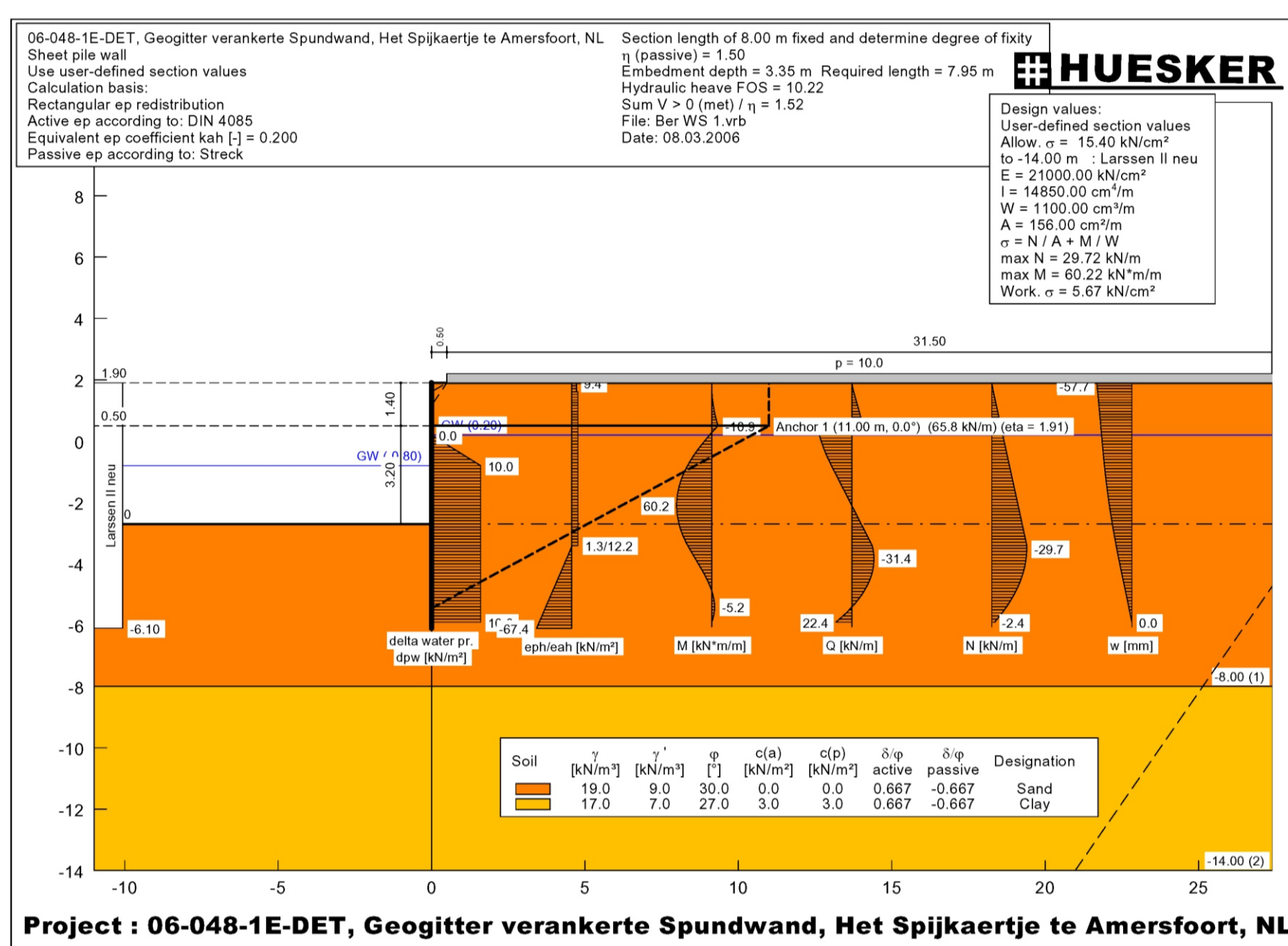


# Geogrid as Anchor for Sheet Pile Walls

## Het Spijkaertje te Amersfoort, Netherland 2006

During reconstruction work in the city of Amersfoort it was necessary to anchor an existing sheet pile wall. The total horizontal movement of the wall has to be limited to less than 10 cm. This was realised by installation of an anchorage based on FORTRAC® R 600/50-30 M. The geogrid was wrapped around a steel pipe, which is fixed to the sheet pile. In this way the anchorage is formed by two reinforcement layers.

