ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Holcim Bulgaria
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	IBU-CEI-HOL-2203120-BG2024001424-ISUE002-EN
Issue date	23/08/2024
Valid to	24/08/2026

Production of STRENTOR CR at Beli Izvor plant, Bulk
hydraulic road binder

Holcim Bulgaria

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1. General Information

Holcim Bulgaria	STRENTOR CR
Programme holder IBU - Institut Bauen und Umwelt e.V. Hegelplatz 1 10117 Berlin Germany	**Owner of the declaration** Holcim Bulgaria Village of Beli Izvor 3040 Vratsa Bulgaria
Declaration number IBU-CEI-HOL-2203120-BG2024001424-ISUE002-EN	**Declared Product / Declared Unit** Cement / 1000 kg
This declaration is based on the product category rules: Cement, 08/2024 (PCR checked and approved by the SRV)	**Scope:** This environmental product declaration shows the life cycle assessment of the production of STRENTOR CR at the Beli Izvor plant of Holcim Bulgaria. The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences. The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard is simple referred to as *EN 15804.* The EPD was calculated with the pre-verified software CarbonCLARITY™ EN 15804 EPD Generator – Cement of Climate Earth.
Issue date 23/08/2024	
Valid to 24/08/2026	**Verification** The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data accroding to *ISO 14025:2011* ☐ intern ☒ extern
Hans Peters (Chairman Institut Bauen und Umwelt e.V.)	
Florian Pronold (Managing Director Institut Bauen und Umwelt e.V.)	Matthias Schulz (Independent verifier)

2. Product

2.1 Product description/Product definition
STRENTOR CR is a hydraulic road binder.
This hydraulic road binder is a factory-made hydraulic binder that is supplied ready for use and has properties particularly suitable for the treatment of materials for base courses, subbases and surface courses, as well as for earthworks and types of infrastructure construction. It consists of a mixture of finely ground, non-metallic, inorganic components. After adding water to the hydraulic road binder, a suspension (cement paste) is formed, which solidifies and hardens both in air and under water due to the onset of a hydration reaction and remains permanently solid. The composition of the product as well as its production and monitoring comply with the specifications of the National Technical Approval BTO 19.2C, 09.12.2024 - Hydraulic Road Binders 'STRENTOR' and 'STRENTOR CR'.

For the use and application of the product the respective national provisions at the place of use apply.

2.2 Application
STRENTOR CR is used as a binder for the production of hydraulically bound base layers.

2.3 Technical Data

STRENTOR CR has performance requirements that differ for different applications (cold recycling or soil stabilisation). The equivalent strength class the cement has according to EN 13282-1 is E 2.

Constructional Data

Name	Value	Unit
Strength class acc. to EN 13282-1	12.5	N/mm^2

Performance values of the product correspond to the performance declaration in relation to the National Technical Assessment BTO 19.2C, 09.12.2024 - Hydraulic Road Binders 'STRENTOR' and 'STRENTOR CR'.

2.4 Delivery status

STRENTOR CR is delivered in bulk.

2.5 Base materials/Ancilliary materials

Portland cement clinker (ca. 30-40 %)

Cement clinker is made from a mixture of raw materials that is heated in a kiln at a temperature of over 1400°C until it is sintered. The starting materials for the production of cement clinker must mainly contain calcium oxide (CaO) and silicon dioxide (SiO2) as well as small amounts of oxides of aluminum (Al2O3) and iron (Fe2O3). Rocks that provide these compounds are limestone, marl and clay or their naturally occurring mixture.

Limestone (ca. 30-50 %)

Minor constituents (ca. 15-35 %) + Gypsum / Anhydrite

Minor components are specially selected, inorganic, natural mineral substances, inorganic mineral substances from clinker production or main cement components, unless the latter are already contained as the main component in the cement. Secondary components can either be inert or have hydraulic, latently hydraulic or pozzolanic properties. Gypsum is also added to the binder as setting regulators.

This product contains substances listed in the candidate list (date: 23/08/2024) exceeding 0.1 percentage by mass: no

This product contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: no

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no

2.6 Manufacture

STRENTOR CR is manufactured at the Beli Izvor plant.

Production of Portland cement clinker

Limestone, marl, clay or their natural mixture, are required for the production of Portland cement clinker. These starting materials are mined in quarries, pre-crushed and transported to the nearby cement works. There they are homogenized into an intermediate product, with additional natural or secondary corrective substances being added to fine-tune the chemical composition. In the subsequent heating process, the Portland cement clinker is produced from the intermediate product. The firing process takes place in a rotary kiln, where the material is thermally converted at around 1450 °C and then rapidly cooled. The finished clinker is stored in silos.

