

Multibeton® XF

Concretes with guaranteed performance
Exposure class XF: Attacked by freezing/thawing
cycles with or without de-icing agents

Multibeton® XF is a durable concrete suitable for environments exposed to significant cycles of freezing and thawing.

Multibeton® XF high performance concretes comply with the provisions of UNI EN 206 and UNI 11104 standards as laid down in the current "Technical Standards for Construction" issued by the Italian Ministry of Infrastructure and Transport and have characteristics that may vary within a wide range depending on the mechanical resistance required, the environment

in which the construction takes place and the complexity of the pour.

For the risk of degradation due to cycles of freezing and thawing, the UNI EN 206 and UNI 11104 standards provide for exposure classes XF1, XF2, XF3 and XF4 depending on the saturation conditions and the presence or otherwise of de-icing salts. The correct exposure class must be specified at the time of order in accordance with the design requirements.

TYPES OF ENVIRONMENT		EXAMPLES OF USAGE	MAXIMUM W/C	MINIMUM RCK
XF1	Conditions leading to moderate concrete saturation in the absence of a de-icing agent	Concrete of facades, columns or vertical or inclined structural elements exposed to rain and cycles of freezing and thawing.	0,50	C32/40
XF2	Conditions leading to moderate concrete saturation in the absence of a de-icing agent	Concrete of facades, columns or vertical or inclined structural elements exposed to rain and cycles of freezing/thawing in the presence of de-icing salts, e.g. road works exposed to frost in the presence of airborne de-icing salts.	0,50 air	C25/30
XF3	Conditions leading to high concrete saturation in the absence of a de-icing agent	Concrete of horizontal elements in buildings where water may accumulate.	0,50 air	C25/30
XF4	Conditions leading to high concrete saturation with the presence of a de-icing agent or sea water	Concrete of horizontal elements, of roads or pavements, exposed to frost and de-icing salts or exposed to frost in coastal areas.	0,45 air	C30/37

Multibeton® XF is available in four versions with differing consistencies: S3, S4, S5 and SCC (self-compacting concrete) and with a minimum strength class dependent on the exposure class.

The consistency class and the strength class must be specified at the time of order in accordance with the design requirements. The choice of consistency class is of fundamental importance to avoid internal/external cavities and depends on the difficulty of execution and the reliability of the workforce on site.



**MULTIBETON®
XF-S3**



**MULTIBETON®
XF-S4**



**MULTIBETON®
XF-S5**



**SCC-MULTIBETON®
XF-SCC**

Table 1:

The development over time of the compressive strength of **Multibeton® XF** under laboratory conditions (20°C) and in a cold (5–10°C) or hot (30–35°C) climate.

TIME (DAYS)		COMPRESSIVE STRENGTH (MPa)		
		20°C	5–10°C	30–35°C
3	XF1 C32/40	25	8	27
	XF2 and XF3 C25/30	15	5	16
	XF4 C30/37	20	7	21
7	XF1 C32/40	35	21	35
	XF2 and XF3 C25/30	25	15	25
	XF4 C30/37	32	20	32
28	XF1 C32/40	45	43	42
	XF2 and XF3 C25/30	35	33	32
	XF4 C30/37	42	40	39

Note:

The values were obtained with wet curing (R.H. = 95%) in the laboratory and on specimens compacted to minimise trapped air content. The values actually obtainable on site depend on the temperature and relative humidity conditions to which the structure is exposed, as well as the degree of compaction of the structure.

Attention: do not rely on these data alone to establish the formwork striking time.

Table 2:

Main physical and mechanical characteristics of **Multibeton® XF**

EXPOSURE CLASS	STRENGTH CLASS	CONSISTENCY CLASS	STANDARD HYGROMETRIC SHRINKAGE AFTER 6 MONTHS (R.H.=50%)	DYNAMIC ELASTIC MODULUS AT 28 DAYS	WATER PENETRATION IN ACCORD WITH UNI 12390-8	HEATING UNDER ADIABATIC CONDITIONS
			µm/m	MPa	mm	°C
XF1	C32/40	S3, S4, S5	400	33000	15	32
		SCC	420	32000	15	36
XF2, XF3	C25/30	S3, S4, S5	550	34000	5	38
		SCC	560	33000	5	40
XF4	C30/37	S3, S4, S5	580	35000	5	40
		SCC	600	34000	5	42