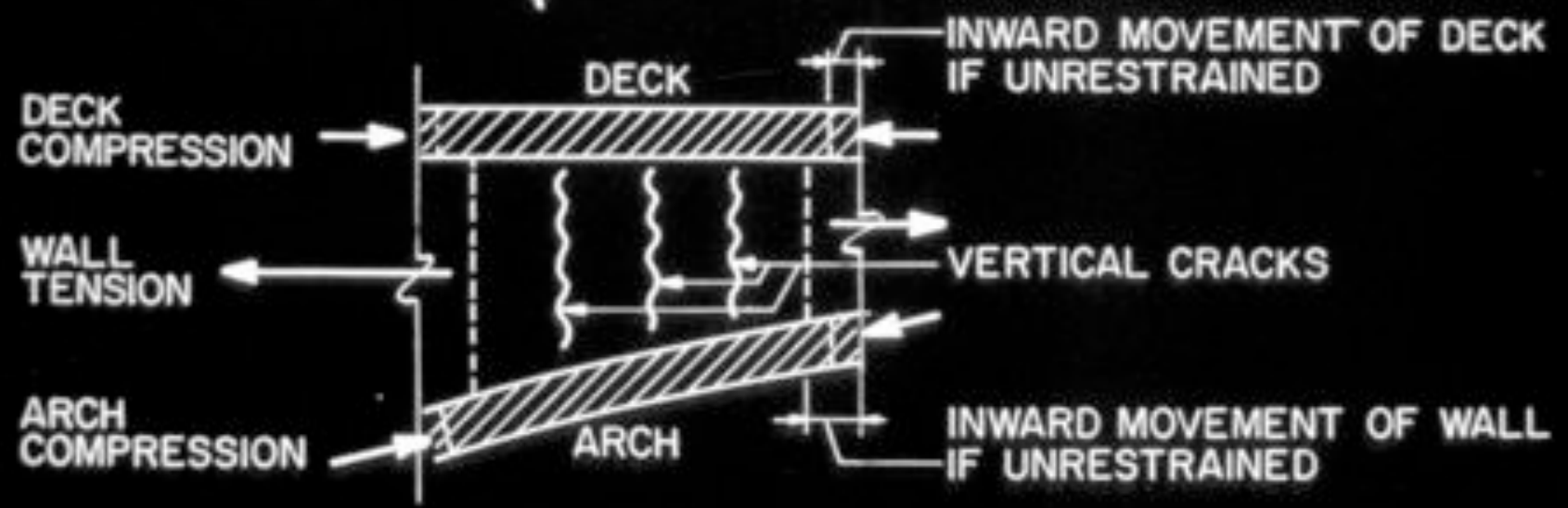


Robert Maillart
1872-1940

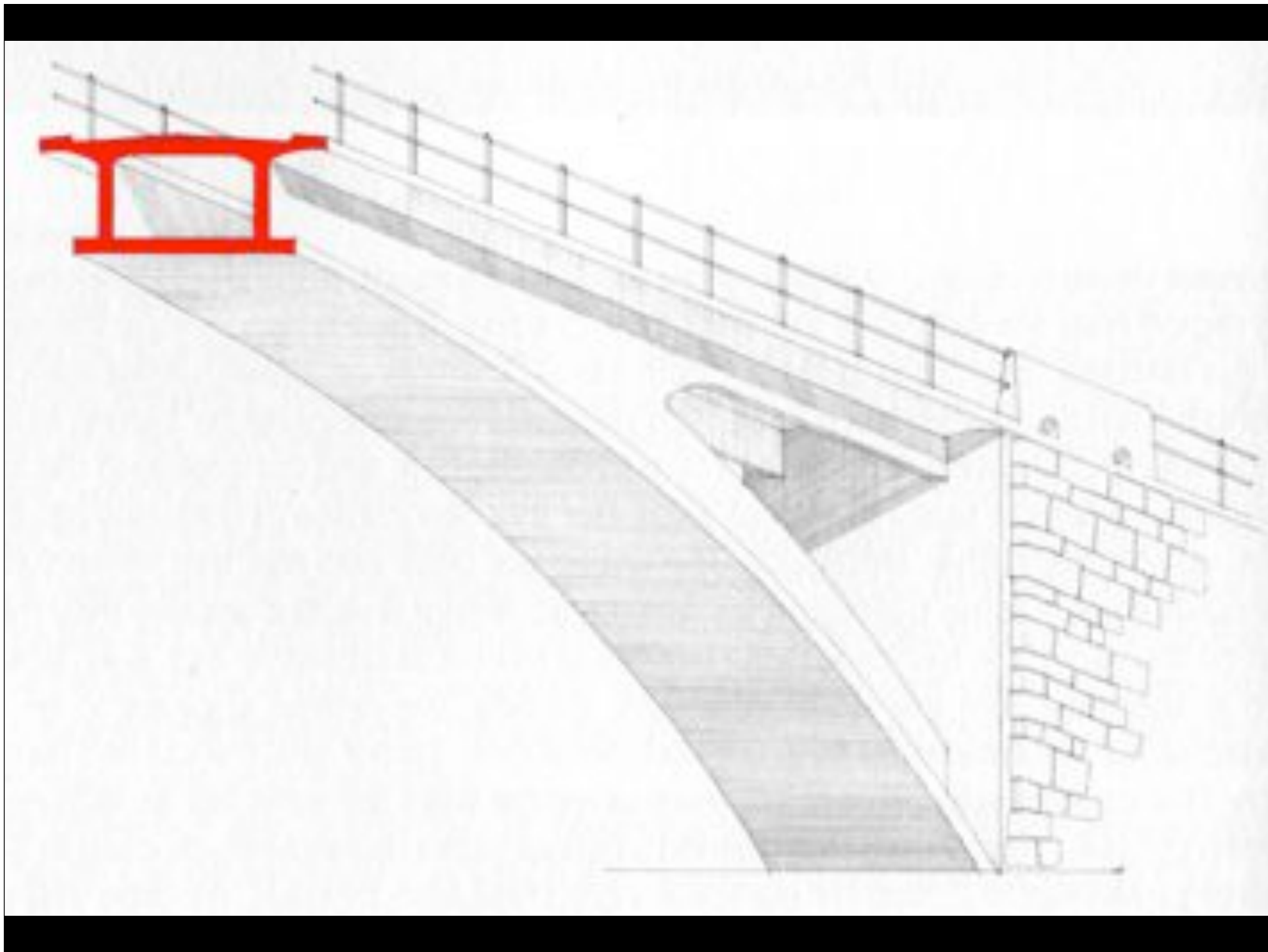




(a)



(b)





Tavanasa Bridge (1906)

51.25 m span



Do these bridges function structurally in different ways?





