

# Masonry Structures 6th Seminar

#### Seminar task

# Design of masonry storage house Structural analysis, drawings



## 6th homework

- Design the masonry pillar between the gates
- Check load-bearing capacity of the pillar



## Strength of masonry

- Like in 5th homework, but there are some differences
- General purpose mortar, thickness of the bed joint ca 10 mm => not negligible
- □  $f_{\rm m}$  strength of the mortar. MC10 => 10 MPa

• Formula for  $f_k$ :

 $f_{\rm k} = K f_{\rm b}^{0,7} f_{\rm m}^{0,3}$ 

## Strength of masonry

K coefficient – the value from the table has to be multiplied by 0,8 because of longitudinal perpend joints



- □ Solid clay bricks => volume of pores = 0 %
- $\Box$   $\gamma_{M}$  = 2,2 (prescribed mortar will be used)

## Design

Maximum normal force in the bottom of the pillar in ground floor (without self-weight of the pillar) => N<sub>max</sub>

**Estimation**:

$$A_{\rm req} = \frac{N_{\rm max}}{0,7f_{\rm d}}$$

Design (with respect to the dimensions of masonry units):

$$A \ge A_{\text{req}}$$



## Design

#### Dimensions:

- b see the assignment
- a = A/b

#### ■ BUT: If a > 1 m => change b $\rightarrow$ 2b and calculate a = A/2b



#### Slenderness ratio

#### Like in 5th homework, but you have to check both directions



#### Cross-sections to be verified

- A. Top of the wall under the roof
  high eccentricity of the loading
- B. Top of the wall at ground floor
  eccentric loading, high vertical loading
- C. Effect of slenderness (possibility of buckling)



### Loading

- Loading from slabs, self-weight of the pillar, parapet on the roof and cladding
- Calculate N<sub>Ed</sub> in kN for cross-sections A, B, C



#### Eccentricity due to loads

- Different values for cross-sections A and B
- Eccentricity:

$$e_{\rm if} = \frac{\sum_{j} N_{j} e_{j}}{\sum_{j} N_{j}}$$



#### Vertical resistance + check

#### □ A, B – see 5th homework

 C – check both directions (different slenderness ratio and relative eccentricity)



## Bond of bricks

#### Important for good load distribution

RULE: Continuous perpend joint is not allowed



RULE: Queen closer should not be placed on the edge of the cross-section

### Bond of bricks

#### Example: Pillar 300 x 750 mm made from classical bricks (290/140/65 mm)



#### Thank you for your attention

#### **Any questions?**