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RENOVATION DES COUVERTURES DES HALLES GCCD et GMP DE L'IUT 1



ETUDE D'ECLAIREMENT NATUREL

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INGENIERIE GENERALE

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I - REGLEMENTATION

I.1 - NORME EN17037

La norme EN17037 définit un ensemble de recommandations, qualitatives et quantitatives concernant l'éclairage naturel des bâtiments :

- Assurer un certain niveau d'éclairement (défini ci-dessous),
- Permettre une vue sur l'extérieur,
- Assurer une certaine exposition au soleil,
- Eviter l'éblouissement.

Les 3 seuils de niveaux d'éclairement préconisés sont :

- 300 lux sur 50% de l'espace ou 100 lux sur 95% de l'espace pendant 50% des heures d'ensoleillement (seuil minimum),
- 500 lux sur 50% de l'espace ou 300 lux sur 95% de l'espace pendant 50% des heures d'ensoleillement (seuil moyen),
- 750 lux sur 50% de l'espace ou 500 lux sur 95% de l'espace pendant 50% des heures d'ensoleillement (seuil haut),

II - CALCULS D'ECLAIREMENT

II.1 - HALLE GCCD

Seuls les locaux avec des sheds ont fait l'objet d'une étude, les lanterneaux seuls ayant un apport minime.
Certains locaux ont été regroupés du fait de leurs dimensions similaires (salles 11 et 14).
Les notes de calcul sont en annexe du présent document.

II.2 - HALLE GMP

Le calcul porte uniquement sur la halle centrale (zones 37,38,39,45,46,47 et circulation attenante).
La note de calcul est en annexe du présent document.

III - CONCLUSION DE L'ETUDE

Le seuil d'éclairement minimum (300lux en moyenne) correspond à un FLJ moyen de 3%.
Aucun local n'a suffisamment d'éclairage naturel pour satisfaire les niveaux d'éclairement recommandés, ils n'offrent pas non plus de vue sur l'extérieur, et l'exposition au soleil est minime.
Aucune des recommandations de la norme EN17037 n'est respectée, et l'éclairage artificiel reste nécessaire pour assurer l'usage nominal du local.

IV - ANNEXES

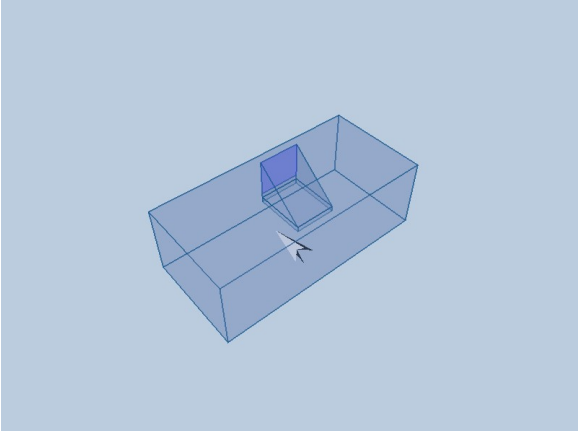
Performance calculation of daylighting

Project : **Halle_GCCD**

Project type : New construction
Address :
Responsible :
Society : TPF Ingenierie
Date : 8.10.2018

Room : **GC2**

Function : Classroom
Weather site : Grenoble (France)
DIAL+ version : 2.8.08



1. GC2 : Input parameters

1.1 Room dimensions

Net surface :	**118.5**	**[m²]**
Width :	15.8	[m]
Depth :	7.5	[m]
Height :	5.2	[m]
Index facade glazing :	0	[%]
Index roof glazing :	5	[%]

1.2 Walls geometry

Name	Orientation	Width [m]	Height [m]	Thickness [m]	Lightness
Floor	-	15.8	7.5	-	0.3
Wall 1	S (180°)	15.8	5.2	0.35	0.5
Wall 2	E (90°)	7.5	5.2	0.35	0.5
Wall 3	N (0°)	15.8	5.2	0.35	0.5
Wall 4	W (270°)	7.5	5.2	0.35	0.5
Roof 5	-	15.8	7.5	0.35	0.7

1.3 Openings geometry

Name	Orientation	Width [m]	Height [m]	Dist to left side [m]	Window sill [m]	Surface [m²]
Open 5.1	-	2.7	3.3	5.8	0.5	8.91

1.4 Detailed openings

Name	Frame [%]	Tl Glazing	g Glazing	Ug Glazing	Psi Frame	Uf Frame	Uw Window	Opening [%]
Open 5.1	30	0.8	0.62	1.1	0.08	1.6	1.4	25

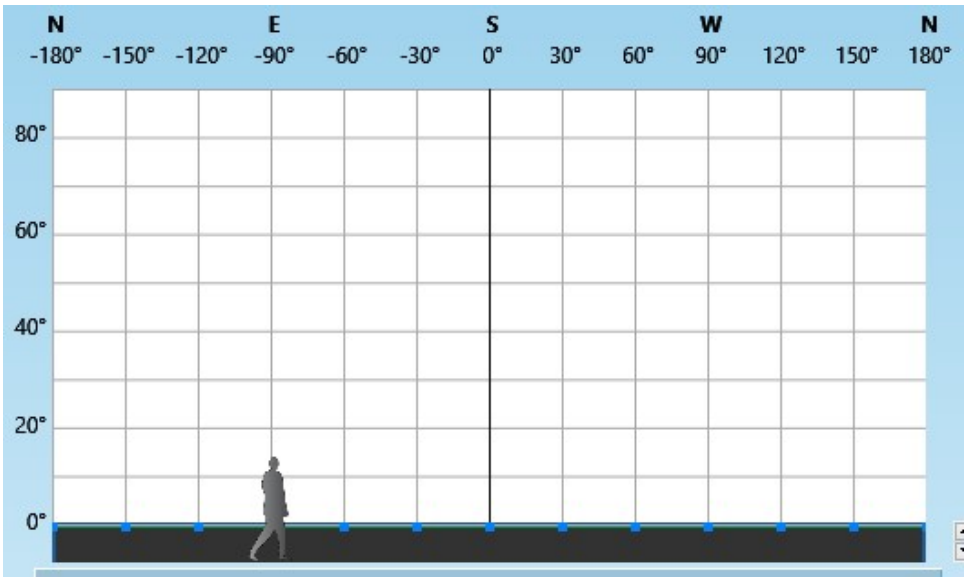
Open X.Y : X is the facade number and Y the opening number.

1.5 Mobiles shadings

Name	Type	Position	g Protection	g Glazing + Protection
Open 5.1	No protection	-	1	0.62

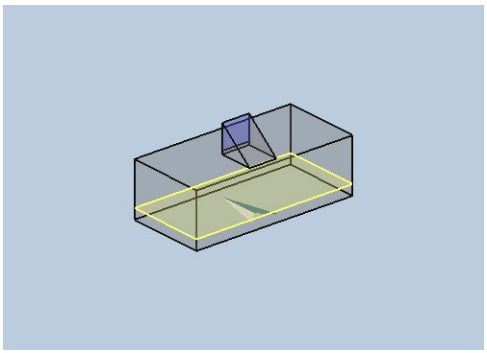
1.6 Horizon

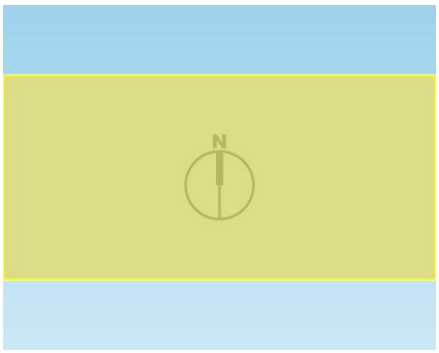
Reflection coefficient of the outside ground : 0.15 [-]
Reflection coefficient of close horizon : 0.25 [-]
Reflection coefficient of distant horizon : 0.25 [-]



2. Results DF (GC2)

2.1 Surface analysis

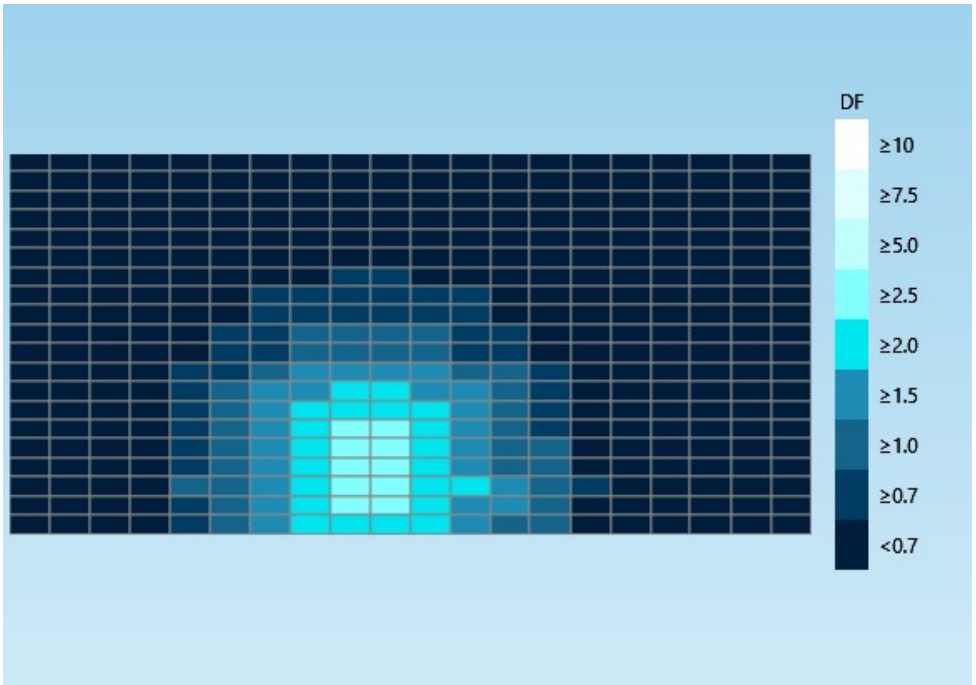




Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	15.8 [m]
- Depth :	7.52 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

2.2 Daylight factor

Maximum :	2.6 [-]	Average :	0.68 [-]	Minimum :	0.11 [-]
		Uniformity :	0 [-]		

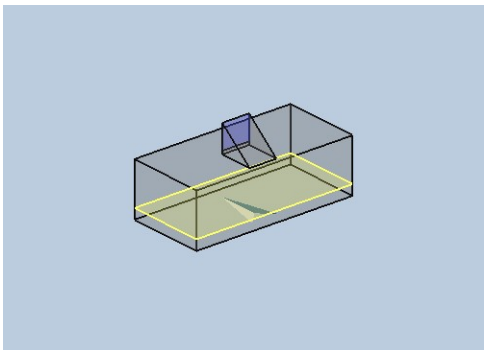


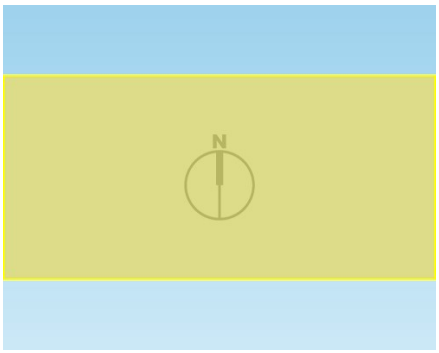
DF is	< 0.7	≥ 0.7	≥ 1.0	≥ 1.2	≥ 1.5	≥ 1.8	≥ 2.0	≥ 2.5	≥ 5.0	≥ 7.5	≥ 10.0
to	70	30	21.3	17.3	12.8	10.8	7.5	1.8	0	0	0

% of the room total surface.

