

## **Lawson Industries Product Approvals: Variables Determining Product Load Capacity**

### **General Overview – Non-Impact Products**

The factors that determine positive (inward acting) pressure capacity are:

1. Water pressure, which is 15% of the tabulated positive capacity.
2. Glass Capacity as determined by ASTM E1300 and testing.
3. Meeting Rail (or interlock) fiber stress as determined by testing and comparative analysis.

The factors that determine negative (outward acting) pressure capacity are:

1. Glass Capacity as determined by ASTM E1300 and testing.
2. Meeting Rail (or interlock) fiber stress as determined by testing and comparative analysis.
3. Anchor capacity as determined by calculation and testing.

A 5 Gallon/SF-Hour water test is first performed under pressure on the fenestration. The test unit must remain leak free for 15 minutes to pass. The passing water test pressure is recorded. This value is divided by 0.15 and the result is one of the variables that determine the maximum tabulated positive pressure that is allowed for the product. (*see first list above*)

Next all Non-Impact products are tested under (+ / -) static pressures for the largest size that Lawson anticipates selling. The pressure that this largest test size is able to carry is typically the lowest capacity for the product. This is because as one decreases the size of the window or door, one is allowed to increase its capacity in the product approval. This is done by a computer interpolation process known as “comparative analysis” which is mentioned above. Comparative analysis is based upon the theory that, given a constant load, as one decreases the glass area and meeting rail (or interlock) spans of a product, it’s ability to carry load increases. This is because both glass and rail bending stresses will decrease as the product is made smaller.

Conversely, as one reduces the size of the product, one increases its ability to carry higher pressures. In all product approvals done by Lawson Industries, the negative capacities of each size are calculated, and then fasteners are selected to fully mobilize this negative capacity. Therefore, one will typically notice the negative capacity pressures on non-impact product approval tables to increase with decreasing size. Positive pressures, which are usually water limited, and hence not a function of unit size, will not increase.

As a result, in non-fixed lite products, the positive (water limited) capacity is typically lower than the negative (structural limited) capacity.

## **Non-Impact Products:**

### **3000 Non-Impact Casement Window**

The configuration (X, XO, OX, XX or XOX) must be known as there are separate tables for each type as noted on the title blocks.

In addition to a standard sill, each table is also separately tabulated with a high rise sill option in order to improve positive pressure (water) performance, if it is needed.

Structural performance is determined by the glass type specified on the table title blocks. In order to offer a range of capacities, Lawson sells the following glass types:

- 3/16" Annealed                      3/16" Tempered
- ¼" Annealed
- ½" Annealed Insulated

### **4000/6000 Non-Impact Designer Fixed Lites**

Fixed lites do not have movable vents that leak or meeting rails that stress. So, given a constant size, the only factor that determines both positive and negative pressure on the 4000/6000 is glass type. Each drawing sheet with a table has pressures associated with the glass type specified in the sheet title block.

This product approval is valid for both fin and flange frame windows up to 50SF.

### **7500/7600 Non-Impact Single Hung Window**

This product has separate product approvals for flange and fin frame versions, but the format is the same for both.

On the flange frame window, the customer has the option of using either ¼" or 5/16" tapcons as anchors. Negative pressures are tabulated separately for each fastener type. The use of 5/16" tapcons will mobilize the full negative capacity of the heavier duty tempered windows, but is usually not necessary with annealed glass. Refer to the pressure tables for your specific application.

Each pressure table (Fin and flange frame) has a glass type – meeting rail combination specified on its title block. In order to offer a range of capacities, Lawson sells standard and heavy duty meeting rails and the following glass types:

*Annealed:* 1/8", 1/8" Insulated , 3/16", ¼"  
*Tempered:* 1/8" Insulated, 3/16"

The various combinations are chosen to match the rail and glass capacities as closely as possible, so there is no wasted material.

