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## EQUIPMENT DEPLOYMENT SAFETY GUIDELINES

### Making sense of Codes, Standards, and Approvals

#### 1. INTRODUCTION

Safe practices in the production, construction, deployment, and operation of various equipment and structures are an essential part of modern society. Most, if not all commercially available equipment and appliances are covered by codes and standards applicable to their design, fabrication, installation, and operation. But where does this all come from, how are codes and standards managed and applied, and how is safe operation assured? And why is this so confusing? Well, you are not alone. This guide provides an overview of safety assurance, increases your understanding of safety practices, and empowers you to ask the right questions of involved parties. Although these guidelines are generic in nature they apply to a wide variety of equipment, from consumer appliances to electrical building systems and industrial equipment, plumbing, fueling, compressed gases, explosive hazards, etc.

#### 2. ELEMENTS OF SAFETY

Safety systems typically consist of five major elements, each unique to the particular type and technology of equipment. The five elements are:

- a. Approval
- b. Codes
- c. Standards/Guidelines
- d. Certifications/Testing
- e. Listing/Marking

Each element plays a critical role in the safety assurance process and is handled by separate constituencies to assure overall integrity and robustness of the process. Reputable equipment manufacturers are knowledgeable in all five elements.

#### 3. APPROVALS

All approvals are at the discretion of the local Authority Having Jurisdiction, or AHJ, which are typically municipal government departments charged with upholding their community standards. AHJ's are the legal entity charged with regulating properties within a community. Examples of AHJ's are fire departments, bridge and tunnel authorities, building permitting and inspection offices, and licensing boards. AHJ's are free to adopt, adapt, and apply any published code, standard, or guideline for the equipment in question. They are also free to accept or reject any certification or test procedure, or to simply define their own required testing. AHJ's have the ultimate approval power. Fortunately, there exist many accepted codes, standards, and certification procedures covering a wide variety of equipment which are consistently adopted by AHJ's. But it is common for an AHJ to require more stringent requirements than a particular code specifies and to require specific testing

procedures or certification bodies. It pays to understand the specific requirements of the AHJ before setting out on any project.

#### 4. CODES

Codes are published documents, revised and updated from time to time, that specify the design construction, installation, and operation of equipment, facilities, and systems, that are important to establish safe practices. Codes are typically written by subject matter experts under the sponsorship of governments or industry groups. Examples of code writing bodies are:

- a. Federal and Local Governments
  - i. OSHA (Occupational Safety and Health Administration)
  - ii. FERC (Federal Energy Regulatory Commission)
  - iii. FAA (Federal Aviation Administration)
  - iv. California Fire Code
- b. Industry Groups
  - i. NFPA (National Fire Protection Association, [NFPA](#))
    - a) NEC (National Electric Code)
  - ii. ICC (International Code Council, [iccsafe.org](http://iccsafe.org))
    - a) IFC (International Fire Code)
    - b) IBC (International Building Code)
    - c) IRC (International Residential Code)

The NFPA and ICC are referred to as model codes and are typically adopted by law or ordinance to establish enforceable requirements used by a jurisdiction in permitting, inspections, and legal actions to ensure that provisions of the code are met.

#### 5. STANDARDS AND GUIDELINES

Codes invariably contain references to other standards, guidelines, and recommended practices developed by trade associations, industry groups, or manufacturers. Standards, guidelines, and recommended practices help the code user better understand a subject, but they do not establish requirements. Examples of Industry groups that publish useful Standards and Guidelines are:

- a. ASME (American Society of Mechanical Engineers)
- b. SAE (Society of Automotive Engineers)
- c. IEEE (Institute of Electrical and Electronic Engineers)
- d. NEMA (National Electric Manufacturers Association)
- e. NIST (National Institute of Standards and Technology)

Typically, standards will specify design minimum and maximum values, construction and assembly practices, operating ranges, materials selection, and various other considerations. Many standards and guidelines will also outline testing procedures and limits that inform independent testing and certification bodies.



## 6. CERTIFICATION AND TESTING

Testing of equipment is required to prove compliance with codes and standards. Testing can occur as part of an individual site commissioning process prior to being placed into service, but more than likely key pieces of equipment will be tested for compliance prior to shipping to a customer site. Testing can be performed by the manufacturer or by an OSHA certified NRTL (Nationally Recognized Test Laboratory, [OSHA's Nationally Recognized Testing Laboratory \(NRTL\)](#)), but in all cases test data must be reviewed and accepted by an NRTL.

Once data test data demonstrating compliance with codes and standards is reviewed and accepted, the NRTL will issue a certificate of compliance attesting that equipment is fit for the purpose. Certification is usually limited to statements that the test data demonstrates compliance or is consistent with published codes and standards reference by the certificate.

AHJ's may demand to inspect test and certification data as part of their approval process. Additionally, AHJ's will require equipment to be listed and labelled as compliant.

## 7. LISTING AND LABELLING

Equipment listing and labelling is an additional service provided by NRTLs that are themselves regulated and overseen by OSHA. This oversight assures the AHJ of their trustworthiness and reliance for equipment safety. The most widely recognized of these is Underwriters Laboratories (UL) and their ubiquitous UL™ service mark found on most consumer goods.

Equipment that is listed by an NRTL has been thoroughly tested and certified as compliant to applicable codes. The NRTL will maintain a file for that equipment containing all pertinent testing data and conditions, the method and place of testing, testing dates, and periodic recertifications. These files usually contain manufacturer proprietary information and are generally only available for inspection at the request of an AHJ under appropriate Non-Disclosure Agreements.

OSHA recognized NRTLs will also maintain a service or trademark that is licensed to the equipment manufacturer and may be applied as a label on their equipment. The presence of a recognized service mark on equipment is usually a minimum requirement for acceptance by an AHJ. For example, a building inspector will look for UL™ marking on circuit breakers installed in the electric power distribution system as a condition of issuing a certificate of occupancy.