Do these bridges express their function in different ways?





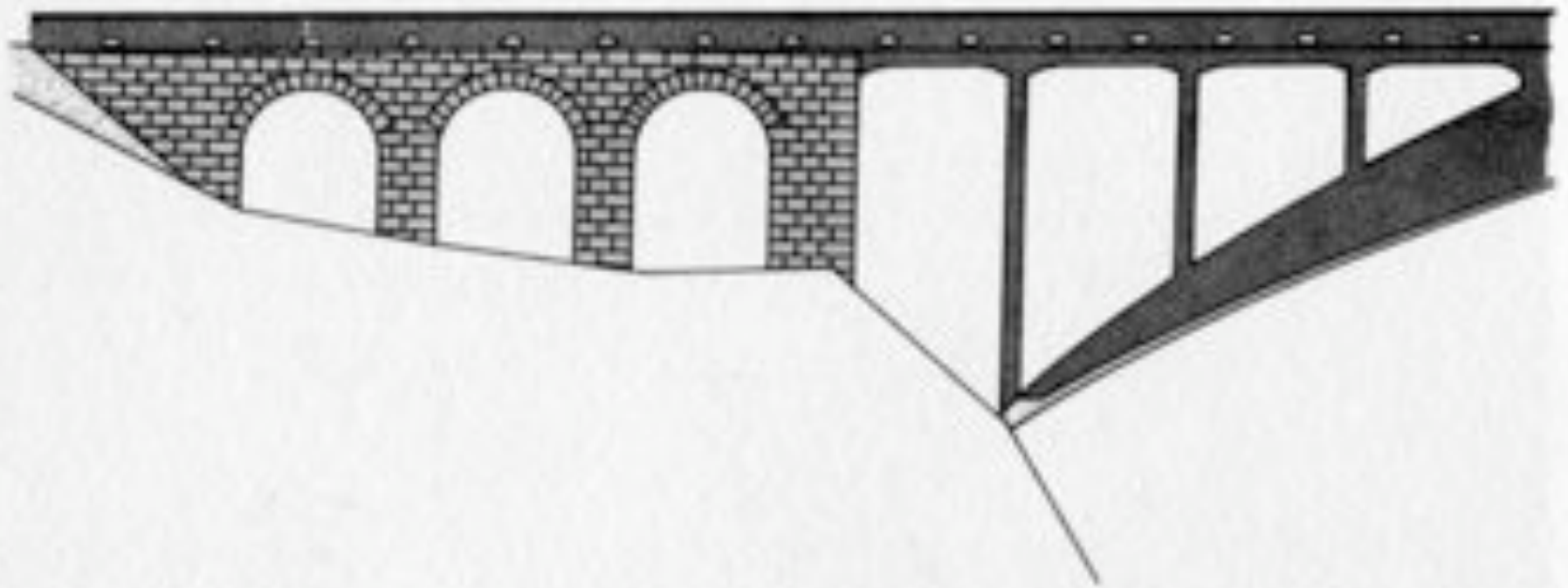


