Standards, Regulations, and Codes

Occupational Safety and Health Administration Standards and Regulations

Backflow Prevention

2014 National Electric Code

Contractors are expected to have a working knowledge of pertinent standards, regulations, and codes. While they are too numerous to list here, especially when involving local codes, three general categories are outlined below: OSHA [Occupational Safety and Health Administration], backflow prevention, and National Electric Code (including minimum cover requirements for wiring).

Occupational Safety and Health Administration Standards and Regulations

Under the OSH Act, employers are responsible for providing a safe and healthful workplace. OSHA's mission is to assure safe and healthful workplaces by setting and enforcing standards and by providing training, outreach, education, and assistance. Employers must comply with all applicable OSHA standards. Employers must also comply with the General Duty Clause of the OSH Act, which requires employers to keep their workplace free of serious recognized hazards.

The complete law and regulations can be found at www.osha.gov/law-regs.html.

Note: This document is an excerpt of OSHA regulations that have particular importance to irrigation contracting. It is not comprehensive or complete, but it does provide information that is notable for those involved in the practice of constructing or building irrigation systems. For complete information visit the following website: www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=STANDARDS&p_toc_level=1&p_keyvalue=Construction.

Who OSHA Covers

Private Sector Workers

Most employees in the nation come under OSHA's jurisdiction. OSHA covers private sector employers and employees in all 50 states, the District of Columbia, and other U.S. jurisdictions either directly through Federal OSHA or through an OSHA-approved state program. State-run health and safety programs must be at least as effective as the Federal OSHA program. To find the contact information for the OSHA Federal or State Program office nearest you, see the Regional and Area Offices map.

State and Local Government Workers

Employees who work for state and local governments are not covered by Federal OSHA but have OSH Act protections if they work in a state that has an OSHA-approved state program. Four additional states and one U.S. territory have OSHA-approved plans that cover public sector employees only. This includes: Connecticut, Illinois, New Jersey, New York, and the Virgin Islands. Private sector workers in these four states and the Virgin Islands are covered by Federal OSHA.

Federal Government Workers

Federal agencies must have a safety and health program that meet the same standards as private employers. Although OSHA does not fine federal agencies, it does monitor federal agencies and responds to workers' complaints. The United States Postal Service [USPS] is covered by OSHA.

The following are not covered by the OSH Act:

- self-employed
- immediate family members of farm employers that do not employ outside employees
- workplace hazards regulated by another federal agency (e.g., the Mine Safety and Health Administration, the Federal Aviation Administration, the Coast Guard)

Workers' Rights Under the OSH Act

Workers are entitled to working conditions that do not pose a risk of serious harm. To help assure a safe and healthful workplace, OSHA also provides workers with the right to

- ask OSHA to inspect their workplace.
- use their rights under the law without retaliation and discrimination.
- receive information and training about hazards, methods to prevent harm, and the OSHA standards that apply to their workplace. The training must be in a language you can understand.
- get copies of test results done to find hazards in the workplace.
- review records of work-related injuries and illnesses.
- get copies of their medical records.

OSHA Standards: Protection on the Job

OSHA standards are rules that describe the methods that employers must use to protect their employees from hazards. There are OSHA standards for construction work, agriculture, maritime operations, and general industry, which are the standards that apply to most worksites. These standards limit the amount of hazardous chemicals workers can be exposed to, require the use of certain safe practices and equipment, and require employers to monitor hazards and keep records of workplace injuries and illnesses. Examples of OSHA standards include requirements to provide fall protection, prevent a trenching cave-in, prevent some infectious diseases, assure that workers safely enter confined spaces, prevent exposure to harmful substances like asbestos, put guards on machines, provide respirators or other safety equipment, and provide training for certain dangerous jobs.

Employers must also comply with the General Duty Clause of the OSH Act, which requires employers to keep their workplace free of serious recognized hazards. This clause is generally cited when no OSHA standard applies to the hazard.

Workers Can Ask OSHA to Inspect Their Workplace

Workers, or their representatives, may file a complaint and ask OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA standards. A worker can tell OSHA not to let their employer know who filed the complaint. **It is a violation of the Act for an employer to fire, demote, transfer, or discriminate in any way against a worker for filing a complaint or using other OSHA rights.**

A complaint can be filed online; download the form (also available in Spanish) and mail or fax it to the nearest OSHA office or call 800.321.OSHA (6742). Most complaints sent online may be resolved informally over the phone with the employer. Written complaints that are signed by a worker or their representative and submitted to the closest OSHA office are more likely to result in an on-site OSHA inspection.

When the OSHA inspector arrives, workers and their representatives have the right to

- go along on the inspection.
- talk privately with the OSHA inspector.
- take part in meetings with the inspector and the employer before and after the inspection is conducted.

Where there is no union or employee representative, the OSHA inspector must talk confidentially with a reasonable number of workers during the course of the investigation.

When an inspector finds violations of OSHA standards or serious hazards, OSHA may issue citations and fines. A citation includes methods an employer may use to fix a problem and the date by when the corrective actions must be completed. Workers only have the right to challenge the deadline for when a problem must be resolved. Employers, on the other hand, have the right to contest whether there is a violation or any other part of the citation. Workers or their representatives must notify OSHA that they want to be involved in the appeals process if the employer challenges a citation.

If you send in a complaint requesting an OSHA inspection, you have the right to find out the results of the OSHA inspection and request a review if OSHA decides not to issue citations.

