

# Door Dealer Accreditation

## Section 5

### Commercial Rolling and Rolling Steel Fire Door Technical Essentials



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# Acknowledgements

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## Section One

# Introduction

This study guide has been created by the Institute of Door Dealer Education and Accreditation (IDEA) as part of its goal to establish the door systems industry as a profession, and to recognize the skilled individuals who work within the industry as professional technicians. This is the fundamental objective of the IDEA Accreditation and Certification programs, and all other professional designation courses offered by IDEA.

Although it is intended that all students will learn some valuable new concepts in studying the curriculum, it is essential that each student begin the process with a broad base of knowledge and experience in the technical aspects of rolling door systems' products and accessories.

*A professional can be defined as one possessing a high degree of skill or expertise.* Individuals trained and experienced in installing, servicing, or repairing rolling doors, operators, and accessories meet that definition. Most people engaged in the door systems industry on a full-time basis would agree that they should be viewed as professionals. However, it is just as important that end users and the general public share that view.

Professionalism goes beyond the pure technical knowledge of an industry's practitioners. Professionals bring additional qualities to the industry, such as customer relations, safe work practices, leadership among colleagues, communication skills, and a comprehensive understanding of the industry and the organizations that support it.

## History of Rolling Doors

Providing cover, security, and protection from the elements has been central to human shelter since prehistoric times. Early humans used animal hides to shield cave openings, and later civilizations crafted doors from wood and other available materials to secure dwellings and control access. These basic functions - protection, access, and security - remain fundamental to human existence.

As societies evolved from barter economies into organized commerce, the need for practical and economical access solutions grew. The Industrial Revolution accelerated this shift, transforming rural lifestyles into urban industrial centers. In these environments, rolling doors emerged as an effective way to secure and access commercial facilities. However, their cost and installation requirements, particularly headroom and structural clearance, limited their use primarily to commercial buildings.

The formation of a dedicated industry for door and access systems is a relatively recent development. In early modern history, commercial doors were typically swinging or sliding. Swing doors, often made of wood, were crafted in various styles to suit architectural needs and could be built onsite by carpenters. This simplicity made them the standard for centuries.

By the early 20th century, swing doors were increasingly seen as cumbersome. They sagged over time, required frequent trimming, and performed poorly in snowy conditions. These limitations drove innovation. In 1895, Kinnear Manufacturing Company founded in Columbus, Ohio became the first company to produce interlocking slat rolling steel doors. These doors addressed many of the

shortcomings of swing doors and laid the foundation for the rolling door industry.

As rolling doors gained popularity, more manufacturers entered the market, introducing new materials, improved installation techniques, and enhanced aesthetics. Early installing dealers faced a limited market, as buildings needed to evolve to accommodate this new style and existing doors had to reach the end of their service life. Over time, demand grew, and more dealers entered the field. Today, rolling doors remain a key part of the commercial market, alongside sectional and specialty doors designed for diverse applications.

This growth has led to increased product complexity and specialization. Skilled technicians are now essential to install, service, and troubleshoot modern door systems. The industry has expanded globally, with manufacturers, suppliers, and vendors supporting a wide range of components, from weatherstripping and springs to windows and electrical operators. As demand continues to rise, so does the variety of styles, applications, and technologies.

This study guide focuses on the rolling door segment of the commercial market, highlighting the skills and knowledge required to work effectively within this specialized field.

## Importance of Fire Walls and Fire Doors

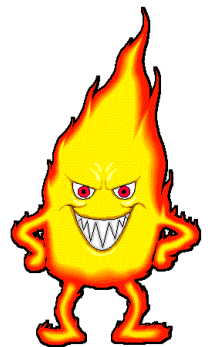
One of the basic principles of firefighting is confinement. By establishing compartments, the damage caused by a fire can be minimized, but in order to do this, the entire building must be taken into account.



Containment begins with the walls, ceilings, and floors surrounding the space where a fire may start. Building codes specify the degree of fire protection required by these building

components in accordance with the degree of hazard represented by the occupancy, the type of building construction, and the function served. Standard fire tests were developed for judging the fire resistance of various building materials, combinations of building materials, and structural assemblies. Based on these tests, the concept of a firewall was born. But when was the last time that you saw a wall or an entire building without any openings in it? What good is the wall if there are unprotected openings that will allow the passage of fire and hot gases? This led to the next level of containment: the protection of openings.

While firewalls and fire doors serve a number of functions, the primary function is to act as a fire barrier and to protect openings and enclosures against the spread of fire and hot gases within buildings or from an external source. This is accomplished by using specific products that have been designed, tested, and manufactured for this primary purpose.



As a result, standard fire tests were developed to rate and evaluate products based on their ability to:

1. Prevent the passage of heat, flames, hot gases, and burning projectiles.
2. Maintain their ability to support anticipated loads.
3. Resist temperature transmission through the assembly (applies to firewalls only).
4. Withstand the impact and erosion effects of debris.

Firewalls and fire doors are found in all types of industrial, commercial, and institutional applications. Additionally, fire doors can be utilized in certain residential applications, such as in row housing developments. They are an integral component in the overall fire protection plan of a facility. They are used to separate buildings into smaller compartments which help control the spread of fire and limit the fire area. They are counted on to act as a physical

barrier and to help prevent the total destruction of facilities and loss of life when all other means of fire protection are exhausted.

In addition to serving as fire barriers, fire doors allow for vehicular, conveyor, and foot traffic through wall openings that are not a required means of egress. The ability of a fire door to function as a fire barrier is highly dependent on its reliability to close automatically upon activation from a detection device. The effectiveness of the entire assembly could be compromised if any component is omitted, improperly installed, improperly maintained, or replaced by one of substandard quality.

Fire doors are an important component in the fire protection plan of a facility. When properly installed, maintained, and regularly tested, they have demonstrated significantly improved performance compared to fire doors that have not received this attention. This plays a critical role in their ability to protect lives and property when a fire occurs.

## Industry Organizations

The door and operator industry is supported by numerous organizations that shape standards, education, safety practices, and professional development. Each organization plays a distinct role in how products are designed, manufactured, installed, and maintained. The following section outlines the major organizations that influence the industry and the functions they serve.

**Door & Access Systems Manufacturers' Association (DASMA)** is North America's leading trade association of manufacturers of garage doors, rolling doors, high performance doors, garage door operators, vehicular gate operators, and access control products. Formed in 1996, DASMA member companies manufacture products sold in the United States, Canada and more than 70 other countries worldwide. DASMA members represent approximately 95 percent of the US market for the door and access systems industry.



[dasma.com](http://dasma.com)

**International Door Association (IDA)**, the industry's authoritative voice to dealers, was formed in 1995 with the consolidation of the Door & Operator Dealers Association and the Far West Garage Door Association. IDA is the industry network for professional door and operator dealers and installers, along with their suppliers. While IDA represents the entire door and operator industry by promoting the use of professional dealers and installers, it is a membership driven association, relying on the input and feedback of its members to create and deliver programs of value.



*Community - Education - Professionalism*  
[doors.org](http://doors.org)

### IDA Affiliate Organizations

IDA maintains an alliance with other door systems industry organizations, known as IDA Affiliates. These are individual trade associations whose missions are similar to the International Door Association. IDA recognizes them as Affiliates, and they work cooperatively to serve the garage door industry more effectively at the grassroots level.



The IDA Affiliates in the United States and Canada are:

- Central States Door Dealers Association (CSDDA)
- Michigan Door and Operator Dealers Association (MIDODA)
- Professional Door Association of New England (PDA)
- Western Access Systems Association (WASA)
- Canadian Door Institute (CDI)

See the IDA website for a complete list of other International Affiliates.

**Institute of Door Dealer Education and Accreditation (IDEA):** A non-profit education foundation sponsored by DASMA and IDA whose mission is to advance public safety and serve in the public interest by promoting and recognizing professionalism in the door, gate, and access systems industry through education, accreditation, and certification. IDEA's goals are to provide the educational resources necessary to develop and maintain a successful business, and to validate, certify, and accredit those door and operator dealers and industry professionals whose standards can meet IDEA's demanding criteria of business excellence and technical expertise.



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### American National Standards

**Institute (ANSI):** A private, non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States. ANSI also coordinates US standards with international standards so that American products can be used worldwide. The organization facilitates the development of American National Standards by accrediting the procedures for organizations who work cooperatively to develop voluntary national consensus standards.



### Occupational Safety and Health Administration

**(OSHA):** Created by the Occupational Safety and Health Act of 1970, OSHA promulgates and enforces safety and health standards in the workplace, and provides consultative services to businesses.



OSHA regulations impact virtually every job site in America.

**Underwriters Laboratories® (UL):** An independent product safety testing, certification, and inspection organization. UL tests products and writes standards for safety. UL tests more than 19,000 types of products, components, materials and systems each year. UL is an important organization to the door and access systems industry due to ANSI/CAN/UL 325 *Door, Drapery, Gate, Louver, and Window Operators and Systems*, which sets forth safety performance requirements for door and gate operator systems. ULC is the Canadian division of UL Solutions.



### National Fire Protection

**Association (NFPA):** A non-profit organization founded in 1896, NFPA's mission is to reduce the worldwide burden of fire and other hazards on the quality of life, by providing and advocating consensus codes and standards, research, training and education. NFPA is the world's leading advocate for fire prevention and an authoritative source on public safety. This organization is important to the fire door industry due to NFPA 80 *Standard for Fire Doors and Other Opening Protectives*. NFPA 80 regulates the installation and maintenance of door systems used to protect openings in walls, floors, and ceilings against the spread of fire and smoke.



### Consumer Product Safety

**Commission (CPSC):** A federal agency charged with protecting the public from unreasonable risks of serious injury or death from thousands of types of consumer products under the agency's jurisdiction. The CPSC is committed to protecting consumers from products that pose a fire, electrical, chemical or mechanical hazard or can injure children. The CPSC's work to ensure the safety of consumer products includes door and access systems.



### FM Approvals: FM

Approvals is the independent third-party testing and certification organization of FM Global, specializing in the evaluation of products and services used for property loss prevention. It conducts scientific testing to verify that products meet stringent performance, safety, and reliability standards related to fire, electrical hazards, building materials, and other loss-prevention concerns. Products that satisfy these requirements earn the FM APPROVED mark, indicating compliance with internationally recognized loss prevention standards.



### International Building Code

**(IBC):** A model building code developed by the International Code Council (ICC), the International Building Code establishes minimum standards to safeguard public health, safety, and general welfare in the design, construction, and operation of buildings. It has been adopted throughout most of the United States and addresses a wide range of topics, including structural requirements, fire and life safety, means of egress, accessibility, and building systems. Although a significant portion of the IBC focuses on fire prevention, both during construction and in the operation of completed buildings, it applies to all buildings and structures in jurisdictions where it has been adopted, except one- and two-family dwellings, which are regulated by the International Residential Code (IRC).



### Canadian Standards

**Association (CSA):** A not-for-profit membership-based association serving business, industry, government and consumers. The organization develops standards that address needs such as enhancing public safety and health, advancing the quality of life, helping to preserve the environment and facilitating trade. CSA functions as a neutral third party in testing products and developing consensus standards.



**Intertek:** Intertek is a global provider of assurance, inspection, product testing, and certification services, supporting manufacturers, importers, and industries in verifying the safety, quality, and regulatory compliance of their products and systems. Headquartered in London, Intertek operates a worldwide network of laboratories and technical experts and has grown from roots dating back to the late 19<sup>th</sup> century, including early testing organizations such as the Lamp Testing Bureau founded by Thomas Edison. Today, Intertek offers comprehensive Total Quality Assurance services across numerous sectors, evaluating products, materials, and processes to ensure they meet applicable standards and performance requirements. Through its third-party testing and certification programs, Intertek issues widely recognized marks, such as the ETL Listed mark, indicating that a product has been independently tested and found compliant with relevant safety standards.



### Warnock Hersey (WH) Mark: As

part of Intertek's building and construction certification programs, the Warnock Hersey mark is used to indicate that a product has been independently tested and certified for safety, performance, and compliance with applicable building codes and standards. The WH mark is widely recognized in North America, particularly for fire doors, fire rated frames, fire rated glazing, and fire rated countertops. Products bearing the Warnock Hersey label have been evaluated to meet the relevant fire, structural, and performance criteria required by code officials and authorities having jurisdiction.



### Texas Department of Insurance (TDI):



An agency which regulates the state of Texas insurance industry and issues product evaluations for wind load performance for use in the state of Texas.

## Florida Building

### Commission (FBC): A

government agency which issues State-Wide Product Approvals for wind load and other products for the state of Florida indicating compliance to provisions of the Florida Building Code.



### Miami-Dade County Product Control

#### Division: An

internationally recognized government agency which provides product approvals through the issuance of a Notice of Acceptance (NOA) indicating building code compliance for wind load and other products used in Miami-Dade and surrounding counties of Florida.



### United States Environmental Protection Agency (EPA): A

US federal government agency created for the purpose of protecting human health and the environment. Most noted in the garage door industry for its regulations for Lead Renovation, Repair and Painting (RPP).



## IDEA Programs and Services

IDEA was created in 1995 as an independent credentialing and educational institute by a coalition of industry groups following more than a decade of discussions and negotiations on how to advance door and access systems dealers as members of a professional industry.

The Door & Access Systems Manufacturers Association (DASMA), the International Door Association (IDA), and the American Rolling Door Institute (ARDI) agreed to establish IDEA as an independent entity in which the three organizations would share through the allocation of directorships. The two manufacturer organizations would hold six seats on the newly created Institute's board of directors, matched by six seats held by IDA. In 2006, ARDI merged with DASMA, leaving the 6-6 share of IDEA leadership positions equally divided between IDA and DASMA.

Dealer Accreditation was the first professional recognition credentialing program launched by the new organization. The first accreditation examinations were offered at the 1997 International Garage Door Exposition in Nashville, Tennessee. Since that time, IDEA has created a series of programs designed to help dealers train new installers, develop professionals in the field, and create career paths for technicians.

The Accreditation curriculum consists of six parts:

- Accounting and General Business Principles
- Insurance and Legal
- Safety Management and OSHA Compliance
- Residential and Commercial Sectional Door Technical Essentials
- Commercial Rolling and Rolling Steel Fire Door Technical Essentials
- Sales and Marketing



Dealers must pass a written examination for each section. At least one person within each applicant company must pass all six of the examinations. This is to expose Accreditation applicants to all phases of business management. Although there are more issues involved in managing a successful door company, these six fields of study generally represent a broad spectrum of business management for door dealers.

In 2001, the IDEA Train-the-Trainer program was launched. Since that time, the one day course which teaches experienced installers to train other employees and coworkers has had a significant impact on a dealer's ability to recruit and train new workers, as well as develop company-wide training programs to improve overall productivity and increase awareness of the industry at all levels within a company. The Train-the-Trainer program teaches training skills, evaluation techniques, communication methods, and other qualities that are as important to the educational

process as knowing how to install and service a door system. IDEA created the Train-the-Trainer program in recognition of the fact that dealers train technicians on-the-job, with few exceptions. The Train-the-Trainer program was designed to create a network of experienced and skilled trainers.

Since the establishment of the Dealer Accreditation program, IDEA has been actively producing a variety of educational programming for dealers and has developed a variety of certification programs for installers, technicians, and other industry professionals.

- Residential Installer Certification (2002)
- Rolling Steel Fire Door Certification (2004)
- Commercial Sectional Door Systems Technician Certification (2006)
- Commercial Rolling Door Systems Technician Certification (2007)
- Automated Gate Operator Installer Certification (2008)
- Certified Door Dealer Consultant (2011)
- Certified Automated Gate Systems Designer (2013)
- Certified Automated Gate Systems Technician Level 1 (2022)
- Certified Automated Gate Systems Technician Level 2 (2023)
- Certified Automated Gate Systems Technician Level 3 (2024)
- Advanced Overhead Door Operator Technician Certification (2026)

While Dealer Accreditation is awarded to companies, certification credentials are issued to individuals. The intent is to build a professional community of industry professionals that will aid the general public when seeking these products and services. This is a market-driven effort, with no federal, state or local requirements that companies or technicians hold the credentials in order to sell or install the products.

However, as a form of voluntary self-regulation, credentials are important to consumers. The door and access systems industry produces products that are essential components in home and property security and safety. The industry has recognized that to provide the highest level of safety and security, the products must be installed, maintained, and serviced properly.

A door systems technician who becomes certified in Residential Sectional, Commercial Sectional, Commercial Rolling, and Rolling Steel Fire Doors is automatically designated as an ***Automated Access Systems Master Technician***.



Similarly, a gate systems technician who becomes certified in Automated Gate Operator Installer and Gate Systems Technician Levels 1, 2, and 3 is automatically designated as an ***Automated Gate Systems Master Technician***.



## Section Two

# Codes and Standards

The installation, inspection, and servicing of rolling doors are governed by a complex framework of codes, standards, and regulatory requirements that work together to ensure life safety, property protection, and reliable performance of fire doors during a fire event. No single document covers every aspect of a rolling door system. Instead, technicians must understand how building codes, fire protection standards, product listings, installation instructions, and workplace safety regulations intersect in real world applications.

For fire door technicians, mastery of these requirements is essential. Fire doors are life safety devices, and their performance depends on strict compliance with the standards that govern their design, installation, testing, and ongoing maintenance. Technicians must recognize when multiple codes apply, how those codes interact, and how to ensure that every fire door assembly meets both the letter and the intent of the governing authorities.

This chapter provides a comprehensive overview of the primary codes and standards that shape the work of rolling door professionals, including those related to fire protection, product listings, building code compliance, and annual inspection requirements.

## Codes vs. Standards

A **standard** is a detailed, consensus based guide for technical specifics. Standards are typically voluntary, as they exist to establish consistency and acceptable approaches to systems, processes, and product development specifications. On their own, standards are **not** legally mandated.

A **building code** is a set of rules, regulations, or guidelines that are formally adopted into law

and enforced by local, state, or federal authorities. Codes are designed to ensure public safety and maintain the integrity and functionality of buildings, structures, systems, and processes. Codes become legally mandated once adopted by a municipality, state, or federal agency. Many codes incorporate published standards by reference, which makes those standards legally enforceable.

## Published Standards

A standard is a consensus developed document that defines accepted technical practices, performance criteria, and design expectations. Standards are typically voluntary in nature. Their purpose is to promote consistency, safety, and uniform approaches to systems, processes, and product specifications. While standards themselves are not laws, they often become enforceable when referenced by building codes, adopted by authorities having jurisdiction, or incorporated into contracts and product listings.

There are several standards applicable to rolling doors, including those that specify testing methods. Prominent standards development organizations include Underwriters Laboratories (UL), ASTM International (formerly the American Society for Testing and Materials), and the National Fire Protection Association (NFPA). Relevant UL standards include UL 10B, a fire test standard; UL 1784, a smoke leakage test standard; and ANSI/CAN/UL 325, the standard governing door, gate, and window operators. Applicable NFPA standards include NFPA 80, the standard for fire doors and other opening protectives; NFPA 252, fire test methods for door assemblies; NFPA 105, the standard for smoke door assemblies and other opening



protectives; and NFPA 5000, the Building Construction and Safety Code.

DASMA is an ANSI-accredited standards development organization that publishes voluntary standards related to sectional doors, rolling doors, door operators, and other topics. While compliance with DASMA standards is not mandated by law, many manufacturers follow them to promote consistency, safety, and industry best practices. Some DASMA standards have achieved ANSI approval, while others are still undergoing the ANSI consensus process and will receive the ANSI/DASMA designation once final approval is granted.

## Building Codes

Building codes are sets of rules and regulations adopted and enforced by local, state, or federal authorities to protect public safety and ensure the proper design, construction, and performance of buildings and related systems. Once a code is formally adopted by a jurisdiction, its requirements become legally mandatory. Many codes incorporate published standards by reference, making those standards enforceable as part of the code.

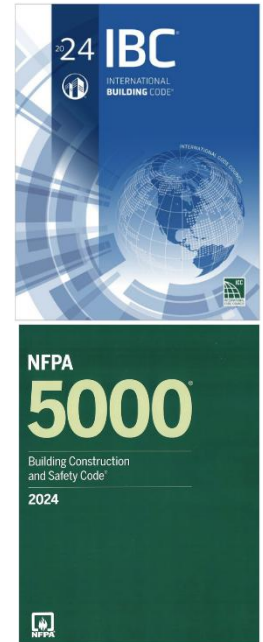
For rolling doors, published standards are referenced throughout various building codes, and the codes themselves often contain additional provisions that apply to rolling door assemblies. Historically, multiple **Model Building Codes** existed in the United States, each developed by different code agencies.

Model building codes are nationally developed, consensus-based documents that establish minimum requirements for building design, construction, and installation practices. They are not laws until adopted by a state or local jurisdiction. Because they reference numerous published standards, those standards also become legally enforceable once the model code is adopted.

Model codes may be adopted at the state level, with or without amendments, or at the municipal level, where local amendments may

also apply. Larger cities and counties may even develop their own building codes.

The two most prominent model building codes are the **International Building Code (IBC)**, published by the International Code Council (ICC), and **NFPA 5000 Building Construction and Safety Code**, published by the National Fire Protection Association (NFPA). Of these, the IBC model code is by far the most widely adopted throughout the United States and forms the basis for most state and local building regulations.



One of the most important responsibilities of an access systems professional is to verify which code is in effect in the jurisdiction where the product is being installed. Even neighboring communities may enforce different codes, and different project types may fall under different code requirements. For example, a commercial building project may have requirements that differ significantly from those of a single-family residence, and multi-family projects may fall under commercial codes rather than residential ones.

Local building codes and officials are only one source of requirements. Architects, insurance underwriters, risk-management professionals, and other stakeholders may impose additional performance criteria beyond those required by the adopted code. These requirements must be identified early in the project to ensure the rolling door assembly meets all specified performance expectations.

Finally, both codes and standards are developed in cycles – sometimes annually, sometimes every two or three years. Even when a new edition is published, a state or local jurisdiction may not adopt it immediately, or at all. Technicians must always confirm

which edition of a code or standard is legally in effect for the project at hand.

## Licensing

Some states and local jurisdictions require contractors to hold a specific license to install or service rolling doors, operators, or related components of a door system. In many regions, it is illegal to perform contracting work of any kind, including rolling door installation, without first obtaining the appropriate license.



Licensing requirements vary widely, but most jurisdictions require applicants to submit an application, document a minimum amount of experience, and pass one or more examinations. These exams typically cover general construction practices, business and financial management, contracts, and state-specific laws rather than material unique to rolling doors or operators. Many areas also require licensed contractors to display their license number in advertising and include it on contracts, proposals, and invoices.

Violating licensing laws in jurisdictions that require them can result in fines, civil penalties, loss of the right to operate, and in some cases criminal charges. It is essential to research and understand the licensing requirements in every area where you perform work to ensure your company remains compliant.

## NFPA

The National Fire Protection Association (NFPA) is a nonprofit organization founded in 1896 with the mission of reducing the worldwide burden of fire and related hazards. NFPA develops consensus based codes and standards, conducts research, and provides training and education used throughout the fire-protection industry.



For rolling steel fire door technicians, NFPA is especially important because it publishes **NFPA 80, Standard for Fire Doors and Other Opening Protectives**, the primary standard governing the installation, inspection,



testing, and maintenance of fire door assemblies. NFPA 80 establishes the minimum requirements for fire doors used to protect openings in fire rated walls, floors, and ceilings. The standard ensures that fire doors function as part of the building's passive fire protection system by closing reliably, resisting fire exposure for their rated duration, and remaining in proper working condition throughout their service life.

NFPA 80 addresses critical topics such as fire-protection ratings, acceptable closing speeds, fusible-link and detector placement, Authority Having Jurisdiction (AHJ) approval, field modifications, and the conditions under which a fire door may be repaired or must be replaced.

The standard also mandates periodic inspection and testing of fire door assemblies, including annual inspection and drop testing. These inspections verify that the door, guides, release mechanisms, and automatic closing devices operate properly and that no field conditions compromise the door's listing or rating. NFPA 80 specifies that these inspections and tests must be performed by a **Trained Rolling Steel Fire Door Systems Technician**, defined as someone with

documented training and demonstrated experience in the inspection, testing, and maintenance of rolling steel fire doors.

Throughout this study guide, we will reference NFPA 80 requirements and explain how they apply to real-world installation, service, and compliance scenarios, including how technicians interact with AHJs, building owners, and other trades to ensure fire door assemblies remain code-compliant and fully functional.

**NFPA 105, *Standard for Smoke Door Assemblies and Other Opening Protectives***, complements NFPA 80 by establishing requirements for smoke door assemblies, which are designed to limit the movement of smoke rather than resist fire exposure. NFPA 105 covers the construction, installation, testing, and maintenance of smoke doors, including air-leakage ratings, gasketing requirements, and the performance of automatic closing devices activated by smoke detection. Like NFPA 80, NFPA 105 mandates periodic inspection and testing to verify that smoke doors close properly, seal as intended, and maintain their rated air-leakage performance. While NFPA 80 governs fire rated rolling doors, NFPA 105 applies to smoke control openings and is referenced throughout this study guide where smoke-door requirements intersect with rolling steel fire door installations.

## Listing Agency

Listing agencies are independent, nationally recognized testing laboratories responsible for evaluating whether a fire door assembly meets the performance requirements of applicable fire-protection standards. These agencies conduct standardized fire and smoke tests, verify construction details, and ensure that the product performs as intended under fire conditions. When a rolling steel fire door passes these evaluations, the listing agency authorizes the manufacturer to apply a permanent label or mark identifying the door's

fire-protection rating and confirming compliance with the tested assembly.

Several nationally recognized testing laboratories are authorized to test, evaluate, list, and label rolling steel fire doors. The primary listing agencies include **UL Solutions** (and its Canadian counterpart **ULC**), **FM Approvals**, and **Intertek**, which issues the **Warnock Hersey (WHI)** listing mark. These organizations determine whether a fire door assembly meets the applicable fire-protection standards, but do **not** approve a specific product for use in a specific installation. Final approval always rests with the Authority Having Jurisdiction (AHJ).



Listing agencies play a critical role in ensuring that fire doors installed in the field match the assemblies that were tested and certified. Technicians must verify that the door bears the correct listing label, that field conditions do not violate the tested assembly, and that any repairs or replacements maintain the door's listing. Because the building code requires fire doors to be listed and labeled, and because AHJs rely on listing marks to confirm compliance, understanding how listing agencies operate is essential for proper installation, inspection, and maintenance of rolling steel fire doors.

## Fire Rating

Rolling steel fire doors are assigned an hourly fire protection rating by the listing agency, indicating how long the assembly withstands exposure during a standardized fire test. Common ratings include 3 hours, 1-1/2 hours, 1 hour, and 3/4 hour, each corresponding to specific code-driven applications. Although a few manufacturers offer 4-hour rated rolling steel door assemblies, this rating is not required or referenced by the major model building codes for typical rolling steel fire door installations.

NFPA 80 does not set the required fire door rating for an application. Building codes, such as the IBC and NFPA 5000, specify the required fire protection rating for a rolling steel fire door based on the fire-resistance rating of the wall in which the opening is located. These building code requirements for fire door ratings differ depending on the specific opening and its function. The most frequently encountered wall-to-door rating associations are:

- 4 hour wall → 3 hour fire door
- 3 hour wall → 3 hour fire door
- 2 hour wall → 1-1/2 hour fire door
- 1 hour wall → 3/4 hour fire door



An alphabetical letter designation was once used to classify the type of *opening* for which a fire door was considered appropriate. This system assigned each letter to a specific opening condition, allowing designers and inspectors to match a fire door to the expected level of fire exposure. According to NFPA Annex D.3, the traditional relationships between these letter designations and their intended applications were as follows:

- Class A – Openings in fire walls and in walls that divide a single building into fire areas.
- Class B – Openings in enclosures of vertical communications through buildings and in 2 hour-rated partitions providing horizontal fire separations.
- Class C – Openings in walls or partitions between rooms and corridors having a fire resistance rating of 1 hour or less.
- Class D – Openings in exterior walls subject to severe fire exposure from outside the building.

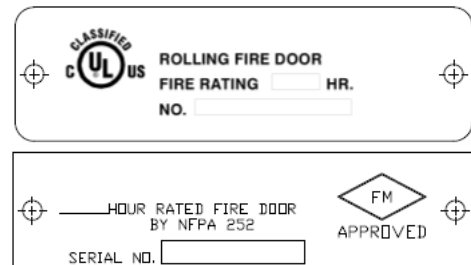
- Class E – Openings in exterior walls subject to moderate or light fire exposure from outside the building.

It's important that the fire rating of the door does not exceed the fire rating of the wall on which it is mounted. NFPA 80 explains that fire doors, shutters, and fire windows are designed to protect openings under normal conditions of use and typically have a lower rating than the surrounding wall. These assemblies also permit heat transmission, so combustible materials should not be stored against or near them.

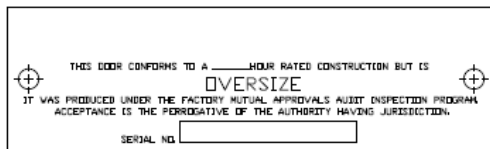
## Fire Door Labels

Fire door labels provide the essential information needed to verify that a rolling steel fire door has been tested, listed, and approved for use in a specific fire rated application. These labels identify the door's fire protection rating, the listing agency, the manufacturer, and the serial number of the door. Because rolling steel fire doors can vary in size, construction, and application, the labeling system includes several distinct categories that reflect how the door was evaluated and how its compliance is documented. Fire door listings are grouped into three types: **Label Size**, **Oversize**, and **Oversize Construction Certificate**.

**Label Size** fire doors represent door sizes up to and including the size of door tested as indicated in the listing agency file. These doors are constructed exactly the same as the tested door and have a label affixed to the bottom bar indicating *Label Size Rolling Fire Door* along with listing information, fire rating, and serial number.



**Oversize** fire doors represent doors larger in width or height than the size of door tested as indicated in the listing agency file. These doors have modified constructions extrapolated from the tested door. They often require larger components and have a label affixed to the bottom bar indicating *Oversize Rolling Steel Fire Door* along with listing information, fire rating, and serial number.



**Oversize Construction Certificate** applies to doors larger in width or height, or otherwise modified from that listed for the manufacturer for oversize fire doors. These doors may require field inspection and drop testing witnessed by the listing agency. Upon approval, the listing agency will issue an *Oversize Construction Certificate* indicating the approval of the door along with the listing information, fire rating, and serial number. There will not be a label on the bottom bar.

Often times the manufacturer can utilize the oversize construction certificate to expand their oversize approvals. Because of this, oversize construction certificates have become much less common than in the past.

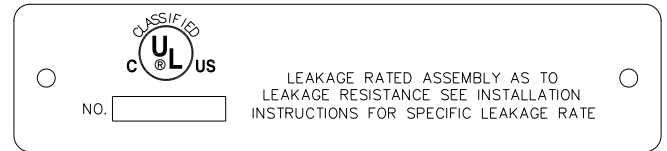
## Smoke Control

When a rolling door is required to meet local building code smoke protection requirements, it must be specified and labeled for **smoke and draft control**. A smoke rated door has been tested in accordance with UL 1784, the standard for air-leakage performance, and must comply with **NFPA 105, Standard for Smoke Door Assemblies and Other Opening Protectives**.



For rolling door products, smoke rated assemblies are typically also fire rated. These doors bear two independent labels:

- A fire-protection rating label
- A smoke and draft control label (commonly referred to as an S-label)



NFPA 105 requires smoke rated assemblies to incorporate an automatic closing device activated by local smoke detection or by the building's fire alarm/smoke detection system. Because smoke movement occurs long before temperatures rise enough to melt fusible links, smoke rated doors must close well before heat activated devices respond.

Rated smoke protection is typically achieved through the use of UL listed guide and lintel brush seals and high temperature silicone sealant. Sealant is applied at all guide assembly points and along the entire perimeter where the guides, brush seal retainers, fascia (if applicable), and other components contact the wall or header. Following the manufacturer's instructions is essential to maintain the door's smoke rating.

Any of the three types of rolling fire doors can alternatively provide limited smoke reduction even when they are not tested or listed for smoke and draft control. In these cases, listed brush seals may be installed around the perimeter of the opening (not attached to the door assembly itself) to reduce smoke infiltration when the door is closed.

The listing of the brush seals ensures that their installation does not affect the fire rating of the door. However, this does **not** mean the door is tested or listed for smoke protection, nor does it provide an air-leakage rating. These installations offer smoke reduction, not smoke rated performance.

Whether a door is smoke rated or non-rated, technicians must always perform a drop test *after* installing any ancillary seals. Additional seals can introduce resistance that may prevent the door from closing fully. Drop testing confirms that the door still closes properly and that no added components interfere with the operation of the fire door assembly.

## Final Approval

Code administration, final code interpretation, and final product approval all fall under the authority of the **Authority Having Jurisdiction (AHJ)**. As defined in NFPA 80, the AHJ is *an organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure*. Depending on the jurisdiction, an AHJ may be a building code official, a fire marshal, or a state or federal government official. When the AHJ approves a product or installation, it signifies that the work complies with the codes and standards adopted by that jurisdiction.



It is important to note that general contractors, firefighters, building owners, and facility managers **are not** AHJs. They may have opinions or preferences, but they do not have the authority to interpret code or approve a fire door installation. Only the AHJ can make final determinations regarding compliance, and technicians must follow the AHJ's direction when questions or conflicts arise.

## Insulation and Thermal Energy Transfer

Insulation is material that retards the flow of energy. Energy (heat) always flows from a high energy source to a low energy source, such as warmth flowing to cold, until the temperatures equalize. By slowing this transfer, insulation helps maintain temperature differences

between spaces. Many insulating materials also reduce sound transmission, since the same physical properties that resist heat flow can dampen vibration and noise.

Heat flow is commonly measured in British Thermal Units (BTUs). One BTU is the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit. To evaluate how well a slat or complete door system resists this heat flow, the industry uses several standardized thermal performance ratings.

**R-Value:** Used to measure a material's *resistance* to heat flow and is the most commonly used metric for determining the thermal performance of an insulating product. A product's R-value represents its ability to retard heat flow. R-values are expressed numerically, with higher numbers indicating better insulating performance and lower numbers indicating poorer performance. Thus, a product with an R-value of 4.00 provides greater resistance to heat flow than a product with an R-value of 2.00. English (Imperial) units for R-value are  $\text{ft}^2 \cdot \text{hr} \cdot ^\circ\text{F} / \text{BTU}$ , and metric (SI) units are  $\text{m}^2 \cdot \text{K} / \text{W}$ . See DASMA TDS 163 for further information.

**K-Value:** Used to measure an insulation material's thermal *conductivity*. Thermal conductivity is defined as the degree to which a material facilitates the flow (conduction) of heat. K-values are expressed numerically, typically as decimals, with higher values indicating higher conductivity (which reduces insulating performance) and lower values indicating lower conductivity (which improves insulating performance). English (Imperial) units for K-value are  $\text{Btu} \cdot \text{in} / (\text{ft}^2 \cdot \text{hr} \cdot ^\circ\text{F})$ , and metric (SI) units are  $\text{W} / (\text{m} \cdot \text{K})$ .

K-value is calculated by dividing a product's insulation thickness by its R-value. An example of this calculation is as follows:

Material: 1.00 inch thick EPS with an R-value of 3.85 per inch.

K-value:  $1.00 \div 3.85 = 0.259$  (K-value)

**U-Factor:** Used to measure the *overall thermal transmittance* of a wall system or, in this case, a rolling door assembly. It accounts for the thermal properties of all components within the system and the performance of the assembly as a whole. Like K-value, a door system's U-factor is typically expressed as a decimal, with lower values indicating better thermal performance. U-factor is determined through testing. The U-factor of an assembly cannot be derived by dividing 1 by the R-value of the curtain. English (Imperial) units for U-factor are Btu/(ft<sup>2</sup>·hr·°F), and metric (SI) units are W/(m<sup>2</sup>·K). See DASMA TDS 163 and 196 for further information.

### Method of Determining Thermal Performance

Thermal performance ratings (slat R-value, insulation K-value, and assembly U-factor) can be derived either by calculation or by testing. Calculated values are typically based on the mean curtain slat profile and do not account for factors such as slat joints, guide interfaces, or building connections. Tested values are obtained from laboratory testing of a complete installed door system. It is important to understand which method was used to generate published thermal performance ratings when comparing products, because calculated and tested values measure performance under different conditions and are not directly comparable. Generally, published ratings for R-value and K-value are determined through calculation, while U-factor is determined through full assembly testing. See DASMA TDS 163 and 196 for further information on manufacturer published insulation values.

### Flame Spread and Smoke Developed

**Flame Spread** rating is a numerical value that compares how quickly a material burns relative to two reference materials: cement asbestos board (rating of 0) and red oak (rating of 100). These ratings are determined using the *Steiner Tunnel Test*, in which the material is mounted

to the ceiling of a horizontal test tunnel and exposed to a controlled gas flame. As the material burns, observers measure how far and how quickly the flame propagates along its surface. The resulting flame spread index is a unitless value indicating how rapidly fire can travel across that material compared to the established benchmarks. Most building codes require materials used in residential and commercial construction to have a flame spread rating of 75 or less, placing them in Class B or better for interior finish applications.

**Smoke Developed** rating measures the density of smoke a material produces when burned in the *Steiner Tunnel Test*. As the material combusts, smoke is drawn through a duct where a photometric device measures its optical density. The resulting value indicates a unitless comparison of how much smoke the material generates relative to the same baseline reference materials used for flame spread.

Building codes typically require a smoke developed rating of 450 or less for materials used in residential and commercial construction. This rating is important because smoke, often more dangerous than flame, can impair visibility, hinder evacuation, and contribute to toxic inhalation hazards.

Materials with a flame spread rating (aka index) not exceeding 75 and a smoke developed rating not exceeding 450 are classified as Class B. Standard test methods for determining these ratings are ASTM E84 and UL 723.

### Sound Transmission

Noise reduction for building components such as rolling doors is evaluated using **STC** (**Sound Transmission Class**) and **OITC** (**Outdoor–Indoor Transmission Class**) ratings, and both are expressed as dimensionless numerical ratings that represent how effectively a partition reduces sound transmission. STC and OITC ratings are laboratory derived indices based on how the

material performs across specific ranges of sound frequencies.

**STC** is the most common rating for interior partitions and building components. It is based on how much a material reduces sound across a standardized range of mid to high frequency noise (speech, office noise, general indoor sounds). A higher STC value indicates better sound reduction.

**OITC** is designed for exterior noise, especially low frequency sounds such as traffic, aircraft, and industrial equipment. OITC uses a broader and lower frequency range than STC, making it more relevant for doors exposed to outdoor noise sources.

In the simplest sense, you can think of a door with an STC rating of 20 as *roughly comparable* to reducing an 80 decibel sound on one side of the door to about 60 decibels on the other. In actuality, an STC 20 door does not literally mean “80 dB becomes 60 dB”. Instead, it means the door’s overall sound transmission performance matches the standardized reference contour for STC 20. Sound Transmission ratings are useful for relative comparison of products, but they are not a direct decibel subtraction measurement.

### Air Infiltration

Air infiltration ratings quantify the amount of air that passes through a door system when exposed to a pressure differential. These ratings are determined through physical testing of a standard sized door, most commonly a 10 foot x 10 foot assembly, installed in a test chamber. During the test, a pressure difference is applied to the exterior face of the door to simulate wind loads typically equivalent to 15 to 25 miles per hour. As pressure is applied, a calibrated flow meter measures the volume of air that leaks through the door’s joints, perimeter interfaces, and hardware penetrations.

The resulting value is expressed in cfm (cubic feet per minute), representing the rate of air

leakage at the specified pressure. Lower cfm values indicate better air leakage resistance, meaning the door provides a tighter seal and improved environmental control. Air infiltration performance is influenced by factors such as slat joint design, perimeter weather seals, and the rigidity of the door assembly.

Air leakage affects both energy efficiency and comfort in conditioned spaces. In commercial and industrial settings, excessive infiltration can increase heating and cooling loads, introduce dust or contaminants, and reduce the effectiveness of climate controlled environments.

Manufacturers often pair air infiltration ratings with U-factor data to provide a more complete picture of a door’s thermal performance. A door with a low U-factor but poor air seal performance may still experience significant heat loss due to uncontrolled airflow.

### Seismic Qualification

Rolling door installations in public safety and/or earthquake prone applications may encounter requirements for **Seismic Qualification**. This means the door requires certificates and/or calculations from the manufacturer showing the ability of the door system to endure the loads anticipated from an **earthquake**.



An example specification for this is “Metal coiling doors shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.” *Withstand* means the rolling door will remain in place without separation of

any parts from the door when subjected to the seismic forces specified. Doors meeting this specification may require larger or more frequent wall attachment fasteners, larger shafts, heavier guides, etc.

The dealer will have to supply the manufacturer information from the Architect's plans in order for the manufacturer to engineer the door properly. Examples of information needed are building height, site class (A, B, C or D), occupancy category (I, II, III or IV), building code reference, seismic design category, component importance factor, spectral response-Ss, spectral response-S1, and jamb configuration.

When installing a rolling door subject to these requirements, the installer should verify that the components provided match that indicated on the seismic qualification documentation and are installed in accordance with the manufacturer's instructions.

## Wind Load Requirements

Wind is the organized translation of large amounts of air at one time. It can shape landforms, transport dirt and debris miles away, uproot trees, and damage buildings. From a windy day to thunderstorm microbursts, tornadoes, and hurricanes, Mother Nature can produce unexpected high winds virtually anywhere in the world. This section aims to give a general understanding of wind loads and rolling doors.



Studies of damage to buildings as a result of hurricanes and other high wind events found that one common cause of catastrophic building failure was a pressure buildup within the building. Much like inflating a balloon until it pops. Researchers found that the cause of this pressure buildup was a breach somewhere in the exterior envelope of the building which allowed high winds to enter. With nowhere to exit, these high winds cause an increase in pressure that eventually can blow out windows, walls, or even blow off roofs.

