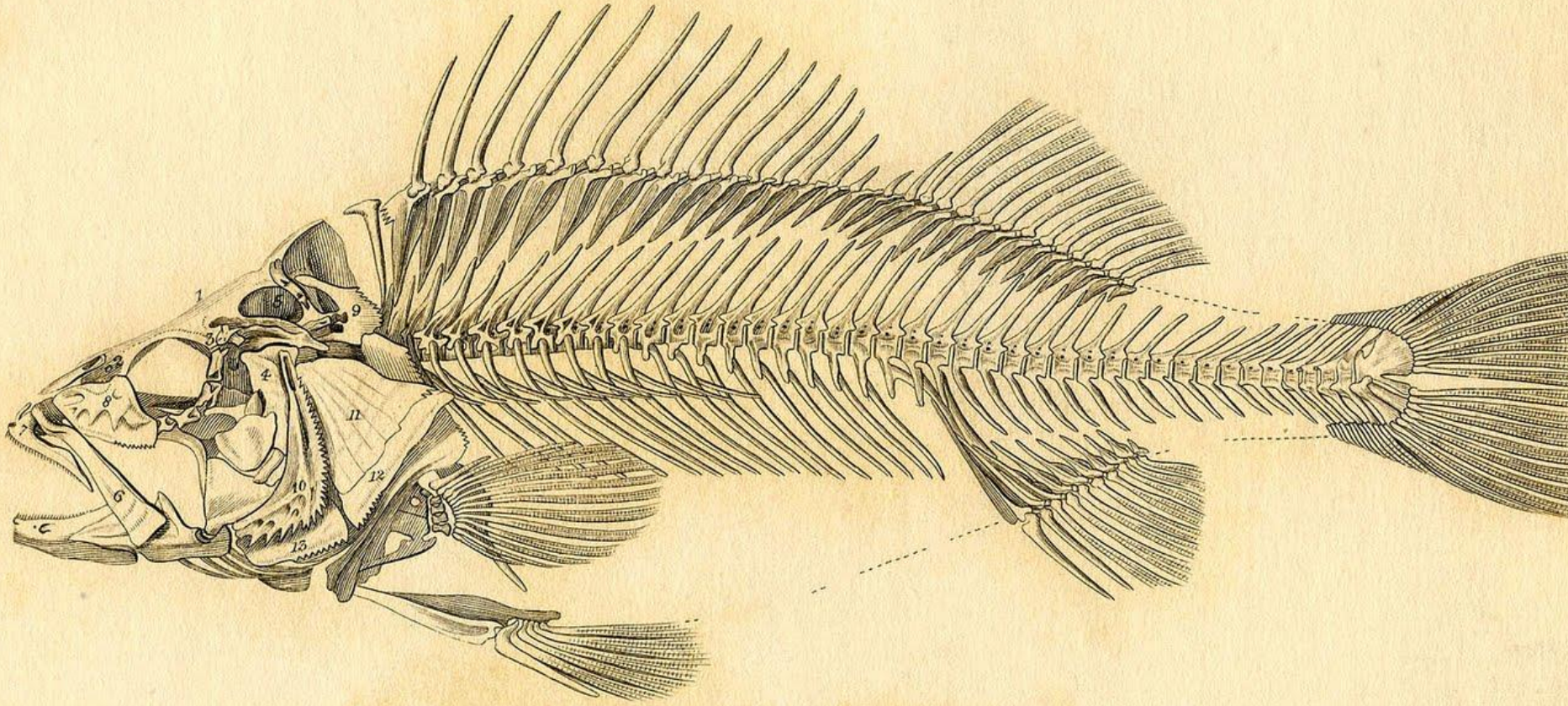
ARK-C005
PERUSTEET: VOIMA

Aalto University
School of Arts, Design

# KANTAVAT RAKENTEET




SKELETON OF THE COMMON PERCH.

*Lizars sc.*

# RAKENNUKSEN RUNKO


Fortum
Fortum
Fortum
Fortum


EATER

# MÄÄRITELMIÄ

**RUNKO**

**Perustusten yläpuolinen kuormia kantava ja rakennusta jäykistävä rakennekokonaisuus**

**RAKENNEOSA**

**Rakennuksen perusosa, joista rakenteet muodostuvat**

**KUORMA**

**Jokainen fysikaalinen ilmiö, joka aiheuttaa rakenteessa jännityksiä tai muodonmuutoksia**

**KUORMITUS**

**Rakennetta samanaikaisesti rasittavien kuormien yhdistelmä**

# KUORMITUKSET

# KUORMITUKSET

- **Useat erityyppiset kuormat, jotka rasittavat rakenteita ja rakenneosia samanaikaisesti = kuormitus**

- **Rakenteet mitoitetaan kestämään pahimmat kuormitustapaukset (RakMK Rakenteiden kuormat)**

- **Rakennesuunnittelija mitoittaa kuormayhdistelmät, niin että ne riittävällä varmuudella edustavat rakenteita eniten rasittavia kuormayhdistelmiä ja kuormien sijainteja**

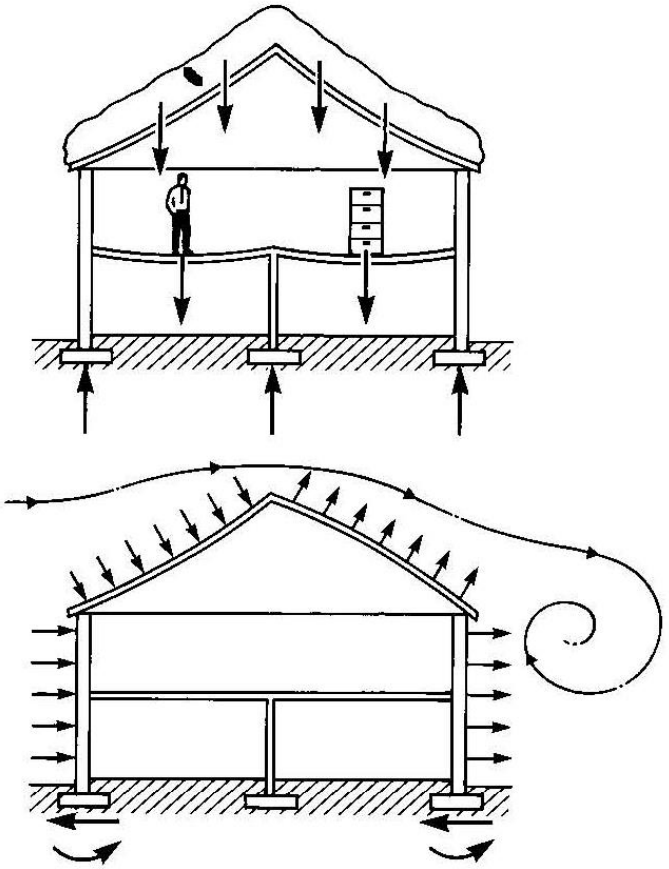
# KUORMAT

**PYSYVÄT KUORMAT**

- **suunnaltaan, suuruudeltaan ja sijainniltaan muuttumattomat kuormat**

**MUUTTUVAT KUORMAT**

- **vaikutusajan perusteella: pitkäaikaiset tai lyhytaikaiset kuormat**
- **sijainnin ja/tai suunnan perusteella: kiinteät tai liikkuvat kuormat**



# KUORMATYYPIT

**PYSYVÄ KUORMA**

- **Kiinteiden rakennusosien omapaino**
- **Muu rakenteeseen vaikuttava muuttumaton kuorma**

**HYÖTYKUORMA**

- **Oleskelukuorma**
- **Kokoontumiskuorma**
- **Tungoskuorma**
- **Tavarakuorma**
- **Piste-, viiva- tai pintakuorma**
- **Myös rakentamisaikaiset kuormat**

