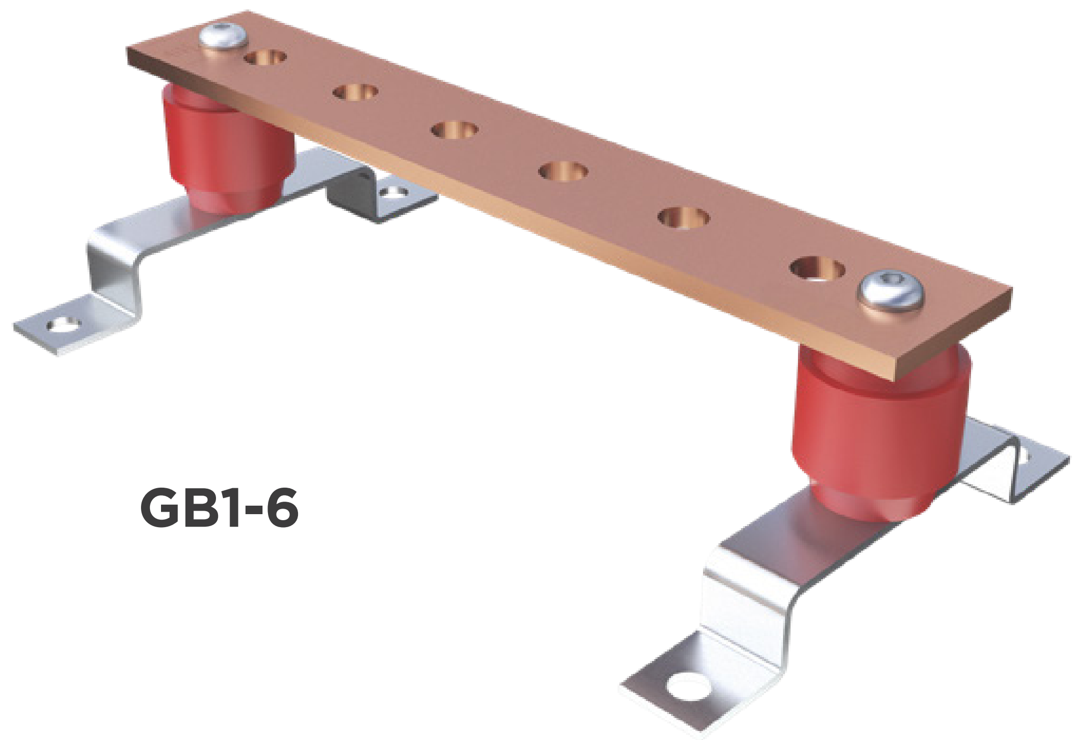
Bus or Ground Bars Copper, Tinned Copper

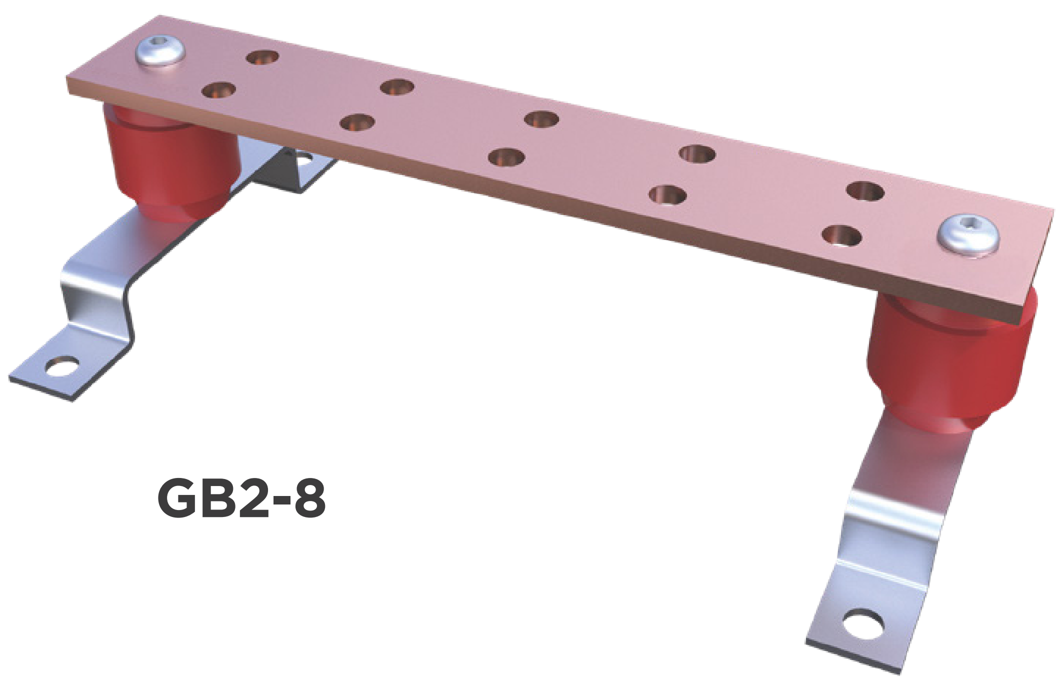
Description:

UL Listed bus or ground bars are available in a wide variety of configurations: Hole and slot patterns, unplated copper, tin plated or stainless steel. These bars are available with or without brackets and insulators. Plexiglass cover is also available. For special applications necessitating a non-standard configuration, please contact Customer Service or your local sales representative.

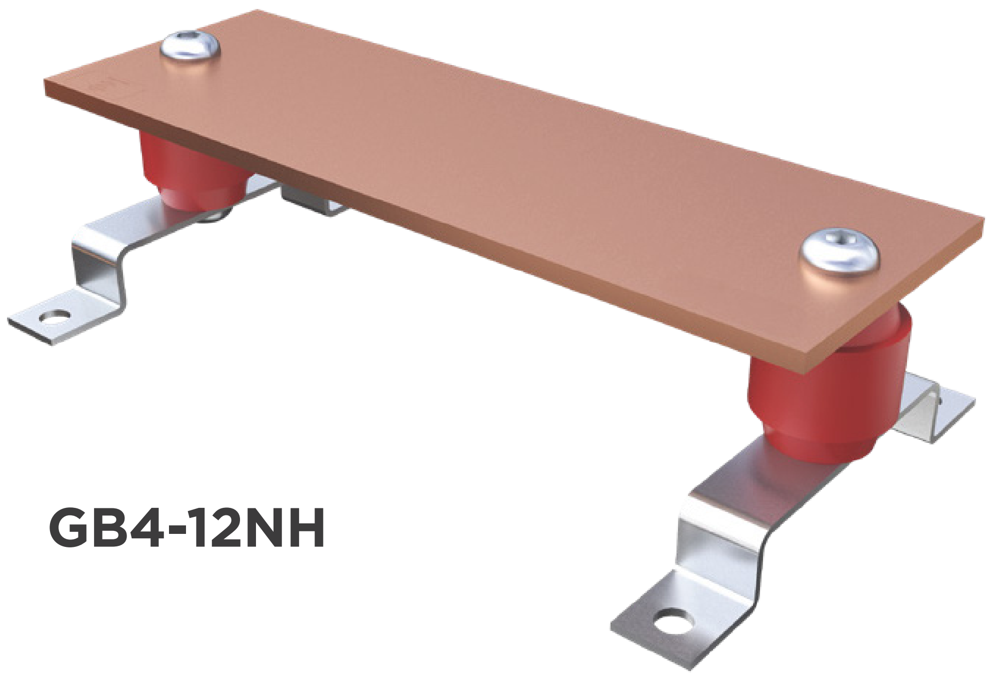
Contents:



