

## Unravelling Legislation on Disability Discrimination

### Contents

- Introduction
- Review of current legislation
- Changes to regulations
- Terminology
- How this affects our area of the construction industry
- Specifics
- Data & examples

### Introduction - Striking the right balance

Door hardware professionals should make every effort to provide solutions that actually perform as compliant systems in the real world. Never has this philosophy been more apt than when applied to the thorny subject of operating forces at the leading edge of fire doors on accessible routes.



It is, of course, a necessary requirement that all fire compartmentation doors perform their primary function, i. e. that they close to form a barrier in a fire situation. Correct attention to system design and your choice of door control hardware will prescribe how this is achieved.

If circumstances dictate that pneumatic, electromagnetic hold-open or swing-free arm devices are not a necessary component part of the system then your choice of hydraulic control will greatly influence the behaviour of the door assembly through both the closing and opening arcs.

Fire doors on accessible routes must be operable independently by all users, irrespective of their personal circumstances.

This document outlines how to ensure that your fire door assembly will give optimum performance and, at the same time, comply with regulations.

### Current relevant legislation is outlined in the following:

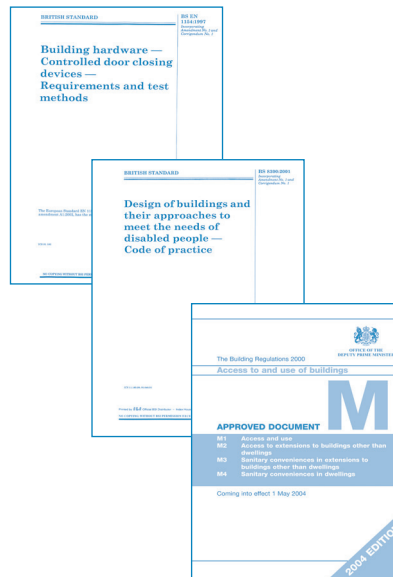
*The Disability Discrimination Act 1995 (DDA) Part III.*

*The Code of Practice BS 8300:2001*

"Design of buildings and their approaches to meet the needs of disabled people" (Revised 2005).

*BS EN 1154:1997 (Incorporating Amendment No. 1 and Corrigendum No. 1) "Building hardware – Controlled door closing devices – Requirements and test methods".*

*Approved Document to Part 'M' of the Building Regulations for England & Wales (Revised March 2005).*



### Who are the issuing bodies?

*DDA* – an act of parliament.

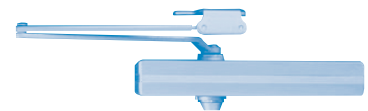
*BS 8300:2001* – a code of practice written by the British Standards Institution.

*BS EN 1154:1997* – an EC Directive adopted by BSI.

*Approved Doc. M* – issued as part of the building regulations by the Office of the Deputy Prime Minister (ODPM).

### A Considered Viewpoint

Relcross Limited believes firmly that it is misleading to suggest a component piece of door hardware, such as an overhead door closer, can be described as being 'DDA compliant', certainly so far as its operating forces are concerned. Similarly, by itself, no individual item of ironmongery can ever provide a warranted solution to comply with ADM 04.



1461PA

More accurately, the opening or entrance as a whole (i.e. the door assembly) may be said to comply... But with what exactly?

Anyone who has ever researched this subject will know that there exists a multitude of standards, codes and other guidelines with which it may be necessary, or advantageous, to comply.

The following pages address a number of common misconceptions pertaining to operating forces on door assemblies and act as a design guide to the correct specification of door control hardware; with particular deference to the requirements of 'DDA' and other miscellaneous criteria.

### Missing the Point

"Does your door closer comply?" Is a typically invalid question...



It is not enough to include a single scheduled component, such as a door closer, that complies with regulations on the test rig alone.

Prevailing conditions, including air pressure differentials, hinges, door seals and stubborn latches will each affect the behaviour of door assemblies on a door by door basis.



## Current Legislation, Including Recent Changes

### The Disability Discrimination Act 1995 (DDA) Part III.

#### DDA – an overview

DDA became law some years ago. The final stage was implemented from 1st October 2004.

DDA applies to all 'service providers' and 'employers' of whatever size.

DDA requires that these two groups shall not discriminate against disabled people by treating them less favourably than someone else.

DDA requires that 'reasonable adjustments' are made to the physical features of a building. Alternatively, that the service is provided by another means.

#### DDA - Focus

DDA focuses on results only.

Hence the Act does not require an employer or service provider to adopt any particular way of meeting their obligations.

