MAGON ACEROS

MG 60/220

CONSTRUCTION SECTOR:
STRUCTURAL PROFILES

MG 60/220 COMPOSITE FLOOR DECK
MG 60/220 NON-COMPOSITE FLOOR DECK

MAGON ACEROS

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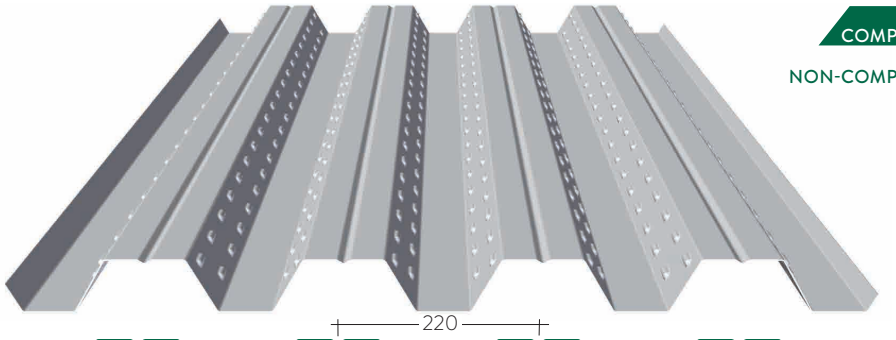
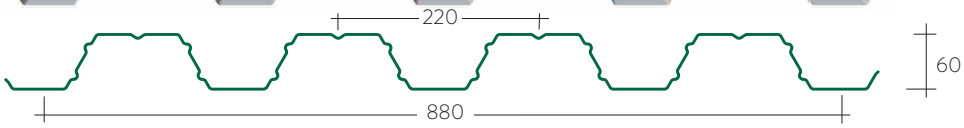
A profile specially designed for the construction of mixed concrete-steel floors for industrial, residential and commercial buildings. It can be used as a composite slab metal profile or as a non-composite floor deck in concrete slabs. It has a rib height of 60 mm, usable width of 880mm, and includes countersunk embossments on the side of the ribs. It drastically reduces the use of struts, enables immediate transit, requires little labour, is quick to install and involves less dead load on the structure.

Product certified according to UNE-EN 10340: 2008 and UNE-EN 1090: 2019 standards.

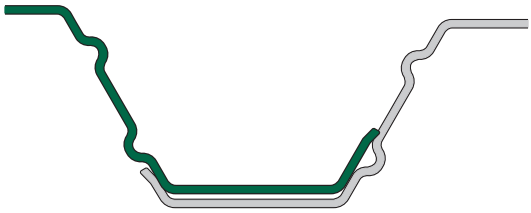


Measurements
In mm



Thickness (mm)	Weight (kg / m²)	Moment of Inertia I (cm⁴)	Resistive Moment W (cm³)	Maximum moment (m. Kg)
0.8	8.92	62.64	20.14	295
1.0	11.12	78.30	25.09	365
1.2	13.38	93.97	30.02	440

JOINT DETAIL



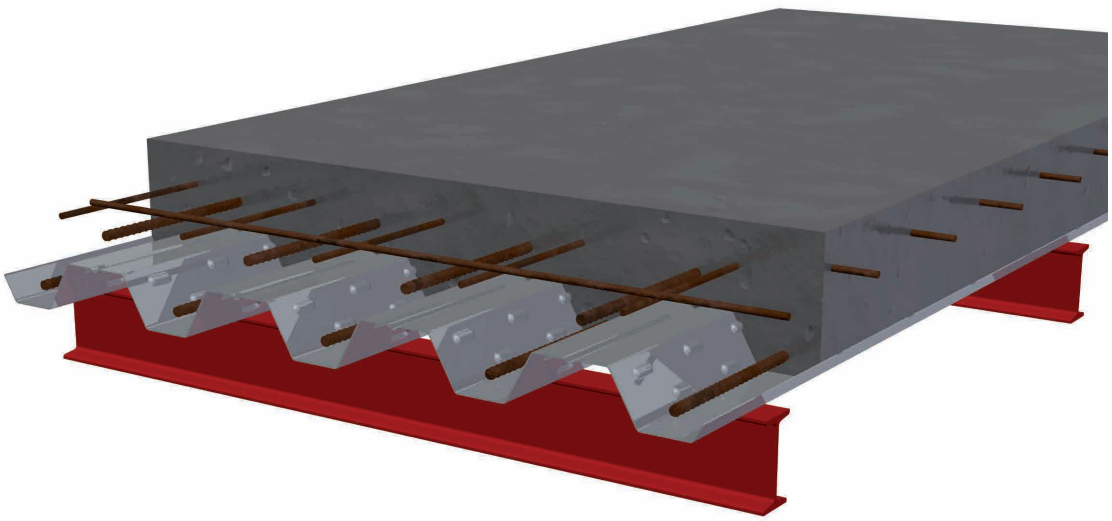
TECHNICAL FEATURES

- **End use:** Composite floors and permanent formwork.
- **Type of steel:** Standard S250GD (other types of steel on request).
- **Rib height:** 60 mm.
- **Rib spacing:** 220 mm.
- **Usable width:** 880 mm.
- **Thickness:** From 0.8 mm to 1.2 mm.
- **Length:** On request (maximum 14 m).