Extraction of limestone

The limestone is extracted from natural deposits in opencast quarries.

Cement Production

To produce the ready-to-sell cement STRENTOR CR, the cement components are finely ground and combined. A sulfate carrier is added to control the setting behavior.

Note: dashed lines indicate production steps that do not necessarily apply to this cement

2.7 Environment and health during manufacturing

The operation of the Beli Izvor plant is subject to the provisions of the Environmental protection law, in particular *Directive 2008/1/EC* on industrial pollution, prevention and control, *Regulation No 6/1999* on continuous emission monitoring, *Regulation No 1/2007* on water monitoring, *Regulation No 4/2013* on incineration and coprocessing of waste, *Regulation No 54/2010* on noise emission monitoring, and *Ordinance No 13/2003* on the protection of workers from risks related to exposure to chemical agents at work. In addition, measures are taken to protect workers from potential exposure to respirable crystalline silica dust in accordance with the European social agreement *Negotiation Platform on Silica* (NEPSI).

An environmental management system according to *ISO 14001* is implemented in the plant.

2.8 Product processing/Installation

General

Mixing cement and water creates the cement paste, which encases the individual grains of the aggregate in concrete or mortar and binds them together firmly as it hardens. The cement paste, which is liquid after the addition of water, turns into the solid cement paste. Today, fresh concrete is produced almost exclusively in ready-mixed concrete plants, on large construction sites or in precast plants in medium-sized and large mixing plants.

Environment and health during product processing

The dust particles of the product can irritate the eyes and respiratory system.

If the product comes into contact with water or if the product gets wet, an alkaline solution will be formed which may cause skin and eye irritation.

The abrasiveness of the aggregate in concrete and mortar can also support skin irritation. Water-soluble chromate may develop allergic chromate dermatitis with prolonged contact.

Further details are available in the product's material safety data sheet.

2.9 Packaging
No packaging material is used as the product is delivered in bulk.

2.10 Condition of use
Not relevant for STRENTOR CR.

2.11 Environment and health during use
Not relevant for STRENTOR CR.

2.12 Reference service life
Not relevant for STRENTOR CR.

2.13 Extraordinary Effects

Fire
STRENTOR CR is neither flammable nor explosive. The product is classified in Class A1 according to *EN 13501-1*.

Water
When cement reacts with water, the so-called hydrate phases arise, which causes the cement paste to solidify and harden to form cement paste. If larger amounts of cement are accidentally released into bodies of water, the pH value in the body of water can increase.

Water hazard class: slightly hazardous to water.

Mechanical destruction
Not relevant for STRENTOR CR.

2.14 Re-use phase
Not relevant for STRENTOR CR.

2.15 Disposal
If STRENTOR CR has to be disposed of, it should be hardened with water and disposed off in accordance with local regulations.

Waste code according to Waste Catalogue Ordinance (*WCO*): depending on the origin 170101 (concrete) or 101314 (concrete waste and concrete slurry).

2.16 Further information
For more information: https://www.holcim.bg/bg.

3. LCA: Rules of calculation

3.1 Declared unit
The declared unit is 1000 kg.

Declared unit

Name	Value	Unit
Declared unit	1000	kg
Conversion factor to 1 kg	0.001	-

3.2 System boundary
Type of EPD: cradle-to-factory gate

The system boundaries include the manufacture of STRENTOR CR including the extraction of raw materials through to the finished product at the factory gate. The product stage includes:

Module A1: Extraction and processing of raw materials

Module A2: Transport of raw materials to the factory gate and internal transport

Module A3: Manufacture of final product

The construction stage, the use stage and the disposal stage are not taken into account in the life cycle assessment for the final product.

3.3 Estimates and assumptions
No estimates or assumptions were made that would be relevant for the interpretation of the life cycle assessment results.

3.4 Cut-off criteria
The flows not taken into account are less than 0.01% of the total incoming mass of each elementary process and in total for module A1-A3.

3.5 Background data
The data on which the life cycle assessment is based comes from data collection at the Beli Izvor plant. Information on the use of material and energy resources as well as transport distances was provided by Holcim Bulgaria.

