



NATIONAL PETROCHEMICAL COMPANY STANDARDS

ENGINEERING STANDARD FOR PILING

NPCS-ES-GC-02

REVISION : 0

FEBRUARY 1993

THIS DOCUMENT IS THE PROPERTY OF NPC. IT IS CONFIDENTIAL AND ALL RIGHTS RESERVED. TO THE OWNER NEITHER THE WHOLE NOR ANY PART OF THIS DOCUMENT MAY BE DISCLOSED TO ANY THIRD PARTY, REPRODUCED, STORED IN ANY RETRIEVAL SYSTEM OR TRANSMITTED IN ANY FORM OR ANY MEANS WITHOUT THE PRIOR WRITTEN CONSENT OF NPC.



CONTENTS

1 GENERAL

1.1 SCOPE

1.2 LAWS AND REGULATIONS

1.3 STANDARDS AND CODES

2 PILES SELECTION

2.1 FOUNDATION PILES

2.1.1 Precast Concrete Piles

2.1.2 Precast Pretensioned Concrete Piles

2.1.3 Raymond Pile

2.1.4 Piles Using Carbon Steel Pipe Filled With Reinforced Concrete

2.1.5 H Beam Steel Pile

2.1.6 Other Types

2.1.7 Pile Cap

2.2 SHEET PILES

THIS DOCUMENT IS THE PROPERTY OF N.P.C. IT IS CONFIDENTIAL AND ALL RIGHTS RESERVED. TO THE OWNER NEITHER THE WHOLE NOR ANY PART OF THIS DOCUMENT MAY BE DISCLOSED TO ANY THIRD PARTY, REPRODUCED, STORED IN ANY RETRIEVAL SYSTEM OR TRANSMITTED IN ANY FORM OR ANY MANNER WITHOUT THE PRIOR WRITTEN CONSENT OF N.P.C.



1 **GENERAL**

1.1 **SCOPE**

This standard covers the minimum requirements for design of piling in industrial complexes.

1.2 **LAWS AND REGULATIONS**

The work shall be done in accordance with local and national laws and regulations. For items not covered by laws and regulations, the work shall be done according to good engineering and working practice subjected to client approval before implementation.

1.3 **STANDARDS AND CODES**

Following standards and codes form minimum requirement for this standard:

- ACI American Concrete Institute.
 - ACI 117 Standard Tolerances for Concrete Construction and Material.
 - ACI 336.1 Standard Specification for Construction of End Bearing Drilled Piers.
- AISC American Institute for Steel Construction.
 - ACI 336 Suggested Design and Construction Procedures for Pier Foundations.
- NPCS National Petrochemical Company Standards.
 - NPCS-ES-ST-01 Engineering Standard for Concrete.
 - NPCS-ES-ST-02 Engineering Standard for Steel Structures.
 - NPCS-CS-ST-01 Construction Standard for concrete.
 - NPCS-CS-ST-02 Construction Standard for Steel structures.
 - NPCS-SD-ST-33 Pile Details (Steel & Concrete)



2 PILES SELECTION.

Two different categories of piles are available; foundation piles and sheet piles.

2.1 FOUNDATION PILES

Piles used to transfer load of equipment, structures, buildings, pits, etc., are called foundation piles. Many types of foundation piles are used. To select appropriate type, a feasibility study shall be performed for each project. Also piling shall be investigated versus methods of soil modification such as preloading (with or without sand blanket, sand column, tafnel drain, etc.) deep compaction, deep vibration, ground water lowering, electrical ground water removal, etc. In this case, the appropriate method shall be investigated and designed by a high qualified soil investigation consulting company. Following pile types may be studied in feasibility study.

2.1.1 Precast Concrete Piles

It consists of a reinforced concrete Precast column of square, octagonal, circular, etc., cross section and about 12 m length and 400 to 600 mm diameter or side. (It is preferred to use Iranian made reinforcement Steel St-37 and St-42 as per DIN 17100). Maximum length can be determined from required pile length (total length of each driven pile) pile leader length, etc. Smaller length piles shall be constructed where required length of driven pile is more than maximum practical pile length. Pile pieces are connected to eachother using weld or another means of connection after driving each piece.

Advantages of this pile are;

- No need for casing (expensive).
- Controlled concrete quality (bad quality piles can be rejected or will be break while driving).
- Needs no special plant for fabrication.

Disadvantages of this pile are;

- Needs time for curing.
- Needs prefabricated formwork.
- Uses high amount of concrete and reinforcement.
- Needs large ponds for curing.