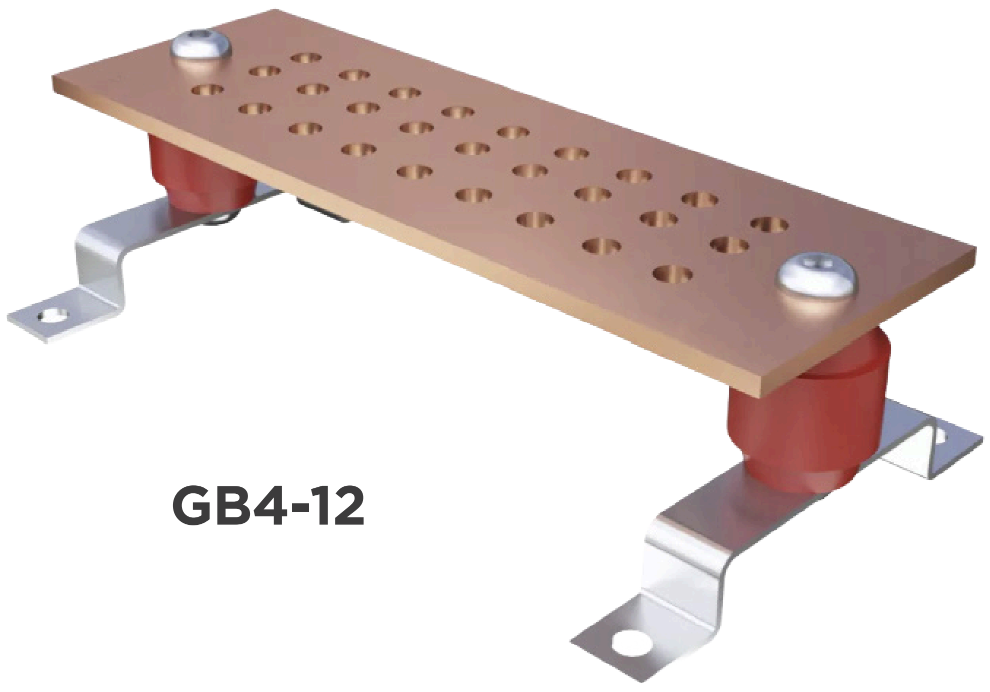
GB1-6



GB2-8



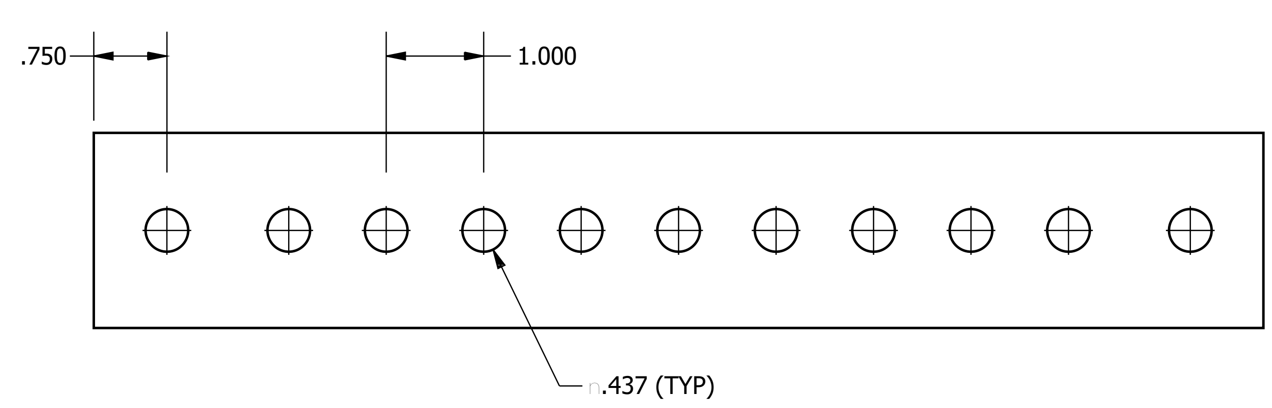
GB4-12NH



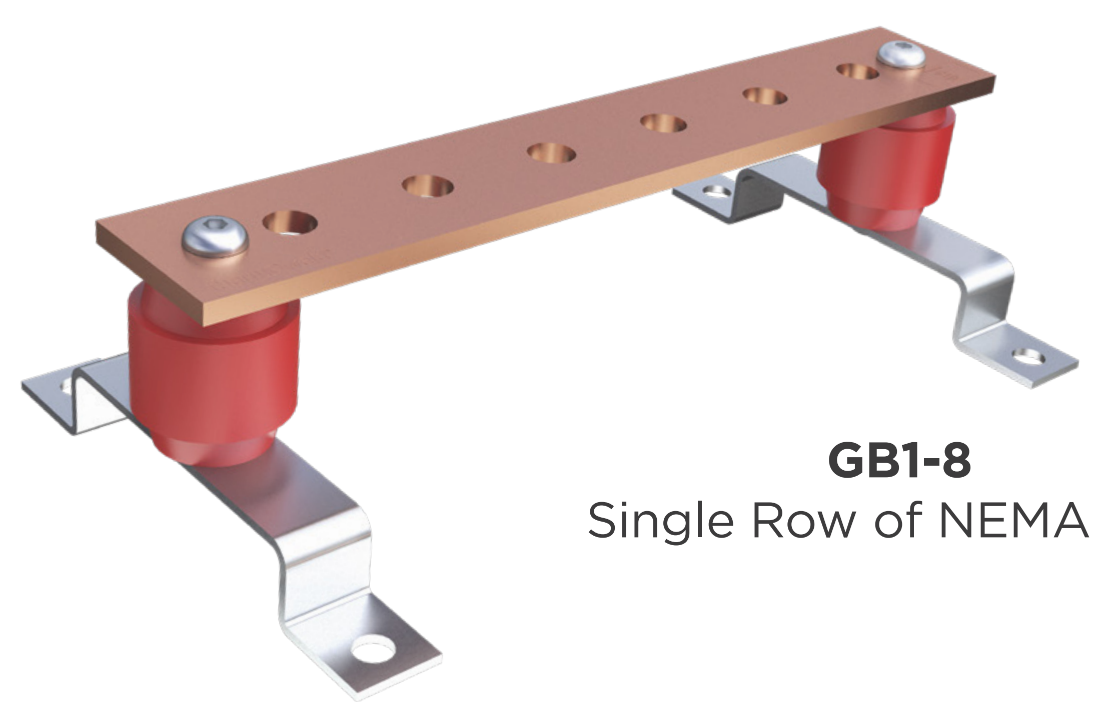
GB4-12

Nav-Tech Stock Hole Pattern Bus or Ground Bus

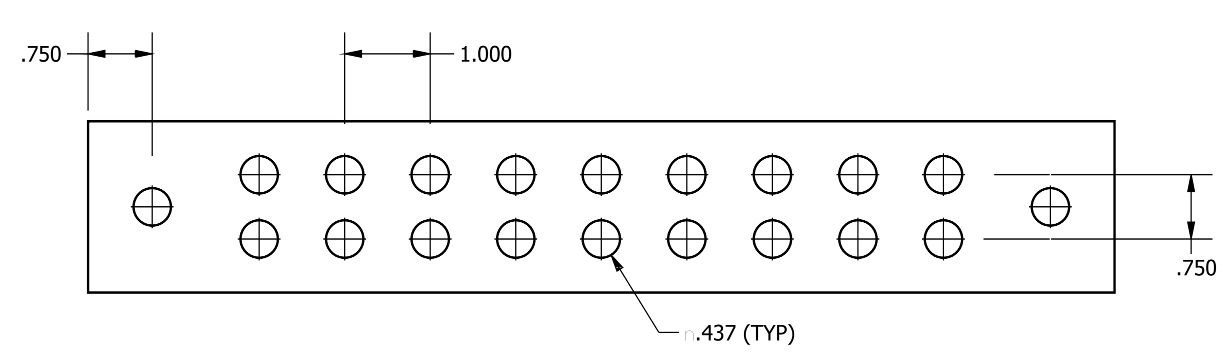
- Industry standard hole pattern in accordance with NEMA CC1 Standard. Add suffix "PL" for insulators and plexiglass cover. Can be used with Nav-Tech Lugs with NEMA pads.



