

# ANSI/ASSP Z590.3-2021

Prevention through Design

Guidelines for Addressing Occupational Hazards  
and Risks in Design and Redesign Processes



AMERICAN SOCIETY OF  
**SAFETY PROFESSIONALS**



PREVIEW ONLY

The information and materials contained in this publication have been developed from sources believed to be reliable. However, the American Society of Safety Professionals (ASSP), as secretariat of the ANSI Z590 Committee, or individual committee members accept no legal responsibility for the correctness or completeness of this material or its application to specific factual situations. By publication of this standard, ASSP or the Z590 Committee does not ensure that adherence to these recommendations will protect the safety or health of any persons or preserve property.

**ANSI/ASSP Z590.3 – 2021**

**American National Standard**

**Prevention through Design**

**Guidelines for Addressing Occupational Hazards  
and Risks in Design and Redesign Processes**

Secretariat

**American Society of Safety Professionals**  
520 N. Northwest Highway  
Park Ridge, Illinois 60068

**Approved August 5, 2021**

**American National Standards Institute**

This document is copyright protected and may not be reproduced or distributed to any other party.

## 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 judgment 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/she 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 circumstance 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 interpretation 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 August 2021 by

**American Society of Safety Professionals**  
**520 N. Northwest Highway**  
**Park Ridge, Illinois 60068**  
**(847) 699-2929 • [www.assp.org](http://www.assp.org)**

Copyright © 2021 by American Society of Safety Professionals  
All Rights Reserved.

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

Printed in the United States of America

## FOREWORD

This standard was developed by a standards committee, national in scope, functioning under the procedures of the American National Standards Institute with the American Society of Safety Professionals (ASSP) as Secretariat. This revision of the standard was developed to provide updated guidance in the consistent practice of identifying, assessing, and treating occupational hazards and risks in the design and redesign processes, and throughout a system's lifecycle. The revision aligns with key risk-based standards and technical reports including ANSI/ASSP/ISO 31000, *Risk Management – Guidelines*, ANSI/ASSP/ISO 31010, *Risk Management – Risk Assessment Techniques*, and ASSP TR-31010 Technical Report: *Risk Management – Techniques for Safety Practitioners* and can be used to integrate a prevention through design (PtD) process into an organization's risk management process.

In addition, the revision is designed to allow the user to integrate PtD elements such as procurement, management of change, risk assessments, and design safety reviews into an organization's safety management system such as ANSI/ASSP Z10.0:2019, *Occupational Health and Safety Management Systems* and ANSI/ASSP/ISO 45001:2018, *Occupational Health and Safety Management Systems – Requirements with Guidance for Use*.

The revision includes updated guidance in: roles and responsibilities of stakeholders; design safety reviews; establishment of safety specifications; management of change; the PtD risk management process; and the hierarchy of risk treatments. In addition, the revision includes additional addendums for: the PtD risk management process; the logic supporting the hierarchy of risk treatments; ergonomics and human factors engineering; and management of change.

**History:** In the late 1990s, the Advisory Committee of the Institute for Safety through Design at the National Safety Council concluded that significant benefits will be derived if decisions affecting safety, health and the environment are integrated into the early stages of the design and redesign processes.

- In 1994, the American Society of Safety Professionals (ASSP) released a position paper approved by the Board of Directors to promote acquisition of knowledge of and application of "Designing for Safety" concepts.

Developments since then have given additional importance and credence to management, design engineers and safety and health professionals having knowledge of the principles and practices applied in addressing occupational risks in the design and redesign processes.

In 2007, the National Institute for Occupational Safety and Health (NIOSH) established a major National initiative to "create a sustainable national strategy for Prevention through Design."

In 2008, an article by Fred A. Manuele, CSP, P.E., entitled "Prevention through Design: Addressing Occupational Risks in the Design and Redesign Processes" was published in *Professional Safety*, which formed an early basis for the Z790.001-2009 technical report, and now this standard.

In 2009, the Technical Report Z790.001-2009 was published. In 2011, the standard, ANSI/ASSP Z590.3-2011, *Prevention through Design: Guidelines for Addressing Occupational Hazards and Risks in Design and Redesign Processes* was published. The standard was then reaffirmed in 2016.

Requirements in the standard are identified by the word "shall." An organization that chooses to conform to this standard is expected to fulfill those "shall" requirements. Explanatory comments and recommended practices preceded by the word "Note" are informative and not requirements

of the standard. Also, addenda are informative and are not normative requirements of the standard.

**Normative Requirements:** This standard uses the single column format common to many international standards. The normative requirements appear aligned to the left margin. To meet the requirements of this standard, machinery, equipment and process suppliers and users must conform to these normative requirements. These requirements typically use the verb “shall.”

