The New Zealand Ecolabelling Trust

Licence Criteria for

Portland Cement and Portland Cement Blends

EC-42-19

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Specification change history

Minor clarifications, corrections or technical changes made since the specification was last reviewed and issued in March 2019

Date	Version	Change

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1 Introduction

Environmental Choice New Zealand (ECNZ) is an environmental labelling programme which has been created to help businesses and consumers find products and services that ease the burden on the environment. The programme results from a New Zealand Government initiative and has been established to improve the quality of the environment by minimising the adverse and maximising the beneficial environmental impacts generated by the production, distribution, use and disposal of products, and the delivery of services. The programme is managed by the New Zealand Ecolabelling Trust (The Trust).

ECNZ operates to the ISO 14024:2018 standard "Environmental labels and declarations – Type I environmental labelling – Principles and procedures" and The Trust is a member of the Global Ecolabelling Network (GEN), an international network of national programmes also operating to the ISO 14024 standard.

ISO 14024 requires environmental labelling specifications to include criteria that are objective, attainable and verifiable. It requires that interested parties have an opportunity to participate and have their comments considered. It also requires that environmental criteria be set, based on an evaluation of the environmental impacts during the actual product or service life cycle, to differentiate products and services on the basis of preferable environmental performance.

The life cycle approach is used to identify and understand environmental issues (adverse or beneficial impacts) across the whole life of a product or service, within a defined product or service category. This information is evaluated to identify the most significant issues and from those to identify the issues on which it is possible to differentiate environmentally preferable products or services from others available in the New Zealand market. Criteria are then set on these significant and differentiating issues. These must be set in a form and at a level that does differentiate environmentally preferable products or services, is attainable by potential ECNZ licence applicants and is able to be measured and verified. As a result of this approach, criteria may not be included in an ECNZ specification on all aspects of the life cycle of a product or service. If stages of a product or service life cycle are found not to differentiate environmentally preferable products or services, or to have insufficient data available to allow objective benchmarking in New Zealand, those stages will not generally be included in criteria in the specification. For some issues (such as energy and waste), criteria may be set to require monitoring and reporting. These criteria are designed to generate information for future reviews of specifications.

The Trust is pleased to publish this revised specification for Portland Cement and Portland Cement Blends. The specification has been published to take account of substances and processes harmful to the environment, energy management, carbon dioxide emissions, and consumption of resources.

This revised specification sets out the requirements that Portland Cement and Portland Cement Blends products will be required to meet in order to be licensed to use the ECNZ Label. The requirements include environmental criteria and product characteristics. The specification also defines the testing and other means to be used to demonstrate and verify conformance with the environmental criteria and product characteristics.

This revised specification has been prepared based on an overview level life cycle assessment, information from specifications for similar products from other GEN-member labelling programmes, relevant information from other ECNZ specifications, publicly available information, and information provided by current licensees.

This specification is valid for a period of five years. Twelve months before the expiry date (or at an earlier date if required), The Trust will initiate a further review process for the specification.

2 Background[1]

Cement manufacture can potentially place a significant burden on the environment. The most significant potential impacts on the environment are related to quarrying raw materials and discharges to air from kilns (products of combustion including particulates, sulphur dioxide and nitrogen dioxide). The manufacture of cement also uses significant quantities of energy and is a significant industrial source of carbon dioxide emissions. In New Zealand, there is currently one manufacturer of clinker and cement, and two main importers of finished cement and one importer of clinker.

The raw material primarily used in the manufacture of cement is limestone which is quarried. Limestone is a non-renewable resource. Potential impacts from quarrying include wastewater and surface water discharges which can increase the pH and suspended solids in receiving waters. The processing and extraction of limestone can generate dust, noise and vibration which can adversely impact on the amenity of surrounding areas. The quarrying is undertaken using open cast quarries, which has the potential to reduce the biodiversity of the immediate area of the quarry with fauna and flora removal.

The cement industry is a large contributor to global carbon dioxide emissions (around 7%) and is the third largest industrial energy consumer globally. There is ongoing research into how the cement industry can transition into being a more sustainable industry, particularly given its importance to infrastructure globally and that the demand for cement is set to continue to increase in most parts of the world.