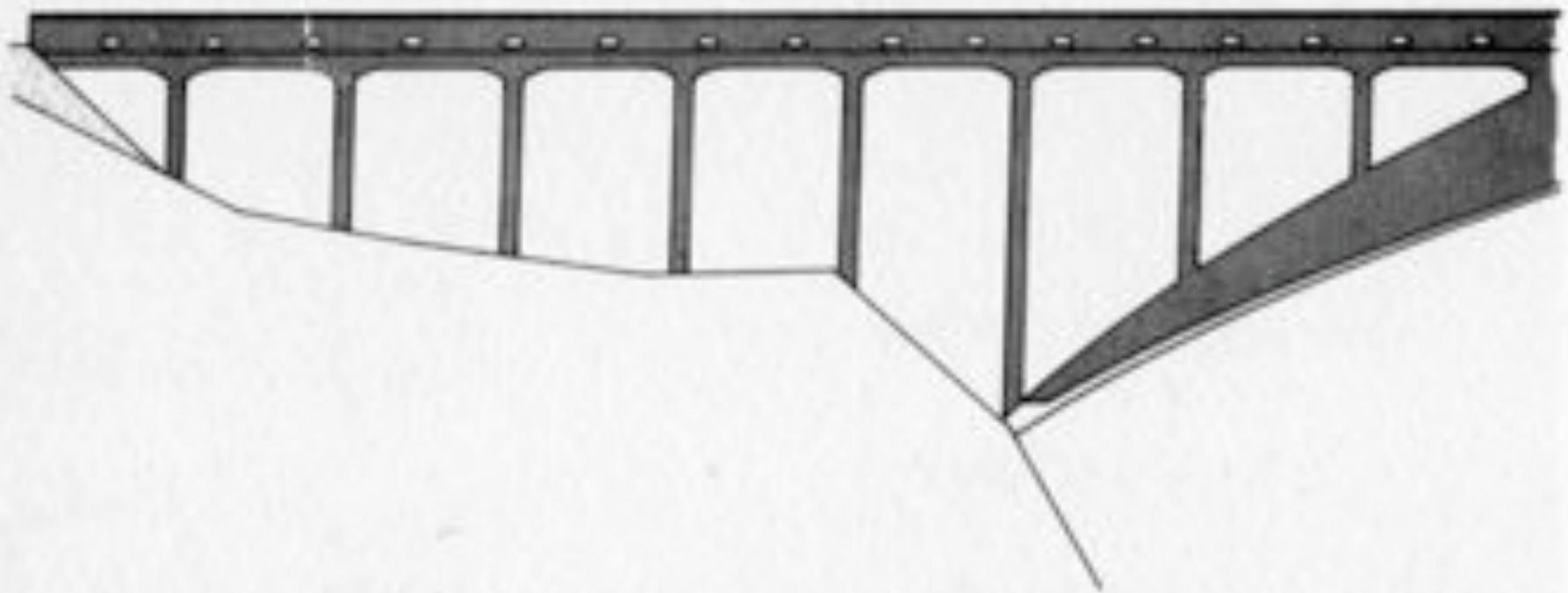


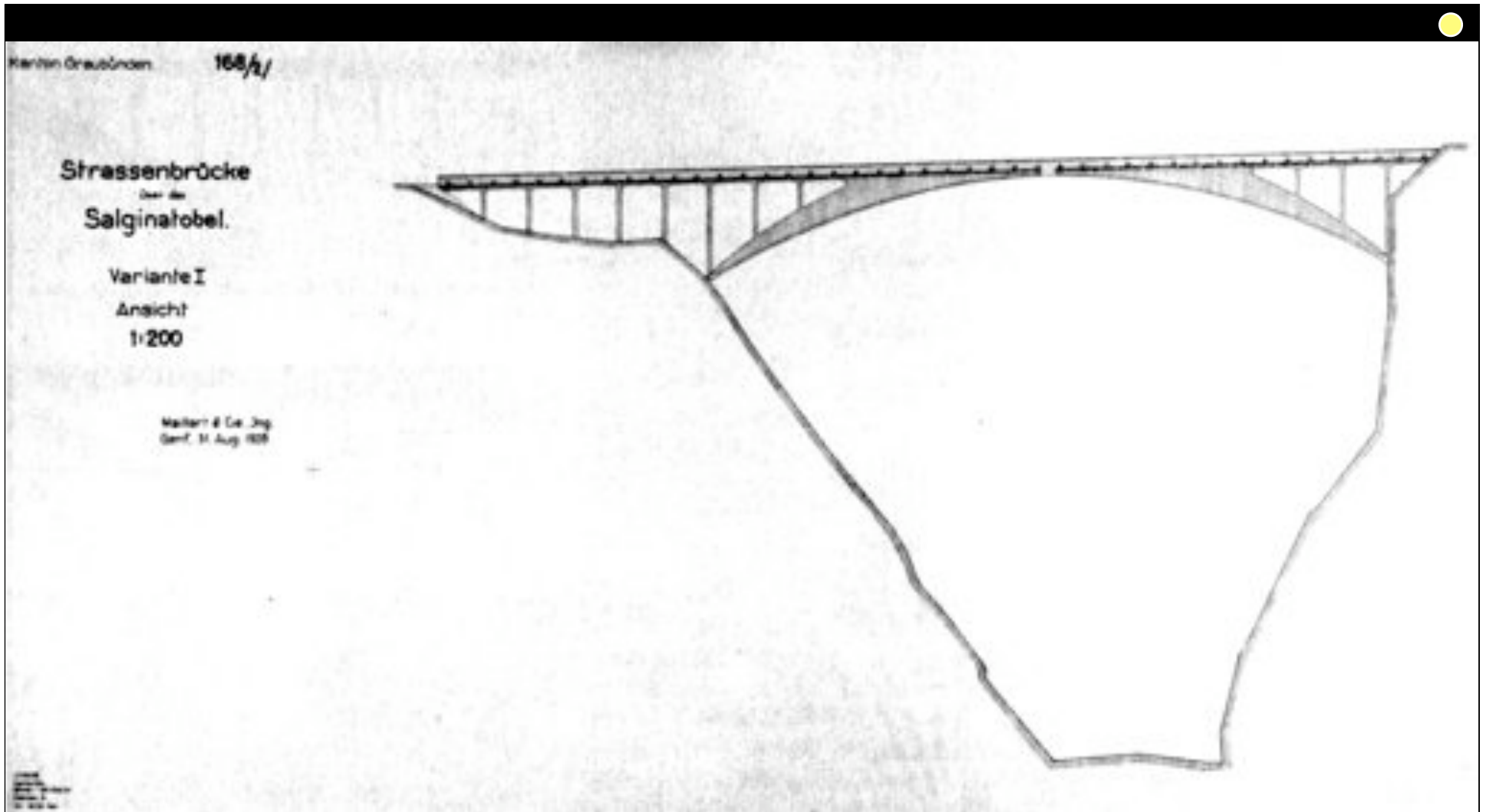












Salginatobel Bridge (1930)