The emission data used in the life cycle assessment of clinker production are based on the legally prescribed emission measurements on rotary kilns of Holcim Bulgaria for the period 01/01/2022 to 31/12/2022. Gaps in kiln emission reporting were filled with proxy data from generic clinker profiles of the Ecoinvent database.

The CarbonCLARITY™ EN 15804 EPD Generator – Cement, version 1.2.0 dated 07/11/2022 with the configuration file dated 18/06/2024 was used for the life cycle assessment. The calculation used the Ecoinvent database v3.8.

3.6 Data quality
The data basis for this EPD is the continuous data acquisition in the Beli Izvor plant.
The data was collected for the calendar year 01/01/2022 to 31/12/2022 by Holcim Bulgaria and checked for plausibility by Climate Earth. The data quality can be rated as very good. Any gaps in the collected data were filled in with conservative proxy data.

The background datasets are on average less than 5 years old and their quality is rated as good or very good.

3.7 Period under review
Data from the period 01/01/2022 to 31/12/2022 were used for the life cycle assessment of STRENTOR CR.

3.8 Geographic Representativeness
Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Bulgaria.

3.9 Allocation
There are no co-products at the Beli Izvor plant and therefore all environmental impacts are allocated to the final product.

Kiln dust or bypass dust can be co-produced during clinker production. The sum of the inputs and outputs of this production process are assigned to the clinker.

The materials resulting from reuse, recycling or recovery in the context of the manufacture of cements are:

- Alternative fuels
- Alternative raw materials

Cementitious products such as fly ash, slag, or silica fume are considered co-products and economic allocation is used. Exemption is applied to any material with a waste status following verification of the waste code.

The alternative fuels used for production are classified as either secondary fuels or waste. Emissions from secondary fuels are included in the environmental impact assessment results, while emissions from the incineration of waste are reported as additional information according to the IBU Cement PCR. The waste status of the fuels concerned was verified using the waste key number. The exclusion of environmental impacts from the incineration of combustible waste was only applied to CO2 emissions, as other emissions (e.g. NOx, SOx, etc.) could not be easily distinguished from different fuel types.

3.10 Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

The Ecoinvent background database is used (version 3.8).

4. LCA: Scenarios and additional technical information

The development of scenarios must be based on the end product (e.g. concrete) and not on the preliminary product STRENTOR CR.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	0	kg C
Biogenic carbon content in accompanying packaging	0	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

Module A3: Manufacturing
The carbon intensity of the electricity used in manufacturing is 0.61 kgCO2eq./kWh.

5. LCA: Results

The following table contains the results of the life cycle assessment for a declared unit of 1000 kg of STRENTOR CR.

The characterization factors of the "Environmental Footprint reference Package 3.0" were used to determine the impact balance.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
x	x	x	ND	ND	ND	ND	MNR	MNR	MNR	ND	ND	ND	ND	ND	ND	ND

RESULTS OF THE LCA – ENVIRONMENTAL IMPACT according to *EN 15804+A2*: 1000 kg STRENTOR CR

Core indicator	Core indicator	Unit	A1-A3
GWP-total	Global warming potential - total	[kg CO_2-Eq.]	241
GWP-fossil	Global warming potential - fossil fuels	[kg CO_2-Eq.]	241
GWP-biogenic	Global warming potential - biogenic	[kg CO_2-Eq.]	0.03
GWP-luluc	GWP from land use and land use change	[kg CO_2-Eq.]	9.93E-3
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	4.42E-6
AP	Acidification potential, accumulated exceedance	[mol H^+-Eq.]	1.09
EP-freshwater	Eutrophication, fraction of nutrients reaching freshwater end compartment	[kg P-Eq.]	0.02
EP-marine	Eutrophication, fraction of nutrients reaching marine end compartment	[kg N-Eq.]	0.31
EP-terrestrial	Eutrophication, accumulated exceedance	[mol N-Eq.]	3.61
POCP	Formation potential of tropospheric ozone photochemical oxidants	[kg NMVOC-Eq.]	0.82
ADPE	Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.28E-4
ADPF	Abiotic depletion potential for fossil resources	[MJ]	1003
WDP	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	[m^3 world-Eq deprived]	40.4