DDA is not prescriptive and there are no design standards guaranteeing compliance.

DDA relates to all service providers and buildings, both new and existing.



#### DDA - Best Practice

Buildings and facilities designed to best practice design standards may reduce the risk of claims for discrimination.

It is not possible for architects and contractors (or specifiers for that matter) to be sued directly under this Act.

**The appliance of science** – You will need to familiarize yourself with the following:

**SI unit?** 'SI' is derived from Systeme International d'Unites, an international system that established a uniform set of measurement units

**newton (N)** – the SI unit of force.

A force of 1 newton will accelerate a mass of 1 kilogram at the rate of 1 metre per second per second (1N = 0.224809 lbs)

### The Code of Practice BS 8300:2001 "Design of buildings and their approaches to meet the needs of disabled people" (revised 2005).

Published in 2001 after a considerable consultation period this code of practice contains many prescriptive requirements (rules) affecting our trade - (i.e. the door hardware industry).

BS8300 is widely used as a reference point where issues are not specifically covered by ADM 04.

### BS EN 1154:1997 (Incorporating Amendment No. 1 and Corrigendum No. 1) "Building hardware – Controlled door closing devices – Requirements and test methods".

The standard provides details on product types, classification by use, test cycles, door mass etc. Specifically BS EN 1154 makes recommendations pertaining to the minimum closing forces considered necessary on fire door assemblies.

### Approved Document to Part 'M' of the Building Regulations for England & Wales (revised 2005).

The revised part M (ADM 04) came into effect for all Building Regulation documents sent for approval post 30<sup>th</sup> April 2004.

Door hardware professionals should be concerned with the performance based requirements set out in part M, although these requirements are not actually mandatory. The guidance contained therein is just one way of satisfying performance based building regulations. There is always room for alternative, occasionally more innovative, solutions. ADM relates to new buildings and to extensions to and changes of use of existing buildings.

**newton metre (N-m)** – the SI unit of torque. Torque, the tendency of force to cause a rotation, is the product of the force and the distance from the centre of rotation to the point where the force is applied. Also referred to here as the **closing moment**.

### Access Statements

An 'Access Statement' is a document produced after due consideration of access requirements including, usually, the undertaking of an 'Access Audit'. It is intended to accompany all plan submissions when seeking Building Control approval.

Although not mandatory, it is seen as a vital document; particularly relevant to heritage buildings, where there are likely to be more constraints on the full application of the guidance in ADM

### Reviewing the Situation

BS EN 1154 was written prior to BS 8300:2001, which in turn was written prior to ADM 04. The DDA was ratified in stages over the best part of 10 years. Inevitably and since each document was drawn up by different bodies - some guidelines conflicted.

In particular – The 2004 edition of Doc M quotes a figure of 20N maximum opening force for doors on accessible routes.

Fire door assemblies could not meet this constraint and the requirements of BS EN 1154:1997 at the same time since BS EN 1154 requires a closing moment of 18Nm minimum at a point between 0° and 4°.

### Pertinent amendments

BS 8300:20001, together with the Technical Memorandum to 'Doc M', now quote a maximum figure of 30N opening force for all accessible entrances when measured at 0° (closed) and a maximum figure of 22.5N when measured between 30° and 60°.

For good measure the above mentioned technical memorandum also recommends that the maximum closing force should occur between 0° and 15° of final closing.



Sir Isaac Newton 1643-1727

# The Revisions Explained (pertaining to LCN Closers - Hydraulic type only)

## Why are opening and closing forces important?

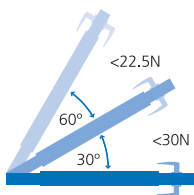
For disabled people to have independent access through single or double swing doors, the opening force, when measured at the leading edge of the door must not exceed 30N between 0° and 30° from closed and 22.5N thence until 60°.

The new figures (post March 2005) are now deemed to be manageable.

As previously mentioned, where fire (compartmentation) doors are concerned the closing force exerted becomes the overriding factor.

BS EN 1154:1997 states that the closing moment for a power size 3 door closer must be a minimum of 18Nm at a point between 0° and 4° - In other words, achievable at any one point only and not throughout the angle.

BS EN 1154:1997 Annexe A states that controlled door closing devices with a power size of less than 3 (see Table 1 of that standard for a full definition) are not considered suitable for use on fire door assemblies since they will be unlikely to provide the necessary torque.



## In simple terms - What does it all mean?

For fire door assemblies -

In general, only **high efficiency** installations are likely to meet the parameters relating to both opening and closing forces.