*Note: The informative or explanatory notes in this standard appear indented, in italics, in a reduced font size, which is an effort to provide a visual signal to the reader that this is informative note, not normative text, and is not to be considered part of the requirements of this standard; this text is advisory in nature only. The suppliers and users are not required to conform to the informative note. The informative note is presented in this manner in an attempt to enhance readability and to provide explanation or guidance to the sections they follow.*

**Revisions:** The Z590.3 Committee welcomes proposals for revisions to this standard. Revisions are made periodically (usually five years from the date of the standard) to incorporate changes that appear necessary or desirable, as demonstrated by experience gained from the application of the standard. Proposals should be as specific as possible, citing the relevant paragraph number(s), the proposed wording, and the reason for the proposal. Pertinent documentation would enable the Z590.3 Committee to process the changes in a timelier manner.

**Interpretations:** Upon a request in writing to the Secretariat, the Z590.3 Committee will render an interpretation of any part of the standard. The request for interpretation should be clear, citing the relevant paragraph number(s) and phrased as a request for a clarification of a specific requirement. Oral interpretations are not provided. No one but ASSP is authorized to provide any interpretation of this standard.

**Effective Date:** This standard is effective 90 days after the publishing of this standard. The committee recognizes that some period of time after the approval of this document is necessary for organizations, suppliers, and users to develop new designs and/or modify existing standards or procedures in order to incorporate the new and/or revised requirements of this standard into their operations. The committee recommends that entities that choose to adopt this standard begin implementing the requirements within 12 months of the approval date.

**Approval:** Neither the Z590.3 Committee nor American National Standards Institute (ANSI) approves, certifies, rates, or endorses any item, construction, proprietary device, or activity.

**Appendices:** Appendices are included in most standards to provide the user with additional information related to the subject of the standard. Appendices are not part of the approved standard.

**Checklists:** Checklists included in this standard may be copied and used in non-commercial settings only.

**Committee Meetings:** Persons wishing to attend a meeting of the Z590.3 Committee should contact the Secretariat for information.

**Standard Approval:** This standard was processed and approved for submittal to ANSI by the American National Standards Committee on Prevention through Design, Z590.3. Approval of the standard does not necessarily imply (nor is it required) that all committee members voted for its approval. At the time this standard was approved, the Z590.3 Committee had the following members:

Georgi Popov, PhD, CSP, ARM, SMS, QEP, CMC, FAIHA, Chair  
 Bruce Lyon, P.E., CSP, SMS, ARM, CHMM, Vice Chair  
 Lauren Bauerschmidt, MS Engr, CSP, STS  
 Jennie Dalesandro, Administrative Technical Support

**Organization Represented**

**Name of Representative**

3M	Paul Adams, Ph.D., P.E., CSP, CPE Shandra Sharif
Accident & Safety Consultants	Dennis Andrews, Ph.D., PSP, CECD, WSO-CSS
AIHA	Stephanie Battista, CIH Robin Miskiewicz
American Foundry Society	Thomas Slavin, CIH, CSP, CSHM, CPEA
ASSP Risk Assessment Institute	Kenneth Daigle, P.E.
Construction Ergonomics LLC	James Borchardt, CSP, CPE
Cummins Inc.	Deena Ibrahim, CSP, CMIOOSH
Design Safety Engineering, Inc.	Bruce Main, P.E., CSP
Eastern Alliance Insurance Group	Frank Baker
Ellis Fall Safety Solutions, LLC	J. Nigel Ellis, Ph.D., P.E., CSP, CPE
Halcon Resources	William Walker, CIH, CSP
Haley & Aldrich, Inc.	Danyle Hepler, CSP, CESCO, CPEA
Hays Companies	Bruce Lyon, P.E., CSP, SMS, ARM, CHMM
Hazards Limited	Fred Manuele, P.E., CSP
Heath & Associates	Frederick Heath
Heinlein, Carl	Carl Heinlein, CSP, ARM, CRIS
Kuwait Oil Company	Ashok Garlapati, FASSP, CFIOOSH, CSP, QEP
LJB Inc.	Thomas Kramer, P.E., CSP
M.C. Dean, Inc.	Aaron Schoemaker, CSP
National Institute for Occupational Safety & Health	Jonathan Bach, PE, CSP, CIH Paul Schulte
NESTI, Inc.	Michael Hayslip, P.E., CSP
Potts, Robert L.	Robert (Robb) Potts
Progressive Safety Management	Jeffrey Vincoli, CSP, CHCM, FASSP
Risky Biz Services Inc.	C. Gary Lopez, MS, CSP, FASSP
Safety Compliance Management, Inc.	Paul Gantt, Ph.D., CSP
Sixth Sense Safety Solutions	Greg Zigulis, CIH, CSP, CHSP
Stony Brook University Hospital	Leo DeBobes, CSP, CPEA, CIT
U.S. Air Force	Robert Baker
University of Central Missouri	Georgi Popov, PhD., CSP, ARM, SMS, QEP, CMC, FAIHA