RESULTS OF THE LCA – INDICATORS TO DESCRIBE RESOURCE USE according to *EN 15804+A2*: 1000 kg STRENTOR CR

Indcator	Indcator	Unit	A1-A3
PERE	Renewable primary energy as energy carrier	[MJ]	49.6
PERM	Renewable primary energy resources as material utilization	[MJ]	0
PERT	Total use of renewable primary energy resources	[MJ]	49.6
PENRE	Non-renewable primary energy as energy carrier	[MJ]	1003
PENRM	Non-renewable primary energy as material utilization	[MJ]	0
PENRT	Total use of non-renewable primary energy resources	[MJ]	1003
SM	Use of secondary material	[kg]	185
RSF	Use of renewable secondary fuels	[MJ]	490
NRSF	Use of non-renewable secondary fuels	[MJ]	700
FW	Use of net fresh water	[m^3]	1.46

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to *EN 15804+A2*: 1000 kg STRENTOR CR

Indicator	Indicator	Unit	A1-A3
HWD	Hazardous waste disposed	[kg]	2.70
NHWD	Non-hazardous waste disposed	[kg]	21.3
RWD	Radioactive waste disposed	[kg]	5.82E-3
CRU	Components for re-use	[kg]	0
MFR	Materials for recycling	[kg]	0
MER	Materials for energy recovery	[kg]	0
EEE	Exported electrical energy	[MJ]	0
EET	Exported thermal energy	[MJ]	0

RESULTS OF THE LCA – additional impact categories according to *EN 15804+A2*-optional: 1000 kg STRENTOR CR

Indicator	Indicator	Unit	A1-A3
PM	Potential incidence of disease due to PM emissions	[Disease Incidence]	4.2E-6
IRP	Potential Human exposure efficiency relative to U235	[kBq U235-Eq.]	18.5
ETP-fw	Potential comparative toxic unit for ecosystems	[CTUe]	906
HTP-c	Potential comparative toxic unit for humans - cancerogenic	[CTUh]	4.97E-8
HTP-nc	Potential comparative toxic unit for humans - not cancerogenic	[CTUh]	2.2E-6
SQP	Potential soil quality index	[-]	381

Tips

2.51e2 = 2.51 x 10^2 = 251

4.25e-3 = 4.25 x $\frac{1}{10^3}$ = 0.00425

On Global Warming Potential (GWP):
Net values are declared for all GWP indicators in A1 – A3. The waste status of the (waste-based) fuels has been verified. Gross emissions (i.e. including CO2 from incineration of waste) are 304 kg CO2-eq. / t (GWP-total), 304 kg CO2-eq. / t (GWP fossil), 0.03 kg CO2 eq. / t (GWP-biogenic).
For wastes with biogenic carbon content, gross CO2 emissions correspond to the uptake of biogenic CO2 during the biomass growth phase.

Disclaimer 1 - for the indicator "potential Human exposure efficiency relative to U235". This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 - for the indicators: "abiotic depletion potential for fossil resources", "abiotic depletion potential for non-fossil resources", "water (user) deprivation potential", "deprivation-weighted water consumption", "potential comparative toxic unit for ecosystems", "potential comparative toxic unit for humans - cancer effects", "potential comparative toxic unit for humans – non-cancer effects", "potential soil quality index".
The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

6. LCA: Interpretation

The following table shows the most important influencing factors on important indicators of the impact and life cycle inventory analysis.

	GWP_{total}	AP	$EP_{terrestrial}$	POCP	PERT	PENRT	ADPE	FW	PM
Clinker production	88.8 %	81.1 %	90.1 %	88.9 %	39.8 %	48.7 %	72.7 %	42.5 %	79.5 %
Blast furnace slag production	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Fly ash production	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Burnt oil shale production	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Sulfate production	0.02 %	0.03 %	0.02 %	0.02 %	0.01 %	0.06 %	0.01 %	7.44E-3 %	0.01 %
Cement production	9.13 %	16.8 %	8.39 %	9.44 %	55.2 %	41.8 %	25.8 %	54.1 %	15.2 %
Dispatch	0.28 %	0.40 %	0.21 %	0.23 %	1.15 %	1.09 %	0.55 %	0 %	0.34 %
Other materials and processes	1.79 %	1.66 %	1.30 %	1.43 %	3.82 %	8.32 %	1.01 %	3.36 %	4.98 %
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Legend	**Clinker production**: Includes the impacts related to the production of cement clinker. **Blast furnace slag production**: Includes the upstream and processing impacts for the production of blast furnace slag. **Fly ash production**: Includes the upstream and processing impacts for the production of fly ash. **Burnt oil shale production**: Includes the impacts associated with burnt oil shale production. **Sulfate production**: Includes the impacts related to the production of primary and secondary sulfates. **Cement production**: Includes the impacts associated with the final grinding or mixing stage to produce the final product. **Dispatch**: Includes the impact related to product preparation for shipping. **Other materials and processes**: Includes the impacts of materials or production processes not covered by the above categories.									