For non-fire doors on accessible routes -

Door assembly efficiency is no longer a specific issue since the opening force is the only measurable parameter. Most adjustable spring power closers (LCN's universal power closers are suffixed with 1 to signify a low power setting) will provide a typical door assembly with a minimum of 30N at the leading edge. However, careful reference must be made to the application (template detail).

## Note -

**This document does not attempt to address the issue of suitable hardware for non-fire door assemblies on accessible routes.**

For alternatives using solutions other than purely hydraulic solutions refer to page 4 of this document

## Efficiency explained (and pertaining to LCN Closers):

Efficiency can be defined as the ratio of the output to the input of any system, or -

The ability to avoid wasted effort

Calculated as follows per BS EN 1154:1997

$$\frac{\text{Average of max. closing force between } 0^\circ \text{ and } 4^\circ \times 100}{\text{Average of max. opening force between } 0^\circ \text{ and } 4^\circ}$$

$$\frac{\text{Average of max. closing force between } 0^\circ \text{ and } 4^\circ}{\text{Average of max. opening force between } 0^\circ \text{ and } 4^\circ}$$

Efficiency is always expressed as a percentage (%).

The higher the efficiency of a door assembly then the *closer* the correlation between closing force and opening force.

## How efficient must we be?

Taking a 900mm door as the most appropriate example (See GAI 'Technical Update' No.2 March 2005). Assume the door assembly provides an 18Nm closing moment (the minimum acceptable) equating to 20N closing force at 900mm

Since the opening force must not exceed 30N at 900mm the door assembly must provide **66.66%** efficiency.

This is confirmed by the following equation:

$$\frac{20\text{N} \times 100}{30\text{N}} = 66.66\%$$

## Tweaking efficiency - Door closer spring power

Adjusting closer spring power has an effect on the efficiency of door assemblies. This effect is minimal but the following applies (taking the LCN 1461 as an example):

For average efficiency between 0° and 8° from closed the variance is less than 3% between size 1 and size 6.

In general, it is true to say that a percentage reduction in door closer spring power produces a flat (equivalent %) reduction of closing force values at each 1 degree interval in the closing arc.

Opening the door has an effect on efficiency. Efficiency reduces slightly over the opening arc from 0° to 60° which is the only relevant arc so far as compliance is concerned

## Spring power - 1461 example

A factory setting for the 1461 is size three (the minimum permissible for fire doors).



-6 turns (from this point) gives a minimum (size one) setting.

+17.5 turns from the size three gives a maximum (size six) setting.

## Alternative ways of obtaining optimum efficiency from the opening.

How do we do this?

## Tweaking efficiency - Door closer templating

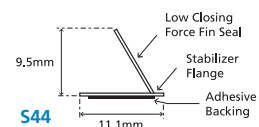
Moving a door closer body further out from the pivot point (i.e. increasing its relative strength) increases the door assembly's efficiency. Remember, by doing this you will restrict the available opening angle for the door.

## Tweaking the closing moment

So long as it exceeds 18Nm the closing moment need be no more than is required to close the door effectively each time. It may be permissible to reduce the spring power for both 1461PA and 4041PA closers from their factory settings (see charts on pages 5 & 6) and still retain a closing moment in excess of 18Nm. This will provide a reduced opening force requirement and will allow you to accommodate narrower door widths if necessary.

However, Relcross always recommends each door be the subject of an individual audit to ensure optimum compliant performance.

## Improving smoke seal performance



Door seals will affect performance – minimal resistance is occasionally essential. 'V' shaped seals are preferred (with a leading edge) in tandem with a small radius to the door. Bevelled door edges will provide the best results.

# Real World Examples of DDA Compliant Fire Door Assemblies

## Improving hinge performance

The specification and alignment of hinges is of significant importance


Initial investigation suggests that pivots perform better than ball race hinges which in turn perform better than concealed bearing hinges. Do not consider plain bearing hinges. All hinge installations must be perfectly aligned.

