

UNIVERSITÀ DEGLI STUDI DI FERRARA  
Dipartimento di Architettura  
Corso di laurea magistrale in Architettura  
a.a. 2017-2018

**Corso di Storia dell'architettura antica e medievale**  
Prof. Renata Samperi

**I sistemi costruttivi dell'antichità:  
il sistema trilitico e l'arco**

Materiali della lezione del 7 marzo 2018

**Bibliografia:**

C.F. GIULIANI, *L'edilizia nell'antichità*, Roma 1990.

J.P. ADAM, *L'arte di costruire presso i Romani: materiali e tecniche*, Milano 1989.

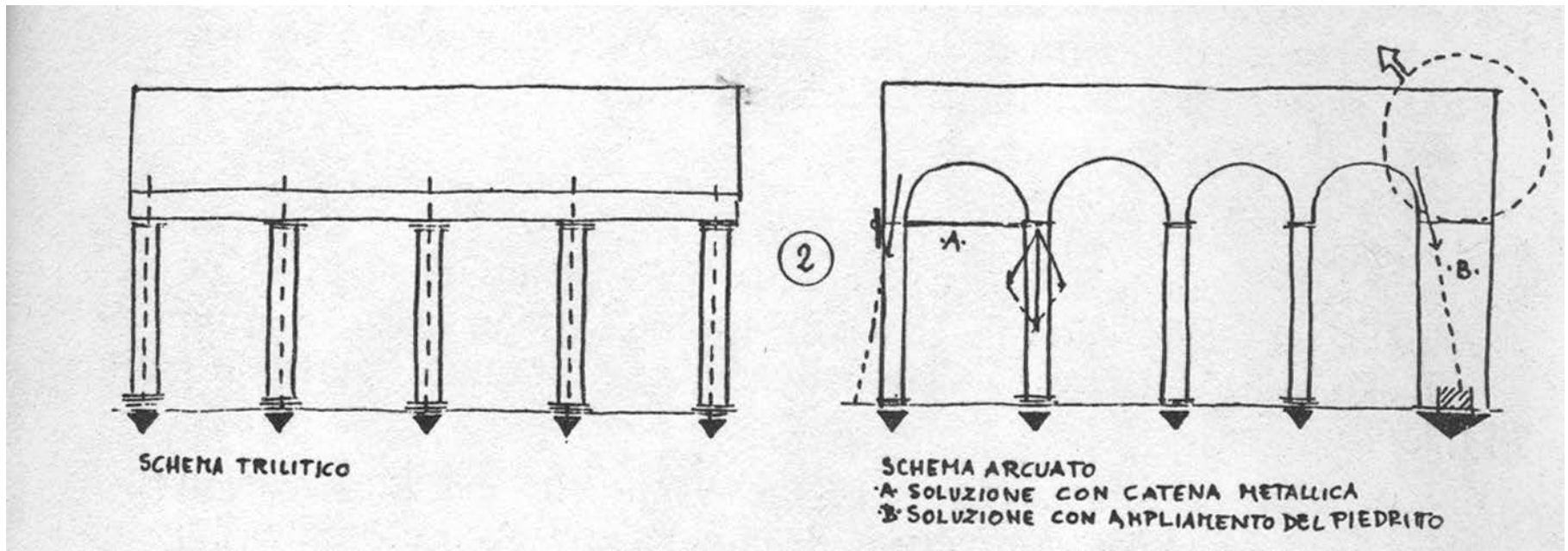
Per lo studio degli argomenti trattati a lezione e qui sintetizzati, si consiglia, in particolare, di utilizzare i capitoli 3 e 7 del testo di Giuliani.

- **Sistema non spingente:**

Comprende tutte le strutture capaci di scaricare pesi (o tensioni) secondo risultanti prossime alla verticale

- **Sistema spingente:**

Comprende tutte le strutture capaci di scaricare pesi (o tensioni) secondo risultanti diverse dalla verticale



- Copertura lignea: non spingente
- Copertura a volta: spingente

Il fatto, apparentemente soltanto tecnico, della presenza o dell'assenza di volte strutturali in muratura ha valore determinante.

L'uso delle volte conferisce agli edifici un carattere di *organicità spaziale*, perché la presenza delle volte porta con sé il complesso problema del loro sostegno e contraffortamento (problema quasi inesistente con la copertura lignea) e le membrature dell'intero edificio si devono disporre e articolare in rapporto alla copertura voltata.

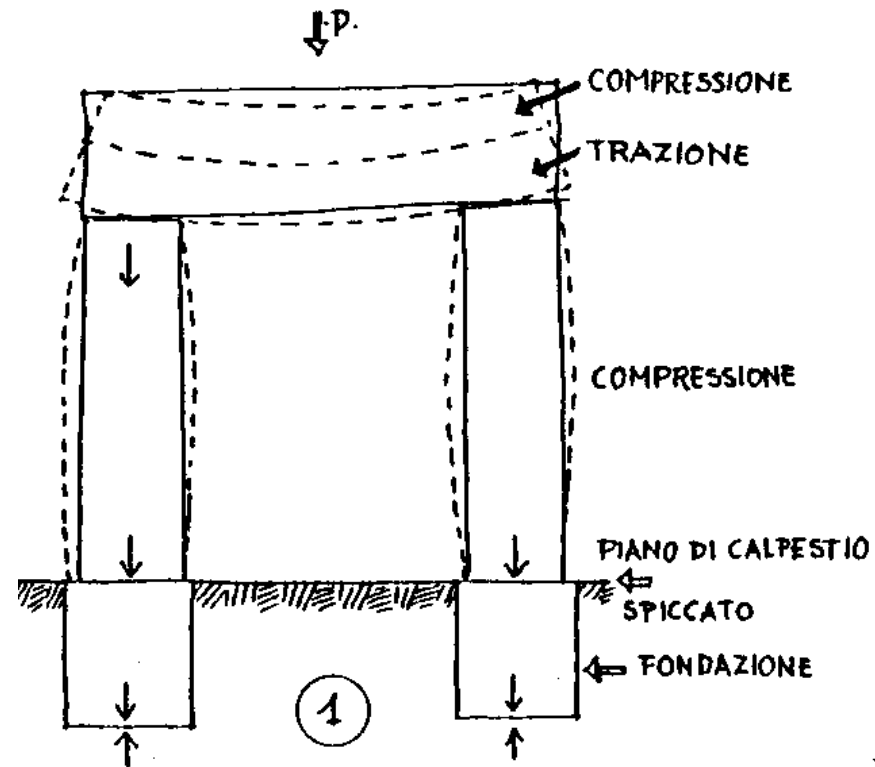
- Copertura lignea: non spingente
- Copertura a volta: spingente

Il fatto, apparentemente soltanto tecnico, della presenza o dell'assenza di volte strutturali in muratura ha valore determinante.

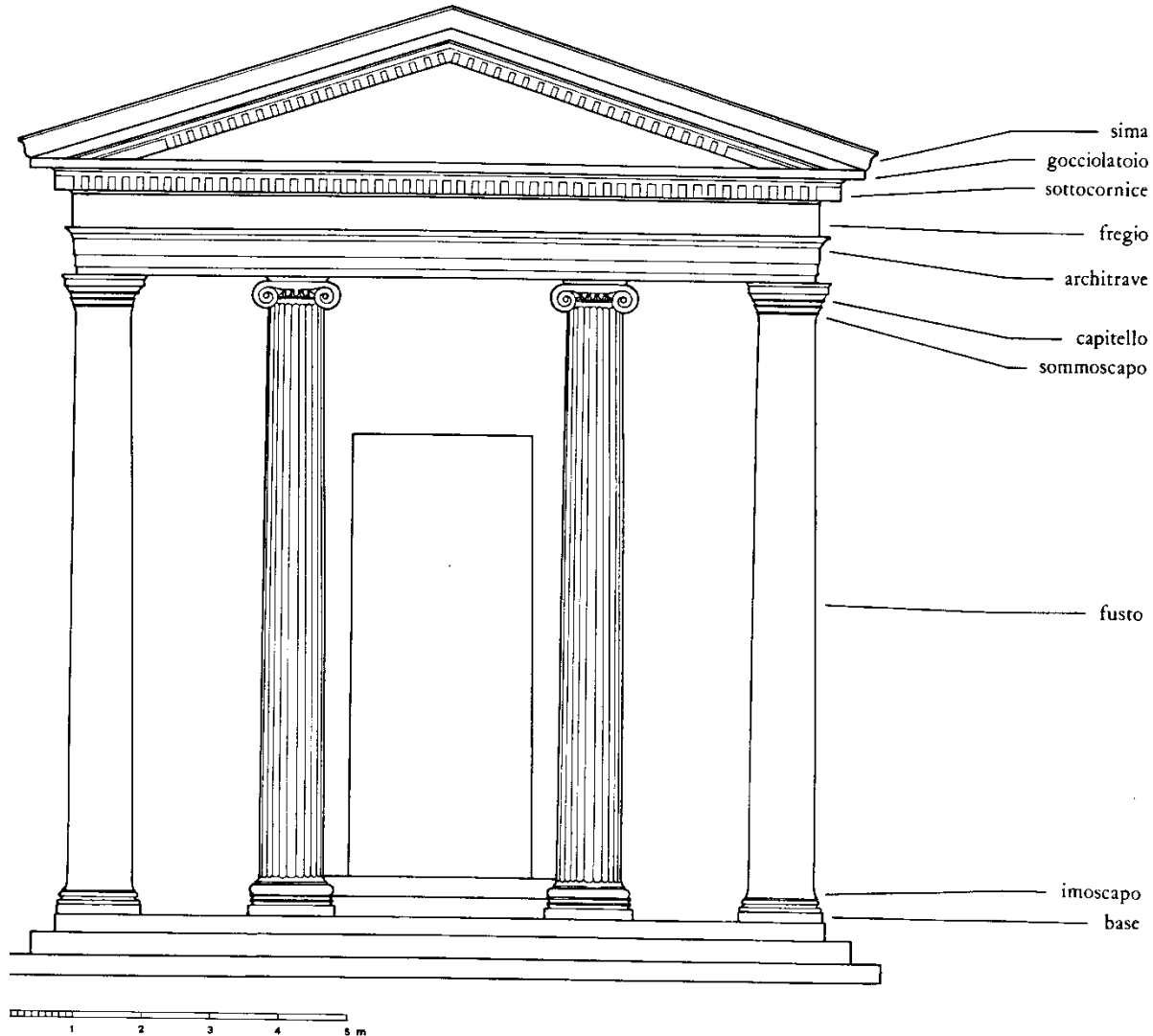
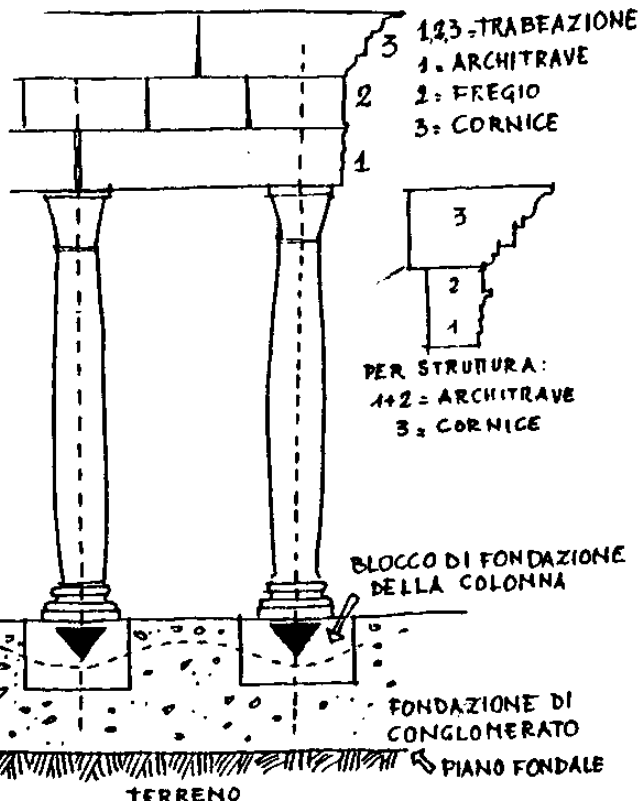
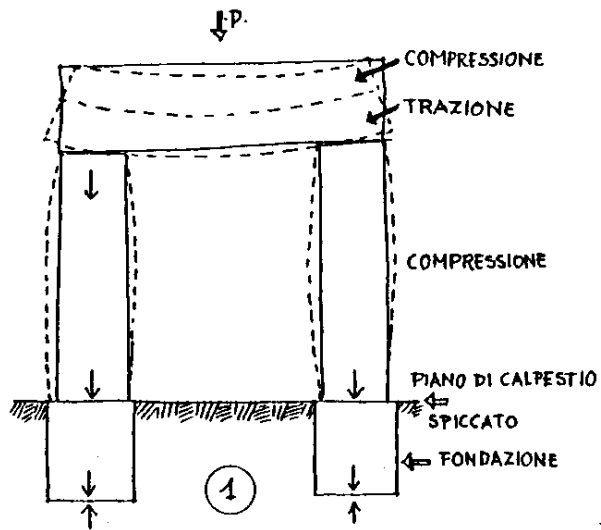
L'uso delle volte conferisce agli edifici un carattere di *organicità spaziale*, perché la presenza delle volte porta con sé il complesso problema del loro sostegno e contraffortamento (problema quasi inesistente con la copertura lignea) e le membrature dell'intero edificio si devono disporre e articolare in rapporto alla copertura voltata.