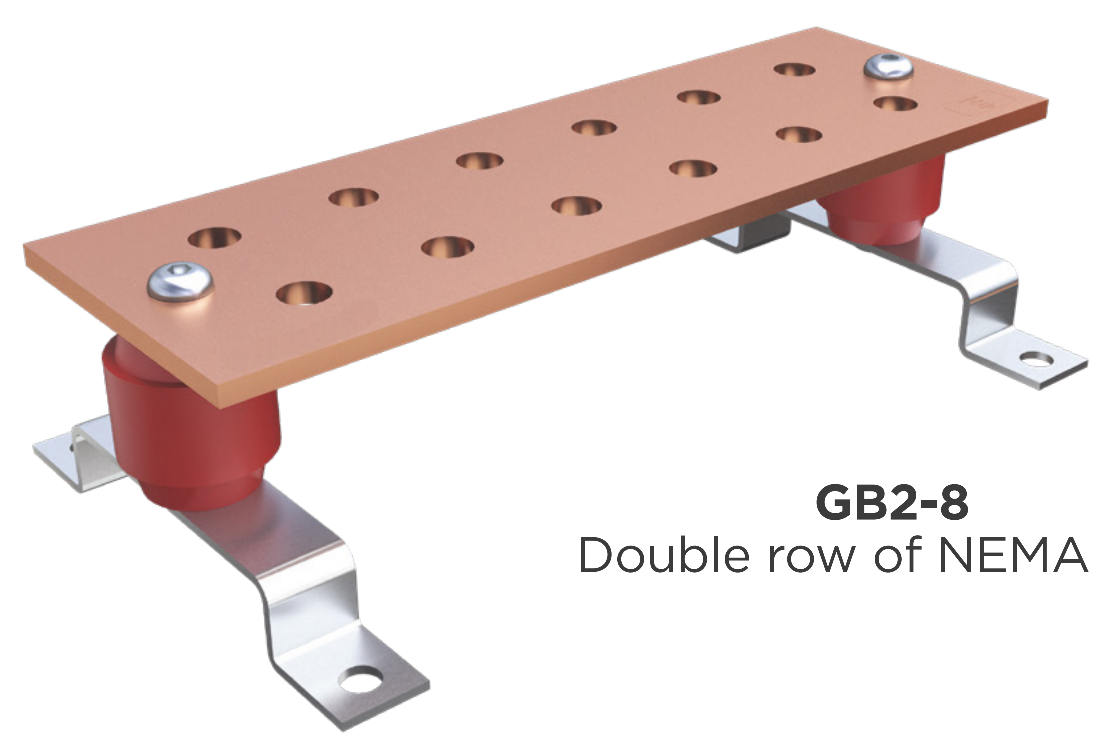
Pattern H
Single Row of NEMA Holes



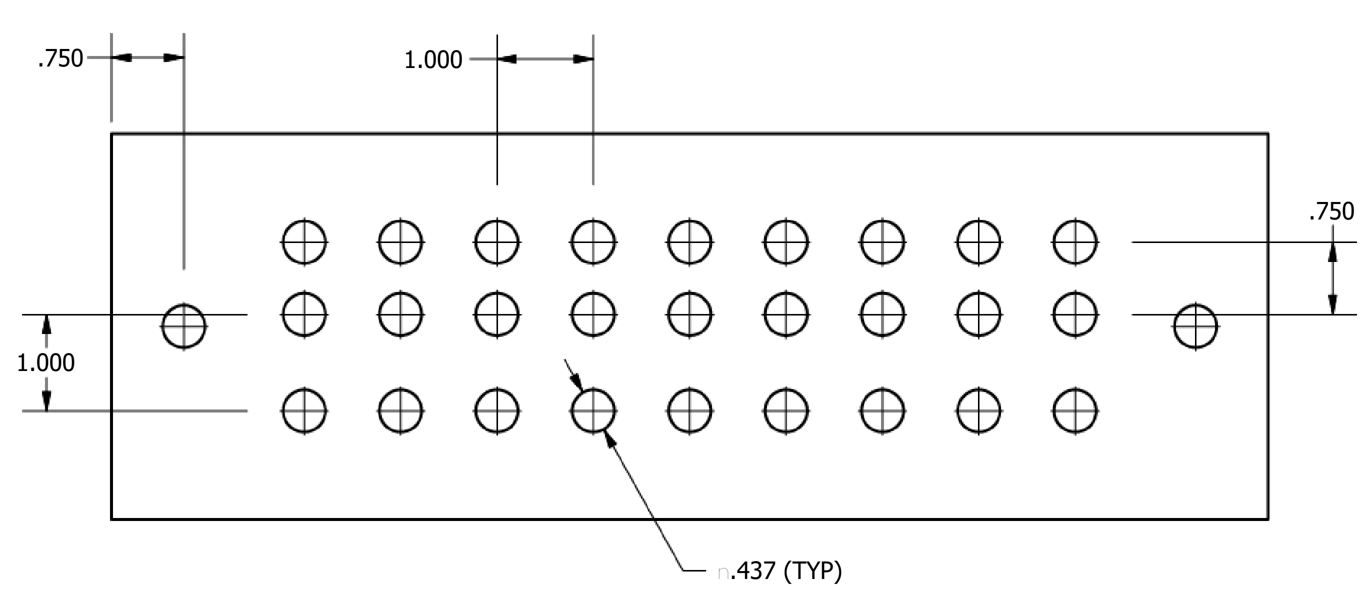
GB1-8
Single Row of NEMA Holes



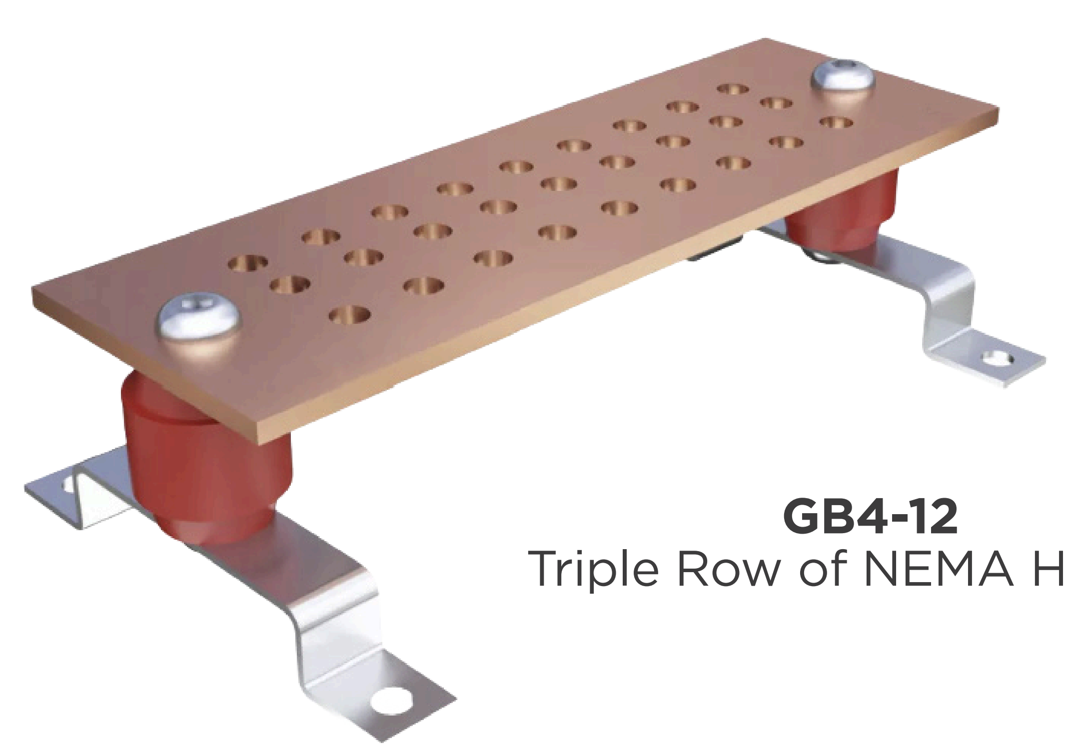
Pattern Z
Double row of NEMA holes



GB2-8
Double row of NEMA holes



Pattern J
Tripe Row of NEMA Holes

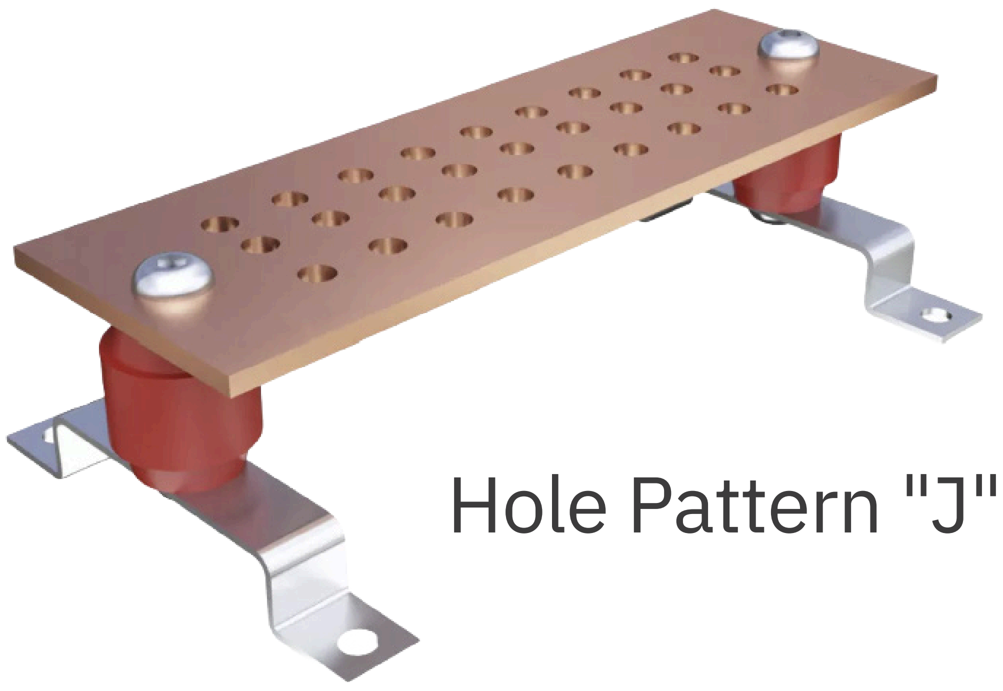


GB4-12
Triple Row of NEMA Holes

Stock Patterns

Features

- Mounting holes not included in total.
- Accommodates 2-hole lugs spaced 3/4", 1”, and 1-3/4“ on center.
- Bars available tin plated; with tamper proof bolts, plexiglass cover.
- Other sizes available, contact sales for details.

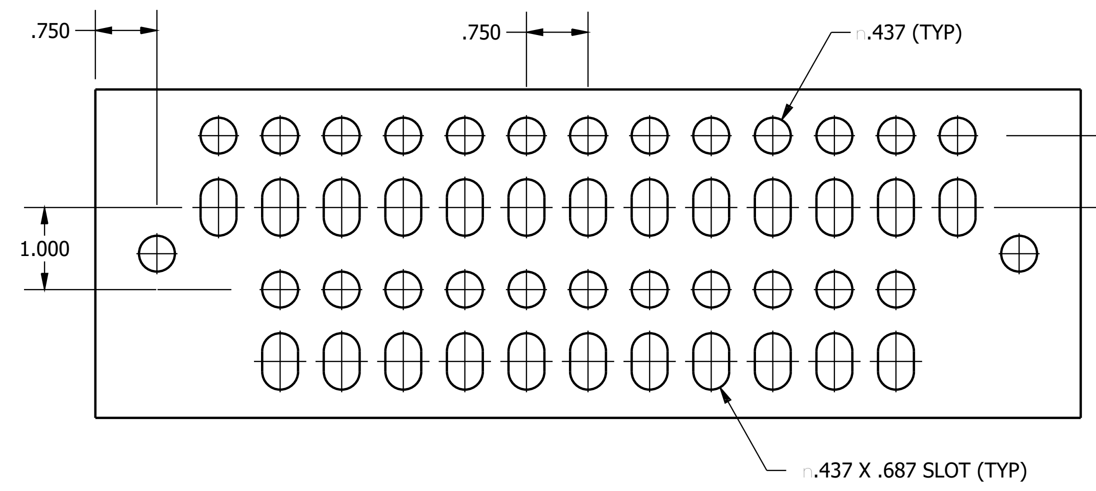


Hole Pattern "J"

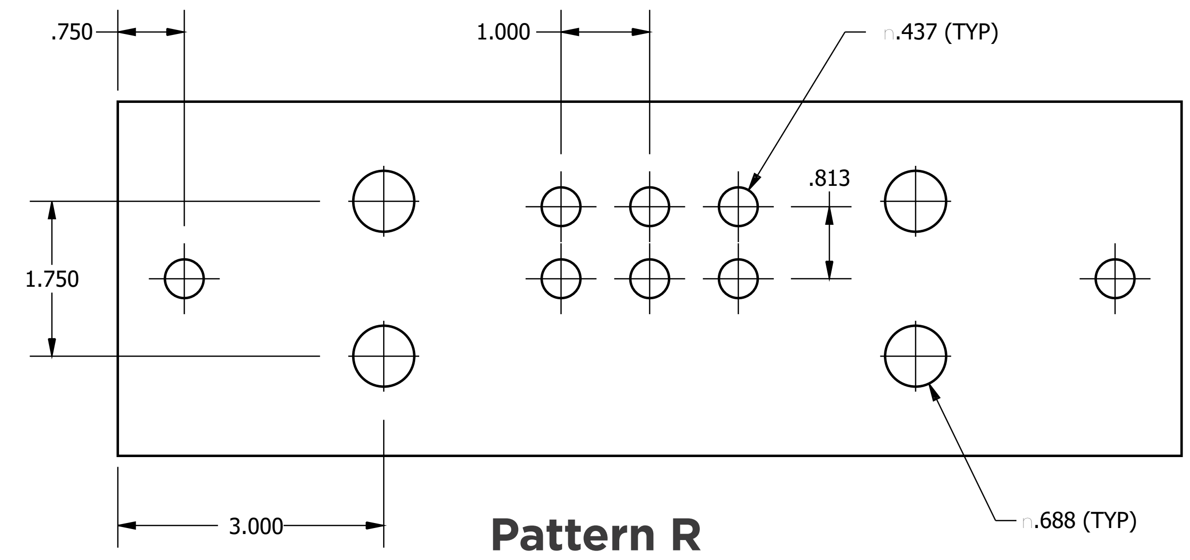
Pattern H				
Catalog Number	**Description**	**Tinned**	**Bar Size**	**# of Holes**
GB1-6	Bar with Insulators and Brackets	No	1" x 6" x 1/4"	5
GB1-12			1" x 12" x 1/4"	9

