Sustainable Urban Rehabilitation in Europe

Heritage Problems. Causes. Solutions

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Sustainable Urban Rehabilitation in Europe

3rd Semester

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Heritage Problems. Causes. Solutions

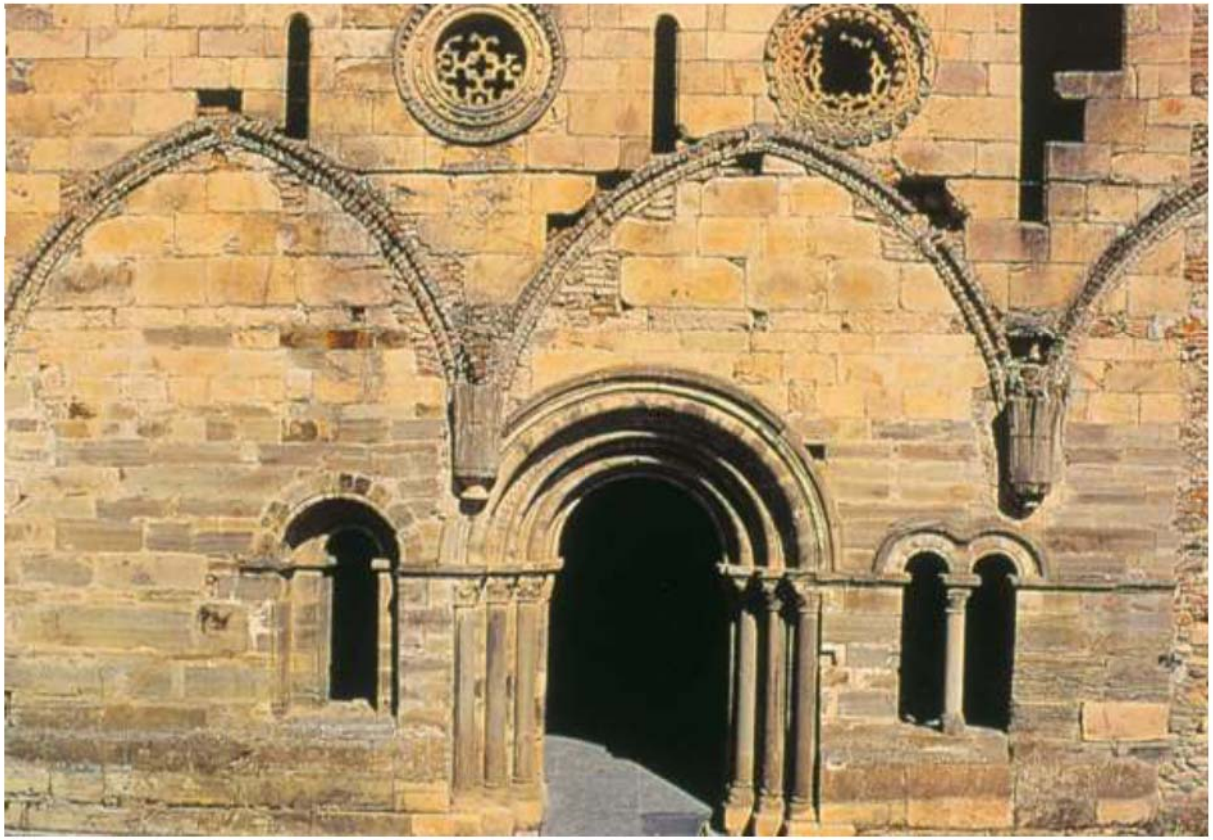
3 ECTS

SH

Sustainable Heritage

EC

Elective Courses



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SURE
SUSTAINABLE URBAN REHABILITATION IN EUROPE

UNIVERSIDAD POLITÉCNICA DE MADRID

1. INTRODUCTION
2. FOUNDATIONS: DAMAGES
3. FOUNDATIONS: REPAIR SOLUTIONS
4. WALLS: CONSTRUCTIVE SYSTEM
5. WALLS II: PROBLEMS AND CAUSES
6. WALLS III: SOLUTIONS
7. VAULTS: CONSTRUCTIVE SYSTEM
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10. **FLOORS**
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13. ROOFS II: SOLUTIONS
14. OTHER TRADITIONAL STRUCTURES
15. SURFACE FINISHES, INTERIOR WOODWORK

CURRICULAR CONTENTS

HERITAGE PROBLEMS. CAUSES. SOLUTIONS

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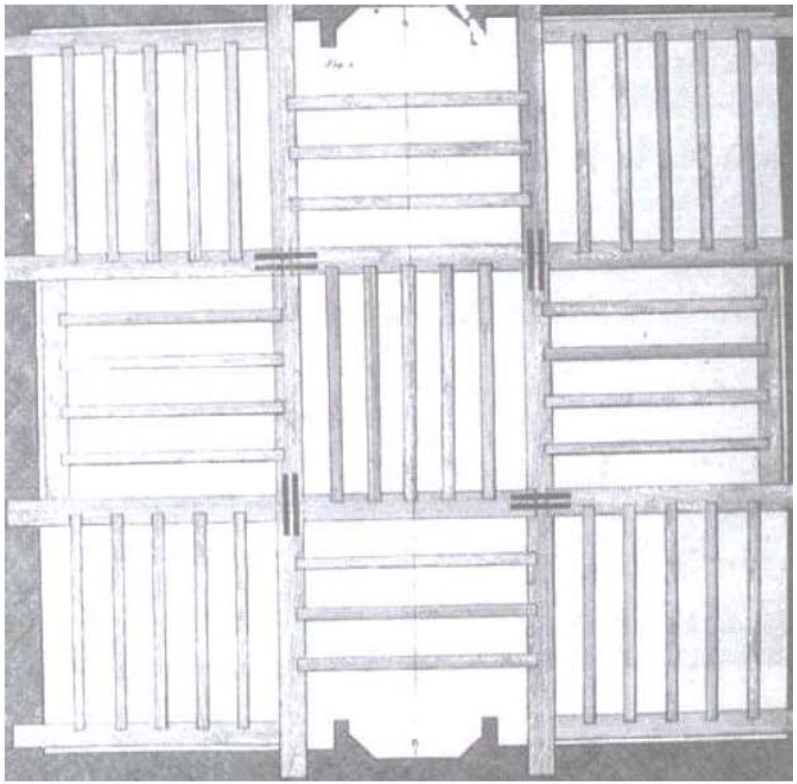
Heritage Problems. Causes. Solutions