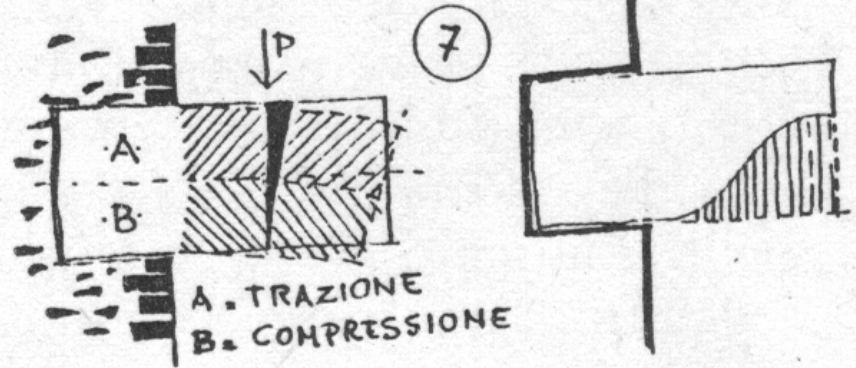
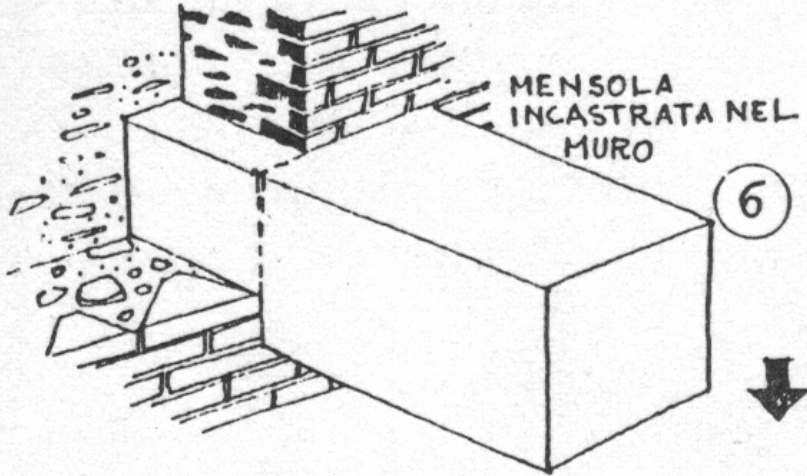


# Il sistema trilitico (sistema non spingente)

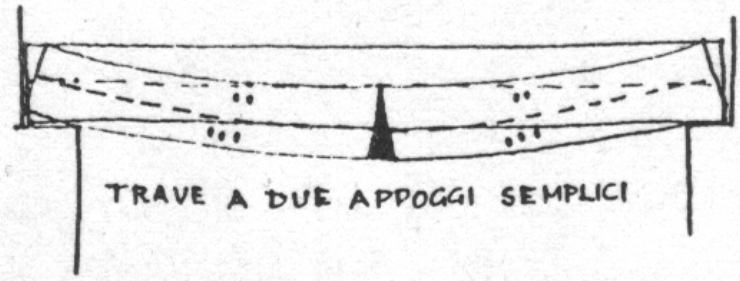


# Sistema trilitico (non spingente) e ordine architettonico

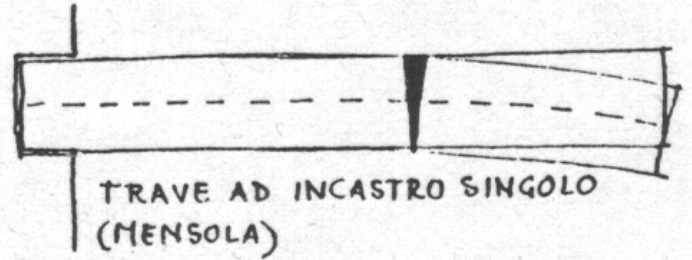
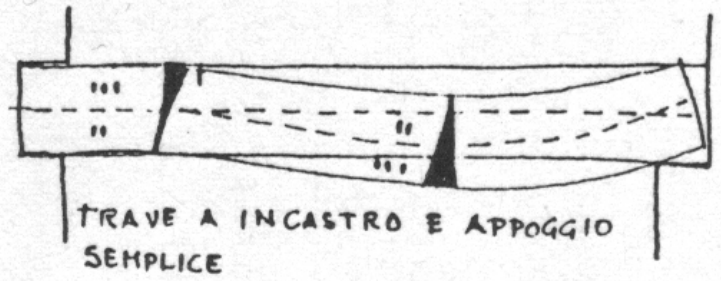




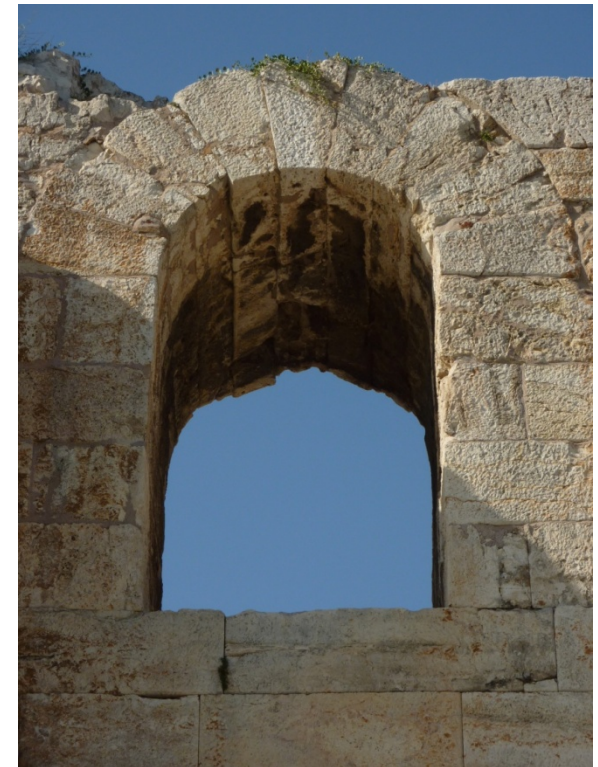
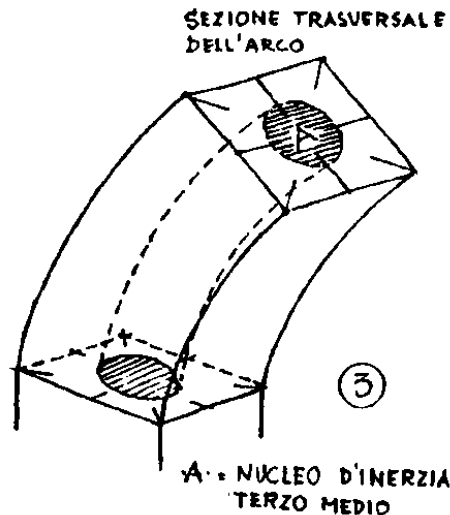
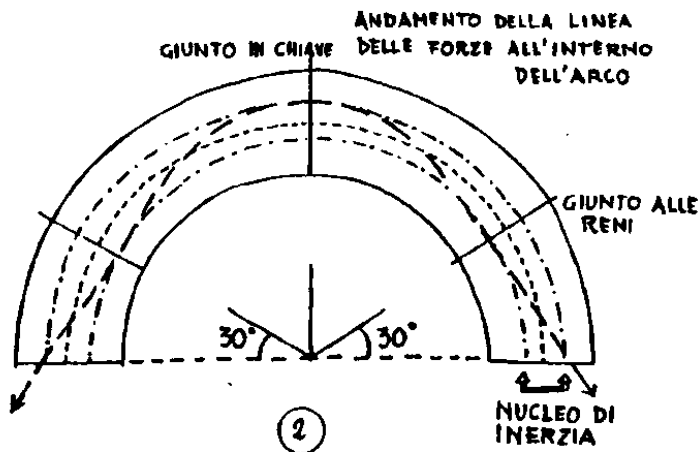
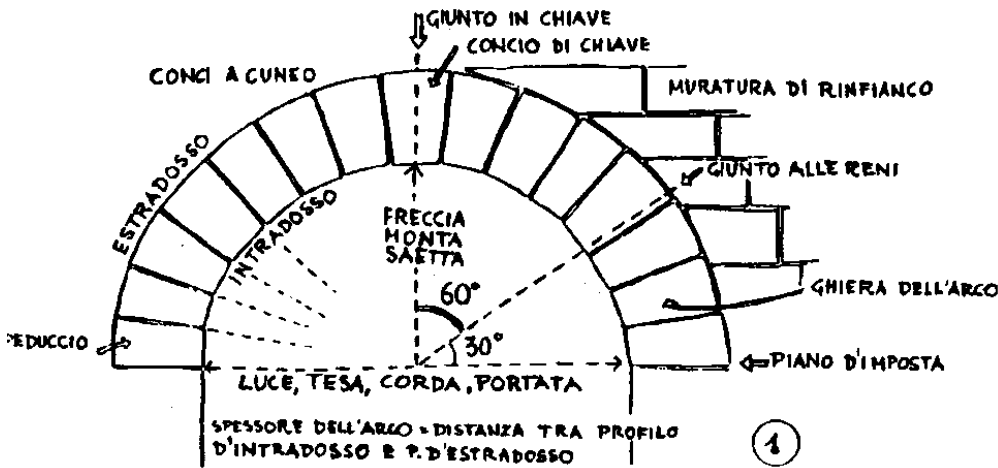
DIFFERENTI CONDIZIONI DI GIACITURA E VINCOLI  
DI UNA TRAVE, " COMPRESSIONE  
" TRAZIONE



