Selecting the Right Louver

When selecting a louver, there are several factors that should be considered:

a) Architectural considerations
b) Location
c) Performance

a) **Architectural considerations:**
Louvers can be built in multiple sections with visible mullions both vertically and/or horizontally or they can be built in a continuous blade method (CB) offering an uninterrupted blade line. They can also be built into a penthouse with mitered or box corners.

b) **Location:**
When louvers or penthouses are installed at ground level where they can be subject to physical abuse, consideration should be given to their structural strength. In these cases, steel or heavy 8 ga. aluminium construction should be considered.

c) **Performance:**
When discussing performance, four major topics must be considered:

First consideration:
FREE AREA

- The minimum area through which air can pass within a louver is called the **free area** of a louver[1].
- The **free area** of a louver is critical to its overall performance and must be considered during its selection process.
- The **free area** has a direct effect on the air velocity though the louver: less **free area** creates higher air velocities thus a higher pressure drop. For intake conditions, higher air velocities equal higher water penetration.
- Everything being relative, this is true for all types and models of louvers.
- Whenever **free area** percentages are used always state the louver size on which it was calculated. (Published **free area** data is based on 48" X 48" louver)

Although it is evident that **free area** varies with louver size, when a louver is selected for a low height application, the **free area** drops much faster than expected. This effect is most drastic as the louver height approaches 3 to 4 times the louver depth. Since the head and sill of a louver are of a fixed height, the space they occupy becomes important, thus reducing considerably the amount of available blade face area (and thus free area). As an example, a 48" x 48" x 4" deep louver may have 8.8 sq.ft. of **free area** (55%), a 48" x 12" of the same model would have 1.5 sq.ft. (37%). As a general rule, avoid selecting a louver when its height is less than 4 times its depth. The actual **free area** should always be checked when designing a louver below 48" in height. When the louver height exceeds 48", the percentage of **free area** will increase slightly.

[1] AMCA PUBLICATION 501-93, Application Manual for Air Louvers

Selecting the Right Louver

Second consideration: *WATER PENETRATION*

- Although **water penetration** data is published based on the AMCA Standard 500 test method, its primary use is for comparison purposes between models and suppliers and of limited use in the design process since wind driven rain is not included.
- No accurate method exists at this time to design and select an intake louver based on ***water penetration*.**
- Experience has shown that selecting an **intake louver** with a reasonable margin of safety below the Beginning Point of ***water penetration*** (as defined by the AMCA Standard 500L) will avoid significant ***water penetration*** under severe storm conditions.
- ***Water penetration*** is not considered on **exhaust louvers**; the selection is usually based on the permissible pressure drop.
- It must be recognized that all louvers (**intake** and **exhaust**) will permit some degree of ***water penetration*** when exposed to wind driven rain. Floor drains should be provided in the plenum behind the louver.
- A new test method that includes **wind driven rain** was being released by AMCA in 1999 (AMCA Standard 500L-1999).
- At this time, no test data exists on ***snow penetration*** through louvers.

Third consideration: *PRESSURE DROP*

- The sizing of a louver for a desired ***pressure drop*** and air flow rate is greatly simplified with the unique **PRICE NOMOGRAPHS**: refer to the appropriate sheet and "How to use PRICE NOMOGRAPHS" for details (see page AA-11).They also permit quick selection based on ***free area*** and airflow rate or louver dimensions and ***free area velocity*** or any other combination of parameters as a starting point. PRICE NOMOGRAPHS have been prepared for fixed blade and adjustable blade louvers and penthouses.
- When installing a damper behind a fixed louver, the **total pressure drop** can be unpredictable. Use a louver with an integrated damper (combination louver) which is built as a single unit, the performance is tested and predictable.
- The **pressure drop curves** of louvers are based on **free area velocity** and vary very little, depending almost exclusively on the shape of the air passage between the blades.
- Screens can add a **pressure drop** increase of up to 10%.
- Fine mesh screens (insect screens) should always be made easily removable and installed only during critical periods.They must be cleaned regularly to remove dirt and debris.

Fourth consideration: *WIND LOADS and STRUCTURAL ELEMENTS*

- As a standard, all **PRICE** louvers built in a single section are designed to support a 25 psf (100 mph) ***wind load*.**
- All louvers having 2 sections in width by 2 sections in height or more may require additional structure to support the ***wind load***.
- Louvers greater than 72" in width by 2 sections in height or more may require additional structure to support the ***wind load***.
- Splice angles used to join sections in height are for alignment purposes only and cannot be considered structural elements.
- Since louver blades are welded to the jambs, securing a louver section by its jambs and central blade support, (if used) is considered acceptable practice.

