

COLD-FORMED STRUCTURES

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Czech Technical University in Prague



Contents



- Advantages, disadvantages
- Production
- Effect of cold working on strength
- Case studies
- Structural details

3

Advantages/disadvantages

Advantages / disadvantages

4



- Advantages:
 - low weight
 - shape variability
 - surface protection
- Disadvantages
 - unit price
 - difficult connecting
 - low fire resistance
 - more careful treatment is required (assembly)



shape variability (Trebilcock)

5

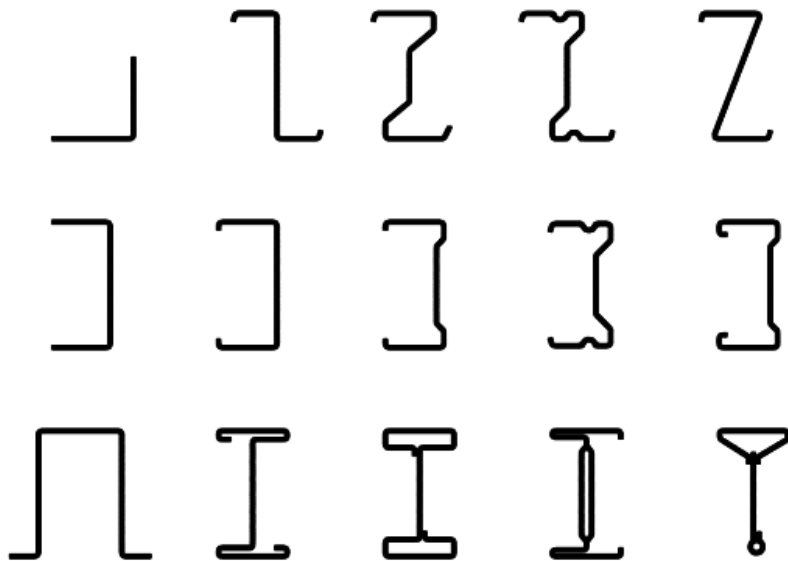
Typical cross-sections

Profiles - bars

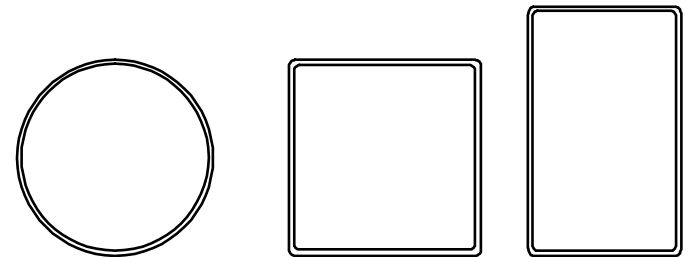
