Manual of Water Supply Practices

M3

Safety Management for Utilities

Eighth Edition

American Water Works Association

Documents
Document Sharing Hub

Full document details: AWWA Manual M3 2022

Manual of Water Supply Practices

M3

Safety Management for Utilities

Eighth Edition

American Water Works Association

Documents
Document Sharing Hub

Full document details: AWWA Manual M3 2022

Manual of Water Supply Practices—M3, Eighth Edition

Safety Management for Utilities

Copyright © 1956, 1963, 1977, 1983, 1990, 2002, 2014, 2022 American Water Works Association

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information or retrieval system, except in the form of brief excerpts or quotations for review purposes, without the written permission of the publisher.

Disclaimer
The authors, contributors, editors, and publisher do not assume responsibility for the validity of the content or any consequences of its use. In no event will AWWA be liable for direct, indirect, special, incidental, or consequential damages arising out of the use of information presented in this book. In particular, AWWA will not be responsible for any costs, including, but not limited to, those incurred as a result of lost revenue. In no event shall AWWA's liability exceed the amount paid for the purchase of this book.

If you find errors in this manual, please email books@awwa.org. Possible errata will be posted at www.awwa.org/resources-tools/resource.development.groups/manuals-program.aspx.

Senior Managing Editor/Project Manager: Melissa Valentine
Technical Editor: Suzanne Snyder
Technical Illustrations: Gillian Wink
Cover Composition: Michael Labruyere
Production: Innodata
Senior Specialist - Manuals: Molly Beach
Manuals Coordinator 2: Janet Greifinger

Library of Congress Cataloging-in-Publication Data
Names: Milligan, Frank (Hydraulic engineer), editor. | American Water Works Association, issuing body.
Title: Safety management for utilities / [edited] by Frank Milligan.
Other titles: Safety practice for water utilities. | AWWA manual ; M3.
Description: Eighth edition. | Denver, CO : American Water Works Association, [2022] | Series: AWWA manual ; M3 | Original title of earlier editions <3-4>: Safety practice for water utilities; <6-7>: Safety practices for water utilities. | Includes bibliographical references and index. | Summary: "This M3 update is the result of Health, Safety, and Environmental (HSE) Committee efforts to provide general but broad guidance to water providers as they develop health and safety programs. The audience for this manual is primarily utility management and other employees with assigned and overall safety responsibilities (e.g., utility safety managers, supervisors)"-- Provided by publisher. Identifiers: LCCN 2022010426 | ISBN 9781647170776 (paperback) | ISBN 9781613006115 (adobe pdf)
Subjects: LCSH: Waterworks--Safety measures--Handbooks, manuals, etc. | Water utilities--Employees--Health and hygiene--Handbooks, manuals, etc. | Water utilities--Safety measures--Handbooks, manuals, etc. | Handbooks and manuals.
Classification: LCC TD358 .S34 2022 | DDC 363.6/10684--dc23/eng/20220502
LC record available at https://lccn.loc.gov/2022010426

Printed in the United States of America

ISBN 978-1-64717-077-6 ISBN, electronic 978-1-61300-611-5
https://doi.org/10.12999/AWWA.M3ed8

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including scanning, recording, or any information or retrieval system. Reproduction and commercial use of this material is prohibited, except with written permission from the publisher. Please send any requests or questions to permissions@awwa.org.

American Water Works Association

American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235-3098
awwa.org

Documents
Document Sharing Hub

Full document details: AWWA Manual M3 2022

Contents

List of Figures, v

List of Tables, vii

Preface, ix

Acknowledgments, xi

Chapter 1 Establishing a Health, Safety, and Environmental Program 1

Regulatory Requirements, 2
Regulatory Requirements and Best Practices for HSE Programs, 4
Developing an HSE Policy, 5
Management Leadership and Employee Participation, 5
Program Staffing and Structure, 9
Roles and Responsibilities, 10
Developing Written Programs, 12
Training and Education, 14
Record Keeping and Reporting, 16
Evaluation, Corrective Action, Metrics, and Continuous Improvement, 16
References, 18

Chapter 2 Job Safety Analysis 21

Advantages of a JSA, 22
JSA Development, 23
The JSA: An Important Safety Factor, 29
References, 30

Chapter 3 Incident Management 31

Incident Management Programs, 31
References and Bibliography, 41

Chapter 4 Prevention Through Design 43

What is Prevention Through Design?, 43
PtD Implementation in the Water Industry, 45
References and Bibliography, 51

Chapter 5 Contractor Safety Management 53

Making Safety Part of The Contract, 55
Contractor Prequalification and Selection, 58
Pre-Job Contractor Orientation And Planning, 61
Contractor Work Rules and Guidance, 62
Injury/Illness/Incident Reporting and Investigation, 63
Contractor Evaluation, 64
Third-Party Contractor Safety Management, 65
References and Bibliography, 66

Documents
Document Sharing Hub

Copyright © 2022 American Water Works Association. All Rights Reserved.

Full document details: AWWA Manual M3 2022

Chapter 6 Common Hazards and Safety Programs 77

Physical Hazards, 78
Biological Hazards, 95
Chemical Hazards, 98
Personal (or Health) Hazards, 107
Additional Information, 114

Appendix A Guidance Documents and Forms 115

Appendix B Canadian Water Works Safety References 155

Acronyms, 159

Index, 161

List of AWWA Manuals, 165

Copyright © 2022 American Water Works Association. All Rights Reserved.

Documents Document Sharing Hub

Full document details: AWWA Manual M3 2022

Figures

1-1 OSHA state plans, 3
1-2 Basic health and safety management program activities (plan, do, check, act), 4
1-3 Example of a large utility safety organization, 10
1-4 Example of a safety procedure header, 14

2-1 Identify potential hazards, 25
2-2 Hierarchy of controls: apply the highest level of control commensurate with the risk level, 27
2-3 Personal protective equipment, 28

3-1 Ratio of indirect to direct costs of on-the-job incidents, 32
3-2 Triangulation method, 35
3-3 Sketching motion through time, 36
3-4 Incident weed and root cause analysis, 37

5-1 Percent recordable cases with no lost workdays by type of operation (1999), 54
5-2 Percent recordable cases with lost workdays by type of operation (1999), 54
5-3 Percent of lost workdays by type of operation (1999), 55

A-1 CS-01 – Contractor pre-qualification information, 68
A-2 CS-02 – Contractor safety orientation checklist , 69
A-3 CS-03 – Facility visitor and contractor orientation/EHS requirements, 70
A-4 CS-04 – Contractor employee training certificate, 74
A-5 CS-05 – Contractor safety evaluation, 75

6-1 Confined space decision tree, 79
6-2 Hard, compact ground (left) can be braced at intervals, while saturated, filled, or unstable ground (right) needs additional sheeting or shielding to hold back loose soil., 81
6-3 Ground fault interrupter, 82
6-4 Proper lifting technique helps avoid back injuries, 85
6-5 Proper placement of cones, vehicles, pipes, and equipment help keep a field operation safe for workers, pedestrians, and public traffic, 91
6-6 Properly stacking and restraining pressure vessels reduces potential hazards, 100

A-6 Accident investigation program, 116
A-7 Accident/incident analysis, 119
A-8 Sample job description (light physical requirements), 120
A-9 Physical capacities requirements, 122
A-10 Early return to work program, 123

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

A-11 Hazard summary/action list, 127
A-12 Hot work permit, 128
A-13 Job safety analysis, 130
A-14 Sample job safety analysis, 131
A-15 Passing criteria, 133
A-16 Physical capacities requirements, 134
A-17 Release to return to work, 135
A-18 Pre-placement physical capacities test, 136
A-19 OSHA Quick Card, 137
A-20 Safety data sheet sample, 138
A-21 Temporary modified duty tasks, 148
A-22 Job description (heavy physical requirements), 149
A-23 Physical capacities requirements (heavy): maintenance and construction crew waterworks operator, 151

Documents Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Tables

1-1 Example activities for observable management involvement in safety, 7
1-2 Example employee participation plan, 9
1-3 General utility HSE responsibilities, 11
1-4 Tracking of training, 15
1-5 Example table of incident action items, record keeping, and reporting, 17

2-1 Types of hazards to consider when conducting a JSA, 26

5-1 Examples of prequalification and selection information to be collected from the contractor, 59
5-2 Examples of prequalification and selection criteria to be used by the owner/utility, 60

A-1 Example Contractor Safety Program Process Forms, 67

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

This page intentionally blank.

Documents
Document Sharing Hub

Copyright © 2022 American Water Works Association. All Rights Reserved.

Full document details: AWWA Manual M3 2022

Preface

The American Water Works Association (AWWA) recognizes the importance of protecting water industry professionals on the job as they work to deliver clean, safe drinking water to customers. As such, it created a safety policy which guides discussion of safety practices that are presented in this eighth edition M3 manual. The most current policy statement can be found on the AWWA website, https://www.awwa.org/Policy-Advocacy/AWWA-Policy-Statements/Safety.

This M3 update is the result of Health, Safety, and Environmental (HSE) Committee efforts to provide general but broad guidance to water providers as they develop health and safety programs. The audience for this manual is primarily utility management and other employees with assigned and overall safety responsibilities (e.g., utility safety managers, supervisors).

M3 cannot cover all situations and regulations that often differ by country, state, or province and therefore does not cite regional regulatory requirements (e.g., measurements, heights) but rather addresses US federal requirements such as those imposed by the US Occupational Safety and Health Administration (OSHA), with Canada-specific guidance included in the appendix.

M3 supplemental information and tools for use in developing HSE programs, including sample checklists, site inspection forms, programs, and job safety analyses, will be delivered electronically to those who purchase this manual through the AWWA website. They also are available at www.awwa.org/M3.

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

This page intentionally blank.

Documents
Document Sharing Hub

Copyright © 2022 American Water Works Association. All Rights Reserved.

Full document details: AWWA Manual M3 2022

Acknowledgments

The AWWA Management and Leadership Division; the Health, Safety, and Environmental Committee; and the M3 Committee gratefully acknowledge the contributions made by the volunteers who drafted, edited, and provided the significant and critical commentary essential to developing M3. The Steering Committee members dedicated many hours in the final stages of preparation of this edition to ensure the overall technical quality, consistency, and accuracy of the manual.

Steering Committee Members

Frank Milligan, Committee Chair, Las Vegas Valley Water District, Las Vegas, Nev.

David Milligan, North Texas Municipal Water District, Wylie, Tex.

Jeff Deville, Watertown Municipal Utilities, Watertown, S.Dak.

Kenya Henderson, Las Vegas Valley Water District, Las Vegas, Nev.

Stephanie Passarelli, American Water Works Association, Denver, Colo.

Contributors to the Eighth Edition

Frank Milligan, Committee Chair, Las Vegas Valley Water District, Las Vegas, Nev.

Brian Exendine, Las Vegas Valley Water District, Las Vegas, Nev.

Dr. Nicholas Ashbolt, University of Alberta School of Public Health, Edmonton, Alberta, Canada

David Baird, III Applied EHS Management, Dallas, Tex.

Marissa Blackeye, Las Vegas Valley Water District, Las Vegas, Nev.

Mia Parton, Aeparmia Engineering, Austin, Tex.

Michael Jacobs, Tualatin Valley Water District, Beaverton, Ore.

Nick Kato, City of Gilbert, Gilbert, Ariz.

Peter Puglionesi, Applied EHS Management, Havertown, Pa.

Pete Wagner, SUEZ, Boise, Idaho.

Documents
Document Sharing Hub

Copyright © 2022 American Water Works Association. All Rights Reserved.

Full document details: AWWA Manual M3 2022

This page intentionally blank.

Documents
Document Sharing Hub

Copyright © 2022 American Water Works Association. All Rights Reserved.

Full document details: AWWA Manual M3 2022

Chapter 1

Establishing a Health, Safety, and Environmental Program

Pete Wagner, Brian Exendine

The safety and health of employees is a key concern in any organization. The goal of sending everyone home safely at the end of each shift should always be at the forefront of any organization's planning efforts. Staff knowledge and management support alone have proved effective in some small organizations but ineffective in others. A formal Health, Safety, and Environmental (HSE) program is a reliable and effective means of consistently protecting workers from occupational injuries and illnesses. Formal written programs can address specific hazards and prevention measures (e.g., fall prevention) and specific regulatory mandates that require a written program (e.g., hazard communication, respiratory protection). Furthermore, there is widespread agreement that written management systems improve organizational performance, including performance in occupational health and safety.