Employer Responsibilities

Employers have the responsibility to provide a safe workplace. **Employers MUST provide their employees with a workplace that does not have serious hazards and follow all relevant OSHA safety and health standards.** Employers must find and correct safety and health problems. OSHA further requires employers to try to eliminate or reduce hazards first by making changes in working conditions rather than just relying on masks, gloves, ear plugs, or other types of personal protective equipment [PPE]. Switching to safer chemicals, enclosing processes to trap harmful fumes, or using ventilation systems to clean the air are examples of effective ways to get rid of or minimize risks.

Employers **MUST** also

- inform employees about hazards through training, labels, alarms, color-coded systems, chemical information sheets, and other methods.
- keep accurate records of work-related injuries and illnesses.
- perform tests in the workplace, such as air sampling required by some OSHA standards.
- provide hearing exams or other medical tests required by OSHA standards.
- post OSHA citations, injury and illness data, and the OSHA poster in the workplace where workers will see them.
- notify OSHA within 8 hours of a workplace incident in which there is a death or when three or more workers go to a hospital.
- not discriminate or retaliate against a worker for using their rights under the law.

Your Right to Report Injuries

As a worker in the United States, you have the right to report work-related injuries and illnesses.

Under OSHA law, your employer must develop a process for workers to report a workplace injury or illness and ensure that you are able to use this process. It is your employer's responsibility to guarantee that workplace practices do not discourage workers from reporting their injuries or illnesses.

If your employer does discriminate or retaliate against you for trying to report an injury or illness, you have the right to file a retaliation complaint with OSHA. You must file the complaint with OSHA within 30 days of the alleged reprisal.

You Cannot be Punished or Discriminated Against for Using Your OSHA Rights

The OSH Act protects workers who complain to their employer, OSHA, or other government agencies about unsafe or unhealthful working conditions in the workplace. You cannot be transferred, be denied a raise, have your hours reduced, be fired, or be punished in any other way because you used any right given to you under the OSH Act. Help is available from OSHA for whistleblowers.

If you have been punished or discriminated against for using your rights, you must file a complaint with OSHA within 30 days of the alleged reprisal for most complaints. No particular form is required to report the discrimination, but you may send a letter, call the OSHA Area Office nearest you, download and send a completed Notice of Whistleblower Complaint Form (OSHA 8-60.1), or file online using the Online Whistleblower Complaint Form.

What To Do If There Is a Dangerous Situation at Work

If you believe working conditions are unsafe or unhealthful, we recommend that you bring the conditions to your employer's attention, if possible.

You may file a complaint with OSHA concerning a hazardous working condition at any time. However, you should not leave the worksite merely because you have filed a complaint. If the condition clearly presents a risk of death or serious physical harm, there is not sufficient time for OSHA to inspect, and, where possible, you have brought the condition to the attention of your employer, you may have a legal right to refuse to work in a situation in which you would be exposed to the hazard.

The regulations or standards are divided into several categories:

- Part 1903 Inspections, Citations and Proposed Penalties
- Part 1904 Recording and Reporting Occupational Injuries and Illness
- Part 1926 Safety and Health Regulations for Construction

Note: There are additional parts, but these are of primary concern to those who do construction.

Part 1903 Inspections, Citations, and Proposed Penalties

1903 Purpose and Scope

The Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1590 et seq., 29 U.S.C. 651 et seq.) requires, in part, that every employer covered under the Act furnish to his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees. The Act also requires that employers comply with occupational safety and health standards promulgated under the Act, and that employees comply with standards, rules, regulations and orders issued under the Act which are applicable to their own actions and conduct. The Act authorizes the Department of Labor to conduct inspections and to issue citations and proposed penalties for alleged violations. The Act, under section 20(b), also authorizes the Secretary of Health, Education, and Welfare to conduct inspections and to question employers and employees in connection with research and other related activities. The Act contains provisions for adjudication of violations, periods prescribed for the abatement of violations, and proposed penalties by the Occupational Safety and Health Review Commission, if contested by an employer or by an employee or authorized representative of employees, and for judicial review. The purpose of this Part 1903 is to prescribe rules and to set forth general policies for enforcement of the inspection, citation, and proposed penalty provisions of the Act. In situations where this Part 1903 sets forth general enforcement policies rather than substantive or procedural rules, such policies may be modified in specific circumstances where the Secretary or his designee determines that an alternative course of action would better serve the objectives of the Act.

1903.7(a) Inspections and Citations

Subject to the provisions of §1903.3, inspections shall take place at such times and in such places of employment as the Area Director or the Compliance Safety and Health Officer may direct. At the beginning of an inspection, Compliance Safety and Health Officers shall present their credentials to the owner, operator, or agent in charge at the establishment; explain the nature and purpose of the inspection; and indicate generally the scope of the inspection and the records specified in §1903.3 which they wish to review. However, such designation of records shall not preclude access to additional records specified in §1903.3.

1903.7(b) Investigative Techniques

Compliance Safety and Health Officers shall have authority to take environmental samples and to take or obtain photographs related to the purpose of the inspection, employ other reasonable investigative techniques, and question privately any employer, owner, operator, agent or employee of an establishment. (See §1903.9 on trade secrets.) As used herein, the term employ other reasonable investigative techniques includes, but is not limited to, the use of devices to measure employee exposures and the attachment of personal sampling equipment such as dosimeters, pumps, badges and other similar devices to employees in order to monitor their exposures.

1903.7(c) Photography

In taking photographs and samples, Compliance Safety and Health Officers shall take reasonable precautions to insure that such actions with flash, spark-producing, or other equipment would not be hazardous. Compliance Safety and Health Officers shall comply with all employer safety and health rules and practices at the establishment being inspected, and they shall wear and use appropriate protective clothing and equipment.

1903.7(d) Disruption

The conduct of inspections shall be such as to preclude unreasonable disruption of the operations of the employer's establishment.

