



Influence Line for Reaction , Moment & Shear for  
Indeterminate Structure

# Influence Lines

---

---

Variation of

*Reaction, Shear, Moment or  
Deflection*

at a SPECIFIC POINT

due to a **concentrated** force **moving** on  
member

# Influence Lines

---

---

## SIGNIFICANCE

- Influence lines are important in the design of structures that resist **large live loads**.
- If a structure is subjected to a live or moving load, **the variation in shear and moment** is best described using influence lines.
- Once the influence line is drawn, **the location of the live load which will cause the greatest influence** on the structure can be found very quickly

# Influence Lines

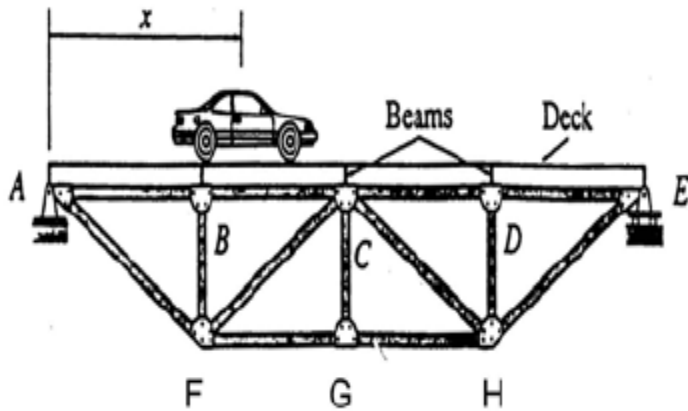


Figure 1. Bridge Truss Structure  
Subjected to a Variable  
Position Load

- As the car moves across the bridge, the forces in the truss members change with the position of the car and the maximum force in each member will be at a different car location.
- The design of each member must be based on the maximum probable load each member will experience
- If a structure is to be safely designed, members must be proportioned such that the maximum force produced by dead and live loads is less than the available section capacity.

# Influence Lines

---

---

Structural analysis for variable loads consists of two steps:

**Response Function** = support reaction, axial force, shear force, or bending moment.

1. Determining the positions of the loads at which the response function is maximum;

**AND**

2. Computing the maximum value of the response function.

# Influence Lines

---

---

## INFLUENCE LINE VS SFD/BMD

- shear and moment diagrams represent the effect of fixed loads at all points along the member.
  
- Influence lines represent the effect of a moving load only at a specified point on a member

# Influence Lines

---

---

## TYPES OF INFLUENCE LINES

- Reaction I.L.**
- Shear I.L.**
- Moment I.L.**
- Floor Girder I.L.**
- Truss Bar force I.L.**

# Influence Lines

---

---

## Structure type

- Determinate
- Indeterminate

## Influence lines

- For Determinate Structure**
- For Indeterminate Structure**



# Influence Lines

---

---

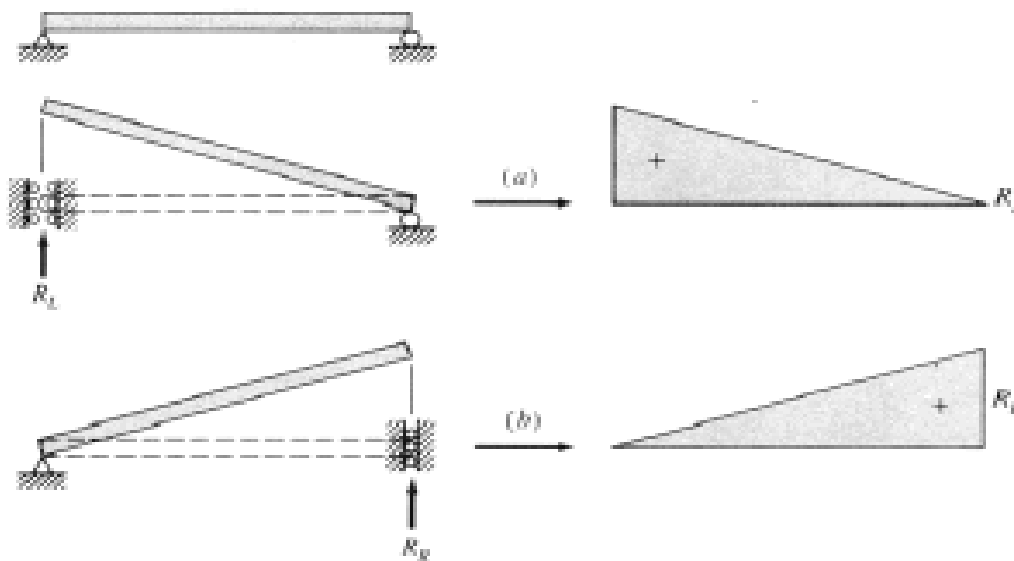
## Methods of constructing the shape of Influence Lines

