GROUPE GICA

GROUPE INDUSTRIEL DES CIMENTS D'ALGERIE

ENTREPRISE DES CIMENTS ET DERIVES D'ECH-CHELIFF

CIMENTERIE DE CHLEF

LIGNE DE PRODUCTION DE 6000 t/j DE CLINKER

IND REV	NOMBRE DE NUMBER OF △	DATE	DESSINE DRAWN	VERIFIE CHECKED	SIGNE SIGNED	MODIFICATIONS
G						
F						
E						
D						
C						
B	16	02/07/2014	CB	RB	RB	MISE A JOUR
A		28/11/2012	AN	AN	AN	VERSION INITIALE

ORIGINAL

REPERE ATELIER / LAYOUT MARK

ATELIER / BUILDING: TOUS BATIMENTS

GROUPE / ITEM: 01

EQUIPEMENT / EQUIPMENT:

ECHELLE / SCALE:

TITRE DU PLAN / DRAWING TITLE:

NOTE GENERALE POUR LE GENIE CIVIL ET LA CHARPENTE METALLIQUE

fives fcb

MATIERE / MATERIAL:	MASSE / MASS:	FORMAT:	
		A4	

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REFERENCE		IND
NUMERO DU PLAN DRAWING NUMBER	CHL1C0201A01	B

SUMMARY - *SOMMAIRE*

A. APPLICABLE NORMS AND UNIT USED - *NORMES APPLICABLES ET UNITES UTILISEES*

• Refer to general note from main contract:

Extrait Cahier 05 - Spécifications des Constructions

Normes, Règlements et Recommandations

"Toutes les études, calculs et travaux de réalisation seront conduits conformément aux normes en vigueur en Algérie (voir Recueil des normes et documents techniques règlementaires de la construction édité par le CTC Centre-Alger)."

Liste of codes and standards available upon request to Fives fcb

RPA 99 Version 2003 Carte de zonage sismique d'Algérie.pdf

RPA 99 Version 2003.pdf

Règles de calculs des apports calorifiques des batiments_DTR C 3-4.pdf

Règles de conception et de calcul des maçonneries_DTR C 2.45.pdf

Règle de conception et de calcul des structures en acier_DTR BC 2,44 - CCM 97.pdf

Règle de conception et de calcul des structures en béton armé_C.B.A.93.pdf

Règlmementation thermique des bâtiments d'habitation_DTR C 3-2.pdf

• The latest editions of Codes and Standards are to be considered (unless otherwise noted).

The main units used in the documents are:

	Units	**Symbol**
Length	meter	m
	millimeter	mm
Surface	square meter	m²
	square millimeter	mm²
Force	Newton	N
	Kilo Newton	KN
Stress	Mega Pascal	Mpa = N/mm²
Temperature	degre Celsius	°C
Angle	decimal degree (with 5 decimals)	

• All documents have to be done with metric system.
• All calculation notes have to be in **French.**
• All execution drawings have to be in **English** and **French.**
• All workshop and assembly drawings for steel structure have to be in **English.**

B. GENERAL HYPOTHESIS - *HYPOTHÈSES GÉNÉRALES*

B.1. DEAD LOADS - *CHARGES PERMANENTES*

It is the total of:
• Equipments dead loads,
• Own weight of the structure,
• Loads resulting from permanent backfilling.

B.2. LIVE LOADS - *CHARGES VARIABLES*

• Refer to general note from main contract:

Extrait Cahier 05 - Spécifications des Constructions

Surcharges d'exploitation

- Plancher des ateliers :	500 Kg/m² sauf stockage sur plancher de chauffe (1000 kg/m²)
- Planchers des bureaux et locaux :	400 Kg/m²
- Passerelles piétonnières :	250 Kg/m²
- Escaliers :	250 Kg/m²
- Planchers en caillebotis ou tôle larmée :	250 Kg/m²
- Toiture en terrasse accessible :	250 Kg/m²
- Toitures en terrasse dites "non accessible" :	150 Kg/m²
- Toitures de silos (non compris dépression) :	300 Kg/m²
- Salles électriques - Zone de stockage armoire :	800 Kg/m²
- Dallages industriels :	1 t/m² ou 12 t/essieu

Efforts dynamiques : Les structures soumises à des vibrations produites par les équipements (ventilateurs, broyeurs, moteurs, etc…) seront conçues pour éviter les phénomènes de résonance, la fréquence propre calculée devra être en dehors d'une plage comprise entre 50% de part et d'autre de la fréquence d'exploitation.

Parallèlement à la surcharge répartie des planchers des ateliers, ceux-ci devront pouvoir supporter des charges poinçonnantes ponctuelles de 1 000 Kg appliquées à une surface de 10 x 10 cm.

Déformations : les déplacements horizontaux, sous l'effet du cumul le plus défavorable des sollicitations appliquées, ne devront pas être à l'origine de troubles dans l'exploitation des bâtiments ni de désordres dans les structures.

• Other live loads: as per the actual load conditions stated on the load drawings.

B.3. CLIMATIC CONDITIONS - *CONDITIONS CLIMATIQUES*

• Refer to general note from main contract:

Extrait Cahier 05 - Spécifications des Constructions

Données climatiques
- **Neige :** Surcharge extrême maximale 90 Kg/m².

1

- **Vent :**
  - Vitesse de référence du vent: Vref = 25 m/s (Chlef est en zone I)

◦ Pression dynamique moyenne de référence : qref = 375 N/m²
◦ Coefficient de topographie : Ct = 1.00
Coefficient de la catégorie III : Zones industrielles
◦ Facteur de terrain : KT = 0.22
◦ Paramètre de rugosité : z0 = 0.3 m
◦ Hauteur minimale : zmin = 8.00 m
◦ Coeffcient de calcul du coefficient dynamique : ε = 0.37
- **Température :** Gradients de +35°C et -15°C.

- **Pluviométrie :** 400 mm en moyenne annuelle, 400 l/ha/s en précipitation instantanée, 40 mm/h (durée une heure)
- **Poussière :** 50 Kg/m² de projection horizontale
- **Séisme :** Application des règles Parasismiques Algériennes RPA 99 - Version 2003 - Zone III

Dust loads shall be considered as follows:
- Addition of the dust load to the live load on the roofs.
- Addition of the dust load to the live load for the floors and platforms of enclosed buildings.
- No additional dust load for the floors and platforms of open buildings (only live load).

Extrait Cahier 01 – Données de bases et informations

- Vent
Les directions dominantes des vents sont pratiquement les mêmes durant la journée/l'année et sont de direction Ouest-Est et Sud Ouest-Nord Est.
- Données sismiques
Le règlement parasismique Algérien, (R.P.A. 99, version 2003), élaboré après le séisme de Boumerdes survenu en Mai 2003 divise le territoire en quatre zones sismiques principales :
◦ Zone III : Zone d'intensité forte
◦ Zone II A & II B : Zone d'intensité moyenne
◦ Zone I : Zone d'intensité faible
◦ Zone 0 : Zone non sismique

La wilaya de Chlef est classée en zone III (Forte séismicité).

Altitude de l'emplacement de l'usine: +100 m environ au dessus du niveau de la mer.

- Pluviométrie
Les moyennes mensuelles des précipitations en mm (source : ONM - Dar El Beida) sont données dans le tableau suivant :

Mensuelles des précipitations

Mois	J	F	M	A	M	J	JT	A	S	O	N	D	Année
Précip. (mm)	55	45	39	32	37	9	1	1	20	35	60	66	400

La pluviométrie annuelle moyenne est de l'ordre de 400 mm.

C. DOCUMENTS REFERENCE SYSTEM / NUMBERING - *NUMÉROTATION DES DOCUMENTS*

The document numbering system applicable for the project contains 17 digits as detailed below .
It is applicable for every document issued by the design offices in charge of the design of steel structure and civil works.
The numbering system contains 2 parts: Fives FCB Doc Number & Revision.

Fives FCB Number — **Revision**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Project Code					Document Type				Group N°			Subgr	Doc N°			Rev
C	**H**	**L**	**1**		**C**	**3**	**0**		**5**	**1**		**B**	**0**	**1**		**A**

Digits 5, 9,12 and 16 are "space"
Digits 17 can be one letter (A to Z) or one number (0 to 9). See § C.6)

C.1. PROJECT CODE AND DOCUMENT CREATOR DIGITS - *NUMEROS DU CODE PROJET*

These digits are fixed for the project

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
C	**H**	**L**	**1**													

C.2. DOCUMENT TYPE DIGITS - *NUMEROS DU TYPE DE DOCUMENT*

C.2.a. Digits for the civil works documents (C) - *Numéros des documents de Génie Civil*

22	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	**Documents for civil works**
C	**H**	**L**	**1**		**C**											
					C	**0**	**1**									Soil investigation, Topographical survey
					C	**0**	**2**									General note for design
					C	**0**	**8**									Document from Civil fcb site
					C	**0**	**9**									Document from Civil Contractor
					C	**1**	**0**									Design calculation note
2					**C**	**1**	**5**									3D model
					C	**2**	**0**									Excavation drawings
					C	**3**	**0**									Formwork drawings
					C	**3**	**0**									Deep foundation drawings
					C	**3**	**5**									Dwgs with formwork and reinforcement
					C	**3**	**5**									Deep foundation dwgs w. formw. & reinf.
					C	**4**	**0**									Reinforcement drawings
					C	**4**	**0**									Post-tensioning cables
					C	**4**	**1**									Reinforcement summary

C.2.b. Digits for the steel structure documents (S) - *Numéros des documents de charpente métallique*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	**H**	**L**	**1**		**S**										
					S	**0**	**2**								
					S	**1**	**0**								
					S	**1**	**5**								
					S	**2**	**0**								
					S	**2**	**5**								
					S	**2**	**5**								
					S	**3**	**0**								
					S	**3**	**5**								
					S	**4**	**0**								
					S	**4**	**5**								
					S	**5**	**0**								
					S	**6**	**0**								

△3

Documents for steel structure

- General note for design
- Design calculation note
- 3D model
- Dwgs: general arrangement and details
- Load and anchorage drawing
- Embedded plates and "inserts" booklet
- Grating flooring drawings
- Checkered plate drawing
- Roofing & cladding drawings
- Drawings for steel deck plates
- Assembly Drawings
- Worskshop Drawings

C.3. GROUPS AND SUB-GROUP NUMBERING & BUILDING CODE - *NUMEROS DU GROUPE ET SOUS-GROUPE ET CODE DU BATIMENT*

△4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
									X	**X**		**X**			

Please refer to Annex 1

C.4. DOCUMENT NUMBER - *NUMERO CHRONO DU DOCUMENT*

from 00 to 99

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
													X	**X**		

C.5. REVISION DIGIT - *NUMERO DE REVISION*

One digit for document under approval from 0 to 9
One digit for document certified from A to Z

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
																X

Examples:
Formwork drawing n°1 of cement silo #1 rev A (good for execution)

C	H	L	1	C	3	0	6	1	C	0	1	A

Steel structure GA drawing n°2 of cooler building rev 0 (1st issue)

C	H	L	1	S	2	0	4	0	A	0	2	0

Any modification (including dimensions) related to revisions A to Z, 0 to 9 have to be clearly located on the drawings with clouds.

