API Standard 610
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CENTRIFUGAL PUMPS FOR GENERAL REFINERY SERVICES

AMERICAN PETROLEUM INSTITUTE
Division of Refining
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FOREWORD

This standard is based on the accumulated knowledge and experience of buyers and manufacturers of centrifugal pumps. The object of this publication is to provide a purchase specification to facilitate the manufacture and procurement of centrifugal pumps for oil refinery service.

This standard requires the purchaser to specify certain details and features. Also, it is recognized that the purchaser may desire to modify, delete, or amplify sections of the standard. It is strongly recommended that such modifications, deletions, and amplifications be made by supplementing this standard, rather than by rewriting or by incorporating sections thereof into another complete standard.

Suggested revisions are invited and should be submitted to the director of the Division of Refining, American Petroleum Institute, 1271 Avenue of the Americas, New York, N.Y. 10020.

Note: An asterisk (*) at the beginning of a paragraph indicates where a decision may be required which may not be obvious from the data sheet in Appendix A; see Checklist, p. 20.

CONTENTS

ABBREVIATIONS USED IN THIS PUBLICATION

allow. ..... allowable
amps ..... amperes
ASA ..... American Standards Association
aux ..... auxiliary
avail. ..... available
BHN ..... Brinell hardness number
bhp ..... brake horsepower
C ..... degrees centigrade
class. ..... classification
conns ..... connections
corr ..... corrosion
cw ..... cold water
des ..... design
diam ..... diameter
diff ..... differential
disch ..... discharge
dwg ..... drawing
eff ..... efficiency
enc ..... enclosed
eros. ..... erosion
F ..... degrees fahrenheit
FL ..... full load
ft ..... feet
gpm ..... gallons per minute
hp ..... horsepower
hr ..... hour
imp ..... impeller
in. ..... inch
insul ..... insulated
lb ..... pound
mat'l ..... material
max ..... maximum
mech ..... mechanical
mfr ..... manufacturer
min ..... minimum
mtd ..... mounted
nor. ..... normal
No. ..... number
NPSH ..... net positive suction head above vapor pressure referred to the pump centerline in the case of horizontal pumps and to the eye of the first-stage impeller in the case of vertical pumps
perf ..... performance
press. ..... pressure
psi ..... pounds per square inch
psia ..... pounds per square inch absolute
psig ..... pounds per square inch gage
PT ..... pumping temperature

req'd ..... required
rpm ..... revolutions per minute
sect. ..... section
sp gr ..... specific gravity
Ssu ..... Saybolt seconds universal
stuff. ..... stuffing
suct ..... suction
temp ..... temperature
U.S. ..... United States
vap ..... vapor
vis ..... viscosity
WP ..... working pressure
WR ..... wearing ring

Note: The nomenclature and part definitions used in this standard are taken from the *Centrifugal Pump Section* of the *Standards of the Hydraulic Institute,* 10th edn.

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SECTION I—GENERAL

1. Scope

This standard is intended to cover the minimum requirements for centrifugal-type pumps for petroleum products, including single-case horizontal, single- and double-case vertical, and in-line pumps.

2. Alternate Design

A vendor may offer an alternate pumping unit of a manufacturer's standard design, provided the alternate design covers a construction which is equivalent to, guaranteed, and otherwise submitted in accordance with the requirements herein specified. All deviations in the manufacturer's standard design from the requirements specified herein shall be described fully in the proposal. The alternate design will receive full consideration.

3. Conflicting Requirements

Whenever the information included on the purchaser's data sheets, order sheets, or purchase orders conflicts with the provisions of this standard, the purchaser's data sheets, order sheets, and purchase orders shall govern.

4. Definitions

Maximum allowable casing pressure is the greatest discharge pressure (100 F) for which the pump casing is designed. Design shall conform to the rules of the pump design laid out in this standard. This pressure shall be equal to or greater than maximum discharge pressure.

Maximum discharge pressure is the maximum possible suction pressure to be encountered, plus the maximum differential pressure the pump is able to develop when operating at the specified condition of speed, specific gravity, and pumping temperature with the furnished impeller.

Rated discharge pressure is the discharge pressure of the pump at the guarantee point with rated capacity, speed, suction pressure, and specific gravity.

Maximum suction pressure is the highest suction pressure to which the pump is subjected during operations.

Rated suction pressure is the suction pressure for the operating conditions at the guarantee point.

Rated brake horsepower is the horsepower required by the pump at specified rated operating conditions, including capacity, pressures, specific gravity, and viscosity.

5. Reference Specifications

See Appendix B, p. 23.

SECTION II—DESIGN

6. General

a. Pumps with constant speed drivers shall be capable of at least a 5-percent head increase at rated conditions by installing a new impeller.

b. Pumping units may be of single- or multistage design. When the rated suction pressure is more than zero psig or the differential pressure exceeds 50 psi, the pump should be designed so as to minimize the pressure on the stuffing boxes. This can be accomplished by one of three methods: i.e., rings on the back of impellers, close-fitting throat bushing with bleed back to suction, or vanes on the back of the impeller.

***c.** Vendor shall, in all cases, list on the data sheet the net positive suction head (NPSH) which would be required if the pump were operated on water at the rated capacity and rated speed. For pumps operated on hydrocarbons, vendor may, if appropriate and unless otherwise specified, apply NPSH factor which, if used, shall be reported separately and shall result in a change no greater than that obtained from the *Centrifugal Pump Section* of the *Standards of the Hydraulic Institute.*

7. Motors

a. Motors required as drivers for any pumps covered by this standard shall have horsepower ratings, including service factor, if any, at least equal to the following percentage of pump rated brake horsepower:

Motor Nameplate Ratings	Percent of Rated Brake Horsepower
25 hp and less	125
30 hp to 75 hp	115
100 hp and over	110

However, the rated brake horsepower shall not exceed the motor nameplate rating. Where it appears that this will lead to unnecessary oversizing of the driver, an alternate quotation shall be submitted for the purchaser's approval.

b. Motors of a particular horsepower rating shall, insofar as possible, be built in frame sizes which comply with the standards of the National Electrical Manufacturers Association. S-frame or short-shaft motors are preferred. On motor-turbine dual drives, the horsepower rating of the motor shall be sufficient to drive the