

# APPLICATION NOTES



## **Application Note 2015: CITY MULTI Installation Clearance**

## Introduction

This document is a general guide to installation clearance requirements for CITY MULTI air-source outdoor units and will act as a supplement to the technical data contained in the Mitsubishi Electric CITY MULTI Engineering Manuals, Submittal Sheets, Service Manuals, and Installation and Operation Manuals.

### ***This Document will Cover the Installation Clearance Requirements for the Following Products:***

*PU(R,H)Y-(H)P\*(T,Y)KMU-A*  
*PUMY-P\*N(H,K)MU*

## Outline

- I. Typical Installations (taken from CITY MULTI engineering manual)
  - a. PU(H,R)Y-(H)P\*(T,Y)KMU-A
  - b. PUMY-P\*N(H,K)MU
- II. Continuous Line of Outdoor Units
  - a. PU(H,R)Y-(H)P\*(T,Y)KMU-A
  - b. PUMY-P\*N(H,K)MU
- III. Outdoor Units Installed in a Recessed Pit
  - a. PU(H,R)Y-(H)P\*(T,Y)KMU-A
  - b. PUMY-P\*N(H,K)MU
- IV. Outdoor Units Installed in a Fenced or Otherwise Enclosed Structure (open roof)
  - a. PU(H,R)Y-(H)P\*(T,Y)KMU-A
  - b. PUMY-P\*N(H,K)MU

\*Please note the service clearances required by NEC or any other prevailing code supersede the clearance requirements described in this document. The clearance requirements in this document are for purposes of ensuring adequate airflow and proper equipment operation.

## I. Typical Installations

### a. PU(H,R)Y-(H)P\*(T,Y)KMU-A

The following several pages were taken directly from the Mitsubishi Electric CITY MULTI engineering manual. They give general installation clearance guidance which can be applied to most installations

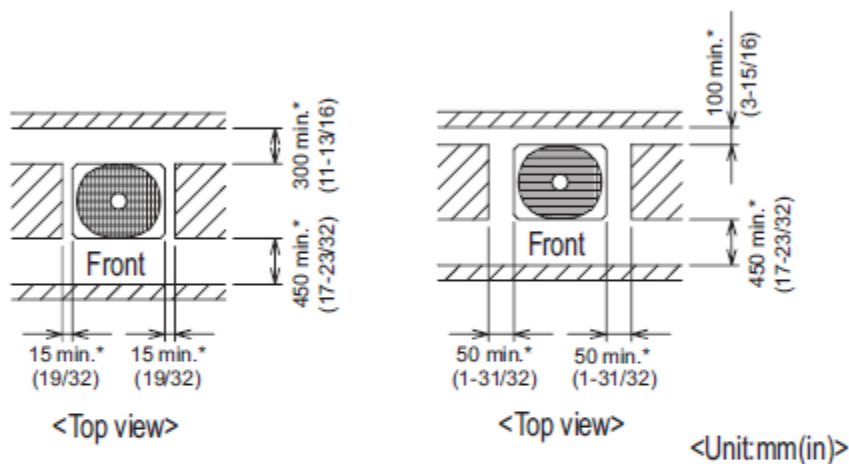
## 1.Required space around the unit

### ●In case of single installation

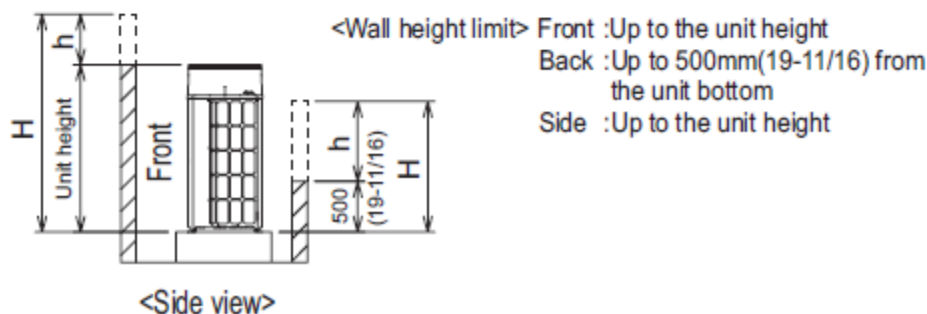
① Secure enough space around the unit as shown in the figure below.