Any revision without cloud on modification will be systematically rejected.

Nota 1:
Any document uncorrectly named will be systematically rejected

Nota 2:
All drawings submitted as electronic files shall be named: “FCBDoc NumbeRevision.file extension” with the exact number and type of digits.
Examples:

CHL1 C40 23 A04 2.dwg	Reinforcement drawing for raw meal feed bins
CHL1 S10 61 D01 A.pdf	Calculation note for steel structure of cement silo #4 roof

It is necessary to respect free space between digit groups to avoid rejection of the drawing.

D. DOCUMENTS TO BE DELIVERED BY FCB TO THE DESIGN OFFICE - *DOCUMENTS REMIS PAR FCB AU BUREAU D’ÉTUDES*

D.1. GENERAL DOCUMENTS - *DOCUMENTS GENERAUX*

For performing the design, the design office shall receive the following documents and information:

- General note for civil and steel design (this present document) [1]
- Soil report [2]
- Topographical survey [3]
- Lay out drawings [4]
- Civil work Standard drawings [5]
- Steel structure Standard drawings [6]

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- Particular conditions / restrictions for civil works if any such as:
  Maximum lifting capacity
  Maximum casting volume

  To be provided by Fives fcb

- Particular conditions / restrictions for steel structures such as:
  Maximum dimensions & weight of elements for transport
  Maximum dimensions & weight of elements for erection

  Length 11,80 m / Width 2,30 m / Height 2,25 m / Weight 20 tons*
  ** special cases to be discussed with FCB upon request*

D.2. GUIDE DRAWINGS - *PLANS GUIDES*

Nota: The numbering system of the drawings is the same as precised above, but with different code for type of documents.
• Preliminary drawings may be transmitted at the early stage of the design, for the design office to execute a predimensionning of the structure and to prepare the foundations outlines and excavation drawings.
• They give the loads of the main equipments and estimations for the minor ones.

D.2.a. General Arrangement drawings (G10) - *Plans d'ensemble*

Example: CHL1 G10 36 001 A - general arrangement drawing n°1 of the preheater tower.

• The general arrangement drawings shall show the structure and the mechanical parts.
• It shows all plan views and the necessary elevations / sections required for understanding.
• It mentions clearly the type of construction (concrete / steel structure, etc…).
• It shows the distance between axis, the accesses, the levels, the allowed positions of bracings, etc…

D.2.b. Architectural drawings (G12) - *Plans architecturaux*

Example: CHL1 G12 61 002 A -architectural drawing n°2 of the cement silos.

• The architectural drawings show the elevation views of the building and specify the type and dimensions of sidings, openings, ventilations, natural lighting, accesses, doors, etc…

D.2.c. Loads and anchorages drawings for concrete structures (G22) - *Plans de charges et d'ancrage pour le béton*

Example: CHL1 G22 54 A05 A - load drawing of the cement mill feed building.

• The loads drawings for concrete structures give all loads and moments applied on the structure (Dead, Live, Variable, from Equipment) .
• The plan and elevations views show the application points of all the loads, in particular :
X,Y,Z direction system used for the drawing.
Location and level of all supports.
Loads distribution, location of the center of gravity.
• A table will give the values of the corresponding loads on the application points, as per following example:

	Dead Load			Live load (causes)			Temparature load			Accidental load (causes)			Wind +/-X			Wind +/-Y			Seismic +/-X			Seismic +/-Y		
All forces in kN	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ	FX	FY	FZ
All moments in kN.m	MX	MY	MZ	MX	MY	MZ	MX	MY	MZ	MX	MY	MZ	MX	MY	MZ	MX	MY	MZ	MX	MY	MZ	MX	MY	MZ
point A.1																								
(type of link)																								
point A.2																								
(type of link)																								
point A.3																								
(type of link)																								
point A.4																								
(type of link)																								

Notes:
- Exceptional live loads might come from operational sequences, erection, maintenance, etc…
- Wind loads are given with basic wind, extreme wind pressure and coefficient of site shall be considered by the design office in charge of the structural design.
- The following informations are also required from the equipment supplier:
    loads distribution & center of gravity.
    dynamic coeficient & operation frequency.
- Some particular major equipment (s) - such as mill, electrofilters, clinker cooler - shall be detailed in specific loads drawings. In that case the general loads drawings shall mention clearly:
    The point of application of the loads with mention of the equipment & drawing number.
    The list of specific loads drawings to be read in relation with the general loads drawings.

The G22 drawings give also the anchorages detailed as follows:
• The location, level, details & dimensions of the anchor pockets (fcb's standards to follow when possible).
    For fcb standard anchors, refer to the document "standard of steel structure" [6]
• The location of the FCB's standard inserts (S01, S02, S03, S04, angles, etc...) supplied by the civil works contractor.
    For fcb standard inserts, refer to the document "standard of steel structure" [6]
• The location, level details & dimensions of the non-standard inserts (not supplied by civil works) with the relevant drawing number.
• The dimensions of all openings required for equipments, piping, cables, etc…

Such dimensions of openings shall allow for necessary tolerances and gaps.
Notes: When possible, the anchorage details may be added on the loads drawing.

D.2.d. Loads, access and gangway drawings for steel structures (G31) - *Plans de charges, accès et passerelles pour la charpente métallique*

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Example: CHL1 G31 57 A11 A - load drawing n°11 of the cement mill building
These drawings give all details for this item with the loads, openings…

The requirements are similar to those presented for G22, the same table will be used to summarize loads.

E. CHARACTERISTICS OF MATERIALS USED FOR REINFORCED CONCRETE (RC) - *CARACTÉRISTIQUES DES MATÉRIAUX UTILISÉS EN BÉTON ARMÉ*

• The design office shall design accordingly to the material available, as specified in the chapters E and F.

E.1. CONCRETE - *BETON*

The concrete shall respect the requirements precised in the contract summarized in the following table:

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Structure type	Concrete quality	Compressive strength (28 days, cylinder 15x30 ht) (MPA)
Superstructure in general (slab, column, beams), foundation & gutters	TC (C25/30)	25
Specific items (slip-forms or specific columns) **Under FCB approval**	TD (C30/37)	30
Lean concrete mass	TE	(*)
Blinding concrete	TA (C16/20)	16
(*) determined by the proportion of cement equal at 200 kg/m^3 of concrete.		

Anchorage shall be realized in TC concrete with adapted aggregates in terms of particle size. No special materials or additives are authorized.

E.2. REINFORCEMENT - *ARMATURES*

• High tensile deformed bars: FY=500 N/mm^2
• Plain round mild steel bars: FY=240 N/mm^2

Diameter of rebar available (in mm)

Diameter (mm)	Area (cm²)	Weight (kg/m)
8	0,502	0,395
10	0,785	0,617
12	1,131	0,888
14	1,539	1,208
16	2,010	1,578
20	3,142	2,466
25	4,909	3,853
32	8,042	6,313

E.3. COVER AND OVERLAPING - *ENROBAGE ET RECOUVREMENT*

The concrete cover for reinforcement shall be as follows:

Concrete Exposure	**Cover (mm)**
Foundations	50
Columns, walls exposed to soil)	50
Columns, walls (above soil)	40
Beams	40
Ground slab	
Bottom contact with soil	50
Top	30
Slab	25

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According to the CBA93 and RPA 99, the minimum lap length and anchorage length is set at 50ϕ with ϕ the bar diameter.

E.4. PILES - *PIEUX*

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If necessary, the type and diameter of piles available will be provided by Fives FCB.

F. CHARACTERISTICS OF MATERIAL USED IN STEEL STRUCTURES (SS) - *CARACTERISTIQUES DES MATERIAUX UTILISES EN CHARPENTE METALLIQUE*

F.1. PROFILES AND SHEETS - *PROFILES ET TOLES*

• Structural steel is designed with bolted connections, welding on site shall be avoided .
• Profiles, sheets, bolts available for design are those indicated in Ienet - on line software for part lists edited by Fives FCB.
• Unless a particular agreement has been obtained from Fives FCB, the profiles and sheets are limited to those contained in IEnet.
• The grade **S235JR** is mainly used for the profiles and sheets.

11 The design can be performed with grade **S355JR** only upon request from Fives FCB, or with previous agreement between the designer and Fives FCB.
As an example large steel profiles of columns and beams for following structures can be optimized using steel quality **S355JR:**
- Preheater main floors.
- Silo roofs.

For these specific items, a comparative estimate between the two steel qualities will be required by Fives FCB during the predimensioning phase.

F.2. BOLTS - *BOULONS*

• One bolt = 1 screw + 1nut + 1 washer
• All bolts used in connections shall be galvanized.
• The designer has to consider only HM 8-8 bolts i.e : No prestressed bolts
• Drill diameter = bolt diameter + 2 mm
• Standard Bolts hexagonal heads: Thread ISO 898-1 series or equivalent.

F.3. EXPANSION BOLTS - *BOULONS A EXPANSION*

The expansion bolts are limited to or equivalent to:

HST M10*90	(type HILTI)	for maximum fastenable thickness of 20 mm
HST M12*120	(type HILTI)	for maximum fastenable thickness of 25 mm
HST M16*140	(type HILTI)	for maximum fastenable thickness of 25 mm
HST M20*170	(type HILTI)	for maximum fastenable thickness of 30 mm

In case of specific application, other type of expansion bolts can be used, with previous agreement from Fives FCB's.

F.4. ANCHOR BOLTS - *CROSSES D'ANCRAGE*

12 • Anchor bolts are of **S235 JR** grade.
• As described in the standard for steel structure, the anchor bolts are limited to those: B16, B20, B24, B30, B36, B42, B48 see document [6].

F.5. OTHER MATERIALS - *AUTRES MATERIAUX*

• Gratings and checkered plates

- Unless especcially specified, the floorings are foreseen with grating, and not checkered plates.
- Gratings shall be hot dip galvanised, mesh dimension 30*30 mm, bearing bar thickness 30x3 mm.
- For the steel structure design, the clear distance between supports is maximum equal to 1100 mm.
- Checkered plates thickness shall be minimum 7 mm, as available on Ienet list.
- Fastenings for steel gratings and checkered plates shall be shown on the drawings.

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• Steel deck for composite floor

- The steel deck available on site is the Cofrasol 60 distributed by ARCELOR - see technical datasheet in annex 2.

• Roofing/cladding

Prepainted steel sheet 0,75mm for roofing and 0,63mm for cladding - or equivalent

- For the steel structure design, see the technical datasheet in annex for analogy**.**

G. PARTICULAR RULES APPLICABLE TO DESIGN - *REGLES PARTICULIERE APPLICABLES A LA CONCEPTION*

G.1. DEFINITION OF CONCRETE BUILDINGS ARRANGEMENT - *DEFINITION DES CARACTERISTIQUES DES BATIMENTS*

Refer to civil works standards document, where are described:
- typical design of manholes, roads, pits, networks.
- general information on drawings.
- details for waterproofing, slipform, masonry, etc.

