

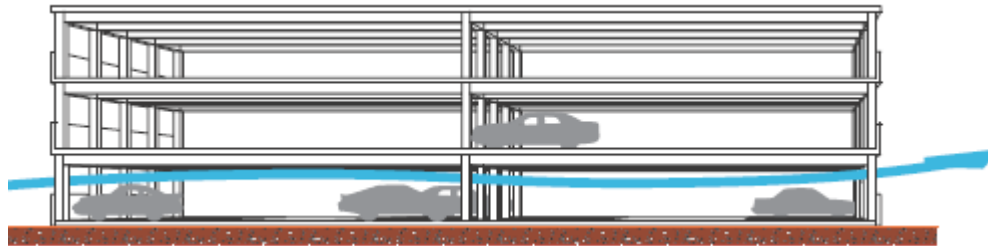
We simplify construction

1. Open steel car parks



1.A. The car parks is open if it satisfies the following conditions:

- Total area of the openings (at each level) > 35% of the overall wall area
- Distance between walls with opening < 100m
- At each level, at least two opposite walls with openings



1.B. The advantages of the open steel car parks in 7 points:

1. Light structure

- Very light steel structure → cheap foundations.

2. Quick erection

- Almost all the pieces are prefabricated in the factory → no time losses on job site
- Quick erection means a quicker payback of the investment.

1.B. The advantages of the open steel car parks in 7 points:

3. The beams span up to 16m



1.B. The advantages of the open steel car parks in 7 points:

4. Adaptability

- Steel solution is always efficient, even if the access to job site is complicated or busy
- High modularity: ease of building extension, demountability

5. User friendly

- Small columns → more security, easier access to the cars.
- High visibility.
- Low number of columns

1.B. The advantages of the open steel car parks in 7 points:

6. Economic solution

- The high span of the beams (16m) gives an optimized quantity of parking places.

7. Fire safety

- A lot of countries have already validated the steel solution for the open steel car parks:
 - Germany : No fire resistance required
 - Luxemburg: No fire resistance required
 - France: Fire resistance according to an official guide
 - ...
 - NOW → Poland : Fire resistance according to an official guide

2. Conception

2.A. Geometric conception

1. Different types of parking places

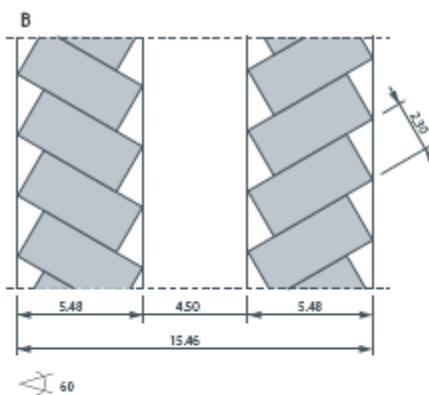
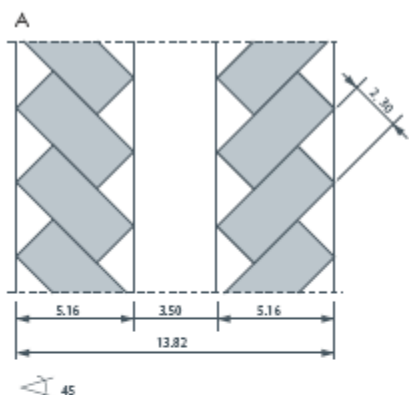
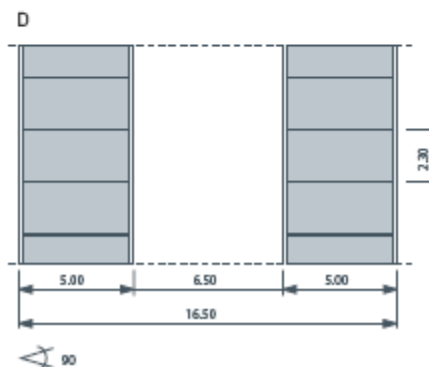
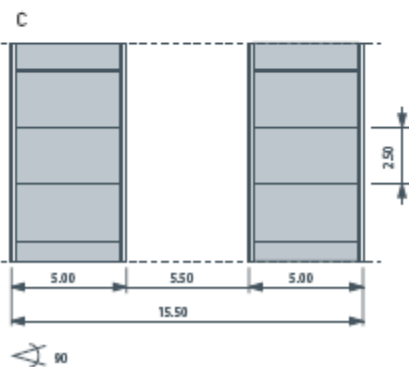