6



□ Open sections



□ Closed sections



Profiles – bars - build-up sections

7



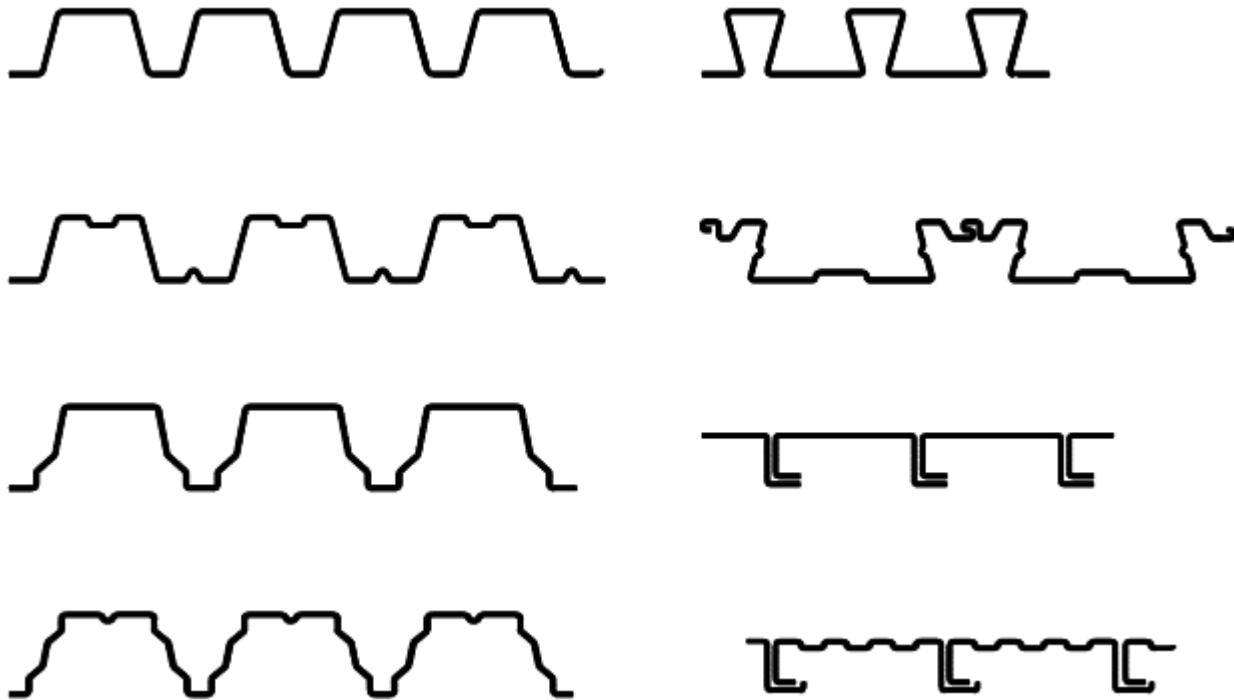
□ Open build-up sections



□ Closed build-up sections



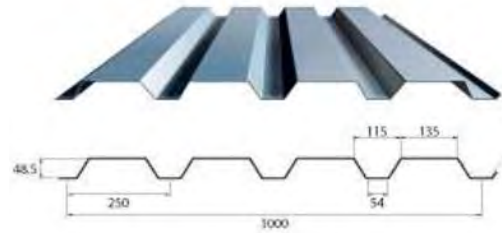
Profiled sheeting



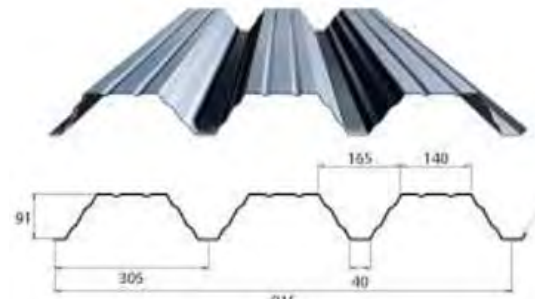
Profiled (trapezoidal) sheeting



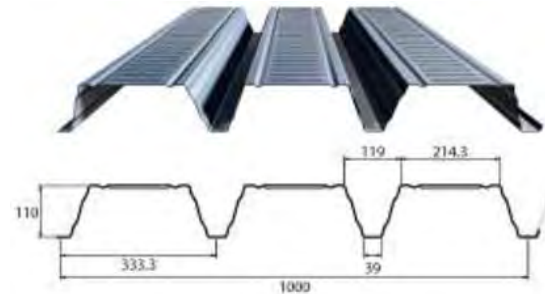
- Without stiffeners



- With longitudinal stiffeners

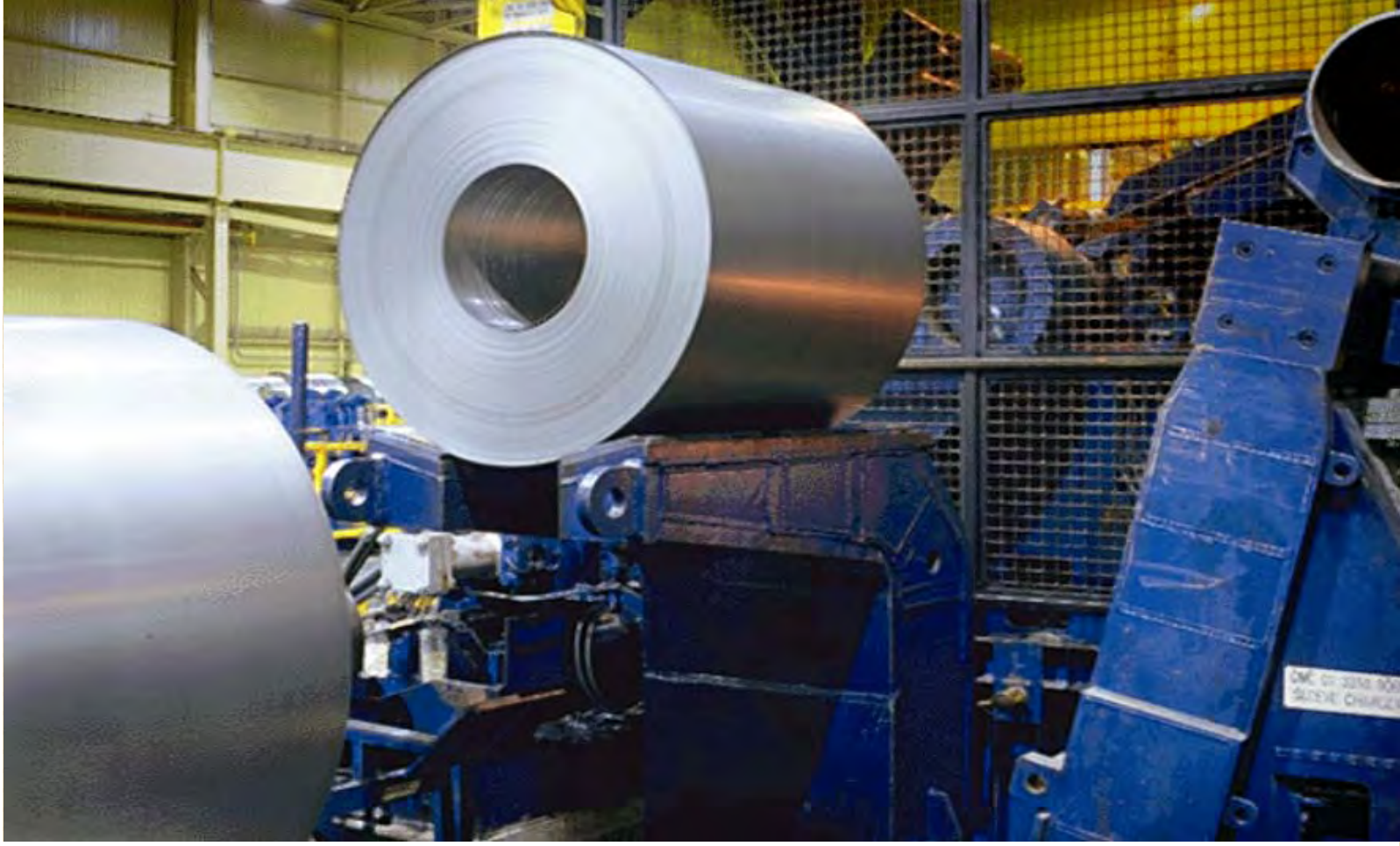


- With transverse and longitudinal stiffeners



10

Production of sections



11

Production from cold-formed sheet

Cold rolled coated sheet steel coil (Dubina)