This manual serves to establish the key components that should be included in a formal HSE program. Chapter 2 describes job safety analysis (JSA) as a means to proactively examine and mitigate existing hazards on the worksite. Chapter 2 also introduces the hierarchy of controls, a methodology that is carried throughout the manual. A thorough HSE program will also outline the procedures necessary should an incident occur (incident management is discussed in Chapter 3). Recognizing that many hazards

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

can be engineered out of a system, Chapter 4 addresses key aspects of prevention through design. A meaningful program should also be effectively communicated with contractors. Chapter 5 describes contractor safety management and some of the special hazards that accompany the construction phase. Last, Chapter 6 provides an index of common hazards. Many of these hazards should be considered in the development of any HSE program, and some can be evaluated depending on the type of system or its geographic location. In addition to planning for the hazards presented in Chapter 6, extreme storm events should be considered in the development of an HSE program. More information on safety during emergencies can be found in AWWA Manual of Water Supply Practices Ml9, Emergency Planning for Water Utilities.

The rest of this introductory chapter presents research that demonstrates the need for a formal HSE program. This chapter then describes how to establish an effective program by delineating management steps and development activities that should be applied to each of the components offered throughout this manual.

To emphasize the need for a formal HSE program, recent safety and health publications and the study noted below provide data that show companies with strong written safety and health programs that include key elements recognized by safety and health professionals and governmental agencies alike experience significant reductions in injury cases, claims, rates, and costs. According to V.J. Roberts (2020), OSHA data show that the average Voluntary Protection Program (VPP) worksites have lost, restricted, and/or transferred case rates that are 52 percent below the average days away/restricted time average for the same industry. According to a series of studies conducted in Canada on the effectiveness of Certificate of Recognition (COR) by Dr. C. McLeod and the Institute for Work & Health (2016), companies that implemented elements of the COR program have 12–14 percent greater reductions in lost-time injury rates than non-certified companies. Similarly, Dr. D. Kandilakis (2016) stated that companies in OHSA's Safety and Health Achievement Recognition Program (SHARP) whose written safety and health policies were reviewed over a 12-year period from 1999 to 2010, experienced an average 52 percent reduction in claims, an average claims cost decrease of 80 percent, and an average lost time per claim decrease of 87 percent.

REGULATORY REQUIREMENTS

The US Occupational Safety and Health Act of 1970 did not grant the Department of Labor's Occupational Safety and Health Administration (OSHA) authority over federal, local, or state government-operated facilities. In developing its program to authorize states to enforce federal regulations, OSHA recognized the need to encourage states to regulate state and local government workplaces. The process of attaining state authority involves submitting an acceptable state plan to OSHA, in which states are required by OSHA to enact legislation and regulations that are equivalent to federal rules and also apply to the state and local government workplace.

As a result, many states have their own OSHA rules that apply to state and local government-operated water treatment plants (WTPs), in particular states with OSHA plans approved by federal OSHA (i.e., OSHA plan states). In addition, some states have enacted equivalent rules that apply only to state and local government employees.

The federal government's employees are covered under Section 19 of the OSH Act. This has been augmented by Executive Order 12196, dated February 26, 1980, which requires agency heads to furnish employees a workplace free from recognized hazards that are causing or are likely to cause death or serious physical harm.

AWWA Documents Document Sharing Hub
AWWA Manual M3
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

As a result, federal- or state-equivalent OSHA rules are applicable and enforceable if the facility is

- a privately-operated plant;
- operated by the federal government; or
- in one of the state's operating OSHA Plans (Figure 1-1).

For utilities in states listed as non-OSHA some governing body or legislation may be applicable, but no OSHA-equivalent safety and health standards exist. For example, in Texas public worker health and safety is managed by the Texas Department of Insurance, Workers Compensation Division, but there is no OSHA coverage of local municipal WTP workers. The Texas Workers' Compensation Act, section 411.101, states legislative policy of this division as "(1) promoting the adoption, application, and implementation of safety measures in industry and enterprise; (2) protecting workers against unsafe and hazardous working conditions; and (3) encouraging correction of any unsafe and hazardous working conditions in industry and enterprise." However, Texas and other non-plan states have no equivalent regulatory standards or enforcement, such as those provided by OSHA. So, for those organizations in non-plan states, the drivers for compliance and even excellence are not the same, and what limited data are available indicate that having a plan with standards and enforcement does make a difference.

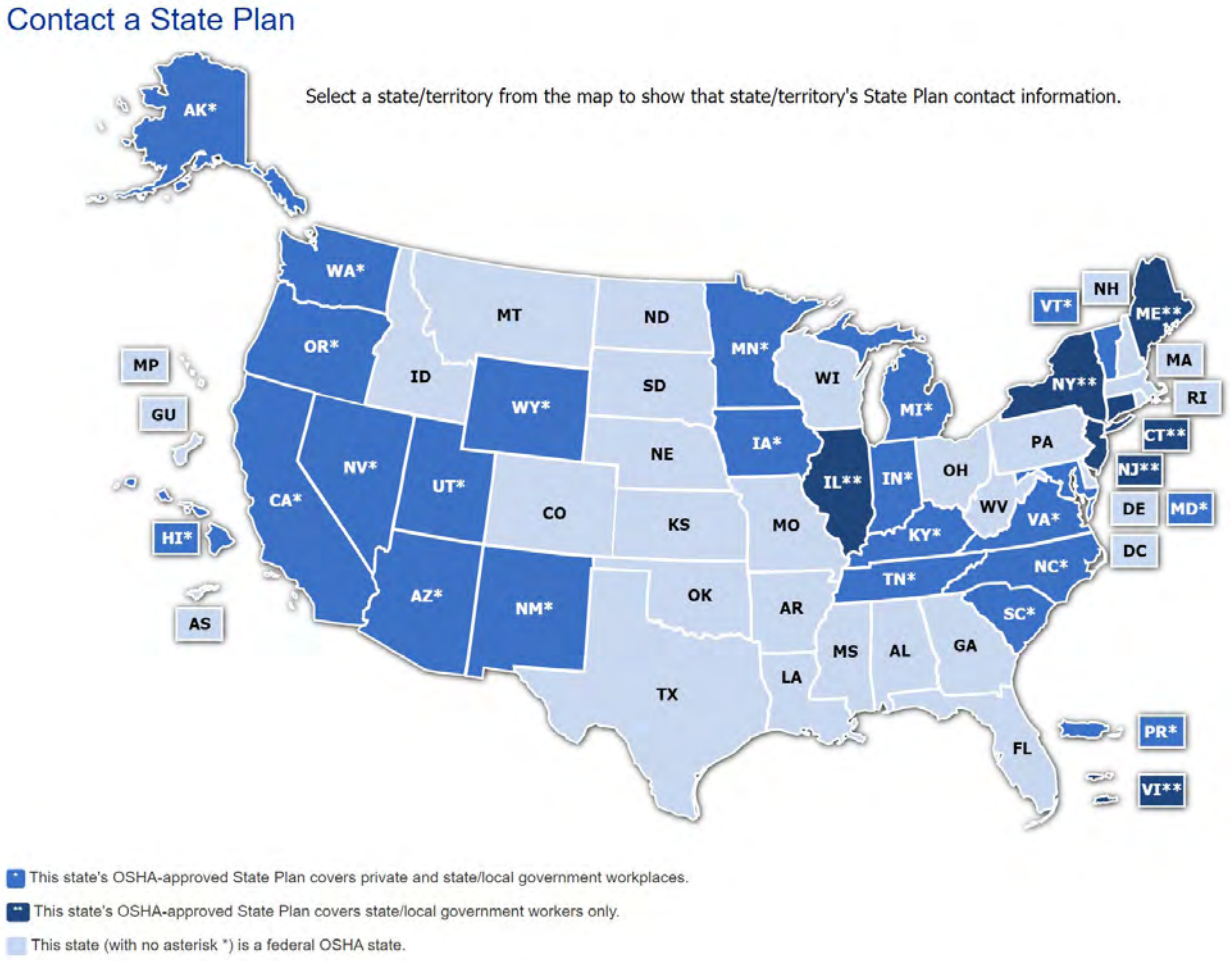


Figure 1-1 OSHA state plans

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

REGULATORY REQUIREMENTS AND BEST PRACTICES FOR HSE PROGRAMS

For those utilities that are regulated by OSHA's Process Safety Management (PSM) or the US Environmental Protection Agency (USEPA) Risk Management Program (RMP) regulations for control of hazardous chemicals, employee participation is a requirement that necessitates a written plan describing how employees are to be involved in implementation of those programs. This is critical for PSM and RMP because employees are working closest to the hazards and are in the best position to recognize and control those hazards. Likewise, employees such as operators and street crews can have the largest impact on injury prevention and safe work practices.

Injury and Illness Prevention Programs (IIPP) are written workplace safety management programs intended to improve workplace safety and health through good management practices and employee involvement. While some states, such as California, mandate that every employer implement an IIPP, there is no equivalent program requirement in the federal OSHA regulations, even though some specific regulations (e.g., confined space and lockout/tagout) call for written programs or plans. Regulations covering some industries or encouraging IIPP development exist in a total of 34 states. In recent years, OSHA has seriously contemplated such a requirement, and public comment on that proposal suggests that the regulation be based in part on one or both of two established industry consensus standards establishing best practices for IIPPs:

- ANSI/AIHA Z10-2012, Occupational Health and Safety Management Systems (American National Standards Institute)
- ISO 45001, Occupational Health and Safety
- OHSAS 18001-2007, Occupational Health and Safety Management Systems (Occupational Health and Safety Assessment Series Project Group) (ISO 45001 replaces 18001)

While terms may vary between sources, the basic concepts of an HSE management programs are management leadership and employee participation, planning, implementation, evaluation and corrective action, and management review, as illustrated in Figure 1-2.

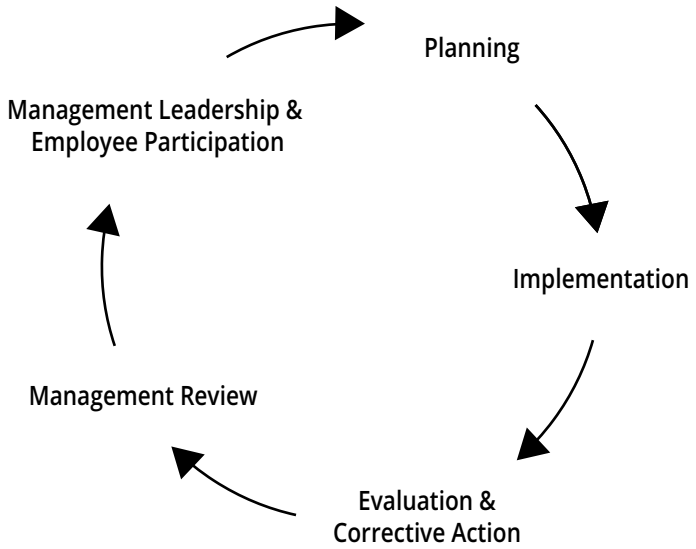


Figure 1-2 Basic health and safety management program activities (plan, do, check, act)

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Based on these activities, this chapter describes the typical process for developing a HSE program and key attributes of successful programs. The primary topics addressed are

- developing a health, safety, and environmental policy;
- management leadership and employee participation;
- program staffing and structure;
- roles and responsibilities;
- developing written programs;
- training and education;
- record keeping and reporting; and
- evaluation, corrective action, metrics, and continuous improvement.

DEVELOPING AN HSE POLICY

"The quality of a person's life is in direct proportion to their commitment to excellence, regardless of their chosen field of endeavor."

—Vince Lombardi

With any endeavor, the quality of the outcome is in large part based on the level of commitment to that outcome. Management commitment is a key element that is universally understood as essential to safety excellence, but what is the actual expression of such commitment? Words? Resources? Presence? The short answer is "Yes" to all three, but it starts with words, initially presented through the HSE policy statement.

ANSI/AIHA standard Z10-2012 (Z10) states that a documented occupational health and safety policy is the foundation for any safety management system and that the policy must include the following four elements:

- Protection and continual improvement of employee health and safety
- Effective employee participation
- Conformance with the organization's health and safety requirements
- Compliance with applicable laws and regulations

Z10 states the policy must be dated and signed or otherwise officially authorized and endorsed by top management and made available and communicated to employees. It is also helpful to share this information with other utility stakeholders and affected par ties such as contractors, customers, and vendors.

