EU Biochar Carbon Removal Standard

CS-BCR, version 0.7

Certification methodology for permanent carbon removals generated by biochar carbon removal activities under Regulation (EU) 2024/3012

Carbon Standards International AG

Impressum

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Carbon Standards International AG, Frick, Switzerland

Contents

Scope

The present Standard (CS-BCR) sets out the requirements under which Carbon Standards International (CS) certifies biochar carbon removal activities as permanent carbon removals under Regulation (EU) 2024/3012 and Commission Delegated Regulation (EU) 2026/285.

The Standard applies to BCR activities whose biochar production facilities and biochar storage are located in the Union. It governs the production of biochar, its tracking to the point of application or incorporation, the quantification of the net carbon removal benefit, and the issuance and registration of permanent carbon removal units.

Every application of biochar to land is recorded with the boundary of the area that receives it and is entered in a land register maintained by CS. The register holds the cumulative loading of each location across production batches, across operators, and across successive versions of this Standard, and it is the basis on which the cumulative application limit is verified.

In two respects this Standard requires more than the Delegated Regulation. (1) Production is monitored continuously, including the mass of biochar produced, so that the carbon entering the process can be reconciled against the carbon leaving it rather than inferred from measurements taken at either end of it. And (2) every application to land is recorded as a geometry rather than as a point or an administrative reference. Neither requirement introduces a threshold and neither reduces the net carbon removal benefit.

CS provides the instruments for both. The CS-BCR-App carries the activity plan, the monitoring plan, and the monitoring report on a single dataset. The CS-BCR dMRV system records production and chain of custody and transmits to it continuously. An operator may use its own dMRV system or that of a third party instead, on the conditions in 5.7. CS develops the Standard and audits the production technologies, and is therefore able both to specify what must be measured and to set up and connect the instruments that measure it.

The Standard is self-contained. Compliance with it is sufficient to demonstrate compliance with Article 4 of the Delegated Regulation. Where the Delegated Regulation permits a certification scheme to specify additional requirements, this Standard exercises that discretion and states the requirement in normative text.

CS certifies the permanence fraction of biochar exclusively by random reflectance assessment. The decay function route permitted by Section 2.2.7.1.2 of the Delegated Regulation is outside the scope of service offered by CS under this Standard. Operators requiring that route must seek certification under a scheme that offers it.

The Standard does not govern the certification of biochar quality, which is the subject of the European Biochar Certificate (EBC). It does not govern carbon sink accounting outside the Union framework, which is the subject of the Global Biochar C-Sink Standard (GBCS). Certification under this Standard and under the GBCS may be conducted within a single audit, on a single declaration and a single dMRV record. However, the two certifications produce distinct units, which are issued and retired separately and mutually exclusively for any given quantity of applied biochar.

Normative references

Reference	Short form
Regulation (EU) 2024/3012	CRCF Regulation
Commission Delegated Regulation (EU) 2026/285	Delegated Regulation
Commission Implementing Regulation (EU) 2025/2358	Implementing Regulation
Commission Implementing Regulation (EU) 2018/2066	MRR
Directive (EU) 2018/2001	RED II
Regulation (EU) 2019/1009	FPR
Commission Delegated Regulation (EU) 2021/2088	CMC 14
Commission Delegated Regulation (EU) 2020/1044	GWP Regulation
Commission Delegated Regulation (EU) 2023/1185	Electricity EF Regulation
Commission Delegated Regulation (EU) 2021/2139	Taxonomy Delegated Act
Regulation (EU) 2020/852	Taxonomy Regulation
Regulation (EC) No 183/2005	Feed Hygiene Regulation
Regulation (EU) No 68/2013	Feed Materials Catalogue
Regulation (EC) No 1069/2009	ABP Regulation
ISO 7404-5	reflectance measurement
EN 12619	total hydrocarbon measurement
Directive 2008/98/EC; Directive 2010/75/EU; Directive (EU) 2025/2360; Regulation (EC) No 1907/2006; Regulation (EU) 2019/1021; Regulation (EU) 2024/1991	cited in full where applied
European Biochar Certificate, current version	EBC
Global Biochar C-Sink Standard, current version	GBCS

Glossary

The definitions in Article 1 and in the Annex to the Delegated Regulation apply. In addition:

Application record - the set of data evidencing the application of a defined quantity of biochar to a defined location at a defined time, recorded through the dMRV system and held in the C-Sink Register.

Batch - A production batch is the total quantity produced by a pyrolysis facility using the same technology with a defined feedstock mix and under stable processing conditions. Representative samples are taken from the batch for laboratory determination and test of eligibility. The representative batch sample establishes the organic carbon content, the permanence fraction, the permitted forms of application, compliance with the limits of the application classes, and the greenhouse gases associated with feedstock and biochar production. A batch closes when any of the conditions under which they were established ceases to hold.

Certified chain - the set of biochar quantities tracked under this Standard from production to application or incorporation.

Co-produced heat - heat recovered from the biochar production process in excess of the heat demand of the conversion itself. The evaporation of moisture contained in the feedstock within the reactor forms part of that demand and is not co-produced heat.

Consignment - a quantity of biochar dispatched from a production facility, processor, or trader under a single transfer record.

Carbon Owner - the legal entity owning the accountable carbon of a registered unit from the factory gate. The Carbon Owner is the Co-Operator of the activity under 1.1.7 and may be the producer or another legal person.

dMRV system - the digital monitoring, reporting and verification system endorsed by CS through which the certified chain is recorded.

dMRV provider - an entity endorsed by CS to operate a dMRV system on behalf of one or more operators.

Holding - an agricultural holding, being the land and livestock under the management of a single operator, identified by its national holding identifier.

Operator - the legal entity owning the biochar production facilities of the activity. The Operator carries the obligations of this Standard to the factory gate under 1.1.5.

Production unit - a single pyrolysis or thermal treatment reactor line.

Registry - the Global C-Sink Registry operated by Carbon Standards, in its CRCF register.

Track A and **Track B** - the two certification tracks defined in 1.3.

Transport unit (TU) - the smallest physically separable quantity of biochar carrying its own identifier. A TU is produced within a batch and filled directly or after transformation steps such as milling or mixing to fertilizer or cement, carrying a unique identifier issued by the C-Sink Register. It has its own dry mass, date of production, location, and chain of custody, and it inherits the attributes of the batch to which it belongs. Registered units are the objects that move, that are pooled, that arrive at a site of application, and against which carbon removals are ultimately quantified.