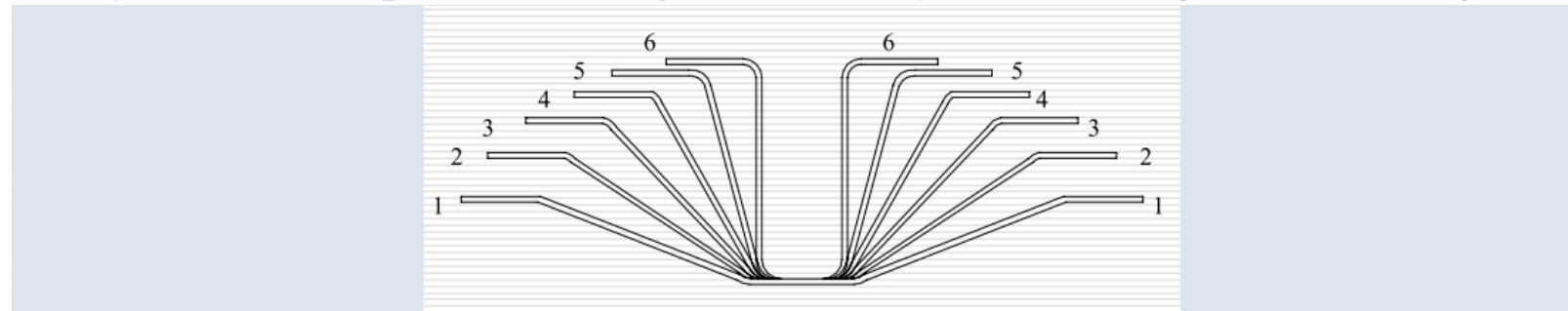
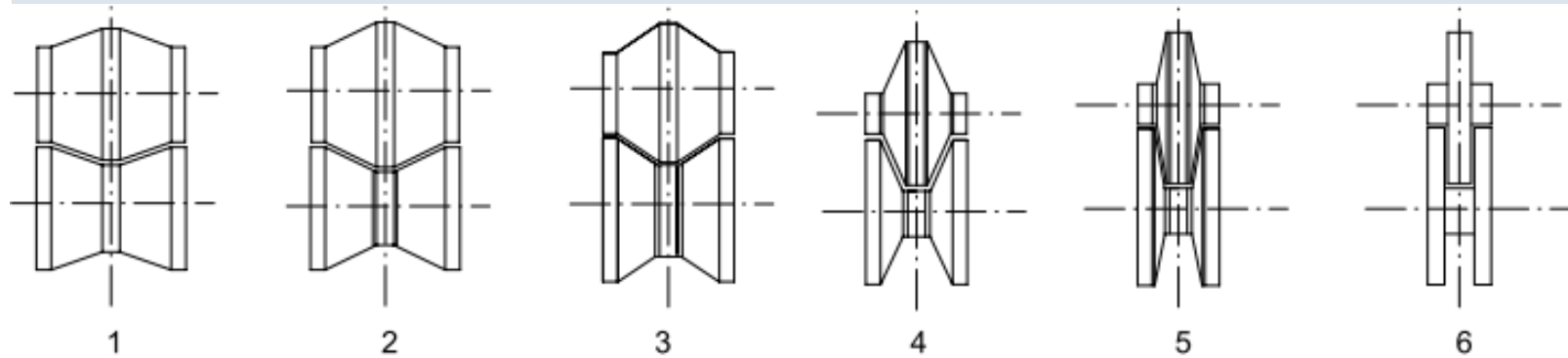
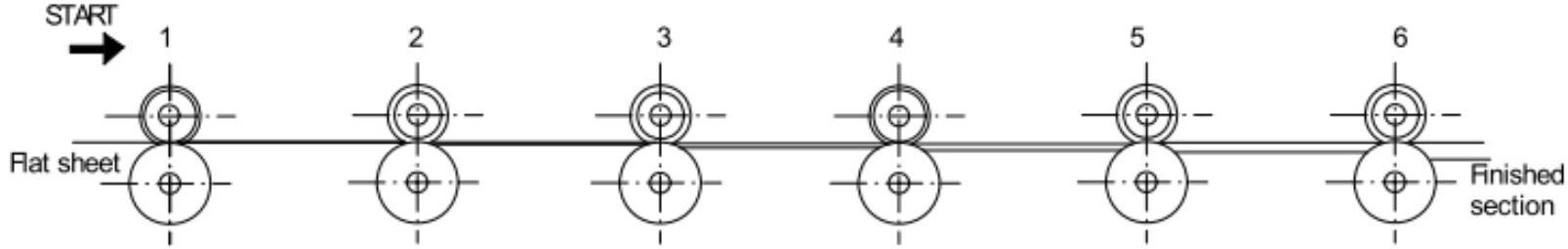
Production

