

# INFLUENCE OF WATER WASHING ON THE QUALITY OF RECYCLED AGGREGATES

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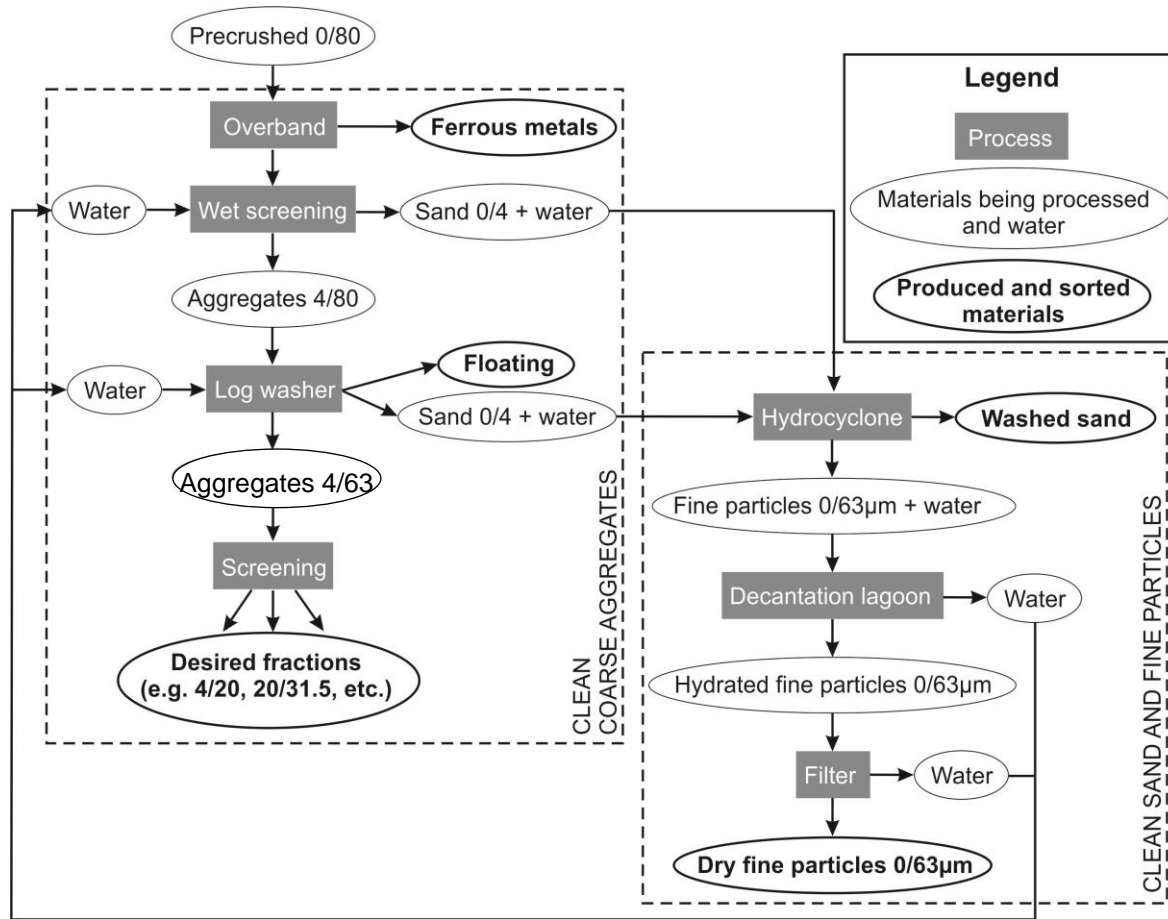
## **RECYCLED AGGREGATES PRODUCTION**

