



**ABB S.p.A.**

ABB SACE Division

DOC3 – Software instructions for designing segregated enclosures

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# New mask for the management of automatic segregation functionality for 2a, 3a, 3b and 4b form switchboards

## General information about the new mask and meaning of automatic spread of segregation

A switchboard segregation requires an appropriate evaluation of the following points:

- 1- segregation of all horizontal busbar systems (forms 2b, 3b and 4b)
- 2- closure of open slots on plates layer with appropriate plates and/or segregation cells, simple or for horizontal and vertical context (forms 2 a, 3 a, 3b and 4b)
- 3- possible transformation of DIN panels and simply segregated instruments into horizontal or vertical context segregated (forms 3b and 4b)

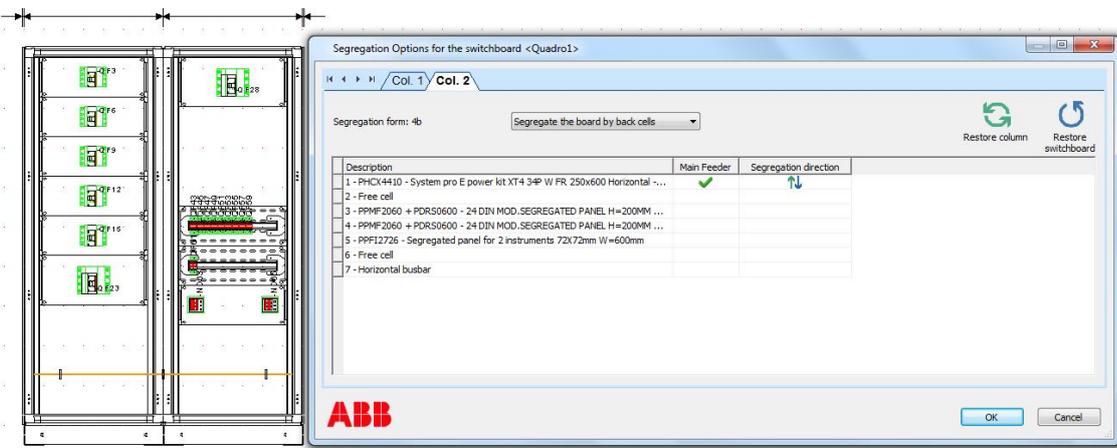
New DOC release contains a specific functionality for automatic completion of these tasks.

It is activated by the button hooped on the following picture:



Each molded case and air circuit breaker device, mounted on the switchboard, is featured by an its own segregation method for horizontal or vertical context.

On each column, user will decide whether to confirm the proposal made by the software, in the empty spaces above or under of a device, of the propagation of the same segregation method the device itself.



Abreast all the horizontally mounted devices, is admissible, both for 3b and in 4b forms, to choose for double indicator upward or downward.

Concerning vertically mounted devices, double indicator is admissible only for 4b form and, in case of main circuit breaker, for 3b form. The role of main circuit breaker could be assigned by the user, modifying the software proposal.

**Important note:** even in 3b form, all kits mounting devices with the property of main circuit breaker, have related accessories of the form 4b.

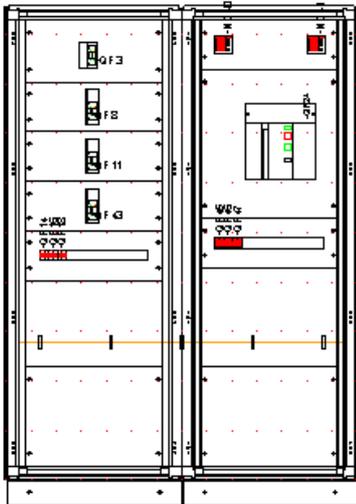
The specific segregation mask requires the user to choose how to proceed in automatic segregation of each column: by using segregated plates or cells.

For mask utilization brief, refers to examples in the following paragraph and in chapters relative to 2a, 3a, 3b and 4b forms segregations.

### Utilization example of automatic segregation spread new functionality

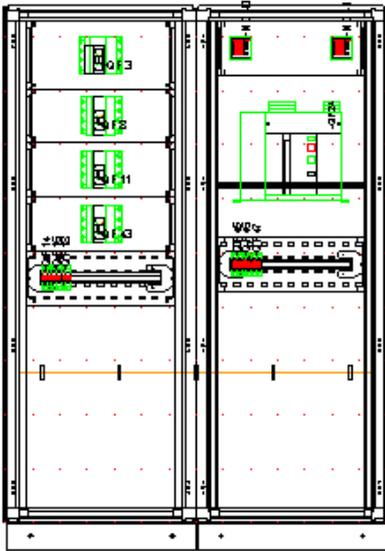
Following an example of a 4b form segregated switchboard.

“Wizard” function and some manual adjustments, allow to define the front view switchboard.



4b form segregation requires an appropriate completion of the switchboard in plates layer.

In the following picture is described the starting situation, before applying the new automatic segregation mask.

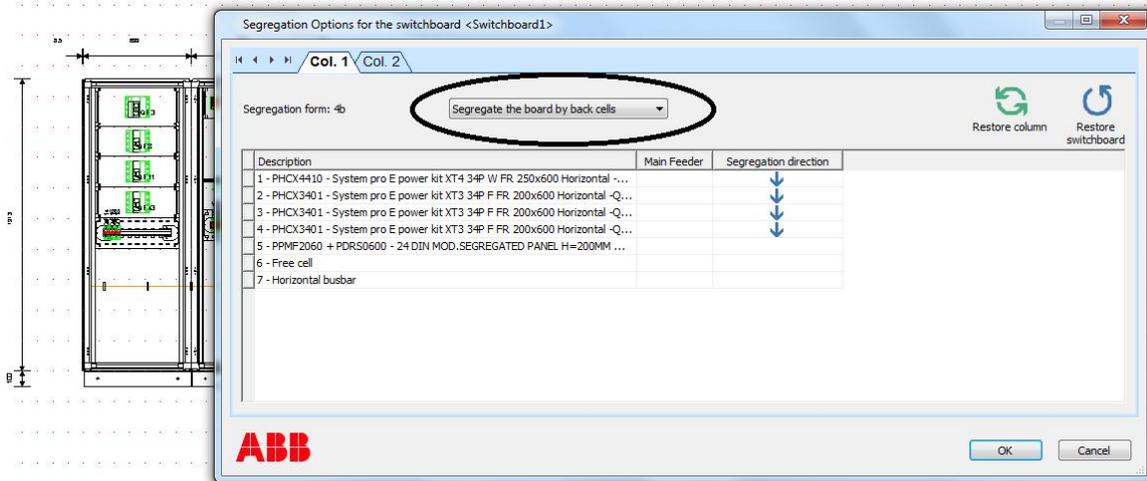


Applying the new automatic segregation functionality on the switchboard, the mask for automatic segregations management is opened.

On the first column are installed horizontally mounted breakers so, the functionality will complete downward the segregation with horizontal context cells (following the direction of indicators) till the intersection with horizontal busbar system.

DIN panel under the horizontal kit also, would be turned into a DIN kit segregated for horizontal context mounting.

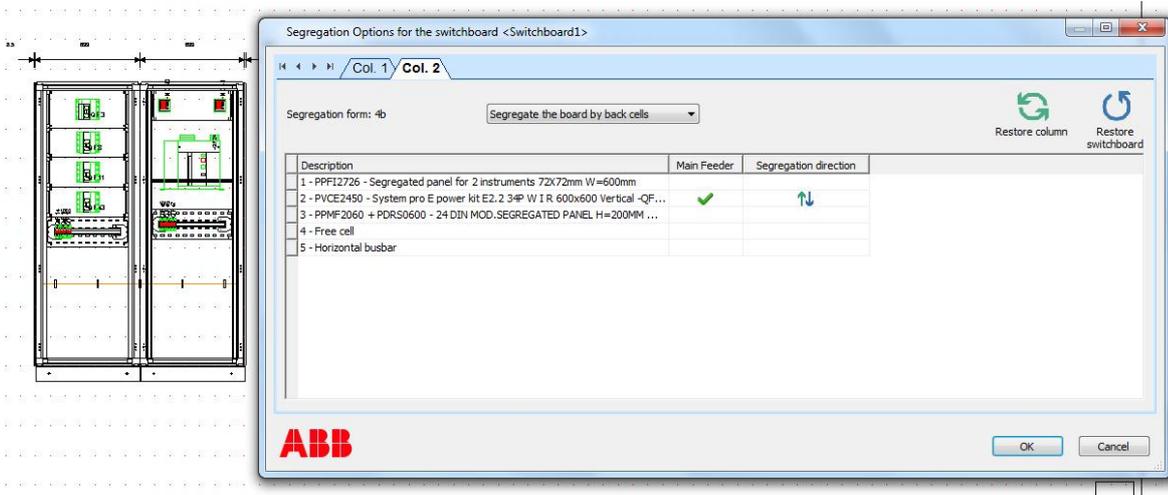
Under the horizontal busbars system, will be introduced simple segregated cells.



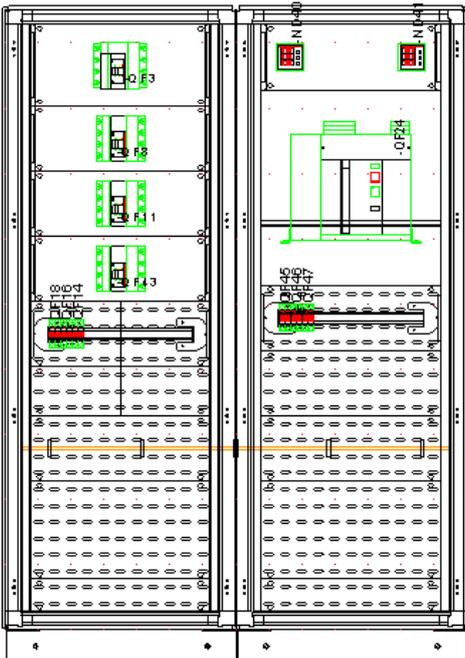
On the second column instead, is installed a main circuit breaker vertically mounted: the automatic functionality will complete the segregation with vertical context cells (both upward and downward, as declared by the indicators) till the intersection with horizontal busbar system.

As well, DIN panel under the vertical kit and instruments panel over it, would be turned into corresponding kit for vertical context mounting.

Under horizontal busbar system would be introduced simple segregated cells.



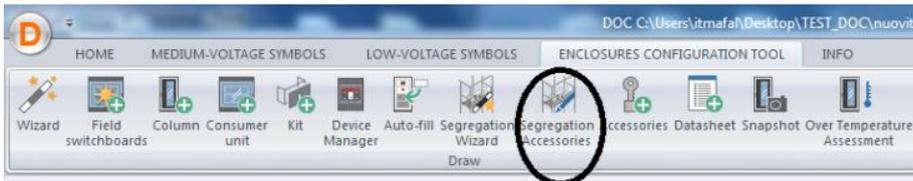
The result achieved is the whole closure of the switchboard even in plates layer, as form 4b demanded.



