

**NATIONAL ANNEX  
TO  
CYS EN 1998-4:2006 Eurocode 8: Design of structures for  
earthquake resistance  
Part 4: Silos, tanks and pipelines**

**Public Enquiry Draft**

**Period of Enquiry**

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**Readers are advised that this is a draft document and subject to change**

**Prepared by: Eurocodes Committee  
Ministry of Interior / Technical Chamber of Cyprus**

## **INTRODUCTION**

This National Annex has been prepared by the Eurocodes Committee of the Technical Chamber of Cyprus which was commissioned by the Ministry of Interior of the Republic of Cyprus

### **NA 1 SCOPE**

This National Annex is to be used together with CYS EN 1998-4:2006

This National Annex gives:

- (a) Nationally determined parameters for the following clauses of CYS EN 1998-4:2006 where National choice is allowed (see Section NA 2)
- 1.1(4)
  - 2.1.2(4)P
  - 2.1.3(5)P
  - 2.1.4(8)
  - 2.2(3)
  - 2.3.3.3(2)P
  - 2.5.2(3)P
  - 3.1(2)P
  - 4.5.1.3(3)
  - 4.5.2.3(2)P
- (b) Decisions on the use of the Informative Annexes A and B (see Section NA 3)
- (c) References to non-contradictory complementary information to assist the user to apply CYS EN 1998-4:2006. In this National Annex such information is provided for the following clauses in CYS EN 1998-4:2006 (see Section NA 4)

## **NA 2 NATIONALLY DETERMINED PARAMETERS**

### **NA 2.1 Clause 1.1 (4) Scope of CYS EN 1998-4:2006**

For the design of facilities associated with large risks to the population or the environment the recommendations of other National Annexes may be used.

### **NA 2.2 Clause 2.1.2 (4)P Ultimate limit state**

For the ultimate limit state, the value of the reference return period,  $T_{NCR}$ , is 475 years.

### **NA 2.3 Clause 2.1.3 (5)P Damage limitation state**

For the damage limitation state, the value of the probability of exceedance,  $P_{DLR}$ , is 10% and the return period,  $T_{DLR}$ , is 95 years.

### **NA 2.4 Clause 2.1.4 (8) Reliability differentiation**

The value of the importance factor  $\gamma_I$  for silos, tanks and pipelines is:

1. Importance Class I,  $\gamma_I=0,8$
2. Importance Class II,  $\gamma_I=1,0$
3. Importance Class III,  $\gamma_I=1,2$

**PUBLIC ENQUIRY DRAFT**

National Annex to CYS EN 1998-4:2006 Eurocode 8: Design of Structures for Earthquake Resistance  
Part 4: Silos, tanks and pipelines

4. Importance Class IV,  $\gamma_I=1,6$

**NA 2.5 Clause 2.2 (3) Reduction factor at damage limitation state**

The reduction factor  $v$  that may be applied to the design seismic action is:

1. Importance Class I and II,  $v=0,5$
2. Importance Class III and IV,  $v=0,4$

In a specific area a different value of the reduction factor  $v$  may be used if this value is justified by special zoning studies.

**NA 2.6 Clause 2.3.3.3 (2)P Foundation damping**

The maximum value of radiation damping  $\xi_{\max}$  for soil-structure interaction analysis is 25%. Further guidance for the selection and use of damping values associated with different motions is provided in the CYS EN 1998-6:2005.

**NA 2.7 Clause 2.5.2 (3)P Combination of seismic action with other actions**

The value of factor  $\varphi$  that must be multiplied with the combination coefficient  $\psi_{Ei}$  is:

1.  $\varphi=1$  for full silo, tank and pipeline
2.  $\varphi=0$  for empty silo, tank and pipeline

**NA 2.8 Clause 3.1 (2)P Introduction – Unit weights**

The unit weights of the particulate solid in silos is the upper value of the unit weight listed in the CYS EN 1991-4:2006, Table E1.

For materials not listed in the table thorough tests must be carried out to determine the lower and upper value of the unit weight.

**NA 2.9 Clause 4.5.1.3 (3) Piping – amplification factor**

The value of the amplification factor  $\gamma_{p1}$  on forces transmitted by the piping to the region of the tank where the piping is attached is 1,3.

**NA 2.10 Clause 4.5.2.3 (2)P Piping – overstrength factor**

The value of the overstrength factor that must be taken into account on the design resistance of the piping is  $\gamma_{p2}=1,3$ .

**NA 3 DECISION ON USE OF THE INFORMATIVE ANNEXES A AND B**

**NA 3.1 Annex A**

Annex A is informative and may be used

**NA 3.2 Annex B**

Annex B is informative and may be used

**NA 4 REFERENCES TO NON-CONTRADICTORY COMPLEMENTARY INFORMATION**

None