8

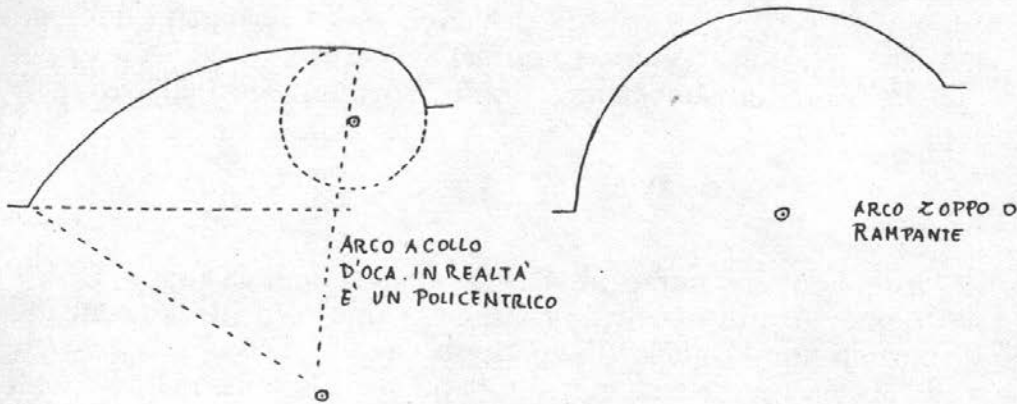
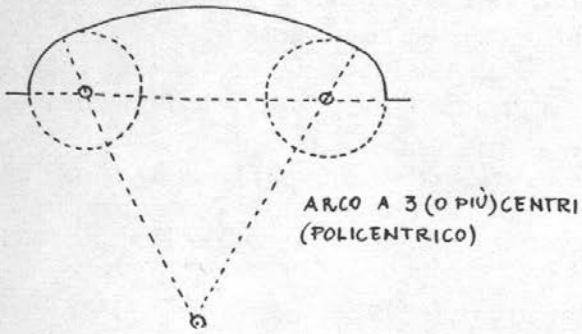
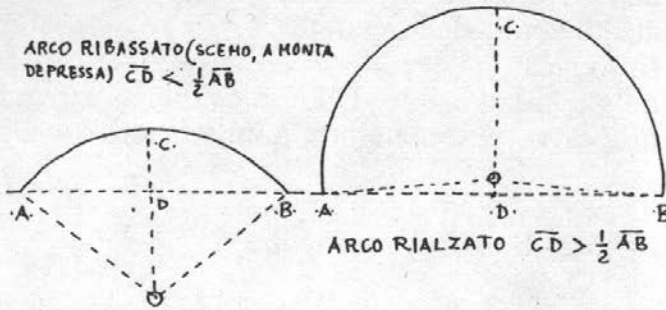
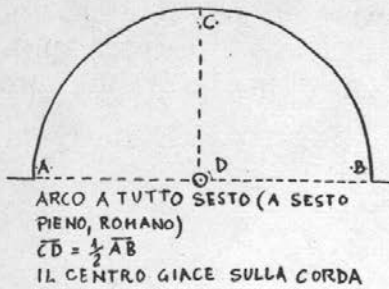


**Arco** (sistema spingente):  
 struttura capace di scaricare pesi (o tensioni) secondo risultanti diverse dalla verticale. La sollecitazione avviene soltanto per compressione (resistenza a compressione dei materiali antichi).

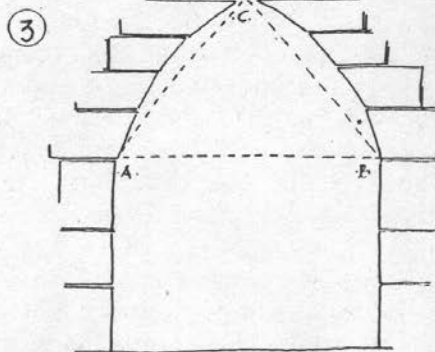
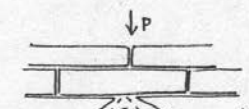
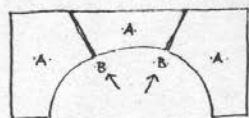
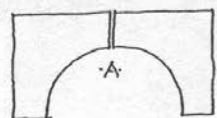
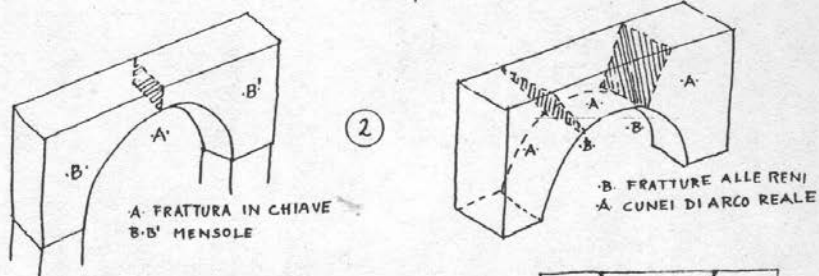
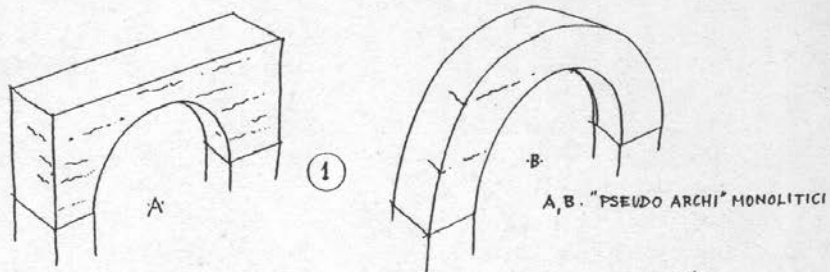




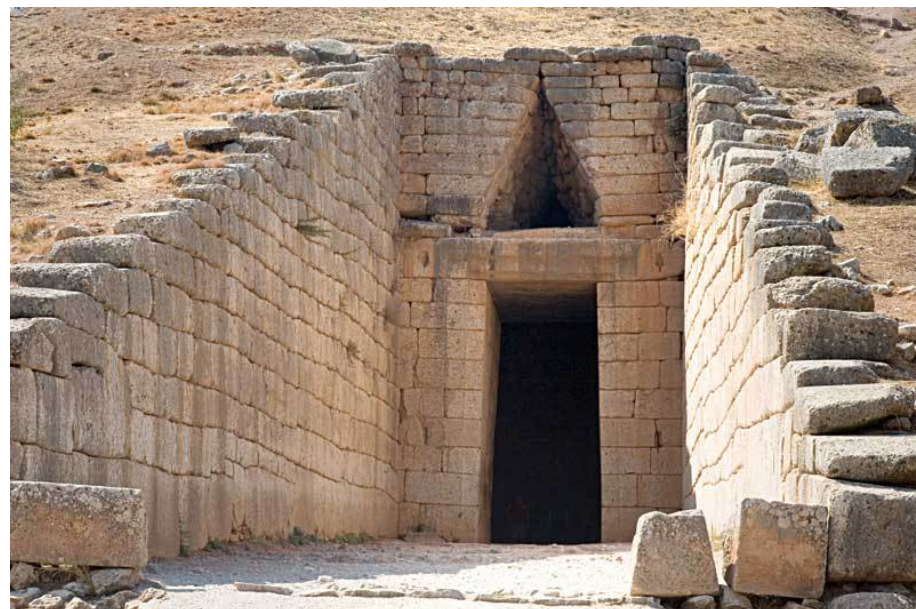
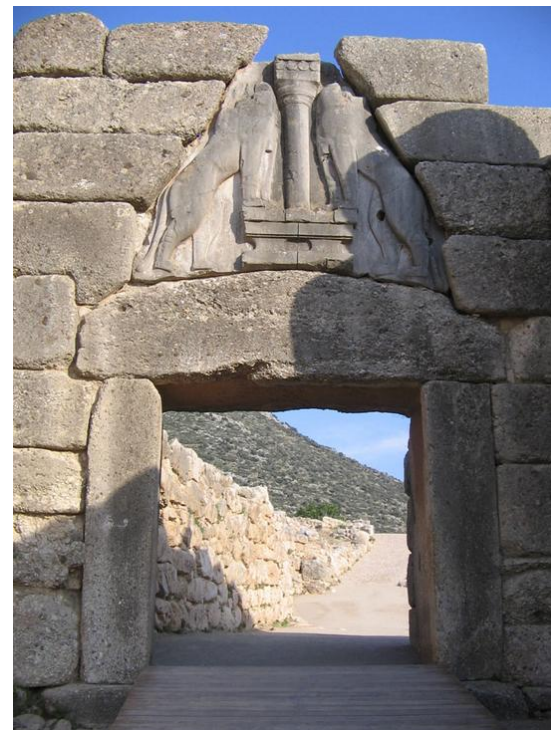
# Forme geometriche di archi



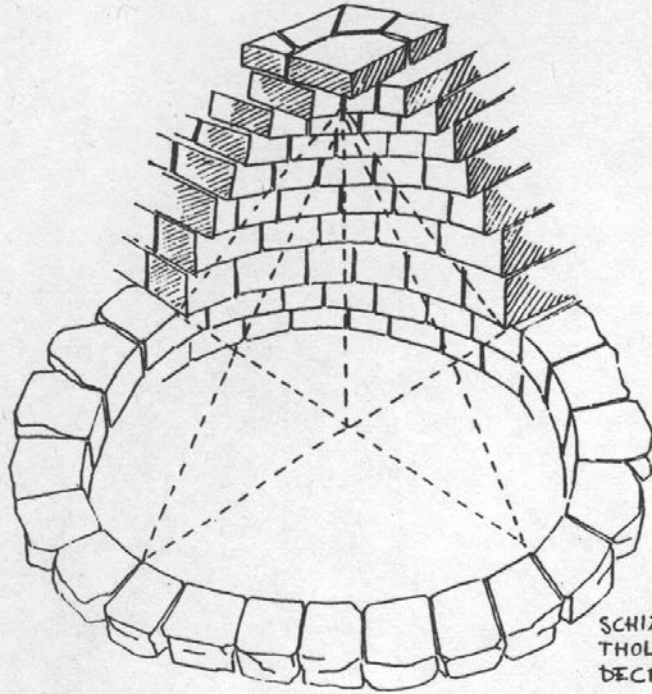
# Pseudo arco



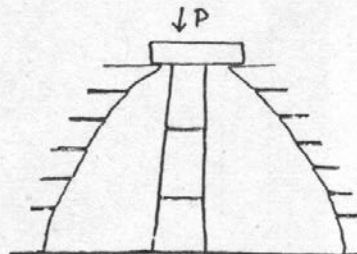
PSEUDOARCO CON CONCI A MENSOLA (SCALFELLATI E NO).  
A-B-C. PRISMA TRIANGOLARE RIPROTONENTE L'ARCO NATURALE