TABLEAU DE COMPARAISON DES SURFACES NÉCESSAIRES
PAR EMPLACEMENT POUR LES DISPOSITIONS SCHÉMATISÉES ICI

	Angle de disposition [°]	Projection de la largeur de l'emplacement [m]	Largeur de l'allée [m]	Largeur du bâtiment [m]	Surface nécessaire par emplacement [m²]	[%]
A	45°	3,253	3,50	13,820	22,48	118
B	60°	2,656	4,50	15,460	20,53	108
C	90°	2,500	5,50	15,500	19,38	102
D	90°	2,300	6,50	16,500	18,98	100



2.A. Geometric conception

2. Different possibilities to position the ramps

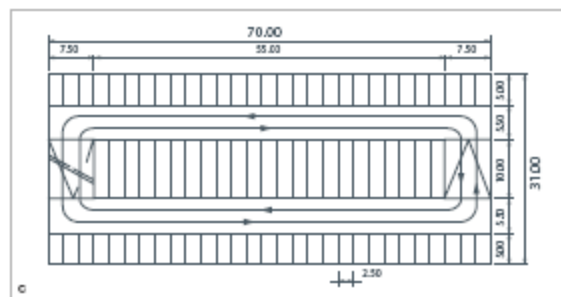
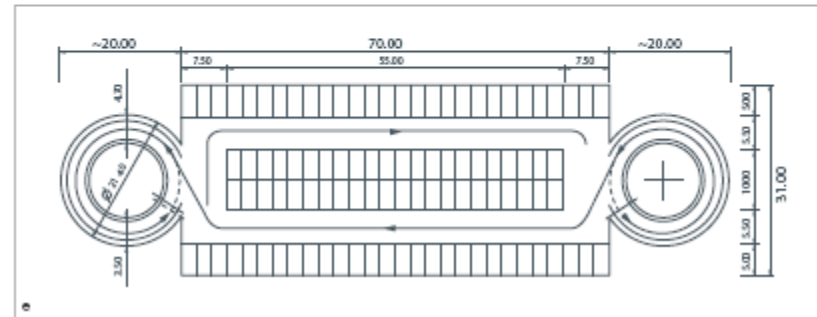
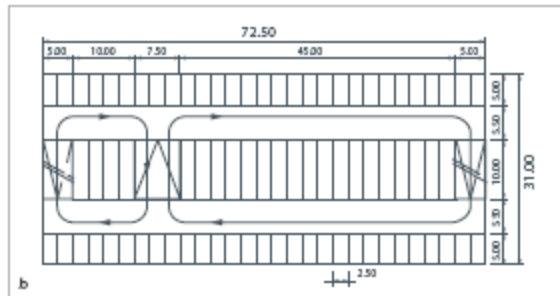
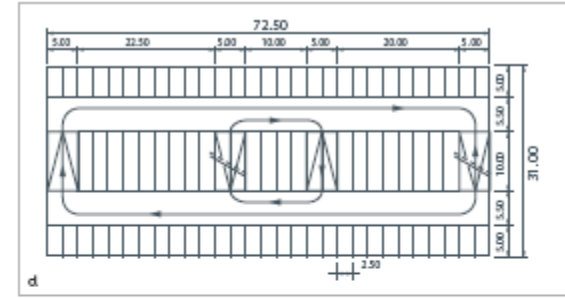
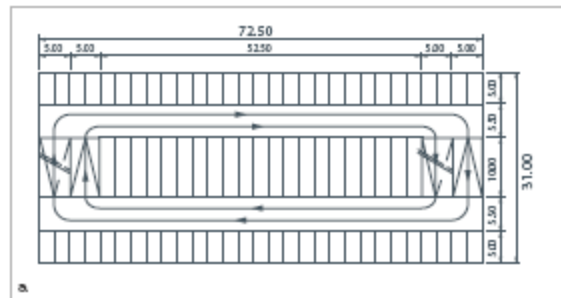