A brief, written safety policy statement might be worded as follows:

The [Anytown Water Utility] highly values the safety of its employees and the public. We are committed through the joint efforts of every employee (including the directors, managers, supervisors, and crews) to keep our workplace free from health and safety hazards and to prevent injuries and illnesses. We continually evaluate our safety performance and make improvements where necessary to maintain a safe workplace. Through routine and effective training and diligent implementation of our safety program, including all policies and procedures of [Anytown Water Utility], we will maintain the safety of our employees and full compliance with all applicable Federal, State and Local regulations.

MANAGEMENT LEADERSHIP AND EMPLOYEE PARTICIPATION

Management commitment is one of the most important requirements for success in any safety performance program. In order to overcome unsafe practices that have become

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

status quo and to be heard above the noise of day-to-day activities and priorities, management commitment must be expressed in meaningful and ongoing ways. A written policy is generally not enough to achieve stated safety goals. Compliance requires the active engagement of all employees to develop a culture aligned with a commitment to safety.

If a utility historically has not used a written safety management program or has had some limited level of safety management but desires to move to the next level, there may be some resistance to this effort. There may be a historic organizational culture that has not placed a priority on regulatory compliance. New managers and supervisors may have history or experience with different safety cultures and may be implementing those cultures at their new workplace. While these individuals may want to do the right thing with regard to safety issues, their previous experience could have had inadequate safety staffing levels, a lackadaisical approach to safety, or other significant obstacles to a successful safety program. In that environment, these employees may have accepted and internalized historical organizational values that had assigned a lower priority to safety compliance, or they may doubt the organization will provide the necessary support (financial, manpower, training) needed to comply.

Human nature can make it difficult for employees to accept new approaches at face value when the new methods appear to conflict with years of experience. Employees may respond negatively to being given safety responsibilities unless there is clear communication that safety is a co-priority with meeting production, repair, construction, and financial objectives and there is sufficient technical safety support and oversight. Management must regularly reinforce the "our job is safety compliance" message and provide tangible evidence of its commitment through regular employee engagement and by providing the resources for achieving the safety objectives.

While policies and management plans are effective in setting the stage for a company commitment to safety, these plans and policies are best reinforced through management's active participation. Examples include the following:

- Directors, managers, and supervisors integrate regular and active involvement in safety compliance efforts into their day-to-day business (Table 1-1).
- Directors and managers discuss safety goals, their commitment, and employee accountability not only with their direct reports, but with other employees.
- Safety objectives and accountability are integrated into performance evaluation goals for directors, managers, supervisors, and all employees.
- Goals are set that measure poor performance by noncompliance rather than by the occurrence of an accident. Goals should be pro-active and specific. Examples could include conducting site visits, audits, reporting and correcting unsafe conditions, etc.
- Corrective and disciplinary action is taken when managers, supervisors, or employees knowingly and repeatedly fail to meet their safety obligations. This is necessary to demonstrate that the organization is serious about meeting its compliance obligations.
- Employees who excel at EHS, just like any other tasks, need to be recognized.
- The safety budget process is openly defined and communicated, and adequate funding is budgeted for safety staff, equipment, and supplies, including unanticipated contingencies such as addressing noncompliance issues quickly when they arise.
- A mechanism is available to expedite funding, engineering, and/or procurement of critical safety needs.
- Currently known critical safety needs are addressed as soon as possible.

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Table 1-1 Example activities for observable management involvement in safety

	Routinely	Weekly	Monthly	Quarterly
Director	Demonstrate leadership, show visible support Participate in incident investigation process	Site safety visit: provide a visible presence in work area with a safety emphasis Participate in weekly safety meetings	Review safety performance reports Hold team members accountable for safety requirements	Conduct a safety observation Participate in audits/ inspections Lead safety toolbox meetings Participate in reward/ recognition event
Managers	Demonstrate a personal commitment to safety at all times Participate in incident investigation process	Lead weekly safety meetings	Conduct safety observations Participate in audits/ inspections	
Supervisors	Continuously practice, educate, and involve employees in hazard identification and use of safe work practices Investigate all incidents and near misses Recognize safety achievements Consistently implement disciplinary program	Lead daily pre-job safety briefings that review activities, hazards, and controls Lead weekly toolbox safety meetings	Participate in audits/ inspections	

Adapted from Clark 2008

Responding quickly to critical resource needs conveys management commitment to safety. Measures such as a priority approval process for safety critical needs and/or a contingency budget reserve are necessary to give management the ability to take actions that will bolster credibility and demonstrate management commitment. Table 1-1 provides additional specific criteria for management involvement that can be incorporated into performance requirements for each member of management and is observable by employees.

Achieving a Culture of Excellence

Many organizations look at compliance as the goal for their safety programs but remember that regulations are often minimum standards and just achieving compliance may not meet all safety goals for a given utility. Moving beyond compliance to safety excellence requires the active engagement of all employees to develop a culture aligned with the newly defined commitment. Culture can be one of the most difficult things to change. Culture change efforts in some larger organizations show that only a small fraction of management and employees will embrace new safety objectives and programs at their inception. The majority will adopt a wait-and-see attitude, and a small fraction will actively resist it. Success requires years of persistent communication, training, and—most important—showing this commitment in tangible ways.

It is never too late to start, and each utility at any time has the opportunity to establish and convey its safety priorities and establish a positive safety culture. Communication and employee participation as outlined in the following sections can improve the chances of success.

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Communication

The following measures are suggested to actively, continually, and effectively communicate safety policy and programs to employees, supervisors, and managers:

- Develop or improve existing model safety tools and plans to facilitate meeting basic safety compliance requirements.
- Create a safety communication vehicle (newsletter or section in an existing utility communication) to regularly communicate to employees on safety policies, programs, new developments, performance, and positive examples.
- Encourage active communication, cooperation, and coordination between individuals with corporate- or management-level safety functions and the supervisors and field staff with safety responsibilities through a safety coordination group that meets regularly.
- Set up an intranet safety page with corporate policies, procedures, model programs, and links to outside resources (e.g., federal and state regulations).
- Adopt incentive programs to promote active participation in safety compliance and excellence. While cost may be an issue, there will be financial returns in reduced injury and environmental costs. Measures should certainly include no-cost and low-cost measures such as featuring "Safety Employee of the Month/Year" in the safety publication and recognition at employee events. Consider low-cost awareness programs, such as caps or shirts for reaching milestones or performance goals as well as more sophisticated moderate-cost programs.

Employee participation. As important as management commitment and its impact on effective safety program implementation and performance is employee involvement.

The intent of employee participation is to encourage employees to

- have meaningful involvement in the structure, operation, and pursuit of the objectives of the safety program;
- identify tasks, hazards, and risks, and possible control measures; and
- participate in implementation of control measures.

In practical terms, employee participation in an effective safety program means pro viding a role for supervisors, hourly employees, and employee representatives in activities such as procedure development, training development, job safety analysis, incident investigations, health- and safety-related audits, and all aspects of the safety system planning and development process. Probably the most common mechanism for employee participation is participation in health and safety committees (adapted from ANSI/AIHA Z10-2012).

A safety committee is made up of both employee and management representatives. Typical duties include

- workplace self-inspections;
- accident investigations;
- developing safe work practices;
- developing written safety programs; and
- facilitating safety training.

The committee also can help promote other activities that encourage employees to support the organization's safety program. Table 1-2 provides an example of defined employee participation for a few sample safety compliance areas.

AWWA Manual M3
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Table 1-2 Example employee participation plan

Safety Program Element	Employee Involvement	Designated Employee(s)
Safety training	Supervisors, operators, and field crews will participate in weekly safety talks about various safety topics. Selected staff may receive more intensive training on particular subjects related to their work situations.	All employees
Incident investigations	Involved personnel will cooperate with investigation team. Selected personnel may participate in the investigation as requested by the incident investigation team lead.	All employees
Emergency planning and response	All employees and contractors currently on-site will be provided emergency warning and evacuation training. Trained employees will be on emergency response team. Emergency response team members will assist in reviewing the emergency response plan.	All employees and affected contractors Emergency response team members
Safety audits	Selected personnel may participate in audits and cooperate when interviewed by auditors. All employees will be provided emergency warning and evacuation training.	All employees

PROGRAM STAFFING AND STRUCTURE

Safety staffing demands are not solely based on an organization's employee count. There is a baseline of activity and expertise needed for the organization-wide and facility levels that is independent of number of facilities and a component of effort that is dependent on the number of employees/facilities. There are certain basic good practices and principles that can apply to any safety management system, including the following:

- Having a safety-accountable executive-level position makes it easier for organizations to achieve and maintain a high level of performance.
- All directors and facility managers must be accountable for safety compliance, support safety efforts for their operations, and regularly reinforce the importance of safety compliance to their employees.
- In large organizations, a central safety group can operate on a high level, providing policies and programs, assessing and auditing performance, encouraging coordination, and providing efficient shared services (e.g., reviewing and communicating emerging regulations).
- Safety compliance is more effective when experienced, trained safety staff provide close support to operations.
- Larger facilities or clusters of facilities may have a safety workload that justifies a designated safety specialist. If these positions report to operations, they should work closely with corporate safety groups (i.e., a "dotted-line" relationship) and follow corporate policies and programs.
- Safety staff at multiple levels within an organization must have clearly defined roles and responsibilities to achieve common safety goals and avoid duplication of effort, divergent programs, and potentially adversarial relationships.
- Everyone in the organization should have some responsibility for supporting the safety programs (integrated into their performance goals).

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

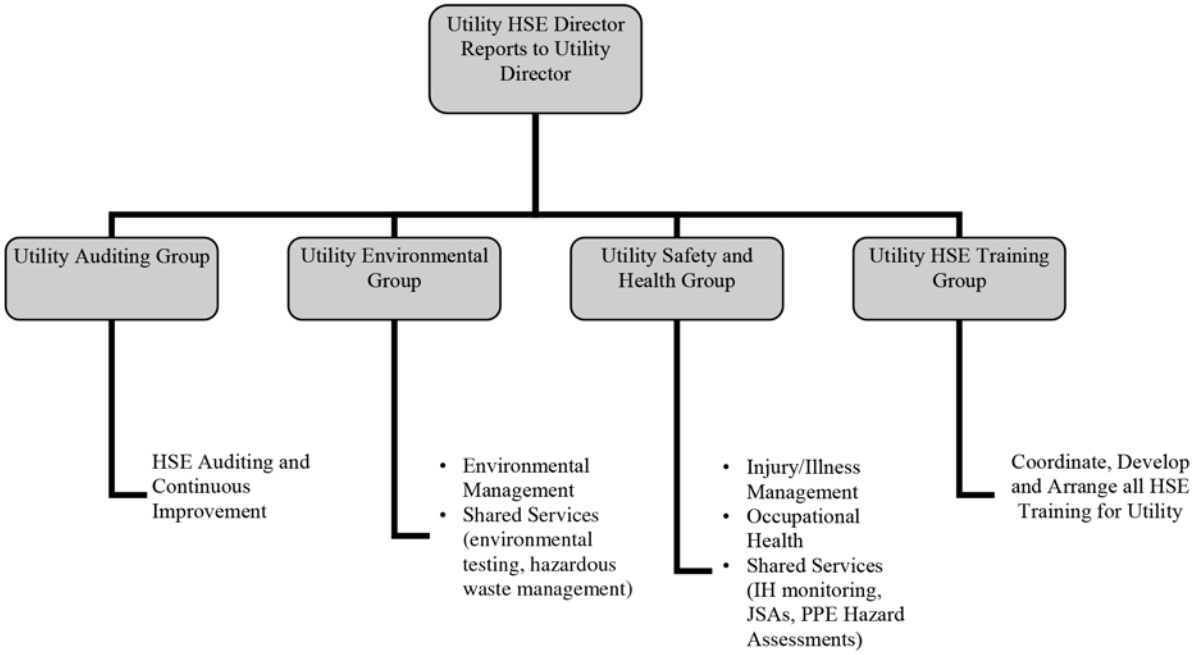


Figure 1-3 Example of a large utility safety organization

The staffing requirements often change and become more clearly defined as programs mature. A higher level of staffing may be necessary in the first few years of new safety program implementation because of time-intensive tasks such as program development and initial training. Once the programs are developed or revised and all initial training is completed, it is typical for a utility to reassess staffing levels based on a regular maintenance level of effort (e.g., refresher training and program support).

Figure 1-3 represents how the safety staff might be organized at a large utility with several facilities.