CHARACTERISTICS OF THE SLAB:

		Mechanical Properties	
Item	**Quality**	**Re (N/mm²)**	**Rm (N/mm²)**
Formed Sheet	S250GD	250	330
Steel Reinforcement	B 500 S	500	550
Concrete	HA-250	250	330

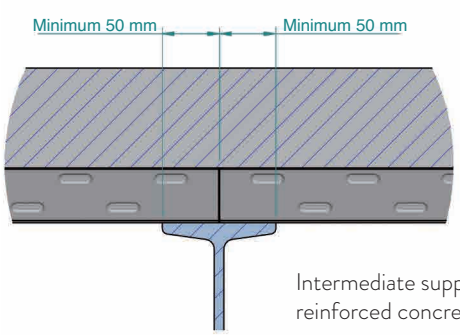
SLAB WEIGHT(kg / m²)					
Thickness (mm)	EDGE (mm)				
	120mm	**140mm**	**160mm**	**180mm**	**200mm**
0.8	216	263	311	359	407
1.0	218	266	314	362	410
1.2	220	268	316	364	412



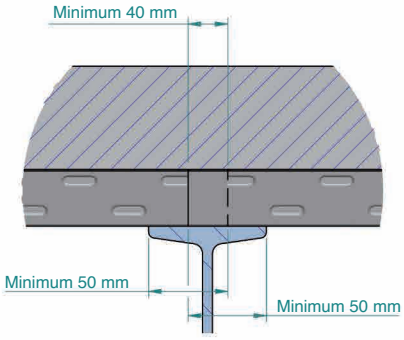
RECOMMENDATIONS FOR USE:

The nature of the supporting structure can be metallic, concrete or masonry. The supports on it must comply with the premises established by the EUROCODE.

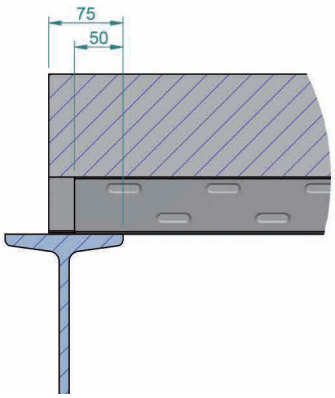
- Slabs that support steel or concrete beams must have a minimum support of 75 mm (50 mm per sidewhere the structure is continuous)



Intermediate support on steel or reinforced concrete without overlap

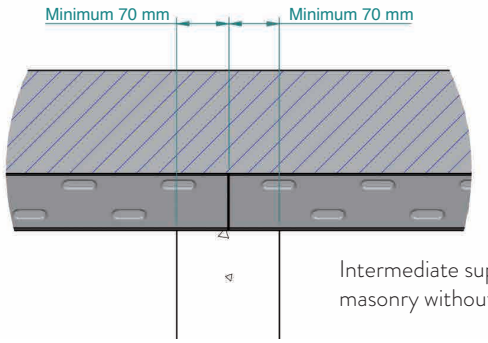


Intermediate support on steel or reinforced concrete with overlap

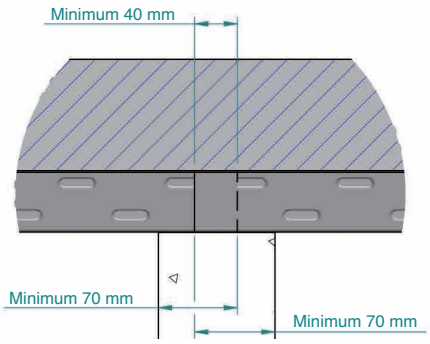


End support on steel or reinforced concrete

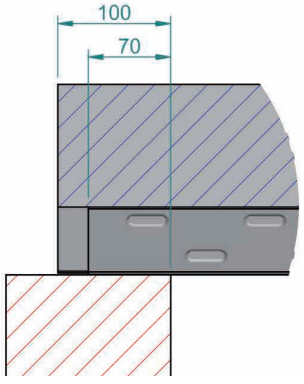
- Slabs which are supported on other materials must have a minimum support of 100 mm (70 mm per side where the structure is continuous)