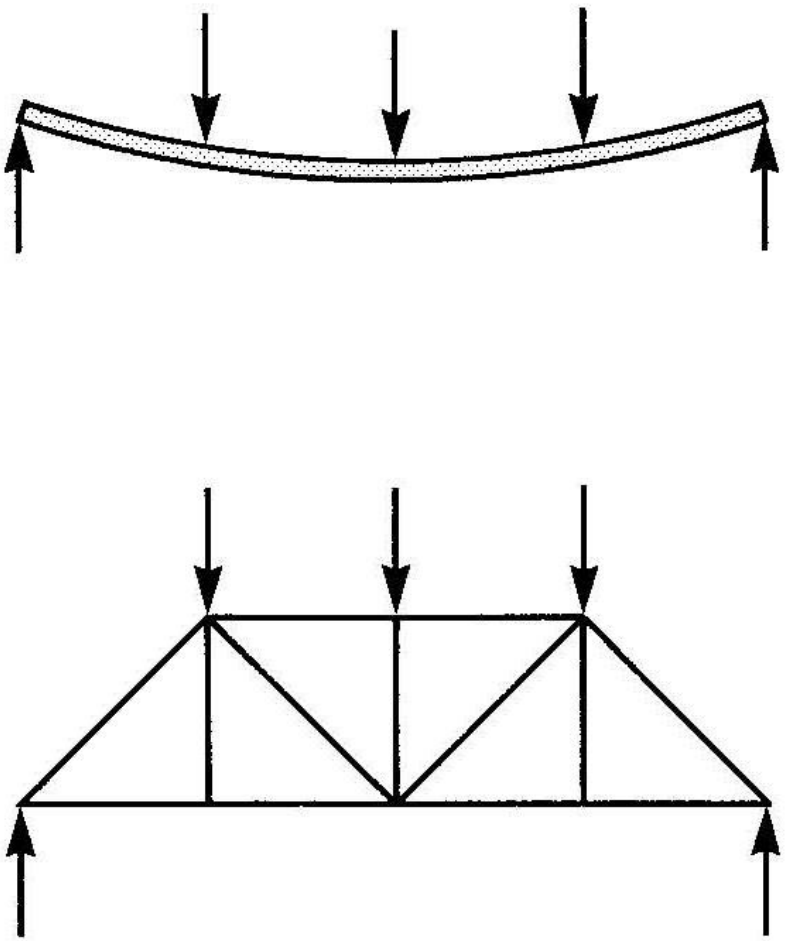


**Fig. 4.10** A solid beam is less strong and rigid than a triangulated structure of equivalent weight.

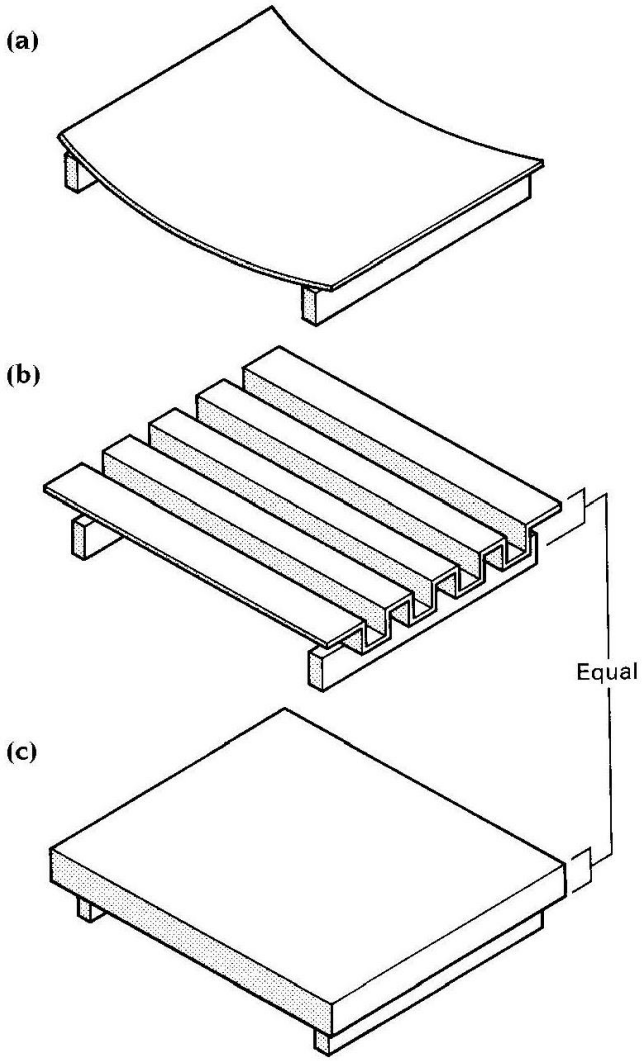
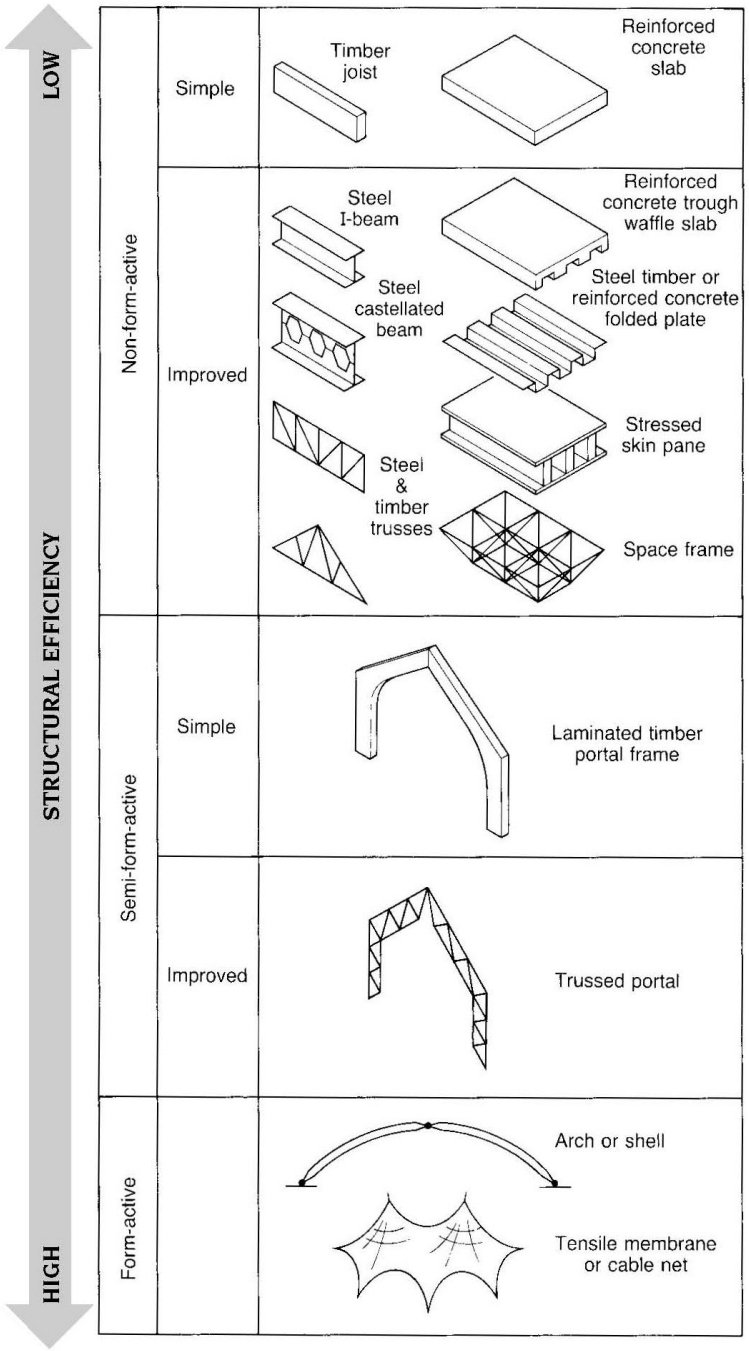
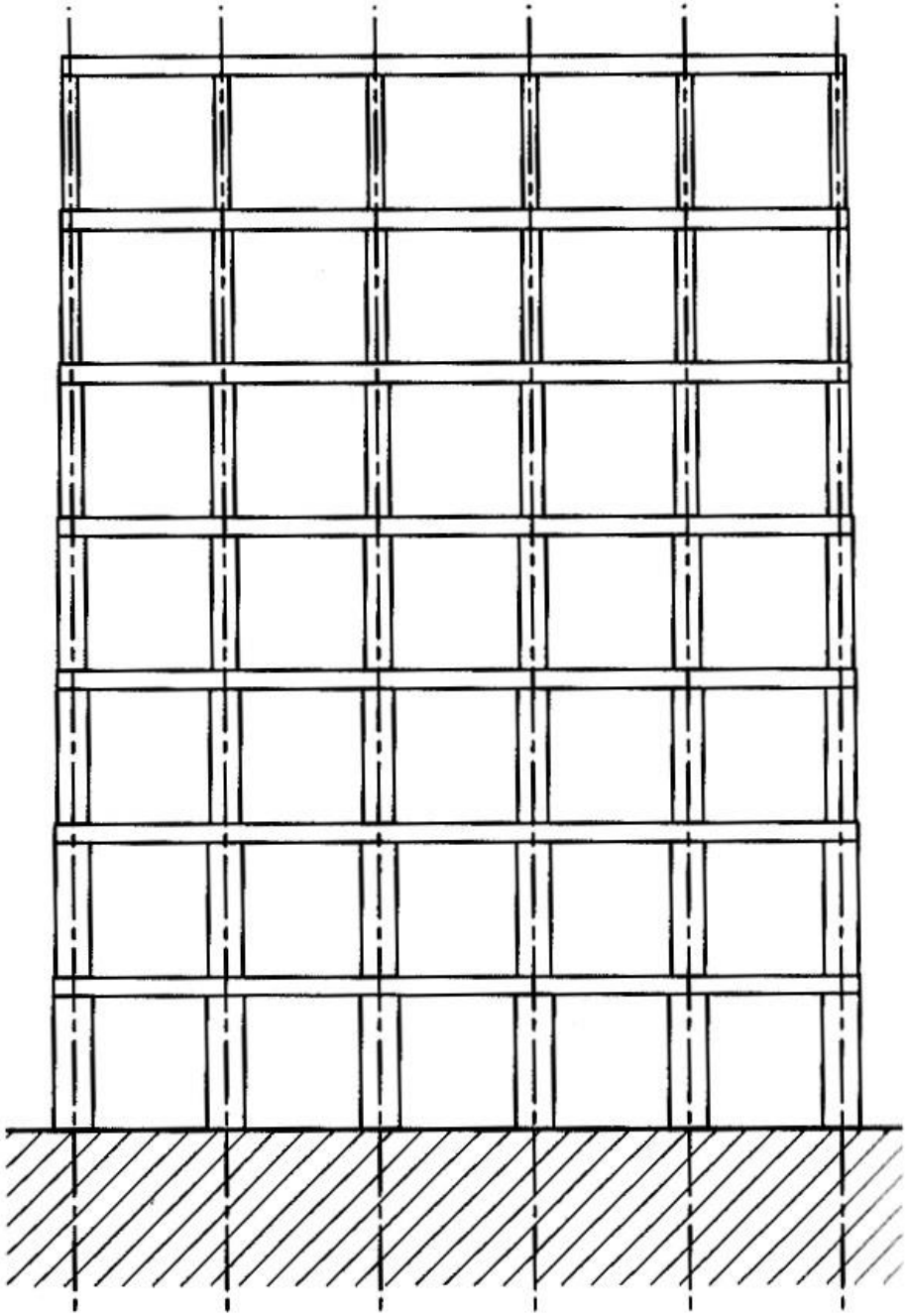
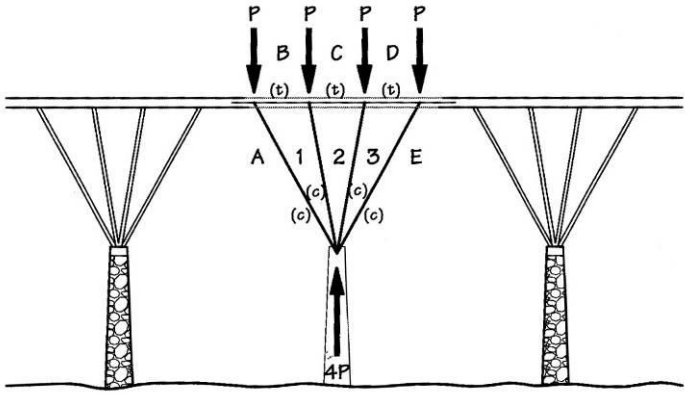
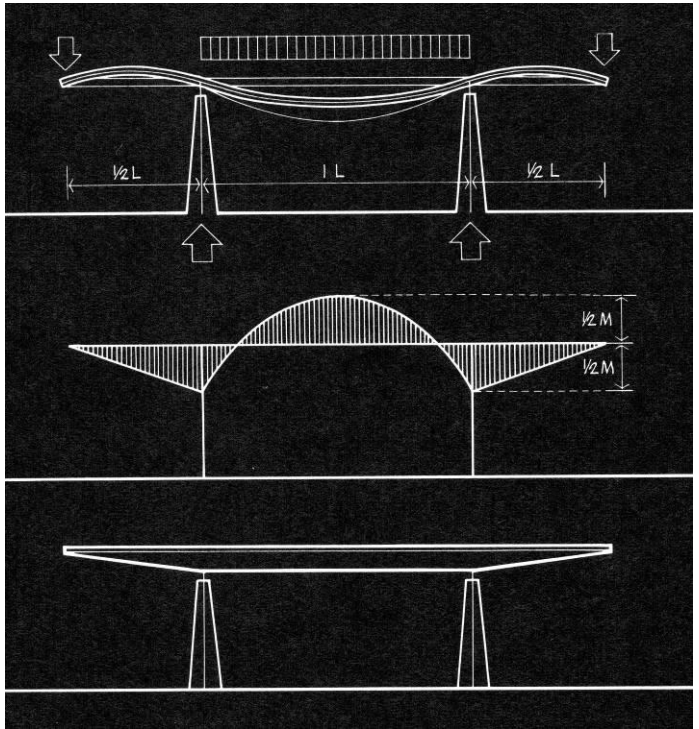


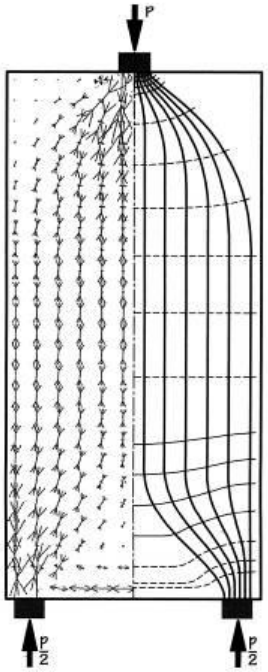

**Fig. 4.7** The effect of cross-sectional shape on the efficiency with which bending-type load is resisted. (a) Thin card which has an inefficient rectangular cross-section. (b) Thin card folded to give an efficient 'improved' cross-section. (c) Thick card with inefficient rectangular cross-section and having equivalent strength and stiffness to the folded thin card.

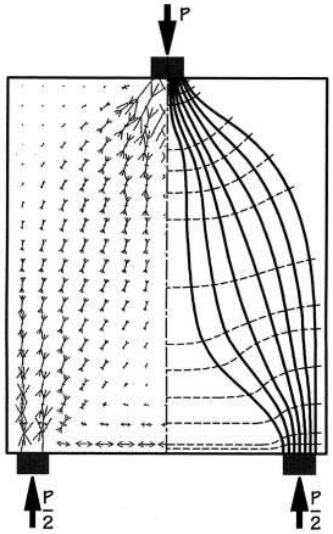

LOW
STRUCTURAL EFFICIENCY
HIGH
Non-form-active
Simple
Timber joist
Reinforced concrete slab
Improved
Steel I-beam
Reinforced concrete trough waffle slab
Steel castellated beam
Steel timber or reinforced concrete folded plate
Stressed skin pane
Steel & timber trusses
Space frame
Semi-form-active
Simple
Laminated timber portal frame
Improved
Trussed portal
Form-active
Arch or shell
Tensile membrane or cable net