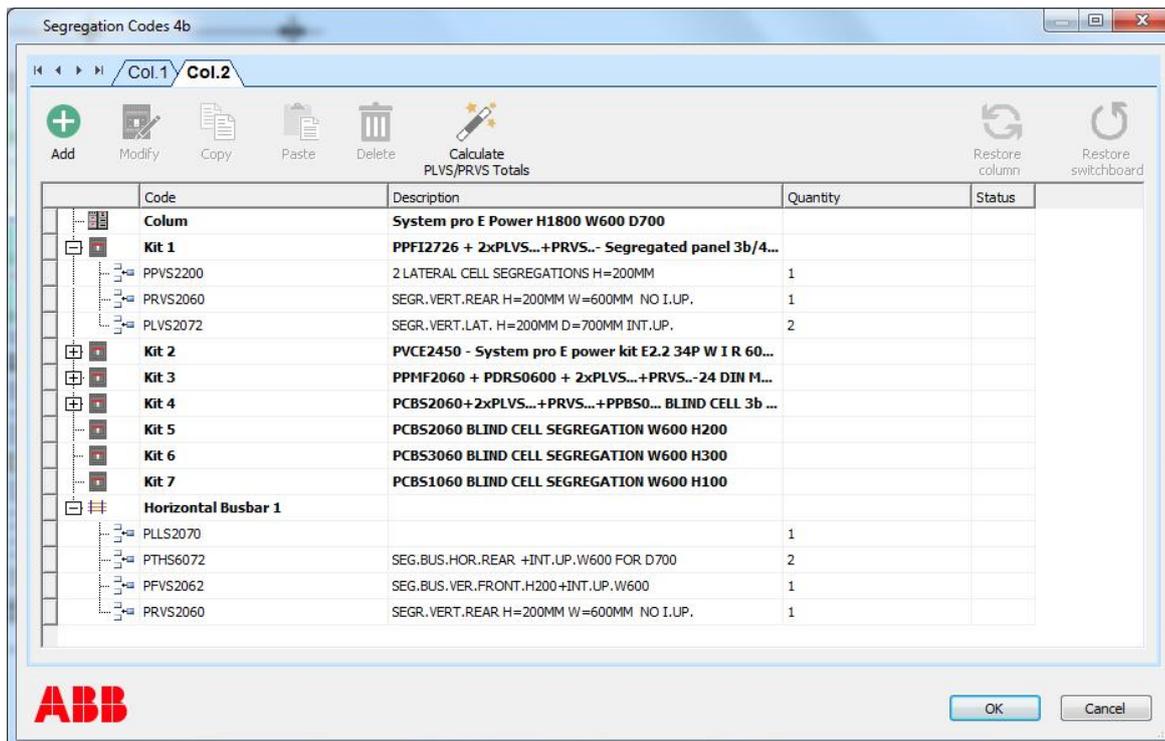
## New mask for the management of main segregation codes for all segregated switchboards

### General information about the new mask

The new mask activates with a click on the button hooped in the following picture.



It allows a detailed control of segregation codes put in each column.



Segregation codes are organized according to the following items:

- Accessories for the segregation of the column;
- Accessories for kit for devices mounting;
- Accessories for segregated cells and plates for simple, vertical or horizontal context;
- Accessories for the segregation of horizontal and vertical busbar systems.



Each code is manually erasable, modifiable or copyable. Is allow to add new segregation codes, beneath already existing nodes.

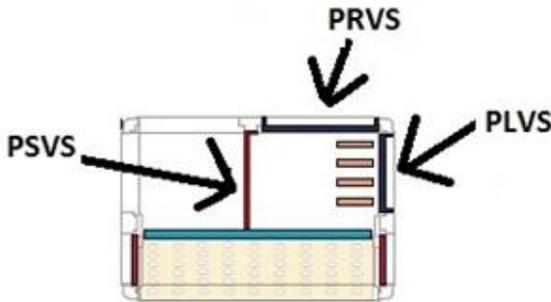
Reset functionality will cancel all user - changes and retrieve the codes list to the original situation.

### Automatic activation of PLVS function on each kit

All horizontal kits and segregation kits 3b and 4b forms for horizontal context, are characterized for the PLVS property, that admits YES or NO values.

Code	Description
Colum	System pro E Power H1800 W600 D700
Kit 1 (Property: PLVS = No)	PHCX4410 - System pro E power kit XT4 34P W FR 250...
Kit 2 (Property: PLVS = No)	PHCX3401 - System pro E power kit XT3 34P F FR 200...
Kit 3 (Property: PLVS = No)	PHCX3401 - System pro E power kit XT3 34P F FR 200...
Kit 4 (Property: PLVS = No)	PHCX3401 - System pro E power kit XT3 34P F FR 200...
Kit 5 (Property: PLVS = No)	PPMF2060 + PDRS0600 +PSVS...+PLVS...+PRVS...-24 DL...
Kit 6 (Property: PLVS = No)	PCBS1560+ PSVS0+PLVS...+PRVS...+PPBS0... 3b or 4...
Kit 7	PCBS2060 BLIND CELL SEGREGATION W600 H200
Kit 8	PCBS3060 BLIND CELL SEGREGATION W600 H300
Kit 9	PCBS1060 BLIND CELL SEGREGATION W600 H100
Horizontal Busbar 1	

The value YES for property PLVS, stands for the presence on the kit of the segregation device shown in the picture below (seen from above):

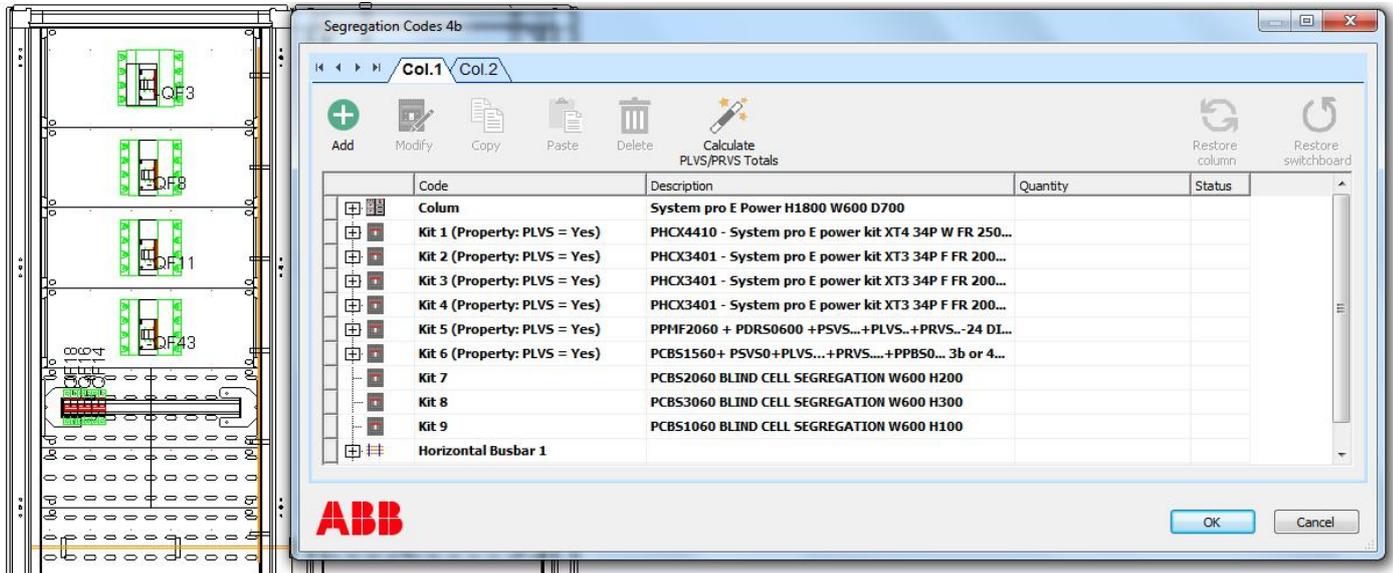


Setting can be manually made / modified on each kit with a click on the right mouse button.

Code	Description
Colum	System pro E Power H
Kit 1 (Property: PLVS = No)	PHCX4410 - System p
Kit 2 (Property: PLVS = No)	PHCX3401 - System p
Kit 3 (Property: PLVS = Yes)	PHCX3401 - System p
Kit 4 (Property: PLVS = No)	PPMF2060 + PDRS0600 +PSVS...+PLVS...+PRVS...-24 DL...
Kit 5 (Property: PLVS = No)	PCBS1560+ PSVS0+PLVS...+PRVS...+PPBS0... 3b or 4...

Context menu for Kit 4:  Use PLVS accessories

The presence of a vertical system aside structure in a column, gives value YES to all PLVS properties in the column.



### Automatic replacement functionality PRVS/PLVS partial height with total height

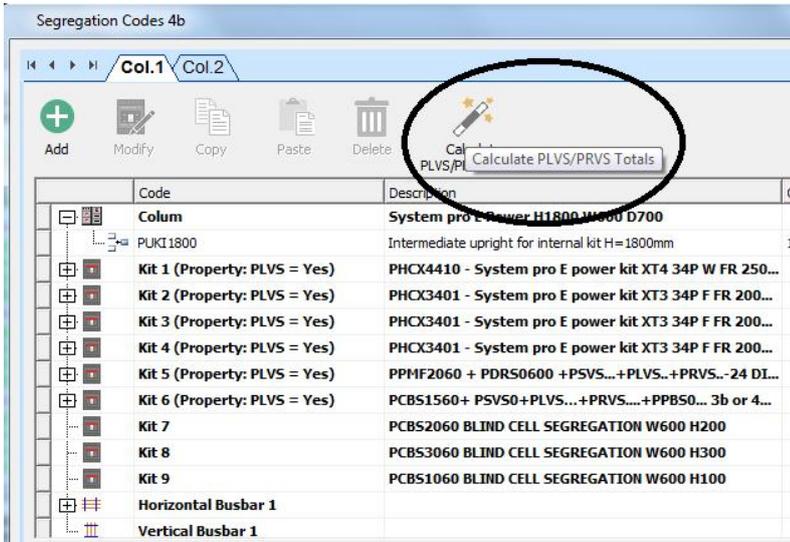
Aimed to reduce the cost of segregation accessories being mounted in 3b and 4b forms, is possible to decide upon the replacement of PRVS/PLVS codes in the kits, with corresponding increased-height codes that can accomplish PRVS/PLVS function on more kits at the same time.

This functionality works only in presence of:

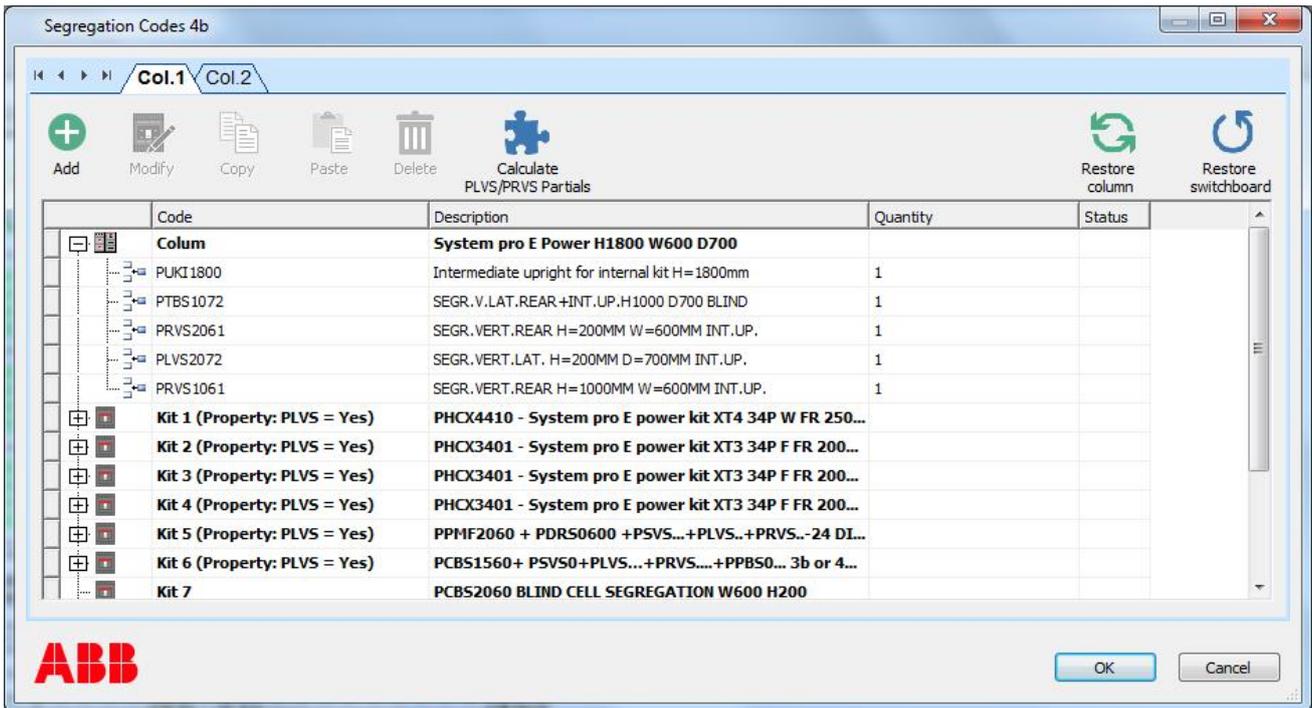
- Horizontal kits;
- Segregation plates/cells in horizontal context;
- DIN kit and customized instruments panel for a horizontal context segregation.

Obviously, PLVS replacement functionality works only on kit with PLVS value YES.

In the following picture is circled the button for activation of that functionality.



PRVS/PLVS total height codes, are introduced beneath column node, meanwhile corresponding accessories in single kits are deleted.



A click on one of the buttons circled in the picture, will restore the starting situation, canceling the PRVS/PLVS replacement.