90 m span









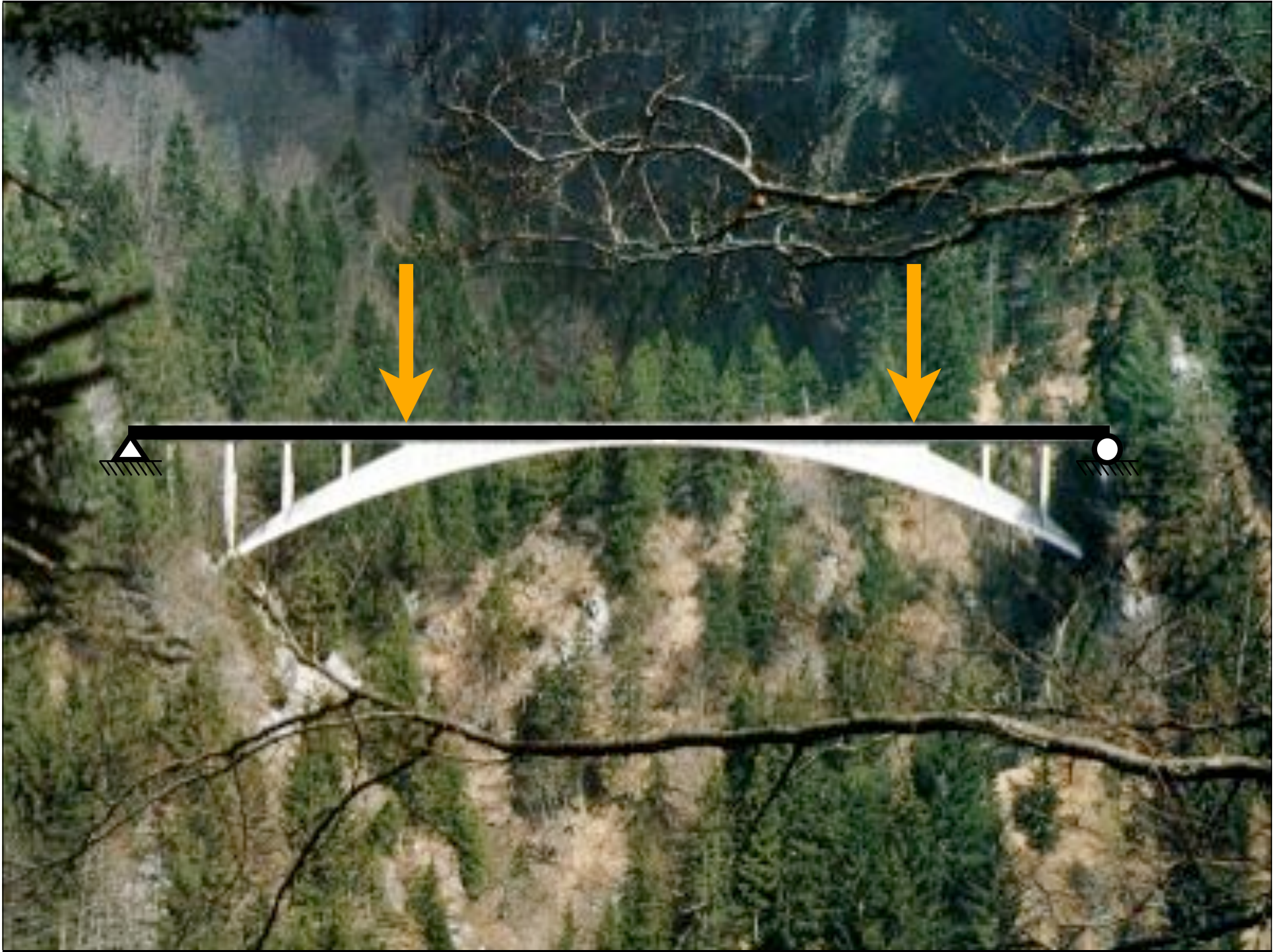








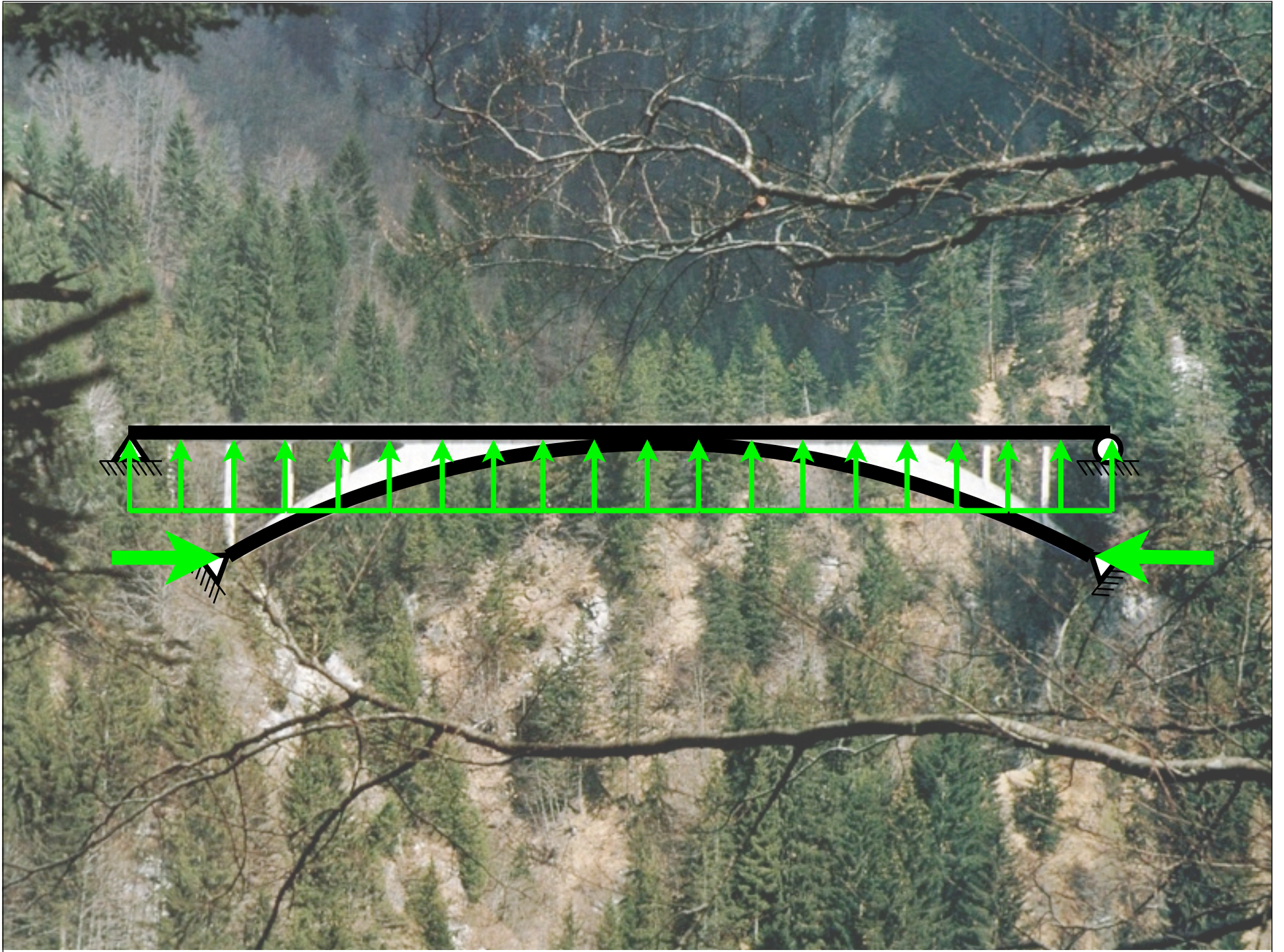


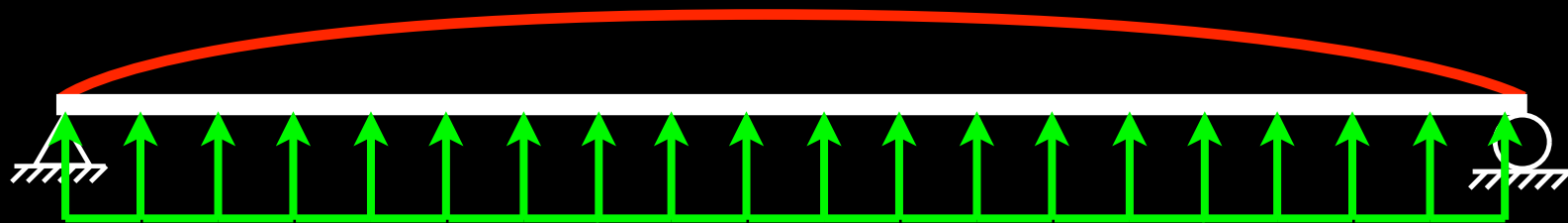




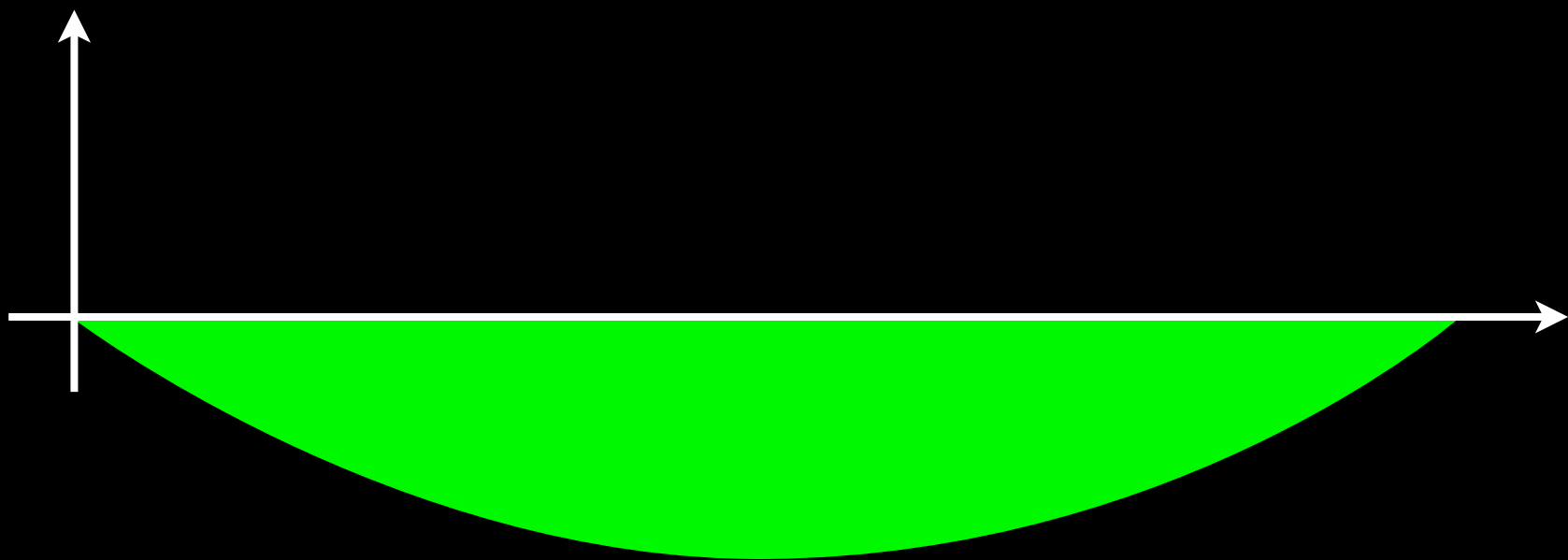
moment

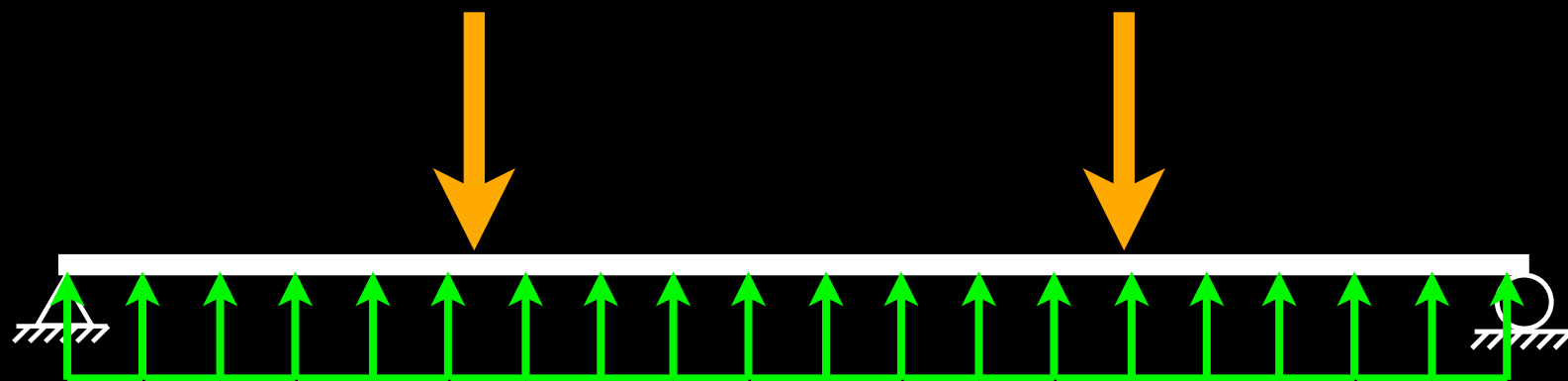




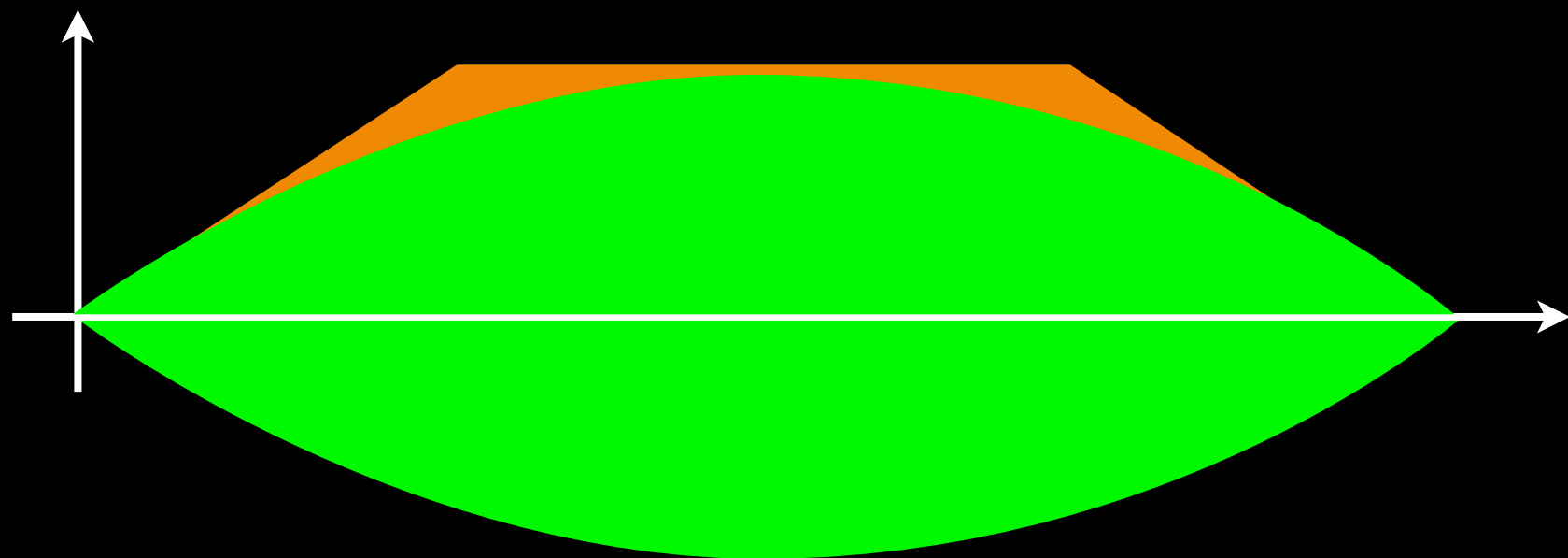


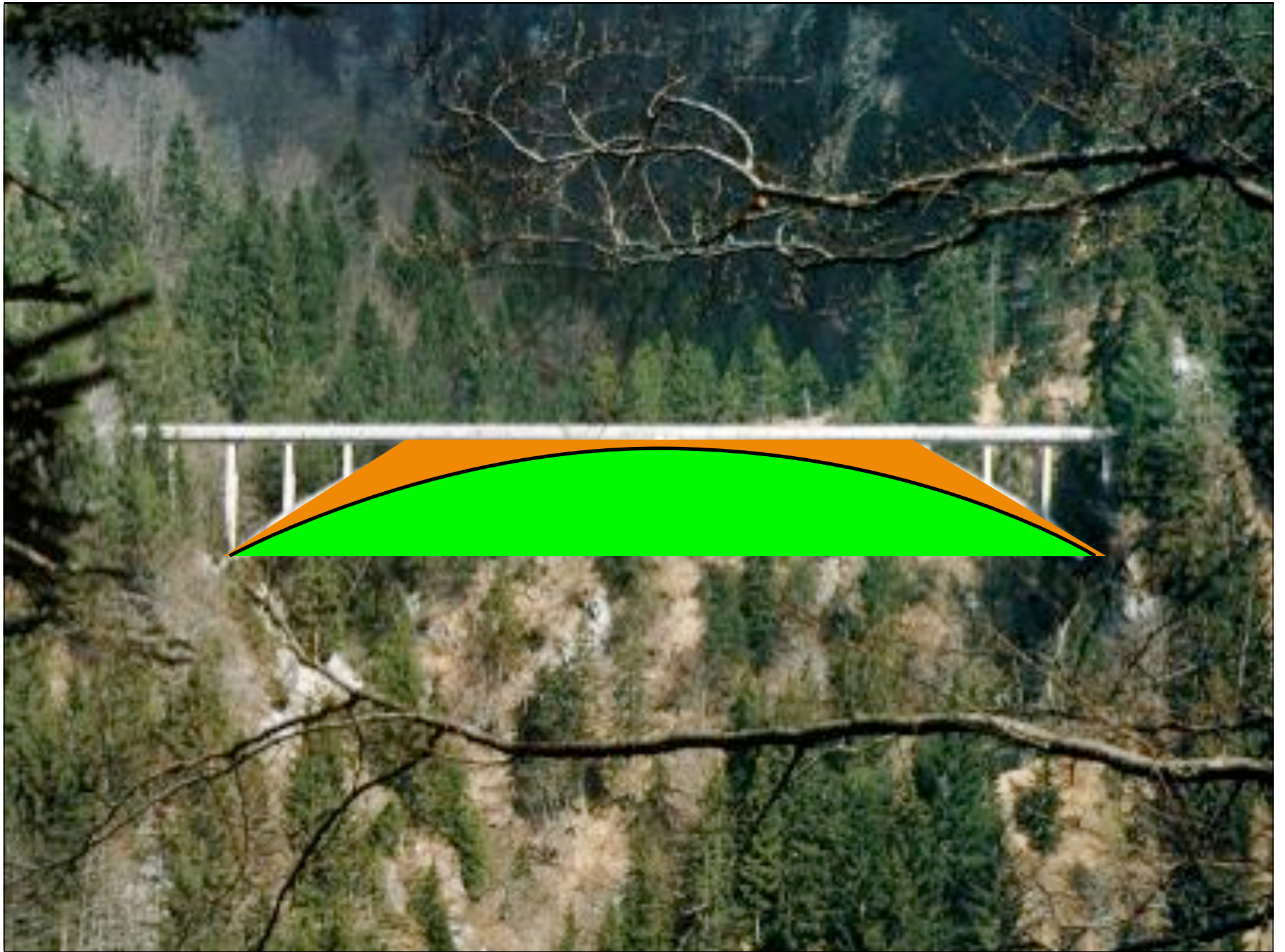
moment

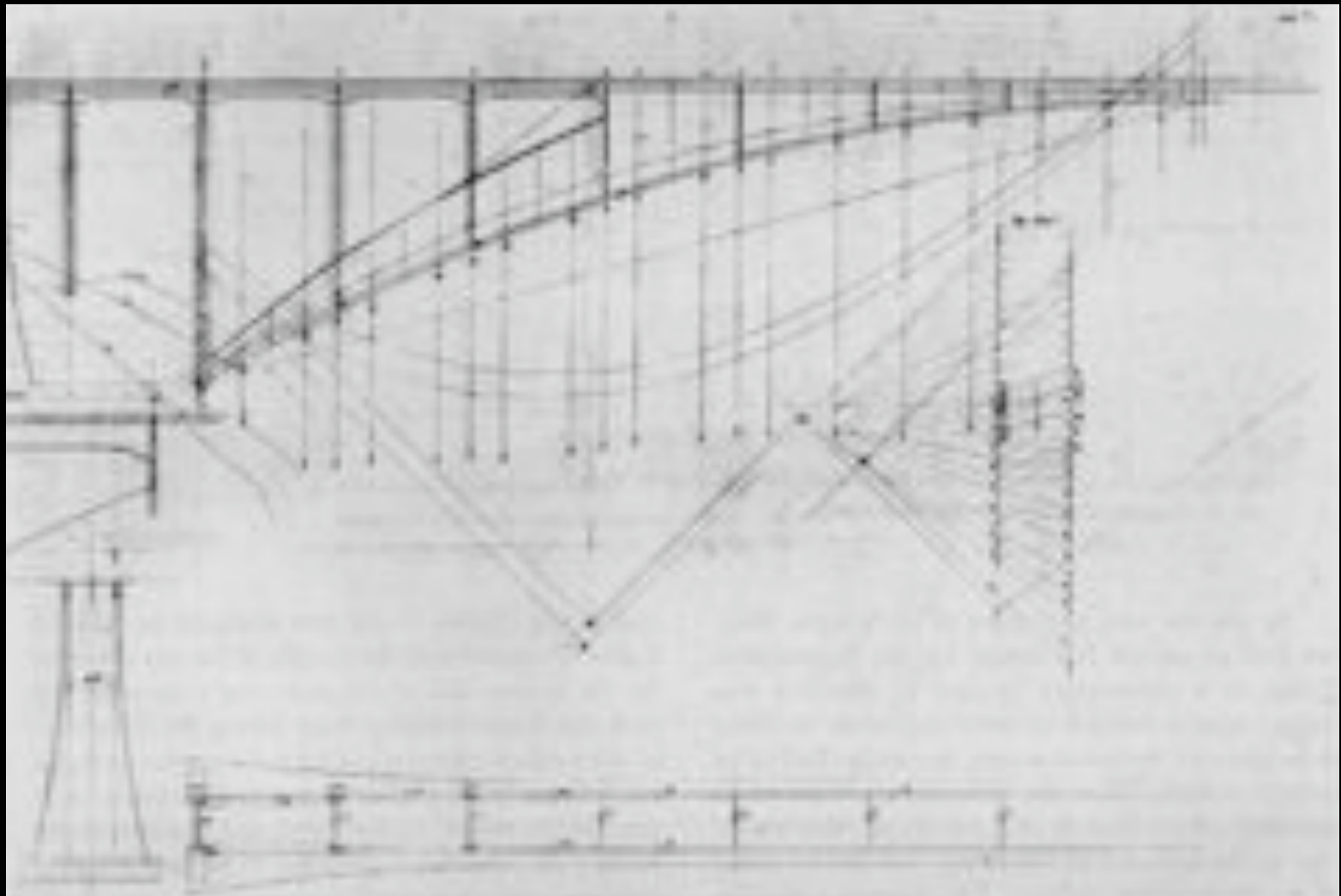




moment

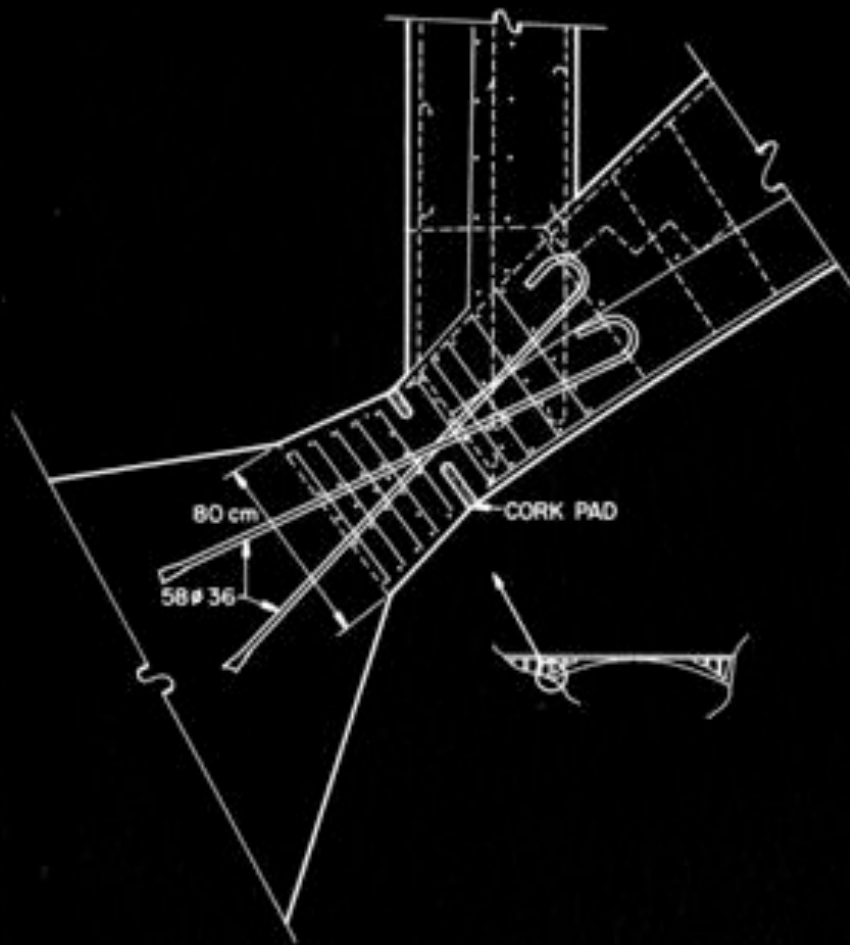


















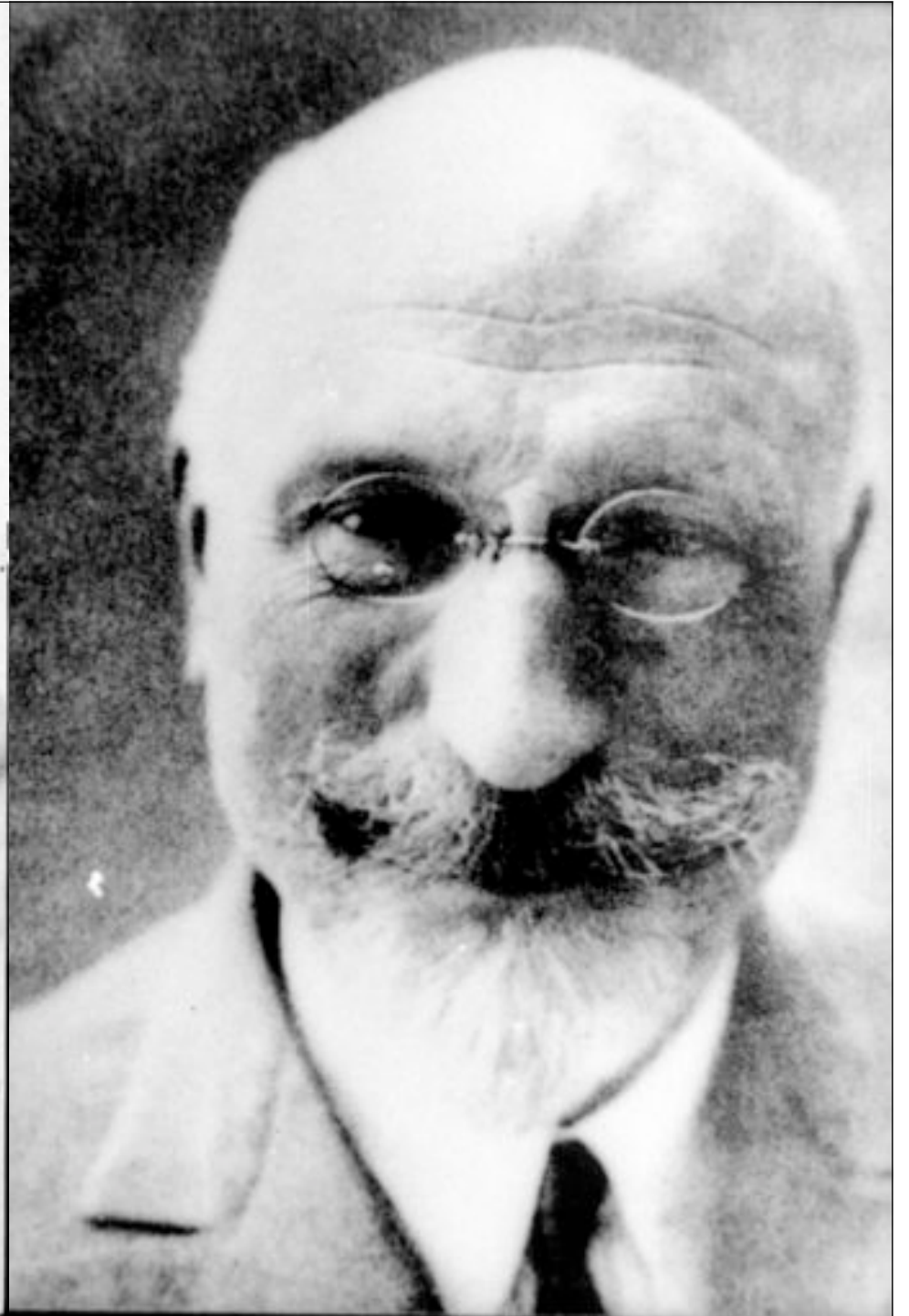




Salginatobel Bridge (1930)

90 m span





Perspectives on the Evolution of Structures

Writing Discussion Section

From Katherine Acton a former TA and
grader for Perspectives

Make an Argument

Make a claim then support it with facts

Facts alone do not make an argument

A claim alone does not make an argument