12



- From thin-walled sheet
 - by bending
 - by pressing
 - by rolling

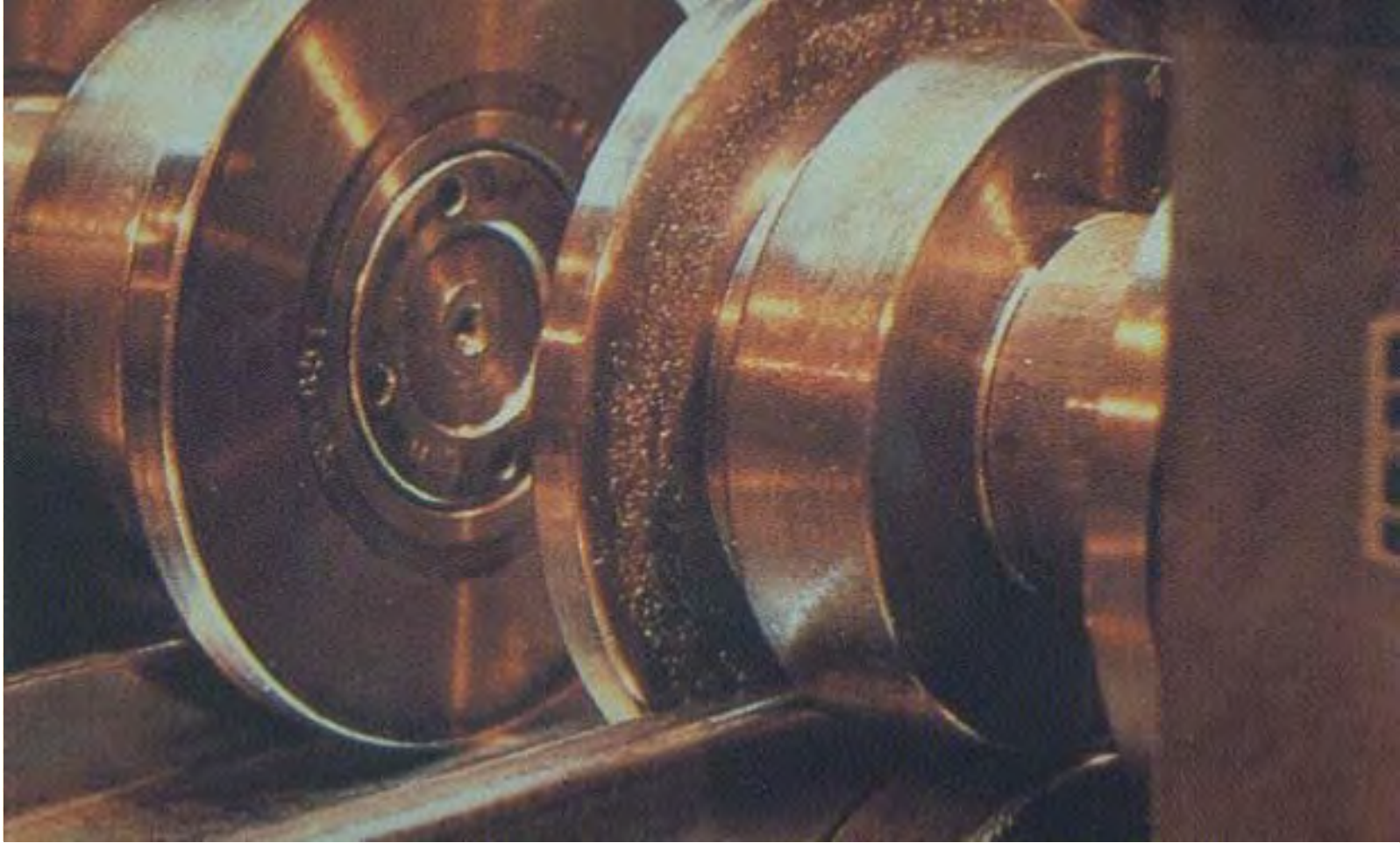
- Final surface protection in roll



13

Rolling

Roll-forming process (Rhodes)



14

Roll-forming of lipped channel

(Dubina)



15

Roll-forming of profiled sheeting

(Dubina)



16

Roll-forming of profiled sheeting

(Vrany)



17

Roll-forming of profiled sheeting

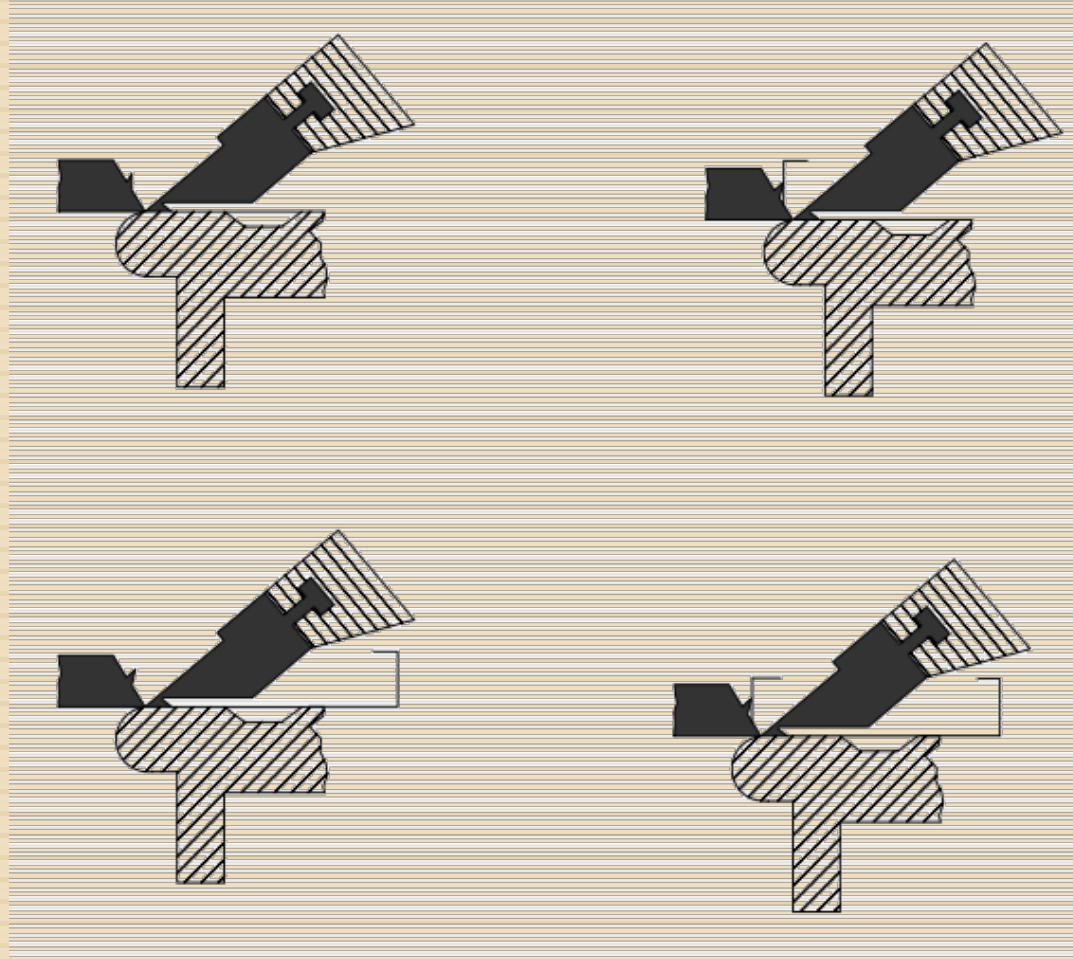
(Vrany)



