



Argex **granules** are lightweight aggregates made from Boom clay. They have a high **insulation capacity** and are non-combustible. Thanks to their light weight, they are very easily processable. Moreover, these sustainable granules are **environmentally friendly**.

PUMPMIX

PUMPABLE ARGEX CONCRETE

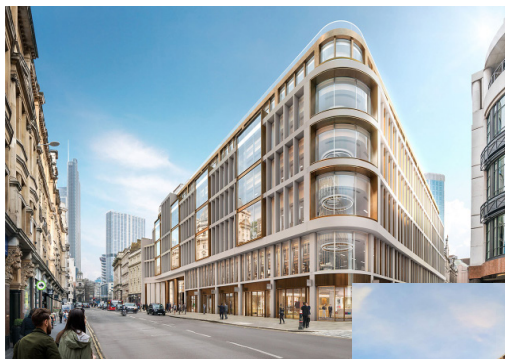
TYPES

PUMPMIX L "Light"

D 1.2 - 10 N/mm²

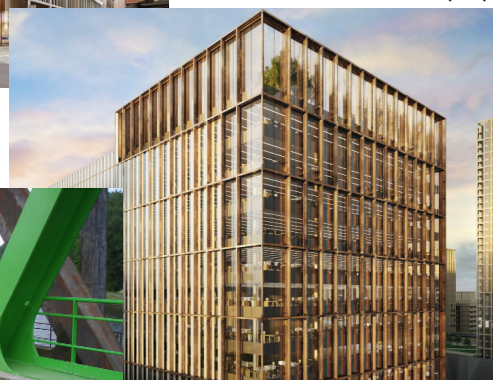
D 1.4 - LC12/13

D 1.6 - LC20/22



60 London Wall (UK)

M7 London Stratford (UK)



Hybride bridge SNCF Béthune
(FR)



Martin's Patershof -
Mechelen (BE)



PUMPMIX S "Structural"

D 1.8 - LC30/33 to
LC40/44

D 2.0 - LC35/38 to
LC45/50

MIX DESIGNS & RECOMMANDATIONS

1. Mix designs

1.1. Pumpmix L - D1.2-D1.4-D1.6

	Density (kg/m³)	Pumpmix L D1.2 8 à 10 MPa - D 1.2 (+/- 1100)			Pumpmix L D1.4 LC 12/13 - D 1.4 (+/- 1320)			Pumpmix L D1.6 LC 20/22 - D 1.6 (+/- 1500)		
		weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)
CEM III/A 42.5 N LA (of CEM I 52,5 N, CEM II...)	3100	350		113	350		113	400		129
fly ash	2300	100			160			100		
or limestone filler	2700	or 115		43	or 190		70	or 115		43
or GGBS	2920	or 125 (6)			or 205 (6)			or 125 (6)		
Argex AR 0/4-650	1050	920 (1)	1000	620	905 (1)	980	607	692 (1)	750	464
Sand 0/1 or 0/2	2650							200 (2)		
Sand 0/4	2650							200 (2)		150
total water		180		180	200		200	200		200
Superplast		0.20 à 0.80% (3)		2.8	0.50 à 1.50% (3)		2.8	0.50 à 1.50% (3)		3
Stabilizer (4)		0.10 à 0.15% (3) option		0.5	0.10 à 0.15% (3)		0.5	0.10 à 0.15% (3)		0.5
Air trainer (5)		0.10 à 0.30% (3)		0.7						
Air				130-140			20			20
Total		+/- 1400		1100	+/- 1620		1010	+/- 1780		1015

(1) in these examples, the wet weight of Argex is calculated with a moisture of 30 % & 710 kg/m³ Oven Dry loose bulk density (typical average) / dosage in weight is based on moisture & OD loose bulk density controls

(2) indicative - to be confirmed by grading simulation of available sands on site vs ideal sieving of concrete --> provide info to Argex Technical support

(3) % on cement - indicative - to be confirmed by preliminary trials - min slumpflow 630-730 mm target for pumping vs pipes length etc

(4) dosage based on liquid admix - in case of colloidal powder, use 0.8 to 1 kg/m³

(5) air-entraining or foaming admix - indicative - to be confirmed by preliminary trials (min slumpflow 630-650 mm & +/- 140 L air/m³)

(6) with GGBS others ratios with cement are possible : ex. 300 CEM + 250 GGBS for D1,4 & 350 CEM + 170 GGBS for D1,6