The contribution of clinker production to the indicators GWP (Global Warming Potential), AP (Acidification Potential of Soil and Water), EP-terrestrial (Eutrophication Potential), POCP (Tropospheric Ozone Creation Potential) and PM (Potential Occurrence of Diseases due to Particulate matter emissions) is largely determined by the exhaust air emissions from the rotary kiln, while the contribution to the PENRT indicator (non-renewable primary energy) is due to the use of fossil fuels and electrical energy.

7. Requisite evidence

7.1 Radioactivity

The radioactivity of cements is currently not routinely measured in Bulgaria. Literature shows that the activity index for cement, is in the order of magnitude of the activity index for natural soils and rocks (*IAEA*).

7.2 Chromate

According to legal requirements (European Regulation (EG) 1907/2006 REACH Regulation and Chemicals Prohibition Regulation), cements or cement-containing preparations that contain more than 2 ppm water-soluble chromate based on the mass of dry cement may not be placed on the market. Exceptions to this are cements that are only used in closed and fully automated processes and where there is no risk of skin contact. This cement complies with the regulations on water-soluble chromate.

The content of water-soluble chromium(VI) is determined according to *EN 196-10*. Evidence of compliance with the limit value is provided as part of the factory production control.

8. References

Norms

EN 196-10
EN 196-10:2016, Methods of testing cement - Part 10: Determination of the water-soluble chromium (VI) content of cement

ISO 14001
EN ISO 14001:2015-11, Environmental management systems - Requirements with guidance for use

EN 13501-1
EN 13501-1:2018, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

EN 13282-1
EN 13282-1:2012, Hydraulic road binders - Part 1: Rapid hardening hydraulic road binders - Composition, specifications and conformity criteria

EN 15804
EN 15804:2012+A2+AC:2021, Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products.

ISO 14025
EN ISO 14025:2011-10, Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

Other Literature

CarbonCLARITY™ EN 15804 EPD Generator – Cement
Version 1.2.0 dated 07/11/2022
www.climateearth.com

CPR
Construction Products Regulation
Establishing harmonized conditions for the marketing of construction products, (EU) No. 305/2011, March 09, 2011.

ECHA
European Chemicals Agency (ECHA): Candidate list of substances of very high concern.
https://echa.europa.eu/

IBU 2022
Institut Bauen und Umwelt e.V.: General instructions for the EPD program of Institut Bauen und Umwelt e.V. Version 2.1, Berlin: Institut Bauen und Umwelt e.V., 2022. www.ibu-epd.com

PCR Part A
Product category rules for building related products and services. Part A: Calculation rules for the life cycle assessment and requirements for the project report according to EN 15804+A2:2021 (v1.4). Berlin: Institut Bauen und Umwelt e.V., 15/04/2024

PCR Cement
Product category rules for building related products and services. Part B: Requirements for the EPD for cement, version 11. Berlin: Institut Bauen und Umwelt e.V. (ed.), 01/08/2024.
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IAEA
International Atomic Energy Agency, Radioactivity in Building Materials: a first Overview of the European Scenario, 2008.

Directive 2008/1/EC
Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control

Negotiation Platform on Silica
Negotiation Platform on Silica (NePSi) 'Agreement on workers' health protection through the good handling and use of crystalline silica and products containing it'

Regulation No 1/2007
Regulation No. 1 of October 10, 2007 on groundwater survey, use and protection

Regulation No 4/2013
Regulation no. 4 of April 5, 2013 on the conditions and requirements for the construction and operation of incineration plants and waste co-incineration plants

Regulation No 6/1999
Regulation No. 6 of March 26, 1999 on the procedure and method of measuring the emissions of harmful substances released into the atmosperic air from facilities with stationary sources

Ordinance No 13/2003
Ordinance No 13 dated 30.12.2003 on protection of workers from the risks related to chemical agents at work

Regulation No 54/2010
Regulation No 54 of 2010 on the activity of the national environmental noise monitoring system and requirements for self-conduct of monitoring and delivering information from industrial sources of environmental noise.

REACH-Regulation
Registration, Evaluation, Authorisation and Restriction of Chemicals, EG 1907/2006:2006-12-18.

WCO
Waste Catalog Ordinance (WCO), December 10th 2001

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