1903.7(e) Conclusion of Inspection

At the conclusion of an inspection, the Compliance Safety and Health Officer shall confer with the employer or his representative and informally advise him of any apparent safety or health violations disclosed by the inspection. During such conference, the employer shall be afforded an opportunity to bring to the attention of the Compliance Safety and Health Officer any pertinent information regarding conditions in the workplace.

Part 1904 Record Keeping and Reporting

1904.0 Purpose

The purpose of this rule (Part 1904) is to require employers to record and report work-related fatalities, injuries and illnesses.

Note to §1904.0: Recording or reporting a work-related injury, illness, or fatality does not mean that the employer or employee was at fault, that an OSHA rule has been violated, or that the employee is eligible for workers' compensation or other benefits.

1904.1 Partial Exemption for Employers with 10 or Fewer Employees

Basic Requirement

If your company had ten (10) or fewer employees at all times during the last calendar year, you do not need to keep OSHA injury and illness records unless OSHA or the BLS informs you in writing that you must keep records under §1904.41 or §1904.42. However, as required by §1904.39, all employers covered by the OSH Act must report to OSHA any workplace incident that results in a fatality or the hospitalization of three (3) or more employees.

If your company had more than ten (10) employees at any time during the last calendar year, you must keep OSHA injury and illness records unless your establishment is classified as a partially exempt industry under §1904.2.

1904.4 Recording Forms and Recording Criteria

Each employer required by this Part to keep records of fatalities, injuries, and illnesses must record each fatality, injury and illness that is work-related and is a new case.

A work-related injury or illness must be recorded if it results in one or more of the following:

- death
- days away from work
- restricted work or transfer to another job
- medical treatment beyond first aid
- loss of consciousness
- a significant injury or illness diagnosed by a physician or other licensed health care professional

How do I decide whether a particular injury or illness is recordable? The decision tree for recording work-related injuries and illnesses in figure C-1 shows the steps involved in making this determination.

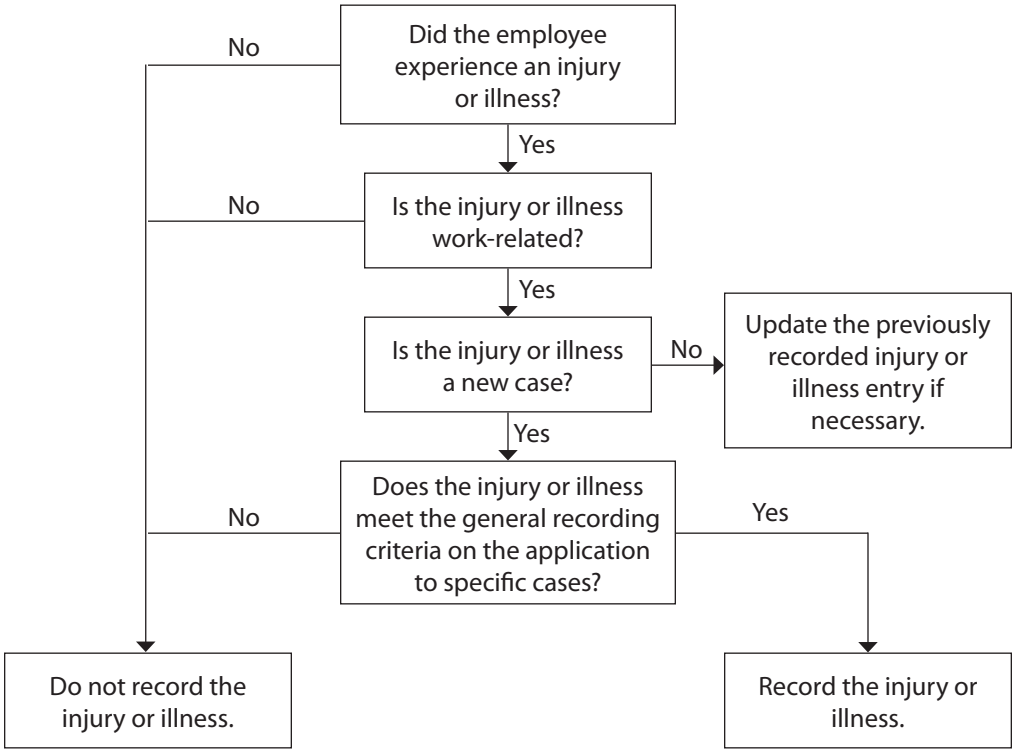

Figure C-1
Decision tree for recording work-related injures and illnesses

1904.29 Reporting Forms

Basic Requirement

You must use OSHA 300, 300-A, and 301 forms, or equivalent forms, for recordable injuries and illnesses. The OSHA 300 form is called the Log of Work-Related Injuries and Illnesses, the 300-A is the Summary of Work-Related Injuries and Illnesses, and the OSHA 301 form is called the Injury and Illness Incident Report.

Implementation

What do I need to do to complete the OSHA 300 Log? You must enter information about your business at the top of the OSHA 300 Log, enter a one- or two-line description for each recordable injury or illness, and summarize this information on the OSHA 300-A at the end of the year.

What do I need to do to complete the OSHA 301 Incident Report? You must complete an OSHA 301 Incident Report form, or an equivalent form, for each recordable injury or illness entered on the OSHA 300 Log.

How quickly must each injury or illness be recorded? You must enter each recordable injury or illness on the OSHA 300 Log and 301 Incident Report within seven (7) calendar days of receiving information that a recordable injury or illness has occurred.

May I keep my records on a computer? Yes, if the computer can produce equivalent forms when they are needed, as described under §1904.35 and §1904.40, you may keep your records using the computer system.

