CRITICAL ELEMENTS FOR CORRECT CLIMATE CONTROL DESIGN FOR ELECTRICAL PANELS

Thermal exchange surfaces

In this WHITE PAPER the goal is to provide a method to determine the unknown not yet treated and present in the formula for calculating thermal dissipations through the electrical cabinet: **the wall exposure surface towards the installation environment.**

Ai[m^2] indicates the i-th surface of each exposed wall. In fact, in the context of electrical panels, the exchange surfaces with the environment must be multiplied by specific corrective coefficients, which depend both on the walls considered and on the layout of the cabinet in space.

Referring to the case, we indicate the dimensions in **[mm]**, defining:

- **L** = width;
- **H** = height,
- **P** = depth.

We list 12 possible layouts of the electrical cabinets in space, the calculation formulas of the total surface A [m^2] is shown with the relative correction coefficients for each:

1) Single cabinet, free on all walls

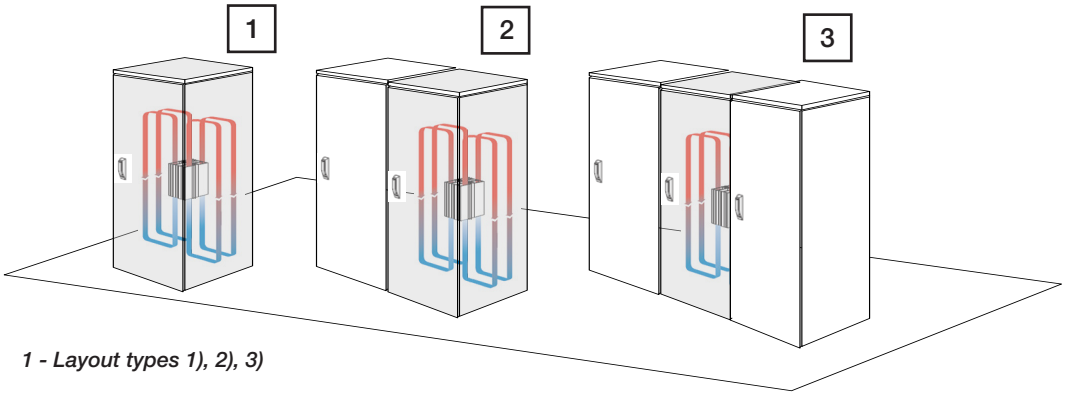
$$A[m^2]= \frac{1.8*H*(L+P)+1.4*L*P}{1000000}$$

2) First or last cabinet, with one wall in contact

$$A[m^2]= \frac{1.4*P*(L+H)+1.8*L*H}{1000000}$$

3) Central cabinet, with two walls in contact

$$A[m^2]= \frac{1.8*L*H+1.4*L*P+P*H}{1000000}$$



1 - Layout types 1), 2), 3)

4) Single wall cabinet

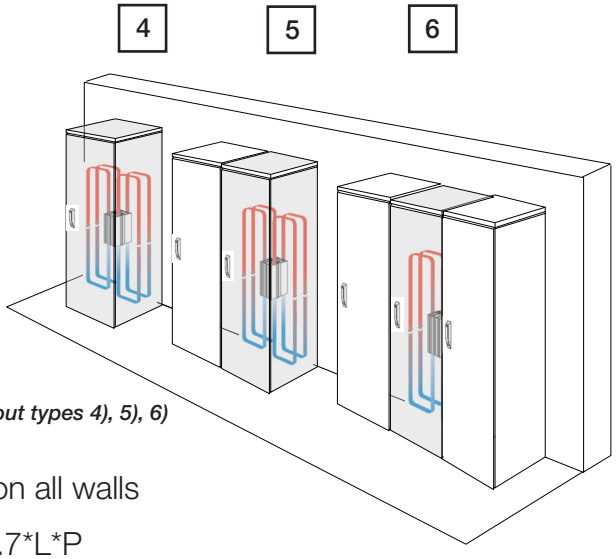
$$A[m^2] = \frac{1.4*L*(H+P)+1.8*P*H}{1000000}$$