Without alternative of ultrafines like fly ash, limestone filler etc, a mix design with 100% cement is possible --> info Argex Technical support

W/C effective (on cement only)	0.51	0.57	0.50
W/P (on total powder)	0.40	0.39	0.40

Water inside Argex aggregates is not included in the effective W/C ratio as free water (see EN 206). Only water around the aggregates (after soaking or water sprinkling) will step in as free water if visually present around the aggregates --> in that case : 15 L for D1.6 & 20 L for D1.4 & D1.2 (± 2,5% of wet weight)

1.2. Pumpmix S - Standard D1.8 & D2.0

	Density (kg/m³)	STANDARD MIXES																	
		Pumpmix D1.8 LC 30/33 to LC 40/44 - D 1.8 (+/- 1760) - G/S 1.24 (5)									Pumpmix D2.0 LC 30/33 to LC 45/50 - D 2.0 (+/- 1850) - G/S 0.83 (5)								
		weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)
CEM III/A 42.5 N LA (of CEM I 52,5 N, CEM II...)	3100	400		129	400		129	350		113	430		139	430		139	330		106
fly ash	2300	92		40							80		35						
or limestone filler	2700				95		35							100		37			
or GGBS	2920							145		50							200		69
Argex AM4/8-700	1230	623 (1)	620	353	623 (1)	620	353	623 (1)	620	353	492 (1)	490	279	492 (1)	490	279	492 (1)	490	279
Sand 0/1 or 0/2	2650	350 (2)		285	350 (2)		285	350 (2)		285	400 (2)		332	400 (2)		332	400 (2)		332
Sand 0/4	2650	400 (2)		285	400 (2)		285	400 (2)		285	480 (2)		332	480 (2)		332	480 (2)		332
total water		180		180	180		180	180		180	195		195	195		195	195		195
Superplast		0.40 à 1.50% (3)		3	0.40 à 1.50% (3)		3	0.40 à 1.50% (3)		3	0.40 à 1.50% (3)		3	0.40 à 1.50% (3)		3	0.40 à 1.50% (3)		3
Stabilizer (4)		0.10 à 0.15% (3)		0.5	0.10 à 0.15% (3)		0.5	0.10 à 0.15% (3)		0.5	0.10 à 0.15% (3)		0.5	0.10 à 0.15% (3)		0.5	0.10 à 0.15% (3)		0.5
Air				20			20			20			20			20			20
Total		2020		1010	2030		1005	2030		1005	2070		1005	2080		1005	2080		1005

(1) in these examples, the wet weight of Argex is calculated with a moisture of 34 % & 750 kg/m³ Oven Dry loose bulk density (typical average) / dosage in weight is based on moisture & OD loose bulk density controls.

(2) indicative - to be confirmed by grading simulation of available sands on site vs ideal sieving of concrete --> provide info to Argex Technical support

(3) % on cement - indicative - to be confirmed by preliminary trials - min slumpflow 630-730 mm target for pumping vs pipes length etc

(4) dosage based on liquid admix - in case of colloidal powder, use 0.8 to 1 kg/m³

(5) based on absolute volume

Without alternative of ultrafines like fly ash, limestone filler etc, a mix design with 100% cement is possible --> info Argex Technical support

W/C effective (on cement only)	0.45	0.45	0.51	0.45	0.45	0.59
W/P (on total powder)	0.36	0.36	0.36	0.38	0.37	0.37

Water inside Argex aggregates is not included in the effective W/C ratio as free water (see EN 206). Only water around the aggregates (after soaking or water sprinkling) will step in as free water if visually present around the aggregates --> in that case : 11 L for D1.8 & 9 L for D2.0 (± 2% of Argex wet weight)