Smaller utility staffing. In smaller utilities the responsibility for managing safety may fall to a single safety manager who is supported by a training coordinator and/or administrative assistant. This can be challenging because, even though the department is smaller, many of the requirements and responsibilities are the same. A safety manager of a smaller utility is often required to not only develop the HSE program but also perform daily tasks such as inspections. Managers of small systems can find assistance from their workers' compensation insurance carrier's loss control department. OSHA also offers consulting services that small utilities can use as a source of expert advice.

Staff qualifications. Qualified staff is critical to safety success; therefore, when hiring and promoting safety staff, it is critical to select highly qualified individuals with the necessary training and education to fill as many safety needs as possible. If a small utility has short-term assignments or non-routine needs calling for skills and manpower in areas such as industrial hygiene and environmental management systems, outside resources can be contracted if necessary.

ROLES AND RESPONSIBILITIES

Whether regulated by OSHA or not, some basic activities must be performed by any organization in order to provide a safe working environment for its employees, including

AWWA Documents Document Sharing Hub
AWWA Manual M3
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

job safety analysis, hazard prevention and control, and training. Beyond this, more detailed and administrative functions must be performed, such as

- injury/illness recordkeeping and reporting;
- workers compensation cases;
- injury case management;
- incident investigation;
- insurance inspections/requirements;
- employee health and safety concerns; and
- union/labor safety meetings and issues.

Often these responsibilities are spread across the organization (especially in smaller utilities) with no one person having overall responsibility for ensuring that these duties are completed. To ensure that all required and desired activities are being performed consistently and effectively, each utility should define the roles and responsibilities for HSE compliance. Table 1-3 provides a general distribution of HSE responsibilities that can be adapted to any organization, whether with dedicated safety staff or only production or administrative staff with dual responsibilities.

In smaller organizations with less staff, time must be spent on programs and tools that can quickly and efficiently be deployed to ensure that safety actions are completed and not continually put off in favor of seemingly more pressing production or financial demands. Regardless of the size of the organization, successful implementation of a safety program depends on each responsibility being formally assigned and effectively executed.

It is essential that the staff at every level make every effort to function as one team and collaborate on procedure and program development and assist each other in implementation, training, audits, and other safety program elements.

Table 1-3 General utility HSE responsibilities

Corporate/Utility level	Regional/Divisional Level	Facility Level
Develop policies.	Implement policies.	Implement programs and procedures.
Coordinate development of utility-wide programs and procedures.	Participate in development of utility-wide programs and procedures and develop tailored procedures, if necessary.	Participate in regional/divisional HSE committees to identify needs and enhance facility HSE capabilities.
Track emerging laws and regulations that affect utility operations and communicate to the regions/ facilities.	Implement HSE programs throughout the region/division by direct support, training, and oversight, as appropriate.	Regularly communicate HSE procedures and precautions to employees.
Provide shared services to the regions/ facilities where it is more efficient to do so at the corporate level (e.g., training, specialty services).	Provide expert services to the facilities where it is more efficient to do so at the utility or regional level (e.g., industrial hygiene, hazmat).	Conduct regular reviews of potentially hazardous operations to verify that proper protections and procedures are used.
Conduct audits of regional/facility HSE compliance and assessments of program implementation efforts.	Conduct regular facility reviews to assess hazards and identify the need for further compliance assistance.	Complete required inspections, training, and records.

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

DEVELOPING WRITTEN PROGRAMS

The process of establishing a written health, safety, and environmental program will help identify what has to be done in an organization to control hazards and promote greater health and safety awareness among employees, supervisors, and all key stakeholders including contractors, vendors, and customers. Developing a written program allows utilities to outline the policies and procedures that are necessary to achieve stated injury and illness prevention goals. Two levels of written documents will help define and guide a safety program:

- Management programs/procedures (e.g., program improvement [audits], incident investigation, record keeping)
- Compliance programs/procedures (e.g., lockout/tagout, hazard communication, confined-space entry)

Management program development. The purpose of a management program is to define the roles and responsibilities of individuals as well as the process mechanisms needed to implement and maintain an effective HSE program, resulting in a systematic, organized, and comprehensive approach to managing and achieving both regulatory compliance and excellence in health and safety performance. While the development of written programs begins within the planning activities, the written document itself needs to specifically address each of the basic elements of safety management: management leadership and employee participation, planning, implementation, evaluation, and corrective action. The following management system components are examples of the types of procedures used to plan, implement, and evaluate the safety and health program.

HSE responsibilities. Each organization is responsible for having in place clearly defined procedures to comply with health, safety, and environmental regulations. Included within this procedure should be assigned roles and responsibilities for those individuals who are responsible for implementing and maintaining an effective health and safety program.

Management program compliance. The compliance procedure can be used to ensure that all applicable regulatory requirements are encompassed in the utility's program documents by correlating the regulatory standards to the contents of the implementation programs.

Employee participation/awareness. This component includes methods for communicating with employees—in a manner readily understood by all affected employees—on matters relating to safety and health. This includes provisions designed to encourage employees to inform the employer of hazards or concerns at the worksite without fear of reprisal. It is also intended to ensure that employees are provided with full awareness of their rights and responsibilities under the utility program.

Employee training. Training is one of the most important elements of any HSE program. It allows employees to learn their job properly, brings new ideas into the workplace, reinforces existing ideas and practices, and puts the program into action. Benefits from safety training include fewer work-related injuries and illnesses, minimizing risks to the environment, and reduced employee stress and worry caused by exposure to hazards. At a minimum, the safety training should include all applicable regulatory man dated training for both supervisors and employees. This program may be merged with or implemented in conjunction with programs that manage and track other required training for water treatment operators.

Injury/incident investigation and reporting. This document contains the basic procedures and requirements for recording and reporting occupational illnesses and injuries as well as identifying the cause(s) of the accident or near-miss occurrence. In turn, this information can be used to implement corrective changes to preclude the recurrence of similar incidents.

AWWA Manual M3
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Program improvement (auditing). An important part of any HSE program includes self-assessment and compliance measurements. By defining and identifying measurable performance marks and auditing against those marks, utilities are able to define specific goals and achieve continuous HSE program improvement resulting in fewer occupational injuries and illnesses.

These are some basic management procedures that should be part of any written HSE management program, and these can be expanded with additional procedures to address any topics that help those with safety responsibility understand and consistently plan, implement, and continuously improve performance. Management programs should be written in conjunction with compliance programs that ensure the observance of HSE standards.

Compliance programs. Compliance programs and procedures detail the procedures, practices, and instructions for the day-to-day implementation of the health and safety systems in accordance with regulatory requirements and your utility policy. These can be augmented by a safe work practices manual that serves as a quick pocket reference intended to supplement written procedures and training. The pocket manual provides guidance in the absence of any written procedure to assist employees and con tractors in the safe performance of their duties. OSHA's general industry standards are broken down into several subject matter areas. Some of these require written compliance programs, such as

- bloodborne pathogens;
- confined space;
- control of hazardous energy;
- hazard communication;
- laboratory chemical hygiene;
- hearing conservation; and
- respiratory protection.

Other compliance areas do not require written programs but do require specific documentation. Developing formal written procedures for addressing these other issues is beneficial to ensure consistent compliance and implementation. One example of this is in personal protective equipment (PPE) where no written program is required but, under 29 CFR 1910.132 (2004), there must be a written and "certified" assessment of the workplace hazards.

Procedure development. People often learn, or are reminded, how to perform a task through procedures, and it is highly likely that most people will forget how to do tasks that are not repeated with frequency, hence the need for written procedures. Additionally, procedures often include checklists and forms that provide extra control and documentation to help ensure that work is performed properly and in accordance with established methods and safety precautions. Lack of procedures or a failure to follow procedures is a key root cause in many incidents and near misses both large and small.

Written procedures should not be too long or written as though only experts will be reading and using them. Here are some basic guidelines for writing effective safety procedures.

Know your objectives. Developing effective safety and health procedures requires a clear idea of what the procedure is to accomplish. Some objectives may be to provide a basis for discipline when safety rules are ignored, establish safe work practices for certain tasks, or to define how your organization will comply with safety regulations.

Know your audience. Very often safety procedures are written for safety professionals, supervisors, trainers, and other members of management who will interpret and enforce company regulations on safety and health (e.g., respiratory protection). Some

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Anytown utilities	SAFETY MANUAL	
Number: SP-1	Subject: Lockout/Tagout Program	
Page 1 of 30	Current issue: Rev. 1	Issue date: 04 Dec 12
Approved for use by:	I.M. manager	

Figure 1-4 Example of a safety procedure header

procedures, however, will have an audience of employees or contractors who will follow the rules (e.g., excavation and trenching or emergency response). Understanding who will be using the procedures and in what environment can help determine what writing and layout style (e.g., significant white space and bold type for emergency situations) will best suit the audience.

Use a consistent format. The format used should make it easy to find a specific rule, procedure, checklist, or form when a safety or health question comes up. Consider using electronic documents for easy access by employees in the office or in the field. Additionally, on each procedure, consider using a consistent header, such as the one in Figure 1-4, that includes

- utility name or logo;
- the manual name (if you have more than one manual);
- section number (if more than one section);
- procedure number and a brief procedure title;
- date of issue and revision number;
- page number (as "page 1 of 3"); and
- optional approval signatures/initials and dates.

Implementation matrix. Even with concise and well-written programs and procedures, compliance is still a challenge and it can be difficult to keep up with all the requirements outlined in the procedures. Limited staffing in smaller organizations can mean that some individuals may be assigned safety compliance responsibilities in addition to other human resources, operations, or management duties. Regardless of the level of staffing, understanding all the required tasks for compliance can be overwhelming. Required actions may include the one-time activities recommended to develop and implement complete safety programs as well as those recurring activities required to meet ongoing federal and state health and safety regulatory requirements.

One tool that can help manage these obligations is an HSE matrix or calendar of regular requirements that can be used by facility personnel with compliance responsibility to schedule and complete the implementation activities. This matrix should include the required initial and refresher training (see next section) and record-keeping requirements. The matrix should also include a column of key actions to achieve and maintain compliance. For recurring activities, a date can be added to track when those obligations are due. Alternately, there are many electronic training systems/databases that track all employee training, not only EHS training.

TRAINING AND EDUCATION

Many standards promulgated by OSHA explicitly require the employer to train employees in the safety and health aspects of their jobs. Other OSHA standards make it the employer's responsibility to limit certain job assignments to employees who are "certified," "competent," or "qualified"—meaning that they have had special previous training, in or

AWWA Documents Document Sharing Hub
AWWA Manual M3
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

out of the workplace. Designated personnel are selected or assigned by the employer or the employer's representative as being qualified to perform specific duties. These requirements reflect OSHA's belief that training is an essential part of every employer's HSE program for protecting workers from injuries and illnesses. Many researchers conclude that those who are new on the job have a higher rate of accidents and injuries than more experienced workers. Increasing knowledge of specific job hazards and proper work practices to lower injury rates is the primary goal of training employees. Training in the proper performance of a job is time and money well spent, and utilities should regard it as an investment rather than an expense. An effective program of health and safety training for workers can result in fewer injuries and illnesses, better morale, and lower insurance premiums, among other benefits. OSHA Publication 2254 (2015) provides the following key steps for developing an effective training program:

- Determine if training is needed
- Identify training needs
- Identify goals and objectives
- Develop learning activities
- Conduct the training
- Evaluate program effectiveness
- Improve the program

Tracking Training

Each employee's training requirements will be commensurate with the hazards the individual may be exposed to in work assignments. The training modules should be developed, and training should be assigned based on job assignments (e.g., confined space entrant for someone required to enter a tank) or workgroup (e.g., all operators or all emergency response team members). In any case a simple spreadsheet or matrix similar to that shown in Table 1-4 can be used to document required training.

Training Documentation

All training needs to be documented. The best training records involve a package of information, including items such as the following:

- The date of the training
- The instructor or presenter
- The content of the training (include slides, handouts, or agenda)
- The training method (e.g., classroom, on the job, tailgate)

Table 1-4 Tracking of training

		Personnel Required to Take Course		
Course/Module	**Frequency**	**Operations**	**Maintenance**	**Office/Admin**
Lockout/tagout (LO/TO)	Initial	√	√	
LO/TO refresher	As required*	√	√	
Hot work	Initial		√	
Hazard communication	Annual	√	√	√

* OSHA regulations require retraining in certain situations (e.g., unsafe work practices or change in equipment).

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

- A sign-in sheet of attendees with signature required
- If applicable, the means used to verify the training was understood (e.g., test scores)

These records can provide evidence of good faith and compliance with OSHA standards and support audits of the program. It can also help answer one of the first questions an accident investigator will ask: "Was the injured employee trained to do the job?"