PART I - THE ACTIVITY

1. Eligibility

(Delegated Regulation, Annex Section 1.1.2)

1.1 Definition and boundary of the BCR activity

1.1.1 A BCR activity consists of biochar production at one or more biochar production facilities owned by the same legal entity and applying the same biochar production technology.

1.1.2 Biochar produced at different locations must not be assigned to the same production batch, irrespective of the similarity of feedstock or process conditions.

1.1.3 Biochar originating from a single activity may be applied to soils or incorporated in products at several sites.

1.1.4 The biochar production facility and the storage of the biochar must be located in the European Union.

1.1.5 The **Operator** is the legal entity owning the production facilities. The Operator carries the obligations of this Standard to the factory gate.

1.1.6 At the factory gate each registered unit carries its identifier and is recorded in the C-Sink Register with the owner of the biochar and the owner of the accountable carbon (the **Carbon Owner**). The Carbon Owner may be the biochar producer or another legal person.

1.1.7 The Carbon Owner is the Co-Operator of the activity. In that capacity it carries the obligations of this Standard from the factory gate to the point of application or incorporation and through the monitoring period, including transport, chain of custody, handling by third parties, the emissions arising after the factory gate, the manner of application or incorporation and its record, and access to the location of application. It is bound from the moment it is recorded in the Register under 1.1.6, and its obligations pass to any successor on transfer of the accountable carbon. Responsibility is allocated between the Operator and the Co-Operator at the factory gate and is not shared.

1.1.8 Where this Standard imposes an obligation on the operator, it binds the Operator up to the factory gate and the Co-Operator from the factory gate to the point of application or incorporation. Where a matter concerns both, both are bound.

1.1.9 The Carbon Owner and the Co-Operator are the same legal person. This Standard names the Carbon Owner where a provision concerns the holding of the accountable carbon, its record in the Register, the issuance of units, or the transfer of any of these. It names the Co-Operator where a provision concerns the performance of an obligation after the factory gate.

> *Rationale.* Regulation (EU) 2024/3012 provides throughout for an activity to be conducted by an operator or by a group of operators. This Standard uses that provision. A BCR activity has two operators: the producer, who controls production and can answer for it, and the Carbon Owner, who controls the biochar after the gate and can answer for that. Every obligation the Delegated Regulation imposes is performed. Each is allocated to the party able to perform it and holding the interest in performing it.

1.2 Requirements on the production process

1.2.1 The process must heat the biomass or biomass fuel to a temperature of at least 350 °C.

1.2.2 The process must be designed with the intention of fully capturing or destroying any methane produced together with the biochar. The operator must evidence this by one of:

(a) a pyrolysis system certificate issued or recognized by CS documenting the gas handling design of the production unit;

(b) a technical audit report documenting the gas handling design of the production unit.

1.2.3 The co-produced heat must be used either for biomass drying or to satisfy another economically justifiable demand for heat, for heating or cooling purposes.

1.2.4 Clause 1.2.3 is a requirement on the use of process heat. The generation of electricity from pyrolysis gas, and the export of condensed pyrolysis liquids or of any other energy-bearing co-products are additional to this and do not discharge it.

1.2.5 Heat recovered from the cooling circuit or the exhaust of an engine or turbine operating on pyrolysis gas, and heat released by the combustion of condensed pyrolysis liquids, count towards 1.2.3 where that heat is used for biomass drying or for another demand for heat.

1.2.6 Compliance with 1.2.3 is evidenced by measurement of the co-produced energy that is utilised, recorded under 5.1.3(b). The CS-BCR-App computes from those measurements and from the energy content of the feedstock the fraction of feedstock energy that is utilised, taking the energy content from Annex F where it is not measured. The fraction is reported and is not a threshold.

1.2.7 Mobile facilities may operate without heat utilization where utilization would be impractical in their specific context. The grounds must be stated in the activity plan. Clause 1.2.6 does not apply to such facilities.

1.2.8 Compliance with 1.2.2 does not discharge the obligation to measure process methane emissions under Chapter 9.

Rationale. The 350 °C floor is an eligibility criterion, not a persistence criterion. Persistence is settled by the H/Corg gate in Chapter 12 and by the measurement in Chapter 12, and no inference about permanence follows from 1.2.1. Clause 1.2.2 concerns design intent and is verified once at the level of the production unit; Chapter 9 concerns realized emissions and is verified by measurement. The Delegated Regulation imposes both.

Section 1.1.2.1(c) of the Delegated Regulation names heat and nothing else, and the definition of useful heat in the Annex confines it to heating and cooling purposes. Electricity and liquid co-products therefore carry no weight in eligibility, however large they are. They carry weight in two other places: as co-products in the allocation under 8.4, where exporting them lowers the share of facility emissions allocated to the biochar, and in the energy share that governs the waste and residue restriction under 1.7.2 and the energy condition in Annex B.2.5. Clauses 1.2.4 and 1.2.5 separate the two roles of waste heat use and energy efficiency. While from an energy efficiency point of view, generating power from the gas is at least as good as using the heat, under the criterion of using waste heat it would not be sufficient. The configuration that fails is a pyrolysis plant that generates power and biochar but recovers no waste heat. Such a plant must find a heat demand or is not eligible.

Section 1.1.2.1(c) permits a certification scheme to set a minimum heat utilization efficiency. This Standard sets no threshold but requires measurement of output energy instead. Metering the utilised

thermal, electric, and chemical energy allows the declaration of the process' energy efficiency and accumulates the data on which a threshold could be set at a later stage of standard development.

Co-produced heat is defined in the Glossary as heat recovered in excess of the heat demand of the conversion itself, so that 1.2.3 is met by putting surplus heat to use, for example in a pre-drying stage upstream of the reactor. The exception granted to mobile facilities in Section 1.1.2.1(c) confirms this reading: it is heat recovery, and not the evaporation intrinsic to any thermal conversion, that the clause requires.

1.3 Certification tracks

1.3.1 An application of biochar falls in one of two tracks.

Track A - soil. Biochar applied to soil, whether directly, after intermixing with soil or with soil amendment products, after incorporation into compost, manure, growing media, or substrates, or after feeding to animals and recovery as manure.

Track B - product. Biochar incorporated in cement, concrete, or asphalt.