General Selection Guidelines

Note for louvers in multiple sections:

Louvers built in multiple sections are designed with provisions for thermal expansion and when installed, should never be butted together. When the temperature varies between -35°C to 40°C, the **thermal expansion** of a 10 ft [3m] aluminium louver is almost ¼" [6mm] (steel louvers expand half this amount).

All Metric dimensions ( ) are soft conversion.

Imperial dimensions are converted to metric and rounded to the nearest millimetre.

Field Measurement Information

Once the louvers have been approved by the architect, the louvers can be released for production. Before you can proceed, the opening dimensions must be confirmed.The next step is critical in ensuring that the louver installation will go smoothly: you must make field measurements of the opening and record the job site conditions and any obstructions. Improper information at this point or neglecting to check all the job conditions can have dire consequences later.

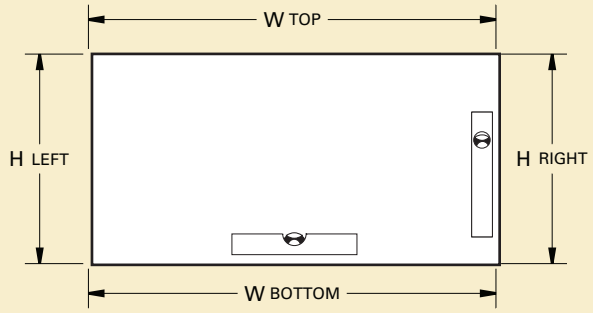
For this reason **PRICE** has developed a step by step method to assist you in completing this essential task.

Basic principle: The basis of precise field measurements is the use of the principle of triangulation. Once you know the lengths of the three sides of a triangle, that triangle is unique and fully defined. The angles at the corners are no longer required. Thus any shape can be sub-divided into a series of triangles and be precisely defined with the dimensions of their sides.

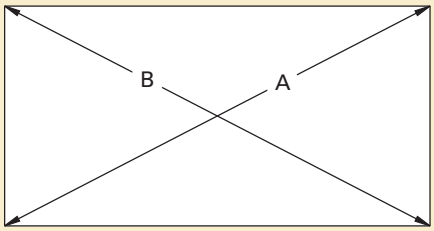
Step 1. Study the architectural drawings and approved submittal drawings to fully understand how the louvers are intended to be installed on the project, how they are to fit in the openings and how they are to be attached in those openings.

Step 2. You can now proceed with the opening measurements. Prepare a sketch of each louver viewed from the exterior and identify its location.

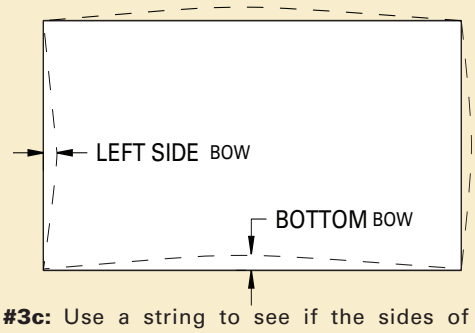
Step 3. Square and Rectangular Louvers



Step #3a: Measure the opening width and height on all 4 sides.



Step #3b: Measure the diagonal distances between opposite corners.



Step #3c: Use a string to see if the sides of the opening bows in or out. If an inward bow is detected, rectify it if possible. For those that cannot be rectified, record them on your sketch.

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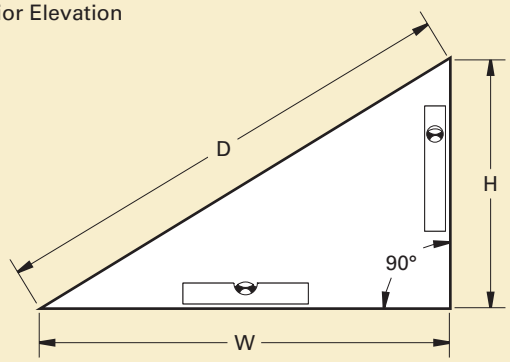
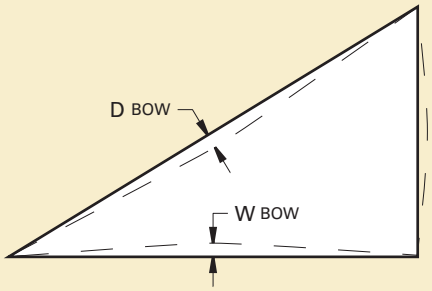
Field Measurement Information