LCN's power curve tests are carried out using non-fire rated pivots to the minimum ANSI requirement of 1.1N - this is the net contribution in force that the pivots contribute to the movement of the door assembly through the opening and closing arcs with no other hardware being present (see also *coefficient of friction* - centre column)

Relcross recommends the following hinge for fire door installations:

### FM10076

Full Mortice Ball Race Hinge  
100mm x 76mm x 3mm  
US32D Satin Stainless Steel  
US32 Bright Polished Stainless

BS EN1935:2002   
4761140 13

Recent audit testing produced the following results for a test door mass of 120 kilos

Torque (after 20 cycles)  
to initiate movement at

0°	0.76Nm
30°	1.04Nm
60°	1.14Nm
90°	1.14Nm

Torque (after 200,000 cycles)  
to initiate movement at

0°	1.40Nm
30°	1.00Nm
60°	1.00Nm
90°	1.20Nm

You will see from the above that lateral and vertical wear over time has some effect on frictional forces although this can in no way be said to be uniform.

## Coefficient of friction - Hinges

Coefficient of friction ( $f_r$ ) is a constant number that is the ratio of the resistive force of friction ( $F_r$ ) divided by the normal or perpendicular force (N) pushing objects together, or:

$$f_r = F_r/N$$

It follows then that ball race hinges will have varying values for  $f_r$  relative to the weight of the door on which they are used, their location on that door and many other variables.

It is much more relevant to refer to starting (or initial friction) torques (see left hand column).

## Closing moment & opening force charts

The charts on the following page show typical behavioural data for door assemblies including the LCN closer type and application listed with Pemko's V-shaped S44 seal and the appropriate quantity, size and type of Stanley FM10076 ball race hinge.

Actual readings will vary slightly on a door by door basis.

## Summarizing the data

The data shows that LCN's universal closers set to size 3, each provide the necessary returns in order to show compliance with the requirements of all relevant guidelines. It is important to stress the word compliance. It is not possible to claim certification to any standard or any form of type testing.

It is also important to stress that the charts reflect calculations including some theoretical data and some actual test data for door assemblies including one door closer of each type.

Differing results will be noticed from door assembly to door assembly due to tolerance variations of door hardware component parts and how they fit together. Differences, of course, will be minimal.

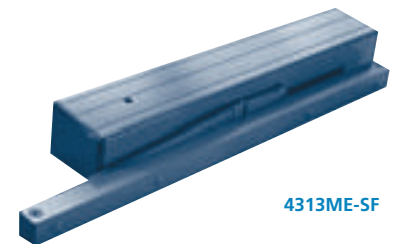
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## Alternative fire door hardware suitable for door assemblies on accessible routes

Fire doors must close in the event of an emergency. At all other times (when the building is occupied) these doors may be held open at 90° or closed using a 'swing-free' function, i.e. independently of any interference from the overhead closer.

### Option 1

Single point electromagnetic hold open 1460SE universal hold open closer 24V – US28 Silver



4313ME-SF

### Option 2

Multi point electromagnetic hold open incorporating swing free arm

4313ME-SF multi point hold open closer - handed (LH or RH)  
24V – US28 Silver

Both options will require a 24V supply incorporating a fire alarm relay:  
PS07 24Vac 800mA transformer  
c/w fire relay

## Force measurement in the field

BS EN 1154 talks about a force gauge with an accuracy of 1.5% or better.

Adjusting measured results by as much as 1.5% may bring the door assembly into line with requirements.

## Points to remember

Generally most of the changes in ADM affect **all** buildings except single dwellings.

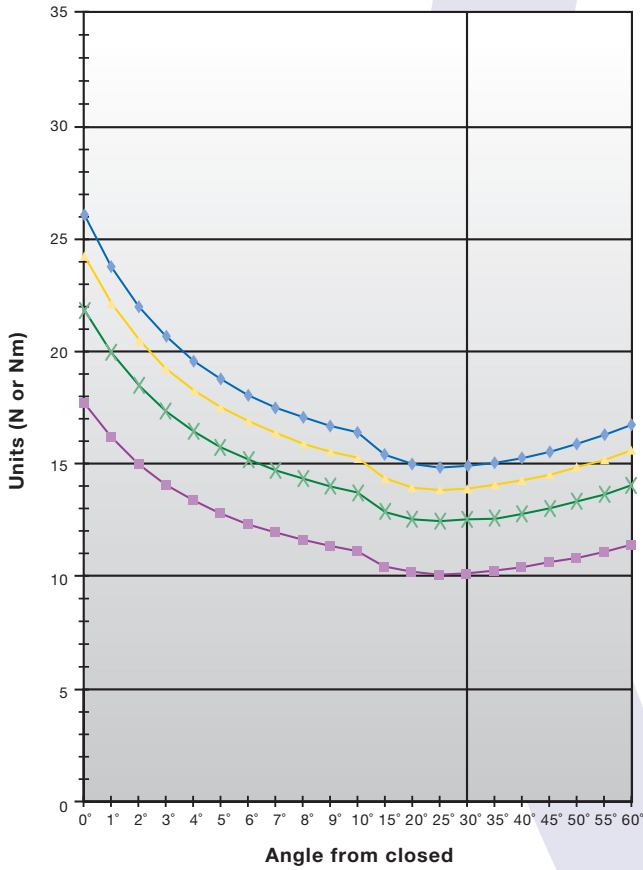
It is our responsibility as door hardware professionals to familiarize ourselves with, and become fully conversant with, the provisions of Approved Document M.

