

# Specification & Use of Alternative Low carbon - Green cement

## Government Policy

The Irish Government published the Green Public Procurement (GPP) Action Plan in January 2012. The legislative basis for Green Public Procurement was established by EU Directives 17 and 18 of 2004. The GPP Action Plan recommends the use of alternative low carbon cements.

The GPP Action Plan recommends the specification of low embodied energy construction materials as one option to reduce the environmental impact of construction. The Irish Concrete Standard I.S. EN 206, makes provision for the use of several alternative low carbon cements, as partial replacement of regular Portland cements (CEM I or CEM II/A) in concrete. These low carbon cement materials are **pulverised fly ash (PFA), and ground granulated blast furnace slag GGBS.**

**PFA** is a recycled by-product of coal powered electricity generation such as in ESB Moneypoint power station, County Clare, and AES power station, Kilroot, County Antrim which conforms to [BS EN 450-1:2012](#) Fly ash for concrete standard. **GGBS** is a recycled by-product from the iron industry. The raw material for GGBS is imported into Ireland from Europe, and then processed into low carbon cement..

In conforming to EU procurement principles the GPP Action Plan avoids being specific in favour any specific construction material or supplier. Specification of the type and quantity of alternative cements is left to the judgement of the specifying authority and technical requirements of the specific project.

Low carbon cement is specified by the National Roads Authority and the Office of Public Works on their capital projects. Low carbon cement has previously been specified by the Dublin Airport Authority, Railway Procurement Agency, Coillte, Bord Gais, ESB, Irish Rail and Local Authority projects.

## Sustainability

The typical CO<sub>2</sub> footprint of GGBS cement is 50 Kg/tonne as opposed to 700-800 Kg/tonne for regular (Portland) cement. Low carbon GGBS cement is whiter in colour with reduced artificial lighting required in underground car parks for example..

## Availability

PFA is available from electricity generation power stations in Moneypoint, Co. Clare and AES Corporation Kilroot, Co. Antrim. GGBS - Ground Granulated Blast Furnace Slag is imported through Dublin, Waterford and Belfast Ports and then is manufactured to I.S. EN 15167-1:2006. There is on average 550,000 tonnes of GGBS cement capacity available per annum on the Irish market.

## Value for Money

Low carbon cement is supplied to concrete suppliers nationwide, and mixed with ordinary Portland cement at a percentage depending on the project specification. The final concrete price is at the concrete supplier's discretion.

## Specification

Low carbon cement (GGBS or PFA) are mixed with (Portland) CEM I or CEM II cement. In Ireland under the concrete code I.S. EN 206 this mix rate can go up to 70% GGBS and up to 35% mix rate for PFA.

However a **50% GGBS / Portland cement mix is most commonly specified**. One consideration is that GGBS percentages greater than 50% (substructure) may require extended striking times, particularly in colder weather. Although the early strength of concrete (at 20°C) with up to 50% GGBS is slightly lower than concrete with Portland cement only, this should not be sufficient to affect formwork striking times or delay construction.

Specification Options for the use of GGBS cement in the ready-mix concrete (substructure and superstructure) and precast concrete include;

- a. "A cement combination comprising a minimum of **50% GGBS** and CEM I or CEM II/A (cement type) is to be used in all **substructure** concrete throughout the Project, unless otherwise specified on the drawings or by the Engineer"
- b. "A cement combination comprising a minimum of **40% GGBS** and CEM I or CEM II/A is to be used in all **superstructure** concrete throughout the Project, unless otherwise specified on the drawings or by the Engineer"
- c. A cement combination comprising a minimum of **35% GGBS** and CEM I or CEM II/A is to be used in power-floated floors at or above ground level throughout the project, unless otherwise specified by the Engineer on a project by project basis.
- d. "A cement combination comprising a minimum of **25% GGBS** and CEM I or CEM II/A is to be used in all **precast** concrete throughout the Project, unless otherwise specified on the drawings or by the Engineer"

Similar specification options for the use of PFA cement in the ready-mix concrete can equally be used, however the upper limit for PFA in concrete is a maximum of 35% mix rate.

## **Low Carbon Cement used in Healthcare Projects**

Some health projects which have previously used or plan to use low carbon cement blends are:

1. **Newbridge Primary Care Centre**, Co. Kildare. Approx 20-40% GGBS in concrete ready mix.
2. **Nenagh Hospital Co. Tipperary**. Approx 35% GGBS in concrete ready mix.
3. **Borrisokane Health Centre**, Co. Tipperary. Approx 35% GGBS in concrete ready mix.
4. **Thurles Hospital**, Co. Tipperary. Approx 35% GGBS in concrete ready mix.
5. **Clonbrusk Primary Care Centre**, Athlone Co. Westmeath. Approx 40% GGBS in concrete ready mix.
6. **St. James Hospital**, Project in Construction. Approx 66% GGBS insitu concrete piles.
7. **St Vincent Hospital 120 Bed Ward Block**. Approx 40% GGBS.
8. **Child & Adolescent Mental Health Centre**, Cherry Orchard Hospital Campus Dublin 10. Approx 40% GGBS.
9. **Ballyfermot Primary Care Centre**, located on the Cherry Orchard Hospital campus. Approx 40% GGBS.
10. **Inchicore Primary Care Health Centre**, Dublin 8. Approx 40% GGBS.
11. **Mater Hospital Campus Development** Approx 30% GGBS in aspects.
12. **St. Loman's Hospital** Mullingar, Co. Westmeath. Approx 20% GGBS.
13. **Kenmare Community Nursing 40 Bed Unit**.
14. **St Luke's Hospital, Kilkenny** Approx 30-50% GGBS is specified
15. **Other Capital Projects as specified by HSE....**