

HZ[®]-M steel wall system

Family for Autodesk[®] Revit[®] 2021

User manual v.2 | November 2021

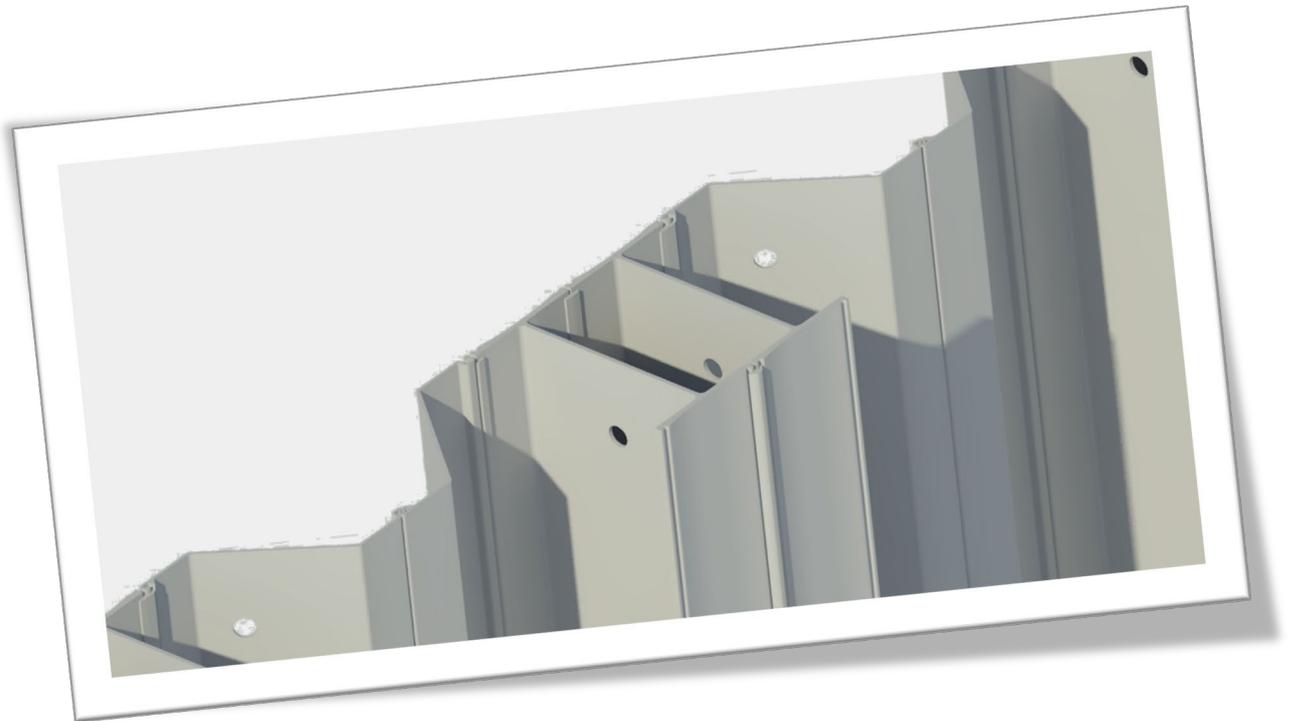


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1 Introduction

The HZ[®]-M steel wall system is a combined wall comprising 2 or 3 different components

- **HZ[®]-M** king pile, with 2 or 4 milled grooves,
- **RZD, RZU, RH** connectors,
- **AZ[®]** infill sheet pile (double pile), used in most combinations.

There are several HZ-M king pile sections. They can be assembled to form a **solution** (1 or 2 HZ-M combined to 2 to 6 connectors).

A **solution** combined to an AZ infill sheet pile forms a **combination**. The sketch on the right shows a **combination 26**: HZ-M Sol. 26 (2 HZ-M king piles and 6 connectors) and one AZ double sheet pile.

Combinations C 1 and C 23 have no AZ infill piles.

AZ infill piles are double piles, built up with

2 single piles, one being a *Pos. A* and the other a *Pos. B*. Double piles are either *Form I* or *Form II*.

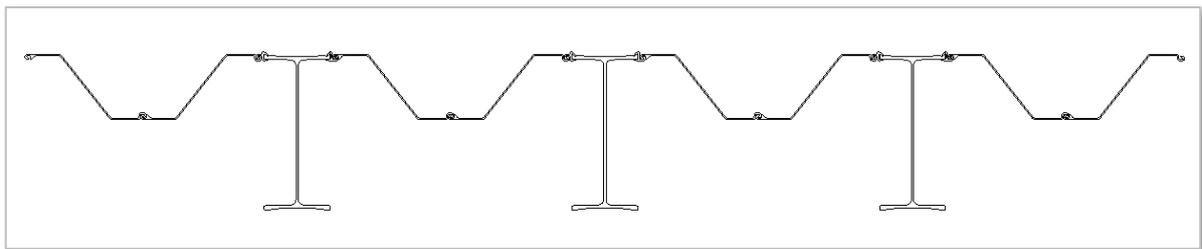
For more information on the HZ-M / AZ system, its design and installation, check the brochure 'HZ-M steel wall system' available on ArcelorMittal's website ([link](#)).

Changes in 2021: the radius *r* of the HZ M are the same for the whole range. This has only a minor influence on the section properties but is important for the design of T-connectors used in specific anchoring systems.

The Revit family HZ[®]-M / AZ[®] was created in the Revit category **Generic Model**.

When inserting into a project, **per default**, the family consists of

3 HZ-M king piles & 4 AZ infill sheet piles



The **default system** is an **HZ 630M - 12 / AZ 18-800**. Select a different system in the **Properties** window.

Due to the implementation of the family

- it is not possible to go below this amount of piles,
- infill sheet piles in this Revit family are *Form I*.

If above assumptions do not fit your needs, you can

- copy an instance of the element and insert it in the model, and then modify it; note that in this case you lose the link to the original family,
- contact our technical department to check if new options are available (AZ *Form II*, AZ in reversed position,...).

2 Properties window

Parameters of the HZ-M / AZ system can be changed in this window.