1.3.2 The two tracks differ as set out in Table 1.1.

Table 1.1 - Comparison of the tracks

	Track A	Track B
Eligible destinations	1.4.1 and 1.4.2	1.4.4
Monitoring ends at	application to soil	incorporation
Evidence of the crediting event	application record, 5.4	incorporation record, 5.5
Contaminant limits	14.1, and 14.3 for the feed pathway	14.4
FPR and CMC 14 feedstock gate	applies	does not apply
Non-biogenic input streams	prohibited	permitted, declared
Cumulative 50 t/ha limit	applies to agricultural and forest soils	does not apply
Application method requirement, 1.6	applies	does not apply
Soil health demonstration, 13.6	applies to agricultural and forest soils	does not apply

1.3.3 Biochar is incorporated in a product for the purposes of Track B only where it is bound in a cementitious or bituminous matrix at the plant producing that matrix. No other material is a product under this Standard.

1.3.4 Intermixing biochar with compost, growing media, substrate, manure, digestate, fertilizer, or any other material destined for soil does not make the biochar a product and does not place it in Track B. Such biochar remains in Track A and must be tracked to application under Chapter 5.

1.3.5 The track is determined per consignment and recorded in the dMRV system. Where a production batch is split between tracks, the requirements of Track A govern the whole batch for the purposes of feedstock eligibility under 1.7 and contaminant testing under Chapter 19.

> *Rationale.* Section 1.1.2.2.2 of the Delegated Regulation is exhaustive: only incorporation in cement, concrete, or asphalt is eligible under the product branch. Compost, growing media, and substrate appear instead in Section 1.1.2.2.1(a), as permitted forms of application to soil. Section 1.2.2.3 fixes the crediting event as permanent storage by application to soils or incorporation in products, and Section 3.2 requires monitoring to the point of application to soil. A bag of biochar-compost is therefore in the same position as a bag of loose biochar, and mixing does not end the monitoring obligation. Clauses 1.3.3 and 1.3.4 state this explicitly because the opposite reading is a natural one and would, if acted on, invalidate every unit issued against it.

1.4 Eligible applications

1.4.1 Under Track A, biochar applied to soils is eligible where it is applied to agricultural or forest soils or soil in greenhouses, by one of the following routes:

(i) directly, without being intermixed with any other material;

(ii) after intermixing with a matrix consisting of soil or of one or more soil amendment products complying with Article 5 FPR;

(iii) after use as an additive to an anaerobic digestion process, intermixed with the digestate of that process;

(iv) after feeding to animals as a feed additive, and recovery in manure.

1.4.2 Under Track A, biochar applied to soils other than agricultural and forest soils is eligible where it is applied, either directly or after intermixing with soil or other appropriate materials, in:

(a) landscaping, daily cover at landfill sites, or the filling of holes, including disused mines and oil wells;

(b) urban soils, including growing media used in flowerbeds, urban tree planting, public parks, and public or private gardens.

1.4.3 Biochar used under 1.4.2(a) must be intermixed with at least one other material before application, and the intermixture must not be capable of self-sustaining combustion. The operator must evidence this by the mixing ratio and the composition of the mixture.

1.4.4 Under Track B, biochar is eligible only where it is incorporated in cement, concrete, or asphalt.

1.4.5 No other use is eligible under this Standard.

1.5 Cumulative application limit

1.5.1 Cumulative application of biochar to any hectare of agricultural or forest soil must not exceed 50 tonnes, counting all applications over time, whether or not certified, and including applications made before the entry into force of the Delegated Regulation.

1.5.2 Every application under 1.4.1 must be entered in the land register maintained by CS under 15.4, and cumulative loading must be computed in accordance with that section.

1.5.3 Where the applier declares prior applications not recorded in the ledger, the declared quantity must be entered before the application record is closed.

1.6 Application method

1.6.1 Biochar applied to soil must be incorporated into the soil profile at application, or covered at application with soil, mulch, or another matrix.

1.6.2 Surface application without incorporation or covering is not eligible.

1.6.3 The application method must be recorded in the application record under Chapter 5 and is carried into the CS land register. An application record stating a method that does not meet 1.6.1 generates no units.

1.6.4 Clauses 1.6.1 to 1.6.3 do not apply to biochar recovered in manure deposited in situ by grazing animals under 5.6.

> *Rationale.* This clause discharges the albedo requirement of the Delegated Regulation. Reduced surface reflectance requires dark particles to remain exposed at the surface, and incorporation or covering removes that mechanism rather than mitigating it. No site-specific albedo assessment is therefore required and none is imposed. The same requirement removes the loss of applied biochar to wind and to surface runoff, and it is verifiable at the moment of application, which an albedo assessment is not. The exception in 1.6.4 reflects that manure deposited by a grazing animal is neither incorporated nor covered by any operation, and that the biochar in it is diluted in a matrix and distributed at rates at which surface albedo is not affected.

1.7 Feedstock eligibility

1.7.1 Feedstock must be listed in Annex B and must be eligible for the intended track and application route.

1.7.2 Where the biochar of a production batch accounts for 50% or more of the total energy output in the co-products of the facility, calculated under 9.1.10, the batch may be produced only from waste or residual feedstocks, or from biofuel, bioliquid or biomass fuel produced from waste or residual feedstocks, within the meaning of Article 2, points (23) and (43), RED.

1.7.3 A non-biogenic input stream must not be introduced into a production batch whose biochar is intended for Track A.

1.7.4 Incidental non-biogenic contamination of a biogenic feedstock stream must not exceed 1% of feedstock mass for batches intended for Track A. The operator must declare the contamination level in the dMRV system.

1.7.5 A non-biogenic input stream may be introduced only into production batches intended for Track B. Where the plant also produces biochar for Track A, the production lines must be physically separated.

1.7.6 Where the feedstock may be expected to contain a fraction of non-biogenic carbon greater than 2% of total feedstock carbon by mass, the biogenic carbon fraction of the biochar must be determined by ^{14}C analysis under Chapter 7.

> *Rationale.* Section 4.4 of the Delegated Regulation excludes from soil application any char produced where non-biogenic material has been co-processed. Clauses 1.7.3 and 1.7.5 implement that exclusion at the level of the input stream, which is where it can be controlled and audited. Clause 1.7.4 bounds the contamination inherent in any real feedstock stream; it is a purity requirement, not

a permission to co-process. The threshold in 1.7.6 is a separate test, on carbon rather than mass, determining whether ^{14}C analysis is required.