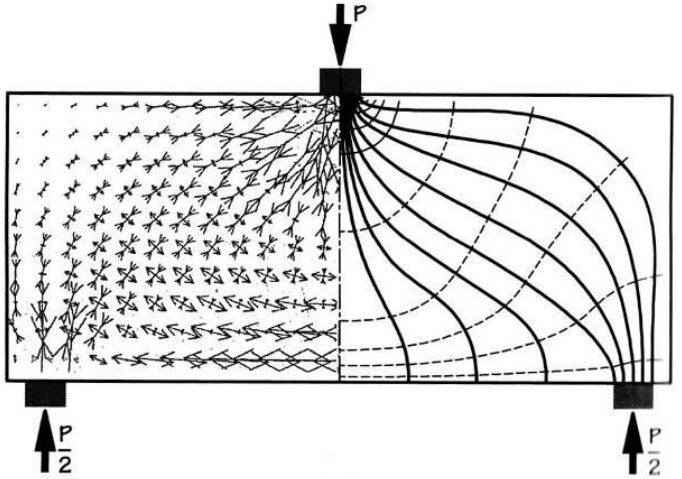


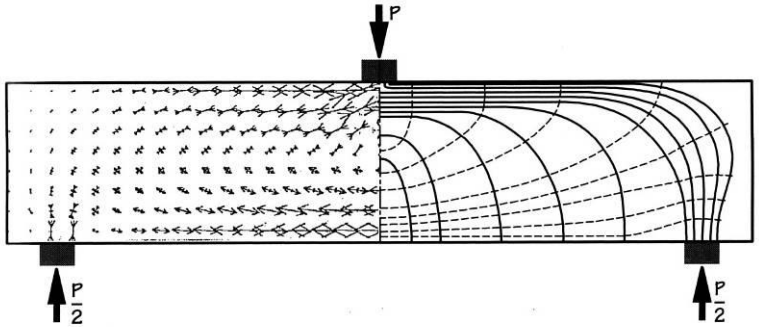

P
P
P
P
B
C
D
(t)
(t)
(t)
A
1
2
3
E
(c)
(c)
(c)
(c)
4P

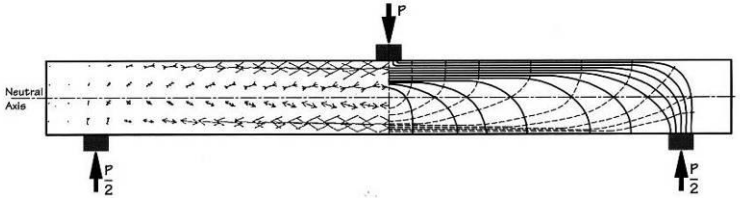

½L
1 L
½L
½M
½M


P
P/2
P/2

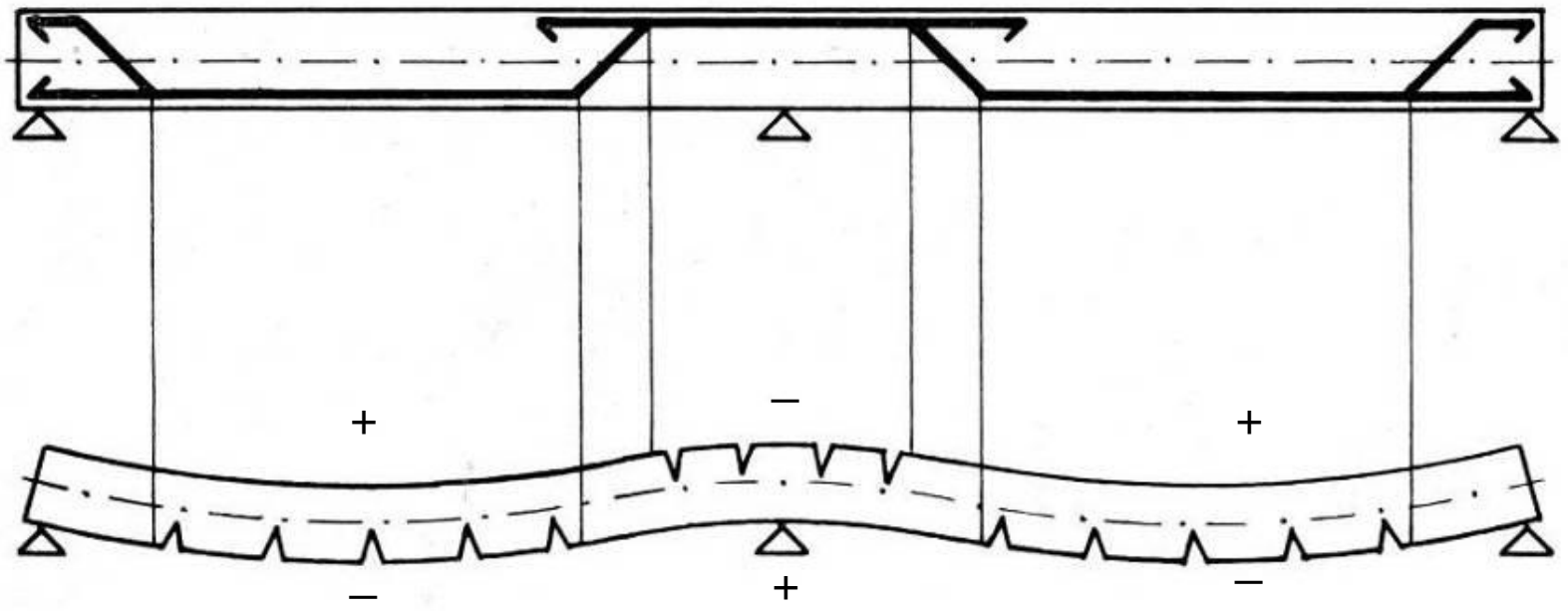

P
P/2
P/2

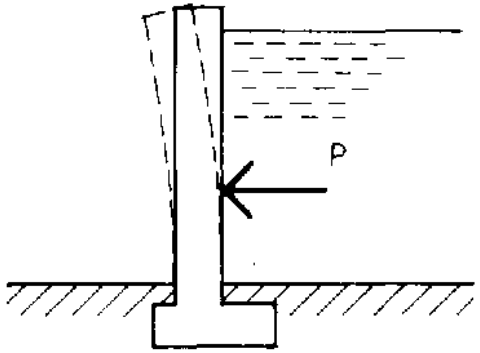

P
P/2
P/2


P
P/2
P/2

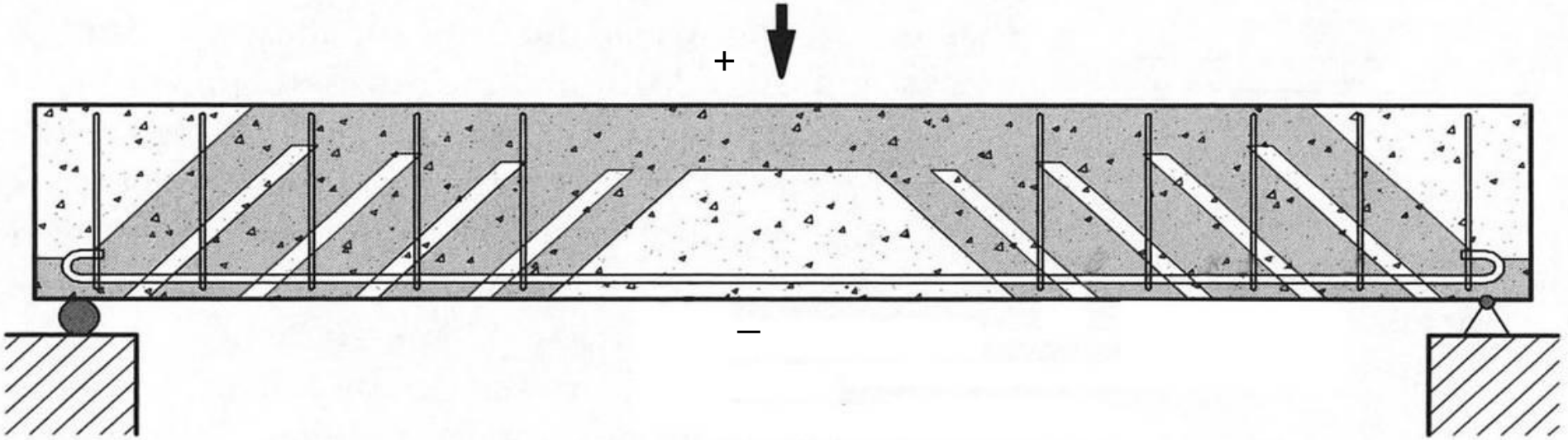

P
Neutral Axis
P/2
P/2

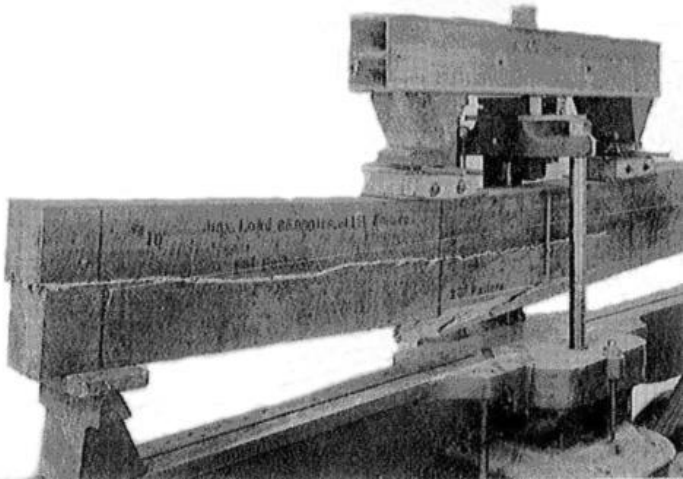
# PURISTUS - VETO

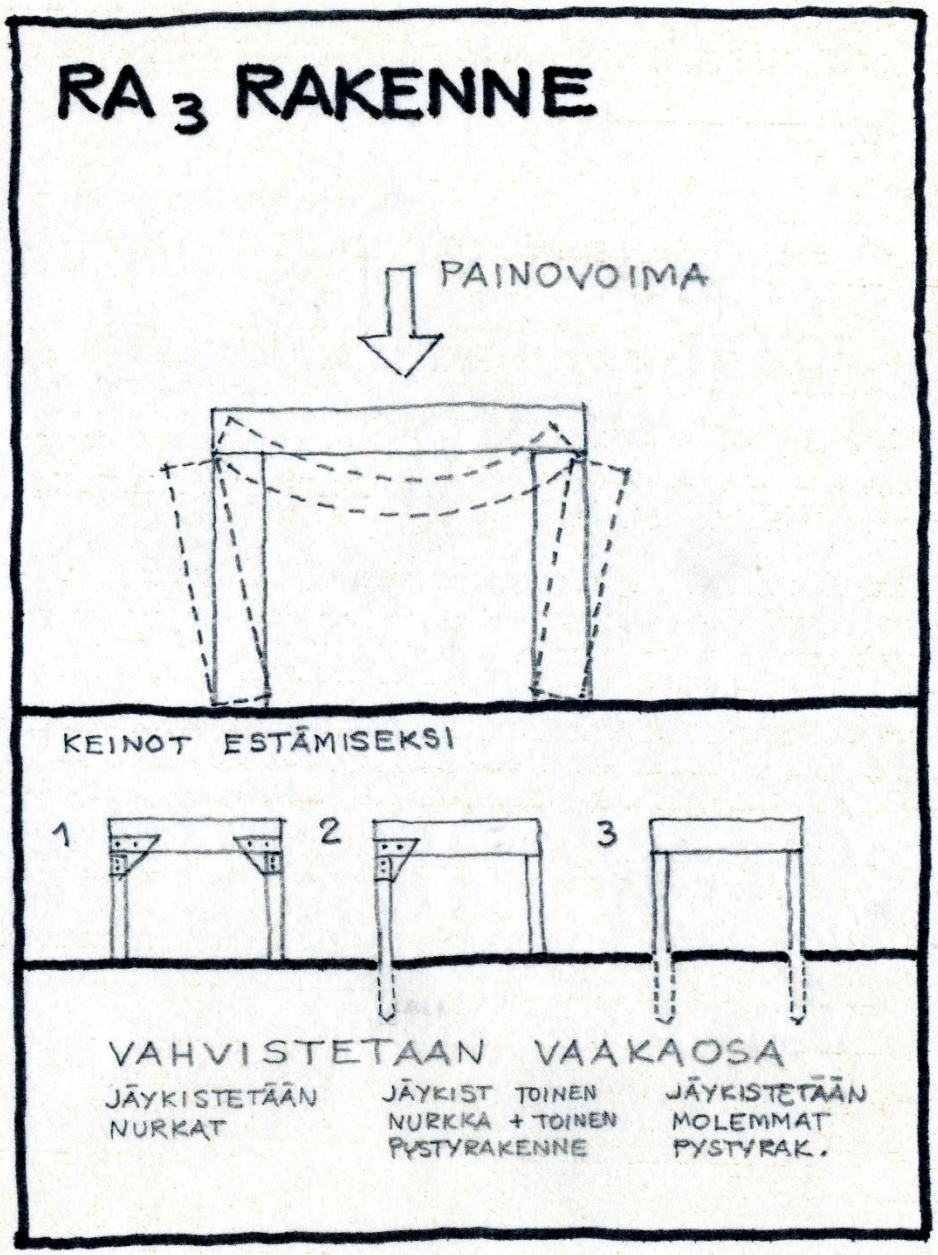


# LEIKKAUSVOIMAT



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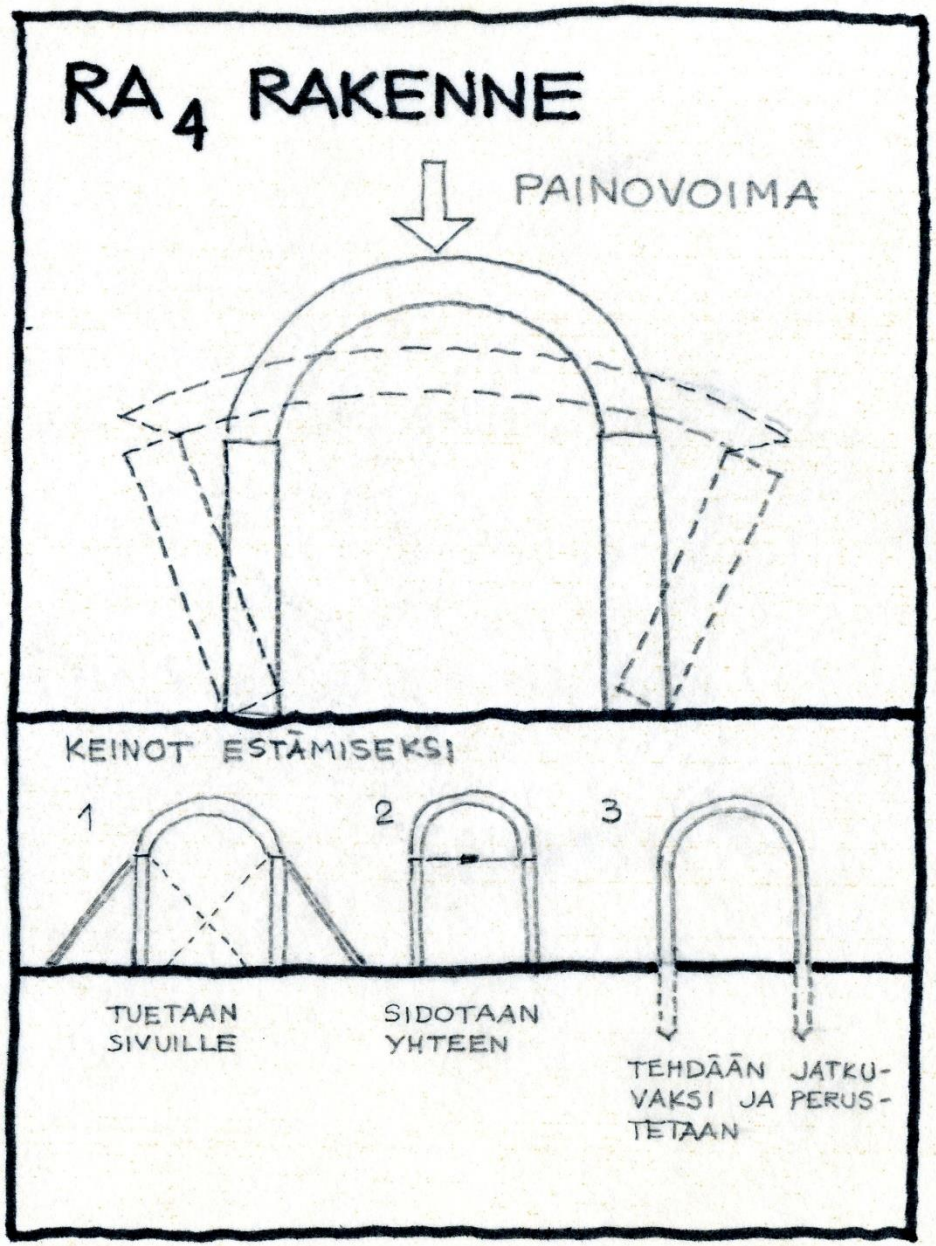


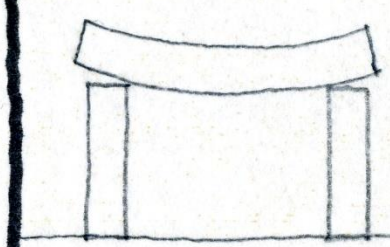

lähde: Bengt Lundsten

# RA 5 RAKENNE

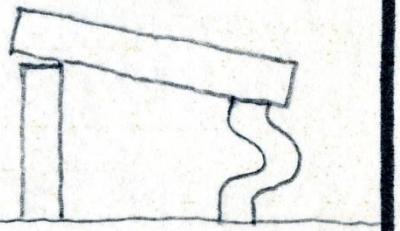
RAKENTEISSA ESIINTYY ERILAISIA MUODONMUUTOKSIA

MUUTOKSET ON ESTETTÄVÄ

1 TAIPUMA

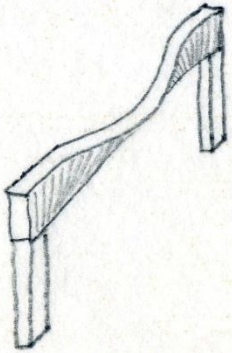


2 NURJAHDUS



3 VÄÄNTÖ

4 KIEPAHDUS



lähde: Bengt Lundsten

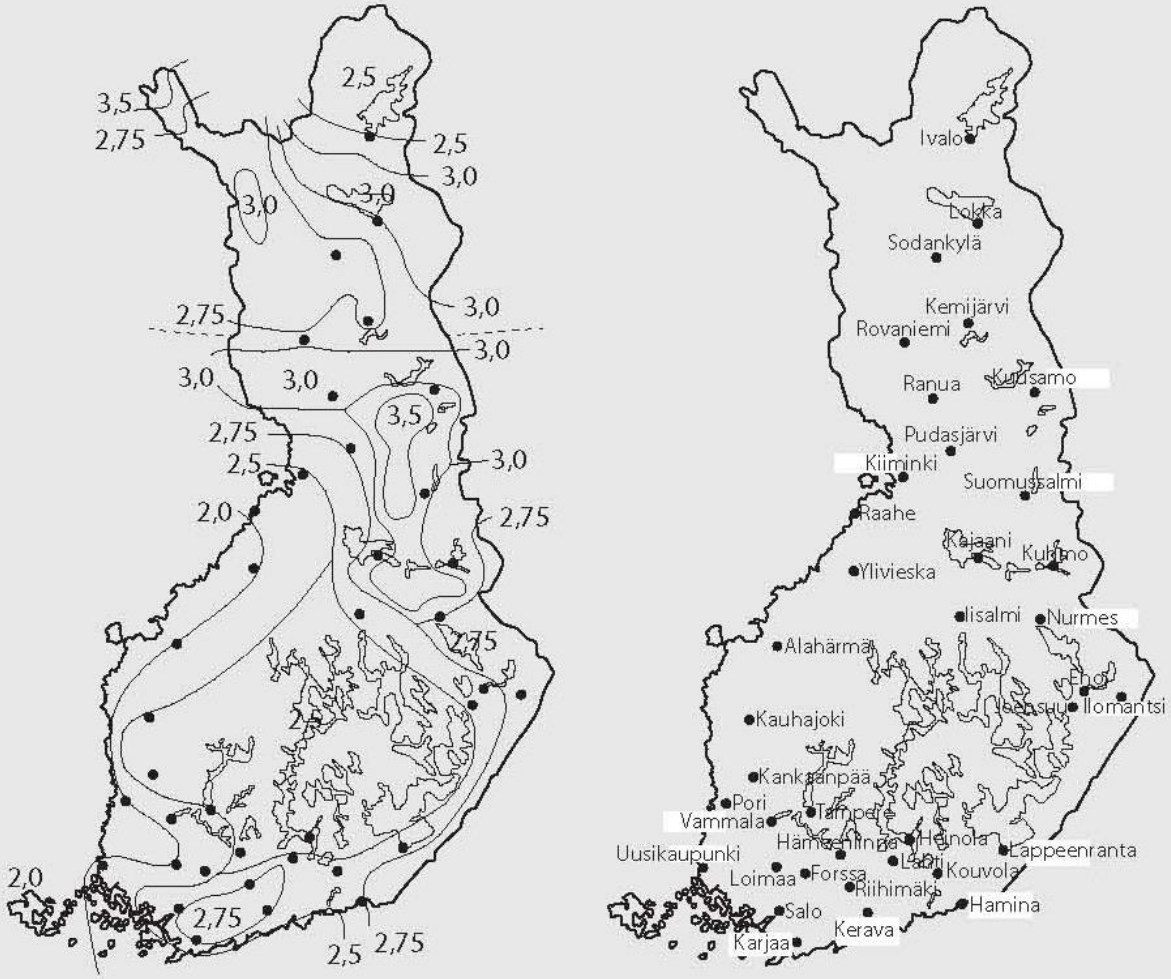
# KUORMATYYPIT

**LUMIKUORMA**

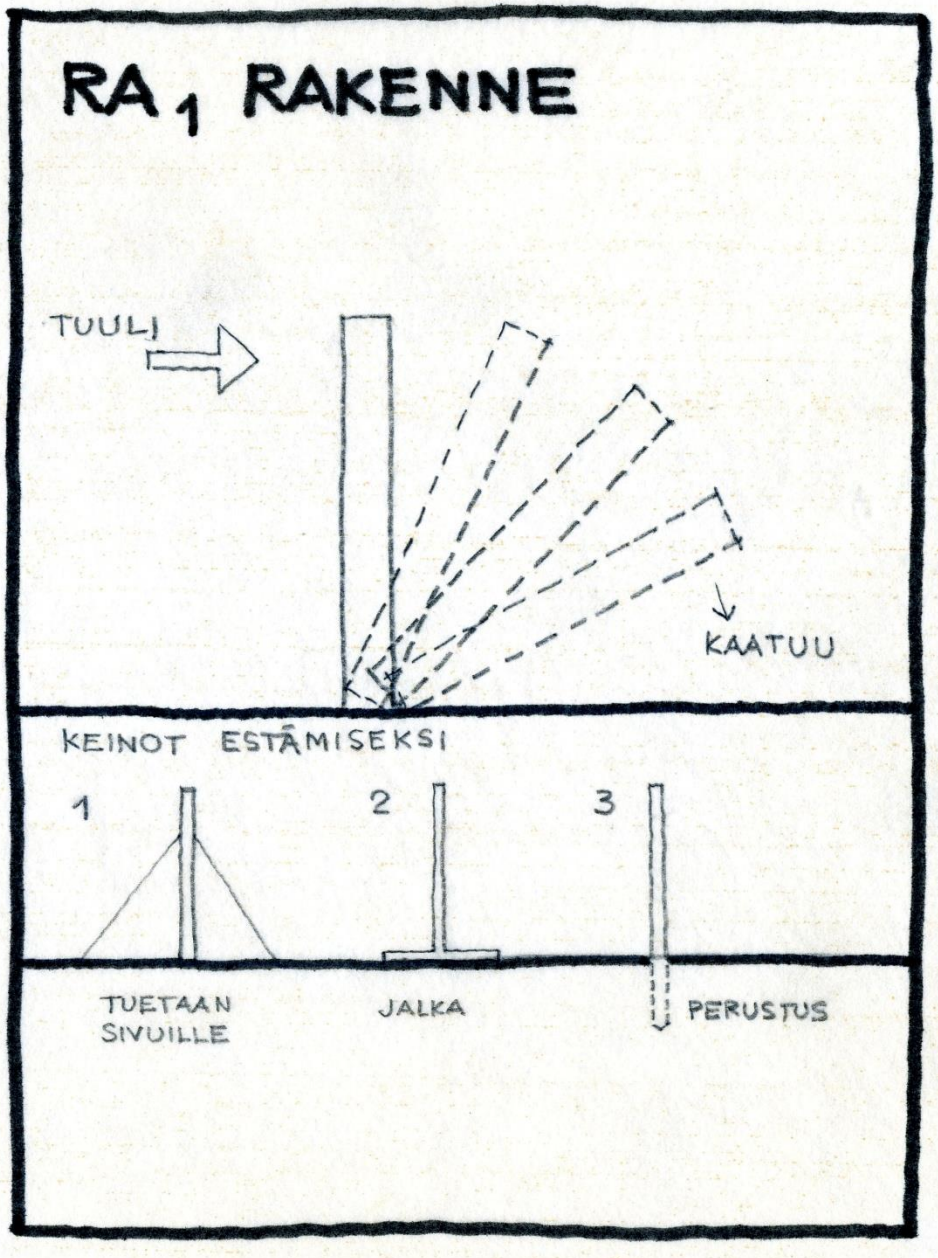
- **Ominaisarvot maantieteellisen sijainnin mukaan**
- **Katon muotokerroin vaikuttaa ominaisarvoon**