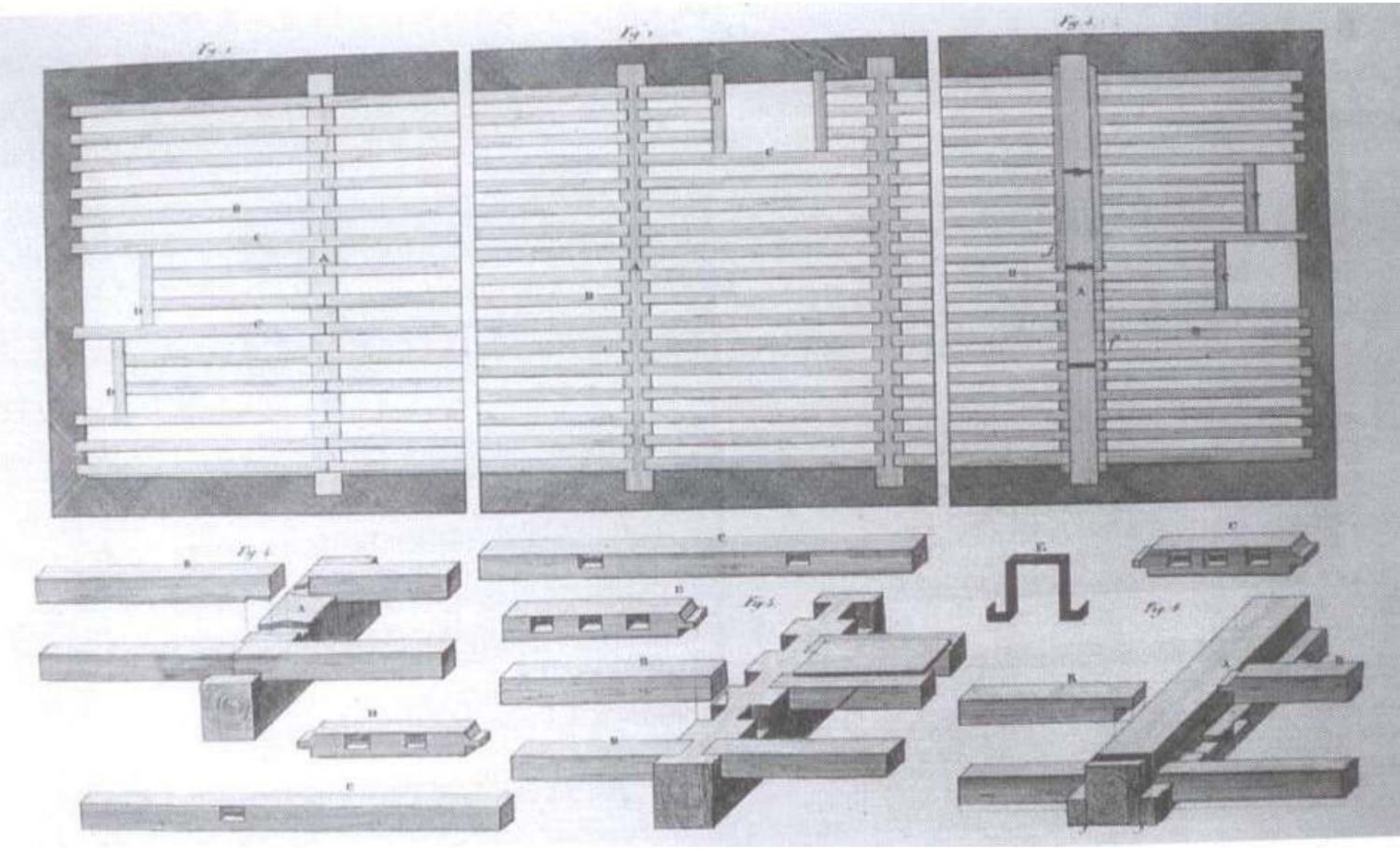
3 ECTS



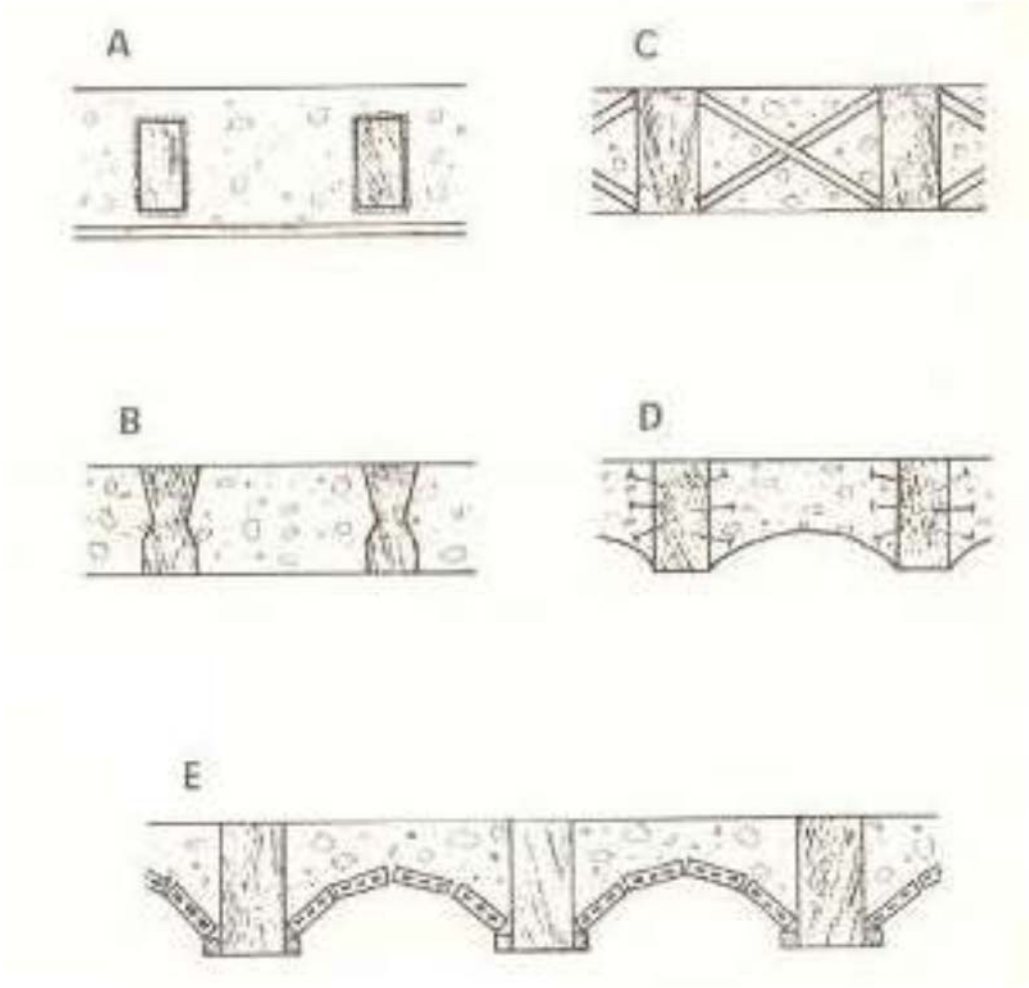
10 FLOORS

10 FLOORS

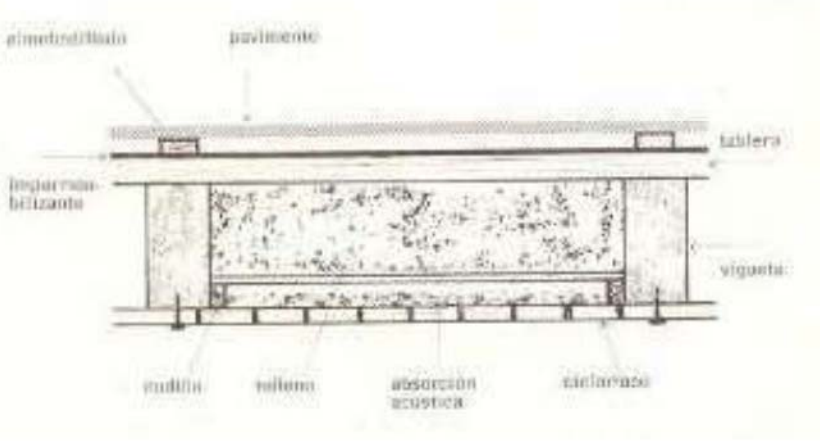
CONSTRUCTIVE SYSTEM



WOODEN FLOORS

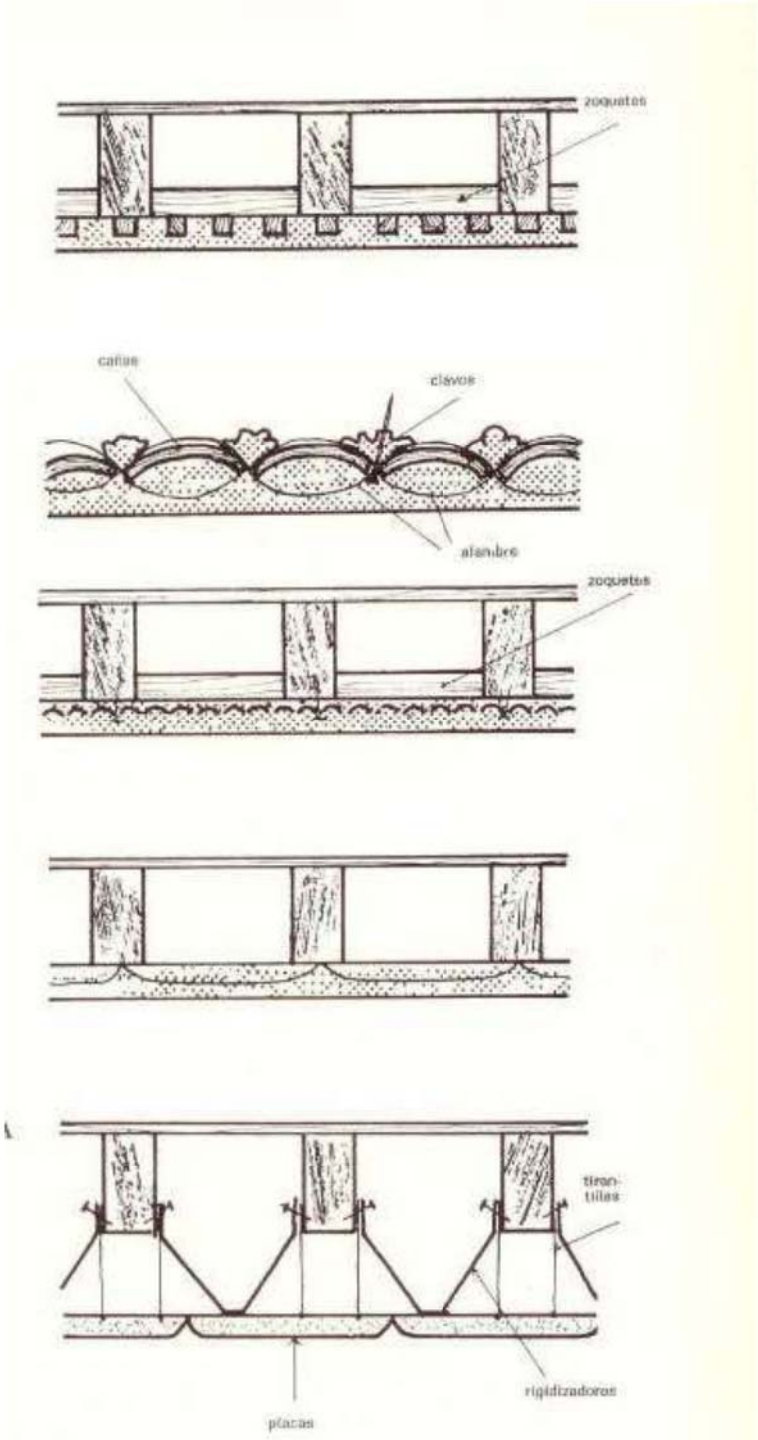


BEAM FILLING

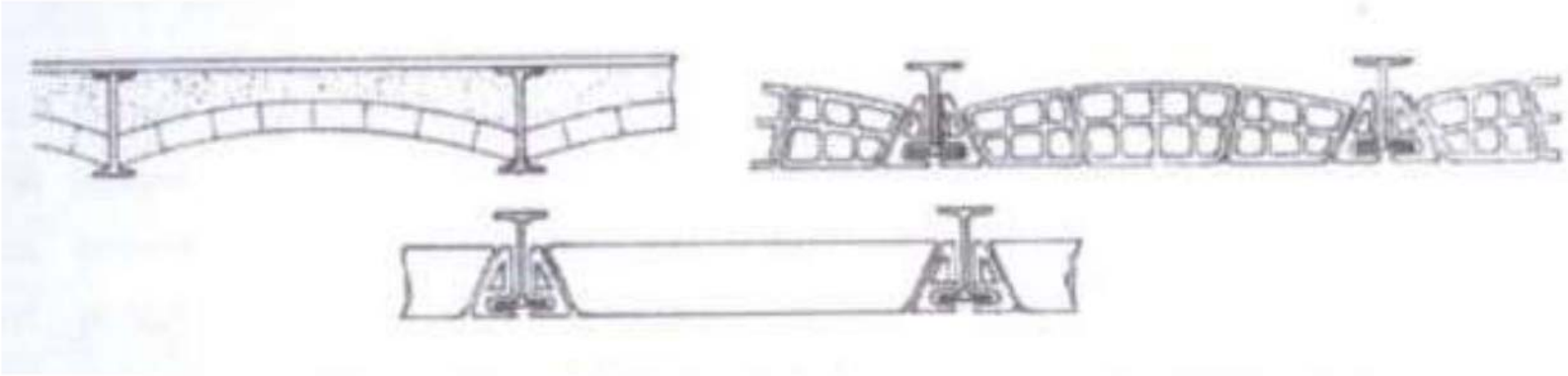


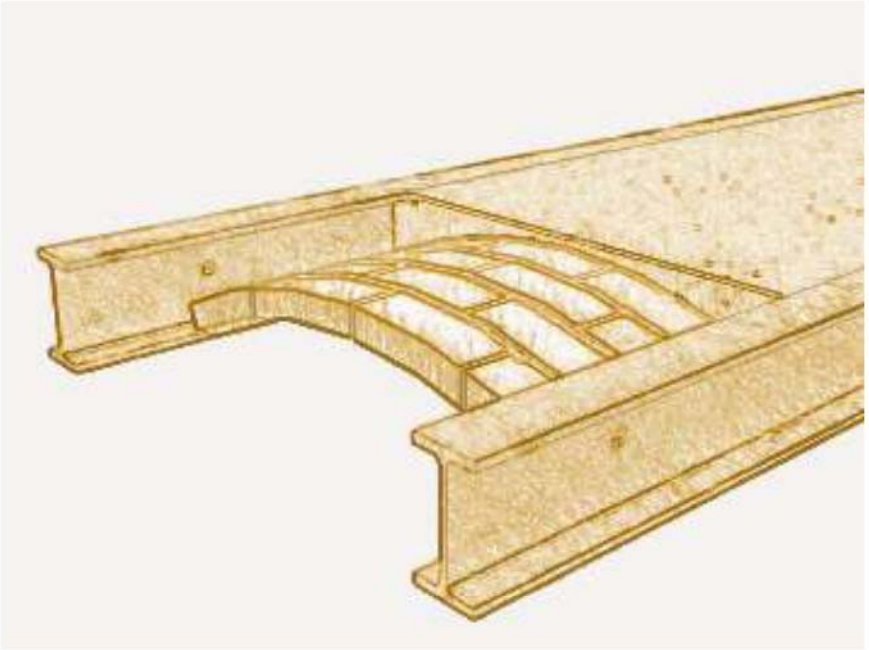
BEAM FILLING WITH LAYERS OF DIFFERENTIATED FUNCTION

WOODEN FLOORS



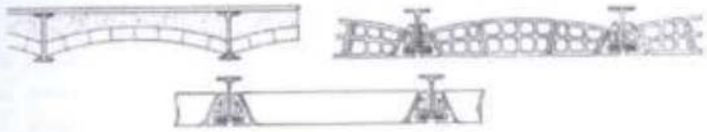
CEILING
WOODEN FLOORS





STEEL BEAMS

SOLAI IN FERRO



PROGETTI: Travetti a I distanti da centro a centro 0,70 ÷ 1m Impostamento nel muro 0,25 ÷ 0,30m. La seguente tabella da le portate e le distanze a cui sono applicabili per R → 10 Kg per mm² : travetti a I di 8.10.12.14.16.18.20. 22cm di altezza nella tabella