3. Results Autonomy (GC2)

3.1 Surface analysis



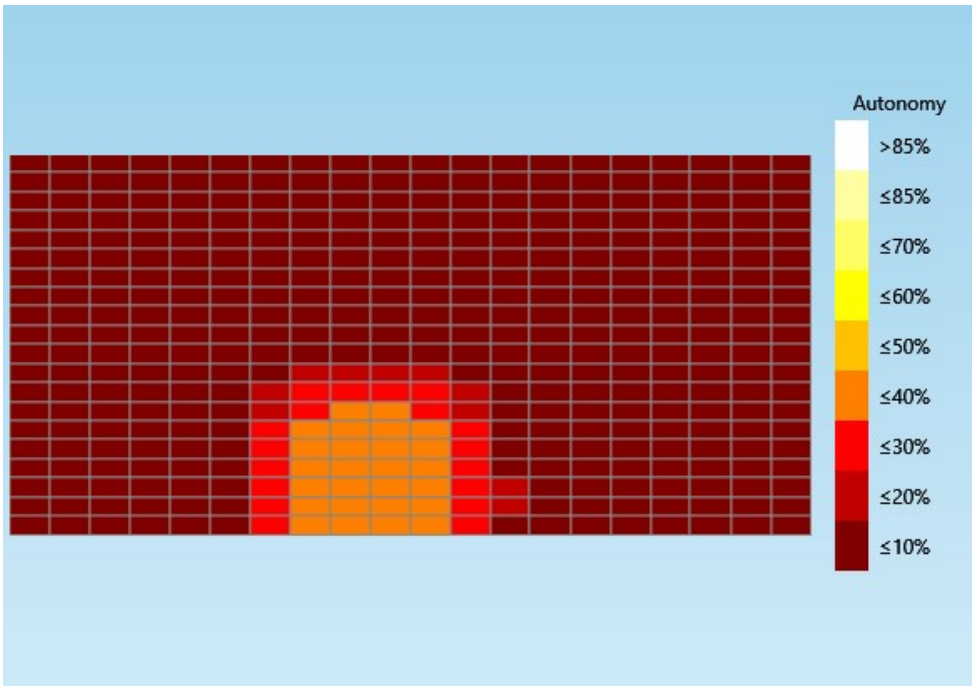


Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	15.8 [m]
- Depth :	7.52 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

3.2 Daylighting autonomy

Required illum. : 500 [lux] Occupation schedule : 7h-18h

Maximum : 40 [%] Average : 4.2 [%] Minimum : 0 [%]



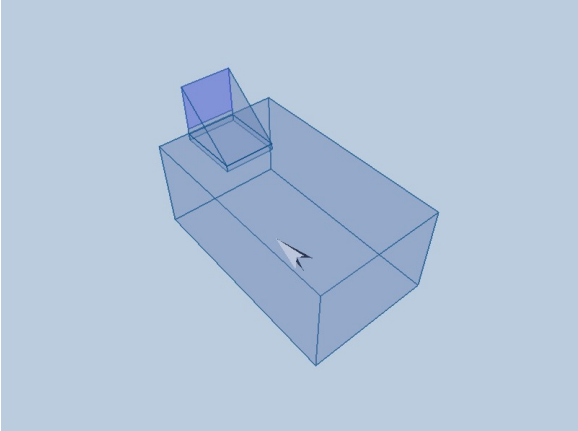
Performance calculation of daylighting

Project : **Halle_GCCD**

Project type : New construction
Address :
Responsible :
Society : TPF Ingenierie
Date : 8.10.2018

Room : **GC11**

Function : Classroom
Weather site : Grenoble (France)
DIAL+ version : 2.8.08



1. GC11 : Input parameters

1.1 Room dimensions

Net surface :	**84**	**[m²]**
Width :	7	[m]
Depth :	12	[m]
Height :	5.2	[m]
Index facade glazing :	0	[%]
Index roof glazing :	8	[%]

1.2 Walls geometry

Name	Orientation	Width [m]	Height [m]	Thickness [m]	Lightness
Floor	-	7	12	-	0.3
Wall 1	S (180°)	7	5.2	0.35	0.5
Wall 2	E (90°)	12	5.2	0.35	0.5
Wall 3	N (0°)	7	5.2	0.35	0.5
Wall 4	W (270°)	12	5.2	0.35	0.5
Roof 5	-	7	12	0.35	0.7

1.3 Openings geometry

Name	Orientation	Width [m]	Height [m]	Dist to left side [m]	Window sill [m]	Surface [m²]
Open 5.1	-	2.7	3.3	1.5	8.2	8.91

1.4 Detailed openings

Name	Frame [%]	Tl Glazing	g Glazing	Ug Glazing	Psi Frame	Uf Frame	Uw Window	Opening [%]
Open 5.1	20	0.8	0.62	1.1	0.08	1.6	1.3	25

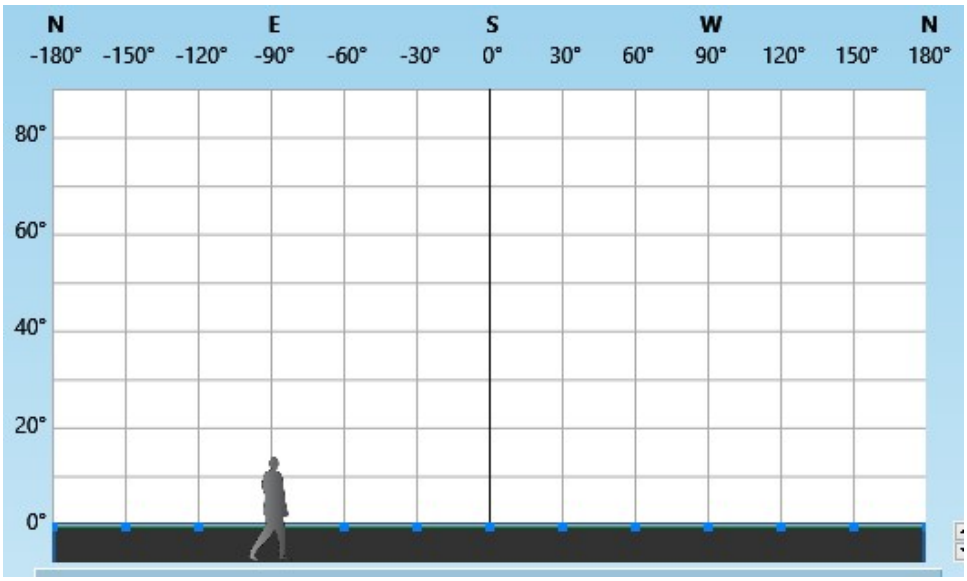
Open X.Y : X is the facade number and Y the opening number.

1.5 Mobiles shadings

Name	Type	Position	g Protection	g Glazing + Protection
Open 5.1	No protection	-	1	0.62

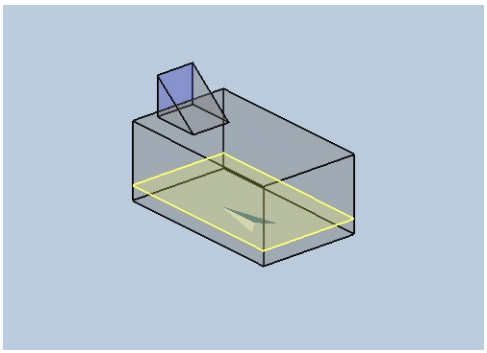
1.6 Horizon

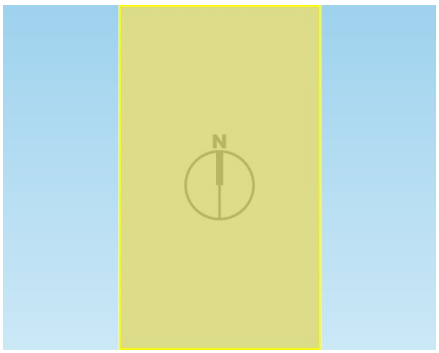
Reflection coefficient of the outside ground : 0.15 [-]
Reflection coefficient of close horizon : 0.25 [-]
Reflection coefficient of distant horizon : 0.25 [-]



2. Results DF (GC11)

2.1 Surface analysis

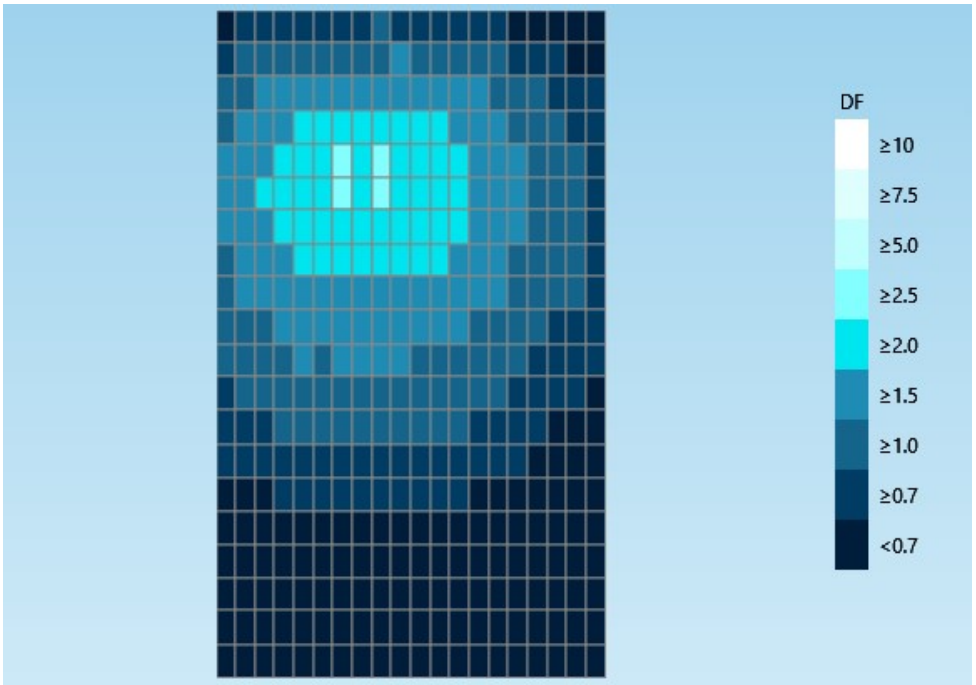




Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	6.99 [m]
- Depth :	12 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

2.2 Daylight factor

Maximum :	2.5 [-]	Average :	1.1 [-]	Minimum :	0.22 [-]
		Uniformity :	0 [-]		

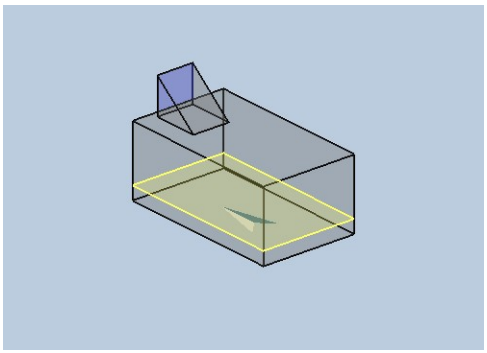


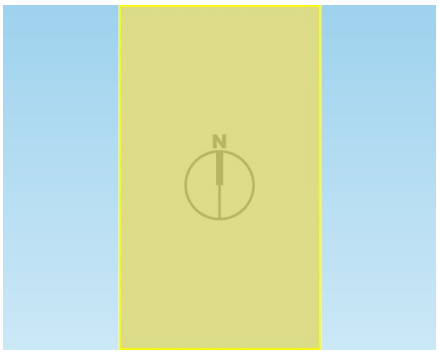
DF is	< 0.7	≥ 0.7	≥ 1.0	≥ 1.2	≥ 1.5	≥ 1.8	≥ 2.0	≥ 2.5	≥ 5.0	≥ 7.5	≥ 10.0
to	31.5	68.5	50.2	40	26.8	17	11	0.3	0	0	0

% of the room total surface.