Equal lite pressure tables qualify both standard and radius head windows. View windows are to be glazed only with 3/16" annealed or tempered and heavy duty rails per tables "V-1" and "V-2".

### **8500/8600 Non-Impact Horizontal Rolling Window**

This product has separate product approvals for flange and fin frame versions, but the format is the same for both.

The configuration (XO or XOX) must be known as there are separate tables for each type as noted on the title blocks.

In addition to a standard sill, each table is also separately tabulated with a high rise sill option in order to improve positive pressure (water) performance, if it is needed.

Structural performance is determined by the glass type – meeting rail combination specified on the table title blocks. In order to offer a range of capacities, Lawson sells standard and heavy duty meeting rails and the following glass types:

*Annealed:* 1/8", 1/8" Insulated , 3/16", 1/4"

The various combinations are chosen to match the rail and glass capacities as closely as possible, so there is no wasted material.

### **9000 Non-Impact Sliding Glass Door**

There are three product approvals for this door that provide three levels of structural strength, by varying the amount of interlock reinforcement and glass thickness:

- 1) 3/16" tempered glass – no reinforcing
- 2) 3/16" tempered glass – light steel reinforcing
- 3) 1/4" tempered glass – heavy steel reinforcing

In addition, each product approval table has four (4) sill height options if increased positive (water) pressure performance required:  
1-3/4", 2-1/4", 2-1/2", 3"

Each product approval is valid for the following configurations:

XX, OX, XO, XXX, OXO, OXXO

For a given nominal panel size and wind pressure, one would begin with the lightest (06-0911.07) product approval and check door capacities with this, and then proceed to the higher strength PA's until the required pressure was met.

### **5000 LaPorte Non-Impact French Door**

Once the required panel size is determined, this door capacity is hard-wired to the tabulated pressures which are valid for the following configurations: O, X, OX, XX, OXO, OXXO.

This door is available in 3/16" tempered and 1/2" tempered insulated glass.

If optional hardware is used, the tabulated pressures must be checked against the following optional hardware load limitations, and the lesser +/- pressures must be used as the door capacity:

#### The Flat (handicap) Sill Limitations:

The flat (handicap) sill is to be used with a 95-1/4" max. frame height. This type of sill is limited to +60/-79.3 PSF and may be used where water infiltration protection is not required, or where the exterior opening is protected with an extended ceiling or roof overhang greater than or equal to the height of the wall where the door is located.

#### Flush Bolt Limitations

Doors with these types of locks are limited to +60/-79.3 PSF

#### Two-Point Lock Limitations:

Doors with these types of locks are limited to +60/-79.3 PSF

A two point lock must be used if the door is to be used as an "egress" door.

Since the door cannot be fitted with "panic" hardware, it may not be used in assembly areas such as clubhouses.

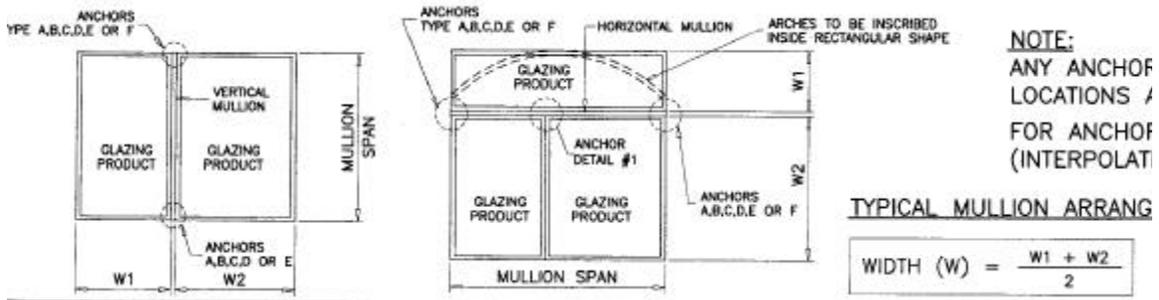
### **Mullions**

A mullion is basically a beam that joins two separate units of fenestration that are being placed in one opening. Examples of this are a door and a transom window, or adjacent double single hung windows.