5) First or last wall cabinet

$$A[m^2] = \frac{1.4*H*(L+P)+1.4*L*P}{1000000}$$

6) Central wall cabinet

$$A[m^2] = \frac{1.4*L*(P+H)+P*H}{1000000}$$



2 - Layout types 4), 5), 6)

7) Single cabinet with cover, free on all walls

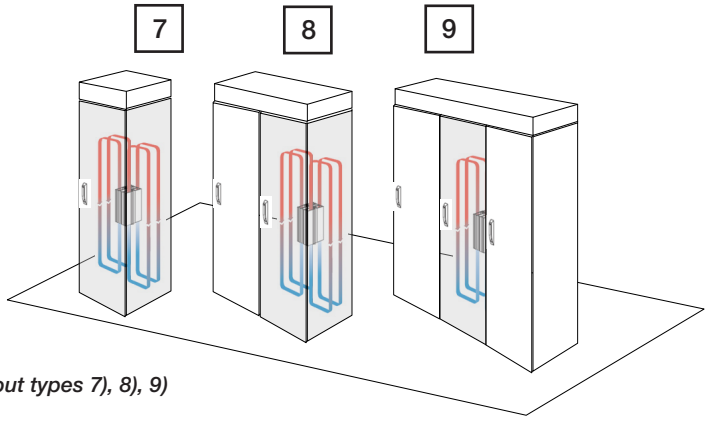
$$A[m^2] = \frac{1.8*H*(L+P)+0.7*L*P}{1000000}$$

8) First or last cabinet with cover, with one wall in contact

$$A[m^2] = \frac{1.4*P*H+1.8*L*H+0.7*L*P}{1000000}$$

9) Central cabinet with cover, with two walls in contact

$$A[m^2] = \frac{1.8*L*H+0.7*L*P+P*H}{1000000}$$



3 - Layout types 7), 8), 9)

10) Single cabinet with cover, on the wall

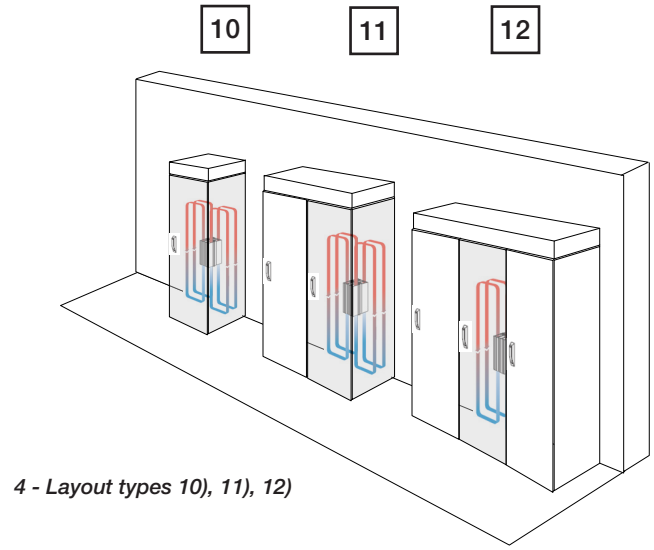
$$A[m^2]= \frac{1.4*L*H+1.8*P*H+0.7*L*P}{1000000}$$

11) First or last cabinet with cover, on the wall

$$A[m^2]= \frac{1.4*H*(L+P)+0.7*L*P}{1000000}$$

12) Central cabinet with cover, on the wall

$$A[m^2]= \frac{1.4*L*H+0.7*L*P+P*H}{1000000}$$



4 - Layout types 10), 11), 12)

In each project, the actual layout of the cabinets must be inserted for the correct calculation of the thermal exchange surface. The coefficients used result in a smaller exchange surface than the geometric one of the cabinet, since they take into account any physical barriers and secondary factors, which reduce the maximum transfer of power theoretically possible.

Once the heat exchange surfaces are also determined, it is possible to determine the numerical value of the thermal dissipations of the electrical cabinet, as will be summarised in the final WHITE PAPER.

Davide Rocca
Alberto Tonietti