Tableau de comparaison des distances de parcours pour les dispositions des rampes a à e pour un parking de 4 étages et 8 demi-niveaux

Disposition des rampes	Surface totale par étage [m²]	Nombre d'emplacements par étage	Surface par emplacement [m]	Distance de parcours Entrée Sortie [m]	
a	2248	100	22,48	654	521
b	2248	102	22,03	514	271
c	2170	100	21,70	673	599
d	2248	100	22,48	654	271
e	2889	100	28,89	316	251

2.B. Technical conception: The loads

1. Life loads on the structure according to the norms.

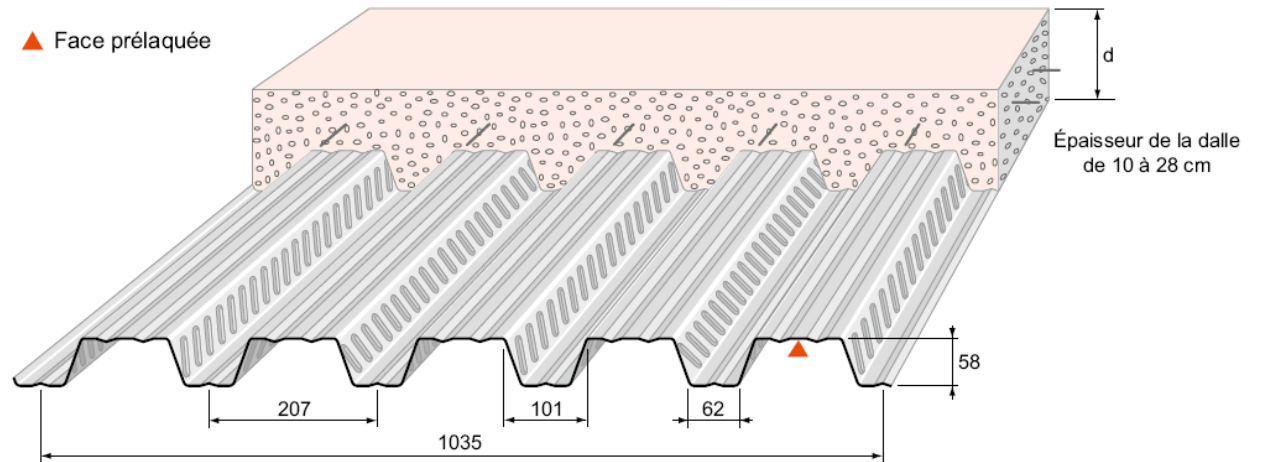
- $2.5\text{KN/m}^2 \rightarrow$ if we consider a parking place of 12.5m^2 , it means vehicles of 3.12Tons
- Impact loads from cars on the structure have also to be considered.

2.B. Technical conception: the floors

2. The floors are made of composite beams with a steel shuttering + concrete. The connection between the steel beams and the concrete is done via the shear studs



2.B. Technical conception: the floors



2.B. Technical conception: fire protection

3. Specific fire protection:

- Concrete between the columns flanges has to be foreseen
- All the beams have to be composite beams
- Additional steel rebars in the concrete floor have to be foreseen

2.B. Technical conception: floor covering

4. Covering of the concrete floor:

- Asphalt
 - Luxembourg: 1 layer of 35mm for the intermediate levels and 2 layers of 25mm for the last level
 - Lower concrete quality and thickness
 - Higher weight on the structure
 - Less maintenance
- Resin or concrete without protection
 - Higher concrete quality and thickness
 - Lower weight on the structure for the resins
 - Higher maintenance