TABELLA PER LE DIMENSIONI DEI TRAVI A DOPPIO I PER VARIE PORTATE

PORTATA	INTERASSI DISTANZE DA CENTRO A CENTRO DEI TRAVETTI A I PER UN CARICO TOTALE AL M² DI Kg							
	300		400		500		600	
	MIN	MAX	MIN.	MAX	MIN.	MAX	MIN	MAX
m	m	m	m	m	m	m	m	m
2,50	0,05	0,60	0,10	0,95	0,18	0,97	0,12	0,81
3	0,10	0,66	0,12	0,85	0,14	1,13	0,12	0,96
3,50	0,12	0,85	0,14	1,00	0,14	0,88	0,16	0,98
4	0,14	1,05	0,14	0,84	0,16	0,89	0,18	1,04
4,50	0,14	0,82	0,16	0,88	0,18	0,96	0,18	0,80
5	0,16	0,90	0,16	0,97	0,18	0,78	0,20	0,79
5,50	0,18	1,07	0,18	0,80	0,20	0,78	0,22	0,81
6	0,18	0,90	0,20	0,83	0,22	0,81	0,22	0,68
6,50	0,20	0,99	0,22	0,87	0,22	0,60	0,24	0,58
7	0,22	1,00	0,22	0,73	0,22	0,60	-	
7,50	0,22	0,87	0,24	0,63	–	–		
8	0,22	2,76	0,22	0,57	–	–		