Intermediate support on masonry without overlap

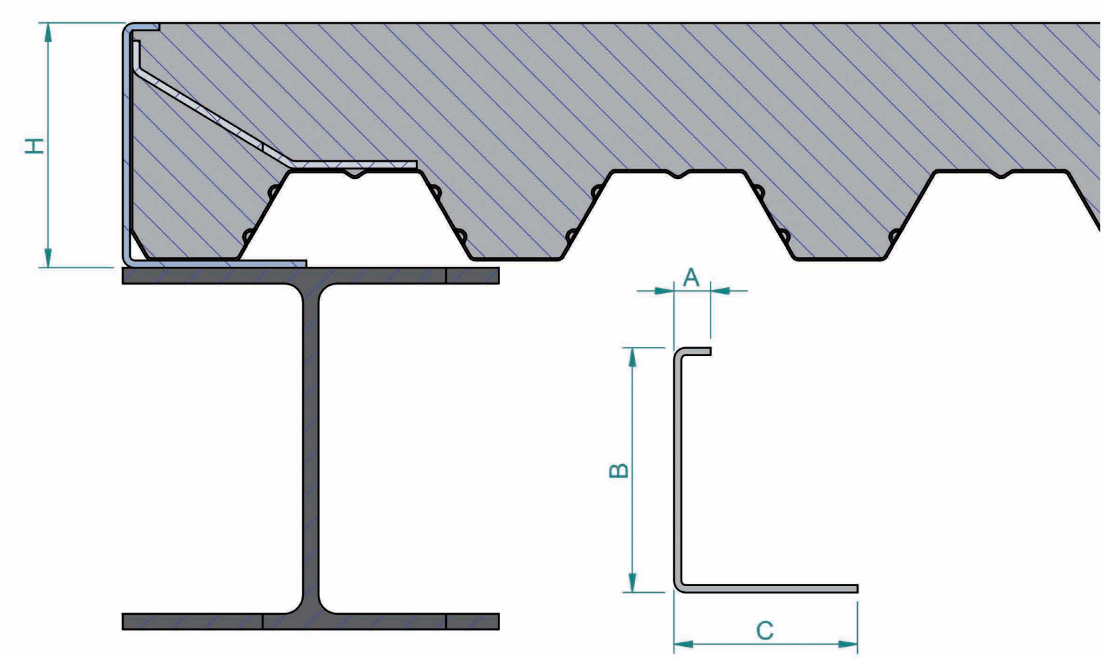


Intermediate support on overlapping masonry



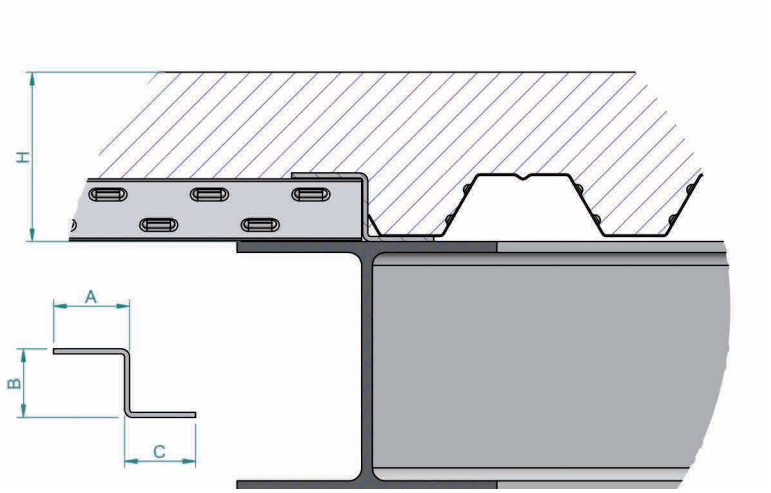
End support on masonry

SIDE PERIMETER CLOSING



	H (mm)				
	120	**140**	**160**	**180**	**200**
A (mm)	25	25	25	25	25
B (mm)	120	140	160	180	200
C (mm)	125	105	148	128	108

DIRECTIONAL PERIMETER CHANGE



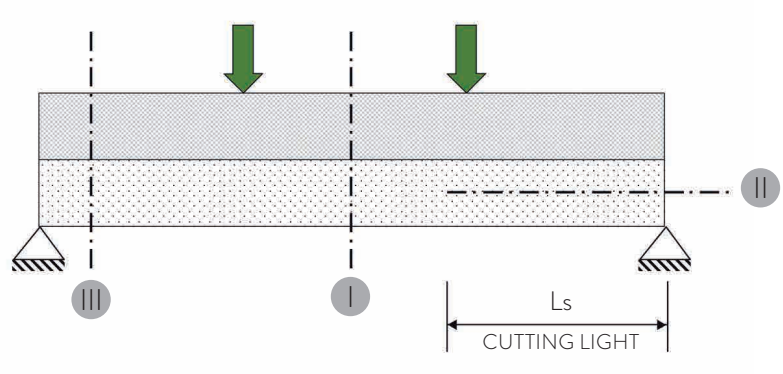
DIRECTIONAL CHANGE	
A (mm)	70
B (mm)	60
C (mm)	70

1.- DEFINITIONS

1.1.- MIXED SLAB

It is an element used as a slab, consisting of a ribbed metal sheet that initially serves as a formwork supporting the weight of the concrete, the reinforcement and the installation loads. After hardening, the set can behave like a slab so that the sheet constitutes all or part of its tensile reinforcement. To confirm that the ribbed sheet works partially with concrete, tests have been carried out at the Eduardo Torroja Construction Institute corresponding to report nº 18664, in which the coefficients m and k are determined.

In this case, the way in which failure occurs determines the calculation criteria based on three types, as seen in the following figure:



Critical sections

- I - Bending
- II - Low-level stresses
- III - Shear and punching

This process can also be omitted by adding reinforcement that absorbs the sagging bending moment in the spans, in which case it will be used as non-composite floor deck.

1.2.- NON-COMPOSITE FLOOR DECK

When designing a concrete slab, it must be taken into account that, during the construction phase, for a certain time, the concrete is soft and requires an element to retain it until it hardens. Hence the idea of non-composite metal floor deck was born.

When used in this way, the trapezoidal sheet presents a series of considerable advantages thanks to its speed of assembly and its self-supporting capacity to bear the weight of fresh concrete and the loads of the slab installation.

The loads that must be considered when calculating a non-composite floor deck are:

- The sheet's own weight.
- The concrete´s own weight (thickness and type: normal or light).
- Temporary loading in the concreting phase.

The criterion used in the tables for the allowable deflection is L/200.

The data necessary to calculate the most suitable profile is:

- Distance between supports and number of spans.
- Slab thickness.
- Type of concrete: Normal (2400 Kg/m^3), Light (1900 Kg/m^3). The resistance of the concrete used to make the boards is HA-25.
- Maximum deflection ratio by default (L/200).

2.- PRE-DIMENSIONAL CALCULATION HYPOTHESIS

2.1.- TABLES CALCULATION CRITERIA

- Deflection criterion in pouring (concreting): F=L/200.
- Elastic limit of complementary reinforcement steel: δ_e >= 500 N / mm2.
- Yield strength of formed sheet S250GD δ_e> = 250 N / mm2.
- Characteristic resistance of concrete: F_{ck}= 25 N / mm2.
- Material reduction coefficient:
  - Concrete: 1.8
  - Steel arm: 1.15
  - Structural steel: 1.1

2.2.- LOADS TO CONSIDER WHEN CONSULTING THE CHARTS

In the calculation of a metal slab, three types of vertical loads come into consideration, which we will now define:

- Own weight: This refers, as its name indicates, to the weight of the resistant element itself, whether it is the ribbed profile, the case of a self-supporting metal slab, or the complete slab, in the case of a composite slab.
- Permanent loads (dead loads): Include all those loads that act permanently on the slab, not varying over time. Clear examples are flooring, false ceilings, suspended installations, partitions, etc.
- Use, in service or working loads: Usable required load, which will vary depending on the type of building and the purpose for which the premises are to be used and corresponds to the weight of anything that may weigh on the slab due to its use.