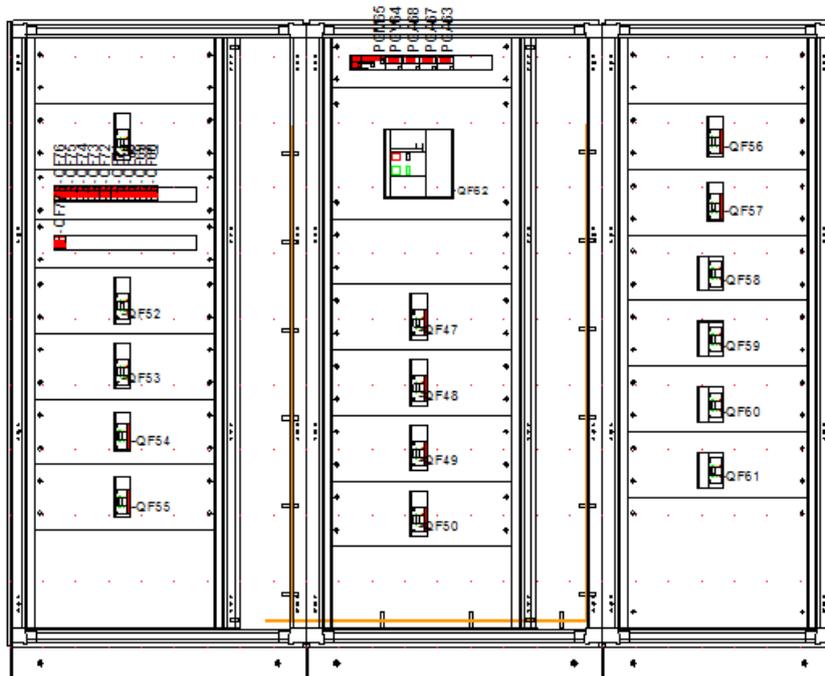


## E Power form 2b

### Standard solution

Wizard inserts the devices in the context of E Power columns.

Automatically the software combines kits and devices, verifying the compatibility between the type of the terminals and the required segregation form.



All the mounting kits related to moulded case or air circuit breakers placed in the enclosure are automatically completed with the necessary segregation items (rubber covers, items PPRS..., for molded case circuit breakers, specific segregations for Emax 2 with rear terminals).

If the expected segregation solution is compatible with the mounting of devices with front terminals, automatically the software provides to complete the equipment for the molded case circuit breakers with dedicated high terminal covers (related to device's type and configuration).

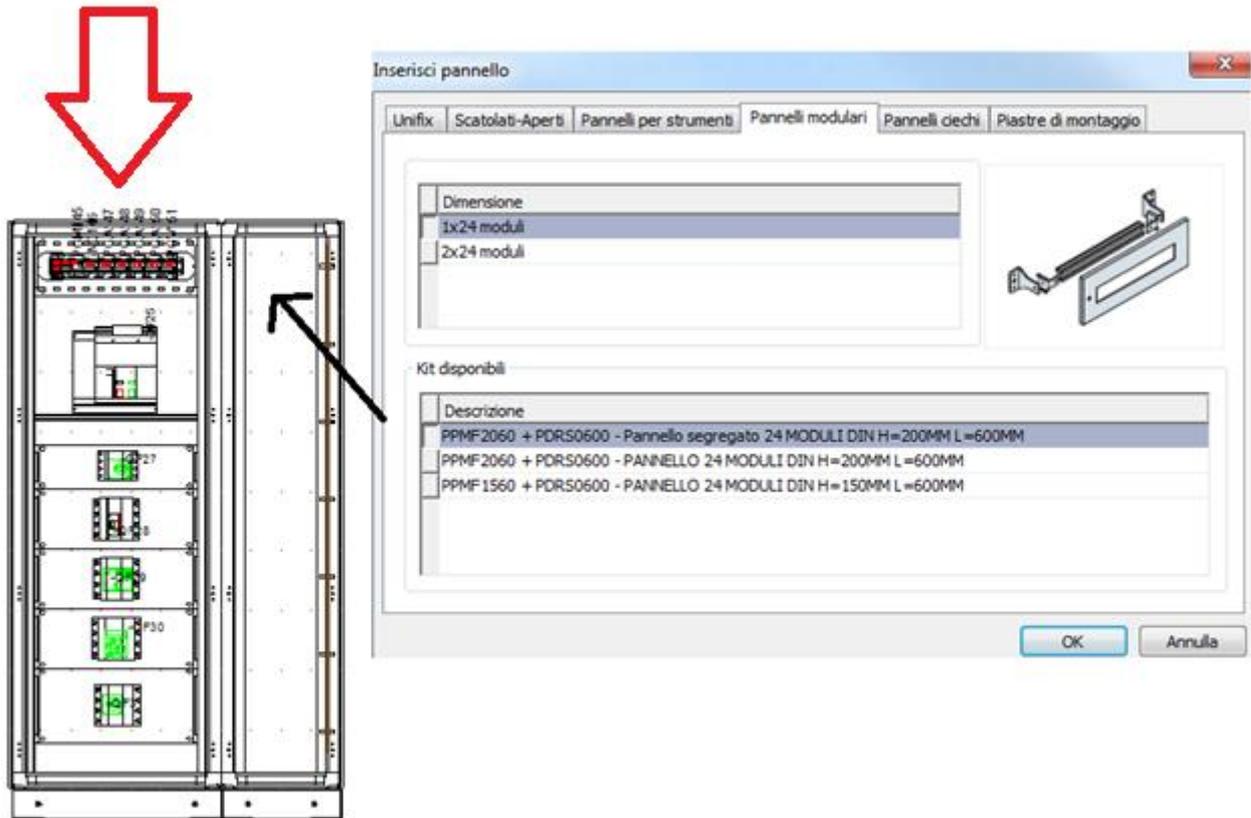
XT 3 poles breakers defined with 3-4 poles kits are automatically completed with AD3305-AD3306-AD3307-AD3308 flanges.

Blind, modular and instruments panels, as form 1, are automatically exploded by the software without rear closure (without segregation cells or plates, as the normative defines for this type of segregation).

### Standard solution – context between Emax and its supply

Wizard automatically inserts the devices in the enclosure.

The incomer is defined by the Emax 2 on the top of the first column.



The software guarantees the possibility to introduce a specific segregation for blind, modular and instruments panels placed in the critical area between the incomer and its supply (clearly set in the upper side, as the red indicator shown).

For the same logic that defines a different segregation for Emax 2 in form 2b, it's possible to insert a segregated model (analogous to the form 2a – 3a) with side closures and a frontal closure placed behind the specific plate (mounting plate or blind cell). In the case of closure with blind cells the side cell closures aren't required.

## E Power form 2a and 3a

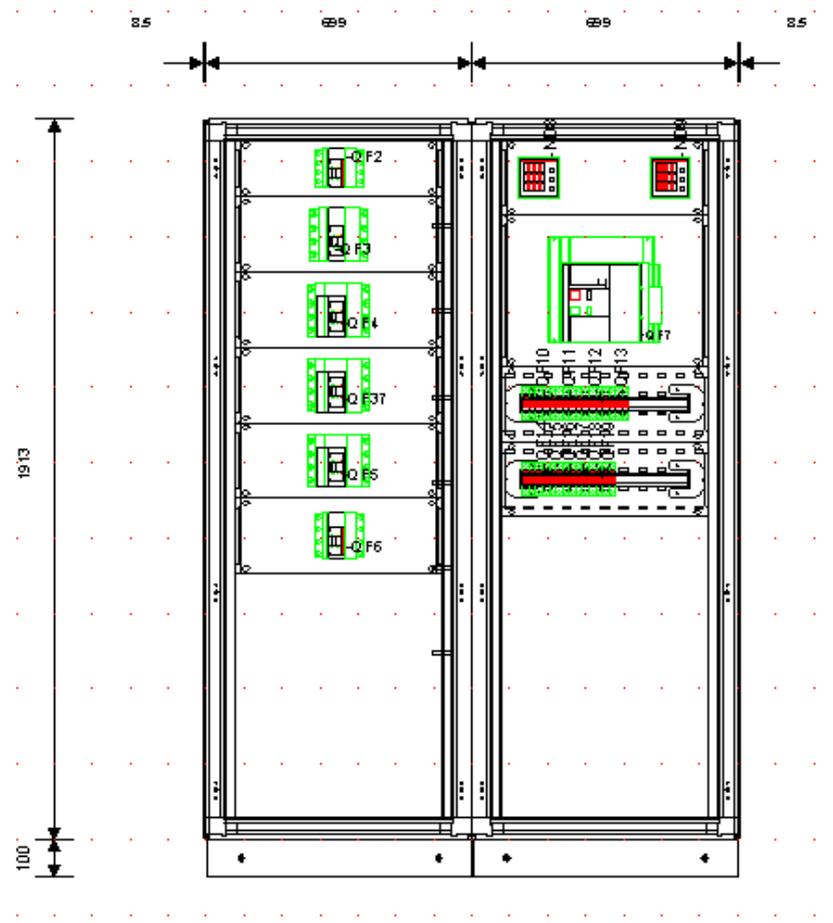
### Standard solution

Wizard inserts the devices in the context of two E Power columns.

If the expected segregation solution is compatible with the mounting of devices with front terminals, automatically the sw provides to complete the equipment for the molded case circuit breakers with dedicated high terminal covers (related to device's type and configuration).

XT 3 poles breakers are automatically completed, when it is necessary, with dedicated flanges.

Modular and instruments panels are automatically exploded by the software in the segregated version with segregation cells-plates and relatives accessories (for instance: for DIN panel the software automatically defines, with DIN rail and panel, the side closure PPDS... and the frontal segregation PFVS... )



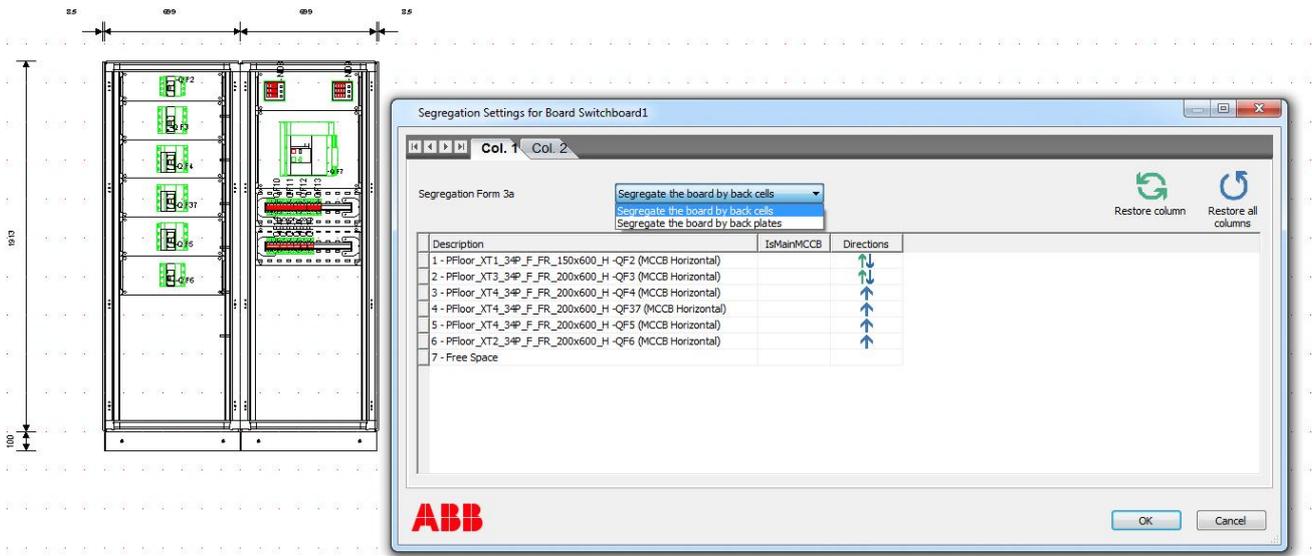
Automatically the software provides to combine kits and devices, verifying the compatibility between the type of the terminals and the required segregation form.

All the mounting kits related to molded case or air circuit breakers placed in the enclosure are automatically completed with the necessary segregation items (items as PPVS..., PSHS..., ... ).

Afterwards, the user must, with the new function of “automatic segregation”, complete the plates area (the rear part) for all blind cells and closure plates...