Fig. 122 Tabelle per il dimensionamento dei solai in ferro. Tabella che riporta le altezze delle travi in rapporto alla luce da coprire, per i solai (illustrati sopra) che rappresentano le più consuete tipologie di solai con orditura metallica: a voltine, con tavelloni, con volterrane. Si notino, nelle due varianti leggere, i laterizi con copertura inferiore della putrella, che aveva il duplice scopo di proteggere l'ala della putrella in caso di incendio e di permettere l'intonacatura.
Criteri di costruzione:
Era raccomandato materiale leggero per le voltine (mattoni misti a carbone o "pietre porose" con peso specifico di circa 1200 kg/mc; mattoni forati porosi: 900 kg/mc). Si possono trovare anche pietre artificiali di cemento e sughero.
Si sono usate anche voltine in cls., gettate su centine mobili (da Milani)

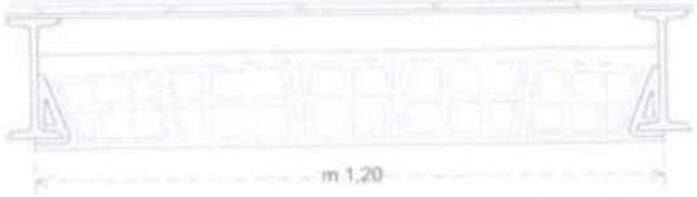
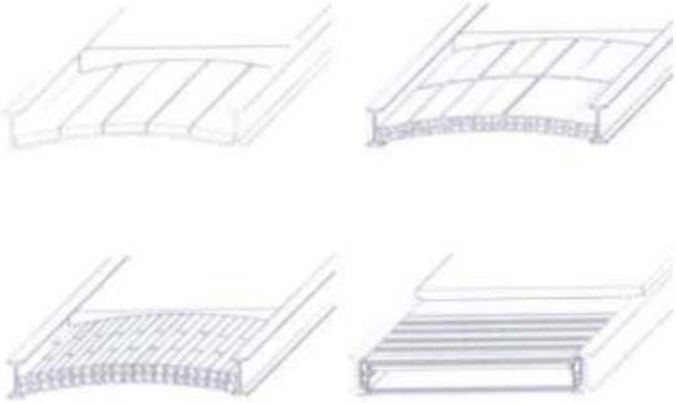


Fig. 124 Resistenza delle volterrane. La figura mostra un solaio con volterrane, cioè mattoni fora appositamente sagomati per formare un intradosso piano, poggiati su coprifferi in laterizio, ch permettevano la sicura intonacatura dell'intradosso del solaio stesso.
Combinando i diversi tipi di laterizi si potevano ottenere solai con interasse tra le travi variabile tra 90 e i 155 cm., ovviamente meno rigidi man mano che l'interasse tra le travi aumentava.
La posa in opera delle volterrane avveniva appoggiandole sopra un tavolato che poteva essere appeso alle travi e spostato man mano che la posa procedeva. Per tali strutture il carico sperimentale di rottura delle sole volticciole, da esperienze realizzate da Anselmo Ciappi, si aggira intorno ai 5030 kg/mq

Fig. 125 Solaio con tavelloni ad arco. Una variante meno comune è quella costituita da un tavello arcuato posato su coprifferi alti e sagomati, e da tavelline piane da posare più in basso sul coprifer La capacità di isolamento termico e acustico di tali strutture è eccellente, con un carico di esercizio (escluse le portanze delle travi di ferro), oscillante tra i 430 e i 450 kg/mq



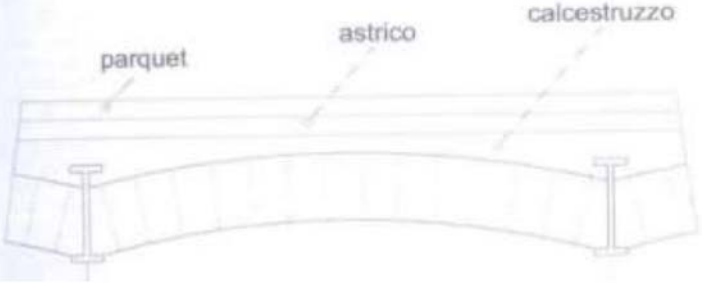


Fig. 126 Esempi di solai in ferro (1946). Compendio dei solai in ferro tratto dall'edizione 1946