Properties	
System HZ-M_AZ_Form I Inside_2020V1 System HZ-M_AZ_Form1 Inside	
Generic Models (1) Edit Type	
Constraints	
Setback_top_AZ	0.0
Setback_top_R1	70.0
Setback_top_R2	20.0
Setback_top_R3	20.0
Setback_top_R4	0.0
Setback_top_R5	20.0
Setback_top_R6	0.0
Level	Level 1
Host	Level : Level 1
Offset	0.0
Moves With Nearby Elements	<input type="checkbox"/>
Construction	
Code_Handling_hole	Handling hole "0 to 7"...
Select_Handling_hole_HZ-M	0
Handling_hole_HZ-M	None
Select_Handling_hole_AZ	0
Handling_hole_AZ	None
Materials and Finishes	
HZ-M_Material	AM_S 430 GP
Connectors_Material	AM_S 430 GP
AZ_Material	AM_S 355 GP
Structural	
Total Mass	1457.200 kg
I _{sys} (/m)	149870.00 cm ⁴
W _y * (/m)	4405.00 cm ³
W _y ** (/m)	4935.00 cm ³
G_100%	207.33 kg/m ²
G_80%	188.78 kg/m ²
G_60%	170.24 kg/m ²
Dimensions	
System_Height	1000.0
AZ_Height	1000.0
Spacing	1000.0
Length_Right	4000.0
Length_Left	4000.0
Length_R1	930.0
Setback_tip_R2	20.0
Length_R3	980.0

Length_R4	1000.0
Setback_tip_R5	20.0
Length_R6	1000.0
Volume	
Identity Data	
Phasing	
Model Properties	
Code_HZ-M	HZ-M "1 to 12"...
Select_HZ-M	1
Type	HZ 630M / 4 Grooves
Code_Solutions	Solutions "1 to 12"...
Select_Solutions	5
Type 2	Sol. 12(4)
Code_AZ	AZ "0 to 26"...
Select_AZ	1
Type 3	AZ 18-800
Other	
DS	1000.0
HZ-M_N_D	2
HZ-M_N_G	2
AZ_N_1_D	2
AZ_N_1_G	2

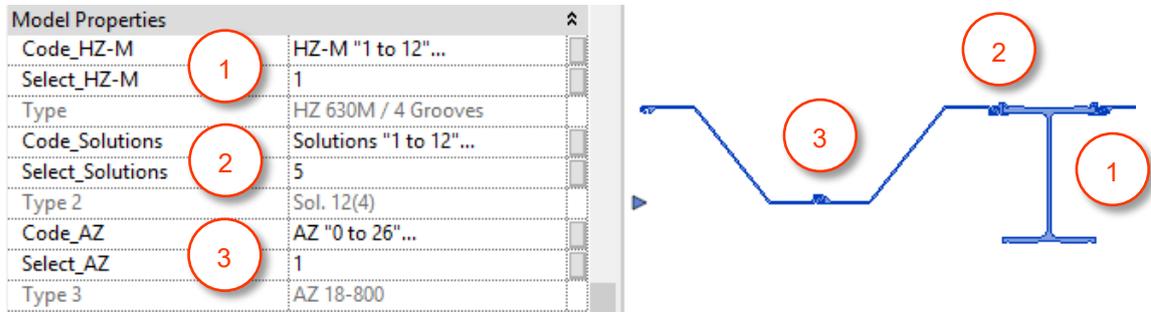
The parameters and data of the system are spread across different sections

- ① **Model Properties** select the combination (HZ-M pile, HZ-M solution and AZ)
- ② **Dimensions** select length of wall and length (height) of components
- ③ **Constraints** select constraints on components: setbacks at top of HZ-M
- ④ **Material and Finishes** select steel grades
- ⑤ **Construction** select handling hole dimension

Notes. Based on above choices

- geometrical / structural data of the HZ-M combination are defined (see section *Structural*),
- greyed parameters cannot be modified.

3 Selection of a system



For example, to select the combination HZ 630M-12 / AZ 18-800 with an HZ-M with 4 grooves (*this specific solution is rarely used, only for illustrative purpose*), select following values

- ① field **HZ-M** 1 ⇒ HZ 630M / 2 Grooves
- ② field **Solutions** 5 ⇒ Sol. 12(4)
- ③ field **AZ** 1 ⇒ AZ 18-800

Hover the mouse over the field of the parameter **Code_HZ-M**, **Code_Solutions** or **Code_AZ** to show a tooltip with the associated data.

The associated data for the different components is shown here below.

Model Properties	
Code_HZ-M	HZ-M "1 to 12"...
Select_HZ-M	1
Type	HZ 630M / 4 Grooves
Code_Solutions	Solutions "1 to 12"...
Select_Solutions	5
Type 2	Sol. 12(4)
Code_AZ	AZ "0 to 26"...
Select_AZ	1
Type 3	AZ 18-800

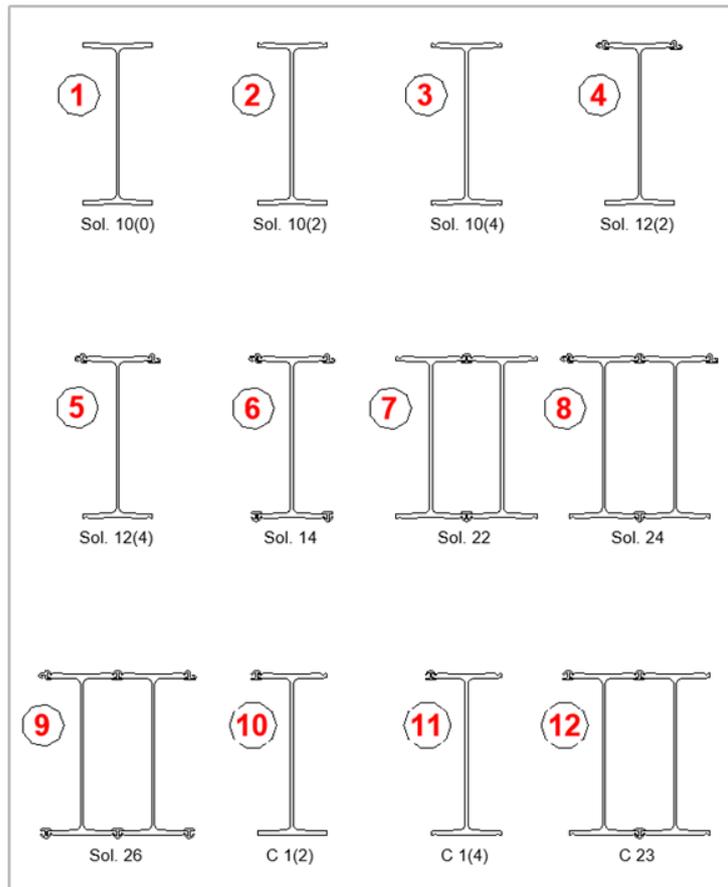
AZ "0 to 26"	
0=	None
1=	AZ 18-800
2=	AZ 20-800
3=	AZ 22-800
4=	AZ 23-800
5=	AZ 25-800
6=	AZ 27-800
7=	AZ 28-750
8=	AZ 30-750
9=	AZ 32-750
10=	AZ 12-770
11=	AZ 13-770
12=	AZ 14-770
13=	AZ 14-770-10/10
14=	AZ 12-700
15=	AZ 13-700
16=	AZ 13-700-10/10
17=	AZ 14-700
18=	AZ 17-700
19=	AZ 18-700
20=	AZ 19-700
21=	AZ 20-700
22=	AZ 24-700
23=	AZ 26-700
24=	AZ 28-700
25=	AZ 18
26=	AZ 18-10/10

HZ-M "1 to 12"	
1 =	HZ 630M
2 =	HZ 880M A
3 =	HZ 880M B
4 =	HZ 880M C
5 =	HZ 1080M A
6 =	HZ 1080M B
7 =	HZ 1080M C
8 =	HZ 1080M D
9 =	HZ 1180M A
10 =	HZ 1180M B
11 =	HZ 1180M C
12 =	HZ 1180M D

Solutions "1 to 12"	
1 =	Sol. 10(0)
2 =	Sol. 10(2)
3 =	Sol. 10(4)
4 =	Sol. 12(2)
5 =	Sol. 12(4)
6 =	Sol. 14
7 =	Sol. 22
8 =	Sol. 24
9 =	Sol. 26
10 =	C 1(2)
11 =	C 1(4)
12 =	C 23

Note. **Solutions 1, 2, 3, 5, 7 and 11** are not standard solutions and should only be considered in **special cases**.

