



Standard Guide for Hand Hole Design in Corrugated Boxes¹

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1. Scope

1.1 This standard provides guidelines for designing pre-cut apertures intended for use as hand holes in corrugated boxes during manual handling of boxed cargo.

1.2 *Limitations*—This standard offers guidance for package development and for subsequent testing of boxes to measure performance. It is not intended to provide specific information on the design of hand holes.

1.3 The values stated in inch-pound units are to be regarded as the standard. The SI units are for information only.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 585 Practice for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, and Related Products²

D 996 Terminology Relating to Packaging and Distribution Environments²

D 1974 Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes²

D 4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing²

D 5276 Test Method for Drop Test of Loaded Containers by Free Fall²

E 4 Practices for Force Verification of Testing Machines²

E 122 Practice for Choice of Sample Size to Estimate a Measure of Quality for a Lot or Process²

3. Terminology

3.1 *Definitions*—General definitions for packaging and distribution environments are found in Terminology D 996.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *hand holes*—apertures, pre-cut in corrugated boxes by box manufacturers, as requested by box purchasers. These apertures facilitate manual handling during distribution and

improve grip during handling.

4. Significance and Use

4.1 It may be desirable at times to provide hand holes in corrugated boxes. Package designers use hand holes to solve ergonomic and handling problems associated with large or awkward containers. This guide provides an aid for proper hand hole design and use.

4.2 Ergonomics:

4.2.1 In studying and applying ergonomic principles, of primary concern is the need to provide a safe work environment for material handlers who may be required to lift or transport packages. A safe work environment is difficult to define and varies with the package in question. Several ergonomic safety issues involve repetitive motions and spine loading in the lifting process. Other issues involve finger and foot protection.

4.2.2 In distribution centers or warehouses, low back disorders have been identified as areas of elevated risk. Low back problems continue to represent the most common and costly musculoskeletal disorders in the work place.³

4.2.3 One method used to reduce the concern of distance of lift (spinal loading) is to bring the reach of the material handler's hands closer to the body. With large or awkward boxes, placing hand holes in a more advantageous position can solve this problem.

4.3 NIOSH:

4.3.1 The National Institute for Occupational Safety and Health (NIOSH) has published *Work Practices Guide for Manual Lifting*.⁴ This document may be of assistance in developing proper hand holes and their placement for a specific package.

4.4 Improper Use of Hand Holes:

4.4.1 Because of past lawsuits involving the use and misuse of hand holes, the corrugated box industry prefers the term access hole instead of hand hole on specifications. This terminology may have to be agreed upon between supplier and user.

4.4.2 Since all end use conditions and requirements cannot

¹ This guide is under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.27 on Paper and Paperboard Products.

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² *Annual Book of ASTM Standards*, Vol 15.09.

³ "Effects of Box Features on Spine Loading during Warehouse Order Selecting," Marras, Granata, Davis, Allread, and Jorgensen, The Institute for Ergonomics, Ohio State University.

⁴ NIOSH Technical Report No. 81-122 from the US Department of Health and Human Services.