

Tarmac Cement  
National Laboratory  
Yelsway Lane  
Waterhouses  
Staffordshire  
ST10 3AZ

20/12/2018

**Composition of Fly ash**

**Tudela Fly ash  
EN 450-1 LOI Cat. B, Fineness Cat.N  
0099-CPR-A95-0019**

Based on the **October 2018** monthly composite sample:

| Property  | Value | BS EN 450-1 Limit   |
|---|-------|---|
| Fineness (45µm Residue %)   | 15.3  | Declared Value 15% (± 10)<br><i>(Tested in accordance with BS EN 450-1 cl. 5.3.1)</i> |
| Sulfate (% SO <sub>3</sub> )  | 0.82  | Max 3.0%  |
| Loss on Ignition (%LOI)   | 2.69  | Max 7.0%  |
| Chloride (% Cl <sup>-</sup> %)  | 0.009 | Max 0.1%  |
| Calcium Oxide (% CaO)   | 5.09  | Max 10.0%   |
| SiO <sub>2</sub> + Al <sub>2</sub> O <sub>3</sub> +Fe <sub>2</sub> O <sub>3</sub> (%) | 84.35 | Min 70%   |
| Free Lime (%)   | 0.23  | Max 1.0%  |
| Alkalis (% Na <sub>2</sub> O eq)  | 1.13  | Max 5.0%  |

\*BS EN 933-10:2009 method replacing the 63 µm sieve with a 45 µm sieve

For and on behalf of Tarmac Cement:

*W.F. Price*

**Dr Bill Price**

**National Commercial Technical Manager  
Tarmac Cement**

**TARMAC.COM**

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20.12.2018

**Conformity of Fly Ash to BS 8500-2: Annex A**

**Tudela EN 450-1 Fly Ash  
0099-CPR-A95-0019**

Based on the **October 2018** monthly composite samples of:

| Constituent      | Source               |
|------------------|----------------------|
| EN 450-1 Fly Ash | Tudela               |
| EN 197-1 CEM I   | Aberthaw CEM I 52,5N |

The results of compressive strength testing (in accordance with BS EN 196-1) on a 70:30 blend of the CEM I with the Fly Ash were:

|                       |      |
|-----------------------|------|
| 2 Day Strength (MPa)  | 24.0 |
| 28 Day Strength (MPa) | 50.8 |

Based on equivalent results obtained for the last **12** months, the permitted proportions of combinations conforming to the requirements of Annex A of BS 8500-2 are:

| Strength Class of Combination | Fly Ash Content (%) |     |
|-------------------------------|---------------------|-----|
|                               | Min                 | Max |
| 32,5R                         | 24                  | 46  |
| 42,5N                         | 0                   | 33  |

| BS 8500-2 Combination Designation | Fly Ash Content (%) |     |
|-----------------------------------|---------------------|-----|
|                                   | Min                 | Max |
| CIIA-V                            | 6                   | 20  |
| CIIB-V                            | 21                  | 35  |

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**Conformity of Fly Ash to BS 8500-2: Annex A**

**Tudela EN 450-1 Fly Ash  
0099-CPR-A95-0019**

Based on the **October 2018** monthly composite samples of:

| Constituent      | Source             |
|------------------|--------------------|
| EN 450-1 Fly Ash | Tudela             |
| EN 197-1 CEM I   | Dunbar CEM I 52,5N |

The results of compressive strength testing (in accordance with BS EN 196-1) on a 70:30 blend of the CEM I with the Fly Ash were:

|                       |      |
|-----------------------|------|
| 2 Day Strength (MPa)  | 20.5 |
| 28 Day Strength (MPa) | 46.0 |

Based on equivalent results obtained for the last **12** months, the permitted proportions of combinations conforming to the requirements of Annex A of BS 8500-2 are:

| Strength Class of Combination | Fly Ash Content (%) |     |
|-------------------------------|---------------------|-----|
|                               | Min                 | Max |
| 32,5R                         | 16                  | 38  |
| 42,5N                         | 0                   | 24  |

| BS 8500-2 Combination Designation | Fly Ash Content (%) |     |
|-----------------------------------|---------------------|-----|
|                                   | Min                 | Max |
| CIIA-V                            | 6                   | 20  |
| CIIB-V                            | 21                  | 35  |

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**Conformity of Fly Ash to BS 8500-2: Annex A**

**Tudela EN 450-1 Fly Ash  
 0099-CPR-A95-0019**

Based on the **October 2018** monthly composite samples of:

| Constituent      | Source             |
|------------------|--------------------|
| EN 450-1 Fly Ash | Tudela             |
| EN 197-1 CEM I   | Lemona CEM I 52,5N |

The results of compressive strength testing (in accordance with BS EN 196-1) on a 70:30 blend of the CEM I with the Fly Ash were:

|                       |      |
|-----------------------|------|
| 2 Day Strength (MPa)  | 22.8 |
| 28 Day Strength (MPa) | 48.9 |

Based on equivalent results obtained for the last **12** months, the permitted proportions of combinations conforming to the requirements of Annex A of BS 8500-2 are:

| Strength Class of Combination | Fly Ash Content (%) |     |
|-------------------------------|---------------------|-----|
|                               | Min                 | Max |
| 32,5R                         | 23                  | 45  |
| 42,5N                         | 4                   | 31  |

| BS 8500-2 Combination Designation | Fly Ash Content (%) |     |
|-----------------------------------|---------------------|-----|
|                                   | Min                 | Max |
| CIIA-V                            | 6                   | 20  |
| CIIB-V                            | 21                  | 35  |