3.- SIZING CRITERIA OF A MIXED SLAB FLOOR

In a project with a composite slab floor, all relevant limit situations and states are considered to guarantee a satisfactory level of safety and service, in particular:

3.1.- ASSEMBLY SITUATION

In this phase, the only resistant element is the ribbed sheets that act as concrete formwork and must withstand the following:

- Weight of concrete and sheet.
- Construction loads, including concrete stacking during pouring.
- Stockpiles of materials, if any.
- “Pooling” effect, a greater thickness of concrete due to deflection in the sheet metal.

3.2.- SERVICE SITUATION

When checking the floor as a composite part once the props have been removed, any unfavorable loads must be distributed by applying one of the following procedures:

- Linear analysis, with or without redistribution.
- Overall rigid-plastic analysis provided that the sections where plastic hinges are formed have sufficient rotation capacity.
- Elastoplastic analysis, considering the non-linear properties of the material.

3.3.- ULTIMATE LIMITS STATES

In a mixed floor with sheet metal as permanent formwork, the rupture modes and the critical sections where a rupture can occur are:

- Critical section type I: these sections occur in the centre of spans and in supports; breakage occurs in the form of bending when the final positive or negative moment is reached.
- Critical section type II: these sections occur in the supports, and are only critical in special cases, such as large depth slabs with small spans and significant loads; failure occurs by vertical shearing and / or punched holes when the ultimate value is reached.

3.4.- IN SERVICE LIMIT STATES

- Concrete cracks: The crack width in continuous negative moment areas is evaluated under the criteria indicated in section 4.4.2. of EUROCODE 2.
- Deflections: the limitations relative to the admissible deflections that these floors must satisfy are similar to those specified for beams and must meet acceptable values for the structural elements they support (partitions, walls, etc.) and for the appearance of the building. In general, the criteria given in section 4.2.2 of the EUROCODE 3 may be adopted.

The reference standard used to prepare these tables is:
• EHE-08 RD 1247/2008
• EUROCODE 4. Part 1-1

COMPOSITE FLOOR TABLES:

ONE SPAN OR END SPAN

CONCRETE: HA-250

STEEL: S250GD

TOTAL FACTORED LOADS (kg / m²)

PROFILE THICKNESS IN mm	TOTAL SLAB THICKNESS IN mm.	L (spans in metres)														max span without bracing (m)
		1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	
0.8	100	1.384	1010	751	564	426	320	156								2.61
	110	1583	1155	858	645	487	367	179								2.58
	120	1780	1299	965	726	548	412	201								2.52
	130	1979	1444	1073	807	609	341	224								2.47
	140	2176	1588	1180	887	670	374	246	145							2.42
	160	2572	1877	1395	1049	792	443	291	171							2.33
	180	2968	2166	1610	1210	737	511	336	198							2.26
	200	3364	2455	1825	1372	835	580	381	225							2.19

TOTAL FACTORED LOADS (kg / m²)

PROFILE THICKNESS IN mm	TOTAL SLAB THICKNESS IN mm.	L (spans in metres)														max span without bracing (m)
		1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	
1.0	100	1845	1368	1038	799	621	486	381	214	147						2.81
	110	2109	1565	1186	914	711	556	436	246	169						2.78
	120	2372	1760	1334	1028	799	625	490	276	190						2.71
	130	2636	1956	1483	1142	889	696	427	308	212						2.66
	140	2900	2151	1631	1256	977	765	469	338	233	146					2.61
	160	3427	2543	1928	1485	1155	904	555	400	275	173					2.51
	180	3955	2934	2225	1714	1333	866	641	462	318	201					2.43
	200	4482	3325	2522	1942	1511	982	727	524	361	228					2.36

TOTAL FACTORED LOADS (kg / m²)

PROFILE THICKNESS IN mm	TOTAL SLAB THICKNESS IN mm.	L (spans in metres)														max span without bracing (m)
		1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	
1.2	100	2307	1728	1326	1035	818	653	523	421	255	188					2.99
	110	2637	1976	1516	1183	936	746	599	482	293	216	152				2.95
	120	2966	2222	1705	1331	1052	839	673	435	329	242	170				2.88
	130	3297	2470	1895	1479	1170	933	749	485	367	270	190				2.83
	140	3626	2717	2084	1627	1286	1026	823	532	403	297	209				2.77
	160	4286	3211	2463	1923	1521	1213	820	630	476	351	247	161			2.67
	180	4945	3705	2842	2219	1755	1400	946	727	550	405	286	186			2.59
	200	5605	4199	3222	2515	1989	1587	1073	824	623	459	324	211			2.51

Struts. Placing 1 girder in the centre of the span.

NOTE:

The tables presented serve as a pre-dimensioning of a mixed slab project, providing a quick tool to define slab thickness and steel thickness to be chosen as a starting point in the development of the project.

The data shown in the tables is for guidance purposes only, with the designer being responsible for carrying out the structural calculations in accordance with the applicable regulations in each country. MAGON ACEROS will not be responsible for the inappropriate use of these tables.