**TUULIKUORMA**

- **Tuuli aiheuttaa rakennuksen pintoihin kohdistuvan paineen**
- **Pintaan kohdistuva tuulikuorma = tuulennopeuspaine x painekerroin**
- **Nopeuspaineeseen vaikuttavat tuulen nopeus, ympäristön maastoluokka ja rakenteen korkeus**
- **Painekertoimeen vaikuttavat rakennuksen muoto ja tuulen suunta**

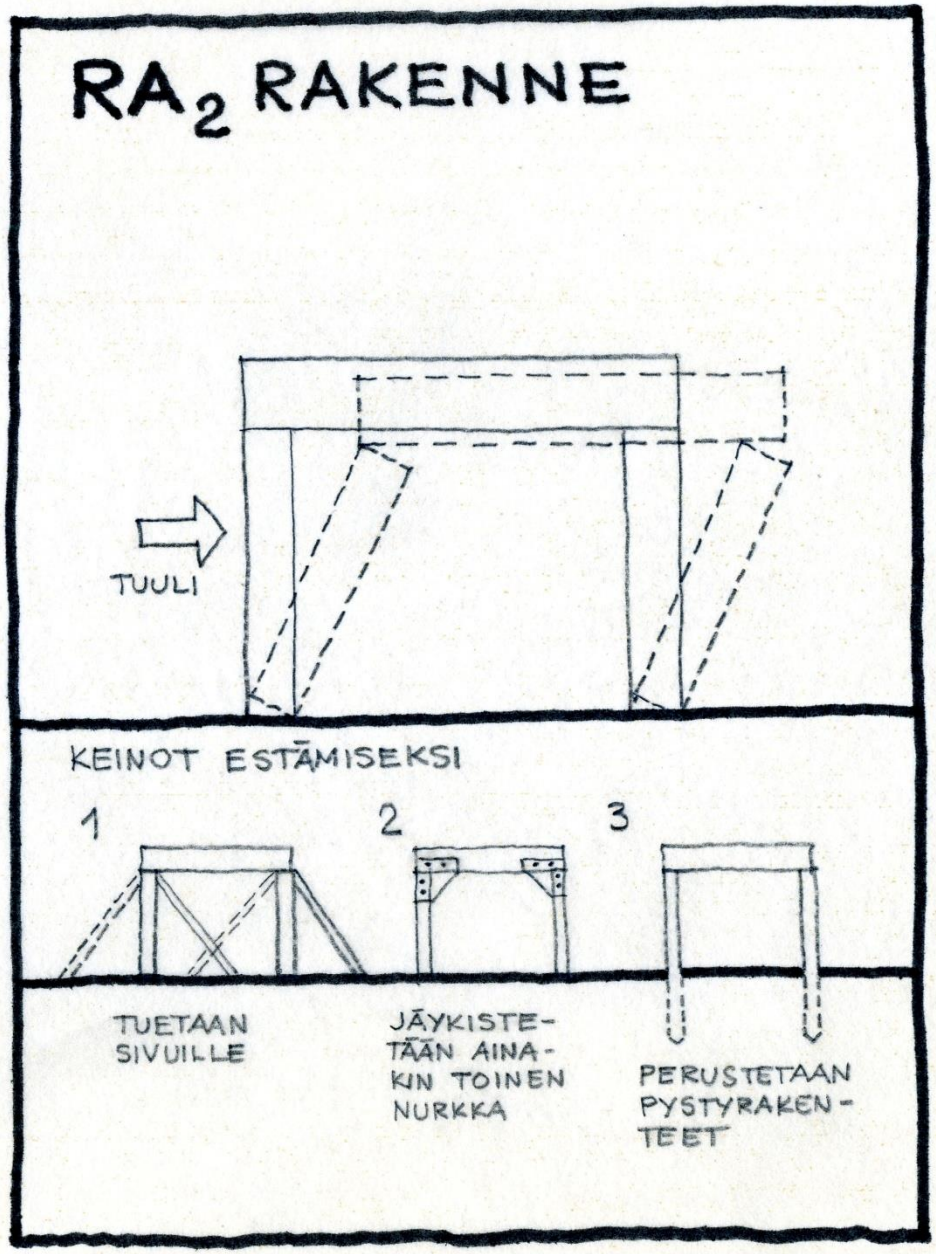



***Kuva 1.*** *Lumen ominaisarvot maan pinnalla, yksikkö kN/m$^2$. Rakennuspaikan sijaitessa alueella, jossa arvo ei ole vakio, väliarvot interpoloidaan suoraviivaisesti suhteessa etäisyyksiin lähimmistä käyristä.*




lähde: Bengt Lundsten

# $RA_2$ RAKENNE




lähde: Bengt Lundsten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# KUORMATYYPIT / MUITA KUORMIA

**MAANPAINEKUORMA**

- **Maata vasten olevan rakenteen vaakasuora kuormitus**

**MUODONMUUTOSKUORMA**

- **Lämpötilan muutokset**
- **Materiaalin kutistuminen (esim. betonirakenteet)**
- **Kosteuden muutokset**

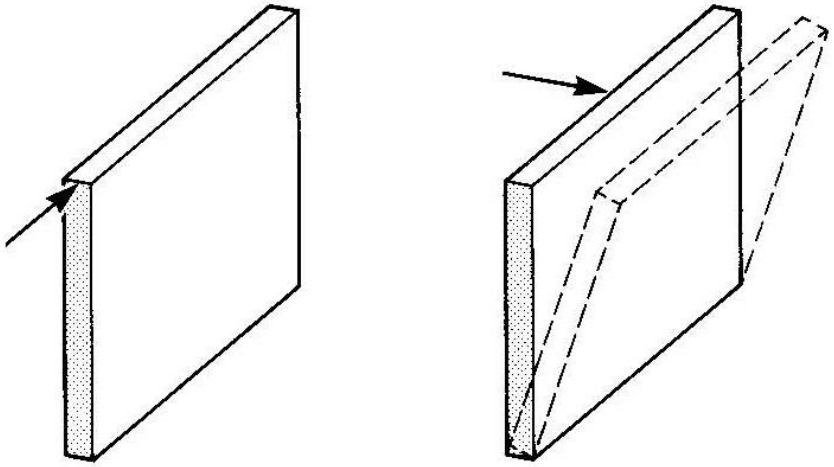
**JÄÄNPAINEKUORMA**

- **Kiinteän jääpeitteen aiheuttama jääpaine**
- **Liikkuvan jään aiheuttamat sysäykset**

**ONNETTOMUUSKUORMAT**

- **Harkitaan tapauskohtaisesti**

# RAKENNUKSEN JÄYKISTÄMINEN



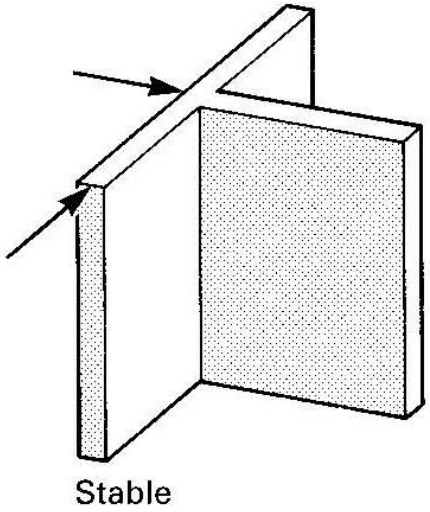
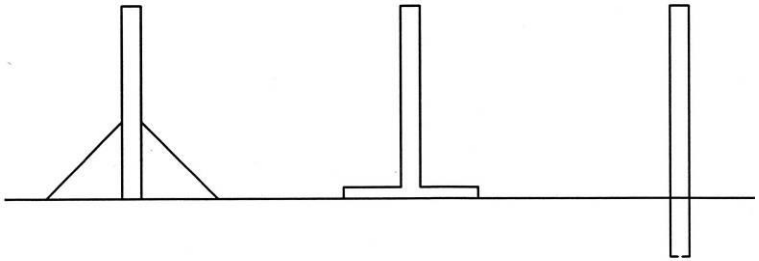
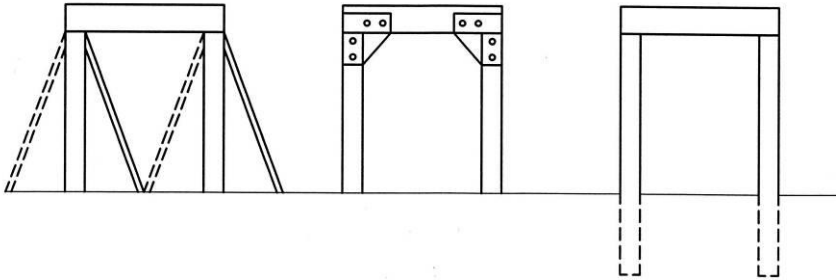
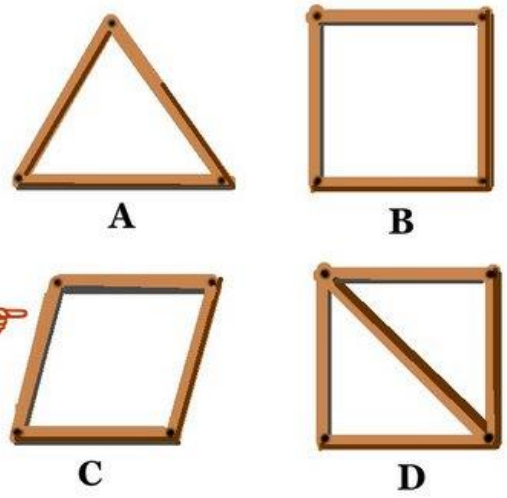
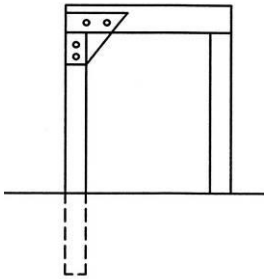



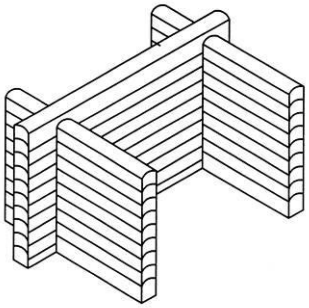

**Fig. 2.14** Walls are unstable in the out-of-plane direction and must be grouped into orthogonal arrangements for stability.