The World Business Council for Sustainable Development (WBCSD) 2018 Technology Roadmap Low-Carbon Transition in the Cement Industry[2] is strongly focused on the United Nations' 2030 Agenda for Sustainable Development; this includes the carbon dioxide emissions trajectory and limiting the average global temperature increase by 2100 to 2°C. Part of this research has involved the development of the "Getting the Numbers Right" system (GNR) – a global, verified information database to keep track of carbon dioxide and energy performance information from individual cement plants that are under the Cement Sustainability Initiative (CSI) and some non-CSI cement plants in Europe. The WBCSD intends that this information will be used to identify factors impacting emissions and to use this to further develop climate mitigation strategies.

Most research by the CSI has focused on finding ways the cement manufacture process can be changed or adapted to minimise emissions, and on moving towards adopting a whole life-cycle approach so that the carbon emission reduction extends beyond manufacture into optimising the use of concrete in construction. The key carbon-mitigating outcomes from the CSI research are the integration of emerging technologies such as carbon capture and storage / utilisation, reducing clinker content (to a ratio of 0.60 by 2050), use of lower-carbon (alternative) fuels, and improving energy efficiency. Implementing these measures can also lead to an increase in energy demand - for example:

[1] Most of the information in this section is based on research by the WBCSD Cement Sustainability Initiative: "Technology Roadmap – Low-Carbon Transition in the Cement Industry", International Energy Agency and WBCSD Cement Sustainability Initiative, March 2018

- the implementation of carbon capture equipment in cement plants currently leads to increased electricity demands and thermal energy use;
- the use of alternative fuels often requires greater specific thermal energy and electricity because of the higher moisture content of these alternative fuels compared with fossil fuels;
- reducing the clinker to cement ratio can reduce the total carbon dioxide emissions but can also increase energy demands; for example, due to the need to calcine raw clays that are used as cement constituents.

Coal is still the most widely used fuel in cement plants, representing 70% of the global cement thermal energy consumption. Oil and natural gas contribute 24% jointly, and biomass and waste contribute around 5%. Alternative fuels that can be used in cement kilns include waste products (some totally or partially biogenic in nature) such as end-of-life tyres, waste oils and solvents; pre-processed or raw industrial waste including lime sludge from paper; non-recyclable plastics; textiles and paper residues; fuels derived from municipal solid waste; and fuels based entirely on biomass which include waste wood, sawdust and sewage sludge. There is also the possibility in the future of using fast-growing cultivated species such as certain wood, grass and algae. These are already possible but this is not currently a globally economical option for the cement industry.

While cement kilns could use up to 100% alternative fuels, the physical and chemical properties of most alternative fuels are significantly different to those of conventional fuels and this means there are a number of limitations to their use. Using waste as an alternative fuel would require a Government–Industry collaboration to develop legislation to support this in New Zealand. The availability, nature and use of alternative fuels, including biomass and waste, varies greatly across regions and countries.

Current approaches in countries that are using alternative fuels have been to set emission limits and prevent landfilling of wastes, rather than restricting the characteristics of the alternative fuels being used. This allows operators to meet local legislation using a fuel combination that is still cost-competitive for the operators. Controlled waste collection, treatment and processing is critical to ensure quality control of alternative fuels to avoid added emissions, such as hazardous pollutants.

Based on a review of currently available information, the following product category requirements will produce environmental benefits by encouraging more sustainable sourcing of raw materials, reducing discharges of carbon dioxide to the atmosphere, and ensuring discharges to the environment are appropriately managed to ensure adverse impacts on the environment are minimised. As information and technology change, product category requirements will be reviewed, updated and possibly amended.

3 Interpretation

Alternative fuel (AF) means fuel that is not derived from conventional fossil fuel sources such as coal, natural gas or unused fuel oil**.** AFs serve as a substitute for conventional fossil fuels and may be biomass AF or fossil AF.

Biomass AF means alternative fuels containing biomass such as waste wood, sewage sludge and municipal waste.

Clinker means the calcinated material that has been passed through the kiln.

CO_{2e} is a quantity that describes, for a given mixture and amount of greenhouse gas, the amount of CO_2 that would have the same global warming potential (GWP), when measured over a specified timescale (generally, 100 years).