STEEL BEAMS

Fig. 43 Solaio con soletta parzialmente laterizia e pignatte a cassone

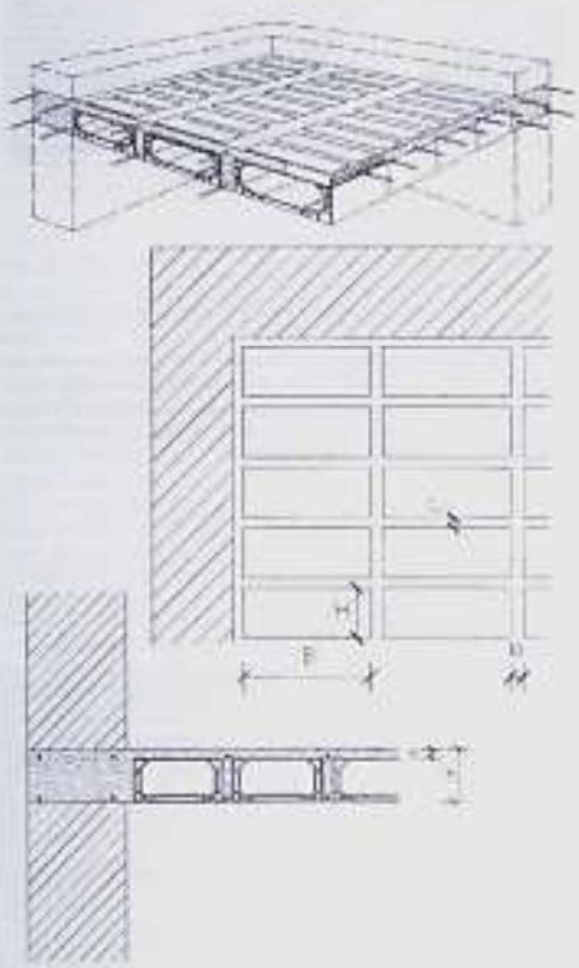


Fig. 44 Solaio con travetti prefabbricati a traliccio

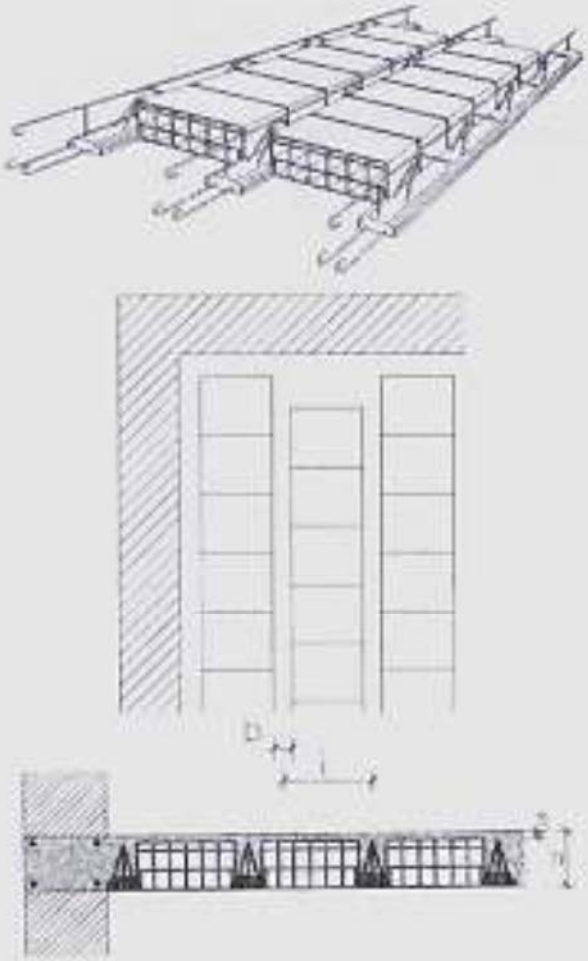
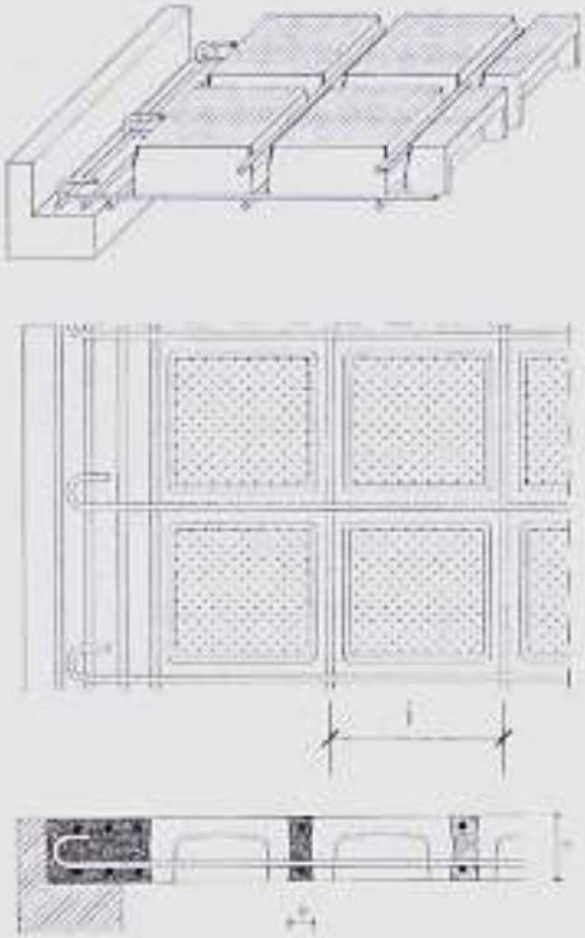
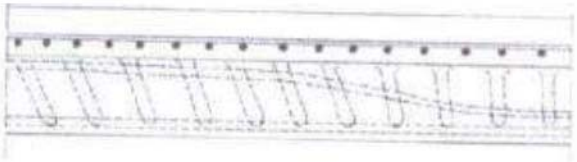
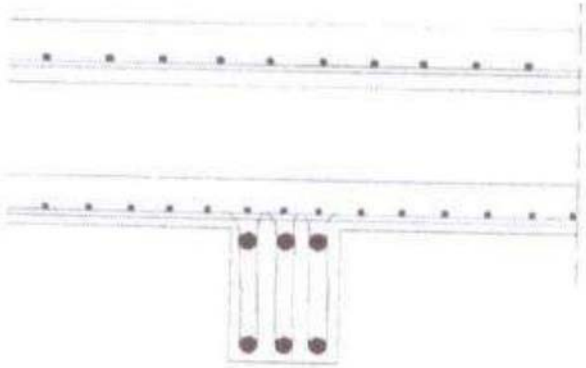


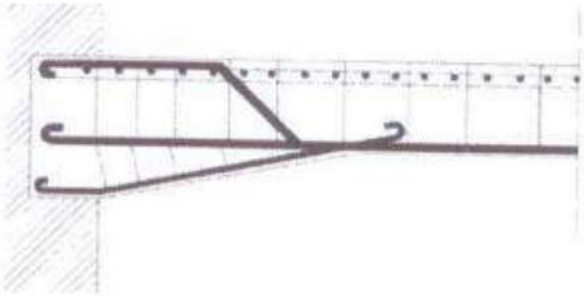
Fig. 45 Solaio con travetti incrociati a voltoncinento



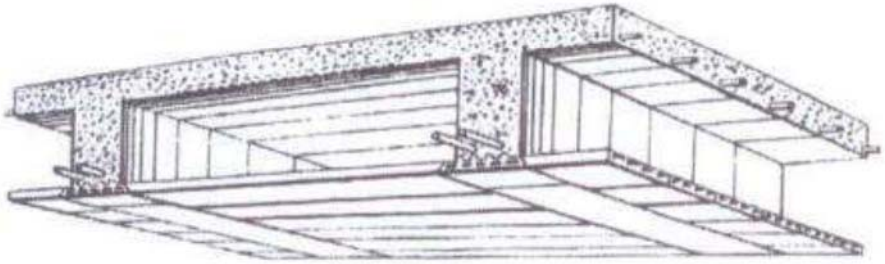
REINFORCED CONCRETE FLOORS



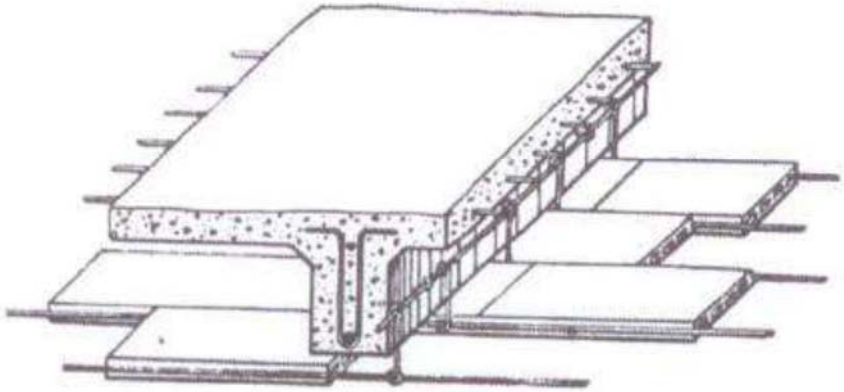




Per evitare la vista delle nervature e migliorare l'isolamento acustico venenro sovente realizzate soffittature che coprivano l'intradosso al fine di renderlo completamente piano e relativamente insonorizzato. Un esempio sono i controsoffitti tipo "Frazzi", con tavelloni di laterizio ad incastro, e tipo "Perret", con tavelle armate: erano a tutti gli effetti opere di completamento della struttura di solaio.



"Frazzi" ceiling



"Perret" ceiling

CEILING

REINFORCED CONCRETE FLOORS

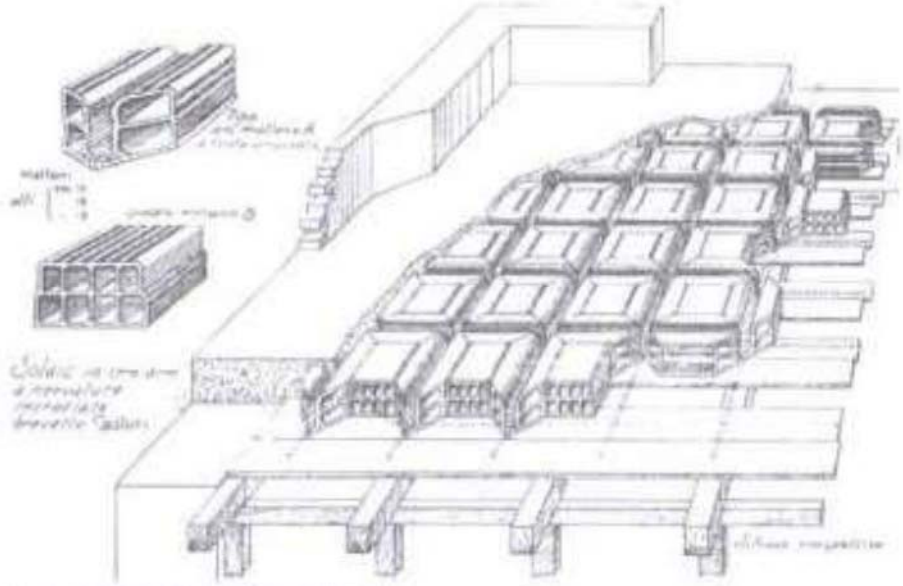


Fig. 30 Solaio tipo "Castolit" (da Breymann)

