

***NATIONAL ANNEX
TO
CYS EN 1993-5:2007
(Including AC:2009)***

***Eurocode 3: Design
of steel structures***

Part 5: Piling

NA to
CYS EN
1993-5:2007
(Including
AC:2009)



NATIONAL ANNEX
TO
CYS EN 1993-5:2007+AC:2009
Eurocode 3: Design of steel structures
Part 5: Piling

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INTRODUCTION

This National Annex has been prepared by the CYS TC 18 National Standardisation Technical Committee of the Cyprus Organisation for Standardisation. (CYS)

NA 1 SCOPE

This National Annex is to be used together with CYS EN 1993-5:2007+AC:2009. Any reference in the rest of this text to CYS EN 1993-5:2007 means the above document.

This National Annex gives:

- (a) Nationally determined parameters for the following clauses of CYS EN 1993-5:2007 where National choice is allowed (see Section NA 2)
- 3.7(1)
 - 3.9(1)P
 - 4.4(1)
 - 5.1.1(4)
 - 5.2.2(2)
 - 5.2.2(13)
 - 5.2.5(7)
 - 5.5.4(2)
 - 6.4(3)
 - 7.1(4)
 - 7.2.3(2)
 - 7.4.2(4)
 - A.3.1(3)
 - B.5.4(1)
 - D.2.2(5)
- (b) Decisions on the use of the Informative Annexes B , C and D (see Section NA 3)
- (c) References to non-contradictory complementary information to assist the user to apply CYS EN 1993-5:2007 (see Section NA 4)

NA 2 NATIONALLY DETERMINED PARAMETERS

NA 2.1 Clause 3.7 (1) Steel members used for anchors

The value $f_{y,spec,max}$ is specified as 500 N/mm² .

NA 2.2 Clause 3.9 (1)P Fracture toughness

Refer to CYS EN1991-1-5 and its National Annex.

NA 2.3 Clause 4.4 (1) Corrosion rates for design

Suitable values for corrosion rates are given in Table 4-1 (CYS) and Table 4-2 (CYS).

Table 4-1 (CYS) : Value for the loss of thickness [mm] due to corrosion for piles and sheet piles in soils, with or without groundwater

Required design working life	5 years	25 years	50 years	75 years	100 years
Undisturbed natural soils (sand, silt, clay, schist,)	0,00	0,30	0,60	0,90	1,20
Polluted natural soils and industrial sites	0,15	0,75	1,50	2,25	3,00
Aggressive natural soils (swamp, marsh, peat, ...)	0,20	1,00	1,75	2,50	3,25
Non-compacted and non-aggressive fills (clay, schist, sand, silt,)	0,18	0,70	1,20	1,70	2,20
Non-compacted and aggressive fills (ashes, slag,)	0,50	2,00	3,25	4,50	5,75

Notes:

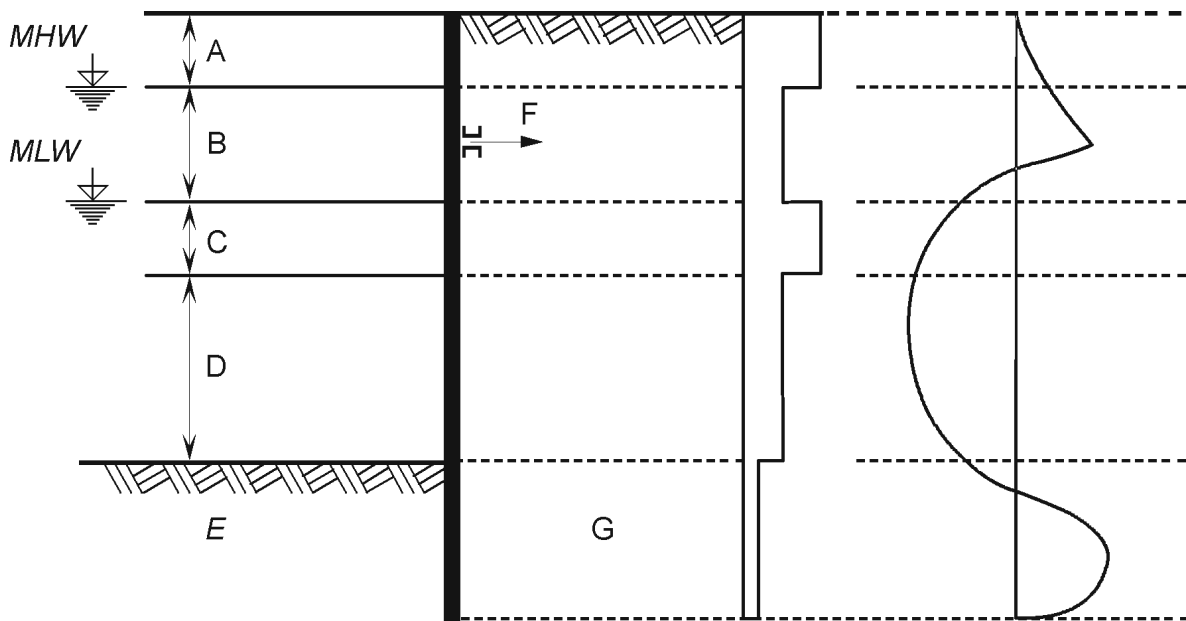
- 1) Corrosion rates in compacted fills are lower than those in non-compacted ones. In compacted fills the figures in the table should be divided by two.
- 2) The values given for 5 and 25 years are based on measurements, whereas the other values are extrapolated.