Pattern Z				
Catalog Number	**Description**	**Tinned**	**Bar Size**	**# of Holes**
GB2-8	Bar with Insulators and Brackets	No	2" x 8" x 1/4"	12
GB2-12			2" x 12" x 1/4"	20
GB2-18			2" x 18" x 1/4"	20
GB2-24			2" x 24" x 1/4"	14

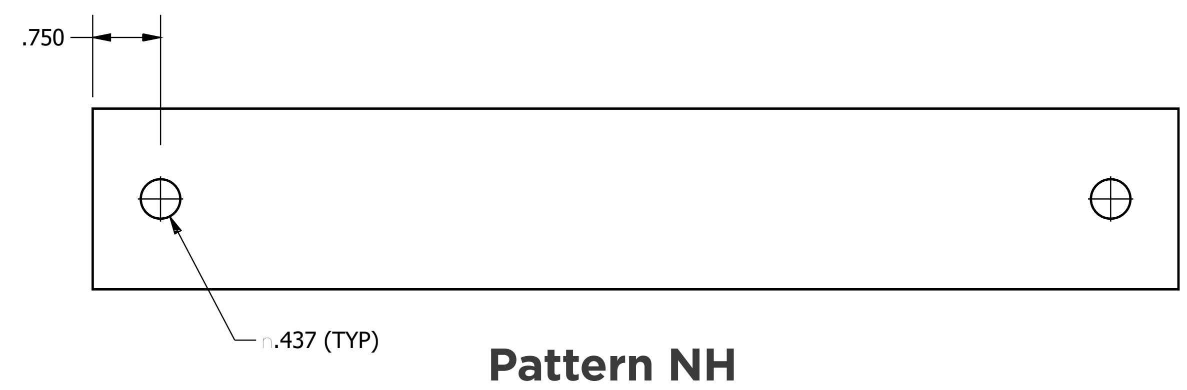
Pattern J				
Catalog Number	**Description**	**Tinned**	**Bar Size**	**# of Holes**
GB4-6	Bar with Insulators and Brackets	No	4" x 6" x 1/4"	11
GB4-12			4" x 12" x 1/4"	29
GB4-18			4" x 18" x 1/4"	20
GB4-20			4" x 20" x 1/4"	20
GB4-36			4" x 36" x 1/4"	20