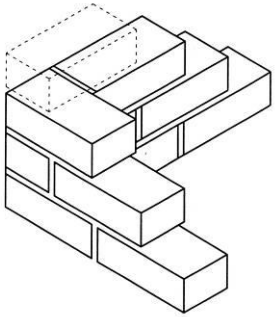


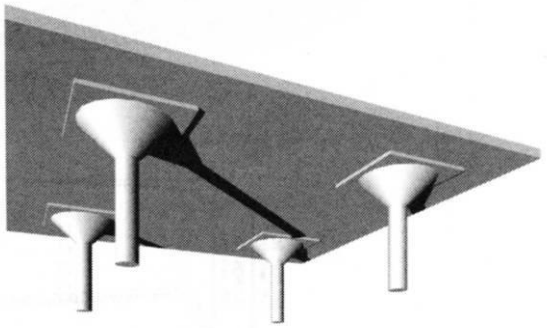



A
B
C
D









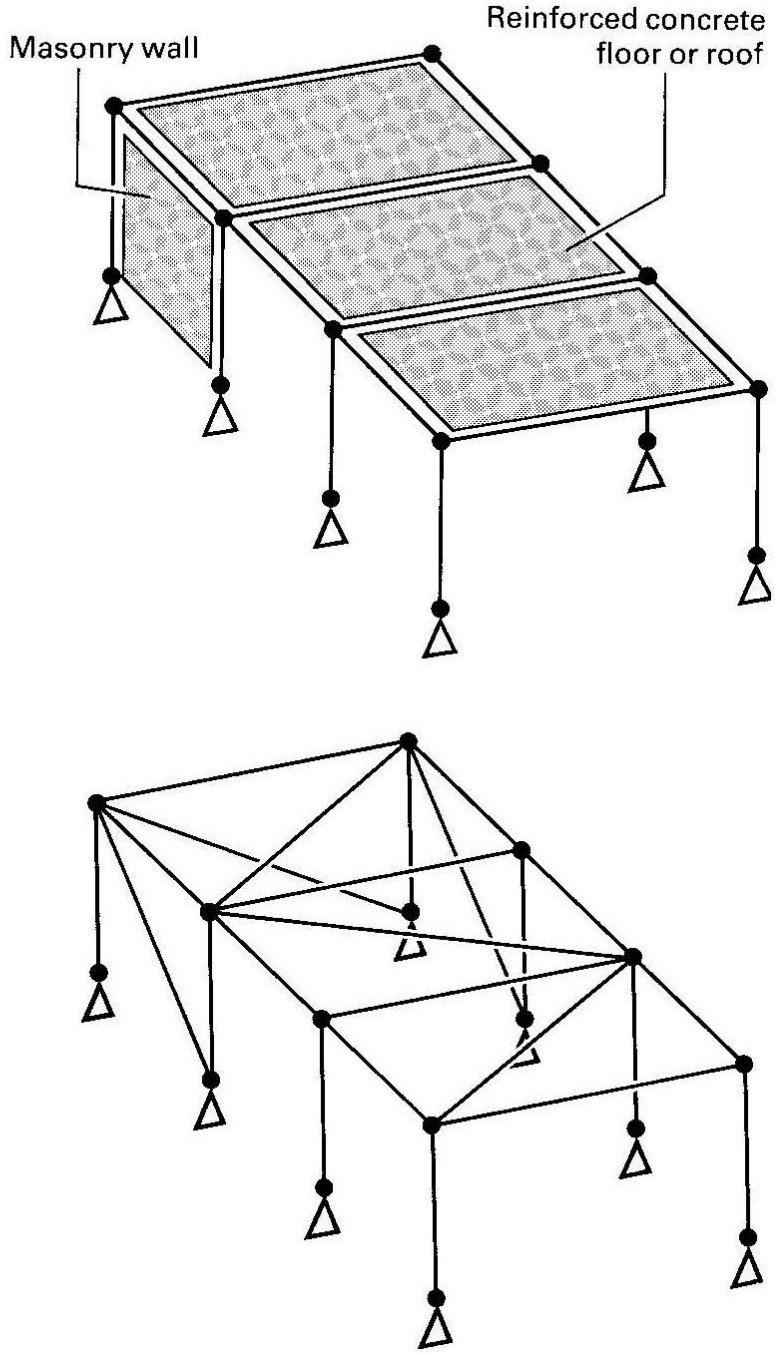
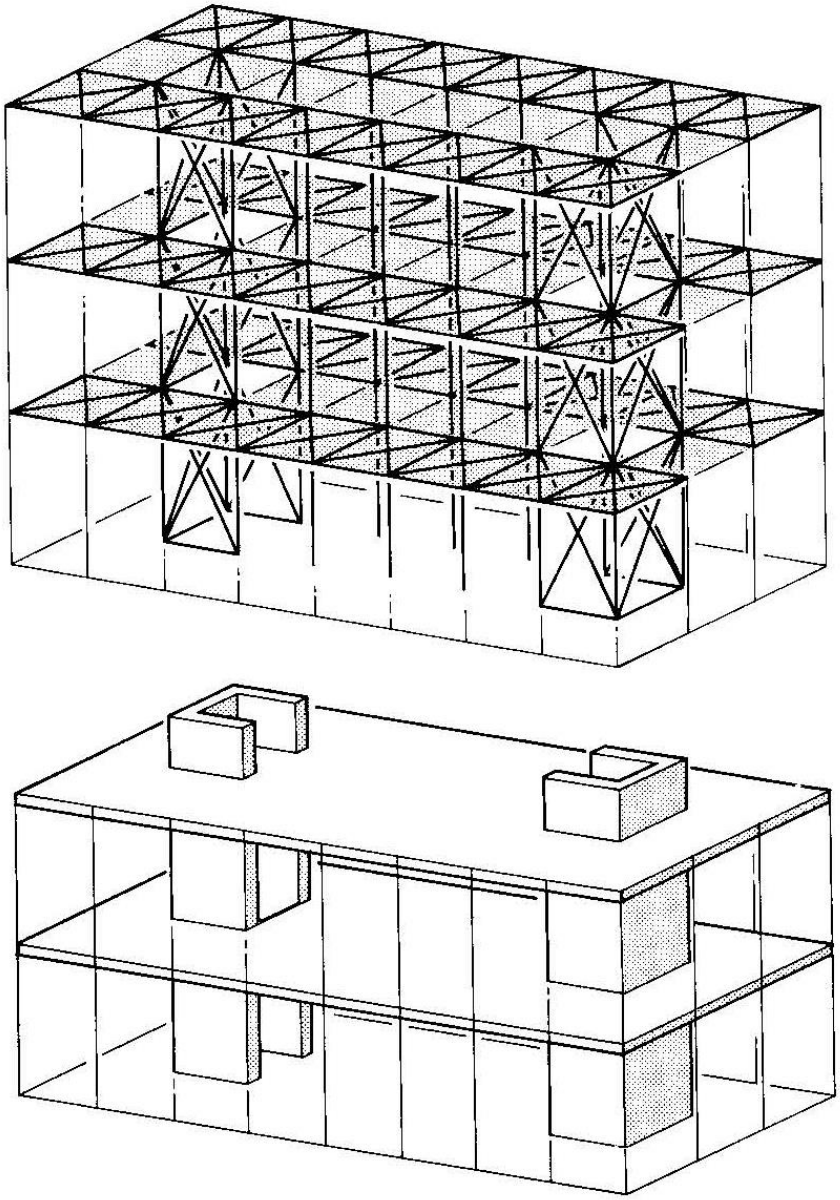
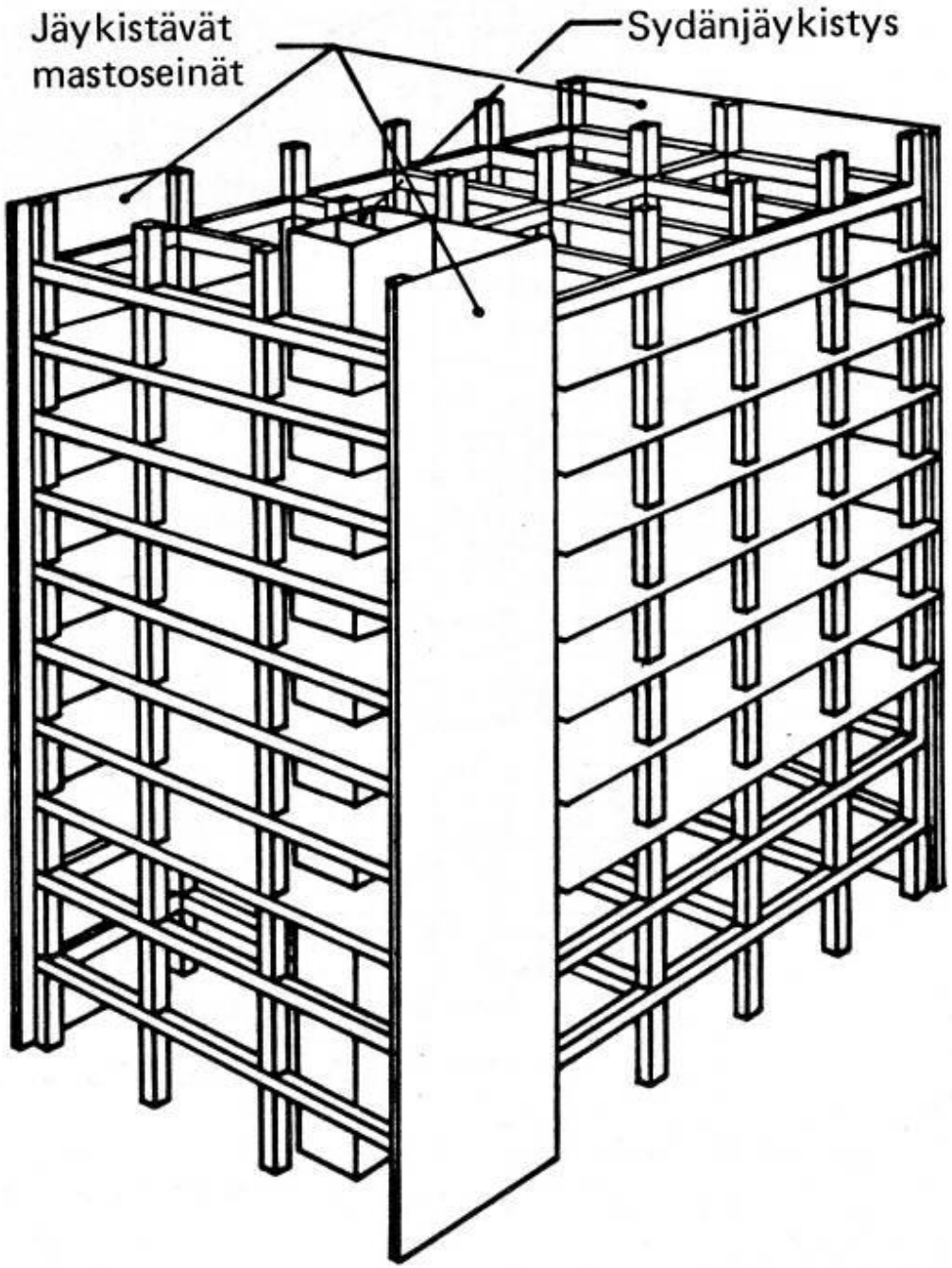
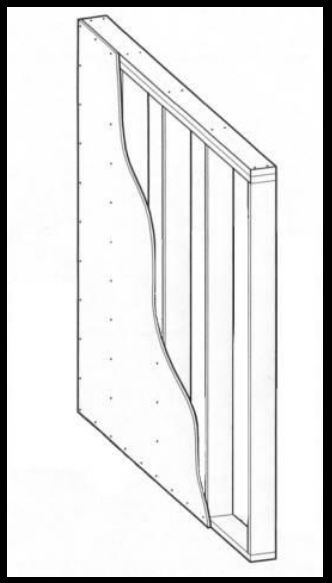
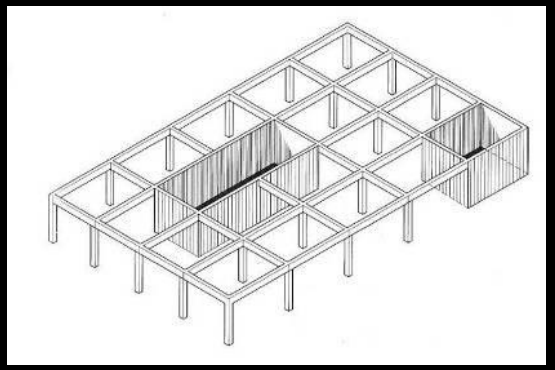



**Fig. 2.7** These frames contain the minimum number of braced panels required for stability.



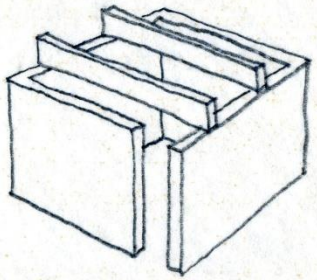

Jäykistävät
mastoseinät
Sydänjäykistys



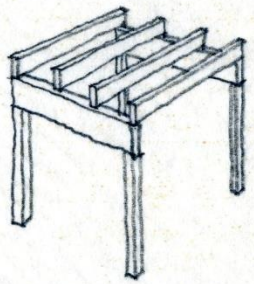


# RA6 RAKENNE

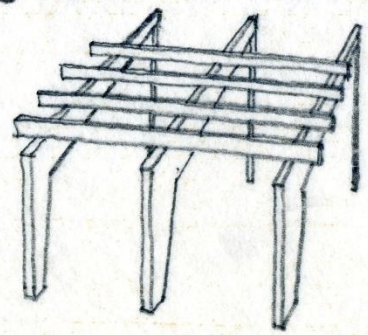
1 KANTAVA SEINÄ JA PALKIT



2 PILARIT JA PALKIT



3 KEHÄT JA PALKIT



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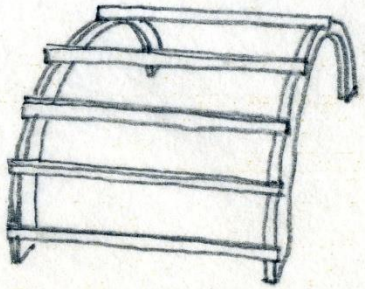
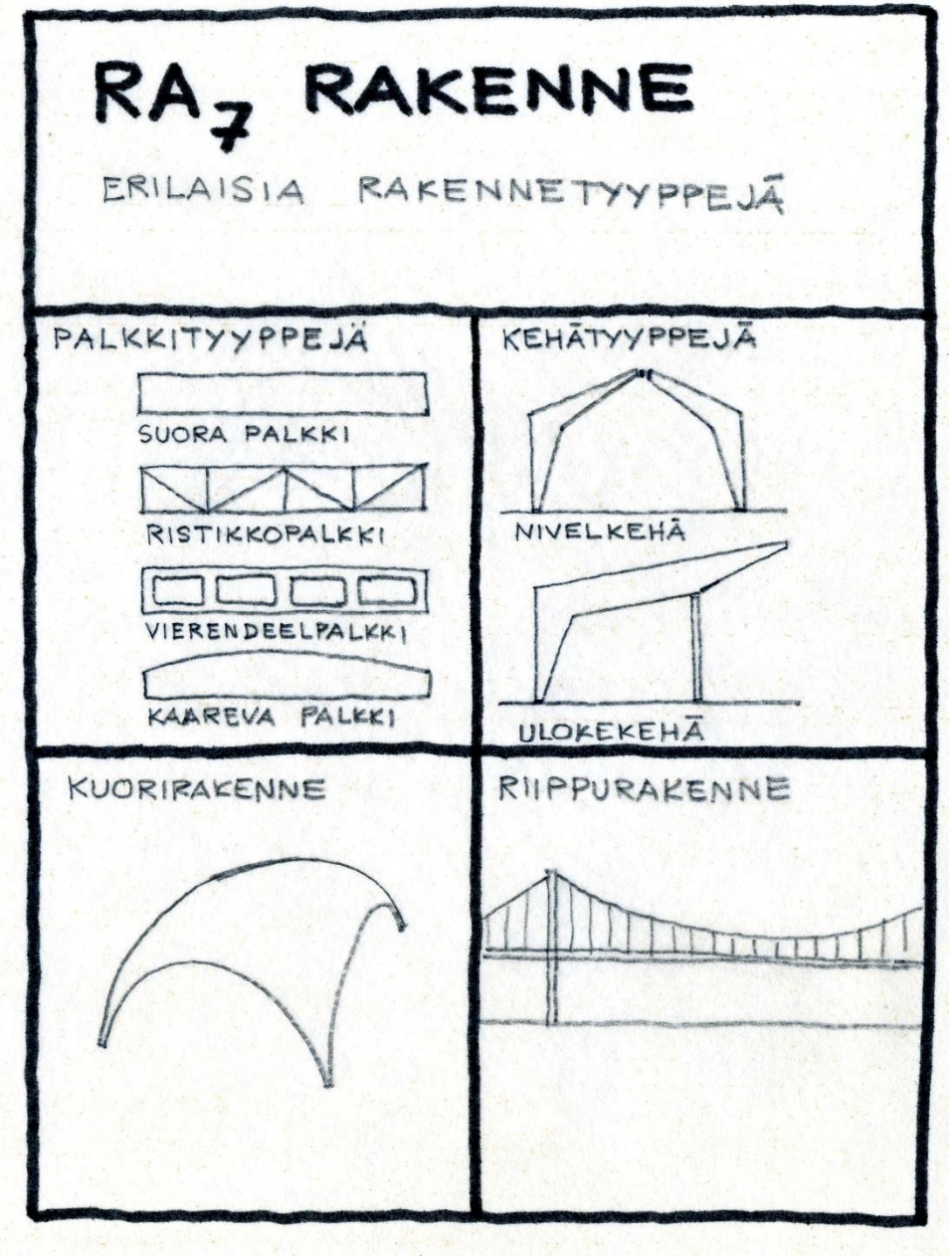
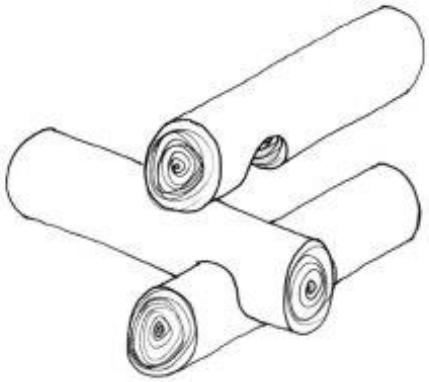