3. Results Autonomy (GC11)

3.1 Surface analysis



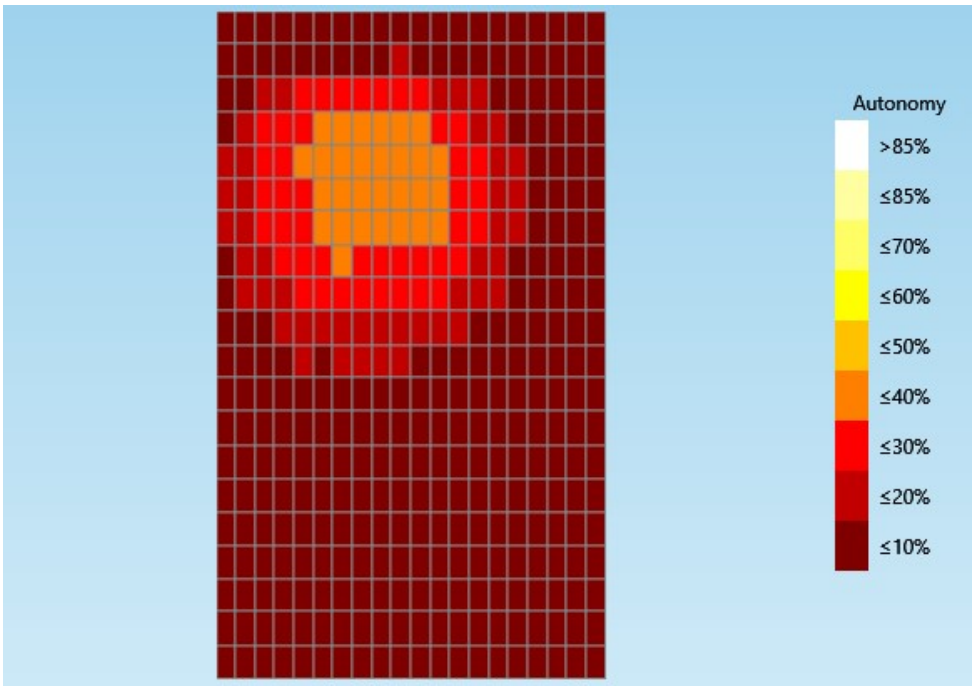


Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	6.99 [m]
- Depth :	12 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

3.2 Daylighting autonomy

Required illum. : 500 [lux] Occupation schedule : 7h-18h

Maximum : 39 [%] Average : 7.9 [%] Minimum : 0 [%]



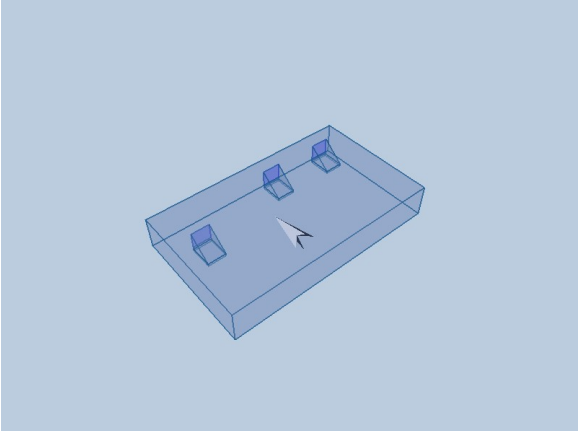
Performance calculation of daylighting

Project : **Halle_GCCD**

Project type : New construction
Address :
Responsible :
Society : TPF Ingenierie
Date : 8.10.2018

Room : **GC12**

Function : Classroom
Weather site : Grenoble (France)
DIAL+ version : 2.8.08



1. GC12 : Input parameters

1.1 Room dimensions

Net surface :	**680 [m²]**
Width :	34 [m]
Depth :	20 [m]
Height :	5.2 [m]
Index facade glazing :	0 [%]
Index roof glazing :	3 [%]

1.2 Walls geometry

Name	Orientation	Width [m]	Height [m]	Thickness [m]	Lightness
Floor	-	34	20	-	0.3
Wall 1	S (180°)	34	5.2	0.35	0.5
Wall 2	E (90°)	20	5.2	0.35	0.5
Wall 3	N (0°)	34	5.2	0.35	0.5
Wall 4	W (270°)	20	5.2	0.35	0.5
Roof 5	-	34	20	0.35	0.7

1.3 Openings geometry

Name	Orientation	Width [m]	Height [m]	Dist to left side [m]	Window sill [m]	Surface [m²]
Open 5.1	-	2.7	3.3	2	7.8	8.91
Open 5.2	-	2.7	3.3	16.2	11.4	8.91
Open 5.3	-	2.7	3.3	25.4	11.4	8.91

1.4 Detailed openings

Name	Frame [%]	Tl Glazing	g Glazing	Ug Glazing	Psi Frame	Uf Frame	Uw Window	Opening [%]
Open 5.1	20	0.8	0.62	1.1	0.08	1.6	1.3	25
Open 5.2	20	0.8	0.62	1.1	0.08	1.6	1.3	25
Open 5.3	20	0.8	0.62	1.1	0.08	1.6	1.3	25

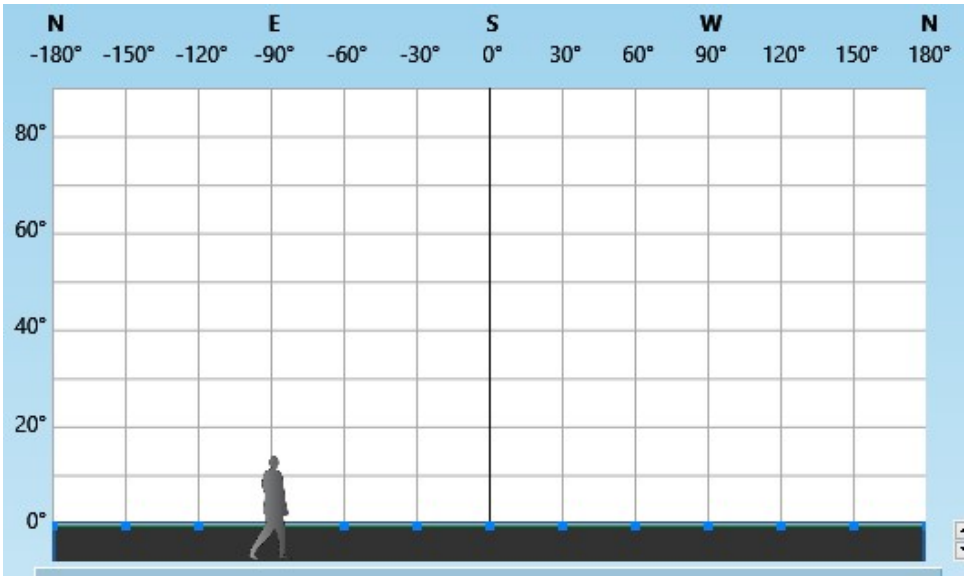
Open X.Y : X is the facade number and Y the opening number.

1.5 Mobiles shadings

Name	Type	Position	g Protection	g Glazing + Protection
Open 5.1	No protection	-	1	0.62
Open 5.2	No protection	-	1	0.62
Open 5.3	No protection	-	1	0.62

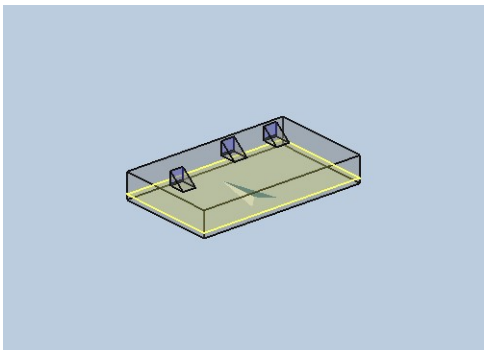
1.6 Horizon

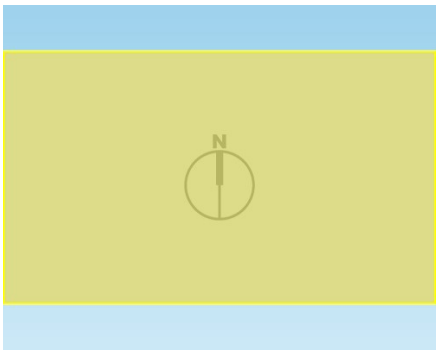
Reflection coefficient of the outside ground : 0.15 [-]
Reflection coefficient of close horizon : 0.25 [-]
Reflection coefficient of distant horizon : 0.25 [-]



2. Results DF (GC12)

2.1 Surface analysis

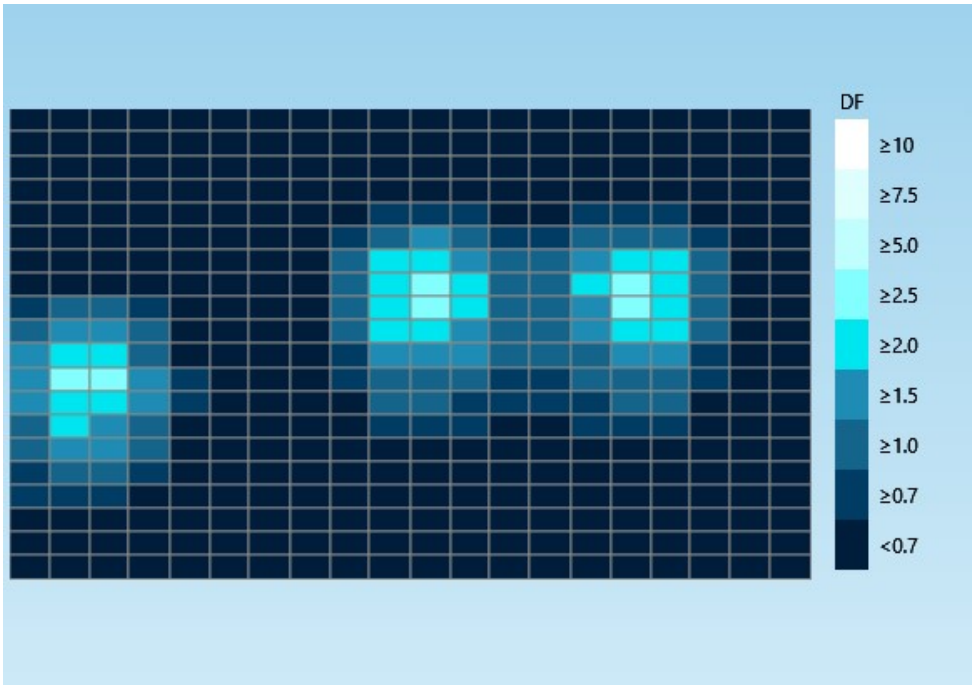




Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	34 [m]
- Depth :	19.99 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

2.2 Daylight factor

Maximum :	2.7 [-]	Average :	0.64 [-]	Minimum :	0.07 [-]
		Uniformity :	0 [-]		

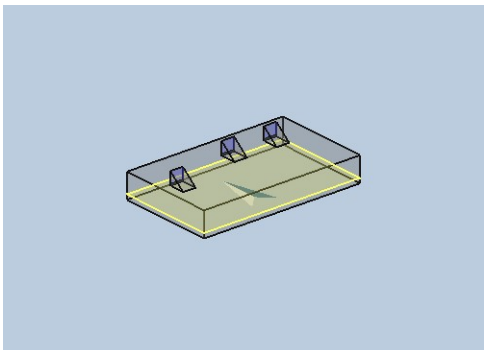


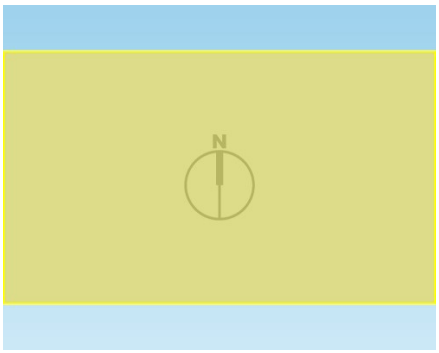
DF is	< 0.7	≥ 0.7	≥ 1.0	≥ 1.2	≥ 1.5	≥ 1.8	≥ 2.0	≥ 2.5	≥ 5.0	≥ 7.5	≥ 10.0
to	68.5	31.5	23	17.3	11	7	5	1.3	0	0	0

% of the room total surface.