Clearly State Your Argument in Your Opening Paragraph

Bad Opening Statement:

“The bridge was built in 1965, and cost \$2mil. Recent renovations cost an additional \$1mil.”

Good Opening Statement:

“The bridge is efficient, elegant, and economically beneficial to the city.”

Proceed to support your claim with factual information in subsequent paragraphs.

3 Criteria of Evaluating the Structure

Social/Economic

Scientific/Efficient

Symbolic/Elegant

Social/Economic General Points

Consider the various ways a structure can be viewed: can you walk on it? drive on it? experience it from inside and outside?

Perhaps its social context is not the same currently as it was when it was built. How have the ways in which the structure is used changed?

What is the expense of the structure?

Social/Economic: Cost

Do not state a *cost* without giving a context for the *expense*.

Inflation changes the meaning of money.

Cost is also location dependent.

Simply stating a cost says nothing about whether the structure is expensive or not.

The best way to get an idea of the expense of a structure is to compare it with the cost of similar structures.

Science/Efficiency: General Points

Does your structure have a “type”? (for example, a suspension bridge, cable stayed bridge, column, arch, buttressed)

How does this type of structure, and your specific structure, react to loads?

Efficiency in terms of material usage

Efficiency in terms of structural design

Science and Efficiency: Structure vs. Construction

Construction is not the focus of this paper.

Innovations in construction may reduce cost, but they don't make the structure itself more efficient.

Do not focus on issues such as method and duration of construction.