1904.32(a) Annual Summary

Basic Requirement

At the end of each calendar year, you must

- review the OSHA 300 Log to verify that the entries are complete and accurate, and correct any deficiencies identified.
- create an annual summary of injuries and illnesses recorded on the OSHA 300 Log.
- certify the summary.
- post the annual summary.

1904.39 Reporting Fatality, Injury and Illness Information to the Government

Basic Requirement

Within eight (8) hours after the death of any employee from a work-related incident or the in-patient hospitalization of three (3) or more employees as a result of a work-related incident, you must orally report the fatality/multiple hospitalization by telephone or in person to the Area Office of the Occupational Safety and Health Administration, U.S. Department of Labor, that is nearest to the site of the incident. You may also use the OSHA toll-free central telephone number, 800.321.OSHA (800.321.6742).

1904.40 Providing Records to Government Representatives

Basic Requirement

When an authorized government representative asks for the records you keep under Part 1904, you must provide copies of the records within four (4) business hours.

1904.44 Retention and Updating Old Forms

You must save your copies of the OSHA 200 and 101 forms for five (5) years following the year to which they relate and continue to provide access to the data as though these forms were the OSHA 300 and 301 forms. You are not required to update your old 200 and 101 forms.

Part 1926 Safety and Health Regulations for Construction

Standards

The standards prescribed in part 1926 of this chapter are adopted as occupational safety and health standards under section 6 of the Act and shall apply, according to the provisions thereof, to every employee and place of employment of every employee engaged in construction work. Each employer shall protect the employment and places of employment of each of his employees engaged in construction work by complying with the appropriate standards prescribed in this paragraph.

1926.1(a) Purpose and Scope

This part sets forth the safety and health standards promulgated by the Secretary of Labor under section 107 of the Contract Work Hours and Safety Standards Act. The standards are published in Subpart C of this part and following subparts.

1926.3(a) Inspections and Right of Entry

It shall be a condition of each contract which is subject to section 107 of the Contract Work Hours and Safety Standards Act that the Secretary of Labor or any authorized representative shall have a right of entry to any site of contract performance for the following purposes:

- to inspect or investigate the matter of compliance with the safety and health standards contained in Subpart C of this part and following subparts
- to carry out the duties of the Secretary under section 107(b) of the Act

1926.20(a) Contractor Requirements

Section 107 of the Act requires that it shall be a condition of each contract which is entered into under legislation subject to Reorganization Plan Number 14 of 1950 (64 Stat. 1267), as defined in 1926.12, and is for construction, alteration, and/or repair, including painting and decorating, that no contractor or subcontractor for any part of the contract work shall require any laborer or mechanic employed in the performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety.

Accident Prevention Responsibilities

- It shall be the responsibility of the employer to initiate and maintain such programs as may be necessary to comply with this part.
- Such programs shall provide for frequent and regular inspections of the job sites, materials, and equipment to be made by competent persons designated by the employers.
- The use of any machinery, tool, material, or equipment which is not in compliance with any applicable requirement of this part is prohibited. Such machine, tool, material, or equipment shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

- The employer shall permit only those employees qualified by training or experience to operate equipment and machinery.

Compliance Duties Owed to Each Employee

- ***Personal protective equipment:*** Standards in this part requiring the employer to provide personal protective equipment [PPE], including respirators and other types of PPE, because of hazards to employees impose a separate compliance duty with respect to each employee covered by the requirement. The employer must provide PPE to each employee required to use the PPE, and each failure to provide PPE to an employee may be considered a separate violation.
- ***Training:*** Standards in this part requiring training on hazards and related matters, such as standards requiring that employees receive training or that the employer train employees, provide training to employees, or institute or implement a training program, impose a separate compliance duty with respect to each employee covered by the requirement. The employer must train each affected employee in the manner required by the standard, and each failure to train an employee may be considered a separate violation.

1926.21 Safety Training and Education

General Requirements

The Secretary shall, pursuant to section 107(f) of the Act, establish and supervise programs for the education and training of employers and employees in the recognition, avoidance and prevention of unsafe conditions in employments covered by the act.

The employer should avail himself of the safety and health training programs the Secretary provides.

The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.

Employees required to handle or use poisons, caustics, and other harmful substances shall be instructed regarding the safe handling and use, and be made aware of the potential hazards, personal hygiene, and personal protective measures required.

In job site areas where harmful plants or animals are present, employees who may be exposed shall be instructed regarding the potential hazards, and how to avoid injury, and the first aid procedures to be used in the event of injury.

Employees required to handle or use flammable liquids, gases, or toxic materials shall be instructed in the safe handling and use of these materials and made aware of the specific requirements contained in Subparts D, F, and other applicable subparts of this part.

1926.23 First Aid and Medical Attention

First aid services and provisions for medical care shall be made available by the employer for every employee covered by these regulations. Regulations prescribing specific requirements for first aid, medical attention, and emergency facilities are contained in Subpart D of this part.

1926.24 Fire Protection and Prevention

The employer shall be responsible for the development and maintenance of an effective fire protection and prevention program at the job site throughout all phases of the construction, repair, alteration, or demolition work. The employer shall ensure the availability of the fire protection and suppression equipment required by Subpart F of this part.

1926.28 Personal Protective Equipment

The employer is responsible for requiring the wearing of appropriate personal protective equipment in all operations where there is an exposure to hazardous conditions or where this part indicates the need for using such equipment to reduce the hazards to the employees.