Energy Management Programme means a programme to achieve and sustain efficient and effective use of energy including policies, practices, planning activities, responsibilities and resources that affect the organisation's performance for achieving the objectives and targets of its Energy Policy.

Fossil AF means alternative fuel derived from fossil fuels, such as waste tyres and used or waste oil.

GEN means the Global Ecolabelling Network.

Kiln material means any material that is part of the final cement product and passes through the kiln.

Label means the Environmental Choice New Zealand Label.

Non-kiln material means material that is added to the final cement product but does not pass through the kiln.

NO_x is a joint chemical abbreviation for nitrogen oxides (NO, N_2O and NO_2). In this document NO_x means total NO and NO_2 measured as NO_2 equivalents.

pH is a scale of numbers indicating how acidic or alkaline a substance is. A pH of 7 is neutral, higher pH values are progressively more alkaline and lower pH values are progressively more acidic.

Product means the final product including all blending and processing.

Raw material means a material used in the manufacture of cement.

Where references are made in this document to published lists, standards, or documents, the reference should be read as referring to the most recent edition of these lists, standards or documents.

4 Category definition

This category includes Portland cement and inter-ground or blended mixtures of Portland cement with other materials, which may include fly ash, slag or naturally occurring pozzolanic materials.

To be licensed to use the Label, the cement product must meet all of the environmental criteria set out in clause 5 and product characteristics set out in clause 6.

5 Environmental criteria

5.1 Legal requirements

Criteria

The licence applicant/holder must demonstrate how applicable legal requirements are met, including that all necessary consents and permits are in place.

Verification required

Conformance with this requirement shall be demonstrated by providing a written statement on regulatory compliance, signed by the Chief Executive Officer or other authorised representative of the licence applicant/holder. This statement shall be supported by documentation identifying the applicable regulatory requirements and demonstrating how compliance is monitored and maintained.

Explanatory notes

Relevant laws and regulations could, for example, include those that relate to:

- Producing, sourcing, transporting, handling and storing raw materials and components for manufacture;
- Manufacturing processes;
- Handling, transporting and disposing of waste products arising from manufacturing;
- Transporting product within and between countries; and
- Using and disposing of the product.

The documentation required may include, as appropriate:

- Procedures for approving and monitoring suppliers and supplies; and
- Information provided to customers and contractors regarding regulatory requirements.

Assurance and/or information that licence applicants/holders may require from their suppliers could include:

- Evidence of a formal certified environmental management system (for example an ISO 14001 certificate) and supporting records on regulatory compliance (for example, copies of regulatory requirements registers, procedures to manage regulatory compliance, monitoring and evaluation reports on regulatory compliance, internal or external audits covering regulatory compliance and management review records covering regulatory compliance)
- Copies of published environmental, sustainability and/or annual reports expressly addressing environmental regulatory compliance (for example verified environmental statements prepared under the European EMAS regulations)
- Audit reports completed by independent and competent auditors addressing regulatory compliance (for example, reports for other ecolabel licences or reports from regulator audits)
- Participation by the supplier in the licence applicant's/holder's own supplier audit programme.

It is not intended to require licence holders to accept increased legal responsibility or liability for actions that are outside their control. The Trust's intention is to ensure any potential for environmental regulatory non-compliance associated with an ECNZ labelled product is managed to a level that minimises risk of reputation damage to the ECNZ label and programme.

5.2 Raw Materials

5.2.1 Quarried materials

Criteria

Quarries from which materials are obtained for an Environmental Choice licensed cement must have and implement:

a Management plans including any policies and management procedures to minimise adverse effects from the following potential impacts:
- Noise;
- Vibration;
- Dust; and
- Discharges to surface water, groundwater, oceans or land.

b A quarry restoration plan (excluding authorised extraction of alluvial gravel from the active river bed where restoration on the completion of mining activities is not required).

Verification required

Conformance with these requirements shall be stated in writing and signed by the Chief Executive or authorised representative of the applicant company. This statement shall be supported by documentation, including:

- Copies of the relevant management plans;
- Records demonstrating the management plans are being effectively implemented (including monitoring results).

