



American National Standard for

Rotodynamic Pumps

for Assessment of Applied Nozzle
Loads

ANSI/HI 9.6.2-2011



6 Campus Drive
First Floor North
Parsippany, New Jersey
07054-4406
www.Pumps.org

This page intentionally blank.

ANSI/HI 9.6.2-2011

American National Standard for

Rotodynamic Pumps for Assessment of Applied Nozzle Loads

Sponsor
Hydraulic Institute
www.Pumps.org

Approved May 19, 2011
American National Standards Institute, Inc.

American National Standard

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgement of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published By

Hydraulic Institute
6 Campus Drive, First Floor North
Parsippany, NJ 07054-4406

www.Pumps.org

Copyright © 2011 Hydraulic Institute
All rights reserved.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior written permission of the publisher.

Printed in the United States of America

ISBN 978-1-935762-06-5



Recycled
paper

Contents

	Page
Foreword	v
9.6.2 Rotodynamic pumps for assessment of applied nozzle loads	1
9.6.2.0 Scope	1
9.6.2.1 Horizontal end suction pumps	1
9.6.2.1.1 Scope	1
9.6.2.1.2 Nomenclature and definitions	1
9.6.2.1.3 Criteria for loading allowances	3
9.6.2.1.4 ANSI/ASME B73.1 pump assessment of applied nozzle loads	4
9.6.2.1.5 ANSI/ASME B73.3 sealless pump assessment of applied nozzle loads	7
9.6.2.1.6 ANSI/ASME B73.5M composite pump assessment of applied nozzle loads	7
9.6.2.1.7 Nozzle load adjustment factors	7
9.6.2.2 Vertical in-line pumps	10
9.6.2.2.1 Scope	10
9.6.2.2.2 Nomenclature and definitions	10
9.6.2.2.3 Criteria for loading allowances	11
9.6.2.2.4 ANSI/ASME B73.2 pump assessment of applied nozzle loads	12
9.6.2.2.5 Temperature and material adjustment factors	13
9.6.2.3 Axial split case pumps (single-stage double suction and two-stage single suction)	14
9.6.2.3.1 Scope	14
9.6.2.3.2 Definitions (refer to Figure 9.6.2.3.2)	14
9.6.2.3.3 Criteria for loading allowances	15
9.6.2.3.4 Axial split case pumps (single-stage double suction and two-stage single suction) assessment of applied loads	16
9.6.2.4 Vertical turbine short set pumps	17
9.6.2.4.1 Scope	17
9.6.2.4.2 Definitions	18
9.6.2.4.3 Methodology	18
Appendix A Example assessments of applied nozzle loads – ASME B73.1 and ASME B73.5M pumps	23
Appendix B Example assessments of applied nozzle loads – ASME B73.2 pumps	31
Appendix C Example assessments of applied nozzle loads – vertical turbine pumps	33
Appendix D References	35

Appendix E	Index	37
Figures		
9.6.2.1.2.2	— Coordinate system for ASME B73.1, B73.3, and B73.5M horizontal end suction pumps	2
9.6.2.1.7.1.1	— Stilt-mounted baseplate	8
9.6.2.2.2.2	— Coordinate system for ASME B73.2 vertical in-line pumps	11
9.6.2.3.2	— Coordinate system for axial split case pumps	15
9.6.2.4.2a	— Nozzle loads for above pump base (floor) discharge pumps	19
9.6.2.4.2b	— Nozzle loads for below pump base (floor) discharge pumps	20
Tables		
9.6.2.1.4a	— Equation sets 1 through 5	4
9.6.2.1.4b	— Maximum forces and moments for use with equation set 1 to assess applied loads	5
9.6.2.1.4c	— Maximum forces and moments for use with equation set 2 to assess applied loads	6
9.6.2.1.4d	— Maximum forces and moments for use with equation set 3 to assess applied loads	6
9.6.2.1.4e	— Maximum forces and moments for use with equation set 4 to assess applied loads	7
9.6.2.1.7.2.2a	— List of material specifications as used in Table 9.6.2.1.7.2.2b	9
9.6.2.1.7.2.2b	— ASME B73.1 metallic pump temperature and material adjustment values to be used on Table 9.6.2.1.4c values	10
9.6.2.2.4a	— Equation set 6	12
9.6.2.2.4b	— Maximum forces and moments for use with equation set 6 to assess applied loads	12
9.6.2.2.4c	— List of material specifications as used in Table 9.6.2.2.5.2	13
9.6.2.2.5.2	— ASME B73.2 metallic pump temperature and material adjustment values to be used on Section 9.6.2.2.4 values	14
9.6.2.3.3a	— Maximum forces and moments for use with equation 1 to assess applied loads based on hold-down bolts	17
9.6.2.3.3b	— Maximum forces and moments for use with equation 1 to assess applied loads based on nozzle stress	17

Foreword (Not part of Standard)

Purpose and aims of the Hydraulic Institute

The purpose and aims of the Institute are to promote the continued growth and well-being of pump manufacturers and further the interests of the public in such matters as are involved in manufacturing, engineering, distribution, safety, transportation, and other problems of the industry, and to this end, among other things:

- a) To develop and publish standards for pumps;
- b) To collect and disseminate information of value to its members and to the public;
- c) To appear for its members before governmental departments and agencies and other bodies in regard to matters affecting the industry;
- d) To increase the amount and to improve the quality of pump service to the public;
- e) To support educational and research activities;
- f) To promote the business interests of its members but not to engage in business of the kind ordinarily carried on for profit or to perform particular services for its members or individual persons as distinguished from activities to improve the business conditions and lawful interests of all of its members.

Purpose of Standards

- 1) Hydraulic Institute Standards are adopted in the public interest and are designed to help eliminate misunderstandings between the manufacturer, the purchaser, and/or the user and to assist the purchaser in selecting and obtaining the proper product for a particular need.
- 2) Use of Hydraulic Institute Standards is completely voluntary. Existence of Hydraulic Institute Standards does not in any respect preclude a member from manufacturing or selling products not conforming to the Standards.

Definition of a Standard of the Hydraulic Institute

Quoting from Article XV, Standards, of the By-Laws of the Institute, Section B:

"An Institute Standard defines the product, material, process or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, quality, rating, testing and service for which designed."

Comments from users

Comments from users of this standard will be appreciated, to help the Hydraulic Institute prepare even more useful future editions. Questions arising from the content of this standard may be sent to the Technical Director of the Hydraulic Institute. The inquiry will then be directed to the appropriate technical committee for provision of a suitable answer.

If a dispute arises regarding contents of a Hydraulic Institute Standard or an answer provided by the Institute to a question such as indicated above, the point in question shall be sent in writing to the Technical Director of the Hydraulic Institute, who shall initiate the Appeals Process.

Revisions

The Standards of the Hydraulic Institute are subject to constant review, and revisions are undertaken whenever it is found necessary because of new developments and progress in the art. If no revisions are made for five years, the standards are reaffirmed using the ANSI canvass procedure.