- ▶ « **Wet Process** » recycling plant

RECYCLED AGGREGATES CHARACTERIZATION

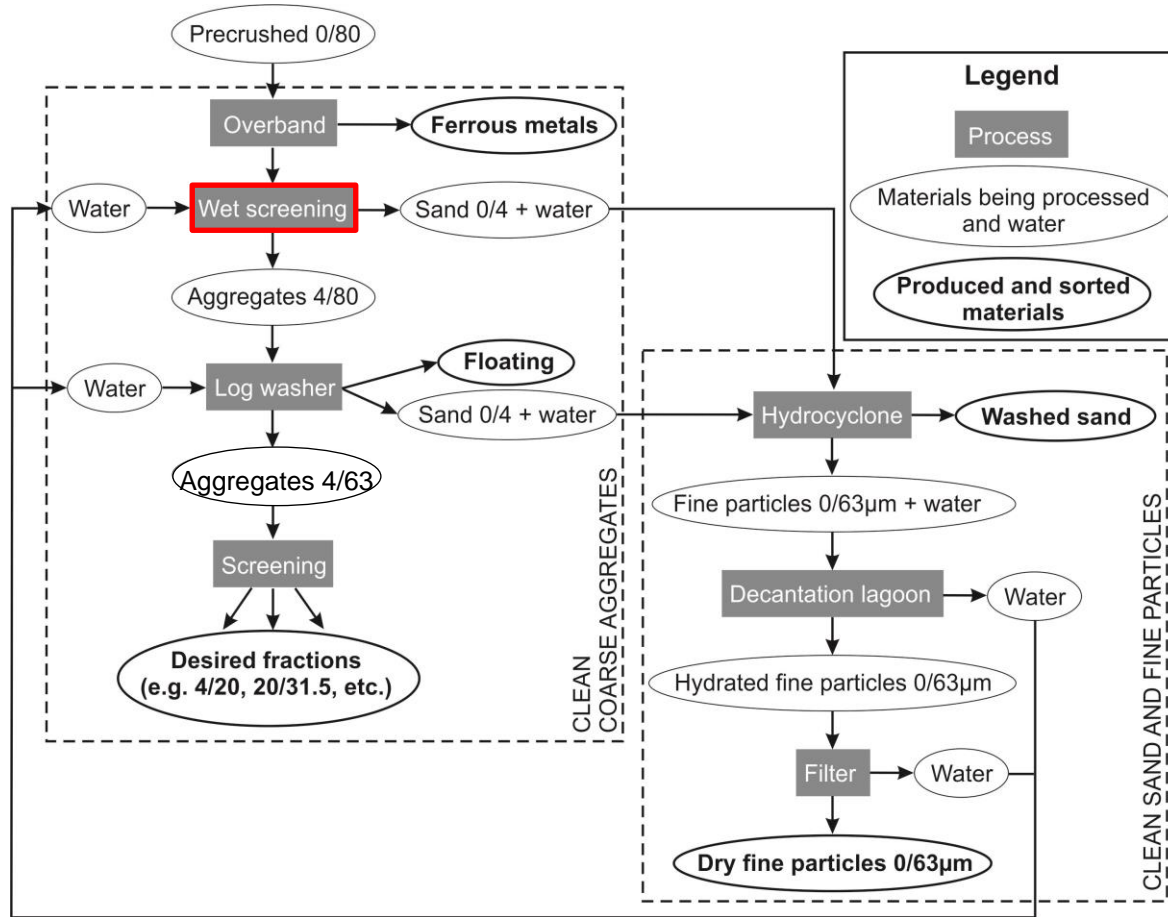
CONCRETE WITH HIGH QUALITY RCA

RECYCLED AGGREGATES PRODUCTION

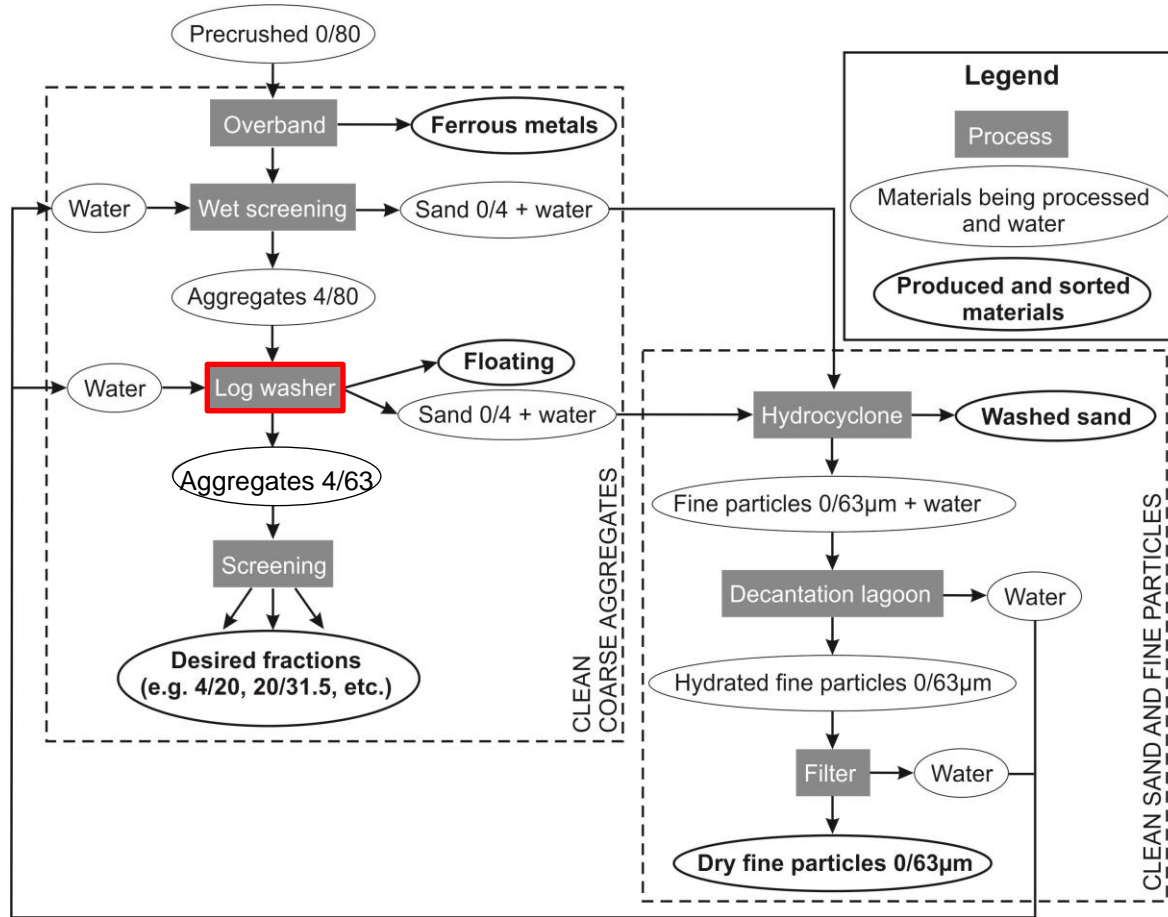




RECYCLED AGGREGATES PRODUCTION



RECYCLED AGGREGATES PRODUCTION