· With a space of at least 300mm(11-13/16) to the wall on the back of the unit

· With a space of at least 100mm(3-15/16) to the wall on the back of the unit

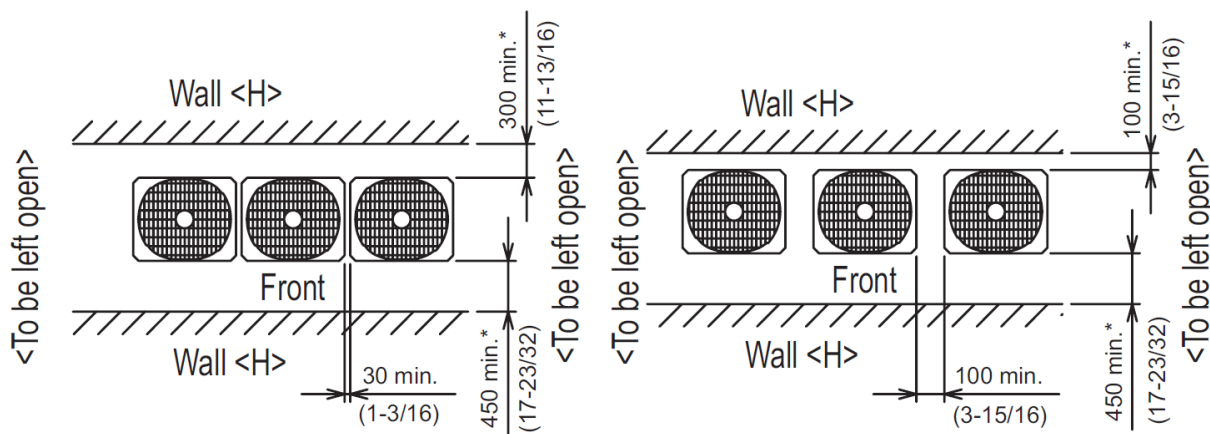


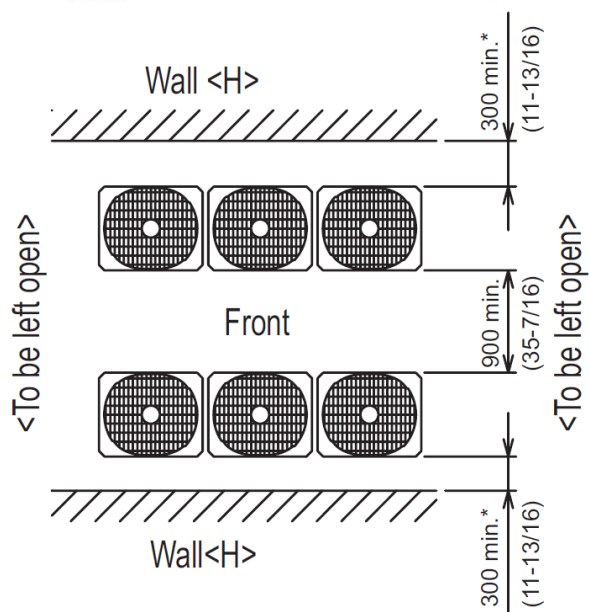
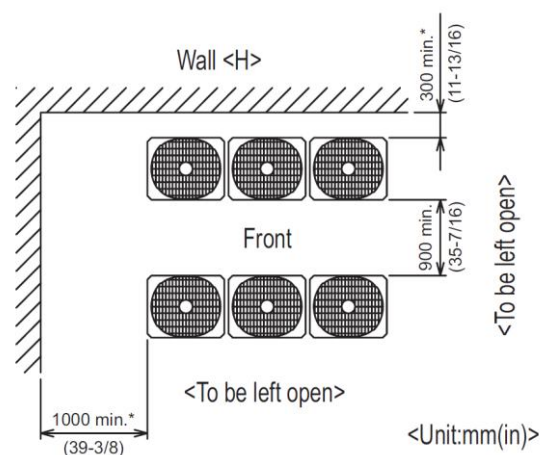
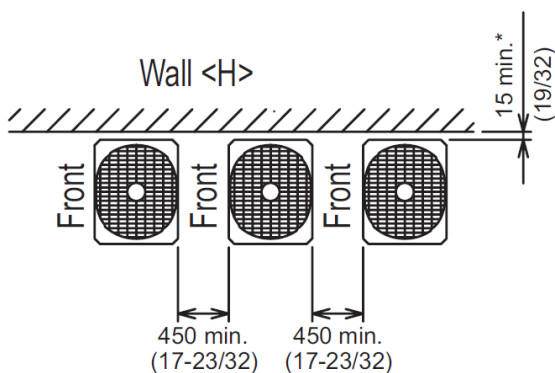
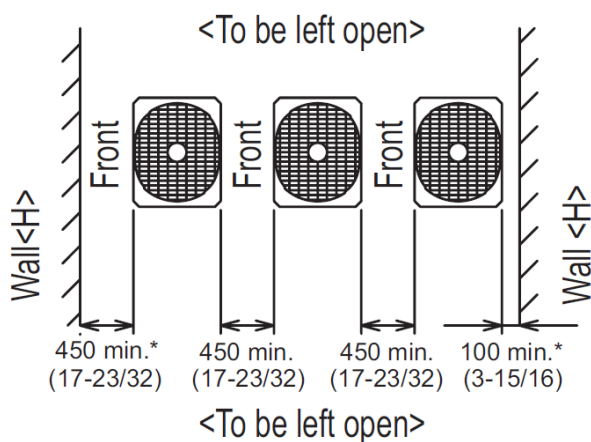
② When the height of the walls on the front,back or on the sides<H> exceeds the wall height limit as defined below add the height that exceeds the height limit <h> to the figures that are marked with an asterisk.



## Collective Installation

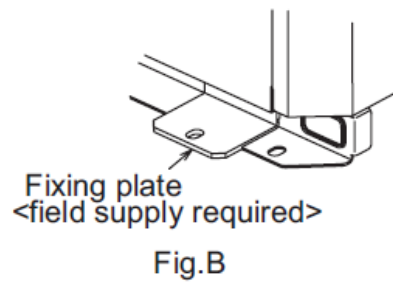
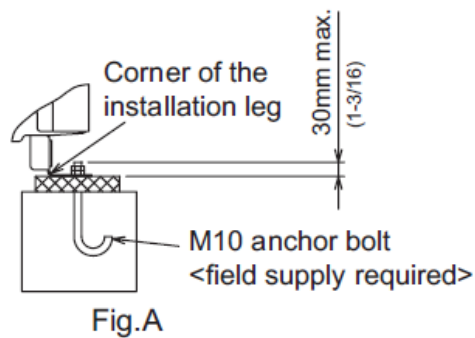
- (1) When multiple units are installed adjacent to each other, secure enough space to allow for air circulation and walkway between groups of units as shown in the figures below.
- (2) At least two sides must be left open.
- (3) As with single installation, add the height that exceeds the height limit <h> to the figures that are marked with an asterisk.
- (4) If there is a wall at both the front and rear of the unit, install up to six units (three for PU(H,R)Y-P120-144) consecutively in the side direction and provide a space of 39-3/8 in. (1000mm) or more as inlet space / passage space for each six unit block (three unit block for PU(H,R)Y-P120-144).





## 2.Foundation work

- ① Take into consideration the surface strength, water drainage route, piping route, and wiring route when preparing the installation site.  
<Note that the drain water comes out of the unit during operation.>
- ② Build the foundation in such way that the corner of the installation leg is securely supported as shown in the right figure.(Fig.A)  
When using a rubber isolating cushion, please ensure it is large enough to cover the entire width of each of the unit's legs.
- ③ The protrusion length of the anchor bolt must not exceed 30mm(1-3/16).(Fig.A)
- ④ Use four fixing plates as shown in the right figure <field supply required> when using post-installed anchor bolts.(Fig.B)
- ⑤ To prevent small animals and water and snow from entering the unit and damaging its parts, close the gap around the edges of through holes for pipes and wires with filler plates <field supply required>.
- ⑥ When the pipes or cables are routed at the bottom of the unit, make sure that the through hole at the base of the unit does not get blocked with the installation base.
- ⑦ Refer to the Installation Manual when installing units on an installation base.



a. PUMY-P\*N(H,K)MU

The following two pages were taken directly from the Mitsubishi Electric CITY MULTI engineering manual. They give general installation clearance guidance which can be applied to most installations.

## 4-2-1. Spacing individual PUMY-P-NHMu/NKMu

Follow Fig. 4-2-2~7 to space individual PUMY-P-NHMu/NKMu at the installation site.

mm[in.]

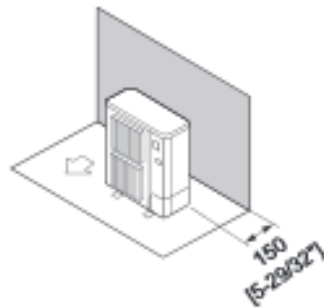


Fig. 4-2-2  
Obstacles at rear only

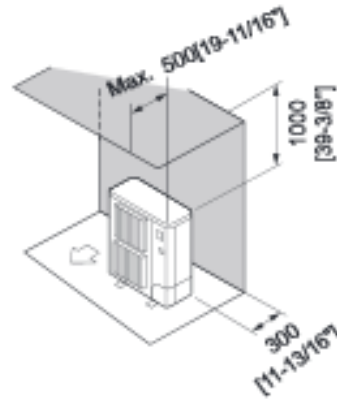


Fig. 4-2-3  
Obstacles at rear and above only

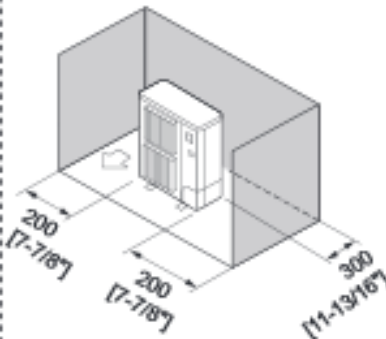


Fig. 4-2-4  
Obstacles at rear and sides only

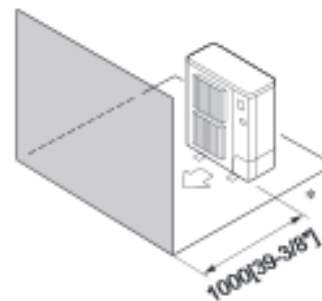
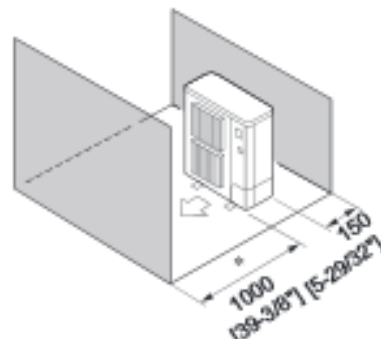