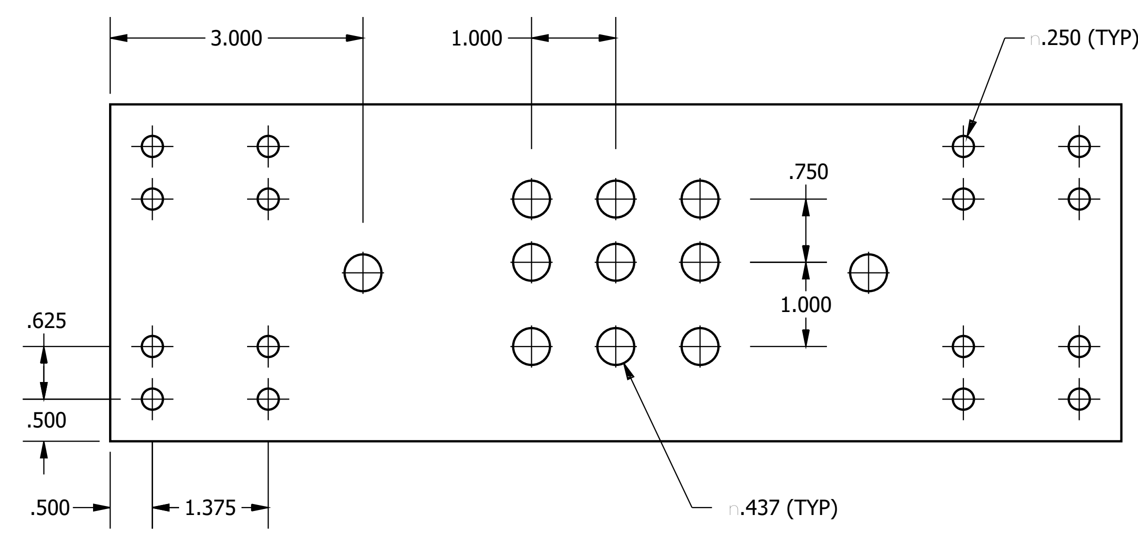
Pattern M



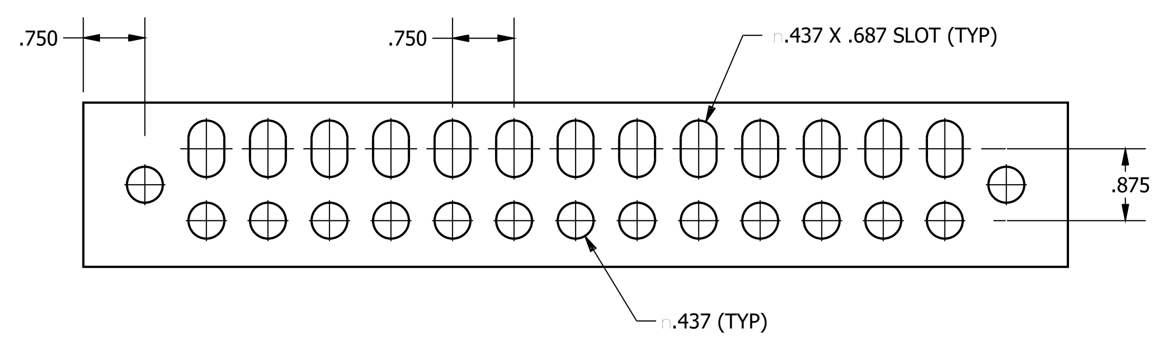
Pattern R



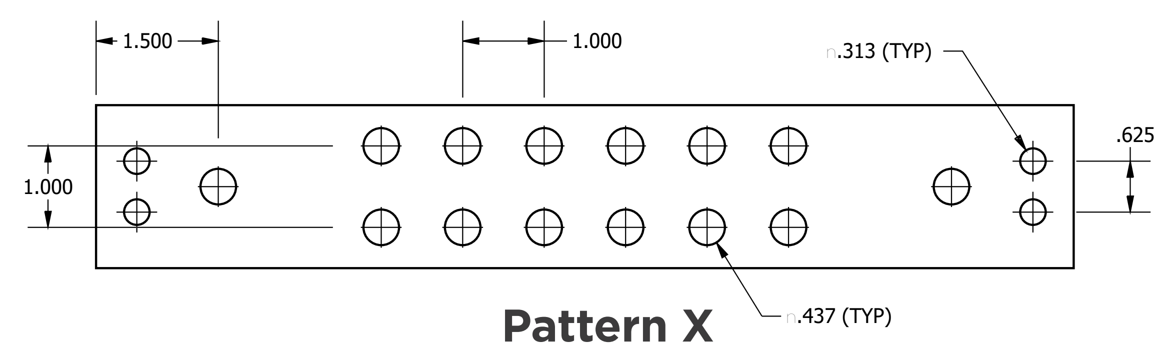
Pattern NH



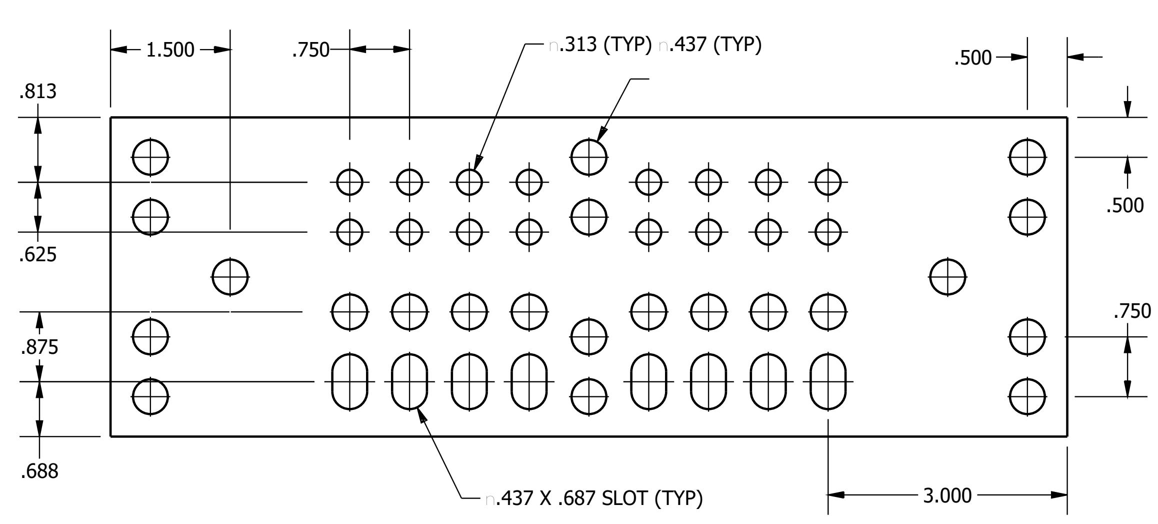
Pattern V



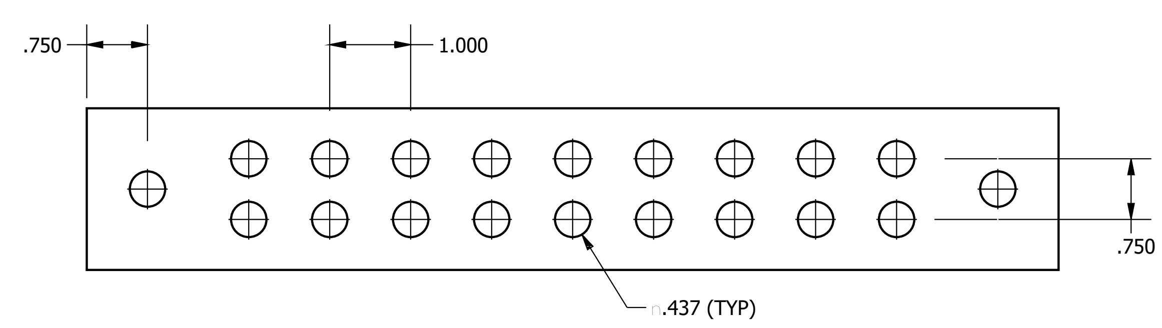
Pattern P



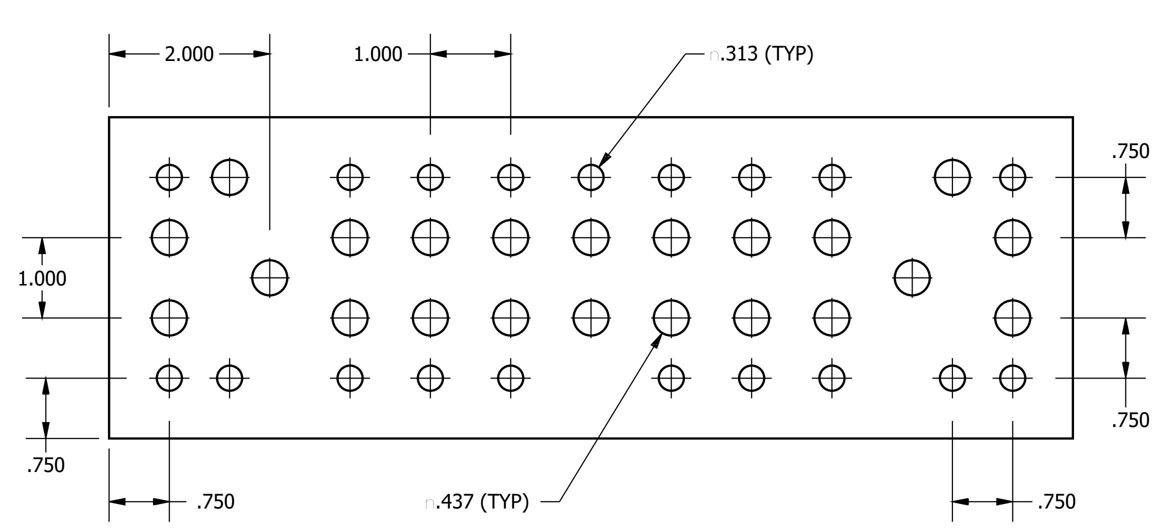
Pattern X



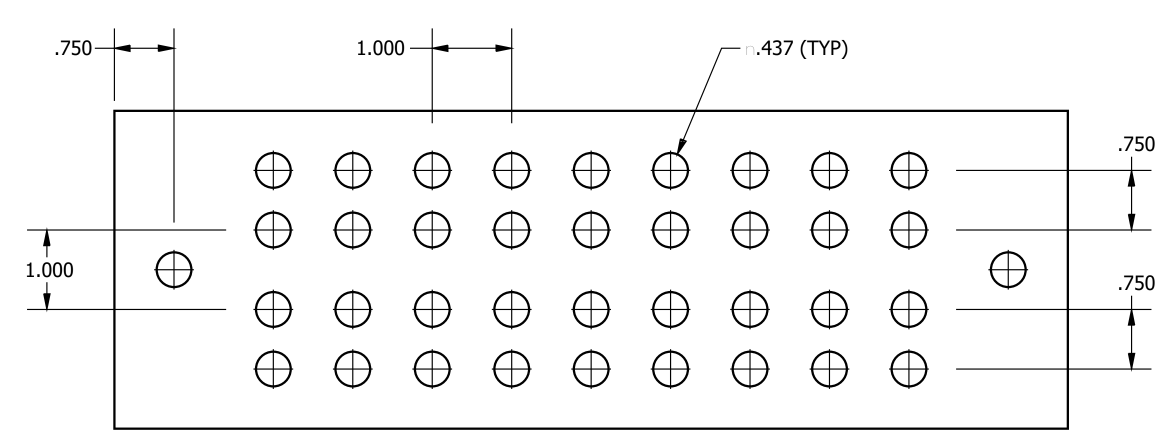
Pattern Q



Pattern Z



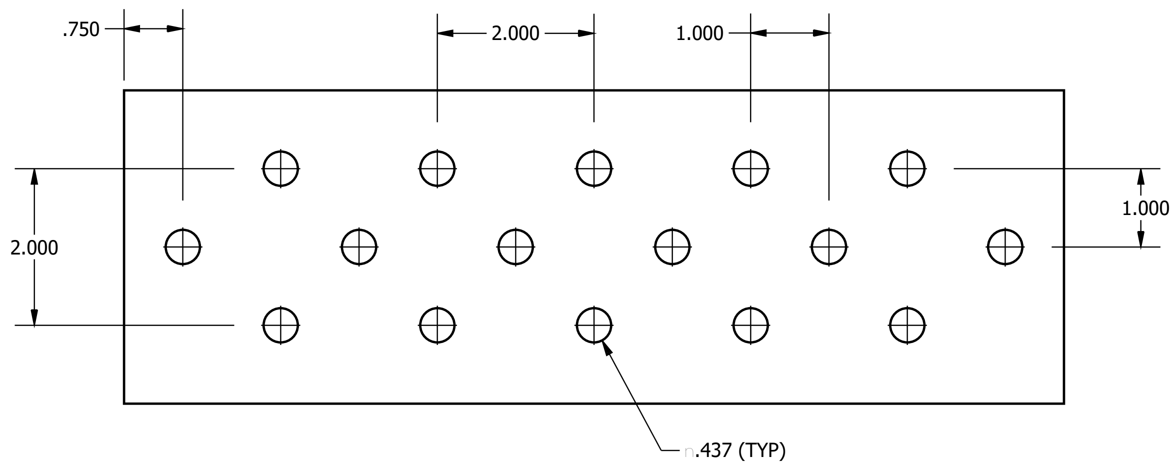
Pattern T



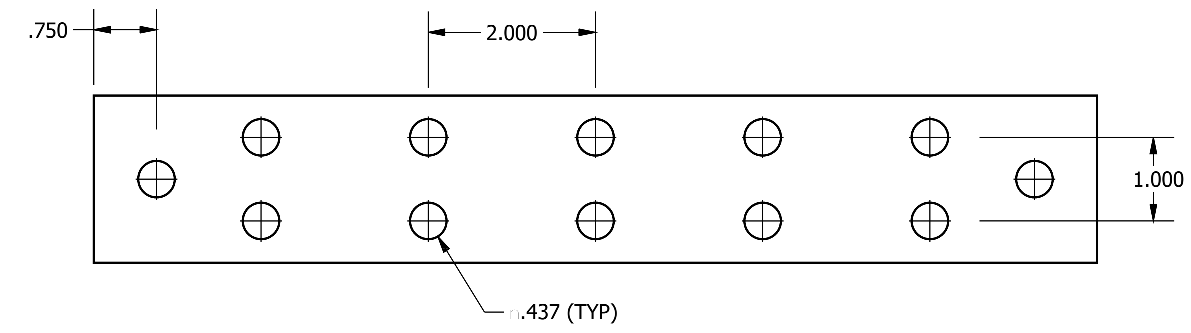
Pattern W

*For telecom ground bars -
See Pattern S on pages 7 & 8

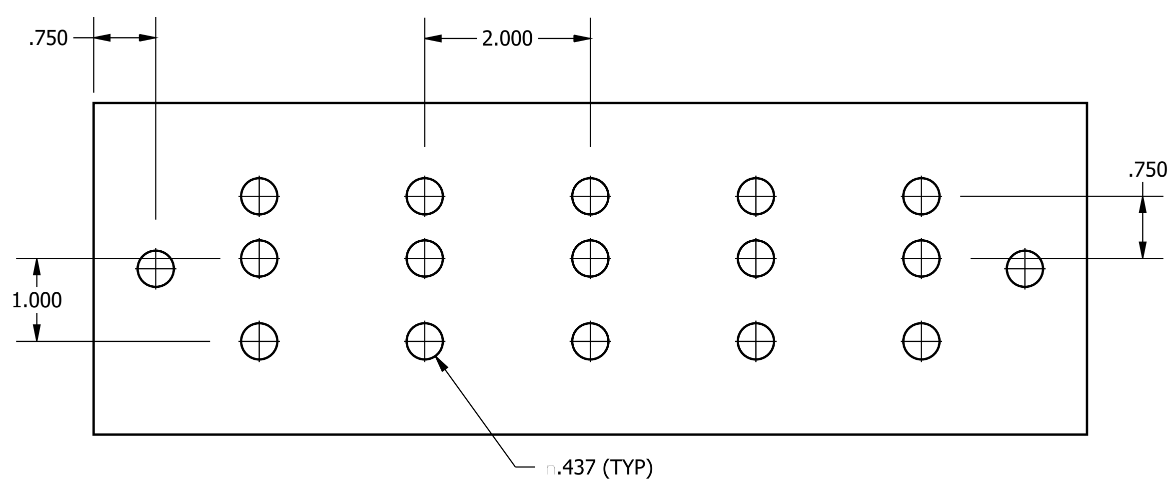
Custom Busbar Patterns Continues



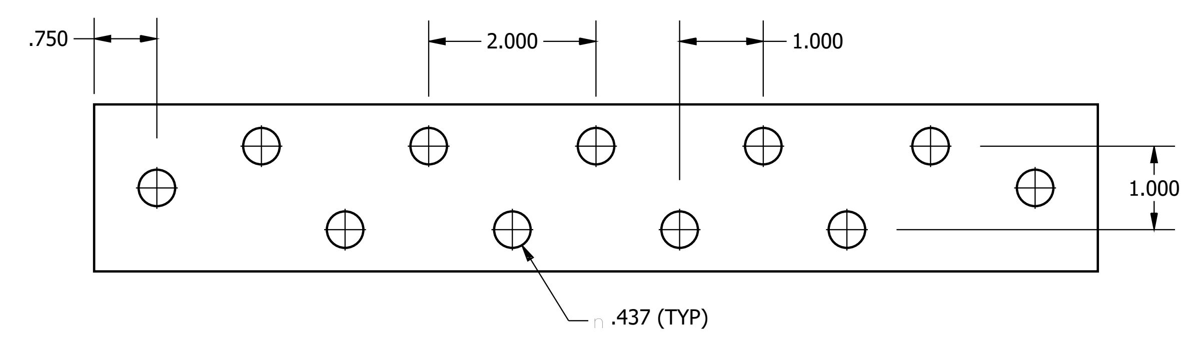
Pattern A



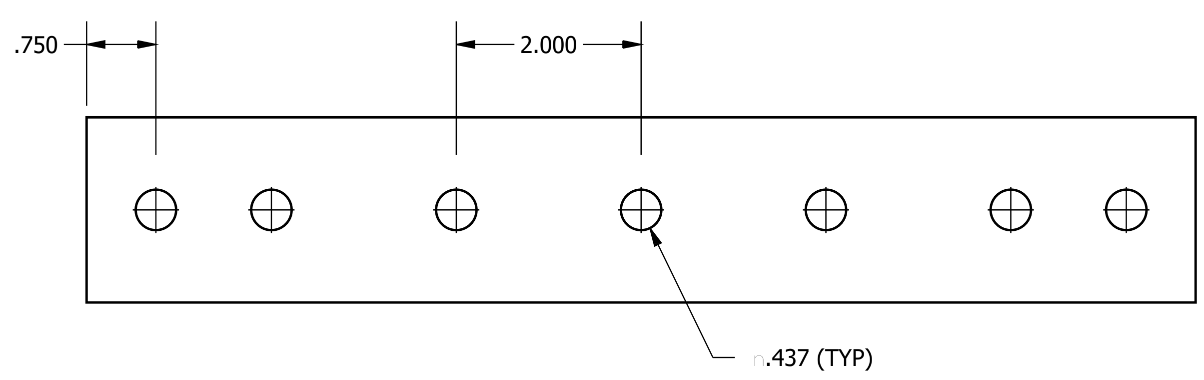
Pattern B



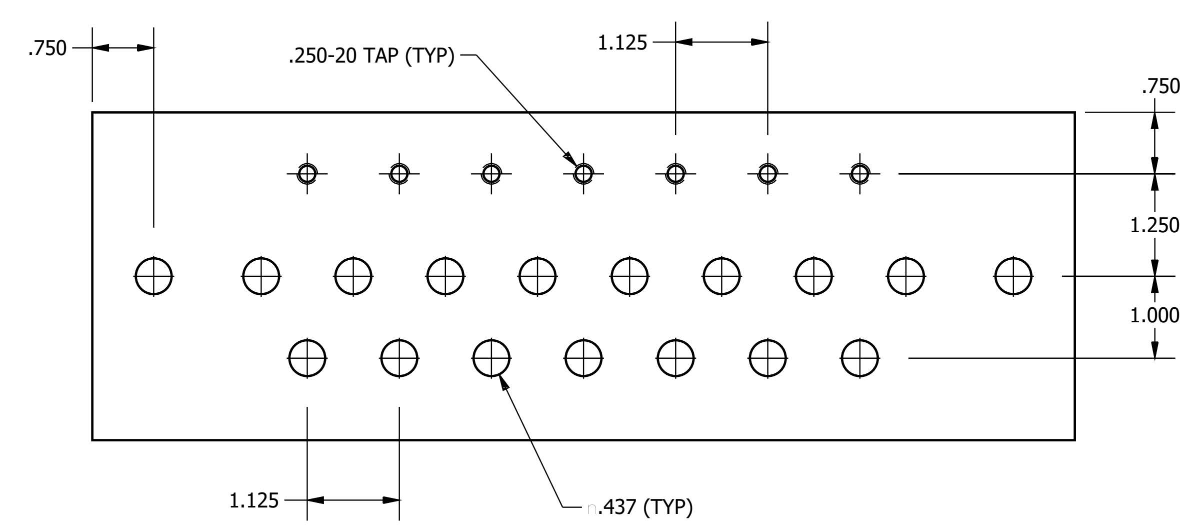
Pattern C