A rolling door mounted on an exterior opening is a significant component in a building's ability to withstand high winds because it often closes the largest opening(s) on a building. An open door, or one which fails during high winds, can create a very large breach in the outer envelope. This opening can allow large amounts of wind to enter at once and rapidly increase the internal pressure until the building fails. This is just one reason why it is important for doors to carry the wind load rating for the location where they will be installed.

Winds are often measured by their speeds. Meteorologists use a measuring instrument called an *anemometer* to measure the wind speed and often report the speed of the peak gusts during a given wind event. The smoother the terrain, the faster the wind speeds can become. Similarly, the more obstructions the wind encounters, the less speed can develop. Required wind load ratings are typically higher in areas near the coast of a large body of water, where there are no obstructions, than in urban areas where numerous closely spaced obstructions are present.



In building design, it's important to understand that wind speed units differ between meteorology and engineering. Meteorologists and the media typically report wind speeds using the 1-minute sustained wind, which is the average wind speed measured over a one minute period. This is the standard used to classify hurricanes and other weather events.



By contrast, building codes such as the International Building Code (IBC), which references ASCE/SEI 7, use the 3-second peak gust as the basis for structural design. This represents the highest wind speed averaged over a 3-second interval and is typically about 15 mph higher than the 1-minute sustained wind for the same storm event. This difference is critical when interpreting wind maps and design requirements.

In structural engineering, wind is evaluated not just by its speed but by the load it exerts on the surfaces it encounters. That load is expressed as a pressure, measured in psf (pounds per square foot), which quantifies the force applied to each square foot of exposed surface area, such as a rolling door curtain, wall panel, or roof system.

Converting wind speed to psf is a complex process governed by formulas in building codes and standards. The calculation considers multiple factors, including:

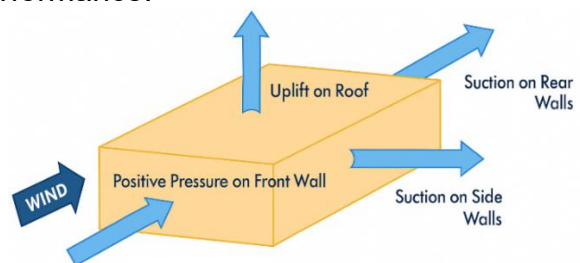
- **Exposure category**, which accounts for the terrain and surrounding obstructions that influence how quickly wind accelerates toward the building.
- **Building height and geometry**, because taller or more irregular structures experience higher pressures.
- **Importance factor (risk category)**, which increases required design loads for buildings where failure would pose greater risk to life or property.

- **Internal and external pressure coefficients**, which describe how wind interacts with surfaces – pushing, suctioning, or creating uplift depending on direction and shape.
- **Wind directionality and enclosure classification**, which adjust the load based on how wind approaches the structure and whether the building is open, partially enclosed, or fully enclosed.

Because these variables differ by jurisdiction and application, wind load ratings must be determined using the specific code adopted in your area.

To help clarify this process, DASMA has published TDS 155, which explains how wind speed relates to wind pressure and outlines wind load requirements across various standards and codes. TDS 155 includes conversion tables and formulas, regional wind speed maps, code references (IBC, ASCE/SEI 7, Florida Building Code, etc.), and guidance for specifying wind rated rolling doors. Due to its technical depth, TDS 155 is best consulted directly. You can download it from the DASMA website to ensure your designs and product selections meet local wind load requirements.

Winds can impart forces on rolling doors and buildings in two different directions. The first is called **Positive** wind load. In the positive direction, winds hit the door directly and attempt to blow the door into the building, similar to the sail on a sailboat. The second direction is called **Negative** wind load. Typically caused by crosswinds on the sides of the building, and turbulent suction on the trailing end of the building. Negative wind loading attempts to suck the door outward. Both loading directions must be accounted for in the door design to ensure proper performance.



Another wind load related performance requirement in some areas is for Impact resistance. High wind events can involve flying debris which can crash into a rolling door. These impacts can cause damage to the door which lessens its wind load resistance, particularly if windows are involved. Impact rated doors have undergone special testing to ensure the wind load performance is maintained after several impacts. The testing involves firing a 2x4 out of a cannon at 50 feet per second (34 miles per hour) and impacting numerous key areas of the door. To pass this testing, the impact cannot result in a hole in the door exceeding the allowable limits. In addition, the door must then endure prescribed cyclic wind load testing to ensure the wind load resistance has not been compromised.



Impact rating is no longer limited to hurricane prone regions near the coast, and is often required outside of these regions. According to the International Building Code, the wind-borne debris region is where glazing is required to be impact rated. Increasing requirements for impact resistance have been driven in part by the insurance industry in an effort to reduce the amount of water damage caused by impact penetration in the outside envelope of the building.

There are typically two classifications for rolling doors with respect to wind protection. The first is wind load rated products that are designed to meet a specific pressure rating. These doors have pressure ratings in both the positive and negative direction. The second, in addition to an assembly being rated for pressure, it is design evaluated to meet the enhanced protection standards that require the complete door assembly to have been evaluated for impact-resistance, including the glazing if the door has glass.

For most of the United States, the doors must be designed in accordance with the International Building Code, but for some parts of the United States it is required that the doors have approvals from certain approval

agencies. Examples of these include Florida Product Approval - required for all doors installed in Florida, Miami-Dade Notice of Acceptance - required for Dade and Broward counties in Florida, and Texas Department of Insurance Windstorm Inspection - required for areas along the Texas coast that need windstorm inspections.

No matter which level of protection that the job requires, it is critical that only the components listed on the wind load design drawing are used, and that no components are substituted or omitted unless approval has been obtained from the manufacturer.

When ordering a door, it is critical to check with the building specifications, as well as the local Authority Having Jurisdiction (AHJ), to ensure that the product ordered will be in compliance with the wind load requirements. As mentioned previously, DASMA has published a number of TDSs that can help determine the required wind load ratings in your area.

Specification of higher wind loads for rolling doors can result in many product changes that may not be obvious to the untrained eye. It is important to understand the implications of specifying higher wind loads, because these changes can significantly increase the cost of the door. Higher ratings may require special engineering or testing to verify that all components can withstand the increased forces. Guide angle and wind bar thicknesses may increase to handle the higher loads transferred through the windlocks. Similarly, guide assembly fastener sizes and quantities may need to increase. In some cases, larger guides can even require larger barrels and brackets to ensure proper curtain transition into the guides.

If the additional wind load exceeds the pull limits of alternating windlocks, continuous and/or special windlocks may be required. Higher wind loads may also require a thicker gauge curtain. Many of these changes increase the overall balance weight of the door, which can in turn require larger springs.

Because these components are integral to the engineered wind load system, it is not possible to convert a door in the field to handle higher wind loads if it was not originally ordered with the proper rating.

## Operation Under Wind Load

DASMA TDS 279 explains how rolling doors behave when subjected to wind loads and why door operation can be affected even when the door is structurally designed for the required wind pressure. Under normal or low-wind conditions, the curtain has minimal contact with the guides. As wind pressure increases, either pushing the curtain inward (positive pressure) or pulling it outward (negative pressure), the curtain deflects and presses against the guide angles. This added friction may reduce or prevent normal door movement. The maximum wind pressure at which a door can still be operated is called its *Operational Wind Load*, and it is typically much lower than the design wind load, which is the pressure the door must withstand without failure after the wind event ends.



The data sheet also explains that doors equipped with curtain-mounted windlocks may experience significant friction when windlocks engage the guide-mounted wind bars, often preventing vertical movement and potentially causing component wear if operation is forced. Electrically operated doors exposed to wind loads may require constant-contact controls to prevent damage when windlocks engage during opening or closing. TDS 279 emphasizes that operational wind performance varies by door width, slat design, material, and gauge, and that manufacturers should be consulted for product-specific guidance. Reference [dasma.com](http://dasma.com) for more information from TDS 279.

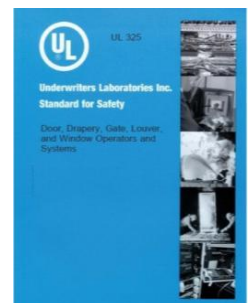
## Hurricanes or High Wind Events

DASMA TDS 282 and TDS 291 explain how rolling doors should be handled before, during, and after hurricanes or other high wind events. These documents emphasize that rolling doors must never be modified or reinforced with non-manufacturer materials, as doing so can compromise the door's design, prevent proper operation, or create dangerous conditions. Rolling doors should be fully closed and locked before high winds arrive, since their wind-load rating only applies when the door is in the closed position. Attempts to brace a door by parking a vehicle or placing objects against it are ineffective and may cause damage; only a properly rated rolling door provides the intended protection.

The data sheets also stress that rolling doors should not be operated during high-wind events, as wind pressure and windlock engagement can dramatically increase operating forces and create hazards. In some coastal areas subject to storm surge, local codes may require doors designed to “break away” rather than resist wind load, making coordination with the local building department essential. After any significant wind event, both the door and its surrounding structure should be inspected by a qualified professional, since the integrity of the guides, jambs, and mounting conditions is just as important as the strength of the door itself. Reference [dasma.com](http://dasma.com) for more information from TDS 282 and TDS 291.

## ANSI/CAN/UL 325

Underwriters Laboratories (UL) is an independent safety organization that develops standards and provides testing, certification, and evaluation services for a wide range of electrical products and systems. UL has long been involved in establishing safety requirements for door, gate, and operator equipment. The standard



governing these products is now formally designated ANSI/CAN/UL 325, reflecting its harmonization across the United States and Canada. Although the official title is **ANSI/CAN/UL 325 Door, Drapery, Gate, Louver, and Window Operators and Systems**, this study guide will refer to it as UL 325 for simplicity.

## UL 325 History

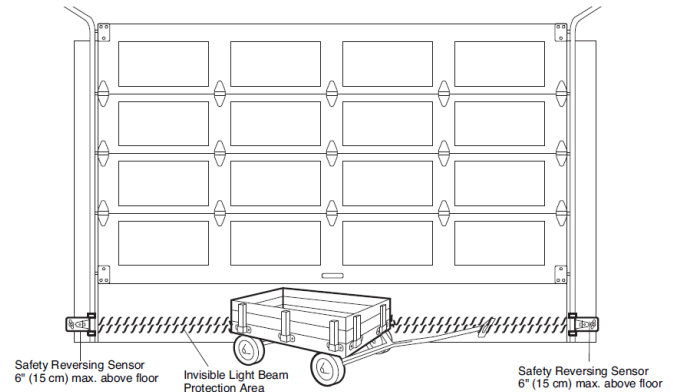
The first edition of UL 325 was published in April 1973, marking the point at which motorized door operators were formally recognized as a distinct product category rather than being treated simply as electric motors. This shift acknowledged that garage door operators required safety provisions beyond basic motor protections. Over the decades that followed, UL 325 underwent numerous revisions to address emerging technologies, evolving safety concerns, and changes in industry practice.

Today, the standard is published under the harmonized title ANSI/CAN/UL 325, reflecting joint adoption in the United States and Canada. UL itself has since separated into two organizations: UL Standards & Engagement, the non-profit standards development body responsible for maintaining UL 325, and UL Solutions, the for-profit testing and certification organization that evaluates products for compliance.

A major early milestone occurred in 1982, when the timed-reversing requirement for residential operators became effective. This rule required an operator to automatically reverse the door to the open position if the close limit was not reached within 30 seconds of a close command. Prior to this change, contact-reversing was the only entrapment protection requirement for residential operators.

In 1990, the Consumer Product Safety Commission (CPSC) became involved in the development and enforcement of UL 325 following a grassroots effort to improve

residential garage door operator safety. This involvement led to significant revisions requiring operators to use external entrapment protection devices, such as photoelectric sensors or sensing edges, and to monitor those devices to ensure they were functional before allowing a door to close from a remote control or a single press of a wall button. These requirements became effective on January 1, 1993.



The CPSC requirements were incorporated directly into UL 325, and after January 1, 1993, manufacturers could demonstrate compliance by applying the UL mark. Compliance may be shown through testing and evaluation performed by UL Solutions or by an independent accredited laboratory certifying that the product meets the requirements of UL 325. Compliance is verified through type testing of representative samples and maintained through periodic factory audits.

In 2008, UL 325 underwent a significant update aimed at improving the consistency and reliability of inherent entrapment protection. The revision strengthened the contact-reversal requirement for residential operators by specifying a minimum reversal distance of two inches after the door encounters an obstruction. It required that if the door encounters a second obstruction during a subsequent closing attempt, the operator must drive the door fully open. Furthermore, the standard clarified that when an inherent entrapment circuit senses an obstruction during upward travel, the operator is not required to return to the full upmost position, it can simply stop. These refinements helped

ensure more predictable and measurable safety performance across manufacturers.

In 2009, the standard was further revised to address unattended closing features, such as timers-to-close and smartphone based controls, by establishing rules for audible and visual warnings and other safeguards. Later editions continued to strengthen and clarify these requirements.

Revisions to UL 325 in 2010 expanded and clarified requirements for commercial and industrial door operators, particularly in the areas of entrapment protection, control functions, and environmental considerations. These updates strengthened the expectations for monitored external entrapment protection devices on commercial operators using momentary contact controls, aligning them more closely with the residential rules adopted in the 1990s. Prior to 2010, commercial and industrial operators still required external entrapment protection devices, but those devices were not required to be monitored.

This revision also refined provisions for timer-to-close functions, requiring appropriate audible and visual warnings before unattended movement, and clarified how commercial operators must respond to faults in monitored devices - typically by reverting to constant pressure to close operation. Additional updates addressed special-purpose operators, such as those used on rolling steel doors, grilles, and fire door systems, ensuring that their unique operating environments and safety needs were reflected in the standard. Collectively, the 2010 changes helped modernize commercial and industrial operator requirements and laid the groundwork for later revisions related to connectivity and advanced control systems.

Following the 2010 update, UL 325 continued to evolve in response to new technologies, expanded operator capabilities, and the growing use of network-connected controls. Revisions in the early 2010s strengthened requirements for monitored external entrapment protection devices, clarifying how operators must detect faults and how they

must respond when a monitored device is disconnected, shorted, or otherwise unable to provide a valid signal. These changes ensured that both residential and commercial operators default to constant pressure to close whenever a monitored device cannot be verified as functional, reinforcing the safety principles first introduced in the 1993 revisions.

As smartphone based controls, building automation systems, and cloud connected operators became more common, UL 325 introduced additional provisions governing unattended operation. These revisions expanded the rules first established in 2009 by defining how operators must handle network initiated close commands, including requirements for audible and visual warnings, minimum warning durations, and consistent behavior across all forms of remote activation. These updates ensured that timers-to-close, app-based controls, and automation systems all meet the same safety expectations, regardless of the technology used to initiate movement.

Later revisions also addressed the increasing complexity of commercial and industrial operator applications, refining requirements for monitored devices, force-limiting performance, and the behavior of operators used on rolling steel doors, grilles, and other specialty systems. Updates clarified how commercial operators must respond to entrapment protection faults, how monitored edges and photoelectric sensors must be supervised, and how operators must behave when integrated into larger access control or facility automation networks. These changes helped align commercial operator safety with the more stringent expectations already applied to residential systems.

In 2017, the standard transitioned to its current harmonized designation, ANSI/CAN/UL 325, marking its joint adoption in the United States and Canada. This period also aligned with UL's organizational restructuring, in which standards development moved to UL Standards & Engagement, a non-profit entity, while testing and certification activities became part of UL

Solutions, a for-profit organization. Although this restructuring did not alter the technical requirements of UL 325, it is historically significant because it defines the modern framework for how the standard is maintained and published. Canada later adopted ANSI/CAN/UL 325 as its sole national standard for commercial and industrial operators in 2023.

## Standards Development

UL Standards & Engagement develops standards through a consensus based process that includes participation and comment from both the affected public and the affected industry. For UL 325, the operator industry works with UL through a Technical Committee (TC), which includes representatives from operator manufacturers, manufacturers' associations, and other interested parties.

The TC is composed of volunteers from various stakeholder groups, including manufacturers, users, regulators, and technical experts. Anyone may submit comments, proposed changes, or revisions for consideration. The TC reviews these proposals, provides feedback, and votes on whether to adopt them.

UL standards are living documents, and revisions may occur at any time. The edition number may or may not change with each revision; when it does not, updated pages are issued to the appropriate parties. A UL standard, including UL 325, is current only when it incorporates the most recently adopted revisions.

Although UL 325 is the safety standard for *Door, Drapery, Gate, Louver, and Window Operators and Systems*, it relies on and incorporates numerous other UL standards for specific test methods and performance requirements.

Some examples are:

UL 498	Attachment Plugs and Receptacles, Electrical
UL 817	Cord Sets and Power Supply Cords
UL 1004	Motors, Electric
UL 746	Polymeric Materials
UL 796	Printed Wiring Boards, Electrical
UL 94	Plastic Materials for Parts in Devices and Appliances, Tests for Flammability
UL 506	Transformers, Specialty
UL 991	Tests for Safety Related Controls Employing Solid State Devices

## UL 325 Standard Layout

UL 325 is organized into a series of major sections that define scope, construction requirements, safety provisions, performance tests, and documentation obligations for door, drapery, gate, louver, and window operators and systems. The primary sections include:

- **Contents:** Introduces the standard and defines its scope, units of measure, terminology, and glossary.
- **Construction:** Covers general construction requirements, including frames, enclosures, mechanical assemblies, and component characteristics.
- **Protection Against Risk of Injury to Persons:** Addresses safety requirements related to moving parts, surface temperatures, pedestrian doors and operators, industrial and commercial door operators, residential garage door systems, and gate operator systems.
- **External Entrapment Protection Devices:** Specifies requirements for photoelectric sensors, edge sensors, and related devices, including installation and instruction requirements for residential and commercial door operators.
- **Performance:** Defines test methods and acceptance criteria, including leakage current tests (before and after humidity conditioning), input current, normal temperature, dielectric voltage withstand,

insulation resistance, metallic coating thickness, gasket aging, switch and control testing, strain relief, puncture resistance, and permanence of marking.

- **Manufacturing and Production Tests:**

Specifies required production-line tests such as dielectric voltage withstand and grounding continuity.

- **Instruction Manual:** Details requirements for installation instructions, user instructions, and field-installed labels.

- **Marking:** Specifies required product markings and identification details.

- **Appendix A - Standards for Components:** Lists referenced UL standards and other component-level standards used for test methods and compliance.

- **Supplements and Annexes:** Provide additional requirements, clarifications, or alternative test methods. These may address:

- Special operator types or configurations
- Additional safety considerations
- Region specific or application specific requirements
- Informative guidance that supports the normative sections of the standard

Supplements and annexes are now a routine part of UL 325's structure and should be reviewed alongside the main body of the standard to ensure full compliance.

## Impact

This standard covers the design, manufacture, and installation of the products. Even the instruction manuals are evaluated when the type testing is accomplished. Any changes made to the products during installation can void the manufacturer's warranty, and create an unreliable, or worse, an unsafe product.

Every installation should have the proper product selected. Use the correct tools for the job. Always follow the installation instructions.

Always use the field-installed labels that are supplied with the product. Educate the users in the proper and safe use of the product.

## UL 325 for Commercial Operators

A revision effective in 2010 requires that all labeled and listed commercial and industrial operators manufactured on or after August 29, 2010 must comply with the 2010 revision to UL 325. The most noteworthy of which was a revision requiring that all commercial/industrial door operators monitor an external entrapment protection device or otherwise function only in constant pressure to close mode.

An external entrapment protection device is an apparatus intended to reduce the risk of injury by preventing persons from becoming caught or held under a closing door. Common examples of these are photo eyes and sensing edges. The requirement for these to be monitored essentially means the operator must verify these are working properly prior to, and during, closing of the door. The monitored device must provide status to the operator, which is designed to receive and monitor the status. In the event that the monitored device is not present or has a fault condition, the operator must revert back to constant pressure to close, or stop and reverse a closing door. Either monitored photoelectric sensors or monitored sensing edge devices are mandatory for any momentary contact, radio control, timer-to-close, or other unattended operation closing cycle.

In industry training, external entrapment protection devices are often described as **primary** or **ancillary**, even though these terms do not appear in UL 325. A primary device is required when momentary contact to close is used and must be a monitored device, such as monitored photo eyes or a monitored sensing edge. Ancillary devices are optional and cannot replace the required primary device; examples include non-monitored electric or pneumatic sensing edges or additional photo eyes installed above the primary set.

When photo eyes are used as the primary monitored device, they must be mounted no higher than six inches above the floor. Installations that do not include a primary monitored external entrapment device must operate with constant pressure to close, regardless of any ancillary devices present.

In a constant pressure to close condition, the operator must stop the door, and may reverse the door, when pressure on the control is released before the door reaches the closed limit. Constant pressure to close is not permitted from a portable transmitter or any unattended operation device; these controls may only initiate an opening cycle. Therefore, any remote or unattended closing command requires primary, monitored external entrapment protection.

The UL 325 listing is dependent on the testing of each operator paired with each of the acceptable entrapment protection devices, so each device must be tested and approved for each operator. All door operator manufacturers or monitored entrapment device manufacturers are required to state within their installation manuals and/or user's guides which photo sensors and sensing edges are approved by UL or other Nationally Recognized Test Laboratory (NRTL) for use with a given operator as a monitored external entrapment protection device. Included with this is to provide suitable instructions on the methods of installation, adjustment, and wiring of external controls or devices serving as required protection against entrapment.

Additional requirements of UL 325 pertaining to commercial door operators are:

- A warning placard is to be placed in the vicinity of the door.
- If a three button station is provided, at least one button must be stop.
- Controls shall be far enough from the door or positioned such that the user is prevented from coming in contact with the door while operating the controls.
- Exposed moving parts of a commercial/industrial door operator

installed more than 8 feet above the floor are not required to be guarded or enclosed, provided the operator is marked to indicate the minimum acceptable installation height. If the operator is installed below 8 feet, all exposed moving parts must be guarded or enclosed to eliminate pinch points.

Prior to the revision in 2010, external entrapment protection devices were required, but they were not required to be monitored. Operators manufactured prior to August 29, 2010 can still be repaired as needed, but the technician should use this opportunity to educate the consumer on the added safety features and benefits of labeled UL 325 compliant operators.

## Environmental Considerations and NEMA Standards

Architectural specifications for commercial rolling door systems



frequently reference standards published by the National Electrical Manufacturers Association (NEMA), a trade association representing manufacturers in the electrical and electromechanical industries. NEMA publishes hundreds of technical standards across many volumes, far too extensive to summarize in this guide. The standard most relevant to door operator installations is **ANSI/NEMA 250, Enclosures for Electrical Equipment**, which defines environmental protection levels for operator control boxes and related electrical components.

Commercial and industrial door operators must be housed in enclosures that meet specific environmental and safety requirements. NEMA enclosure types describe the degree of protection an enclosure provides against dust, water, corrosion, and other environmental conditions. UL 50E complements these definitions by establishing the construction and performance tests used to verify that an enclosure labeled as a specific NEMA type

actually meets the protective characteristics defined by NEMA.

The following NEMA enclosure types are the ones most commonly referenced in operator specifications:

- **NEMA 1 - General Purpose:** An enclosure designed for indoor use to prevent accidental contact with live electric parts. It is not dust-tight or watertight.
- **NEMA 3R - Rainproof:** Designed for outdoor use to protect against rain and sleet. It is not required to be watertight from underneath.
- **NEMA 4 - Watertight:** A sealed enclosure that excludes water spray from any direction. It is not necessarily submersible.
- **NEMA 4X - Corrosion Resistant:** This is the same as NEMA 4, with added corrosion resistance. The enclosure material is typically plastic or stainless steel.
- **NEMA 7 - Hazardous Area (Gases/Vapors):** An explosionproof enclosure for areas containing flammable vapors or gases. Classified by gas groups (A, B, C, D).
- **NEMA 9 - Hazardous Area (Dust):** An explosionproof enclosure for areas containing combustible dust particles. Classified by dust groups (E, F, G).
- **NEMA 12 – Dust-Tight:** A sealed enclosure for indoor use that protects against dust, lint, fibers, and oil.

Applying NEMA Ratings in Door Operator Installations:

- All electrical controls are housed in NEMA 1 enclosures as a minimum.
- A particularly dirty or dusty environment would use a NEMA 12 Operator Modification.
- Areas with a lot of moisture or water spray should use a NEMA 4 or 4X Operator Modification.
- Hazardous areas containing explosive gases or combustible dusts may require a

NEMA 7/9 Operator Modification if the operator is installed within the classified location. Examples include chemical processing rooms, grain handling or milling facilities, powder coating or finishing booths, and petroleum or fuel-handling areas.

## Section Three

# Types of Rolling Doors

When discussing rolling door products, the term *door* is often used generically to describe a range of upward-acting rolling assemblies, including rolling service doors, rolling counter doors, and rolling grilles. This study material focuses on these core product types and does not address specialty rolling products, such as sheet doors or high-performance doors, which are discussed in the specialty applications section.

## Types of Non-Fire Rated Rolling Doors

The primary function of a rolling door is to provide controlled access to specific areas within or around a building. Depending on the product type, a rolling door may also contribute to security, environmental separation, visibility, airflow, or fire protection, but access control remains the foundational purpose across all rolling door categories.

### Rolling Service Door:

Rolling service doors are built from interlocking slats, a double angle bottom bar, guides, a barrel assembly typically with a counterbalance mechanism, support brackets, and a hood. These assemblies can be engineered to secure openings ranging from small service entrances to very large industrial or transportation-scale openings, such as those found in rail, aircraft, or heavy-vehicle facilities. Because of their durability and structural capacity, rolling service doors are used for both vehicular and pedestrian openings that are not designated as required means of egress.



**Rolling Counter Door:** Rolling counter doors, often called Counter Shutters, consist of the same components as rolling service doors, but are generally built on a smaller scale, using a smaller slat profile for the curtain and lighter gauge guides. They typically close on sill angles or countertops and are designed with a more finished appearance suited to interior or customer-facing environments. This contrasts with the more industrial look of rolling service doors, which are intended for heavier duty commercial applications. Although most counter doors serve pass-through or countertop openings, they may also be configured to run the full height of an opening and close on the floor when required by the application.



### Service Counter Door:

Also known as *Integral Frame Units* or *Packaged Units*, a service counter door consists of a rolling counter door that incorporates a four sided frame. These assemblies are used for openings in walls where the primary purpose of the opening is for non-pedestrian use, such as food-service counters, pharmaceutical dispensaries, package and baggage transfer points, or observation ports.



## Rolling Grilles:

A rolling grille is an upward acting rolling closure designed to provide security while allowing maximum air circulation, light infiltration, and visual access. Because they secure an opening without visually blocking it, grilles are widely used in shopping malls, storefronts, airports, schools, and parking facilities, where visibility and ventilation are important.



The curtain of a rolling grille is formed from galvanized steel, stainless steel, or aluminum rods and links that are laced together to create an open-pattern assembly. Rods may be solid or hollow, and the links can be arranged in various patterns and pattern sizes depending on the required appearance, airflow, and security level. Some grille designs allow clear polycarbonate inserts to be woven into the pattern to increase security while maintaining visibility.

Aside from the open-pattern curtain, the remaining components of a rolling grille - guides, bottom bar, barrel assembly, counterbalance mechanism, support brackets, and hood - are similar to those used in rolling service doors. This shared architecture allows grilles to operate with the same reliability and serviceability as solid-curtain rolling doors.

## Types of Fire Rated Rolling Doors

Fire rated rolling doors represent a distinct category within rolling door products because they must meet specialized performance, testing, and installation requirements. Unlike non-fire-rated doors, these assemblies are designed and listed to withstand standardized fire exposure and to compartmentalize a building during a fire event. Industry professionals must be able to recognize when an opening requires a fire-rated door and understand the features that distinguish a rated

assembly from a standard rolling door. The following section outlines the primary types of fire-rated rolling doors and the characteristics that define them.

## Rolling Fire Door:

Rolling fire doors generally consist of interlocking slats of a larger profile, a double angle bottom bar, guides configured of three or four steel angles, a barrel assembly, a counterbalance



mechanism, support brackets, a hood, an automatic closing device that will initiate emergency closing and a governing device to control automatic closing speed. These units can be designed and approved to protect small to very large openings and have fire ratings of 4, 3, 1-1/2, or 3/4 hours available. Rolling fire doors can be used for both vehicular and pedestrian opening applications that are not a required means of egress. Installation is covered in NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, Chapter 11.

Although these doors share many components with rolling service doors, they are specifically designed to close automatically when a fire is detected. Depending on the listing and application, specialty dropout mechanisms and automatic closing devices may be incorporated, along with sash chains or cable routings that activate the door's closing motion during a fire event. Fire rating and listing agency marks are applied to the bottom bar of the door to identify the door's rating and verify its listing approval.

## Rolling Counter Fire Door:

Rolling counter fire doors, often called *Fire Shutters* or *Fire Rated Counter Shutters*, consist of the same basic components as rolling fire doors,



but are generally of a smaller scale utilizing a smaller slat profile to make up the curtain and smaller guides normally configured of lighter gauge bent steel shapes. The maximum size opening in a fire wall these units protect is much smaller than rolling steel fire doors. The maximum width is about 16 feet and the maximum height is about 10 feet.

Counter fire doors may close on sill angles, noncombustible sills, or factory-built labeled countertops, depending on the application. Although most counter fire doors protect pass-through or countertop openings, they can also be configured to run the full height of an opening and close on the floor when required. Installation requirements for these assemblies are covered in NFPA 80, Chapter 11. Rolling counter fire doors may also be used to protect conveyor openings or pedestrian type openings that are not designated as required means of egress.

While some manufacturers use the term *fire shutter* when referring to rolling counter fire doors, note that NFPA 80 defines a fire shutter more specifically as *a fire door assembly used for the protection of a window opening in an exterior wall*. Requirements specifically for *fire shutters* (window openings) are addressed in NFPA 80, Chapter 12, and the installation of rolling counter fire doors in fire shutter applications must comply with the same functional requirements that apply to rolling steel fire doors in Chapter 11.

## Service Counter Fire Door:

Similar to Service Counter Doors, a Service Counter Fire Door is a fire rated door assembly consisting of a rolling counter fire door that incorporates a four sided frame and will bear a *Service Counter Frame and Fire Door Assembly*



label. These assemblies are used to protect openings in fire rated walls where the primary function of the opening is non-pedestrian use, such as food service counters, pharmaceutical dispensaries, package and baggage transfer points, or observation ports. Similar in construction to rolling counter fire doors, service counter fire doors are also designed to close automatically when a fire is detected.

The opening is limited to approximately 10 feet wide and 6 feet high. The fire rating is typically 1-1/2 or 3/4 hour. Installation is covered in NFPA 80, chapter 13.

Service counter fire door construction generally falls into one of two categories:

- A complete, labeled assembly consisting of the curtain, bottom bar, guides, and a four-sided frame with an integral countertop. This is the traditional service counter fire door package.
- A listed service counter fire door assembly consisting of the curtain, bottom bar, guides, brackets, and hood, designed for mounting directly to masonry or non-masonry walls. This version does not include a factory frame or countertop but is still listed as a service counter fire door.

## Conveyor Openings

Rolling fire doors and smoke control products are often used to protect fire rated wall openings that contain conveyor systems passing through the wall.



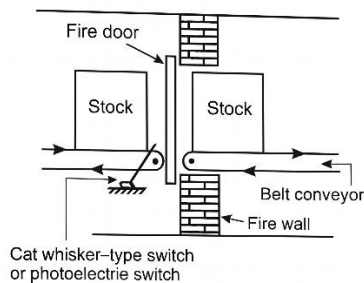
When supplying and installing fire rated products for conveyor openings, two critical requirements must be addressed:

1. The fire door must completely close off and seal the opening.
2. The conveyor system must be designed so that the curtain can close without obstruction during a fire event.

The most reliable way to ensure complete closure is to design the fire door to close to the floor or to a sill angle located between two

separate conveyor belts. The required slot size between the conveyors depends on the size of the materials being transported. Many manufacturers offer special bottom bar designs that reduce the required slot width, but these details must be coordinated early in the project between the conveyor supplier and the fire door manufacturer.

In some applications, it may be acceptable to construct fire rated walls up to the height of the conveyor belt to close off the side gaps, allowing the fire rated rolling door to come to rest on top of the conveyor and the built-up



side walls. This configuration requires prior approval from the AHJ.

Special planning is required to ensure that the curtain will fully close when the automatic closing device is activated. Common approaches include:

- Integrating the fire door operator with the conveyor system's control logic. The fire alarm signal is routed through the conveyor control system, which delays the door's closing command until the conveyors have run long enough to clear all material from the opening.
- Using multiple rolling fire doors when material size and spacing are consistent. Installing more than one fire door within the opening ensures that at least one door will clear the material and fully close to protect the opening.

Regardless of the configuration, ensuring full closure during a fire emergency is essential. Proper coordination between the conveyor designer, fire door supplier, and installer is necessary to achieve a compliant and reliable system.

## Specialty Applications

The commercial rolling door industry includes a wide range of specialty and custom designed products. While some of these assemblies share components with standard rolling doors, many are unique enough to require their own dedicated training and technical guidance. Some specialty rolling products incorporate unique construction features, operational characteristics, or code-driven requirements that place them outside the scope of standard rolling door training.

This section outlines several of the more common specialty applications that technicians may encounter in rolling door applications. These specialty applications are rarely applicable to rolling steel fire doors. Because these products often involve unique design features, installation requirements, or code

considerations, it is important for technicians to recognize when an opening involves a specialty application and to obtain the appropriate training before performing installation, service, or inspection work.

**Pass Door:** A pass door, sometimes called a wicket door, is typically a hollow metal pedestrian door that is integrated into a rolling door assembly to allow personnel access without raising the entire curtain. The pass door frame is hinged at the jamb so the entire frame can swing clear of the opening. The leading edge of the pass door incorporates a vertical guide section that the rolling door curtain lowers into when the pass door is secured.



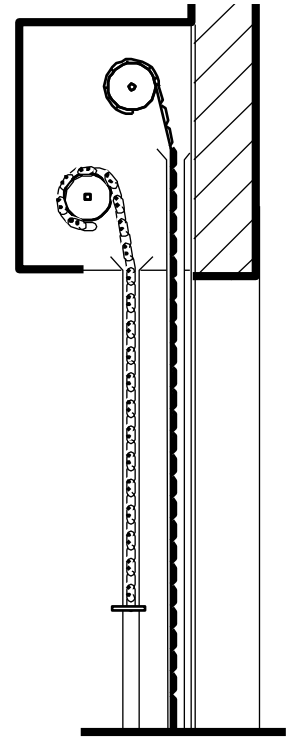
Pass doors may be located on either the right or left side of the opening and can be configured to swing inward or outward depending on the application. Because the pass door frame interrupts the curtain path, this option is not suitable for high wind environments. On motorized rolling doors, an interlock is required to prevent the door from operating unless the pass door frame is fully closed and locked into position, ensuring the curtain can descend safely without obstruction.

**Wood Rolling Doors:** Wood rolling doors, while less common today, have been used primarily in counter door applications where a traditional or architectural wood appearance is desired. In these assemblies, the curtain, hood, and bottom bar are constructed from wood, while the remaining components are the same as those used in standard rolling counter doors. These doors have been manufactured in a variety of wood species and finishes, allowing

them to match surrounding millwork or interior design requirements.



**Combination Doors:** Combination doors, sometimes referred to as superimposed or compound doors, use a dual guide system that allows two different rolling door types to operate within the same opening. This configuration is used when an opening requires two distinct performance characteristics that a single door cannot provide.



The most common arrangement pairs a rolling grille with a rolling service door. This setup allows the grille to provide airflow and visibility during non-secure hours, while the solid slat service door provides full security and environmental separation when the opening must be closed. In typical installations, the exterior door is the solid slat unit, while the interior door is the fenestrated door or rolling grille.

**Sloped Bottom Bar:** A sloped bottom bar is an optional bottom bar design used when the sill or threshold of an opening is not level. The bottom bar is fabricated by inserting a tapered plate between the bottom bar angles so that the curtain edge matches the slope of the floor, improving the seal when the door is fully closed.

Because the tapered plate extends farther downward on the low side, it will hang into the opening when the door is raised unless additional clearance is provided. To avoid interference, the door height may need to be increased, and the coil mounted higher, so the sloped portion clears the opening during operation.



### Side Coiling Doors:

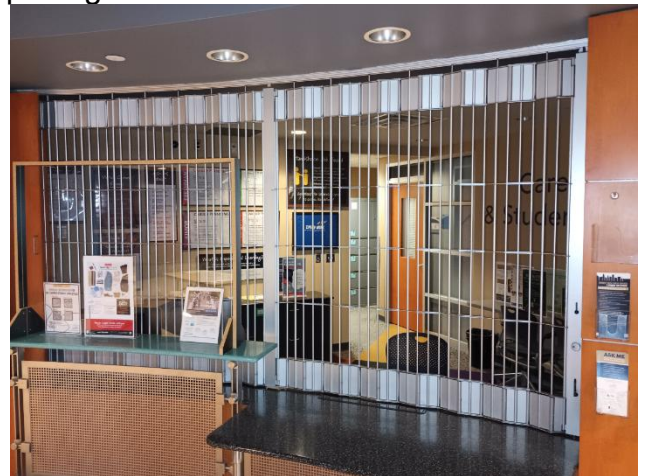
Side coiling doors are specialty rolling products designed for applications where overhead space is limited or where the opening follows a curved or irregular path. Instead of rolling upward into a coil, the curtain travels horizontally along an overhead track, allowing the door to operate in locations where a traditional vertical coiling door cannot be used.



These doors are available in solid curtain and grille configurations, and their horizontal travel allows for pattern combinations and design options not achievable with standard coiling doors. The curtain is supported by an overhead track, which allows it to free-hang during operation, while a bottom track controls swing and provides security.

Side coiling doors can be configured as single sliding units or as bi-parting assemblies for wider openings. They are typically motor operated and can incorporate many of the same options found on conventional rolling door products, including access control features, safety devices, and specialized curtain materials.

**Side Folding Grilles:** Side folding grilles are accordion style security closures that slide horizontally into the sides of an opening and stack compactly into a recessed wall pocket. Instead of rolling around a barrel like a traditional rolling grille, the curtain folds back and forth along its length until the opening is fully clear. This makes side folding grilles especially useful in locations where overhead space is limited or where a rolling grille coil cannot be accommodated, such as a curved opening.



These grilles use a curtain constructed from vertical rods connected by horizontal links, suspended from a top track that supports and guides the assembly. The track can be straight or curved, allowing the grille to follow irregular or serpentine storefront layouts. Because the curtain hangs from the top track, no barrel or coil is required, and the grille simply stacks into a pocket when opened.

Side folding grilles are commonly used in airports, office buildings, shopping centers, and other public spaces where visibility and security are needed but overhead clearance is restricted. Their ability to follow curved openings and store neatly out of sight makes

them a versatile option for architectural environments.

### Sheet Doors:

Sheet doors are vertically operating, coiling door assemblies commonly used in commercial, industrial, and self storage applications.



Unlike rolling service doors, which use interlocking slats, sheet doors feature a curtain made from roll formed metal sheets seamed together into a single continuous panel. When opened, the curtain coils around an axle assembly located at the head of the door.

Sheet doors are similar in appearance and function to rolling service doors but are generally more economical and limited to smaller openings due to their construction. Their simplified design makes them well suited for applications where cost efficiency and basic security are priorities, but they are not recommended for high cycle, high security, or frequent use applications.

**Horizontal Doors:** Horizontal doors are specialty rolling products designed to cover horizontal or inclined openings, rather than vertical wall openings. These assemblies operate similarly to rolling service doors but are rotated so the curtain travels across a horizontal plane, making them suitable for applications such as skylights, pit covers, or floor hatches.



The curtain coils into a barrel assembly when opened, just like a standard rolling door, but the track system is configured horizontally. Tracks may be straight or curved to follow the

contour of the opening, allowing the door to seal irregular or sloped surfaces.

### High Performance Doors:

High performance doors are non-residential rolling, folding, or sliding assemblies designed for high cycle counts, high operating speeds, and enhanced durability compared to standard rolling doors. They are typically made-to-order and engineered for demanding environments where frequent operation, environmental control, or process efficiency is essential.



The most common type is the high speed rolling door, which is designed to travel at a minimum opening speed of 32 inches per second and a minimum closing speed of 24 inches per second. These higher operating speeds help reduce air exchange, improve traffic flow, and support controlled environments such as manufacturing facilities, warehouses, clean rooms, and cold storage applications.

These doors rely on specialized designs that vary significantly between manufacturers, including differences in curtain materials, guide systems, counterbalance methods, and operator technology. Their construction allows them to withstand heavy use and harsh conditions, but also means that components, controls, and maintenance procedures are often product specific. Because of this variation, technicians must be familiar with the particular high performance models they encounter and understand the unique operational and service requirements associated with them.

**Crane-way Doors:** Crane-way doors are a specialized type of rolling door designed for openings that must accommodate the travel of an overhead bridge crane. These doors take their name from their most common

application, closing wall openings along a crane runway so that a bridge crane can move from the interior of a building to the exterior or between separate bays. To allow this movement, the curtain is built with two distinct vertical sections: an upper portion that spans the full width of the opening, and a shorter lower portion sized to fit between the structural beams of the crane runway.

When the door is open, the shortened lower section creates a clear path for the crane bridge and hoist to pass through without interference. When closed, the full curtain assembly provides security and environmental separation just like a standard rolling door. Because these doors must integrate with structural steel, crane rails, and building movement, they require careful coordination during design and installation to ensure proper clearances, alignment, and safe operation.



**Mullions:** Mullions are combined guide assemblies used to join two adjacent rolling doors so they can function together across a wider opening. They may be stationary or removable, depending on the application. Removable mullions can be mechanically or motor operated, allowing the center guide to hinge upward, lift out, or slide to the side so the full opening width is available when all doors are raised. This makes them especially useful in very wide openings where a single rolling door would exceed practical design limits for weight, wind load, or structural support.