T beams in industrial buildings
• T beams will not be used in the industrial buildings in order to maintain the possibility of slab cutting.

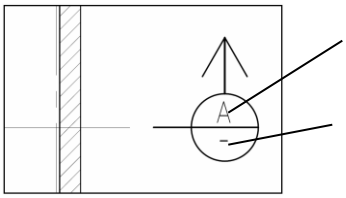
Industrial slabs
• Industrial ground & elevated slabs: min. thickness of 150 mm.
• Industrial slabs will be designed in such a way to allow for casting beams and then slabs.
• Industrial slabs will be designed in such a way to allow for next floor slab propping over it. If in a particular case a separate beams/slab casting cannot be supported on the lower floor, it will be mentioned on the relevant beams/slab formwork drawing.

G.2. STANDARDIZATION IN DESIGN - *STANDARDISATION DE LA CONCEPTION*

IT IS COMPULSORY TO FOLLOW IT STRICTLY

1/• View, section and elevation

1.a/ The view A and the reference of the view are in the same drawing.

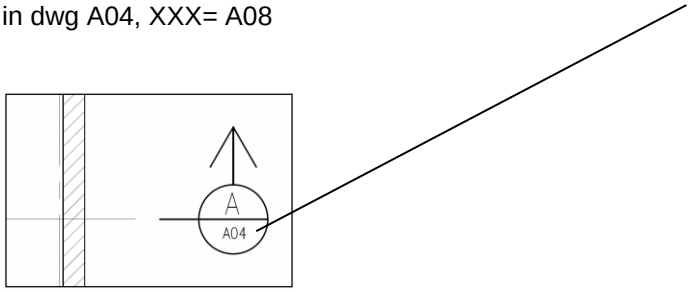


Section name

If the section view is on the same drawing

1.b/ The reference of the view and the view are not in the same drawings.

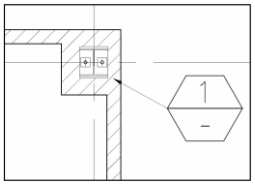
Ex: on drawing A08 we have a reference of the view A which is detailed in drawing A04
In dwg A08, XXX=A04 & in dwg A04, XXX= A08



2/ • Details

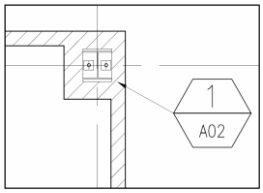
The principle is the same

2.a/ Details shown on the concerned drawing :



2.b/ Detail shown in another drawing

Ex: A02 is the reference of the drawing on which we find the detail or from which the detail comes

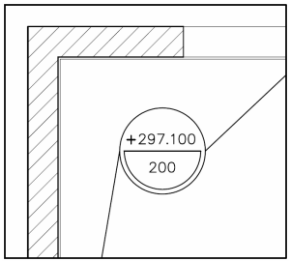


3/ • Levels are always given:

For concrete levels, "rough floor level" i.e.

Top of concrete slab before grouting, tiling…

Below a representation of concrete floor with level and thickness

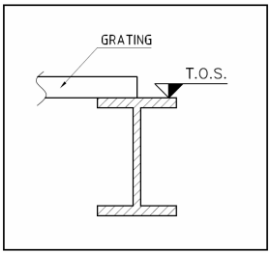


For steel levels, "finished floor level" i.e.

Top of grating

Top of checkered plate

Top of steel structure can be indicated for information (TOS)



4/ • Grouting thickness over RFL is indicated on drawing

5/ • When practicle, the finished floor level is indicated on drawing (FFL) i.e:top of screed, tiling, grating, checkered plate…

6/ • Unless otherwise stated, grouts are foreseen with simple concrete grout, to be mentioned on drawings.
• Any special grout imposed by an equipment supplier has to be clearly shown and mentioned.

7/ • Use as far as possible round numbers for coordinates and levels (100 mm).

8/ • Draw buildings as per lay out orientation. If not possible, mention clearly the orientation.

9/ • As a principle, the ground floor level of all buildings shall be 200 mm above finished ground level.

10/ • Platforms shall be provided with stairs: inclination 40 degrees, length to be limited to match a maximum stair height of 3m.
• The minimum clearance height for undisturbed passage on all stairways shall be H/W = 2,2/0,8m H being measured perpandicular to the plight.
• Use steps of height 200 mm, steps 250 mm deep and 800 mm wide.

11/ • All platforms shall be designed to the following rules:

- Less than 10% inclination:	no special requirement
- 10% to 20% inclination:	no special requirement for grating anti glide device on checkered plates (e.g. welded on iron bars)
- 20% to 25% inclination:	as for 10 to 20% with horizontal platform every 10 to 15 m.
- More than 25% inclination:	steps

12/ • Connection of the steel structure onto the concrete.
• Steel structure standards for inserts, stairs, handrails are issued by FCB.
Refer to steel structure standards document [6]
This document shall be followed by all design offices and contractors.
• Steel structure building anchorages over RC floors will be made on RC blocks with J-bolts and anchorage pockets.
• Expansion bolts are preferable to inserts or anchor box but the design office must consider the location of the reinforcement bars to avoid interference.
• Secondary steel structure will be fixed directly with expansion bolts on RC floors (no plinth).
• Secondary steel structure will be fixed on inserts if it is on soffit or top face of beams.
• Secondary steel structure will be fixed directly with expansion bolts on RC plinths over roof floors.

G.3. DRAWINGS FORMAT - *FORMAT DES PLANS*

• Use only standard formats A0, A1, A2, A3, A4 and standard scales 1/100, 1/50, 1/20 and multiples.
• All drawings shall be made in AutoCAD 2004.
• The title block of the project shall be used for all documents.
Refer to civil works standards document [5].
• Only 4 lines can be used

1 Plain lines	————————	
2 Dotted lines	- - - - - - - - - - - - - - -	(hidden lines)
3 Mixed lines (long & short line)	—·—·—·—·—·—·—	(axis)
4 Double mixed lines	—··—··—··—··—	(over the plan)

• Color code **TO FOLLOW COMPULSORILY**. A plotstyle file fcb.ctb is sent to the design office.

1	Red	=	0,70	mm	
2	Yellow	=	0,18	mm	
3	Green	=	0,13	mm	
4	Cyan	=	0,50	mm	
5	Blue	=	1,00	mm	
6	Magenta	=	0,25	mm	
7	White	=	0,35	mm	
8	Grey	=	0,00	mm	(construction lines – non apparent on print)
9 to 256		=	0,25	mm	

• Dimensions are always associated, they are never forced.

G.4. DOCUMENTS TRANSMISSION SYSTEM - *MOYEN DE TRANSMISSION DES DOCUMENTS*

14 All documents shall be transmitted through the Oodrive platform as presented in the annex C of the contract [7].

G.5. DESIGN PROGRESS GESTION SYSTEM - *GESTION DE L'AVANCEMENT DE LA CONCEPTION*

• Design office will issue weekly to FCB a progress report, which shall contain:
- time schedule annotated with real progress.
- list of documents sent for approval.
- projected list of documents to be issued in the following two weeks.
- reminder of pending minor and major issues.
- update of the estimated main quantities (monthly).

H. DOCUMENTS TO BE ISSUED BY THE DESIGN OFFICES - *DOCUMENTS EMIS PAR LE BUREAU D'ÉTUDES*

The design office will prepare and send to fcb the following documents:

H.1. GENERAL AND DETAILED CALCULATION NOTE - *NOTE GENERALE ET NOTE DE CALCUL DETAILLEE*

The General calculation note of a structure will be based on the soil report (for the Civil works part), the general arrangement drawings, the architectural drawings & the loads drawings.
The general calculation note will have a summary and will mention:
• The reference standards, loads conditions, reference documents.
• The main dimensions of all building elements .
• The procurement list for steel structure, reinforcement, prestressing. (as an annex)
• The concrete, formwork and masonry quantity (as an annex).

The General calculation notes shall be structured as follow:
• Summary,
• Method of construction of the building,
• Hypothesis for calculation,
• Loads applicable on sketches,
• Results of the calculation,
• Dynamic analysis for structures receiving vibrating equipment,
• All calculation sheets,
• Annexes.

A detailed calculation note will be included for each part of a structure:
• for the civil works: foundations, floor1, floor2, floor3, equipments foundations, ground slab, masonries, etc…
• for steel structure: columns, beams, monorails, crane runway beams, main connections…

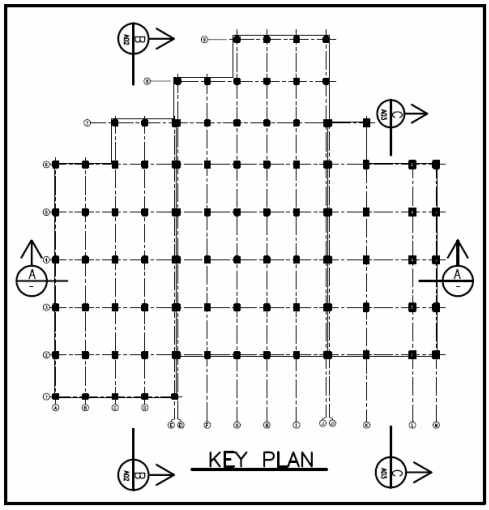
The calculation note shall be sufficient to obtain the approval of the Client or/and his Engineer, and the approval of the local Authority which is for the **CHL1** project the **CTC Chlef (Centre Technique de la Construction de Chlef).**

The general calculation note for steel structure will include the load and anchor drawings of the steel structure applied on the civil structure.
These drawings will show clearly the arrangement of anchor bolts, base plates, shims & grout.

Nota - procurement list
On the basis of the output of the General calculation note, the design office will issue a procurement list for the rebars and/or the steel structure and materials.
This procurement list will allow FCB to purchase the corresponding profiles and sheets.

H.2. CIVIL WORKS (CW) DESIGN - *CONCEPTION DU GENIE CIVIL*

Nota:
• Execution drawings for civil works will not show any equipment or steel structure unless it is necessary for understanding (embedded parts, anchorages,etc…).
• Execution drawings for civil works shall contain a key plan oriented as per layout, or an isometric view, allowing an easy understanding of the location of the structures described.
see the example besides: key plan with indication of the drawings where the sections are shown



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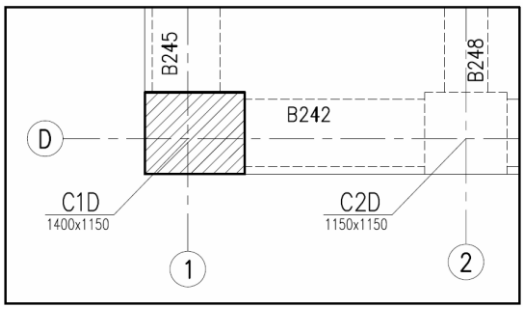
H.2.a. Execution drawings for Civil works: Formwork - *Plans d'exécution : Coffrages*

• Refer to § G.2) Standardization in design.
• Refer to civil works standards document.
• Format A0 and scale 1/50 shall be preferred.
• Formwork drawings are representing the outer face of the structure form. The types of lines have to be chosen accordingly.