2. Activity period, certification period, monitoring period

(Delegated Regulation, Annex Section 1.2.2)

Three periods govern a BCR activity and answer different questions. The activity period is the term of the activity plan and fixes the configuration of technologies, feedstocks, and routes for which the activity is certified. The certification period is the interval between audits and fixes the accounting boundary, determining which period a removal and its associated emissions belong to. The monitoring period is the span over which the operator must maintain, and be able to evidence, the record of a given quantity of biochar; it runs from the production of that biochar to the point at which its application or incorporation is treated as demonstrated. For soil application, that point falls one year after the end of the certification period in which the application was reported. It is the only one of the three that continues after units have been issued.

2.1 The activity period must not exceed five years. At the end of an activity period the operator may begin a new activity period by submitting a new activity plan.

2.2 The certification period must not exceed one year.

2.3 Carbon removals are recorded in the certification period in which the biochar is applied to soils or incorporated in products. The emissions of transport, handling, application, and incorporation under Chapters 14 and 15 are recorded in the same period. The production emissions of a batch under Chapter 9 are recorded in the certification period in which that batch closes.

2.4 Where biochar is produced in one certification period and applied or incorporated in a later certification period, the removal and the emissions under Chapters 14 and 15 are recorded in the later period. The production emissions of the batch remain recorded in the period in which the batch closed.

2.5 The monitoring period is:

(a) for Track A, the period up to one year after the end of the certification period in which the biochar is reported to have been applied to soil;

(b) for Track B, the period up to the point at which incorporation is demonstrated.

2.6 The operator is not subject to monitoring requirements after the end of the monitoring period.

Rationale. Section 1.2.2.2(a) of the Delegated Regulation permits a shorter monitoring period for Track A, ending at application, where the application is directly overseen by a representative of the certification body. This Standard does not use that option. A certification body cannot attend individual applications to soil, and this Standard does not assume that it will. The certification body verifies the production process, the operator's procedures, the operator's use of the dMRV system, and the records it holds, as set out in 21.4. The applications themselves are evidenced by the records made at the time under Chapter 5 and by the access right under 17.6.

This Standard therefore applies the longer of the two monitoring periods the Delegated Regulation provides, to every Track A application. That is the conservative branch and cannot be a ground of

objection. It has one consequence for planning: a Track A activity cannot be closed out at application, and the monitoring period runs a further year beyond the certification period in which the application was reported.

3. Activity plan

(Delegated Regulation, Annex Section 1.3.1)

3.1 Before the certification audit the operator must submit an activity plan to the certification body, using the template in Annex C.

3.2 The activity plan must contain:

(a) a description of the activity, the technologies, and the infrastructure;

(b) the identity and role of every entity in the carbon removal value chain, including dMRV providers, processors, traders, and appliers;

(c) identification of, and demonstration of compliance with, the applicable local, regional, and national legal requirements;

(d) the list of emission sources and sinks under 8.1;

(e) estimates of total carbon removals and associated GHG emissions for the activity period, in accordance with points (k), (l), and (m) of Annex II to the CRCF Regulation;

(f) the materiality assessment under 9.8 and 9.10;

(g) the uncertainty assessment under Chapter 13;

(h) proof of compliance with Chapters 18 and 19;

(i) all public financing received or applied for in respect of the activity;

(j) the CS-endorsed laboratories to be used for the analyses under Chapters 12 and 19;

(k) the tracks and application routes under Chapter 1 that the activity will use, and confirmation that the operator has informed appliers of the requirements of 1.6;

(l) the feedstocks to be used, by Annex B entry;

(m) any further information the certification body requires to conduct the certification audit.

3.3 Where the operator changes the activity plan during the activity period, the operator must submit the rationale to the certification body without delay, together with any recalculation of expected emissions and removals and any consequence for Chapters 18 and 19.

Rationale. Item 3.2(i) is required by Sections 1.3.1(i) and 2.2.2 of the Delegated Regulation and serves to document that the activity is not overcompensated. Additionality under this methodology is granted by the standardised baseline in 6.2 rather than tested activity by activity, on the premise that a BCR activity faces a funding gap which may be closed by public support, by revenue from units, or by both. Disclosure of public financing is the only control on that gap being closed twice.

The obligation covers financing applied for as well as financing received, so a pending application must be declared. It continues through the activity period under 3.3 and into each monitoring report under 4.2.5(d), and the disclosure is carried onto the certificate of compliance under 6.2.3.

The Delegated Regulation attaches no cap, no deduction from the net carbon removal benefit, and no disqualification to the disclosure. Its effect is transparency toward buyers, national authorities, and the State aid assessment those authorities carry out, and it does not alter the quantification.

4. Monitoring plan and monitoring report

(Delegated Regulation, Annex Sections 1.3.2 and 1.3.3)

4.1 Monitoring plan

4.1.1 Before the certification audit the operator must submit a monitoring plan to the certification body, using the template in Annex C.

4.1.2 CS provides a monitoring plan application through which the operator may prepare, maintain, and submit the monitoring plan. The application implements 4.1.4 and the parameter register of Annex D, derives the parameters applicable to the activity from its declared tracks, routes, and feedstocks, and identifies incomplete or inconsistent entries before submission.

4.1.3 Use of the application is not mandatory, and a monitoring plan prepared by other means must meet the same requirements. The application does not verify compliance, and its output does not bind the certification body. The operator remains responsible for the completeness and accuracy of the monitoring plan in either case.

Rationale. The requirements on the monitoring plan are not gathered in one place. Section 1.3.2 of the Delegated Regulation states nine criteria, four of which import Articles 33, 42, 44, 60, and 67(1) and Annex VII of the Monitoring and Reporting Regulation, and the parameters to be covered are distributed across the quantification chapters of this Standard. Which of those parameters apply depends on the tracks, routes, and feedstocks the activity uses. Assembled by hand, the result is a document whose completeness is hard for the operator to establish and hard for the certification body to check, and incompleteness is discovered at audit rather than before it. The requirements that follow should be read with that instrument in view.

The application exists to make the assembly tractable rather than to add a further requirement. It holds the parameter register, resolves which parameters a given activity must monitor, and reports gaps while they can still be closed. The same application carries the activity plan template of Annex C.

Clause 4.1.3 keeps the roles apart. CS is the certification scheme and not the certification body, and an instrument that helped an operator prepare a submission must not be mistaken for one that has assessed it. The assessment belongs to the certification body under 21.4 and is unaffected by whether the application was used.