The inclusion of the correct LCN door closer, Stanley hinges and Pemko seals on fire door assemblies will ensure you provide a 'compliant solution' and a professional level of accurate advice to all your clients.

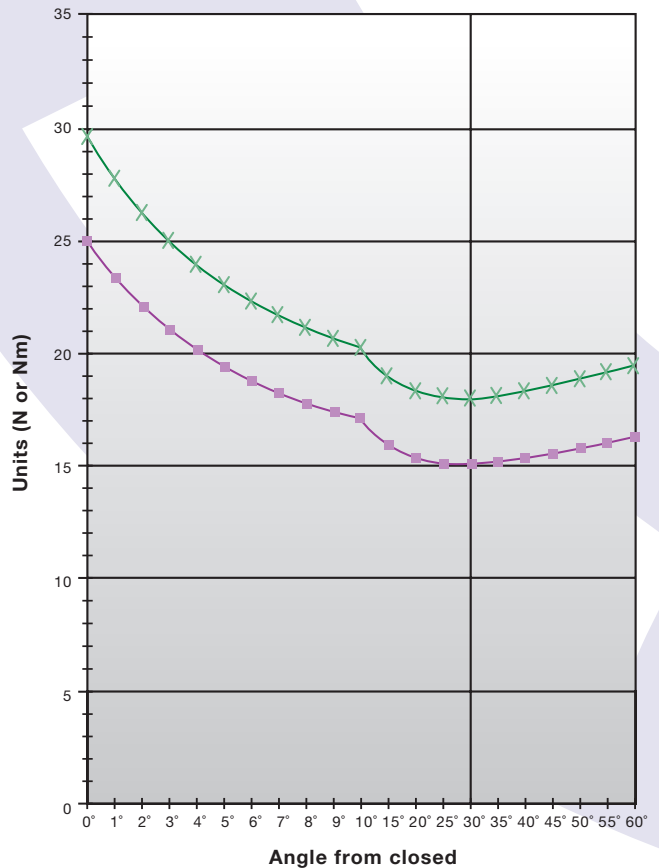
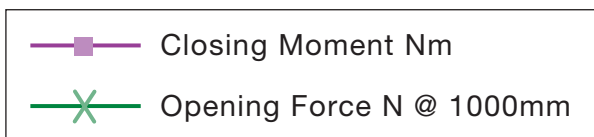
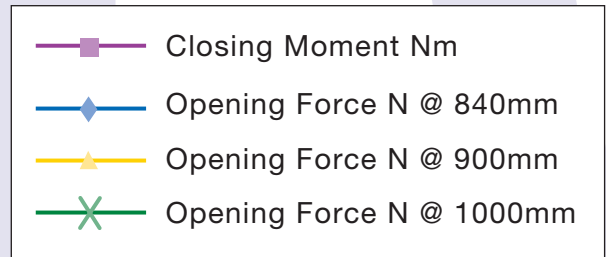
# Real World Examples of DDA Compliant Fire Door Assemblies

## Power curve data

The charts on pages 5 and 6 show examples of power curve information for LCN 1071PA , 1461PA & 4041PA closers set to size 3 and extrapolated for 840mm, 900mm, 1000mm and 1050mm wide doors.