For example, on a plan view of a RC floor:

- elements seen and above the floor are represented with plain lines.
- beams and columns below the floor are represented with dotted lines.
- axis are shown in mixed lines.



• Formwork drawings shall mention at least 3 characteristic coordinates points and axis.
• Formwork drawings shall mention:

- the main axis of the building, the absolute levels.
- all dimensions with closed cotation lines. No measurement should be scaled.
- the list of inserts to be embedded in the relevant element (ie: floor + columns below). when same inserts are visible on several drawings, they shall be listed only on the plan view drawing.
- the grade(s) of the concrete to be used.

• Formwork drawings include masonry drawings. On masonry drawings shall add "schedule of finishings".
• Formwork drawings include deep foundations drawings. Drawings for piles can be issued with both formwork and reinforcement (C35 drawings - see numbering).

H.2.b. Execution drawings for Civil works: Reinforcement - *Plans d'exécution : Armatures*

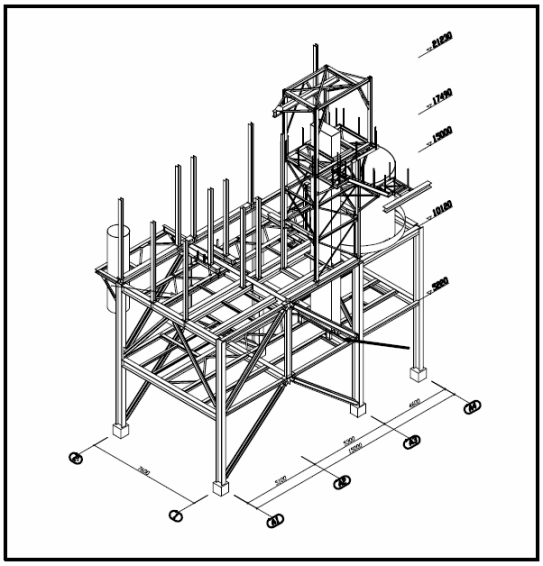
• Format A0 shall be preferred.
• Each reinforcement drawings shall mention which formwork drawing it concerns.
• All bars shall be represented and marked on plan view, section and elevation with corresponding Mark number, quantity, grade, diameter and spacing.
• All bars **except rebar for construction (chairs, …)** shall be listed in the bending schedule on the drawing (not on separate folios)with corresponding Mark number, grade, diameter, quantity, length, radius, shape & total length.
Rebars for construction are in Civil Works Contractor 's scope of supply and design.
• Each reinforcement drawings shall include a summary table (quantitative) of the reinforcement used in the drawing.
The table shall indicate for each grade: the unit weight, length & weight per diameter and the total weight.

H.3. STEEL STRUCTURE (SS) DESIGN - *CONCEPTION DES CHARPENTE METALLIQUES*

Nota
• Execution drawings for steel structure will not show any equipment or civil work unless it is necessary for understanding (embedded parts, anchorages, RC slab on decking, etc…).

• Execution drawings for steel structure shall contain a key plan or an isometric view, allowing an easy understanding of the location of the structures described.

See the example besides: 3D view with location of the part of structure in the drawing.



H.3.a. Load and anchoring drawings - *Plans de charges et d'ancrages*

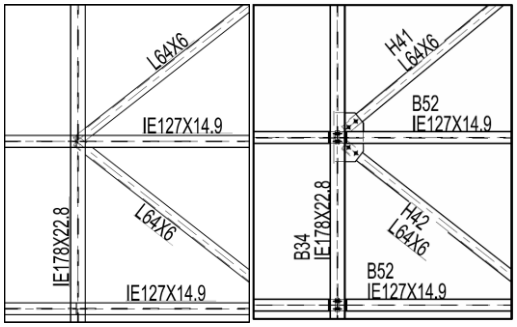
• Load and anchoring drawing shall permit the design of the civil works
• These drawings shall follow the same rules as the load drawings issued by FCB
- Refer to § D.2.c) of the present document.
- In particular, the loads shall be clearly indicated as shown in the table defined in § D.2.c).

H.3.b. General arrangement and details drawings for the structures - *Plans d'ensemble et de détails*

• Format A0 and scale 1/50 shall be preferred.
• GA drawings will show the axis, dimensions, levels and the main views.
The first drawing will show a lay out of the structure with the position of all sections and details which are detailed in the following drawings.

• They shall specify the type of profiles used (revision number before approval) (cf 1) and shall be completed with mark numbers (after approval, when issuing for execution) (cf 2) in order to be used for manufacturing and erection.

See examples below:



(1) (2)

• They shall include the main details necessary for the fabrication & for the connections.
When it is not feasible to include all these details in the General arrangement drawings, specific detailed drawings must be issued. Mark numbers will then refer to this independent drawing number.

H.3.c. Workshop and assembly drawings - *Plans de fabrication et d'assemblages*

• **Assembly drawings:** they show the indivisible pieces sent to the site for the erection of the structures, these pieces are made by the assembling of unit elements issued from the fabrication.
All pieces shall be marked on the drawings and shall be detailed in the IEnet software (as hereunder stated).

Assembly drawings corresponding to a structure or part of structure shall be issued as a unique booklet S50 with one document number. Example: CHL1 S50 36 B01 A.zip

practical terms, the assembly drawings are issued in a zip file, which contains:

- the standard title block A4 in dwg file, with document number.
- a folder with all individual assembly drawing concerned (files .dwg or .dxf or equivalent).
- standards for welding.
- a summary for revision tracking.

• **Workshop drawings:** they show the unit elements to be fabricated with all necessary details.
All elements shall be marked on the drawings and shall be detailed in the Ienet software (as hereunder stated).
Workshop drawings corresponding to a structure or part of structure shall be issued as a unique booklet S60 with one document number. Example: CHL1 S60 51 E01 B.zip

In practical terms, the workshop drawings are issued in a zip file, which contains:

- the standard title block A4 in dwg file, with document number.
- a folder with all individual workshop drawing concerned (files .dwg or .dxf or equivalent).
- a summary for revision tracking.

Nota 1 - marks and sub-marks system

• Each indivisible piece of steel structure sent to the site shall be named by its mark number.
Identical elements may have the same mark number only if it refers to the same drawing.
• Each individual sub-element of a mark number shall be named by its submark number.
Identical elements may have the same submark number only if it refers to the same mark.
• All Marks & Submarks shall be entered in IEnet.

Nota 2 - IEnet: On-line software for material list

• FCB has developped a on-line software called IEnet which is accessible to each designer with a code and a user name.
• The list of the elements available is given in Ienet, and has to be followed compulsorily.
• The design office has an access restricted to the groups and subgroups included in his scope of design.

• FCB has prepared all data concerning: the materials, the group names, the sub-groups names, the items, the available materials. Then the designer has only to enter in his dedicated items, to create his drawing numbers and titles and to fill in the concerned material lists with marks and sub-marks.
• The material lists for steel structure shall be associated with the corresponding assembly drawing number (S50).
• Each group/subgroup is associated with an item. The file giving the association between the group/subgroup and the item for manufacturing is given by FCB at the beginning of the design.
Example: the group/subgroup 36B is linked with the item 323 BH01 S01. The design office in charge of this item will find this item after having entered in IEnet with his code and password.
• In any case, refer to the IEnet user's manual, available directly from the web page.
• Every mark must have its own price code which is defined as follows:

1-main structure - price code:	MAIN
2-gangways and platforms - price code:	GANGW
3-handrails - price code:	HANDR
4-stairways - price code:	STAIR
5-ladders - price code:	LADDE

• The price code of main structure, handrail and ladders are explicit but the price codes of gangway and stair have to be used as follow:
1-price code GANGW applies to all platforms for which the width is less than 1500mm
or for which the area is less than 6m²
2-price code STAIR applies for stairs stringers only. Whenever stairs are supported by columns or / and beams with eventual bracings, these elements are considered as MAIN.
The handrails put on the stringers are obviously considered as HANDR.

Nota 3 - inserts / embedded devices

• Inserts are shown on separate GA drawings (S25 - see numbering), to allow their supply in due time for the civil works.
• Dedicated assembly and workshop drawings have to be issued, allowing their manufacturing before the main steel structure.
• All Marks & Sub-marks shall be uploaded in IEnet.

H.3.d. Execution drawings for roofing, cladding - *Plans d'exécution pour le bardage et la couverture*

• Format A0 and scale 1/50 shall be preferred.
• The arrangement drawings, in order to be used by the supplier and by the erector, will show the axis, dimensions and levels, the types of the metal sheets; they shall specify the details of the accessories, the type of fixation and connections. They shall be completed with mark numbers.
• All Marks (sheets, accessories, fixations) & Sub-marks shall be uploaded on IEnet.

H.3.e. Execution drawings for checkered plates or metal deck - *Plans d'exécution pour les toles larmées et les coffrages perdus*

• Format A0 and scale 1/50 shall be preferred.
• The arrangement drawings, in order to be used for manufacturing and erection, will show the axis, dimensions and levels & specify the type of sheets, fixing devices, connection details and accessories. They shall be completed with mark numbers.
• All Marks (sheets, accessories, fixations) & Sub-marks shall be uploaded on IEnet.

H.3.f. 3D model S15/C15

15

3D file shall be fully compatible with PDMS software and particularly:
- Coordinates of the structure shell shall respect this general coordinate system.
- 2D Autocad file shall support the 3D model.

I. REFERENCES

16

[1] CHL1 C02 01 A01 – *Note générale pour le génie civil et la charpente métallique;*

[2] Soil report;

[3] Topographical survey;

[4] CHL1 G05 00 001 – *Lay out drawing;*

[5] CHL1 C30 01 A01 – *Civil Work Standard drawings;*

[6] CHL1 S20 01 A01 – *Steel Structure Standard drawings;*

[7] iExtranet User Guide for contacts – EN (present in annex C of the contract).