Note: If the quarry is attached to the cement plant, combined management plans may be prepared and implemented to meet these requirements and the requirements in criteria 5.6 and 5.7.

5.2.2 Kiln fuel supply

Criteria

a Fuel used within the kiln shall consist of a minimum of 10% alternative fuels on an annual basis;

b Licence holders must have and implement a formal process to increase the use of alternative fuels used within the cement kiln; and

c Licence holders must report annually to Environmental Choice New Zealand on the volume of alternative fuels used, including:
- Percentage of alternative fuels used annually;

- Results of any chemical analysis for contaminants undertaken on any alternative fuels used, or determined to be inappropriate.

NOTE: the specification does not require the testing of alternative fuels used for contaminants. However, if any testing is undertaken either voluntarily or as a requirement of a resource consent or permit, then the results are to be reported to The Trust.

Verification Required

Conformance with these requirements shall be stated in writing and signed by the Chief Executive Officer or other authorised representative of the applicant company. This statement shall be supported by documentation detailing the annual composition of the fuel supply for the kilns and demonstrating the 10% limit is met and records of any testing completed.

5.3 Kiln emissions

Criteria

a Air emissions from the kiln shall not exceed the following limits:

Pollutant	Maximum Allowable Concentration (kg/tonne of clinker)
Particulate Matter (total)	0.046
NO_x (as NO_2)	2.4
SO_2	1.38

Source: Table 1.24 of IPPC BREFT Cement and Lime Manufacturing Industries Draft September 2007

b Discharges to air from the kiln shall be demonstrated to result in an acceptable and environmentally sustainable level of impact on the quality of the receiving environment.

Verification Required

Conformance with these requirements shall be demonstrated by providing a written statement on compliance, signed by the Chief Executive Officer or other authorised representative of the applicant company. The statement shall be supported by the following:

- Continuous or discontinuous (no less than annually) stack emission monitoring for particulate, NO_x and SO_2 undertaken in accordance with the relevant ISO, USEPA or ASTM test methods and calculations of the pollutant concentrations to demonstrate compliance with (a).
- Where discontinuous monitoring is undertaken, supporting information shall be presented to justify the frequency and intensity of monitoring. The justification should include consideration of:
  - The potential for adverse environmental effects
  - The variability in the emission rate (for example, a lesser frequency may be justified by a period of continuous monitoring showing that emissions are stable and predictable)
  - The amount of data available to characterise the emissions (for example, a lesser frequency may be justified by an extensive history of stack testing results)
  - Any process changes or changes to raw materials or fuels that may affect the level of emissions and therefore warrant more frequent monitoring

- An independent assessment of discharges to air identified in (b) and the impact on the receiving environment completed by a person or agency competent to complete such an assessment. An assessment of environmental effects and other supporting information lodged in support of a resource consent application would be deemed to meet this criterion.

5.4 Point discharges to air (non-kiln)

Criteria

Air emissions shall not exceed the following limits:

Pollutant	Units	Maximum Allowable Concentration
Particulate Matter	mg/Nm^3	50

Verification Required

Conformance with this requirement shall be stated in writing and signed by the Chief Executive Officer or other authorised representative of the applicant company. This statement shall be accompanied by stack emissions testing results undertaken in accordance with the relevant ISO, USEPA or ASTM test methods to demonstrate compliance with the above limits.

Sites shall make available for inspection, if required, a copy of the sites' preventative maintenance plan for all air emission control equipment.

5.5 Carbon dioxide

Criteria

The production of cement shall have a maximum emission rate of 940 kg CO_{2e} per tonne of clinker manufactured. This shall exclude indirect CO_2 emissions, such as from electricity generation, mobile equipment and transport and CO_2 emissions from carbon neutral biomass AF.

Verification Required

Conformance with this requirement shall be stated in writing and signed by the Chief Executive Officer or other authorised representative of the applicant company. This statement shall be accompanied by documentation including either:

- Stack emissions testing results undertaken in accordance with the relevant ISO, USEPA or ASTM test methods to demonstrate compliance; or
- Calculations of carbon dioxide emissions per tonne of clinker manufactured.

Where the applicant elects to demonstrate compliance with criterion 5.5 by presenting calculations, the calculations shall be in accordance with the methodology set out in Appendix A.