## RECYCLED AGGREGATES PRODUCTION

**Final product granular fractions:**

- 4/20 mm
- 20/31,5 mm
- 31,5/63 mm



## RECYCLED AGGREGATES PRODUCTION

- ▶ « Wet Process » recycling plant

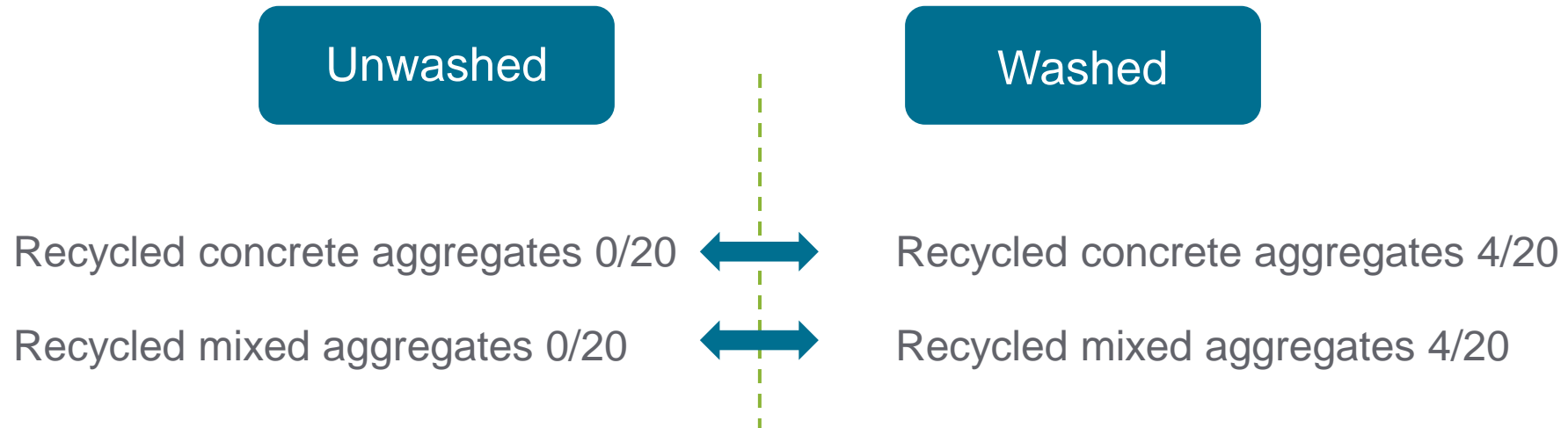
## RECYCLED AGGREGATES CHARACTERIZATION