Step 4. Right Angle Triangular Louvers

Exterior Elevation



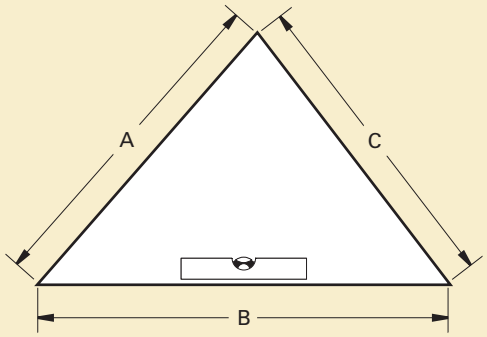
Step #4a: Measure the opening width, height and diagonal side. Based on these dimensions, louver dimensions will be corrected to obtain 90° between width and height.



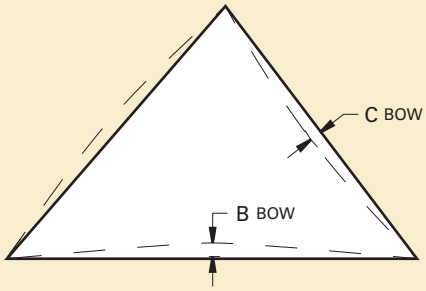
Step #4b: Use a string to see if the sides of the opening bows in or out. If an inward bow is detected, rectify if possible. For those that cannot be rectified, record them on your sketch.

Step 5. Common Triangular Louvers

Exterior Elevation



Note: Dim. A and C are not necessarily equal.



Step #5a: Measure the 3 sides of the opening.

Step #5b: Use a string to see if the sides of the opening bows in or out. If an inward bow is detected, rectify if possible. For those that cannot be rectified, record them on your sketch.

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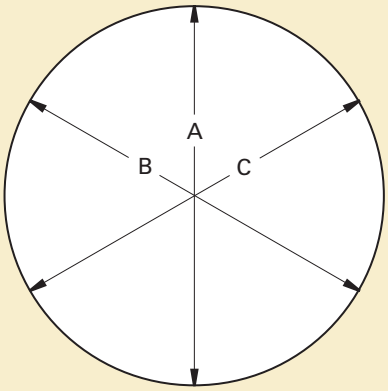
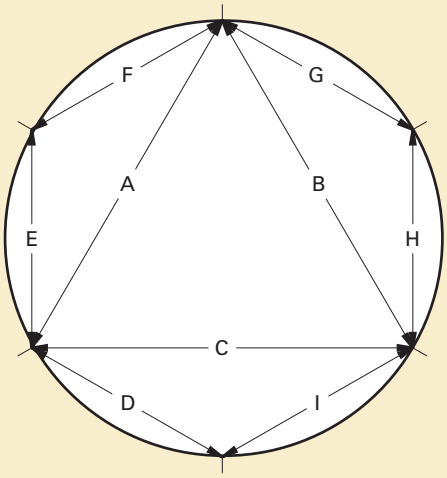
Field Measurement Information

Step 6. Circular, Semicircular and Ogive Shaped Louvers

Exterior Elevations



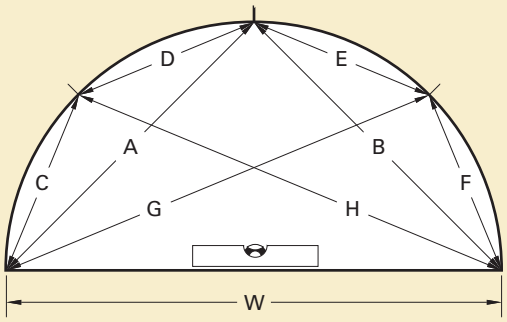
For openings of 72" [1829] or less.

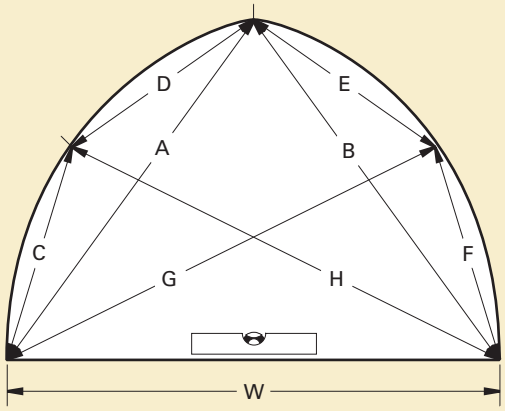


Step #6a: If the circular opening is relatively small and has a consistent circumference, you can measure the diameter in 3 or 4 locations and record the smallest dimension. For larger or irregular openings, mark the circular opening in 6 approximately equidistant points on the edge of the opening. Measure the distances A, B, C and the actual distances D through I. By the use of computer assisted drafting (CAD), a true circle will be fitted to the actual opening.