Mullions are structural members only and not water tested. Factors that determine mullion strength are:

- 1) Span (The length of the mullion. See drawing below)

- 2) Tributary Width (The average of the widths of the adjacent fenestration. See drawing below)
- 3) Mull Size (1x3, 1x4, 2x4, 2x6")
- 4) The presence (or absence) of steel reinforcing. Reinforced (06-0620.17) and non-reinforced (06-0620.18) mullion tables are grouped into separate product approvals.
- 5) Anchor and substrate type.



Mull span and tributary width are first calculated as shown in the above sketch. One would then enter the non-reinforced (06-0620.18) product approval with this information, and determine from the first (mull capacity) table which mull size would carry the applied pressure.

If the largest (2x6) mull capacity is found to be inadequate, repeat this initial step with the steel reinforced (06-0620.17) product approval.

When a mull size is found to be adequate, one would move on the second (anchor capacity) table to verify the strength of the anchorage. One would need to know the type of substrate (wood or masonry).

## **General Overview –Impact Products**

Unlike non-impact products, impact products are subjected to cyclic and not just static test loading. Because cyclic loads induce fatigue stresses that become a factor in the strength of these products, comparative analysis is not allowed when calculating the capacities of the smaller sizes. Hence, negative capacities do not increase with the decreasing size of impact products. Positive pressures, which are usually water limited, and therefore not a function of unit size, never increase either. So when looking at an impact capacity table, one usually sees the same +/- pressures for all sizes.

The factors that determine positive (inward acting) pressure capacity are:

1. Water pressure, which is 15% of the tabulated positive capacity
2. Glass Capacity as determined by ASTM E1300 and testing
3. Meeting Rail (or interlock) fiber stress as determined by testing.

The factors that determine negative (outward acting) pressure capacity are:

1. Glass Capacity as determined by ASTM E1300 and testing.
2. Meeting Rail (or interlock) fiber stress as determined by testing.
3. Anchor capacity as determined by calculation and testing.

## **Lawson Hurricane Guard® Impact Products:**

### **3200 Impact Casement Window**

The configuration (X, XO, OX, XX ) must be known as there are separate tables for each type as noted on the title blocks.

In addition to a standard sill, each table is also separately tabulated with a high rise sill option in order to improve positive pressure (water) performance, if it is needed.

Structural performance is determined by the glass type specified on the table title blocks. In order to offer a range of capacities, Lawson sells a variety of glass types:

### **4200/6200 Impact Designer Fixed Lites**

Given a specific size, the only factor that determines both positive and negative pressure on the 4200/6200 is glass type. This product approval is valid for a flange frame window only up to 30SF.

### **7700 Flange Frame Impact Single Hung Window**

Given a specific size, the factors that determine both positive and negative pressure in the 7700 table are glass type and fastener type. This product approval is valid for both equal and view windows, with either monolithic or impact-insulated glass.

### **7800 Fin Frame Impact Single Hung Window**

This product approval is valid for fin frame equal lite, view, and radius head single hung windows.

Given a specific size, the factors that determine both positive and negative pressure in the 7800 design pressure tables are glass type only.

This product is available with 5/16" annealed and 5/16" heat strengthened laminated glass in both mono-glazed and impact-insulated versions.

### **8700 Flange Frame Impact Horizontal Rolling Window**

This product approval is valid for XO flange frame horizontal rolling windows only, with either monolithic or impact-insulated glass.

Given a specific size, the factors that determine both positive and negative pressure in the 8700 design pressure tables are glass type, anchor type and the presence or absence of a sill riser.

### **8800 Fin Frame Impact Horizontal Rolling Window**

This product approval is valid for XO fin frame horizontal rolling windows only.

Given a specific size, the factors that determine both positive and negative pressure in the 8800 design pressure tables are glass type only.