## CONCRETE WITH HIGH QUALITY RCA

## INFLUENCE OF WASHING ON THE PROPERTIES OF RECYCLED CONCRETE AGGREGATES

**Anticipated outputs:**

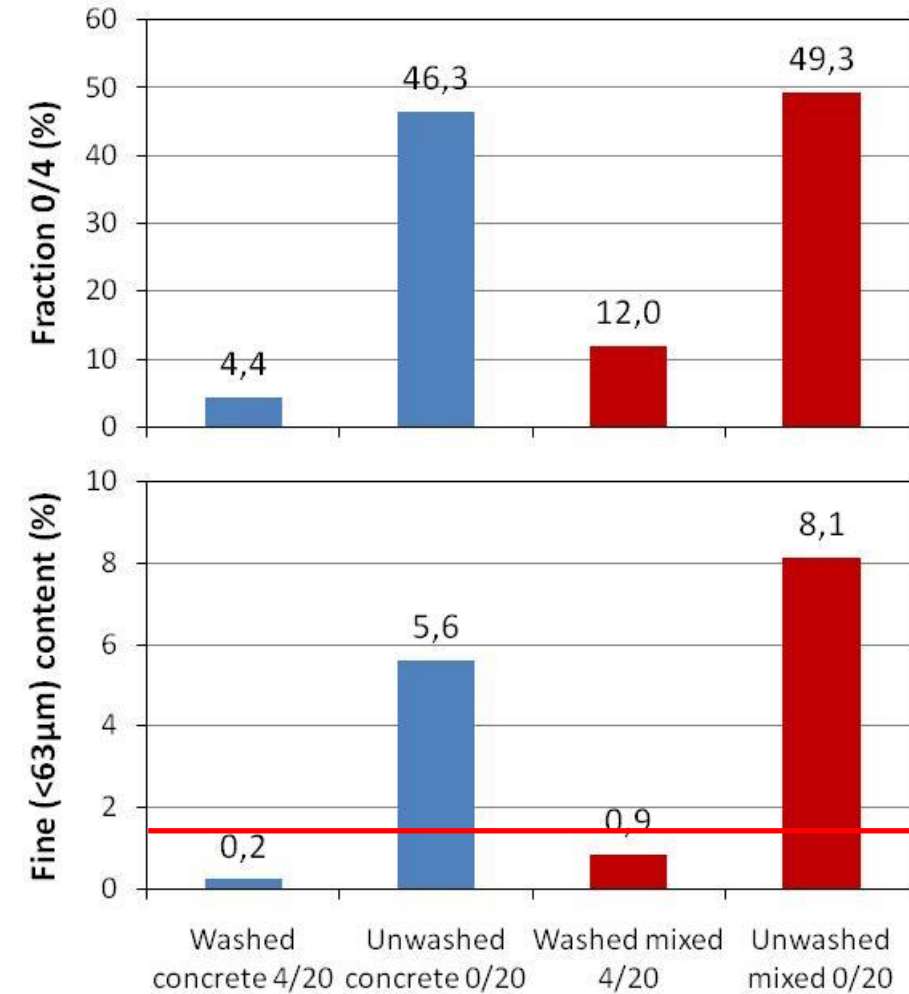
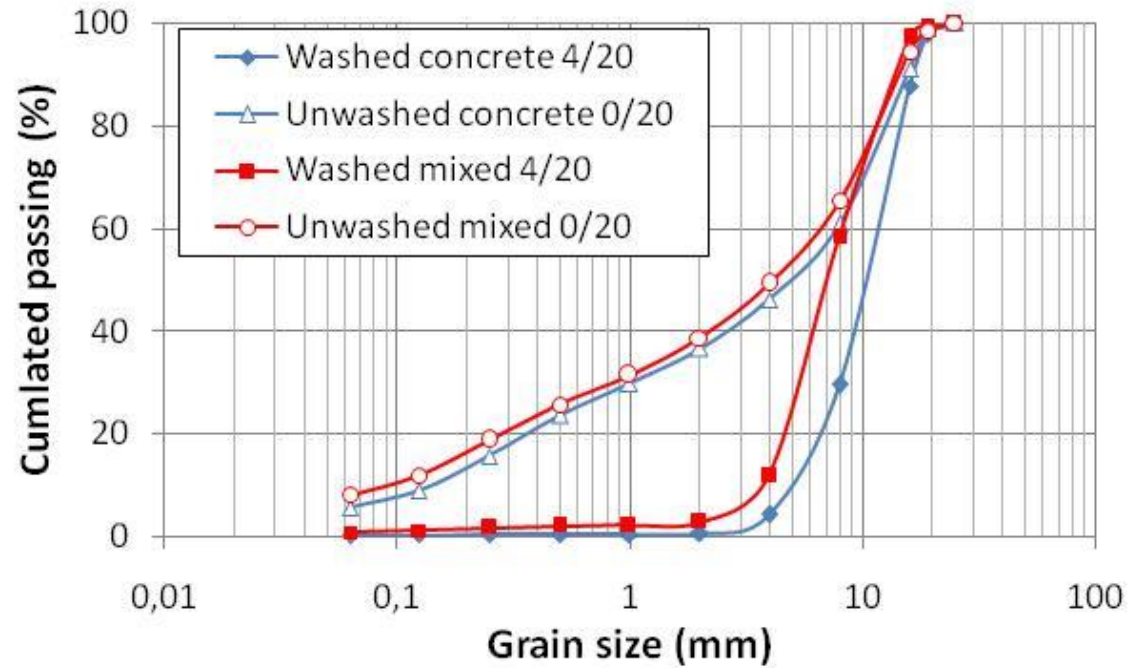
- ▶ Narrower grain size distribution curve
- ▶ Reduced fines content
- ▶ Reduced unwanted elements content (plaster, clay, plastic, wood, etc.)
- ▶ Better abrasion resistance
- ▶ Lower water absorption by immersion

**Methodology :**



## EFFECT OF THE WET SCREENING

Washing significantly reduces the importance of the sand fraction and the fines content