1.3. Pumpmix S - D2.0 High strength

		HIGH STRENGTH D2.0 MIXES											
		Pumpmix D2.0 LC 40/44 à LC 50/55 - D 2.0 (+/- 1890) - G/S 0.64 ⁽⁵⁾									Pumpmix D2.0 LC 40/44 to LC 50/55 - D 2.0 (+/- 1930) - G/S 0.82 ⁽⁵⁾		
		Density (kg/m³)	weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)
CEM III/A 42.5 N LA (of CEM I 52,5 N, CEM II...)	3100	400		129	430		139	350		113	400		129
fly ash	2300	150		65							130		57
or limestone filler	2700				145		54						
or GGBS	2920							220		76			
Argex AM4/8-700	1230	402 (1)	400	228	402 (1)	400	228	402 (1)	400	228	352 (1)	350	199
Sand 0/1 or 0/2	2650	400 (2)		355	400 (2)		355	400 (2)		355	400 (2)		332
Sand 0/4	2650	540 (2)			540 (2)			540 (2)			480 (2)		
total water		200		200	200		200	205		205	190		190
Superplast		0.40 à 1.50% (3)		3	0.40 à 1.50% (3)		3	0.40 à 1.50% (3)		3	0.40 à 1.50% (3)		3
Stabilizer (4)		0.10 à 0.15% (3)		0.5	0.10 à 0.15% (3)		0.5	0.10 à 0.15% (3)		0.5	0.10 à 0.15% (3)		0.5
Limestone 4/8 - 4/16	2650										190		72
Air				20			20			20			20
Total		2095		1000	2120		1000	2120		1000	2150		1000
(1) in these examples, the wet weight of Argex is calculated with a moisture of 34 % & 750 kg/m³ Oven Dry loose bulk density (typical average) / dosage in weight is based on moisture & OD loose bulk density controls.													
(2) indicative - to be confirmed by grading simulation of available sands on site vs ideal sieving of concrete --> provide info to Argex Technical support													
(3) % on cement - indicative - to be confirmed by preliminary trials - min slumpflow 630-730 mm target for pumping vs pipes length etc													
(4) dosage based on liquid admix - in case of colloidal powder, use 0.8 to 1 kg/m³													
(5) based on absolute volume													
Without alternative of ultrafines like fly ash, limestone filler etc, a mix design with 100% cement is possible --> info Argex Technical support													
W/C effective (on cement only)		0.50			0.47			0.59			0.48		
W/P (on total powder)		0.36			0.35			0.36			0.36		
Water inside Argex aggregates is not included in the effective W/C ratio as free water (see EN 206). Only water around the aggregates (after soaking or water sprinkling) will step in as free water if visually present around the aggregates --> in that case : 7 - 8 L for D2.0 (± 2% of Argex wet weight)													

1.4. Pumpmix S - D1.6 & D1.8 with Argex sand

		MIXES WITH ARGEX SAND										
		Pumpmix D1.8 LC 30/33 to LC 35/38 - D 1.8 (+/- 1700) - G/S 0.82 (5)			Pumpmix D1.6 LC 30/33 to LC 35/38 - D 1.6 (+/- 1560) - G/S 0.49 (5)			Pumpmix D1.6 LC 25/28 to LC30/33 - D 1.6 (+/- 1460) - G/S 0.44 (5)				
	Density (kg/m³)	weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)	weight (kg)	volume - loose (L)	absolute volume (L)		
CEM III/A 42.5 N LA (of CEM I 52,5 N, CEM II...)	3100	430		139	350		113	430		139		
fly ash	2300	85		37	155		67	95		41		
or limestone filler	2700	or 100			or 181			or 110				
or GGBS	2920	or 108			or 195			or 120				
Argex AM4/8-700	1230	492 (1)	490	279	351 (1)	350	199	322 (1)	320	182		
Argex AR 0/4-650	1050	194 (1)	210	130	526 (1)	570	353	618 (1)	670	415		
Sand 0/1 or 0/2	2650	160 (2)		211	135		51					
Sand 0/4	2650	400 (2)										
total water		190		190	195		195				200	200
Superplast		0.40 à 1.50% (3)		3	0.40 à 1.50% (3)		3				0.40 à 1.50% (3)	3
Stabilizer (4)		0.10 à 0.15% (3)	0.5	0.10 à 0.15% (3)	0.5	0.10 à 0.15% (3)	0.5					
Air			20			20			20			
Total		1930		1010	1760		1000	1690		1000		
(1) in these examples, the wet weight of Argex is calculated with a moisture of 34 % & 750 kg/m³ Oven Dry loose bulk density (typical average) / dosage in weight is based on moisture & OD loose bulk density controls. For AR0/4-650 : ex with 30% moisture & 710 kg/m³ OD loose bulk density . Option AM0/4-600 to be confirmed by trials.												
(2) indicative - to be confirmed by grading simulation of available sands on site vs ideal sieving of concrete --> provide info to Argex Technical support												
(3) % on cement - indicative - to be confirmed by preliminary trials - min slumpflow 630-730 mm target for pumping vs pipes length etc												
(4) dosage based on liquid admix - in case of colloidal powder, use 0.8 to 1 kg/m³ as first approach (to be confirmed by preliminary trials)												
(5) based on absolute volume												
Without alternative of ultrafines like fly ash, limestone filler etc, a mix design with 100% cement is possible --> info Argex Technical support												
W/C effective (on cement only)		0.44			0.55			0.47				
W/P (on total powder)		0.37 - 0.35			0.39 - 0.36			0.38 - 0.36				
Water inside Argex aggregates is not included in the effective W/C ratio as free water (see EN 206). Only water around the aggregates (after soaking or water sprinkling) will step in as free water if visually present around the aggregates --> in that case : 13 L for D1.8 & 18 L for D1.6 (± 2% of Argex wet weight)												