### Calculation & Design



$J_{d,req} = 14000$  [kNm] required geogrid modulus for load time 120 years  
 $F_{d,req} = 65.8$  [kN/m] required design tensile strength for loadtime 120 years

chosen geogrid: Fortrac M 600/50-30 M with  $F_k = 600$  kN/m

#### 1. Verification of Fortrac M Geogrid Modulus

$\epsilon_{ult} = 5$  [%] maximal strain for load time 120 years  
 $\beta_{allow,long} = 65$  [%] load ratio or percentage of ultimate tensile strength (UTS) for load time 120 years at 5 % strain

$A_2 = 1.10$   $A_2$  = partial material factor for transport and mechanical installation damage  
 $F_k = 600$  [kN/m]  $F_k$  = characteristic tensile strength

$J_{available} = \frac{2 \cdot F_k \cdot \beta_{allow,long}}{A_2 \cdot \epsilon_{ult}}$   $J_{available}$  = available geogrid modulus

$J_{available} = 14181.82$  [kNm]

$J_{available} \geq J_{d,req}$  OK!

#### 2. Verification of Fortrac M Geogrid tensile strength

$F_{d,req} = 65.8$  [kN/m]  $F_{d,req}$  = required tensile strength

$A_1 = 1.53$   $A_1$  = partial material factor for creep, time dependent

$A_2 = 1.10$   $A_2$  = see above

$A_3 = 1.0$   $A_3$  = partial factor for joints and connections

$A_4 = 1.0$   $A_4$  = partial factor for environmental effects

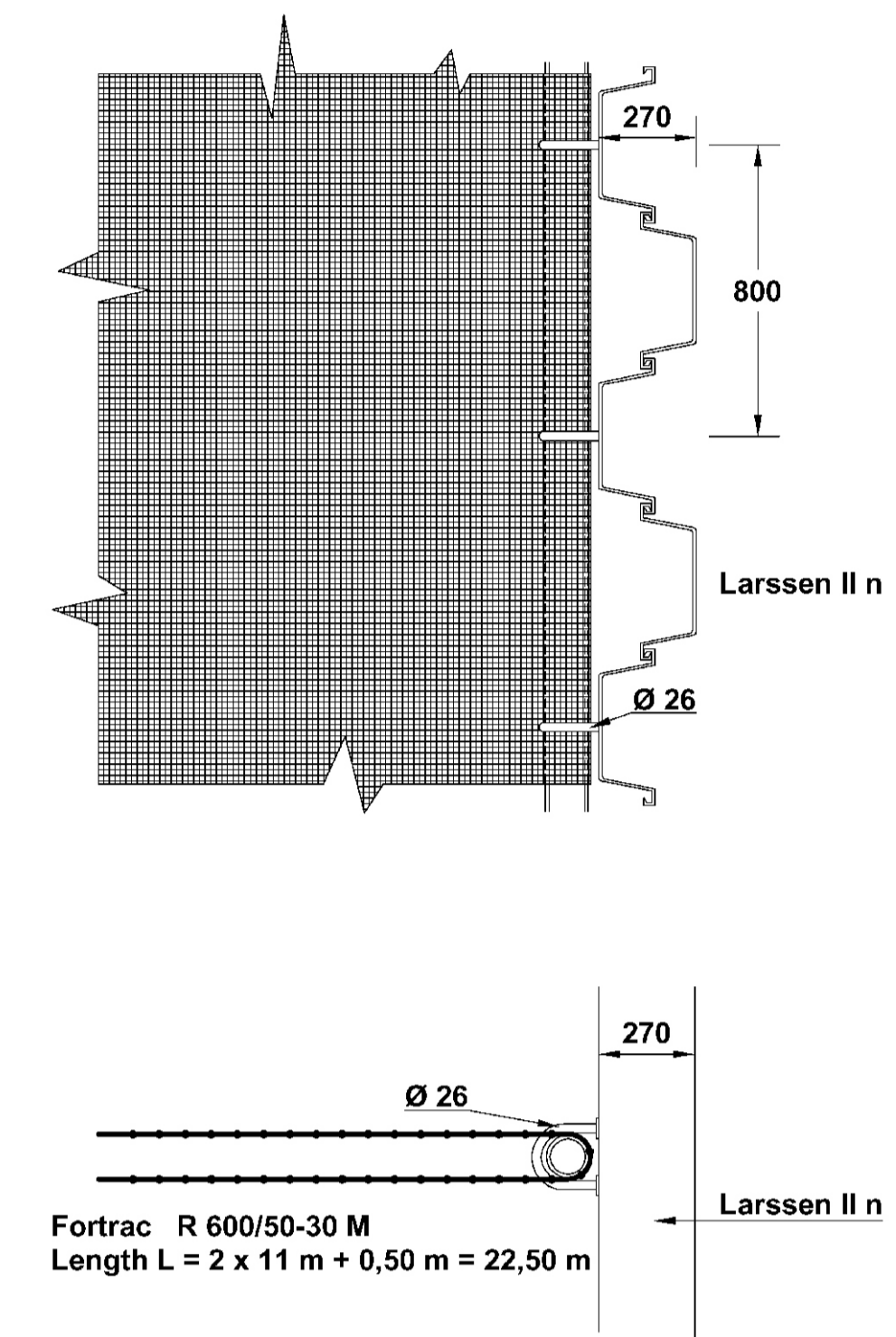
$\gamma_B = 1.75$   $\gamma_B$  = partial factor of material safety