3. Results Autonomy (GC12)

3.1 Surface analysis



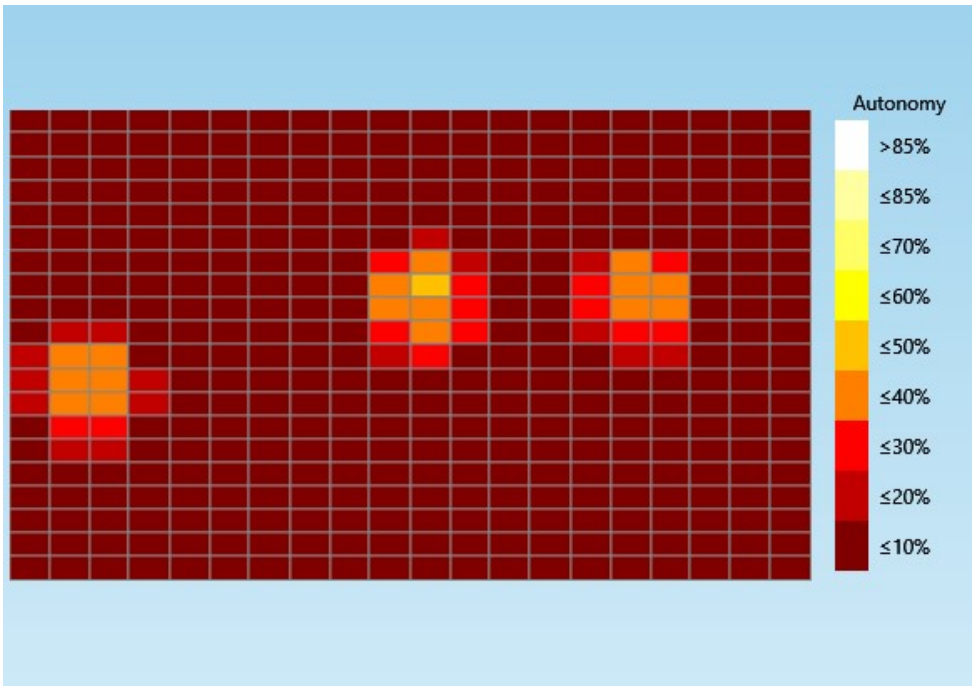


Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	34 [m]
- Depth :	19.99 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

3.2 Daylighting autonomy

Required illum. : 500 [lux] Occupation schedule : 7h-18h

Maximum : 42 [%] Average : 3.5 [%] Minimum : 0 [%]



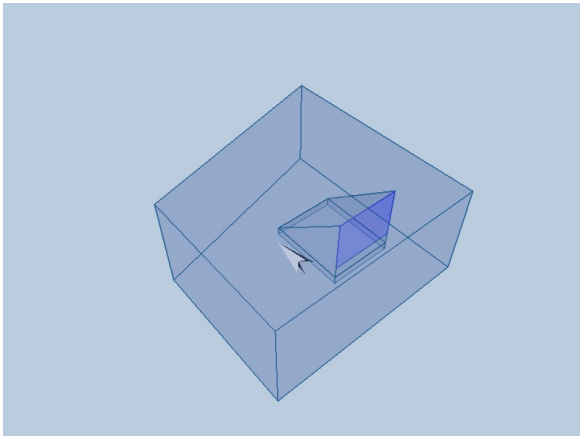
Performance calculation of daylighting

Project : **Halle_GCCD**

Project type : New construction
Address :
Responsible :
Society : TPF Ingenierie
Date : 8.10.2018

Room : **GC13**

Function : Classroom
Weather site : Grenoble (France)
DIAL+ version : 2.8.08



1. GC13 : Input parameters

1.1 Room dimensions

Net surface :			**111.44**	**[m²]**
Width :	0	11.2	11.2	[m]
Depth :		8.3	11.6	[m]
Height :			5.2	[m]
Index facade glazing :			0	[%]
Index roof glazing :			5	[%]

1.2 Walls geometry

Name	Orientation	Width [m]			Height [m]			Thickness [m]	Lightness
Floor	-	11.2	11.2	0		11.6	8.3	-	0.3
Wall 1	S (180°)		11.2			5.2		0.35	0.5
Wall 2	E (90°)		11.6			5.2		0.35	0.5
Wall 3	N (343°)		11.68			5.2		0.35	0.5
Wall 4	W (270°)		8.3			5.2		0.35	0.5
Roof 5	(180°)	11.2	11.2	0		11.6	8.3	0.35	0.7

1.3 Openings geometry

Name	Orientation	Width [m]	Height [m]	Dist to left side [m]	Window sill [m]	Surface [m²]
Open 5.1	(180°)	2.7	3.3	3	0.2	8.91

1.4 Detailed openings

Name	Frame [%]	Tl Glazing	g Glazing	Ug Glazing	Psi Frame	Uf Frame	Uw Window	Opening [%]
Open 5.1	30	0.8	0.62	1.1	0.08	1	1.2	25

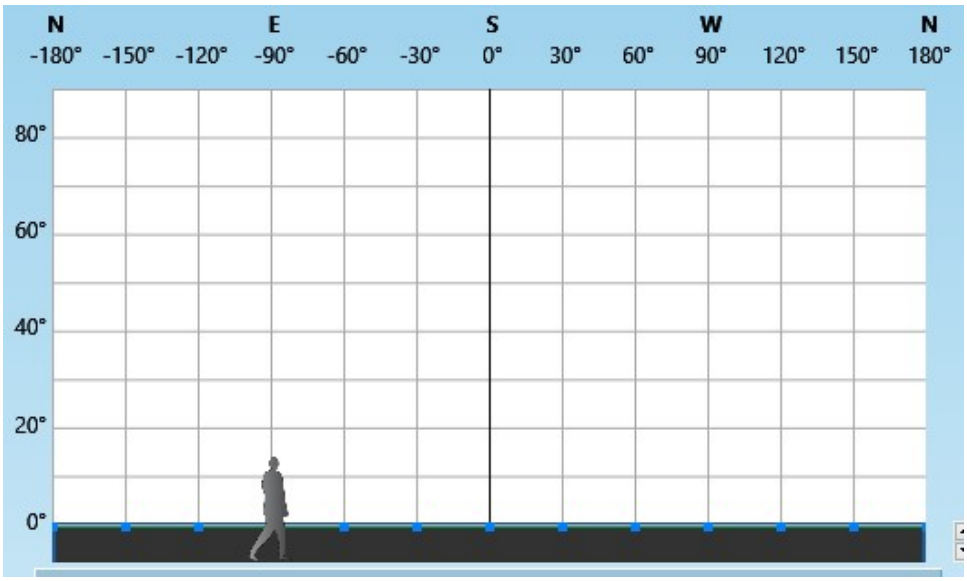
Open X.Y : X is the facade number and Y the opening number.

1.5 Mobiles shadings

Name	Type	Position	g Protection	g Glazing + Protection
Open 5.1	No protection	-	1	0.62

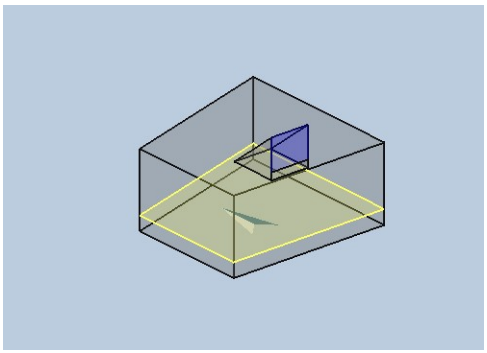
1.6 Horizon

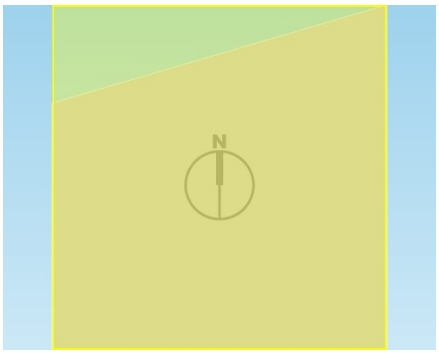
Reflection coefficient of the outside ground : 0.15 [-]
Reflection coefficient of close horizon : 0.25 [-]
Reflection coefficient of distant horizon : 0.25 [-]



2. Results DF (GC13)

2.1 Surface analysis

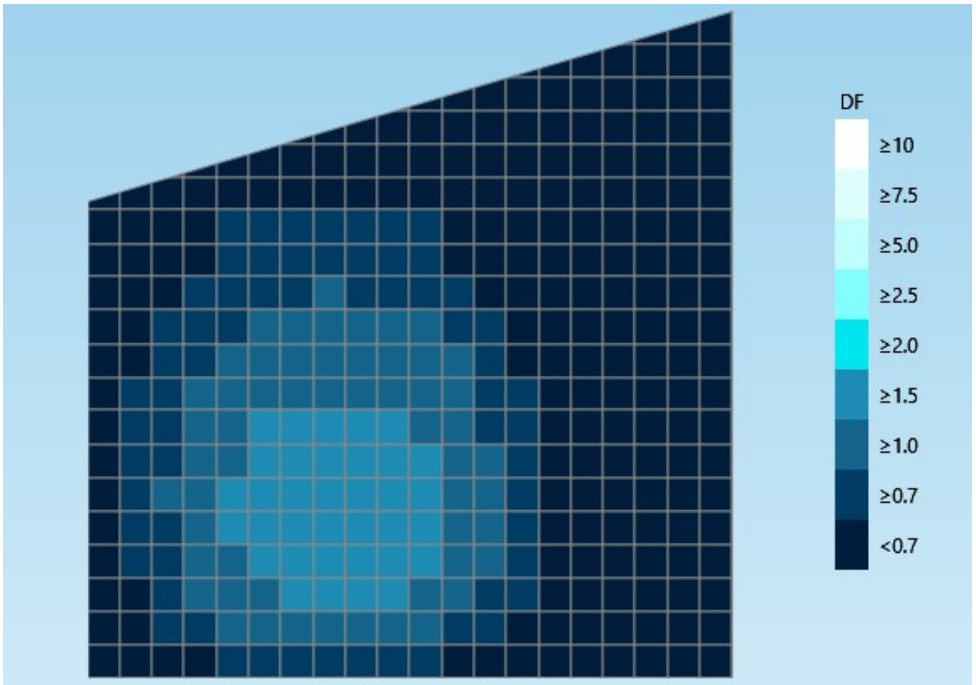




Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	11.19 [m]
- Depth :	11.6 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

2.2 Daylight factor

Maximum :	1.9 [-]	Average :	0.72 [-]	Minimum :	0.09 [-]
		Uniformity :	0 [-]		

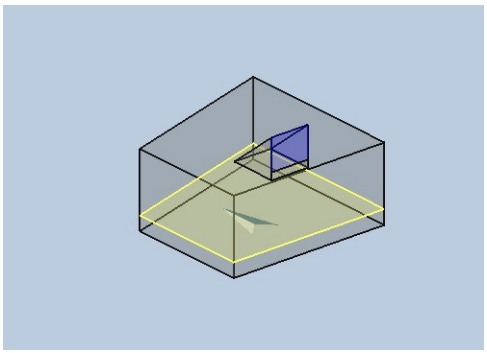


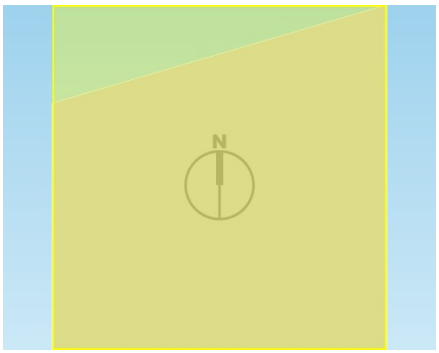
DF is	< 0.7	≥ 0.7	≥ 1.0	≥ 1.2	≥ 1.5	≥ 1.8	≥ 2.0	≥ 2.5	≥ 5.0	≥ 7.5	≥ 10.0
to	56.9	43.1	24.8	18	9	1.7	0	0	0	0	0

% of the room total surface.