4.1.4 The monitoring plan must:

(a) describe the activity to be monitored;

(b) describe the assignment of monitoring and reporting responsibilities and the management of personnel competence;

(c) state every default value used as a calculation factor and its source;

(d) list the laboratories carrying out the analytical procedures;

(e) describe every measurement method, including the written procedures;

(f) apply the minimum analysis frequencies of Annex VII MRR where applicable;

(g) apply the quality assurance standard of Article 60 MRR;

(h) apply record keeping consistent with Article 67(1) MRR;

(i) describe the sampling protocol under 6.3 and 6.4;

(j) describe the dMRV system and the operator's interface to it under Chapter 5;

(k) state the methane quantification method under 8.6.

4.1.5 Each monitored parameter must be accompanied by the responsible entity, the data source, the equipment and measurement method including accuracy and calibration, the monitoring frequency, and the quality assurance and quality check procedures.

4.1.6 All measurements must be made with calibrated equipment in accordance with Article 42 MRR, and data aggregation must follow Article 44 MRR.

4.1.7 Where the monitoring plan cannot be fully detailed at the time of application, it must be submitted as completely as possible, with the non-final elements identified and the intended resolution indicated. It must be finalized before the first re-certification.

4.2 Monitoring report

4.2.1 Before each re-certification audit the operator must submit a monitoring report stating the net carbon removal benefit, the total gross carbon removals, the associated GHG emissions, and the information supporting the quantification.

4.2.2 The monitoring report is prepared in the same CS-BCR-App as the monitoring plan, on the same dataset. The report module carries forward every parameter declared under 4.1.5, draws the quantities applied or incorporated from the dMRV record and the analyses from the laboratory results held for the activity, and computes the quantification of Chapters 8 to 16 from the values entered.

4.2.3 A change made to the monitoring plan in the application takes effect in the monitoring report without re-entry. Where a change made during a certification period affects a parameter already reported, the application identifies the affected values and the periods concerned.

4.2.4 Use of the application is not mandatory, and a monitoring report prepared by other means must meet the same requirements. The application does not verify compliance, and its output does not bind the certification body. The operator remains responsible for the completeness and accuracy of the monitoring report in either case.

> *Rationale.* The monitoring report is the monitoring plan carried out. Section 1.3.3 of the Delegated Regulation requires it to state every parameter measured or calculated over the certification period, alongside the feedstock consumed, the financing, the laboratory results, and the uncertainty assessment, and the certification body must be able to trace each figure back to the procedure declared in the plan. Rebuilding that structure by hand once a year, from a plan written up to five years earlier, is where reports begin to diverge from the plans they are meant to execute.
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> Holding both in one application on one dataset removes the divergence rather than testing for it afterwards. The parameters declared under 4.1.5 are the rows of the report, the dMRV record supplies the quantities, the laboratory results supply the analyses, and the quantification is computed rather than transcribed. What the operator supplies each year is the data the activity generated, not the structure in which to present it.
>
> Clause 4.2.4 carries the same separation as 4.1.3. The application prepares a submission; it does not assess one. The assessment belongs to the certification body under 21.4.

4.2.5 The monitoring report must contain:

(a) every parameter listed in Annex D, measured or calculated over the certification period under audit;

(b) the biomass feedstock or feedstock mix consumed, disaggregated to the level required under 18.7;

(c) the quantity of carbon farming sequestration units purchased under 18.9, which may be zero;

(d) the financing received or applied for in respect of the activity;

(e) the results of the laboratory analyses required under Chapters 12 and 19;

(f) the uncertainty assessment and the resulting conservatism factor under Chapter 13.

4.2.6 Emissions of greenhouse gases other than CO_2 must be converted to tonnes of CO_2e using the 100-year global warming potentials in Annex I to the GWP Regulation.

Rationale. Clause 4.2.6 fixes the GWP set for this Standard. It differs from the values used in the GBCS, which follow IPCC AR6. Where a facility is certified under both standards, the emission quantities in mass terms are identical and only the conversion differs; the dMRV system therefore records emissions by gas in mass units and applies the conversion at reporting.

5. Digital monitoring, reporting and verification (dMRV)

CS has developed a dMRV system for this Standard. It records the production parameters, the chain of custody, and the application and incorporation records that this Chapter requires; it is installed and configured on the operator's plant by CS; and it is connected directly to the CS-BCR-App, which draws on it for the monitoring report and for the quantification, so that the operator does not assemble those figures separately. An operator that prefers its own system, or one supplied by a third party, may use it instead, provided the system is endorsed by CS and transmits its data to the App continuously, on the conditions in 5.7.

This Chapter sets out what must be recorded and at what frequency, how quantities are identified and kept apart along the chain, how applications and incorporations are evidenced, and how the record connects to the C-Sink Register.

5.1 Function of the dMRV system

5.1.1 Every quantity of biochar that is to generate units must be recorded in a dMRV system endorsed by CS, continuously and without interruption, from the production batch to the application or incorporation record.

5.1.2 The dMRV record is the primary evidence for the mass and identity of biochar applied or incorporated. That mass, once held in the C-Sink Register, is the term Qbiochar in the quantification of total carbon removals under 10.3.

5.1.3 The dMRV system must record at least the following, at the frequency stated:

(a) **Production**, recorded continuously or, where a parameter is not amenable to continuous measurement, per production run and at least daily:

(i) the type and quantity of feedstock charged, identified by Annex B entry;

(ii) the mass of biochar produced;

(iii) the process temperature in the reactor;

(iv) the temperature of the flue gas;

(b) **Energy outputs**, metered continuously or per production run, except where 1.2.7 applies: (v) the quantity of co-produced heat utilised, by heat meter, distinguishing heat used within the activity from heat exported; (vi) the quantity of electricity generated and the quantity exported; (vii) where condensed pyrolysis liquids are recovered, their quantity.

(c) **Biochar properties**, by on-site analysis daily or weekly according to the measured variation: (viii) the dry matter content, determined in accordance with Annex G; (ix) the organic carbon content, determined in accordance with Annex H;

(d) **Activity data**, being the quantities from which the greenhouse gases associated with the activity are calculated under Chapters 9, 14, and 15:

(i) up to the factory gate, recorded against the production batch: the procurement and transport of feedstock, the storage of feedstock, the inputs and energy consumed by the facility, and the treatment or disposal of wastes;

(ii) from the factory gate to the point of application or incorporation, recorded against the registered unit in accordance with 7.4.2: each transport leg, each processing, intermixing, or repackaging step, each storage event, and the energy consumed in applying or incorporating the material.

(e) **Chain of custody**, from production to the point of application or incorporation, as required by 15.2, including the track and the segregation state of every quantity and the location, date, and method recorded in the application or incorporation record.

(f) **Declarations** required under Chapters 17, 18, and 19.