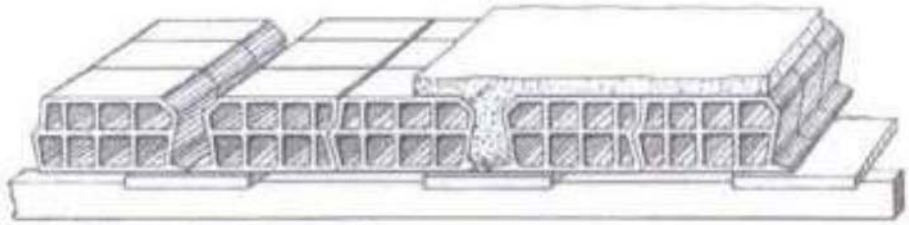


Fig. 31 Solaio tipo "Villa" (da Breymann)

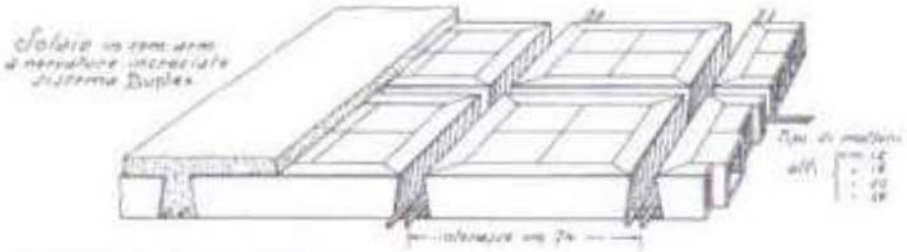


Fig. 32 Solaio tipo "Duplex" (da Breymann)

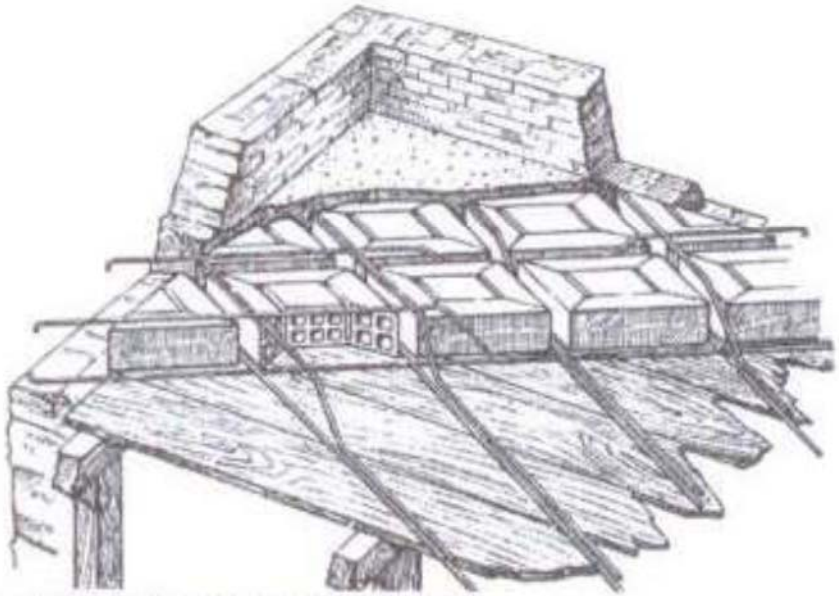
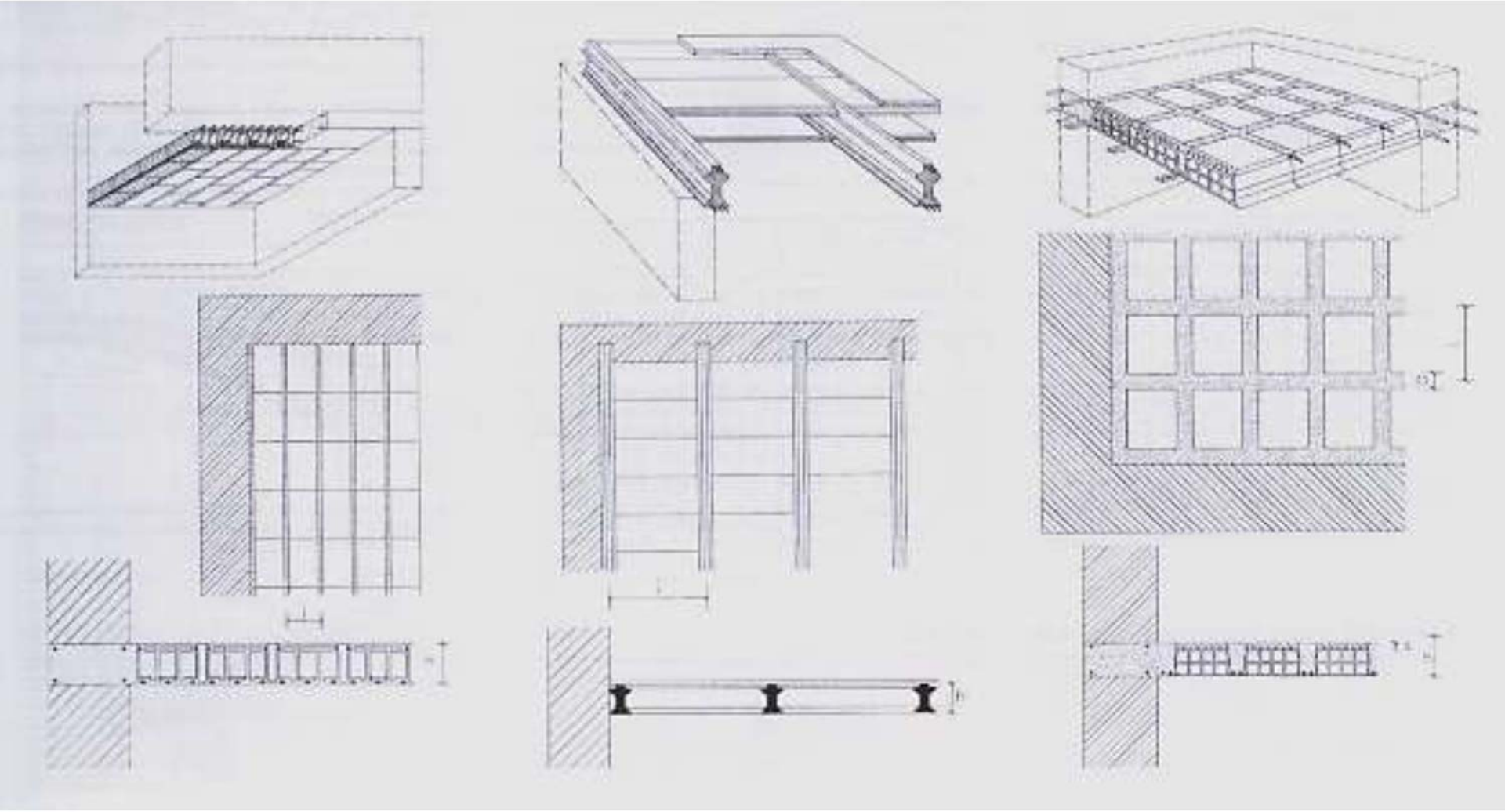
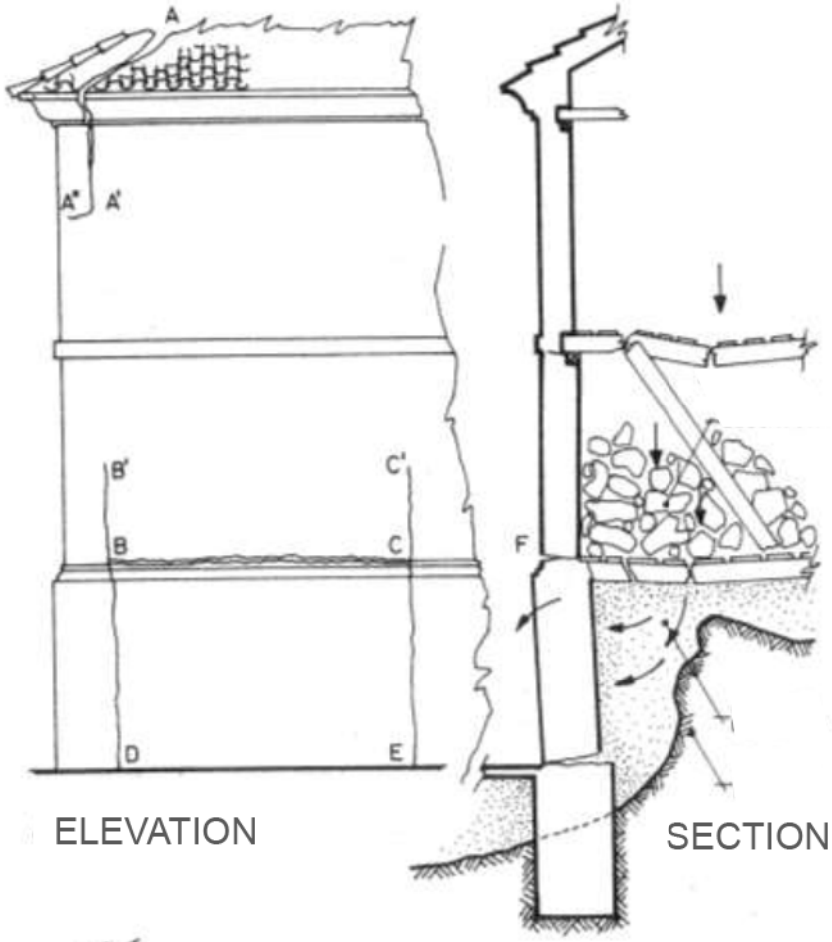


