



NATIONAL PETROCHEMICAL COMPANY
STANDARDS

ENGINEERING STANDARD
FOR
POWER SYSTEM DESIGN

NPCS-ES-EL-02

REVISION : 0

MARCH 1993



CONTENTS

- 1 SCOPE
- 2 STANDARDS AND CODES
- 3 LANGUAGE AND UNITS
- 4 POWER SYSTEM DESIGN
- 5 ELECTRICAL EQUIPMENT

THIS DISCLOSURE 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 REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN CONSENT OF N.P.C.



1 SCOPE

- 1.1 'This standard describes the minimum requirements for the design of power system in a petrochemical complex.
- 1.2 'This standard shall be read in conjunction with the electrical standards of NPC for material and engineering, and the requirements of specific codes, recommendations and standards referred to in these standards.

2 STANDARDS AND CODES

- 2.1 'The power system design shall be in accordance with the standards or recommendations issued by the following:
- 2.1.1 International Electrotechnical Commission (IEC) .
- 2.1.2 CENELEC Standards.
- 2.1.3 National Electrical Manufacturer's Association (NEMA) .

3 LANGUAGE AND UNITS

- 3.1 All project documents shall be written in English.
- 3.2 All measurements shall be based on SI system, according to NPC-ES-GN-03.

4 POWER SYSTEM DESIGN

- 4.1 The distribution system shall be designed taking into account all possible factors affecting the choice of the system to be adopted such as safety of personnel or equipment during operation and maintenance, ease of maintenance, required continuity of supply, flexibility of operation, minimum power losses, reliability of supply from available power sources, total load and the concentration of individual loads.
Voltage insulation levels, interrupting capacities, continuous current capacities, circuit protection and mechanical strengths shall be selected and coordinated in accordance with the latest edition of above listed standards.

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 BY ANY MEANS WITHOUT THE PRIOR WRITTEN CONSENT OF NPC.



THIS DOCUMENT IS THE PROPERTY OF NPCC. 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 NPCC.

Necessary calculations shall be made to insure the suitability of power systems.

All the components of the power system shall be sized to suit the maximum load under the worst operating conditions. Accordingly, the maximum simultaneous consumption of power required by continuously operating loads shall be considered and an additional margin shall be taken into account for intermittent service loads, if any.

The power system shall be arranged and earthed as a TN-S system, having separate neutral and protective conductors throughout the system.

In general, all area sub-stations serving process and essential loads shall consist of suitably-rated switchgear as a secondary selective radial system. This type of sub-station will be supplied by two feeders from different sections of the main switchboards. Each switchgear assembly will consist of two buses, each supplied by a normally closed breaker and connected by a normally open tie breaker; feeder breakers will be provided to supply step-down power transformers.

Each sub-station shall contain secondary switchgear and motor control. All switchgears will be secondary selective.

"A" and "B" motors shall be connected to different buses of the motor control centers.

Sub-stations without 6 KV loads will have no primary switchgear. The 6 KV cables will be connected directly to the distribution transformers via an isolating switch and key interlock with the 6 KV feeder breaker. Alternate routes shall be used for the installation of dual feeders to the area sub-stations.

4.2 VOLTAGE AND FREQUENCY

Electrical system voltage levels are indicated in table 1.

4.2.1 Voltage and Frequency Variation

4.2.1.1 AC System

The following maximum variations shall be considered for equipment:

Voltage : Differing from its nominal value by not more than $\pm 5\%$.

Frequency : Differing from its nominal value by not more than $\pm 5\%$.



4.2.1.2

DC System

The voltage variation to be considered for electrical control circuits and instrumentation shall be $\pm 10\%$.

TABLE 1

THE STANDARD VOLTAGE RATINGS FOR VARIOUS UTILIZATION LOADS

NO.	ITEM	AC/DC	RATED VOLTAGE	PHASE/WIRE
1	MOTORS 150 KW above 0.2 KW to below 150 KW Below 0.2 KW	AC AC AC	6000 V 380 V 220 V	3/3 3/3 1/2
2	Construction and Maintenance	AC	380/220 V	3/4
3	Lighting	AC	380/220 V	3/4
4	Emergency Lighting	AC	380/220 V	3/4
5	Vital Lighting	AC	220 V	1/2
6	Instruments (nonvital) Instruments (vital) Instruments (vital)	AC AC DC	110 V 110 V 24 V	1/2 1/2 -
7	Control for HT Board+ HT motors	DC	110 V	-
8A	Control for LT Board Incoming and Tie Circuit Breaker	DC	110 V	-
8B	Control for MCC LT Motors (Note 1)	AC	110 V	1/2
9	Trip Alarms	DC	24 V	-
10	Handlamps for Maintenance	AC	24 V	1/2

Note: 1. 110 V AC derived from a common control transformer per bus section.

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 BY ANY MEANS WITHOUT THE PRIOR WRITTEN CONSENT OF NPC.