5.1.4 The dMRV system must be connected to the C-Sink Register. It transmits an application record to the register on closure under 15.4.2 and retrieves from the register the cumulative loading of the location, so that the operator is informed before application whether the limit in 1.5.1 would be exceeded. The cumulative loading is computed by the register and not by the dMRV system.

5.1.5 A quantity of biochar for which the chain of records is incomplete is excluded from the certified volume. It is not estimated, and it is not carried forward.

Rationale. The integrity of a BCR unit does not rest on the analysis of the biochar, which is straightforward, but on the assertion that a specific mass of that biochar reached a specific eligible destination. That assertion is unverifiable after the fact: applied biochar cannot be counted in the soil at reasonable cost, and the Delegated Regulation accordingly requires no monitoring after application. The whole weight of the claim falls on the record made at the time. Clause 5.1.5 is the consequence. A monitoring system that fills gaps by estimation converts an absence of evidence into a unit, which is the failure mode this chapter exists to prevent.

The reactor temperature is the only continuous evidence that the process meets the 350 °C floor in 1.2.1, and the flue gas temperature shows whether the gas handling design required by 1.2.2 continues to perform between audits. Without a continuous record of both, compliance with the eligibility criteria could be asserted at the moment of an audit visit and at no other time.

Continuous measurement of the mass of biochar produced under 5.1.3(a)(ii) is not required by the Delegated Regulation, which needs only the mass applied or incorporated. It is required here because it closes the material balance. With feedstock type, quantity, and moisture on one side, and biochar, pyrolysis gas, condensates, and exported energy on the other, the carbon entering the process can be reconciled against the carbon leaving it, and a discrepancy becomes visible without a site visit. Without the production mass no balance can be struck, and the carbon accounting rests on measurements taken at the two ends of a process whose middle is unobserved.

The on-site determinations of dry matter and organic carbon under 5.1.3(b) are likewise not required by the Delegated Regulation, which is satisfied by a laboratory value per production batch. They are required here because these two quantities carry the largest measurement uncertainty in the calculation of total carbon removals, and because a single value per batch cannot detect drift within a batch or between batches while the process is running. A frequent on-site series correlated to the laboratory determinations closes the material balance in near real time and shows when the laboratory value has ceased to be representative. Both on-site determinations enter the quantification. The dry matter content establishes the dry mass of each packaging unit and therefore Qbiochar under 7.5. The organic carbon content does not replace the laboratory value but corrects it under 7.2.3, where the on-site series departs from it beyond the tolerance in Annex H. The properties determined by laboratory analysis are not recorded by the dMRV system at all, since endorsed laboratories transmit their results directly to the App under 6.3.8.

5.2 Completeness of the record

5.2.1 All biochar produced by the activity is recorded and followed to its destination. No quantity leaves the record.

5.2.2 Where the destination of a quantity is not an eligible application or incorporation under Chapter 1, the destination category is recorded and the quantity generates no C-sink units.

5.2.3 A quantity recorded under 5.2.2 must be segregated under 20.2.6 and must not subsequently be presented for unit issuance.

5.3 The application record (Track A)

5.3.1 An application record must be created for every application to soil and must contain:

(a) the identifiers and dry masses of the biochar quantities applied;

(b) the date of application;

(c) the geometry of the application area as a KML file under 20.5.4, and the national land parcel identifier where one exists;

(d) the eligible application route under 1.4;

(e) the application method, stating whether the biochar was incorporated into the soil profile or covered as required by 1.6, and the composition and mixing ratio where the biochar was intermixed;

(f) the identity of the applier;

(g) the applier's confirmation of the access right under 17.6;

(h) the applier's declaration of prior biochar applications to the parcel under 1.5.

5.3.2 The application record must be created at the time of the event. A record created later must state the reason for the delay, and the certification body must accept the reason before units are issued against it.

5.3.3 An application record is closed when all items under 5.3.1 are present and the accumulated post-gate emissions of every registered unit named in the record are complete, as required by 7.6.2. On closure the units named in the record move from the Registered state to the Stored state under 20.3.2, and the deduction of post-gate emissions under 8.4 is performed. An open record generates no units.

> *Rationale.* Item 5.3.1(h) asks the applier to declare biochar applied to the parcel before this application, whether or not it was certified. Where the earlier application was made by a CS operator it is already in the land register, and the App presents it rather than asking for it. Where it was certified by another scheme, or was made privately, the declaration is the only source and no party to the certification can verify it.
>
> The declaration is nonetheless the right instrument. The limit in 1.5.1 counts applications that the certifier cannot see, so either the applier is asked or the limit is applied to a figure known to be incomplete. The obligation falls on the one party with the knowledge, the answer is recorded and auditable as a statement, and 20.5.7 resolves a prior application whose area cannot be stated in the direction that reduces the remaining capacity.
>
> The exposure is also narrower than it appears. Fifty tonnes per hectare is several times a normal application rate, so a parcel approaches the limit only after repeated heavy applications, and those are the applications an applier is most likely to recall. The gap closes fully only with a shared land layer: 15.4.11 offers reciprocal queries to other recognised schemes, and the Union registry may provide a common layer from 2028. Until then the register holds a lower bound on cumulative loading, and the declaration is what stands between that bound and the true figure.

5.4 The incorporation record (Track B)

5.4.1 An incorporation record must be created for every incorporation in cement, concrete, or asphalt and must contain:

(a) the identifiers and dry masses of the biochar quantities incorporated;

(b) the date of incorporation;

(c) the identity and location of the plant producing the cementitious or bituminous matrix;

(d) the plant's confirmation that the biochar has been incorporated, stating the matrix type and the quantity of matrix produced.

5.4.2 Clauses 5.3.2 and 5.3.3 apply to incorporation records.

5.5 Biochar recovered in manure and digestate

5.5.1 A holding or anaerobic digestion (AD) plant at which biochar is fed to animals or add to manure or digestate is registered once in the C-Sink Register. The registration records:

(a) the national holding or AD identifier;

(b) the utilised agricultural area of the holding;

(c) the livestock keeper's declaration under 14.3.4;

(d) the livestock keeper's confirmation of the access right under 17.6, given for the holding and for the duration of the activity period.

5.5.2 For each certification period the Co-Operator records the identifiers and dry masses of biochar supplied to the holding and fed during that period. No record is required per delivery or per feeding event.

5.5.3 Geometry under 20.5.4 is not required for this pathway. The holding identifier and the utilised agricultural area constitute the geographically specific record.

