



## Technical Manual – Section 5

### Manufacture of LWAC using Lytag<sup>®</sup> LWA

<b>Requirements for Lytag Lightweight Aggregate Concrete</b>	<b>2</b>
<b>Strength Class</b>	<b>2</b>
<b>Density</b>	<b>2</b>
<b>Consistance</b>	<b>3</b>
<b>Alkali Silica Reaction (ASR)</b>	<b>3</b>
<b>Production of Lytag LWA Structural Concrete</b>	<b>3</b>
<b>Materials</b>	<b>3</b>
<b>Aggregates</b>	<b>3</b>
<b>Storage of Aggregate</b>	<b>3</b>
<b>Cement</b>	<b>3</b>
<b>Water</b>	<b>3</b>
<b>Admixtures</b>	<b>4</b>
<b>Mix design of Lytag lightweight aggregate concrete</b>	<b>4</b>
<b>Batching, Mixing and Transportation</b>	<b>4</b>
<b>Batching</b>	<b>4</b>
<b>Batch Weight Calculation for Added Mixing Water</b>	<b>5</b>
<b>Mixing</b>	<b>5</b>
<b>Transportation</b>	<b>6</b>



Lytag Ltd  
2nd Floor, 75-77 Margaret Street,  
London W1W 8SY



+44 (0) 20 7499 5242



sales@lytag.com

## Requirements for Lytag Lightweight Aggregate Concrete

### Strength Class

The strength class for the concrete should be selected from Table 8 of BS EN 206 – 1 Compressive strength classes for lightweight concrete.

An important point to note is that in BS 8110, design was based on concrete cube compressive strengths and so the equivalent lightweight concrete strength would reflect the cube strength, i.e. C30 normal weight concrete would equate to a C30 lightweight concrete. In the Eurocodes, design is based on cylinder strength, hence the equivalent strength class would be based on the cylinder strength, i.e. C30/37 would become an LC30/33

### Density

The air-dry density of normal weight concrete ranges from 2300-2500kg/m<sup>3</sup>. Lightweight concrete using coarse Lytag LWA has a range of 1700-1900kg/m<sup>3</sup> and using coarse and fine LWA in the concrete gives a density in the range 1550-1700kg/m<sup>3</sup>. The density of the concrete contributes significantly to the live loading that structural members can carry.

The following sets out the approximate relationship between different density states.

Oven Dry Density = Density of a concrete sample, oven dried at 105oC, until there is no apparent decrease in weight. BS EN 12390-7

Air Dry Density = Oven dry density + 85kg/m<sup>3</sup> (equilibrium moisture content 5%)  
 Fresh Wet Density = Oven dry density + 250kg/m<sup>3</sup>

Density classes should be taken from Table 9 of BS EN 206 – 1. Concrete using coarse Lytag® LWA and natural fine aggregate should be assumed to be Density Class 1.8 and concrete using both coarse and fine Lytag LWA should be assumed to be Density Class 1.6.

Property	Density Class	
	1.6	1.8
Density (kg/m <sup>3</sup> )	1400–1600	1600–1800



Lytag Ltd  
 2nd Floor, 75-77 Margaret Street,  
 London W1W 8SY



+44 (0) 20 7499 5242



sales@lytag.com

## **Consistence**

The workability of the concrete should be selected from tables 3 and 6 of BS EN 206-1. For skip mixes the workability will normally be measured by slump. For pumpable concrete the workability should be measured by flow, generally F5

## **Alkali Silica Reaction (ASR)**

In accordance with BRE Digest 330, sintered pfa, Lytag LWA, is considered to be of low reactivity. The guidelines given in Digest 330 Part 2 should be followed to minimise the risk of damaging ASR in new construction. This could entail replacing a high reactivity aggregate with Lytag LWA to reduce the risk of ASR occurring.

## **Production of Lytag LWA Structural Concrete**

### **Materials**

#### **Aggregates**

Depending on the method of placing, generally the coarse aggregates shall be Lytag® LWA granular 4/14mm to BS EN 13055. The fine aggregate shall be Lytag LWA 0/4mm to BS EN 13055. For mixes incorporating natural fine aggregate, it should conform to BS EN 12620 Aggregates for Concrete.

#### **Storage of Aggregate**

Individual grades shall be delivered separately and stored in properly constructed stock bays, which will prevent intermixing, and contamination.

Care should be taken with Lytag coarse LWA, as it may pose a slip/trip hazard being a rounded aggregate.

#### **Cement**

Lytag LWA is compatible with all types of cement and cement replacements conforming to the relevant Standards.