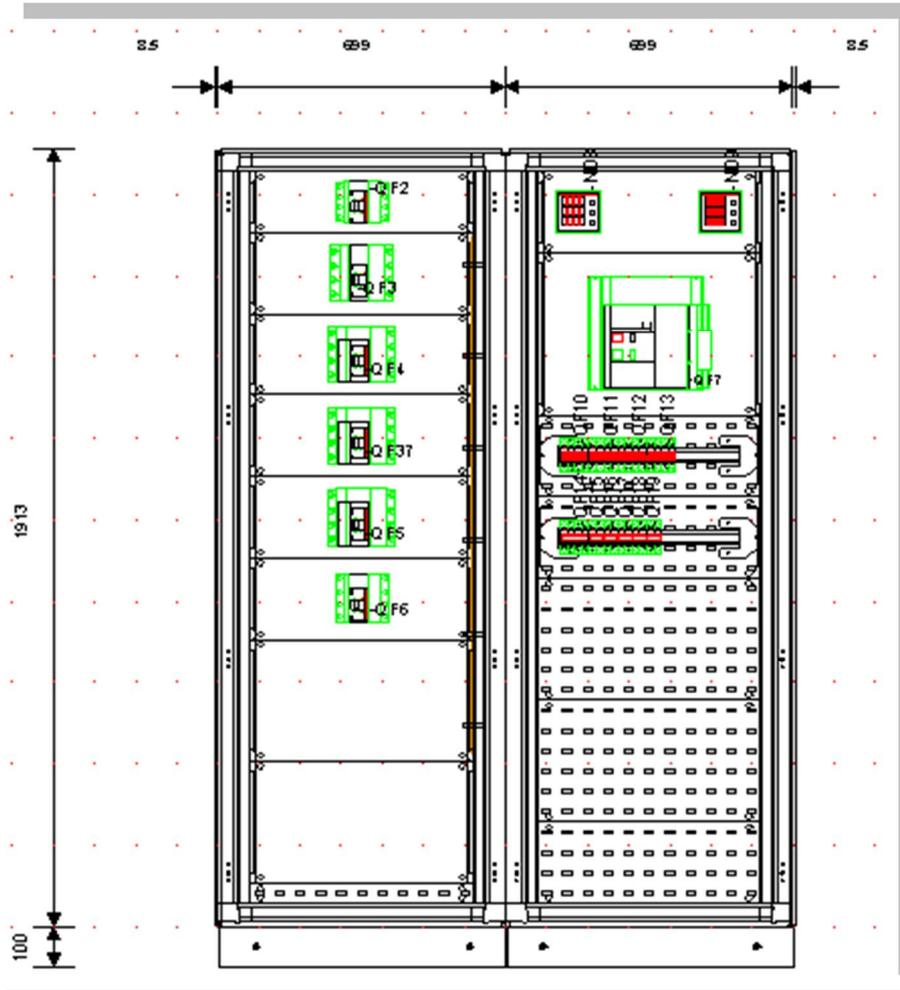


For that aim, it is necessary to open the automatic segregation mask using the dedicated “**Segregation Wizard**” command on the ribbon bar and define for each columns, if the segregation process is intended to be completed with back cells rather than back plates of 2a – 3a forms.

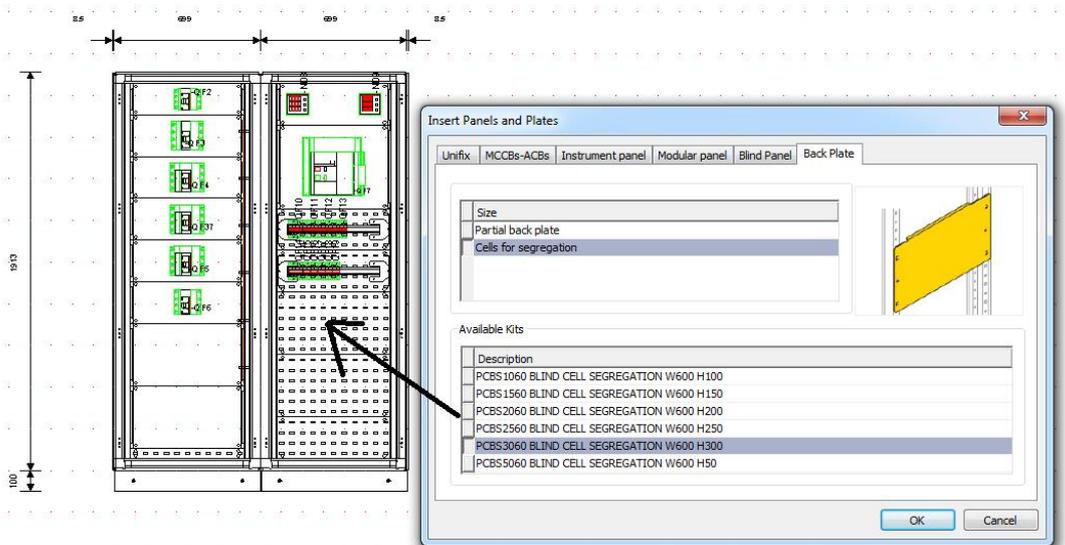


Clicking on OK button on the mask, the segregation process is automatically completed and the following picture shows the result (in case of use of segregation form 2 a – 3 a, the segregation direction has no meaning, so it is not necessary to indicate the direction in the segregation settings).

In the following picture, showing the result, has been chosen back plates to be installed in the right column and back cells in the left column.



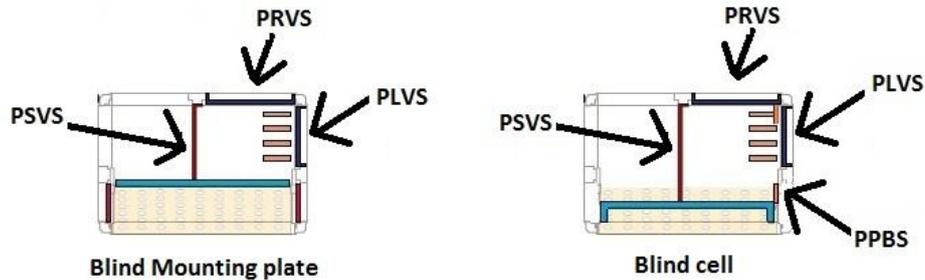
To visualize the products code and kind of segregation form, click on the plates or cells designed by the software (2a and 3a form are considered “simple” plates or cells).



## E power form 3b and 4b

### Standard solution – horizontal kits context (product side)

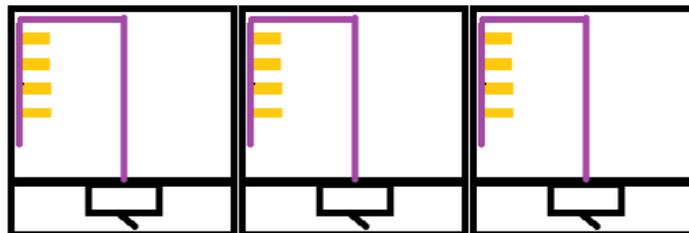
In this applicative context is necessary to segregate the plates area (included DIN rails and instruments) following the logic shown in the two pictures:



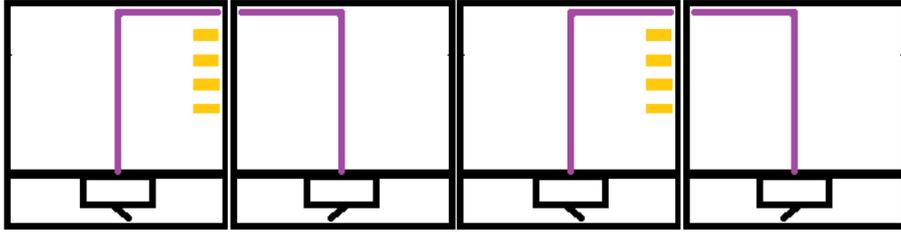
- The terminals divider PSVS... represents the main element in this segregation context;
- The rear segregation PRVS... guarantees the rear closure of the vertical busbars system;
- The side rear segregation PLVS... completes the busbars delimitation;
- Blind cells need a completion of the side front segregation with the side walls PPBS...

Related to the characteristics of the considered enclosure, it's important to pay attention that the side rear segregation PLVS... isn't always necessary:

- The case of the figure below always needs the segregation PLVS... because in the three columns there are independent busbars systems:



- In this further case the side segregations PLVS... aren't necessary for any columns. The busbars systems feed two adjacent columns and the dividers guarantee the rear side segregation (item PSVS...):

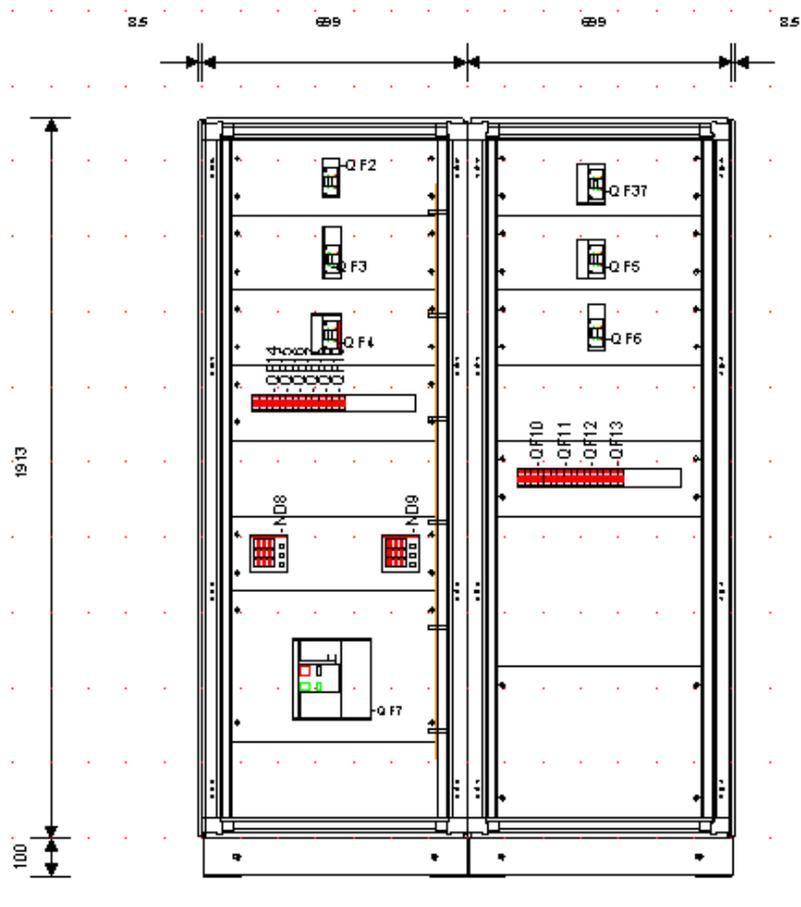


**Standard solution – horizontal kits context (software side)**

Wizard automatically inserts the devices in the enclosure; the standard solution provides the use of horizontal kits.

The incomer is represented by the Emax 2 near the bottom of the first column.

A vertical busbar system on the right side of the first column provides to supply all the outgoing placed on both columns:

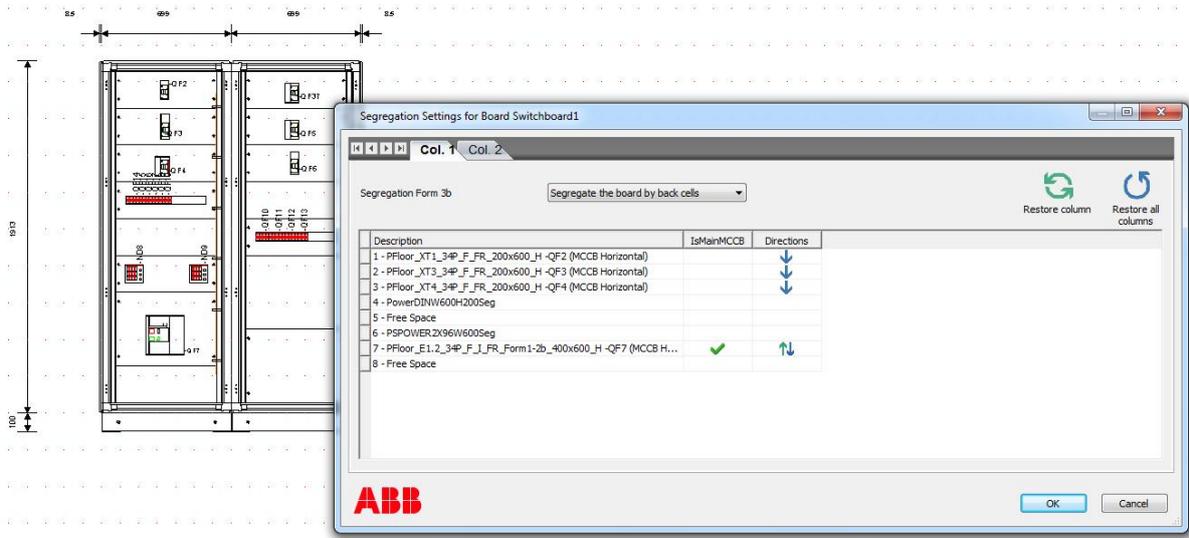


All the mounting kits related to molded case or air circuit breakers placed in the enclosure are automatically completed with the necessary segregation items (items form 2a - 3a + further segregation elements form 3b – 4b).