5.5.4 Cumulative loading is computed across the utilised agricultural area of the holding in accordance with 20.5.8.

5.5.5 Where manure is exported from the holding, the mass is apportioned to the receiving holdings on the basis of the manure transfer records maintained under national nutrient legislation.

5.5.6 The declaration of prior applications under 5.3.1(h) is not required for this pathway.

Rationale. Biochar reaching soil in manure arrives at rates far below those of any direct application. A herd of fifty dairy cows receiving 100 g per animal per day returns about 1.8 tonnes of biochar a year, which over a five-year activity period and across fifty hectares is under 0.2 tonnes per hectare. Reaching the limit in 1.5.1 by this route alone would take centuries. Applying parcel-grade recording to it would impose the cost of the cumulative-loading machinery on a pathway that cannot approach the limit that machinery exists to enforce.

The requirements that remain are those the Delegated Regulation states directly: the monitoring of use up to application, satisfied by the standing registration and the periodic mass; the assurance under Section 4.4.2 that all manure reaches soil; the geographically specific record, satisfied by the holding and its area; and the access right, given once rather than per event. Manure deposited in situ by a grazing animal produces no application event and admits no finer record in any case.

This section concerns only biochar that has passed through an animal. Biochar mixed into bedding or manure as a soil amendment is a matrix mixture in the same sense as compost or substrate under 1.3.4, and follows the ordinary Track A chain of custody and the application record under 5.3.

5.6 Consignments below one tonne

5.6.1 Tracking to the application location under 5.3.1(c) is required for consignments of one tonne dry matter or more.

5.6.2 For a consignment of less than one tonne dry matter, 5.3.1(c) is satisfied by a written declaration of the region of sale, and 5.3.1(f), (g), and (h) do not apply. All other requirements of 5.3.1 apply unchanged, including the eligible application route and the application method.

5.6.3 Consignments under 5.6.2 are not entered in the land register under 20.5.

Rationale. Biochar sold in retail quantities reaches gardens and planters in units of tens of litres, and the applier is not a counterparty to any certification arrangement. Tracking to the application location is not achievable at that scale. The threshold is set at the mass below which the cost of location tracking exceeds the value of the units generated. This is a construction of this Standard and not of the Delegated Regulation, which requires monitoring to the point of application without qualification. It should be raised with the certification body at recognition.

5.7 Endorsement and integrity

5.7.1 A dMRV system may be used under this Standard only where CS has endorsed it.

5.7.2 The operator may use the CS-BCR dMRV system, which is designed to serve this Standard, or a dMRV system of its own or of a third party. A system other than the CS-BCR dMRV system must transmit all data recorded under this Chapter to the CS-BCR-App as those data are recorded and without manual intervention. A system that transmits periodically, on request, or in batches at the end of a period is not endorsed.

5.7.3 All data recorded under this Chapter are held on servers and in databases operated by CS and are accessible to the CS-BCR-App. Storage by the operator or by a dMRV provider is additional to, and does not replace, storage under this clause.

5.7.4 An endorsed dMRV system must:

(a) record every event with a timestamp that cannot be altered without leaving a trace;

(b) preserve superseded values together with the identity of the person making the change and the reason;

(c) prevent the same identifier or mass from being recorded against more than one application or incorporation;

(d) evaluate track and route eligibility under Chapter 1 and Annex B per production batch and per consignment;

(e) query the land register under 15.4 before closing an application record, and prevent closure where 15.4.7 is not satisfied;

(f) make the record available to the certification body, to CS, and to competent national authorities.

5.7.5 Records must be retained for the period required under Article 67(1) MRR and in any event for the duration of the activity period plus five years.

5.7.6 The operator remains responsible for the completeness and accuracy of the record where a dMRV provider operates the system

5.8 Data availability , confidentiality, and security

5.8.1 The operator must make available, on request by CS, a competent national authority, or the Commission, the data and information relating to the activity that is not commercially sensitive.

5.8.2 The dMRV system must protect the data it holds before transfer, under access control and against loss and against alteration, to the standard CS applies to the same data after transfer to its systems and register.

5.8.3 Transmission to the CS-BCR-App must be authenticated and protected against interception and alteration in transit. A failed transfer must be retried, and the failure and its resolution recorded.

> *Rationale.* Responsibility for the data changes hands at the point of transfer. After it, the data is on CS systems and is protected under 15.5. Before it, the data is on the operator's plant or on a provider's infrastructure, and neither CS nor the certification body has any control over it. Clause

5.8.2 therefore holds the dMRV side to the same standard rather than leaving the exposure to sit in the gap between the two. Clause 5.8.3 covers the transfer itself, which is the point at which a record could be lost or altered without either side noticing.

PART II – Production, Emissions, and Registration

Part II sets out how biochar is produced, characterised, registered, and tracked to the point of permanent storage. The chapters follow the order in which these are established. Chapter 6 sets out the production batch, the reference and subset analyses, and the conditions of batch closure. Chapter 7 sets out the daily determination of organic carbon content and dry matter, the formation and identification of transport units, and their registration and tracking. Chapter 8 and 9 set out the emissions associated with the activity and the manner in which they are deducted.

6. The production batch

(Delegated Regulation, Annex Sections 2.2.5.1, 2.2.5.2, 2.2.5.3)

The production batch is the envelope within which a single set of determinations is valid. Everything that is determined by laboratory analysis is established for a batch: the organic carbon content, the permanence fraction, the energy density, and compliance with the contaminant limits. Everything that governs eligibility is established for a batch: the feedstock and therefore the permitted application routes. And the greenhouse gases of production are averaged over a batch and deducted at its closure.

A batch is therefore not a quantity of material. It is a claim that a defined set of properties holds across a defined production run, and it lasts exactly as long as the conditions supporting that claim hold. This Chapter states what those conditions are, how the properties are established, and what happens when the claim ends.

6.1 Definition and boundary

6.1.1 A production batch is the quantity of biochar produced by a single production unit under a shared feedstock or feedstock mix and common processing conditions, meaning the same underlying process, target temperature, solid residence time, and oxygen management technique across the batch.

6.1.2 A batch is bound to a single production facility. It may consists of several units presenting the same endorsed pyrolysis system if the units are fed from the same feedstock, are run under the same pyrolysis conditions, and the produced biochar of all connected units are continuous mixed.

6.1.3 A batch must not include biochar produced at more than one location or in more than one certification period.

6.1.4 A batch may be interrupted and restarted. Biochar produced from the same feedstock under the same conditions and split into more than one consignment remains a single batch.