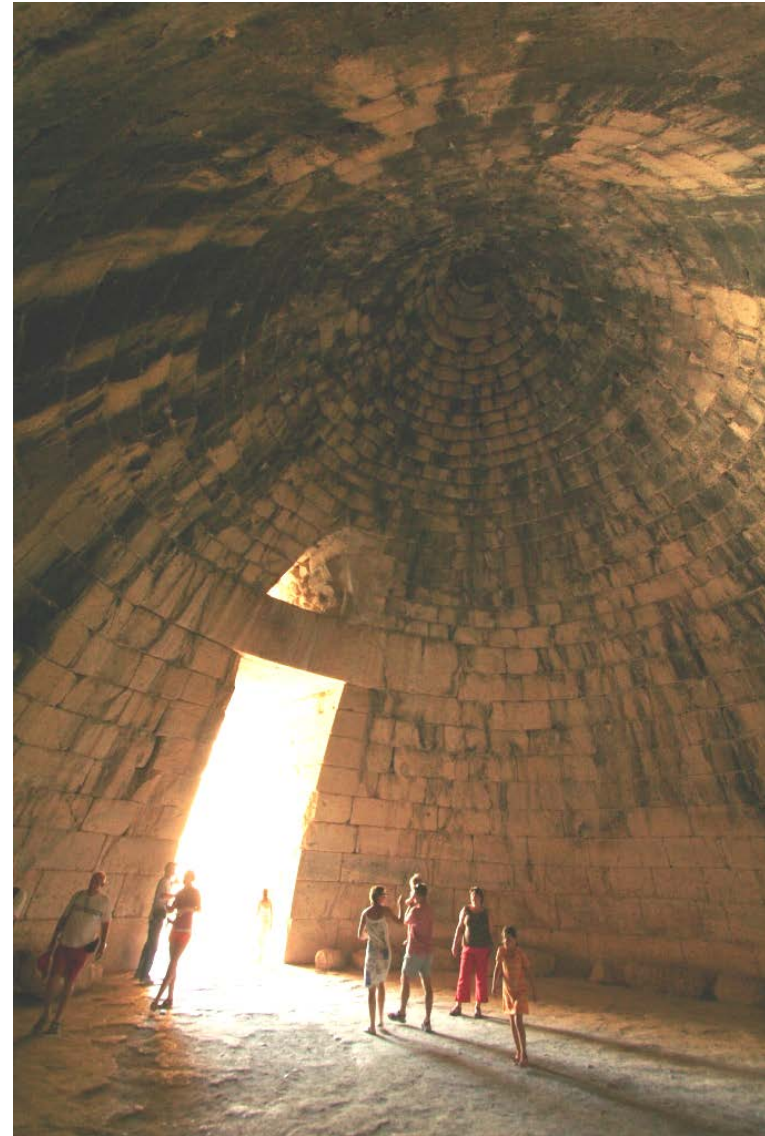
# Pseudo cupola



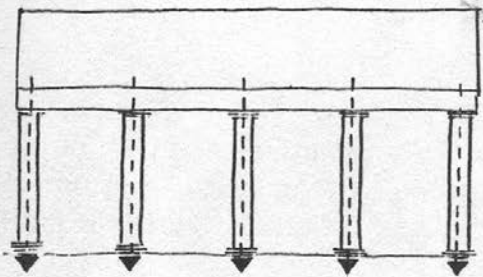
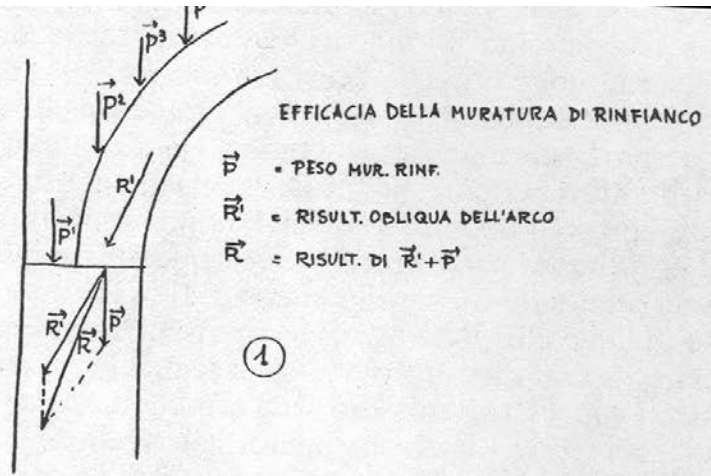
SCHIZZO ASSONOMETRICO DI UNA  
THOLOS AD ANELLI CONCENTRICI  
DECRESCENTI



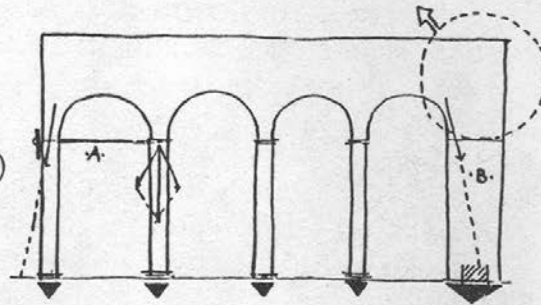
THOLOS CON PROFILO INTERNO  
RETTIFICATO E PILASTRO  
CENTRALE



# Stabilità dell'arco

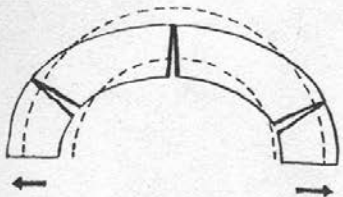


SCHEMA TRILITICO

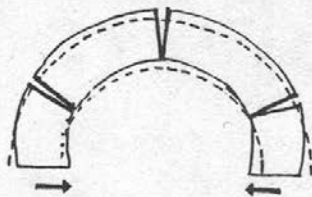


SCHEMA ARCUATO  
 A SOLUZIONE CON CATENA METALLICA  
 B SOLUZIONE CON AMPLIAMENTO DEL PIEDRITO

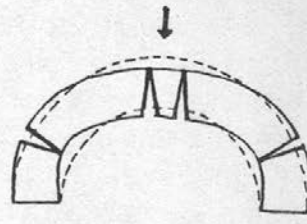
## DISSESTI POSSIBILI NELL'ARCO



ROTTURA PER ALLONTANAMENTO DEI PIEDRITTI

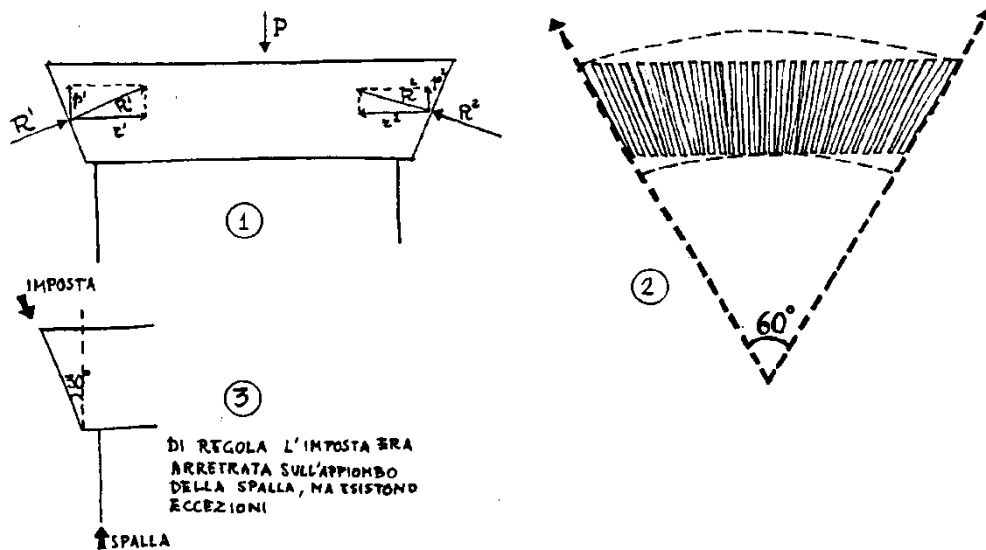


ROT. PER AVVICINAMENTO DEI PIEDRITTI

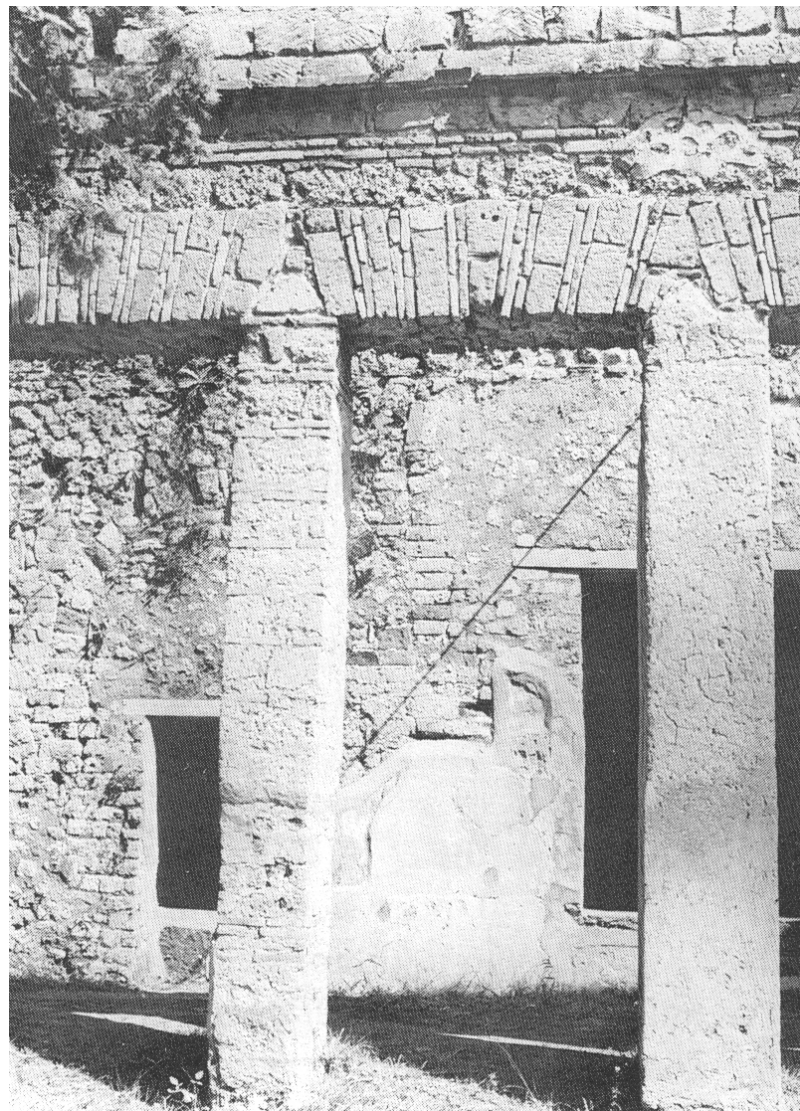
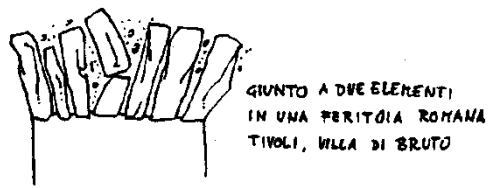
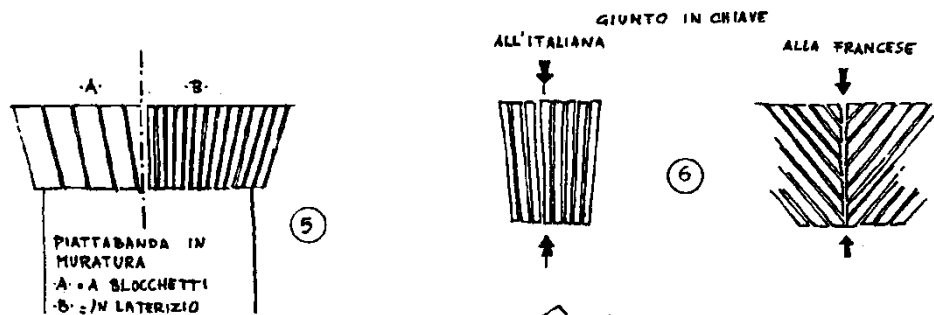
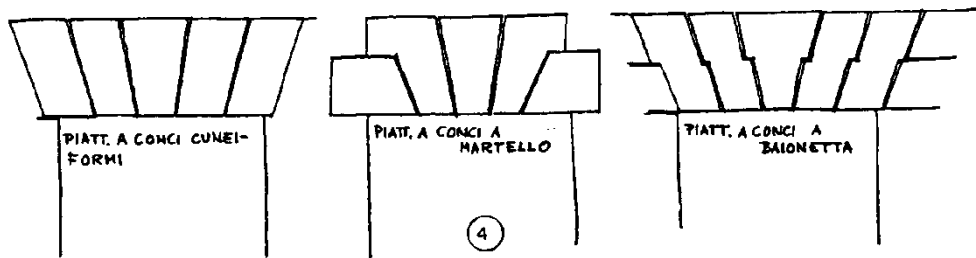