Note: Dimensions D through I should be approximately equal to the radius of the circle.

Exterior Elevations





Step #6b: Mark the circular portion of the opening in 4 approximately equidistant points on its edge opening. Measure the distances A, B, G, H, W and the actual distances C through F. By the use of computer assisted drafting (CAD), a true circular portion will be fitted to the actual opening.

Step #6c: Use a string to see if the base of the opening bows in or out. If an inward bow is detected, rectify it if possible. If it cannot be rectified, record it on your sketch.

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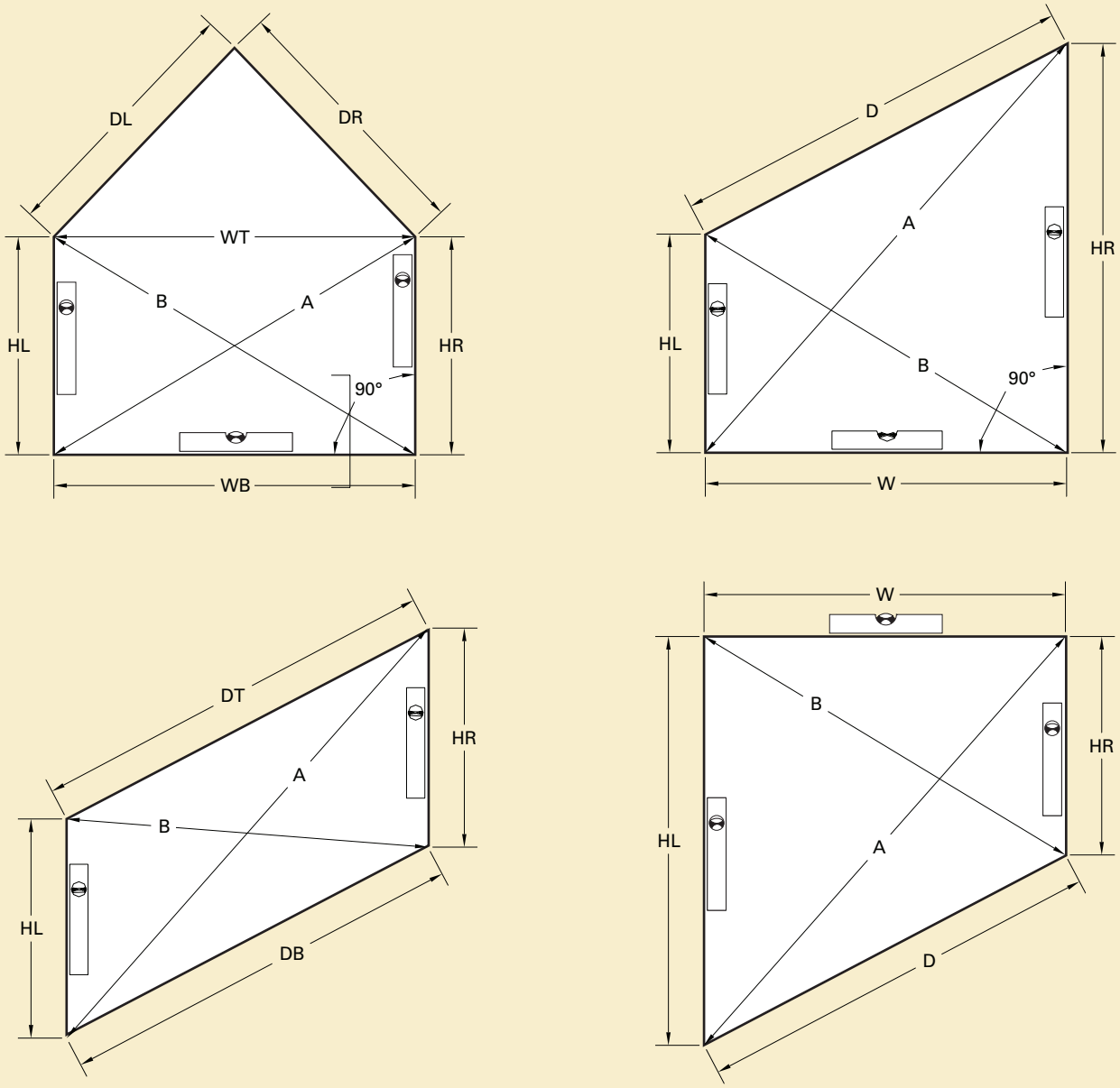
Field Measurement Information

Step 7. Louvers Shapes with 2 Vertical Parallel Sides

Exterior Elevations



Step #7a: Divide opening into rectangles and triangles and treat as in Steps #3a through 5b. Based on these dimensions, louver dimensions will be corrected to obtain parallel sides and/or 90° between width and height.