Note: Where applicable, the calculated CO_{2e} emissions from woodwaste or other biomass AF (excluding municipal waste) shall be reported, but are not included in the total CO_{2e} emissions per tonne of product manufactured.

5.6 Dust Management Plan

Criteria

The cement product manufacturer must have and implement a dust management plan covering all areas of the operation including haul roads, cement plant and associated activities including quarries.

Verification Required

Conformance with these requirements shall be stated in writing and signed by the Chief Executive or authorised representative of the applicant company.

The company shall make available for inspection, if required, documentation, including a copy of the site dust management plan and records to show it is being effectively implemented.

5.7 Discharge of contaminants to natural water bodies and land

Criteria

a Discharges to the natural environment after reasonable mixing (natural water bodies, ocean) shall not exceed the following criteria:

Pollutant	Allowable Range
pH	6-9

And

b Discharges of contaminants to the natural environment (natural water bodies, ocean or land) shall be demonstrated to result in acceptable and environmentally sustainable level of impact on the quality of the receiving environment.

c The cement product manufacture must have and implement a management plan for discharges to surface water, groundwater, oceans or land.

Verification Required

Conformance with these requirements in shall be demonstrated by providing a written statement on compliance, signed by the Chief Executive Officer or other authorised representative of the applicant company.

The company shall make available for inspection, if required, documentation, including:

- Test results demonstrating that the above criterion (a) is being met; and
- An independent assessment of the discharge quality and its impact on the receiving environment completed by a person or agency competent to complete such an assessment. The assessment may be based on the quality of discharge from the point at which the discharge from the site or any relevant combined or municipal waste collection and treatment system discharges to the natural environment; or from the plant in situations where the plant discharge is mixed with other organisations waste streams and the combined waste stream

and its treatment before it is discharged to the natural environment is outside the control of the plant or licence applicant and suitable information is not available on the quality of the combined discharge.

- Copies of the relevant management plans and records demonstrating the management plans are being effectively implemented (including monitoring results).

5.8 Energy Management

Criteria

a The production of cement shall have a maximum thermal energy use for the kiln of 3800 MJ/tonne of clinker as an annual average (including start-ups and shut-downs).

b The cement manufacturer must have effective energy management policies and procedures and/or an energy management programme.

c Licence holders must report annually to Environmental Choice New Zealand on energy management, including:

- Total energy use including fuel used for delivery vehicles;
- Breakdown of total energy use to types of energy used;
- Energy use related to production;
- Initiatives taken to reduce energy use and improve energy efficiency; and
- Initiatives taken to calculate and reduce CO_2 emissions associated with energy use;
- Carbon dioxide emissions associated with clinker production.

Verification Required

Conformance with this requirement shall be stated in writing and signed by the Chief Executive Officer or other authorised representative of the applicant company. This statement shall be accompanied by documentation that:

- Describes the energy management policies, procedures and programmes; and
- Includes annual reports on energy use and management.

Where the licence holder cannot meet the criterion in (a) due to the use of alternative fuels, the licence holder must demonstrate that the criterion would be able to be met if standard fuels (e.g. coal) were used for the fuel component above the minimum requirements in 5.2.2 a) for use of alternative fuels.

5.9 Waste Management

Criteria

a The cement product manufacturer must have effective waste management policies and procedures and/or a waste management programme covering manufacturing operations; and

b Licence holders must report annually to Environmental Choice New Zealand on waste management, including:

- Quantities and types of waste recovered for reuse internally and externally;

- Quantities and types of waste recycled internally and externally;
- Quantities and types of waste disposed of to landfill;
- Information on disposal locations for all wastes; and
- Initiatives taken to reduce waste generation and improve recovery/recycling of waste.

Verification Required

Conformance with this requirement shall be stated in writing and signed by the Chief Executive Officer or other authorised representative of the applicant company. This statement shall be accompanied by documentation that:

- Describes the waste management policies, procedures and programmes; and
- Includes annual reports to The Trust on waste generation and management.