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**Conformity of Fly Ash to BS 8500-2: Annex A**

**Tudela EN 450-1 Fly Ash  
0099-CPR-A95-0019**

Based on the **October 2018** monthly composite samples of:

| Constituent      | Source               |
|------------------|----------------------|
| EN 450-1 Fly Ash | Tudela               |
| EN 197-1 CEM I   | Limerick CEM I 52,5N |

The results of compressive strength testing (in accordance with BS EN 196-1) on a 70:30 blend of the CEM I with the Fly Ash were:

|                       |      |
|-----------------------|------|
| 2 Day Strength (MPa)  | 21.4 |
| 28 Day Strength (MPa) | 46.0 |

Based on equivalent results obtained for the last **12** months, the permitted proportions of combinations conforming to the requirements of Annex A of BS 8500-2 are:

| Strength Class of Combination | Fly Ash Content (%) |     |
|-------------------------------|---------------------|-----|
|                               | Min                 | Max |
| 32,5R                         | 14                  | 41  |
| 42,5N                         | 0                   | 24  |

| BS 8500-2 Combination Designation | Fly Ash Content (%) |     |
|-----------------------------------|---------------------|-----|
|                                   | Min                 | Max |
| CIIA-V                            | 6                   | 20  |
| CIIB-V                            | 21                  | 35  |

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**Conformity of Fly Ash to BS 8500-2: Annex A**

**Tudela EN 450-1 Fly Ash  
 0099-CPR-A95-0019**

Based on the **October 2018** monthly composite samples of:

| Constituent      | Source             |
|------------------|--------------------|
| EN 450-1 Fly Ash | Tudela             |
| EN 197-1 CEM I   | Platin CEM I 52,5N |

The results of compressive strength testing (in accordance with BS EN 196-1) on a 70:30 blend of the CEM I with the Fly Ash were:

|                       |      |
|-----------------------|------|
| 2 Day Strength (MPa)  | 21.4 |
| 28 Day Strength (MPa) | 45.3 |

Based on equivalent results obtained for the last **12** months, the permitted proportions of combinations conforming to the requirements of Annex A of BS 8500-2 are:

| Strength Class of Combination | Fly Ash Content (%) |     |
|-------------------------------|---------------------|-----|
|                               | Min                 | Max |
| 32,5R                         | 14                  | 40  |
| 42,5N                         | 0                   | 25  |

| BS 8500-2 Combination Designation | Fly Ash Content (%) |     |
|-----------------------------------|---------------------|-----|
|                                   | Min                 | Max |
| CIIA-V                            | 6                   | 20  |
| CIIB-V                            | 21                  | 35  |

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**Conformity of Fly Ash to BS 8500-2: Annex A**

**Tudela EN 450-1 Fly Ash  
 0099-CPR-A95-0019**

Based on the **October 2018** monthly composite samples of:

| Constituent      | Source            |
|------------------|-------------------|
| EN 450-1 Fly Ash | Tudela            |
| EN 197-1 CEM I   | Rugby CEM I 52,5N |

The results of compressive strength testing (in accordance with BS EN 196-1) on a 70:30 blend of the CEM I with the Fly Ash were:

|                       |      |
|-----------------------|------|
| 2 Day Strength (MPa)  | 21.4 |
| 28 Day Strength (MPa) | 47.1 |

Based on equivalent results obtained for the last **12** months, the permitted proportions of combinations conforming to the requirements of Annex A of BS 8500-2 are:

| Strength Class of Combination | Fly Ash Content (%) |     |
|-------------------------------|---------------------|-----|
|                               | Min                 | Max |
| 32,5R                         | 19                  | 40  |
| 42,5N                         | 0                   | 28  |

| BS 8500-2 Combination Designation | Fly Ash Content (%) |     |
|-----------------------------------|---------------------|-----|
|                                   | Min                 | Max |
| CIIA-V                            | 6                   | 20  |
| CIIB-V                            | 21                  | 35  |

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**Tudela EN 450-1 Fly Ash  
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Based on the **October 2018** monthly composite samples of:

| Constituent      | Source               |
|------------------|----------------------|
| EN 450-1 Fly Ash | Tudela               |
| EN 197-1 CEM I   | Tunstead CEM I 52,5N |

The results of compressive strength testing (in accordance with BS EN 196-1) on a 70:30 blend of the CEM I with the Fly Ash were:

|                       |      |
|-----------------------|------|
| 2 Day Strength (MPa)  | 18.2 |
| 28 Day Strength (MPa) | 44.2 |

Based on equivalent results obtained for the last **12** months, the permitted proportions of combinations conforming to the requirements of Annex A of BS 8500-2 are:

| Strength Class of Combination | Fly Ash Content (%) |     |
|-------------------------------|---------------------|-----|
|                               | Min                 | Max |
| 32,5R                         | 16                  | 41  |
| 42,5N                         | 0                   | 27  |

| BS 8500-2 Combination Designation | Fly Ash Content (%) |     |
|-----------------------------------|---------------------|-----|
|                                   | Min                 | Max |
| CIIA-V                            | 6                   | 20  |
| CIIB-V                            | 21                  | 35  |

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