Step #7b: Use a string to see if the base of the opening bows in or out. If an inward bow is detected, rectify it if possible. If it cannot be rectified, record it on your sketch.

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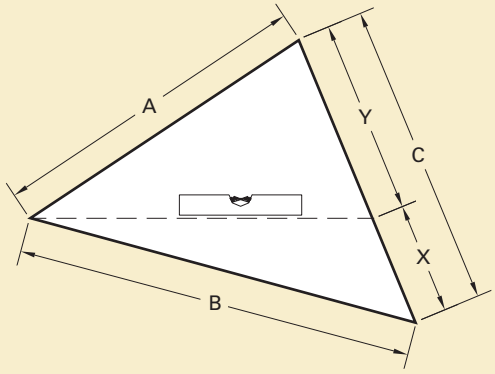
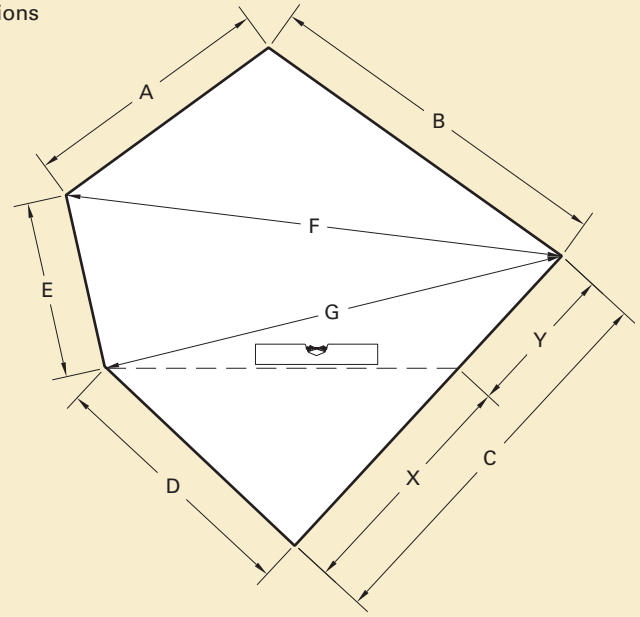
Field Measurement Information

Step 8. Irregular Shaped Louvers

Exterior Elevations





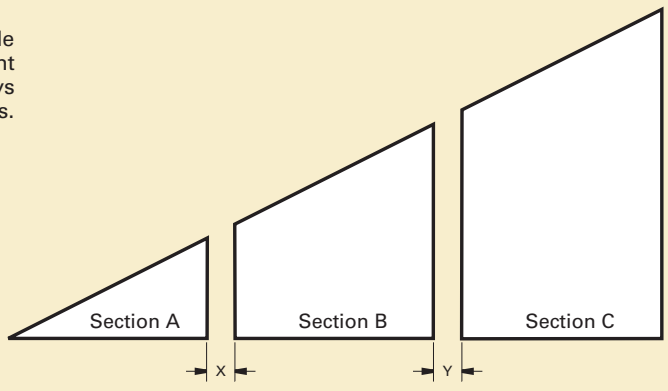
Step #8a: After measuring the 3 sides of the opening, draw a horizontal line to establish the blade orientation and measure distance X and Y.

Step #8b: Measure the distances A through E. Divide shape into simple triangular shapes and measure the remaining distances F and G. Draw a horizontal line to establish the blade orientation and measure distances X and Y.

Step #8c: Use a string to see if the base of the opening bows in or out. If an inward bow is detected, rectify it if possible. If it cannot be rectified, record it on your sketch.

Large shapes divided into sections

When a louver shape is divided into sections by visible mullions or when various louver shapes are interdependent and if the blades must line up in the final assembly, always include a sketch of the relative positions of the individual shapes.



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Field Measurement Information

Louver Undersizing

Allowance must always be made in the final sizing of the louver to compensate for the irregularities in the sides of the opening, thermal expansion and caulking. By always giving the actual opening dimensions with a clear indication of nonlinear conditions on the opening edges, proper undersizing can be achieved. This is especially true for louver shapes.

As a standard practice, **PRICE** will manufacture the louvers with a minimum ¼" (6mm) gap all around. If a different gap is preferred be sure to indicate it on your order.

Thus, for a 48" by 48" opening without excessive bowing of the sides of the opening, the actual louver size, as manufactured, would be 47.5" by 47.5".