18

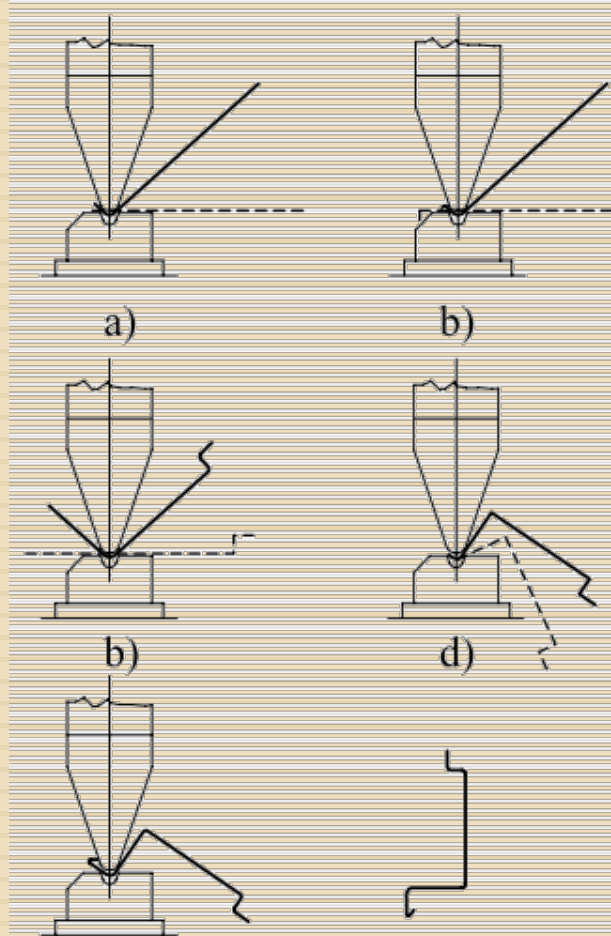
Roll-forming of profiled sheeting

(Vrany)



19

Forming by folding



20

Press-braking



21

Press-braking

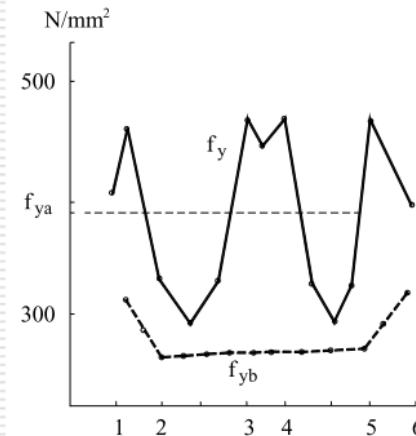
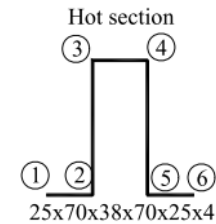
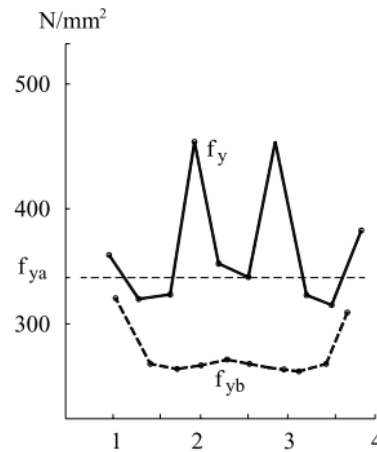
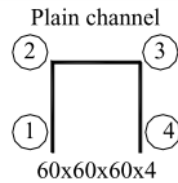
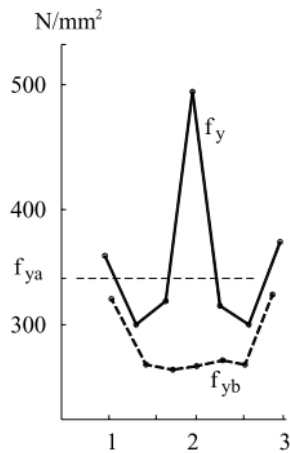
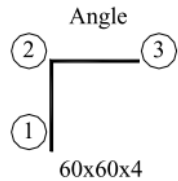
(Dubina)