$F_k = 600$  [kN/m]  $F_k$  = Characteristic tensile strength

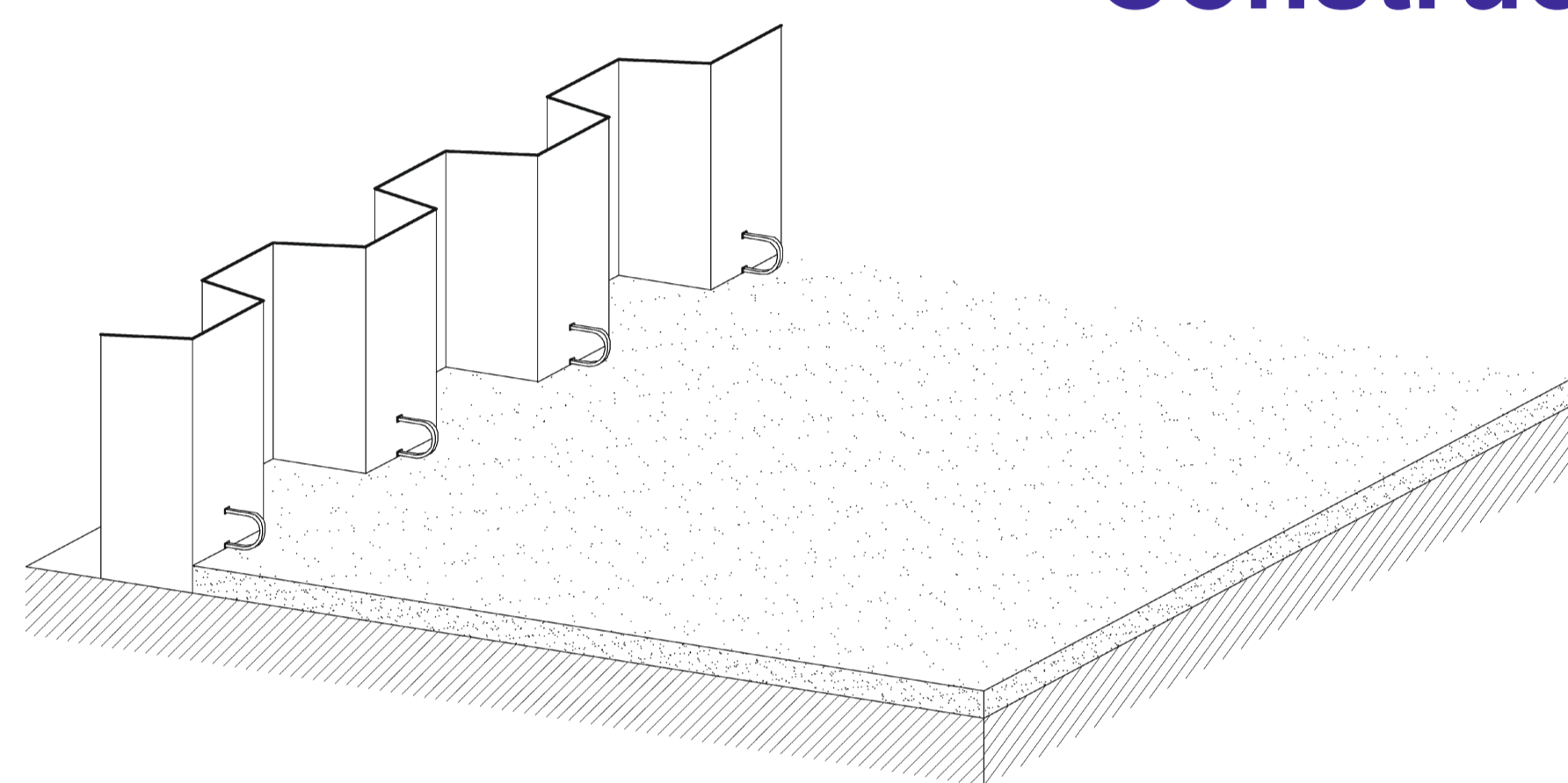
$F_{design} = \frac{F_k \cdot 2}{A_1 \cdot A_2 \cdot A_3 \cdot A_4 \cdot \gamma_B}$