5.10 Storage of Raw Materials

Criteria

The cement manufacturer must have effective management policies, procedures and systems covering the appropriate storage and handling of raw materials including fuels and limestone. These procedures shall:

a Ensure any storage of environmentally hazardous substances is located and managed to prevent contamination of surface water or land, (including ensuring potentially hazardous liquids are bunded);

b Include a Spill Response Plan detailing procedures to identify, contain and clean-up any spill of potentially hazardous substances.

Verification Required

Conformance with these requirements shall be stated in writing and signed by the Chief Executive or authorised representative of the applicant company.

The company shall make available for inspection, if required, documentation, including details of the location and type of storage facilities on site and the materials stored in each and a copy of the Spill Response Plan.

6 Product characteristics

Criteria

The product shall be fit for its intended use and conform, as appropriate, to relevant product performance standards.

Verification required

Conformance with this requirement shall be demonstrated by providing a written statement of compliance, signed by the Chief Executive Officer or other authorised representative of the applicant company.

The company shall make available for inspection, if required, documentation, including:

- Identifying the applicable standards, specifications and or consumer/customer requirements;
- Demonstrating how compliance is monitored and maintained (including quality control and assurance procedures);
- Records of customer feedback and complaints.

7 Requirements and notes for Licence Holders

Monitoring compliance

Prior to granting a licence, The Trust will prepare a plan for monitoring ongoing compliance with these requirements. This plan will reflect the number and type of products covered by the licence and the level of sampling appropriate to provide confidence in ongoing compliance with criteria. This plan will be discussed with the licence applicant and when agreed will be a condition of the licence.

As part of the plan, The Trust will require access to relevant quality control and production records and the right of access to production facilities. Relevant records may include formal quality management or environmental management system documentation (for example, ISO 9001 or ISO 14001 or similar).

The monitoring plan will require the licence holder to advise The Trust immediately of any noncompliance with any requirements of this specification which may occur during the term of the licence. If non-compliance occurs, the licence may be suspended or terminated as stipulated in the Licence Conditions. The licensee may appeal any such suspension.

The Trust will maintain the confidentiality of identified confidential information provided and accessed during verification and monitoring of licences.

Using the ECNZ Label

The Label may appear on the wholesale and retail packaging for the product, provided that the product meets the requirements in this specification and in the Licence Conditions.

Wherever it appears, the Label must be accompanied by the words “Cement” and by the Licence Number eg ‘licence No1234’.

The Label must be reproduced in accordance with the ECNZ programme’s keyline art for reproduction of the Label and the Licence Conditions.

Any advertising must conform to the relevant requirements in this specification, in the Licence Conditions and in the keyline art.

Failure to meet these requirements for using the ECNZ Label and advertising could result in the Licence being withdrawn.

Appendix A: Method of calculating CO_2 emissions per tonne of product manufactured

Note: This methodology has been drawn from the New Zealand Climate Change Regulations and the CO_2 Accounting and Reporting Standard for the Cement Industry (June 2005).

In cement plants, direct CO_2 emissions result from the following sources (excluding CO_2 from mobile equipment and transport)[2]:

- Calcination of carbonates contained in raw materials
- Combustion of organic carbon contained in raw materials;
- Combustion of conventional fossil kiln fuels;
- Combustion of alternative fossil kiln fuels (also called fossil AF or fossil wastes);
- Combustion of biomass kiln fuels (including biomass wastes);
- Combustion of the carbon contained in wastewater.

For the purposes of this specification, CO_2 produced from the combustion of wastewater is not included in the calculation as it represents a very small contribution to total CO_2 emissions. Therefore the total CO_2 emissions per tonne of product manufactured (TE) is calculated using the following equation:

$TE = (TE_{calcination} + TE_{organic\ carbon} + TE_{fuel\ combustion})$ / tonnes of cement produced for the year

where—

- $TE_{calcination}$ is the total emissions from calcination of raw materials for the year in tonnes
- $TE_{organic\ carbon}$ is the total emissions from combustion of organic carbon in raw materials for the year in tonnes.
- $TE_{fuel\ combustion}$ is the total emissions from the combustion of fuel for the year in tonnes.

a Method of calculating annual CO_2 emissions from calcination of raw materials

Calcination is the release of CO_2 from carbonates in the raw materials. Calcination CO_2 is directly linked with clinker production. In addition, calcination of cement kiln dust and bypass dust can be a relevant source of CO_2 where such dust leaves the kiln system for direct sale, addition to cement, or is disposed as a waste.