Below are the cross sections of the available *solutions*.



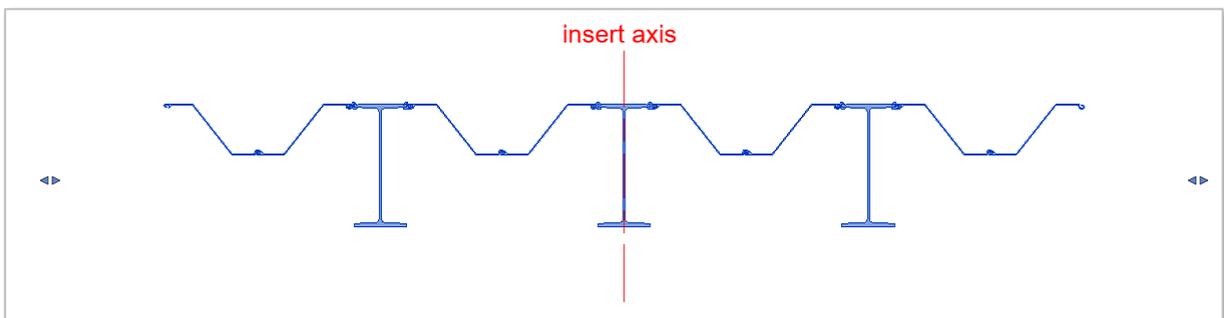
4 Parameters *length & height*

4.1 *Length of the wall*

There are two ways to modify the length of the wall.

Note. Depending on the length of the wall, rendering of the new layout of the wall may take a few seconds; please be patient.

4.1.1 Use of handles

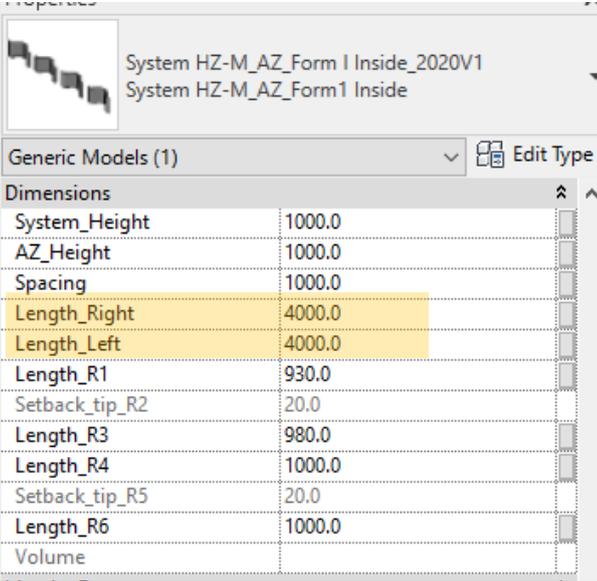


Handles on both ends of the system allow modifying the wall length to the left and/or to the right. Select the system and the two handles appear on both ends.

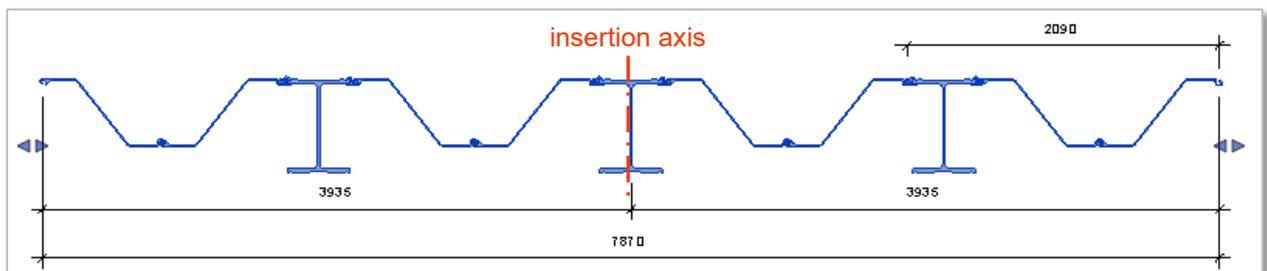
Select one of the handles and move it to stretch or to shorten the wall length. When finetuning the wall length, the user can add / remove one HZ-M *solution* or one single AZ pile at a time, depending on the element located on the extremity of the wall.

4.1.2 Use of the window *Parameters*

When inserting the family into a project, two parameters related to the wall length appear under *Dimensions: Length_Right* and *Length_Left*. Default values are 4 000 mm.



Generic Models (1)		Edit Type
Dimensions		
System_Height	1000.0	
AZ_Height	1000.0	
Spacing	1000.0	
Length_Right	4000.0	
Length_Left	4000.0	
Length_R1	930.0	
Setback_tip_R2	20.0	
Length_R3	980.0	
Length_R4	1000.0	
Setback_tip_R5	20.0	
Length_R6	1000.0	
Volume		



These values are only indicative and can be modified to meet the length of the wall. Revit adapts the number of components that fit within this length.

4.1.3 Notes on the *length* parameter

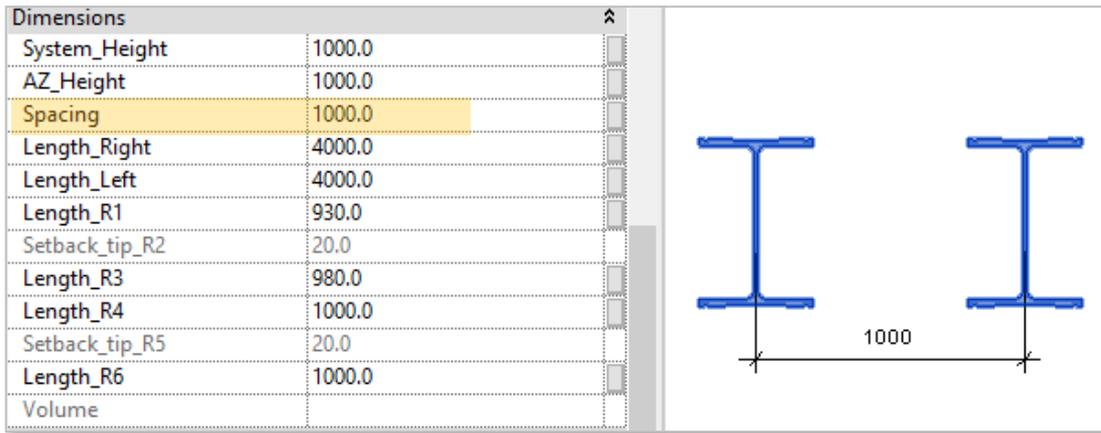
- Revit adds as many elements as will fit in the additional space. Matching perfectly a specific length requires most often special piles.
- There is a minimum number of components on the left and on the right of the insertion axis of the system.
- If you shorten the wall or enter a value below the length corresponding to the basic system (3 HZ-M and 4 AZ), Revit will not fix the value in the field, hence the field contains a wrong value, although the display is correct! There is no warning nor error messages.
- If you need to draw a wall shorter than the basic system length, you need to duplicate single elements (see Chapter 8).
- The wall can end on both sides with an HZ-M *solution*, a single AZ or a double AZ.

