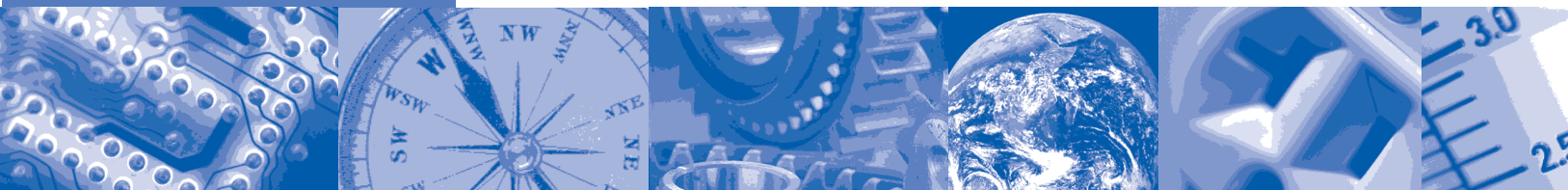


ISA-RP74.01-1984



Application and Installation of Continuous-Belt Weighbridge Scales



**ISA—The Instrumentation,
Systems, and
Automation Society**

Approved 30 March 1984



Documents

Document Sharing Hub

ISA-RP74.01-1984, Application and Installation of Continuous-Belt Weighbridge Scales

ISBN 0-87664-814-6

Copyright ©1984 by the Instrument Society of America. All rights reserved. Printed in the United States of America. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), without the prior written permission of the publisher.

ISA
67 Alexander Drive
P.O. Box 12277
Research Triangle Park, North Carolina 27709

Preface

This preface is included for information purposes and is not a part of ISA-RP74.01-1984.

This recommended practice has been prepared as a part of the service of ISA toward a goal of uniformity in the field of instrumentation. To be of real value, this document should not be static, but should be subject to periodic review. Toward this end, the Society welcomes all comments and criticisms, and asks that they be addressed to the Secretary, Standards and Practices Board, ISA, 67 Alexander Drive, P.O. Box 12277, Research Triangle Park, NC 27709, Telephone (919) 549-8411, e-mail: standards@isa.org.

The ISA Standards and Practices Department is aware of the growing need for attention to the metric system of units in general, and the International System of Units (SI) in particular, in the preparation of instrumentation standards. The Department is further aware of the benefits to U.S.A. users of ISA standards of incorporating suitable references to the SI (and the metric system) in their business and professional dealings with other countries. Toward this end, this Department will endeavor to introduce SI-acceptable metric units in all new and revised standards to the greatest extent possible. *The Metric Practice Guide*, which has been published by the Institute of Electrical and Electronic Engineers as ANSI/IEEE Std. 268-1982, and future revisions will be the reference guide for definitions, symbols, abbreviations, and conversion factors.

It is the policy of ISA to encourage and welcome the participation of all concerned individuals and interests in the development of ISA standards. Participation in the ISA standards-making process by an individual in no way constitutes endorsement by the employer of that individual, of ISA, or of any of the standards that ISA develops.

The information contained in the preface, footnotes, and appendices is included for information only and is not a part of the recommended practice.

Prior to issuance of this recommended practice, NBS Handbook 44 (Specification Tolerances and Other Technical Requirements for Commercial Weighing and Measuring Devices) and OIML IR50 (Laws of the Member States' Journal of European Communities Relating to Continuous Totalizing Weighing Machines) were available to guide specifiers and buyers of weighbridge-type, continuous-belt weigh scales. These two documents are intended for use on the regulation of weighing and apply to sales approved by weights and measures personnel.

The purpose of this recommended practice is to furnish design criteria to simplify the specification of weighbridge-type, continuous-belt weigh scales and to provide recommendations for their installation, calibration, and maintenance. It is recognized that nuclear-radiation-type belt weigh scales and "bolt-on" sensors perform a valuable service in the industry and can provide Class III accuracy (1-percent error). This recommended practice, however, addresses only the weighbridge-type scale, leaving the application and installation of nuclear scales and other weighing devices to subsequent consideration.