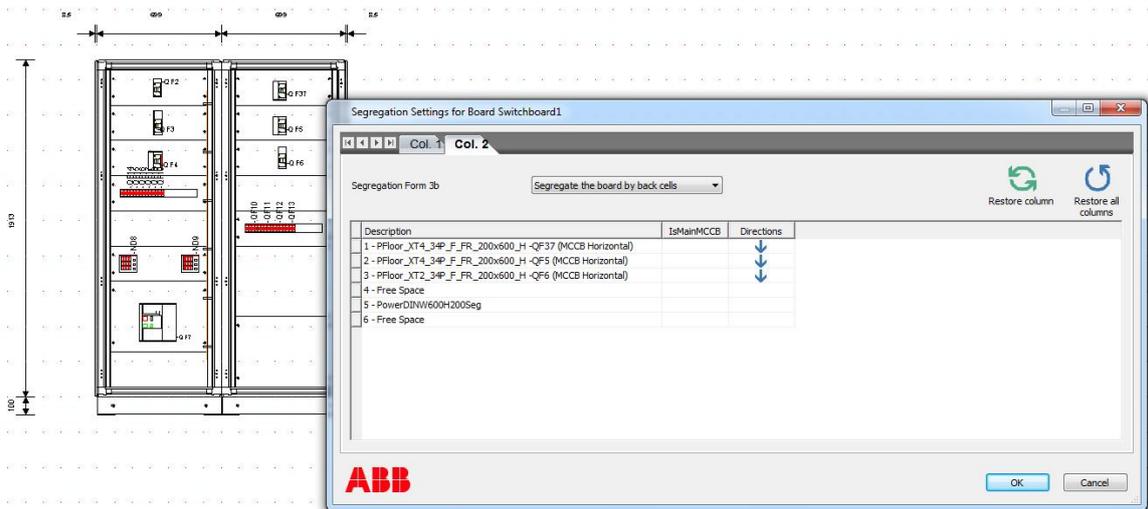
### Automatic segregation process

It is required to decide both in the first and in the second column whether to use back cells or back plates. Therefore, to define with the use of indicators, the direction of the segregation spread (“Directions” field in the segregations settings). The direction is modifiable with a double-click on related field. Directions allowed are upwards, downwards, and both upwards and downwards, as the case of the main circuit breaker).

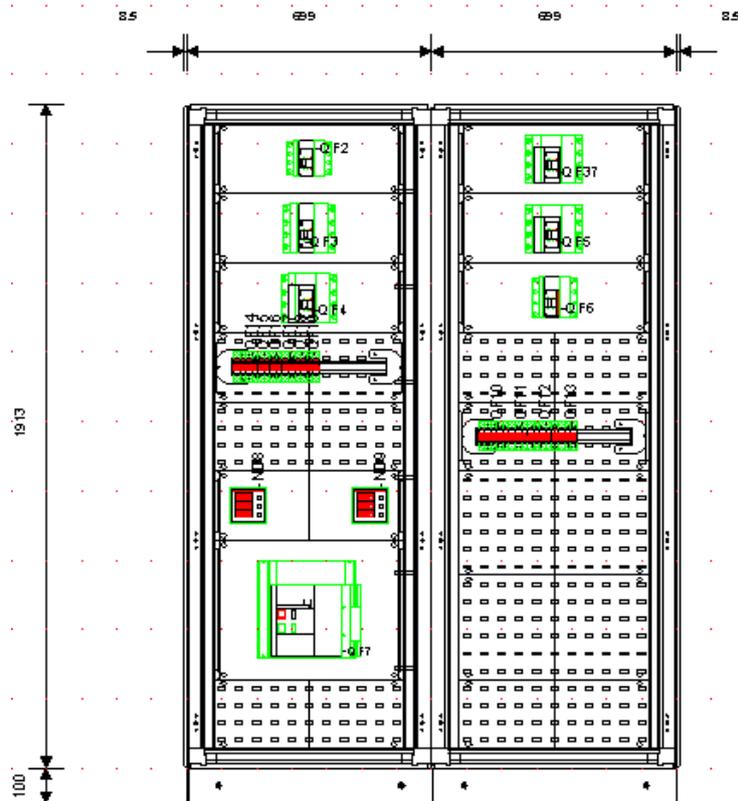
### Column 1 set-up



### Column 2 set-up

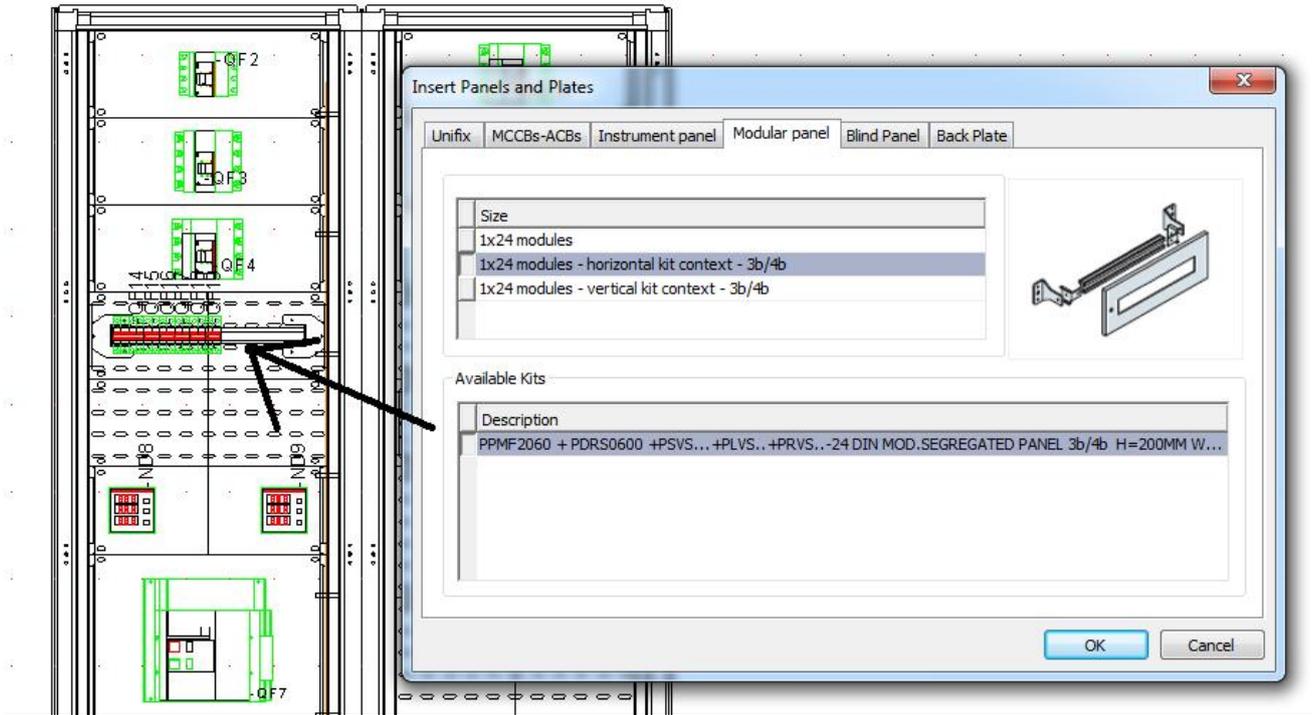


The following picture is the result closing the segregation mask with a click on “OK” button.

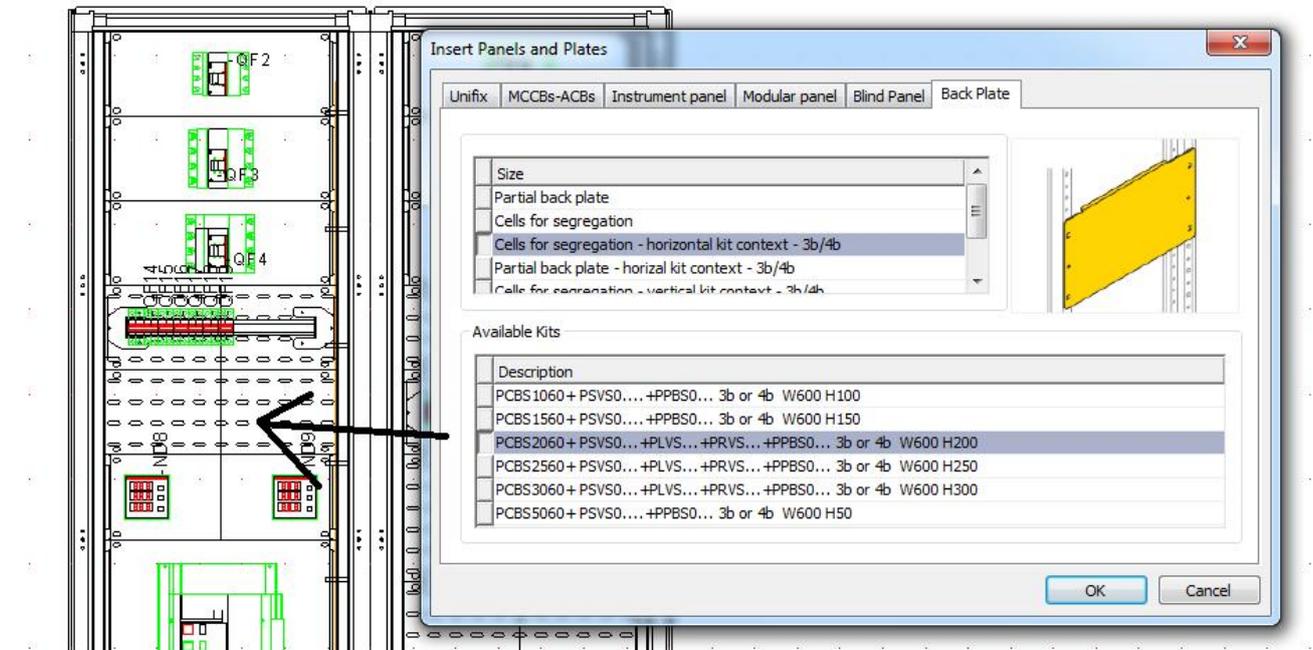


Empty spaces has been filled with segregate horizontal context back cells; furthermore, as a consequence, DIN panels and instruments panels introduced in the board front with simple segregation version, has been modified.