Science/Efficiency: Construction Materials

Make an argument about whether your structure is efficient or inefficient in the amount of materials used.

Like cost, quantity of materials should not be given as a stand-alone fact.

Instead, give a context. For example, your structure used X tons of steel, compared with Y tons used by a similar structure.

Are new material innovations used to reduce amount of material needed?

Science/Efficiency: Design

Design will often dictate efficiency in terms of materials.

If (a lot/not a lot) of materials are used, what factors in the design led to the necessity of using (more/less) materials.

Are the materials appropriate for the design?

Symbolic/Elegance

Is the structural form and forces readable?

Is the structure an emblem of its locale?

Is it a landmark?

Is it a symbol of a war? Is it named after a person?

What about the structure lends itself to being an emblem/landmark/symbol?

Do you think the structure is elegant or unappealing? Why?

The Distinction Between Social and Symbolic

Social: How is the structure *used*?

Symbolic: How is the structure *thought of*?

Make a Comparison

Comparing your structure to another structure will often give a needed context.

Comparison can help you decide if the structure is efficient structurally/ economically based on the performance of another, similar structure.

Formal Writing Style

Do not use contractions

Do not use colloquial expressions

Do write in the 3rd person (avoid “I,” “me,” “you”)

Do NOT Plagiarize

Do not use direct language without direct quotes.

Be sure to cite all of your sources.

We will be checking for this.