4.1.4 Special parameter **Spacing**

The value **Spacing** represents the distance between the axis of adjacent HZ-M profiles. The user needs to distinguish two different cases.

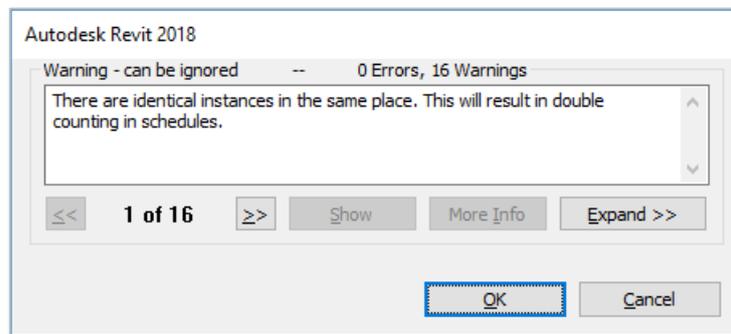
4.1.4.1 Solutions 10(0), 10(2), 10(4), 22, C 1(2), C 1(4) and C 23

Infill sheet piles AZ are automatically deactivated, although a height might be shown in the field **AZ_Height**.



By default, the value of **Spacing** is 1 000 mm, but can be modified as required.

Note. It is possible to reduce the spacing to move the HZ-M closer together. However, it is not foreseen to overlap them. A warning message will inform the user of current issues.



4.1.4.2 Solutions 12(2), 12(4), 24 and 26

Although these solutions are almost exclusively combined to AZ infill sheet piles, it is possible to model such combination without AZ infill sheet piles by selecting the value **0** as the choice of the AZ.

The minimum spacing between adjacent king piles is approximately

HZ-M section	Solution	
	12(2) & 12(4)	24 & 26
HZ 630M	520 mm	960 mm
HZ 880M A to HZ 1080M B	560 mm	1 030 mm
HZ 1080M C to HZ 1180M D	-	1 030 mm

4.2 Height of the components

The **reference level** of the system is the **top of the HZ-M**. The user can define the length of the other components and add a setback length at the top of the elements. The setback of the RZD and RZU connectors simplifies the threading of the infill sheet piles at the jobsite.

The sketch on the right shows the naming convention of the connectors.

Notes

- the height of connectors R1 and R3 are usually identical,
- only box piles (Sol. 14 / 26 / C23) have connectors R2 & R5,
- connectors R4 & R6 are usually shorter than R1 & R3.

4.2.1 HZ-M, AZ and connectors R1, R3, R4, R6

The sequence of the selection of the lengths of the different components should be

- **System_Height** (= HZ-M height)
- **AZ_Height**
- **Length_R1** and **Length_R3**, and if applicable (Solutions 14 and 26) **Length_R4** and **Length_R6**

Dimensions	
System_Height	1000.0
AZ_Height	1000.0
Spacing	1000.0
Length_Right	4000.0
Length_Left	4000.0
Length_R1	930.0
Setback_tip_R2	20.0
Length_R3	980.0
Length_R4	1000.0
Setback_tip_R5	20.0
Length_R6	1000.0
Volume	

The tip of the AZ should not be lower than the tip of connectors R1 and R3.

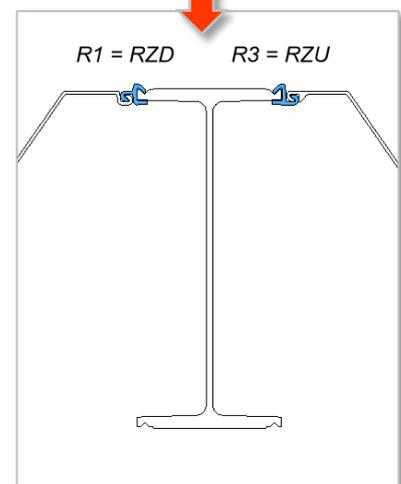
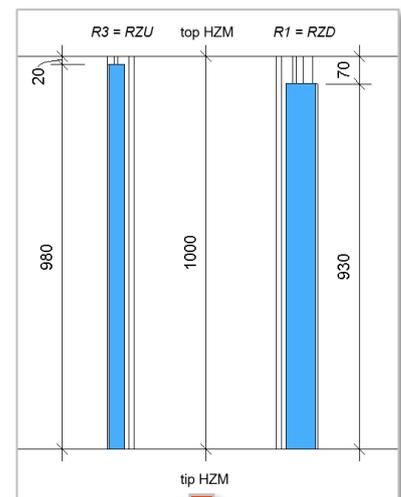
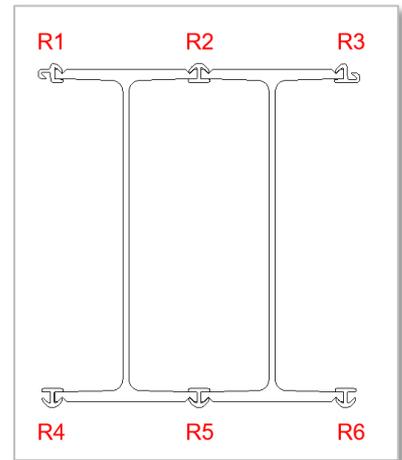
The tip of the AZ and of the connectors should never be lower than the tip of the HZ-M.

Pay attention to the setback length when entering the height of a connector. Revit does not warn the user when a value in a field is not compatible with the setback!

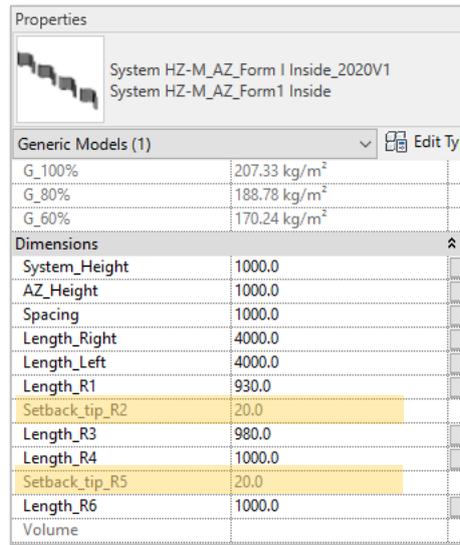
Revit will curtail the AZ and the connectors at the head of the HZ-M!