COMPOSITE TABLES:

INTERMEDIATE SPAN

CONCRETE: HA-250

STEEL: S250GD

TOTAL FACTORED LOADS (kg / m²)

PROFILE THICKNESS IN mm	TOTAL SLAB THICKNESS IN mm.	L (spans in metres)													max span without bracing (m)
		1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	
0.8	100	1785	1318	995	762	588	457	354	190							2.90
	110	2040	1507	1137	871	673	523	405	218	144						2.86
	120	2295	1695	1279	980	757	587	456	245	161						2.80
	130	2551	1884	1422	1089	842	653	507	273	180						2.74
	140	2805	2072	1564	1198	926	718	427	300	197						2.69
	160	3316	2449	1849	1416	1094	849	505	355	234						2.59
	180	3826	2827	2133	1634	1263	803	584	410	270	156					2.51
	200	4336	3204	2418	1852	1431	911	662	465	306	177					2.44

TOTAL FACTORED LOADS (kg / m²)

PROFILE THICKNESS IN mm	TOTAL SLAB THICKNESS IN mm.	L (spans in metres)													max span without bracing (m)
		1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	
1.0	100	2353	1761	1349	1052	830	661	530	425	258	189					3.13
	110	2690	2013	1542	1203	950	756	606	487	296	217	152				3.09
	120	3026	2264	1735	1352	1068	851	681	547	332	244	171				3.02
	130	3363	2517	1928	1503	1187	946	758	608	370	272	191				2.96
	140	3699	2768	2121	1653	1305	1040	833	539	407	299	209				2.90
	160	4371	3271	2507	1954	1543	1229	985	637	481	353	248	160			2.79
	180	5044	3775	2892	2255	1781	1419	960	736	555	408	286	185			2.70
	200	5717	4279	3278	2556	2018	1608	1088	834	630	463	325	210			2.62

TOTAL FACTORED LOADS (kg / m²)

PROFILE THICKNESS IN mm	TOTAL SLAB THICKNESS IN mm.	L (spans in metres)													max span without bracing (m)
		1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	
1.2	100	2924	2205	1705	1343	1073	867	706	578	475	307	237	179			3.32
	110	3342	2521	1949	1535	1227	991	807	661	543	352	272	205	149		3.28
	120	3760	2836	2192	1727	1380	1115	908	743	611	396	306	231	167		3.21
	130	4178	3151	2436	1919	1534	1239	1009	827	561	440	341	257	187		3.14
	140	4595	3466	2680	2111	1687	1363	1110	779	617	484	374	282	205		3.08
	160	5431	4097	3167	2495	1994	1611	1312	921	729	572	443	334	242	165	2.97
	180	6267	4727	3654	2879	2301	1859	1514	1063	842	661	511	386	280	190	2.87
	200	5605	4199	3222	2515	1989	1587	1073	824	623	459	324	211			2.79

Struts. Placing 1 girder in the centre of the span.

NOTE:
The tables presented serve as a pre-dimensioning of a mixed slab project, being a quick tool to define slab and steel thickness to be chosen as a starting point in the development of the project.

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NON-COMPOSITE FLOOR DECK TABLES:

TWO SPANS

TOTAL LOADS UNFACTORED (kg / m²)

	REINFORCED SECTION (mm)	L (spans in metres)													
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
SLAB 200mm	16	5,470	4,862	4,376	3,772	3,169	2,700	2,326	2,028	1,783	1,579	1,409	1,264	1,141	1,035
	12+ 10	5,391	4,792	4,313	3,677	3,090	2,633	2,270	1,977	1,738	1,540	1,373	1,232	1,112	1,009
	12+ 8	5,188	4,594	4,115	3,401	2,857	2,435	2,089	1,829	1,607	1,424	1,270	1,140	1,029	933
	12	4,771	4,004	3,243	2,680	2,252	1,919	1,855	1,441	1,267	1,122	1,001	896	811	735
	10	4,247	3,356	2,718	2,246	1,868	1,606	1,387	1,208	1,062	941	839	753	680	616
SLAB 180mm	16	5,085	4,520	3,996	3,302	2,775	2,365	2,039	1,776	1,561	1,383	1,233	1,107	999	906
	12+ 10	5,004	4,448	3,897	3,220	2,706	2,306	1,988	1,732	1,522	1,348	1,203	1,079	974	884
	12+ 8	4,778	4,247	3,606	2,980	2,504	2,134	1,840	1,603	1,409	1,248	1,113	999	901	818
	12	4,375	3,514	2,847	2,353	1,977	1,684	1,452	1,265	1,112	985	879	789	712	645
	10	3,731	2,948	2,388	1,974	1,658	1,413	1,218	1,061	933	826	737	661	597	541
SLAB 160mm	16	4,687	4,166	3,428	2,833	2,381	2,029	1,749	1,524	1,339	1,186	1,058	950	857	777
	12+ 10	4,605	4,093	3,344	2,764	2,322	1,979	1,706	1,486	1,306	1,157	1,032	926	836	758
	12+ 8	4,376	3,824	3,097	2,560	2,151	1,833	1,580	1,377	1,210	1,072	956	858	774	702
	12	3,828	3,025	2,450	2,025	1,701	1,450	1,250	1,089	957	848	756	679	613	556
	10	3,215	2,540	2,058	1,701	1,429	1,218	1,050	915	804	712	635	570	514	467
	8	2,549	2,014	1,632	1,348	1,133	965	832	725	637	565	504	452	408	370
SLAB 140mm	16	4,276	3,532	2,861	2,364	1,987	1,693	1,460	1,271	1,117	990	883	792	715	649
	12+ 10	4,193	3,446	2,791	2,307	1,938	1,652	1,424	1,241	1,090	966	862	773	698	633
	12+ 8	3,961	3,195	2,588	2,139	1,797	1,532	1,321	1,150	1,011	896	799	717	647	587
	12	3,209	2,535	2,053	1,697	1,426	1,215	1,048	913	802	711	634	569	513	466
	10	2,699	2,133	1,728	1,428	1,200	1,022	881	768	675	598	533	479	432	392
	8	2,144	1,694	1,372	1,134	953	812	700	610	536	475	424	380	343	311
SLAB 120mm	16	3,583	2,831	2,293	1,895	1,592	1,357	1,170	1,019	896	793	708	635	573	520
	12+ 10	3,498	2,764	2,239	1,850	1,555	1,325	1,142	995	875	775	691	620	560	508
	12+ 8	3,249	2,567	2,080	1,719	1,444	1,231	1,061	924	812	720	642	576	520	472
	12	2,589	2,046	1,657	1,369	1,151	980	845	736	647	573	511	459	414	376
	10	2,183	1,725	1,397	1,155	970	827	713	621	546	484	431	387	349	317
	8	1,739	1,374	1,113	920	773	658	568	495	435	385	343	308	278	252