These assemblies are also common in airport hangar doors, where the center portion of the opening is often required to be taller than the outer sections to accommodate aircraft tail heights. By dividing the opening into multiple door sections with a removable center mullion, the system provides both the necessary clearance and the flexibility to open the full span when needed. Proper alignment, secure engagement, and coordinated operation are critical, as mullions directly influence the performance and safety of the doors they connect.

## Section Four

# Rolling Door Components

Rolling door products can be comprised of four different materials: aluminum, steel, stainless steel, and to a lesser extent, wood. Due to the lower melting point of aluminum and the flammability of wood, aluminum and wood are not used for any critical fire door components. That leaves steel and stainless steel as the base material for rolling fire rated products.

## Steel Components

The great majority of rolling door components are often made of steel, including slats, bottom bar, hoods, brackets, barrels, springs, guides, fasteners, and others. Many of these components are available from manufacturers in stainless steel or aluminum as well.

Standard or available finishes for steel components other than sheet metal are dependent on the manufacturer. The most common finishes are:

**Primed** – A factory-applied primer coating that provides basic corrosion resistance and prepares the surface for field painting. Primer color varies by manufacturer.

**Primed and Painted** – Components are factory-primed and then finished with a manufacturer-applied topcoat. This provides improved durability and appearance compared to field-applied paint.

**Hot Dip Galvanizing** – A hot liquid process that applies a protective zinc coating in a metallic silver finish.

**Cold Galvanizing** – A zinc rich spray on liquid coating or zinc rich powder coating is applied to metal components for enhanced protection against weather and corrosion.

**Powder Coating** – An electrostatic applied polymer that is baked onto steel or aluminum components providing a durable finish in a wide array of color choices.

Sheet metal steel components are commonly galvanized with zinc coatings ranging from G40 to G90. In many cases slats are also finished with at least one layer of baked-on primer and a polyester topcoat. Hood coatings may match the curtain, or at a minimum be painted steel. Other exposed ferrous non-galvanized components are supplied at a minimum with a coat of primer, paint, or powder coating.

## Stainless Steel Components

Curtain slats and hoods can be formed of rolled or bent stainless steel sheet metal in varying gauges. Bottom bars and guides can be made from bent stainless steel plate or structural stainless steel angles. Most stainless used for rolling fire product components is grade 304.

**Type 304 stainless steel** is the most versatile and widely used of the 300-Series alloys, making it the primary stainless grade for rolling door components. It offers excellent forming and welding characteristics and can be readily break formed or roll formed into slats, hoods, guides, and other structural parts. Its corrosion resistance is strong across a wide range of environments. This balance of formability, weldability, and corrosion resistance makes 304 the preferred choice for most stainless steel rolling door assemblies.

**Type 302 stainless steel** is a close relative of Type 304, sharing the same basic composition but with a slightly higher carbon content. This gives 302 increased strength and hardness when cold-worked, making it suitable for roll formed components that benefit from higher tensile properties. It can be readily break

formed or roll formed into slats, hoods, and other light-gauge parts. While its corrosion resistance is good, it is generally considered slightly lower than that of Type 304, particularly in more aggressive environments. Its combination of formability and strength makes 302 a practical choice for certain rolling door components where additional strength is desirable.

**Type 316 stainless steel** is an austenitic alloy similar in strength and formability to Type 304 but with the addition of molybdenum for enhanced corrosion resistance, particularly in chloride-rich or chemically aggressive environments. It can be roll formed or break formed into slats, hoods, guides, and other components where elevated corrosion protection is required. While not commonly specified for standard rolling door assemblies, Type 316 may be selected for installations in marine, industrial, or high corrosion environments where its superior resistance to pitting and chemical attack provides long term durability.

**Type 430 stainless steel** is a ferritic grade commonly used in applications where moderate corrosion resistance is acceptable and cost efficiency is a priority. It offers good formability and can be roll formed into slats, hoods, and other components for rolling doors, especially in non-coastal or controlled-environment installations. As a ferritic alloy, Type 430 is magnetic and has lower corrosion resistance than the austenitic 300 Series grades, but it performs well in many indoor or mild outdoor conditions. Its balance of formability, availability, and lower material cost makes 430 a practical option for rolling door products that do not require the enhanced corrosion resistance of 304 or 302.

## Stainless Steel Finishes

Stainless-steel finishes affect both the appearance and performance of rolling door components. Differences in reflectivity, surface texture, cleanability, and weld blending determine which finish is appropriate for a

given application. The three finishes most commonly encountered in rolling door assemblies are #4 Polished, 2B, and Structural Stainless (Mill Finish).

**#4 Polished Finish** is produced by abrasive belt polishing of cold rolled stainless steel sheet, plate or strip. Since polished grain lines follow one direction, hand or machine polishing after fabrication can restore finish. In welded assemblies the weld beads are first ground smooth and then re-polished to blend with original finish. Polished finishes can be cleaned frequently without changing surface appearance. This general purpose polished finish finds wide application in restaurant equipment, dairy equipment, food processing, medical and chemical equipment, as well as various architectural products.

**2B Finish** is the standard general purpose cold rolled finish for stainless steel. It has a smooth, uniform gray appearance that varies slightly with alloy type and thickness, with thinner gauges typically appearing brighter. Because of its clean, consistent surface and broad availability, 2B is used for a wide range of fabricated parts, including many rolling door components where a polished appearance is not required.

**Structural Stainless Primary Finish (Mill Finish)** is produced after hot rolling when heavier gauge plate and sheet are annealed and pickled. The resulting surface is dull, etched, and naturally variable in appearance. This finish is typically used in industrial applications where surface smoothness and uniformity are not critical, making it suitable for structural components of rolling doors that prioritize strength and durability over appearance.

## Aluminum Components

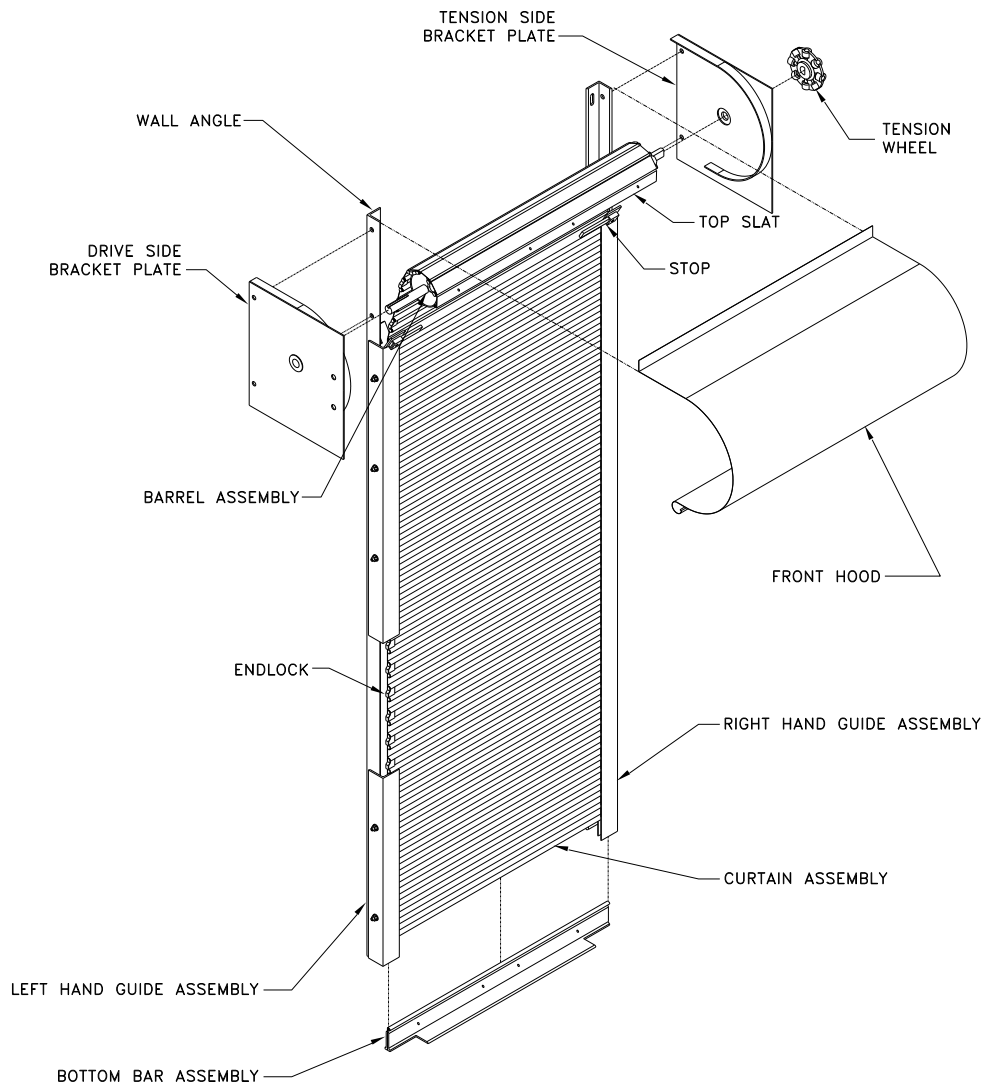
Most aluminum components are constructed from aluminum extrusions which are pre-formed and cut to length for the door. Aluminum can also be roll formed into various

shapes. Aluminum slats typically are available in 14 and 16 gauge material.

Aluminum can be finished in a number of ways. Most aluminum doors are mill finish, and for more corrosive environments or better appearance can be clear anodized. Primed and painted, or powder coated finishes are also available.

Aluminum is also commonly used for rolling grilles. Available in mill finish, anodized (can be clear or colored), or powder coated, grille curtains are often made using aluminum links and hollow or solid aluminum rods.

### Typical Rolling Door Components



## Curtains

The curtain is the largest component of a rolling door and forms the protective barrier that covers the opening. It is the part of the door that travels vertically within the guides, winding onto and off of the barrel assembly during operation. The curtain is assembled by interlocking individual slats, which slide together to form a continuous sheet of metal. To keep the slats aligned and prevent them from separating under load, endlocks are installed on alternating slats or on every slat depending on the design. These endlocks maintain the curtain's structural integrity, help distribute forces during operation, and reduce wear on the slat edges.



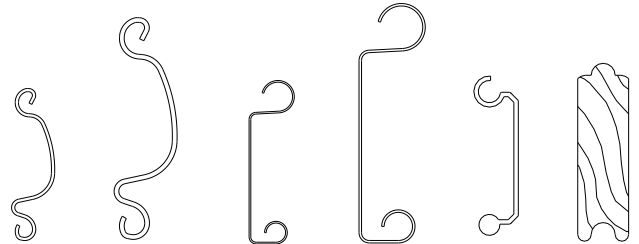
Once the slats and endlocks are assembled into a complete curtain, the top of the curtain is secured to the barrel assembly. This connection is made directly to the barrel or barrel rings, using fastening sections or one or more starter slats. This attachment point transfers the curtain's weight and operating forces to the barrel and counterbalance system, allowing the curtain to wind smoothly and evenly as the door opens and closes.

## Slats

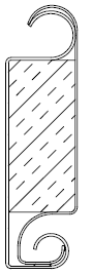
The curtain configuration varies based on the type of door. Solid curtain slats are made of stainless steel, prime painted steel, galvanized steel, aluminum (mill or anodized), or wood. Interlocking curls are formed on the top and

bottom of the slats that are laced together to form the curtain. They can be produced in a curved or flat configuration in a variety of sizes and gauges.

Examples of typical slat profiles, from left to right, are; small curved slat, large curved slat, small flat slat, large flat slat, aluminum extruded slat, and wood slat:



Insulated slats have an added backer slat with insulation sandwiched in-between. This insulation improves the door's resistance to heat flow and sound transmission. The foam may be foamed-in-place during slat production or laid in place during curtain assembly. Insulated Rolling doors typically have an R value between 6 and 8 and an STC/OITC rating of around 20 decibels. Reference your specific manufacturer for exact ratings.



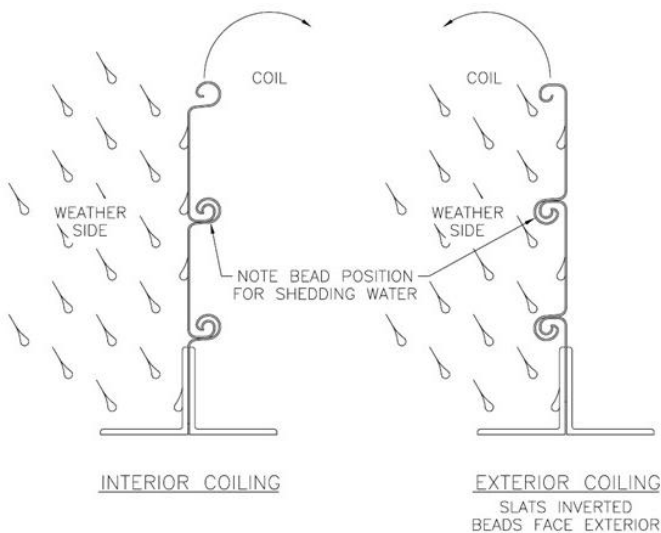
Insulated slats for fire doors are typically made using mineral wool insulation because of its fire resistance properties. Insulated fire doors typically have an R-value between 4 and 5 and an STC/OITC rating of around 20 decibels. Reference your specific manufacturer for exact ratings.

Slats are commonly available in 26, 24, 22, 20, and 18 gauge thickness with some large slats using 16 or even 14 gauge. The finish on the galvanized steel curtain can be left unpainted, phosphate treated for paint adhesion, prime painted, finish painted, powder coated, and/or finished with a zinc rich coating to prevent corrosion. With the exception of secondary coating such as powder coating, finishes are typically applied prior to the roll forming process. The finish on the stainless steel curtain is typically a #4 polished finish, however 2B finish is available from some manufacturers

when the doors are in a corrosive environment and aesthetics is not an issue.

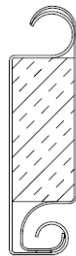
Slats interlock together differently for a door mounted on the inside of a building vs. a door mounted on the outside of a building. The orientation of the slats is reversed to provide proper watershed and prevent water infiltration into the building. This orientation is such that the upper slat bead on the outdoor side of the curtain covers the slat joint, preventing water from infiltrating the slat connection. If the slats were not properly oriented when assembled, water would collect inside the individual slat beads and ultimately penetrate into the building. It is important to specify interior vs. exterior mounting when the door is ordered to ensure the slats are assembled for proper watershed.

Reference the image below showing the different orientation of a flat slat assembly for an interior vs exterior mounted door:



## Insulation

Insulation plays a key role in the thermal performance, sound control, and, in the case of fire doors, the fire-resistance characteristics of rolling door assemblies. Manufacturers use several types of insulation depending on the door's design, required performance, and intended application. Each material has distinct properties that affect how it is installed between the front and backer



slats and how the finished door performs in service. The most common insulation materials used in rolling steel doors include Expanded Polystyrene (EPS), Polyurethane (PUR), and Mineral Wool.

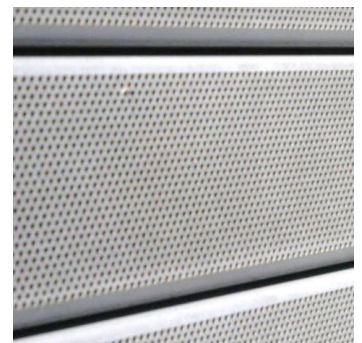
**Expanded Polystyrene Insulation (EPS):** A rigid foam insulation made from compacted polystyrene beads. EPS is commonly used as lay-in-place insulation, where pre-cut pieces are inserted between the front and backer slats. It provides consistent thermal performance and is widely used in non-fire-rated insulated rolling doors.

**Polyurethane Insulation (PUR):** A two-component, expandable foam that is typically foamed in place between the front and backer slats. PUR can also be manufactured in block form and cut to size for lay-in-place applications. It offers higher thermal resistance per inch than EPS and is used when improved energy performance is required.

**Mineral Wool (Fire Doors):** Produced by spinning molten rock into fine fibers, similar to the process used to make cotton candy. These fibers are formed into dense, workable insulation with excellent fire resistance, sound absorption, and thermal properties. Mineral wool is commonly used in insulated fire doors, where it is laid between the front and backer slats to help the assembly meet its fire protection rating.

## Perforated Slats

Perforated slats are available with multiple small holes punched in the slats on a tightly repeated pattern. These slats allow air and light to flow through the door while still maintaining security and strength.



The smaller holes of perforated slats can also prevent most insects from entering through the curtain.

## Fenestrated Slats

When greater air or light penetration is desired, fenestrated slats are available. These slats are similar to perforated slats, but have larger rectangular cutouts instead of small holes which can improve the durability of the slat. Fenestrated slats can comprise the entire door, or just a few rows of slats depending on how much light and air penetration is desired.



## Vision Slats

Similar to fenestrated slats, vision slats utilize rectangular cutouts in the slats with clear coverings to create small windows in the door. They are typically grouped in rows of multiple slats at eye level of the door to provide visibility to the opposite side of the door. The clear coverings prevent bugs and weather from entering and allow light to pass through the curtain.

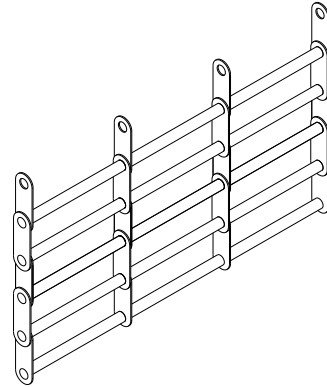


## Grille Curtains

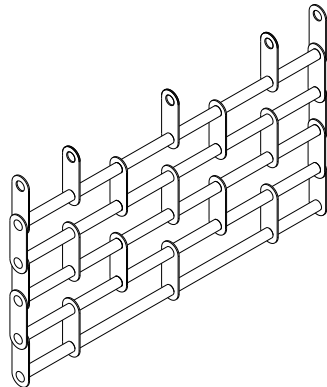
Grille Curtains are constructed from solid or hollow rods, links, and spacers which are laced

together to form a pattern. Available in aluminum, steel, and stainless steel, grille curtains are most commonly produced in straight and brick patterns of various pattern lengths.

### Straight Pattern:

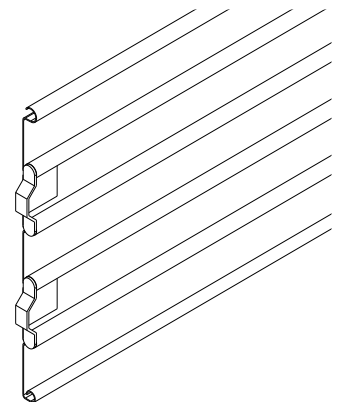


### Brick Pattern:

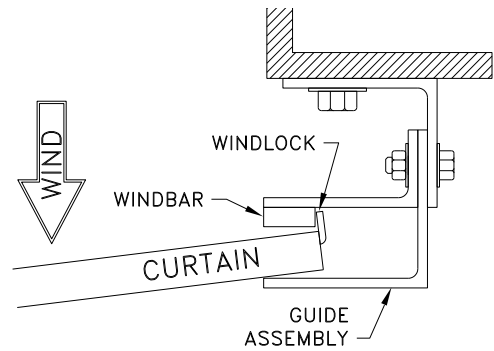


## Endlocks/Windlocks

Endlocks are the component of the door curtain that prevents the slats of the curtain from sliding apart or shifting during the travel of the door. Rolling door endlocks typically are constructed of cast iron, stamped steel, or nylon. Fire product endlocks are constructed of cast iron or stamped steel. They are typically riveted to both ends of each or alternating slats. Specifications sometimes call for endlocks on both ends of each slat, or continuous endlocks.



In certain applications, endlocks utilize a *windlock* design. Windlocks incorporate a locking tab to secure the curtain inside the guides, preventing the curtain from releasing in high wind events or to meet specific wind load requirements. When utilizing windlocks, guides must be adapted to incorporate a *wind bar*. The wind bar allows the windlocks to engage and hold the curtain in place under wind load for the designed PSF rating. Specifications or wind load requirements may sometimes call for windlocks on both ends of each slat, or continuous windlocks.

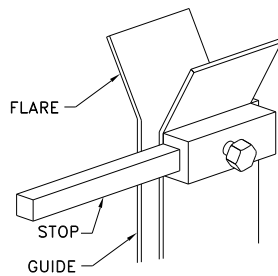


There are three factors that determine the design of the guides on rolling doors.

## Guides

Guides retain the edges of the curtain within the opening. Guides are available in various materials. Typically, they are constructed of formed shapes and/or structural angles. Steel guides can be powder coated, prime painted, galvanized, non-galvanized (bare), stainless steel, or zinc rich coated to prevent corrosion. Aluminum extruded guides are also available for non-fire rated products in some of these finishes along with mill finish and clear or colored anodized.

The tops of the guides are often flared (bellmouth), providing a smooth transition for the curtain to enter into the guides. Stops are installed at the top of each guide to prevent the curtain from exiting the guides. Some designs combine the flare and the stops into one component.

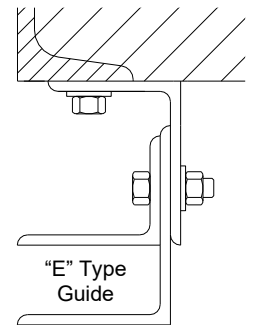


The inside of the guide opening may contain a *wind bar* on wind load rated or larger doors. A wind bar is a channel or bar welded inside the guide opening which engages the windlocks under wind load. This prevents the curtain from releasing from the guides when wind is present.

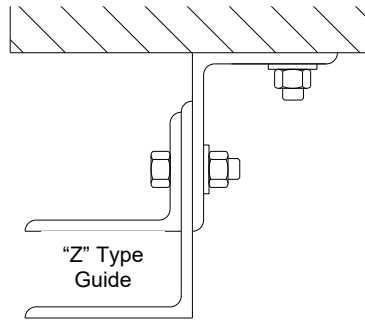
First, since the guide angles are fastened to the wall and provide the only supporting connection between the door and the wall, they must be sized correctly to support the weight of the counterbalance assembly and curtain assembly. Guide construction and fastener type must be designed around the intended loads as well as any other loading requirements such as wind loads or seismic loads.

Second, wall construction and building material clearances influence guide design. There are two primary designs for face of wall mounted guides with regards to wall fastening and both affect only the part of the guide that attaches to the wall, called the *wall angle*.

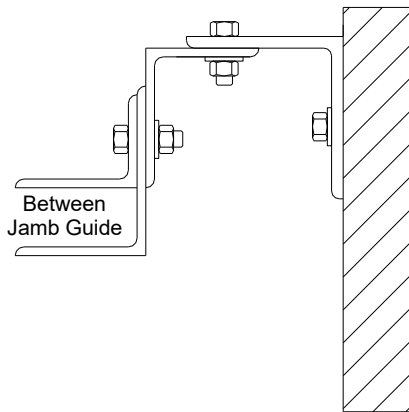
On steel jambs the wall angle can be bolted to the jamb or welded to the face of the jamb in accordance with the manufacturer's listing. The toe of the wall angle is pointing toward the jamb opening. This type of guide configuration is also known as an **"E" type guide**. FM does not allow guides to be welded to steel jambs.



When mounting to wood, masonry, or concrete, the mounting fasteners are moved away from the edge of the opening. This prevents the jamb corners from cracking. The distance from the edge should be at least 6 times the diameter of the fastener. In this case the toe of the wall angle is pointed away from the jamb opening. This type of configuration is also known as a **“Z” type guide**.



Third, the guide mounting location can also affect the guide design. There are times that because of headroom and/or sideroom limitations the guide cannot mount on the face of the jamb. In these cases, the guide is mounted within the jamb opening, which is known as **between jamb mounted**. This application normally uses a four angle guide design, as opposed to a standard three angle design. The addition of the fourth angle provides clearance from the jamb to accommodate drive and tension side components of the door.



There are several ways to attach the guides to the jamb. Steel jambs may be drilled and tapped to accept machine bolts, drilled to accept through bolts and nuts, or the guides may be welded in place. When welding guide angles to the face of steel jambs, strict adherence to the manufacturer’s requirements regarding number of welds and length of welds is required.

On solid masonry jambs the use of expansion anchors or through-the-wall type bolts and crush plates are acceptable. Expansion

anchors, bolts, and crush plates must be manufactured from zinc or cadmium coated steel or stainless steel.

On hollow block walls the guides shall be attached by means of through-the-wall type bolts and crush plates.

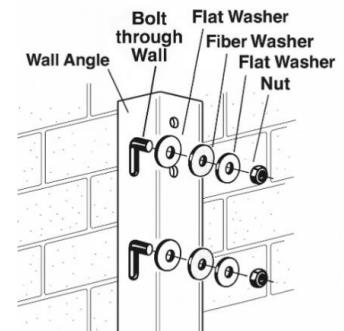
When attaching fire door guides to the jambs, it is extremely important to follow the manufacturer’s directions for upward or downward expansion and for the installation to be in accordance with NFPA 80.

**NOTE:** The installer should only use manufacturer supplied fasteners and verify them against the installation manual. NFPA 80 does not approve the use of lead anchors for fire door installations. Do not use lead anchors to install any component of a fire door.

### Fire Door Guide Expansion Clearance

The fire door guides are exposed to a tremendous amount of heat during a fire event. Steel expands as temperatures increase, which causes the guide angles to grow in length. This guide expansion must be compensated for with the guide and door designs to prevent catastrophic failure in the event of a fire. One way this is done is by incorporating *Expansion Clearance* into the door design. Expansion clearance is an amount of space built into the door design to accommodate the length increase of the guides during a fire. There are two types of expansion clearance.

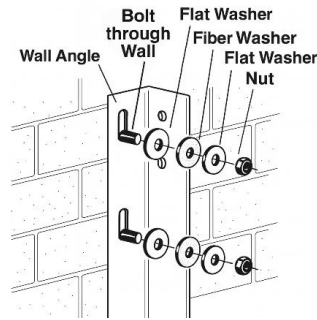
**Upward Expansion** is when the expansion clearance is at the top of the door and the guides are designed to move upwards during a fire. Fasteners attaching the guides to the wall must be located at the tops of the wall mounting slots, so that the guide angles can slide upwards during a fire. These



fasteners typically use special galvanized or fiber washers to aid with this guide movement during a fire. The fiber or special galvanized washers are designed to melt during a fire, creating clearance for the guide angles to move. It is critical to ensure proper clearance at the top of the door to maintain this upward expansion.

### Downward Expansion

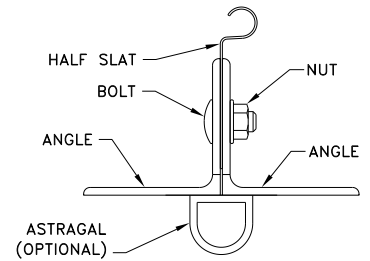
is when the expansion clearance is at the bottom of the door and the guides are designed to move downward during a fire. This requires the guides to be shimmed an additional distance off the floor during installation to provide the required clearance. Wall mounting fasteners in downward expansion designs are required to be installed at the bottoms of the wall mounting slots, so the guide angles can slide downward in a fire. These fasteners also typically use special galvanized or fiber washers to aid with guide movement during a fire. In some cases, it may be necessary to install additional metal shielding at the bottom of the guides to cover gaps for expansion clearance and/or from shimming the guides level.



The requirements for upward and downward expansion vary from one manufacturer to another depending on their listing agency's approval. The amount of expansion required is typically 1/8 inch per foot of height. For example, an 8 foot tall door would typically require 1 inch of expansion clearance. It is crucial to the safe function of a fire door to strictly adhere to the manufacturer's installation instructions for the amount and location of the guide expansion clearance. Failure to follow these instructions could result in failed protection in the event of a fire.

### Bottom Bars

The bottom bar is the part of the door curtain that rests on the floor or sill when the door is closed. It is typically constructed of structural or formed steel or aluminum angles, tubes, or aluminum extrusions. The most common construction is two angles mounted back-to-back with a half slat sandwiched between the angles. Some smaller door designs or doors used with conveyor systems might have only one angle for the bottom bar. The bottom bar is notched, or coped, at the ends so that the vertical portion of the angle can extend into the guide.



Bottom bars perform several functions which are important to the design and security of the product. It reinforces the curtain assembly and can greatly deter someone from lifting or prying the curtain up to gain access under the door. It provides a surface on which one or more locks can be mounted to secure the door. It can also be equipped with an astragal for weather protection or a sensing device for safety. On an electrically operated door equipped with a bottom bar sensing edge, the door would stop and reverse when it senses an obstruction.

The bottom bar prevents the curtain from exiting the guides when the door is open. By contacting the stops, the door cannot proceed up into the hood mechanism causing damage to various door components.

Bottom bars typically have a label affixed which identifies the manufacturer and serial number of the door.

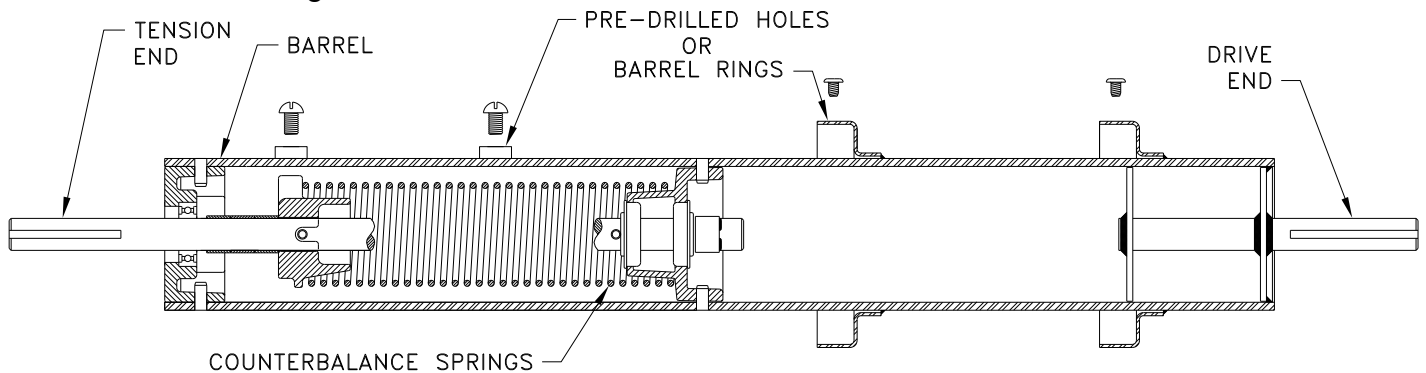
On fire rated products, the bottom bar also provides hanging weight required to initiate automatic fire door closing. They typically have the fire door label, and smoke label if applicable, affixed which identifies the manufacturer, listing agency, fire and/or smoke rating, and serial number of the door. It is important that the information on the label be

retained for replacement parts. For fire doors, replacement bottom bars, if needed, may only be supplied by the original fire door manufacturer.

Bottom bars can be finished in a variety of ways. Steel bottom bars can be galvanized, painted, powder coated, or left unfinished. Stainless steel bottom bars can be mill finish, 2B finish, #4 finish, painted, or powder coated. Aluminum bottom bars are available in clear or colored anodized, mill finishes, primed and painted, or powder coated finishes.

## Barrel

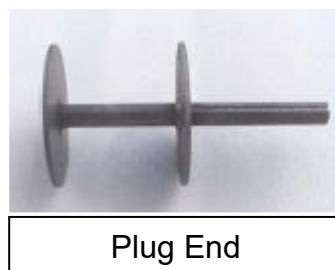
The barrel is typically a cylindrical member, steel tubing or pipe, whose main function is to house the counterbalance spring(s) and related hardware. Welded nuts/studs, or predrilled and tapped holes in the barrel or barrel rings allow for attachment of the curtain to the barrel.



The barrel must be large enough to house the springs required to correctly balance the door. Industry practice requires that the barrel pipe should not deflect more than 0.03 inches per foot of width.

One end of the barrel is the *tension end*, and the opposite end is the *drive end*. If a door is designated as right hand operated, the drive end is located toward the right jamb of the door, as viewed from the coil side of the door.

Drive shafts consist of a short solid shaft with one or more round plates welded to the shaft and pipe called a *plug end*, sometimes called a drive plug. The tension end



contains the counterbalance mechanism and the tension shaft is connected to the springs.

## Counterbalance Mechanism

The counterbalance mechanism consists of one or more helical torsion springs and related hardware, and is housed within the barrel. The springs are designed to compensate for the weight of the curtain and to facilitate the desired method of operation. The counterbalance mechanism will not balance the door at all intervals of the opening and closing cycle. The door, when balanced properly, should hold tight in the open position and rest on the floor or sill with minimal lift. Rolling doors are often out-of-balance to some degree through portions of mid-travel because the

counterbalance system is designed to achieve its best balance near the fully closed and fully open positions.

Fire door counterbalance mechanisms must be designed, manufactured, and installed in such a way that allows the door to drop from the open position upon activation from a release device. The release device can be a heat sensing fusible link, a smoke or other type of detector, or the building alarm system. This can be accomplished several ways.

For tension release style systems, upon activation from the signaling device, a release arm or drop arm disengages the drive mechanism from the barrel, and allows for a release of a portion of the spring tension from the counterbalance mechanism. Releasing the spring tension allows the weight of the curtain and bottom bar assembly to start the closure of the door. This counterbalance release should only be performed from the fully open position as non-repairable damage to the release components and/or counterbalance mechanism or serious injury may occur if it is released while the door is in the closed position.

Other systems utilize a counterbalance mechanism that is already underbalanced. A brake prevents the door from falling during normal operation and a governing device controls the closing speed of the door when signaled to close.

Rate of closure upon release is outlined in NFPA 80: The door *shall have an average closing speed of not less than 6 inches per second (152 mm per second) or more than 24 inches per second (610 mm per second).*

## Cycles

A cycle is defined as one opening plus one closing of a door. The springs within the counterbalance mechanism of a rolling door are engineered to last a predetermined number of cycles. Most doors manufactured today are engineered with minimum 20,000 cycle springs.

Higher cycle springs are available from manufacturers, and are typically specified as 25,000, 50,000, and 100,000 cycles. Specifying higher cycle springs should be based on the anticipated usage of the door in application. A door which is expected to be opened and closed many times throughout the course of the day would require higher cycle springs than a door which is only opened and closed once at the beginning and end of the day. It is important to evaluate the application's anticipated duty cycle before ordering the door so that the spring design provides adequate cycle life.

The result of specifying higher cycle springs is the use of larger diameter spring wire and longer springs. These larger springs are stronger and therefore last longer. In some cases, a process known as *shot peening* is used to further extend spring life. During shot peening, the surface of the spring is bombarded with small steel or ceramic pellets. This creates a thin layer of compressive stress on the surface of the wire, which helps counteract the tensile stresses that cause fatigue cracks to form. By strengthening the surface in this way, shot peening increases the spring's resistance to fatigue and provides additional operational cycles.

Doors with higher cycle springs specified often also utilize heavy duty support bracket bearings, as well as thrust bearings within the barrel, to provide longer life of components other than the springs. Refer to the manufacturer's recommended maintenance schedule to help achieve the expected life of the door.

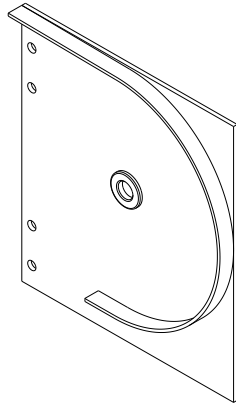
Torsion springs are manufactured in specific combinations of wire size and coil diameter to ensure safe and efficient operation. Each spring design must fall within acceptable *Index Ratio (IR)* parameters. The IR, defined as the ratio of the spring's inside diameter to its wire diameter, ensures the spring has the proper flexibility, strength, and fatigue life for its intended application. DASMA specifications require an index ratio of 6 or greater, meaning

the coil diameter should be at least six times the wire diameter.

Springless barrel assemblies are also used for extreme cycle life applications. Accompanied with higher horse powered operators to help with the heavier weight of the door.

## Brackets

The brackets provide structural support for the barrel, counterbalance mechanism, curtain assembly, and hood. They are constructed of steel, stainless steel, or aluminum and are usually square or rectangular in shape. The finish on a steel bracket can be galvanized, painted, or powder coated. Stainless steel brackets can be mill finish, 2B finish, or #4 finish.



The brackets will have predrilled holes for bolting to the top of the guide wall angles. They also provide support for attachment of gears, operators, chain hoists, automatic closing devices, governors, tension wheels, etc. and will house the bearing for the drive shaft. The bracket on the drive side is known as the *drive* bracket and the tension side bracket is known as the *tension* bracket.

## Operating Mechanism

For non-pushup operated doors, there are typically operating mechanisms mounted on the outboard side of the drive bracket. Depending on the type of operation, these mechanisms could be as simple as mounting a sprocket on the drive shaft, to complex compound reduction chain hoists and fire door dropout mechanisms. Operating mechanisms



can vary tremendously from one manufacturer to the next and are far too complex in scope to cover them all in this text. Reference the manufacturer's information for details on specific operating mechanisms. Some manufacturers factory assemble the operating mechanisms to the drive brackets to aid field assembly.

## Inertia Brake

Sometimes called a Stop-Lock Bearing, an Inertial Brake is a unit that is attached to the door shaft and bracket or wall which will stop the door from freefalling should there be a catastrophic failure in the motor operator brake, roller chain drive, or tension spring assembly. When the shaft is moving above a certain RPM, the unit will lock up the shaft, preventing it from moving until the door can be repaired. Inertia brakes are recommended for springless doors, very large doors with very large out of balance springs, and are sometimes specified. They are often chosen as a redundant failure device to prevent the door from freefalling in the event of spring or operator failure.



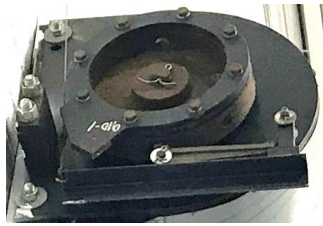
## Tension Wheel

Tension wheels, sometimes called adjusting wheels, are a component attached to the counterbalance assembly tension shaft, which controls the spring tension as it is applied and locked to the bracket. These typically mount on the outboard side of the tension side bracket and often have outwardly radiating holes to receive winding bars for applying spring tension. A tension wheel can be connected to the tension shaft with keys and setscrews, pins, or with interfacing shaft



and hub shapes such as a D or Hex shape. They are commonly made of stamped steel, cast steel, or cast iron and range in size depending on the amount of spring tension required for the door.

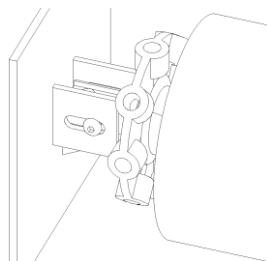
For tension release fire doors, the tension wheel is part of a tension release mechanism designed to automatically release a controlled portion of the spring tension upon activation. These mechanisms commonly use one or more drop arms to hold spring tension during normal operation. When the release device is triggered, the drop arm disengages and the tension wheel is allowed to rotate, relieving a measured amount of spring tension. A stop block assembly mounted to the tension bracket limits rotation and prevents the spring from fully unwinding.



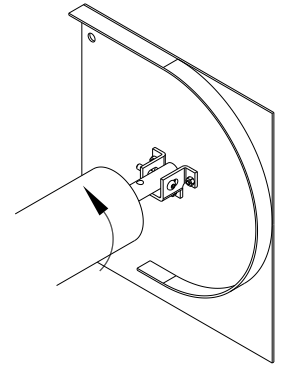
### Inside Tension Device

An inside tension device is often used on counter doors and between jambs applications where side room is limited. There are two types of inside tension devices, inside tension wheels and inside shaft holders. Inside tension devices create a more finished look on counter doors and may be required on between jambs applications.

As the name implies, **Inside Tension Wheels** have the tension wheel mounted on the interior side of the tension bracket. A cradle is mounted to the tension bracket and the tension wheel is used to turn the tension shaft and apply tension to the springs. Tension is applied while the curtain is in the closed position. The top most slats are typically shorter than the rest of the door to provide access to the tension wheel while the door is closed.



When **Inside Tension Holders** are used, a cradle is mounted inside the bracket and the tension shaft is pinned through the cradle. The shaft may contain alternating holes for winding the shaft, or tension may be applied by pre-charging the barrel before assembling the curtain. The top most slats may also be shorter than the rest of the door to provide access to apply tension the shaft while the door is closed.

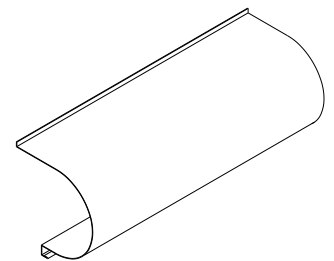


### Compound Tension Device

A **Compound Tension Device** provides a gear reduction between the tension wheel and the tension shaft. This gear reduction reduces the amount of force the installer must exert in order to apply the initial tension to the springs. These are used on very large, heavy rolling doors where the required spring tension is high. A full revolution of the tension shaft will require multiple revolutions of the tension wheel. Therefore, spring turns must be counted from the tension shaft, rather than the tension wheel. It is important to follow the manufacturer's installation instructions closely when utilizing compound tension devices to ensure the spring tension is safely contained.

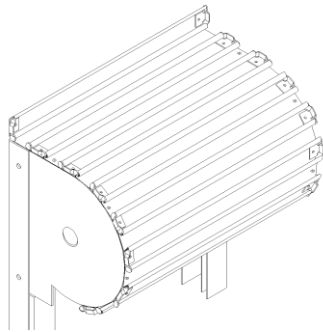
### Hoods

A hood is a sheet metal housing that mounts horizontally between the brackets, serving as an enclosure for the coiled curtain and closing the space between the door coil and the lintel. The hood on a rolling door is constructed of steel, aluminum, or stainless steel and typically is the same material and finish as the door curtain. The hood can be round or square in shape to



attach to the brackets, and can be attached at various points along the wall above the opening. The top and bottom edges of the hood are bent or curled to add rigidity over the length of the hood.