3. Results Autonomy (GC13)

3.1 Surface analysis



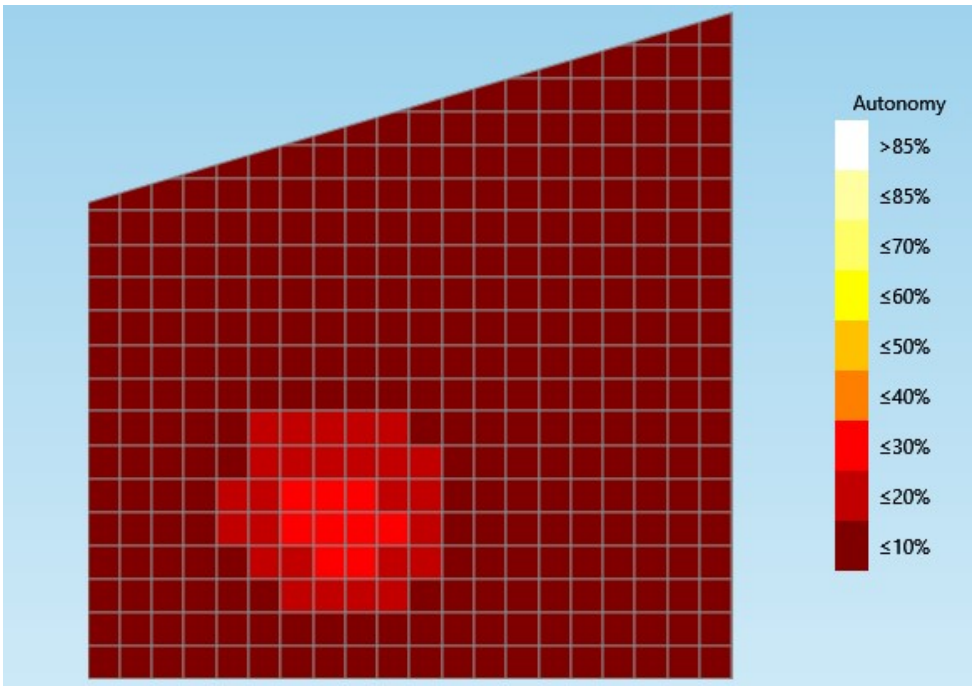


Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	11.19 [m]
- Depth :	11.6 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

3.2 Daylighting autonomy

Required illum. : 500 [lux] Occupation schedule : 7h-18h

Maximum : 24 [%] Average : 2.4 [%] Minimum : 0 [%]



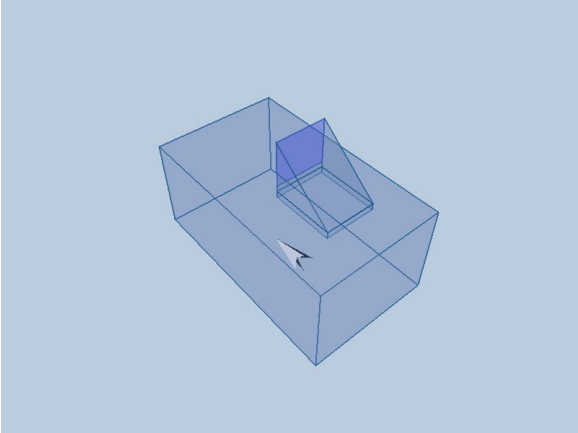
Performance calculation of daylighting

Project : **Halle_GCCD**

Project type : New construction
Address :
Responsible :
Society : TPF Ingenierie
Date : 8.10.2018

Room : **GC19**

Function : Classroom
Weather site : Grenoble (France)
DIAL+ version : 2.8.08



1. GC19 : Input parameters

1.1 Room dimensions

Net surface :	**84**	**[m²]**
Width :	7	[m]
Depth :	12	[m]
Height :	5.2	[m]
Index facade glazing :	0	[%]
Index roof glazing :	8	[%]

1.2 Walls geometry

Name	Orientation	Width [m]	Height [m]	Thickness [m]	Lightness
Floor	-	7	12	-	0.3
Wall 1	S (180°)	7	5.2	0.35	0.5
Wall 2	E (90°)	12	5.2	0.35	0.5
Wall 3	N (0°)	7	5.2	0.35	0.5
Wall 4	W (270°)	12	5.2	0.35	0.5
Roof 5	-	7	12	0.35	0.7

1.3 Openings geometry

Name	Orientation	Width [m]	Height [m]	Dist to left side [m]	Window sill [m]	Surface [m²]
Open 5.1	-	2.7	3.3	2.2	2	8.91

1.4 Detailed openings

Name	Frame [%]	Tl Glazing	g Glazing	Ug Glazing	Psi Frame	Uf Frame	Uw Window	Opening [%]
Open 5.1	20	0.8	0.62	1.1	0.08	1.6	1.3	25

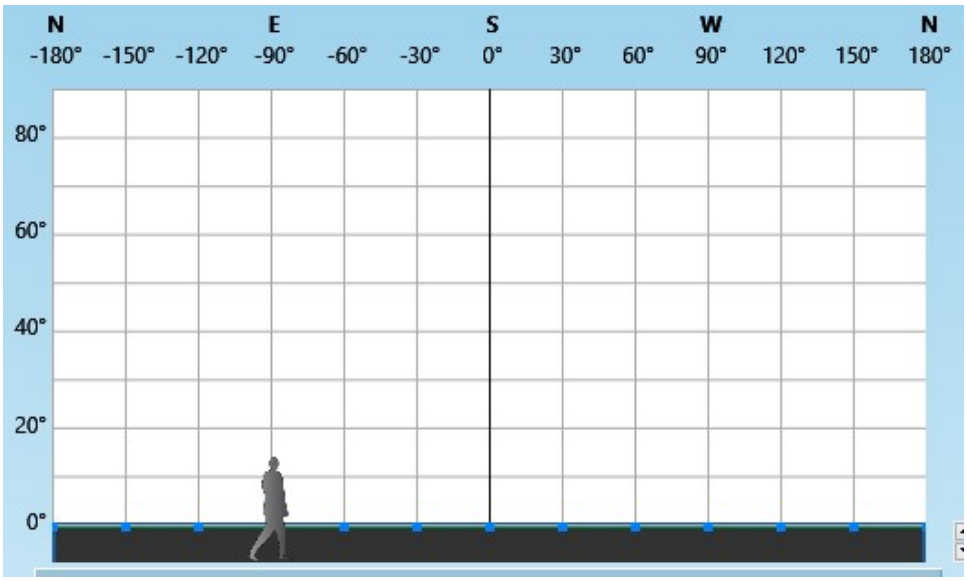
Open X.Y : X is the facade number and Y the opening number.

1.5 Mobiles shadings

Name	Type	Position	g Protection	g Glazing + Protection
Open 5.1	No protection	-	1	0.62

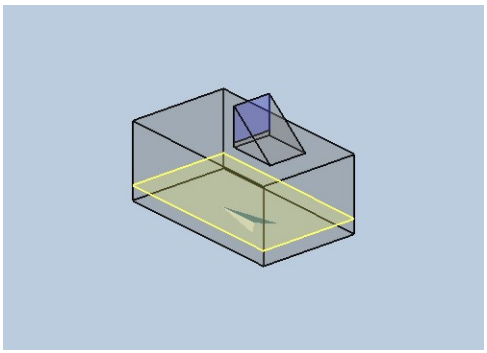
1.6 Horizon

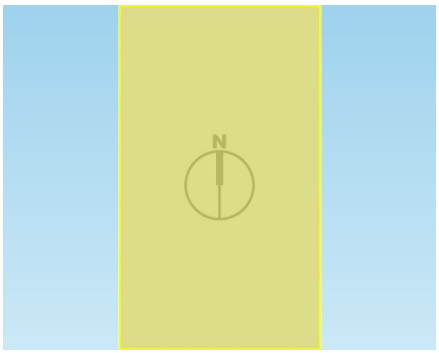
Reflection coefficient of the outside ground : 0.15 [-]
Reflection coefficient of close horizon : 0.25 [-]
Reflection coefficient of distant horizon : 0.25 [-]



2. Results DF (GC19)

2.1 Surface analysis

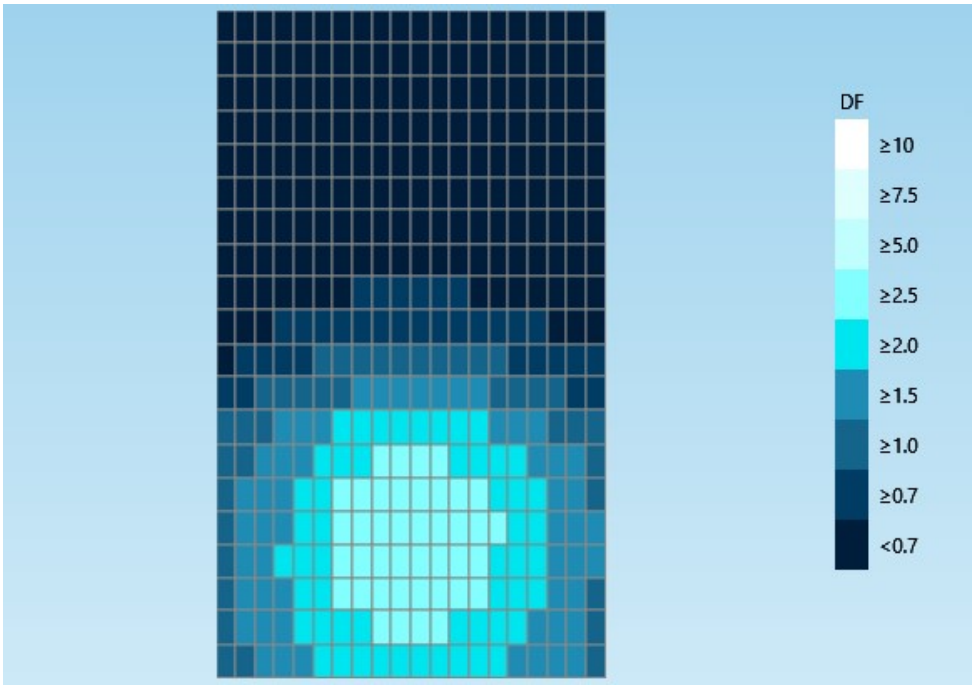




Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	6.99 [m]
- Depth :	12 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

2.2 Daylight factor

Maximum :	2.9 [-]	Average :	1.1 [-]	Minimum :	0.13 [-]
		Uniformity :	0 [-]		

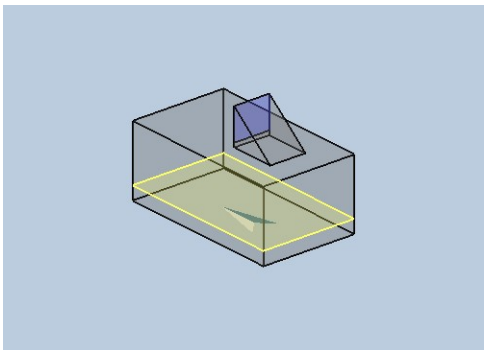


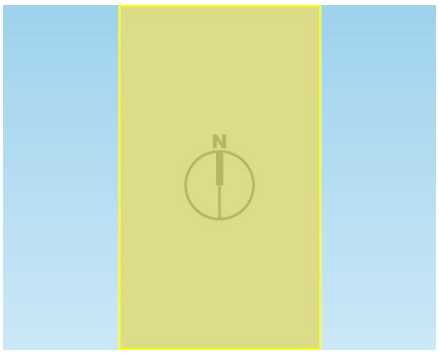
DF is	< 0.7	≥ 0.7	≥ 1.0	≥ 1.2	≥ 1.5	≥ 1.8	≥ 2.0	≥ 2.5	≥ 5.0	≥ 7.5	≥ 10.0
to	45.5	54.5	46.5	42.5	34.8	26.3	22.5	8.5	0	0	0

% of the room total surface.