2. Particle-size distribution

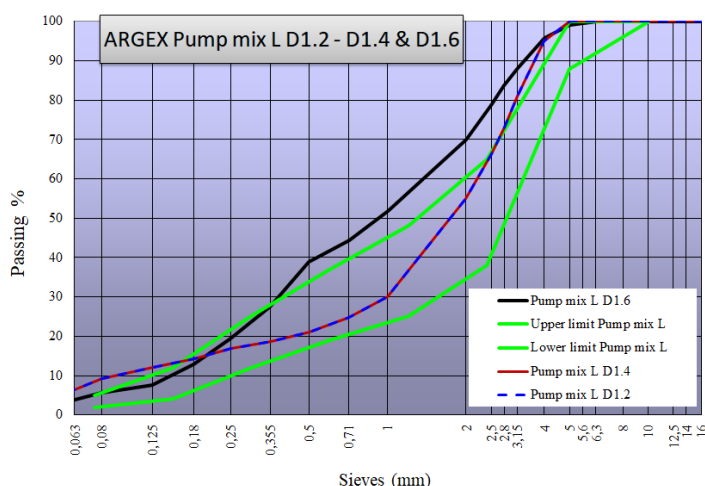
The aggregates' and the concrete's grading is optimized for the pumping of every type of Pumpmix and fits within a fixed particle-size distribution. Therefore, it is necessary to follow the Pumpmix mix designs and to adjust the % of fine and coarse sand - based on their own grading.

It is recommended to transmit the available sand's data in order to determine an optimal ratio of each type of sand - Argex Technical support service.

Two essential rules are applicable:

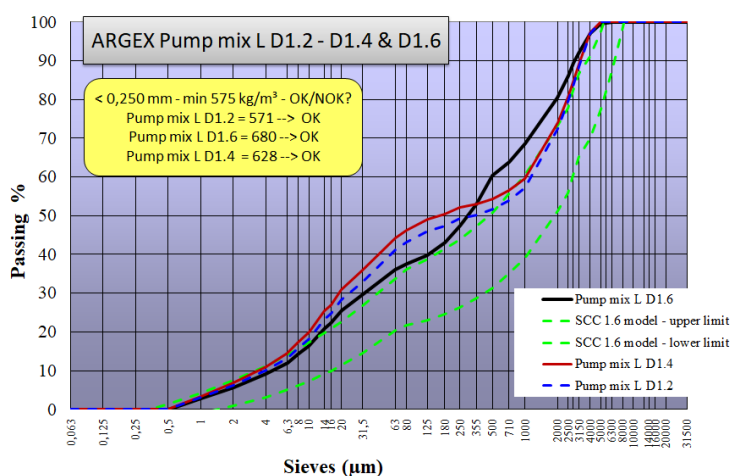
Pumpmix L:

Argex grading + sand (D1.6) or just Argex (D1.2-D1.4) - see below for the ideal particle-size distribution and examples (the choice of sand is relevant for the D1.6).



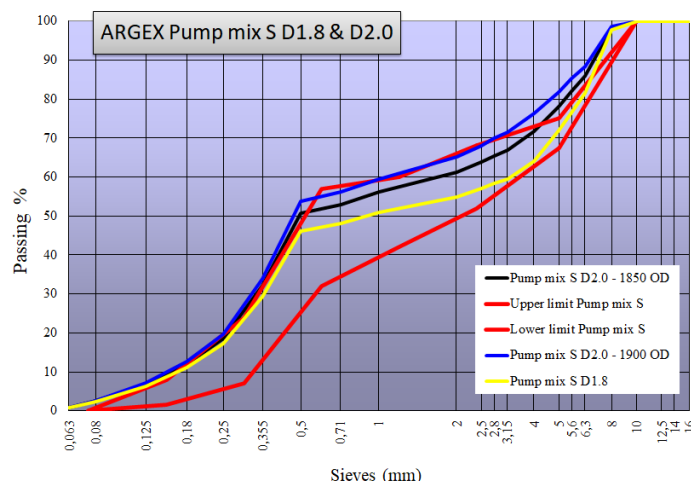
Concrete grading: all components mixed (cement, filler, sand, Argex) - minimum 575 kg/m³ < 0,250 mm.