Louver Flanges

Although flanges of various widths are available, the most common flange is 1½"(38mm). The flange width is defined as the width that exceeds the louver frame. Thus, the overall size of a louver with 1½" flanges to fit a 48" x 48" opening would be 50½" by 50½" and would exceed the opening by 1¼".

48" x 48" opening less undersizing (2 x ¼") = 47½" x 47½" louver with flanges added (2 x 1½") = 50½" x 50½" overall

Structural Support

When the louver comes in several sections, structural supports must be provided to securely attach these sections to the building. In most cases, these structural elements are installed ahead of time **by others** and their exact location "as installed" must be verified to ensure that their location matches the louver submittal drawings. If required, changes can be made to relocate the mullions on the louvers before they are put into production with little or no cost.

Here are other questions which may have to be addressed:

Is there adequate space behind the louver to permit fastening from inside?

Are there any structural or other elements that might interfere with the louver?

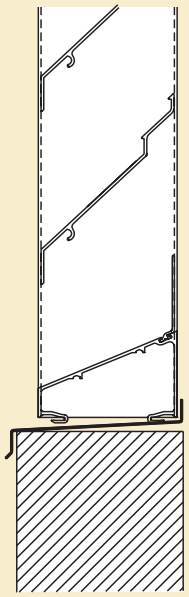
Are the vertical edges of the opening sufficiently rigid to attach the sides of the louver?

Sill Extension or Loose Sills

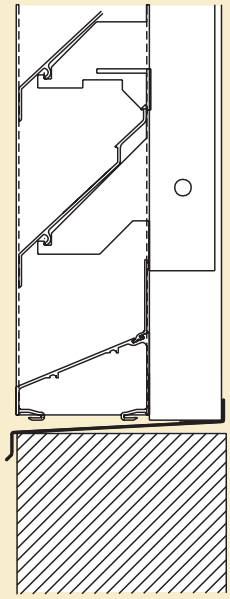
Loose sills or sill extensions are used to deflect rain water away from the sill of the louver towards the exterior of the building. They are designed to maintain a continuous watertight ledge under the louver extending downwards from its backside towards the exterior finished wall. To establish its proper size, measure the distance between the proposed location of the louver face to the finished face of the building, add the overall louver depth plus ¼" [6mm]. In some cases, sill extensions may be shipped in sections; always give the opening width so that sufficient overlap can be allowed for.

Louvers in Multiple Sections

Louvers built in multiple sections are designed with provisions for thermal expansion and when installed, should never be butted together. When the temperature varies between -35°C and 40°C, the ***thermal expansion*** of a 10 ft [3m] aluminum louver is almost ¼" [6mm] (steel louvers expand half this amount).