1926.405 Electrical, Wiring Methods, Components

General Requirements for Temporary Wiring

- Feeders shall originate in a distribution center. The conductors shall be run as multiconductor cord or cable assemblies or within raceways; or, where not subject to physical damage, they may be run as open conductors on insulators not more than ten (10) feet (3.05 m) apart.
- Branch circuits shall originate in a power outlet or panelboard. Conductors shall be run as multiconductor cord or cable assemblies or open conductors, or shall be run in raceways. All conductors shall be protected by overcurrent devices at their ampacity. Runs of open conductors shall be located where the conductors will not be subject to physical damage, and the conductors shall be fastened at intervals not exceeding ten (10) feet (3.05 m). No branch-circuit conductors shall be laid on the floor. Each branch circuit that supplies receptacles or fixed equipment shall contain a separate equipment grounding conductor if the branch circuit is run as open conductors.
- Receptacles shall be of the grounding type. Unless installed in a complete metallic raceway, each branch circuit shall contain a separate equipment grounding conductor, and all receptacles shall be electrically connected to the grounding conductor. Receptacles for uses other than temporary lighting shall not be installed on branch circuits which supply temporary lighting. Receptacles shall not be connected to the same ungrounded conductor of multiwire circuits which supply temporary lighting.
- Extension cord sets used with portable electric tools and appliances shall be of three-wire type and shall be designed for hard or extra-hard usage. Flexible cords used with temporary and portable lights shall be designed for hard or extra-hard usage.

1926.50 Medical Services and First Aid

- The employer shall insure the availability of medical personnel for advice and consultation on matters of occupational health.
- Provisions shall be made prior to commencement of the project for prompt medical attention in case of serious injury.
- In the absence of an infirmary, clinic, hospital, or physician, that is reasonably accessible in terms of time and distance to the worksite, which is available for the treatment of injured employees, a person who has a valid certificate in first-aid training from the U.S. Bureau of Mines, the American Red Cross, or equivalent training that can be verified by documentary evidence, shall be available at the worksite to render first aid.

First aid supplies shall be easily accessible when required:

- The contents of the first aid kit shall be placed in a weatherproof container with individual sealed packages for each type of item, and shall be checked by the employer before being sent out on each job and at least weekly on each job to ensure that the expended items are replaced.
- Proper equipment for prompt transportation of the injured person to a physician or hospital, or a communication system for contacting necessary ambulance service, shall be provided.
- In areas where 911 is not available, the telephone numbers of the physicians, hospitals, or ambulances shall be conspicuously posted.
- Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

Sanitation

Potable Water

- An adequate supply of potable water shall be provided in all places of employment.
- Portable containers used to dispense drinking water shall be capable of being tightly closed and equipped with a tap. Water shall not be dipped from containers.
- Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purpose.
- The common drinking cup is prohibited.
- Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.
- Potable water means water that meets the standards for drinking purposes of the State or local authority having jurisdiction, or water that meets the quality standards prescribed by the U.S. Environmental Protection Agency's National Primary Drinking Water Regulations (40 CFR part 141).

Toilets at Construction Job Sites
Toilets shall be provided for employees according to table C-1.

Table C-1
Toilets at construction job sites

Number of employees	Number of toilets
20 or less	1
20 or more	1 toilet seat and 1 urinal per 40 workers
200 or more	1 toilet seat and 1 urinal per 50 workers

- Under temporary field conditions, provisions shall be made to assure not less than one toilet facility is available.
- Job sites, not provided with a sanitary sewer, shall be provided with one of the following toilet facilities unless prohibited by local codes:
  - privies (where their use will not contaminate ground or surface water)
  - chemical toilets
  - recirculating toilets
  - combustion toilets

The requirements of this paragraph (c) for sanitation facilities shall not apply to mobile crews having transportation readily available to nearby toilet facilities.

Washing Facilities
The employer shall provide adequate washing facilities for employees engaged in the application of paints, coating, herbicides, or insecticides, or in other operations where contaminants may be harmful to the employees. Such facilities shall be in or near proximity to the worksite and shall be so equipped as to enable employees to remove such substances.

Washing facilities shall be maintained in a sanitary condition.

Lavatories
- Lavatories shall be made available in all places of employment. The requirements of this subdivision do not apply to mobile crews or to normally unattended work locations if employees working at these locations have transportation readily available to nearby washing facilities which meet the other requirements of this paragraph.
- Each lavatory shall be provided with hot and cold running water, or tepid running water.
- Hand soap or similar cleansing agents shall be provided.
- Individual hand towels or sections thereof, of cloth or paper, air blowers or clean individual sections of continuous cloth toweling, convenient to the lavatories, shall be provided.

1926.52 Occupational Noise Exposure

Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in table C-2 of this section when measured on the A-scale of a standard sound level meter at slow response.

When employees are subjected to sound levels exceeding those listed in table C-2 of this section, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of the table, personal protective equipment as required in Subpart E, shall be provided and used to reduce sound levels within the levels of the table.

If the variations in noise level involve maxima at intervals of 1 second or less, it is to be considered continuous.

In all cases where the sound levels exceed the values shown herein, a continuing, effective hearing conservation program shall be administered.

Table C-2
Permissible noise exposures

Duration/day {h}	Sound level, dBA slow response
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

1926.95 Criteria for Personal Protective Equipment

Application

Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

Employee-Owned Equipment

Where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

Design

All personal protective equipment shall be of safe design and construction for the work to be performed.

Payment for Protective Equipment

- Except as provided by paragraphs (d)(2) through (d)(6) of this section, the protective equipment, including personal protective equipment [PPE], used to comply with this part, shall be provided by the employer at no cost to employees.
- The employer is not required to pay for nonspecialty safety-toe protective footwear (including steel-toe shoes or steel-toe boots) and nonspecialty prescription safety eyewear, provided that the employer permits such items to be worn off the job site.
- When the employer provides metatarsal guards and allows the employee, at his or her request, to use shoes or boots with built-in metatarsal protection, the employer is not required to reimburse the employee for the shoes or boots.