ANNEXE 1: BREAKDOWN OF GROUPS - *DECOMPOSITION DES OUVRAGES*

CHL1 - CHLEFF (Algeria) - 2014

	CIVIL DESIGN	ETUDES DE GENIE CIVIL
Gr	items	items
05	**Roads and networks**	**Routes et réseaux**
05A	Roads and networks	Routes et réseaux
08	**Weighbridges**	**Ponts bascules**
08A	Entrance weighbridges	Ponts bascules
08B	Control office at the entrance	Bureau d'expédition
10	**Primary crusher, gama ray analyser & transport**	**Concassage calcaire-argile et transport**
10A	Building including concrete hoppers (112 HP1 & 112HP2) and control room	Bâtiment du concasseur, y compris deux trémies béton et salle de contrôle
10B		
10C		
10D	Foundations of gama ray analyser builidng	Fondations de l'analyseur gamma
10E	Foundations of conveyor 112-BC2	Fondations du transporteur 112-BC2
10F	Foundations of transfer tower 112-BC2/112-BC3	Tour de transfert 112-BC2/112-BC3
10G	Foundations of conveyor 112-BC3	Fondations du transporteur 112-BC3
10H	Foundations of transfer tower 112-BC3/112-BC4	Tour de transfert 112-BC3/112-BC4
10I	Foundations of conveyor 112-BC4	Fondations du transporteur 112-BC4
18	**Premix storage**	**Stockage et reprise du pré-mélange**
18A	Foundations of transfer tower 112-BC4/182-BC1/202-BC3	Tour de transfert 112-BC4/182-BC1/202-BC3
18B	Foundations for conveyor 182-BC1	Fondations du transporteur 182-BC1
18C	Circular Storage building: building foundation + equipement rail foundations+ peripheral wall	Stockage polaire : fondations de la toiture + rails des équipements + muret périphérique
18D	Extraction chamber and tunnel	Chambre et tunnel d'extraction
18E	Foundations of conveyor 192-BC1	Fondations du transporteur 192-BC1
18F	Foundations of transfer tower 192-BC1/192-BC2	Tour de transfert 192-BC1/192-BC2
18G	Foundations of conveyor 192-BC2	Fondations du transporteur 192-BC2
20	**Additives & Correctives unloading and transport**	**Déchargement des additifs et correctifs**
20A	Unloading building including concrete hopper (202 HP1)	Bâtiment de déchargement (y compris trémie béton)
20B		
20C	Foundations of conveyor 202BC2	Fondations du transporteur 202BC2
20D	Foundations of transfer tower 202BC3-202BC2	Tour de transfert 202BC3-202BC2
20E	Foundations of conveyor 202BC3	Fondations du transporteur 202BC3
21	**Additives & Correctives storage**	**Stockage et reprise des additifs et correctifs**
21A	Longitudinal Storage building: foundation + peripheral wall	Bâtiment de stockage : fondations et sous-bassement
21B	Equipment foundations: stacker / reclaimer / conveyor 202BC4 / underground network	Fondations des équipements : jeteur / gratteur / transporteur de jetée / réseau électrique enterré
21C	Separation walls	Murs de séparation des tas
21D	Foundation for conveyor 222BC1 (to cement mill feed hoppers)	Fondations du transporteur 222BC1 (vers trémies ciment)
21E	Transfer tower 222BC1-222BC2	Tour de transfert 222BC1-222BC2
21F	Foundation for conveyor 222BC2 (to cement mill feed hoppers)	Fondations du transporteur 222BC2 (vers trémies ciment)
21G	Foundation for conveyor 212BC1 (to raw mill feed hoppers)	Fondations du transporteur 212BC1 (vers trémies cru)
21H	Transfer tower 212BC1-212BC2	Tour de transfert 212BC1-212BC2
21I	Foundation for conveyor 212BC2 (to raw mill feed hoppers)	Fondations du transporteur 212BC2 (vers trémies cru)
21J	Building supporting metalic hopper (212HP1) for emergency feeding	Support de trémie d'alimentation d'urgence
23	**Raw mill feed bins**	**Trémies et dosage du broyage cru**
23A	Raw Mill Feed Bins Building	Bâtiment des trémies
23B		
23C		
23D		
23E	Foundation for conveyor 232BC1 & 233BC1 (to raw mill grinding 1 & 2)	Fondations des transporteurs 232BC1 & 233BC1 (vers broyages cru 1 & 2)
26	**Raw mill - Vertical mill 1 & 2**	**Broyage du cru**
26A	Vertical mill fondations (for mill 1 & 2)	Massifs de fondation des broyeurs verticaux 1 & 2
26B	Feeding tower: foundations	Fondations de la tour de recirculation
26C	Cyclone structure support (including mixing chamber support)	Structure support des cyclones
26D	Foundation for arislide support 263AS3 (to homo silo)	Fondations pour l'aéroglissière 263AS3
26E	Fan 263FN1: foundation	Massif de fondation du ventilateur 263FN1
26F	Fan 264FN1: foundation	Massif de fondation du ventilateur 264FN1
26G	Foundation of screw conveyor 483CV1	Fondation du transporteur 483CV1
30	**Raw mill silo and kiln feeding**	**Stockage de la farine & Alimentation du four**
30A	Prestressed silo (including interior structure at extraction level)	Silo précontraint (y compris la structure intérieure à l'extraction)
30B		
30C		
30E	Dust bin support: foundation and superstructure + 483CV4 foundation	Structure support de la trémie poussière + fondation du transporteur à chaînes 483CV4
36	**Preheater Tower**	**Préchauffeur - Précalcinateur**
36A	Preheater Building (foundations, walls, columns, slabs on metal deck, deck, peripheric equipment foundations,…) - including compressor room at ground floor ***Walls, columns and beams made by slipform***	Tour préchauffeur (fondations, voiles, poteaux, poutres, planchers sur bacs aciers, fondations des équipements périphériques …) - y compris salle compresseur au rez-de-chaussée ***Voiles, poteaux et poutres réalisés en coffrage glissant***
36L	Fan 363FN1: foundation	Massif de fondation du ventilateur 363FN1
36M	Fan 363FN2: foundation	Massif de fondation du ventilateur 363FN2
39	**Kiln**	**Four**
39A	Foundation of the 3 kiln blocks, of the TAD & of stairs	Structure des trois massifs de four & fondations des escaliers et supports de GAT
39B	Scanner support foundation	Fondation du support de scanner
40	**Clinker cooler**	**Refroidisseur**
40A	Building - including extraction tunnel	Bâtiment (y compris le tunnel d'extraction)
42	**Cooler dedusting**	**Exhaure du refroidisseur**
42A	Foundations for heat exchanger, filter, fan	Fondations de l'échangeur, du filtre, du ventilateur
42B	Foundations for chain conveyors	Fondations des transporteurs à chaînes
	Foundation for stack	Fondation de la cheminée
48	**Raw Mill and Kiln dedusting**	**Dépoussiérage principal - four et broyage cru**
48A	Filter foundation, incl fan 483FN1	Fondations du filtre et du ventilateur
48B	Foundations of chain conveyor supports (483CV2 & 483CV3)	Fondations des transporteurs à chaînes (483CV2 & 483CV3)
48C	Foundation for stack 483SK1	Fondation de la cheminée 483SK1
48C	Foundations for duct supports	Fondations des supports de gaine

	STEEL DESIGN	ETUDES DE CHARPENTE
Gr	items	items
05	**Roads and networks**	**Routes et réseaux**
	Not applicable	-
08	**Weighbridges**	**Ponts bascules**
	Not applicable	-
10	**Primary crusher, gama ray analyser & transport**	**Concassage calcaire-argile et transport**
10A	Building superstructure incl. roofing (no cladding) with crane runway beams	Structure supérieure couverte, y compris poutres de roulement pour pont
10B	Walkways & stairs	Accès et escaliers
10C	Superstructure for filter support	Structure support du filttre
10D	Monorail for gama ray analyser building	Monorail pour l'analyseur gamma
10E	Support of conveyor 112BC2	Supports et passerelles du transporteur 112BC2
10F	Superstructure of transfer tower 112BC2-112BC3	Tour de transfert 112-BC2/112-BC3
10G	Support of conveyor 112BC3	Supports et passerelles du transporteur 112BC3
10H	Superstructure of transfer tower 112BC3-112BC4	Tour de transfert 112-BC3/112-BC4
10I	Support of conveyor 112BC4	Supports et passerelles du transporteur 112BC4
18	**Premix storage**	**Stockage et reprise du pré-mélange**
18A	Superstructure of transfer tower 112BC4-182BC1-202BC3	Tour de transfert 112-BC4/182-BC1/202-BC3
18B	Support of conveyor 182BC1	Supports et passerelles du transporteur 182BC1
18C	Circular Storage building: superstructure	Couverture du stockage polaire
18D	-	
18E	Support of conveyor 192BC1	Supports et passerelles du transporteur 192BC1
18F	Superstructure of transfer tower 192BC1-192BC2	Tour de transfert 192-BC1/192-BC2
18G	Support of conveyor 192BC2	Supports et passerelles du transporteur 192BC2
20	**Additives & Correctives unloading and transport**	**Déchargement des additifs et correctifs**
20A	Building superstructure incl. roofing (no cladding)	Superstructure du bâtiment, y compris toiture
20B	Staircase	Escalier et accès
20C	Support of conveyor 202BC2	Supports et passerelles du transporteur 202BC2
20D	Superstructure of transfer tower 202BC3-202BC2	Tour de transfert 202BC3-202BC2
20E	Support of conveyor 202BC3	Supports et passerelles du transporteur 202BC3
21	**Additives & Correctives storage**	**Stockage et reprise des additifs et correctifs**
21A	Building superstructure inlcuding roof & cladding, doors	Superstructure du bâtiment, y compris bardage, couverture et portes
21B	-	-
21C	-	-
21D	Support of conveyor 222BC1 (to cement mill feed hoppers)	Supports et passerelles du transporteur 222BC1 (vers trémies ciment)
21E	Superstructure of transfer tower 222BC1-222BC2	Tour de transfert 222BC1-222BC2
21F	Support of conveyor 222BC2 (to cement mill feed hoppers)	Supports et passerelles du transporteur 222BC2 (vers trémies ciment)
21G	Support of conveyor 212BC1 (to raw mill feed hoppers)	Supports et passerelles du transporteur 212BC1 (vers trémies cru)
21H	Superstructure of transfer tower 212BC1-212BC2	Tour de transfert 212BC1-212BC2
21I	Support of conveyor 212BC2 (to raw mill feed hoppers)	Supports et passerelles du transporteur 212BC2 (vers trémies cru)
21J	Superstructure above concrete building for emergency feeding (roof)	Couverture de la trémie d'alimentation d'urgence
23	**Raw mill feed bins**	**Trémies et dosage du broyage cru**
23A	Steel stairs	Escalier
23B	top floors	Planchers supérieur
23C	Structure for cladding support	Structure support du bardage
23D	Gangways for access to equipments	Passerelles d'accès aux équipements
23E	Support of conveyor 232BC1 & 233BC1 (to raw mill grinding 1 & 2)	Supports et passerelles des transporteurs 232BC1 & 233BC1 (vers broyage cru 1 & 2)
26	**Raw mill - Vertical mill 1 & 2**	**Broyage du cru**
26A	Vertical mill fondations (for mill 1 & 2)	Divers autour des broyeurs verticaux
26B	Feeding tower: whole superstructure (including staircase, monorail, gangway,…)	Tour de recirculation : structure, escaliers, accès …
26C	Cyclone structure support: Extraction floor & airslide support (263AS1 & 263AS2)	Plateforme d'extraction sous cyclone et passerelle d'aéroglissières
26D	Support of arislide 263AS3 (to homo silo)	Supports et passerelles de l'aéroglissière 263AS3 (vers silo farine)
26E	Fan 263FN1: handrail & access	Massif ventilateur 263FN1 : garde-corps et accès
26F	Fan 264FN1: handrail & access	Massif ventilateur 264FN1 : garde-corps et accès
26G	Support of screw conveyor from mixing chamber to 483CV3 (483CV1)	Supports et passerelles du transporteur 483CV1
30	**Raw mill silo and kiln feeding**	**Stockage de la farine & Alimentation du four**
30A	Suuport of airslides from preheater to silo (305AS1 & 333AS4 on top + 305AS4 on bottom)	Passerelles d'aéroglissières entre préchauffeur et silo (305AS1 & 333AS4 + 305AS4)
30B	Silo roof beams	Poutres de toiture du silo
30C	Support of airslides on roof	Supports d'aéroglissières en toiture du silo
30E	Dust bin and screw conveyor from dust bin to bucket elevator (483CV4)	Support trémie poussière et passerelles du transporteur de poussière
30F	Top structure for bucket elevator	Guides d'élévateur et structure supérieure en toit de silo
36	**Preheater Tower**	**Préchauffeur - Précalcinateur**
36A	Floor : level 1	Plancher niveau 1
36B	Floor : level 2	Plancher niveau 2
36C	Floor : level 3	Plancher niveau 3
36D	Floor : level 4	Plancher niveau 4
36E	Floor : level 5	Plancher niveau 5
36F	Floor : level 6	Plancher niveau 6
36G	Floor : level 7	Plancher niveau 7
36H	Structures over N7	Structures au-delà du niveau 7
36I	Structures between N1 & N2	Structures entre les niveaux 1 et 2
36J	Staircase	Escalier principal
36K	Ducts and stack supports & Miscellaneous	Divers - Supports de gaines, guides de cheminée, etc
36L	Fan 363FN1: handrail & access	Massif ventilateur 363FN1 : garde-corps et accès
36M	Fan 363FN2: handrail & access	Massif ventilateur 363FN2 : garde-corps et accès
39	**Kiln**	**Four**
39A	Gangway along the kiln piers	Passerelle le long du four
39B	Staircase (kiln 1 & 3)	Escaliers
39C	Tertiary air duct: steel supports	Supports de la gaine d'air tertiaire (GAT)
40	**Clinker cooler**	**Refroidisseur**
40A	Steel portal frame for burner handling including roof	Superstructure, avec maintenance de la tuyère
40B	Internal secondary platforms and gangways	Passerelles internes et plateformes secondaires
40C	Staircase	Escalier
42	**Cooler dedusting**	**Exhaure du refroidisseur**
42A	Fan and stack: handrails and access	Massifs ventilateur et cheminée : garde-corps et accès
42B	Support of chain conveyor & service walkways	Supports et passerelles des transporteurs de poussière
48	**Raw Mill and Kiln dedusting**	**Dépoussiérage principal - four et broyage cru**
48A	Stairs and handrails on filter RC structure and fan 483FN1	Escalier et supportage du filtre
48B	Supports and gangways along chain conveyors (483CV2 & 483CV3)	Supports et passerelles des transporteurs de poussière
48C	Stack 483SK1: handrail and access	Massifs ventilateur et cheminée : garde-corps et accès