Fig. 33 Solaio tipo "Diagonal-Cavallazzi" (da Breymann)

STRUCTURAL HOLLOW CLAY BLOCK
REINFORCED CONCRETE FLOORS



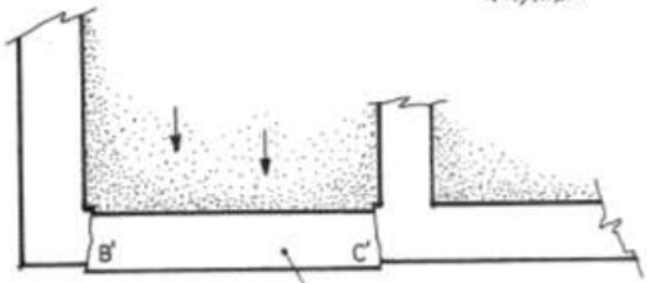
OTHER TYPES OF FLOORS



ELEVATION

SECTION

wall is uniformly pushed and displaced with vertical shear cracks



PLAN

DISPLACEMENT

10 FLOORS

CAUSES

INTERNAL MOVEMENTS

FOUNDATION AND GROUND DAMAGES

CONSOLIDATION OF FLOORS

- SHORTEN DISTANCE FROM A BEAM
- SHEAR CONNECTORS
- OVERLAY:
    - REINFORCEMENT
    - SUSPENDED STRUCTURE
- ANCHORING

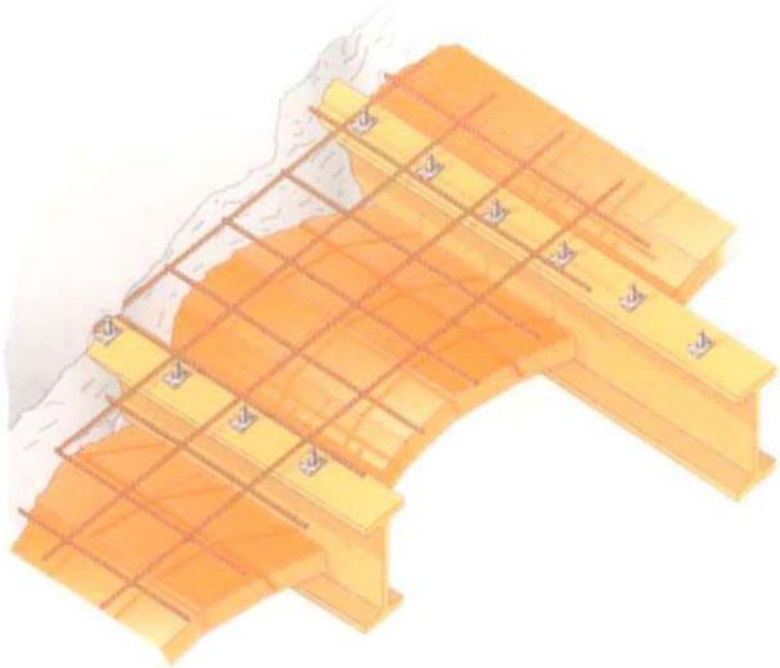
10 FLOORS

SOLUTIONS

SHORTEN DISTANCE FROM A BEAM

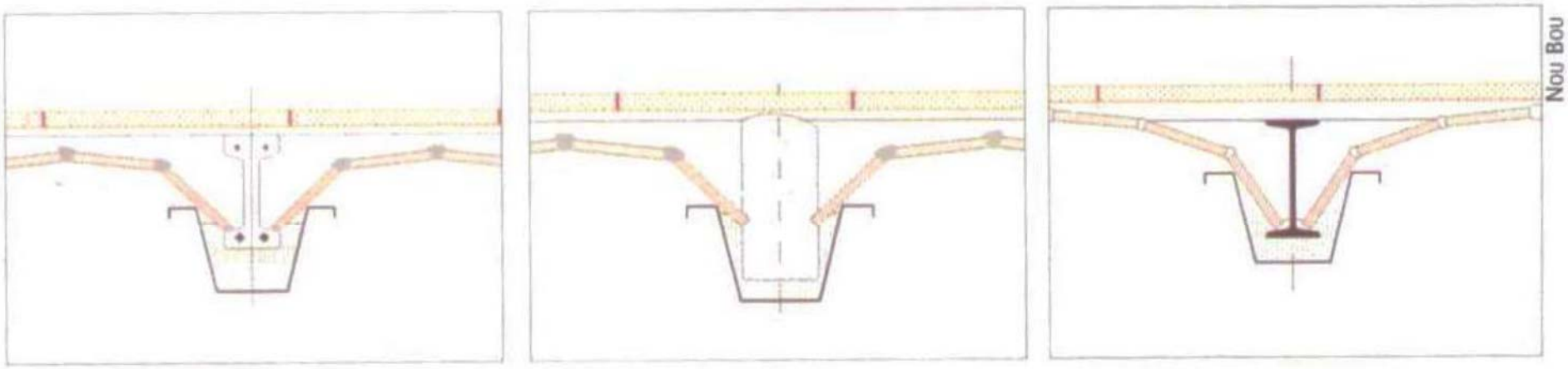
WOODEN BEAMS