The employer is not required to pay for

- everyday clothing, such as long-sleeve shirts, long pants, street shoes, and normal work boots.
- ordinary clothing, skin creams, or other items, used solely for protection from weather, such as winter coats, jackets, gloves, parkas, rubber boots, hats, raincoats, ordinary sunglasses, and sunscreen.

The employer must pay for replacement PPE, except when the employee has lost or intentionally damaged the PPE.

Where an employee provides adequate protective equipment he or she owns pursuant to paragraph (b) of this section, the employer may allow the employee to use it and is not required to reimburse the employee for that equipment. The employer shall not require an employee to provide or pay for his or her own PPE, unless the PPE is excepted by paragraphs (d)(2) through (d)(5) of this section.

1926.300 Tools – Hand and Power

Condition of Tools

All hand and power tools and similar equipment, whether furnished by the employer or the employee, shall be maintained in a safe condition.

When power-operated tools are designed to accommodate guards, they shall be equipped with such guards when in use.

Employers shall not issue or permit the use of unsafe hand tools:

- Wrenches, including adjustable, pipe, end, and socket wrenches shall not be used when jaws are sprung to the point that slippage occurs.
- Impact tools, such as drift pins, wedges, and chisels, shall be kept free of mushroomed heads.
- The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool.

Electric Power-Operated Tools

- Electric power-operated tools shall either be of the approved double-insulated type or grounded in accordance with Subpart K of this part.
- The use of electric cords for hoisting or lowering tools shall not be permitted.

Pneumatic Power Tools

- Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.
- Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
- All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than 100 psi pressure at the tool shall have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.
- Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment which meets the requirements of Subpart E of this part. The 30 psi requirement does not apply for concrete form, mill scale and similar cleaning purposes.
- The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded,
- The use of hoses for hoisting or lowering tools shall not be permitted.
- All hoses exceeding ½-inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.
- "Abrasive blast cleaning nozzles" — The blast cleaning nozzles shall be equipped with an operating valve which must be held open manually. A support shall be provided on which the nozzle may be mounted when it is not in use.

Fuel-Powered Tools

- All fuel-powered tools shall be stopped while being refueled, serviced, or maintained, and fuel shall be transported, handled, and stored in accordance with Subpart F of this part.
- When fuel-powered tools are used in enclosed spaces, the applicable requirements for concentrations of toxic gases and use of personal protective equipment, as outlined in Subparts D and E of this part, shall apply.

Hydraulic Power Tools

- The fluid used in hydraulic-powered tools shall be fire-resistant fluids approved under Schedule 30 of the U.S. Bureau of Mines, Department of the Interior, and shall retain its operating characteristics at the most extreme temperatures to which it will be exposed.
- The manufacturer's safe operating pressures for hoses, valves, pipes, filters, and other fittings shall not be exceeded.

Powder-Actuated Tools

- Only employees who have been trained in the operation of the particular tool in use shall be allowed to operate a powder-actuated tool.
- The tool shall be tested each day before loading to see that safety devices are in proper working condition. The method of testing shall be in accordance with the manufacturer's recommended procedure.
- Any tool found not in proper working order, or that develops a defect during use, shall be immediately removed from service and not used until properly repaired.
- Personal protective equipment shall be in accordance with Subpart E of this part.
- Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any employees. Hands shall be kept clear of the open barrel end.
- Loaded tools shall not be left unattended.
- Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick, or hollow tile.

1926.650 Excavations

Scope and Application

This subpart applies to all open excavations made in the earth's surface. Excavations are defined to include trenches.

Surface encumbrances. All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.

Underground Installations

- The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.
- Utility companies or owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.
- Means of egress from trench excavations: a stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are four (4) feet (1.22 m) or more in depth so as to require no more than twenty-five (25) feet (7.62 m) of lateral travel for employees.

1926.652 Requirements for Protective Systems

Protection of Employees in Excavations

- Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with paragraph (b) or (c) of this section except when
  - excavations are made entirely in stable rock.
  - excavations are less than five (5) feet (1.52 m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.
  - protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

Details about Soil Classification

www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10931

Sloping and Benching

www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10932

Figure C-2 is a graphic summary of the requirements contained in subpart P for excavations twenty (20) feet or less in depth. Protective systems for use in excavations more than twenty (20) feet in depth must be designed by a registered professional engineer in accordance with 1926.652(b) and (c).