ROT. PER SOVRACCARICO E ASIMMETRICA E IRREGOLARE, SI PUO' VERIFICARE IN SEDE DI DISARMO.

# Piattabanda



## TIPI DI PIATTABANDE A BLOCCHI

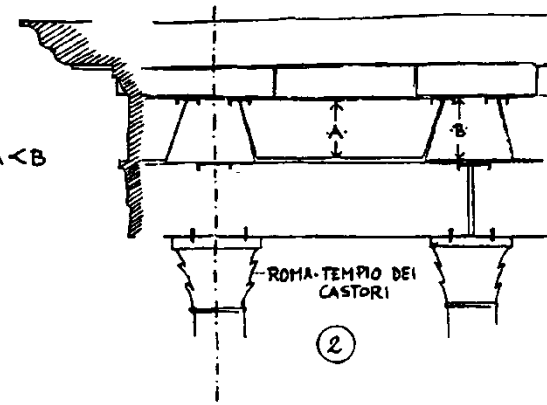




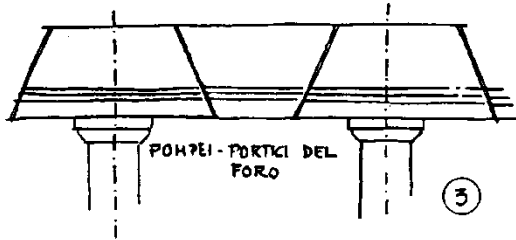
NUCLEO DI TRAVERTINO

①

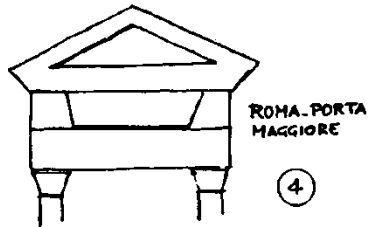
A < B



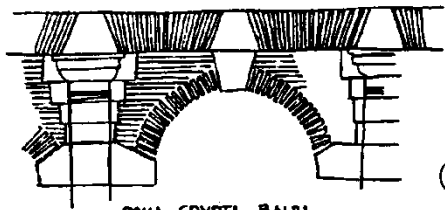
②



③

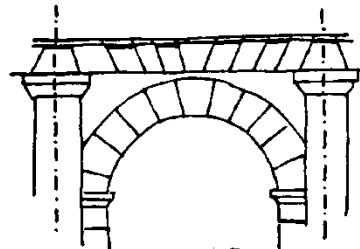


④



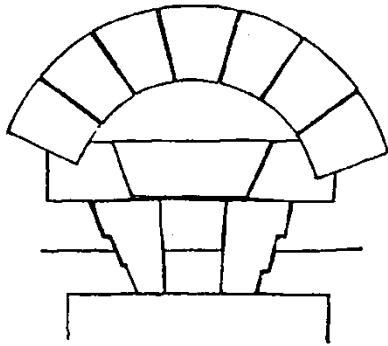
⑤

ROMA - CRYPTA BALBI



⑥

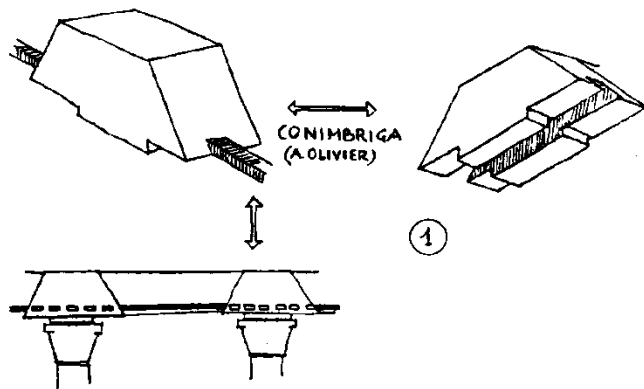
ROMA - TABULARIUM



TARRAGONA - TORRE DELL'AUDIENCIA

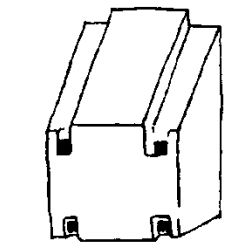
⑦





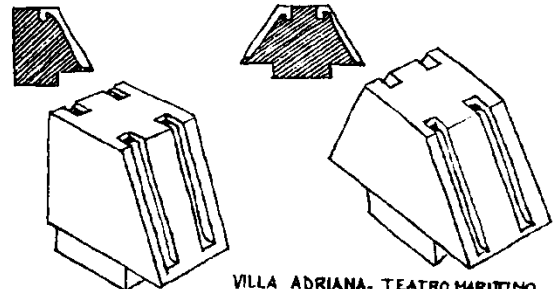
CONIMBRIGA  
(A. OLIVIER)

①



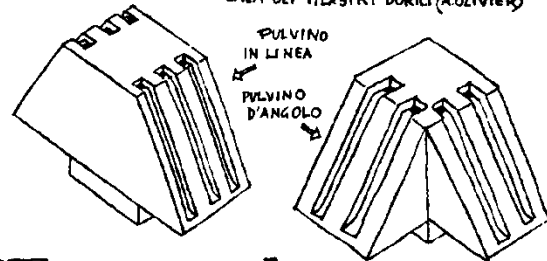
ROMA-TABULARIUM  
(DELBRÜCK)

②



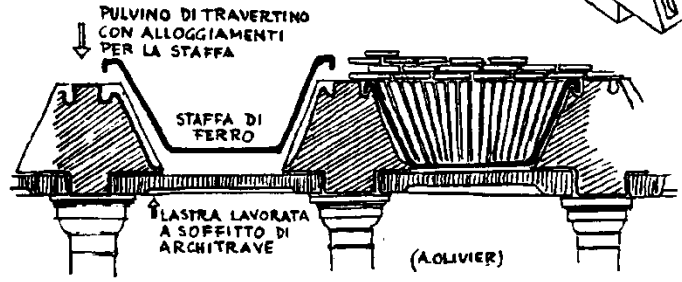
VILLA ADRIANA-TEATRO MARITTIMO,  
SALA DEI PIASTRI DORICI (A. OLIVIER)

③

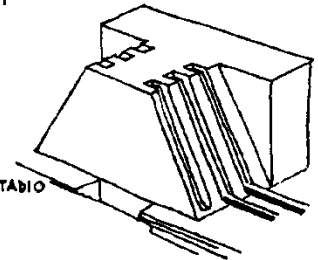


PULVINO  
IN LINEA  
PULVINO  
D'ANGOLO

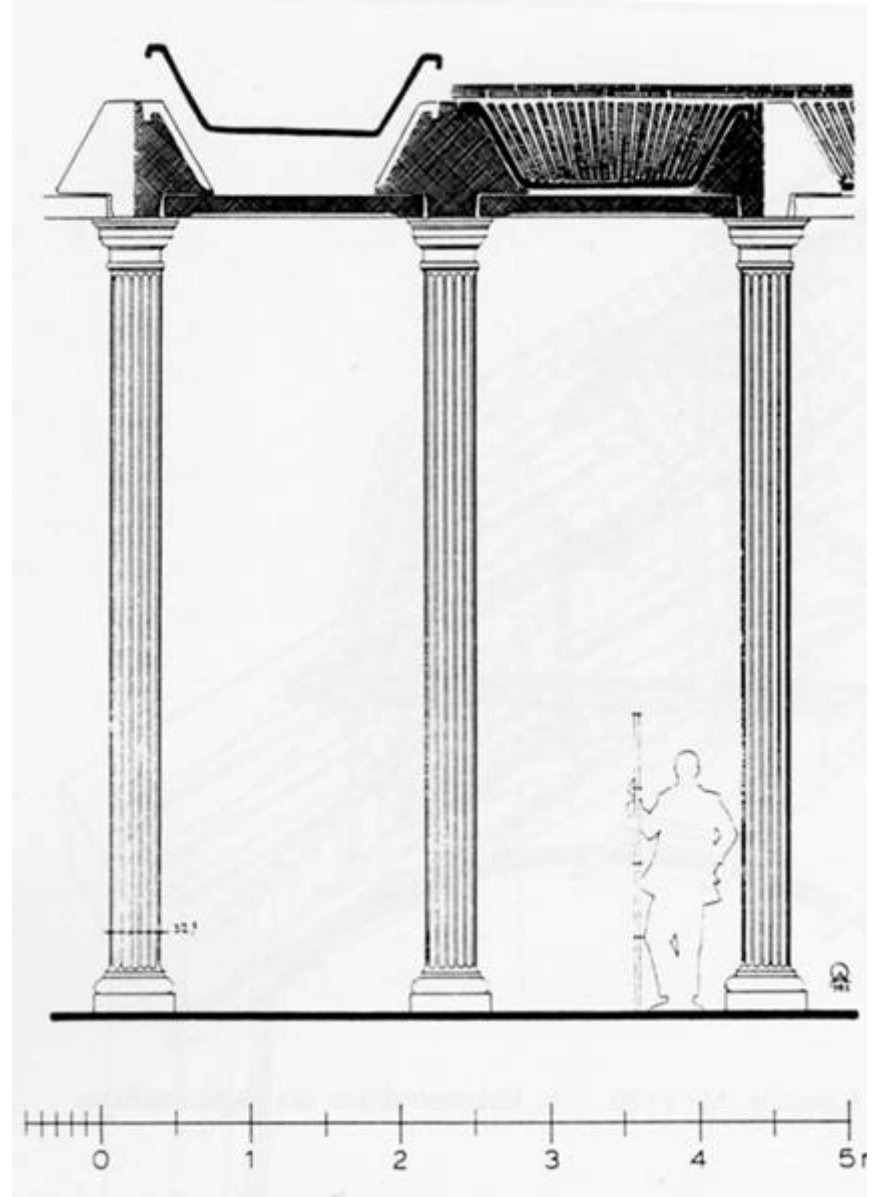
IN BIANCO IL :  
PULVINO, IN NERO  
LA FODERA DI  
MARMO