4.2.2 Connectors R2 and R5

Connectors R2 and R5 connect two HZ-M to form a box-pile (Solution 22, 24, 26, C 1 and C 23), and have the same length as the HZ-M. However, for fabrication purposes, a short setback at the top and at the tip is foreseen.



The setback at the top and the tip for R2 and R5 is 20 mm (this standard value cannot be changed).



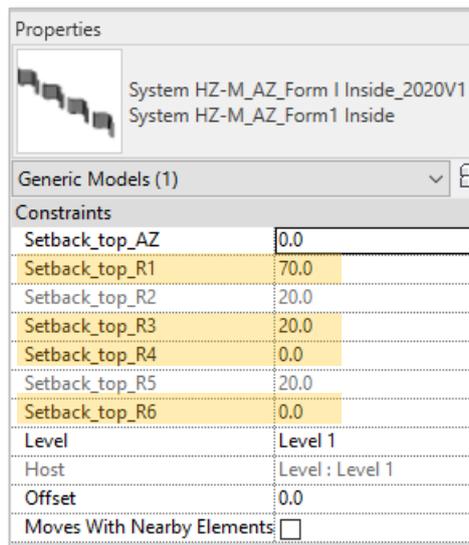
Generic Models (1)	
G_100%	207.33 kg/m ²
G_80%	188.78 kg/m ²
G_60%	170.24 kg/m ²
Dimensions	
System_Height	1000.0
AZ_Height	1000.0
Spacing	1000.0
Length_Right	4000.0
Length_Left	4000.0
Length_R1	930.0
Setback_tip_R2	20.0
Length_R3	980.0
Length_R4	1000.0
Setback_tip_R5	20.0
Length_R6	1000.0
Volume	

5 Constraints on AZ and connectors

A setback at the top of the connectors allows the correct positioning of the connectors R1 to R6 on the HZ-M profile.

A negative setback for the AZ is not allowed in this standard version (it is very rare that the final elevation of the top of the AZ lies above the top of the HZ-M = reference level).

Note that the tip of the AZ should never be below the tip of the HZ-M.



Constraints	
Setback_top_AZ	0.0
Setback_top_R1	70.0
Setback_top_R2	20.0
Setback_top_R3	20.0
Setback_top_R4	0.0
Setback_top_R5	20.0
Setback_top_R6	0.0
Level	Level 1
Host	Level : Level 1
Offset	0.0
Moves With Nearby Elements	<input type="checkbox"/>

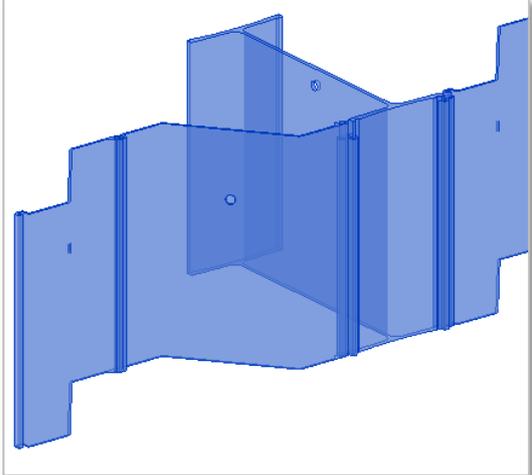
The default value for the setback at the top of R1 (RZD) is 70 mm, and 20 mm for R3 (RZU). These default values can be changed if there is a valid technical reason (for instance if the head of the AZ lies several meters below the top of the HZ-M and there is no additional constraint for the threading at the job-site).

6 Handling holes

Hover the mouse over the field to show the tooltip containing the standard handling holes **Handling hole "0 to 7"**. The list is valid for the HZ-M and for the AZ.

Select the handling holes for the HZ-M and AZ: **Handling_hole_HZ-M** and **Handling_hole_AZ**.

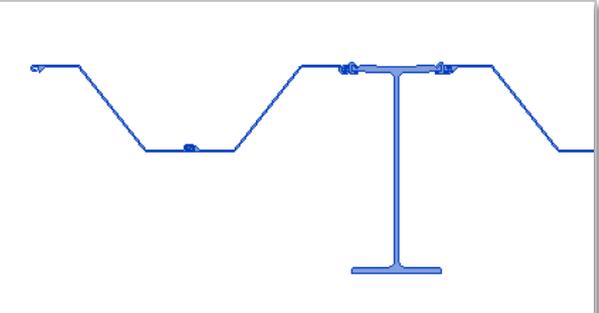
Construction		
Code_Handling_hole	Handling hole "0 to 7"...	
Handling_hole_HZ-M	1	Handling hole "0 to 7" Ø Y
Handling_hole_HZ-M	Ø40 Y75	
Handling_hole_AZ	3	
Handling_hole_AZ	Ø40 Y300	
Materials and Finishes		
HZ-M_Material	AM_S 430 GP	0 = None
Connectors_Material	AM_S 430 GP	1 = 40 75
AZ_Material	AM_S 355 GP	2 = 40 150
		3 = 40 300
		4 = 50 200
		5 = 50 250
		6 = 63.5 230
		7 = 2.5 9 (Inch)
Structural		
Total Mass	1289.400 kg	
Isys (/m)	407530.00 cm ⁴	
Wy* (/m)	7125.00 cm ³	
Wy** (/m)	7995.00 cm ³	
G_100%	228.38 kg/m ²	
G_80%	210.13 kg/m ²	
G_60%	191.89 kg/m ²	



7 Steel grades

Choose the steel grade under the section **Materials and Finishes** for the HZ-M, AZ and connectors.

Handling_hole_HZ-M	None
Handling_hole_AZ	0
Handling_hole_AZ	None
Materials and Finishes	
HZ-M_Material	AM_S 430 GP
Connectors_Material	AM_S 430 GP
AZ_Material	AM_S 355 GP
Structural	
Total Mass	1289.400 kg
Isys (/m)	407530.00 cm ⁴
Wy* (/m)	7125.00 cm ³
Wy** (/m)	7995.00 cm ³
G_100%	228.38 kg/m ²



Default values correspond to the standard solution

- HZ-M S 430 GP
- AZ S 355 GP
- Connectors S 430 GP

Additional steel grades for the HZ-M and AZ according to the European and American standards are available in the file 'ArcelorMittal.adsklib' that is supplied with the .rfa file. Simply add it to your Revit library. Contact our technical department if you encounter any problem with the steel grades database.

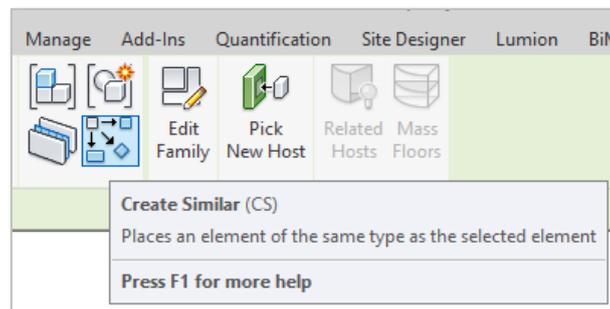
8 Duplication of elements of a system

It is not possible to configure an HZ-M / AZ combination with single components.

