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American National Standard for

Rotodynamic Centrifugal Slurry Pumps

for Nomenclature, Definitions, Applications, and Operation

HYDRAULIC INSTITUTE™

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Rotodynamic Centrifugal Slurry Pumps

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American National Standard

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Foreword [Not part of American National Standard (ANSI)]

Purpose and aims of the Hydraulic Institute
The purpose and aims of the Hydraulic Institute are to drive all Pump System stakeholders towards a sustainable future by:

a) Advancing Solutions for Pump System Performance and Efficiency

b) Developing Standards and Technical Resources

c) Educating the Global Marketplace

d) Advocating for the Industry

Purpose of Document:
Hydraulic Institute Standards and Guidelines may be published as American National Standards, and are adopted in the public interest 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. Use is completely voluntary and does not in any respect preclude a member from manufacturing or selling products which are not conforming.

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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."

Definition of Hydraulic Institute Guideline
A Hydraulic Institute Guideline is not normative. The guideline is tutorial in nature, to help the reader better understand the subject matter.

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 directed to the Technical Director of the Hydraulic Institute. If appropriate, the inquiry will then be directed to the appropriate technical committee for provision of a suitable answer.

Revisions
American National 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. Errata or addenda may be issued to address limited changes. If no revisions are made for five years, the standards are reaffirmed using the ANSI canvass procedure.

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This document does not contain a complete statement of all requirements, analyses, and procedures necessary to ensure safe or appropriate selection, installation, testing, inspection, and operation of any pump or associated products. Each application, service, and selection is unique with process requirements that shall be determined by the owner, operator, or its designated representative.

Units of measurement
Metric units of measurement are used, and corresponding US customary units appear in parentheses. Charts, graphs, and sample calculations are also shown in both metric and US customary units. Because values given in metric units are not exact equivalents to values given in US customary units, it is important that the selected units of measure to be applied be stated in reference to this standard. If no such statement is provided, metric units shall govern.

Consensus
Consensus for this American National Standard was achieved by use of the canvass method. The following organizations, recognized as having an interest in the standardization of pumps, were contacted prior to the approval of this revision of the standard. Inclusion in this list does not necessarily imply that the organization concurred with the submittal of the proposed standard to ANSI.

Brown and Caldwell	Leistritz
Servicios Procure SPA	Sulzer
Westinghouse Electric Co.	Summit Pump Inc
Ekwestrel LLC	Wood
Swiss Flow Solutions GmbH	Syncrude Canada
Universidad Pontificia	Irving Oil
Worley	Weir Minerals

Committee list
Although this standard was processed and approved for submittal to ANSI by the canvass method, a working committee met many times to facilitate its development. At the time it was developed, the committee had the following members:

Committee List
Chair – Aleksander Roudnev, Weir Minerals North America

Vice-Chair – Robert Visintainer, GIW Industries, Inc. (A KSB Company)

Committee members	**Company**
Michael Mueller	Flowserve Corporation
Jack Bagain	John Crane Inc.

Alternates	**Company**
Michael Cugal	Weir Minerals North America
Randy Kosmicki	Weir Minerals North America

12 Rotodynamic centrifugal slurry pumps

12.0 Introduction

This standard covers rotodynamic slurry pumps used for pumping and/or transporting mixtures of solids and liquids or so-called “slurries.” Slurries are often abrasive and, if not considered, may cause high wear and shortened life of pumps. Unlike clear water, slurries alter the performance of the pumps and cause wear to the wet-end parts. Below a certain velocity, some slurries also settle out in the piping, causing blockages. These differences are such that if they are not taken into account, the pumps will not work satisfactorily or not at all. For this reason, this standard includes information about slurries and their effects, which is necessary to select, apply, operate, and maintain slurry pumps of different designs and materials of construction.

12.0.1 Purpose

This standard is normative and sets out requirements, recommendations, and statements to define, select, apply, operate, and maintain slurry pumps. Requirements convey criteria to be fulfilled if compliance with the document is to be claimed and from which no deviation is permitted. Recommendations convey that, among several possibilities, one is particularly suitable, without excluding or prohibiting others.

12.0.2 Scope

This standard is for rotodynamic centrifugal, single-stage, overhung impeller slurry pumps, horizontal and vertical of industrial types used for abrasive slurries, herein referred to as slurry pumps. It includes types and nomenclature; definitions; design and application; installation, operation and maintenance; and guidelines on testing.

12.0.3 Units, Symbols & Subscripts

This section defines terms used in slurry pump applications. Symbols, terms, units, and conversion factor are listed in Table 12.0.3a and subscripts in Table 12.0.3b.

Table 12.0.3a — Principal symbols

Symbol	Term	To Convert US Customary Units (USCS)	Units	To Metric Units	Units	Multiply by Conversion Factor
A	Area	Square inch	in^2	Square millimeter	mm^2	645.2
Cv	Concentration by volume	Percentage	%	Percentage	%	1
Cw	Concentration by weight	Percentage	%	Percentage	%	1
Δ (delta)	Difference	Dimensionless[a]	–	Dimensionless	–	–
D	Diameter	Inch	in	Millimeter	mm	25.4
η (eta)	Efficiency	Percent	%	Percent	%	1
γ (gamma)	Specific weight	Pound force per cubic foot	lb/ft^3	Newton per cubic meter	N/m^3	157.1
g	Gravitational acceleration	Foot/second squared	ft/s^2	Meter/second squared	m/s^2	0.3048
h	Head (general term)	Foot	ft	Meter	m	0.3048
H	Pump total head	Foot	ft	Meter	m	0.3048