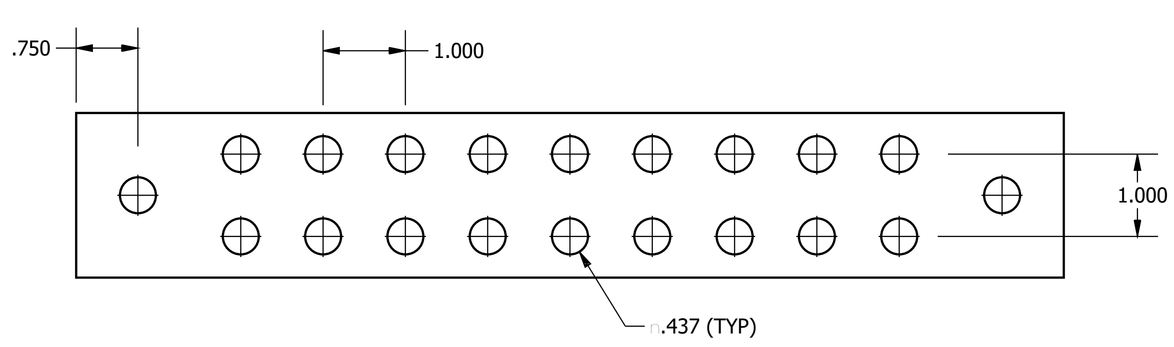
Pattern D



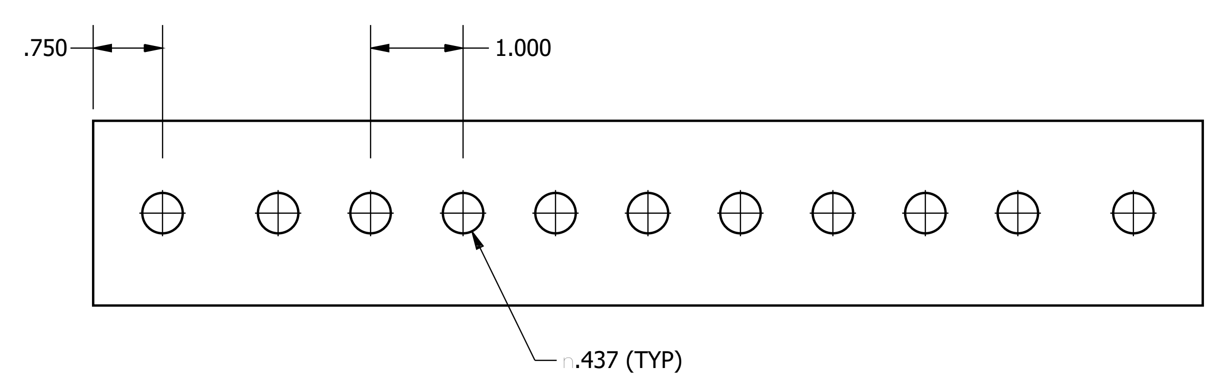
Pattern E



Pattern F

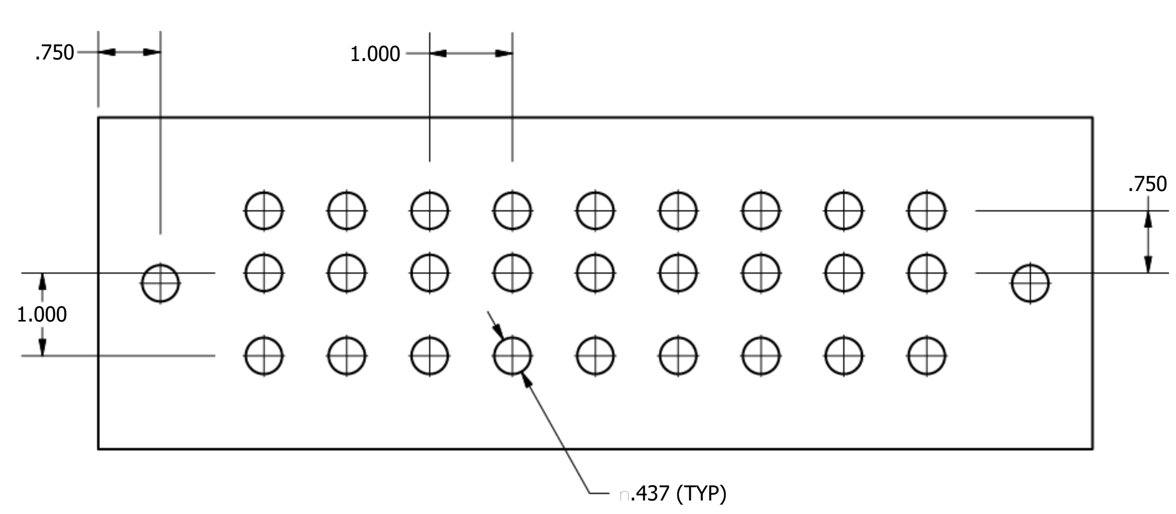


Pattern G



Pattern H

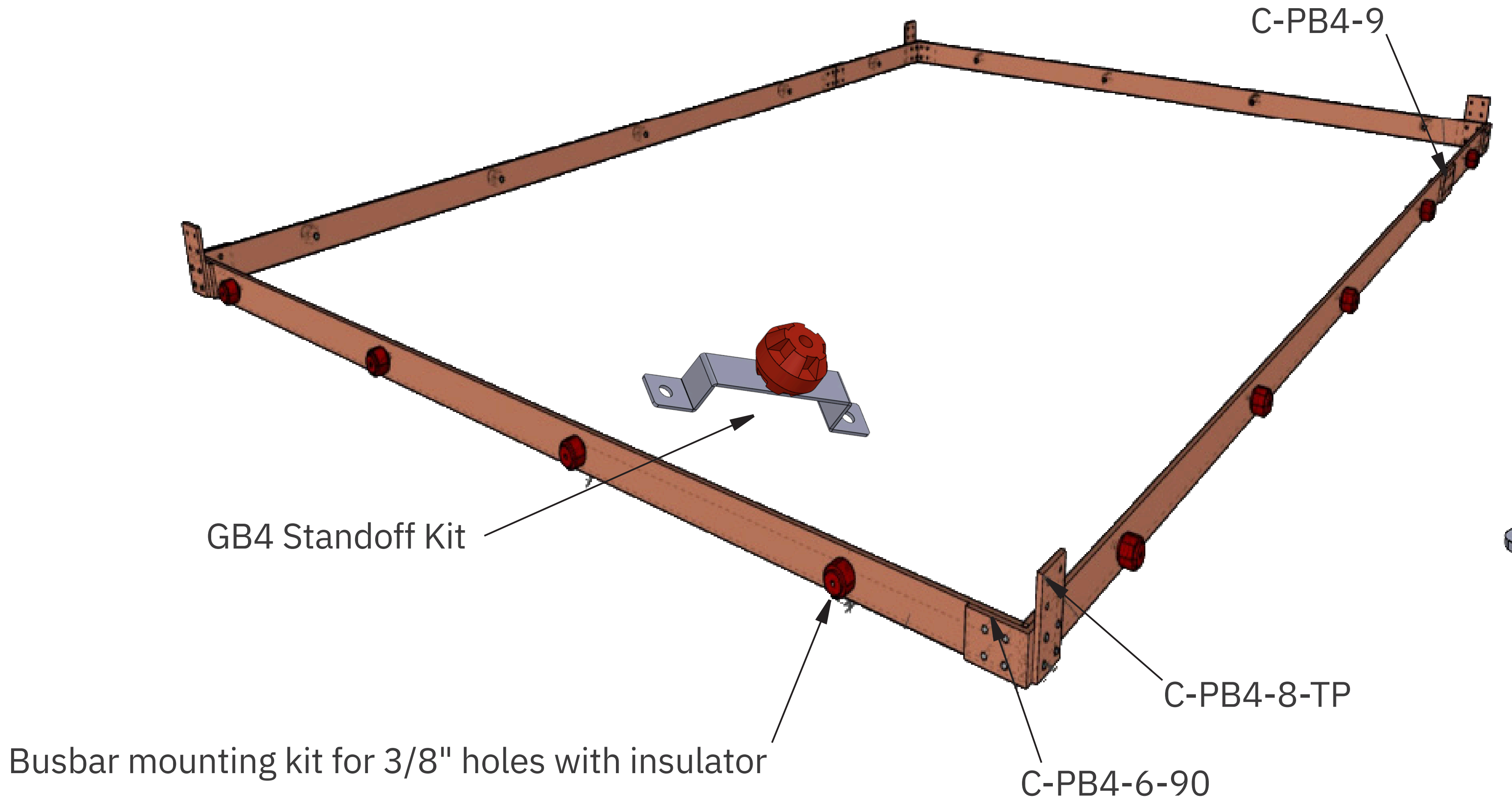
- All holes are 7/16" unless specified differently. To order threaded holes, specify hole size; the standard tapped hole size is 1/4"-20 unless specified otherwise.
- Above bar patterns represent a 12" ground bar.
- All bars are available with tin plating.
- For NEMA hole pattern ground bars see page 9.

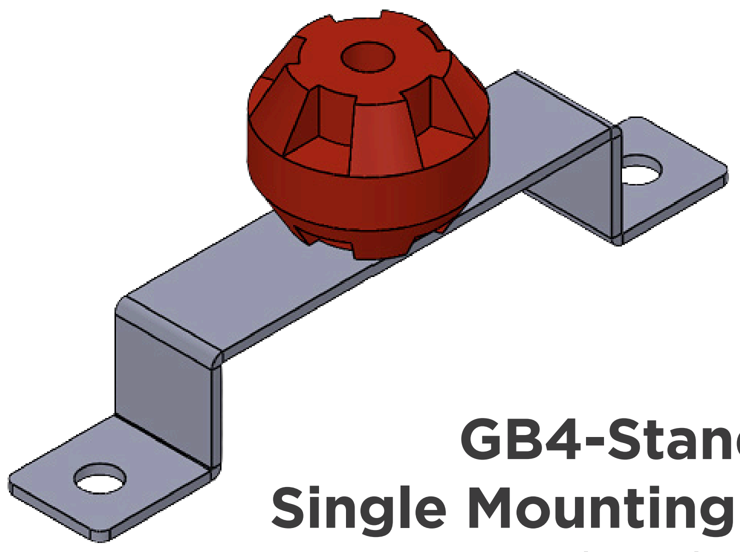


Pattern J

Room Perimeter Busbars

Typical complete perimeter copper grounding bus system assembly





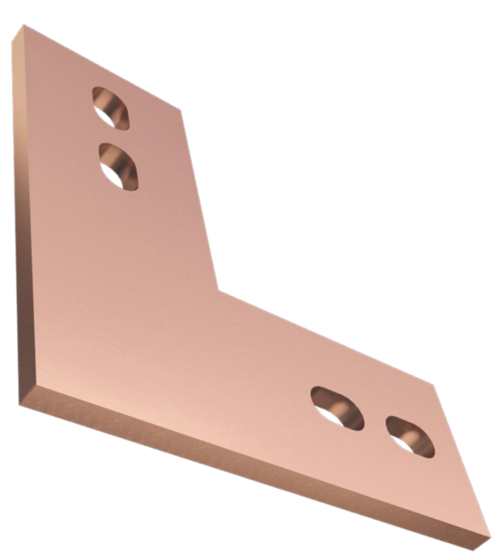
GB4-Standoff Kit
Single Mounting Assembly Set
(1 insulator, bracket and hardware necessary for a single set) Sold separately