Emissions in relation to calcination of raw materials are calculated in accordance with the following formula:

$TE_{calcination} = (A \times 0.7848\ t\ CO_{2e} / t) + (B \times 1.0919\ t\ CO_{2e} / t) + (C \times 0.7848\ t\ CO_{2e} / t)$

where—

- A is the total number of tonnes of calcium oxide in clinker produced in the year
- B is the total number of tonnes of magnesium oxide in clinker or burnt lime produced in the year (see Note 1).

[2] CO_2 Accounting and Reporting Standard for the Cement Industry, World Business Council for Sustainable Development, June 2005

- C is the total number of tonnes of calcium oxide and magnesium oxide in cement kiln dust or lime kiln dust (i.e. the calcined proportion of the dust) produced by the person in the year, excluding any dust that is recycled into cement or lime.

Note 1: Magnesium, in various mineral forms, is likely to be present as an impurity in the limestone used for clinker and lime production. If less than 5% MgO is present due to impurities then this can be calculated as CaO. If more than 5 per cent of MgO is present due to impurities, or if magnesium is added in the form of dolomite or other inputs, it must be included in the calculation as MgO.

b **Method of calculating annual CO_2 emissions from combustion of organic carbon**

Organic carbon in the raw materials is a source of CO_2 emissions from the kiln. The CO_2 Reporting and Accounting Standard states that a typical value for Total Organic Carbon (TOC) in kiln raw materials is about 0.1 to 0.3 % (dry weight). This corresponds to CO_2 emissions of about 10 kg/t clinker, representing about 1% of the typical combined CO_2 emissions from raw material calcination and kiln fuel combustion. For this reason, CO_2 emissions from combustion of organic carbon will only be significant if a large quantity of raw material containing appreciable TOC, such as a large quantity of fly ash, is used in the kiln.

For the purposes of demonstrating compliance with criteria 5.5 of this specification, CO_2 emissions from combustion of organic carbon only needs to be calculated if the combined TOC content in the raw materials is greater than 0.5 % (dry weight). Therefore the applicant should either:

a Provide information to demonstrate that the combined TOC content in the raw materials is less than 0.5 % (dry weight); or

b Calculate the annual CO_2 emissions from combustion of organic carbon in the raw materials using the following equation:

$TE_{organic\ carbon} = D \times 3.6641\ t\ CO_{2e} / t\ C$

where—

- D is the total number of tonnes of TOC in the raw material to the kiln for the year

c **Method of calculating CO_2 emissions from burning fuel**

Fuels that may be used in cement kilns include:

- Conventional kiln fuels
- Alternative fossil fuels (fossil AF)
- Biomass fuels (biomass AF)

Emissions in relation to combustion of fuels in the kiln are calculated in accordance with the following formula:

$TE_{fuel\ combustion} = (E_1 \times CV_1 \times EF_1) + (E_2 \times CV_2 \times EF_2) + \ldots$

where—

- E_{1-x} is the total number of tonnes (or cubic metres) of the class of fuel used in the year
- CV_{1-x} is the weighted average calorific value (expressed in units of TJ per tonne (or cubic metre)) of the class of fuel
- EF_{1-x} is the emission factor (expressed in units of t CO_{2e} / TJ) for the class of fuel (see Note 2).

Note 2: There are various sources of emission factors for fuels. The source (reference) for the emission factors selected should be stated. Where possible, these emission factors should be based on country-specific emission factors for the country of cement manufacture. In New Zealand, the

most appropriate source of emission factors is Schedule 2 of the Climate Change (Stationary Energy and Industrial Processes) Regulations 2009. Where country-specific emission factors are not available, the IPCC 2006[3] default emission factors for stationary combustion in the energy industries may be used.

Note 3: CO_{2e} emissions from biomass AF, with the exception of municipal waste, are to be reported as a separate item CO_{2e} and are not included in $TE_{\text{fuel combustion}}$. The default emission factor for CO_{2e} emissions from solid biomass is 110 kg CO_2/ GJ.

[3] 2006 IPCC Guidelines for National Greenhouse Gas Inventories