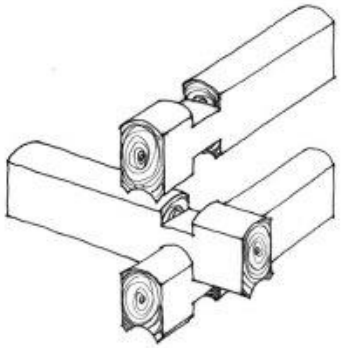
lähde: Bengt Lundsten

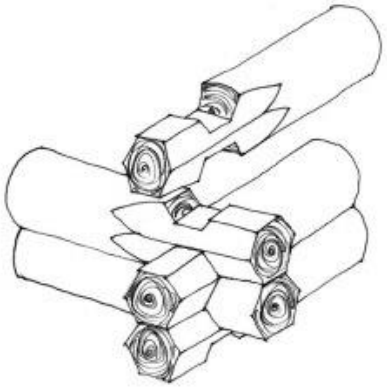


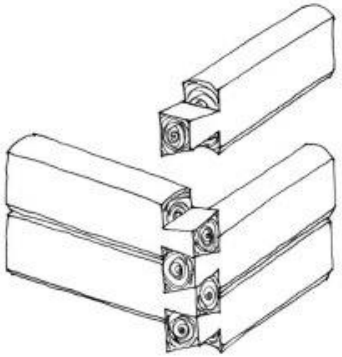

lähde: Bengt Lundsten

# LADOTUT RAKENTEET

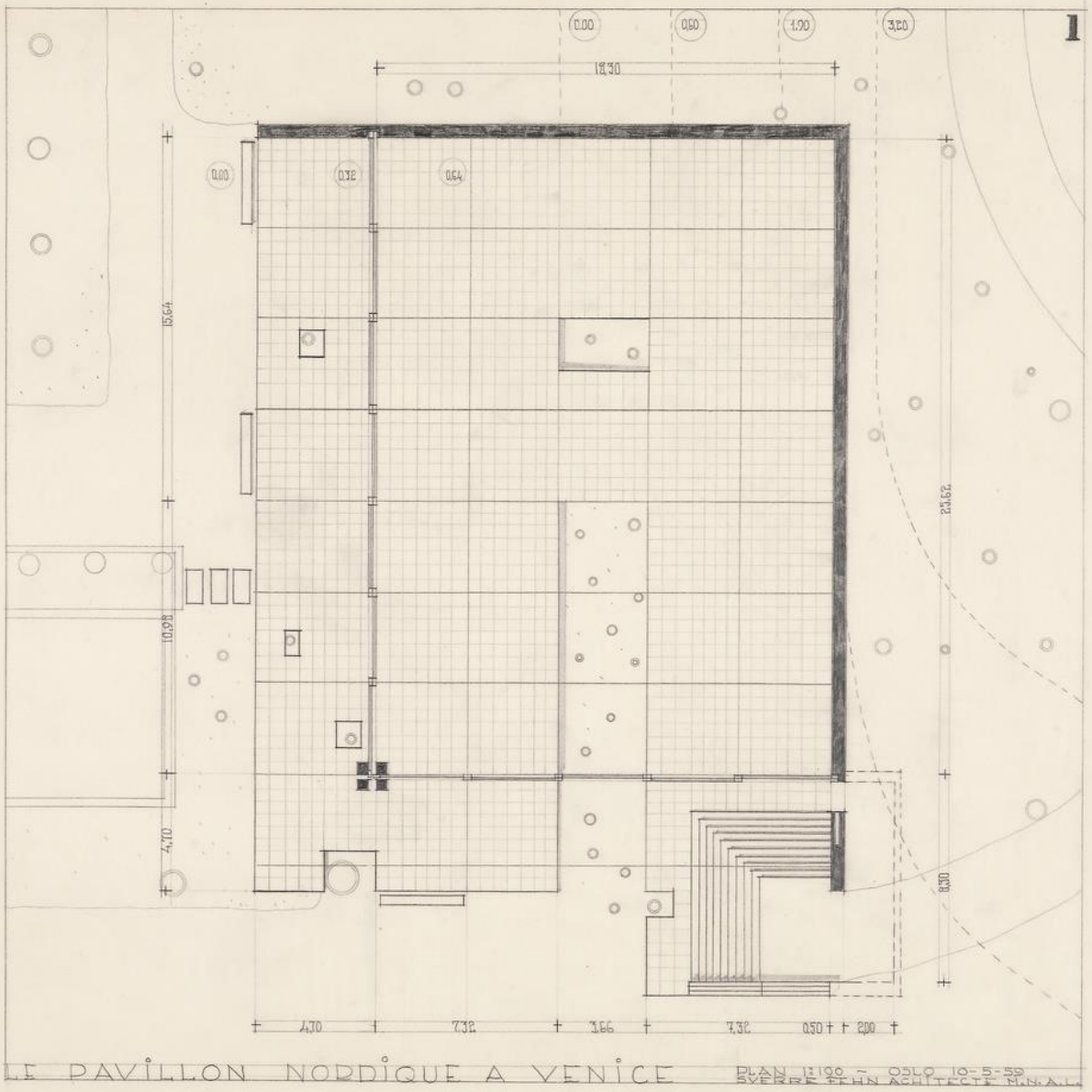


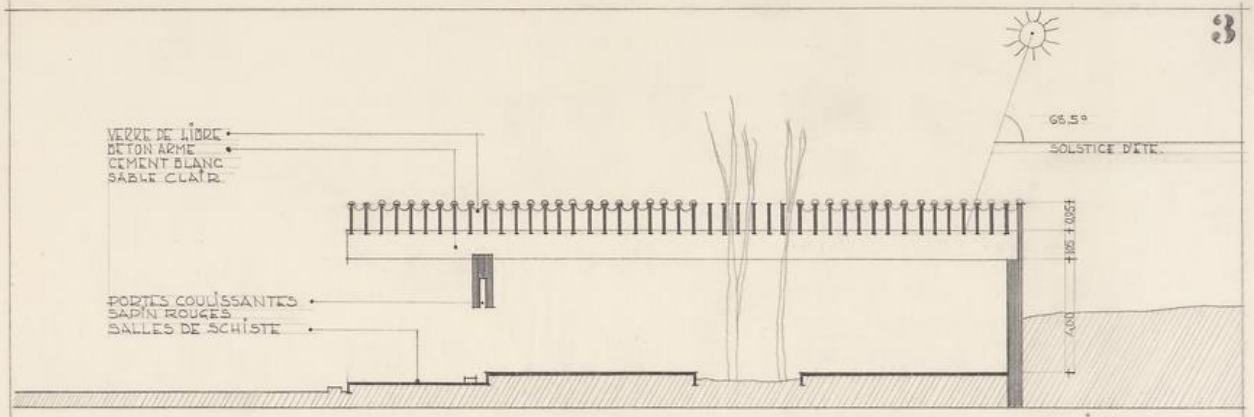




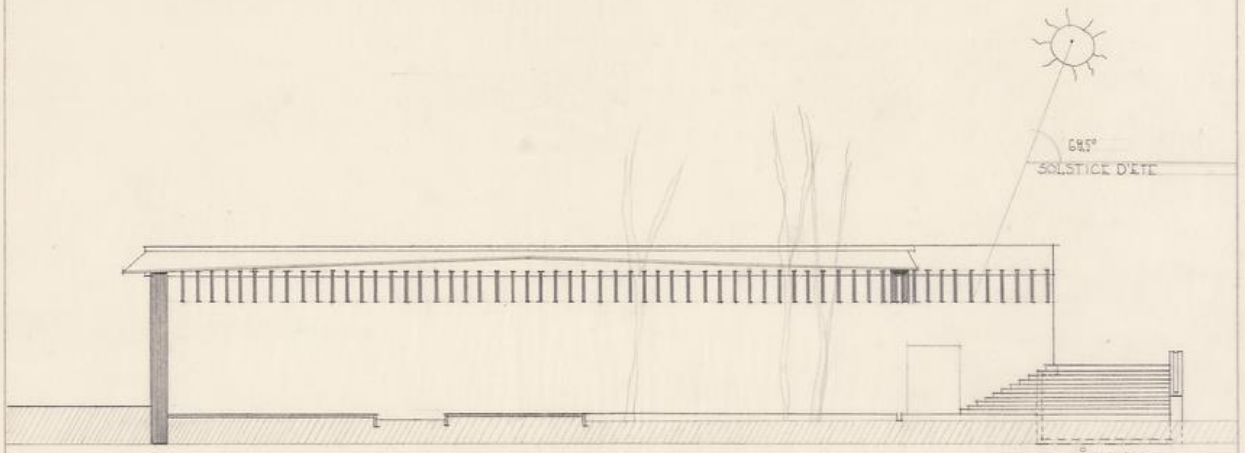


# PILARI – PALKKI-RAKENTEET


1
0.00
0.60
1.90
3.20
18.30
0.00
0.32
0.64
15.64
10.98
4.70
23.62
8.30
4.70
7.32
3.66
7.32
0.50
2.00
LE PAVILLON NORDIQUE A VENICE
PLAN 1:100 – OSLO 10-5-59
SVERRE FEHN ACHITECTE M.N.A.L.A.




SECTION A-A.



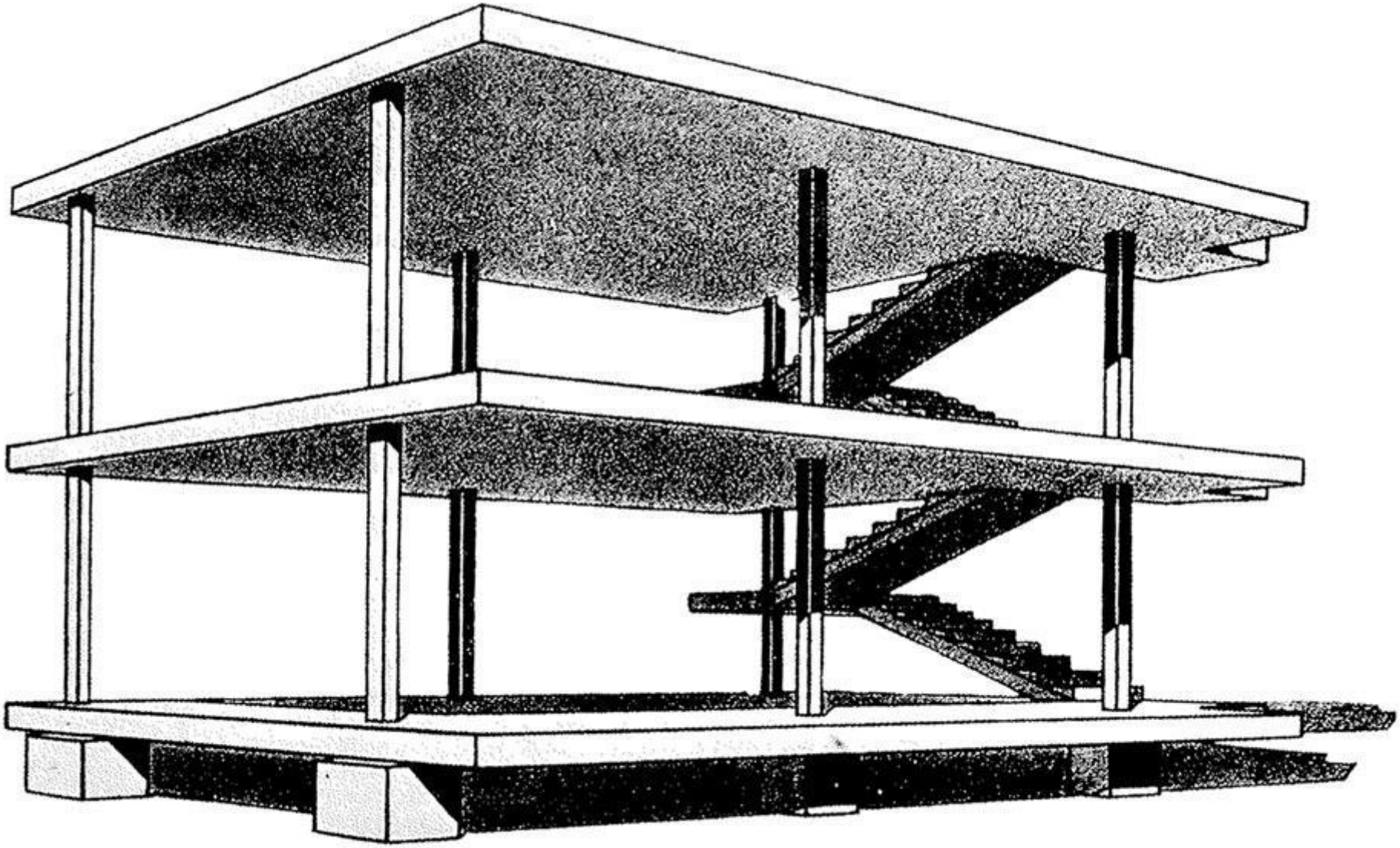

SECTION B-B.

# LE PAVILLON NORDIQUE A VENICE

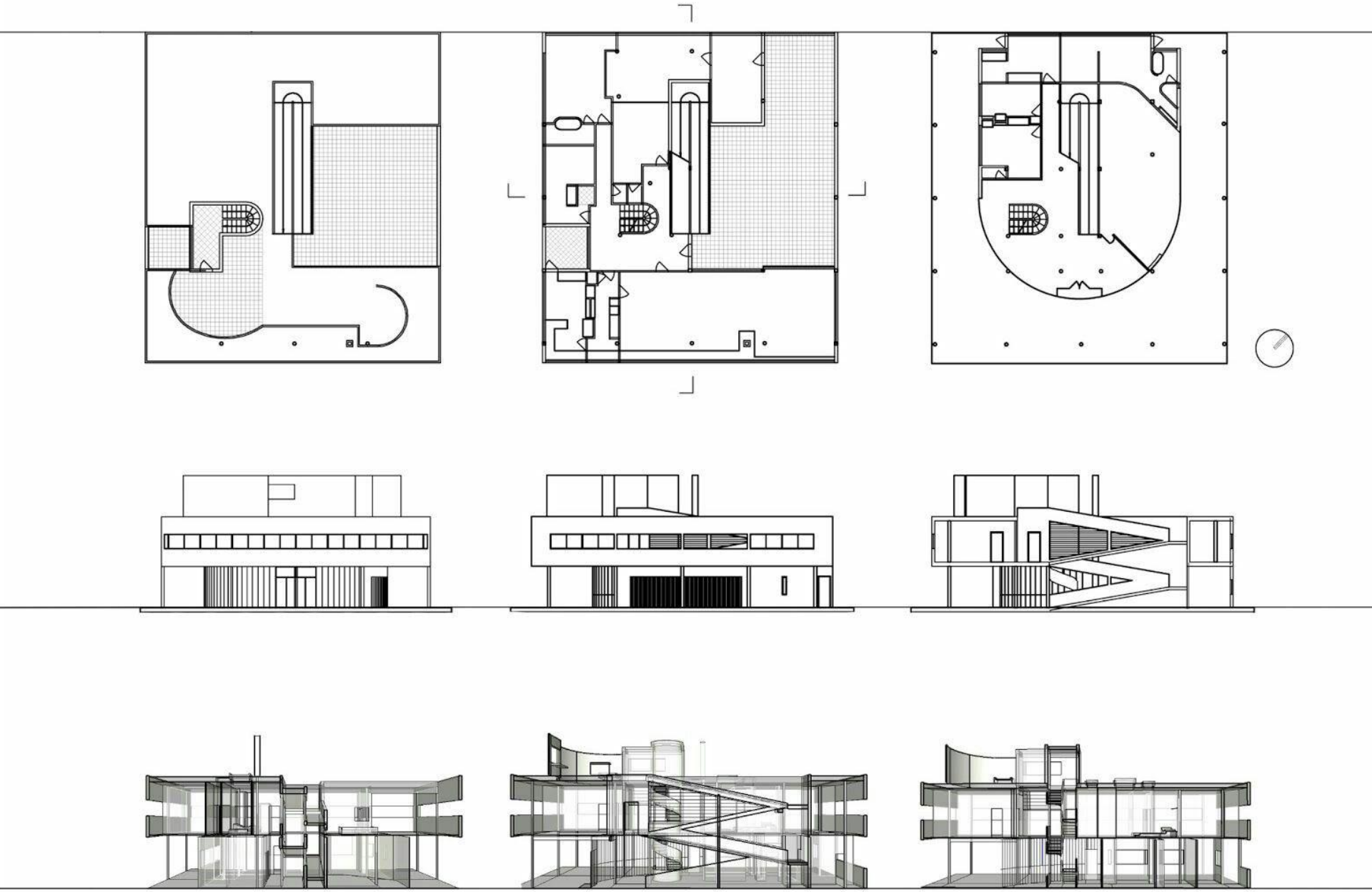
SECTIONS 1:100 OSLO 12-5-58
SVERRE FEHN ARCHITECTE M.N.A.L.