Standard Installation



Continuous Blade Installation

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Louvers Performance Data

How to Use the Price Nomographs

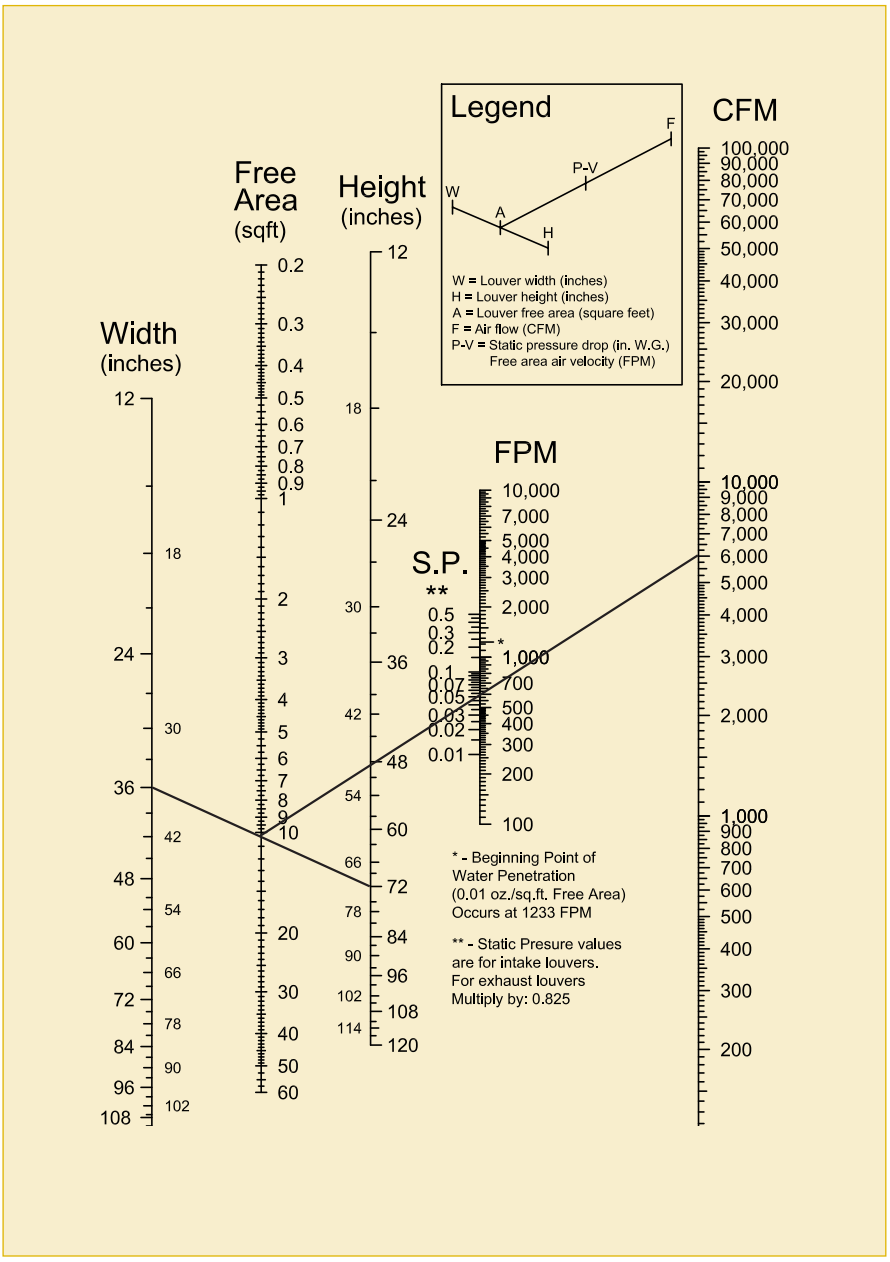
PRICE has developed this unique graphical tool to help you select PRICE louvers without the use of a calculator.
All you need is a ruler and a pencil. A multitude of "what if" conditions can be quickly evaluated and the working copy of the nomograph can be retained for future reference.

Step 1.To use the **PRICE** Nomographs, you need to know at least 3 of the following 6 variables: the louver width and height, the louver free area, the air volume, free area air velocity or static pressure loss. The possible starting point combinations are as follows:
One louver dimension – flow rate – free area velocity
One louver dimension – flow rate - pressure drop
One louver dimension – flow rate – free area
Two louver dimensions – flow rate
Two louver dimensions – pressure drop
Two louver dimensions – free area velocity

Step 2. The **PRICE** Nomograph is comprised of 2 interrelated areas. The **dimensional** characteristics are on the left side of the sheet and the **air flow** characteristics are on the right. Drawing a line joining the "Louver Width" (**W** scale) to the "Louver Height" (**H** scale), you obtain the free area as the line crosses the "Louver Free Area" (**A** scale). You can also start with the free area and one dimension to obtain the 2nd dimension.

Step 3. Drawing a second line joining the "Louver Free Area" (**A** scale) (obtained in step 2) to the "Louver Air Flow" (**F** scale), you obtain the free area velocity and pressure drop as the line crosses the "Pressure drop / Free area velocity" (**P-V** scale). The line can also be drawn with any combination of 2 starting points: [free area & pressure drop] or [flow rate & pressure drop] or [flow rate & free area velocity].
The **PRICE** Nomographs give you maximum flexibility in the selection of your **PRICE** louvers.

See the examples on the following page for more details.



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How to Use the Price Nomographs

EXAMPLES:

1. ***The louver size is 36" wide by 72" high and the required intake air volume is 6,000 CFM. What is the free area, the pressure drop and the free area velocity?***

a). Draw a line joining 36" wide on the "Louver Width" (**W** scale) to 72" high on the "Louver Height" (**H** scale).

b). Read the free area at the point where the line meets the "Louver Free Area" (**A** scale).

ANSWER ***The louver free area is 10.02 square feet.***

c). Draw a line joining 6,000 CFM on the "Air Flow" (**F** scale) to the free area you just found.

d). Read the free area velocity and static pressure loss at the point where this second line meets the "Pressure Drop/ Free Area Velocity" (**P-V** scale).

ANSWER ***The free area air velocity is 600 FPM and louver static pressure loss is 0.06".***

2. ***The louver exhaust air volume is 6,000 CFM and expected static pressure loss is 0.06". Louver height must be smaller or equal to 72". What is the required free area and minimum louver width?***

a). Apply pressure drop correction factor for exhaust condition 0.06" ÷ 0.825 = 0.07" WG

b). Draw a line joining 6,000 CFM on the "Air Flow" (**F** scale) to the calculated static pressure loss on the "Pressure Drop/Free Air Velocity" (**P-V** scale) and continuing to the "Louver Free Area" (**A** scale).