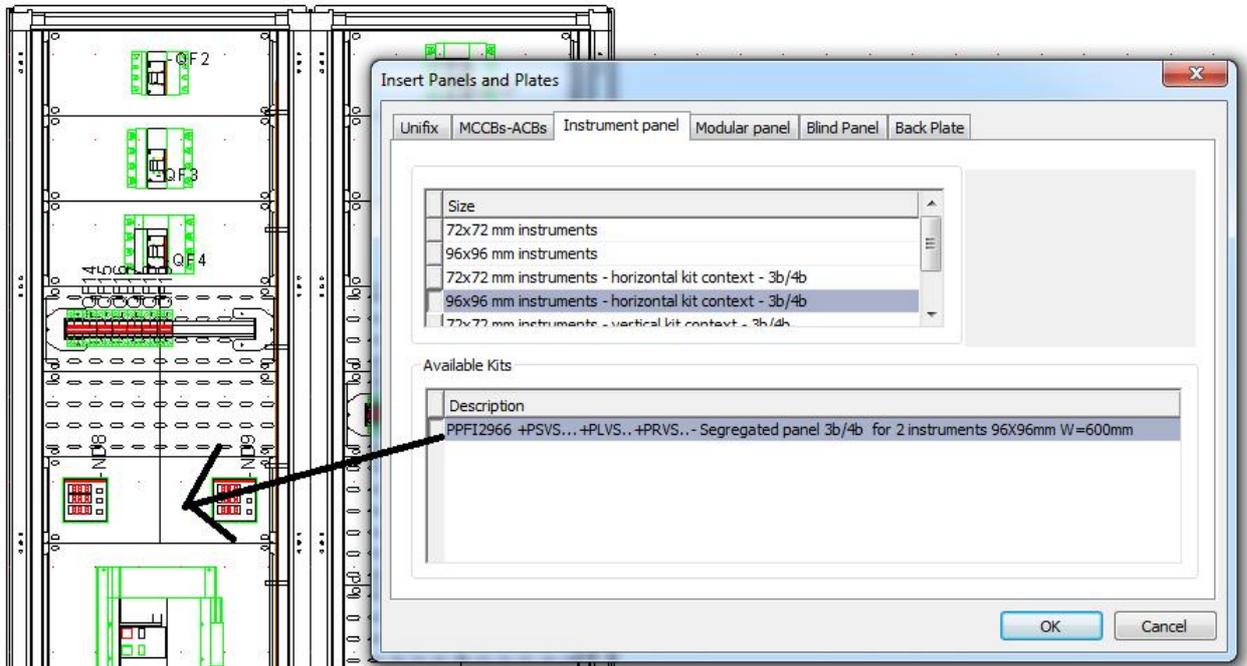
The DIN rail in the center of the first column, due to its location between horizontal kits and the busbars passage on the right side, is automatically replaced with a DIN rail contextualized for this type of positioning (it's easy to recognize it for the vertical line in the center that defines the presence of the rear divider, item PSVS...):



For the same reasons also the position below the DIN rail has to be occupied by a blind cell or a plate contextualized for this type of positioning:

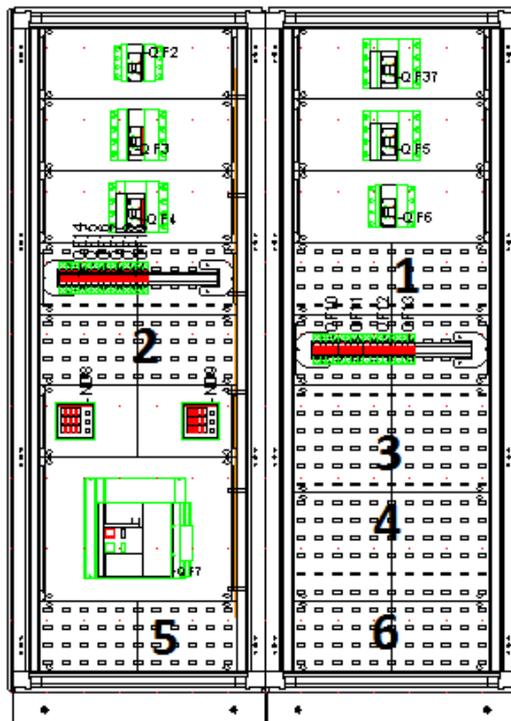


And the instruments panel....



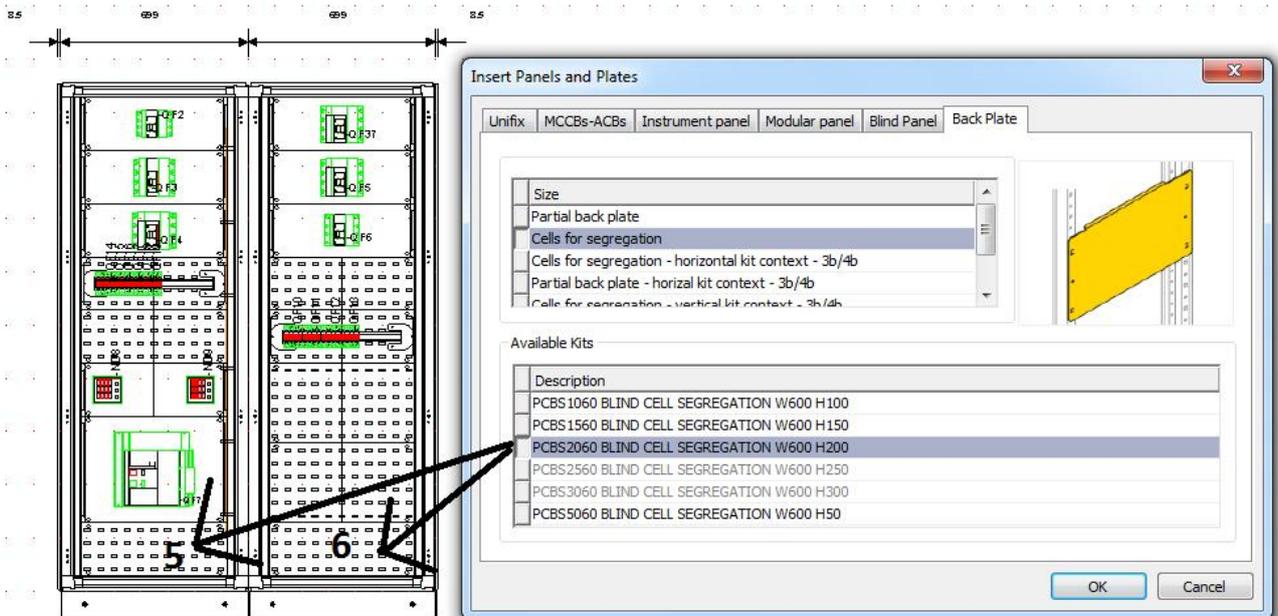
The same type of segregated cell or plate has to be defined for other zones with a vertical busbars passage. The segregation model also defines the necessary rear segregation for the cell.

These blind cells or plates contextualized for the use with horizontal kits have to be inserted automatically at points 1,2, 3, 4, 5 and 6.



If necessary, the automatic choice made by the software for 5<sup>th</sup> and 6<sup>th</sup> cells, could be manually modified, replacing horizontal context cells with general blind cells or plates.

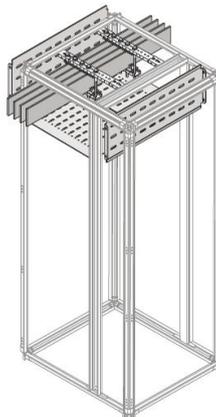
Example of manual replacement of cells automatically plugged (horizontal context cells 5 and 6) with simple cells, deemed by the user more appropriate for that application.



The user can evaluate the effective necessity to use the side rear segregations PLVS..., always inserted for this model with quantity 1, coherently with the horizontal kits segregations: if they are considered unnecessary ("product side" section) they must be manually removed from the items list.

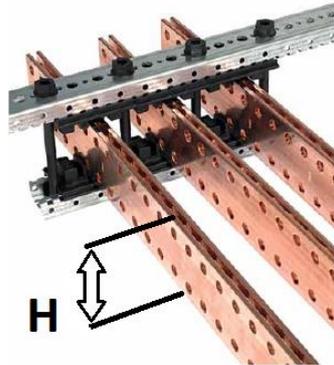
### Standard solution – horizontal busbar system (product side)

The applicative context needs a different segregation criteria, according to the requirement of not access to horizontal busbars.



As shown in the picture, the busbar required to be segregated in the front, behind, above and below side.

- For the front side is required the utilization of PFVS codes of 200 and 300 mm height, according to the busbar H value ( in the specific, 200 mm for H up to 100 mm height and 300 mm for H that exceed 100 mm height);



- Idem for the behind side is required the utilization of PRVS codes of 200 and 300 mm height, according to the busbar H value ( in the specific, 200 mm for H up to 100 mm height and 300 mm for H that exceed 100 mm height); anyway, in this case, codes might be determined by the presence of an intermediate upright (PUKI) that requires the utilization of two splitted codes (PRVS\*1 and PRVS\*2).
- For the above and below side instead, is required the utilization of PTHS codes (to be selected considering switchboard depth also). With reference to the picture above, in that specific case is not necessary to segregate above the busbars, because the top of the enclosure accomplishes this requirement.

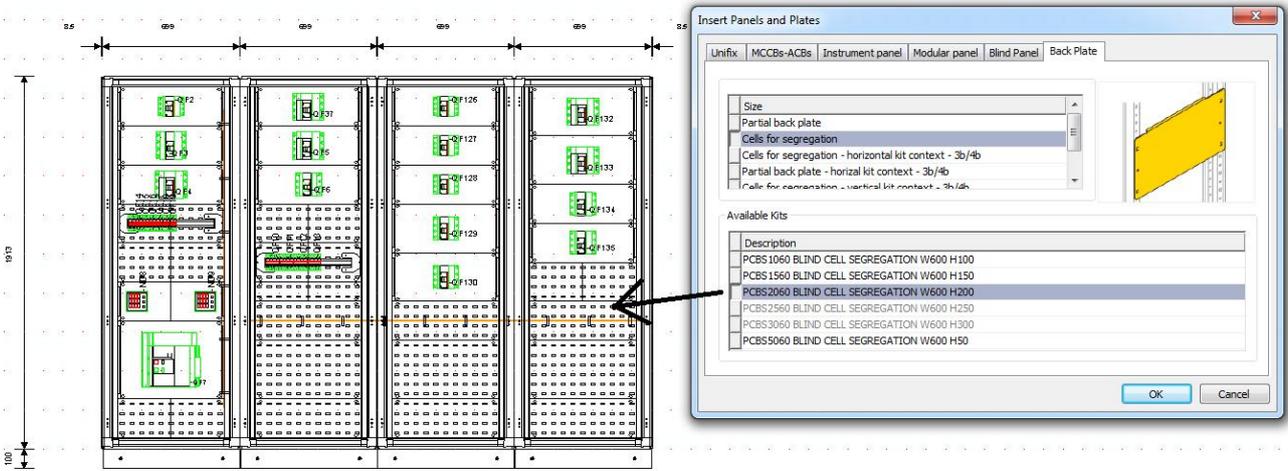
Plates layer in correspondence of horizontal busbars is to be isolated with simple segregation plates and cells 200 or 300 mm height (the rule 200 mm for H of bar up to 100 mm height and 300 mm for H that exceed 100 mm height, is effective also in this case).

#### **Standard solution – horizontal busbars system (software side)**

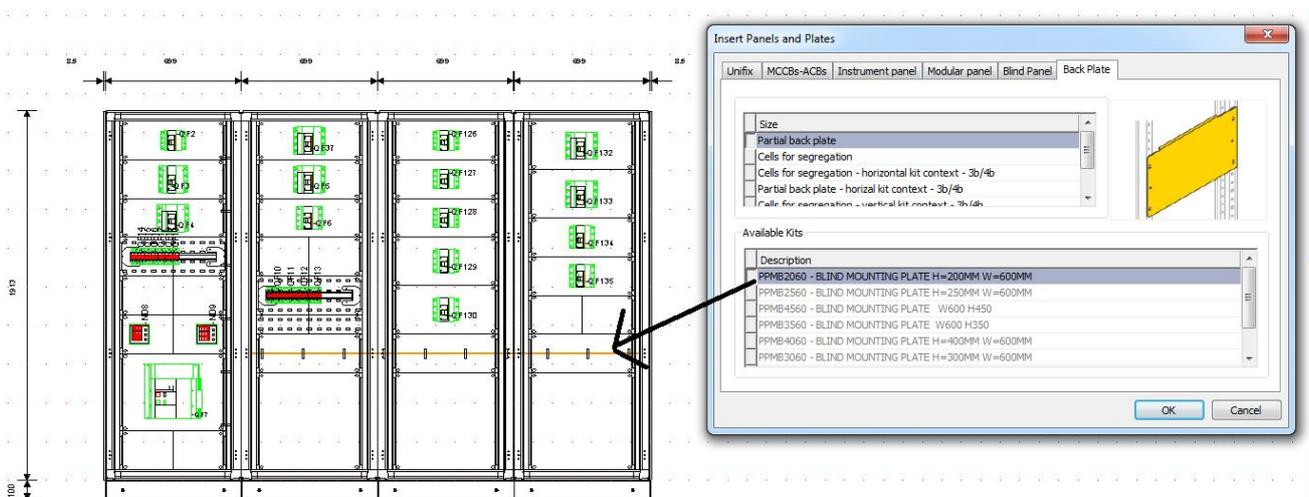
The following is a solution similar to the standard solution for horizontal kits context, seen in a previous chapter, with in addition a horizontal busbars systems.