3. Results Autonomy (GC19)

3.1 Surface analysis



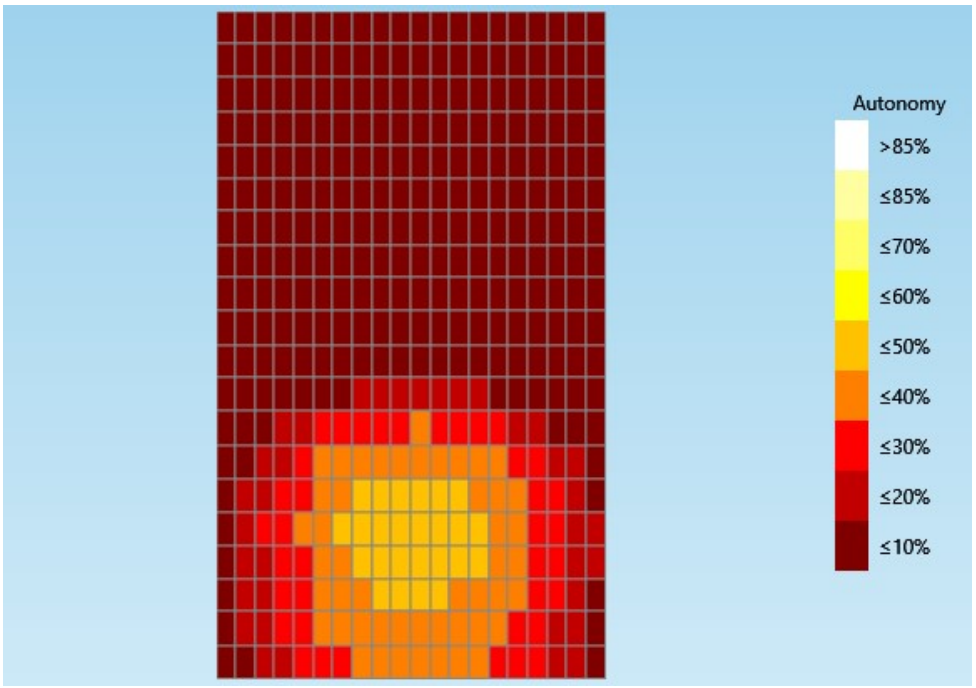


Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	6.99 [m]
- Depth :	12 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

3.2 Daylighting autonomy

Required illum. : 500 [lux] Occupation schedule : 7h-18h

Maximum : 47 [%] Average : 11.3 [%] Minimum : 0 [%]



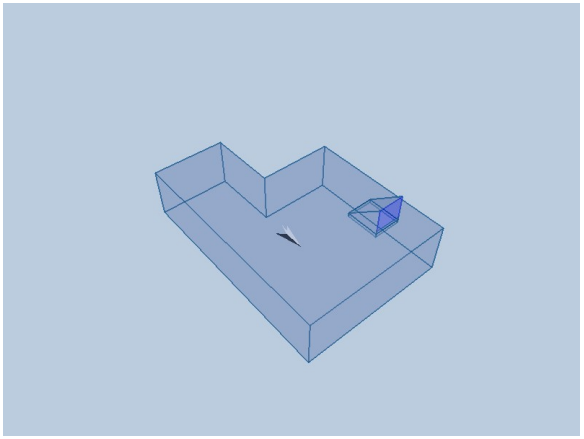
Performance calculation of daylighting

Project : **Halle_GCCD**

Project type : New construction
Address :
Responsible :
Society : TPF Ingenierie
Date : 8.10.2018

Room : **GC21**

Function : Classroom
Weather site : Grenoble (France)
DIAL+ version : 2.8.08



1. GC21 : Input parameters

1.1 Room dimensions

Net surface :		**282.75**	**[m²]**
Width :	7.5	15.2	[m]
Depth :	22.3	15	[m]
Height :		5.2	[m]
Index facade glazing :		0	[%]
Index roof glazing :		2	[%]

1.2 Walls geometry

Name	Orientation	Width [m]			Height [m]			Thickness [m]	Lightness
Floor	-		15.2	7.5		22.3	15	-	0.5
Wall 1	N (360°)		15.2			5.2		0.35	0.5
Wall 2	W (270°)		15			5.2		0.35	0.5
Wall 3	S (180°)		7.7			5.2		0.35	0.5
Wall 4	W (270°)		7.3			5.2		0.35	0.5
Wall 5	S (180°)		7.5			5.2		0.35	0.5
Wall 6	E (90°)		22.3			5.2		0.35	0.5
Roof 7	(360°)		15.2	7.5		22.3	15	0.35	0.7

1.3 Openings geometry

Name	Orientation	Width [m]	Height [m]	Dist to left side [m]	Window sill [m]	Surface [m²]
Open 7.1	(360°)	2.7	3.3	10	3	8.91

1.4 Detailed openings

Name	Frame [%]	Tl Glazing	g Glazing	Ug Glazing	Psi Frame	Uf Frame	Uw Window	Opening [%]
Open 7.1	30	0.8	0.62	1.1	0.08	1.6	1.4	25

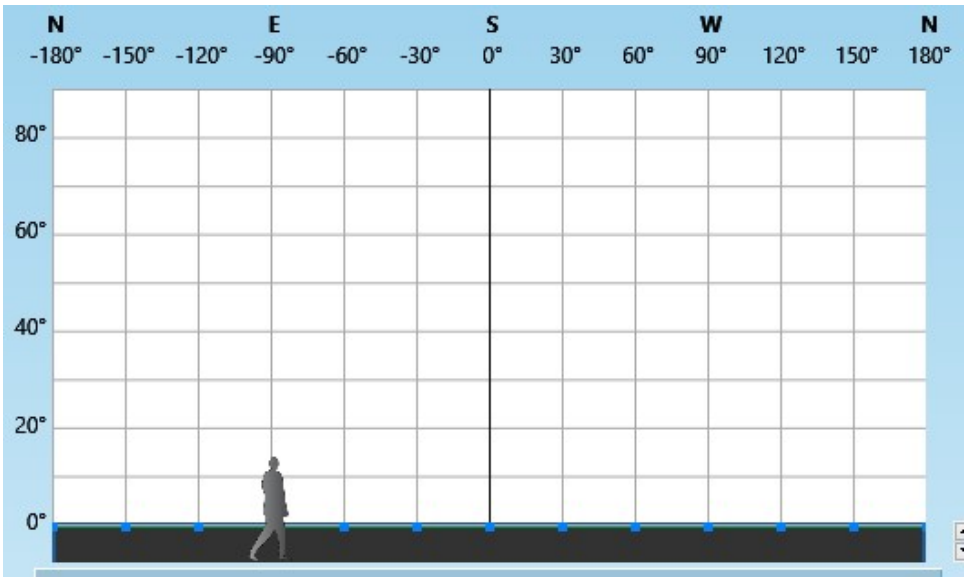
Open X.Y : X is the facade number and Y the opening number.

1.5 Mobiles shadings

Name	Type	Position	g Protection	g Glazing + Protection
Open 7.1	No protection	-	1	0.62

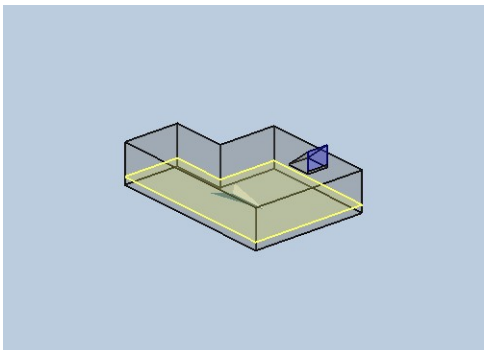
1.6 Horizon

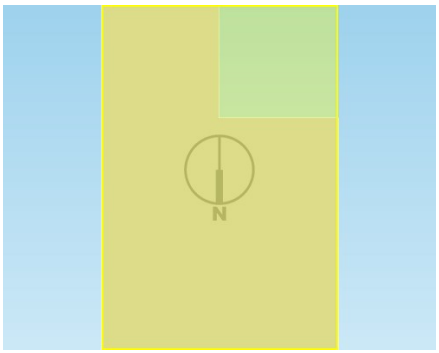
Reflection coefficient of the outside ground : 0.15 [-]
Reflection coefficient of close horizon : 0.25 [-]
Reflection coefficient of distant horizon : 0.25 [-]



2. Results DF (GC21)

2.1 Surface analysis

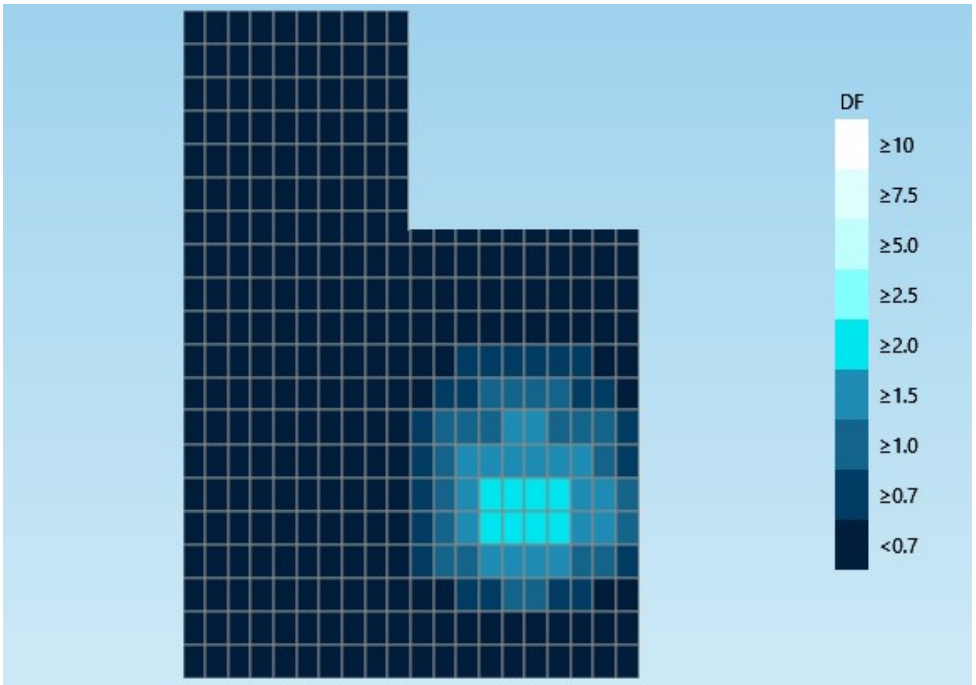




Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	15.22 [m]
- Depth :	22.3 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

2.2 Daylight factor

Maximum :	2.3 [-]	Average :	0.43 [-]	Minimum :	0.01 [-]
		Uniformity :	0 [-]		

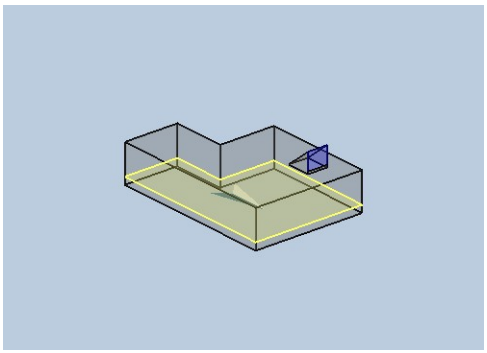


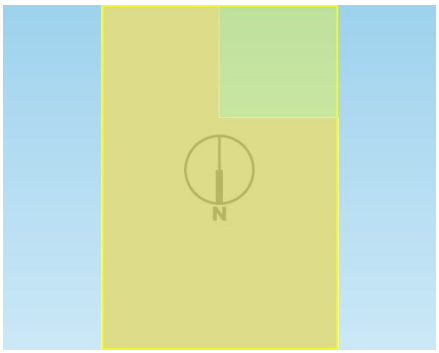
DF is	< 0.7	≥ 0.7	≥ 1.0	≥ 1.2	≥ 1.5	≥ 1.8	≥ 2.0	≥ 2.5	≥ 5.0	≥ 7.5	≥ 10.0
to	79.4	20.6	13.8	10.6	6.8	2.9	2.4	0	0	0	0

% of the room total surface.