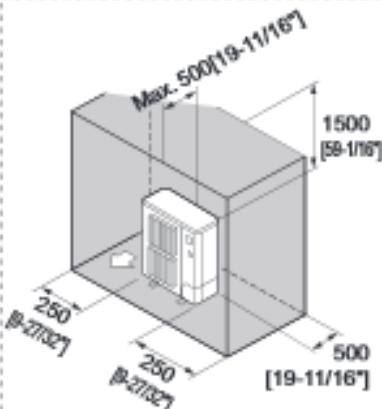
Fig. 4-2-5  
Obstacles at front only

\* Using an optional air outlet guide, the clearance  $\geq 500$  mm [19-11/16\"/>



\* Using an optional air outlet guide, the clearance  $\geq 500$  mm [19-11/16\"/>

Fig. 4-2-6  
Obstacles at front and rear only



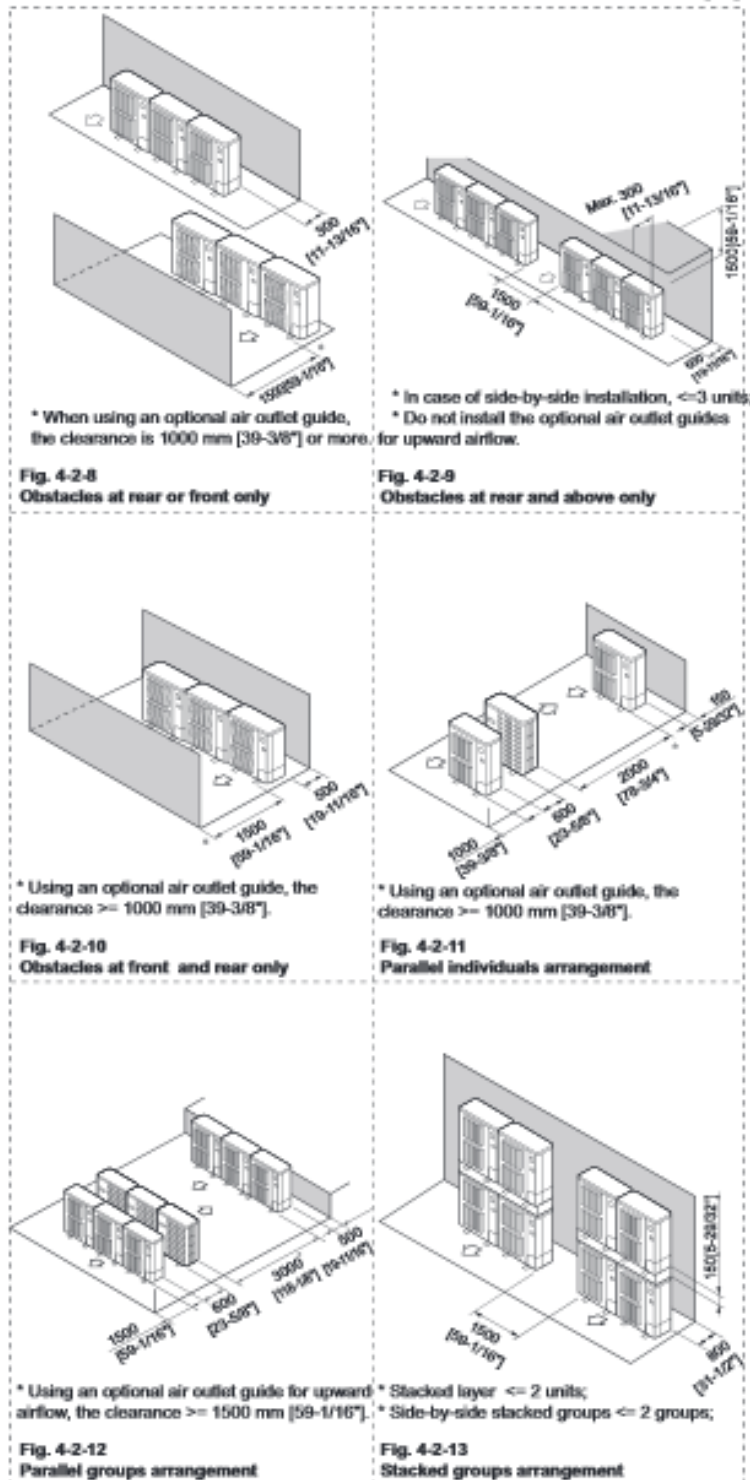
\* NO upward airflow outlet guide.

Fig. 4-2-7  
Obstacles at rear, sides and above only

## 4-2-2. Spacing grouped PUMY-P-NHMU/NKMU

Follow Fig. 4-2-8~13 to space grouped PUMY-P-NHMU/NKMU at the installation site. Leave 10 mm [3/32"] space or more between PUMY-P-NHMU/NKMU units.

mm[in.]



## II. Continuous Line of Outdoor Units

### a. PU(H,R)Y-(H)P\*(T,Y)KMU-A

Rows of CITY MULTI outdoor units can be installed in a continuous or repeating pattern using the clearance guidelines shown in the drawing below. Rows of units may be installed front-to-front, front-to-back, or back-to-back.

50 (1-31/32) if back of unit is > 300 (11-13/16) from a wall, 100 (19/32) if back of unit is < 300 (11-13/16) from a wall