The implementation logic of DOC3, combines busbars systems with specific segregations that above, below and frontally isolate the horizontal busbars: furthermore, the software inserts the blind cell or the blind mounting plate to be plugged in the plates area.

For this reason, the completion of segregations related results to be automatic; following a picture showing the process described:

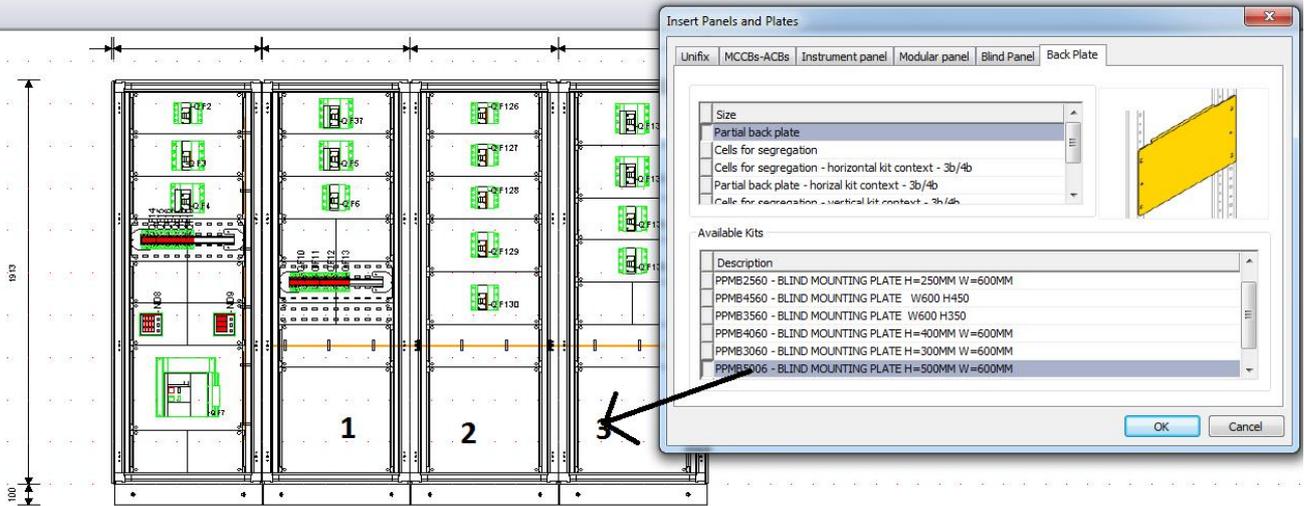


The blind cell placed in the third column at the height of the horizontal busbars must be of the simple type like shown in the image above. All the plates and cells result of the same height and coaxial.



Above the picture represents the result in case of using plates, instead of cells, to segregate.

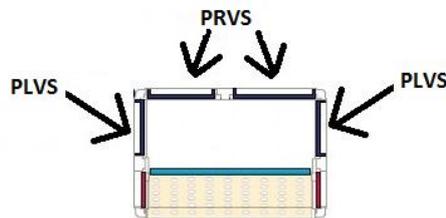
The area below the horizontal busbars system is automatically completed by the software with plates or blind cells of the simple type, as indicated in the following picture, so without more additional items of segregation (at points 1, 2 and 3):



**Standard solution – additional presence of vertical kits for Emax 2 (product side)**

The applicative context needs a segregation logic to protect from the access to the column with vertical kits, often incomers.

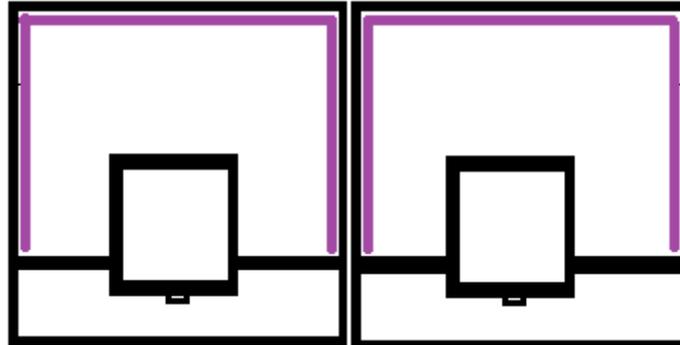
In form 4b this segregation method is better applied along all the height of the column:



- The rear segregation PRVS... performs a full-width segregation of the cell; based on the presence or the absence of the rear intermediate upright it is defined with one or two elements;
- The side rear segregation PLVS... completes the side closure of the columns; the quantity of needed PLVS... is variable;
- The case with blind cells could need the completion of side front segregation with the side wall for blind cell PPBS...

Note that the number of side rear segregations PLVS to insert in a segregated space can vary respect to the context of column positioning.

The shown case considers the segregation of two adjacent columns with vertical breakers: the first and the second columns are segregated on both sides.

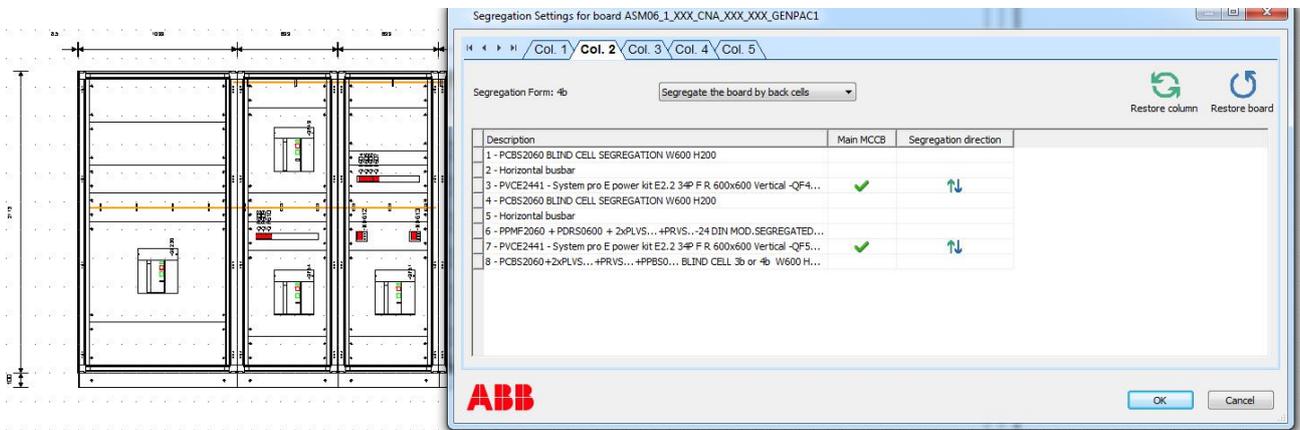


In the picture above, purple rim to indicate the segregation applied from a top view.

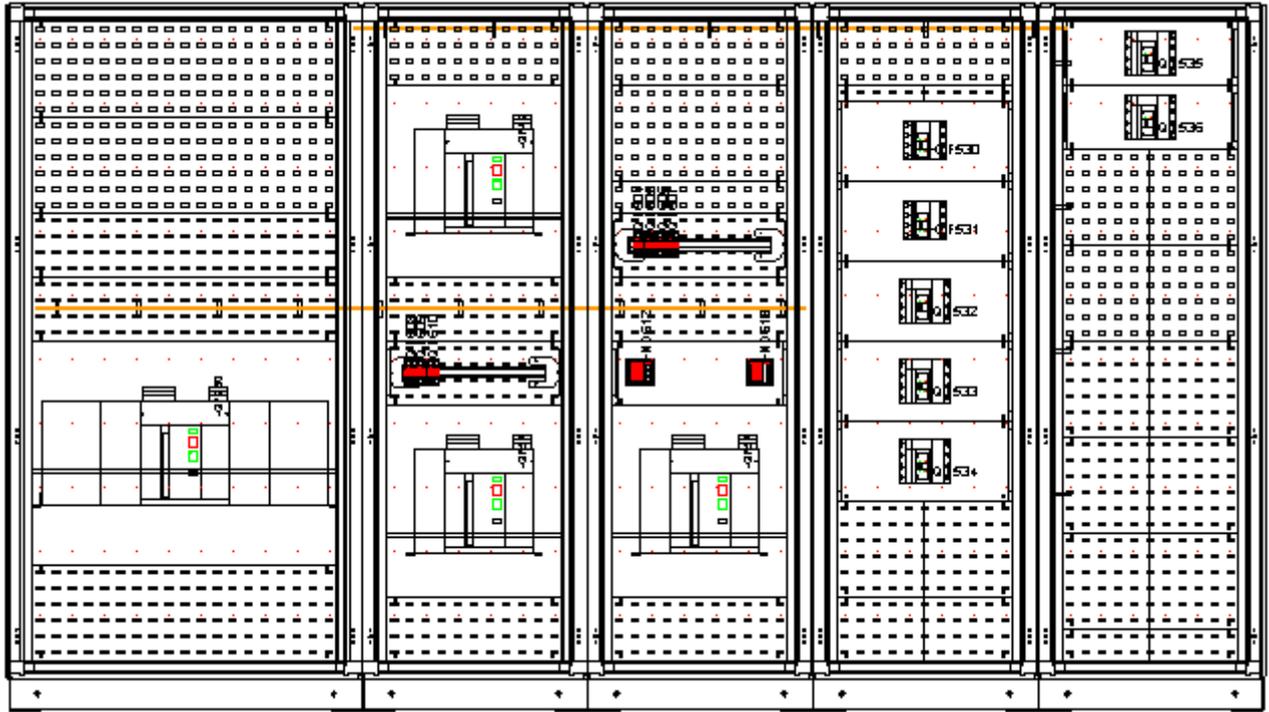
**Standard solution – additional presence of vertical kits for Emax 2 (software side)**

In this case the enclosure is in form 4b and the incomer is represented by a vertical withdrawable Emax4.2. Following the incomer there are three other withdrawable air circuit breakers (Emax 2.2).

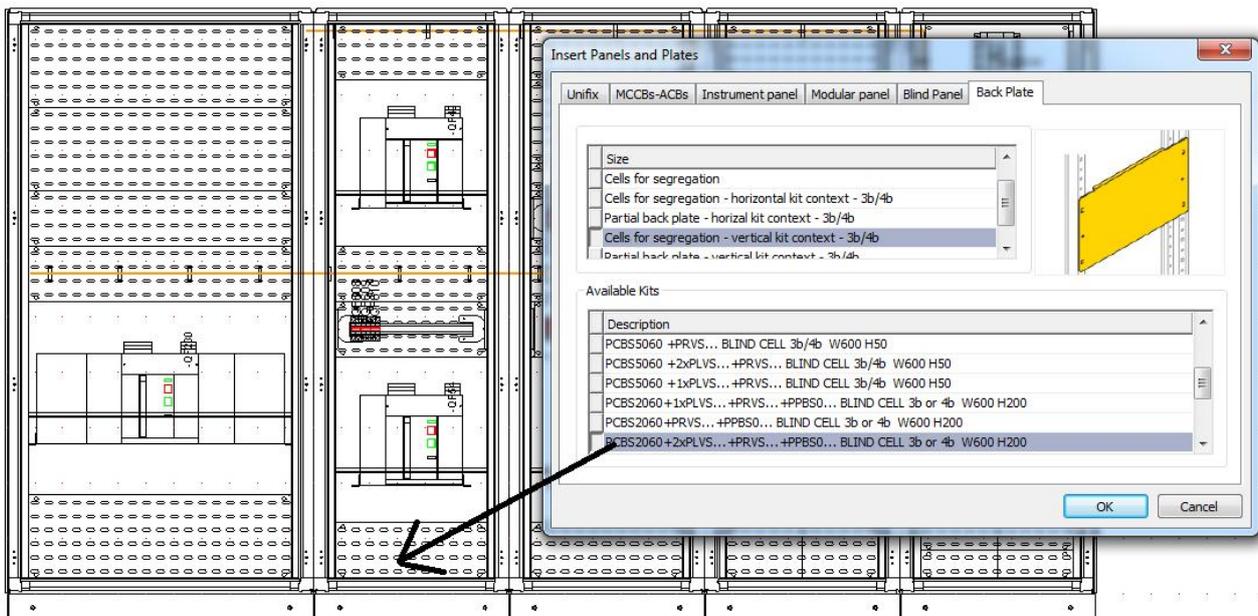
The first three columns on the left are characterized for the utilization of a segregated solution related to vertical kits, while the last two on the right are related to the logic already described for the presence of horizontal kits (previous cases). First step consists on activate the segregation procedure: the mask allow the user to set the “segregation spread” for each columns: it is driven mainly by busbar systems and horizontal or vertical breakers.