(A. OLIVIER)

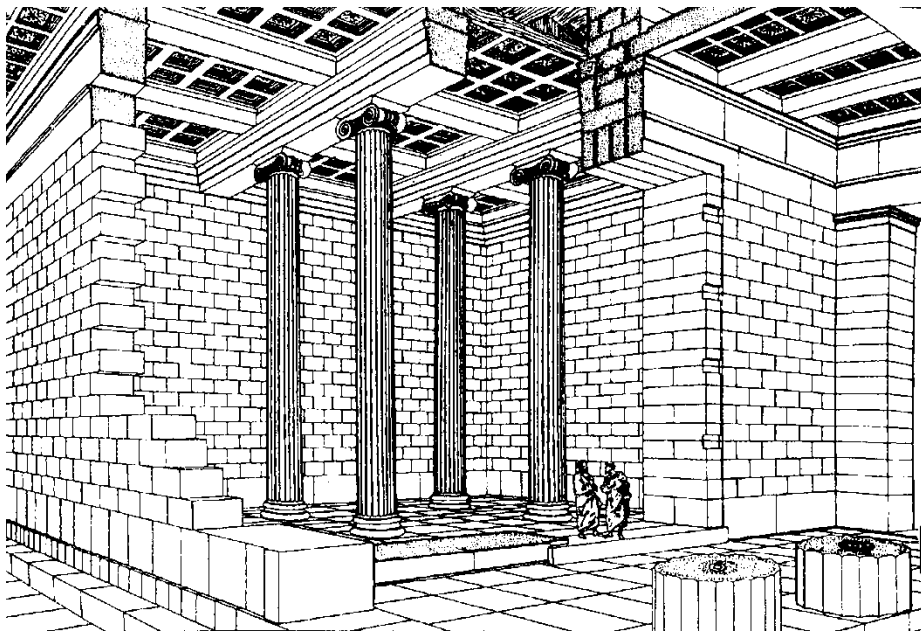


VILLA ADRIANA-C.D. STADIO  
(HOPFMAN)

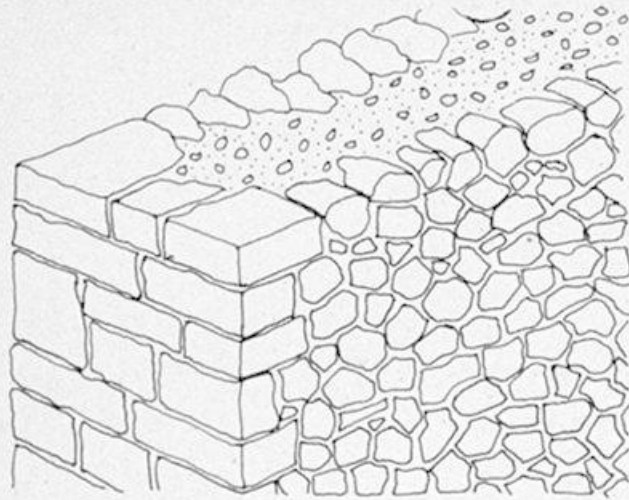




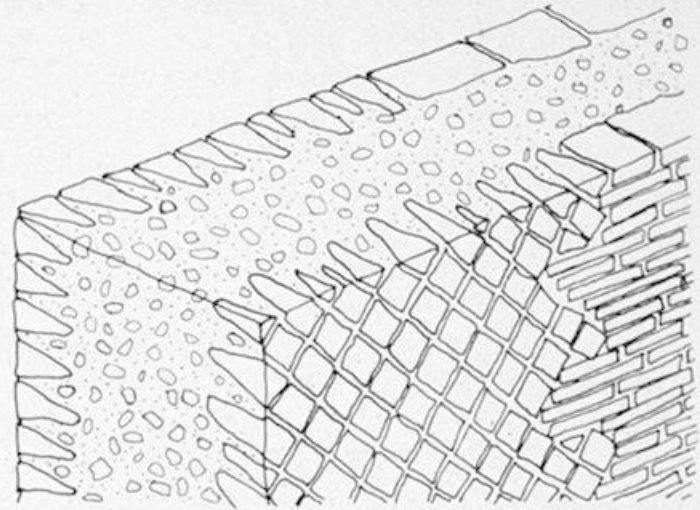
# Opus quadratum



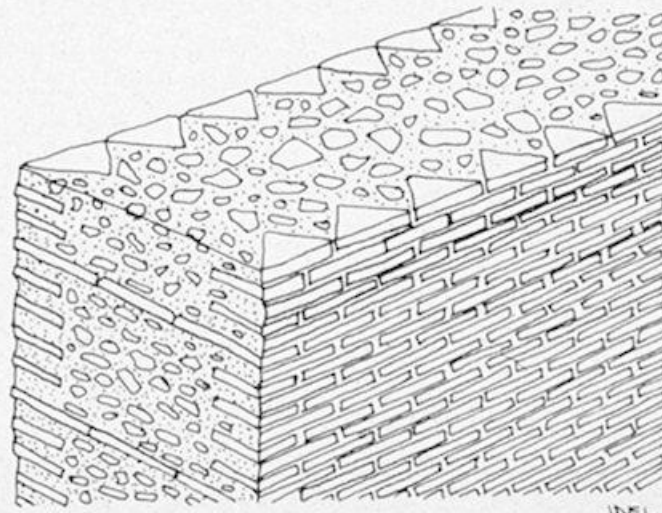
# Muratura a emplecton e opus caementicium



OPUS INCERTUM



OPUS RETICULATUM



OPUS TESTACEUM

## Calcinazione (1000 °C)



carbonato  
di calcio

ossido di calcio (calce viva)

## Spegnimento



idrossido di calcio (calce spenta)

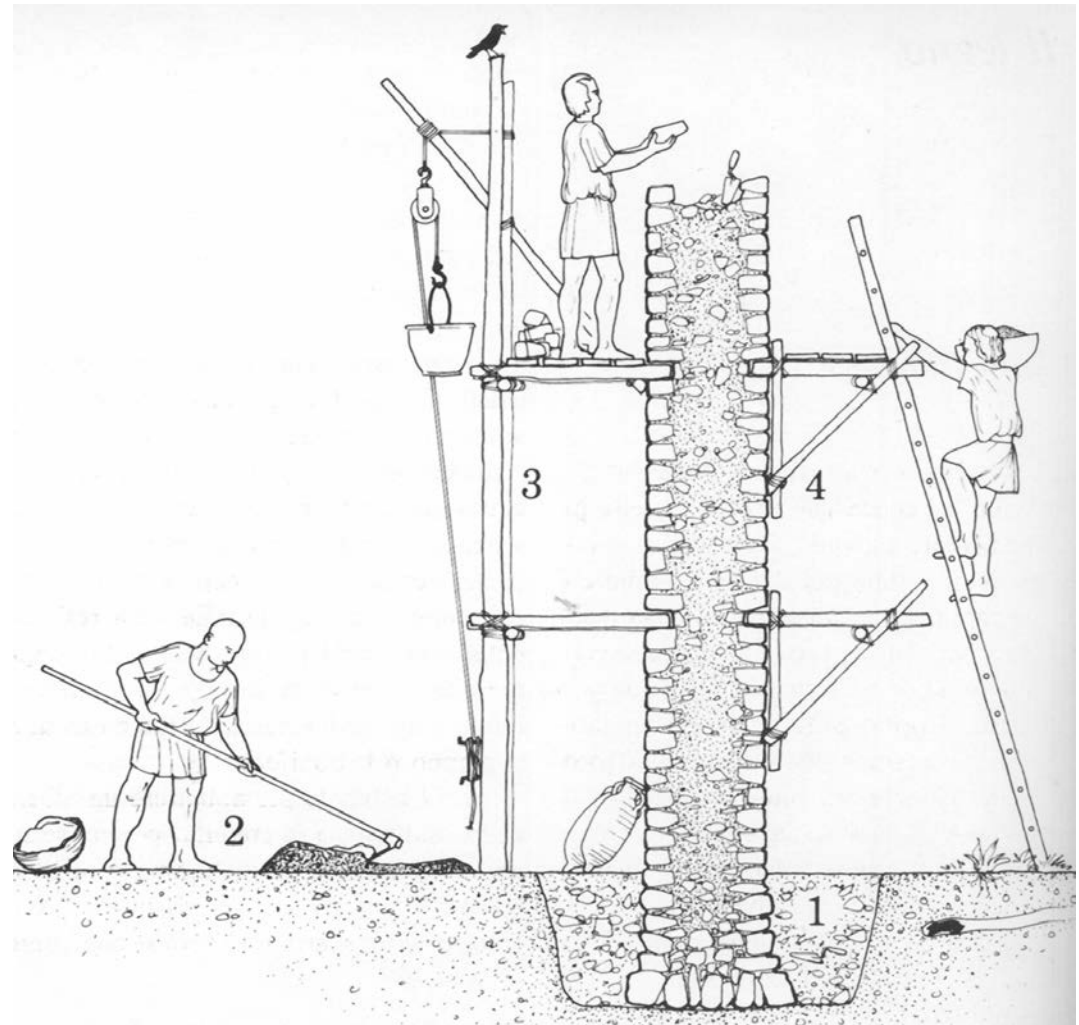
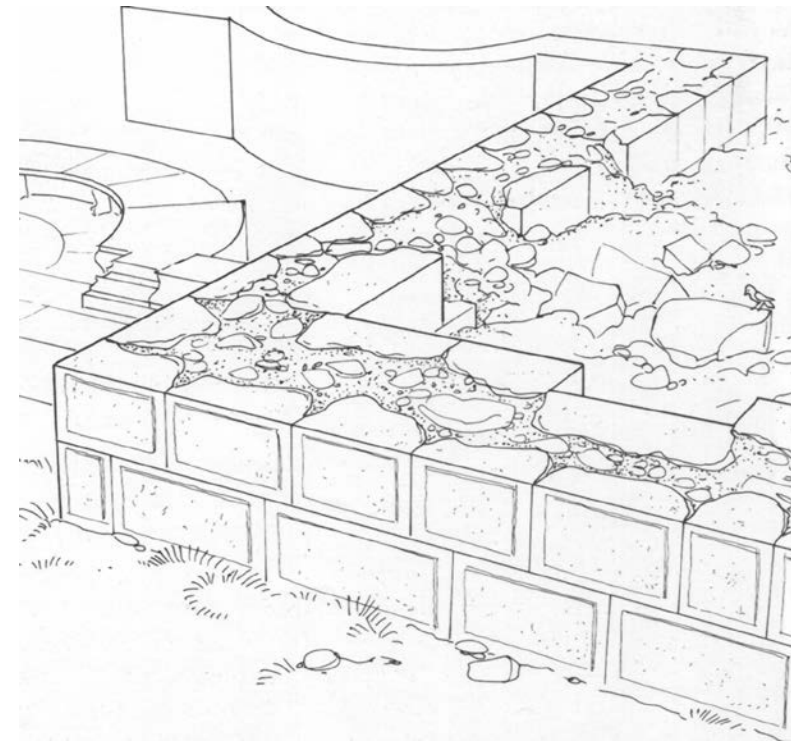
## Principali composizioni delle malte antiche