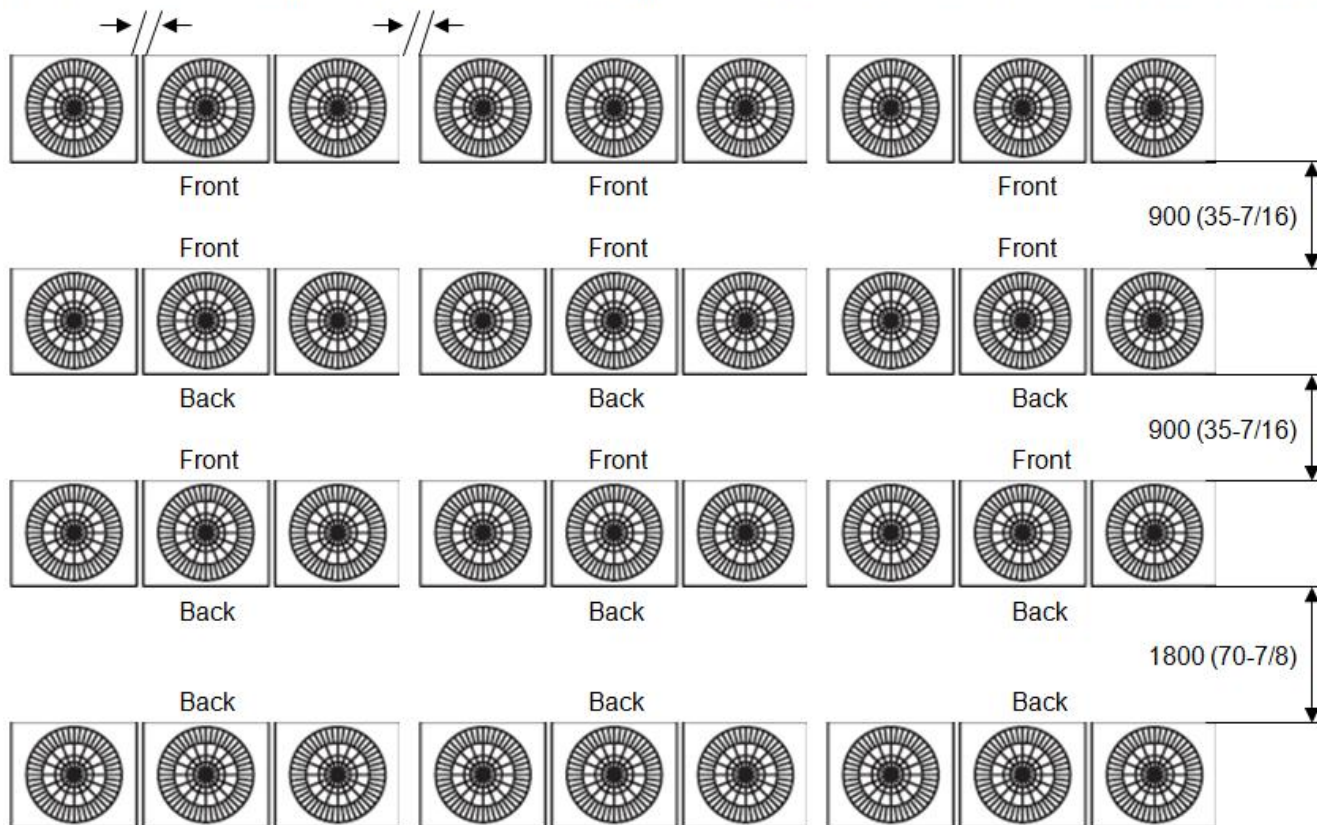


**Figure 1:** Continuous Line of PU(H,R)Y Outdoor Units

## b. PUMY-P\*N(H,K)MU

Rows of CITY MULTI S-Series outdoor units can be installed in a continuous or repeating pattern using the clearance guidelines shown in the drawing below. Units may be installed front-to-front or back-to-back, but NOT front-to-back. Air outlet guides which deflect exhaust air upward are recommended for large installations. The use of these outlet guides reduces the minimum separation in front-to-front installations from 3000 (118-1/8") to 1500 (59-1/16"). Tiered installation of S-Series units is NOT recommended for large installations in which there are multiple rows of units.

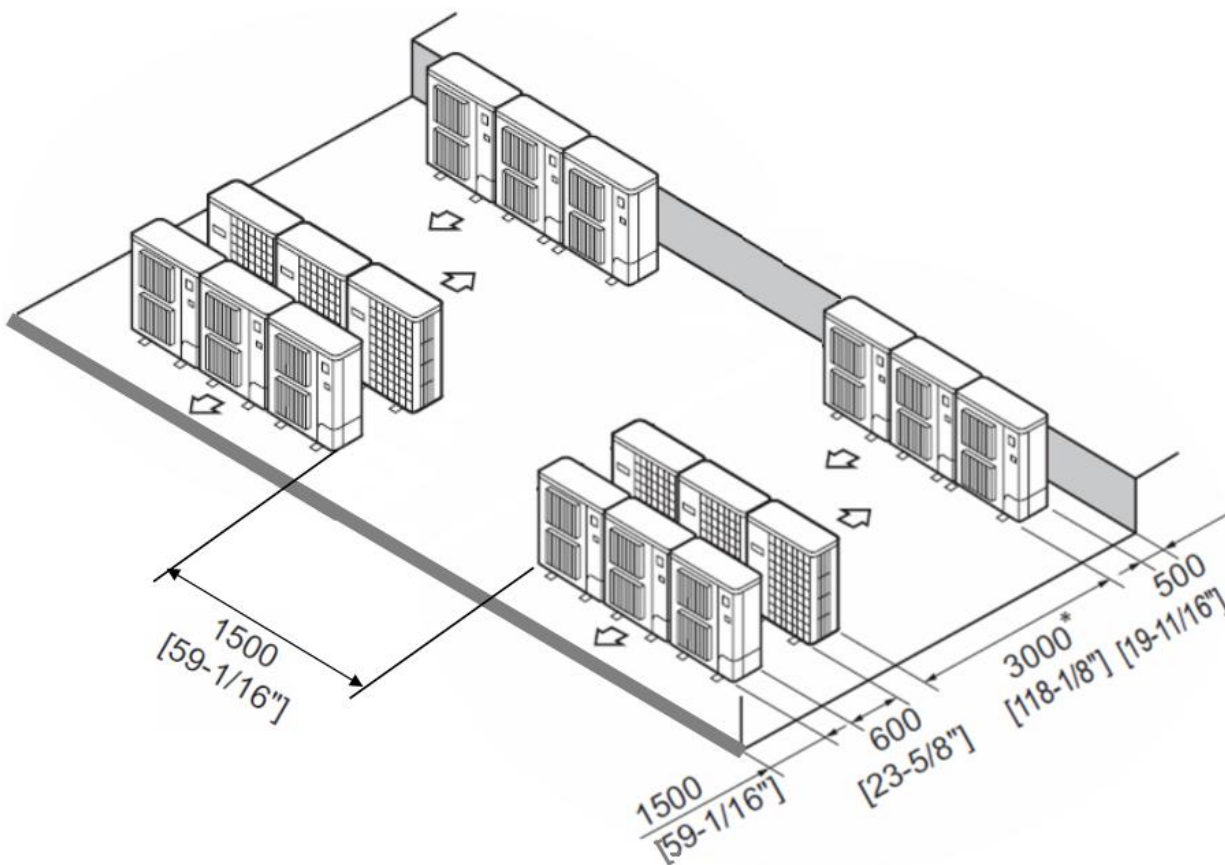


**Figure 2:** Continuous Line of PUMY Outdoor Units

### III. Outdoor Units Installed in a Recessed Pit

#### a. PU(H,R)Y-(H)P\*(T,Y)KMU-A

When the height of the walls <H> surrounding the unit are equal to or less than the height of the unit, use the clearance requirements specified in Figure 3.