tamedia

# PILARI - LAATTARAKENTEET



L'ossature standard « Dom-ino », pour exécution en grande série

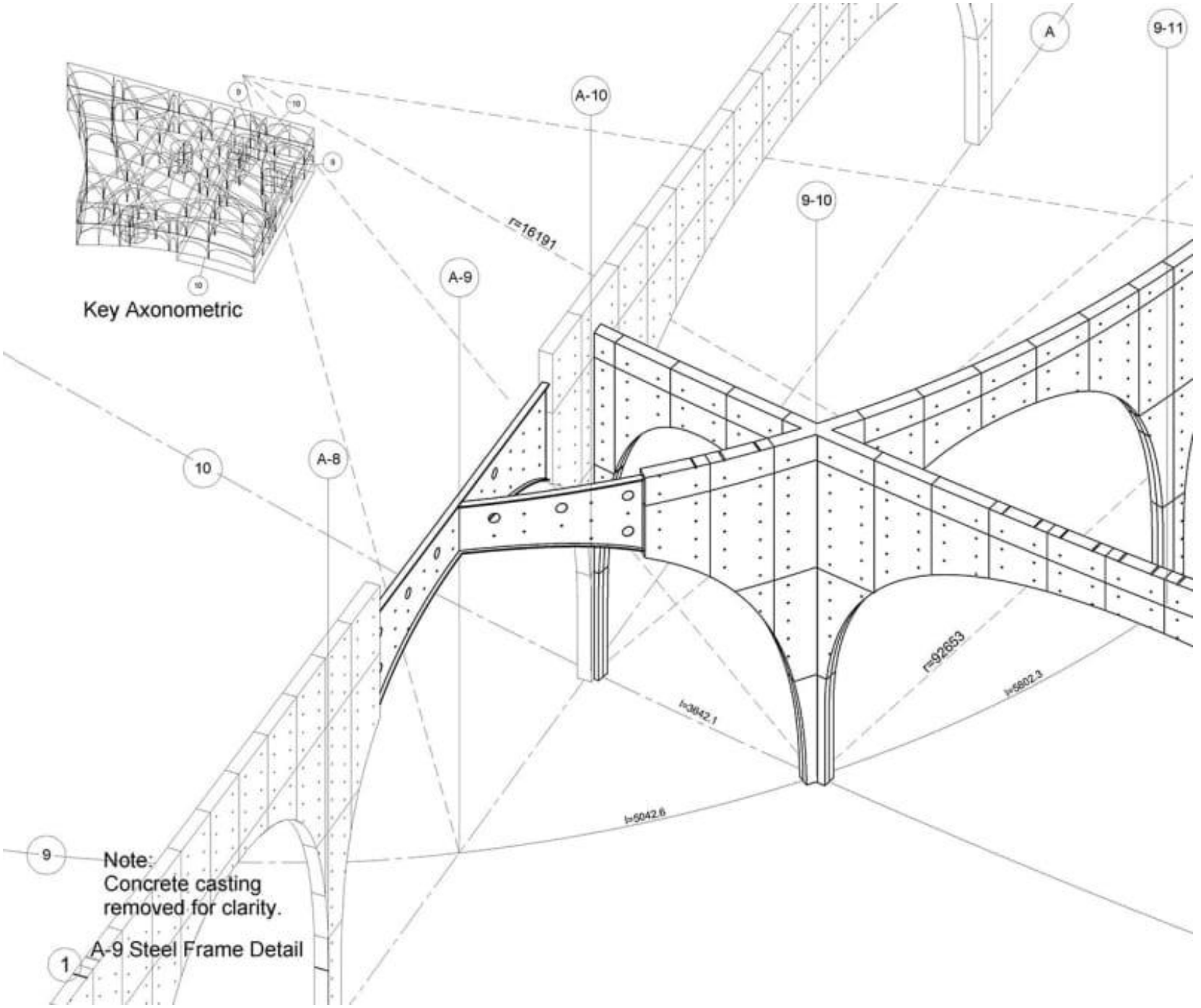


# VILLA SAVOYE - LE CORBUSIER

VISHANT KUMAR z3331772

# KEHÄRAKENTEET

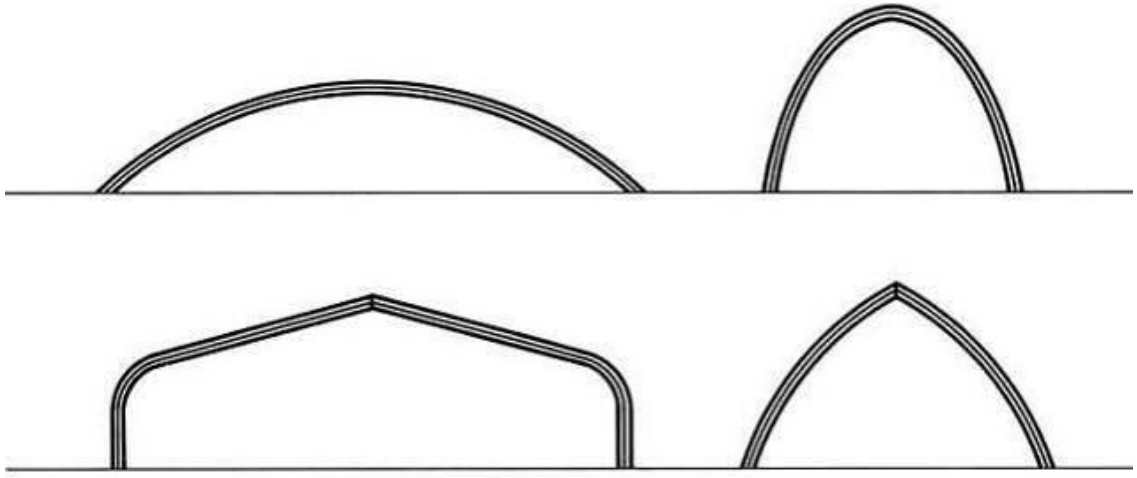
Key Axonometric

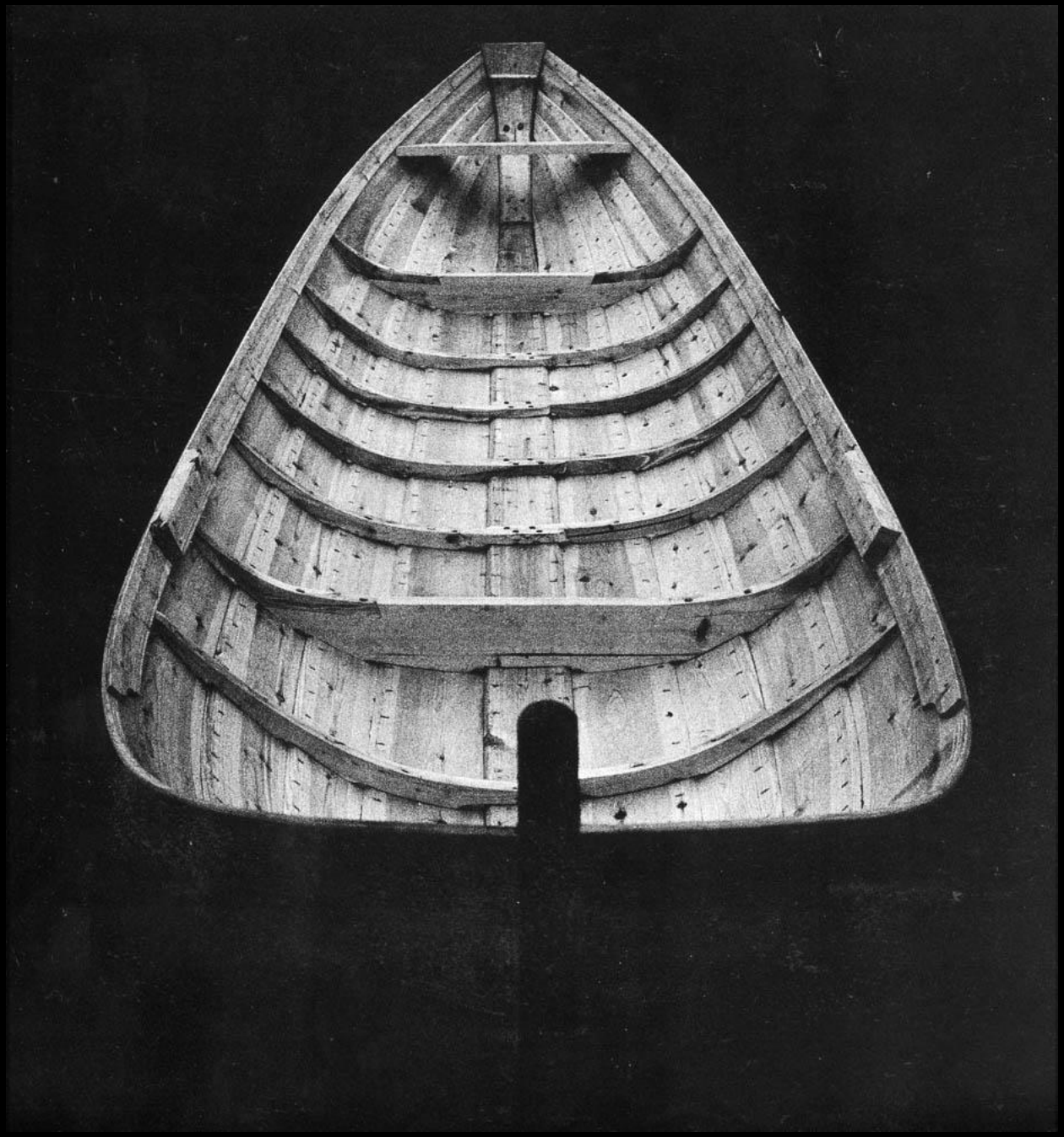



Note:
Concrete casting
removed for clarity.

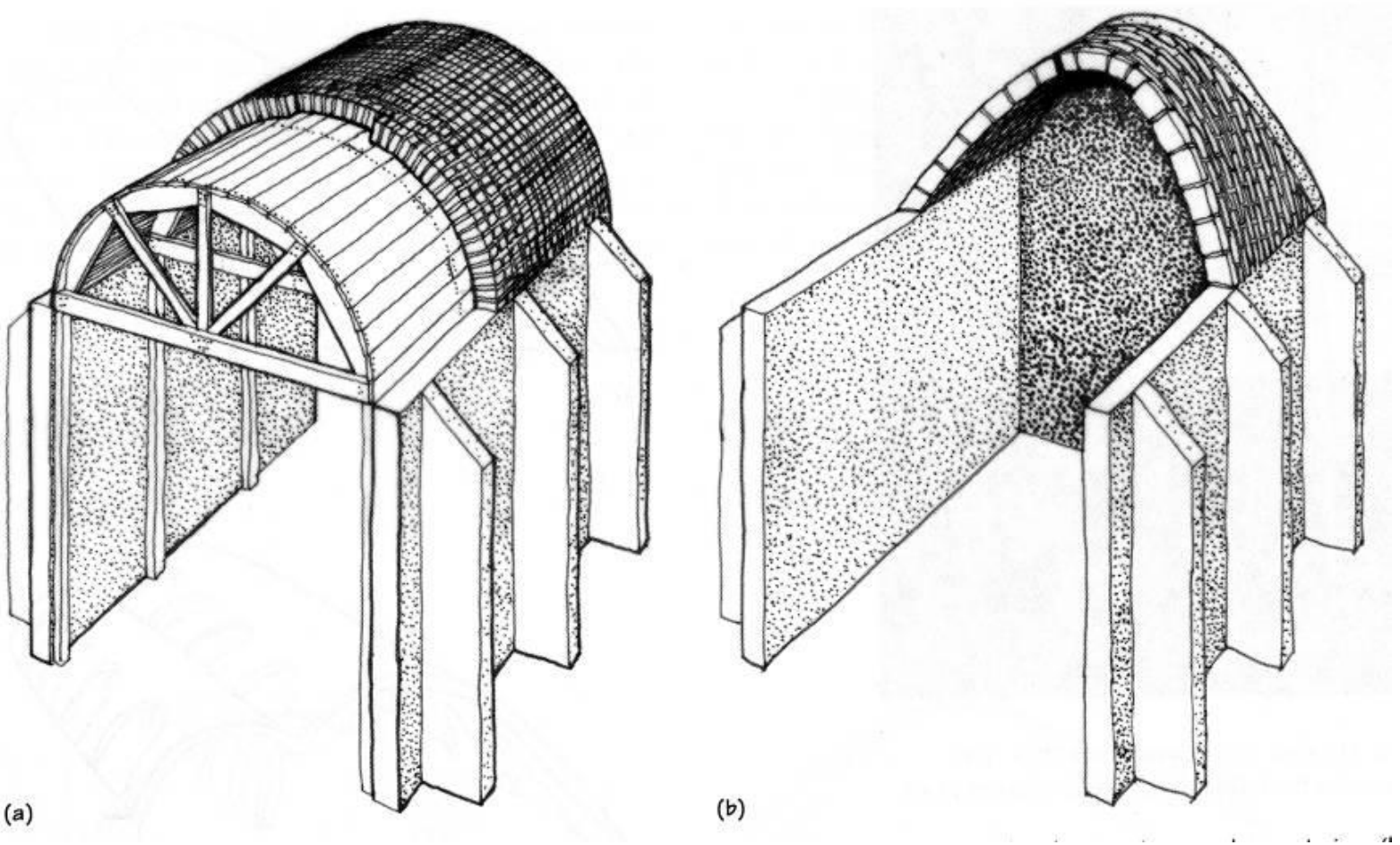
1 A-9 Steel Frame Detail

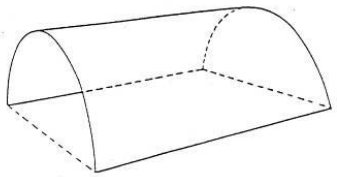
# KAARIRAKENTEET

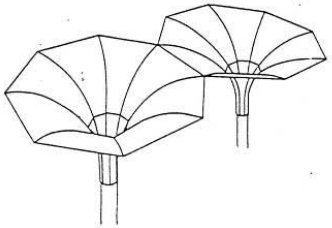


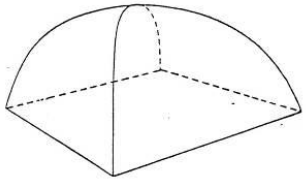


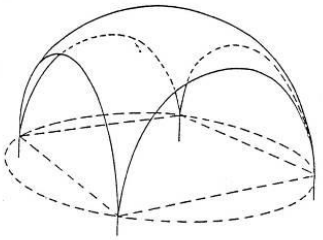
# HOLVIRAKENTEET

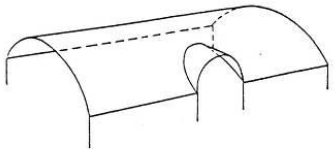

(a)
(b)