#### **Water**

The water shall be from a mains supply or other approved source suitable for making concrete.



Lytag Ltd  
2nd Floor, 75-77 Margaret Street,  
London W1W 8SY



+44 (0) 20 7499 5242



sales@lytag.com

## **Admixtures**

Generally lightweight aggregate concrete will contain admixtures. In most cases either a water reducer or high range water reducer will be included. When pumping lightweight concrete it may be advisable to include a pump aid/viscosity modifier.

Lytag LWAC is also compatible with most other admixtures and additions such as polypropylene or structural fibres, waterproofers, colouring agents etc.

## **Mix design of Lytag lightweight aggregate concrete**

The strength class, density (oven dry class or target) and any additional durability requirements shall be confirmed by the contractor and the mix proportions confirmed by the concrete producer with advice as necessary from Lytag Ltd. Details should be submitted to the Engineer for approval.

Suggested mix designs are give in Section 3 of the Lytag® Technical Manual. These however should only be taken as guidelines as factors such as cement source and type, fine aggregate source and type and particular admixture used can affect the properties of the plastic and hardened concrete.

## **Batching, Mixing and Transportation Batching**

The materials to produce Lytag LWAC shall be batched by weight unless prior approval is obtained from the Engineer. An allowance for absorbed water shall be made when calculating the final batch weight. The moisture content of Lytag LWA should be checked regularly.



Lytag Ltd  
2nd Floor, 75-77 Margaret Street,  
London W1W 8SY



+44 (0) 20 7499 5242



[sales@lytag.com](mailto:sales@lytag.com)

## Batch Weight Calculation for Added Mixing Water

Typical example based on Skip Mix Lytag LWA Granular / natural fine aggregate as shown below:

Grade LC 30/33 Concrete

Fine aggregate - Measured moisture content = 5% Lytag LWA Granular aggregate

- Dry loose bulk density 740 kg/m<sup>3</sup>
- Measured moisture content = 12%

Mix constituents from appropriate table	Dry Weights (kg/m <sup>3</sup> )	Corrected Batch Weights (kg/m <sup>3</sup> )	
Cement	360	360	
Fine aggregate	600 + 5% (moisture content)	630	
Lytag 0.88 * 740 kg/m <sup>3</sup>	651 + 12% (moisture content)	729	
Calculation of total water requirement		Subtotals	<b>Totals</b>
Effective water (assume typical recommended consistence of 70mm)		180	
Lytag LWA absorption 15% of 651		98	278
Less moisture content for fine aggregate of 5% of 600		-30	
Less moisture content for Lytag of 12% of 651		-78	-108
Therefore mixing water to be added (278-108)			<b>170 litres</b>

Mix constituents from appropriate table - Dry Weights

### Mixing

The Lytag LWAC shall be mixed in a type of mixer approved by the Engineer. The quantity of water to be added at the mixer should be determined by full- scale trials.

NOTE: recommended sequence for mixing of Lytag LWAC is: Approximately 50% of the mixing water

Lytag LWA            )  
 Fine aggregate    )       Ribbon fed together  
 Cement             )

Remainder of water and any admixture.

Lytag LWAC shall be mixed until there is a uniform distribution of materials.



Lytag Ltd  
 2nd Floor, 75-77 Margaret Street,  
 London W1W 8SY



+44 (0) 20 7499 5242



sales@lytag.com

## Transportation

Transportation of Lytag LWAC shall be as normal weight concrete. Should there be a reduction in specified concrete workability due to aggregate absorption during transportation, the workability shall be increased to that specified by the controlled addition of water on site. Any additions of water on site, above that required to achieve the specified workability must be noted and signed for by the purchaser.

For specification clauses appertaining to other considerations such as curing, cold weather concreting etc., reference should be made to the appropriate section of this manual.



Lytag Ltd  
2nd Floor, 75-77 Margaret Street,  
London W1W 8SY



+44 (0) 20 7499 5242



[sales@lytag.com](mailto:sales@lytag.com)

## References

BS EN 206-1 Concrete – Specification, performance, production and conformity

BS 8110-1:1997 Structural use of concrete. Code of practice for design and construction

BS EN 12390-7:2009 Testing hardened concrete. Density of hardened concrete BRE Digest 330 Alkali–silica reaction in concrete

BS EN 13055-1 Lightweight Aggregates – Lightweight aggregates for concrete, mortar and grout

BS EN 12620 Aggregates for concrete

Lytag Technical Manual, Section 3 - Mix designs



Lytag Ltd  
2nd Floor, 75-77 Margaret Street,  
London W1W 8SY



+44 (0) 20 7499 5242



sales@lytag.com