$F_{design} = 407.44$  [kN/m]

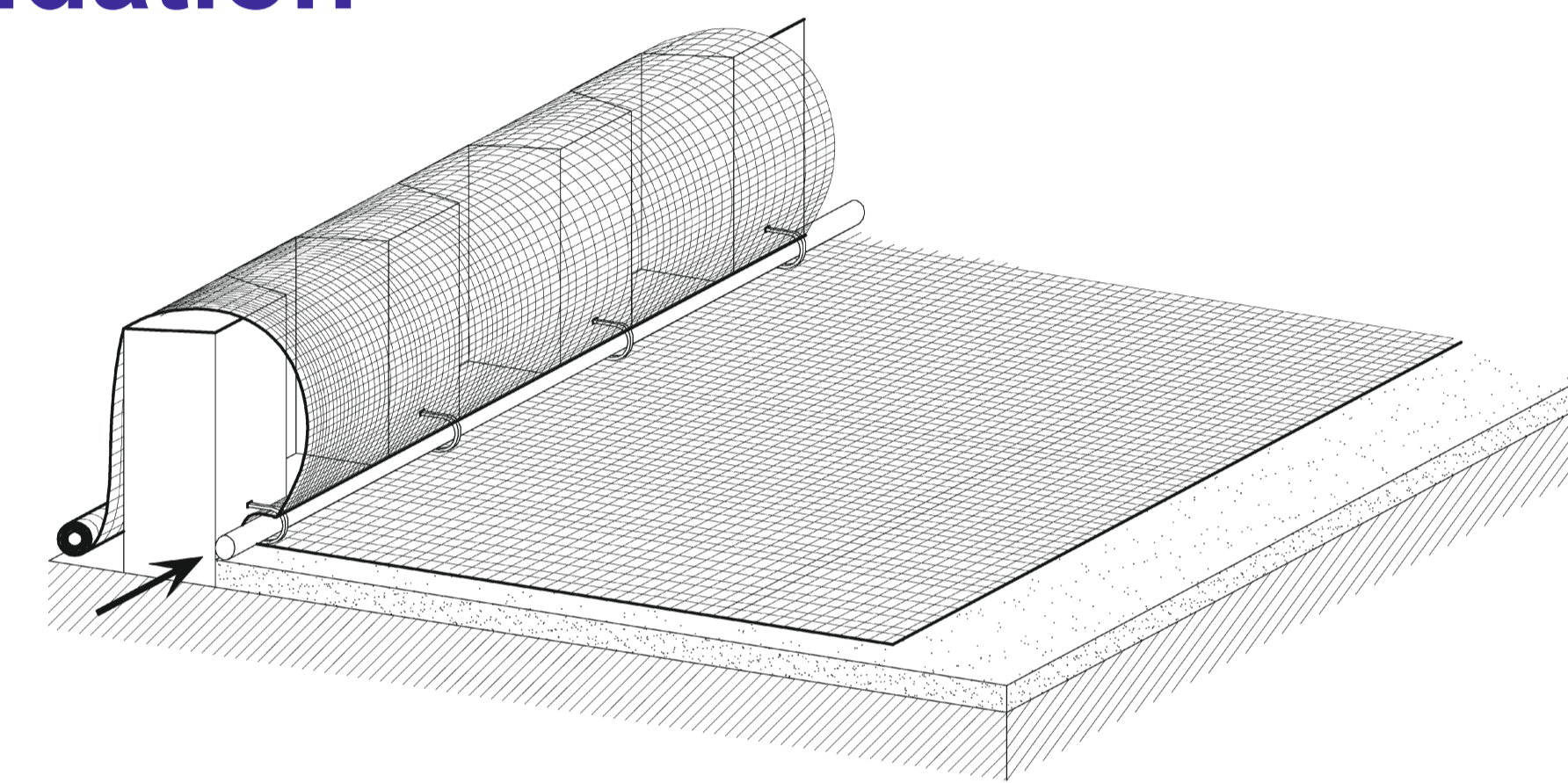
$F_{design} \geq F_{d,req}$  OK!