The persons listed below served as members of ISA Committee SP74:

NAME

COMPANY

N. L. Kautsky, Chairman
R. W. Brockmeyer
P. Chase

Stearns Catalytic Corporation
AMAX Corporation
Ramsey Engineering Company



Documents

Document Sharing Hub

S. Ciesiewski
W. J. Coulam
E. Duncan
D. R. Gilmore
M. R. Gruber
W. Heerman
R. Horne
G. Kachel
O. C. Murdoch
R. L. Nickens (deceased)
R. Osgood
L. J. Walker

Peabody Coal Company
Kennecott Research Center
K & P, Inc.
Thayer Scale Company
Southern Weighing & Inspection Bureau
Tech Sales, Inc.
Ralph M. Parsons Company
Riede Systems, Inc.
Duval Corporation
Reynolds Metal Company
K & P, Inc.
Merrick Scale Company

This recommended practice was approved for publication by the ISA Standards and Practices Board in March 1984.

NAME

COMPANY

W. Calder III, Chairman
N. L. Conger
B. Feikle
T. J. Harrison
H. S. Hopkins
J. L. Howard
R. T. Jones
R. Keller
O. P. Lovett, Jr.
E. C. Magison
A. P. McCauley
J. W. Mock
E. M. Nesvig
R. Prescott
D. Rapley
W. C. Weidman
K. A. Whitman
P. Bliss*
B. A. Christensen*
L. N. Combs*
R. L. Galley*
R. G. Marvin*
W. B. Miller*
G. Platt*
J. R. Williams*

The Foxboro Company
Conoco
Bailey Controls Company
IBM Corporation
Westinghouse Electric Company
Boeing Aerospace Company
Philadelphia Electric Company
The Boeing Company
Isis Corporation
Honeywell, Inc.
Chagrin Valley Controls, Inc.
Bechtel Power Controls
ERDCO Engineering Corporation
Moore Products Company
Stearns Catalytic Corporation
Gilbert Commonwealth
Allied Chemical Corporation

Moore Products Company
Bechtel Power Corporation
Stearns Catalytic Corporation

*Director Emeritus

Contents

1 Purpose and scope	7
2 Definitions	7
3 Conveyor design recommendations	10
3.1 Conveyor length	10
3.2 Maximum angle of inclination	10
3.3 Belt speed	10
3.4 Troughing angle carrying idlers	10
3.5 Idler spacing	10
3.6 Takeup	10
3.7 Concave/convex curves	10
3.8 Conveyor stringers	10
3.9 Conveyor vertical supports	10
3.10 Support footing	11
3.11 Training idlers	11
3.12 Weigh idlers	11
3.13 Conveyor load point	11
3.14 Wind loading	11
3.15 Material transition	11
3.16 Idler alignment	11
3.17 Belt tracking	11
3.18 Calibration chain storage	11
4 Calibration	12
4.1 Methods	12
4.2 Frequency of alignment, calibration, and zero balancing	13
5 Accuracy	13
6 Belt weigh scale components	14
6.1 Load sensor and reactor	14
6.2 Speed measurement system	14
6.3 Multiplier	14
6.4 Information display	14
6.5 Transmission	15

6.6 Power supply	15
6.7 Enclosure	15
7 Scale maintenance	16
7.1 Cleanliness	16
7.2 Alignment	16
7.3 Tension adjustment	16
7.4 Monitoring accuracy	16
8 Bibliography	17
Appendix A—OIML recommendation no. 50, chapter II, metrological requirements	18
Appendix B—Test report	23

Copyright The Instrumentation, Systems, and Automation Society

1 Purpose and scope

The purpose of this recommended practice is to furnish design criteria conducive to simplified specifications and to provide recommendations for installation, calibration, and maintenance of continuous-belt, weighbridge-type scales. The recommended practice will provide an effective base of comparison of scale suppliers, will establish minimum values, and will ensure that a scale specification and purchase incorporates the essentials to satisfy a particular weighing job. It will permit full knowledge of the weigh scale configuration (regardless of the manufacturer) early in the design stages of the belt conveyor.

2 Definitions

The following definitions apply to this recommended practice. (See also Figure 1.)

Approach idler: The last *idler* passed before the material on a belt reaches the weighbridge.

Belt conveyor: An endless fabric, rubber, plastic, leather, or metal belt operating over suitable drive, tail-end, and bend terminals; belt idlers; or slider beds for handling bulk materials, packages, or objects placed directly upon the belt.