When the amount of powder is defined, the choice of the sand (D1.6) will also be crucial.



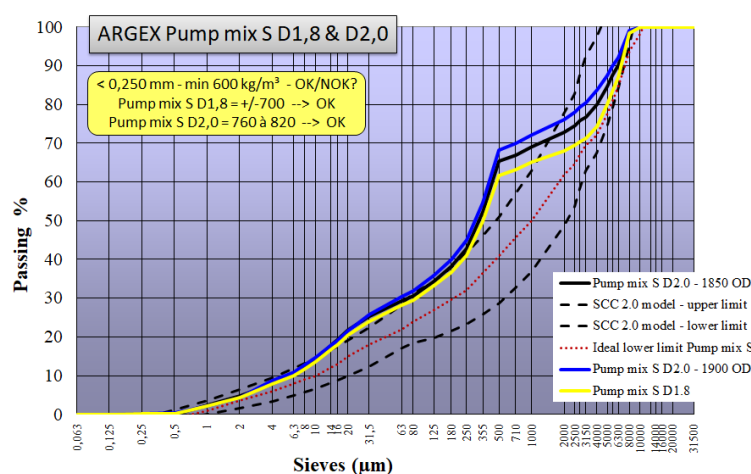
Pumpmix S: standard mix & high strength

Argex grading + the same sand for D1.8 & D2.0 - see below for particle-size distribution's ideal bandwidth and examples. Considered the high dosage, the choice of sand (or combination of the available types of sand) will be important for the Pump mix S.



Concrete grading: all components mixed (cement, filler, sand, Argex) - minimum 600 kg/m³ < 0,250 mm.

When the amount of powder is defined, the choice of the sand will also be crucial. See ideal sand particle-size distribution.



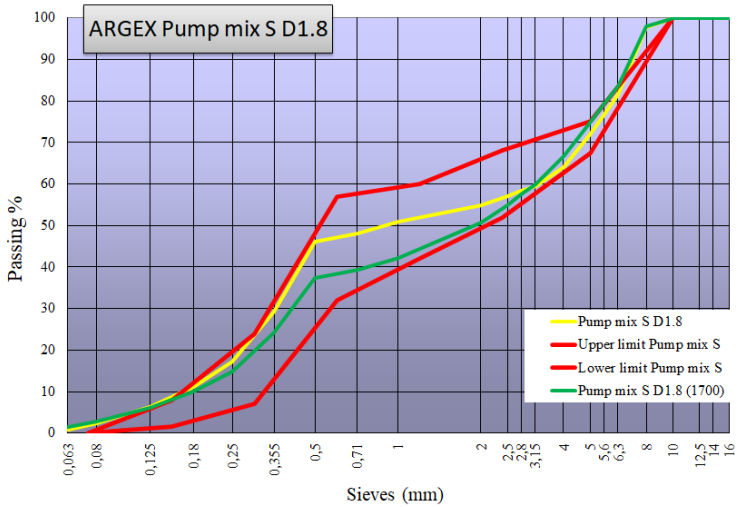
Ideal particle-size distribution of the sand (normal) for Pumpmix S or the result of 2-3 types of sand combined:

	Sieves (mm) vs Passing (%)										
	63	125	250	500	1000	2000	2500	3150	4000	5000	6300
MAX	4	26	44	78	89	93	94	96	99	100	100
min	0,3	1,5	15	49	66	80	84	90	93	96	100
min – "ideal"	1	7	19	55	71						