- Tabulation Method.**
- Muller –Breslau principles.**

# Influence Lines

## Muller-Breslau Principle

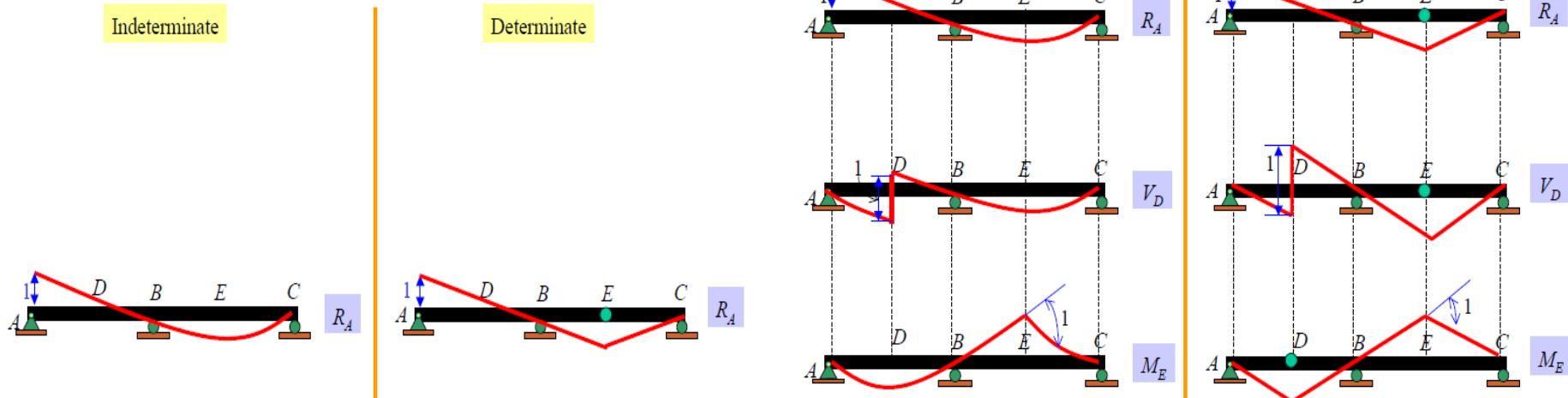
- Müller-Breslau Principle: "If a function at a point on a beam, such as reaction, or shear, or moment, is allowed to act without restraint, the deflected shape of the beam, to some scale, represent the influence line of the function".



# Influence Lines

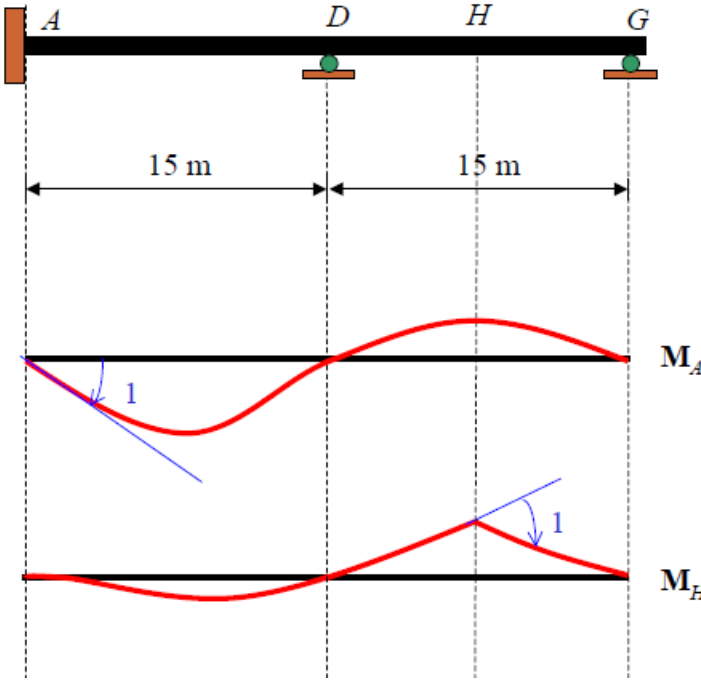
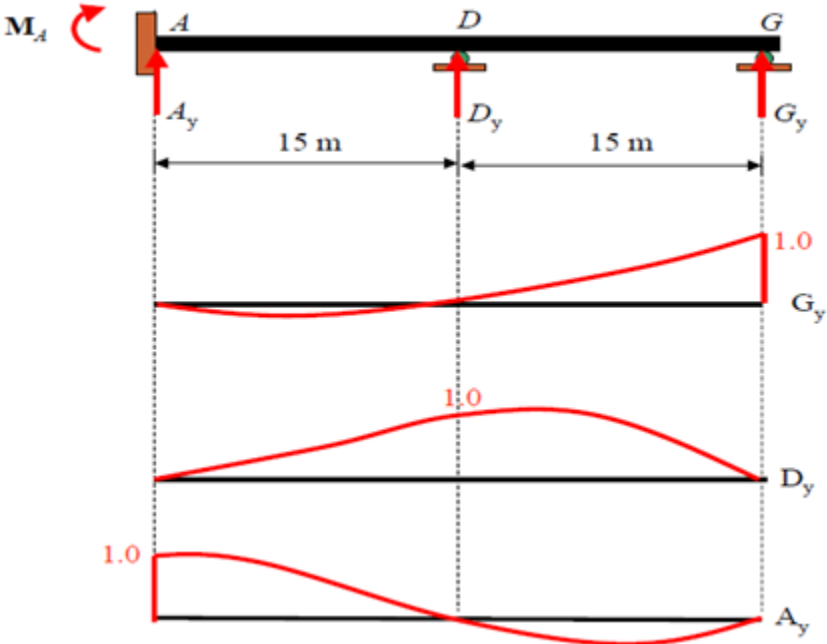
## Indeterminate VS Determinate

### Comparison between Indeterminate and Determinate



- Influence lines for statically determinate structures are always piecewise linear.
- For indeterminate structures, the influence line is not straight lines!

# Influence Lines



# Influence Lines