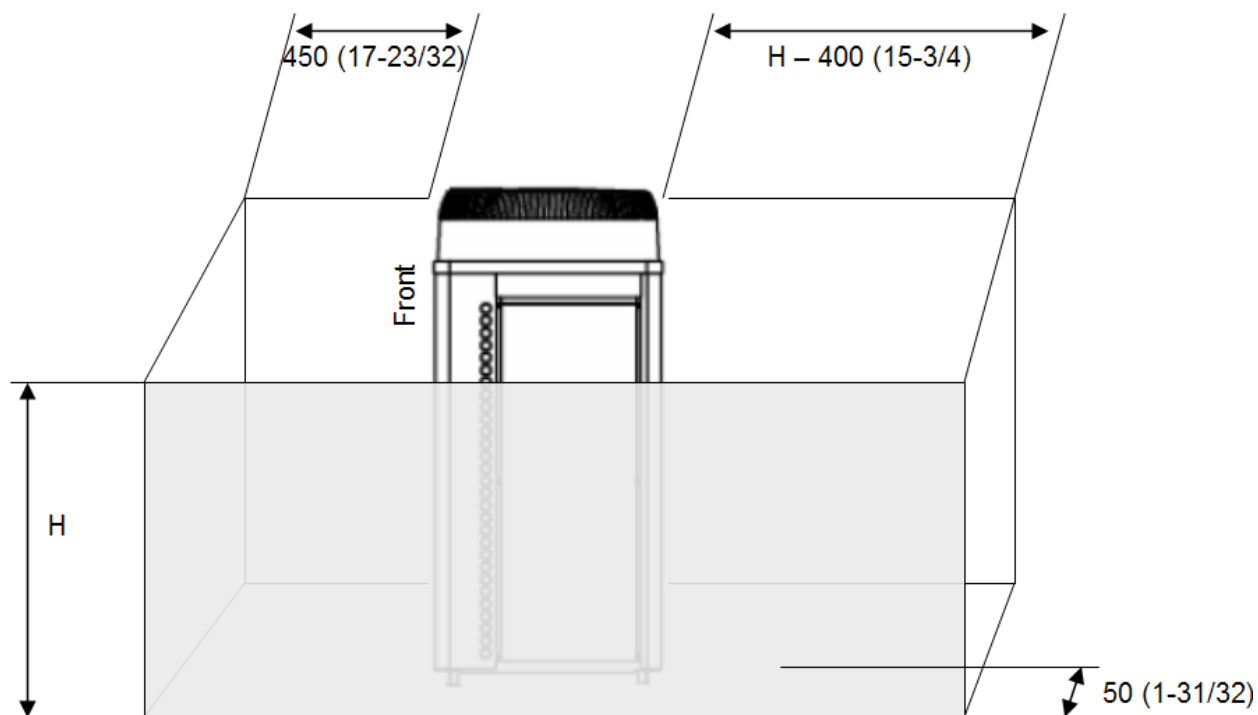


**Figure 3:** Singular PU(H,R)Y Outdoor Unit Module Installed in a Recessed Pit

When installing multiple units **side-by-side**, install up to six modules (or three modules for sizes PU(H,R)Y-P120-144) consecutively in the side direction with minimum 50mm (1-31/32") clearance between sets of six (or three) modules. Then between six-unit (or three-unit) sets, provide a space of 1000mm (39-3/8") or more as inlet space / passage space.

When installing **multiple rows** of units, **side-by-side**, in a recessed pit, use the clearance requirements specified in Figure 4 for the spacing of the rows. When installing multiple units side-by-side, install up to six modules (or three modules for sizes PU(H,R)Y-P120-144) consecutively in the side direction with minimum 50mm (1-31/32") clearance between sets of six (or three) modules. Then between six-unit (or three-unit) sets, provide a space of 1000mm (39-3/8") or more as inlet space / passage space.

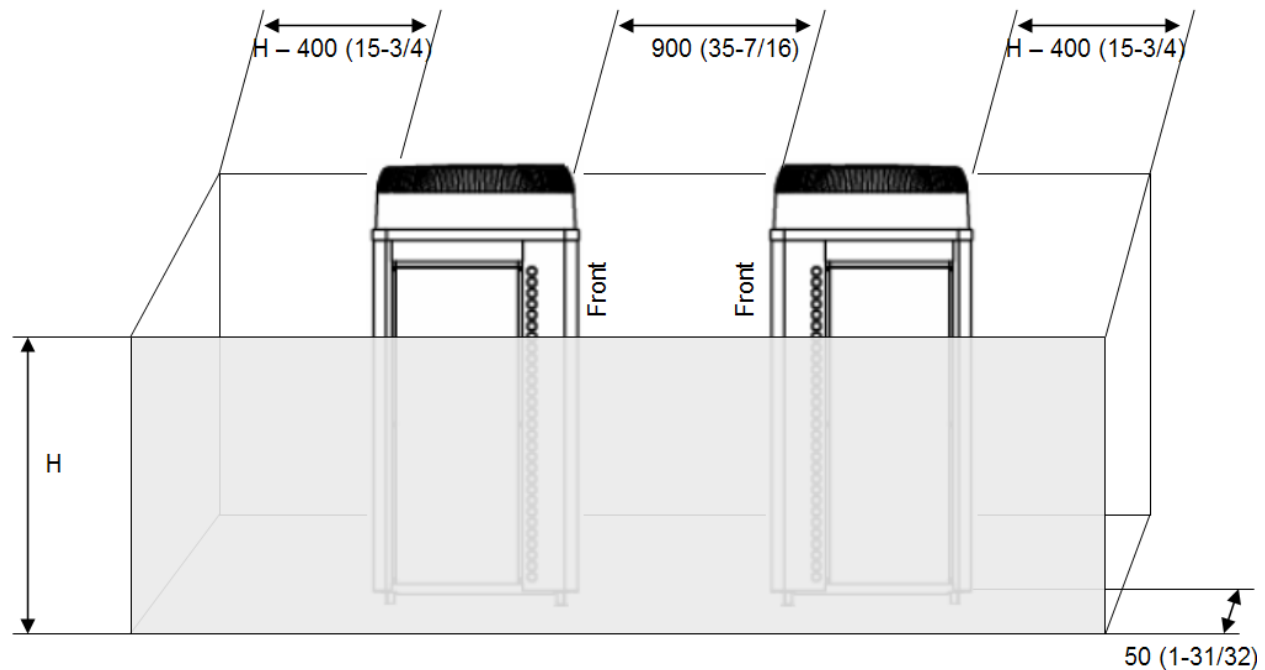


**Figure 4:** Multiple PU(H,R)Y Outdoor Units Installed in a Recessed Pit

When installing **multiple rows** of units, lined up side-to-side but the rows facing **front-to-back** instead of **front-to-front**, the same clearances shown in Figure 4 still apply with a few additional considerations. Any row of units with the front facing a wall must have a minimum of 457.2mm (18") clearance for service purposes. When installing rows of units back-to-back, the 900mm (35-7/16") separation between rows should be doubled and the unit fronts facing walls must have a minimum of 457.2mm (18") clearance for service purposes.

When the height of the walls <H> surrounding the unit are larger than the height of the unit, use the clearance requirements specified in Figure 5. This type of installation will require that the exhaust air be ducted above the total wall height to prevent short cycling of exhaust air into the coil intake.

