



NATIONAL PETROCHEMICAL COMPANY STANDARDS

ENGINEERING STANDARD FOR CONCRETE

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1 GENERAL

1.1 SCOPE

This standard covers the requirements for the design, material of concrete foundations and structures and miscellaneous concrete civil work.

1.2 REGULATIONS

1.2.1 The work shall be done in accordance with the national and local law and regulations.

1.2.2 For subjects not covered by regulations or specifications, the design and material shall be based on good engineering and working practice. The methods are subject to approval by client.

1 . 3 CODES AND STANDARDS

All concrete structures design and material, shall conform to the latest edition of the following :

- a) Iranian National Building Code part :5, Building Materials and Products.
- b) ACI 318-89 Building Code Requirements for Reinforced Concrete.
- c) ISIRI No. 519, Minimum Design Loads in Buildings and Other Structures.
- d) UBC Uniform Building Code
- e) American National Standards Institute [ANSI)

A58.1 Building Code Requirements for Minimum Design Loads in Buildings and Other Structures.

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1.4 UNITS

Units shall be in accordance with NPCS-ES-GN-03:

- Length : Meter (m), millimeter (mm).
- Force : Kilogram force (Kg) and tons(T).
- Weight : Kilogram (Kg).
- Moment : Ton-meter (T-m).
- Stress and pressure : Kg/Cm².
- Loadings : Kilogram/m² (Kg/m²).

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2 MATERIALS

2.1 CEMENTS

Cement shall be an approved brand of Portland cement conforming to ISIRI No.389 to 394 and 1692 to 1695 and or to "Specifications for Portland Cement"; (ASTM C150), type at owner's option and/or design requirements.

Cement shall be mill tested and duplicate copies of mill test reports covering cement to be used in the work shall be furnished to the owner. One brand of cement shall be used throughout the work to maintain uniform color and establish undivided responsibility.

Other types of cement can be used for specific jobs, provided the contractor obtains written approval of owner whenever and when a change of cement is needed. All cement to be used in piles, rafts and foundations should be in accordance with the recommendation of the soil investigation report.

2.2 ADMIXTURES

Admixtures to increase workability, hardness or other desirable characteristics may be only used if prior written approval by the owner has been obtained.

2.3 WATER

Water used in mixing concrete shall be fresh, clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials or other substances that may be deleterious to concrete or steel.

Potable water is suitable for use in mixing concrete without testing.

Nonpotable water may be used if mortar test cubes made with this water have: a 1-day and a 28-day strength equal to at least 90 percent of the strengths of companion specimens made with potable water. Mortar cubes shall be made and tested in accordance with "Standard Method of Test for Compressive Strengths of Hydraulic Cement Mortar" (ASTM C109).

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2.4 AGGREGATES

Aggregates shall conform to the requirements of ISIRI No. 300, 302 and or "Standard Specification for Concrete Aggregates" (ASTM C33). Fine and coarse aggregates shall be regarded as separate ingredients. Each size of coarse aggregate, as well as the combination of sizes when two or more are used, shall conform to the grading requirements of the appropriate ASTM specifications.

Maximum size of aggregates should not exceed 25 mm except in the case of deep foundation rafts or grade slabs, where it may be more economical to use larger size aggregate, all in accordance with ACI 301, section 3.6.

2.5 STORAGE OF MATERIALS

- a) Cements shall be stored in weathertight buildings, bins or silos that exclude moisture and contaminants.
- b) Aggregates shall be stored and used in a manner to prevent segregation of individual aggregates, as well as to prevent mixing of the coarse and fine aggregates.
- c) Admixtures shall be stored in such a manner as to avoid contamination, evaporation or damage. Liquid admixtures shall be protected from freezing and from temperature changes that adversely affect their characteristics.
- d) Materials that have deteriorated or been contaminated shall not be used for concrete.

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3 BASIC DESIGN

The design shall be based on the codes and standards as stipulated in section 1.3 of this standard.

3.1 LOADING CONDITIONS

The design shall be checked against the various combinations as outlined in section 3.2 with the following components:

D= Dead Load.

Weight of structure proper.

Weight of equipment.

Empty weight of vessels, columns, etc.

Foundation dead loads shall also include the weight of the soil immediately above the foundation.

L= Live Load.

Live Load of vessels, columns, etc.

Live loads (imposed loads).

Exchanger bundle pull force.

Moving loads.

Thermal effects and shear effects.'

T= Hydrostatic Test Load.

W= Wind Load.

E= Earthquake Load.

S= Snow Load.

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