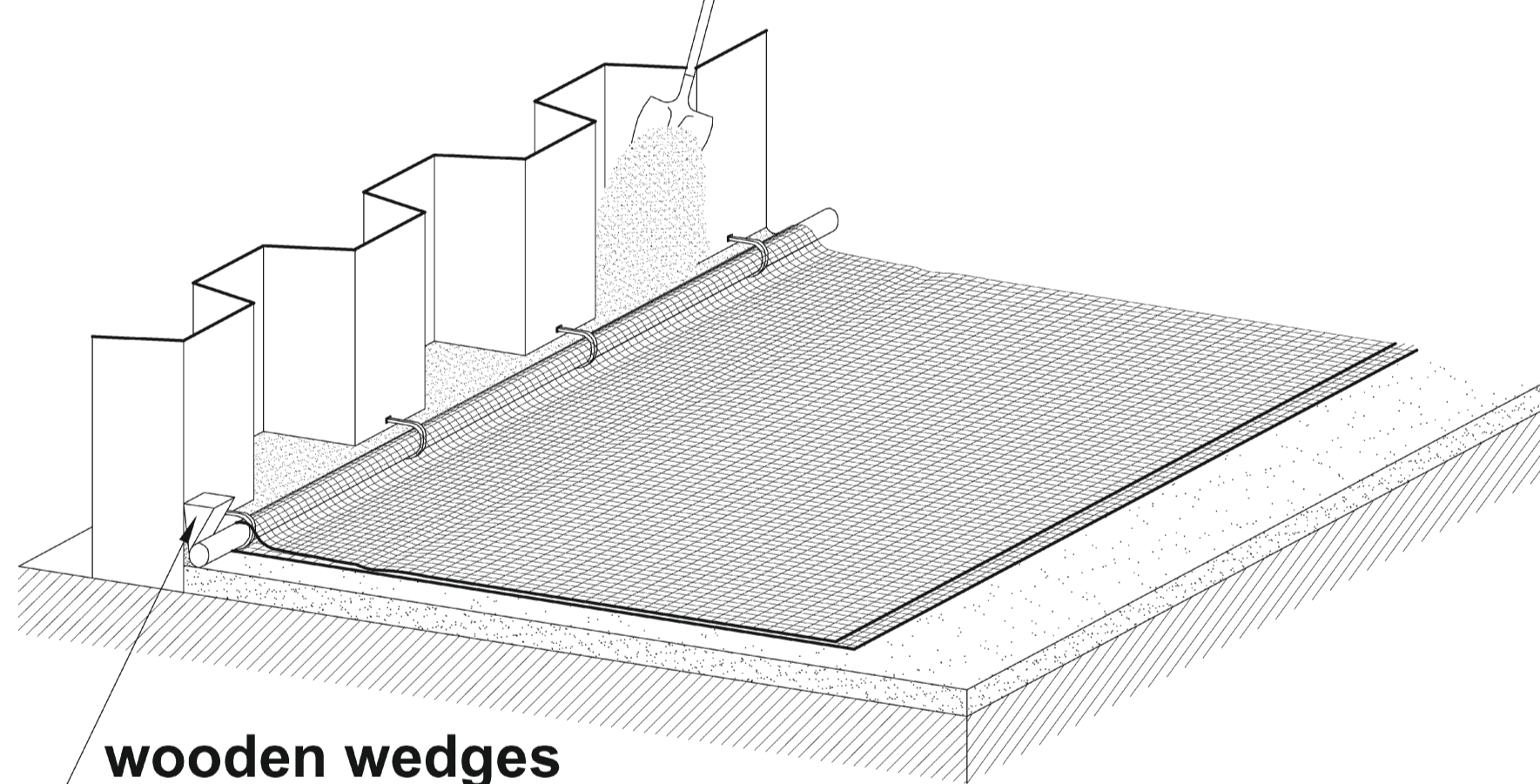
### Construction Recommendation



welded steel loops at the sheet pile

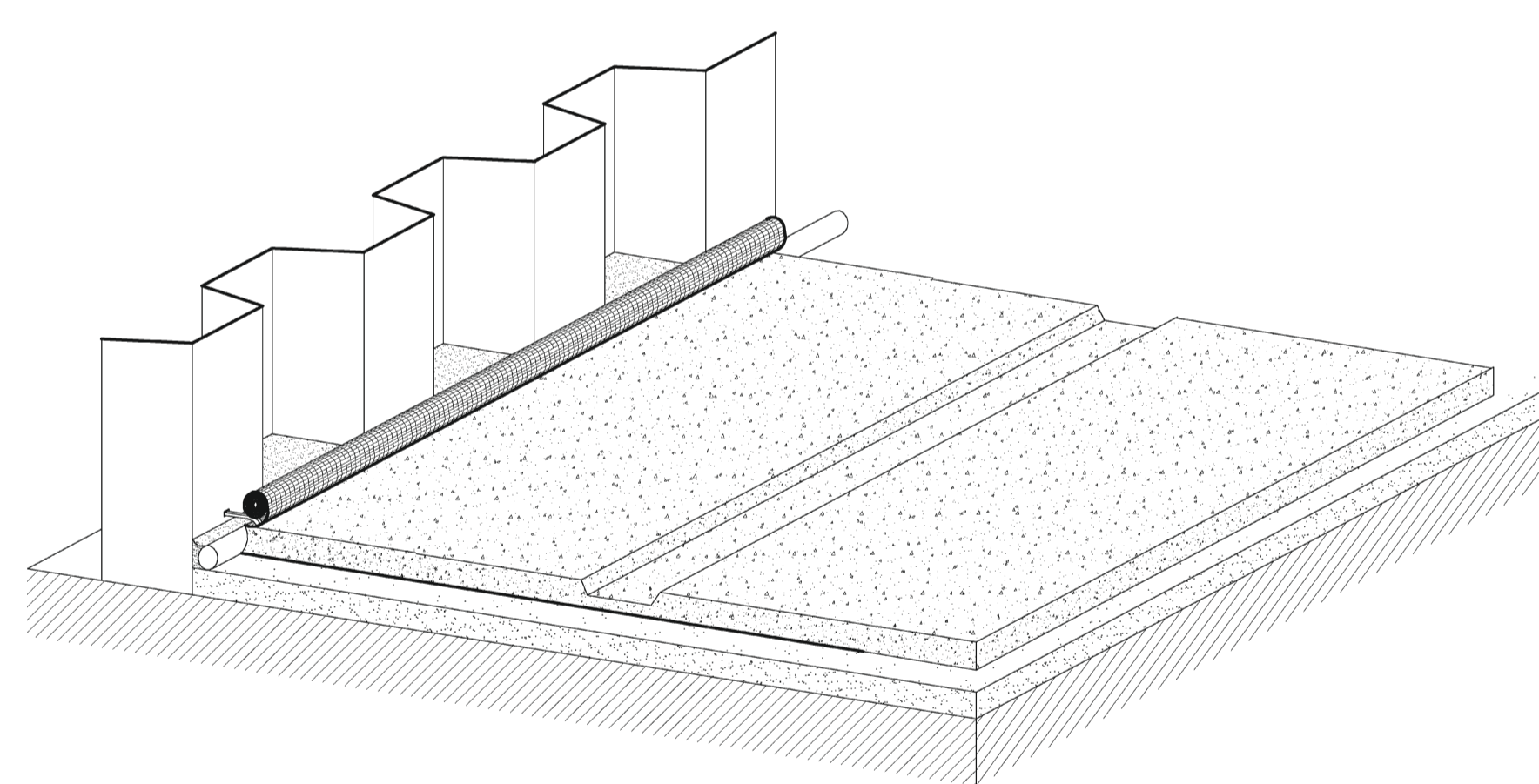


placing the geogrid and the steel pipe

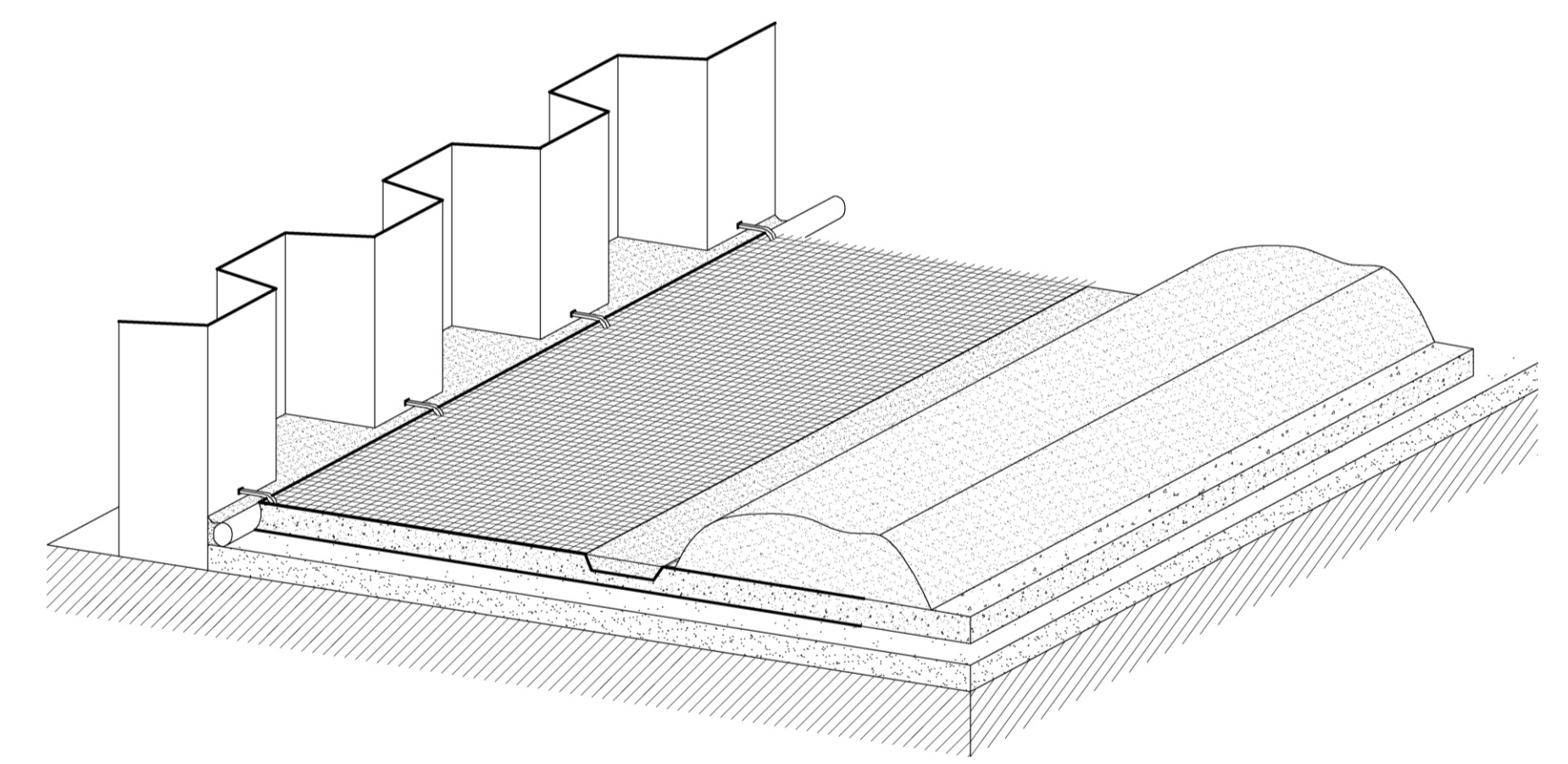


wooden wedges

fixing the steel pipe to reduce the movement



excavated trench to tension the geogrid



### Photos of the construction side



connection detail



trench excavation



"slacky" placed geogrid



fixing & tensioning the geogrid with the excavator shovel



tensioned geogrid over the trench



placing a non-woven over the trench to retain the sand on the geogrid



backfilling and compacting



well tensioned geogrid after compaction