The total allowable wall height will be limited by the maximum external static pressure the outdoor unit fan is capable of given the dip switch configurations shown in the table below. It is recommended that the ducting come off the top of the unit at the diameter of the fan collar or larger and that soft radius bends are used. The sum of static resistance presented by all connected ductwork, 90° bends, louvers, grilles, and other devices that present a restriction to airflow must not exceed 0.24" w.g. at the nominal airflow rate.

**Table 1:** K-Generation Outdoor Unit Dip Switch Settings for various external static pressures. 0 in w.g. is the default factory setting

|                      | SW6-4 | SW6-5 |
|----------------------|-------|-------|
| 0 in w.g. (0 Pa)     | OFF   | OFF   |
| 0.12 in w.g. (30 Pa) | ON    | ON    |
| 0.24 in w.g. (60 Pa) | ON    | OFF   |

When installing multiple units **side-by-side**, install up to six modules (or three modules for sizes PU(H,R)Y-P120-144) consecutively in the side direction with minimum 50mm (1-31/32") clearance between sets of six (or three) modules. Then between six-unit (or three-unit) sets, provide a space of 1000mm (39-3/8") or more as inlet space / passage space.

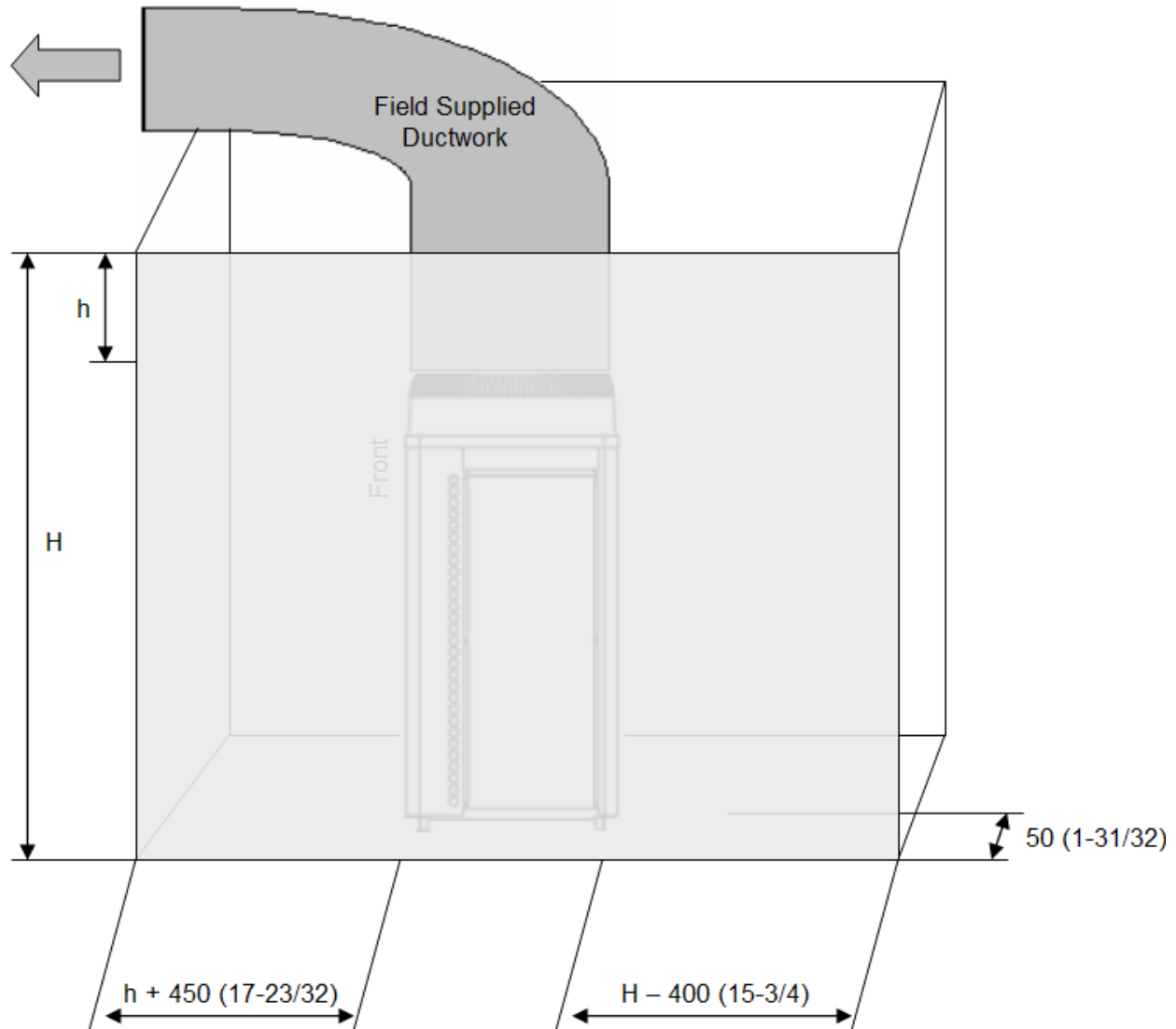


**Figure 5:** Installation of an Outdoor Unit in a Recessed Pit, when the height of the wall exceeds the height of the unit

When installing multiple rows of units, use the clearance requirements specified in Figure 6.

When installing multiple units side-by-side, install up to six modules (or three modules for sizes PU(H,R)Y-P120-144) consecutively in the side direction with minimum 50mm (1-31/32") clearance between sets of six (or three) modules. Then between six-unit (or three-unit) sets, provide a space of 1000mm (39-3/8") or more as inlet space / passage space. **Each module must be ducted separately.**

When installing rows of units front-to-back instead of front-to-front, the same clearances shown in Figure 6 still apply with a few additional considerations. Any row of units with the front facing a wall must have a minimum of 457.2mm (18") clearance for service purposes. When installing rows of units back-to-back, the 900mm (35-7/16") separation between rows should be doubled and the unit fronts facing walls must have a minimum of 457.2mm (18") clearance for service purposes.