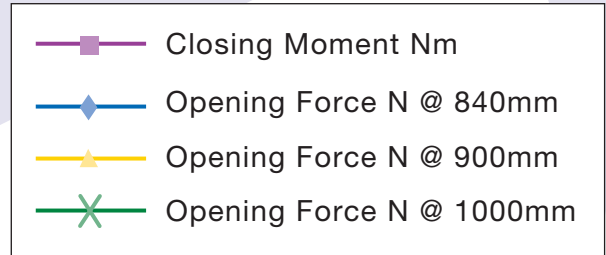
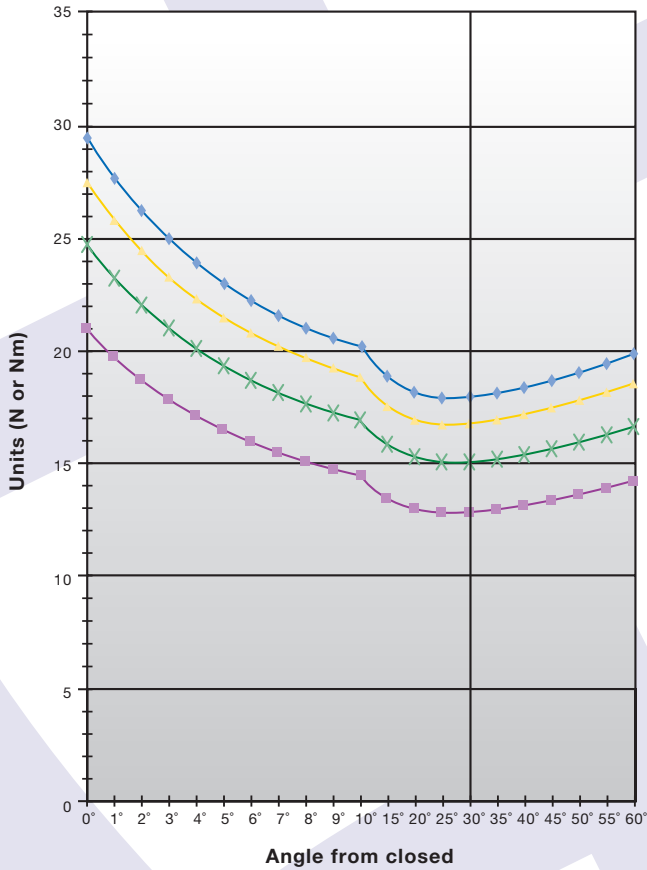


1071PA Size 3 @ 105° template

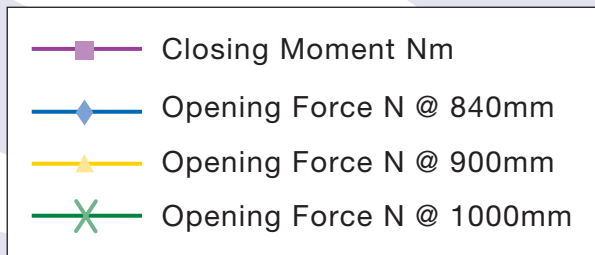
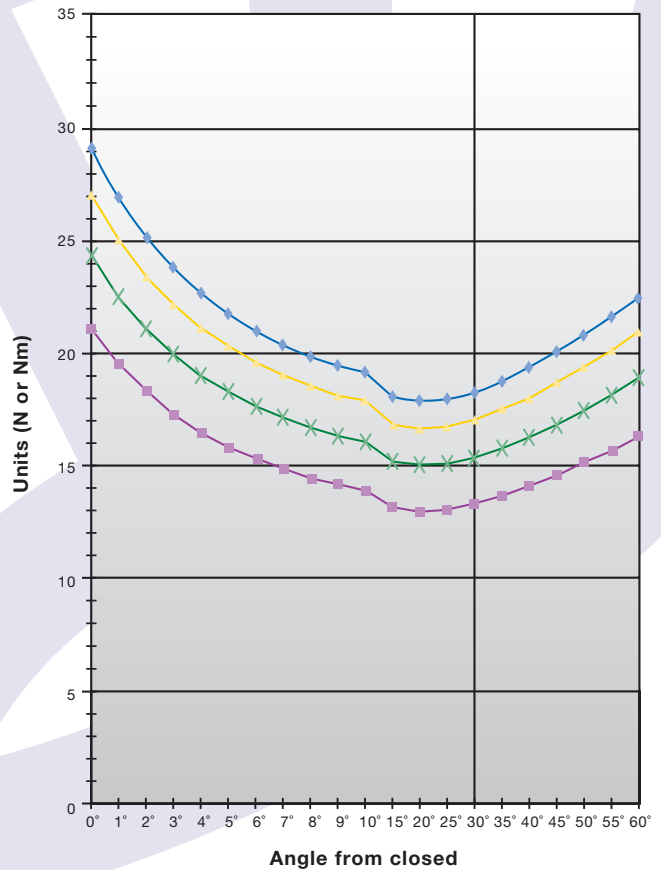


4041PA Size 3 @ 180° template

## Real World Examples of DDA Compliant Fire Door Assemblies



1461PA Size 3 @ 180° template



1461PA Size 3 @ 100° template