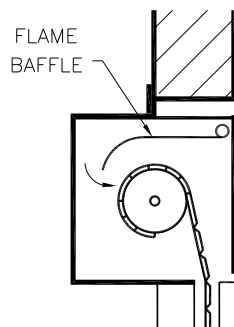
Some doors utilize door slats to make a hood, called a *Slat Hood*. These hoods are made by assembling a predetermined number curtain slats with end locks and fastening them such that the slats wrap around the bracket. These hoods typically match the material and finish of the door curtain and provide a hood which looks the same as the inside of the door curtain. Slat hoods are less popular than sheet hoods because the complex shape of the slats can trap dirt and debris.



The hood performs multiple functions. First it serves as a cover for the counterbalance assembly and the rolled curtain. This helps to prevent items such as dirt and debris from interfering with the coiling and uncoiling of the curtain as the door travels. The second function it serves is a stabilizer for the drive bracket and tension bracket. The hood is mounted between the two brackets and helps to prevent the brackets from shifting or bowing out. Wider doors will require multiple hood sections with intermediate hood support(s) or bracing.

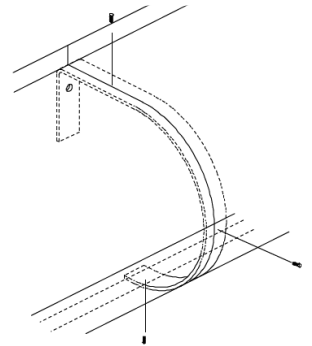
On fire rated products, the hood also serves as a barrier that prevents flames from making their way around the coil area.

Some manufacturers and/or listing agencies may also require the use of a *flame baffle* that mounts on the inside of the hood. The flame baffle is an additional sheet metal component that prevents the spread of flame around the curtain and barrel of the door, thereby preventing the flame from reaching the other side of the

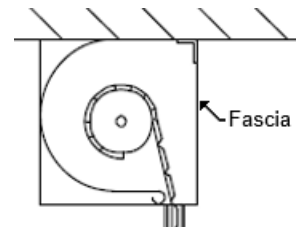


opening. The flame baffle will be held away from contact with the curtain during normal operation by the sash chain or cable and released to contact the coil in an activated state. Flame baffles are required on all doors utilizing a Factory Mutual (FM) label. Intermediate hood supports may be on the exterior side of the hood when a flame baffle is present.

Wider doors and longer hoods utilizing multiple hood sections will require the use of *intermediate hood support(s)*. An intermediate hood support is a rigid member which is contoured to the shape of the hood and mounted to the wall between the brackets. The hood is then attached to the support to give the hood rigidity. These may mount on the inside or the outside of the hood depending on if there is a flame baffle present. These support the hood to prevent sagging and provide an attachment point for multi-section hood splices.

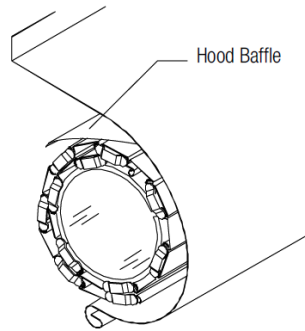


When the door is mounted under a lintel, a secondary cover called a *fascia*, or backhood, is provided. A fascia panel is a finished metal cover used to conceal the opening which remains when the door height is less than the height of the opening. They are most commonly used on doors that are installed on under lintel applications, to enclose the counterbalance and curtain assembly on the opposite coil side of the door.



The attachment of the hood or fascia to the wall or brackets supports only the weight of the hood itself. Although the hood can provide stability as noted earlier, it does not carry or support the weight of any other door components beyond the functions already described.

Weather protective doors can have hoods with internal hood baffles to minimize air infiltration. Typically made of plastic or rubber, an internal hood baffle is a flat sheet mounted inside the hood designed to close the space between the hood and the door coil to restrict air infiltration. These hood baffles rely solely on the hood for support and may require special installation techniques if internal hood supports are required.

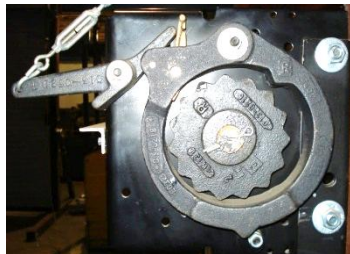


A specialty hood option available from some manufacturers is a sloping hood. Sloping hoods are formed with a larger slope to the upper, flat portion of the hood. These are typically used for exterior door applications where heavy snow loads or watershed requirements are anticipated.

## Governors

A governor is a speed control mechanism that regulates the rate of descent of an automatic closing fire door. Several types of governing devices are used in the industry, with the most common being ratcheting or oscillating (escapement) governors, viscous governors, and centrifugal governors.

**Ratcheting or Oscillating (Escapement) Governors** use a mechanism that ratchets up and down or oscillates side to side in



conjunction with a notched wheel. This provides mechanical resistance preventing the wheel from spinning freely and slowing the descent of the door. These types of governors can be noisy during drop testing depending upon the method of mechanical resistance.

**Viscous Governors** use liquids of specific densities housed within a notched or ported wheel. As the governor rotates, the fluid is forced through these restricted openings, creating resistance to motion. The faster the governor spins, the more fluid is displaced through the notches, increasing resistance and limiting the descent speed of the fire door.



**Centrifugal Governors** are speed activated braking devices typically constructed using arrangements of spring loaded brake pads. The faster the governor spins, the greater the amount of centrifugal force, causing greater resistance. These governors sometimes require additional sprocket and/or gear reductions to increase the rotational speed of the governor.



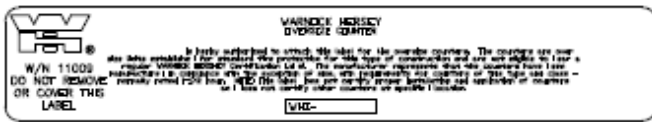
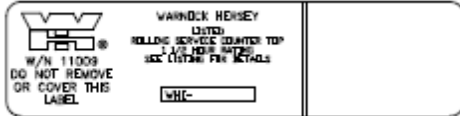
Automatic closing fire doors shall close no slower than 6 inches per second (152 mm per second) and no faster than 24 inches per second (610 mm per second). A governing device is required on all units that require controlled automatic closing speed to meet the requirements of NFPA 80.

## Sills and Countertops

All automatic closing rolling fire doors must come to rest in full-width contact with the floor, a sill, or countertop to completely close off the opening and provide required fire protection. NFPA 80 specifies that the floor structure beneath rolling fire doors must be constructed of noncombustible material and must extend through the door opening. If combustible flooring is present beneath the opening, a noncombustible sill material must be installed that extends fully through the opening. In some installations, a sill angle or similar noncombustible surface may be provided for the fire door to close on when the opening is

elevated above the floor, such as conveyor pass-throughs or window protection.

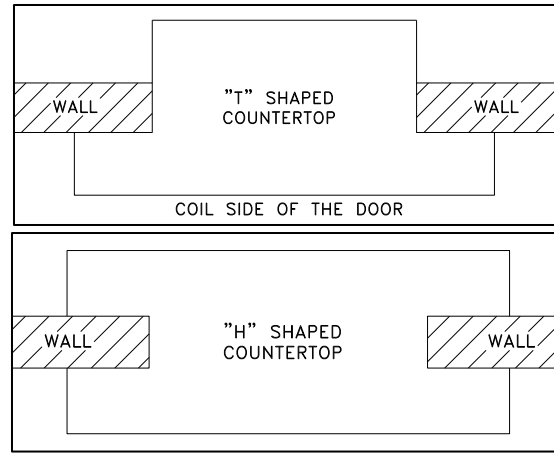
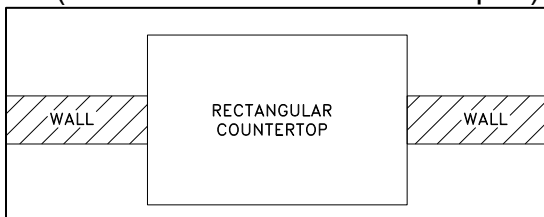
Service Counter Fire Doors in NFPA 80 covers interlocking slat type door curtains integrally mounted in a four sided frame forming a labeled door and frame assembly, as well as counter fire doors that mount to noncombustible opening framing. When countertops are supplied separately from the rest of the door assembly, they shall be labeled and installed in accordance with their listing.



When countertops are to be provided and installed with counter fire doors, both labeled plastic laminate and labeled stainless steel countertops are available from counter fire door manufacturers. Labeled countertops normally carry a 1-1/2 hour rating and are available in various shapes to fit both face of wall and between jamb mounted installations.

These countertops have minimum projection requirements beyond the centerline of the curtain and beyond the width of the guide assembly. Check with individual suppliers for specific configuration requirements and size limitations.

Countertops are generally supplied in 3 shapes: Rectangular, "T" shaped, and "H" shaped (sometimes referred to "I" shaped):



The following guidelines apply to fire rated countertops:

- The countertop must be within the minimum and maximum dimensions allowed by the listing agency. See the manufacturer's data sheet and countertop shop drawing.
- Single-piece countertops are typically provided for smaller opening widths and two-piece countertops with a center joint may be required for wider openings.
- Depending on the listing agency approval, it may be required for all surfaces of laminated countertops to be laminated, including those which are not visible.
- The listing agency label must remain visible at all times after installation.
- The countertop cannot be modified in the field. No holes may be drilled, no trimming performed, and no other modifications of any kind made other than those specifically permitted in the manufacturer's installation instructions. All other trades must work around the Architect's prescribed fabrication dimensions to ensure the proper fit of the fire rated countertop.
- Not all laminates are approved for fire rated countertops. Contact the manufacturer for a list of approved laminates.
- Radius corners are recommended on the public or corridor side of the countertop, where applicable, to reduce the risk of injury to people walking by.
- Radius edges are recommended on the tenant side of the countertop.

- Adequate mounting support inside the fire rated wall must be provided by others to support the anticipated loads on the countertop.
- Face of Wall Mounting
  - The countertop must extend out from the centerline of the guide groove a minimum of 4 inches on each side (coil side and opposite coil side) to accommodate deflection of the bottom bar.
  - The countertop must extend past each jamb as necessary to be completely under the guides. This ensures the closing surface is continuous across the entire opening and prevents unsupported areas where heat and deflection could create gaps.
  - For “T” shaped countertops, the countertop must extend through the opening to at least to the face of the finished wall on the opposite coil side of the door. This maintains a continuous, noncombustible sill surface through the opening.
  - The fire rated wall should be flush and continuous at each jamb and below the countertop. Any misalignment can create unprotected voids or expose combustible framing. The countertop should bear directly against the finished fire-rated wall surface, not recessed or unfinished framing.
- Between Jamb Mounting
  - The countertop must extend out from the centerline of the guide groove a minimum of 4 inches on each side (coil side and opposite coil side) to accommodate deflection of the bottom bar.
  - The countertop must provide a continuous, noncombustible closing surface beneath the full width of the opening and be fully under the guides.
- For “H” and “Offset H” shaped countertops, sometimes referred to as “I” shaped countertops, the overall width and height of the opening must allow for installation. The countertop must be able to fit through the opening diagonally to be installed.

## Options and Accessories

Rolling doors can be customized with a range of options and accessories to meet specific operational, environmental, and security needs. These enhancements include locking mechanisms for manual or motorized doors, weather seals to improve thermal performance and reduce air infiltration, mounting configurations, and others. Understanding these options helps technicians select, install, and maintain doors that meet both code requirements and customer expectations.

**Locks:** A variety of lock types are available depending on the application and the level of security required. Most locks are mounted on the bottom bar assembly to secure the door in the closed position.

*Slide Locks:* The most basic lock type, mounted to the bottom bar and designed to slide into a hole or slot in the guide to secure the door. Once engaged, slide locks can be secured in the locked position using padlocks, or cylinder lock mechanisms.

*Cylinder Locks:* These use keyed cylinders connected to lock rods that extend into the door guide assemblies. The rods engage an adjustable stop or pass through a hole in the guides to secure the door.

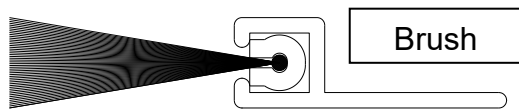
Cylinder locks can be keyed in several ways to meet the security needs of the building:

- Individual Keyed: Each lock operates with its own unique key.
- Keyed Alike: Two or more lock cylinders can be opened using the same key.
- Master Keyed: Each lock cylinder utilizes its own key, but all locks can also be operated using a single master key.

*Thumb-Turn Locks:* Similar in function to cylinder locks but operated by a manual thumb turn instead of a key. These are commonly used on interior or controlled access applications where keyed security is not required but positive locking is still needed.

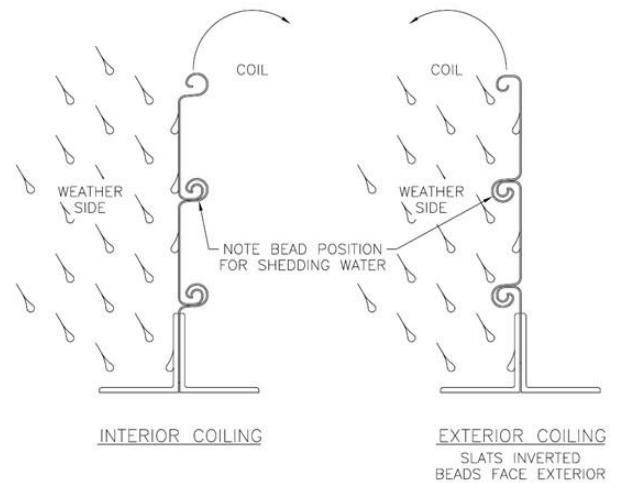
To prevent damage, doors equipped with motor operators must include an electrical interlock to prevent the operator from running when the door is locked. Interlocks may be mounted on the guide or integrated into the operator assembly.

**Weather Seals** are used to limit air infiltration around the perimeter of a door. Typically, this is accomplished by utilizing a vinyl or a brush seal with a rigid retainer. These seals can be attached to the guides or to the jamb systems as required. Additionally, the bottom seal, or astragal, can be factory installed as part of the bottom bar assembly. For fire doors, contact the door manufacturer for guidance on the approval of auxiliary weather and smoke seals. Always drop test a fire door after adding any additional weather seals to ensure the seals do not interfere with the closing operation of the fire door.



**Wearstrips** are a component incorporated into the guide to reduce noise and wear from the curtain rubbing during operation. These are made from smooth materials like plastic, felt, or wool pile and sometimes incorporate weather seals. They run the vertical length of the guides providing a barrier between the curtain and the guides anywhere the two come in contact. Wearstrips may be factory attached, clipped onto a guide as an accessory item in the field, or integrated into the guide profile itself.

**Exterior Mounted Doors:** There are two primary differences between an interior and exterior mounted door. The first is the slat orientation. With exterior mounted doors, the slats are oriented in a way to prevent water infiltration into the interior of the building. Depending on the mounting scenario, the slats are flipped, so the joining curl of the upper slat is oriented to cover the slat joint on the outdoor side of the curtain. This prevents water from entering and collecting in the slat joint.



The second is that the operating mechanism and winding mechanisms are provided with a weather resistant enclosure to prevent damage from natural elements, or are thru-wall mounted.



## DASMA 203 Standard for Rolling Doors

*(Reference [dasma.com](http://dasma.com) for the latest edition)*

Among the primary activities of DASMA is the publication of standards for the Door and Access Systems industry. DASMA 203 is a voluntary standard defining minimum design and performance requirements for rolling doors. This standard is outlined below to aid in understanding the performance requirements of rolling doors and related components.

## 1.0 Scope

- 1.1 This standard defines minimum design and performance specifications for non-fire rated rolling doors in commercial and industrial applications, consisting of assembled, interlocking slats of steel, stainless steel, or aluminum.
- 1.2 This standard for non-fire rated rolling door assemblies shall be intended to cover commercial and industrial type warehouses, factories, and other facilities.
- 1.3 This standard is not intended to cover doors such as: rolling sheet doors; rolling fire doors; rigid, folding or multi-leaf sectional type doors; perforated slat construction; or special applications.
  - 1.3.1 Rolling sheet doors are covered in DASMA 207.
- 1.4 Without limitation, DASMA does not represent or imply that this standard relates to any component or system other than the rolling doors expressly identified and described herein.
- 1.5 See informational statements in Appendix A on important design and operation information.

2.0 Definitions – See publication for definitions.

## 3.0 General

### 3.1 Wind Loads

- 3.1.1 Door shall be designed to withstand a minimum wind load as required by the authority having jurisdiction over the geographic location where the door is to be installed. When required by the authority having jurisdiction, structural tests shall be in accordance with ANSI/DASMA 108 or other accepted means required by the authority having jurisdiction.
- 3.1.2 Where resistance to windborne debris is required by the authority having jurisdiction over the geographic location where the door is to be installed, a door system shall meet the requirements of ANSI/DASMA 115 or other accepted means

as required by the authority having jurisdiction.

- 3.1.3 Exception: Counter shutter doors are not wind loaded.

## 3.2 Durability

- 3.2.1 Rolling doors shall be designed to operate at a minimum of 10,000 cycles when they are properly selected, installed, operated, and maintained.
- 3.2.2 Rolling doors shall be designed to operate for the specified cycle life when more than 10,000 cycles are specified, and when they are properly selected, installed, operated, and maintained.

## 4.0 Material Thickness

- 4.1 Metal gauge shall comply with Figure 1.

## 5.0 Guide Assemblies

- 5.1 Guide assemblies shall contain the curtain edges throughout the door operation and under the required wind load.
- 5.2 Guide assembly design shall allow for installation variances in the distance between left and right guides of  $\pm 1/8$  inch (3 mm) within the specified value provided by the door manufacturer.
- 5.3 Guide assemblies shall be constructed to support the weight of the door and the wind loads transmitted by the curtain.
- 5.4 Guide assemblies shall include curtain stops on the guides to ensure the bottom bar stops at a designated position.

## 6.0 Curtains

- 6.1 Curtain slats shall interlock to allow the full range of angular rotation required to wrap around the barrel assembly without binding or separation.
- 6.2 Curtains shall be designed to resist lateral motion.
- 6.3 Where windlocks are required, windlock construction, material, and attachment to curtain shall be adequate to resist wind load.

- 6.4 When subjected to the provisions of Section 3.1, curtain performance shall be such that the door shall remain operable after removal of the wind load.
- 6.5 The attachment of the curtain to the barrel and curtain slats shall be designed to not pull apart when subjected to operating forces.
- 6.6 Steel slats shall conform to ASTM A653/A653M, G40 minimum zinc coating, with grade chosen by manufacturer to meet performance requirements set forth herein. Slats may be painted.
- 6.7 Stainless steel slats shall conform to ASTM A240 or equivalent.
- 6.8 Aluminum slats shall conform to ASTM B209, ASTM B221, or equivalent. Slats may be anodized.
- 6.9 For other materials and finishes, contact manufacturer for availability.
- 6.10 Foam plastics used in insulated rolling doors shall meet requirements established by the authority having jurisdiction for flame spread and smoke development.
- 7.0 Bottom Bars
  - 7.1 A bottom bar may incorporate an astragal or sensing edge for motor operated doors.
  - 7.2 A bottom bar shall be designed to incorporate locks that engage at one or both ends of the bottom bar. If a locking mechanism is incorporated on a motor operated door, one of the following shall be installed:
    - 7.2.1 An interlock switch, or switches, activated by the lock mechanism.
    - 7.2.2 An operator with the ability to sense either torque or starting current to the motor.
- 8.0 Brackets
  - 8.1 Brackets shall be designed to support the weight of the barrel assembly and the total curtain assembly weight.
- 9.0 Hoods and Hood Baffles
  - 9.1 Hoods, when specified, shall be constructed with gauge thickness in accordance with figure 1.
  - 9.2 A hood, or hood fasteners, shall not be in contact with the curtain during any position of the door.
  - 9.3 A hood baffle (when required) shall maintain full-width contact with the curtain when the door is closed.
  - 9.4 A hood baffle shall not hinder operation of the door.
- 10.0 Fascia
  - 10.1 Metal Fascia, when specified, shall be constructed with gauge thickness in accordance with Figure 1.
- 11.0 Barrel Assemblies
  - 11.1 Torsion Springs
    - 11.1.1 Helical wound spring wire shall comply with ASTM A229 or equivalent.
    - 11.1.2 Springs shall be designed for a minimum of 10,000 cycles of operation. Higher cycle life may be specified.
    - 11.1.3 The selection of wire size relative to coiled diameter shall be such that mean coil diameter is at least six times the wire diameter.
  - 11.2 Spring Anchors
    - 11.2.1 Spring anchors shall be designed to withstand the radial and lateral forces exerted by the torsion spring to properly retain the spring when fully wound or unwound and allow the application of torque.
  - 11.3 Pipe Deflection
    - 11.3.1 The deflection of the pipe, with the weight of the curtain and counterbalance assemblies applied, shall not exceed .03 inches per foot of length while supported only on both ends.
- 12.0 Tension Wheels
  - 12.1 Tension wheels and locking mechanism shall be designed with sufficient strength to withstand the maximum torque from torsion springs, and/or winding devices.

### 13.0 Operation

- 13.1 A door normally operated by chain hoist shall not require more than 35 pounds (156 N) of force to operate the door.
- 13.2 A door normally operated by using a crank shall not require more than 25 pounds (111 N) of force to operate the door.
- 13.3 A door normally operated by manually pushing up the door shall not require more than 30 pounds (134 N) of force to operate the door. Recommended maximum door size shall be 80 square feet (7.44 square meters), recommended maximum door width shall be 10 feet (3.05 m), and recommended maximum door height shall be 8 feet (2.44 m).

### 14.0 Installation and General Operation

- 14.1 The door manufacturer shall furnish standard details and instructions for proper installation and general operation. Such instructions shall include warnings relative to the installation and general operation of the door.

### 15.0 Maintenance

- 15.1 The door manufacturer shall furnish a list of components requiring regular maintenance, with instructions on and frequencies for such maintenance.

### 16.0 Labels

- 16.1 Each door shall be labeled to identify the name and address of the door manufacturer.
- 16.2 DASMA labels RDD-201 and RDD-202 shall be placed on the door as described in TDS-267.
  - 16.2.1 Labels in accordance with the applicable provisions of ANSI-Z535.1, ANSI-Z535.3, ANSI-Z535.4, shall be placed on the door.

## Appendix A: Informational Statements

- A.1 Most rolling doors with windlocks cannot be operated when wind load engages the windlocks, due to the sliding friction of the

curtain within the guides. Contact the manufacturer for special requirements.

- A.2 Loads are imposed onto the building structure from two sources: Wind load and door weight. Wind loading can produce substantial catenary forces in rolling doors as a result of the locking action of the curtain edges within the guides. The jambs must be designed to withstand these loads. These loads are in addition to those created by the direct wind pressure and weight of the door assembly. The magnitude and direction of these loads should be obtained from the manufacturer. DASMA Technical Data Sheet TDS-251 may be used to state these loads.
- A.3 After being subjected to wind loading, rolling doors may retain some curvature in the curtain, particularly on narrow doors.
- A.4 Calculations for overall performance and pass/fail prediction of the door are well established. Detailed stresses in the curtain slats under wind loads cannot be calculated accurately since the large-deflection of these parts invalidates the assumptions used to derive common engineering formulae.
- A.5 Manual operation of rolling doors (push up, hand chain, or crank to open) is generally heavy in the bottom half to two-thirds of door travel and light for the top third. Refer to DASMA Technical Data Sheet TDS-272 for additional information.

Figure 1 (DASMA Gauge Chart)

GAUGE No.	Bare Steel	Steel G-40	Steel G-60	Steel G-90	Aluminum	Stainless Steel
14	0.0697	0.0704	0.0707	0.0712	.060	.0751
16	0.0548	0.0555	0.0558	0.0563	.050	.0595
18	0.0438	0.0445	0.0448	0.0453	.040	.0480
20	0.0329	0.0336	0.0339	0.0344	.032	.0355
22	0.0269	0.0276	0.0279	0.0284	.025	.0293
24	0.0209	0.0216	0.0219	0.0224	.020	.0235
26	0.0159	0.0166	0.0169	0.0174	N/A	.0178

NOTES:

1. CHART REPRESENTS UNPAINTED THICKNESS MINIMUMS (IN INCHES) PER GAUGE NUMBER AND SEVERAL COMMON GALVANIZING WEIGHTS.
2. CHART IS BASED ON AISI REFERENCES AND TOLERANCES.
3. BARE STEEL THICKNESSES REPRESENT STEEL WITHOUT THE ADDITION OF GALVANIZING.
4. REFERENCE DASMA TDS-154, STEEL GAUGE CHART.

## **DASMA 204 Standard for Fire Rated Rolling Door Assemblies**

*(Reference [dasma.com](http://dasma.com) for the latest edition)*

DASMA 204 is a voluntary standard defining minimum design and performance requirements for fire rated rolling door assemblies. This standard is outlined below to aid in understanding the performance requirements of rolling fire doors.

### **1.0 Scope**

- 1.1 This standard defines minimum design and performance specifications for fire rated rolling door assemblies in commercial and industrial applications, consisting of assembled, interlocking slats of steel or stainless steel. Refer to individual manufacturer's listings.
- 1.2 This standard for fire rated rolling door assemblies is intended to cover commercial and industrial type warehouses, factories, and other facilities where a service counter fire door, fire shutter, or fire door is required to close an opening in a fire wall during an emergency. Rolling fire doors intended for frequent use should be designed for high cycle operation. Refer to section 13.1.2.
- 1.3 This standard is not intended to cover doors used for egress passage, nor other types of doors such as rigid, folding, or multi-leaf sectional type doors, coiling doors without interlocking slats (sheet doors), perforated slat construction, or special applications.
- 1.4 Without limitation, DASMA does not represent or imply that this standard relates to any component or system other than the rolling doors expressly identified and described herein.

2.0 Definitions – See DASMA publication for definitions.

### **3.0 General**

- 3.1 A rolling steel fire door assembly shall retard the passage of fire through a wall opening and the assembly shall include a Fire Protection Rating, an Automatic Closing Device, and a Governor.

- 3.2 Fire resistance testing shall be in accordance with NFPA 252 or UL 10B.

### **4.0 Material Thickness**

- 4.1 Metal gauge shall comply with the manufacturer's Label Procedure and with DASMA TDS 154.

### **5.0 Automatic Closing**

- 5.1 The fire door shall include an automatic closing device.
- 5.2 In the event of fire, the fire door shall descend automatically to the completely closed position.
- 5.3 The door descent shall be at a controlled rate, not less than 6 in/sec or greater than 24 in/sec.

### **6.0 Guide Assemblies**

- 6.1 Guide assemblies shall contain the curtain edges throughout the door operation.
- 6.2 Guide assembly design shall allow for installation variances in the distance between left and right guides of  $\pm 1/8$  inch (3 mm) within the specified value provided by the door manufacturer.
- 6.3 Guide assemblies and fastener location shall be designed to allow for thermal expansion.
- 6.4 The guide assemblies shall be constructed to support the total weight of the door and loads transmitted by the governor and motor (if supplied).
- 6.5 Guide assemblies shall include curtain stops on the guides to ensure the bottom bar stops at a designated position.
- 6.6 Crush plates shall be installed when fire doors are mounted to hollow concrete masonry units.

### **7.0 Curtains**

- 7.1 Curtain slats shall interlock to allow the full range of angular rotation required to wrap around the barrel assembly without binding or separation.
- 7.2 Curtain shall be designed to resist lateral motion.
- 7.3 The attachment of the curtain to the barrel and curtain slats shall be designed to not pull apart when subjected to operating forces.
- 7.4 Steel slats shall conform to ASTM A653, G40 minimum zinc coating, with grade

- chosen by manufacturer to meet performance requirements set forth herein. Slats may be painted.
- 7.5 Stainless steel slats shall conform to ASTM A240 or equivalent.
- 7.6 The door manufacturer's listing may be referred to for other materials and finishes.
- 8.0 Bottom Bars
- 8.1 The bottom bar may incorporate an astragal or sensing edge for motor operated doors.
- 8.2 The bottom bar may be designed to incorporate a locking mechanism that engages at one or both ends of the bottom bar. If a locking mechanism is incorporated on a motor operated door, one of the following shall be installed:
- 8.2.1 An interlock switch, or switches, activated by the lock mechanism.
- 8.2.2 An operator with the ability to sense either torque or starting current to the motor.
- 8.3 The bottom bar may bear a (3/4, 1-1/2, 3, 4) hour fire protection-rating label, from a recognized listing agency, indicating that the door has been manufactured in accordance with the listing agency requirements.
- 9.0 Brackets
- 9.1 Brackets shall be designed to support the weight of the barrel assembly and the total curtain assembly weight.
- 9.2 Brackets shall be designed to incorporate an automatic closing device.
- 10.0 Hoods and Hood Flame Baffles
- 10.1 A metal hood shall be designed to enclose the coiled curtain.
- 10.2 A hood, or hood fasteners, shall not be in contact with the curtain at any position of the door.
- 10.3 A hood flame baffle (when required) shall actuate through fusible links or other automatic means. These links may be independent of the links that deploy the automatic closing device. When deployed, the baffle shall maintain full-width contact with the curtain when the door is closed.
- 10.4 A hood flame baffle shall not hinder operation of the door.
- 11.0 Fascia
- 11.1 Fascia shall be designed to enclose the exposed partial or no header in the back of the door coil. Standard for between jamb mounted doors.
- 12.0 Barrel Assemblies
- 12.1 Torsion Springs
- 12.1.1 Helical wound spring wire shall comply with ASTM A229 or equivalent.
- 12.1.2 Springs shall be designed for a minimum of 10,000 cycles of operation. Higher cycle life may be specified.
- 12.1.3 The selection of wire size relative to coiled diameter shall be such that mean coil diameter is at least six times the wire diameter.
- 12.2 Spring Anchors
- 12.2.1 Spring anchors, shall be designed to withstand the radial and lateral forces exerted by the torsion spring to properly retain the spring when fully wound or unwound and allow the application of torque.
- 12.3 Pipe Deflection
- 12.3.1 The deflection of the pipe, with the weight of the curtain and counterbalance assemblies applied, shall not exceed 0.03 inches per foot of length while supported only on both ends.
- 13.0 Tension Wheels
- 13.1 Tension wheels and locking mechanism shall be designed with sufficient strength to withstand the maximum torque from torsion springs, and/or winding devices, and impact load when applicable.
- 14.0 Operation
- 14.1 A door normally operated by chain hoist shall not require more than 35 pounds of force to operate the door.
- 14.2 A door normally operated by using a crank shall not require more than 25 pounds of force to operate the door.
- 14.3 A door normally operated by manually pushing up the door shall not require more than 30 pounds of force to operate

the door. Recommended maximum door size shall be 80 square feet (7.44 square meters), recommended maximum door width shall be 10 feet (3.05 m), and recommended maximum door height shall be 8 feet (2.44 m).

#### 15.0 Installation and General Operation

15.1 The door manufacturer shall furnish standard details and instructions for proper installation and general operation. Such instructions shall include warnings relative to the installation, general operation testing and resetting of the automatic closing device of the door. A drop test form (see DASMA TDS 271) shall be provided to certify that door operates and has been tested in accordance with the manufacturer's installation.

15.2 Installation of door and accessories and fusible link routing shall be in accordance with NFPA 80, DASMA TDS 254, and DASMA TDS 255.

15.3 Installation of detectors shall be in accordance with NFPA 80, NFPA 72, and DASMA TDS 254.

#### 16.0 Maintenance

16.1 The door manufacturer shall furnish a list of components requiring regular maintenance, with instructions on and frequencies for such maintenance.

16.2 The door shall be inspected and tested not less than annually, to the requirements of NFPA 80.

#### 17.0 Labels

17.1 Fire door assemblies up to the maximum size tested in accordance with the listing agency shall bear a label attached to the bottom bar. Fire door assemblies over the size opening tested shall be provided with an oversize label.

##### 17.2 Oversize Doors

17.2.1 Oversize label shall be attached to the bottom bar of an oversize fire door, which indicates that the door is larger than the size fire tested but has been manufactured in accordance with the listing agency requirements.

17.2.2 Oversize certificate document may be provided for an oversize fire door, which indicates that the door is larger than the size fire tested but has been manufactured in accordance with the listing agencies requirements. The oversize certificate may be provided in lieu of an oversize label.

17.2.3 Oversize doors shall be subject to approval by the authority having jurisdiction.

17.3 Each door shall be labeled to identify the name and address of the door manufacturer.

17.4 DASMA labels RDD-200, RDD-201, and RDD-202 referenced in DASMA TDS 267, shall be placed on the door.

17.4.1 Warning labels in accordance with the provisions of ANSI Z535.1, ANSI Z535.3, ANSI Z535.4, shall be placed on the door.

#### 18.0 Durability

18.1 Rolling doors shall be designed to operate at a minimum of 10,000 cycles when they are properly selected, installed, operated, and maintained.

18.2 Rolling doors shall be designed to operate for the specified cycle life when more than 10,000 cycles are specified, and when they are properly selected, installed, operated, and maintained.

#### Appendix A: Informational Statements

A.1 Manual operation of rolling doors (pushup, hand chain, or crank to open) is generally heavy in the bottom half to two-thirds of door travel and light for the top third. Refer to DASMA Technical Data Sheet TDS 272 for additional information.

## Section Five

# Methods of Operation

Rolling doors can be operated in several different ways, and selecting the correct method is an important part of proper door specification. The choice depends on factors such as door size, available headroom and sideroom, frequency of operation, cost, and power availability. Matching the operating method to the application helps ensure smooth performance, long service life, and customer satisfaction.

Rolling fire doors add another layer of consideration: although their primary purpose is to provide a rated level of fire protection (and sometimes smoke control), they may also be used for everyday access control, security, or weather protection. Regardless of how they are used, fire doors must include an automatic closing system that responds to an emergency signal mechanically or electrically. When a fire door is also used for regular operation, the everyday operating method and the automatic closing system often function independently of one another.

This section describes the four primary methods of operating rolling doors:

1. Manual Pushup Operation
2. Manual Chain Hoist Operation
3. Manual Hand Crank Operation
4. Electric Operation

For any mechanically operated door, it is also necessary to determine the hand of operation before ordering. When facing the door from the coil side, the operating mechanism may be located on the left or right, and this choice should avoid field obstructions, align with traffic patterns, and meet appearance requirements, especially for counter door applications where concealed operators may be preferred. Properly specifying both the operating method and the hand of operation helps prevent installation challenges and ensures the door functions as intended.

## Manual Pushup Operation

Manual Pushup Operation is the simplest method of operation which involves manually lifting the curtain from the closed position and pushing it up to the open position. Pushup operation requires that the effort to operate the door at any point of travel will not exceed 30 pounds of force. The maximum size of a given door will vary based upon curtain weight and counterbalance design, but generally will not exceed 10 feet in width. Although a pulldown/pushup pole or rope can be utilized for doors up to around 10 feet tall, pushup operation is not normally recommended for doors over 8 feet tall due to the reach limitations of the average height person.

Lift handles are commonly attached to the bottom bar to provide secure gripping points. Careful fine tuning of spring tension during installation is essential to achieve the lowest possible lift effort.

In special circumstances, pushup operation may be used beyond these typical size limits when the product is a fire rated door that will remain open during normal use and only close during a fire event. In such cases, the allowable lifting effort may be increased to 40 pounds, depending on the manufacturer's ability to counterbalance the curtain. This approach can be an economical way to provide fire protection while keeping testing and maintenance relatively simple compared to other operating methods. However, it carries an important caution: if the end user later decides to close the door daily for security or environmental control, a door counterbalanced only for emergency closing may be unsafe or impractical for regular manual operation. Ensuring the customer understands this limitation is critical during specification.

## Manual Chain Hoist Operation

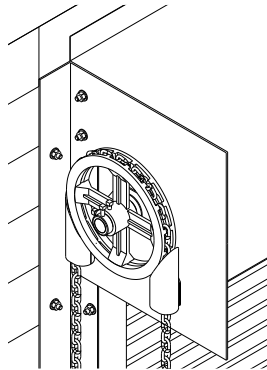
Manual chain hoist operation is a cost effective method for operating larger or heavier doors that exceed the practical limits of manual pushup operation. A chain hoist mechanism is connected to the door, and a continuous hand chain hangs down beside the opening for the user to pull. As the hand chain is pulled, the barrel rotates and lifts or lowers the curtain. Because the hoist can incorporate reduction gearing, it provides a mechanical advantage that allows users to operate doors well beyond the size and weight limits of pushup doors.

Manufacturers select the appropriate gearing ratio based on the door's spring torque out of balance so that the operating force on the hand chain does not exceed 35 pounds. Chain hoists are most commonly used on doors that are not operated frequently but still require reliable and manageable manual operation when needed.

There are three types of chain hoist operating mechanisms used for rolling doors, each offering different advantages depending on the installation and user requirements:

### Direct Drive Chain

**Hoists:** Mount directly to the door shaft or barrel assembly, using a large diameter chain wheel to transfer the pulling force from the hand chain to the door. Because the hoist wheel turns at a 1 to 1 ratio with the door shaft, one revolution of the wheel produces one revolution of the barrel. The diameter of the chain wheel determines the mechanical advantage: a smaller wheel requires more force, while a larger wheel reduces the effort needed to lift the same door. This simple, direct connection makes the system easy to understand and maintain, but it also limits the amount of assistance it can provide.

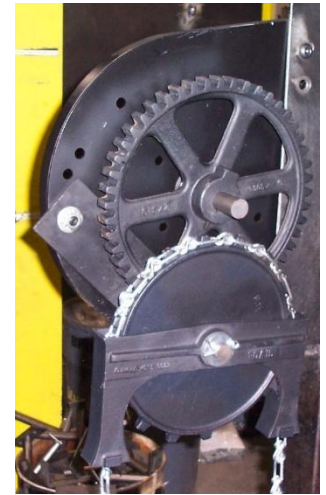


Due to the minimal mechanical advantage of the 1 to 1 ratio, direct drive chain hoists are

generally used only on smaller or lighter doors where the spring counterbalance can keep operating forces within acceptable limits. They are rarely used on fire doors, because fire rated products typically require additional mechanisms to disengage the hoist during automatic closing, making direct drive systems impractical. Their simplicity makes them a viable option in select applications, but larger or heavier doors require a geared chain hoist to achieve safe and manageable operating forces.

### Reduced Drive Chain Hoists:

These hoists are mounted to the door's support bracket and transmit motion to the barrel through a set of gears or roller chain sprockets. By sizing these components to create a single stage reduction, the hoist provides significantly more mechanical advantage than a direct drive system. A typical reduction is 4 to 1, meaning the user must pull the hand chain four revolutions to produce one revolution of the barrel. This gearing allows reduced drive hoists to lift heavier or larger doors while keeping the operating force within acceptable limits.



The tradeoff for this increased lifting capability is the additional number of hand chain pulls required to open the door. While reduced drive hoists are slower to operate than direct drive versions, they remain a practical and economical choice for doors that are too heavy for pushup operation but do not require the speed or convenience of an electric operator. The reduction mechanism is also often used as part of the release, to disconnect the hoist, during an activation of the automatic closing of a fire door. Their balance of mechanical advantage, cost, and reliability makes them one of the most commonly used manual operating methods for medium to large sized rolling doors.

**Compound Reduction Chain Hoists:** These hoists are larger, more powerful versions of reduced drive hoists, designed for very heavy rolling doors that require significantly more mechanical advantage than a single reduction can provide. These systems use multiple gears and/or sprockets to achieve higher levels of reduction, and because of their size and complexity, they often require auxiliary bracket plates to support the additional components. Their purpose is to keep the hand chain operating force within acceptable limits even when the curtain weight and spring imbalance are substantial.

The most common configuration is the double reduction hoist. In this design, the hand chain wheel is fixed to a small sprocket, which drives a larger sprocket on an auxiliary shaft using roller chain. That larger sprocket is fixed to another small sprocket, which then drives a second large sprocket mounted on the door shaft. The difference in tooth counts between the small and large sprockets determines the total reduction: the greater the difference, the greater the mechanical advantage. Gears may be used in place of sprockets and roller chain on some manufacturers' designs.

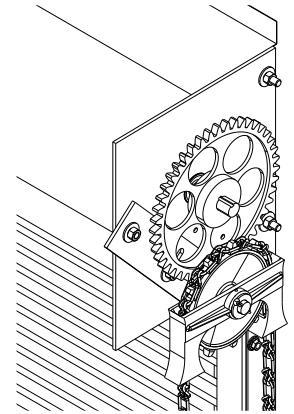


As reduction increases, the door becomes easier to lift, but operates more slowly, requiring many more hand chain pulls to open fully. Because of this slow operation, compound reduction hoists are recommended only for doors that are infrequently operated, where ease of lifting is more important than speed.

## Chain Hoist Mounting Locations

Chain hoists can be mounted in several locations depending on the available space and the operational requirements of the installation. When determining the mounting location, factors such as hand of operation, sideroom, headroom, and the desired hand chain drop location must all be considered before the door is manufactured.

The most common arrangement is bracket mounted, where the hoist is installed on the outboard side of the operator bracket. In this configuration for a fire door, the hoist typically connects directly to a dropout mechanism that disengages the hoist during fire door automatic closing. Bracket mounting is preferred because it provides a clean, predictable connection to the door and does not rely on field conditions or additional structural support.



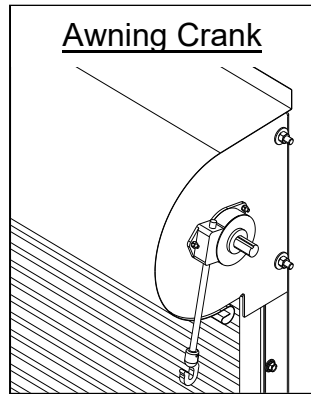
When sideroom is limited or obstructions prevent bracket mounting, the hoist can be wall mounted. Wall mounting attaches the hoist to the wall, and it connects to the drive shaft or dropout mechanism of a fire door using roller chain. This allows the hoist to be positioned where space permits while still providing reliable operation.

In situations where the hoist must be operated from the opposite coil side of the door, a thru-wall chain hoist is used. In this configuration, the hoist is mounted on the opposite side of the wall, while an idler bracket assembly remains on the coil side. A roller chain is routed through the wall to the idler bracket and then to the sprocket on the drive shaft or fire door dropout mechanism, allowing full operation from a remote location while maintaining mechanical connection to the door.