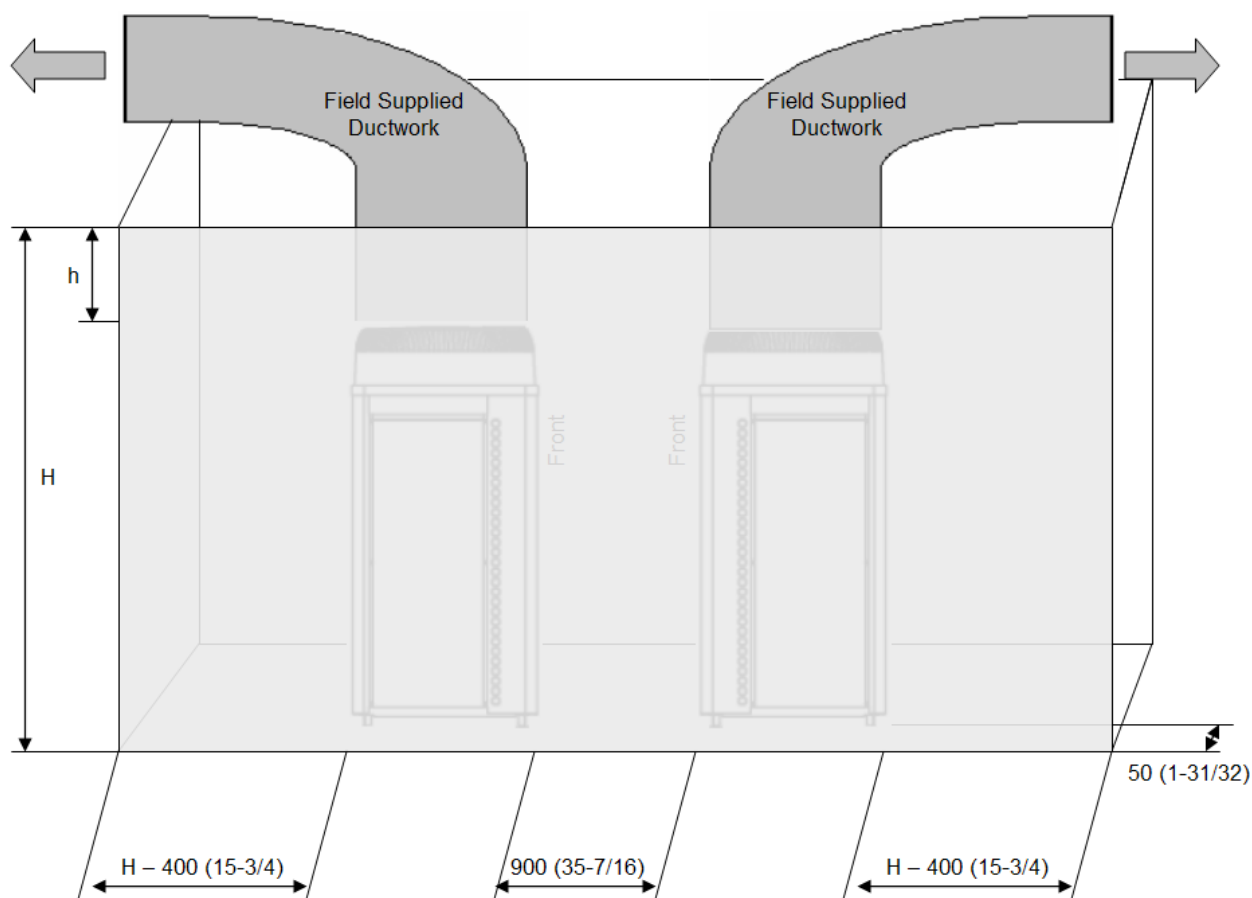


**Figure 6:** Installation of multiple rows of Outdoor Unit in a Recessed Pit, when the height of the wall exceeds the height of the unit

a. PUMY-P\*N(H,K)MU

For PUMY installations, pit height should never be taller than the unit and 45° upward facing outlet guide vanes should be used to deflect exhaust air out of the enclosure. Figure 7 and Figure 8 illustrate that the exhaust side of the PUMY should never be closer than 53-3/16" from the enclosure and that a wall should be field constructed to separate the intake and exhaust sides of the unit.

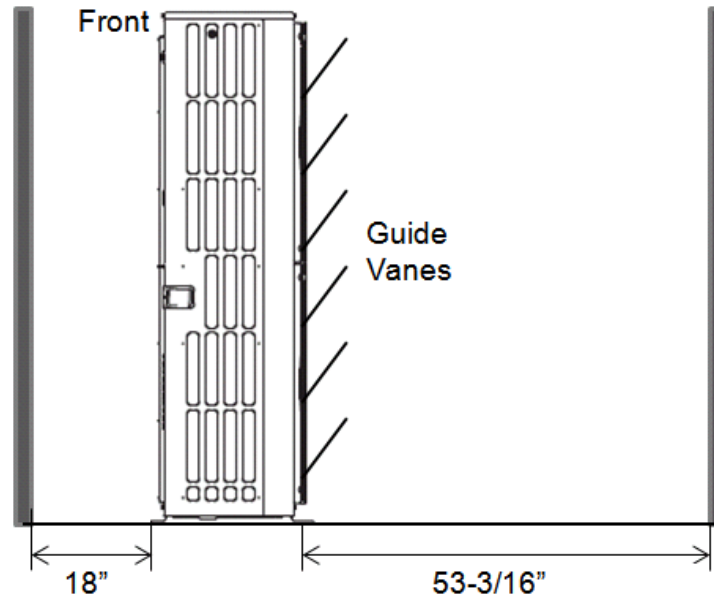


**Figure 7:** Installation of a PUMY in a Recessed Pit (Side View)

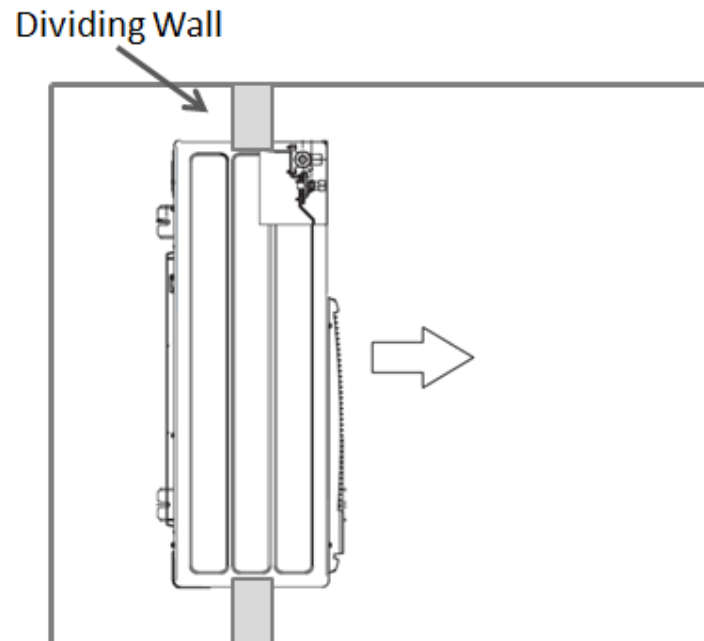


**Figure 8:** Installation of a PUMY in a Recessed Pit (Top View)

#### IV. Outdoor Units Installed in a Fenced or Otherwise Enclosed Structure (open roof)

##### a. PU(H,R)Y-(H)P\*(T,Y)KMU-A

When installing air-source outdoor units in a perforated enclosure (ie, fencing, paneling, etc.), the amount of free area needs to be calculated and cross referenced with the airflow required for the outdoor unit(s) in order to compute clearance requirements. As an example, a 12 ton PU(R,H)Y-P144TJMU-A outdoor unit require 12,010 cfm of airflow in order to produce nominal capacity at full loading conditions. Using the formula below, cfm is held constant and the amount of free area is varied systematically to determine the resultant static pressure presented.

$$\text{Velocity (FPM)} = \text{Airflow (CFM)} / \text{Area (Sq.Ft.)}$$

**Table 2:** Example Calculation of Velocity with Varying Free Area and Corresponding ESP

| Airflow (CFM) | Free Area (Sq.Ft.) | Velocity (FPM) | ESP (in w.g.) |
|---------------|--------------------|----------------|---------------|
| 12010         | 4                  | 3003           | 1.4           |
| 12010         | 6                  | 2002           | 0.9           |
| 12010         | 8                  | 1501           | 0.5           |
| 12010         | 10                 | 1201           | 0.35          |
| 12010         | 12                 | 1001           | 0.28          |
| 12010         | 14                 | 858            | 0.22          |
| 12010         | 16                 | 751            | 0.17          |
| 12010         | 18                 | 667            | 0.15          |
| 12010         | 20                 | 601            | 0.13          |
| 12010         | 24                 | 500            | 0.09          |
| 12010         | 28                 | 429            | 0.08          |
| 12010         | 32                 | 375            | 0.06          |
| 12010         | 36                 | 334            | 0.05          |
| 12010         | 40                 | 300            | 0.04          |
| 12010         | 44                 | 273            | 0.03          |
| 12010         | 48                 | 250            | 0.03          |
| 12010         | 52                 | 231            | 0.02          |

To fill in the last column (external static pressure), use the chart in Figure 9 which cross references damper face velocity with pressure drop.