2.B. Technical conception: Life-line

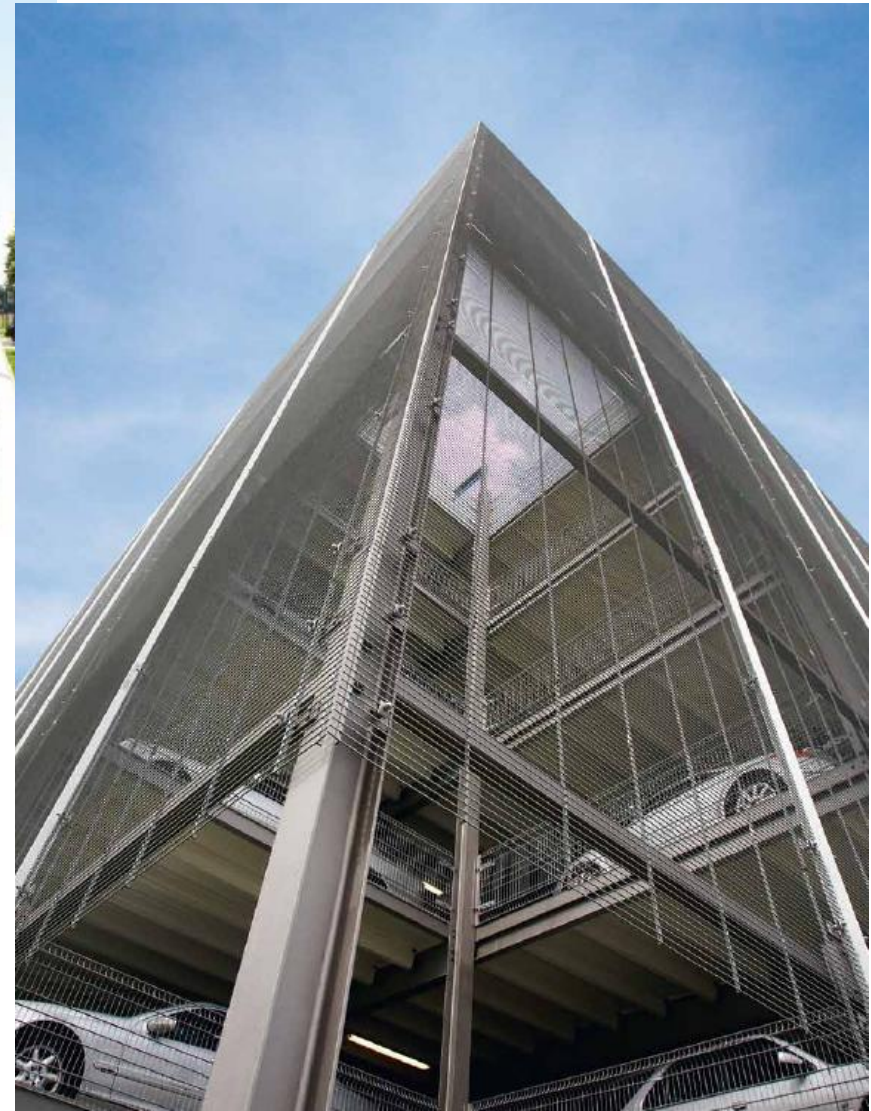
5. Lifeline :

- Patented life-line:
 - Max length: 5.500mm
 - Impact loads from cars according to EN1991-1-7
 - Man loads from 1.0KN/m according to DIN EN 1991-1-1



Mercedes Benz Hannover

2.B. Technical conception: architectural features



3. References Astron



3.A. References Astron: « La Provencale »

- Construction place: Leudelange-Luxembourg
- Surface: $\pm 15.000\text{m}^2$
- Number of places: 511 cars and 42 trucks

3.A. References Astron: « La Provencale »



3.A. References Astron: « La Provencale »



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3.A. References Astron: « La Provencale »



3.A. References Astron: « La Provencale »



3.B. References Astron: « Horsmans & Rosati »

- Construction place: Bech-Kleinmacher, Luxembourg
- Surface: $\pm 2.500\text{m}^2$
- Number of places: 112
- Car-lift integration inside the building

3.B. References Astron: « Horsmans & Rosati »



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