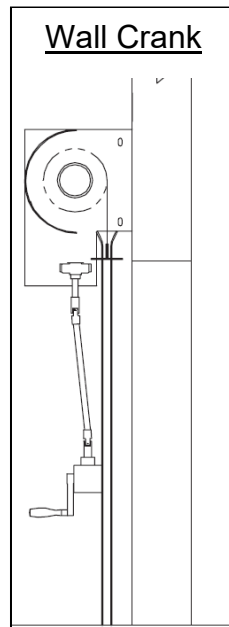
## Manual Hand Crank Operation

Manual hand crank operation is another method used to operate rolling doors; most commonly found on counter doors, but suitable for other door types when conditions call for a compact, finished-appearance operating mechanism.

Manual hand crank operation can be awning crank style. A worm gear drive mechanism is mounted directly to the drive side bracket with a hooked shaft hanging down for operation. Rotating the shaft turns the worm gear drive mechanism to rotate the drive shaft and move the door.



Wall mounted cranks typically mount a crank box to the wall and connect to the door using a drive shaft and/or roller chain sprockets. With the use of a reduction gearing crank box, manual hand crank operation can be used within and beyond the size limits of manual pushup operated doors. The manufacturer will select a crank box and a reduction ratio based on the spring torque imbalance of the specific door so that the operating force on the hand crank will not exceed 25 pounds. The larger the door and greater the reduction, the more you will have to rotate the crank to open the door.



Crank operation is generally selected over chain operation when doors are installed in more finished applications or when access to the bottom bar prevents manual pushup operation, such as deep countertop units. Manual cranks provide large reductions,

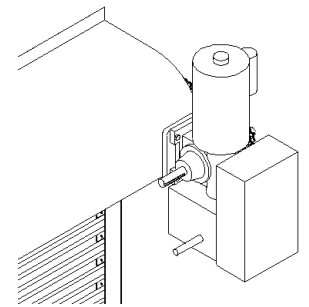
typically around 20 to 1, which make the door very easy to operate. Hand crank operation will not be desirable on larger size doors that will be used frequently due to the many rotations of the crank required to open the door.

A crank rod can be suspended from the bracket, mounted to the wall, or be removable so it can be used to engage the crank mechanism but be stored away out of sight when not in use. The crank rod is designed to spin in your hand, similar to a car scissor jack, which makes the many rotations required to open the door more manageable. Use caution to remove crank rods before drop testing a fire door equipped with this type of operation.



## Electric Operation

Electric operation refers to the use of a powered door operator, control equipment, and safety devices to move a door safely and reliably. An automated door system includes the door, an electric operator, the controls that command the operator, and the safety equipment that protects people and property.



A wide range of operator types and control options are available to suit virtually any size or application. Because a rolling door is a large, heavy object, the safety of the system depends on proper design, installation, and maintenance. The door itself must be correctly balanced, aligned, and able to move freely by hand; an operator is not intended to overcome a poorly installed or worn out door. Attempting to use the motor to compensate for mechanical defects can create a hazardous condition and significantly increase the risk of injury.

In fire rated applications, electric operators can also serve as part of the automatic closing

system required for fire doors. Multi-function fire door operators provide controlled closing during a fire event and offer safer, more convenient testing and resetting compared to mechanical closing devices. When an electric operator is used on a fire rated door, these multi-function units should be strongly considered to ensure proper performance and compliance. Additional details on fire door operators and automatic closing devices are provided in the dedicated section of this study guide.

## Operator Selection

It is important to select the proper type and size of door operator for each application. Emergency manual operation, which can make the difference between life and death in an emergency, should be considered on every system. Smaller doors generally use small, light duty operators, while larger doors require heavy duty operators with features such as friction brakes and delayed start. These differences are reflected in the standard features of operators designed for each door type and size. A mismatch or improper selection between the door and operator can result in a malfunctioning or dangerous system.

A sensing device is recommended with all electrically operating units; note an approved monitored sensing device is required when activation is other than constant pressure to close. This includes any operator that utilizes momentary contact pushbuttons or that can be remotely signaled to electrically close. UL 325 also requires all moving operator components that create possible pinch points below 8 feet above floor level be guarded or covered. Refer to the *ANSI/CAN/UL 325* section for complete details on these and other requirements.

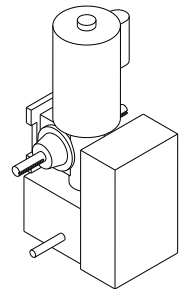
**Operator Usage:** Operator usage must match the expected duty cycle of the door, since both the door and the operator must be capable of withstanding the frequency and intensity of operation. A system that cycles 25 times per hour, for example, cannot rely on an operator intended for limited or occasional use.

Operators that use worm gear reduction gearboxes generally tolerate higher frequency operation better than belt-reduced designs, and continuous-duty motors provide longer service life than limited-duty motors when subjected to repeated cycling.

In applications where the door will be used frequently, three-phase power is preferred when available, as three-phase motors typically outperform single-phase motors in both durability and efficiency. Three-phase operators also draw fewer amps for the same horsepower, which can reduce electrical consumption and lower operating costs over time.

Properly matching the operator to the application ensures not only reliable performance but also safer operation and reduced long-term maintenance.

**Operator Size:** The available sizes of electric operators range in power from 1/4 horsepower mini operators to industrial duty 5 horsepower or larger operators. Electric operators utilize high reduction gearboxes making them capable of lifting very large doors, while allowing average door operating speed of approximately 8 inches per second.



Door size area charts can be used to aid in the proper selection of an operator. However, these charts are only estimates and can vary widely based on the door design. Always consult the door manufacturer for recommendations when issues arise with operator selection. The door size area charts can be used with caution to determine the required operator horsepower.

Oversizing an operator for rolling doors can be dangerous. Startup torques for larger operators can be too much for a door to handle if it has not been designed to accommodate it. Selecting an operator that is too big can cause premature door failure, such as a twisted drive shaft, bent brackets, broken roller chain, broken gear teeth, etc. Consult the

manufacturer for operator size recommendations for specific doors.

**Door Speed:** Operator selection also involves taking door speed into account. Door speed can be adjusted by changing the size of the sprockets driving the door. For example, a door with a 24 tooth sprocket on the drive shaft will go twice as fast as a door with a 48 tooth drive sprocket.



Adjustments to door speed must be made with caution as they directly impact the amount of torque on the operator and door components. Careless adjustment to door speed could result in premature operator failure, roller chain breakage, shaft failure, etc. Consult the manufacturers as needed to ensure the door and operator will support any desired speed modifications.

Average door speed, in inches per second, can be estimated using the formula:

$$\text{Door Speed} = \frac{\text{RPM} \times \text{TT} \times \text{MT}}{60 \times \text{DT} \times \text{WR}}$$

Where RPM is the revolutions per minute of the motor output shaft, TT is the total travel of the door in inches, MT is the number of teeth on the motor sprocket, DT is the number of teeth on the door sprocket, and WR is the working revolutions of the door, or the number of times the barrel turns while the door is being opened.

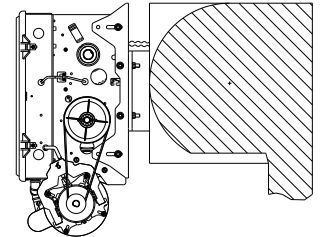
Safe door operating speeds range from 6 to 12 inches per second. In addition, if the motor is used as part of the automatic closing of a fire door, remember that the door must operate within 6 to 24 inches per second to satisfy drop speed requirements of NFPA 80.

## Operator Mounting Locations

As with chain hoists, rolling door operators have a number of installation locations available to suit the field conditions of the job.

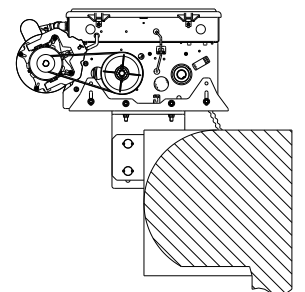
Operators can be bracket mounted vertical at the front of the hood, top of hood mounted, bracket mounted horizontal, wall mounted, thru-wall mounted, or an internal mounted tube motor can be used. Other special operator mounting locations may be available for extraordinary field conditions. Consult the door manufacturer when these conditions arise.

The most common operator mounting location is *bracket mounted vertical*, also known as front of hood mounted or front of coil mounted. Bracket

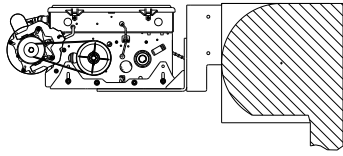


mounted vertical operators mount to an operator support plate or operator mounting bracket that is bolted directly to the door support bracket. The operator is oriented up and down with the operator output shaft parallel to the door drive shaft. The operator support plate typically has slots for adjusting the roller chain tension by tilting the operator towards the door for less tension and away from the door for more tension. Bracket mounted operators are preferred because they take away the uncertainty of unknown field conditions by providing a self-contained operator mounting arrangement with predetermined roller chain lengths.

Another common operator mounting location is *top of hood mounted*. In this installation, the operator is turned horizontal and mounted directly to the door support bracket above the hood. Top of hood mounted is typically used to reduce the projection of the door from the header in order to avoid obstructions. It's also commonly used on shorter doors to lift the operator out of reach to improve safety and avoid tampering.

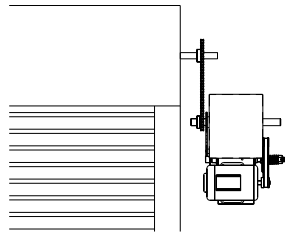


*Bracket mounted horizontal operators*, sometimes called bench mount, are used when head



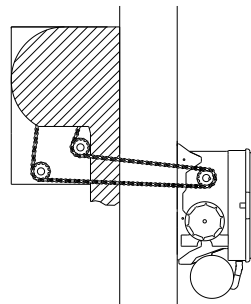
room and side room are limited. The operator is turned horizontal, perpendicular to the opening, protruding out in front of the door. This mounting location typically requires an operator modification to relocate the control box and a special mounting plate with additional reinforcement to support the weight and operational loads of the cantilevered operator.

Rolling fire door operators can be *wall mounted* when field conditions provide adequate sideroom. The operator either mounts directly to the wall, or



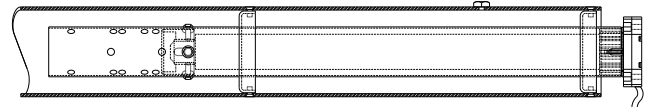
mounts to a wall mounting support plate, above or below the door drive shaft. The optimum distance from the center of the motor shaft to the door drive shaft is 12 to 15 inches. Wall mounting provides additional flexibility for operator location in the field and is frequently used when obstructions would interfere with bracket mounted operator locations.

For exterior mounted doors with electric operation, a typical operator mounting location is *thru-wall mounted*. This allows the operator to be installed on the wall opposite the coil side of the door. The operator mounts directly to the wall or to a wall mounted operator support. The drive chain then goes through the wall to an auxiliary idler assembly, and then connects to the drive mechanism of the door. Thru-wall mounting is usually used to keep the operator out of the outside elements when field conditions do not permit the door to be interior mounted.



Another type of rolling door operator is a tube motor. Tube motors typically install inside the

barrel assembly of the door. The motor head is bolted directly to the support bracket when installed. The motor turns the barrel to cause the door to operate. Tube motors provide a clean looking installation without visibility of the operator. One downside to tube motors is that any servicing needed to the operator usually requires the door curtain and barrel to be uninstalled.



## Emergency Egress

Emergency egress is a special operator feature and door design most typically encountered on rolling grilles. Emergency egress provides an emergency release on the wall near the door that disconnects the door operator. The door is over-sprung at the floor so that when the operator is released, the door opens on its own. This provides quick opening of the door for people to escape in the event of an emergency. Early versions of these doors were designed to only open to around 36 inches off the floor. More recent versions are now designed to open a minimum of 48 inches or fully clear the opening on their own when activated.



Many codes require that a minimum of one grille on every retail storefront have this modification. Operator selection is limited to those operators which are compatible with the Emergency Egress option. It is important to specify this requirement in advance of ordering the door so that the manufacturer can adjust the spring design to account for it. Attempting to achieve this modification in the field on a door not designed for it will result in an unsafe condition and dramatic reduction in the cycle life of the door or premature spring failure.

Care must be taken when servicing Emergency Egress doors because disconnecting the operator and/or roller chains can result in rapid

upward acceleration of the door due to the overbalanced condition. The internal resistance of the operator acts as a break to prevent the door from moving while engaged. Always service Emergency Egress doors in the fully open position and with the curtain and bottom bar adequately restrained from movement.

## Access Controls

A wide variety of access control devices are compatible with rolling door operators. Most operators are supplied with a standard Open/Close/Stop three button station, which provides full local control of the door. However, many installations require additional devices to meet specific convenience, security, or access management needs.

Most access control devices involve a balance between ease of use and the level of security required. Pushbutton stations are simple for nearly anyone to operate, but this same convenience can make the unsuitable in secure areas. Key control stations offer a higher level of security by requiring a physical key to open or close the door. Card readers function similarly in that the user must possess a credential, but they also allow administrators to issue multiple cards, track usage, and assign different access levels throughout a facility.

Digital keypads provide a comparable degree of security and flexibility without requiring the user to carry a device. Instead, the user must remember an access code to operate the door.

Doors are often operated by people in vehicles, and in these situations, devices such as overhead pull switches, loop detectors, or radio controls are commonly used. Radio controls are especially convenient because the transmitter can be mounted inside the vehicle.

Automatic controls may also be used when permitted by the installation, and fire door listings when applicable. Auto-close timers can close the door automatically after a preset interval, while 365-day time clocks can be

programmed to open and close the door at scheduled times throughout the year. Following are some of the more common access controls used for commercial door operators:

**Digital Keypads:** Digital keypads provide a convenient and secure method of access control for door systems, offering users a simple numerical interface while allowing facility managers to control access to operate the door. They are available in both stand-alone versions, where the keypad directly controls the door operator, and computer managed versions that integrate with broader access control systems. Housings may be lighted or non-lighted, depending on visibility requirements and the environment.



A digital keypad functions as a numerical entry station: when an authorized access code is entered, the keypad sends a signal to open, close, or unlock the door. Modern keypads can store a large number of individual codes, allowing administrators to add, modify, or delete user credentials as needed. This flexibility makes them well suited for applications where access must be granted to multiple users while still maintaining tight control over who can operate the door. Because codes can be changed without altering hardware, digital keypads offer an efficient way to manage turnover, limit access to specific personnel, and maintain security over time.



### **Stand-Alone Card Access:**

These systems use cards with encoded credentials rather than numerical codes to control who can operate a door. They are available in swipe-card, touch-plate, and proximity formats. These devices can be used for vehicular, pedestrian, or building access control, making them versatile for a wide range of commercial and industrial applications. Each card carries a unique identification code, giving facility managers full accountability over issued credentials and allowing them to track, restrict, or revoke access as needed.



Most stand-alone card readers allow card codes to be assigned to specific time zones, enabling access only during approved hours, or to be fully deactivated when a card is lost or no longer authorized. Touch-plate and proximity readers are especially popular because they offer fast, contact free operation and can be integrated with computer based systems for monitoring usage and maintaining access logs. This combination of convenience, security, and administrative control makes stand-alone card access a strong option for facilities that require controlled entry without relying on shared PIN codes.

**Radio Receivers and Transmitters:** Radio receivers and transmitters work together to provide wireless control of door operators, and this pair of devices forms one of the most common access control methods used in commercial and industrial settings. The receiver is the fixed component, wired into the door operator or integral to the control board, while the transmitter is the portable device that sends the command signal. Their capabilities, range, and security features vary depending on the system design.

*Radio Receivers* allow doors to be operated remotely by handheld or vehicle mounted transmitters. When the receiver detects a valid coded signal, it activates the appropriate door function. The effective operating range can be increased by using a coaxial antenna, which improves reception and allows transmitters to

function reliably from greater distances or in areas with mild obstructions. Receivers may support multiple transmitters, rolling code security, and integration with broader access control systems.

*Radio Transmitters* are handheld pushbutton devices that send coded signals to the receiver to open, close, or stop the door.



Depending on the model, a single transmitter can control several openings by using multiple channels. Standard transmitters typically operate one to four doors, depending on the number of channels available. Multi-button transmitters allow users to assign different channels to different doors or functions.

Transmitters are easy to add or delete from a system, making them flexible for facilities with changing personnel or access needs.

*Commercial/Industrial Multi-Channel Remote Access Control Systems* provides significantly expanded capability for larger facilities. These systems use a transmitter capable of controlling up to 250 doors, making them suitable for warehouses, distribution centers, and industrial campuses.

Key characteristics include:

- The receiver is typically installed in the operator housing or inside the building near the controlled doors.
- The handheld transmitter is programmed to the same code as the receiver and commonly uses rolling code technology, which changes the code with each use to enhance security.
- A single receiver can store up to 250 transmitters, allowing broad but controlled access across a large facility.

These systems offer high scalability, strong security, and centralized control, making them ideal for environments where many doors must be managed efficiently.

## Control Stations

Control stations provide the user interface for commanding an electric operator, and they form a critical part of the overall access control and safety strategy. While access control devices such as keypads, card readers, and radio systems determine who may operate the door, control stations determine how the door is operated once access is granted. Their design, placement, and functionality must match the application, the operator type, and the safety requirements of the opening. Control stations range from simple open/close/stop buttons to more advanced, logic-based interfaces that integrate with fire door functions, traffic flow systems, and building automation.

Control stations must be located where the user has a clear view of the door and can operate it safely. They also must be compatible with the operator's control logic - some operators require momentary contact, others require maintained contact, and fire door operators may require dedicated test/reset stations. In larger facilities, control stations may be combined with remote access systems such as multi-channel transmitters or networked access control panels to provide both local and centralized control.

Most control stations are available in both flush mount and surface mount configurations to match the station to the wall construction and the facility's aesthetic or durability needs. Housings can be supplied in a range of NEMA ratings, ensuring the controls are properly protected for the environment, whether clean, dry interior spaces or harsher locations requiring dust-tight or weather-resistant enclosures.

**Three Button Stations:** The most common type, providing Open, Close, and Stop functions. These are used on most commercial operators and allow the user to stop the door at any point in travel.



**Single Button Station:** A single button control can either open, close, or stop/reverse the door using just one button.

**Two Button Station:** Typically, Open and Close only, used in applications where the operator logic automatically stops the door at limits or where a stop function is not required by code or application.



**Lighted Three Button Station:** Three button control Open/Close/Stop with red pilot light "on" buttons will activate the door.

**Key Access Three Button Station:** Similar to three button stations but require a key to activate the controls. These are used where access must be restricted to authorized personnel without relying on electronic access control.



**Key Access Lighted Three Button Station:** Three button control with pilot light and on/off key switch. Buttons will open, close, and stop the door when the key is in the on position. Key switch will render push buttons inactive in the off position. Key is removable in both positions.

**Spring Return Key Switch:** Surface or flush mounted, key activated with spring return to center offering open and close control. May or may not include a stop button.



**Push Button Station Lockout:** Push button control with open, close, and stop with lockable stainless steel housing, suitable for flush or surface mounting. Key-lock covers can be used to prevent the use of the door by unauthorized personnel.

**Mushroom-Head Buttons:** A large, highly visible actuator used where quick, positive control of a powered door is essential, offering a broad contact surface that can be pressed with a hand, elbow, or gloved fist to ensure reliable activation even in demanding industrial environments. Their distinctive shape makes

them easy to locate and reduces operator error, and they are commonly used for Open, Close, Stop, or Emergency Stop functions in applications that require clear, unmistakable control input.

**Pull-Cord Switches:** Provide a simple method of activating a powered door by using a ceiling or wall mounted switch connected to a hanging pull cord. When the cord is pulled, the switch sends a momentary signal to open or close the door, making this style especially useful in warehouses, loading areas, or any environment where forklift operators or personnel need quick access without leaving their equipment. Their straightforward design, durability, and ease of use make pull-cord switches a practical control option in high traffic industrial settings.

**Fire & Postal Lock Boxes:**

Fire and postal lock boxes provide secure, code-driven access for emergency responders and postal services. These enclosures are designed to accept padlocks or dedicated fire department and postal keys, allowing authorized personnel to gain entry without damaging the door or building. Depending on the setup, opening the lock box can either directly activate the door for automatic opening or provide access to a secured control device or key stored inside. This approach maintains day-to-day security while ensuring rapid, controlled access when emergency or postal entry is required.



**Fire Door Test/Reset Stations:**

Used for fire door operators that include automatic closing features. These stations allow the user to test the fire door release, reset the operator after a drop test, and verify proper operation without manually releasing the door.



**Emergency Egress Release/Reset Stations:**

Used with emergency egress operators that include a built-in release mechanism. These stations allow personnel to activate the egress release, verify proper operation, and reset the operator after an emergency event or functional test.



**Touchless Actuators:** Can be used to allow a door activation without physical contact, using technologies such as infrared presence detection, microwave motion sensing, or hand-wave activation. These devices are especially useful in environments where cleanliness, speed, or hands free operation is important, such as food processing, healthcare, logistics, or any facility where operators may have limited ability to press a button. When a user approaches or gestures within the sensor's detection zone, the actuator sends a signal to open the door, reducing touchpoints and improving traffic flow.

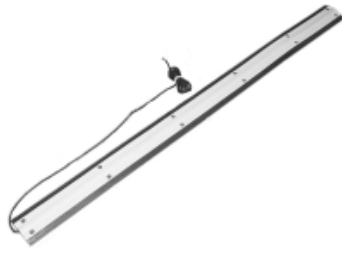
*For all control stations, the open button is frequently used as an override. Pressing the open button while a door is closing will stop and reverse direction to open. Momentary contact to close can only be used in conjunction with monitored external entrapment protection as required by UL 325.*

**Automated Access Control**

Automated access control devices manage how a door responds to approaching vehicles, equipment, or pedestrians. These components use pressure, motion, magnetic fields, or electronic sensing to command the door to open, close, or reverse, and many also function as safety inputs that prevent the door from closing on vehicles or equipment. Selection depends on traffic patterns, environmental conditions, and the level of automation required, and together these devices improve workflow efficiency, reduce operator involvement, and enhance safety around the opening.

### Electric Vehicle Treadle Switch:

An electric treadle switch is a pressure activated device placed on the floor, typically about 4 feet from the door, that responds when a vehicle tire rolls over it. The pressure pad closes an internal switch, sending a signal to open or close the door, or to reverse it if the door is descending. Because it reacts only to physical pressure, it provides a simple and reliable method of vehicle triggered control.



**Approach Sensor:** An approach sensor is a directional microwave motion detector that responds only to movement approaching the door. By ignoring traffic moving away from the opening, it allows the door to close sooner in two-way traffic areas and reduces unnecessary open time. This improves both security and environmental control while maintaining safe operation.



### Loop Vehicle Detector:

A loop vehicle detector uses an inductive loop embedded in the driveway to sense the presence or movement of a vehicle. When a metal vehicle passes over or stops within the loop, the detector registers a change in inductance and sends a command to open, close, or reverse the door. These detectors are fully electronic, highly adjustable, and commonly installed by saw-cutting the loop pattern into existing pavement.



### Visible Warning Devices:

Visible warning devices, such as rotating beacons or flashing lights, activate when the door is opening or closing, providing a clear visual alert to pedestrians and vehicle operators. They may also be used to signal the automatic closing of a fire door. Some models incorporate annunciator functions, combining visual indication with an integrated audible signal to enhance awareness around the opening.



### Preformed Loops:

Preformed loops function the same way as saw-cut loops but are installed before new concrete or asphalt is poured. The loop is placed, wired, and secured during construction, eliminating the need for saw-cutting and reducing installation time while providing a clean, protected installation.



### Audible Warning Devices:

Audible warning devices emit a tone or alarm during door movement, offering an important alert in areas where visibility is limited or background noise is high. These devices can also be tied into fire door closing sequences to warn occupants when a drop has been initiated. When equipped with annunciator capability, an audible device can provide status indication for door motion, timed closing cycles, or fire door activation.



**Microloop Probe:** A microloop probe is an alternative to traditional loop wire systems, designed for locations where saw-cutting is not possible such as heated driveways, suspended ramps, or areas with structural limitations. The probe detects changes in magnetic fields caused by nearby vehicles and can be mounted above the door, on ramp walls, or embedded in the driveway, providing flexible vehicle detection without cutting into the surface.

**Horn/Strobe:** A horn/strobe combines both audible and visual alerts into a single unit, providing maximum awareness during door movement or emergency closing cycles. This combination is especially effective in high traffic or high noise environments where a single type of signal may be missed. Horn/strobe units function as annunciators because they integrate audible and visual signaling to announce door operation or an activated closing sequence.



**Traffic Signal:** A traffic signal uses red and green lights to indicate door status to approaching vehicles. Red typically signals that the door is closed or moving, while green indicates that the door is fully open and safe to proceed. This device is especially useful at loading docks, parking structures, automotive service entrances, and high traffic industrial openings.



**Interior Solenoid Locks:** Interior solenoid locks automatically engage to secure the door when it reaches the closed position. When the operator receives an open command, the solenoid retracts the locking bolt, allowing the door to move. This provides enhanced security without requiring manual locking.

**Electric Interlock Switch:** An electric interlock switch prevents the door from operating when certain conditions are unsafe, such as when a pass door is open, a dock leveler is deployed, or an interior lock is engaged. By interrupting the control circuit, the interlock protects the door, operator, and surrounding equipment from accidental damage.

## Safety Accessories

All modern electric operators accept safety accessories to protect people and equipment where motorized doors are used. Some operators will accept more accessories than others.

UL 325-2010 introduced the requirement that all commercial and industrial motorized doors using anything other than constant pressure to close must employ a monitored external entrapment protection sensing device. The standard recognizes two categories of external entrapment protection devices: contact and non-contact sensors.

**Contact Sensing Devices:** Commonly referred to as sensing edges, these are mounted on the bottom leading edge of the door and connect to the operator either through hard wiring or a wireless transmitter. When the door encounters an obstruction while closing,

the sensing edge signals the operator to stop and/or reverse. Because monitored functionality is required, technicians must verify that both the operator and the sensing edge are UL 325 approved for use together before installation.

When utilizing a monitored sensing edge as a primary entrapment protection device, an interface module may be required. This module translates the device signal to interface with the operator. Reference manufacturer instructions for specific details.

**Non-Contact Sensing Devices:** These include photoelectric sensors and motion sensors. These devices detect a person or vehicle without requiring physical contact and will stop and/or reverse the door when the detection field is interrupted. Proper mounting height, alignment, and placement are essential for these devices to function correctly, and the final configuration depends on jobsite conditions and the type of traffic expected to use the opening.

All installations should have warning signs in place to alert pedestrians of the dangers of operating doors. These should be carefully placed according to the manufacturer's instructions. Depending on the location and surroundings of the door, consider using additional warning signs as necessary. These can be obtained through the manufacturer.

## Sensing Devices

Most sensing devices supplied for door industry operators are compatible with rolling door operators. This includes pneumatic edges, electric edges, through-beam photo eyes, retro-reflective photo eyes, and others. If the door does not have a bottom sensing edge or photoelectric sensors, encourage the owner to purchase one and place the operator in constant contact mode. If not preinstalled by the door manufacturer, mount the sensing device on the door according to the instructions provided with the device. The sensing device

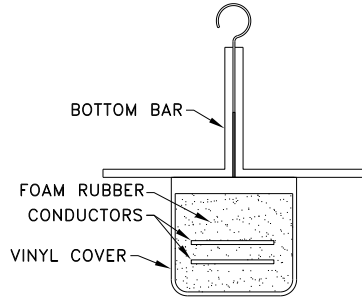
may be electrically connected by wire, coiled cord, take-up reel, or wireless devices.

*Note: Sensing devices with normally open output are not considered monitored. Therefore, the operator will require constant contact to close operation per UL 325.*

**Electric Sensing Edge:** Electric sensing

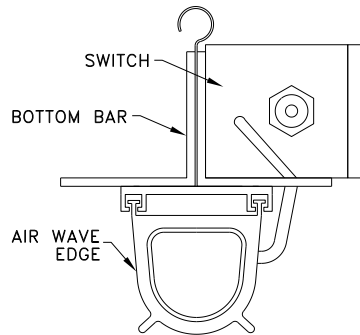
edges reverse and/or stop a closing door when contact is made.

This edge is comprised of two metal contact strips enclosed in a hermetically sealed elastomeric extrusion. This sensing edge has a three point contact. Even lateral pressure on these edges makes contact to reverse and/or stop operation.



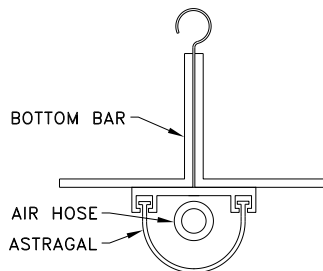
**Air Wave Type Sensing Edge:** As the leading

edge of the door meets an obstruction, an air wave is created. This wave motion is then detected by an electrical switch which activates the door control panel and reverses and/or stops the door.



**Pneumatic Sensing Edge:** When the door

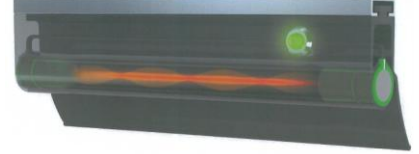
encounters an obstruction during its downward travel, compression of a pressurized air hose in the bottom seal increases its internal pressure, which then triggers the air switch and an electric signal is sent to the operator, causing the operator to reverse and/or stop the door.



**Non-Contact Sensing Edge:** As the door closes this device creates an invisible beam near the leading edge of the door. Once this invisible beam detects an obstruction, the door reverses to the open position without the door making any contact with the obstruction.

**Optical Sensing Edge:**

Optical sensing edges reverse and/or stop a door when contact is made.



This type of edge consists of a photo eye installed in a weather seal profile on the leading edge of the door. The light beam is interrupted when the seal profile contacts an obstruction, causing the operator to stop and/or reverse the door movement.

**Photoelectric Sensors:**

Photo eyes can be used for multiple applications. Photo eyes can be used as a safety device as well as to signal the operator to start a timer or other various functions. The most common is for use as a safety reversing device. Photo eyes are to be installed no more than 6 inches above the ground when used as entrapment protection. Some photo eyes can have an operating range or working distance of up to 35 feet. Additional photo eyes can be added when coverage is desired for reasons other than entrapment protection.



There are two common photo eye devices used today:

1. *Through-Beam Photo Eyes*, include one sending unit and one receiving unit. The photoelectric controls are positioned close to the door and project a light beam across the doorway path. If the beam should be interrupted while the door is closing, it will cause the door to reverse and/or stop. Depending on the device and

purpose of use, these may be monitored or non-monitored.

2. *Retro-Reflective Photo Eyes*, include one sending/receiving unit and a reflective component for the opposite side of the door. The photoelectric controls are positioned close to the door and the sending/receiving unit projects a light beam across the doorway path. The reflective component on the opposite side of the door sends the beam back to the sending/receiving unit. If the beam should be interrupted while the door is closing, it will cause the door to reverse and/or stop.

### Wireless Edge Transmitter:

Provides a monitored or non-monitored wireless signal to commercial operators from a sensing edge. The transmitter mounts on the bottom of the door and the receiver is interfaced with the operator. These can be used to take the place of take-up reels and coil cords.



Verify the sensing device satisfies UL 325 requirements for the application when used as monitored external entrapment protection.

## Sensing Device Accessories

**Take-Up Reel:** A take-up reel stores the electric wire used to connect a sensing device to the operator in a housing preventing it from hanging down. The wire is coiled up inside the housing, and extends and retracts as the door is operated. Take-up reels are not recommended for monitored devices. The slip coupling device breaks contact as it spins and may cause nuisance reversals.

**Coil Cord:** A coil cord provides a flexible method of connecting a sensing device to the operator. The coil cord attaches to a junction box mounted on the wall approximately halfway up the door opening,



and the junction box is then hardwired to the operator. The opposite end of the coil cord is connected to the bottom of the door and wired to the sensing device. The coils in the cord stretch and retract during door movement, helping to manage slack and reduce wire sag throughout operation.

## Section Six

# Fire Door Automatic Closing Devices

The single most important ability of a rolling steel fire door, beyond its construction to withstand the ravages of fire for a predetermined period of time, is its automatic closing feature. It is this feature that allows the door, without direct human intervention, to complete its primary mission, which is to close on alarm or in the event of a fire emergency.

Designs vary among manufacturers, but there are common methods of initiating the automatic closing.



## Rolling Fire Door Release Theory

The following outlines typical release of a fire door to initiate a closing activation. Not all fire doors are designed and manufactured the same. It is essential to follow manufacturer's instructions for testing and resetting fire doors. These sections are only intended to provide a general understanding of the mechanisms.

### Pushup Fire Doors:

When a rolling fire door is in the charged condition, a dropout or release arm is held in place with a sash chain or cable. A fusible link connects two sections of the sash chain or cable.



When the fusible link melts, the sections separate and the release arms drop. This action releases a significant amount of spring tension from the counterbalance assembly. Once the spring tension is released, nothing remains to hold the door in the open position. At that point, gravity takes over and the now unbalanced door descends to the closed position. A governing device controls the speed of descent to ensure a safe and compliant closing.

### Chain, Crank, or Motor Operated Fire

**Doors:** During normal operation, dropout arms are held in place by sash chains or cables that are connected with fusible links, or by release



holders when the system is tied into electronic detectors or alarm panels. When a fusible link melts or a release holder trips, a sequence of events is triggered. At the drive end of the door, the drive mechanism disengages, while at the tension end, a drop arm falls and releases a significant amount of spring tension. This creates an out of balance condition, allowing gravity to take over to begin the closing of the door. The now heavy door descends to the closed position, with its speed regulated by a governor device.

## Rolling Fire Door Resetting Theory

The following outlines typical procedures to reset a fire door after a closing activation. Not all fire doors are designed and manufactured the same. It is essential to follow manufacturer's instructions for testing and resetting fire doors. These procedures are only intended to provide a general understanding of the procedures involved with resetting a fire door after a drop test or activation has occurred.

**Pushup Fire Doors:** Raise the door to the open position and attach a clamp in the guide to prevent the door from closing. Reapply spring tension to the counterbalance mechanism according to the manufacturer's instructions until the door remains open. Raise the dropout or release arm and reconnect the two segments of the sash chain or cable. When the tension of the counterbalance mechanism is holding open the door, remove the clamp from the guide and cycle the door to verify operation.

**Chain, Crank, or Motor Operated Fire Doors:** To reset the door, follow the manufacturer's instructions. Generally, this will necessitate the following procedure. For motorized units, it may first be necessary to run the motor to the fully closed position to synchronize the limit switch settings. Reopen the door and clamp it in the open position so it cannot close. This may require reengaging the operator and clamping the drop arm in position at the drive end, then using the operator to open the door. Verify with the manufacturer before using the operator to ensure operator capacity.

Next, at the tension end of the door, rewind the charge wheel, restoring the lost spring tension and clamp the drop arm in place. Now, replace the broken fuse link or clear the detector (most smoke detectors reset by turning power off for a few seconds and then back on) or alarm panel so as to reset the release holder allowing the release pin to be reinstalled. Restore the sash chains or cables to their original configuration. Finally, remove all clamps and

operate the door for two full cycles to verify operation.

## Automatic Closing

All fire doors must close automatically when a fire occurs. Conventional fusible link units activate from the ambient heat created by fire. A fusible link is two pieces of metal held together by solder which melts at a prescribed temperature, typically 165°F for most fire door applications.

However, a door connected to smoke detectors or alarm panels requires an electromechanical release device to convert the electronic alarm signals into a mechanical movement for the door to close. The release holder may cause the door to close by gravity, like a fusible link, or close motorized doors with the motor, as long as power is present. When power is not present, the door will mechanically release and be closed by gravity. Release holders must also be self-monitoring, closing the door as described without the need for an outside power source after initially applying power.

Alarm systems may protect the entire building or specific areas within the building. Covering large areas requires the system to divide the area into zones.



## Non-Spring Release Fire Door Operators

Many fire door designs do not release spring tension. This simplifies the resetting process by eliminating the need to reapply spring tension to reset the door and allows for more frequent testing of the fire door system to assure fire readiness of the automatic closing system. These systems are ideal for larger size fire doors that are under extreme spring tension, for fire doors in applications where the coil and bracket assembly is mounted concealed above a ceiling, or for any application where mechanical resetting is not practical or not desired.

Non-spring release operators are available for both electric and manually operated systems. Typical with these style systems is an operator that does not disengage with the drive shaft assembly for automatic closing. In many instances, the operator also acts as the governor to control the automatic closing speed of the door. Many of these style governing systems are very effective in controlling automatic closing speed, both in consistency of speed for the entire closing of the door and by maintaining the average closing speed on the slower end of the allowable spectrum of no slower than 6 inches per second and no faster than 24 inches per second, adding an additional level of safety.

Since spring tension is not released for automatic closing, the resetting procedure is much easier and safer. Some electric systems simply require opening the door using the open pushbutton on the control station after the alarm signal is cleared and power is restored. Other systems may require reengaging the sash chain or cable at the release device. But no matter what style non-spring release system is selected, the dangers and inconvenience of rewinding spring tension to reset the door are eliminated.

The installer should take special precautions when servicing non-spring release fire doors. These doors are designed to fall under their own weight from any point of travel. If the brake mechanism is disengaged or if the governing device is disengaged or defective, release of the door could result in a rapid freefall causing damage or injury. Never service the drive components of these doors without first securing the curtain from moving, even in the closed position. It is also critical to maintain proper chain tension and sprocket alignment during installation to prevent the roller chain from coming off during operation.

Although non-spring release systems tend to be more costly up front, their long term costs can be significantly less than traditional tension-release style systems when comparing the costs and inconvenience associated with mechanically resetting fire doors. These style

systems also add a higher level of reliability, both in design and due to the fact that the closing system can be effectively tested as much as desired.

## Floor Level Disconnect

Common with non-spring release fire doors is the use of a *floor level disconnect*. This device is typically a wall or guide mounted release lever connected into the sash chain or cable routing. Activating the disconnect introduces slack into the sash chain or cable, simulating the separation of a fusible link and initiating the automatic closure of the door. On fire doors that use motor controlled closing, the floor level disconnect may also be configured as a key switch test station, allowing authorized personnel to initiate a controlled drop test from floor level. Once the drop test is complete, resetting the lever or key switch according to the manufacturer's instructions returns the door to normal operation.



Special care must be taken with sash chain or cable routings when floor level disconnects are used. The disconnect should be mounted in a location that is easily accessible to users, while turnbuckles and other fittings should be positioned out of reach to prevent tampering. When pulleys are used in the fuse link routing, caution is required to ensure the proper amount of slack is maintained when the disconnect is activated. Improper routing with pulleys could cut the disconnect lever stroke in half.

Floor level disconnects allow for convenient and frequent drop testing of a fire door. They are often intended to enable end users to perform more regular functional checks, helping ensure safe operation and providing early indication when service may be needed. End users should be shown how to perform a safe drop test and encouraged to secure the disconnect to prevent unauthorized use. This is

also an appropriate time to remind customers that NFPA 80 requires fire doors to be inspected and tested annually by a trained rolling steel fire door systems technician, and that written documentation of these inspections must be maintained.

## Release Devices

A key element to the automatic closure of a fire door is the release device. A release device is a component that senses an emergency condition and mechanically or electrically initiates the door's closing mechanism. The following information outlines common release devices, how they function, and the requirements associated with each. Refer to DASMA TDS 255 for additional guidance and supporting details.

## Fusible Links

Fusible links are the most common heat-responsive release device used on rolling fire doors. A fusible link consists of two metal plates joined by a low melting point solder alloy. The link connects sections of sash chain or cable in the fire door release system. When exposed to sufficient heat, the solder melts, the plates separate, and the release arm or dropout mechanism activates, allowing the door to close automatically. Listings for fusible links are available in the *UL Product iQ* database and the *FM Approvals Guide*.



Fusible links are typically marked with information such as the link manufacturer's name, agency listing mark, temperature rating, and model designation. Letters or codes imprinted on the link such as "A," "B," "D," "FL-1," etc., are part of fuse link manufacturer model number identification.

Fusible links used for fire door release are most commonly rated to a melting temperature of 165°F. This means the link will separate when the surrounding temperature exceeds 165°F. A 165°F fusible link has a recommended maximum ambient exposure temperature of 100°F. If ambient temperatures are expected to exceed 100°F on a regular basis, a 212°F link should be used.



It is also important to ensure compatibility between the fusible link temperature rating and other fire protection systems in the building. This may require special temperature rating for fusible links. For example, when used in conjunction with temperature activated sprinkler systems, the fuse link activation temperature must be lower than the sprinkler activation temperature. Fusible links must also be kept clear of sprinkler discharge patterns, and shields may be required to prevent direct spray.



Fusible links have maximum pull load capacities which vary by link model and manufacturer. Links used by most fire door manufacturers are rated for 20 to 40 pounds maximum pull load. Installers must avoid excessive tension in sash chain or cable routings to ensure the rated load of the link is not exceeded.

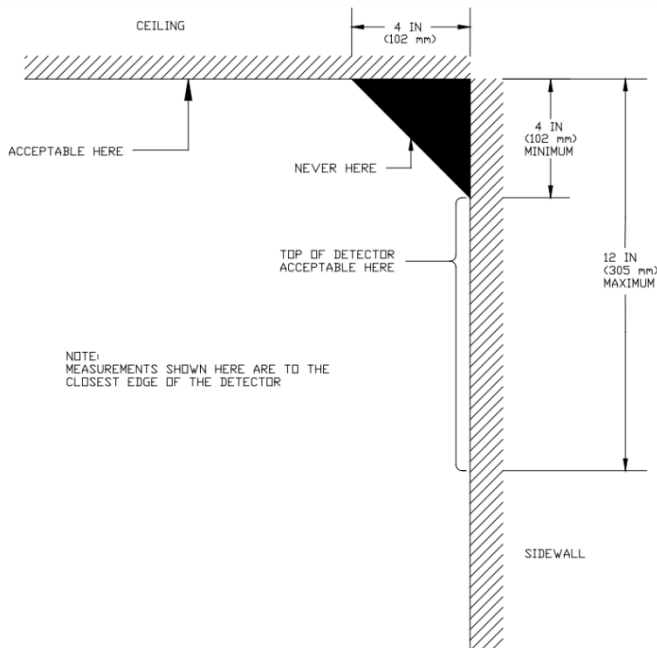


Unless printed directly on the link, these must be separately verified with the fire door manufacturer's specifications or the fusible link manufacturer's published data for longer sash chain or cable runs or higher tension applications. In higher load applications, fusible links may be doubled when allowed by the AHJ and fire door manufacturer to increase load capacity.