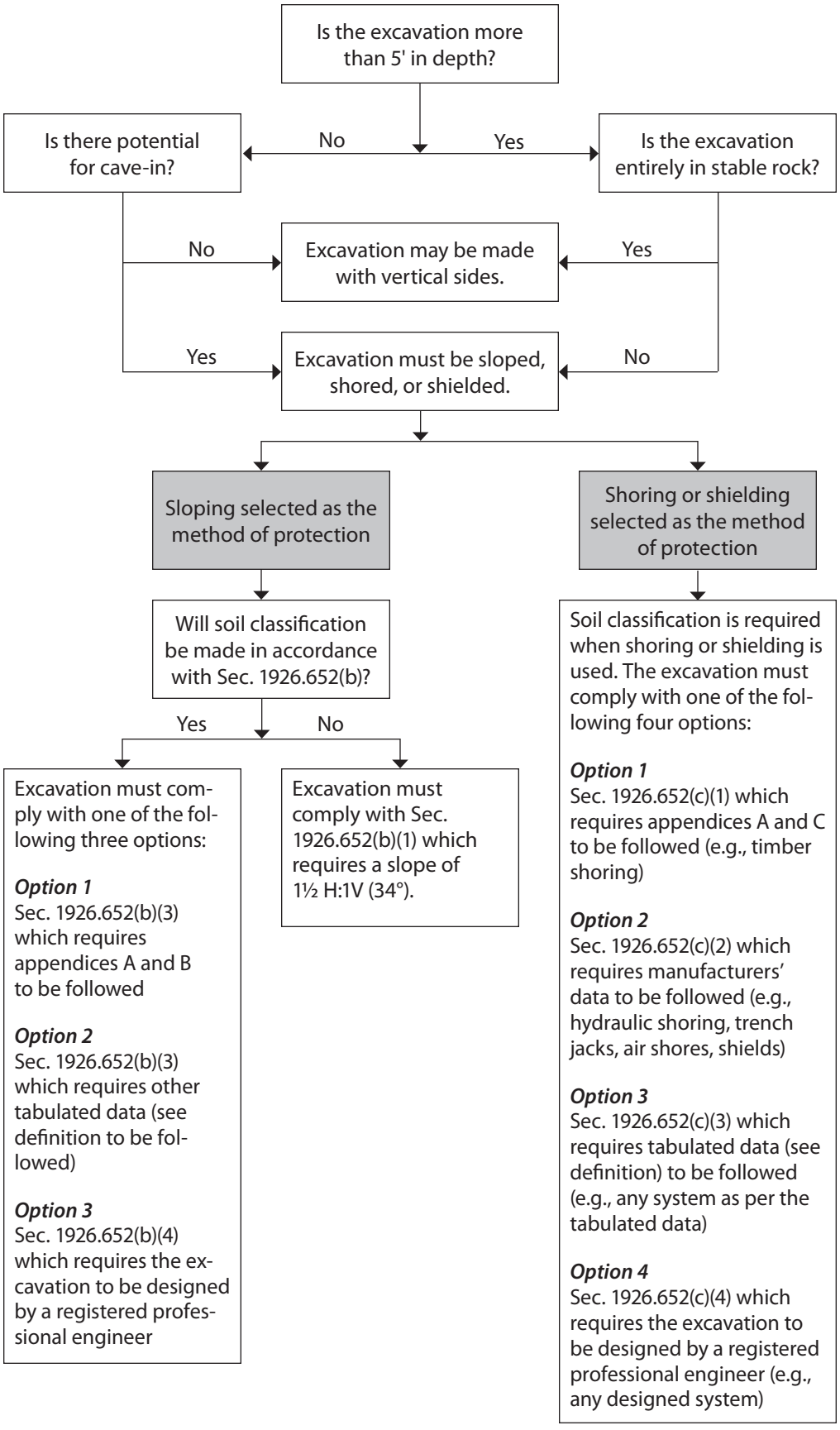

Figure C-2
Sloping, shoring, and shielding options

Backflow Prevention

The connection of the irrigation system to a potable water supply must comply with plumbing codes that have provisions stating what type of backflow prevention is required to protect the potable water supply. Each state has a plumbing code that it has adopted from one of the model codes, modified one of the model codes, or has written their own plumbing code to meet their unique requirements. The most commonly used or referenced plumbing codes are: International Plumbing Code [IPC] written by the International Code Council, the Universal Plumbing Code [UPC] written by the International Association of Plumbing and Mechanical Officials, or the National Standard Plumbing Code, which is published by the National Association of Plumbing-Heating-Cooling Contractors. A list of each state and which plumbing code is being used can be found at www.tests.com/State-Plumbing-Codes-License.

Irrigation contractors should understand the plumbing code being used in the jurisdiction where the irrigation system is being installed. For the purposes of this document "the plumbing code" will be used as a generic term applicable to all specific plumbing codes.

The plumbing code has specific requirements for the type of backflow prevention device/assembly that can be used for landscape irrigation systems. Generally speaking, backflow prevention assembly can be tested for proper operation and function while a backflow prevention device cannot be tested. Frequently the two terms "device" and "assembly" are used interchangeably. The term backflow preventer will be used in this discussion and could be either an assembly or a device.

A backflow preventer is used on all irrigation systems that are connected to a domestic or potable water supply. The backflow preventer is used to mitigate two possible hydraulic conditions: backpressure and/or backsiphonage. These two conditions can occur if there is a sudden drop in pressure or water volume within the public water distribution system and can cause backflow of water from the irrigation piping into the public water distribution system. A backflow event is usually associated with contamination or pollution of the potable water supply.

The degree of hazard also is used to determine the type of backflow preventer needed for a particular application. Low-hazard is when the potable supply might be polluted if backflow were to occur. Contamination is considered high-hazard when the backflow water might also contain industrial fluids or sewage that could carry disease, would impair water quality, and creates an actual hazard to public health. Because chemicals and fertilizers are used on lawns, there is potential for the chemicals to be introduced into the water supply and contaminate it. In most jurisdictions, lawn sprinklers are considered a high hazard.

Table C-3 shows which type of backflow preventer should be used based upon the type of backflow condition and degree of hazard. In freezing climates, backflow prevention devices and assemblies should be protected by an insulated or heated enclosure or by removal and storage in a heated environment. Removal requires the installation of unions.