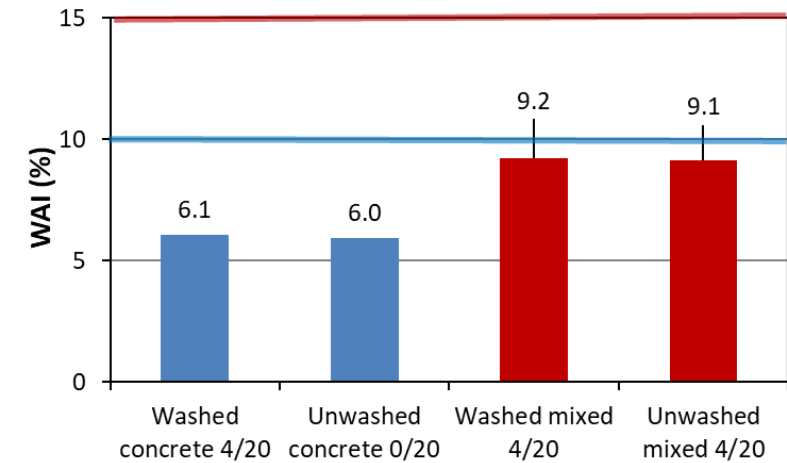
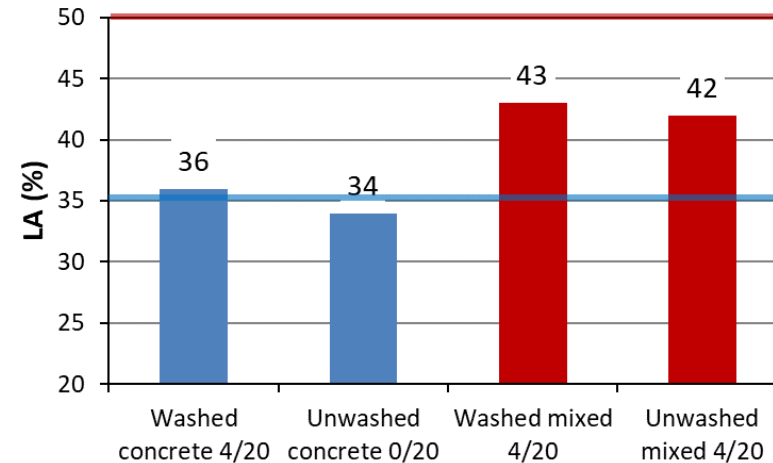
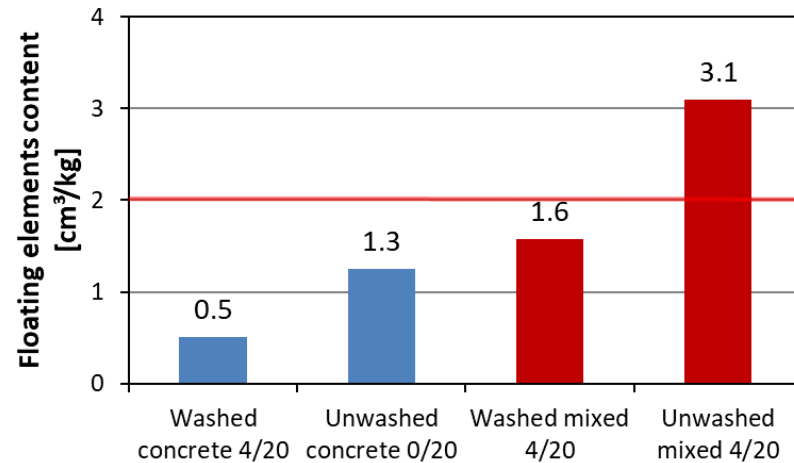


Max.  
allowed

## EFFECT OF THE LOG WASHER

50% reduction in unwanted elements content (plaster, clay, plastic, wood, etc.)