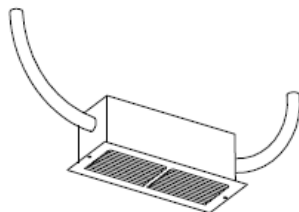
Factory Mutual (FM) fusible link requirements differ from UL requirements. FM listed fire doors must use FM listed fusible links. Using a

UL listed link on an FM listed door may result in AHJ rejection or void the FM fire rating.

NFPA 80 requires fusible links to be positioned so they reliably sense heat and activate the fire door release. One fusible link must be located near the top of the opening, and additional links must be placed at or near the ceiling on both the coil side and opposite coil side of the door, with all links installed no more than 12 inches below the ceiling line. Installers must avoid placing links within the 4 inch dead air space at ceiling corners, where stagnant air can delay heat transfer. All fusible links in the system must be interconnected so that the separation of any single link will trigger automatic closure.



When a drop or false ceiling is present, fusible links may be required both above and below the drop ceiling. Some manufacturers provide fusible link housings specifically designed to pass through ceiling materials and keep the link properly exposed. Check with the AHJ on specific requirements when applications involve drop ceilings.



Fusible links should be connected to sash chain or cable using S-hooks. All fusible links

must be installed at least 6 inches away from any fixed point such as pulleys, through-wall pipe or raceway, etc. to prevent snagging that could interfere with release. Sash chain or cable routings should avoid sharp turns or bends tighter than 90 degrees and should be guided through eyebolts or pulleys securely fastened to the wall.



Turnbuckles should be used to tension the sash chain or cable and positioned high enough that they are out of reach to avoid tampering. The routing must not hang up on ceiling construction, and it may be necessary to use cable instead of sash chain in these areas. The AHJ has final authority over approval of fusible link routing.



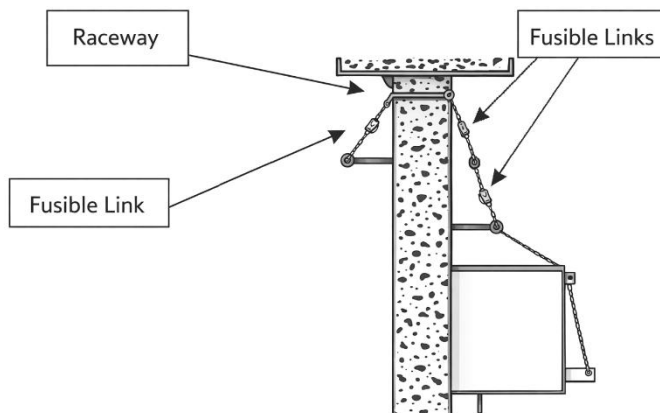
Fusible links and their routings should be inspected annually for corrosion, cracked solder joints, paint or chemical contamination, deformation, or any other foreign material that could impair performance. Debris should be removed using compressed air. Links should be replaced annually in severe environments such as corrosive, greasy, or high-particulate areas. Fusible links must never be painted or modified. Any link that has been painted, sprayed, or otherwise altered must be replaced immediately.

Some fusible link manufacturers recommend annual replacement. The solder alloy used in fusible links is subject to creep, or cold flow, meaning that continuous load over time can weaken the joint and eventually lead to failure. Although NFPA 80 does not specify a replacement interval, it does require that fusible links be installed and maintained in accordance with the manufacturer's instructions. When a manufacturer specifies annual replacement, that recommendation

becomes the required practice for that installation.

## Sash Chain and Cable

For conventional fire doors, the fusible link or release device is connected to the dropout mechanism on the door by means of a sash chain or cable. Upon activation of the fusible link or release device, the sash chain or cable must travel smoothly through any eyelets or pulleys. The chain or cable must be free from any twists or kinks that would prevent the door from closing properly. On through-wall applications, the chain or cable must travel freely through the raceway. The raceway shall be 1/2" diameter galvanized steel conduit or pipe with the ends deburred, and fitted with a collar or bushing at each end to secure the sleeve around the wall.



Twists or snagged cable and sash chain arrangements are frequently noted as a reason for failure of such systems to operate properly. According to DASMA TDS 254, the following recommendations are made to prevent operational failures and ensure proper operation:

- Plastic coated cable should not be used as part of the fire door release assembly.
- Cable should be 7x19 stranded steel, either 3/32 inch or 1/8 inch diameter.
- A sash chain used in a rolling fire door release assembly should be provided by the original fire door manufacturer.
- For proper operation, do not locate the travel path of a fusible link close to an

eyehook, wall penetration, or other obstruction.

- When routing cable or sash chain, do not make more than a 90 degree bend.
- If sash chain is used, orient the small, folded end of the sash chain to be in the direction of release assembly movement.

Refer to the complete DASMA TDS 254 for more information.

## Closing Speed

The standard for closing speed of rolling steel fire doors is mandated in the NFPA 80, *Standard for Fire Doors and Other Opening Protectives* in that: *rolling steel fire doors shall have an average closing speed of not less than 6 inches per second (152 mm per second) or more than 24 inches per second (610 mm per second)*. All manufacturers' fire doors are designed to meet this standard, and the installer must test the installation to demonstrate compliance for the AHJ's approval.



## Electromechanical Release Devices

### Basic Electromechanical Release Device:

This is a device that will initiate the release of the sash chain or cable system when it receives an electrical signal from a fire alarm or smoke detection system.



The sash chain or cable is routed through, or anchored to, a mechanical holding mechanism on the release device. Under normal conditions, the device keeps the chain or cable under tension. When the device receives a release signal, or when power is lost, the internal holding mechanism disengages, allowing the sash chain or cable to drop or slacken. This action simulates the separation

of a fusible link and triggers the automatic closing sequence of the fire door.

A time delay between signal reception and release can be incorporated to reduce nuisance drops, typically set to 10 seconds. Fire doors equipped with a device that delays activation of automatic closing, self-closing, or emergency power operation shall not delay the initiation of the closing or reclosing of the door for more than 10 seconds unless specifically approved by the AHJ.

**Electromechanical Release Device with Battery Backup:** This type of unit operates in a similar fashion to the basic release device with the addition of a battery backup and additional features.

- The unit can support auxiliary devices, such as smoke detectors, sounder alarms, and strobe lights.
- The unit has close limit detection capability. The mechanism will not release if the door is already in the closed position.
- The battery backup will prevent the door from closing in the event of a power outage for up to 72 hours.

The battery powers the release device only and will not power the motor operator.



**Electromechanical Release Device with Battery Backup and Motor Controller:** The addition of the motor controller on this unit provides the following added features:

- The fire door will close via the motor operator during an alarm situation, provided there is power to the operator.
- Most units have built-in obstruction sensing logic. If the fire door closes electrically and encounters an obstruction, the door will

reverse to the open position and then attempt to return to the closed position again. The door may cycle up to three times prior to resting on the obstruction. If the obstruction is removed the door will continue to the fully closed position.

If power is not present at the fire door operator when activated, the door will mechanically release and close.

### **Motor Controlled Release (Non-Spring Release):**

This unit does not have a separate release device, but does have releasing logic directly built-in to the motor operator. This unit has the following features:

- The fire door will close via the motor operator during an alarm condition, provided there is power to the operator.
- Most units have built-in obstruction sensing logic. If the fire door closes electrically and encounters an obstruction, the door will reverse to the open position and then attempt to return to the closed position again. The door may cycle up to three times prior to resting on the obstruction. If the obstruction is removed the door will continue to the fully closed position.
- The fire door will NOT release mechanically. If power is lost, the door closes when the electric brake disengages, allowing the door to descend by gravity. Once power is restored, the operator can raise the door normally, and the system automatically returns to its standard operating mode.



**Motor Controlled Release with Battery Backup (Non-Spring Release):** This unit operates the same as the motor controlled release device with the addition of a battery backup:

- This unit has a battery backup system that will monitor the fire door's alarm function for a period of 72 hours. If power is lost to the operator, the door will remain in the open position as long as the alarm system is not activated. Upon alarm activation or a low power warning in the battery, the door will close via release of an electric brake.

It is critical to follow the manufacturer's instructions for testing and resetting any release device and fire door.

## Detectors

Fire door release systems rely on detectors to recognize early signs of a fire and trigger the door's automatic closing sequence. Depending on the application, detectors may sense smoke, heat, or electrical circuit conditions, and may be paired with end-of-line devices or warning appliances to ensure proper operation and supervision. This section explains the major detector types and the installation practices required for code-compliant fire door operation.

### Smoke Detectors

Smoke detectors are electronic sensing devices that monitor the air for the presence of smoke particles and signal a fire condition when smoke reaches a predetermined threshold. In fire door release systems, smoke detectors can serve as the primary initiating devices that trigger the automatic closing of the door when smoke is detected. Smoke detectors fall into two groups, photoelectric and ionization.



**Photoelectric** types measure the amount of light scattered by smoke. Photoelectric detectors utilize a light source and a photosensor. When smoke particles scatter the light beam it is redirected to the sensor and triggers an alarm. Its operation may be sensitive to aerosols not related to fire, such as

dense fog, steam, or theatrical special effects. Some models are available with heat detection.

**Ionization** types measure the density of visible and invisible combustion particles. Ionization detectors use a small amount of radioactive material to ionize the air in a sensing chamber. When smoke enters this chamber, it disrupts the ion flow and triggers an alarm. Its operation may be sensitive to combustion particles not related to fire such as vehicle exhaust and vapors from chemical reactions. Some models are available with heat detection.

All smoke detectors must be designed to transmit a signal to activate the releasing system of the door. Detectors designed for release will have Form C contacts for such use. Form C contacts are the auxiliary relay contacts used to connect the smoke detector to the release holder. Smoke detectors are available with and without a heat sensor, depending on the specifications, and both types are acceptable for fire door use. Where multiple smoke detectors control a number of doors, they must be wired so that activation of any one detector will result in door closure.

Other specialty detectors, such as carbon monoxide detectors, rate-of-rise heat detectors, fixed-temperature heat detectors, and combination devices, may also be used in conjunction with smoke detectors in certain applications. These devices are typically part of the building's fire alarm or life-safety system and can serve as initiating devices for fire door release when permitted by the AHJ and the system design.

### End-of-Line Devices

UL requires that smoke detectors have supervised power, but the method of supervision depends on the detector's design. For 4-wire smoke detectors, the power circuit is separate from the alarm circuit and is not inherently



supervised, so manufacturers specify an *End-of-Line Relay* installed at the last detector to provide power supervision. This relay changes the alarm circuit to a trouble condition if detector power is lost anywhere in the run.

2-wire smoke detectors inherently supervise both power and wiring integrity through the alarm circuit, because the same two conductors carry power, monitoring, and alarm signals. The fire alarm panel constantly checks this circuit for continuity, and any open, short, or removal of a detector changes the circuit's resistance. An *End-of-Line Resistor* at the last device establishes the expected load, allowing the panel to detect faults anywhere on the loop. Because loss of power also disrupts the alarm circuit, the panel automatically registers a trouble condition, eliminating the need for a separate *End-of-Line Relay* for power supervision.

Some smoke detectors incorporate built-in end-of-line components, but most require external devices. Proper installation of End-of-Line power-supervision devices is critical for safe and compliant fire door release when using smoke detectors and is often overlooked during bidding.

## Warning Devices

Smoke detectors used with rolling fire doors function solely as initiating devices for the release mechanism and do not provide any type of occupant notification. If the building's fire alarm system does not include audible or visible notification appliances near the opening, supplemental local warning devices may be added to alert occupants that the door is about to close. These devices can include sounders, strobes, sounder-strobes, or annunciators, depending on the release device model and the requirements of the AHJ. Any supplemental warning device must be listed for fire-protective signaling and installed in accordance with the manufacturer's instructions and NFPA 72.

## Location

Mounting location of smoke detectors is described in NFPA 80 and NFPA 72 the *National Fire Alarm and Signaling Code*. The first guideline installers must follow is that smoke detectors should be installed in accordance with the manufacturer's instructions.

Detectors or fusible links shall be installed on both sides of the wall, interconnected so that the operation of any single detector or fusible link causes the door to close. An exception to this may be where detectors are not required to be mounted to the exterior side of exterior walls, as determined by the AHJ.

Generally, smoke detectors should be mounted on the ceiling at least 4 inches from a wall or on a wall with the top of the detector not less than 4 inches or more than 12 inches below the ceiling. An exception to this, according to the *National Fire Alarm and Signaling Code*, is that when a mounting surface might become considerably warmer or cooler than the room, such as a poorly insulated ceiling below an unfinished attic, the detectors shall be mounted on an inside wall.

Smoke detectors used for fire door activation may be connected directly to the building's fire alarm system rather than operating as local door specific detection points. When fire doors are tied into the overall fire alarm system without the use of localized regions or zones, an alarm anywhere in the building can cause all fire doors within the building envelope to close simultaneously.

For example, in a six-story building with multiple fire doors on each floor, connecting all doors to a single building-wide alarm circuit would result in every fire door on every floor closing each time the system activates. This can create unnecessary disruption and may interfere with normal building operations. By dividing the building into local regions or zones, fire doors can be grouped so that only the doors within the affected zone close during an activation. This approach minimizes

disturbance, improves building usability, and still maintains code compliant fire and smoke protection.

## Section Seven

# Obtaining and Installing the Correct Door

Ensuring a rolling door is properly specified, ordered, and installed is essential for safe operation, code compliance, and long term performance. This chapter guides technicians through the entire process, from interpreting bid and door specifications to ordering the correct materials, inspecting the job site, and preparing the opening. It then provides step-by-step instructions for assembling, installing, and tensioning the door, along with the critical checks required before final inspection and fire door drop testing. By understanding each stage of this workflow, technicians can avoid common pitfalls, streamline installation, and deliver a door system that performs as intended.

## The Bid Specifications

The specification section is an area to become familiar with. During installation and testing, it is often necessary to review the project specifications before beginning the work.



Knowing how to read and understand the specifications of the installed product will allow an installer to carry out the installation efficiently and professionally. Should you discover a questionable installation issue with regards to the specification, you should first discuss the issue with your company's sales staff.

This section provides an overview of the paragraphs within a specification. While architectural formats may vary, most specifications address the same areas.

CSI *MasterFormat* is the industry standard in North America for organizing construction specifications. Often referred to as the "Dewey

Decimal System" of construction, it typically follows the format shown in the following paragraphs.

### Part 1.00 General

- 1.01 Material to be furnished. The paragraph will have a brief overview of what is to be supplied. i.e. rolling fire door, electrical operators, etc.
- 1.02 The rating of the door specified. What class and hour rating is required. Wind load ratings when applicable.
- 1.03 Opening preparation. Who is to prepare the opening? Ultimately, you will be responsible for the inspection of the prepared opening and ensuring it is adequate for installation of the type and rating of the specified door.

### Part 2.00 Product

- 2.01 Manufacturers. In this paragraph a list of acceptable manufacturers will be listed. Some architects will have an area and criteria for accepting manufacturers other than those listed. These are called an "or equal." Here some will also list the model number of a specific door that they are looking for.
- 2.02 Materials
  - 2.02.1 Curtain. Here the curtain design and type will be called out. For example, 22 gauge with a 3 inch slat design.
  - 2.02.2 Guides. Here the guides will be discussed. Type, thickness, finish, galvanizing, wind bars, etc.
  - 2.02.3 Counterbalance. The type of counterbalance desired, such as torsion spring or weight, amount of cycle springs required, etc.
  - 2.02.4 Brackets. The type, thickness, and finish of the brackets.
  - 2.02.5 Hoods. The type of hood, gauge of steel, finish, baffles, etc.

2.02.6 Operation. Options include pushup, chain hoist, crank, or motor operation. If an electric operator is desired, the type, size, etc. will be specified here.

2.02.7 Closing devices. This may be the most challenging area of the specification. With many types and designs of closing devices available, it may be difficult to determine the intentions of the architect and the end user beyond simply ensuring the door closes.

## 2.03 Finishes

2.03.1 Galvanizing. The type of galvanizing to be used.

2.03.2 Finish selection. Galvanized unpainted, prime painted, or powder coat finish may be specified.

2.03.3 Stainless steel finish. The type and finish. Most typical is #4 finish.

## Part 3.00 Execution

### 3.01 Installation

3.01.1 Typically this area calls for the door to be installed according to the manufacturer's instructions.

3.01.2 A requirement for an IDEA Accredited dealer or Certified installer with a certain number of years experience may be required.

### 3.02 Testing

3.02.1 Typically a requirement for a drop test will be specified. This area may also request an end user representative on hand to witness the drop test. Be sure a drop test form is used when conducting fire door drop tests. The form must be signed by both the customer or the AHJ and the technician performing the test.

### 3.03 Quality Assurance

3.03.1 This area will specify certain quality assurance issues, not only with the installation but also with the drop test, including clean up at the jobsite, touching up the finish, and testing and lubricating the door after the installation is complete.

## Ordering the Door

Ordering the door should be accomplished with careful planning and attention to detail. An installer may be consulted in this process and should be knowledgeable about the product and its application. Rules governing the installation of rolling doors not only follow specifications, but also laws and local building codes in many cases. Taking proper action to ensure the correct door is ordered is an important step in the installation process, whether the project is small and simple or large and complex.



Prior to ordering a door, shop drawings should be submitted to the construction manager, contractor, owner, and any other essential person involved in the project. Written approval should be obtained on the drawing from the proper authority on the job. This may be an architect, engineer, etc.

When drawings are returned “approved as corrected” or other similar wording, the drawings should be reviewed with a high degree of scrutiny. Some changes may have an impact on the originally quoted price for the installed door. When this occurs, the issue should be addressed prior to ordering the door, rather than after the installation is completed. If the drawings are not approved as submitted, new drawings should be submitted and approved.

A professional installer also will perform a site survey to verify field dimensions against the approved shop drawings including opening

size, sideroom, headroom, etc. Taking the extra steps to ensure accuracy from the initial stages of the process will enhance the efficiency and profitability of the project.

When ordering the door, drawings should be sent to the manufacturer along with the order. Errors or mistakes can be prevented through this additional review stage. In some cases, manufacturers may require copies of the shop drawings at the time of ordering. Adhering to this simple rule may not only help prevent mistakes but may also provide protection in the event of a dispute. In most cases the seller of the door will remain contractually bound in accordance with the plans and specifications for the project, unless a specific request for an exception to these requirements is granted.

## Receiving the Door

Once the door has been ordered and shipped the next step is properly receiving the materials. When the product is received, a proper counting and checking of the material before the truck has left the dock is required. In some cases, shipping errors involving missing items or damage may delay the start of a project. Any shortages or damage should be noted on the Bill of Lading. This is extremely important for claims involving damage or replacement from the manufacturer. An even worse scenario is to discover missing parts or specialty hardware once the installation process has begun.



When all items are received and accounted for, proper storage and handling is the next step. The door should be stored indoors, protected from outside elements. Careful attention must be given to storage of the curtain assembly as these are typically very heavy and can be easily damaged if dropped due to excessive weight. Some doors may have a powder coated finish, which serves as the final applied coating and provides a durable, uniform, and polished appearance. In this instance, the final product will be expected to appear as a

finished product. Damaged parts can lead to expensive replacements and additional delays in the installation process.

## Rolling Door Installation

The following is a basic installation guide for rolling doors. **This section is intended only as a general reference guide, and not as actual installation instructions.** Always refer to the manufacturer's instructions supplied for the specific door being installed.



As noted elsewhere in this study guide, it is important to follow the manufacturer's instructions when installing a rolling door. These products are well-designed and effective tools used in the protection of lives and property. However, they are intended to work under specific installation conditions. If at any time you experience a conflict between a manufacturer's instructions and an installation circumstance, contact the manufacturer for guidance prior to proceeding with installation.

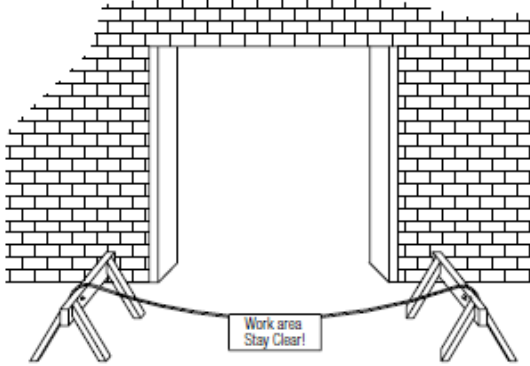
## Getting Started

Prior to loading material, check that all paperwork is complete and correct. All crates and boxes must be accounted for and loaded. It is important to read all instructions carefully, checking shop drawings supplied for any special conditions. Open all crated materials and check with attached parts list prior to installation. All parts supplied should correspond with the type of door being installed. If special devices such as electrical releases, smoke or heat detectors are supplied, their individual instructions should be reviewed prior to installation.



## Site Inspection

Once at the job site, check in with the appropriate person and review all paperwork and job requirements prior to proceeding. Review all conditions and the area required for the installation. For safety reasons, be sure other trades and people will remain outside the work area. In some situations, installing caution tape to rope off the area may be required.



## Assessing the Opening

All jambs must be plumb, level, and square. If removing an old door, ensure all jambs are clean of existing welds and debris from previous mounting materials. After the door is removed and jambs are cleaned and prepared, inspect and repair the jambs and attachments as necessary before proceeding with the installation.

Part of the installer's responsibility is verifying the type of wall construction and jambs meet the requirements of the door being installed. This requires verifying the wall construction is appropriate for the door that was ordered as well as sufficient to support the weight of the door and any applicable fire, wind load, or seismic jamb requirements.

If the installer discovers a wall that is not adequate at the project site, it is their responsibility to stop prior to beginning installation and bring the conflict to the attention of the job site Superintendent. Proceeding with the installation can result in project delays and complications, along with increased liability to the installer and the company.

## Sizing the Opening

The opening dimensions and clearances must be verified and compared with the approved shop drawings and manufacturer



installation instructions. Verify the opening width and height, ensure the opening surfaces are plumb, and the floors and lintels are level. If they are not, compensation for these conditions must be addressed before door installation.

Where floors are not level, always raise the low side of the guide wall angles to gain level across the opening, never cut a door down without first checking with the manufacturer. Cutting may cause operational issues. Also of importance, field modifications are generally not permitted on fire rated doors.

Adequate sideroom clearances must be available. Particularly with the use of dropout mechanisms, release arms, etc., more sideroom is usually required so the door can move freely and unobstructed. If the proper clearance is not available, these conditions must be corrected before the installation can begin.

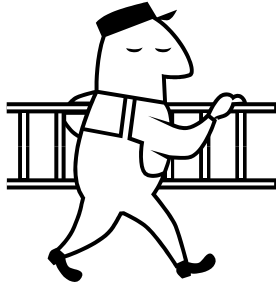
Headroom dimensions and clearances must be verified and compared with the approved shop drawings and manufacturer installation instructions. In most cases for fire doors, additional headroom will be necessary for the release device to be attached properly. All cables and attachments must be installed in a clear, unobstructed environment so they release and move without obstruction.

Addition of future conduit, duct work, sprinkler systems, and other potential obstructions should be discussed with the contractor and building owner before installation begins. It is important for the owner to understand nothing should be attached to the door, and objects should not be stored, or installed, in a manner obstructing the door or affecting the release

devices of fire doors. If ceilings are installed after door installation, it is important to ensure ceiling construction will not interfere with dropout arms and other automatic closing components for fire doors, and access panels be provided for future resetting of the door closing mechanisms. Also note a fuse link housing may be required to be installed.

### Job Site Organization

It is important that all materials are organized to ensure a safe and efficient installation process is achieved. Layout guides in an area adjacent to the wall, keeping the curtain, counterbalance, and support brackets clear of the opening to prevent tripping hazards during installation of the guides. Layout and sort all hardware and fasteners to check for proper count and type. For fire rated products, use only manufacturer provided hardware. If the provided hardware cannot be used, substituted hardware must be approved by the manufacturer.



Once everything has been accounted for, and the job has been checked, installation can begin. Taking the proper steps prior to beginning installation will save time and increase efficiency by avoiding complications.

### Truck, Tools, and Equipment

The following section is meant to be used as a recommendation only for minimum standards for installers. Markets will vary and require special needs. Training in the safe and proper use of each of these tools is part of a comprehensive training program provided at the dealer level.

The following tools are typically used in the installation of rolling doors:

#### Tool List:

- Claw hammer
- Carpenter's level
- Water level
- Pliers
- Ratchet wrench and sockets ( 5/16" to 7/8" )
- Impact sockets ( 3/8" to 9/16" )
- Extensions for ratchets
- 10' x 1/2" sling ropes
- Measuring tape
- Screwdrivers
- Winding bars
- Vice grips
- Wrenches (5/16" to 7/8")
- Drill bits for steel (3/16", 1/4", 15/64", 7/16", 3/4", 5/16", 3/8", 1/2")
- Drill bits for masonry (3/16", 1/4", 5/16", 3/8", 1/2")
- Tin snips
- Adjustable wrench
- Nut drivers (1/4" to 7/16")
- Wall clamps
- Cable cutters
- Tool pouch
- Pry bar
- Speed wrench
- Uni-bit
- PPE: work gloves ,welding gloves, safety glasses, hard hat, etc.



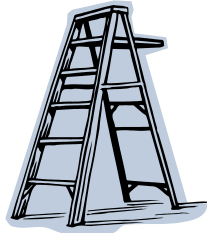
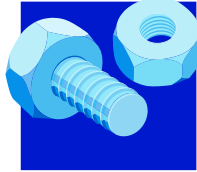
#### Power Tools:

- 3/8" electric/cordless drill
- 1/2" electric/cordless drill
- 1/2" masonry drill
- 1/2" rotary hammer
- Impact driver
- Circular saw
- 4-1/2" grinder
- Reciprocating saw
- Extension cords
- Extra batteries
- Battery charger
- Electrical gang box with ground fault interruption (GFI) circuit



## Truck Inventory:

- 8' step ladders (x2)
- 24' extension ladders (x2)
- 5/16" and 3/8" expansion/wedge anchors
- 5/16" and 3/8" all-thread
- Assorted nuts and bolts
- Touchup spray paint for welds and curtain
- Cleaner and rags
- Shovel
- Broom
- Oxygen & acetylene burning outfit
- Electric arc welder and rods
- Generator
- Gas can
- Caulking gun
- 4 wheel dollies
- Sawhorses
- 1-Ton Come-A-Long (x2)
- 1-Ton Chain hoist
- Genie/Vermette Lift
- Angle iron cutter
- Fire extinguisher
- First aid kit
- Caution Tape



This may have to be done at the expense of your company, which may not be recoverable from the contractor or owner. It is the responsibility of a professional door installer to be aware of these conditions and considerations before the job is done. For an installer, recognizing the correct type of wall and fire door rating, when applicable, is an important step. This should be addressed when ordering the door and reconfirmed before installation begins. This type of training and forethought is an important attribute of a professional technician.

**Concrete Walls:** Typically, poured concrete walls do not require any additional capping of the jamb. For mounting the rolling door guides, usually concrete expansion anchors are used, but through-wall bolts can also be utilized.

If the jamb is capped with a structural steel channel or a bent steel plate has been provided at the wall jamb, the door may be designed to mount to either the concrete wall with the use of "Z" type guides, or to the steel member with use of "E" type guides. If mounting to the steel member, refer to steel wall type for wall mounting information.

## Wall Types and Mounting

There are a variety of wall types onto which rolling doors can be installed. The type of wall construction will determine, in part, the required guide construction and fasteners, and the fire rating of a fire door. This must be determined before the installation can begin.

For example, according to the specifications or manufacturer's details, you are supposed to install a 3 hour rated fire door. You arrive at the job and there is a 2 hour wood wall designated for the door installation. At this point, it would be wise to contact your supervisor and discuss the situation. If not, you may end up removing the installed door to have the contractor change the wall conditions and then be required to reinstall the door.

**Masonry Walls:** There are two types of configurations for this wall. The first is the unfilled or hollow block wall, requiring special attention. According to NFPA 80, through-bolts with crush plates are required for this type of mounting application for fire doors. This is also a best practice for non-fire rated rolling doors. Expansion anchors should never be used with hollow block walls as there's nothing for them to expand into. The purpose of the crush plates is to prevent the bolt from pulling through the wall.



The second type is filled concrete masonry block, also referred to as *Concrete Masonry Units (CMU)*, or brick. On these types of walls,

the use of through-bolts or approved expansion anchors is acceptable.

**Steel:** Steel jambs in pre-engineered buildings or concrete walls capped with steel members are common applications. Guides installed to steel jambs may be bolted to the steel member with tap bolts, or if the mounting condition allows, using a bolt and nut on the back side of the steel member. Welding guides to the steel member may only be permitted if it adheres to the manufacturer's installation instructions and approved listings for fire doors, ensuring all welds comply with these requirements.

Before welding fire door guides to steel jambs, be sure to follow the manufacturer's written instructions. Not all manufacturers have approval for welding of fire door guides, and not all listing agencies, most notably FM Approvals, approve the use of welding to steel jambs. While you may find it easier to weld the guides to the jambs, it may violate approvals and listings. Afterwards, the only fix is to remove the guides and install them correctly using the proper fasteners.

**Stud-Mounted Drywall:** This is a common wall mounting application for counter doors. The studs behind the drywall are metal or wood. Through-wall bolt mounting is required for fire doors unless the manufacturer has other specific mounting approvals included with their listing. Non-fire rated door guides can also be attached using metal screws or lag screws appropriate for the stud material.

**Wood Walls:** Rolling doors may be mounted to wood walls using lag screws or through-wall bolts as specified by the manufacturer.

Wood walls are the least common wall type for fire door installations. Although certain wood assemblies may carry limited fire ratings, they are generally not used for rated openings. When a fire door is installed onto a wood wall, through-wall bolts must be used unless the manufacturer's listing specifically authorizes alternative mounting methods.

Fire rated products mounted to non-masonry walls must be provided as approved by the manufacturer's listing agency and be mounted to the wall with the fasteners provided by the manufacturer.

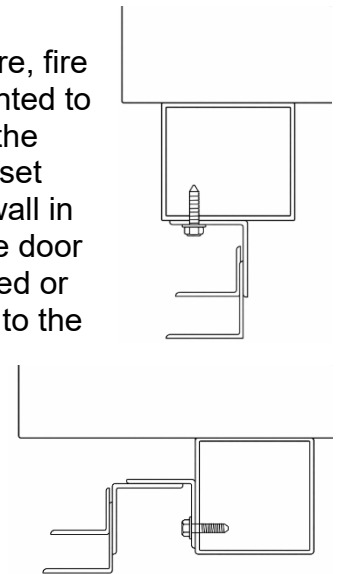
**Tube Mounted Doors:** Another rolling door mounting method is the use of a tube mounted assembly placed in front of the opening or between the jambs. Front of opening mounting is most common for Rolling Grilles and is helpful for situations where attaching bolts to the wall is difficult if not impossible.

In these cases, base plates are secured to the floor or sill, and continuous steel tubes are attached to the base plates. The top of the steel tube is secured to either structural steel at the ceiling construction or to the wall above the opening. The tubes may be supplied by the manufacturer or by others and should be verified to be adequately attached to the building framing members to support the loads of the door.

When part of the manufacturer's procedure, fire doors may also be mounted to tubes placed in front of the opening. The tubes are set against the face of the wall in front of the opening. The door can then be face mounted or between jamb mounted to the steel tubes. The guides are bolted

directly onto the steel tubes using "E" type guides or between jamb guides as appropriate. Note that the steel tubes cannot be mounted between jamb, they must be mounted against the face of the wall.

The steel tubes themselves are not fastened directly to the wall. Each tube is designed to fit over a base plate assembly that is anchored to the floor or sill. The top of the tube accommodates vertical movement for fire doors through an expansion tube sleeve assembly,



which is secured either to structural steel at the ceiling construction or to the wall above the opening. The upper expansion tube assembly may be through-bolted to the wall or fastened to the existing ceiling structure when conditions permit. Because not all manufacturers have listings for this type of installation, it is essential to verify the manufacturer's listing before using this mounting method.

Spacing the door out from the wall will create a gap at the top of the hood. This gap must be closed in a manner acceptable to the AHJ, with material suitable for attachment of the hood when required.

Regardless of jamb construction, doors must be installed with the hardware provided and/or specified by the manufacturer, unless otherwise dictated or approved by a local AHJ for fire doors. In the event the hardware provided by the manufacturer does not appear to be appropriate for the installation, the manufacturer should be contacted for verification and direction.

Reference DASMA TDS 273 for more details on tube mounted fire doors.

## Fire Door Jamb Construction

Jamb construction plays a critical role in a fire door's ability to resist fire spread. To maintain and achieve the door's rated performance, the jambs must have a fire resistance rating equal or greater than that of the door assembly, as required by applicable building codes. While installers are not expected to fabricate every jamb type, they must be familiar with each jamb's construction, attachment method, and guide orientation to ensure compatibility with the door's fire rating and adequate support for operating loads.

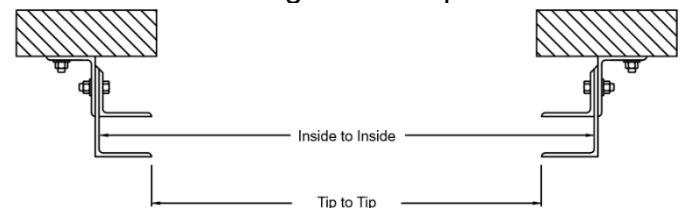
DASMA has published several Technical Data Sheets (TDS) providing recommended jamb constructions and guide mounting details for architects and designers. Reference the following TDSs:

- **DASMA TDS 261** – *Common Jamb Construction for Rolling Steel Fire Doors: Masonry Construction – Bolted and Welded Guides*
- **DASMA TDS 262** – *Common Jamb Construction for Rolling Fire Doors: Non-Masonry Construction – Bolted Guides*
- **DASMA TDS 263** – *Common Jamb Construction for Rolling Steel Counter Fire Doors – Masonry Construction – Bolted Guides*
- **DASMA TDS 264** – *Common Jamb Construction for Rolling Steel Counter Fire Doors: Non Masonry Construction – Bolted Guides*
- **DASMA TDS 273** – *Rolling Steel Fire Doors Bolted onto Steel Tubes, Set Against Face of Fire-Rated Walls*

## Guide Installation

Guides are the first component of the door to be installed and must be installed precisely to ensure proper operation and performance. They are typically shipped assembled from the factory and may need disassembled for proper installation. If disassembly is required, verify guide gap/opening dimensions for proper reassembly.

Refer to the manufacturer's installation documents to determine the spacing of the guides. This measurement may be provided as an inside to inside dimension, or a tip to tip of angle dimension. It is imperative this spacing is adhered to within the manufacturer's tolerances and the guides are plumb.



Particularly for wind load rated and fire rated doors, installing the guides at the proper spacing and with strict adherence to the manufacturer's installation instructions is the most important element of a good installation. If the guides are not installed as shown on the

drawings, as outlined in the instructions, the door will not operate correctly, and fire and/or wind load ratings of the door may be void. Contact the manufacturer for guidance anytime field conditions deviate from the drawings and installation instructions.

Once the guide spacing measurement has been determined, measure the width of the opening and mark its center on the header. Divide the guide spacing measurement in half, then use the center mark to layout the left and right guide locations on the jambs. This ensures the door and guides are properly centered within the opening.

Measure the slope of the floor and shim as necessary to ensure the guides and brackets will be level with one another. Some manufacturers use downward guide expansion for fire doors, requiring both guides to be shimmed an additional amount off the floor to provide proper clearance. Reference installation instructions and/or shop drawings for specific expansion requirements.

Use a water level or transit level to verify the guides are level with one another. Determine the location of all guide mounting fasteners and install the guides to the manufacturer's specifications. Ensure you use the fasteners supplied by, or specified by, the manufacturer and double check them against the installation instructions and shop drawings. Fasteners must be positioned in specific locations within the wall mounting slots for proper fire door guide expansion in the event of a fire.

**Warning!** Guide assemblies can be extremely heavy. Take proper precautions to ensure safety when lifting or standing up the guides.

## Preparing the Barrel

The manufacturer will identify the barrel's hand of operation, either left or right hand determined as you face the coil side. This designation always



refers to the operating side, not the spring assembly side.

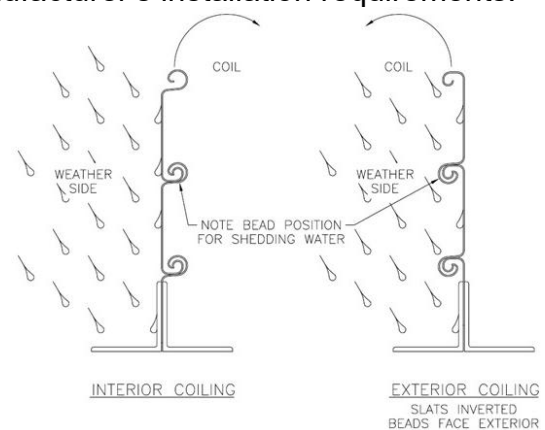
Before placing the barrel at the base of the guides, prepare the drive shaft while the assembly is still on the ground: inspect the shaft ends for burrs, sharp edges, or deformation, and use a file to dress the shaft as needed so it will slide smoothly through the bearings, drive components, or operating mechanism.



Once the shaft is properly prepared, position the barrel assembly according to the specified hand of operation. If rings are supplied, install them on the barrel, aligning each ring with the drilled and tapped holes for the attachment studs. Verify the direction of the coil to ensure the rings are installed in the correct orientation. Refer to the manufacturer's installation instructions for the specific ring-attachment drawings and any additional requirements.

## Attaching Curtain to Barrel Assembly

If the door is to be mounted on the exterior side of the building, the slats must be arranged differently than they would be for an interior mounted installation. Refer to the figure and verify that the slats are oriented correctly for the mounting condition. Proper slat orientation is essential to ensure weather shedding, correct curtain travel, and compliance with the manufacturer's installation requirements.

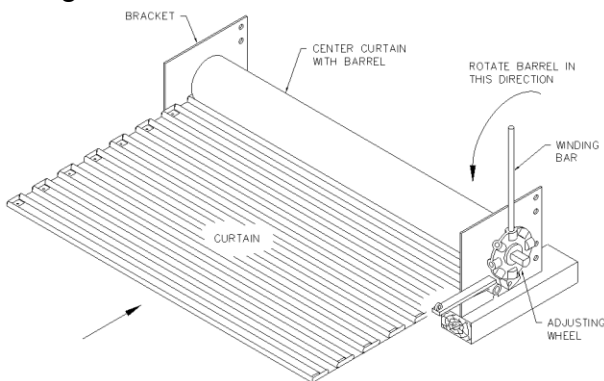


There are two main methods used to install the curtain and barrel assemblies. For smaller doors, the curtain can be attached to the barrel on the ground, while for larger doors the curtain is typically lifted separately and slung from the barrel. Both installation methods will be discussed in this study guide.

### Curtain Rolled on Barrel on Floor

Use lumber, PVC pipe, cardboard, or any other adequate material to protect the curtain finish and unroll the curtain on the ground with the coil side of the slat facing up. Place the barrel on top of the curtain and line up the barrel with the top slat, centering the barrel on the curtain.

Install the curtain to the barrel using the fasteners provided and roll the curtain up around the barrel. Ensure the curtain roll is tight and straight, securing it with ropes or strapping to prevent it from unrolling. Carefully lift each end of the curtain and barrel assembly and slide each support bracket onto the barrel shafts. Be sure the drive end of the barrel gets the drive side bracket, and the tension end gets the tension side bracket. In most applications, the drive side bracket will have a bearing, and the tension side bracket will not.

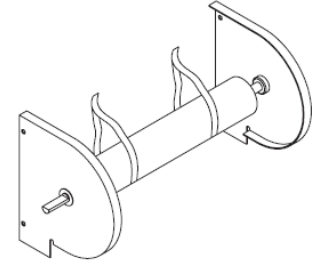


Take precautions to prevent curtain damage while lifting, and raise the curtain, barrel, and bracket assembly up into location. Line up the bracket holes with the guide holes, and fasten using the manufacturer's specified fasteners.

### Slings the Curtain

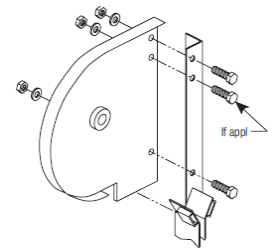
For larger doors, the combined weight of the coil and barrel may be too heavy to lift into place as one item as treated in the previous method. The following method describes how to lift each one separately.

Slide the drive side and tension side brackets onto the appropriate shafts of the barrel and secure from falling. Lift the barrel and bracket assembly into place



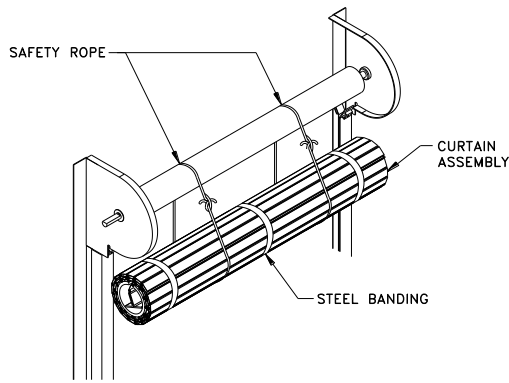
using slings. The barrel assembly will not balance from the center, as the tension side of the barrel assembly contains the springs and will be significantly heavier than the drive end. Be sure to offset the slings appropriately to balance while lifting. The offset is often labeled on the barrel.