Desciption (No Hole Patterns)

- A perimeter busbar system is designed to terminate ground wires and cables from equipment and other devices within a structure. The system encompasses straight bars, elbows, splicers, insulators and mounting brackets. This versatile system is great for clean rooms, data centers and laboratories when designing around corners and doors.

Perimeter Busbar Splices

Catalog Number	Description
C-PB2-6	2" Single axis splice plate
C-PB4-9	4" Single axis splice plate
C-PB2-4-90	2" 90° Horizontal splice plate
C-PB2-6-90	4" 90° Horizontal splice plate
C-PB2-5-L	2" 90° Vertical splice plate
C-PB4-8-TP	4" 90° Vertical splice plate

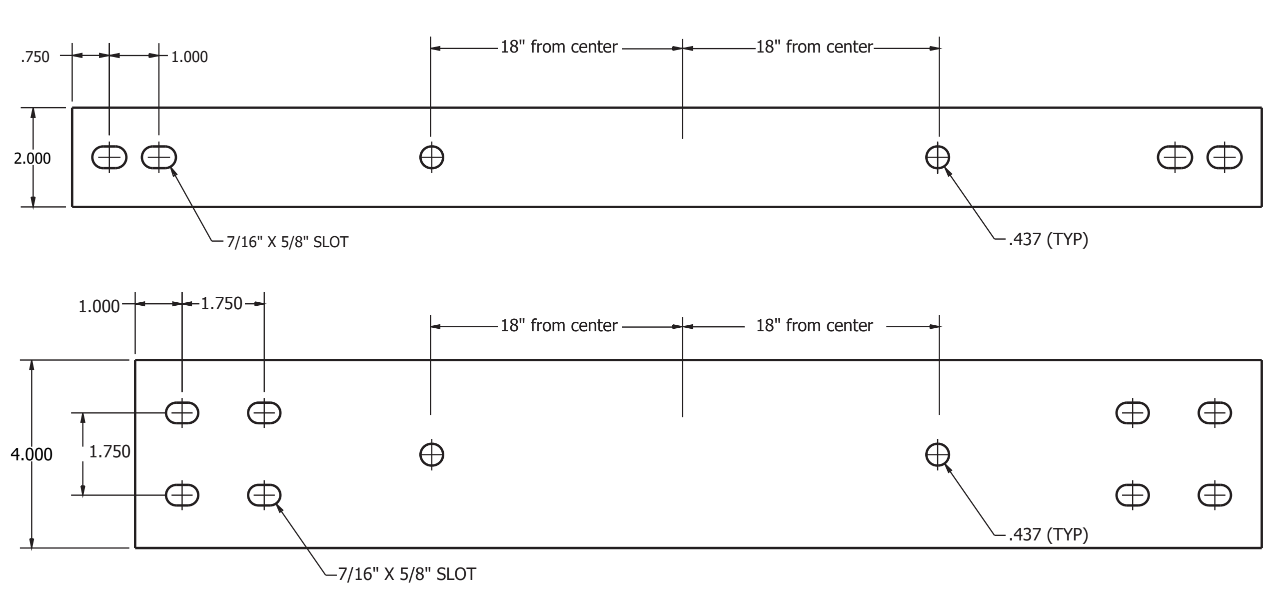


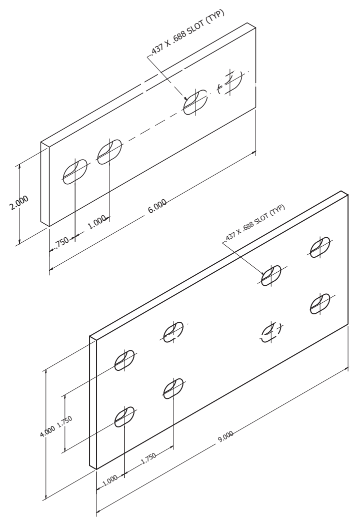
Flat 90 Degree Splice Plate (2")