Belt-conveyor scale: A device installed on a belt-conveyor structure that continuously weighs the material being conveyed.

Belt-speed sensor: A device that generates a signal as a function of belt speed.

Belt-speed transmitter: A device that transmits a belt speed signal to a receiver.

Bend pulley: Any pulley used to change the direction of travel of a belt.

Calibration test: A test using known weights and forces to load the scale in order to determine the performance of a *belt-conveyor scale*.

Concave curve: A change in the angle of inclination of a *belt conveyor* where the center of the curve is above the conveyor.

Convex curve: A change in the angle of inclination of a *belt conveyor* where the center of the curve is below the conveyor.

Conveyor stringers: Support members for the conveyor on which the *idlers* are mounted.

Design capacity: The maximum weight load that the scale is designed to weigh in one hour within the designated class accuracy. It is customarily 125 percent of normal capacity and is also known as "scale capacity."

Head pulley: The pulley at the discharge end of the *belt conveyor*. The power drive for the belt is generally applied to the end pulley.

Idler spacing: The center-to-center distance between consecutive *idler rollers*, measured parallel to the belt.

Idlers (idler rollers): Freely-turning cylinders mounted on a frame to support the conveyor belt. For a flat belt, the *idlers* may consist of one or more horizontal cylinders transverse to the direction of belt travel. For a troughed belt, the *idlers* may consist of one or more horizontal

cylinders with one or more additional cylinders at an angle that lifts the sides of the belt to form a trough.

Impact idler: A belt *idler* incorporating resilient roll coverings to absorb large amounts of shock at the *loading point*.

Load reactor: A device that generates a signal proportional to the force imposed upon it by the *load sensor*.

Load sensor: See "weigh carriage." Also called "load receiving element."

Loading point: The location at which material to be conveyed is applied to the conveyor.

Normal capacity: Normal capacity is 80 percent of design capacity.

Retreat idler: The first *idler* reached after the material on the belt leaves the weigh carriage. Also called "departure idler."

Service idlers: Those *idlers* in the weighing area, including scale-borne *idlers* and several *idlers* on either side of the scale-borne *idlers*. They must be of the same type and grade and receive maintenance as *weigh idlers*.

Simulation tests: Tests on the weighing unit in which either the movement of the belt, the effect of the material thereon, or both are simulated by using known weights and forces.

Skirting: Stationary sideboards or sections of the *belt conveyor* attached to the conveyor support frame or other stationary support to prevent the bulk material from falling off the side of the belt.

Snub pulley: Any pulley used to increase the arc of contact between the belt and the drive pulley.

String lines: Wires, piano wire, or monofilament line of suitable tensile strength and visibility, strung over each of the three rolls of the *weigh idlers* to confirm idler alignment and elevation (three-wire line alignment).

Tail pulley: The pulley at the opposite end of the conveyor from the *head pulley*.

Takeup (gravity): A device plus a calculated quantity of dead weight to provide sufficient tension in a conveyor belt to ensure that the belt will be positively driven by the drive pulley. A counter-weighted *takeup* consists of a horizontal pulley free to move in either the vertical or horizontal direction, with dead weights applied to the pulley shaft to provide the tension required.

Test chain: A calibrating device consisting of a series of rollers or wheels linked together to ensure that their weight is uniform and they move freely (so that chain weight loss due to wear is minimized).

Totalizer: A device used with a *belt-conveyor scale* to indicate the total weight of the material that has been conveyed over the scale. The master weight *totalizer* is the primary indicating element of the *belt-conveyor scale*. An auxiliary vernier counter used for scale calibration should not be part of the master weight *totalizer*. *Totalizers* can be remote auxiliary *totalizers* as well as local masters. The *totalizer* shows the accumulated weight; a *totalizer* may be nonresettable or resettable to zero to measure a definite amount of conveyed material.

Training idlers: *Idlers* of special design or mounting that are intended to counteract any tendency of the belt to shift sideways.

Tripper: A device for unloading a *belt conveyor* at a point between the loading point and the head pulley.

Weigh carriage: A structure supporting the *weigh idlers*, which in turn transmits weight to the load reactor.

Weigh idlers: *Idlers* positioned in the *weigh carriage* assembly so that they sense the weight of the material on the conveyor belt and transmit the weight through the carriage to the *load reactor*.