Once the assembly is positioned at the top of the guide assembly wall angles, line up the holes in the brackets with the holes in the wall angles and attach the brackets to the guides.



Choose multiple equal lengths of strapping or safety rope. It is the installer's responsibility to verify the strapping or safety rope is of adequate strength, and sufficient quantity are used, to safely support the coil's weight and prevent damage to the curtain.

Tie a large loop in the straps around each end of the barrel to cradle the coil. The coil and barrel should be separated by a minimum of 18 inches, and the coil should be rolled to have the top attachment slats exposed.

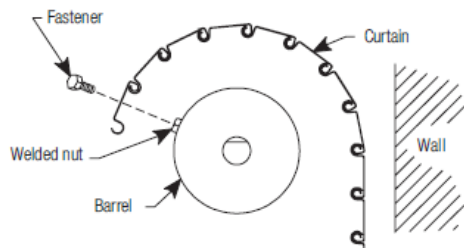


## Installing the Tension Wheel

If not installed while rolling the curtain around the barrel, follow the manufacturer's instructions for installing the tension wheel to the tension shaft and secure from falling.



Using a vice clamp to hold the top attachment slat(s) to the straps or ropes, begin to rotate the barrel in the direction to raise the curtain. The rope/straps will consequently uncoil the curtain. When sufficient curtain has been uncoiled, attach the top slat to the barrel assembly. It may be necessary to use a lift to raise the curtain assembly and ease the hanging weight while attaching the curtain to the barrel or rings.



With the top slat attached, continue to completely roll the curtain onto the barrel assembly in a similar fashion. Some installers use spring tension and/or manual chain hoists to make it easier to rotate the barrel and roll the coil onto the barrel assembly.

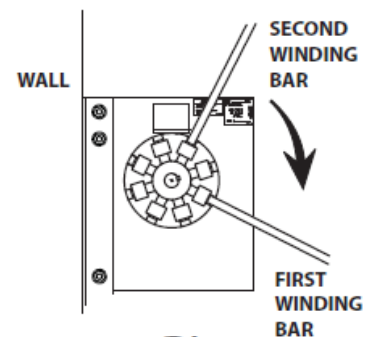
While restraining the coil from turning freely, feed the bottom bar into the top of the guides allowing the curtain to advance approximately 6 to 12 inches. Block the bottom bar so it cannot travel beyond this point. Proceed to attach the stops to the top of both guides.

## Applying Tension

The amount of initial revolutions of the spring, usually specified by the manufacturer, is the theoretical starting point for the required spring tension with the door in the open position and the curtain wrapped around the barrel. For fire doors, depending on the type of automatic closing device, this may be the amount of tension required to balance the door, or could be the initial turns required to result in the required underbalance to close the door. For underbalanced doors, initial turns may be close to zero. Due to variations in steel, springs, friction, etc., slight field adjustment to the specified initial turns may be required to provide optimum balance and/or drop speed.

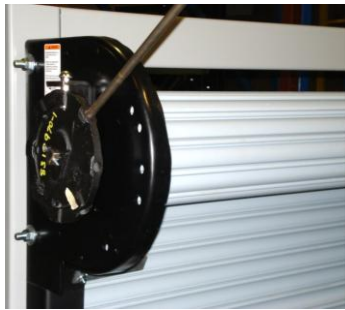
**Caution!** Always apply and adjust spring tension when the door is in the fully open position. The springs are under the least amount of tension at this point. Reference the manufacturer's installation instructions when special springing systems are utilized.

Rotate the tension wheel by hand in both directions to determine the neutral point of the spring tension. Mark the hole on the tension wheel nearest to the retaining lug on the tension side bracket. Using two sufficiently sized winding bars, insert the two winding bars securely into the holes in the tension wheel.



Tension is applied in the same direction the curtain turns as it coils upward, counting the turns, as specified by the manufacturer, from the mark previously made on the tension wheel.

Once the specified turns are applied, hold the winding bar firmly in one hand and insert the tension wheel pin with the other hand through the lug in the bracket and into the hole in the tension wheel. This locks the spring tension at the desired number of revolutions. After the pin is fully seated, remove the winding bars.



Manually move the bottom bar a few inches up and down to verify proper balance and adjust tension as needed. It may be necessary to temporarily clamp fire door dropout mechanisms in place until the sash chain or cable routing is complete, or to complete assembly of the operating mechanisms, to allow for accurate balance checks. Also note that underbalanced fire doors may require completion of the full installation and/or operator installation before a proper balance check can be performed.

**Inside Tension Holder/Wheel:** When side room is limited, an inside tension adjustment mechanism may be used. Follow the manufacturer's installation instructions and safety precautions. The curtain must be unrolled down and locked into the guides to access the tension shaft and/or tension wheel. The top curtain slats are typically shortened to provide access to apply tension. Using the proper winding bars, apply the total spring turns indicated by the manufacturer. The tension shaft is then typically pinned to an inside shaft holder to secure tension. Carefully unlock the curtain, and test and adjust as required for proper balance.

**Compound Tension Wheel:** On doors with large amounts of spring tension, a compound

adjusting mechanism may be used. These mechanisms use mechanical gear reductions to decrease the force required by the installer to tension the door. Refer to the manufacturer's installation instructions for installation of a compound tension wheel.

Once installed, operate the door to ensure the proper spring tension and make adjustments as needed to provide a safe, well-operating door.

## Operating Mechanism Assembly

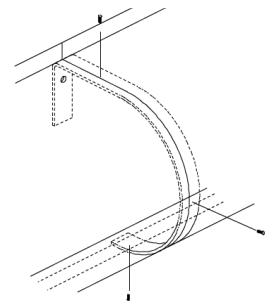
If the door is manual pushup operation, this step may not be required. For all other configurations, it may be necessary to assemble the operating mechanisms to the operator bracket before installing the hood, as this provides the needed access for fasteners and alignment. If the door will be motor operated, refer to the separate electric operator installation instructions in this study guide, since the motor mounting bracket may also require fastener access prior to hood installation.

Operating mechanisms vary significantly depending on the type of operation and from one manufacturer to another. Reference the manufacturer's installation instructions for the specific assembly sequence and component details. Some manufacturers factory-assemble the operating mechanisms to the drive side brackets to aid with field installation.

## Hood Installation

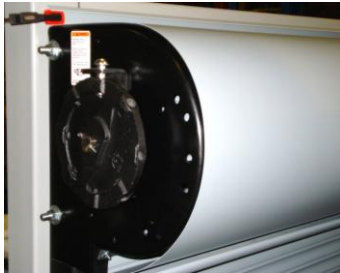
It may be necessary to install lintel brush seal, if specified, before installing the hood.

Determine if the hood uses one or more intermediate hood supports and if they will be installed on the inside or outside of the hood. To install intermediate hood supports, use a chalk line



to strike a level line across the top of the support brackets with the appropriate offset for inside vs outside of hood locations. Reference the manufacturer's specifications to determine the mounting location of the hood supports. Install the top of the hood support to the lintel in line with the chalk line using the supplied fasteners.

Lift the hood up into position and fasten to the brackets and/or intermediate supports. Fasten the top flange of the hood to the lintel using the fasteners supplied by the manufacturer. Follow the same procedure for installation of the fascia if provided.



Fusible links are required on the coil side of the opening, both near the opening and near the ceiling, and an additional fusible link is required on the opposite coil side near the ceiling. Plan the routing to avoid interference with the hood, fascia, and any required drive-side or tension-side housings.

If the door is supplied with a flame baffle, check for proper flame baffle functionality. Reconnect release chain or cable for flame baffle and secure.

### Fire Door Fusible Link Routing

Proper routing of sash chain or cable requires careful planning and is often influenced by field conditions. All routing and fusible link placement must comply with NFPA 80, the manufacturer's listing, and any requirements of the AHJ, as detailed in the Automatic Closing Devices section of this study guide.

The sash chain or cable must be routed so that it secures the drop arm(s) during normal operation and releases them reliably under any alarm condition. The drop arm(s) must fully disengage regardless of which fusible link or release device activates.

All fusible links must be located at least 6 inches away from fixed points such as pulleys, eyebolts, or through-wall pipes, or far enough away to ensure the drop arm(s) can fully disengage if any link melts. Routing must also avoid sharp bends that could impede movement or create snag points.

If the door includes a manual floor level disconnect, the routing must reach the release handle with proper length and alignment so that pulling the handle engages the drop arm(s), and releasing the handle allows the drop arm(s) to fully disengage. Vertical routing is often required at the handle to ensure proper release.

Use S-hooks to connect fusible links, turnbuckles, pulleys, and related hardware. After assembly, S-hooks should be crimped closed to prevent separation or snagging during release.

Use turnbuckles to fine tune sash chain or cable tension for proper drop arm engagement and, when applicable, correct operation of the floor level disconnect. Turnbuckles must be installed high enough to prevent tampering.

Install any specified electromechanical release devices and connect the sash chain or cable routing.

There are many acceptable routing configurations, but it is critical that fusible link and detector locations meet the requirements of NFPA 80, the manufacturer's listing, and the AHJ.

## Final Assembly

Attach the guide and lintel seals, if specified.

If applicable, install the tension and drive side covers with the supplied fasteners.

Drop test fire doors to be sure all devices release, cables and sash chains slide properly, and all adjustments have been made to ensure the door drops correctly. Once the door has passed the drop test, properly secure all release devices and set for operation.

A second drop test is required and must be witnessed by the building owner or the owner's representative, as specified in NFPA 80 (Section 5.2.3.9.3.1). Complete the drop test form that provided by the manufacturer or use the DASMA form included in TDS 271. Leave a completed copy with the appropriate building representative and retain the original for your records.

Before handing the door over to the owner or general contractor, thoroughly clean the entire door assembly including hoods and covers, and install all safety and warning labels. Finally, clean all debris and trash created by the door installation and leave the area clean and swept.

## Inspection and Drop Testing of Fire Doors

A fire door is required to be drop tested at the time of initial installation in accordance with NFPA 80, Section 5.2.1, and at least annually thereafter as required by Section 5.2.4.1. Fire doors must also be drop tested after any repairs or service that could affect the door's operation, per Section 5.5.10. All drop testing must be performed in accordance with the requirements of the AHJ. This testing is essential to verify safe closing performance and to ensure the door will provide its intended level of fire protection in the event of a fire.



The first step in performing a safe drop test of a fire door is to perform a thorough visual inspection of the door. This visual inspection should be conducted upon completion of any new installation and for any fire door undergoing service or drop testing in the field. It is important to complete the visual inspection prior to performing a drop test to avoid a dangerous situation or damage to the door due to a malfunction.

The following are items to look for during a visual inspection:

- Guide and wall fasteners are not missing or loose. There should be no gaps between the guide wall angles and the jambs. Welds and weld locations comply with the manufacturer's installation instructions.
- Guide assemblies have the proper guide expansion clearance, and the fasteners are installed in the proper slot locations per the manufacturer's instructions.
- Curtain, barrel, and guides are plumb and level.
- Release and/or drop arms are properly connected to the fusible link and/or release device.
- Fusible links and detectors function properly and are in accordance with the

manufacturer's instructions, the requirements of NFPA 80, and local code.

- Fusible links and sash chain or cables are not painted or coated with dust or grease, cable is not kinked or pinched, chain is flexible and not twisted, and raceways and eyelets are not obstructed.
- Smoke detectors and auxiliary devices have power.
- Door curtain slats are not bent, cracked, or torn, and endlocks are not missing, bent, broken, or loose.
- Bottom bar should be straight with no loose bolts and should contact the floor, sill, or countertop for the full width of the opening in the closed position. Verify the labels are attached and clearly visible.
- Guides are clear of any debris and are not pinched, bent, or have any loose attachment points.
- Hood, fascia, and/or flame baffle should be properly attached, not bent, and not rubbing the curtain when the door is in motion.
- Brackets and operating mechanisms should not show any signs of worn, missing, or misaligned parts. Gears or sprockets should not be missing any teeth and shafts should not be bent.
- Release mechanism should not be tied off preventing automatic closing.
- Nothing that is not a part of the fire door assembly is attached to any part of the fire door assembly.
- The opening is clear of any obstructions which may prevent the door from closing.

Any replacement parts must be obtained from the original manufacturer of the fire door. If the door manufacturer is no longer in business and original parts are not available, the technician must inform the building owner that approved replacement parts cannot be sourced. In such cases, replacing the entire door assembly may be required to maintain the listing and ensure continued code compliant fire protection.

The next step in a drop test, following the visual inspection, is an operational inspection. The door should be operated through a complete cycle to verify smooth and proper operation.

Excessive lift effort, unusually high hoist or crank effort, or a struggling operator may indicate a broken or weakened spring. Any abnormal noises, visible damage, or irregular movement must be fully investigated and corrected before performing a drop test. It is critical to assess the possibility of a broken spring prior to initiating automatic closure, as a spring failure can result in a rapidly falling door and create a significant safety hazard.

If the door has passed visual and operational inspections, operate the door to the fully open position to prepare for the drop test. The area should be roped off to keep people away from the door while it is being tested.



**WARNING!** Drop testing should only be performed from the fully open position. This position is critical not only in measuring the success of the test, but also in avoiding permanent damage to the door and in safeguarding against potential injury to people in the vicinity of the door.

The drop test is required to verify that the fire door will close automatically during a fire emergency and that all means of activating the release mechanism function properly. It is essential to follow the manufacturer's instructions when testing each release device. If the door is equipped with multiple closing or activation options, every option must be tested to confirm reliable operation under all conditions.

Initiate the drop test by inducing slack into the sash chain or cable routing. The method used may vary based on the type of door and the requirements of the AHJ. One method occasionally required by the AHJ is melting and separating one of the fusible links. Activating a floor level disconnect or separating a turnbuckle are other common ways of initiating a drop test. Fire doors integrated into building smoke or fire alarm systems or using

electromechanical release devices must also be tested utilizing those systems to ensure proper functionality.

For the drop test to be successful, the door must close completely from the fully open position and be in full width contact with the floor, sill, or countertop. The drop speed of the door should be no slower than 6 inches per second (152 mm per second) and no faster than 24 inches per second (610 mm per second) as required by NFPA 80. Determine the drop speed by dividing the door height in inches by the time in seconds from release until the door contacts the floor, sill, or countertop.

Upon completion of a successful drop test, reset the release device(s) according to the manufacturer's instructions. After the release device(s) have been reset, operate the door through a full cycle using its normal means of operation. Fire doors must be drop tested twice: once to verify proper automatic closure, and a second time to confirm that the automatic closing device was correctly reset. Final acceptance of the fire door is determined by the AHJ, as defined in NFPA 80.

The drop test should be witnessed by the building owner, the owner's authorized agent, and/or the AHJ. A drop test form must be completed, with one copy provided to the building owner and another retained in the installer's records. These records should be maintained to support future scheduling and verification of annual drop test inspections.

Refer to DASMA Technical Data Sheets 252, 258, 271, 275, 299, and 2502 for additional drop test information.

**DASMA ROLLING STEEL FIRE DOOR DROP TEST FORM\***

**General:** NFPA 80 and Model Codes require the inspection and testing of fire doors to demonstrate proper operation. All closures and opening tests. Perform the visual inspection before the operational check and drop test. Use the form below to record the Visual, Operational, and Drop Test results. Check Pass or Fail in the boxes. See the Guidelines for additional instructions.

**⚠ WARNING**

Door could close rapidly and could result in death or serious injury. Perform drop test and reset per manufacturer's instructions.

The drop test, three (3) tests and maintenance should be performed by a Trained Rolling Steel Fire Door Technician with complete knowledge of this type of fire door and the manufacturer's instructions. Repair parts must be obtained from the original door manufacturer. After repairs are completed, the door must be reset to ensure proper door operation and automatic closing capability. The fire door must be in the fully open position before the drop test. Raise the door following the drop test and lock again.

**FACILITY INFORMATION**

Project: \_\_\_\_\_ Company: \_\_\_\_\_  
 Phone: \_\_\_\_\_ Address: \_\_\_\_\_

Door Location	Opening Test		Door Mfg. Serial No.	Visual Inspection		Operational Checks		Drop Test		Drop Test	
	Visual	Function		Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail

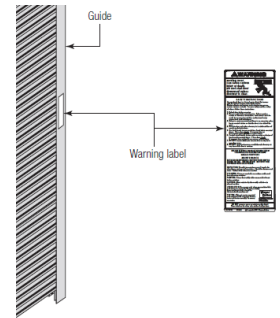
Comments (attach additional piece if needed):  
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 \_\_\_\_\_  
 \_\_\_\_\_

Tested By: \_\_\_\_\_ Witnessed By: \_\_\_\_\_  
 Company: \_\_\_\_\_ Representing: \_\_\_\_\_  
 Address: \_\_\_\_\_ Title: \_\_\_\_\_  
 Phone #: \_\_\_\_\_ Phone #: \_\_\_\_\_  
 Signature/Date: \_\_\_\_\_ Signature/Date: \_\_\_\_\_

\* Required only for periodic inspection and drop testing.  
 For more information, visit: [www.dasma.com/forms.html](http://www.dasma.com/forms.html)  
 Rev: 01/15 (Rev. 01/15, 01/13, 01/10) DASMA Rolling Steel Fire Door Annual Drop Test Form - 2502 (F)

## Miscellaneous Final Checklist

- Apply all warning labels in the appropriate locations before leaving the installation site.
- Check the area for any extra parts, and be sure these were not omitted in the installation process.
- Have the customer or customer representative sign off on the installation, and exchange all documentation and keys to locks at this time. Be sure the customer receives a copy of the operation manual and installation drawing.
- If the customer is unfamiliar with the product, demonstrate the operation of the door and any optional equipment before leaving the job site.
- Don't leave a mess. Clean up the area and make sure the area is secure if you're the last one to leave.



## Section Eight

# Operator Installation

**WARNING!** To reduce the risk of injury or death, always read and follow all manufacturers' instructions and safety precautions. The following general instructions are for reference only and are in no way intended to replace or supplement the instructions and safety precautions provided by the manufacturer with the operator.

Door operators and associated control equipment should only be installed and serviced by qualified professionals. Professional installers should observe the following safe installation procedures.

### Before Installation:

1. Verify the operator is proper for the type, size of door, and frequency of use per the operator specifications.
2. Power should always be disconnected when installing, wiring, or servicing a door operator or automatic door system. Not only is the chance of electric shock eliminated, but the moving chains in most door operators can catch clothing or fingers and cause severe injury.
3. Installation and wiring must comply with local building and electrical codes.
4. If the door system will be operated using momentary contact or remote operation, additional equipment such as reversing edges, photoelectric sensors, or similar devices must be installed as part of the system to prevent entrapment.
5. Outdoor or easily accessible controls must be secured to prevent unauthorized use of the system.
6. Place controls far enough from the door so a user cannot touch the door when operating the controls.
7. Controls should be placed so the user has full view of the door when operating.
8. Always set the limits on the operator, even if power has not been supplied.
9. Some manufacturers tape the cotter pin against the clutch pulley. Make sure you remove it and pin the adjusting nut as per the manufacturer's recommendations.
10. Do not overtighten the clutch to compensate for a damaged door.
11. Test door and service monthly. If adjusting limit travel, retest the door opener. Failure to adjust the door may cause death or injury.
12. Keep doors properly balanced. An improperly balanced door has the potential to cause severe injury. Qualified service personnel should perform all repairs to the door if needed.
13. Use emergency operation mechanisms only when the operator has been electrically disconnected. If possible, use them only when the door is closed. Use caution when using emergency operation mechanisms with the door open. Weak or broken springs may cause the door to fall rapidly.
14. The installer is responsible for assuring the owner of the door system understands its basic operation and safety. In particular, be sure the owner/end user understands the location and operation of the emergency operation mechanism.
15. Point out to the owner/end user of the door system children or pets should not be allowed to play on or near the door or any part of the system, and the safety instructions supplied with the operator are the responsibility of the owner/end user.
16. Leave the installation and maintenance manual for the operator as well as any additional information supplied with the operator or any other components of the door system with the owner/end user.
17. If you have any questions about the safety of the door operating system, do not install the operator.

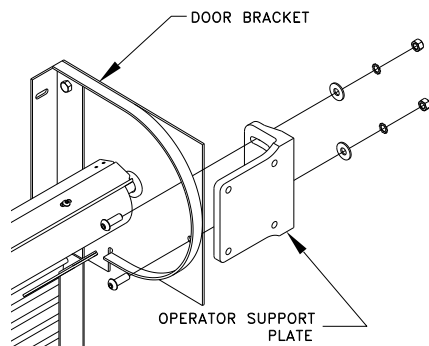
To reduce the risk of severe injury or death, read and follow all manufacturer's safety warnings and installation instructions. Ensure the door is properly installed and working freely

in both directions. Do not install the operator until all door problems have been corrected. If necessary, oil all moving parts (chains, guides, etc.). Remove any old accessories (locks, bolts, etc.) before installing the operator. Locate any pushbutton controls within sight of the door, at a minimum height of 5 feet so small children cannot reach them, and away from all moving parts of the door.

## Mounting the Operator Support Plate

**Bracket Mounted Operators:** Operator support plates are sometimes shipped pre-assembled to the door brackets by the manufacturer. If the support plate is already installed on the bracket, skip this step.

Locate the operator support plate. Using the manufacturer's installation documents, identify the mounting hole locations on



the drive side bracket and determine the hardware provided. Align the support plate with the drive side bracket and fasten it using the hardware provided. Before tightening the fasteners, slide the support plate towards the door bracket to allow maximum adjustment for tightening the roller chain. Some manufacturers may also provide guidelines for welding the support plate to the door bracket.

**Wall Mounted Operators:** Determine the best location for the operator. The operator should mount to the wall off to the side of the door with the operator output shaft in alignment with the door drive shaft. The mounting location should provide adequate structure for mounting the operator to the wall. Locate the operator as close to the door as reasonably possible to reduce the length of the roller chain; optimum location is 12 to 15 inches between the operator shaft and the door shaft. Excessively long roller chains may require additional

devices, such as idler sprockets and chain guides. If a wall mounted operator support plate was provided, lift the support to the predetermined location and fasten to the wall using the appropriate fasteners.

## Mounting the Operator

The entire operator assembly should be installed a minimum of 8 feet above the floor. Installations below 8 feet require the use of an operator cover to protect personnel from accidental contact with the unit's sprockets and other moving parts.



**WARNING!** Electric operators can be very heavy. Exercise extreme caution while performing this step to prevent and secure the operator from falling in order to avoid severe injury or death.

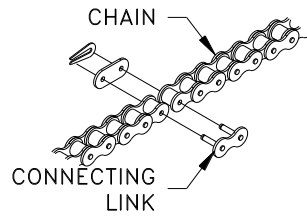
Determine a safe way to securely hoist the electric operator up into position. Carefully align the operator to the support plate and install the operator using the fasteners provided. If the operator is to mount directly to the wall, use the appropriate operator-to-wall mounting fasteners. Make certain the operator's mounting fully supports the entire weight of the operator before removing the lifting mechanism.

Place the door sprocket on the drive shaft. Slide the sprocket as close to the bracket as the operator installation will allow while still maintaining alignment with the operator output shaft. Insert the key into the door shaft keyway. Using the correct size Allen wrench, tighten the set screws to lock the sprocket in place.

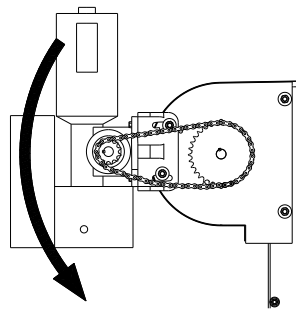
Use an Allen wrench to loosen the set screws in the operator drive sprocket. Slide the sprocket into alignment with the door drive shaft. If installation permits, use a straight edge to line up the faces of the two sprockets. Once the sprockets are aligned, verify the operator

drive sprocket key is in place, and tighten the set screws to lock the sprocket to the operator drive shaft.

Lay the roller chain on the sprockets to determine the appropriate chain length. If needed, cut the roller chain to length using a chain breaker. To shorten the chain, punch out the pin leaving an inside link nearest to the desired length. Connect the roller chain around the sprockets and join the two ends of the chain together with the connecting link. In some cases, half links may be needed to achieve the appropriate length.



Loosen the operator support mounting bolts enough to allow the operator to slide or pivot. Slide the operator away from the door shaft to tighten the drive chain and firmly tighten the mounting bolts. Check the tension on the roller chain after adjustment. There should be no more than 1/4 inch slack when the chain is depressed between the sprockets.



If an auxiliary chain hoist is supplied, run the hand chain through the pocket wheel and chain guide allowing both ends to hang down towards the ground and, if necessary, cut the hand chain so both ends are approximately 2 feet from the floor. Connect the ends of the hand chain and attach the release cable to the chain hoist engaging lever and route it to approximately 4 feet from the floor following the manufacturer's instructions. If provided, mount the operator's disconnect lever to the wall allowing the cable to be slightly loose when the lever is in the engaged (upwards) position.

Locate and install the chain keeper with the appropriate fasteners.

## Manual Operation of Electric Operator

If the electric operator is equipped with an emergency chain hoist, use the following instructions to manually operate the door.

With door in the closed position, pull the disconnect cable downwards to the "disengaged" position. This will disengage the drive mechanism of the operator from electrical operation and transfer it to manual chain hoist drive. A switch disconnects the electrical controls to prevent injuries.

Operate the door manually by pulling downward on one side of the hand chain. Pulling the other side will move the door in the opposite direction.

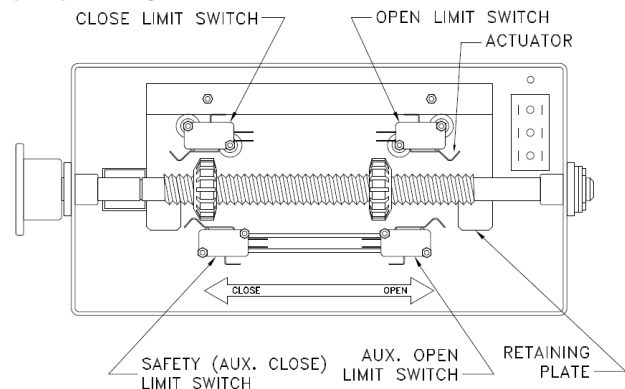
Release the disconnect upwards to the "engaged" position to return the operator to electrical operation.

## Setting the Limits

There are two main types of limit adjustment; electronic and mechanical.

**Electronic Limit Adjustment:** Limits are adjusted electronically using the operator's control board. Follow the manufacturer's instructions for proper key sequence required to set the operator travel limits.

**Mechanical Limit Adjustment:** Limits are adjusted mechanically using an external limit box. Follow the manufacturer's instructions for proper adjustment of mechanical limits.



There are typically up to four limit switches. Two are used as end of travel, one is for radio control or single button operation, and one is for reversing devices such as sensing edges.

Traditional mechanical limit adjustment is as follows:

- i. The open limit switch is the end of travel in the open position. Adjust the cam so the door stops in the open position at the desired location. Be sure to set the limit so the door stops just before contacting the bottom bar stops.
- ii. The advanced open limit switch is used for radio control and for single button (open/close) devices. This limit switch is set to activate slightly before the open limit switch when opening.
- iii. The close limit switch is the end of travel in the closed position. Adjust the limit cam so the door stops in the closed position at the desired location. The limit should be set so the door contacts and seals with the floor, but does not crush the curtain downward.
- iv. The advanced close limit switch is used in the operation of a sensing edge or other reversing devices. This limit switch deactivates reversing devices slightly before the door reaches its closed position to prevent the door from reversing when the edge contacts the floor.

## Control Wiring Type

Refer to the wiring diagram located on the inside cover of the electrical box to determine the type of control wiring.

Prior to 2010, standard operators were typically shipped from the factory set for C2 wiring, which required constant pressure to close the door. If momentary contact to close was desired, the operator was either rewired or an adjustment on the control board was required to achieve this wiring type known as B2 wiring.

1. **Constant Pressure to Close (C2 wiring):** The operator requires constant pressure on a wired close control in order

to keep the door moving in the close direction until it reaches the close limit.

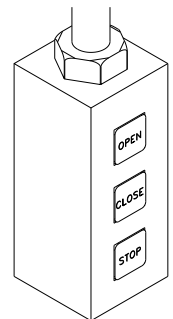
2. **Momentary Contact to Close (B2 wiring):** The operator requires only momentary contact on the close control in order to close the door.

Since 2010, commercial operators have been required to include a monitored external entrapment protection device if momentary contact to close is desired. The exception to this is when a fire door operator is closing in an alarm condition. In this instance, the operator is allowed to ignore safety devices immediately, or after a number of attempts to close, and close with momentary contact even if external monitored entrapment protection is not present, for the purpose of fire containment and protection.

**Special Control Wiring:** If the operator was shipped from the factory with non-standard control wiring or with optional accessories requiring additional instructions, refer to the wiring diagram(s) indicated in the special control wiring data box. When a replacement wiring diagram is present, refer only to the replacement wiring diagram for all connections. If the wiring diagram is missing, or any uncertainties exist regarding the proper wiring type, contact the operator manufacturer before making any connections.

## Locating the Control Station

All operators are supplied with some type of control station. Generally, a three button station (Open/Close/Stop) is provided. Alternative control stations may be used depending on the needs of the customer. The wall control(s) must be located so the door remains visible to the user and positioned either at a safe distance or in a way preventing the user from coming in contact with the door while operating the controls. UL 325 requires the control station to be mounted a minimum of five feet above the floor to prevent small children from reaching.



Reference DASMA TDS 384 if you encounter a conflict between UL 325 and ADA mounting height requirements.

UL 325 requires an entrapment warning placard to be mounted next to the control station in a prominent location. The placard should be located such that it is visible when operating the door.

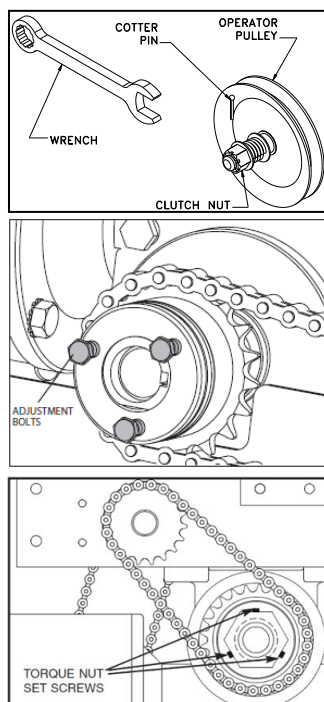


## Clutch Adjustment

If the electric operator is supplied with a clutch, it is necessary to adjust the clutch to ensure proper engagement. Failure to adjust the clutch specific to each door installation will result in an unsafe door system and potential for an accident, injury, or damage to the door. A clutch is not intended to be used as an alternative to proper entrapment protection, but rather an auxiliary device to protect the door from damage.

Follow these procedures for properly adjusting the clutch. Refer to the manufacturer's instructions for specific clutch type adjustment procedures.

1. Move the door to the closed position.
2. Remove the cotter pin or loosen the set screws from the nut on the clutch shaft if needed.
3. Back off clutch adjustment until there is very little tension on the clutch.
4. Tighten the clutch gradually until there is just enough tension to permit the



operator to move the door smoothly but to allow the clutch to slip if the door is obstructed.

5. Once final adjustment to the clutch is made, reinstall the cotter pin or retighten the set screws if previously loosened. End users must be instructed in clutch assembly safe operating and testing procedures.

## Brake Adjustment

When the electric operator is supplied with a brake, the brake is factory set but may require adjustment after usage. In order to obtain optimal performance and maximum life, the brake must be adjusted for proper clearance between friction pads and brake tensioning. Reference the operator manufacturer's installation instructions for detailed information on brake adjustment.

## Test the System

Once power is supplied, test all controls and safety devices for proper operation and make any necessary adjustments to the limit switches.

Do not leave the power on unless all safety and entrapment protection devices have been tested and are working properly.

Install all safety stickers and warning labels.

Conduct a thorough review of safe operating procedures with the owner or person(s) responsible for the operation of the door. Review safety instructions, emergency manual operation of the door, if provided, and explain how any safety devices operate and demonstrate how to test them.

All installations should include a thorough review to document the door system is working properly at its conclusion. As with any door system, rolling fire doors and operators may be damaged or modified by others following completion of the installation. Checklists, digital

photographs, and forms signed by the end user are methods of documentation that may be important in the future, in the event of a malfunction. The post-installation process can also reveal any undetected flaws or defects in the installation.

## Section Nine

# Service and Operation

Proper service and safe operation of rolling doors are essential to maintaining code compliance, ensuring reliable performance, and protecting building occupants. This chapter provides technicians with practical guidance for repairing and servicing existing fire doors and outlines required maintenance practices, troubleshooting procedures for both doors and operators, and the electrical considerations involved in servicing these systems. By following these guidelines, technicians can confidently diagnose issues, perform repairs, and keep fire door systems functioning as intended throughout their service life.



## Fire Door Repairs

The correct repair and service of fire doors is paramount to safe operation of the door during a fire event. Fire doors have special requirements when service is needed. A fire door technician should be familiar with these requirements and handle repair and service properly.

Following is a list of these requirements for UL, as outlined by DASMA TDS 257 *Procedure for*

*Repair of UL Classified Rolling Steel Type Fire Doors:*

### General Information

- Repairs shall be made and defects that could interfere with door operation shall be corrected without delay. "Repair" is defined as "any action that restores the door to its original approved condition". *NFPA 80 addresses repairs and modifications to fire protection systems. The following guidelines reflect some of the information found in NFPA 80 but cannot be used as a substitute for the Standard.*
- All fire doors shall be repaired with parts obtained from the original manufacturer of the fire door needing repair. When parts are not available from the original manufacturer of the fire door needing repair, it is required that the complete fire door be replaced. As an alternative, a fire door operator, governor, and automatic closing device may be replaced with a labeled retrofit fire door operator when it is installed in accordance with its installation instructions and is acceptable to the AHJ. A retrofit operator may be provided by other than the original manufacturer of the fire door needing repair provided the retrofit operator listing allows it to be used on the manufacturer's door.
- Modifications of any fire door should be arranged with the door manufacturer, and with the authority having jurisdiction, i.e. the organization, office, or individual responsible for approving equipment, an installation, or a procedure (definition from NFPA 80, paragraph 3.2.2). Field modifications can be made only after being submitted to and approved by UL. Modification submittals must also include the product manufacturer, since NFPA 80 requires that both UL and the product manufacturer are to be involved in any modification request. A field inspection after

the modifications are made may also be required. "Field modification" is defined as "a deviation from the product according to the approved procedure".

- All fire doors that are repaired shall be drop tested to ensure the repairs have been completed properly. Two successive successful drop tests are required – one to demonstrate proper operation and full closure, and a second to verify that the door was properly reset. The trained door systems technician's company and building owner should retain a written record of the drop test results, including the names of witnesses. Refer to the installation manual or drop test procedures provided by the door manufacturer.
- Replacement bottom bars will be made in accordance with the specifications in the manufacturer's UL follow-up service procedure. The replacement bottom bar along with instructions for installation and drop testing will be sent to a qualified local door company. A trained door systems technician should accomplish repair and testing. Coordination with the local authority having jurisdiction is recommended.

**UL Rolling Steel Fire Door Bottom Bar Replacement Procedure**

A replacement bottom bar must be ordered from the original fire door manufacturer. The order should include the manufacturer's serial number and, if available, the UL label affixed to the damaged bottom bar. The manufacturer will determine the correct UL label (Figure 1 and Figure 2) to use and the hourly rating, and will process the replacement bottom bar order as follows:

- The door manufacturer will make a replacement bottom bar and attach a new UL replacement part label (Figure 1 or Figure 2).
- The door manufacturer shall maintain a record of the original fire door factory order number and original UL label or certificate number along with the serial number on the UL replacement bottom bar label. This information and the original UL label, if returned, shall be available for a minimum

of one year for review by UL representatives.

- The door manufacturer will ship the replacement bottom bar, along with instructions for installation and drop testing, to a qualified local door company to complete the repair.

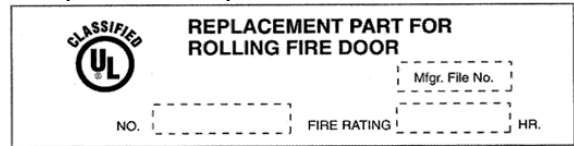


Figure 1

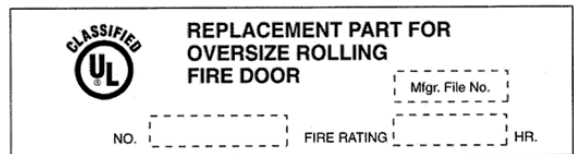


Figure 2

Following is a list of repair guidelines for FM Approved doors as outlined by DASMA TDS 275 *Procedure for Repair of FM Approved Rolling Steel Fire Doors*:

**A. General**

1. All repairs to fire doors should be made by a trained door systems technician.
2. All repairs to fire doors must be made with components from the original door manufacturer of the fire door. If that company is no longer in existence, it is recommended that the entire fire door be replaced.
3. Modifications of any fire door are not subject solely to the authority of FM Approvals. Such modifications should be arranged with the door manufacturer, and with the authority having jurisdiction, i.e., the organization, office, or individual responsible for approving equipment, an installation, or a procedure (refer to NFPA 80).
4. All fire doors that are repaired shall be drop tested. The building owner should retain a record of the drop testing results, including the names of witnesses. Refer to the installation manual or drop test procedures provided by the door manufacturer.

5. When slat repair of a fire door curtain is required, all slats shall be from the original door manufacturer and be the same shape and gauge. DO NOT REPLACE damaged slats using slats from another supplier.
6. When a guide repair is required, the damaged angles shall be replaced. The new angles must exactly duplicate the original angles. If this cannot be done, the complete guide must be replaced. Expansion clearances are critical on fire doors and slot/hole match may not occur if only one or two angles are replaced. Attach the new guide assembly to the jambs with jamb fasteners located in the slots as shown in the manufacturer's instructions.
7. If counterbalance spring tension is released while the door is in the closed position, the door shall be inspected for damaged parts by a trained door systems technician. Any damaged parts shall be restored to original condition. DO NOT modify the installation in any way to compensate for damaged parts.
8. FM Approvals can be contracted for field site approval of repairs if required by local authorities. Requests for field inspection by FM Approvals should be set up through the original door manufacturer.

### **B. Rolling Steel Fire Door Bottom Bar Replacement Procedure**

A replacement bottom bar must be ordered from the original fire door manufacturer. The label denoting FM Approval on the damaged bottom bar should be returned to the original manufacturer along with the manufacturer's serial number. If the original bottom bar did not contain a label denoting FM Approval, the door is ineligible for the Bottom Bar Replacement Procedure.

### **1. When the label denoting FM Approval is returned to the door manufacturer:**

- The door manufacturer will make a replacement bottom bar and attach a new label denoting FM Approval.
- The door manufacturer will ship the bottom bar, along with instructions for installation and drop testing, to a qualified local door company to complete the repair.

### **2. When the original bottom bar included a label denoting FM Approval, and the label from the damaged bottom bar is either not available or not returned to the original door manufacturer:**

- The door manufacturer must receive confirmation that the label denoting FM Approval was destroyed.
- The door manufacturer will make a replacement bottom bar and attach a new label denoting FM Approval.
- The door manufacturer will ship the bottom bar, along with instructions for installation and drop testing, to a qualified local door company to complete the repair.

## **Servicing an Existing Rolling Door**

Although the information contained in this study guide is intended to cover a wide range of rolling doors, there are times when you will encounter doors that are not familiar to you. These may be doors that are very old or ones that have been modified with other manufacturers' parts. In those cases, it is important that you follow the original manufacturer's recommendations. If you do not have those recommendations, you will need to contact the manufacturer for this information or ask the building owner if they have a copy of the door manual on file. If none are available and the manufacturer cannot be contacted, you will need to assess the situation and make one of the following recommendations to the building owner.

*Do not perform service or fire door drop testing; and recommend that a door be replaced if:*

- Servicing the door will result in an unsafe condition.
- The door is damaged or modified and cannot be repaired.
- The door is no longer manufactured, and the required repair parts are not available.
- A fire door is damaged or modified and cannot be repaired using parts from the original manufacturer.
- The original manufacturer of a fire door is out of business.
- The door has sustained unrepairable damage.

*Do not perform service or fire door drop testing; and recommend that the owner obtain service from another qualified entity if:*

- The door is not functioning correctly, and you do not have the information or manuals available to correct the situation.
- You do not have access to necessary parts for a fire door from an original manufacturer whom you know to be in business.
- You do not feel qualified to service the door properly.

*Proceed with service and/or fire door drop testing if and only if:*

- After reviewing the site, you determine that you have the expertise to proceed with the service call and complete the repair.
- The door is not damaged, it only requires routine maintenance, or all repairs for a fire door can be done using parts from the original manufacturer.

## Relocating an Existing Fire Door

Rolling steel fire door manufacturers have occasionally been asked if an existing rolling steel fire door can be removed from where it was originally installed and then reinstalled on a different opening. The following information is

a list of guidelines taken from DASMA TDS 285, which outlines items that manufacturers, dealers, code officials, design professionals, and building owners and managers may consider before such an existing door is relocated.

1. Is the original fire door label from the approval agency still attached to the bottom bar, intact, and legible, or original oversize door certificate still available?
  - If not, it may be difficult or impossible to get the door approved by the AHJ in its new location. Purchasing a new door may be a better option.
2. Is the other opening the same size?
  - A fire door is manufactured for a specific opening width and height. It cannot be field modified to fit either a larger or smaller opening.
  - A door might be able to be installed on a smaller opening without being modified if it can be properly mounted and attached.
3. Is the wall construction the same?
  - A fire door may have been manufactured for a specific wall construction and mounting condition.
  - The wall construction where the new opening is located must be in accordance with the listing of the door. Some doors – especially older ones – were approved only for installation on masonry wall construction.
  - The wall bolts used to reinstall the door must also be in accordance with the listing of the door.
4. Is the wall rating the same?
  - A fire door is manufactured with a specific hourly rating. It is not uncommon for a fire door rating to be less than the rating of the wall on which it is installed, but it must be as required by local codes and the Authority Having Jurisdiction. For example, a 1-1/2 hour rated fire door is commonly allowed on 2 hour rated non-masonry wall construction if it is listed for such an installation.
  - A fire door with a rating higher than that of the wall is normally acceptable.
5. Is the fire door still “code compliant”?