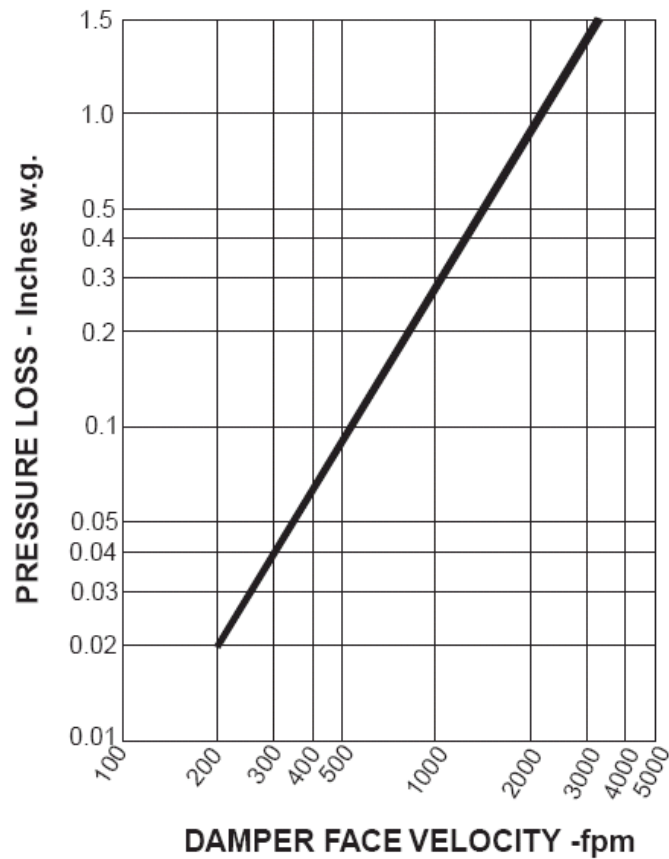


**Figure 9:** Velocity vs. ESP chart

Looking at the static pressure results in the last column of the table, the designer has the choice to design such that the equipment operates at free air (0.0" w.g. of ESP), which in this example equates to approximately 52 sq.ft. of free area, or design to purposely make use of the additional static pressure capabilities present in the fan via dipswitch SW3-9 and SW3-10 settings as described in Table 1.

If making use of the additional static pressure capabilities of the outdoor unit fan, it is important not to exceed the 0.24" w.g. of ESP available as it will negatively impact your capacity at full loading conditions. If there is no choice but to exceed this pressure drop, please contact your local Mitsubishi Electric representative so that the percentage of capacity loss at full load conditions can be calculated and factored into your overall design.

An example of calculating free area is shown below where a fence with a 50% perforation pattern surrounds a 12 ton outdoor unit. The dimensions of the 12 ton unit are 65" x 68-15/16" x 29-15/16" (H x W x D) and the fence is 65" x 75" x 54" (H x W x D).

$$\text{Free Area} = \frac{1}{2} [2(65" \times 75") + 2(65" \times 54")]$$

$$\text{Free Area} = 8,385 \text{ sq.in.}$$

$$1 \text{ sq.in.} = 0.0069444 \text{ sq.ft.}$$

$$\text{Free Area} = 58.2 \text{ sq.ft.}$$

In this example, there will be no need to use the higher static pressure fan settings as this fence will not present virtually no airflow restriction.



**Figure 10:** Outdoor Unit with Chain Linked Fence Enclosure

If we revisit this example with a more restrictive enclosure (ie, wood paneling) that has 10% free area, the calculation yields 11.6 sq.ft. of free area, and consequently, approximately 0.27" w.g. of ESP. In this case, we will also look at the top view of the installation since air can also flow over the top of the enclosure. Adding the area on the sides and behind the unit (not the front side), we have now found an additional 4.4 sq.ft. for a total free area of 16 sq.ft. This reduces our ESP calculation to 0.17" w.g., which is well within the capabilities of the fan, but will require the high static setting.

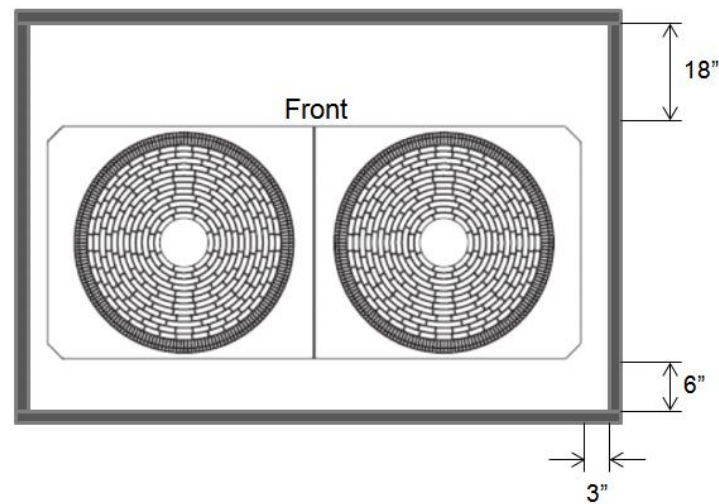


**Figure 11:** Example – Top View of outdoor unit in an enclosure

For installations where the enclosure is taller than the outdoor units, the exhaust should be ducted to the height of the enclosure to prevent recirculation of exhaust air through the coil and the top view free area calculation will have to be revisited as there will be added restriction. Please refer to the “Outdoor Units Installed in a Recessed Pit” section of this document for ducting guidelines.

a. PUMY-P\*N(H,K)MU

For PUMY installations, enclosure height should never be taller than the unit and 45° upward facing outlet guide vanes should be used to deflect exhaust air out of the enclosure. The enclosure should have dimensions and a perforation pattern that present as close to zero ESP as possible.

Refer to Figure 7 from earlier in this document, which illustrates that the exhaust side of the PUMY should never be closer than 53-3/16” from the enclosure when the perforation pattern is <50%. For perforation patterns >50%, the ESP calculation method above should be used to determine required clearance (make sure to perform a separate calculation for inlet air and exhaust air). The exhaust air calculation should not include top view area in the calculation.