

Reciprocal Frames
Training at the Tishk International University in Erbil

Presenter:

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Abstract and Objectives:

The name “reciprocal frame” comes from Graham Brown, who developed this type of structure and used the term “reciprocal” because of the way the beams mutually support each other.

A reciprocal frame is a three-dimensional structure with complex geometry, consisting of linear straight members which are mutually supported and interlocking, forming either a flat, horizontal structure or a pitched three-dimensional frame system.

Reciprocal frames and structures like them have been built by many cultures throughout history. Villard de Honnecourt provides us with information on how to deal with the problem of beams shorter than the span, but he gives no information on the spans. His solution to this problem was a planar grillage that adopts principles like the reciprocal frames, for spanning long distances with shorter beams.

Generally, it is always useful to begin with physical models, because it is the best way to understand the complexity of the design with all implied parameters. Here we try to present some of the opportunities the reciprocal frame offers, however, like any structural form, the reciprocal frame structure has its limitations too.

On the figure shows nine different morphology forms of classical self-supporting structures (reciprocal frames). All these physical models are made of one type of rectangular wooden beam with a length of 30 cm. Traditionally, reciprocal frames were used as roofs, but we can also consider them art due to their beauty.

Training Outcomes:

Following the completion of this training, the participant can:

- Understand the basic theory about traditional (form follows function) and non-traditional (form follows force) lightweight design.
- Create physical models of reciprocal frames and grid elastic shells for public spaces, pleasure, and relaxation.
- Design virtual and subsequently construct real models (simply of wood) in a creative way by physically searching for a form.
- Use modern geometry in the creation of the public spaces design process: from innovative form-finding to the final industrial fabrication.