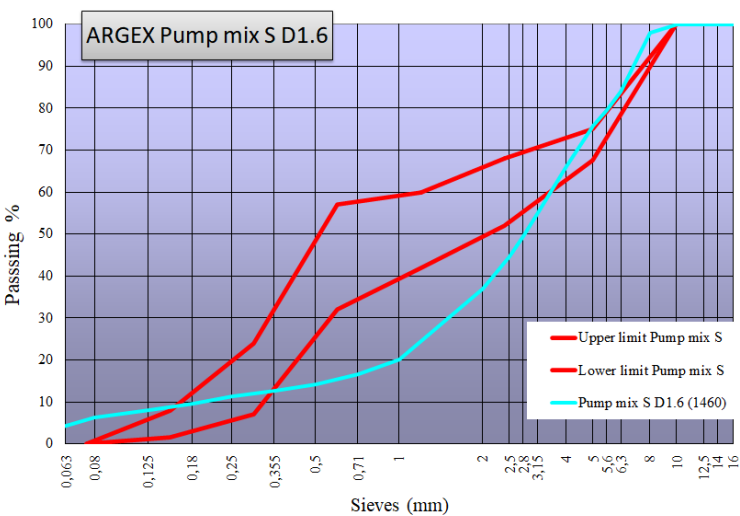
Pumpmix S: mix with lightweight Argex sand

Argex + sand grading - see below for the ideal particle-size distribution and examples. For the Pumpmix S, the choice of the sand (or combination of available types of sand) will be important for the D1.8 & D1.6 (1560). We notice a difference for the D1.6 (1460) with 100% ARGEX (aggregates & sand). This involves a stronger focus on the concrete's grading.

D1.8:

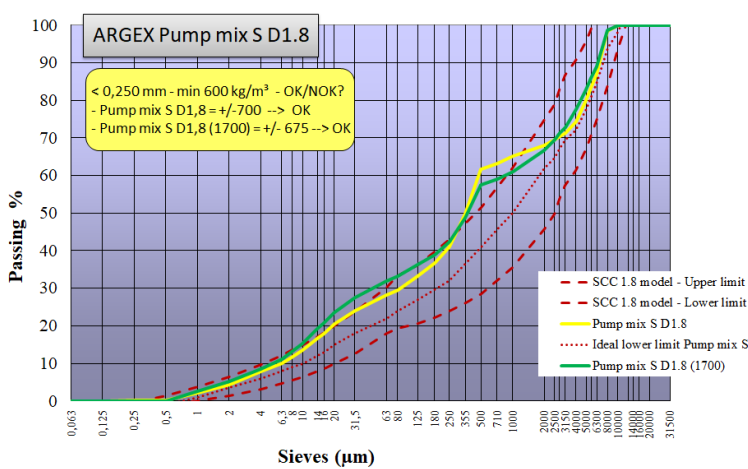


D1.6:

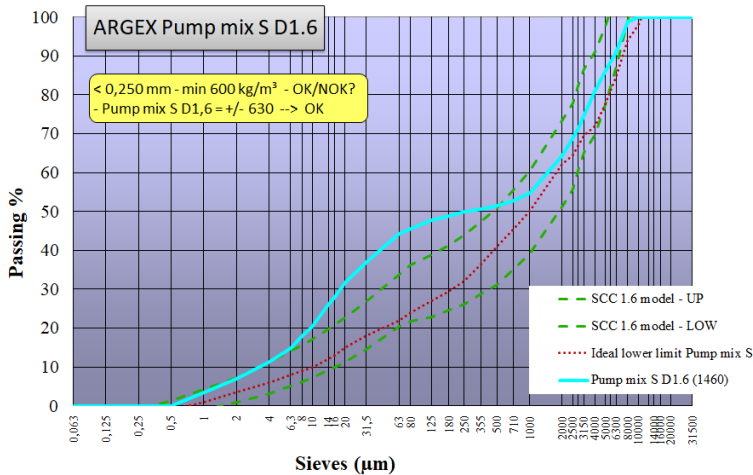


Concrete grading: all components mixed (cement, filler, sand, Argex) - minimum 600 kg/m³ < 0,250 mm. When the amount of powder is defined, the choice of the sand will also be crucial. See ideal particle-size distribution of the sand or of the result of 2 types of sand combined. The D1.6 (1460) is 100% Argex (aggregates & sand).