1 parte di calce    3 parti di sabbia di cava    acqua 15-20%

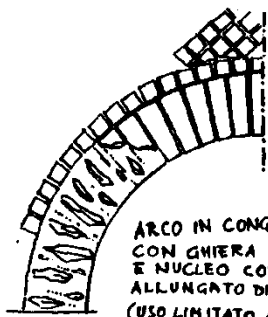
1 parte di calce    2 parti di sabbia di fiume    acqua 15-20%

1 parte di calce    2 parti di sabbia di fiume    acqua 15-20%  
1 parte di cocci di tegole

1 parte di calce    2 parti di pozzolana    acqua 15-20%

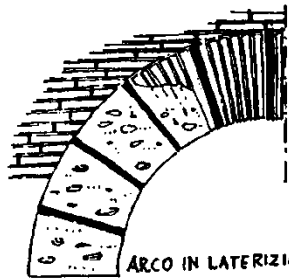
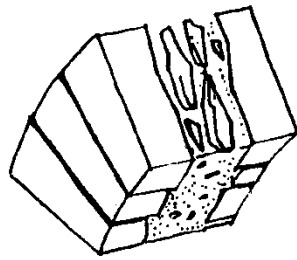


Durante la costruzione la malta viene mischiata con caementa o inerti



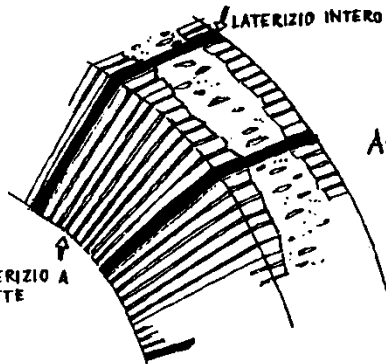
ARCO IN CONGLOMERATO  
CON GHIERA IN BLOCCHETTI  
E NUCLEO CON PIETRAE  
ALLUNGATO DISPOSTO A RAGGIERA  
(USO LIMITATO ALL'ETA' REPUBBLICANA).

①

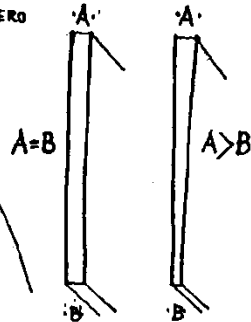


ARCO IN LATERIZIO

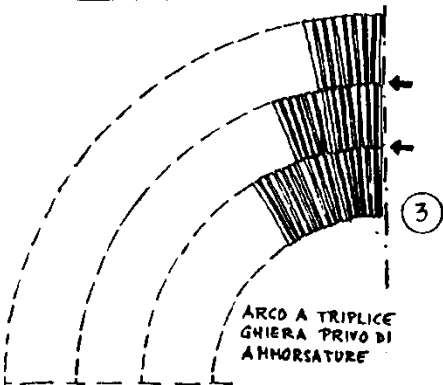
②



LATERIZIO A  
FETTE



LATERIZIO LAVORATO  
A CUNEO



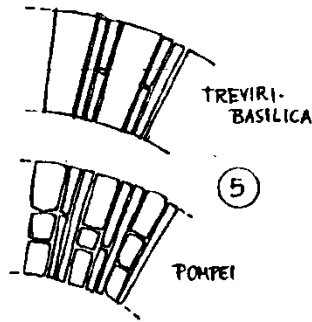
ARCO A TRIPlice  
GHIERA PRIVO DI  
AMMORSATURE

③



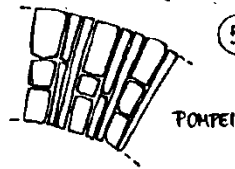
OSTIA - TEATRO

④

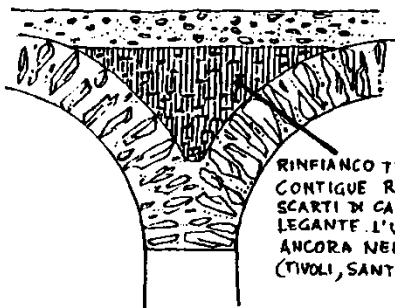


TREVIRI-  
BASILICA

⑤

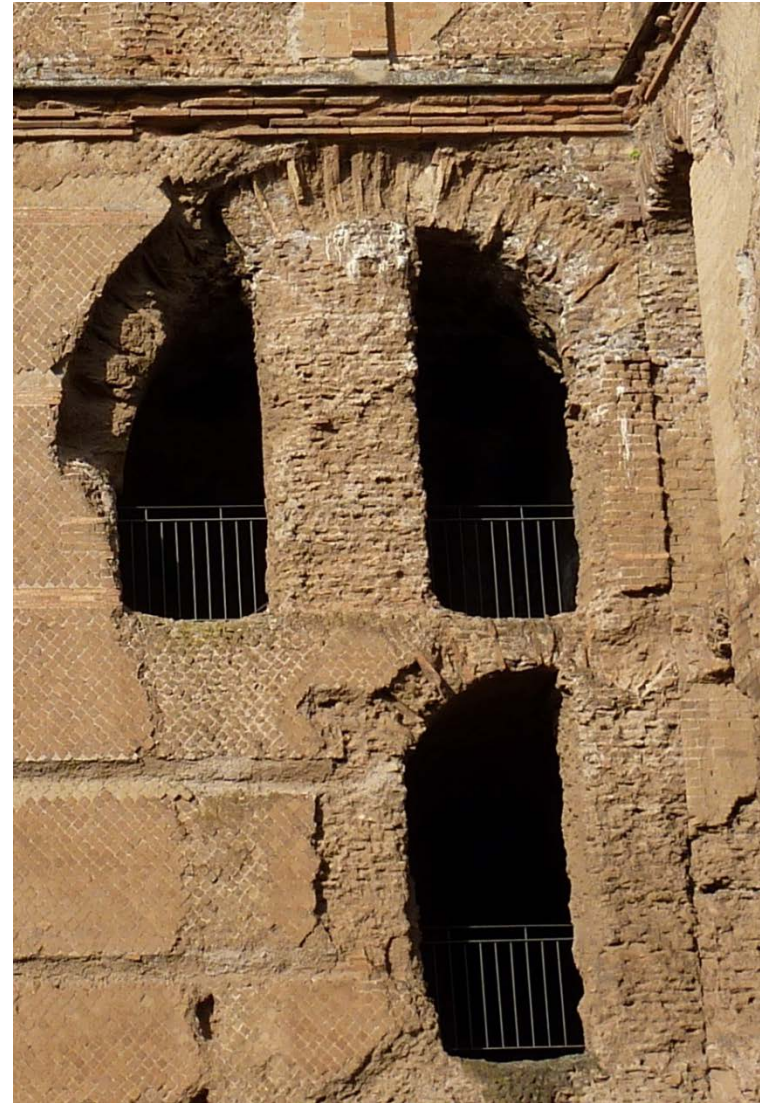


POMPEI

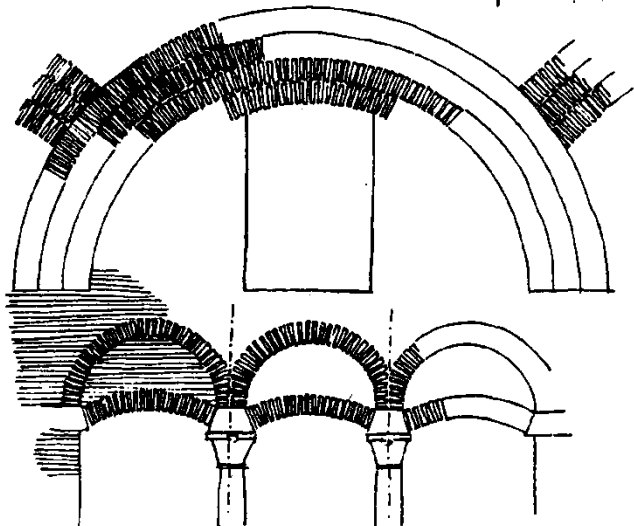
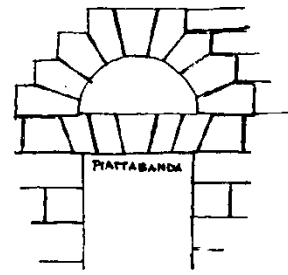
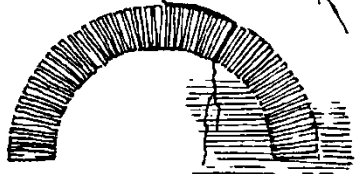
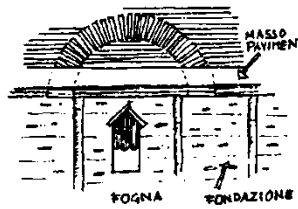
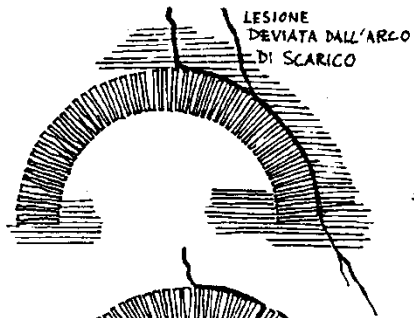


RINFIANCO TRA VOLTE (ARCHI)  
CONTIGUE REALIZZATO CON  
SCARTI DI CANTIERE PRIVI DI  
LEGANTE. L'USO E' ATTESTATO  
ANCORA NEL I SEC. A. CR.  
(TIVOLI, SANTUARIO DI BR. COLE)

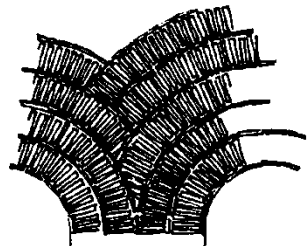
⑥



# Archi di scarico



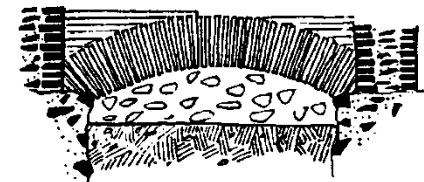
ROMA - PANTHEON



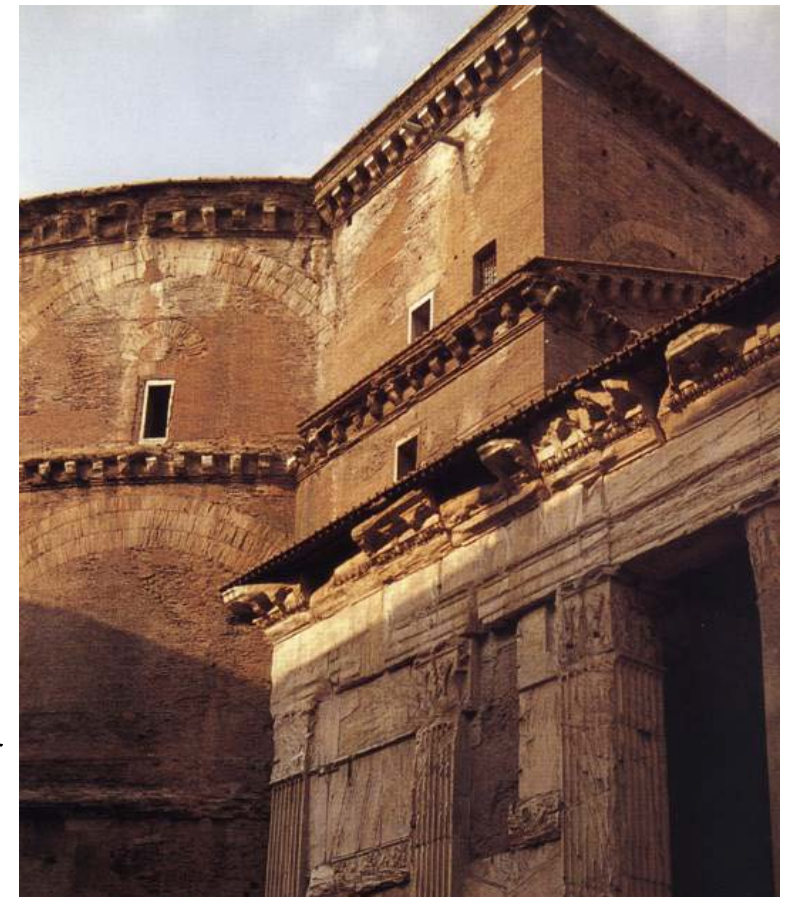
TREVIRI - PALAZZO IMPERIALE  
LE GHIERE SONO SEPARATE DA  
UNA ASSISE DI MATTONI INPIANS