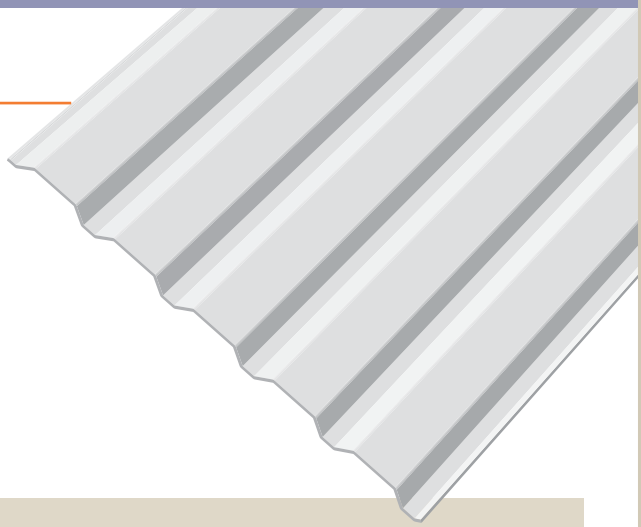
	CIVIL DESIGN	ETUDES DE GENIE CIVIL
Gr	items	items
51	**Clinker transport & storage**	**Stockage du clinker**
51A	Foundation of pan conveyor to clinker silo	Fondations du transporteur d'alimentation des silos
51B	Prestressed clinker silos 1 & 2	Silos clinker précontraint n°1 et n°2
51C		
51D		
51E	Off spec silo	Silo des incuits
51F		
51G	Emergency hopper: foundation & superstructure	Support de trémie d'alimentation d'urgence
51H	Foundation of conveyors to cement mill feed building (523BC1 & 523BC2)	Fondations des transporteurs vers trémies ciment (523BC1 & 523BC2)
51I	Tower angle 523BC1 & 523BC2 - 523BC3	Tour de transfert 523BC1 & 523BC2 - 523BC3
51J	Foundation for conveyor 523BC3	Fondations du transporteur 523BC3
51k	Tower angle 523BC3-523BC4	Tour de transfert 523BC3-523BC4
51L	Foundation for conveyor 523BC4	Fondations du transporteur 523BC4
54	**Cement mill feed bins**	**Trémies et dosage du broyage ciment**
54A	Cement mill feed building	Bâtiment des trémies
54B		
54C	Foundation for conveyors to cement mill buiding (545BC1-546BC1-547BC1)	Fondations des transporteurs vers le broyage ciment (545BC1-546BC1-547BC1)
57	**Cement grinding**	**Broyage du ciment**
57A	Cement mill building 1 (for 575BM1 & 576BM1)	Bâtiment de broyage ciment n°1 (pour 575BM1 & 576BM1)
57B	Cement mill building 2 (for 577BM1)	Bâtiment de broyage ciment n°2 (pour 577BM1)
57C		
57D		
57E		
57F	Cement ball mill blocks (for the 3 mills)	Massifs des broyeurs à boulets
60	**Cement transport**	**Transport du ciment vers les silos**
60A	Foundation for airslide (575AS6, 576AS6, 577AS6) & feeding tower	Fondations des aéroglissières et de la tour d'alimentation
61	**Cement storage**	**Stockage du ciment et chargement du vrac - camions**
61A	Cement silo 1 (including equipment foundations & structure below cone)	Silo précontraint n°1 (y compris la structure intérieure et les fondations d'équipements)
61B	Cement silo 2 (including equipment foundations & structure below cone)	Silo précontraint n°2 (y compris la structure intérieure et les fondations d'équipements)
61C	Cement silo 3 (including equipment foundations & structure below cone)	Silo précontraint n°3 (y compris la structure intérieure et les fondations d'équipements)
61D	Cement silo 4 (including equipment foundations & structure below cone)	Silo précontraint n°4 (y compris la structure intérieure et les fondations d'équipements)
61E		
61F		
61G	Control room and weigh bridges (for 2 silos)	Salle de contrôle et ponts bascules (pour 2 silos)
61H		
61I		
61J		
61K	Foundation for airslide support (611AS3, 611AS2, 613AS3, 614AS3) toward packing plant	Fondations des aéroglissières vers l'ensachage
61L	Foundation for airslide support (614AS4) toward train loading station	Fondations des aéroglissières vers le chargement vrac-train
64	**Cement packing and bag loading**	**Ensachage et chargement des sacs - camions**
64A	Packing and bag loading building (including compressor room)	Bâtiment (y compris la salle des compresseurs)
65	**Cement train bag loading**	**Chargement des sacs - train**
65A	Cement train bag loading building	Bâtiment
66	**Cement train bulk loading**	**Chargement du vrac - train**
66A	Cement train bulk loading building	Bâtiment
74	**Water Networks**	**Réseau d'eau**
74A	Water tanks (742TK1 & 742TK2)	Réservoirs d'eau (742TK1 & 742TK2)
74B	Water Treatment and Pumps room	Salle de pompage et de traitement d'eau
77	**Compressed Air Networks**	**Réseau d'air comprimé**
77A	Compressor room n°1 - included in 10A	Salle des compresseurs n°1 - inclus dans le 10A
77B	Compressor room n°2 - included in 36A	Salle des compresseurs n°2 - inclus dans le 36A
77C	Compressor room n°3 - included in 64A	Salle des compresseurs n°3 - inclus dans le 64A
80	**Diesel generator**	**Salle de groupe électrogène**
80A	Diesel generator room	Salle du groupe électrogène - inclus dans le 39A
81	**Natural gas**	**Réseau gaz**
81A	Gas reduction station	Station de détente de gaz
81B	Gas network foundations	Fondation pour réseau de gaz
82	**Central Control Room**	**CCR - Salle de contrôle centrale**
82A	Offices and Control Room Building	Bâtiment bureaux et salle de commande
83	**Laboratory**	**Laboratoire**
83A	Laboratory building	Bâtiment laboratoire
84	**Auxiliary buildings**	**Bâtiments auxiliaires**
84A	Gatehouse at plant entrance	Poste de garde
84B	Locker room & sanitation	Bâtiment vestiaires et sanitaires
84C	Offices at quarry plant (included in 86A)	Bureaux à la carrière - inclus dans le 86A
84D	Guard houses	Loges de gardiens
85	**General Workshop**	**Atelier d'entretien général et magasin central de pièces de rechange**
85A	General workshop (storage area & offices)	Bâtiment atelier et magasin
86	**Maintenance workshop at quarry plant**	**Atelier engins roulants, parking couvert, poste de livraison de carburant (carrière)**
86A	Maintenance workshop at quarry plant (including parking and offices)	Atelier engins roulants, y compris parking couvert et bureaux
86B	Fuel station at quarry plant	Poste de livraison de carburant en carrière
87	**Storage warehouses**	**Dépots huiles, graisses, boulets et réfractaires**
87A	Storage warehouses (greases, oil, refractories,…)	Bâtiment
89	**Electrical Network**	**Généraux électriques**
89A	Electrical Network - Electrical tunnel	Réseau électrique - galerie technique
90	**Elec substations (L x W)**	**Sous-stations électriques**
90A	Main station	Poste d'alimentation principal 220kV
90B	Main sub-station	Sous-station électrique principale
91A	Elec substation - Primary crusher	Salle électrique concassage (LS1)
92A	Elec substation - Material handling	Salle électrique manutention (LS2)
93A	Elec substation - Raw mill area	Salle électrique broyage du cru (LS3)
94A	Elec substation - Kiln area	Salle électrique four (LS4)
95A	Elec substation - Cooler area	Salle électrique refroidisseur clinker (LS5)
96A	Elec substation - Cement grinding area	Salle électrique broyage ciment (LS6)
97A	Elec substation - Packing area	Salle électrique ensachage et expédition (LS7)
98A	Elec substation - Utilities	Salle électrique auxiliaires (LS8)