No influence on either the resistance to abrasion or the water absorption by immersion



**Anticipated output:**

- ▶ Narrower grain size range
- ▶ Reduced fines content
- ▶ Reduced unwanted elements content (plaster, clay, plastic, wood, etc.)
- ▶ Better abrasion resistance
- ▶ Lower water absorption by immersion



## RECYCLED AGGREGATES PRODUCTION

- ▶ « Wet Process » recycling plant

## RECYCLED AGGREGATES CHARACTERIZATION

## CONCRETE WITH HIGH QUALITY RECYCLED AGGREGATES

For each type of recycled aggregates, three substitution rate have been considered to assess the influence of the recycled aggregates on concrete properties

Concrete mixes		Test series n°3 - CEM I 52 R LA						
		REF - 0 %	Concrete recycled aggregates			Mixed recycled aggregates		
		N100	B100	B75	B40	M100	M75	M40
Total Water	[kg]	180	180	180	180	180	180	180
<b>Absorption water</b>	<b>[kg]</b>	<b>9</b>	<b>50</b>	<b>40</b>	<b>25</b>	<b>53</b>	<b>41</b>	<b>26</b>
Cement	[kg]	400	400	400	400	400	400	400
<b>Effective W/C</b>	<b>[-]</b>	<b>0,45</b>	<b>0,45</b>	<b>0,45</b>	<b>0,45</b>	<b>0,45</b>	<b>0,45</b>	<b>0,45</b>
W/C	[-]	0,47	0,57	0,55	0,51	0,58	0,55	0,51
Sand 0/2	[kg]	615	615	615	615	615	615	615
NA 2/6	[kg]	273	-	273	273	-	273	273
NA 6/14	[kg]	909	-	-	454	-	-	454
RA 2/6	[kg]	-	237	-	-	216	-	-
RA 6/14	[kg]	-	791	791	395	723	723	362
<b>Substitution rate</b>	<b>[%]</b>	<b>0</b>	<b>100</b>	<b>77</b>	<b>38</b>	<b>100</b>	<b>77</b>	<b>38</b>
SP	[%]	0,5%	0,5%	1%	1%	1%	1%	1%

### Target properties

$R_c$  : 50-55 MPa

W/C  $\leq$  0,45

Cement  $\geq$  340 kg/m<sup>3</sup>

WAI  $\leq$  6,5%

The Concrete samples tested verify most of the criterion for an environmental class EE 4 (rain, freeze-thaw cycle with de-icing salts)

Properties		REF - 0	Recycled concrete aggregates			Recycled mixed aggregates		
		%	B100	B75	B40	M100	M75	M40
<b>Fresh concrete properties</b>								
W/C measured	[-]	0,41	0,44	0,41	0,44	0,42	0,41	0,44
Slump	[-]	S4(21c m)	S3(10c m)	S4(18c m)	S4(21c m)	S3(10c m)	S4(18c m)	S4(17c m)
Fresh state Density	[kg/m <sup>3</sup> ]	2344	2254	2319	2229	2299	2261	2326
<b>Hardened concrete properties &amp; durability</b>								
Rc 28 days	[MPa]	76.4	<b>42,5</b>	74,3	72,4	59,0	69,6	75,8
WAI	[%]	5,2	<b>9,1</b>	5,6	5,9	<b>7,1</b>	6,0	5,5
Density	[kg/m <sup>3</sup> ]	2380	<b>2051</b>	2195	2282	2071	2195	2234
Freeze-thaw cycles (mass loss)	[kg/m <sup>2</sup> ]	0,67	<b>5,28</b>	<b>1,73</b>	<b>1,77</b>	<b>2,61</b>	<b>2,54</b>	<b>1,87</b>

### Target properties

$R_c$  : 50-55 MPa

W/C ≤ 0,45

Cement ≥ 340 kg/m<sup>3</sup>

WAI ≤ 6,5%



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THANK YOU



## Secondary Raw Materials for Concrete precast products

## Résultats des essais de cycles gel-dégel à 28 jours

- ▶ La surface des échantillons produit à base de granulats recyclés est fortement endommagée

N100 (Ref)  
0,72 kg/m<sup>2</sup>  
0,43 kg/m<sup>2</sup>



B75  
1,27 kg/m<sup>2</sup>



B40  
2,15 kg/m<sup>2</sup>



M75  
1,96 kg/m<sup>2</sup>