Struts. Placing 1 girder in the centre of the span.

MG 60/220 0.8 mm | MG 60/220 0.8 mm/1.0 mm | MG 60/220 0.8 mm/1.0 mm/1.2 mm

NOTE:
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NON-COMPOSITE FLOOR DECK TABLES:

THREE SPANS

TOTAL LOADS UNFACTORED (kg / m²)

SLAB 200mm

REINFORCED SECTION (mm)	L (spans in metres)													
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
16	4,376	3,890	3,501	3,183	2,917	2,499	2,154	1,877	1,650	1,461	1,303	1,170	1,056	958
12+ 10	4,313	3,833	3,450	3,136	2,865	2,442	2,105	1,834	1,612	1,428	1,274	1,143	1,032	936
12+ 8	4,134	3,675	3,308	3,007	2,667	2,273	1,960	1,707	1,500	1,329	1,185	1,064	960	871
12	3,816	3,392	3,053	2,543	2,137	1,821	1,570	1,367	1,202	1,065	950	852	769	698
10	3,597	3,197	2,603	2,151	1,808	1,540	1,328	1,157	1,017	901	803	721	651	590

SLAB 180mm

REINFORCED SECTION (mm)	L (spans in metres)													
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
16	4,068	3,616	3,254	2,958	2,538	2,163	1,865	1,624	1,428	1,265	1,128	1,012	914	829
12+ 10	4,003	3,559	3,203	2,912	2,482	2,115	1,823	1,588	1,396	1,237	1,103	990	893	810
12+ 8	3,823	3,398	3,058	2,754	2,314	1,972	1,700	1,481	1,302	1,153	1,028	923	833	756
12	3,500	3,111	2,680	2,215	1,861	1,586	1,367	1,191	1,047	927	827	742	670	608
10	3,278	2,806	2,273	1,878	1,578	1,345	1,160	1,010	888	786	701	630	568	515

SLAB 160mm

REINFORCED SECTION (mm)	L (spans in metres)													
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
16	3,749	3,333	2,999	2,552	2,144	1,827	1,575	1,372	1,206	1,068	953	855	772	700
12+ 10	3,684	3,275	2,947	2,497	2,098	1,788	1,541	1,343	1,180	1,045	932	837	755	685
12+ 8	3,501	3,112	2,801	2,333	1,961	1,671	1,440	1,255	1,103	977	871	782	706	640
12	3,174	2,819	2,284	1,887	1,586	1,351	1,165	1,015	892	790	705	633	571	518
10	2,948	2,398	1,942	1,605	1,349	1,149	991	863	759	672	600	538	486	440
8	2,438	1,926	1,560	1,290	1,084	923	796	693	610	540	482	432	390	354

SLAB 140mm

REINFORCED SECTION (mm)	L (spans in metres)													
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
16	3,421	3,041	2,520	2,082	1,750	1,491	1,286	1,120	984	872	778	698	630	571
12+ 10	3,354	2,982	2,468	2,040	1,714	1,461	1,259	1,097	964	854	762	684	617	560
12+ 8	3,169	2,817	2,314	1,913	1,607	1,370	1,181	1,029	904	801	714	641	579	525
12	2,837	2,330	1,887	1,560	1,310	1,117	963	839	737	653	582	523	472	428
10	2,519	1,990	1,612	1,332	1,120	954	823	717	630	558	498	447	403	366
8	2,033	1,606	1,301	1,075	903	770	664	578	508	450	402	360	325	295

SLAB 120mm

REINFORCED SECTION (mm)	L (spans in metres)													
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
16	3,050	2,410	1,952	1,613	1,356	1,155	996	868	763	675	602	541	488	443
12+ 10	2,993	2,365	1,916	1,583	1,330	1,134	977	851	748	663	591	531	479	434
12+ 8	2,821	2,229	1,806	1,492	1,254	1,068	921	803	705	625	557	500	451	409
12	2,329	1,840	1,491	1,232	1,035	882	760	662	582	516	460	413	373	338
10	2,003	1,583	1,282	1,060	890	759	654	570	501	444	396	355	321	291
8	1,627	1,286	1,042	861	723	616	531	463	407	360	321	289	260	236

Struts. Placing 1 girder in the centre of the span.

MG 60/220 0.8 mm

MG 60/220 0.8 mm/1.0 mm

MG 60/220 0.8 mm/1.0 mm/1.2 mm

NOTE:
The tables presented serve as a pre-dimensioning of a mixed slab project, providing a quick tool to define slab edges and steel thickness to be chosen as a starting point in the development of the project.