RECORD KEEPING AND REPORTING

Accurate and consistent record keeping is a key factor in compliance and excellence.

Therefore, maintaining up-to-date documentation and records is critical for complying with specific regulatory requirements, where required (e.g., OSHA 300 logs), but also for ensuring that the safety management program can be adequately understood, effectively evaluated, efficiently operated, and systematically improved. As part of the management system procedures discussed above, it is helpful to establish, implement, and maintain a procedure(s) for the identification, storage, protection, retrieval, retention, and disposal of records. This procedure can help ensure that all required records and reports of occupational illnesses and injuries are maintained in accordance with regulatory requirements (e.g., OSHA 29 CFR 1904). Another purpose of this procedure is to prevent recurrences of occupational injuries and illnesses by documenting and investigating major incidents, identifying root causes, and taking corrective actions. Incident investigation helps to identify hazardous areas and work assignments, systemic or repetitive patterns, and improvements that will reduce the overall injury and illness rate.

This procedure should include necessary and useful record-keeping forms or links to forms (OSHA and/or state equivalent forms), such as the following:

- Log of Work-Related Injuries and Illnesses (OSHA 300)
- Summary of Work-Related Injuries and Illnesses (OSHA 300A)
- Injury and Illness Incident Report (OSHA 301)
- Utility Incident Investigation Report (IIR) (unless a separate IIR procedure exists)
- Instructions for Recording and Reporting Injuries and Illnesses

Another helpful record-keeping tool is a summary of incident action items to aid in completing the correct records for specific incidents. Table 1-5 provides an example of a table that can be customized to meet specific utility policies as well as federal and state requirements for record keeping and reporting. This table includes some regulatory requirements, such as reporting to OSHA on fatalities, but it can be modified to meet individual expectations with regard to reporting.

Ultimately, the data you record need be uniform and accurate to assure the consistency and validity of the statistical data reported to OSHA. Accurate records are used for many purposes, including audits, performance measurement, program improvement, and resource allocation to critical operations. This information can also help utilities analyze their health, safety, and environment and make improvements where necessary.

EVALUATION, CORRECTIVE ACTION, METRICS, AND CONTINUOUS IMPROVEMENT

One of the primary goals of any performance improvement program is to ensure that the organization is in full regulatory compliance with existing applicable federal, state, and local HSE regulations. A secondary objective is to use performance improvement

AVA Documents Document Sharing Hub

Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Table 1-5 Example table of incident action items, record keeping, and reporting

Severity	Incident Threshold	OSHA 300 Report	Incident Investigation Report (IIR)	Internal Notification	Report to OSHA within 8 hours
Major	Fatality of an employee or third party on utility premises, in a utility vehicle, or on utility business	Yes	Yes	Yes	Yes
	Hospital admission of three or more employees	Yes	Yes	Yes	Yes
	Hospital admission >24 hours of any employee	Yes	Yes	Yes	No
Moderate	Days away from work (lost workday case)	Yes	No	Yes	No
	Medical treatment	Yes	No	Yes	No
Minor	First aid case	No	No	Yes	No
	Minor property damage/ downtime resulting in < $10,000 damage s	No	No	Yes	No
	Near miss	No	No	Yes	No

processes, such as audits, as an opportunity to informally train personnel in compliance requirements and procedures and to raise awareness regarding utility HSE goals. Ultimately, a performance improvement program should be more broadly focused than just maintaining strict compliance; it should also include determining whether the established policies and procedures have been properly implemented and maintained, assessing measures to promote HSE excellence, identifying underlying root causes of HSE noncompliance incidents, and conducting evaluations of HSE management systems.

Measuring and monitoring are key elements of any safety program. Measuring and monitoring are used to determine whether the program is working as designed, any deficiencies are corrected, and opportunities for improvement are rolled back into the program.

Among other methods, Zl0 lists the following methods to monitor, evaluate, and control hazards:

- Workplace inspections and testing
- Exposure assessment
- Injury, illness, and incident tracking
- Employee input
- Occupational health assessments

The organization can use these measures to identify and correct problems and identify opportunities for risk reduction before injuries or illnesses occur.

Other main components of the continuous improvement and feedback process are

- incident investigation;
- audits;
- corrective and preventative action; and
- feedback to the planning process.

Incident investigation. Incidents and even near-misses can be indicators of potential problems and as such should be thoroughly investigated to determine root causes and identify corrective actions.

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Audits. Audits of both the management system and regulatory compliance are valuable and a necessary part of the safety program. The system audit should determine if the management system procedures and their implementation are effective in managing the program. Compliance audits and inspections should outline appropriate corrective and preventive action activities as well as identify areas for feedback to the planning process for improving the management system. When possible, audits should be conducted by individuals independent of the activities being examined. This does not necessarily mean individuals external to the organization, but the auditors should be independent of the activities being evaluated.

Corrective and preventive action. As part of its safety management system, each utility should establish and implement procedures for identifying and investigating noncompliance issues, developing effective corrective and preventive actions, and tracking actions to closure. An effective procedure of this nature should include, at a minimum, the following elements:

- A method to address and investigate potential or actual non-compliance or safety issues
- A system to assign responsibility and provide resources to initiate and complete corrective or preventive actions
- A process to prioritize corrective or preventive actions based on the significance of risk and include deadlines for completion
- A process to track corrective actions to closure and communicate status to leadership and affected personnel
- A quality assurance process to confirm that corrective or preventive actions are adequate and appropriate to address the non-conformance
- A method to follow up on completed corrective actions to confirm that the intended results were achieved

Feedback to planning. As described in Zl0, the findings and lessons arising from all the evaluation and corrective action activities must become part of the information that feeds back to the employee participation process, ongoing planning process, and management review. This information is used to help determine the underlying causes and other factors contributing to system or risk control failures, and hence is used to establish revised objectives and implementation plans. This feedback loop is an essential component of the continual improvement process.

REFERENCES

ANSI/AIHA Z10. 2012. American National Standard for Occupational Health and Safety Management Systems. American Industrial Hygiene Association.

Clark, J. 2008. Developing a Zero Incident Safety Culture, A Case Study. American Society of Safety Engineers Professional Development Conference and Exhibition, Las Vegas, Nev.

Institute for Work & Health. Employers Certified by COR Programs Have Greater Reduction in Injury Rates: Studies (2016).

ISO 45001, Occupational health and safety management systems — Requirements with guidance for use. International Organization for Standardization.

Kandilakis, D. 2016. Evidence That Injury Prevention Programs Are Cost Effective for Small Business Too! LinkedIn.

Occupational Safety and Health Administration. 2019 (6th ed.) *OSHA Construction Safety Handbook*, Neenah, Wisc.: J.J. Keller & Associates Inc.

AWWA Manual M3

Copyright © 2022 American Water Works Association. All Rights Reserved.

Full document details: AWWA Manual M3 2022

Occupational Safety and Health Administration. 2004. *Code of Federal Regulations*. Title 29, Subpart I, §1910.132, Personal Protective Equipment.

Occupational Safety and Health Administration. *Code of Federal Regulations*. Title 29, §1904.

OSHA Publication 2254. 2015. Training Requirements in OSHA Standards and Training Guidelines (revised). Occupational Safety and Health Administration.

Roberts, V.J. How-To Guide to OSHA's Voluntary Protection Programs. 2020. [Online.] Accessed May 10, 2022.

US Department of Labor, Office of Inspector General, Office of Audit. 2000. Evaluating the Status of Occupational Safety and Health Coverage of State and Local Government Workers in Federal OSHA States (report 05-00-0001-10-001.) [Online.] Accessed May 10, 2022.

To access the 2000 report directly above, visit:

https://www.oig.dol.gov/public/reports/oa/2000/05-00-001-10-001.pdf

https://www.oig.dol.gov/cgi-bin/oa_rpts-v6.cgi?s=&y=2000&a=all (Scroll down to no. 48.)

Documents
Document Sharing Hub

Copyright © 2022 American Water Works Association. All Rights Reserved.

Full document details: AWWA Manual M3 2022

This page intentionally blank.

Documents
Document Sharing Hub

Copyright © 2022 American Water Works Association. All Rights Reserved.

Full document details: AWWA Manual M3 2022

Chapter 2

Job Safety Analysis

Frank Milligan, Brian Exendine

Workers are injured or killed at workplaces across North America every day. Accidents can mean both human loss and financial loss to the employer and the employee. How can these losses be minimized? The best way to prevent losses caused by accidents and occupational illness is to develop a solid, working program for accident prevention. Systematically looking at workplace operations, establishing proper job procedures, and ensuring all employees are properly trained can help prevent workplace injuries and illnesses.

As a part of an effective health, safety, and environmental (HSE) program, a job safety analysis (JSA) has proved to be an effective accident and occupational illness prevention tool in many industries. The JSA, also known as a job hazard analysis (JHA), is a safety management tool in which the risks or hazards of a specific job in the workplace are identified and measures to eliminate or control those hazards are determined and implemented. Most safety programs are considered reactive, an action in response to past incidents. A JSA is considered a proactive approach to workplace safety. A JSA is a process of systematically evaluating certain jobs, identifying the hazards or potential hazard associated with each step of the job, and finding effective control measures to eliminate or reduce the risk or hazards and make the workplace as safe as possible before those hazards have a chance to become accidents.

The Occupational Safety and Health Administration (OSHA) defines a JSA as a means of "carefully studying and recording each step of a job, identifying existing or potential job hazards, and determining the best way to perform the job to reduce or eliminate these hazards."

JSAs are a valuable tool for water utilities that have a commitment to reduce and prevent accidents and illnesses on the job. Developing and implementing safe job procedures and training employees to work properly to prevent accidents is likely to result in fewer worker injuries and illnesses, reduced workers' legal claims, more effective work methods, and increased productivity.

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

JSAs play an important role in effectively managing HSE programs. This chapter provides a guideline for how JSAs can be used, prepared, and implemented. Key terms for understanding the function of a JSA are as follows.

A *hazard* is a potential for harm. If left uncontrolled, a hazard could result in injury or harm. A hazard can be a physical object, chemical, noise, radiation, extreme heat or cold, electrical energy, or anything else that has the potential to cause harm.

An *accident* is an unintended occurrence that may result in injury, loss, or damage. As soon as people are involved, a hazard may cause an accident. Someone slipping in an oil spill would be an accident.

An *injury* is the result of an accident. A sprained wrist or broken arm from a fall would be an injury.

A hammer balanced on a windowsill is a hazard. Knocking the hammer off the sill is an accident. The hammer striking someone and causing a cut or laceration is an injury.

ADVANTAGES OF A JSA

The JSA is used to determine physical, procedural, and/or environmental hazards that do or could exist. JSAs also identify actions of personnel that could result in accidents or injuries and preventive measurements which would eliminate or control hazards, so a job can be performed safely.

The JSA not only helps supervisors and employees become aware of hazards on the job, but it also has many other uses as well. A JSA may be used

- to determine specific training or skill development an employee should receive;
- as a basis for inspection;
- as an informational tool for accident investigations;
- as part of a continuing communication program on employee safety and health awareness; and
- as a documented hazard assessment for PPE selection.

A JSA is especially helpful as a training tool because this tool provides an organized system for training both new and existing employees. Once a JSA has been prepared for a specific job, training new employees on that job will become more consistent. The entire job procedure does not have to be redeveloped every time an employee is to be trained or retrained. With a thorough JSA as a guide, all the steps of the process are identified and will not be overlooked during the training. The JSA also provides a basis for documentation of ongoing employee safety training. Training sessions with workers can be periodically conducted using the JSA to reinforce how to safely conduct a job.

A JSA can be of great value to the person investigating an accident. By reviewing the process and understanding the hazard, controls, job steps, and safe practices that have already been defined and implemented, accident investigators can gain valuable insight leading to a better accident investigation. The actions of the employee can be compared to the recommended job actions in the JSA to determine if the employee was performing his job properly. The investigator should also consider whether the JSA itself was correct and if any possible hazards are missing from the JSA, which might have led to the accident in question.

JSAs may also help supervisors learn about the various jobs their workers perform. If the supervisors have not actually performed a specific job themselves, the JSA can guide them through process of that job. Because the JSA identifies what is involved in each job, step-by-step, the supervisor can learn in detail about each of the individual jobs they supervise.