However, you can extract from the HZ-M / AZ combination a single *solution* HZ-M or a single sheet pile AZ, Pos. A or Pos. B.

The easiest way to extract a *solution* HZ-M is to open the directory tree of the project (/ Families / Generic Models / Solutions F1 / Solution.rfa), and to insert the *solution* into the project.

For the AZ, you should use the tool **Create Similar**. Select the combination in your model, isolate the single component to be duplicated (via the *Tab* key), and activate the tool to create a similar element.



Notes

- the **Create Similar** tool works also for a *solution* HZ-M,
- all the parameters of the HZ-M/AZ family are reset (lengths, setbacks,...).

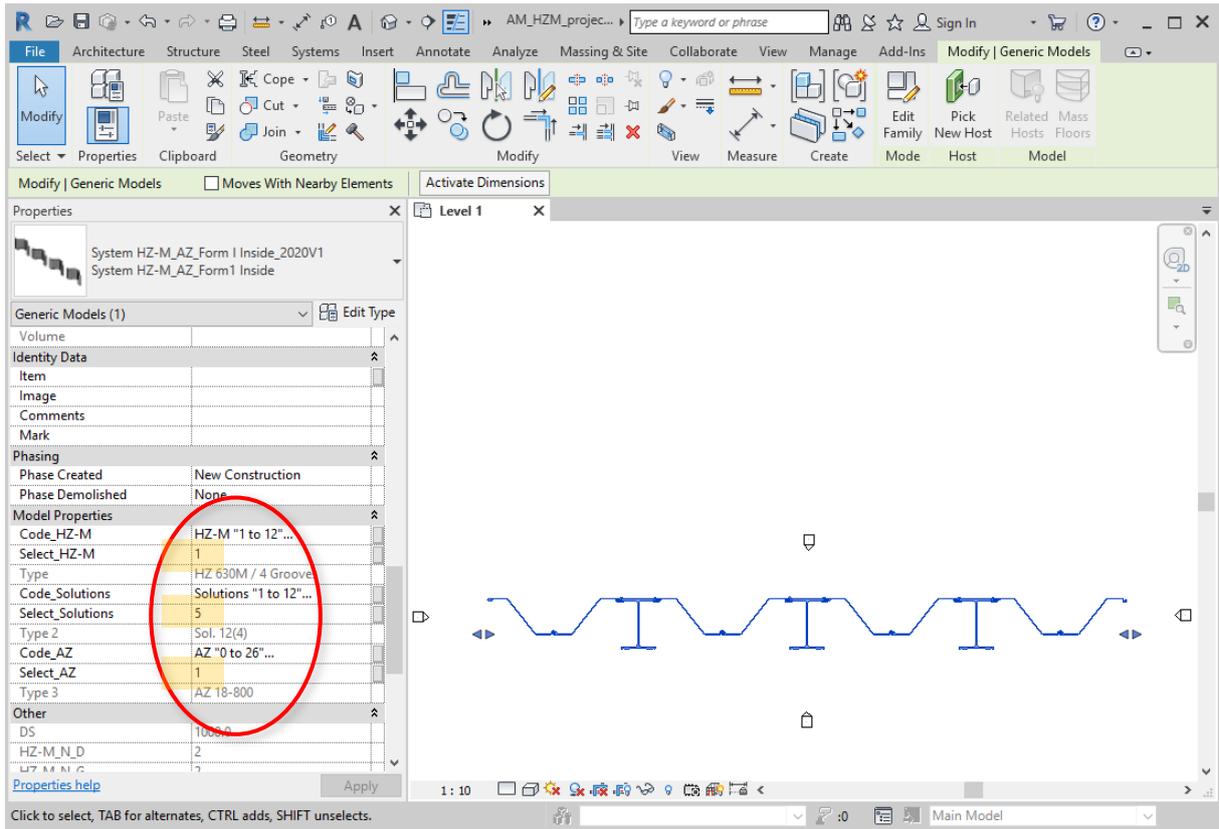
9 Example

9.1 Insert a family 'HZ-M / AZ system' into a new project

When importing the family into a project, the default combination has following *Model Properties*:

- *Select_HZ-M* = 1,
- *Select_Solutions* = 5,
- *Select_AZ* = 1:

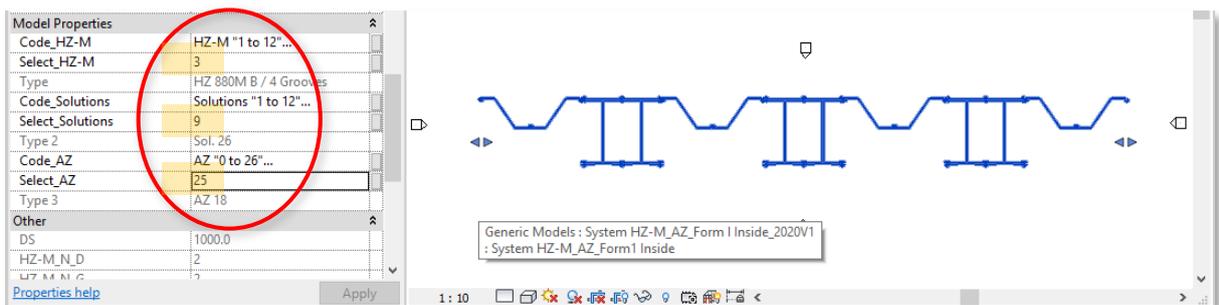
which matches the HZ 630M - 12 / AZ 18-800 system.



9.2 Select a specific HZ-M / AZ combination

Change from the default combination to a specific combination by selecting the corresponding parameters in *Model Properties*.

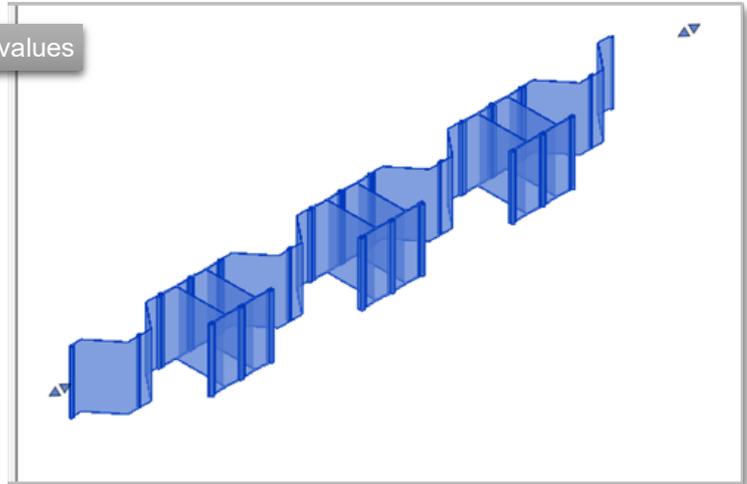
Example: the parameters 3 – 9 – 25 (see sketch below) correspond to the HZ 880M B - 26 / AZ 18.



