



## Thematic Session

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### TS8. Form with no formwork (vault construction with reduced formwork)

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Studies on masonry vault building are often grouped according to materials, trades, or historical periods. This session, however, aims to focus on a transversal issue, the assembling process itself, by bringing together ongoing research on the relationship between form and need for formwork. The purpose is to bring to a common venue studies on formwork reduction in vault construction as a consequence of decisions concerning the form, whether it be the general design, the arrangement or bonding or the particular shape of the pieces, as well as the formal control procedures required when there is no supporting centering.

Throughout the history of construction, different materials and arrangements have been used to reduce formwork in vault construction. Since at least the 13th century B.C., in Mycenae, we know of examples of "false vaults" by successive horizontal projections that do not need formwork thanks to their horizontal bed arrangement. Nubian adobe vaults and later brick vaults by slices in Byzantium did not need formwork due to the use of ingenious arrangements, and we know that they have been used until the 20th century in Spain and that this tradition is still alive today in Iran and especially in Mexico. Choisy focused for the first time on the constructive advantages and reduction of formwork of Byzantine vaults; in addition, he proposed that the internal brick ribs in Roman concrete vaults had the main function of lightening the formwork.

The material is also key in the absence of formwork in tile vaults construction, with a first layer laid with plaster, or in the support systems using precast plaster plates as light formwork for masonry vaults construction, which could have been already used in the early days of the Sassanid Empire. Almagro has documented its use in the 8th century during the Islamic rule of North Africa and the Middle East. Gothic and Renaissance springings, built by horizontal beds, do not need formwork either. Likewise, the Gothic web may not require supporting formwork if it is made of unique stone pieces





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within a dense rib network, or if it is made of tile vaults or bricks disposed in concentric courses, or slices.

This session therefore aims to focus on the general form, that of the bonding or that of the pieces, whether in stone, brick, adobe or mortar vaults, from the point of view of their impact on the assembling process, especially the possible formwork reduction or suppression and the necessary formal control.