SHEAR CONNECTORS



STEEL BEAMS

SHEAR CONNECTORS



REINFORCEMENT

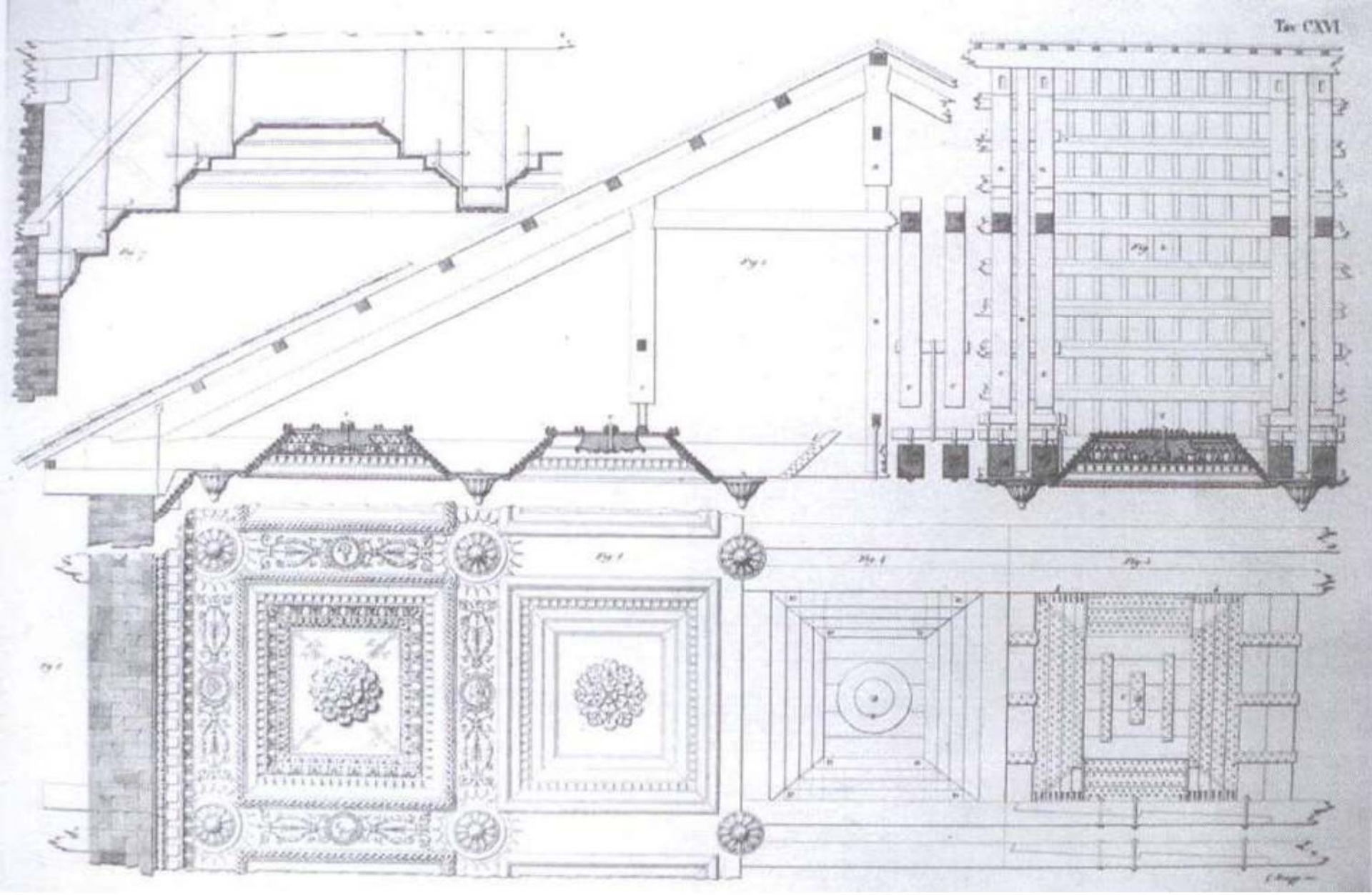
OVERLAY

REINFORCEMENT. STEEL AUXILIARY STRUCTURE

OVERLAY

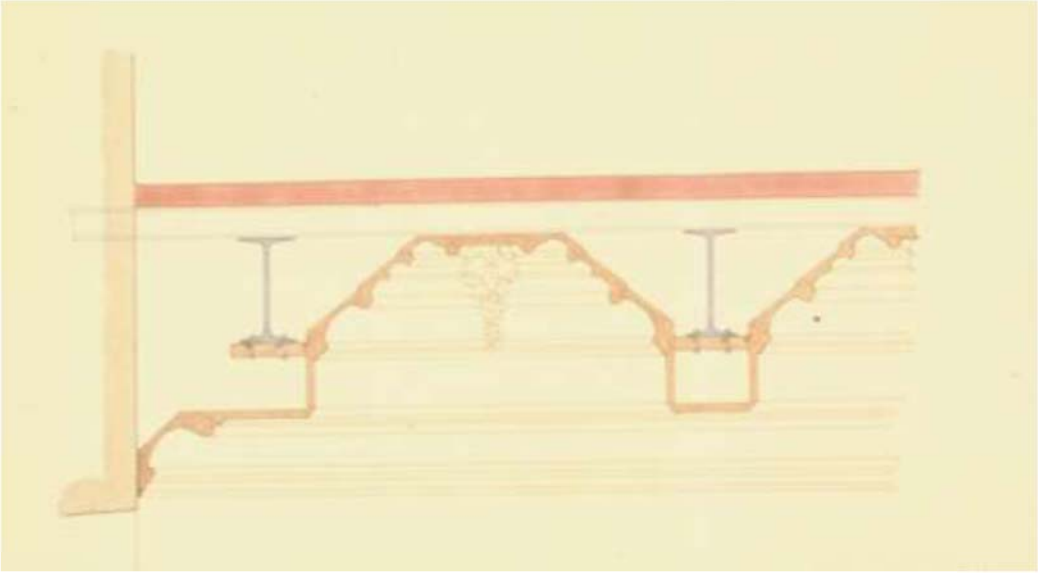
COFFERED CEILING

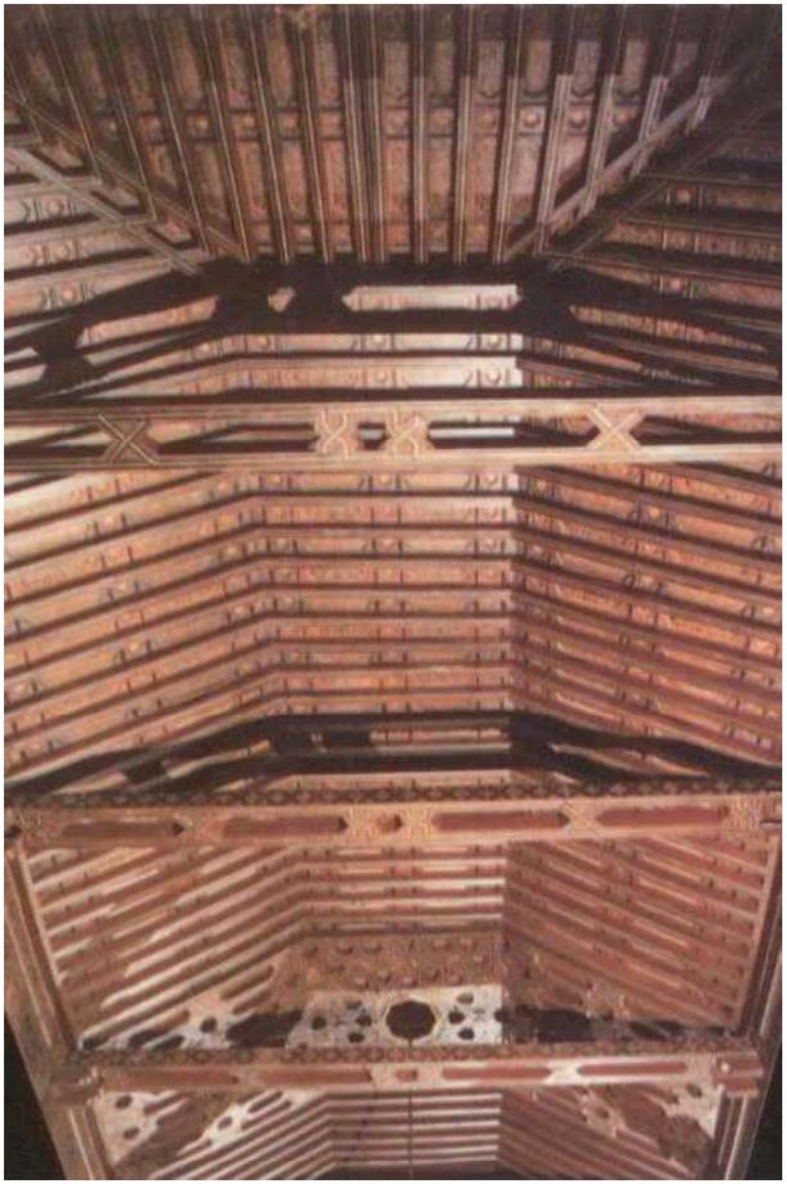
SUSPENDED STRUCTURE



COFFERED CEILING

SUSPENDED STRUCTURE





COFFERED CEILING

SUSPENDED STRUCTURE

ANCHORING

ANCHORING OF THE FLOOR TO THE MASONRY CONSOLIDATION

ANCHORING

Project "SURE - Sustainable Urban Rehabilitation in Europe"
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Key Action 2: Strategic Partnership Projects
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