**Z590.3 Edit Committee:**

Jonathan Bach, PE, CSP, CIH  
Stephanie Battista, CIH  
Kenneth Daigle, P.E.  
Carl Heinlein, CSP, ARM, CRIS  
Thomas Kramer, P.E., CSP  
C. Gary Lopez, CSP  
Bruce Lyon, P.E., CSP, SMS, ARM, CHMM  
Bruce Main, P.E., CSP  
Fred Manuele, P.E., CSP  
Georgi Popov, PhD., CSP, ARM, SMS, QEP, CMC, FAIHA

PREVIEW ONLY



# Contents

1. Scope, Purpose and Application .....	10
1.1 Scope .....	10
1.2 Purpose .....	10
1.3 Application .....	11
2. Referenced and Related Standards and Guidelines .....	12
3. Definitions .....	12
4. Roles and Responsibility .....	16
4.1 Leadership .....	16
4.2 Stakeholders .....	17
5. Relationships with Suppliers .....	18
6. Establishing Safety Specifications .....	19
7. Design Safety Reviews .....	20
7.1 Policies .....	20
7.2 Process .....	20
8. Management of Change .....	20
9. PtD Risk Management Process .....	21
9.1 Leadership, Direction and Communication .....	21
9.2 Competent Assessors .....	21
9.3 Establish Risk Criteria .....	22
9.4 Establish the Context .....	22
9.5 Anticipate/Identify Risk .....	23
9.6 Analyze Risk .....	25
9.7 Evaluate Risk .....	26
9.8 Select and Implement Risk Reduction and Control Methods .....	27
9.9 Monitor and Review .....	27
9.10 Record and Report .....	28
9.11 Follow Up on Actions Taken .....	28
10. Risk Assessment Techniques .....	28
11. Hierarchy of Risk Treatments .....	29
Addendum A – The PtD Risk Management Process (Informative) .....	32
Addendum B – Progression of Occupational Health Issues Flow Chart (Informative) .....	35
Addendum C – Procurement Guidelines (Informative) .....	36
Addendum D – Risk Assessment Report (Informative) .....	38
Addendum E – A Design Safety Review Guide (Informative) .....	40
Addendum F – Examples of Risk Assessment Matrices and Definitions of Terms (Informative) .....	46

Addendum G – Comments on Selected Risk Assessment Techniques (Informative) ..... 51  
Addendum H – Potential Failure Mode and Effects Analysis Sequence (Informative) ..... 60  
Addendum I – The Logic Supporting the Hierarchy of Risk Treatments (Informative)..... 61  
Addendum J – Ergonomics and Human Factors Engineering (Informative)..... 66  
Addendum K – Management of Change (Informative) ..... 69  
Addendum L – Bibliography (Informative)..... 71

PREVIEW ONLY

**AMERICAN NATIONAL STANDARD Z590.3  
PREVENTION THROUGH DESIGN  
GUIDELINES FOR ADDRESSING OCCUPATIONAL HAZARDS  
AND RISKS IN DESIGN AND REDESIGN PROCESSES**

## 1. Scope, Purpose and Application

### 1.1 Scope

This standard provides guidance on including prevention through design concepts within an occupational safety and health management system. Through the application of these concepts, decisions pertaining to occupational hazards and risks can be incorporated into the process of design and redesign of work premises, tools, equipment, machinery, substances, and work processes including their construction, manufacture, use, maintenance, and ultimate disposal or reuse. This standard provides guidance for a life-cycle assessment and design model that balances environmental and occupational safety and health goals over the life span of a facility, process, or product. Figure 1 illustrates an example of the lifecycle phases of a system.



Figure 1. Example of the lifecycle phases of a system

This standard complements but does not replace performance objectives existing in other specific standards and procedures.

The goals of applying prevention through design concepts in an occupational setting are to:

- Achieve acceptable risk levels.
- Prevent or reduce occupationally related injuries, illnesses, and fatalities.
- Reduce the cost of retrofitting necessary to prevent and mitigate hazards and risks that were not sufficiently addressed in the design or redesign processes.

### 1.2 Purpose

This standard pertains principally to the avoidance, elimination, reduction or control of occupational safety and health hazards and risks in the design and redesign process.

*Note: Incidents or exposures that have the potential to result in occupational injuries and illnesses can also result in damage to property and business interruption, and damage to the environment. Reference is made in several places in this standard to those additional loss potentials which may require evaluation and resultant action.*