AWWA Documents Document Sharing Hub
AWWA Manual M3
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

JSA DEVELOPMENT

All jobs in an organization have common elements. They all require people performing at their best level of productivity, producing goods and services in a safe and efficient manner. Helping do that is what the JSA is all about.

Often, employers, foremen, supervisors, and safety professionals conduct JSAs that are subsequently reviewed by workers who perform the job. At other times, workers may discover a task on the job site which does not have a written JSA and may conduct their own JSA on the job site before beginning the task. This worker produced JSA should be documented for review by the safety manager and the supervisor. JSAs should be developed for the following:

- jobs with the highest injury or illness rates;
- jobs recognized by employees as being high hazard with the potential to cause severe or disabling injuries or illnesses, even if there is no history of previous accidents;
- jobs in which simple human error could lead to a severe accident or injury;
- jobs that are new to your operation or have undergone changes in processes or procedures; and
- jobs complex enough to require written instructions.

Preparing for a JSA

- Review company accident history. Review with employees the worksite's history of accidents, losses that required repair or replacement, and any "near misses"—events in which an accident or loss did not occur but could have. These events are indicators that the existing hazard controls (if any) may not be adequate and deserve more examination. Involve company employees. Asking employees what they consider high hazard or high-risk job assignments and involving them in the initial hazard ranking of all jobs being considered for JSAs and the development and review of JSAs, creates buy-in and provides the whole-picture view. The people who do a job have a unique understanding of the realities of the job, and this knowledge is invaluable for identifying hazards as well as effective and workable control measures. Involving employees helps minimize oversights, ensures a quality analysis, and gets workers to buy in to the solutions because they will share ownership in their HSE program.
- Conduct a preliminary job review. Discuss with employees the hazards they know exist in their current work and surroundings. Brainstorm with them for ideas to eliminate or control those hazards. If any hazards exist that pose an immediate danger to the workers' life or health, take immediate action to protect the workers.
- Any problems that can be corrected easily should be corrected as soon as possible. Do not wait to complete a JSA before correcting serious hazards. This will demonstrate a commitment to safety and health and clear the way for identifying all hazards that present unacceptable risks and evaluating types of hazard controls.

Development of a JSA is not a one-time activity; it is a process. JSAs need to be developed properly with solid input from those familiar with the job in question; identified control measures must be agreed upon and implemented effectively; and affected workers and supervisors must be trained on the information contain in the JSA.

Additionally, JSAs should be seen as living documents. Keeping JSAs up-to-date may sound like a lot of extra work, but changes are not needed frequently. A company's safety program should have a system for regularly reviewing and updating JSAs. If a situation,

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

a job environment, or any other change occurs, the change must be reflected on the JSA as quickly as possible. If the JSA is changed or revised, everyone concerned with the job should be informed of the changes and instructed in the new procedure.

When should supervisors review a JSA for possible updating? A JSA should be reviewed when an accident occurs on a job covered by the document. In this case, review the JSA to decide whether it needs revision. Check the JSA to see if the accident occurred because the JSA was not followed, or if the accident occurred because something was basically wrong with the job procedure or the analysis, or if a hazard existed that had not previously been recognized or eliminated.

When conditions change, such as job requirements, site conditions, manpower, or equipment operations, it is important to stop and reanalyze the job for potential new hazards created by these changes. New controlling measures should be put in place to eliminate or minimize the new hazard. If new controls cannot be implemented to reduce the hazard to an acceptable risk level, new engineering and administrative controls may need to be devised by job supervisors before work is resumed.

Writing the JSA: 3 Basic Steps

There are three basic steps in writing the JSA:

1. Each job is broken down into a sequence of steps. Each step describes the actions of the job as that job is performed.
2. Each step is examined to identify and define hazards (i.e., actions, conditions, possibilities) that could lead to an accident.
3. Recommended actions or procedures are determined for each hazard. The JSA becomes a guideline for what actions are necessary to eliminate or minimize the hazards that could lead to an accident or injury.

Step 1: List job tasks. Nearly every job can be broken down into job tasks or steps. Outline those sequential steps that it takes to carry out the job. Begin a job safety analysis by watching the employee perform the job and listing each step as it is performed. (Figure 2-1) Be sure to record enough information to describe each action without getting overly detailed. Avoid breaking down the steps in such detail that it becomes unnecessarily long or so broad that it does not include basic steps. It may be valuable to get input from other workers who have performed the same job. Later, review the job steps with the employee to ensure everything significant is included.

Point out that the analysis is done to understand the sequence of steps that it takes to conduct the job and is not an evaluation of the employee's job performance. Include the employee in all phases of the analysis—from reviewing the job steps and procedures to discussing uncontrolled hazards and recommended solutions. Be sure to document the findings in order to create a written record of the JSA.

Sometimes it may be helpful to photograph or videotape the worker performing the job or to photograph the work equipment and work environment. These visual records can be handy references when doing a more detailed analysis of the work. Management and workers may also find it useful to assign a probability and severity ranking to each hazard in the job, noting how likely or probable the hazard is to occur, and the severity of the consequences should it occur.

Step 2: Look for hazards. Once the basic steps of the job have been recorded, the next step is to identify the potential hazards associated with each step. Consider talking with employees who have performed the job for several years, as they usually have a wealth of information and will be able to describe injuries or near-misses they have had conducting the job, or injuries coworkers have experienced.

AWWA Documents
Document Sharing Hub
AWWA Manual M3
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Source: Gorodenkoff/Shutterstock.com

Figure 2-1 Identify potential hazards

Do not just look for obvious hazards like a pallet leaning against the wall in an aisle. Look at the total environment. Some potential hazards are not obvious. Always consider the possibility of debris or other obstructions in aisles even if nothing is there at the time the JSA is developed. In order to consider the entire work environment, ask the following questions:

- What can go wrong?
- What are the consequences?
- How could the hazard arise?
- What are other contributing factors?
- How likely is it that the hazard will occur?

Document the answers to these questions in a consistent manner. Describing a hazard in this way helps ensure that efforts to eliminate the hazard and implement hazard controls target the most important contributors to the hazard. Probe for details regarding the job steps and the work involved in doing the job: How often does the job need to be done (e.g., daily, weekly, annually)? How often is each step of the job carried out (e.g., per shift, per hour)? How heavy is equipment that is lifted, pushed, or pulled?

Good hazard scenarios describe

- where it is happening (environment);
- to whom or what it is happening (exposure);
- what precipitates the hazard (trigger);
- the outcome that would occur should it happen (consequence); and
- any other contributing factors.

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Table 2-1 Types of hazards to consider when conducting a JSA

Chemical	Biological	Ergonomic	Physical
Inhalation	Bloodborne pathogens	Awkward positions	Caught in/on/ between; pinch points
Skin contact	Building-related illness	Contact stress	Electrical
Absorption	Legionnaires' disease	Forceful exertions	Fire or explosion
Injection	Mold	Repetition	Noise
Ingestion	Plant and insect poisons	Vibration	Radiation
	Tuberculosis (TB)	Work area design	Thermal stress
	Wastewater		Slips and falls
			Striking against
			Struck by

The purpose of the JSA is to identify *all* hazards—both those produced by the environment or workplace conditions and those connected with the job procedure. Examine each step carefully from both perspectives to find and identify hazards (Table 2-1).

Practical questions to ask that will help identify potential hazards include the following:

- Can any body part get caught in or between two objects?
- Do tools, machines or equipment present any hazards?
- Can the worker make harmful contact with moving objects?
- Can the worker slip, trip, or fall?
- Can the worker suffer strain from lifting, pushing, or pulling?
- Is the worker exposed to extreme heat or cold?
- Is excessive noise or vibration a problem?
- Is there a danger from falling objects?
- Is excessive brightness or poor visibility a problem?
- Can weather conditions affect safety?
- Is harmful radiation a possibility?
- Can contact be made with hot, toxic, or caustic substances?
- Are there dust particles, fumes, mists, or vapors in the air?
- Can the worker make plant, insect, or animal contact?
- Can any foreign object contact the eyes?

A safety data sheet (SDS) can be good resource for assessing chemical hazards. An SDS is a written document that outlines information and procedures for handling and working with chemicals. SDS documents contain physical and chemical property information, potential hazard information, emergency procedures, personal protection and manufacturer contact information. For a knowledgeable user, exposure limits and chemical property data are the most useful because identifying a type of hazard alone does not inform you of severity. For example, hydrochloric acid and ferric chloride are both corrosive, but one can immediately damage on contact with skin or eyes and off gas to cause inhalation exposure and lung damage. Protective procedures also vary widely—some are generic or are more appropriate for uses with the highest potential for contact and exposure.

AVA Documents Document Sharing Hub

Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Step 3: Recommended controls and actions. Once the basic steps of the job and potential hazards associated with each step have been recorded, the final step in conducting the JSA is to determine ways to eliminate or control the identified hazards. A control measure is anything that will help to control the hazard by either preventing it from occurring or minimizing its impact if it does occur. If a hazard cannot be eliminated, steps should be taken so the consequences of the hazard are as low as reasonably practical in order to protect workers and the public.

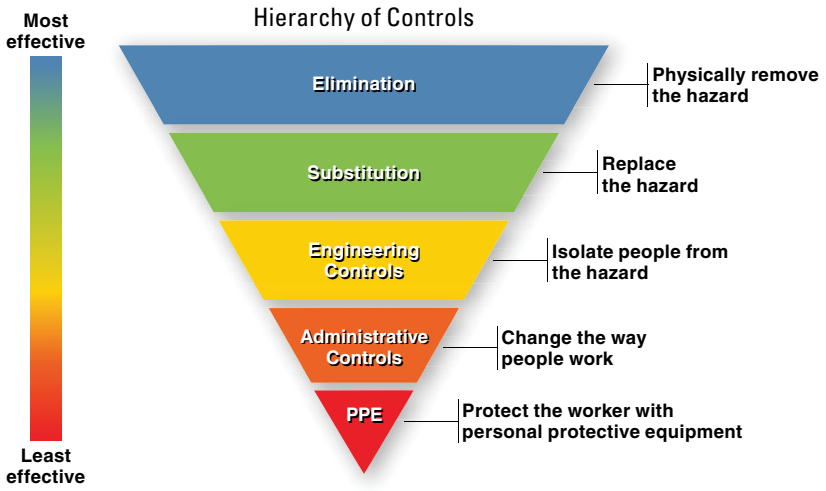
When evaluating options for corrective measures, consider the hierarchy of controls:

- Elimination
- Substitution
- Engineered
- Administrative
- Personal protective equipment

As shown in Figure 2-2, progressing down the hierarchy results in reduced effectiveness. According to the Centers for Disease Control and Prevention, which developed the hierarchy, "The idea behind this hierarchy is that the control methods at the top of the list are potentially more effective and protective than those at the bottom. Following the hierarchy normally leads to the implementation of inherently safer systems, ones where the risk of illness or injury has been substantially reduced" (CDC 2010).

Elimination of the hazard altogether is the most effective control measure to reduce risk. By adopting the Planning through Design methodology described in chapter 4, many hazards can be eliminated or designed out of a system. For example, human interaction with potentially hazardous machinery or equipment can be reduced by automating certain processes. Similarly, the design team or operations and maintenance (O&M) staff can opt for an appropriate material or process substitution that is less hazardous. It is important to equally assess the substituted material or process for any risks it may pose.

Where elimination or substitution controls are not practical, the next strategy is to control the hazard at its source. Engineered controls do this, unlike controls that generally focus on the employee exposure to the hazard. The basic concept behind engineered controls is that, to the extent feasible, the work environment and the job itself are designed



Source: Centers for Disease Control and Prevention (www.cdc.gov/niosh/topics/hierarchy/default.html)

Figure 2-2 Hierarchy of controls: apply the highest level of control commensurate with the risk level

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

to eliminate hazards or reduce exposure to hazards. Engineered controls can be simple in some cases. They are based on the following principles:

- If feasible, design the facility, equipment, or process to remove the hazard or substitute something that is not hazardous.
- If removal is not feasible, enclose the hazard to prevent exposure during normal operations.
- Where an enclosure is not feasible, establish barriers or local ventilation to reduce exposure to the hazard during normal operations.

If engineered controls are not feasible, administrative controls should be considered. Administrative controls include safe work practices, such as the utility's general workplace rules, standard operating procedures, or other operation-specific regulations. For example, even when a hazard is enclosed, exposure can occur during maintenance of the enclosed equipment. Through established safe work practices that incorporate additional protective measures when conducting maintenance operations, employee exposure to hazards can be further reduced. Administrative control measures also include additional relief worker, exercise breaks, and rotation of workers. These types of control are normally used in conjunction with other controls that more directly prevent or control exposure to the hazard.