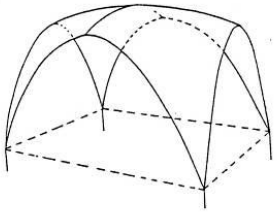


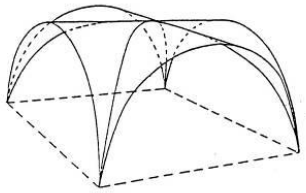


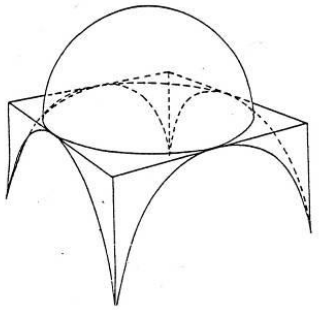


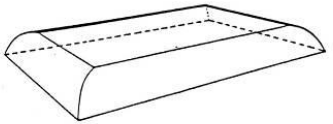


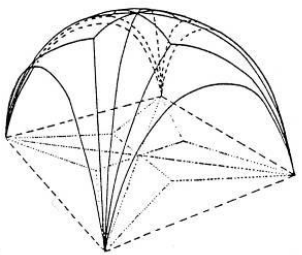


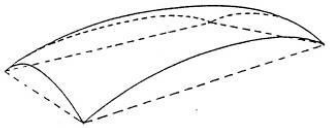


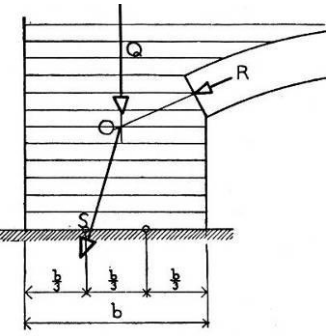


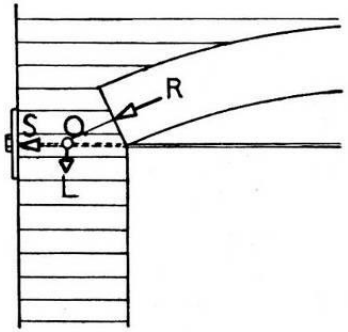


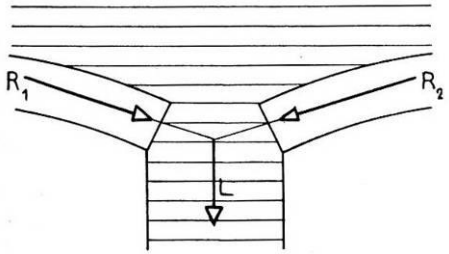


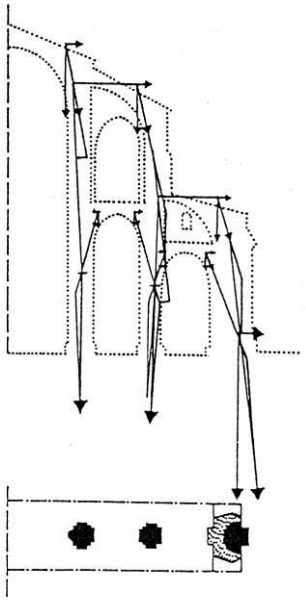


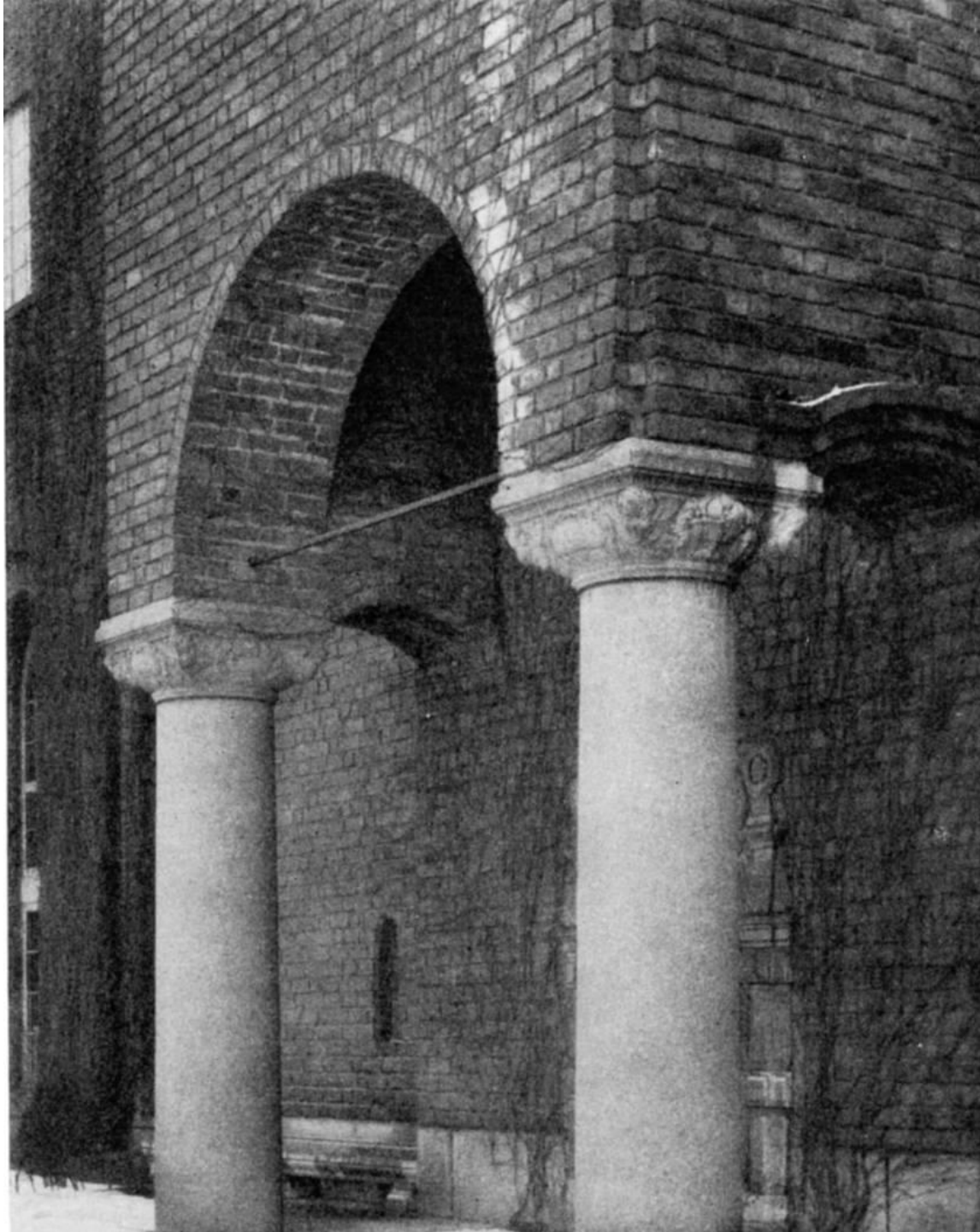


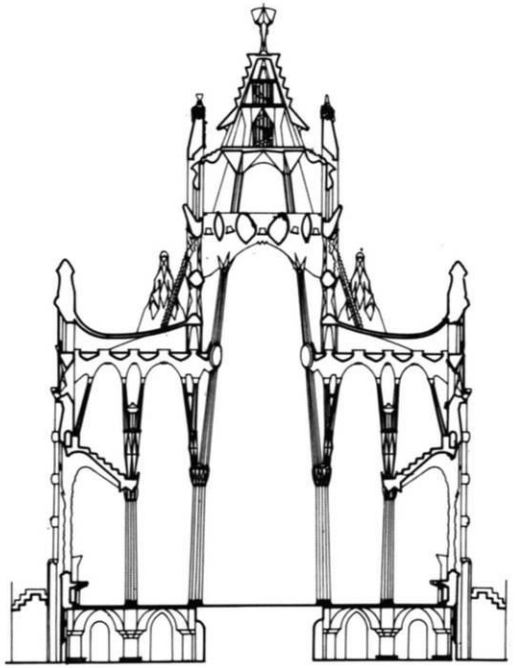

Q
R
S
b/3
b/3
b/3
b

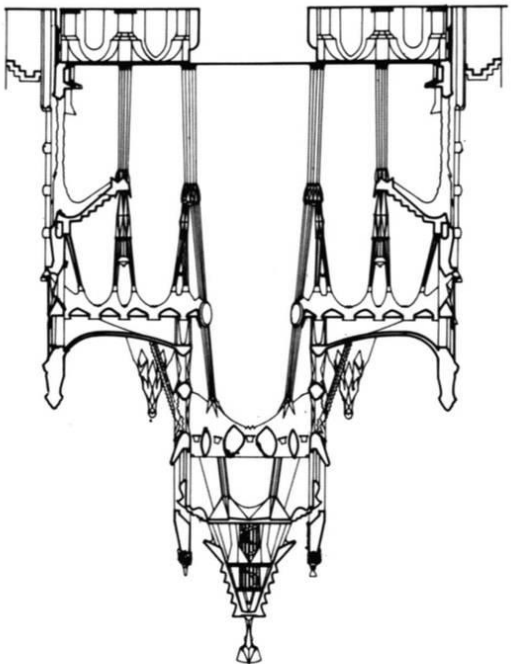

R
S
Q
L


R1
R2
L

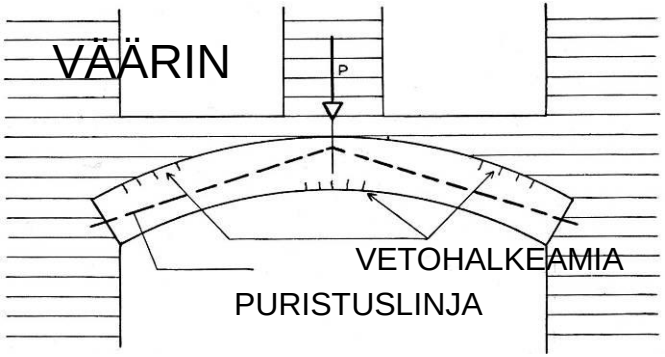








VÄÄRIN

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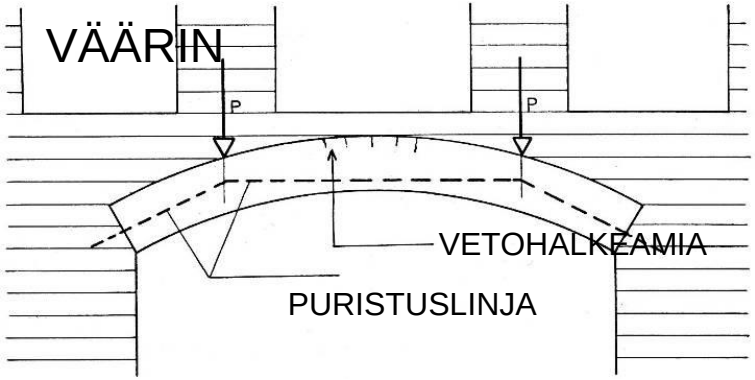


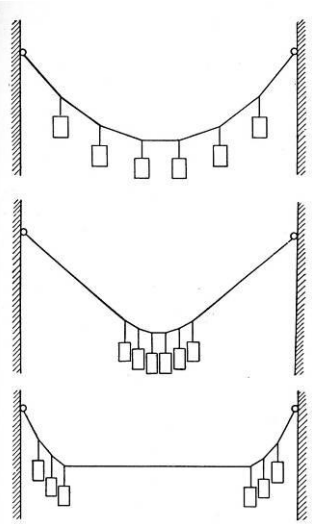

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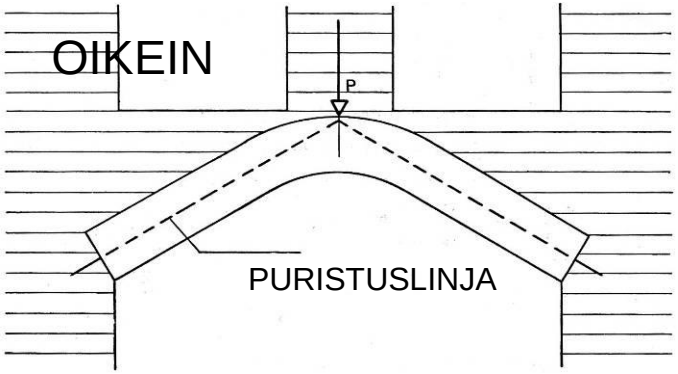


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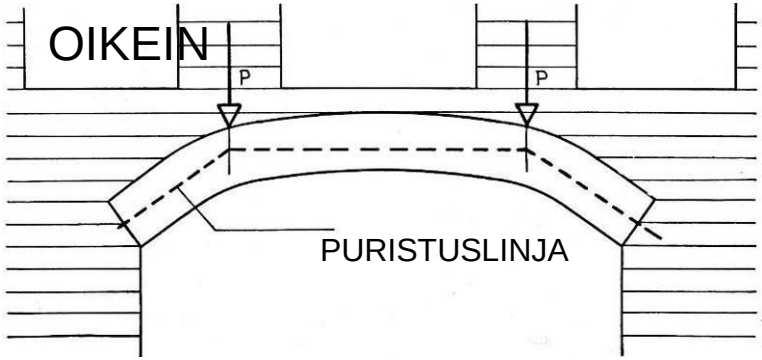
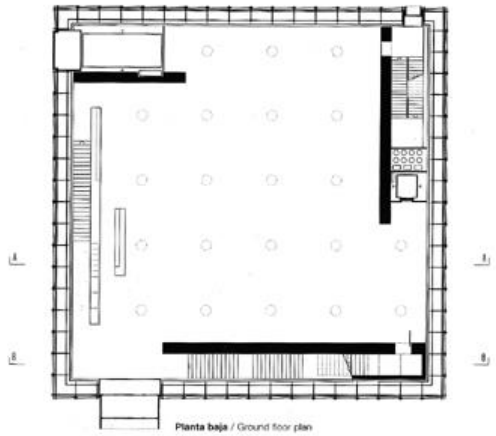
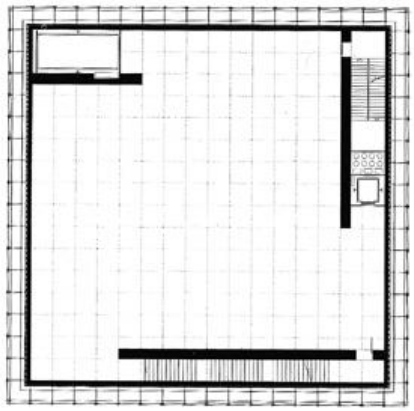


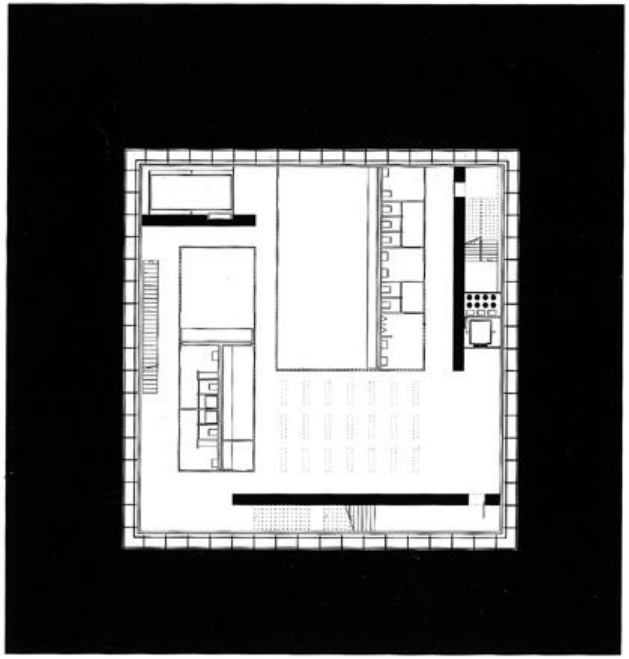
# LEVYMÄISET RAKENTEET



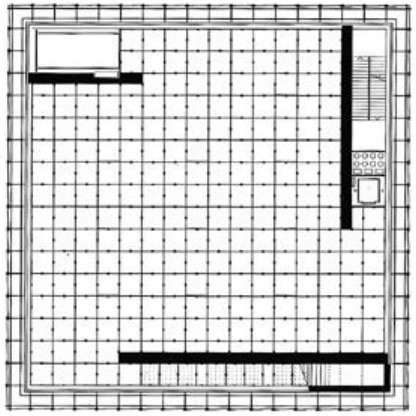
**Planta baja** / Ground floor plan



**Planta nivel exposición** / Exhibition level plan



**Planta sótano** / Basement floor plan



**Planta de espacio intersticial de luz** / Interstitial light space plan