3. Results Autonomy (GC21)

3.1 Surface analysis



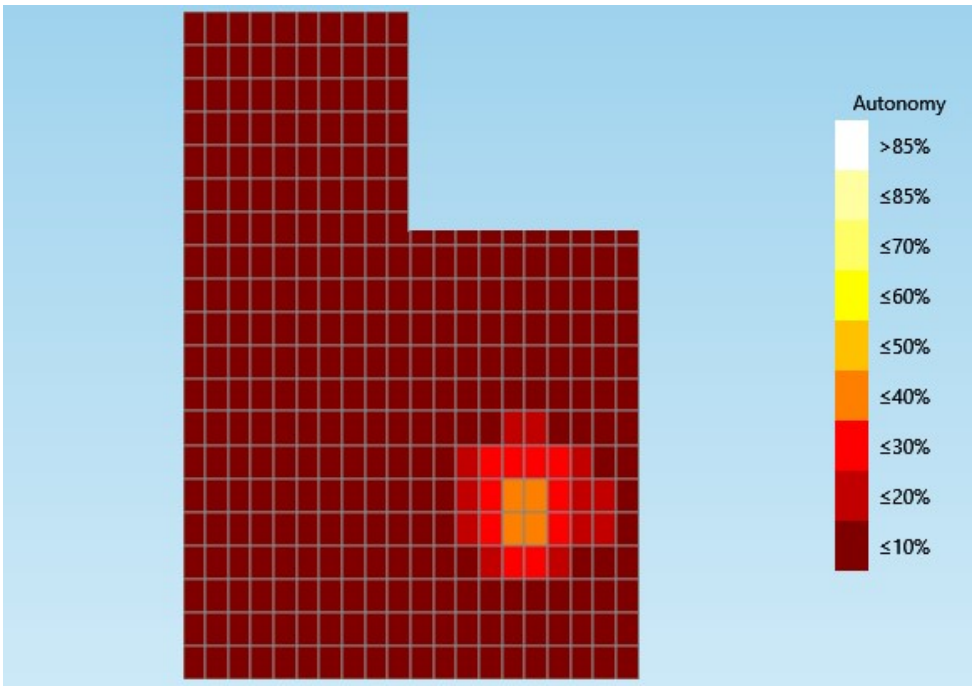


Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	15.22 [m]
- Depth :	22.3 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

3.2 Daylighting autonomy

Required illum. : 500 [lux] Occupation schedule : 7h-18h

Maximum : 33 [%] Average : 1.9 [%] Minimum : 0 [%]



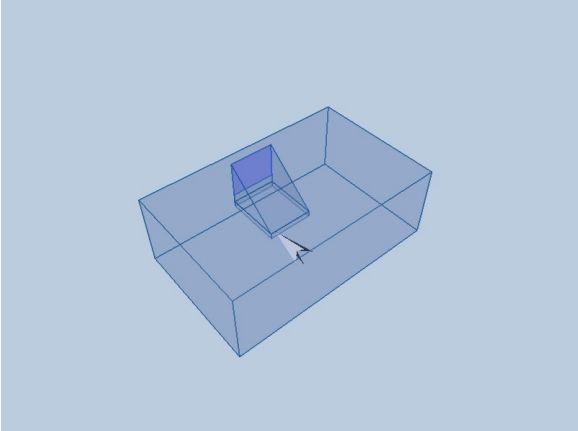
Performance calculation of daylighting

Project : **Halle_GCCD**

Project type : New construction
Address :
Responsible :
Society : TPF Ingenierie
Date : 8.10.2018

Room : **GC_24**

Function : Classroom
Weather site : Grenoble (France)
DIAL+ version : 2.8.08



1. GC_24 : Input parameters

1.1 Room dimensions

Net surface :	**139.5**	**[m²]**
Width :	15	[m]
Depth :	9.3	[m]
Height :	5.2	[m]
Index facade glazing :	0	[%]
Index roof glazing :	4	[%]

1.2 Walls geometry

Name	Orientation	Width [m]	Height [m]	Thickness [m]	Lightness
Floor	-	15	9.3	-	0.3
Wall 1	S (180°)	15	5.2	0.35	0.5
Wall 2	E (90°)	9.3	5.2	0.35	0.5
Wall 3	N (0°)	15	5.2	0.35	0.5
Wall 4	W (270°)	9.3	5.2	0.35	0.5
Roof 5	-	15	9.3	0.35	0.7

1.3 Openings geometry

Name	Orientation	Width [m]	Height [m]	Dist to left side [m]	Window sill [m]	Surface [m²]
Open 5.1	-	2.7	3.3	4	2	8.91

1.4 Detailed openings

Name	Frame [%]	Tl Glazing	g Glazing	Ug Glazing	Psi Frame	Uf Frame	Uw Window	Opening [%]
Open 5.1	30	0.8	0.62	1.1	0.08	1	1.2	25

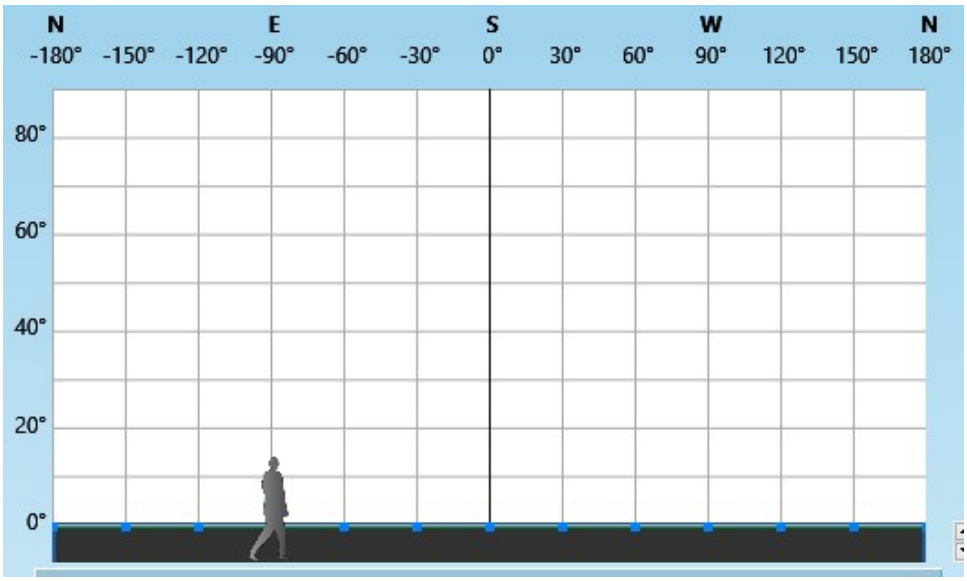
Open X.Y : X is the facade number and Y the opening number.

1.5 Mobiles shadings

Name	Type	Position	g Protection	g Glazing + Protection
Open 5.1	No protection	-	1	0.62

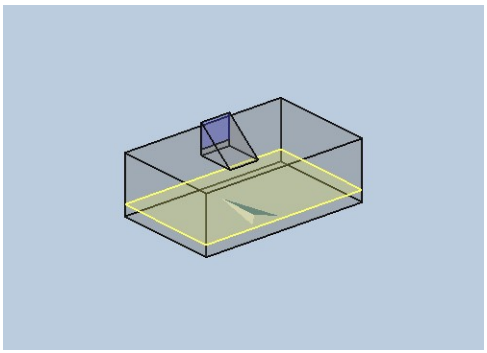
1.6 Horizon

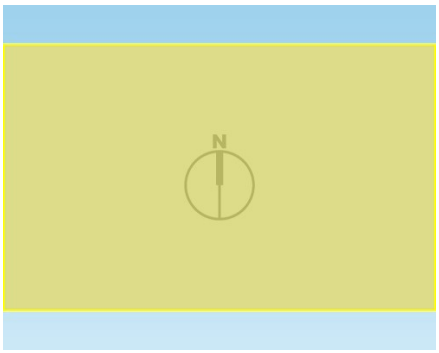
Reflection coefficient of the outside ground : 0.15 [-]
Reflection coefficient of close horizon : 0.25 [-]
Reflection coefficient of distant horizon : 0.25 [-]



2. Results DF (GC_24)

2.1 Surface analysis

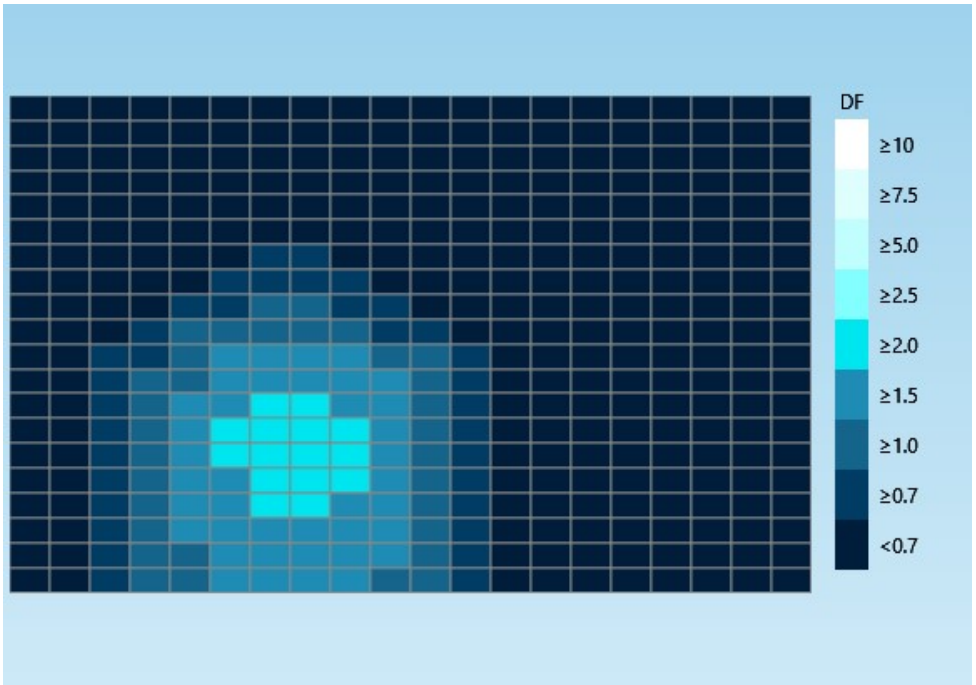




Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	15 [m]
- Depth :	9.3 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

2.2 Daylight factor

Maximum :	2.1 [-]	Average :	0.61 [-]	Minimum :	0.07 [-]
		Uniformity :	0 [-]		

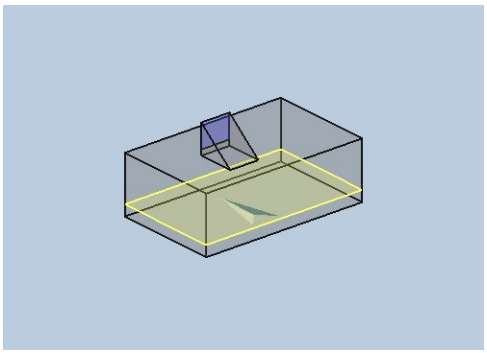


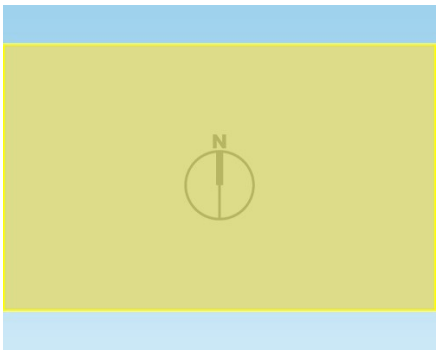
DF is	< 0.7	≥ 0.7	≥ 1.0	≥ 1.2	≥ 1.5	≥ 1.8	≥ 2.0	≥ 2.5	≥ 5.0	≥ 7.5	≥ 10.0
to	70.5	29.5	21.5	17.3	13	6.3	2.8	0	0	0	0

% of the room total surface.