Table C-3
Backflow prevention requirements per plumbing code

Device or assembly	Degree of hazard				Installation	Clearances
	Pollution low-hazard		Contamination high-hazard			
	Back-siphonage	Back-pressure	Back-siphonage	Back-pressure		
Atmospheric vacuum breaker [AVB]	X		X		Upright position. No downstream valve. Not testable. Maximum of 12 h operating pressure in 24-h period.	6 in. above downstream piping
Pressure vacuum breaker [PVB]	X		X		Upright position. May have downstream valves. Testable.	12 in. above downstream piping. May discharge water.
Reduced pressure principle backflow preventer [RP, RPZ, RPA]	X	X	X	X	Horizontal unless listed otherwise. Testable.	12 in. minimum clearance at bottom for maintenance. May discharge water.
Double-check valve assembly [DCV]	X	X			Horizontal unless listed otherwise. Testable.	12 in. minimum clearance at bottom for maintenance. Does not discharge water.

In many jurisdictions only reduced pressure principle backflow assemblies are allowed on irrigation systems. If there is a pump or chemigation/fertigation equipment being used, a reduced pressure principle assembly will be required.

Double-check valve assembly is shown on the table but can only be used in low-hazard conditions. Most jurisdictions list lawn sprinklers as high hazard.

All testable devices must have sufficient clearance to allow testing. The plumbing codes state that they should be tested after installation and annually thereafter or as required by the authority having jurisdiction. Testers must be certified.

2014 National Electrical Code

The following is originally published as NFPA 70 by National Fire Protection Association. This section includes an overview of key sections that impact landscape irrigation systems for the wiring of remote control valves to a controller.

Chapter 3 – Wiring Methods and Materials

300.2 Limitations

(A) Voltage. Methods discussed in chapter 3 shall be used for 1,000 volts or less.

300.3 Conductors

(B) Conductors of the same circuit shall be contained in the same trench.

300.5 Underground Installations

(A) Minimum cover requirements as per table 300.5.
(B) Wet locations. Any connections or splices in an underground installation shall be approved for wet locations.
(F) Backfill. Where necessary to prevent physical damage to the raceway or cable, backfill that contains large rocks, paving materials, cinders or sharply angular substances or corrosive material shall not be placed where the cable could be damaged.
(J) Earth Movement. Where direct-buried conductors are subject to movement by settlement or frost, conductor shall be arranged so as to prevent damage.

340 Underground Feeder, Type UF

340.2 Definition

Underground Feeder shall be a factory assembly of one or more insulated conductors with an integral or an overall covering of nonmetallic material suitable for direct burial in the earth.

340.10 Uses Permitted

Type UF shall be permitted as follows:
(1) for use underground
(3) for wiring in wet, dry, or corrosive locations

340.12 Uses Not Permitted

Many interior commercial applications
(8) embedded in concrete
(9) where exposed to direct sunlight unless identified as sunlight resistant
(10) where subject to physical damage

340.24 Bending Radius

Bends in Type UF shall be made so the cable is not damaged. The radius of the inner curve shall not be less than five times the diameter of the cable.

352 Rigid Polyvinyl Chloride Conduit: Type PVC

(F) Exposed. PVC conduit shall be permitted for exposed work. PVC Conduit Type Schedule 80 is identified for areas of physical damage.

352.20 Size

Minimum size is trade size ½-inch and maximum size is 6-inch.

352.6 Bends

The number of bends in one run shall not be more than four quarter bends (360 degrees total) between pull points such as conduit boxes.

Article 725 Class 1, 2 or 3 Remote-Control, Signaling, and Power-Limited Circuits

Provisions in 725 can supersede those listed in chapters 1–4.

725.1 Scope

This section covers remote-control, signaling, and power-limited circuits that are not an integral part of a device or appliance. These circuits are characterized by usage and electrical power limitations that differentiate them from electric light and power circuits.

725.24 Mechanical Execution of Work

Class 1, Class 2, and Class 3 circuits shall be installed in a neat and workmanlike manner.

725.121 Class 2 and Class 3 Circuits

(A) Power Source Requirements
1) A listed Class 2 or Class 3 transformer
2) A listed Class 2 or Class 3 power supply

(B) Interconnection of power sources
Class 2 or Class 3 power sources shall not have the output connections paralleled or otherwise interconnected unless listed for such interconnection.

725.179 Listing Requirements

(G) Cables for Class 2 circuits shall have a voltage rating of not less than 150 volts. Class 3 cables shall have a voltage rating of not less than 300 volts.
(H) Class 3 Single Conductors. Single conductors shall not be less than 18 AWG and shall be Type CL3.

Note: Article 675 covers the requirements for Electrically Driven or Controlled Irrigation Machines.

	Type of wiring method or circuit				
Location of wiring method	**Direct-burial cables or conductors {in.}**	**Rigid metal conduit or intermediate metal conduit {in.}**	**Nonmetallic raceways listed for direct-burial without concrete encasement {in.}**	**Residential branch circuits rated 120V or less with GFCI protection and maximum overcurrent protections of 20 amps {in.}**	**Circuits for control of irrigation and landscape lighting limited to not more than 30V and installed with Type UF or in other identified cable or raceway {in.}**
All locations not specified below	24	6	18	12	6
In trench below 2-in. thick concrete	18	6	12	6	6
Under a building	0 in raceway	0	0	0 in raceway	0 in raceway
Under 4-in. thick concrete exterior slab, no vehicular traffic	18	4	4	6 in direct-burial 4 in raceway	6 in direct-burial 4 in raceway
Under streets, highways, roads, driveways, parking lots	24	24	24	24	24
One- and two-family dwelling driveways and outdoor parking	18	18	18	12	18
Under airport runways and adjacent areas where trespassing prohibited	18	18	18	18	18

Note: Cover is defined as the shortest distance in inches measured between a point on the top surface of any direct-buried conductor, cable, conduit, or other raceway and the top of surface of finished grade, concrete, or similar cover.

Table C-4
Minimum cover requirements for wiring methods, 0–1,000 volts (Table 300.5 in 2014 National Electrical Code)