Perimter Busbar Main Leaves

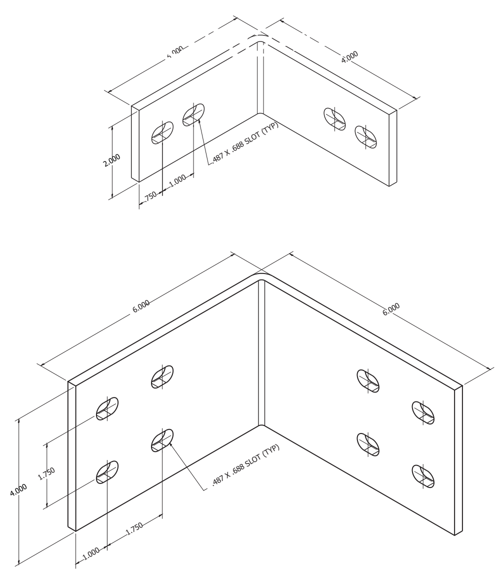
Catalog Number	Description
C-PB2-XX	2" Perimeter bar leaf
C-PB4-XX	4" Perimeter bar leaf

*No hole pattern except mounting holes.
Can be made to any length.

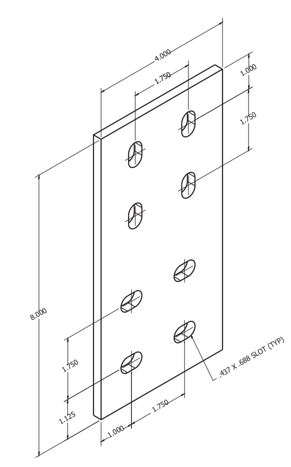




Single Axis Splice Plates



90 Degree Splice Plates



Flat 90 Degree Splice Plates (4"-6")

Custom Busbar Patterns Continues

Calculating the ampacity of a busbar is very complex as it is dependent on several variables. Some of these variables include, but are not limited to, size and shape of bar, bar orientation, bar material, and other various operating environmental conditions such as ambient temperature, allowed operating temperature, and air flow (enclosure vs open free air or forced air convection), and AC vs. DC current.

Published data from the Copper Development Association is an excellent starting point for a quick reference table of standard bar sizes vs. common allowed temperature rises, as seen in industry. The table provides ampacities at three different temperature rises, 30°C, 50°C, and 65°C. The values shown in the table are based "on samples exposed for 60 days in an industrial environment". Some of the variables were fixed, such as 40°C ambient temperature, horizontal on edge orientation, AC current, and a bar emissivity of 0.4. To use the table, first determine your bar width as well as the allowed temperature rise. Then, look for the intersection of these two points on the table to determine the ampacity for that bar size under the specific operation conditions.

Bar Dimensions (Thickness x Width)	Example Catalog	30°C Rise (70° Operating Temp.)	50°C Rise (70° Operating Temp.)	50°C Rise (70° Operating Temp.)
1/4 x 1	CB14112	400	530	620
1/4 x 1.5	CB141.512	560	740	860
1/4 x 2	CB14212	710	940	1100
1/4 x 3	CB14312	990	1150	1550
1/4 x 4	CB14412	1250	1700	1950
1/4 x 6	CB14612	1750	2350	2700

On the following page, you will find the set of equations, derivations, and variables (based on the governing equation in the above data sheet) you can use to calculate the ampacity of the busbar. Simply determine your operating conditions and assumptions and modify the necessary variables. The following sample equation is for a 1/4" thick, 4" wide and 12" long bar, oriented horizontally on edge, with a 40°C ambient temperature, 30°C temperature rise, DC current, and assumed variable values.

*Calculated values might differ slightly from the values shown in the Copper Development Association table, as variables and assumptions might be different and calculated values are theoretical, where values in the Copper Development Association table are experimental, based on actual samples.

For a more complete list of ampacities based on bar size and temperature rises, please visit the Copper Development Association: https://www.copper.org/applications/electrical/busbar/bus_table1.html

Calculating thermal energy produced and thermal energy dissipated

- $E_{in} = I_2 \times R$
  - I = current
  - R = resistance = $\frac{\rho L}{A_c}$
  - ρ = resistivity of the conductor
  - L = length of conductor
  - A_c = cross sectional area of the conductor
- $E_{out} = Q_{conv} + Q_{rad}$
  - Q_{conv} = heat disputed due to convection
  - Q_{rad} = heat disputed due to radiation

Calculating heat dissipation via convection

- $Q_{conv} = [h_v * A_v * (T_c - T_a)] + [h_{ht} * A_{ht} * (T_c - T_a)] + [h_{hb} * A_{hb} * (T_c - T_a)]$
  - h_v = vertical convection coefficient of free air $\frac{W}{m^2K}$
  - h_{ht} = horizontal convection coefficient of top surface of free air $\frac{W}{m^2K}$
  - h_{hb} = horizontal convection coefficient of bottom surface of free air $\frac{W}{m^2K}$
  - A_v = vertical surface of conductor (m_2)
  - A_{ht} = top horizontal surface area of conductor (m_2)
  - A_{hb} = bottom horizontal surface area of conductor (m_2)
  - T_a = ambient temperature (K)
  - T_c = conductor operating temperature (K)

Calculating heat dissipation via radiation

- $Q_{rad} = \sigma \times e\ (T_{c4} - T_{a4}) \times A$
  - σ = Stefan – Boltzmann Constant = 5.6073 x 10 – 8 ($\frac{W}{m^2K}$)
  - e = emmisivity (material property)
  - T_c = conductor operating temperature (K)
  - T_a = ambient temperature (K)
  - A = surface area of conductor (m_2)

Calculating ampacity

- $E_{in} = E_{out}$
- $I^2 \times R = Q_{rad} + Q_{conv}$

  $I^2 = \frac{Q_{rad} + Q_{conv}}{R}$
- $$I = \sqrt{\frac{\sigma \times e\,(T_c - T_a) \times A) + [h_v * A_v * (T_c - T_a) + [h_{ht} * A_{ht} * (T_c - T_a)] + [h_{hb} * A_{hb} * (T_c - T_a)]}{\frac{\rho L}{A_c}}}$$

Where:

σ = Stefan – Boltzmann Constant = 5.6073 x 10 – 8

ρ = resistivity (70°C operating temp.) = 2.0524 x 10_{-8} ohm (m)

L = length of conductor = 0.3048 m

A_c = cross section area of the conductor = 0.00064516 m_2

H_v = vertical convection coefficient of conductor = 5.5262

H_{ht} = horizontal convection coefficient of top surface of free air = 0

H_{bt} = horizontal convection coefficient of bottom surface of free air = 0

A_v = vertical surface area = 0.063266 m_2

A_{ht} = horizontal surface area of top surface of conductor = 0.001935 m_2

A_{bt} = horizontal surface area of bottom surface of conductor = 0.001935 m_2

T_{amb} = ambient temperature = 313.15 (K)

T_{cond} = conductor temperature = 343.15 (K)

e = emissivity = 0.4

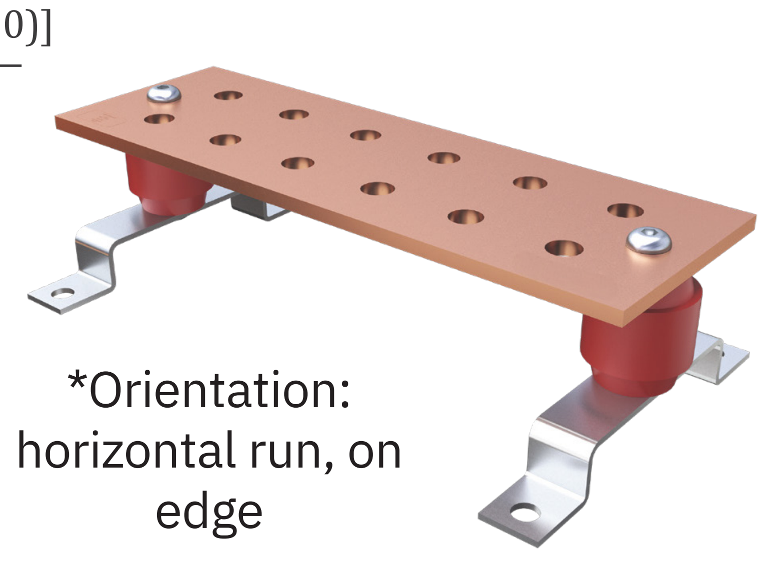
A = surface are of conductor = 0.067097 m_2

***For this example bar size and application, H_{ht} and H_{hb} are both 0 due to small surface area.**

$$I = \sqrt{\frac{(5.6703 \times 10_{-8} \times 0.4\,(343.15^4 - 313.15^4) \times 0.0670966) + [5.5262 * 0.063226 * (30)] + [0 * 0.001935 * (30)] + [0 * 0.001935 * (30)]}{\frac{(2.0524 \times 10_{-8}) \times 0.3048}{0.000645516}}}$$

$$I = \sqrt{\frac{(6.4666) + [10.4820]}{9.6966 \times 10^{-6}}}$$

$$I = 1,322.08$$



*Orientation: horizontal run, on edge