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NON-COMPOSITE FLOOR DECK TABLES:

FOUR SPANS

TOTAL LOADS UNFACTORED (kg / m²)

SLAB 200mm

REINFORCED SECTION (mm)	L (spans in metres)													
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
16	4,558	4,052	3,647	3,315	3,039	2,805	2,605	2,346	2,062	1,826	1,629	1,462	1,320	1,197
12+ 10	4,492	3,993	3,594	3,267	2,995	2,764	2,567	2,292	2,015	1,785	1,592	1,429	1,289	1,170
12+ 8	4,307	3,828	3,445	3,132	2,871	2,650	2,450	2,134	1,875	1,661	1,482	1,330	1,200	1,089
12	3,975	3,534	3,180	2,891	2,650	2,276	1,962	1,709	1,502	1,331	1,187	1,065	961	872
10	3,747	3,331	2,998	2,689	2,259	1,925	1,660	1,446	1,271	1,126	1,004	901	813	738

SLAB 180mm

REINFORCED SECTION (mm)	L (spans in metres)													
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
16	4,237	3,766	3,390	3,082	2,825	2,608	2,331	2,031	1,785	1,581	1,410	1,266	1,142	1,036
12+ 10	4,170	3,707	3,336	3,033	2,780	2,566	2,279	1,985	1,745	1,546	1,379	1,237	1,117	1,013
12+ 8	3,982	3,540	3,186	2,896	2,655	2,450	2,125	1,851	1,627	1,441	1,286	1,154	1,041	944
12	3,646	3,241	2,917	2,652	2,327	1,982	1,709	1,489	1,309	1,159	1,034	928	838	760
10	3,414	3,035	2,731	2,348	1,973	1,681	1,449	1,263	1,110	983	877	787	710	644

SLAB 160mm

REINFORCED SECTION (mm)	L (spans in metres)													
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
16	3,906	3,472	3,124	2,840	2,604	2,284	1,969	1,715	1,508	1,335	1,191	1,069	965	875
12+ 10	3,837	3,411	3,070	2,791	2,558	2,234	1,927	1,678	1,475	1,307	1,165	1,046	944	856
12+ 8	3,647	3,242	2,917	2,652	2,431	2,088	1,801	1,568	1,379	1,221	1,089	978	882	800
12	3,306	2,939	2,645	2,359	1,982	1,689	1,456	1,269	1,115	988	881	791	714	647
10	3,071	2,730	2,428	2,007	1,686	1,437	1,239	1,079	948	840	749	673	607	551
8	2,879	2,408	1,950	1,612	1,354	1,154	995	867	762	675	602	540	488	442

SLAB 140mm

REINFORCED SECTION (mm)	L (spans in metres)													
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
16	3,563	3,167	2,850	2,591	2,187	1,864	1,607	1,400	1,230	1,090	972	872	787	714
12+ 10	3,494	3,106	2,795	2,541	2,143	1,826	1,574	1,371	1,205	1,068	952	855	771	700
12+ 8	3,301	2,934	2,641	2,391	2,009	1,712	1,476	1,286	1,130	1,001	893	801	723	656
12	2,956	2,627	2,359	1,949	1,638	1,396	1,204	1,048	921	816	728	653	590	535
10	2,717	2,416	2,015	1,666	1,400	1,192	1,028	896	787	697	622	558	504	457
8	2,523	2,008	1,626	1,344	1,129	962	830	723	635	563	502	450	407	369

SLAB 120mm

REINFORCED SECTION (mm)	L (spans in metres)													
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
16	3,210	2,853	2,440	2,017	1,695	1,444	1,245	1,084	953	844	753	676	610	553
12+ 10	3,140	2,791	2,395	1,979	1,663	1,417	1,222	1,064	935	829	739	663	599	543
12+ 8	2,944	2,617	2,257	1,865	1,567	1,336	1,152	1,003	882	781	697	625	564	512
12	2,594	2,300	1,863	1,540	1,294	1,102	951	828	728	645	575	516	466	422
10	2,353	1,978	1,603	1,324	1,113	948	818	712	626	555	495	444	401	363
8	2,034	1,607	1,302	1,076	904	770	664	579	509	450	402	361	325	295

Struts. Placing 1 girder in the centre of the span.

MG 60/220 0.8 mm | MG 60/220 0.8 mm/1.0 mm | MG 60/220 0.8 mm/1.0 mm/1.2 mm

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DISTRIBUTION REINFORCEMENT

In the upper slab, a distribution reinforcement will be laid out with steel wires of at least 4 mm in diameter in both directions, at intervals not exceeding 35 cm in both directions (perpendicular and parallel to the ribs).

Distribution reinforcement features:

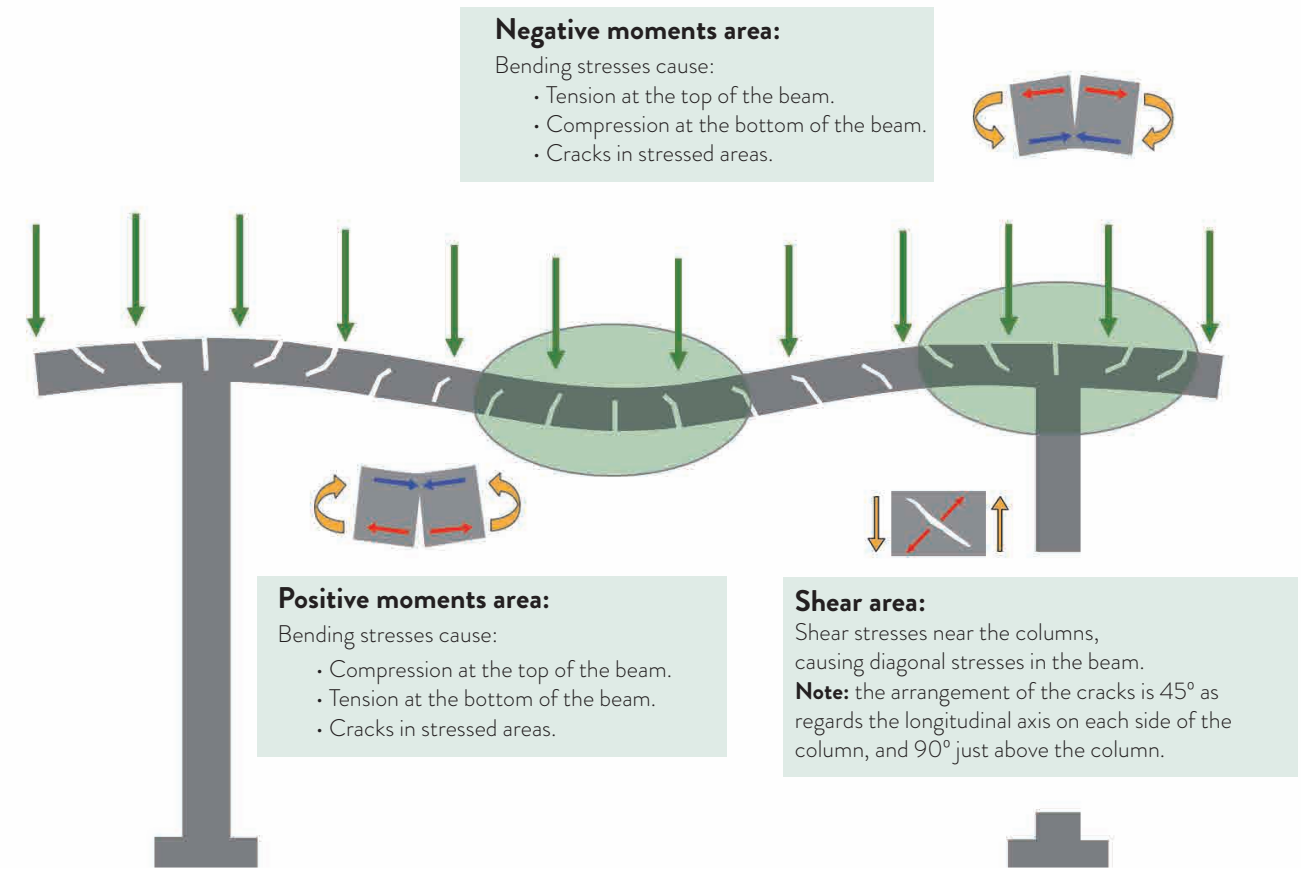
- The distribution reinforcement plays an essential role for the transversal distribution of the local loads, preventing the cracking of the lining of the lower face of the floor.
- It serves to distribute the cracks produced by shrinkage and temperature variations.
- Provides resistance, long the plane of the slab, against horizontal forces that act on the entire structure.
- Protects the link between the slab and the rest of the structure against unforeseen forces. For this reason, it is prescribed that the distribution reinforcement is required to be made up of bars in both directions, although the bars will be predominately perpendicular to the ribs.

NEGATIVE REINFORCEMENT

The function of the **negative** reinforcement in **slabs** is to support the **negative** bending moments , meaning, the tensile stresses produced on the upper face of the **slab**. The material used is corrugated bars of different diameters depending on the specifications of the slab. The length of these bars must be at least one-third of the length of each span.

Basic scheme of applied load in a concrete structure:

APPLIED LOADS



MG 60/220
NON-COMPOSITE
FLOOR DECK

RESISTANCE TO FIRE

The Technical Building Code - Basic Safety Document in case of fire CTE-DB-CI only establishes the necessary fire resistance time of the structural elements so for its verification in mixed structures, it is necessary to apply the criteria of Eurocode 4.

The fire resistance of the slab is ensured by reinforcing the passive (negative) reinforcements. This can be the reinforcement put into the design at room temperature (for control of cracking, etc.) which in many cases is sufficient for the fire conditions.

During a fire the corrugated sheet heats up rapidly and expands, and there is the possibility that it will separate from the concrete. However, recent tests have shown that this behaviour is not relevant. The sheet contributes to improving the criteria of integrity and thermal insulation: it acts as a shield preventing the passage of flame and hot gases, thus reducing the flow of heat through the concrete.

This is why a composite slab is guaranteed an **RF-30** (30 minutes of fire resistance without the need for complementary reinforcement).

If the project requires a fire resistance of more than 30 minutes, there are several possible solutions:

- Place a fire protection system, continuous coatings, ceilings, etc. on the underside of the slab.
- As mentioned earlier, with the incorporation of passive (negative) reinforcements, with which its supporting capacity in a fire situation (factor R) is increased.

OPENING A HOLE IN AN EXISTING SLAB

In the first place, as always when we act on a structural element, it must be removed to unload it and be able to work safely. Props must be placed in order to transfer the load to the ground, since otherwise damage can be caused to the slab on to which the loads are transmitted.

The holes must be made prior to pouring the concrete. In general, when the side of the hole to be made is greater than one rib, we must reinforce the perimeter of the hole longitudinally and transversely. Normally the following guidelines are followed when placing the reinforcements:

- If the sides of the hole are less than 300 mm, it is not necessary to use reinforcements.
- If the sides are between 300 and 700 mm, it is necessary to use reinforcements.
- For larger measurements, auxiliary structures will have to be used. The cutting of the steel will be done when the concrete is set.

C/ Persiles y Segismunda, s/n • 45221 Esquivias / Toledo / Spain
Phone: +34 925 520 035
www.magon.es
magonaceros@magon.es

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