Table 4-2 (CYS) : Value for the loss of thickness [mm] due to corrosion for piles and sheet piles in fresh water or in sea water

Required design working life	5 years	25 years	50 years	75 years	100 years
Common fresh water (river, ship canal,) in the zone of high attack (water line)	0,15	0,55	0,90	1,15	1,40
Very polluted fresh water (sewage, industrial effluent,) in the zone of high attack (water line)	0,30	1,30	2,30	3,30	4,30
Sea water in temperate climate in the zone of high attack (low water and splash zones)	0,55	1,90	3,75	5,60	7,50
Sea water in temperate climate in the zone of permanent immersion or in the intertidal zone	0,25	0,90	1,75	2,60	3,50

Notes:

- 1) The highest corrosion rate is usually found in the splash zone or at the low water level in tidal waters. However, in most cases, the highest bending stresses occur in the permanent immersion zone, see figure 4-1.
- 2) The values given for 5 and 25 years are based on measurements, whereas the other values are extrapolated.



a) Vertical zoning of sea water aggressivity

b) Corrosion rate distribution at side exposed to sea water

c) Typical bending moment distribution

- | | | | |
|-----|---------------------------------------|-----|---------------------------|
| A | Zone of high attack (splash zone); | B | Intertidal zone; |
| C | Zone of high attack (Low water zone); | D | Permanent immersion zone; |
| E | Buried zone (Water side); | F | Anchor; |
| G | Buried zone (Soil side) | | |
| MHW | Mean high water; | MLW | Mean low water |

NOTE: Corrosion rate distribution and zones of sea water aggressivity may vary considerably from the example shown in Figure 4

Figure 2-1, dependant upon the conditions prevailing at the location of the structure.

Figure 2-1 (CYS): Example of corrosion rate distribution

NA 2.4 Clause 5.1.1 (4) Ultimate limit states - General

The values for the partial factors γ_{M0} , γ_{M1} and γ_{M2} for piling are specified as : $\gamma_{M0} = 1,00$; $\gamma_{M1} = 1,10$ and $\gamma_{M2} = 1,25$.

NA 2.5 Clause 5.2.2 (2) Sheet piling in bending and shear

The numerical value for β_B for single and double U-piles is specified as 1,00 .

NA 2.6 Clause 5.2.2 (13) Sheet piling in bending and shear

The value l is specified as 500 mm .

NA 2.7 Clause 5.2.5 (7) Straight web steel sheet piles

The recommended value $\beta_R = 0,8$ shall be used .

NA 2.8 Clause 5.5.4 (2) Primary elements

The recommended value $h = 5$ m shall be used .

NA 2.9 Clause 6.4 (3) Structural aspects of steel sheet piling

The numerical value for β_D is specified as 1,00 .

NA 2.10 Clause 7.1 Anchors, walings, bracing and connections - General

The recommended values for the partial factors $\gamma_{Mb} = 1,25$ and $\gamma_{M3,ser} = 1,10$ shall be used.

NA 2.11 Clause 7.2.3 (2) Anchorages - Ultimate limit state verification

The recommended $k_t = 0,6$ shall be used. This is motivated for cases where possible bending in the anchor as an effect of actions is not made explicit. Only in cases where the structural detailing of the location where the anchor rod is joined to the wall is such that bending moments are avoided at that location, the value for k_t may be chosen as $k_t = 0,9$.

NA 2.12 Clause 7.4.2.(4) Bearing piles

No further information on the design procedure for pile couplers is provided in this National Annex.

NA 2.13 Clause A.3.1(3) Material properties

The following recommended limiting values shall be used:

- $f_u / f_y \geq 1,1$;
- elongation at failure ≥ 15 %;
- $\varepsilon_u \geq 15 \varepsilon_y$;
- where ε_y corresponds to the yield strength f_y ;

NA 2.14 Clause B.5.4.1 Design values

The recommended value $\eta_{sys} = 1,0$ shall be used for the well defined standard testing procedures given in B.2, B.3 and B.4

NA 2.15 Clause D.2.2.2 (5)

No further information concerning the required density is provided in this National Annex.

NA 3 DECISION ON THE USE OF INFORMATIVE ANNEXES

NA 3.1 Annex B

Annex B may be used.

NA 3.2 Annex C

Annex C may be used.

NA 3.3 Annex D

Annex D may be used.

NA 4 REFERENCES TO NON-CONTRADICTORY COMPLEMENTARY INFORMATION

None

**NA to
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1993-5:2007
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