	STEEL DESIGN	ETUDES DE CHARPENTE
Gr	items	items
51	**Clinker transport & storage**	**Stockage du clinker**
51A	Support of pan conveyor to clinker silo 1 (513PN1)	Supports et structure du transporteur d'alimentation du silo n°1
51B	Clinker silo & top housing	Toitures des silos clinker et cabanons
51C	Support of conveyor to clinker silo 2 (513PN2)	Supports et structure du transporteur d'alimentation du silo n°2
51D	Chute to off spec silo: supports & access	Supports et accès pour la chute vers les incuits
51E	Roof beams of the off spec silo	Poutres de toiture du silo des incuits
51F	Staircase of off-spec silo & truck loading structure	Escalier et structures internes du silo des incuits
51G	Shelter above the emergency hopper	Abri au-dessus de la trémie d'urgence
51H	Support of conveyors to cement mill feed building (523BC1 & 523BC2)	Supports et passerelles des transporteurs vers trémies ciment (523BC1 & 523BC2)
51I	Tower angle 523BC1 & 523BC2 - 523BC3	Tour de transfert 523BC1 & 523BC2 - 523BC3
51J	Support of conveyor 523BC3	Supports et passerelles du transporteur 523BC3
51k	Tower angle 523BC3-523BC4	Tour de transfert 523BC3-523BC4
51L	Support of conveyor 523BC4	Supports et passerelles du transporteur 523BC4
54	**Cement mill feed bins**	**Trémies et dosage du broyage ciment**
54A	Last floor & steel structure supporting input conveyors	Plancher supérieur et structure support des transporteurs d'arrivée
54B	Staircase	Escalier
54C	Support of conveyors to cement mill buiding (545BC1-546BC1-547BC1)	Supports et passerelles des transporteurs vers broyage ciment (545BC1-546BC1-547BC1)
57	**Cement grinding**	**Broyage du ciment**
57A	Structure above concrete level for building 1	Supports des équipements au-dessus du niveau béton - Bâtiment 1
57B	Structure above concrete level for building 2	Supports des équipements au-dessus du niveau béton - Bâtiment 2
57C	Staircase (idetical for the 2 building)	Escaliers pour les deux bâtiments
57D	Equipement supports (airslide, ducts,…) and accesses - building 1	Supports d'équipements et accès - Bâtiment n°1
57E	Equipement supports (airslide, ducts,…) and accesses - building 2	Supports d'équipements et accès - Bâtiment n°2
57F	Ball mill (access, handrail, gangways) for the 3 mills	Broyeurs à boulets : accès, garde-corps, passerelles
57G	Monorail and traveling crane (for the 2 buildings)	Fer de maintenance et supports de pont roulant (pour les deux bâtiments)
60	**Cement transport**	**Transport du ciment vers les silos**
60A	Airslide supports (575AS6, 576AS6, 577AS6) - including tower for buckets feeding	Passerelles d'aéroglissières vers les silos et alimentation des élévateurs
60B	Bucket elevator (support, top structure on roof,…)	Guides d'élévateur et structure supérieure en toit de silo
60C	Airslides supports and gangways on roofs	Passerelles d'aéroglissières en toiture des silos
61	**Cement storage**	**Stockage du ciment et chargement du vrac - camions**
61A	Roof beam of the silo 1	Poutres de toiture du silo n°1
61B	Roof beam of the silo 2	Poutres de toiture du silo n°2
61C	Roof beam of the silo 3	Poutres de toiture du silo n°3
61D	Roof beam of the silo 4	Poutres de toiture du silo n°4
61E	Tower for staircase common to silos and accesses	Tour d'escalier commune aux 4 silos
61F		
61G	Platforms and access below cone at silo n°1	Plateformes et accès sous cône - Silo n°1
61H	Platforms and access below cone at silo n°2	Plateformes et accès sous cône - Silo n°2
61I	Platforms and access below cone at silo n°3	Plateformes et accès sous cône - Silo n°3
61J	Platforms and access below cone at silo n°4	Plateformes et accès sous cône - Silo n°4
61K	Airslide support (611AS3, 611AS2, 613AS3, 614AS3) toward packing plant	Supports et passerelles d'aéroglissières vers l'ensachage
61L	Airslide support (614AS4) toward train loading station	Supports et passerelles d'aéroglissières vers le chargement vrac - trains
64	**Cement packing and bag loading**	**Ensachage et chargement des sacs - camions**
64A	Staircase	Escaliers
64B	Monorail, accesses and miscellaneous	Divers - Accès, monorail
65	**Cement train bag loading**	**Chargement des sacs - train**
65A	Staircase and gangway (bag loading) Staircase and gangway (bulk loading)	Escalier et accès
66	**Cement train bulk loading**	**Chargement du vrac - train**
66A	Staircase and gangway (bag loading) Staircase and gangway (bulk loading)	Escalier et accès
74	**Water Networks**	**Réseau d'eau**
74A	Water tanks accesses (742TK1 & 742TK2)	Accès aux toits des réservoirs
74B	Pumps room & water treatment: monorail	Monorail de la salle des pompes
77	**Compressed Air Networks**	**Réseau d'air comprimé**
77A	Compressor room n°1 (for crusher area): monorail or crane runway	Salle des compresseurs n°1 - monorail
77B	Compressor room n°2 (for burning area): monorail or crane runway	Salle des compresseurs n°2 - monorail
77C	Compressor room n°3 (for cement grinding & packing area): monorail or crane runway	Salle des compresseurs n°3 - monorail
80	**Diesel generator**	**Salle de groupe électrogène**
81A	Diesel generator room	Salle du groupe électrogène - inclus dans le 39A
81	**Natural gas**	**Réseau gaz**
81A	Gas reduction station	Station de détente de gaz
81B	Gas network foundations	Supports pour réseau de gaz
82	**Central Control Room**	**CCR - Salle de contrôle centrale**
82A	Offices and Control Room Building	Divers - Bâtiment bureaux et salle de commande
83	**Laboratory**	**Laboratoire**
83A	Laboratory building	Divers - Bâtiment laboratoire
84	**Auxiliary buildings**	**Bâtiments auxiliaires**
84A	Gatehouse at plant entrance	Poste de garde
84B	Locker room & sanitation	Bâtiment vestiaires et sanitaires
84C	Offices at quarry plant (included in 85A)	Bureaux à la carrière - inclus dans le 86A
84D	Guard houses	Loges de gardiens
85	**General Workshop**	**Atelier d'entretien général et magasin central de pièces de rechange**
85A	General workshop (storage area & offices)	Divers - Bâtiment atelier et magasin
86	**Maintenance workshop at quarry plant**	**Atelier engins roulants, parking couvert, poste de livraison de carburant (carrière)**
86A	Maintenance workshop at quarry plant (including parking and offices)	Divers - Atelier engins roulants
86B	Fuel station at quarry plant	Poste de livraison de carburant en carrière
87	**Storage warehouses**	**Dépots huiles, graisses, boulets et réfractaires**
87A	Storage warehouses (greases, oil, refractories,…)	Divers - Dépots
89	**Electrical Network**	**Généraux électriques**
89A	Electrical Network - Electrical tunnel	Réseau électrique - galerie technique
90	**Elec substations (L x W)**	**Sous-stations électriques**
90A	Main station	Poste d'alimentation principal 220kV
90B	Main sub-station	Sous-station électrique principale
91A	Elec substation - Primary crusher	Salle électrique concassage (LS1)
92A	Elec substation - Material handling	Salle électrique manutention (LS2)
93A	Elec substation - Raw mill area	Salle électrique broyage du cru (LS3)
94A	Elec substation - Kiln area	Salle électrique four (LS4)
95A	Elec substation - Cooler area	Salle électrique refroidisseur clinker (LS5)
96A	Elec substation - Cement grinding area	Salle électrique broyage ciment (LS6)
97A	Elec substation - Packing area	Salle électrique ensachage et expédition (LS7)
98A	Elec substation - Utilities	Salle électrique auxiliaires (LS8)

ANNEXE 2: TECHNICAL DATASHEET ARCELOR OF THE CLADDING, ROOFING SHEETS AND THE STEEL DECK - *DONNÉES TECHNIQUES POUR LES COUVERTURES, BARDAGES ET LES COFFRAGES PERDUS*

Arval
by ArcelorMittal

Trapéza 5.207.32 B/HB

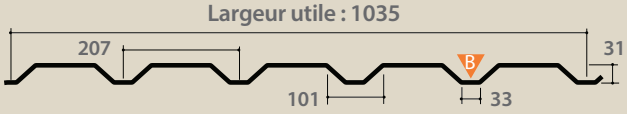


Plaque nervurée en acier galvanisé ou galvanisé prélaqué pour bardage simple et double peau

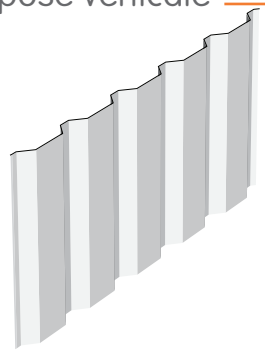
Référence normative :
Règles professionnelles pour la fabrication et la mise en œuvre des bardages métalliques : Janvier 1981 - 2ème édition

CARACTERISTIQUES DU MATERIAU DE BASE		NORMES
Nuance d'acier	S 320 GD	NF EN 10346
Type de protection	Galvanisé	NF EN 10346 P 34310
	Galvanisé-Prélaqué	NF EN 10169 XP P 34301

Largeur utile : 1035



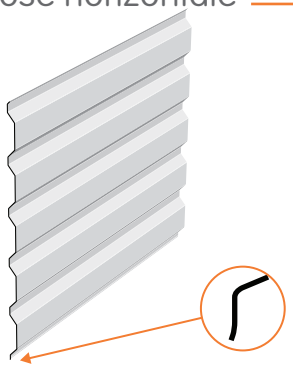
pose verticale



Epaisseur (mm)	0,63	0,75
Masse (kg/m²)	5,66	6,74
Longueur maximale (m)	12,80	

B Face prélaquée

pose horizontale



Epaisseur (mm)	0,75
Masse (kg/m²)	6,74
Longueur maximale conseillée (m)	9,50

Pour épaisseur supérieure, nous consulter.