This product is available with 5/16" annealed, 5/16" heat strengthened laminated glass and impact-insulated 5/16" annealed glass.

## **9200 Impact Sliding Glass Door**

There are two product approvals for the 9200 that qualify the 2 panel configuration (07-0516.01) and the 2, 3 & 4 panel configuration (06-0406.07). The two panel product approval has higher capacities and should be used when this configuration is specified.

For a given nominal panel size, one can arrive at the required positive and negative strength by selecting the appropriate sill height (and glass type in the 2 panel product approval only).

## **5200 LaPorte Impact French Door**

Once the required panel size is determined, the door capacity is hard-wired to the tabulated pressures which are valid for the following configurations: O, X, OX, XX, OXO, OXXO. The table has two glass type options that offer capacities of 86psf and 76psf regardless of panel size.

Both monolithic and impact-insulated glazing options are available.

### The Flat (handicap) Sill Limitations:

The flat (handicap) sill is to be used with a 95-1/4" max. frame height. This type of sill is limited to +76/-76 PSF and may be used where water infiltration protection is not required, or where the exterior opening is protected with an extended ceiling or roof overhang greater than or equal to the height of the wall where the door is located.

### 4 Flush Bolt Limitations:

Doors with these types of locks and glass type "A" are limited to +86/-86 PSF. Doors with these types of locks and glass type "B" are limited to +76/-76 PSF.

### 2 Point Lock Limitations:

Doors with these types of locks are limited to +76/-76 PSF.

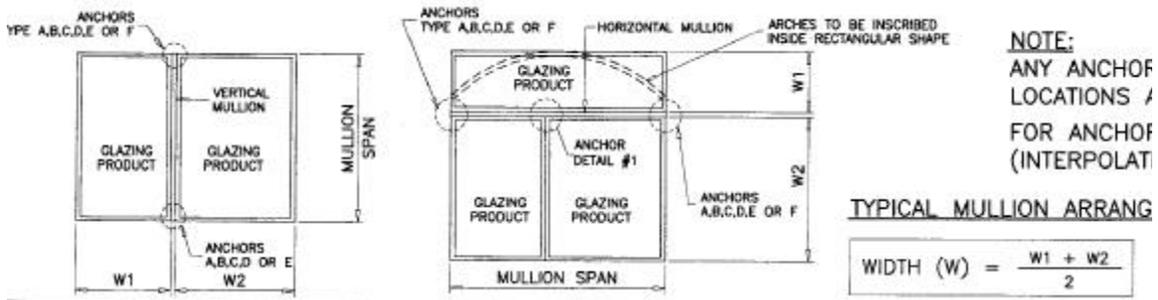
A two point lock must be used if the door is to be used as an "egress" door.

Since the door cannot be fitted with "panic" hardware, it may not be used in assembly areas such as clubhouses.

## **Mullions**

A mullion is basically a beam that joins two separate units of fenestration that are being placed in one opening. Examples of this are a door and a transom window, or adjacent double single hung windows. Mullions are structural members only and not water tested. Factors that determine mullion strength are:

- 1) Span (The length of the mullion. See drawing below)
- 2) Tributary Width (The average of the widths of the adjacent fenestration. See drawing below)
- 3) Mull Size (1x3, 1x4, 2x4, 2x6")
- 4) The presence (or absence) of steel reinforcing. Reinforced (06-0620.17) and non-reinforced (06-0620.18) mullion tables are grouped into separate product approvals.
- 5) Anchor and substrate type.



Mull span and tributary width are first calculated as shown in the above sketch. One would then enter the non-reinforced (06-0620.18) product approval with this information, and determine from the first (mull capacity) table which mull size would carry the applied pressure.

If the mull capacity is found to be inadequate, repeat this initial step with the steel reinforced (06-0620.17) product approval.

When a mull size is found to be adequate, one would move on the second (anchor capacity) table to verify the strength of the anchorage. One would need to know the type of substrate (wood or masonry).