The result is the following:

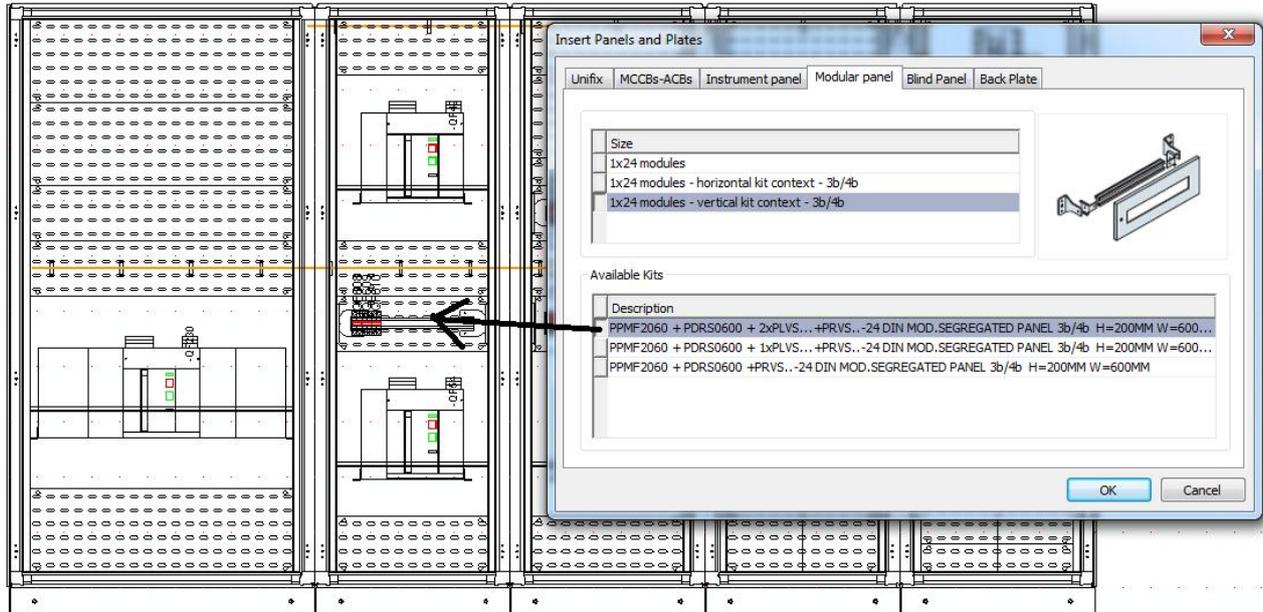


In the first three columns the segregation form 4b requires the use of segregated cells/plates with rear segregation over the entire width of the column (item PRVS...) and also 2 side rear segregations (item PLVS) related to the enclosure context: the software automatically introduce appropriate segregation kits. Represented in the following picture an example of vertical segregation cell, introduced by automatic function.

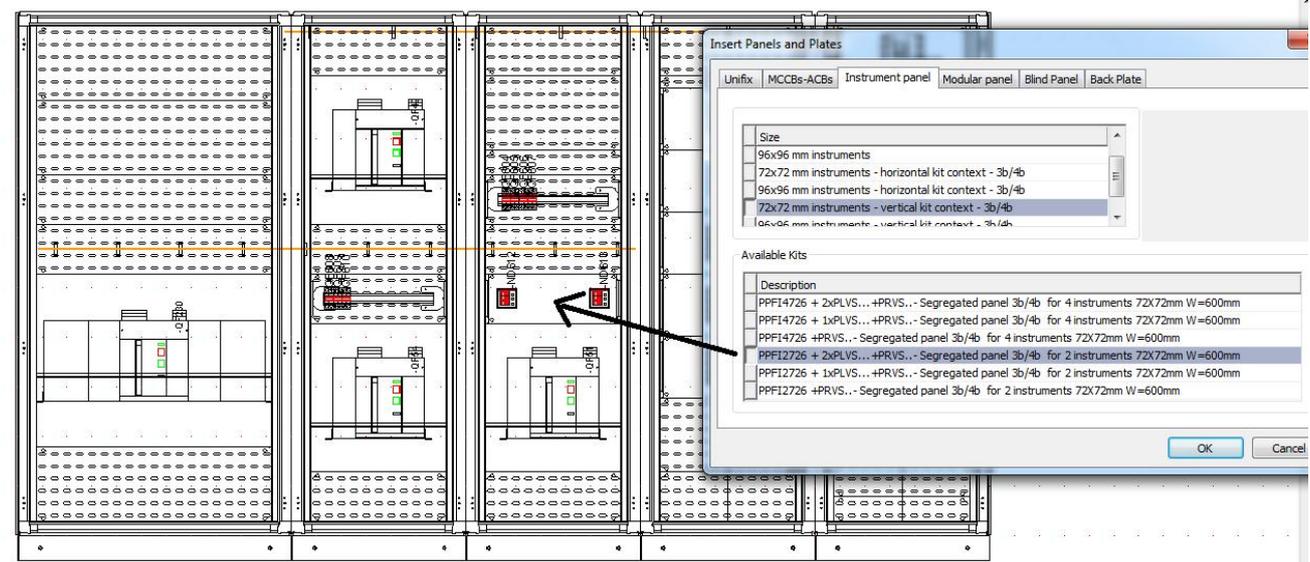


The same concept has to be extended to all modular and instruments kits placed in the second and third columns.

This type of segregation that software introduce in that case, is shown in the image below: it consists on a DIN cell specific for vertical segregation.



The same situation happens for instruments kits, as following picture shows:



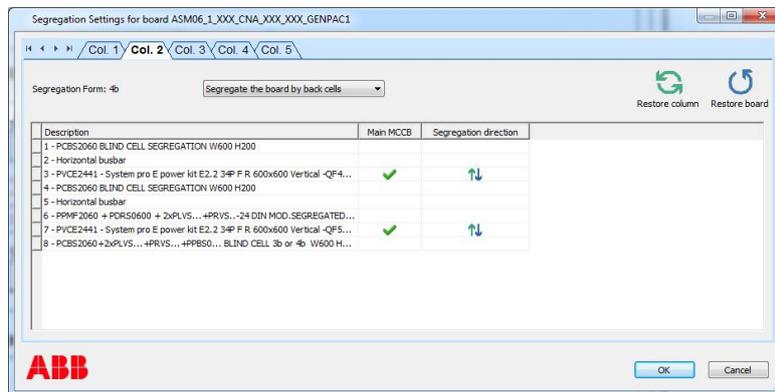
### A brief summary of main rules used for 3b and 4b automatic segregation

1-First of all horizontal busbars has to be segregated and, in their front are introduced 200 mm or 300 mm plates/cells, according to busbar height ( plates 200 mm height for busbar height up to 100 mm, plate 300 mm height for busbar height that exceed 100 mm).

2-Software automatically adds in codes list all the components necessary for 3b and 4b form segregation of horizontal busbars.

3-Despite segregation form choice for a switchboard is 3b, all devices with incomer role are segregated with 4b form.

4-Segregation spread for vertical and horizontal context is driven by settings in the specific management mask of automatic segregation. Indicators denote spread orientation of segregations in each column context and might be easily managed by the users in order to optimize automatic segregation result.



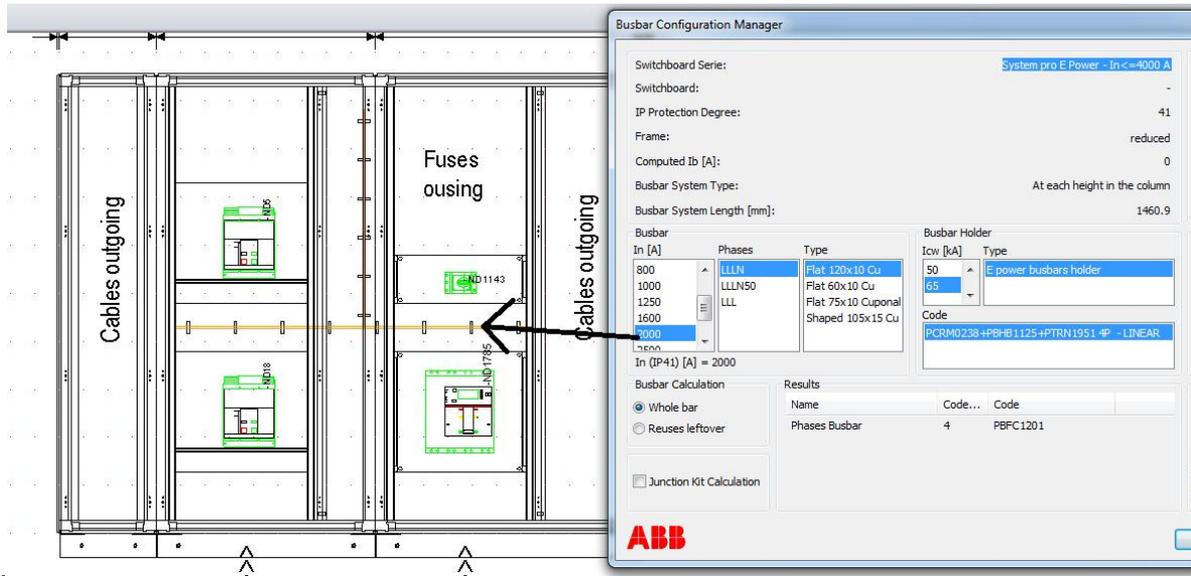
Concerning incomers (main breakers) usually (both for 3b form and 4b form) is required the spread of their own segregation orientation both upward and downward.

Horizontal busbar systems stop segregation process.

### Examples of compatible / incompatible situations versus automatic segregation

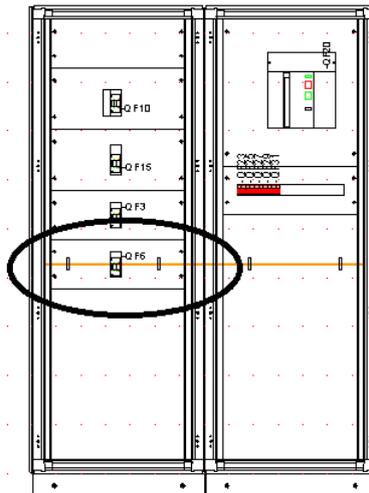
#### 1 - Case incompatible with automatic segregation

Horizontal busbar with  $H > 100\text{mm}$  and vertical available space equals to  $200\text{mm}$  ( $300\text{mm}$  is required)



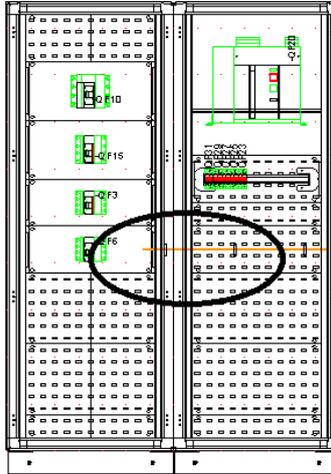
#### 2 - Case incompatible with automatic segregation

Horizontal busbar behind a horizontal breaker with length that exceed appendix (about  $15\text{cm}$ ).



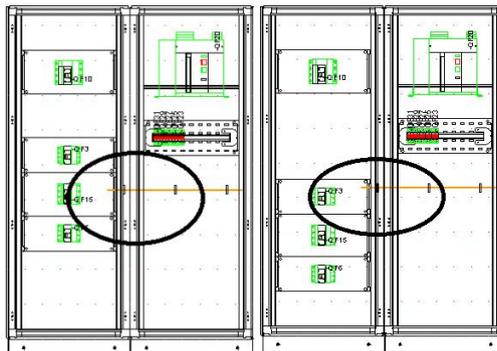
#### 3 - Case compatible with automatic segregation

Horizontal busbar behind a horizontal breaker with length that not exceed appendix.



### 3 - Case incompatible with automatic segregation

The busbar enters column on the left with an appendix, but kit has a different height than what the busbar space required (at least 200 mm); the same if the kit, despite the correct height, stands in a misaligned position.



### 4 - Case incompatible with automatic segregation

The W1250 column has no 100 mm panels and plates/cells: in the case, the configuration consists of two kits with 300 mm space in between, and the user decides to use a 200 mm length horizontal busbar (or instance 1600 A size), it means a 100 mm empty space. It is no possible to isolate closing this space for no existing appropriate segregation codes.