22

Influence of production route

Strength increase due to cold working

23



□ In Eurocode

▣ In tensional load cases $f_{yb} = f_y < f_{ya}$

24

Utilisation

Utilisation

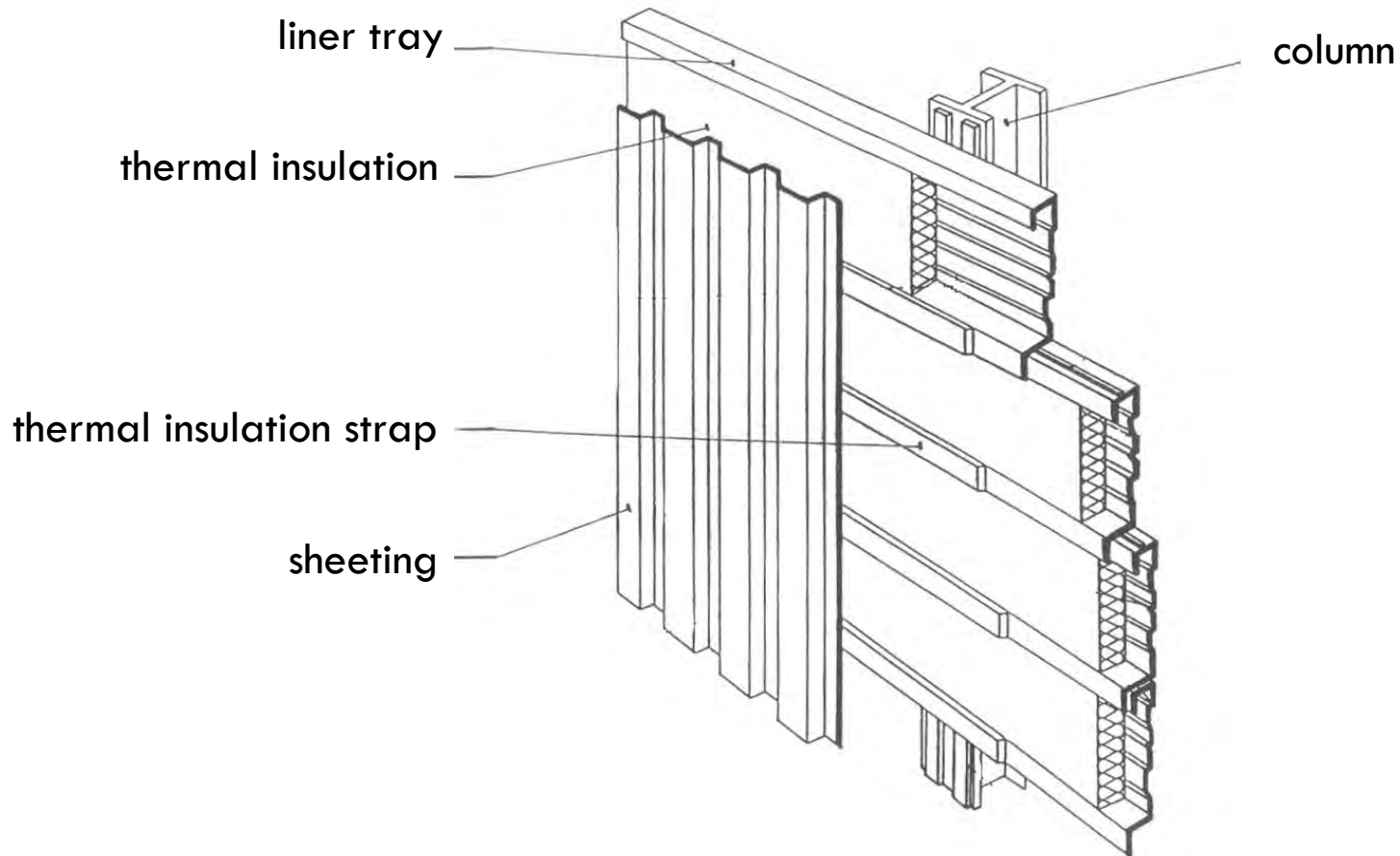
25



- floors (support for concrete slabs / permanent shuttering)
- cladding, roofing
- purlins, rails
- elements of light-weight structures