3. Results Autonomy (GC_24)

3.1 Surface analysis



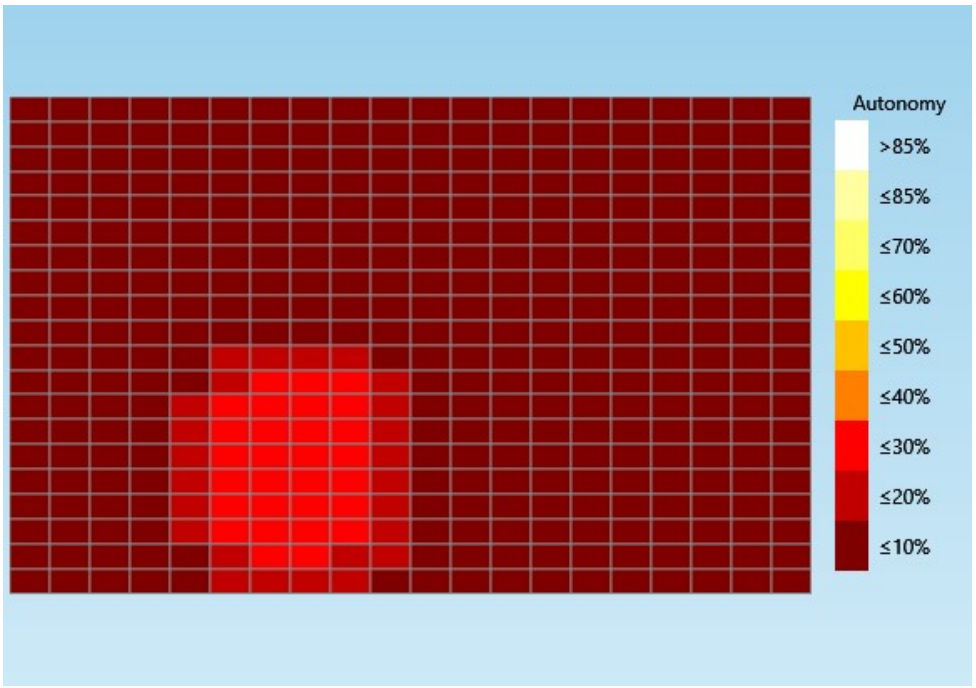


Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	15 [m]
- Depth :	9.3 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

3.2 Daylighting autonomy

Required illum. : 500 [lux] Occupation schedule : 7h-18h

Maximum : 30 [%] Average : 3.2 [%] Minimum : 0 [%]



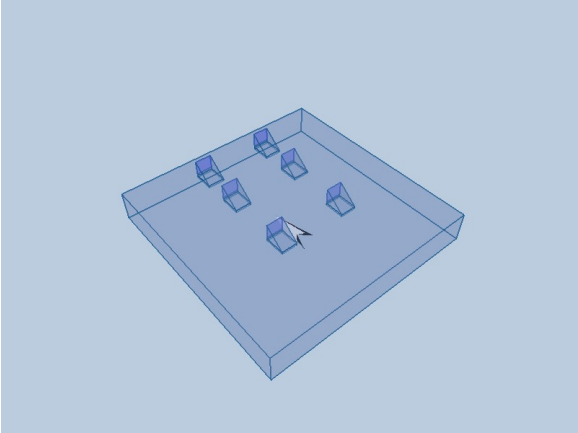
Performance calculation of daylighting

Project : **Halle_GMP**

Project type : New construction
Address :
Responsible :
Society : TPF Ingenierie
Date : 8.10.2018

Room : **Halle GMP**

Function : Classroom
Weather site : Grenoble (France)
DIAL+ version : 2.8.08



1. Halle GMP : Input parameters

1.1 Room dimensions

Net surface :	**1369 [m²]**
Width :	37 [m]
Depth :	37 [m]
Height :	5.2 [m]
Index facade glazing :	0 [%]
Index roof glazing :	3 [%]

1.2 Walls geometry

Name	Orientation	Width [m]	Height [m]	Thickness [m]	Lightness
Floor	-	37	37	-	0.3
Wall 1	S (180°)	37	5.2	0.35	0.5
Wall 2	E (90°)	37	5.2	0.35	0.5
Wall 3	N (0°)	37	5.2	0.35	0.5
Wall 4	W (270°)	37	5.2	0.35	0.5
Roof 5	-	37	37	0.35	0.7

1.3 Openings geometry

Name	Orientation	Width [m]	Height [m]	Dist to left side [m]	Window sill [m]	Surface [m²]
Open 5.1	-	2.7	3.3	11.3	11.5	8.91
Open 5.2	-	2.7	3.3	22.75	11.5	8.91
Open 5.3	-	2.7	3.3	22.75	22.3	8.91
Open 5.4	-	2.7	3.3	11.3	22.3	8.91
Open 5.5	-	2.7	3.3	11.3	29.5	8.91
Open 5.6	-	2.7	3.3	22.75	29.5	8.91

1.4 Detailed openings

Name	Frame [%]	Tl Glazing	g Glazing	Ug Glazing	Psi Frame	Uf Frame	Uw Window	Opening [%]
Open 5.1	20	0.8	0.62	1.1	0.08	1.6	1.3	25
Open 5.2	20	0.8	0.62	1.1	0.08	1.6	1.3	25
Open 5.3	20	0.8	0.62	1.1	0.08	1.6	1.3	25
Open 5.4	20	0.8	0.62	1.1	0.08	1.6	1.3	25
Open 5.5	20	0.8	0.62	1.1	0.08	1.6	1.3	25
Open 5.6	20	0.8	0.62	1.1	0.08	1.6	1.3	25

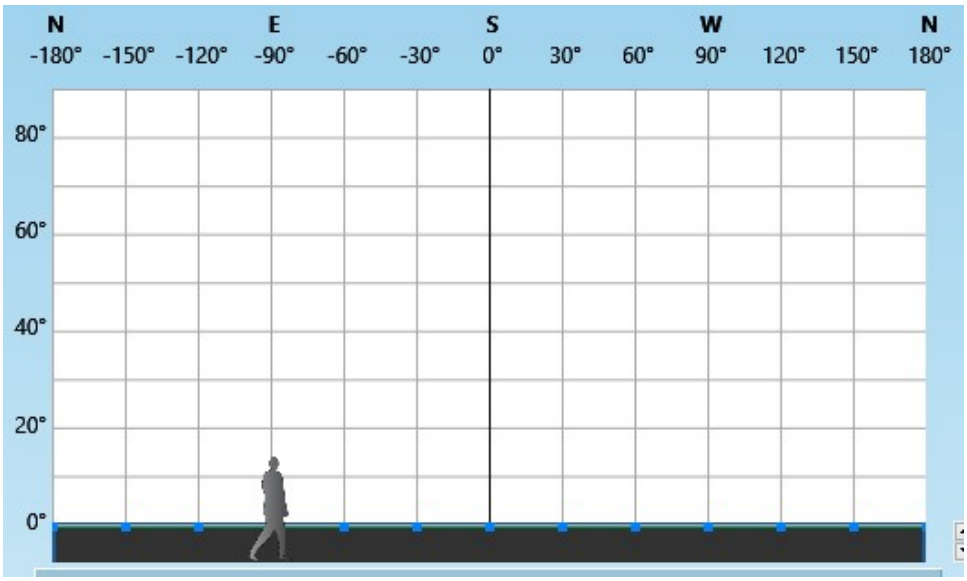
Open X.Y : X is the facade number and Y the opening number.

1.5 Mobiles shadings

Name	Type	Position	g Protection	g Glazing + Protection
Open 5.1	No protection	-	1	0.62
Open 5.2	No protection	-	1	0.62
Open 5.3	No protection	-	1	0.62
Open 5.4	No protection	-	1	0.62
Open 5.5	No protection	-	1	0.62
Open 5.6	No protection	-	1	0.62

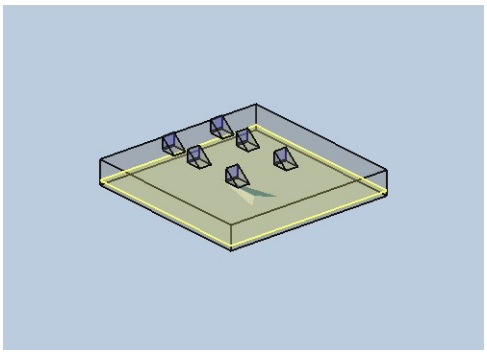
1.6 Horizon

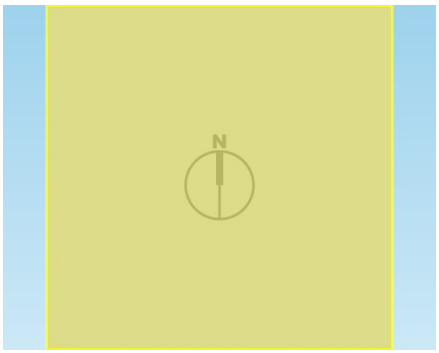
Reflection coefficient of the outside ground : 0.15 [-]
Reflection coefficient of close horizon : 0.25 [-]
Reflection coefficient of distant horizon : 0.25 [-]



2. Results DF (Halle GMP)

2.1 Surface analysis

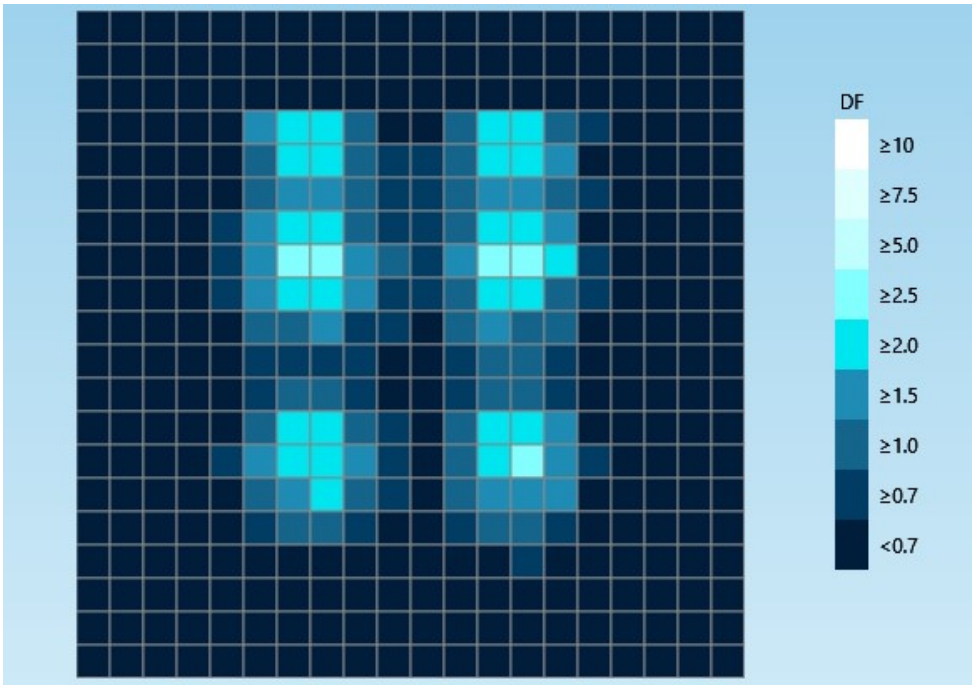




Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	37 [m]
- Depth :	37 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

2.2 Daylight factor

Maximum :	2.8 [-]	Average :	0.62 [-]	Minimum :	0.03 [-]
		Uniformity :	0 [-]		

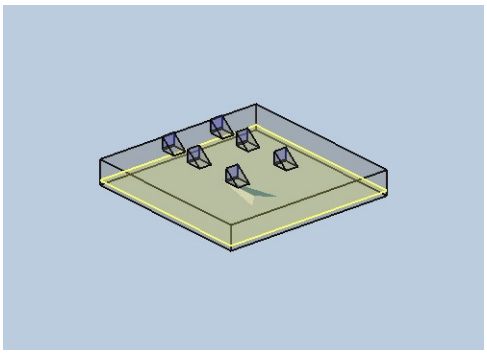


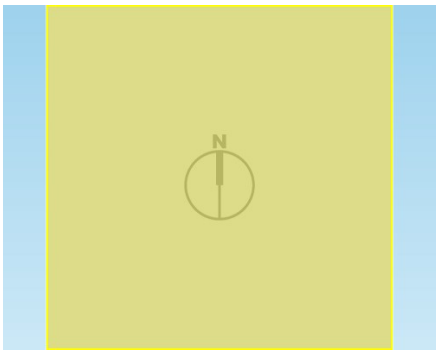
DF is	< 0.7	≥ 0.7	≥ 1.0	≥ 1.2	≥ 1.5	≥ 1.8	≥ 2.0	≥ 2.5	≥ 5.0	≥ 7.5	≥ 10.0
to	68.3	31.8	22.5	19.5	12.5	8.8	7.3	1.3	0	0	0

% of the room total surface.

3. Results Autonomy (Halle GMP)

3.1 Surface analysis





Surface analysis :	Work plane
Work plane height :	1 [m]
Size of the surface analysis :	
- Width :	37 [m]
- Depth :	37 [m]
- Left distance :	0 [m]
- Bottom distance :	0 [m]
Calculation grid :	20x20

3.2 Daylighting autonomy

Required illum. : 500 [lux] Occupation schedule : 7h-18h

Maximum : 45 [%] Average : 4 [%] Minimum : 0 [%]