9.3 Modification of parameters

Dimensions	
System_Height	1000.0
AZ_Height	1000.0
Spacing	1000.0
Length_Right	4000.0
Length_Left	4000.0
Length_R1	930.0
Setback_tip_R2	20.0
Length_R3	980.0
Length_R4	1000.0
Setback_tip_R5	20.0
Length_R6	1000.0
Volume	

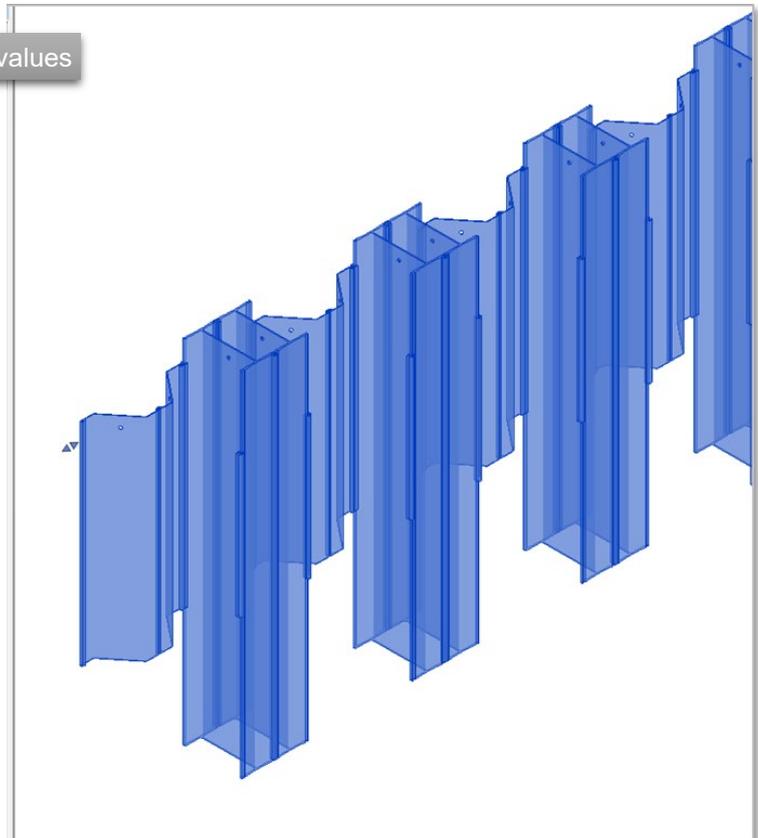
Default values



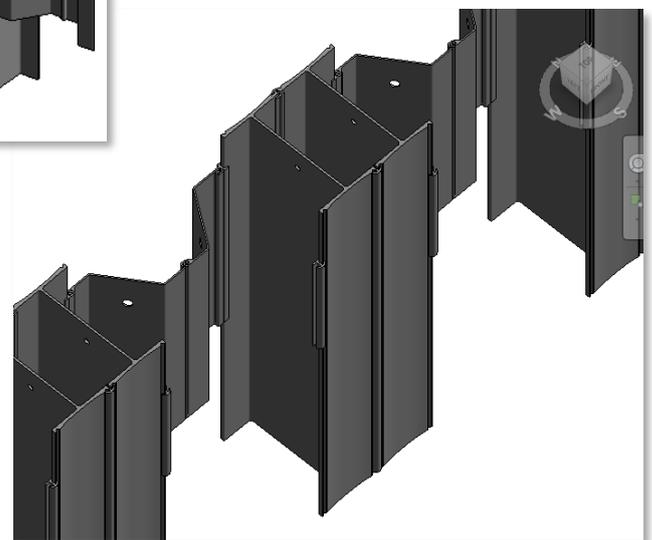
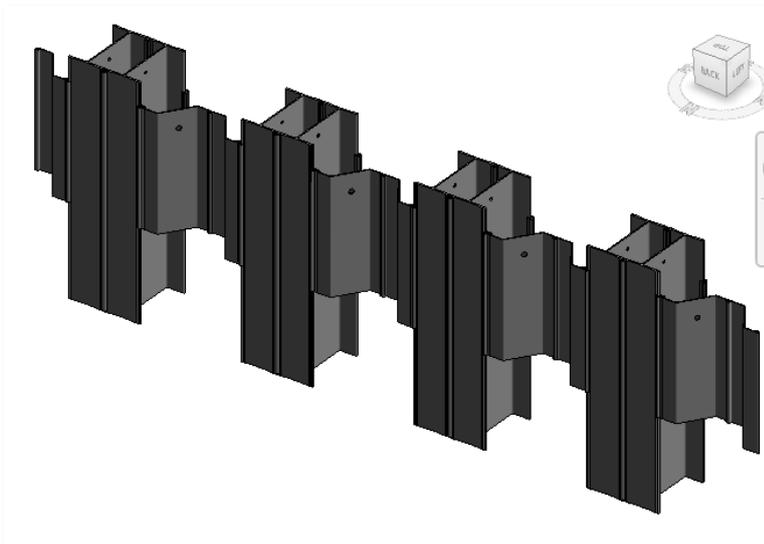
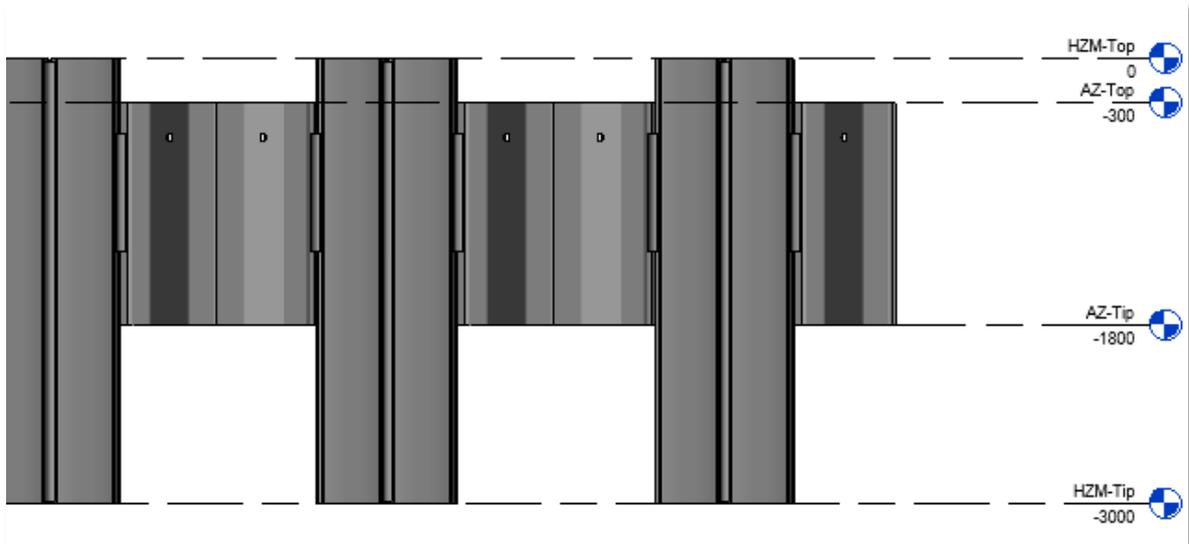
Constraints	
Setback_top_AZ	0.0
Setback_top_R1	70.0
Setback_top_R2	20.0
Setback_top_R3	20.0
Setback_top_R4	0.0
Setback_top_R5	20.0
Setback_top_R6	0.0
Level	Level 1
Host	Level : Level 1
Offset	0.0
Moves With Nearby Elements	<input type="checkbox"/>