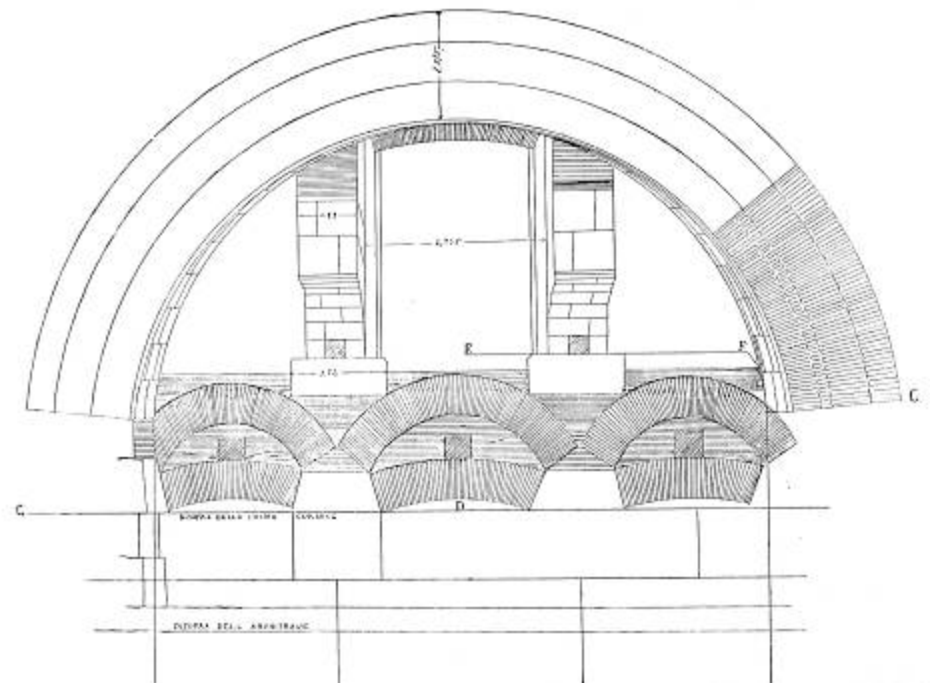
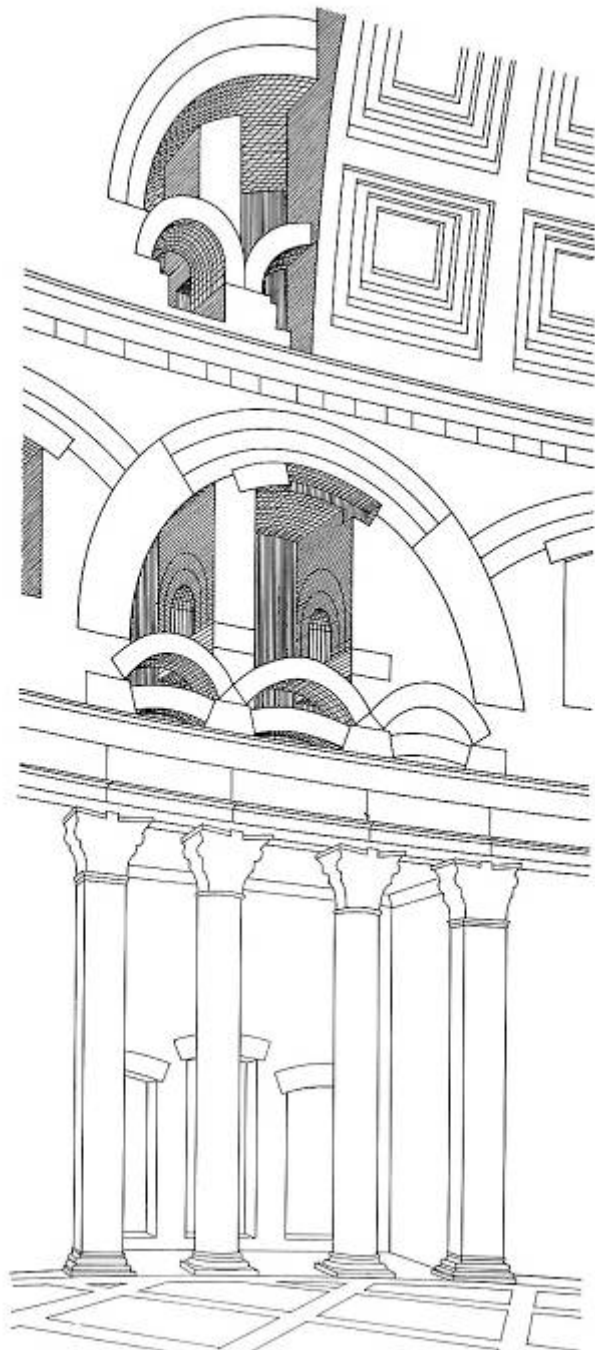


POMPEI - VIA DELL'ABBONANZA  
ARCHI DI SCARICO A TRE  
CENTRI



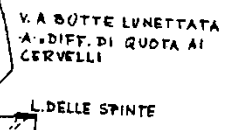
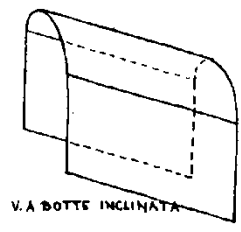
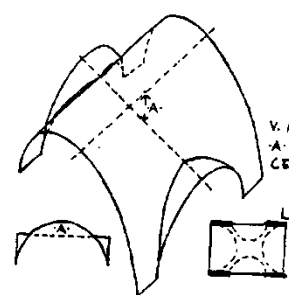
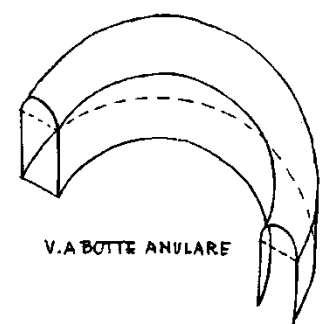
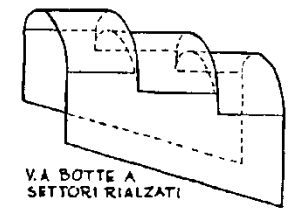
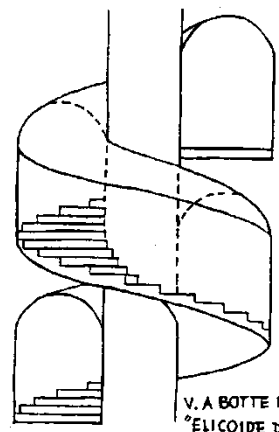
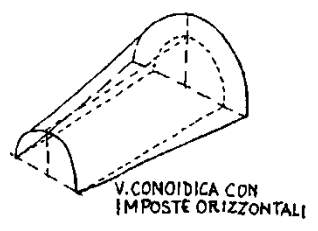
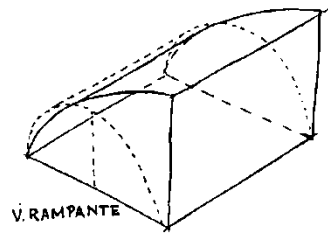
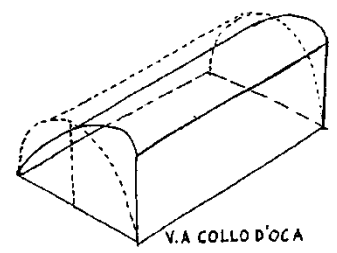
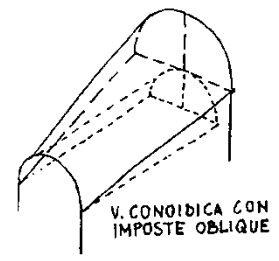
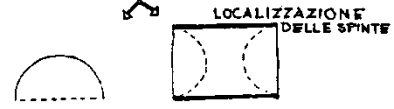
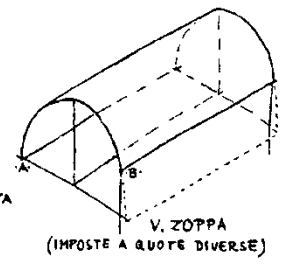
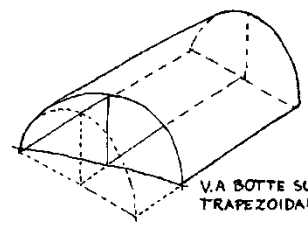
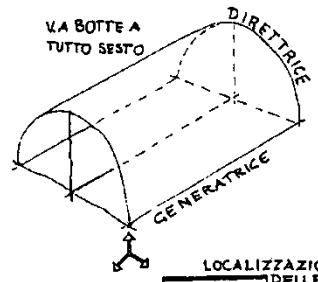
ROMA - FORO ROMANO - ROSTRI  
DI DIOCLEZIANO. ARCO DI CONTRASTO  
TRA FONDAZIONI PROFONDE

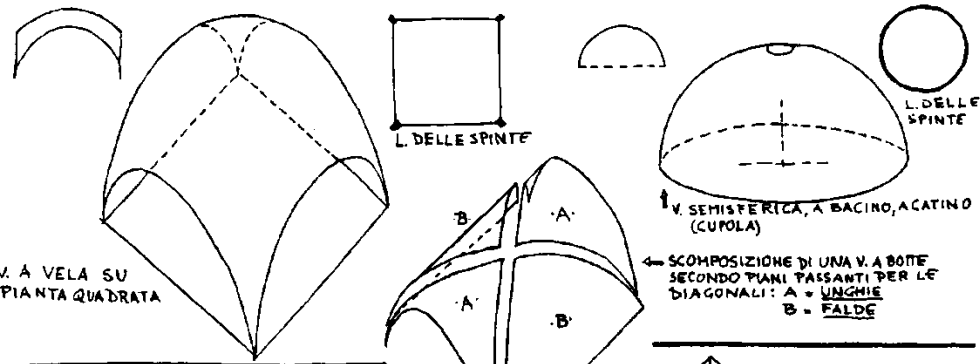






VOLTE SEMPLICI





**VOLTE COMPOSITE**