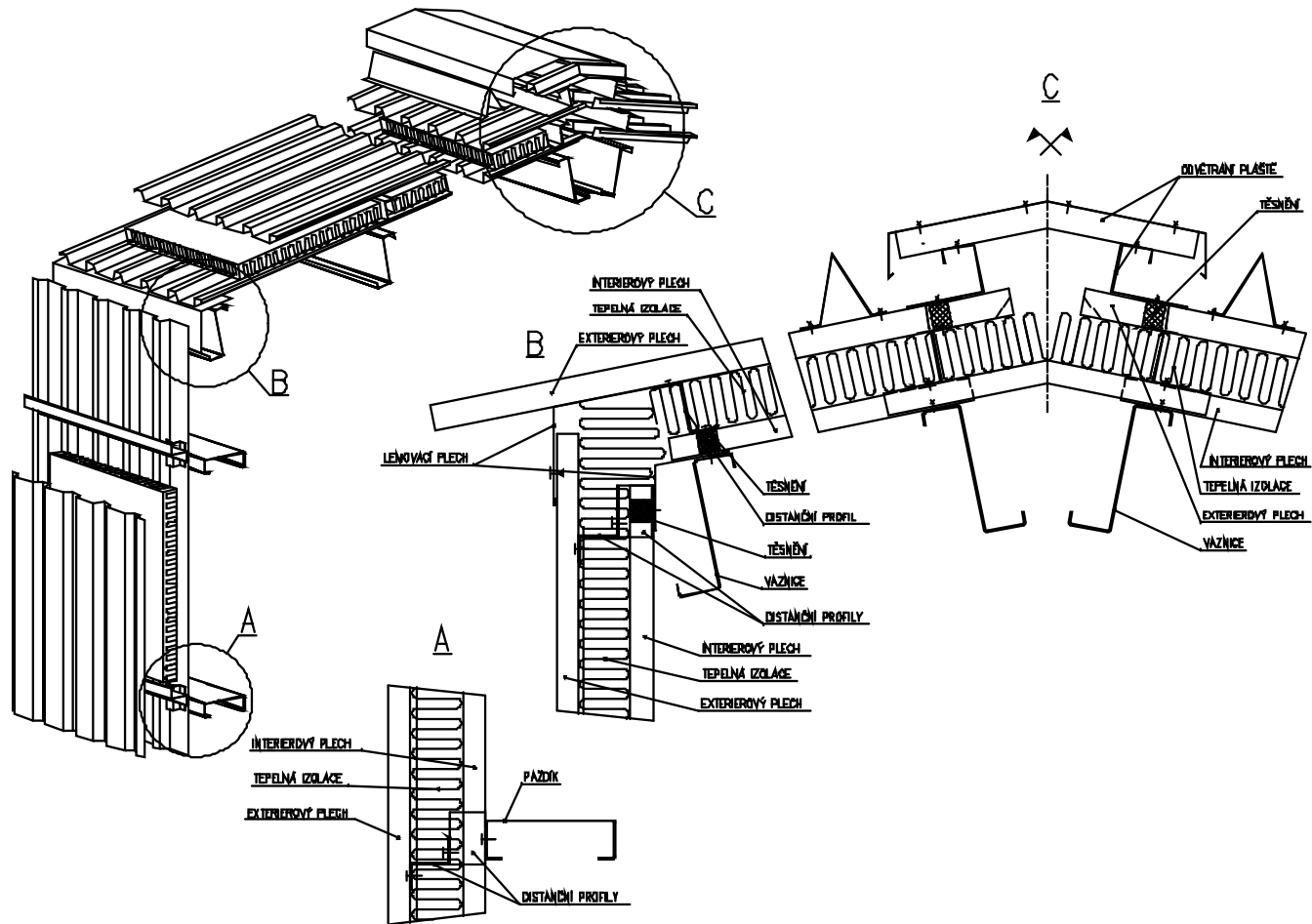
Utilisation

26



Utilisation

27

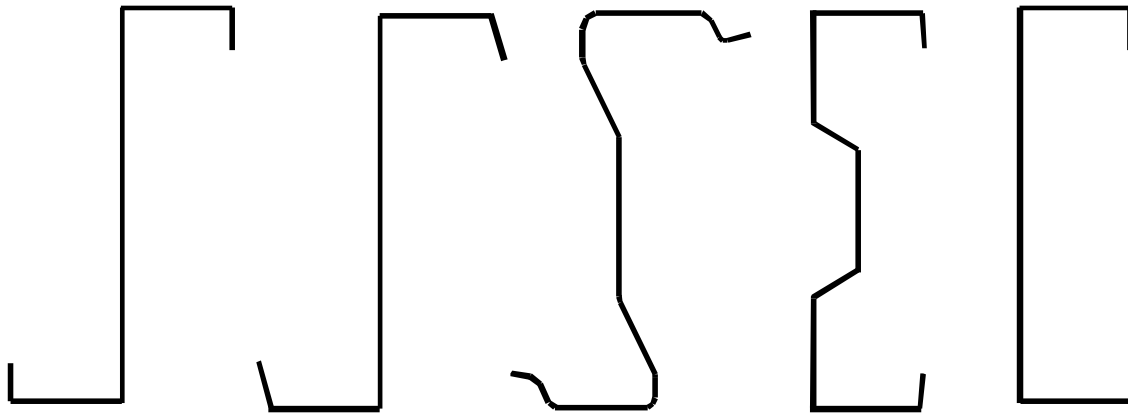


Cold-formed purlins and rails

28



□ Profiles



□ Span – up to 10 m (12-15 m)



29

Cold-formed purlins and rails



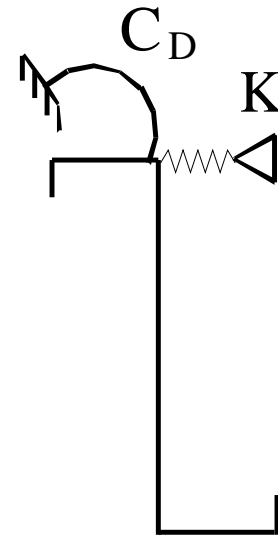
30

Roofing

31



- Corrugated sheeting
- Sandwich panels
- Rigid in its plane
 - ▣ Support of purlin top flange
- Uniaxial bending
- Lateral and rotational restraint