When exposure to hazards cannot be engineered out of normal operations or maintenance work, and when safer work practices and other forms of administrative controls cannot provide sufficient additional protection, a supplementary method of control is the use of protective clothing or equipment. This is collectively called personal protective equipment (PPE).

While PPE (Figure 2-3) seems to be the most common form of protection and in some cases is mandated by law, it should be considered a last line of protection and always used

Figure 2-3 Personal protective equipment

AWWA Manual M3
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

in conjunction with engineered and administrative controls. PPE may also be appropriate for controlling hazards while engineered and work practice controls are being installed.

Note, one of the major weaknesses of PPE is the inconsistency of its effectiveness. This is primarily due to improper fit and application. Both of which can be hard to monitor on a routine basis.

As with Steps 1 and 2, document all the specific steps that need be done to correct or mitigate the identified hazards. Specify exactly what is to be done to correct the hazard, then take action to make those corrections. Using the JSA as a roadmap, follow through regularly to ensure that precautions are in place and new procedures are being followed. If new techniques for doing a job are required, provide training to affected employees.

The JSA can also be an effective means of uncovering health hazards in a job operation. The job could be contributing to a medical problem that otherwise might not become known for a long time. Examples are things like deterioration of the lower back, loss of hearing or loss of sight, chemical overexposure, or some other occupational disease.

These health problems are not visible or as dramatic as accidents because they usually do not happen all of a sudden. Nevertheless, they are extremely costly to the company and serious detriment to employee health. Many health hazards have to be assessed through measurements conducted by an industrial hygienist or other qualified individual. If a potential health hazard exists, it is important to determine the actual situation so appropriate steps can be taken to eliminate or control the hazard.

Challenges

Significant pitfalls are possible in developing JSAs that could result in a safety program being less effective than it might otherwise be. Common pitfalls include

- not listing all hazards;
- listing hazards but taking no action;
- listing nonspecific action and recommendations;
- failing to involve all levels of staff;
- failing to update JSAs when changes occur; and
- failing to train and retrain staff on JSAs.

THE JSA: AN IMPORTANT SAFETY FACTOR

If adopted effectively, JSAs can be valuable tools to help to reduce accidents and occupational illnesses and to increase operational efficiency. They often result in cost reductions, may lead staff to find a better way to do a job, and serve to document employee training. They are an important tool in the overall safety program.

Measurement of past incidents, successes and failures happens after the fact and is considered a "lagging" indicator. Measurement of future performance or commitment to tangible goals is considered a "leading indicator." Performing a JSA can help workers and management identifies potential hazards before they occur and implement corrections to minimize the risks. Setting tangible goals to perform safety analyses of all jobs, or to correct hazards so that they reach a specific minimal level of risk are examples of using leading indicator to drive a safety program, as opposed to lagging indicators, which measure past performance.

These items can be found in the electronic resources that are offered as part of this manual available at www.awwa.org/M3:

- Instructions for completing a Job Safety Analysis form

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

- Example of a completed Job Safety Analysis
- Job Safety Analysis—blank form
- Example of a job description and physical requirements for a conservation coordinator
- Example of a job description and physical requirements for waterworks operator field crew
- Hazard action list—blank form

REFERENCES

Centers for Disease Control and Prevention (CDC). 2010. The National Institute for Occupational Safety and Health (NIOSH) Hierarchy of Controls. www.cdc.gov/niosh/topics/hierarchy/default.html. Accessed December 15, 2021.

Michigan Department of Licensing and Regulatory Affairs, Michigan Occupational Safety & Health Administration, Consultation Education & Training (CET) Division, National Safety Council. 2020. Job Safety Analysis. SP #32. [Online.] Accessed December 15, 2021.

OSHA (Occupational Safety and Health Administration). 2002 (revised). Job Hazard Analysis OSHA 3071. [Online.] Accessed December 15, 2021.

Texas Department of Insurance, Division of Workers' Compensation Workplace Safety. Job Safety Analysis. [Online.] Accessed December 15, 2021.

AWWA Manual M3

Copyright © 2022 American Water Works Association. All Rights Reserved.

Full document details: AWWA Manual M3 2022

Chapter 3

Incident Management

Mike Jacobs, Brian Exendine

Even after the most thorough Job Safety Analysis (JSA), incidents can still happen. The repercussions of any incident can affect a utility's financial stability. According to the Occupational Safety and Health Administration (OSHA), US employers pay an estimated $1 billion per week in direct workers' compensation costs alone. This does not include the sometimes-immeasurable indirect costs of incidents. These indirect costs include lost productivity, training replacement employees, incident investigation, and low employee morale, to name a few. As shown in Figure 3-1, OSHA has historically used the results of a 1981 Stanford University study that found the indirect costs of incidents on the job can range from 1.1 (for the most severe injuries) to 4.5 (for the least severe injuries) times the direct costs, which include medical expenses and insurance premiums for workers' compensation benefits, liability, and property losses. According to OSHA, "the lower the direct costs of an incident, the higher the ratio of indirect to direct costs" (US Department of Labor 2013).

INCIDENT MANAGEMENT PROGRAMS

In addition to JSAs, formal incident management programs are invaluable components of any comprehensive health, safety, and environmental (HSE) program. Incident management serves to reduce costs of future incidents by analyzing and improving upon utility processes. A Water Research Foundation (WRF) project, *Water Utility Safety and Health: Review of Best Practices* (Borowski and Adams 2010), found that "one of the most significant opportunities [in the water industry] for improving safety and health performance is to conduct thorough incident investigations and to manage the return to

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

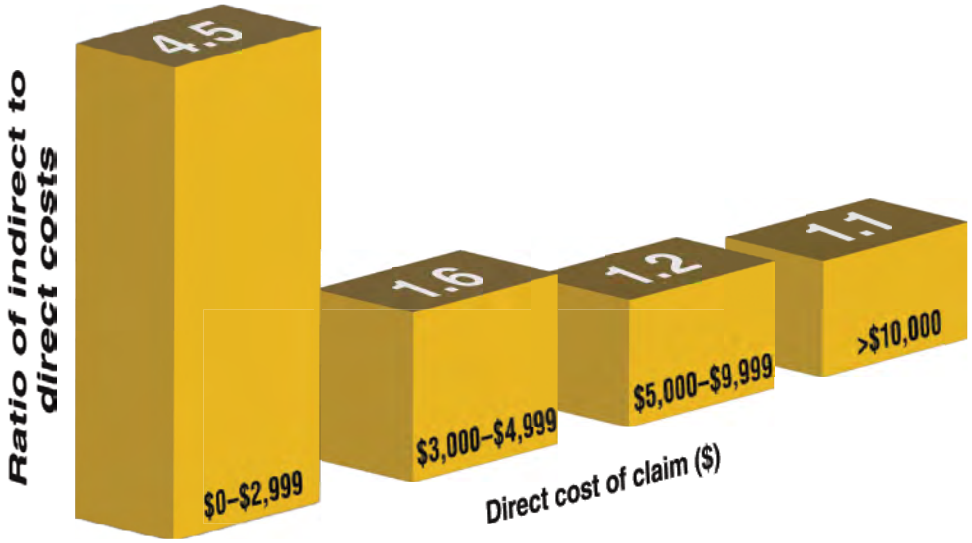


Figure 3-1 Ratio of indirect to direct costs of on-the-job incidents

work process for the injured workers." From initial emergency response and reporting to effective return- to-work (RTW) programs and record keeping, this chapter will outline practices that will help develop an efficient injury and illness management process.

Incident Response

Initial medical attention. A utility must be prepared to respond quickly and efficiently to any injury. The first priority at the scene of an incident is to ensure that the area is safe for the injured employee and the responders, and that the injured employee receives adequate medical attention. Employees should be assisted with obtaining, or instructed to seek or provide, medical attention as needed before doing anything else.

To facilitate a quick response, a utility should have readily available first aid kits and facilities that are appropriate to the employees' potential exposure to injury in any given area of the facility (e.g., eye wash in the laboratory). Employees who may need to provide immediate care (e.g., distribution or plant operators) should be trained in first aid/cardiopulmonary resuscitation (CPR) and safe handling of bloodborne pathogens. In some cases, this training is required (e.g., a confined-space attendant) and a utility should check local regulations. A review of completed Job Safety Analyses can help determine which employees should be trained in first aid/CPR; the number of employees per shift or per work area that are to be trained should also be outlined in the HSE program. All employees should be trained in how to contact emergency medical services. If emergency services cannot respond in a reasonable amount of time, a utility may need to establish an in-house emergency response team with specialized training in immediate medical care.

For injuries that do not need immediate care but do require medical attention, utilities should consider contracting with an occupational health provider (OHP). This will ensure that employees are seen in a timely manner by an occupational health doctor who is specially trained to deal with occupational injuries and illnesses. By establishing a relationship with an OHP, a utility also ensures that the treating physicians are familiar with the types of work being performed at the utility, as well as the utility's workers' compensation insurer's requirements and return-to-work program.

AWWA Manual M3
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Incident Reporting

All incidents should be reported as soon as possible so each incident can be investigated thoroughly—before evidence is altered or destroyed—and causes corrected. Initial reports also provide documentation for incidents that were initially thought to require on-the-scene first aid only, but later require medical attention and reporting under workers' compensation requirements and/or must be logged for OSHA or another regulatory agency. Once an injury or illness is reported, the response will help determine the ongoing well- being of the employee and the ultimate cost of the claim.

Supervisors are typically responsible for investigating incidents and should be trained in post-incident response, even if the utility rarely has work-related injuries. An infrequent claim history makes it more likely that employees and supervisors will not know what to do in the event of an injury. They may inadvertently make a decision that could adversely impact the well-being of the employee and the length or cost of the claim. It is the responsibility of utility management to establish an incident-response program that clearly defines the roles and responsibilities of employees, supervisors, and any other staff that may be involved in the reporting and investigation process. A strong incident reporting and response program identifies, probes, and documents all aspects of an incident scene and the events that led to the incident.

After the appropriate medical attention is provided, incidents should be reported to the employee's immediate supervisor. The supervisor should then complete an injury report form that documents the initial findings. The form used for initially reporting an injury should be simple but informative. The form should include the who, what, when, and where, and how (i.e., it is not only important to know if personal protective equipment was being used, but also *how* was it being used) of the incident. A complete injury report will include the answers to the following questions:

1. What exact job was the injured employee doing? (e.g., Employee was loading water pump onto truck.)
2. What tools, materials, or equipment were being used to accomplish the work assignment?
3. What specific action caused the incident? (e.g., Employee slipped, and water pump hit his side.)
4. What action did the employee do or not do that caused the injury? (e.g., Employee was not using hand crane to load the pump.)
5. What safety protection devices were provided? Were they being used?
6. What, if any, unsafe conditions or defects in equipment, materials, or tools were there at the job site where the incident occurred?
7. What, if anything, was wrong with work methods employed or other acts that caused the incident? (e.g., The hand crane is provided to load and unload heavy items from the truck. Employee was in a hurry and did not use the crane.)
8. What safeguards were being used (or not) and what safeguards should have been used?
9. What steps will be taken to prevent similar injuries? (e.g., Incident was discussed with crew at weekly safety tailgate meeting.)
10. What else should be done to prevent recurrence? (e.g., Foreman or helper should check loading and unloading of equipment to ensure that safe procedures are followed.)
11. Were there any witnesses to the incident or the events leading up to it?

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022

Some utilities may have other staff, such as a safety, risk, or human resource specialist, who can assist with the gathering of information and completion of the incident report. If the incident results in a serious injury that requires medical attention, a report will typically need to be filed with the utility's workers' compensation insurer. Regulatory agencies (e.g., OSHA) also have reporting requirements.

Investigation and Documentation

A thorough investigation following an incident provides an excellent opportunity for the utility to demonstrate that it values its employees' well-being and is interested in preventing future incidents. Findings from the investigation should be used to reinforce good safety practices, develop control methods, eliminate hazards, and develop training. A properly implemented incident investigation process will promote continuous improvement and can reduce the recurrence of injuries and cost of claims.

As stated above, the investigation should begin immediately after an incident occurs. The injured employee's supervisor is typically the most familiar with the work being done and the work area; the supervisor should initiate the investigation and ensure that important evidence is not moved, lost, taken, or destroyed. The site investigation should establish how the incident was work-related and document information that cannot be preserved but will be needed to complete a formal incident report. The investigation should also include photographing the work area and equipment involved as well as interviewing witnesses.