- The Authority Having Jurisdiction (AHJ) may require the fusible link system to be set up so there are fusible links on both sides of the wall. If the existing system is not, additional fusible links and chain or cable will need to be purchased to set up the new release layout.
  - If the original door is equipped with only fusible links to trigger the automatic closing, it must be evaluated for acceptability at the new location. Relocation of the door may require the door's automatic closing to be triggered by the building's alarm system with the fusible links being used only as a back up to this system. If this is the case, an approved electro-mechanical releasing device will need to be purchased in order to reinstall the door and connect it to the building's alarm system. Additional fusible links and sash chain / cable may also need to be purchased to set up the release layout.
  - If a fire door is being moved to an opening on a corridor or certain other locations, current building codes may require that the door also be leakage rated as an air leakage rated "smoke door" assembly.
  - In most cases, an existing fire door cannot be field-labeled to comply. Even if the existing door can be field-labeled, purchasing a new door may be a better option.
6. What is the condition of the door?
- Depending on the age of a fire door, how well it operates, whether there is damage to be repaired, and other potential issues such as corrosion of guides and slats, it may not be worth moving.
  - After the door is reinstalled, it must also be drop-tested successfully two times in accordance with the requirements of NFPA 80.
  - The door must be re-installed at the new location per the original installation instructions and as originally required by its listing. Copies of the original installation drawings/instructions should be available to refer to for reinstallation of the doors. If not, the door manufacturer should be contacted for availability of such drawings. [NOTE: In most cases, the manufacturer will require the original job number in order to provide these documents. This may be on a nameplate somewhere on the door, most likely on the bottom bar, or it may be marked in an inconspicuous location such as inside the sheet metal hood, on the counterbalance shaft or inside one of the end plate brackets of the door. Check to see if this number is available before contacting the manufacturer for drawings.] The following items are among those that must be verified:
    - ✓ Expansion clearance beneath the guides or above the top of the coil
    - ✓ Size and type of wall mounting bolts
    - ✓ Bolt locations in the guide and wall angle slots
    - ✓ Type of washers used on the mounting and assembly bolts
7. What is happening with the existing opening from which the door is being removed?
- If the existing opening is part of a building undergoing demolition, no further consideration is needed.
  - If the existing opening is part of a building undergoing abandonment, consultation with a fire protection engineer and the Authority Having Jurisdiction may be needed as to whether the opening can be left open.
  - If the existing opening is being replaced by another door with different specifications, the Authority Having Jurisdiction should be consulted. If the existing opening is being left open and the areas on both sides of the door are still under the same use, a fire protection engineer and the Authority Having Jurisdiction should be involved.
8. Is the relocation approvable from a building code standpoint?
- The Authority Having Jurisdiction has the final authority regarding approval.
  - The manufacturer and/or the door listing agency will likely need to supply supporting information relating to the relocation.

In conclusion, it is very important to inspect, operate, and drop-test a fire door before committing to move it. It may also be necessary to consult with the door manufacturer to obtain any information that cannot be determined by a site inspection. As with any fire door installation, doors that are relocated must be installed per the provisions of NFPA 80. The original door installation instructions should also be obtained and made available, to refer to regarding type of mounting hardware and method of installing such hardware.

## Safe Operation of Rolling Doors

Rolling doors are large, heavy, moving assemblies. When operated safely and correctly, potential hazards can be mitigated. It is essential for professional technicians to understand safe operation of these doors, not only to follow safe procedures on the job site, but also to properly educate end users. The following guidelines outline key practices for the safe operation of rolling doors. While some may seem like common sense, they should never be overlooked or taken for granted, as each plays an important role in preventing injury and ensuring safe, reliable operation.

- Visually inspect the door for damage or defective components before and during each operation.
- Release all locking devices prior to operating the door. Attempting to operate a door while locks are engaged can cause damage to the lock and/or operating mechanisms.
- Only operate the door when it is in full view. User intervention can be much more effective in avoiding dangerous situations than relying upon any safety accessories the door may have.
- Operate the door only when it is properly adjusted and free of all obstructions.
- Always operate doors with smooth, controlled movements. Jerking the hand chain, slamming doors open or closed, and rapid start/stop operator movements can

cause damage and wear to the door and operator components.

- For manually operated doors, lift the door using lift handles or other suitable gripping points only.
- Never walk away from a closing door until it has safely reached the closed position. The door should be observed for the duration of its movement to ensure safe closing.
- Do not walk or drive under a moving door regardless of whether it is closing or opening.
- Keep people clear of the opening while the door is moving.
- Do not operate a door that is jammed, has a broken spring, or is damaged in any other way. Attempting to operate a damaged door could result in additional damage or injuries.
- Avoid stopping the door at locations other than fully open and fully closed.
- Secure all operator controls to prevent use by unauthorized personnel.
- Keep controls away from children. Do not allow children to play with, on, or around the door or operator.
- Do not pull the electric operator hand chain or release during operation.
- Keep hands and other body parts away from a moving door.
- Never operate a door under high wind or air pressure differential. Wind and pressure gusts can cause the door to lock up or exit the guides resulting in damage to the door.
- Should the door become difficult to operate or completely inoperable, a trained rolling door systems technician should perform immediate repairs.
- Follow proper lockout/tagout procedures to secure a malfunctioning or damaged door from operation until repaired to prevent safety risks to others.

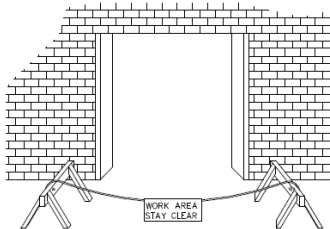
## Floor Level Disconnect Operation

Many fire doors provide floor level disconnects which afford convenient access to drop test and ease of resetting a fire door.

With this added functionality comes many benefits, including safety benefits, but also new risks. It is imperative that the professional technician fully understand and explain these risks and appropriate procedures to the end users of the door. The following guidelines are provided as reference for understanding these risks and the proper procedure for using a floor level disconnect to drop test a fire door. Always follow the manufacturer's instructions precisely when drop testing any fire door to ensure safety of surrounding personnel and to prevent damage to the door or its automatic closing function.



- Do not close the door by pulling the release lever. The floor level disconnect should be used for fire door drop testing only.
- Never activate a floor level disconnect during operation of the door.
- Follow the manufacturer's instructions and safety guidelines for drop test procedures.
- Do not perform a drop test without blocking or roping off the opening. The door descends rapidly during the test drop. Once a test is initiated, the descending door often cannot be stopped. Rope off or block the opening to keep people from entering the area during a test.
- Secure hand chains and any other moveable items before drop testing a door.
- Clear the opening of all obstructions to ensure clear path of travel to the closed position prior to drop testing.
- Never activate a floor level disconnect on a damaged door.
- Only operate floor level disconnects from the fully open position. Activating a fire door closing mechanism from any position other



than fully open could result in damage or injury.

- Never attempt to stop a moving door once a drop test has been initiated.
- If the floor level disconnect is activated and the door does not fall, immediately secure the door to prevent unintended movement. After the door is safely secured, reengage the disconnect. Reengaging the disconnect alone may not be sufficient to prevent the door from falling. A Trained Rolling Steel Fire Door Systems Technician must properly repair, adjust, and drop test the door to correct the problem and restore operation.
- Always drop test a door twice consecutively to ensure proper reset of the floor level disconnect. Failure to verify proper reset procedure could prevent the door from closing in the event of a fire or cause improper operation resulting in severe damage or injury.
- Proper drop testing should verify the door closes in full width contact with the floor, sill, or countertop and travels no slower than 6 inches per second (152 mm per second) and no faster than 24 inches per second (610 mm per second).
- Always secure floor level disconnects to prevent use by unauthorized personnel.

## Maintenance and Troubleshooting

The following sections illustrate some common maintenance and troubleshooting techniques for doors and operators. These are not intended as actual procedural instructions, but as a template for general practices with which a professional technician should be familiar. Many operators include electronic error codes to aid in troubleshooting problems.

Do not lubricate a motor. Motor bearings are rated for continuous operation. Do not lubricate a clutch or V-Belt. Inspect and service whenever a malfunction is observed or suspected. Always disconnect operator from power source before servicing.

**WARNING!** Never adjust the operator clutch to compensate for an improperly balanced or damaged door. Repair all door defects prior to adjusting operator settings.

### Door and Operator Maintenance Schedule

It's generally recommended to check the following items at the intervals listed below:

Item	Procedure	Monthly	Every 3 Months	Every 6 Months	Every 12 Months
Drive Chain	Check for excessive slack. Adjust as required. Lubricate.		X		
Sprockets	Check set screw tightness		X		
Clutch	Check and adjust as required			X	
Belt	Check condition and tension			X	
Fasteners	Check and tighten as required			X	
Manual Disconnect	Check and operate			X	
Bearings and Shafts	Check for wear and lubricate		X		
Door	Inspect for wear and damage				X
Operator	Inspect for unusual noises				X
Operator	Inspect for evidence of corrosion				X
Photo Eye/Sensing Edge Operation	Verify proper operation	X			

## Troubleshooting Rolling Doors

The chart below is a list of possible problems with the operation of a door. The causes listed are the most common, and are not meant to include all possibilities. With the variety of product and field conditions, other factors may be involved. If assistance beyond this troubleshooting chart is needed, please contact the supplier.

<b>TROUBLE</b>	<b>POSSIBLE CAUSE</b>	<b>REMEDY</b>
Door is difficult to open; closes easily	Insufficient spring tension	Increase spring tension
Door is difficult to close; raises easily	Too much spring tension	Decrease spring tension
Door jumps up from floor	Too much spring tension	Decrease spring tension
Curtain runs to one side	Broken endlocks Barrel not level Slat misalignment	Check and replace Check and level barrel Check and align
Door sticks when closing	Bent guide angle(s) Damaged end locks Incorrect guide gap/opening Damaged hood or bellmouths	Inspect for bent or kinked guides, hood or bellmouths. Straighten guides and check opening measurement. Replace damaged curtain end locks. Verify guide gap/opening and adjust.
Door coil makes cracking sound	Bent slats	Inspect, remove, and straighten or replace
Door is difficult to operate or squeaks when operating	Door out of level Tight guides Dirty guides Damaged hood, curtain, or bottom bar Spring interference Bad bearings	Check level, alignment, and spacing. Inspect and clean inside of guide. Use light, weatherproof lubrication. Repair or replace damaged or bent parts. Check curtain/ring attachment to barrel to verify screws are not hitting spring. Replace bearings.
Door is difficult to raise, will not stay open	Broken spring	Remove barrel and replace spring.
Motor runs, door does not operate	Curtain jammed Drive chain off sprocket Sprocket key fell out	Inspect and remove obstruction. Replace drive chain and align sprockets. Replace key, align, and secure.
Corroded parts	Standing water or excessive exposure to water	Limit exposure to water and replace corroded parts.
Drop speed too fast.	Insufficient spring tension. Governor Malfunction	Increase spring tension Inspect/adjust governor
Drop speed too slow.	Too much spring tension. Governor Malfunction	Decrease spring tension Inspect/adjust governor
Door does not drop when tested	Improper sash chain/cable routing Curtain bound	Check and adjust sash chain/cable routing. Inspect/repair cause of binding. Check hood/flame baffle is not rubbing the curtain. Check curtain is not rubbing the guides.
Door does not move when motor runs	Release lever disengaged.	Check sash chain/cable routing

## Troubleshooting Operators

In addition to troubleshooting issues with the door itself, it may also be necessary to diagnose problems with electric operation. Operators are tested and adjusted at the factory before shipping, so when problems occur, they often arise after installation, particularly once external devices have been connected. If problems appear after adding external controls or accessories, the fault is frequently found in the external devices or in the wiring leading to them.

Verify all external wiring, ensuring that no conductors are pinched or damaged and that no external voltage is being introduced into the control circuit. The operator is designed to function only with dry contacts; all voltages required for proper operation are supplied by the operator's internal transformer.

The following troubleshooting guide will help identify the source of some common problems based on the symptoms observed:

Symptom	Possible Cause	Suggested Action
Door will not respond to open or close push buttons.	Motor overload thermal protection has tripped.	Reset overload protection: press reset button or wait for operator to cool and reset. Is the door unbalanced? Is a larger operator needed?
	Circuit breaker tripped	Reset circuit breaker
	Fuse is blown	Replace/reset fuse.  If fuse keeps blowing: Disconnect all external devices. Leave power terminals connected. (Remove power to terminals). Run operator artificially using jumpers and shorting out appropriate terminals as indicated in the startup and testing guide. Reconnect external devices one by one until you find one causing short to ground.  Use an ohmmeter to check all incoming wires for continuity to ground. Meter should read infinity in all instances. If there is continuity between any control circuit wire and ground, this indicates a leak to ground and why the fuse blows when power is applied. In some cases, the trouble is intermittent, i.e., the fuse only blows at certain times. This problem is difficult to detect, but again, disconnect all wires going to external devices and run the operator. If the fuse does not blow, this indicates the trouble lies in the external devices.
	Transformer defective	Replace
	Defective Stop button	Replace
	Loose connection in one of the pushbuttons	Verify, tighten, or replace
	Defective open or close pushbutton	Replace
Door will not respond to open command, but will respond to close command.	Defective Open pushbutton	Replace
	Defective Open Limit Switch	Replace
	Loose wire on open pushbutton, open limit switch, or coil of open contactor. Bad open relay.	Verify, tighten, or replace
Door will not respond to close command but will respond to open command.	Defective close button	Replace
	Defective close limit switch	Adjust
	Loose wire on close pushbutton, close limit switch, or coil of close contactor. Bad close relay.	Verify, tighten, or replace
	Entrapment protection fault	Verify and replace
Door moves in wrong direction with a three-phase motor.	Incorrect phasing	Interchange any two power leads
Door closes by itself and operator does not shut off at the end of closing travel.	Close contactor is defective	Verify and replace

Door opens by itself and operator does not shut off at end of opening travel.	Close limit switch defective	Verify and replace
	Open contactor is defective	Verify and replace
Door coasts when stopped at any position.	Brake pad is worn out or requires adjustment	Replace or adjust
Sensing edge does not reverse door.	Pneumatic hose broken, electrical wiring not connected	Replace or reconnect
When door closes it reverses to fully open after it hits the floor.	Advanced close limit switch defective	Replace
	Advanced close limit switch not being engaged by traveling cam.	Advanced close limit switch needs adjusted slightly ahead of close limit switch.
	A close command is being given	Check close push button or any closing device for short circuit.
Radio control does not function or hesitates for 10 seconds before working.	It is normal for a radio receiver to take up to 10 seconds before being fully operational.	Check transmitter and receiver are programmed. Press transmitter and verify receiver reaction. Transmitter battery may be dead or receiver may need service. To test radio control function, momentarily short out terminals on operator. It should function normally. Receiver relay may be defective.
Motor hums, starts when spun	Capacitor defective	Replace
Motor fails to shut off at fully closed or opened positions.	Defective limit switch	Operate limit switch manually while door is moving. If door does not stop, replace switch.
	Limit cams are not adjusted	Verify and adjust
	Limit drive chain broken	Replace
	Loose sprocket on limit shaft	Tighten set screw
	Limit shaft does not rotate	Verify and replace
Motor turns but door does not move.	Sprocket key is missing	Replace
	Drive chain is broken	Replace
	Clutch is slipping	Adjust clutch tension
Motor hums or does not run.	Door locked or jammed	Verify manual operation of door.
	Dead phase (three-phase supply)	Check power supply, fuses on each phase.
	Brake does not release	Check wires to brake solenoid. Verify and adjust brake tension.
Limit switches do not hold their settings.	Loose drive or limit chain allows chain to jump sprocket teeth.	Adjust chain to proper tension
	Limit cam retainer not engaging slots in limit cams.	Be sure retainer is in slots of both cams.
	Limit cams are binding on the shaft threads which allow them to jump position on retainer.	Lubricate shaft threads. Limit cams should turn freely.
Radio control opens and reverses the door, but when the door is fully opened, will close door a little and bounce back to open position again. Door cannot be closed except by the close push button.	Advanced open limit switch is insufficiently advanced from the full open limit switch. When the door is fully opened, and a pulse is sent from transmitter, receiver maintains contact for 1.5 seconds. If advanced open limit switch has returned to normal state, reversing relay will be activated, and door bounces back to open position.	Adjust the advanced open limit

## Electrical Procedures

1. Disconnect the operator from its power source before opening the control box.
2. Inspect the wiring compartment and remove any dirt from the control unit.
3. Inspect all terminations for corrosion. Be particularly careful to check ground wires.
4. Check the terminal strip to ensure all screws are tight.
5. Verify the sensing edge or other safety devices installed on the operator are fully operational.
6. Verify the voltage at the input terminals while the operator is running. The voltage must not drop more than 10% during operation. If the voltage drop is excessive when running, the relays may chatter, the contact points will wear prematurely and may eventually weld.
7. Inspect the power terminals for corrosion.
8. Verify the current consumption of the unit with an ammeter. The value of current should be consistent with the name-plate specifications.
9. For three-phase operators, incorrect phasing of the power supply will cause the motor to rotate in the wrong direction. To correct this, interchange any two of the incoming three phase power lines.



doors because of the potential danger that exists in a malfunctioning door. Use common sense and think about the consequences of what you do during each step of the repair process. Also, point out any potential problems you see to the customer and make your recommendations in writing. Document everything that was done on a service call and have the customer sign and keep a copy of the paperwork.

By taking these recommended steps, you will limit potential liability to you and your company in the event that anything should go wrong with the door after you have completed your work. Most building owners disregard their rolling door's need for maintenance or service work until something goes wrong. Take a few minutes to explain routine maintenance procedures and attach rolling door safety literature to the service paperwork.

## Conclusion

This section on service and maintenance should provide a solid background of basics with which to start. In order to become proficient, you must experience many different types of job situations and have the opportunity to work with seasoned door technicians. If you run into difficulty and do not have access to the manufacturer's guidelines, you should always contact your supervisor or the manufacturer for the most effective and safest solution.

You must always work with an *attitude of safety* when working in the repair of overhead

## Section Ten

# Glossary of Terms

References (refer to the latest editions for the most current terms and definitions):

1. ANSI/CAN/UL 325, Standard for Safety for *Door, Drapery, Gate, Louver, and Window Operators and Systems*
2. DASMA TDS 277, *Rolling Door Terminology*
3. NFPA 70, *National Electrical Code*
4. DASMA TDS 160, *Sectional Garage Door Terminology*
5. DASMA TDS 350, *Garage Door Operator and Gate Operator Terminology*

**Access Panel:** An opening in a ceiling for access to tension adjusting wheel and to drive mechanism (motor, crank, chain hoist). Furnished by the ceiling subcontractor or general contractor and not by the door manufacturer.

**Accessory:** Any supplemental item or device added to the basic gate or door system.

**Adjusting Wheel:** See Tension Wheel.

**Adjustable Clutch:** See Clutch.

**Air Infiltration:** The leakage or passage of air through a door system.

**Astragal:** A compressible or deformable seal provided on the bottom edge of a door.

**Authority Having Jurisdiction (AHJ):** The organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

**Automatic Closing Device:** A device, that causes the door or window to close when activated by a fusible link or detector.

**Automatic Fire Detectors:** See Detectors.

**Backroom:** Amount of clear unobstructed space extending back from the face of the wall.

**Barrel Assembly:** A cylindrical horizontal member at the head of the opening that supports the door curtain and contains the counterbalance springs.

**Barrel Ring:** A component attached to the counterbalance pipe or barrel, which is used to increase the curtain wrap diameter and which is attached to the curtain top slat.

**Bar Stop:** See Wind Bar.

**Base Plate:** Optional plate mounted on the floor to distribute weight from a framing system supporting the door.

**Bellmouth:** Flared upper portion of guides to ease entry of curtain into the guides.

**Between Jamb Mounted:** Type of mounting where the guides are positioned between the mounting surfaces and not on the surface (interior or exterior) of the wall.

**Bottom Bar:** A reinforcing member at the bottom of a curtain or curtain panel.

**Brackets:** Plates bolted to the wall or to extensions of the guide wall angles that serve to support the barrel and form end closures for the hood.

**Brush Seals:** Term used to refer generically to the use of brush filament material either in use as a weather-seal or when used as smoke seals for smoke and fire doors.

**Brush Weather-Stripping:** Weather-stripping for use on all configurations of doors to close the gaps at jambs and header. Brush material can be UL listed for "fire door" use.

**Chain Hoist:** A mechanical device used to raise and lower the door by use of hand chain.

**Charge Pin:** A metal pin used to lock tension wheel after proper spring tension is applied.

**Charge Wheel:** See Tension Wheel.

**Closed Position:** A position of the door curtain with the underside of the bottom bar, including an astragal or sensing edge in contact with the sill along the entire width of the opening.

**Contact Edge Sensor:** A sensor, attached to an edge surface of a door, a gate or an object in the vicinity of the door or gate, that upon detecting an obstruction via contact with the edge, signals the operator to stop and/or reverse (source: ANSI/CAN/UL 325, Type B2 Entrapment Protection).

**Counter Shutter:** A door which closes on a counter-type sill.

**Counterbalance Assembly:** An assembly consisting of torsion springs, spring anchors, and a shaft, which is positioned inside the barrel assembly.

**Counterbalancing:** A method by which the hanging weight of the door curtain is balanced by the helical torsion springs or weights

**Crush Plates:** Bearing plates provided where doors are mounted on wall units with hollow cells to accommodate through-wall bolts to prevent crushing of the hollow wall.

**Curtain (Rolling Door):** Interlocked slats assembled together.

**Curtain Slats:** Formed or extruded members that comprise the curtain on a rolling door.

**Cycle:** An action on the door from the fully closed position, to the fully open position, and returned to the fully closed position.

**Cylinder Lock:** Key-operated locking device located on the bottom bar.

**Detectors:** A device suitable for connection to a circuit that has a sensor that responds to a physical stimulus such as heat or smoke.

**Door Frame:** The frame into which the door fits; consists of two door jambs, and a door header.

**Door Header:** The upper part of a door frame, consisting of the head jamb, head casing, stop and trim molding.

**Door Jamb:** The upright framing on each side of the door opening

**Door Opening:** The clear open width and height

**Door Size:** Door dimensions characterized by the width first and the height second.

**Double Throw Lock:** Center locking device that throws a locking bar into both guides, mounted on bottom bar.

**Drive Gear:** Large gear for chain- or crank operated units. It is directly fastened to the door shaft on the drive side bracket plate.

**Drive Plug Assembly:** See Plug End.

**Drive Shaft:** The shaft in the barrel that is securely attached to the barrel, through welding or pinning. When this shaft rotates the barrel should also rotate.

**Dropout:** Weighted mechanical device for disengaging gearing or motor operator for rolling fire doors. Also used to activate closing spring and to release governor in case of fire.

**Drop Test:** Test performed on a fire door to ensure proper operation during emergency. Testing is required to be performed annually (see NFPA 80).

**"E" Guides** - Common expression for the shape that guides form when they are mounted to steel jamb supports or frames.

**Electric Operator:** An electrically-powered device to control the opening and closing of a door.

**Electric Sensor Edge:** See Sensing Edge.

**Electromechanical Release:** A device, that triggers the automatic closing device upon receipt of a signal from a fire alarm or detection system.

**Emergency Electric Operation:** Motor operation of a door via Uninterruptible Power Supply (UPS) when facility line power is off.

**Emergency Release Device:** Permits emergency egress (exit). Device allows manual operation of the door without electrical power to open.

**Endlocks:** A component which is attached to slats to prevent lateral shifting.

**End Plates:** See Brackets.

**Entrapment:** The condition when a object is caught or held in a position that increases the risk of injury. (source: ANSI/CAN/UL 325)

**Entrapment Protection Device:** A device installed with a gate or door operator, or internal circuitry, intended to prevent persons from becoming caught or held in a position that increases the risk of injury.

**Exterior Hood:** A hood mounted on the exterior (weather exposed) surface of a wall.

**Exterior Mounted:** Condition where door is mounted on the exterior (weather exposed) surface of a wall.

**External Entrapment Protection Device:** A device, examples being an edge sensor, a photoelectric sensor, or similar entrapment protection device, which provides protection against entrapment when activated and is not incorporated as a permanent part of an operator. (source: ANSI/CAN/UL 325)

**Face of Wall:** Door mounting condition where guides mount directly to the wall, and side clearance is allowed for tension wheel and drive mechanism.

**Fascia:** Metal closure for the back of door housing.

**Fire Door:** The door component of a fire door assembly.

**Fire Door Assembly:** Any combination of a fire door, a frame, hardware, and other accessories that together provide a specific degree of fire protection to the opening.

**Fire Protection Rating:** The designation indicating the duration of the fire test exposure to which a fire door assembly or fire window assembly was exposed and for which it successfully met all acceptance criteria as determined in accordance with NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*, or NFPA 257, *Standard for Fire Tests of Window Assemblies*, respectively.

**Fire Shutter:** A fire door assembly used for the protection of a window opening in the exterior wall.

**Flame Baffle:** A hinged piece of sheet metal within the hood that, when released, closes the space between the top of the curtain and the hood of a rolling steel fire door.

**Fuse Link Housing:** A box in which fusible links are sometimes furnished when rolling fire doors are mounted above ceiling to provide a finished exposure area in ceiling for link.

**Fusible Link:** Two pieces of metal held together by low-melting-point solder.

**Gear Cover:** Metal cover protecting the drive mechanism from weather and debris.

**Governor:** A device that controls the rate of descent of the door during automatic closure.

**Guide:** Vertical assembly in which the curtain travels and that is fastened to the jamb,

retaining the edges of the door curtain and closing the space between the curtain edges and the jamb.

**Guide Standout:** The distance that face-mounted guide assembly extends from wall face.

**Gusset:** Metal reinforcement plate, angle or bracket which is fastened in corners to stiffen joints.

**Half Slat:** Modified bottom slat used to attach bottom bar angle(s) to bottom of curtain.

**Hand of Operation:** The side on which the door operator is placed, as viewed from the mounting surface side of the door. It is either a right-hand (RH) or left-hand (LH) operation.

**Header Seal:** Weather-stripping mounted at opening header to seal the opening between header and curtain.

**Headplates:** See Brackets.

**Headroom:** Vertical clear space required above the door opening, and below the lowest ceiling obstruction, required for proper installation and operation of the door and its hardware.

**Helical:** A term referring to the type of torsion spring used in the spring counterbalance.

**High Cycle Design:** Door components and operator designed for a fixed number of cycles for a specific period of time.

**Hood:** A housing that mounts horizontally, serving as an enclosure for the counterbalance assembly and door header.

**Housing:** See Hood.

**Inch-Pounds:** English unit of measurement of torque.

**Initial Charge:** See Initial Turns.

**Initial Tension:** See Initial Turns.

**Initial Turns:** Amount of turns of the tension shaft to apply spring tension from zero with the door in the fully open position. These turns provide the minimum moment or force to hold door in the open position.

**Inset:** See Setback.

**Installation:** Placing a door in position for use.

**Installer:** Person placing the door in position for use.

**Insulation:** Material having ability to reduce heat or cold transmission.

**Interlock, External:** An electro-mechanical device that prevents motor operation when door lock is engaged.

**Intermediate Hood Support:** A rigid member, which is contoured to the shape of the hood and mounted to the wall, between the brackets. The hood is then attached to the support to give the hood rigidity.

**IPPT:** Acronym for Inch-Pounds Per Turn; torque rate of a spring, indicating the number of inch pounds of torque delivered to a shaft for each turn the spring is wound.

**Jamb:** The vertical member that frames the side of an opening in the wall.

**Jamb Angle:** See Wall Angle.

**Jamb Load:** Force exerted on jamb by guide assembly when curtain is subjected to wind load.

**Key:** A square piece of steel that slides into a key way to prevent parts from rotating on a shaft.

**Key Switch Control:** Use of key switch to actuate a door operator in place of or in addition to a pushbutton or transmitter.

**Key Way:** A groove, milled into an object, which when used with a key will prevent parts from rotating on a shaft.

**Keyed Shaft:** A shaft that has an integrated key way.

**Keyed-Alike:** Two or more lock cylinders intended to be opened with the same key.

**K-Value:** Laboratory-determined value of thermal conductance of a material.

**Label Size Door:** The largest size of a fire door or fire shutter assembly fire proven by test to meet a specific fire rating.

**Labeled:** Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

**Lift Handle:** A handle attached to the inside or outside of a door section, to be grasped by hand when a door is to be operated manually.

**Lintel:** A horizontal member spanning and carrying the load above an opening.

**Magnetic Release:** Device connected to a smoke detector or alarm system that on either an interruption of electrical power or applied signal will release the automatic closing device of a fire door or fire shutter.

**Manual Override:** Means of operating a door by chain or by hand in case of power loss.

**Master Keying:** Arrangement whereby cylinder locks, although fitted with different keyed cylinders can be opened or locked by means of one "master" key.

**Motor Cover:** Cover to protect the motor from weather, debris, or to meeting OSHA safety requirements.

**NFPA 72, National Fire Alarm Code:** Code deals with the application, installation,

performance, and maintenance of fire alarm systems and their components.

**NFPA 80, Standard for Fire Door and Fire Windows:** Regulates the installation and maintenance of assemblies and devices used to protect openings in walls, floors, and ceilings against the spread of fire and smoke within, into, or out of buildings.

**NFPA 105, Standard for the Installation of Smoke-Control Door Assemblies:** Regulates the use of door assemblies in openings where passage of smoke is to be governed.

**Offset:** Dimension between face of header or jamb and centerline of curtain. Required to reduce drag of curtain on bellmouth of guides when curtain is in a lowered position.

**Opening Height:** Distance from floor to the bottom of header.

**Opening Width:** Distance between jambs of the door opening.

**Operator:** An electric or air-powered mechanism that opens and closes a door.

**Oversized:** A term applying to a fire door or fire shutter assembly that has not been fire tested, but receives a label or a Certificate of Inspection which does not indicate that the door is capable of furnishing "Standard Fire Protection", but that the door conforms to the construction requirements and was manufactured in accordance with the door's listing / approved agency requirements.

**Packout:** Guide build-out to clear an obstruction or provide clearance for drive or tension mechanism when door is between-jamb mounted.

**Pass Door:** Hollow-metal pedestrian door integrated into the rolling door, the frame of which is hinged at the jamb so doorframe swings out of the opening.

**Photoelectric Sensor:** A device that uses a light beam or other technology for the purpose

of detecting obstructions by providing a detection signal to the operator upon the breaking of the beam, NOT requiring physical contact with the door or gate. Where permitted by ANSI/CAN/UL 325, this device may be used as an external entrapment protection device.

**Pipe Shaft:** See Barrel Assembly.

**Plug End:** Drive end of barrel assembly driven by gear or sprocket for which the curtain is raised and lowered. Consists of assembly of short solid shaft and one or more round plates welded to the shaft and pipe, which fit within the pipe.

**Pre-turns:** See Initial Turns.

**R-Value:** An expression of thermal resistance.

**Rolling Counter Fire Door:** A fire rated rolling door assembly with an automatic-releasing device used in fire rated walls where the primary purpose of the opening is for non-pedestrian use, such as counter service for food, a pharmaceutical dispensary, package and baggage transfer. **Rolling Door:** A coiling door typically used in commercial or industrial applications.

**Rolling Fire Door:** A fire rated rolling door assembly with an automatic-releasing device, providing protection in fire rated wall openings.

**S-Hook:** A type of hook used to connect a cable to a pulley assembly.

**Security Chain Box:** Metal enclosure that encloses hand chain in a steel pad-lockable assembly attached to door guide.

**Sensing Edge:** See Contact Edge Sensor.

**Service Counter Fire Door:** A fire rated door assembly consisting of a rolling counter fire door that incorporates a four-sided frame used for the protection of openings in fire rated walls where the primary purpose of the opening is for non-pedestrian use, such as counter service for food, a pharmaceutical dispensary,

package and baggage transfer, or observation ports.

**Setback:** A standard space where the guide is recessed from edge of the jamb at both sides of opening on a face of wall-mounted door.

**Sideroom:** Required unobstructed space on either side of the opening.

**Sill:** Bottom part of an opening onto which a door curtain and bottom bar come to rest when in the closed position.

**Slat:** See Curtain Slats.

**Slide Bolt:** Locking device on bottom bar, which slides into guide or guide shoe and is equipped for padlocking. Mounted either inside, outside or both sides of the door.

**Sloped Bottom Bar:** Bottom bar with a vertical dimension larger on one end than the other, to match sloped sill of opening. Requires additional headroom to keep clear opening when door is up.

**Smoke Detector:** A device that senses visible or invisible particles of combustion and/or heat.

**Smoke Gasketing:** Brush seal used on fire doors or fire shutters to reduce the passage of smoke and gases.

**Spot-Type Detector:** A device with a detecting element concentrated at a particular location. Typical examples are bimetallic detectors, fusible alloy detectors, certain pneumatic rate of rise detectors, certain smoke detectors, and thermoelectric detectors.

**Spring Cycle Life:** Spring counterbalance is designed for a fixed number of cycles.

**Stand-out:** The distance that guide assembly extends out from the wall on face-of-wall mounted doors.

**Starter, Fire Door:** A mechanical device to start the closing of door in the event of a fire and to do it independently of the hand chain,

crank or motor operator normally used to close door.

**Starter Slats:** Partial slats used to connect curtain to barrel or barrel rings.

**Stops:** Bars mounted at top of guides to prevent bottom bar from traveling out of the guides when the curtain is fully raised.

**Tapered Bottom Bar:** See Sloped Bottom Bar.

**Tension Wheel:** A component attached to the counterbalance tension shaft, which controls the spring tension as it is locked to the bracket.

**Thru-Wall Fusible Link:** Extending a fuse linkage to the opposite side of an opening, with respect to the side the door is mounted on. Required per NFPA 80 for all non-exterior mounted doors.

**Thru-Wall Operation:** A door driven by means of a hand chain, crank or motor operator located on the opposite side of the wall.

**Thumb Turn Mortise Cylinder:** Locking device, much like a cylinder lock but does not require a key to lock or unlock.

**Torque:** The twisting force around an axis.

**Torsion Spring:** A spring that works by turning one end about a longitudinal axis while the other end is held or turned in the opposite direction, developing torque.

**Tubular Operator:** A cylindrical operator that mounts directly into the pipe and electrically drives the barrel assembly.

**U-Factor:** Thermal transmission coefficient which is a measurement of heat, in BTU's, transmitted through one square foot of material (the door) in one hour at a temperature difference of 1 degree from one side to the other.

**Vision Lite:** Glazing that is mounted in a door.

**Wall Angle:** An angle of the guide assembly, which attaches to the face of wall and supports the load of the door assembly.

**Wicket Door:** See Pass Door.

**Wind Bar:** Channel or bar attached to guide, which engage windlocks under wind load.

**Windlock:** A component attached at predetermined intervals to slat ends to prevent curtain from leaving the guides under wind load, and which is used in conjunction with wind bars inside the guides.

**Working Turns:** The additional winding of the springs as the barrel rotates and the curtain closes.

**"Z" Guides:** Common expression for the shape that guides form when they are mounted to masonry jambs.

## Section Eleven

# DASMA Standards and Technical Data Sheets

Door and Access Systems Manufacturers Association (DASMA) has produced many publications which can aid with both understanding the requirements of the product being installed and dealing with various common situations which arise in the field. These and other Standards and Technical Data Sheets relative to Rolling Doors, Operators, and Electronics can be found at DASMA's website [dasma.com](http://dasma.com) under the Data Sheets and Standards dropdown. A certified technician should be familiar with the documents listed below and their content.

Below outlines these documents relative to rolling doors and operators at the time of this publication. Reference the DASMA website for latest versions and availability.

### **Standards:**

- *Test Method for Thermal Transmittance and Air Infiltration of Garage Doors and Rolling Doors (ANSI/DASMA 105)*
- *Room Fire Test Standard for Garage Doors Using Foam Plastic Insulation (ANSI/DASMA 107)*
- *Standard Method for Testing Sectional Garage Doors, Rolling Doors, and Flexible Doors: Determination of Structural Performance Under Uniform Static Air Pressure Difference (ANSI/DASMA 108)*
- *Test Method for Air Leakage of Sectional Garage Doors, Rolling Doors, and High Performance Doors (DASMA 112)*
- *Standard Method for Testing Sectional Garage Doors, Rolling Doors, and Flexible doors: Determination of Structural Performance Under Missile Impact and Cyclic Wind Pressure (ANSI/DASMA 115)*
- *Standard for Non-Fire Rated Rolling Doors (DASMA 203)*
- *Standard for Fire Rated Rolling Door Assemblies (DASMA 204)*
- *Standard for Rolling Grilles (DASMA 208)*
- *Performance Criteria for Accessible Communications Entry Systems (DASMA 303)*

### **Technical Data Sheets –Operator & Electronics:**

- *Garage Door Operator and Gate Operator Terminology (TDS 350)*
- *Loop Systems and Depth in Road Pavements (TDS 354)*
- *Access Controlled Egress Doors (TDS 355)*
- *Vehicular Commercial Door and Gate Operators, and OSHA Requirements (TDS 358)*
- *Gate Operators, Commercial Door Operators, and NEC Provisions (TDS 359)*
- *Garage Doors Operated in Tandem (TDS 361)*
- *Edge Sensors (TDS 368)*
- *Motor Operated Commercial Sectional Doors and Rolling Doors: Typical Installation Concerns (TDS 375)*
- *Rolling Doors Operated by Roller Chains (TDS 381)*
- *Proper Installation of Photoelectric Non-Contact Sensors on Vehicular Commercial Door Operators (TDS 382)*
- *Garage Door Operator Wall Control Button Mounting Height ADA Requirements and ANSI/CAN/UL 325 (TDS 384)*

### **Technical Data Sheets – Rolling Door Division:**

- *Residential and Commercial Wind Load Guides (TDS 155)*
- *Architects and Designers Should Understand Loads Exerted by Overhead Coiling Doors (TDS 251)*

- *Test Rolling Fire Doors in the Fully Open Position ONLY (TDS 252)*
- *Rolling Fire Doors: Installation of Hoods and Covers (TDS 253)*
- *Guidelines for Installation of Rolling Steel Fire Door Release Assembly (TDS 254)*
- *Guidelines for Fusible Links (TDS 255)*
- *Procedure for Repair of UL Classified Rolling Steel Type Fire Doors (TDS 257)*
- *Rolling Steel Fire Doors: Release Options (TDS 258)*
- *Rolling Door Jamb Construction: Steel Reinforcement in Concrete and Masonry Walls (TDS 259)*
- *Common Rolling Door Installation Problems(TDS 260)*
- *Common Jamb Construction for Rolling Steel Fire Doors: Masonry Construction – Bolted and Welded Guides (TDS 261)*
- *Common Jamb Construction for Rolling Steel Fire Doors: Non-Masonry Construction – Bolted Guides (TDS 262)*
- *Common Jamb Construction for Rolling Steel Counter Fire Doors: Masonry Construction – Bolted Guides (TDS 263)*
- *Common Jamb Construction for Rolling Steel Counter Fire Doors: Non-Masonry Construction – Bolted Guides (TDS 264)*
- *Standard Rolling Door Architectural Details(TDS 265)*
- *Rolling Steel Fire Door Protection for Fire Wall Openings (TDS 266)*
- *Rolling Door Labels(TDS 267)*
- *Rolling Door Performance Evaluation by a Facility Manager or Building Superintendent (TDS 269)*
- *Recommended Rolling Door Maintenance Practices for Building Maintenance Supervisors (TDS 270)*
- *Rolling Steel Fire Doors Drop Testing and Annual Follow-Up (TDS 271)*
- *Rolling Door Counterbalancing (TDS 272)*
- *Rolling Steel Fire Doors Bolted on Steel Tubes, Set Against Face of Fire-Rated Walls (TDS 273)*
- *Rolling Steel Door Paint Wear (TDS 274)*
- *Procedure for Repair of FM Approved Rolling Steel Fire Doors (TDS 275)*
- *Rolling Door “Red Zone” for Installations and Service (TDS 276)*
- *Rolling Door Terminology (TDS 277)*
- *Rolling Steel Fire Doors and Balanced Fire Protection (TDS 278)*
- *Rolling Door Operation Under Wind Load Conditions (TDS 279)*
- *Rolling Door Wind Load Determination – Effective Wind Area (TDS 281)*
- *Rolling Doors and Hurricanes (TDS 282)*
- *Rolling Door Winding Bars (TDS 284)*
- *Relocating an Existing Rolling Steel Fire Door (TDS 285)*
- *Rolling Sheet Door Maintenance and Performance Evaluation (TDS 286)*
- *Rolling Door Component Substitution (TDS 287)*
- *Special Considerations for Rolling Fire Doors on Exterior Openings (TDS 288)*
- *Rolling Sheet Doors – Accessibility in Self-Service Storage Facilities (TDS 289)*
- *Protecting Rolling Steel Fire Doors from Vehicular Traffic Related Damage (TDS 290)*
- *Rolling Doors and High Wind Events (TDS 291)*
- *Vehicular Access Door Interface with Building Framing (TDS 292)*
- *Architects and Designers Should Understand Loads Exerted by Rolling Sheet Doors (TDS 293)*
- *Environmental Considerations for Exterior Doors (TDS 294)*
- *Rolling Steel Fire Doors - Frequently Asked Questions (TDS 295)*
- *Fabric and Film Closures Used for Smoke and Fire Protection (TDS 296)*
- *Fire Related Standards and Rolling Steel Fire Door Ratings (TDS 297)*
- *Water Infiltration Under the Bottom Bar of a Rolling Steel Door (TDS 298)*
- *Rolling Steel Fire Door Periodic Inspection and Technician Training Requirements (TDS 299)*
- *Rolling Door Advantages (TDS 2501)*
- *Rolling Steel Fire Door Repair and Parts Replacement (TDS 2502)*



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