Tableau d'utilisation : Charges normales admissibles en daN/m² en fonction des portées d'utilisation

PV VERITAS DLC L7 86 715

2 appuis		Portée (m)	3 appuis		pose verticale / pose horizontale
Epaisseur (mm)			Epaisseur (mm)		
0,75	0,63		0,63	0,75	
160	160	1,80	160	160	Pression
160	153		160	160	Dépression
160	117	2,00	160	160	Pression
134	123		160	160	Dépression
116	87	2,20	134	160	Pression
103	91		141	160	Dépression
86	66	2,40	113	160	Pression
82	69		116	145	Dépression
65	51	2,60	96	138	Pression
67	53		95	118	Dépression
50		2,80	83	114	Pression
55			80	98	Dépression
		3,00	72	96	Pression
			68	82	Dépression
		3,20	63	81	Pression
			58	70	Dépression
		3,40	54	69	Pression
			50	60	Dépression
		3,60		60	Pression
				52	Dépression

PV VERITAS DLC L7 86 715

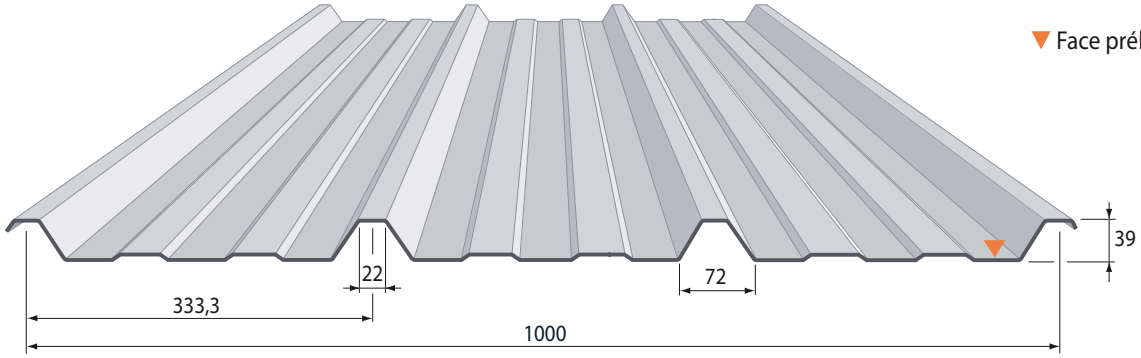
2 appuis	Portée (m)	3 appuis
Epaisseur (mm)		Epaisseur (mm)
0,75		0,75
160	1,60	160
160		160
160	1,80	160
160		160
160	2,00	160
134		160
116	2,20	160
103		160
86	2,40	160
82		145
65	2,60	138
67		118
50	2,80	114
55		98
	3,00	96
		82

Portées pour bardage double peau, voir paragraphe "conseils de mise en œuvre"

Plaque nervurée de couverture de type trapézoïdale.

GAMME TRAPEZA

▼ Face prélaquée



I - IDENTIFICATION

CARACTERISTIQUE DU MATÉRIAU DE BASE		NORMES
Nuance d'acier : S 320 GD	Tolérances normales	NF EN 10346
Type de protection	Galvanisé	NF EN 10346 P 34310
	Galvanisé-Prélaqué	NF EN 10169-1 XP P34301

NF P 34-205-1 / Réf. DTU 40.35

LONGUEUR DE PROFILAGE (mm)	
Mini	1800
Maxi	12800

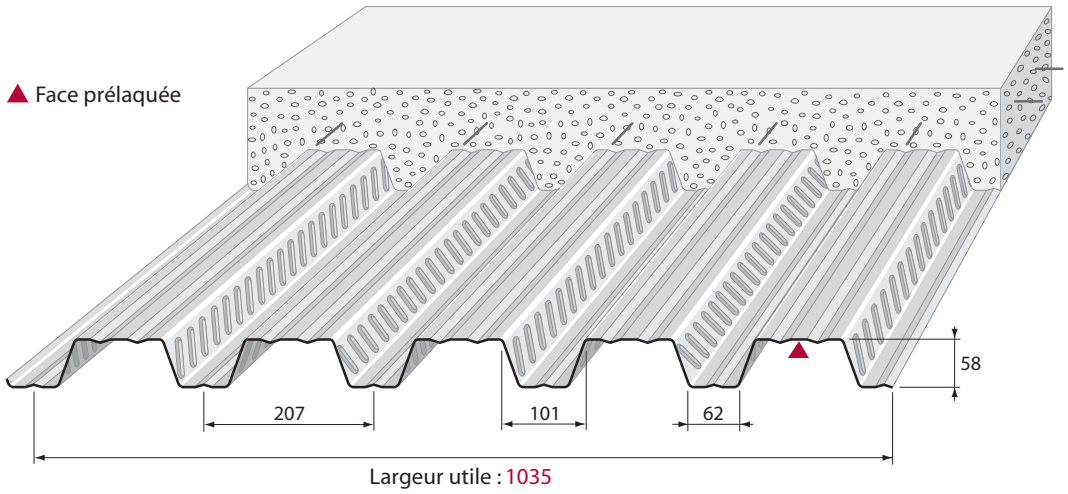
II - CARACTERISTIQUES EXPERIMENTALES - Selon PV VERITAS N° DLC / L 7 84 295

						EPAISSEUR (en mm)			
						0,63	0,75	0,88	1,00
ACTION DES CHARGES DESCENDANTES			MASSE SURFACIQUE (kg/m²)		m	5,86	6,98	8,19	9,30
			Moments d'inertie (cm⁴/ml)	Travée simple	I2	17,06	16,47	19,32	21,96
				Deux travées égales	I3	10,96	14,06	16,49	18,74
				Continuité	Im	14,01	15,26	17,91	20,35
			Moments de flexion (m.daN/ml)	en travée – Système élastique	Md2T	113,78	139,24	163,38	185,66
				en travée – Système élasto-plastique	Md3T	140,00	189,85	222,75	253,13
				Sur appui	Md3A	135,65	148,02	173,68	197,36
				Sous charge concentrée	Mc	96,66	134,03	157,27	178,71
				Réaction d'appui (daN/ml)	Rd	525,37	612,54	718,71	816,72
ACTION DES CHARGES ASCENDANTES	Fixation en sommet de nervure	Fixation complète	Moments de flexion (m.daN/ml)	en travée – Système élastique	Ma2T	100,71	164,68	193,23	219,58
				en travée – Système élasto-plastique	Ma3T	116,64	182,21	213,80	242,95
				Sur appui	Ma3A	83,39	137,86	161,75	183,81
				Efforts d'arrachement sur appui (daN/ml)	Sa	467,44	602,11	706,47	802,81
		Fixation réduite	Moments de flexion (m.daN/ml)	en travée – Système élastique	Ma2Tr	100,71	164,68	193,23	219,58
				en travée – Système élasto-plastique	Ma3Tr	78,69	195,33	229,19	260,44
				Sur appui	Ma3Ar	56,52	87,69	102,89	116,92
				Efforts d'arrachement sur appui (daN/ml)	Sar	311,13	455,31	534,23	607,08

III - PORTEES UTILES SOUS L'ACTION DES CHARGES CLIMATIQUES (pour travées égales)

HACIERCO 3.333.39 T	CHARGES D'EXPLOITATION NON PONDEREES EN daN/m²		2 APPUIS				3 APPUIS				4 APPUIS			
			0,63	0,75	0,88	1,00	0,63	0,75	0,88	1,00	0,63	0,75	0,88	1,00
CHARGES DESCENDANTES	45		1,95	2,35	2,75	3,05	2,20	2,95	3,40	3,80	2,20	2,95	3,40	3,80
	55		1,95	2,35	2,75	3,05	2,20	2,95	3,40	3,80	2,20	2,95	3,40	3,80
	65		1,95	2,35	2,75	3,00	2,20	2,95	3,40	3,80	2,20	2,95	3,40	3,60
	75		1,95	2,35	2,75	2,85	2,20	2,95	3,40	3,70	2,20	2,95	3,35	3,45
	90		1,95	2,35	2,60	2,70	2,20	2,95	3,35	3,50	2,20	2,95	3,15	3,30
	100		1,95	2,35	2,50	2,60	2,20	2,95	3,25	3,40	2,20	2,90	3,05	3,20
	125		1,95	2,25	2,35	2,45	2,20	2,75	2,95	3,15	2,20	2,70	2,85	2,95
	150		1,95	2,10	2,20	2,30	2,20	2,50	2,70	2,90	2,20	2,55	2,70	2,80
	175		1,85	2,00	2,10	2,20	1,95	2,25	2,50	2,65	2,05	2,35	2,55	2,65
	200		1,70	1,90	2,05	2,10	1,70	1,95	2,30	2,50	1,85	2,15	2,40	2,55
	225		1,50	1,75	1,95	2,05	1,50	1,75	2,05	2,35	1,65	1,95	2,25	2,40
	250		1,35	1,60	1,85	1,95	1,35	1,60	1,85	2,10	1,50	1,75	2,05	2,30
CHARGES ASCENDANTES	Fixation complète en sommet de nervure	75	1,95	2,35	2,75	3,05	2,20	2,95	3,40	3,80	2,20	2,95	3,40	3,80
		100	1,95	2,35	2,75	3,05	2,20	2,95	3,40	3,65	2,20	2,95	3,40	3,70
		125	1,95	2,35	2,75	3,05	2,15	2,80	3,00	3,25	2,20	2,85	3,10	3,30
		150	1,90	2,35	2,65	2,85	1,95	2,50	2,75	2,95	2,05	2,60	2,80	3,00
		200	1,60	2,05	2,30	2,45	1,60	2,05	2,35	2,50	1,75	2,25	2,40	2,60
	Fixation réduite en sommet de nervure	50					2,20	2,95	3,40	3,80	2,20	2,95	3,40	3,80
		75					2,20	2,90	3,15	3,40	2,20	2,95	3,40	3,70
		100					2,00	2,50	2,70	2,90	2,10	2,70	2,95	3,15
		125					1,75	2,20	2,40	2,60	1,85	2,40	2,60	2,80
		150					1,45	2,00	2,20	2,35	1,55	2,20	2,35	2,55
		200					1,05	1,55	1,85	2,00	1,15	1,70	2,00	2,20

Pour fixation en plage, nous consulter.



CARACTERISTIQUE DU MATÉRIAU DE BASE		NORMES
Nuance d'acier	S 320 GD	NF EN 10326
Type de protection	Galvanisé	NF EN 10326 P 34-310
	Galvanisé-Prélaqué	NF EN 10169-1 XP P 34-301

ÉPAISSEUR	0,75	0,88	1,00	1,25
M kg/m²	8,53	10,00	11,37	14,22

TABLEAU D'UTILISATION

Portées maximales d'utilisation (en m) - (Phase de coulage selon Avis Technique n° 3/03-390)

Travée simple

Dalle (cm)	EPAISSEUR (mm)			
	0,75	0,88	1,00	1,25
10	2,70	2,85	2,95	-
11	2,60	2,70	2,80	-
12	2,50	2,60	2,70	-
13	2,40	2,50	2,65	-
14	2,30	2,45	2,55	-
15	2,25	2,35	2,45	-
16	2,20	2,30	2,40	-
17	2,15	2,25	2,35	-
18	2,10	2,20	2,30	-
19	2,05	2,15	2,25	-
20	2,00	2,10	2,20	-
21	1,95	2,10	2,15	-
22	1,95	2,05	2,15	-
23	1,90	2,00	2,10	-
24	1,90	2,00	2,05	-
25	1,85	1,95	2,05	-

Travées continues

Dalle (cm)	EPAISSEUR (mm)			
	0,75	0,88	1,00	1,25
10	3,60	3,85	4,00	-
11	3,50	3,70	3,85	-
12	3,35	3,55	3,70	-
13	3,25	3,40	3,55	-
14	3,10	3,30	3,45	-
15	2,95	3,20	3,35	-
16	2,80	3,15	3,25	-
17	2,70	3,00	3,20	-
18	2,60	2,90	3,10	-
19	2,50	2,80	3,05	-
20	2,40	2,70	2,95	-
21	2,35	2,60	2,85	-
22	2,25	2,50	2,75	-
23	2,20	2,45	2,65	-
24	2,10	2,35	2,60	-
25	2,05	2,30	2,50	-

Volume de remplissage des nervures : 22,81 dm^3/m^2
Flèche théorique inférieure ou égale au 240ème de la portée.