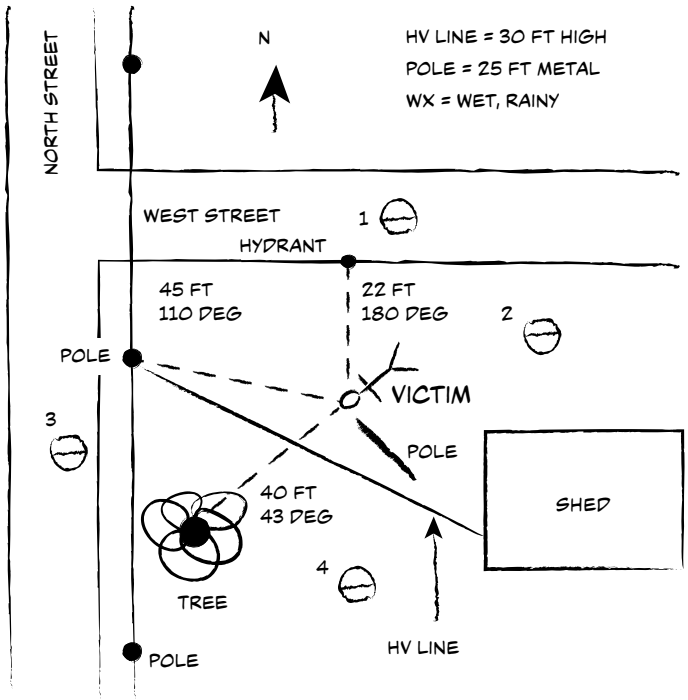
If the injury is minor (i.e., first aid only) and the cause is clear, the supervisor may be able to complete the investigation and report the findings quickly, with no need to contact outside authorities. If the injury is serious (i.e., requires medical attention) and/or the cause is unclear, a more thorough investigation will be needed. This investigation may involve employees, safety committee members, management staff, engineers, safety professionals, and insurance representatives. The site investigation should establish surface causes of the incident. Guidelines for conducting this investigation include the following:

- Record the time of day, location, and type of work being done at the scene.
- Use all of your senses and take note of your initial observations:
  - What is the condition of the equipment, tools, and other materials involved in the incident?
  - Are there skid marks, spills, stains?
  - Is there anything that seems irregular or out of place?
  - What are the weather conditions?
  - Is there excessive noise, light, or other distractions?
  - Who is on scene?
- Take photos. Some important points to remember:
  - Take photos at different angles.
  - Be sure to capture the entire scene and all equipment and witnesses.
  - Take notes on each photo. Identify the type of photo, date, time, location, subject, weather conditions, measurements, etc.
  - Place an item of known dimensions in the photo if hard-to-measure subjects are being photographed.
  - Identify the person taking the photos.
- If possible, videotape the scene. Video recordings can provide detail that photos may not be able to capture.

Documents
Document Sharing Hub

Copyright © 2022 American Water Works Association. All Rights Reserved.

Full document details: AWWA Manual M3 2022



Source: Adapted from OSHA

Figure 3-2 Triangulation method

- Take statements from witnesses and ask them to explain how the incident happened. Also, have them describe anything that was moved or otherwise disturbed before the investigation began.

Measure distances and positions of anything and everything you believe to be of any value to the investigation and make a diagram of the incident scene. Be precise when making diagram and make sure measurements are tied to permanent points. Other information that should be included on the diagram includes direction (N, S, E, W) and where people were located when the incident occurred.

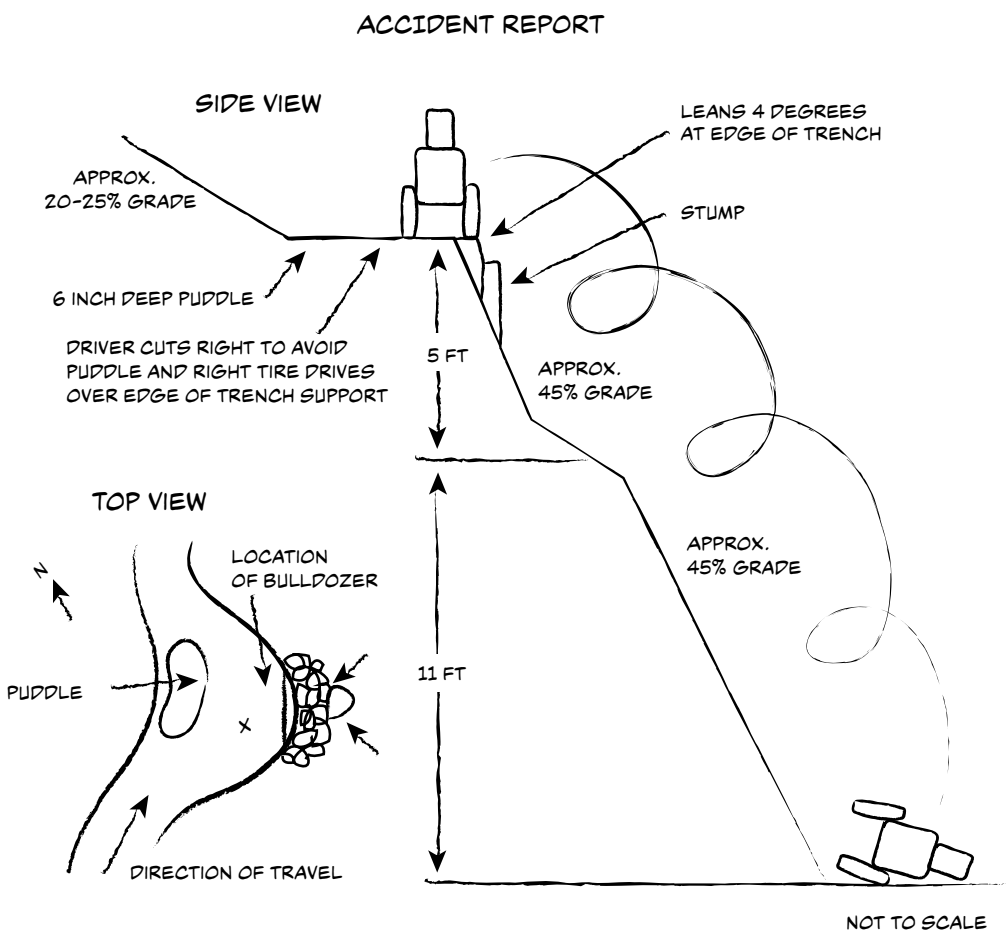
The diagram in Figure 3-2 illustrates the triangulation method, which makes it possible to later pinpoint the exact location of an object. In this incident, the victim contacted a high-voltage line with a metal tree-trimming pole. The position of the victim's head is measured from three points. Notice the small circles with horizontal lines through them. These circles indicate where photos were taken. Also, directional north is indicated, and all major objects are identified.

Figure 3-3 is another diagram that demonstrates a major advantage of illustrating an incident scene. It shows motion through time by diagraming how a bulldozer rolled down the side of a hill.

Root Cause Analysis

The initial and site investigations identify surface causes of the incident such as technical defects or employee error, but the investigation must not stop there. If it does, the opportunity to prevent similar incidents may be lost. Oregon OSHA fatality investigator Mike Riffe says it best: "Too often, finger pointing is used in incident investigations. If the employer's goal is to find out who did it, they will never get to prevention. They need to

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022



Source: Adapted from OSHA

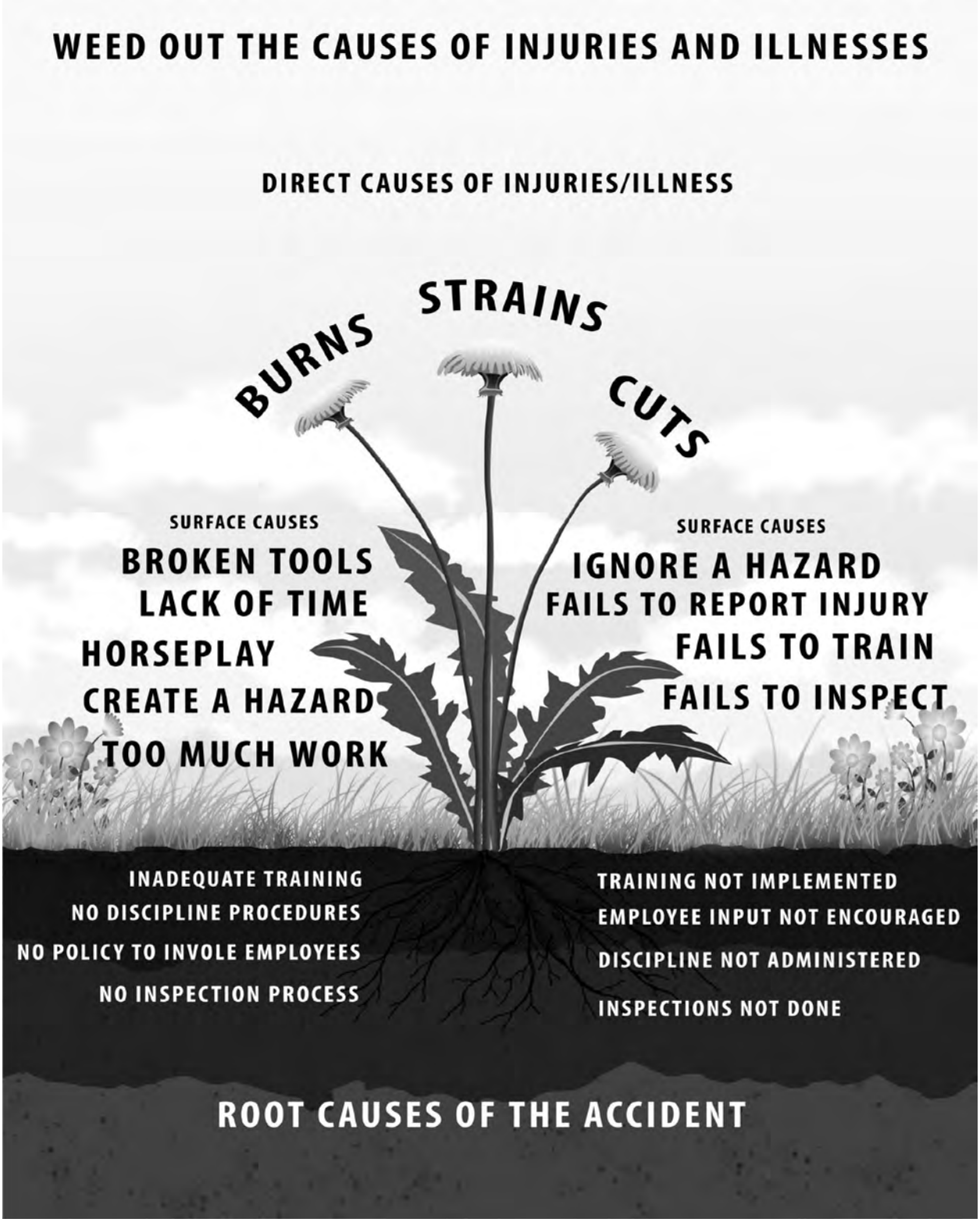
Figure 3-3 Sketching motion through time

ask, 'What went wrong?' and then look carefully for weaknesses or holes in their safety program and fix them to prevent future incidents" (Mesaros 2012).

When technical defects and employee error contribute to an incident, they are often linked to underlying safety system conditions that have created a hazardous situation and unsafe behaviors that are manifested in the surface causes of incidents. These underlying conditions are typically the root cause of the incident. The "incident weed" shown in Figure 3-4 is often used to illustrate the relationship between surface and root causes, and common examples of each are shown.

Many techniques are used to evaluate the root causes of incidents, but one of the most useful is the "5-Why" technique, which is relatively easy to use and requires no advanced statistical analysis or data collection. The technique follows a structured question-and-answer sequence that contains a feedback loop to the previous question. By asking enough times why an event happened, the technique is supposed to "peel away the layers of symptoms" associated with a problem. The process continues until another answer cannot be justified and the root cause is narrowed to the last question or answer set. An example of a question-and-answer sequence using this technique is as follows:

AWWA Manual M3
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022



Source: Oregon OSHA Instructors Manual: Accident and Incident Investigation

Figure 3-4 Incident weed and root cause analysis

Documents
Document Sharing Hub
Copyright © 2022 American Water Works Association. All Rights Reserved.
Full document details: AWWA Manual M3 2022