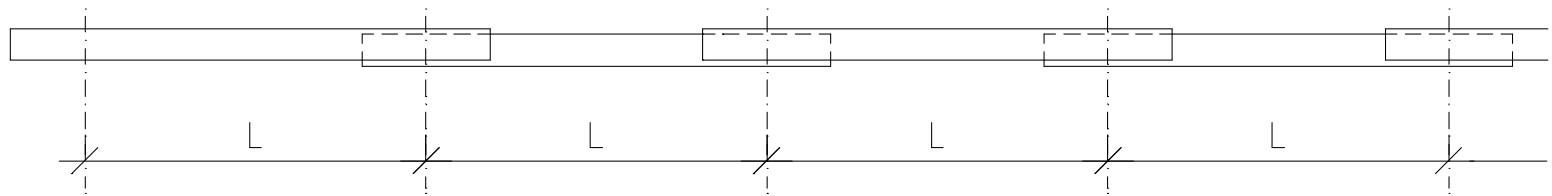


Continuous beams

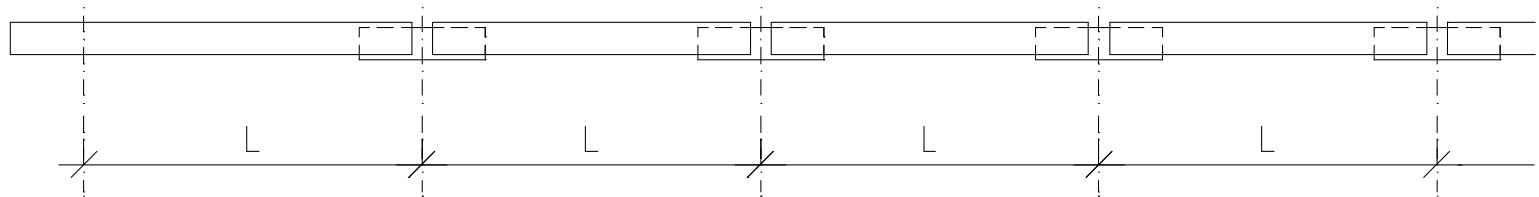
32



□ Overlap

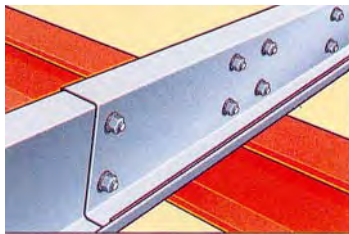
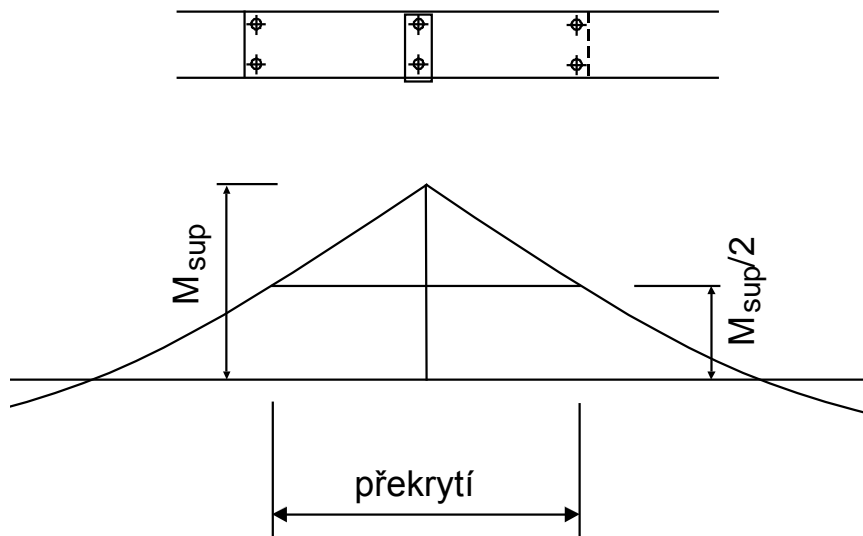


□ Sleeve



Overlap – at support

33

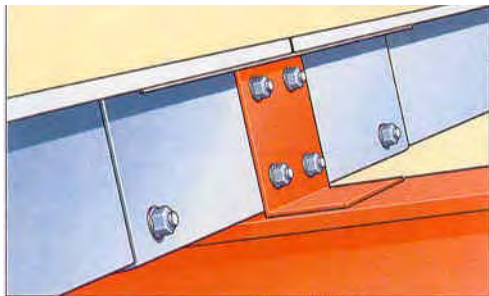
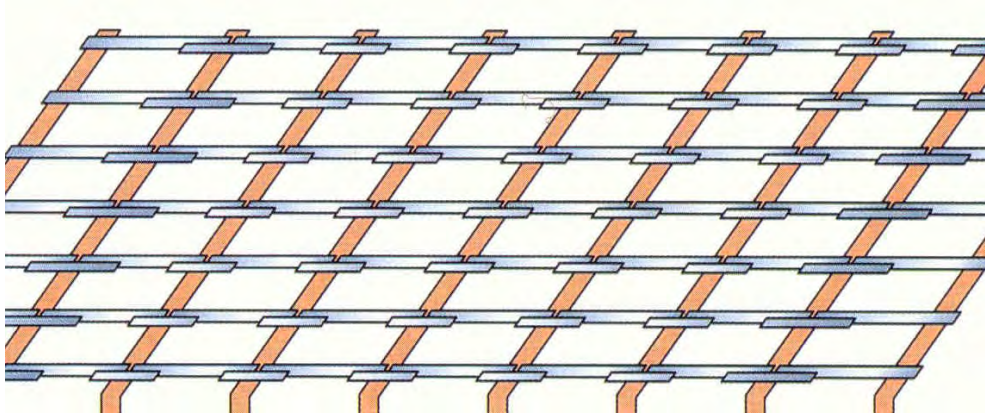


Sleeve

34



- Sleeve – bigger sheet thickness



35

Structural details

Structural details

36



□ Support on main frame



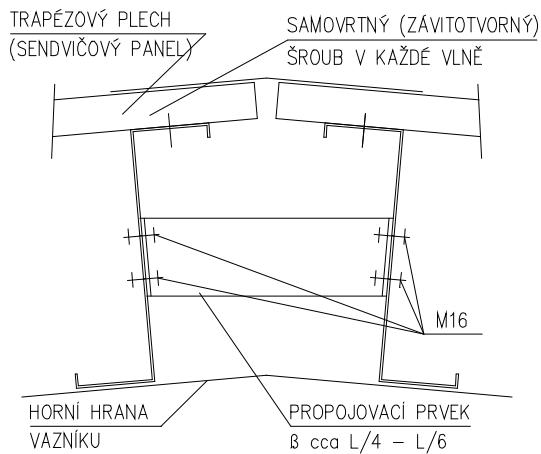
Structural details

37

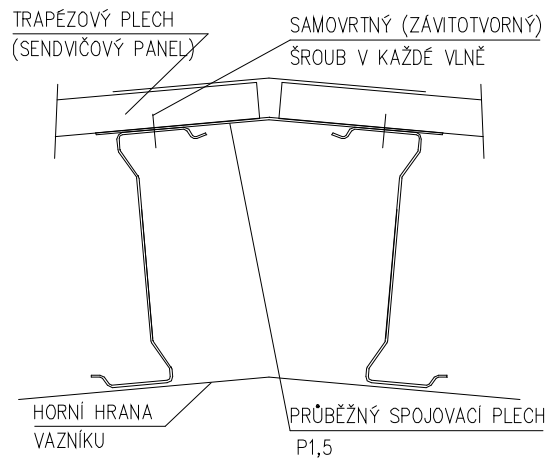


□ Roof apex connection

SPOJENÍ PROPOJOVACÍMI PRVKY



SPOJENÍ PRŮBĚŽNÝM PLECHEM



SPOJENÍ PRŮBĚŽNÝM PLECHEM