Dimensions	
System_Height	3000.0
AZ_Height	1500.0
Spacing	1000.0
Length_Right	6000.0
Length_Left	4000.0
Length_R1	1500.0
Setback_tip_R2	20.0
Length_R3	1500.0
Length_R4	800.0
Setback_tip_R5	20.0
Length_R6	800.0
Volume	

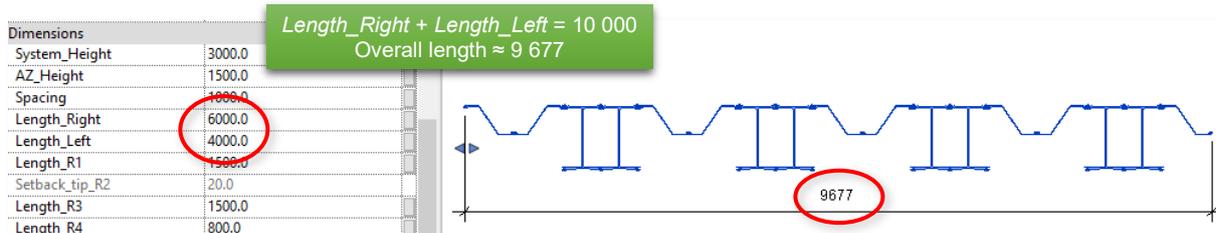
Specific values



Constraints	
Setback_top_AZ	300.0
Setback_top_R1	0.0
Setback_top_R2	20.0
Setback_top_R3	0.0
Setback_top_R4	500.0
Setback_top_R5	20.0
Setback_top_R6	500.0
Level	Level 1
Host	Level : Level 1
Offset	0.0
Moves With Nearby Elements	<input type="checkbox"/>

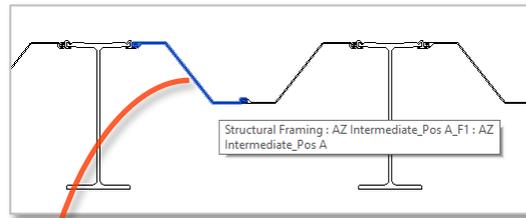


Usually, the overall length of the wall will not match exactly the initial input of the fields related to the length of the wall ($Length_Right + Length_Left$) – see sketch below; a special pile would be required to match the value exactly.



9.4 Extraction of an AZ, pos. A

Phase Demolished	None
Model Properties	
Code_HZ-M	HZ-M "1 to 12"...
HZ-M	5
Type	HZ 1080M A / 2 Grooves
Code_Solutions	Solutions "1 to 12"...
Solutions	4
Type 2	Sol. 12(2)
Code_AZ	AZ "0 to 26"...
AZ	1
Type 3	AZ 18-800
Other	
DS	1000.0
HZ-M_N_D	2

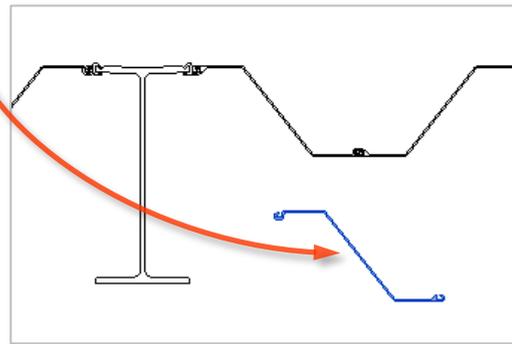
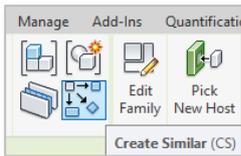


9.4.1 Step 1: copy a single element

Select the HZ-M/AZ system.

Use the key *Tab* to select the element AZ pos. A.

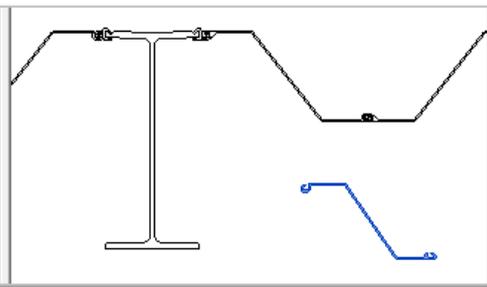
Activate the tool **Create Similar**.



Create the element.

9.4.2 Step 2: configure the copied element

Phase Created	Phase 1
Phase Demolished	None
Model Properties	
Code_AZ	AZ "1 to 26"...
AZ	25
Type	AZ 18
Other	
ac	22.0
gr	44.0
r1	20.0
r2	15.0



Select the correct section, and modify parameters as needed, ...

Notes

- To create a double pile AZ, *Form I* or *Form II*, create one AZ Pos. A and one AZ Pos.B, and then assemble them.
- Did you notice the change in the copied element? **AZ "1 to 26"...** instead of **AZ "0 to 26"...**.... Logical, as in the original HZ-M / AZ system, you can choose a combination without an infill sheet pile.

10 General notes

Autodesk Revit¹ families are not protected and can be modified by any user. We do recommend using ArcelorMittal's original .rfa files (download available on our website) before using the families. You can adapt the families to your specific needs, but do not change the original data (section properties such as section modulus, mass, ...) nor the geometry of the profiles.

If you plan to use a Revit model to issue an accurate material list of the HZ-M / AZ system, avoid using the tool **Mirror**. Mirroring a sheet pile may change the form of the sheet piles, which is not a major concern for the layout itself, but it can definitely mess up a material list (bill of material).

Parameters **Spacing**, **Length_Left** and **Length_Right** are indicative values. You can modify them but pay attention to values which are not compatible with the basic system (low values).

The HZ-M / AZ system is a quite complex sheet pile system built up with several components; consequently, it uses numerous parameters and requires a rigorous modelling approach and verification of the final model.

This Revit family might not fit all the specific needs of every project. Our technical department may be able to work out a specific family for your project.

ArcelorMittal Sheet Piling's technical team can assist BIM modelers with detailing. This service is free of charge.

If you have any comments or suggestions, feel free to contact us at sheetpiling@arcelormittal.com.

More information about steel sheet piles on <https://sheetpiling.arcelormittal.com>

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