D1.8:



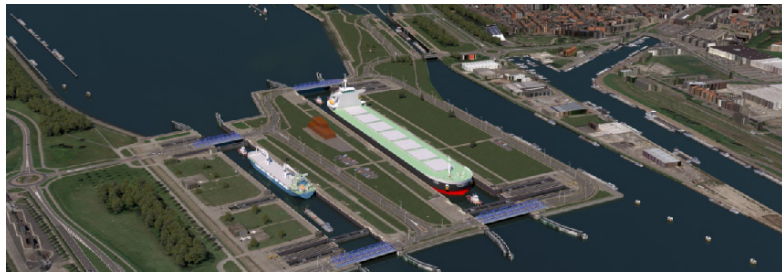
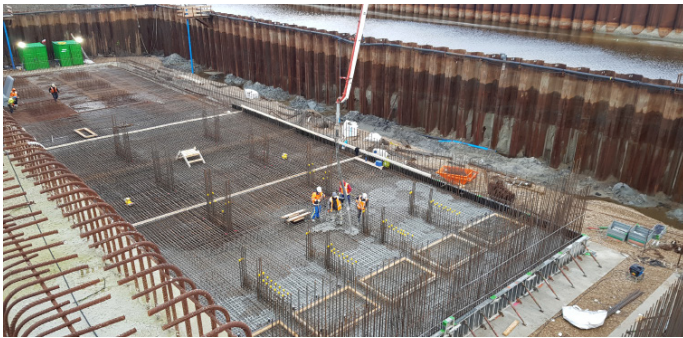
D1.6:



Dubai Royal Atlantis



Lock Terneuzen (NL)



Colmore Row Birmingham (UK)

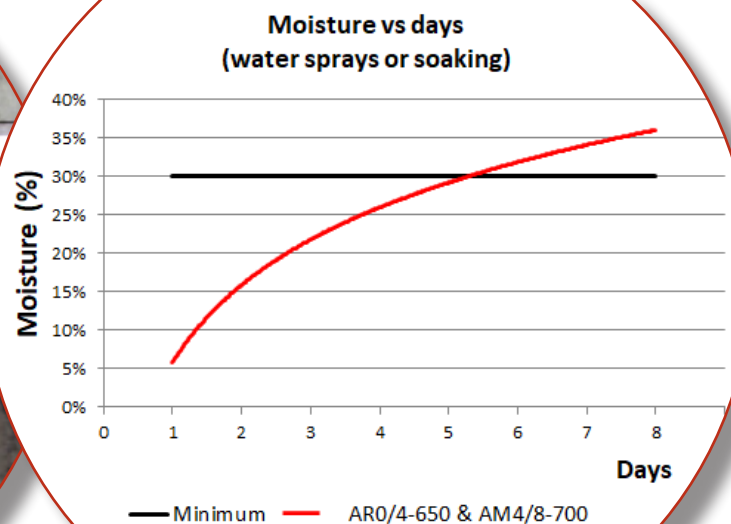


3. Moisture and dosage of Argex aggregates

3.1. Moisture

For pumping, a **moisture of at least 30%** is required! Therefore, we recommend the following:

- » **Order the Argex** at least **2 weeks** before the pumping.
- » **Water the** Argex stock intensively and constantly during at least **1 to 1,5 weeks** (by mixing regularly by means of a bulldozer) or **soak** the aggregates (min. **1 week**) - see graph. **End the watering or the soaking 24h before the pumping** to reduce the amount of water around the aggregate (free water !).
The soaking is not suitable for the AR0/4-650 for the Pumpmix L!
For certain projects, a pre-moistened stock of AM4/8-700 with a moisture of 30 - 33% is available upon request - to check with the Argex sales department.
- » **Check the Argex moisture regularly** (representative stock sample - EN 932-1/-2 - e.g. at least 3 different locations and at least 40 cm deep) in the oven at 105°C (EN 1097-5).



3.2. Dosage

As most plants dose the aggregates by weight, it is recommended to check the Argex' **dry loose bulk density and its moisture** in order to convert the mix design's bulk volume into wet weight that needs to be dosed.

This method is applicable for the AR0/4-650 (Pumpmix L) !

A second option is possible for the AM4/8-700 (Pumpmix S) - time saving:

Measure the wet loose bulk density with a known volume (**density pot - EN 1097-3**) and convert the bulk volume immediately to wet weight that needs to be dosed!

Guideline for density pot:

https://www.youtube.com/watch?v=nQ5iFOSq_V0



3.3. Concrete mixing

- » Dose the Argex (wet weight), add with the other components in the mixer and load the mixer truck (classic process).
- » According to another method, you load the Argex separately (in accordance with volumetric dosage) immediately into the mixer truck via a conveyor belt or a hopper and then you add the paste (sand, cement, fly ash, etc.) via the mixer.

