NOTICE OF CHANGE

MIL-HDBK-1004/2
NOTICE 1
15 FEBRUARY 1991

MILITARY HANDBOOK

POWER DISTRIBUTION SYSTEMS

TO ALL HOLDERS OF MIL-HDBK-1004/2:

1. THE FOLLOWING PAGES OF MIL-HDBK-1004/2 HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
xi	15 February 1991	xi	31 March 1988
xia	15 February 1991	xi	31 March 1988
xii	15 February 1991	xii	REPRINTED WITHOUT CHANGE
39	15 February 1991	39	31 March 1988
39a	15 February 1991	39	31 March 1988
40	15 February 1991	40	31 March 1988
40a	15 February 1991	40	31 March 1988

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-HDBK-1004/2 will verify that all changes indicated above have been made. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military handbook is completely revised or canceled.

CUSTODIAN:
NAVY-YD

PREPARING ACTIVITY:
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PROJECT NO.
FACR-1054

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c) overhead or underground supply required, and
d) primary switching.

For feeder or load circuits, determine the following conditions:

a) number of circuits,
b) capacity of circuits,
c) voltage and phase, and
d) overhead or underground distribution required.

Finally, consider coordination of circuit protective devices between supply and feeder circuits.

5.5.3 Incoming-Line Switching. Design the substation with a minimum of incoming-line switching consistent with good maintenance and operation. For rating of equipment, refer to MIL-HDBK-1004/3, Switchgear and Relaying. Also, consider the methods described in paras 5.5.3.1 through 5.5.3.3.

5.5.3.1 Circuit Breakers. Circuit breakers should be utilized only when the circuit interrupting or relaying requirements do not allow the use of switches. Provide a disconnect and bypass switching features where drawout circuit breakers cannot be utilized.

5.5.3.2 Switches. Switches are covered in Section 2 of this handbook. For voltages of 15 kV or less, load interrupter or disconnect switches areavailable. Load interrupter switches disconnect circuits under fully loaded conditions and are therefore usually the most desirable choice. Use disconnect switches only to interrupt transformer exciting currents. The use of disconnect switches is not recommended, except for primary incoming lines where secondary circuit breakers can interrupt loads. Assure that operators do not open disconnect switches under load, either by interlocking with load switching equipment or by operating procedures.

5.5.3.3 Current Limiting Protectors. Current Limiting protection devices are covered in Section 2. They are generally inappropriate for substation use where metal-enclosed or metal-clad switchgear for 15-kV applications provides a more desirable design.

5.5.4 Outgoing-Feeder Switchgear. For ratings and selection of equipment, refer to MIL-HDBK-1004/3.

5.5.4.1 600 V and Less. For load circuits below 600 V, select from one of the following:

a) metal-enclosed (low-voltage power) circuit breakers where reliability and the longer withstand rating period are desirable; or

b) molded-case circuit breakers. Molded-case circuit breakers must be further defined as to tripping and interrupting currents and whether

fully-rated capability or other features are desirable. The use of the term "insulated case" conveys no minimum requirements in accordance with any recognized industry specification and should not be used.

5.5.4.2 Over 600 Volts. For load circuits over 600 V, use criteria in

MIL-HDBK-1004/3 to select from the following:

a) either oilless, metal-clad, medium-voltage circuit breakers, preferably of the vacuum circuit breaker type; or

b) grounded, metal-tank type, frame-mounted circuit breakers, with open disconnecting switches. Circuit breakers may be oil, gas, vacuum, or compressed air type. Oil-insulated type shall be installed only in outdoor locations and only for voltages exceeding 35 kV.

5.5.5 Substation Structures. Depending on the chosen design, the substation structure may consist of the following:

a) flat concrete base without elevated structures, applicable for underground supply and load circuits served by metal-clad switchgear;

b) steel or aluminum superstructures mounted on concrete piers; or

c) a combination of either of the aforementioned systems.

5.5.6 Transformers

5.5.6.1 Selection. Consider the types of insulation that are suitable for the site and the system voltages (see Table 6). Select oil-insulated for outdoor applications, except where fire safety considerations require the use of less-flammable, liquid-insulated insulation which is not usually available for voltages above 34.5 kilovolts. For indoor installations, see the paragraph on transformer insulations of this section.

5.5.6.2 Cooling. Forced cooled ratings are only available on larger size transformers and the designer should check their availability before specifying. Dependent upon standard ratings and overload capacity calculations, specify the cooling method from one of the following:

a) self-cooled, type OA,
b) one-stage forced-cooled, type FA,
c) two-stage forced-cooled, type OA/FA,
d) one-stage double-forced-cooled; forced-oil, forced-air, type FOA, or
e) triple-rated, types OA/FA/FOA/ or OA/FA/FA.

5.5.6.3 Transformer Capacity. Choose the transformer rating by considering the maximum load to be carried for normal and contingency conditions and the possibility of accepting overloading with accelerated loss of system life. Transformers should be sized for 10-25 percent more than calculated loads to minimize future growth costs.

5.5.6.4 Fire Protection. For minimum safe distances of transformers to buildings and other fire protection criteria refer to MIL-HDBK-1008. Also refer to IEEE 979, Guide for Substation Fire Protection.

5.5.6.5 Transformer Noise. Specify transformer noise levels as given in NEMA TR-1. When standard noise levels are found to be too high, estimate the cost effectiveness of sound minimizing methods such as:

a) specifying a transformer with a lower noise level,