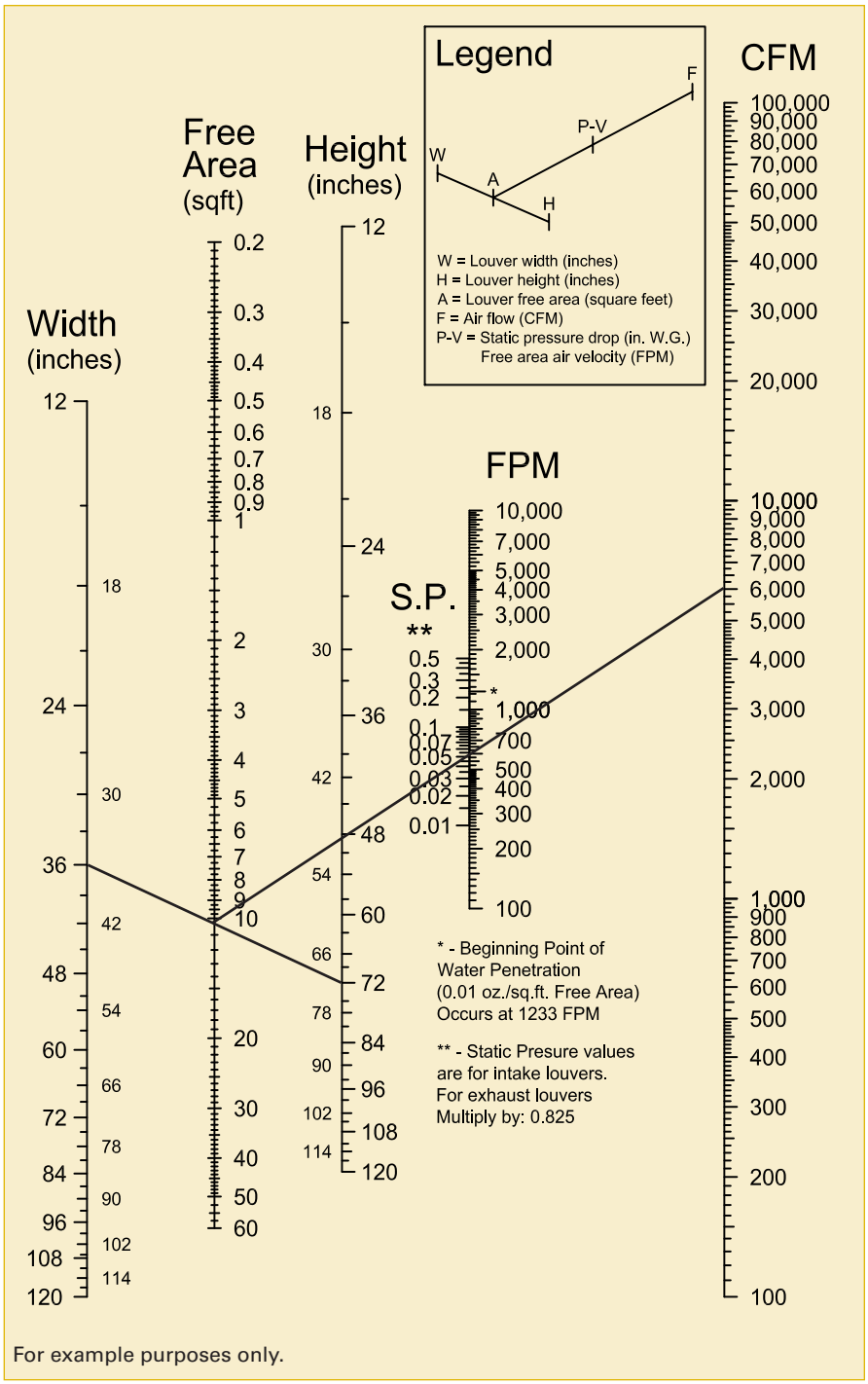
c). Read the free area at the point where the line meets the "Louver Free Area" (**A** scale).

ANSWER ***The louver free area is 10.02 square feet.***

d). Draw a line joining the 72" high on the "Louver Height" (**H** scale) to the free area and continuing to the "LouverWidth" (**W** scale).

e). Read the required louver width.

ANSWER ***The minimum louver width is 36".***



For example purposes only.