This must be mixed for at least 1/2 hour!

4. Fresh concrete consistency

The dosage of additives and water (W/C Max.) are suggested for a **high flow** in order to facilitate the pumping. This **depends** mainly on the hoses' length (& diam) and on the type of pump (piston vs rotor).

Before the pumping we mainly measure the **Slumpflow**, which will be between **630 and 730 mm**. The loss of flow before and after the pumping can range between 20 and 80 mm.



The dosage of all components is fixed, except for the **superplasticizer**, which will be **adjusted** to aim for the recommended slumpflow (no water added!).



5. Miscellaneous

- » The compressive strength classes and the density classes are set in accordance with the indicative W/C ratios and the Slumpflow of at least 630 mm.
- » Both rotor as piston pumps can be used (based on pumping distance, etc.).
- » Avoid waiting times with concrete in the pump's container. **Solution to avoid having to add water or superplasticizer on site: add 0.1% retarder/m³** (to be confirmed by the distributor).
- » Avoid reductions in the diameter between the hoses or the connections as much as possible (the bigger, the easier the pumping).



- » Surface finishings for the pumping of floors etc.: don't lift the pump hose while placing, vibrate if necessary (adjusted vibration e.g. low frequency to avoid segregation), level the concrete, vibro screed finish, optional additional manual float finish or power float finish after x time.
- » Possibility of using steel fibres and other types (see picture).
- » Various how-to videos and references are available upon request.

SPECIFICATIONS

1. General specifications and requirements

The concrete's preparation, specification and characteristics as well as the production monitoring must comply with the standard EN 206 requirements and with the National Annexes (NBN B 15-001,...).

2. Special specifications

	Requirements							
Example Refer to combinations of strength and density in 1.	A	B		C	D	E1	E2	E3
		B1	B2					
Argex Pump mix S D 1.8	LC 30/33				8			
Argex Pump mix L D 1.6	LC 20/22				4			

A: compressive strength class (according to EN 206)

B : sustainability requirements with B1 (scope) and B2 (exposure class):

B1: scope: NRC = not reinforced concrete (chlorides $\leq 1,0\%$), RC = reinforced concrete (chlorides $\leq 0,4\%$)

B2: exposure class: the standard EN 206's exposure classes and the National Annexes. However, this application on light concrete is not limited to the following parameters: dosage of the minimal amount of cement, the maximum W/C ratio and the composition. For light concrete, there's no minimal compressive strength class approach.

Sustainability: in accordance with EN 1992-1-1, the exposure classes are applicable (see B2) and the reinforcement's cover will be increased with 5 mm. The additional mechanical characteristics (modulus of elasticity, shrinkage, creep, etc.) will either be calculated in accordance with EN 1991-1-1, or will be measured in the lab or will be supplied by Argex.

C: consistency class: for the Argex Pumpmix, there's only a reference of the Slumpflow (EN 12350-8) or Flow measurement (EN 12350-5) - see E1

D: nominal maximum size of the aggregates (D max)

E1: Slumpflow: the Slumpflow for the pumping on site will range between 630 and 730 mm, depending on the hoses' length etc. Classes SF1 & SF2. If necessary, an update between before and after pumping can be drawn up.

E2: mix design: see chart Mix designs.

E3: effective W/C ratio: the water absorbed by the Argex will not be taken into account; each addition of the type of fly ash (see E2) in the effective W/C ratio will be taken into account according to the above standards. See chart Mix designs. W/P (powder) optionally.

NORMATIVE REFERENCES

ARGEX aggregates according to EN 13055: AR0/4-650 & AM4/8-700 : DoP1 & technical sheet CE - available via www.argex.eu

ARGEX concrete:

- **EN 206:** Concrete - Specification, performances, production and conformity
- **NBN B 15-001:** Concrete - Specification, characteristics, production and conformity or other National Annex
- **EN 1992-1-1:** Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings
- **EN 13670:** Execution of concrete structures

Testing on fresh concrete: EN 12350-1 to -12 & ASTM C 173 «Standard test method for air content of freshly mixed concrete by the volumetric method»

Testing on hardened concrete: EN 12390-1 to -7 & Test on segregation "EUROLIGHTCON BE96-3942/R21, June 2000"



EN 13055
0965-CPR-GT0525



ISO 9001: 2015 &
ISO 14001: 2015

The technical information in this sheet is merely indicative and can not be considered as contractual. Version of 15/02/2022.