6.1.5 A production unit may produce successive batches within a certification period where feedstock or production conditions change. An interruption must be recorded in the CS Biochar Tool before another batch of the same production unit is started or restarted.

> *Rationale.* The batch is the unit for which a single organic carbon content and a single permanence fraction are claimed to be representative. Two reactors do not share a

thermal history, and reflectance distributions from separate units are not poolable even where mean values agree.

6.2 Registration and opening

6.2.1 A production batch is opened by registration in the CS-BCR-App before the first biochar of the batch is produced. The register issues a unique batch identifier.

6.2.2 The registration records the pyrolysis system, the feedstock or feedstock mix by Annex B entry and by proportion, the target process temperature, the solid residence time, the oxygen management technique, the intended track and application route under 1.3 and 1.4, the planned quantity of biochar on a dry matter basis, and the certification period in which the batch falls.

6.2.3 On registration the register determines the expected production emissions of the batch under 8.4 and confirms that the reserve satisfies 8.4. A batch is not opened where it does not.

6.2.4 Biochar produced before the batch to which it belongs has been registered is not part of any batch, is recorded under 5.2.2, and generates no units.

6.3 The reference analysis

6.3.1 A representative sample is taken during the first week of the initial batch and submitted to a laboratory endorsed by CS. The analysis of that sample is the reference analysis of the initial batch and establishes:

(a) the organic carbon content, Corg;

(b) the molar ratio of hydrogen to organic carbon, H/Corg;

(c) the energy density on a lower heating value basis;

(d) the reactive organic carbon fraction and the reflectance distribution under Chapter 12;

(e) compliance with the limits in Chapter 19.

6.3.2 The reference analysis must be performed on the representative sample taken for the EBC batch certification of the same batch. Separate sampling for the purposes of this Standard is not accepted.

6.3.3 Samples for all batches following the initial batch are taken from the collected daily retention samples. They constitute average samples for the production during the retention sampling period.

6.3.4 At least three samples per batch are required for the determination of the permanence fraction under 12.1.2. This number may not be reduced. The first sample is taken from the first week representative sample of the initial batch. The second and third sample are taken from the daily retention samples.

6.3.5 The properties established by the reference analysis are the properties of every registered unit of the batch, subject to correction under 7.2.3.

6.3.6 A certification body or CS may require analysis of retention samples where this is necessary to establish a representative characterisation of a batch or to confirm that measurements taken were representative.

6.3.7 Where a subset analysis departs from the reference analysis such that the batch would fall into a different track or application route, or would fail a limit in Chapter 19, the batch closes with effect from the production date of the subset concerned.

6.3.8 Endorsed laboratories transmit their results directly to the CS-BCR-App.

> *Rationale.* Clause 6.3.2 preserves the single-sample principle of the Global Biochar C-Sink Standard. One representative sample serves the EBC batch certification, the C-sink certification, and this Standard. Separate sampling would allow three different characterisations of the same material and would remove the basis on which the three certifications can be conducted in a single audit under 21.4.10.
>
> Clause 6.3.7 is the consequence of treating the batch as a claim rather than as a quantity of material. A subset analysis that contradicts the reference analysis has not merely produced a different number; it has shown that the conditions under which the reference analysis was representative no longer held. Continuing the batch would extend a characterisation to material it does not describe.

6.4 Sampling and retention samples

6.4.1 All production batches must be sampled. Samples must be representative of the average properties of the batch.

6.4.2 The sampling protocol must be described in the monitoring plan and must be consistent with Article 33 MRR, excluding the last sentence of paragraph 1 of that Article. The protocol must follow the EBC sampling requirements.

6.4.3 For each production batch, the producer must take a one litre retention sample from the production unit producing that batch on every day that biochar is produced. Samples may be aggregated across the calendar month for storage, keeping batches separate. Retention samples must be stored for at least two years and made available on request to the certification body, to CS, and to competent national authorities.

6.4.4 All samples for reference analyses following the initial representative sample from the initial batch must be taken from the aggregated daily retention samples of the period from batch start or since the last sample for reference analyses was taken.

6.6 Conditions of closure

6.6.1 A production batch closes on the first of the following to occur:

(a) the end of the certification period in which it falls;

(b) 365 days from the registered opening of the batch, including all interruptions;

(c) production of 1000 tonnes of biochar on a dry matter basis;

(d) a change in the proportion of any feedstock type in the mix of more than 20% of that proportion;

(e) a change in the process temperature of more than 20% of the declared target temperature, or a change in the solid residence time or in the oxygen management technique;

(f) a determination under 6.3.7;

(g) a change of production unit;

(h) the decision of the operator, recorded in the register.

6.6.2 Biochar produced under conditions falling outside the tolerances in 6.6.1(d) and (e) is not part of the batch, is recorded under 5.2.2, and generates no units.

6.6.3 On closure under any limb of 6.6.1, a subsequent batch must be registered under 6.2 before further production is assigned.

> *Rationale.* Clauses 6.6.1(b), (d), and (e) reproduce the batch definition applied under the EBC, so that an operator certified under both schemes maintains a single set of physical records and a single set of batch boundaries. The limits are stated numerically rather than by reference so that the methodology is complete as submitted and verifiable by the certification body without recourse to a document outside the recognised scheme. Clause 7.6.1(c) exercises the discretion in Section 2.2.5.1 of the Delegated Regulation to set a maximum batch size.

6.7 Closure

6.7.1 On closure the operator determines the realised production emissions of the batch and the realised production emission intensity under Chapter 9.

6.7.2 The register cancels from the reserve a quantity of certified removal equal to the realised production emissions of the batch, under 8.4, together with any correction under 8.5.2.

> *Rationale.* Closure ends the production run and settles its emissions. It does not affect the material, which continues to move and to be applied on the basis of the determinations made under 6.3. This is what allows production emissions to be settled once, at the moment they become knowable, without holding back the biochar. A unit applied after the closure of its batch carries a production emission term of zero for the same reason as one applied before it: the emission has already been deducted.

7. Registered transportation units, and post-production tracking

(Delegated Regulation, Annex Sections 1.3.2, 2.2.3, 2.2.5.6, 3.2)

This Chapter states how a quantity of biochar becomes a unit with its own dry mass and carbon content, what it inherits from its batch, what accrues on it after the factory gate, and how it behaves when it is divided or pooled on the way to a site of application.

Every requirement of Chapter 5 applies to the matters dealt with in this Chapter. In particular, the recording obligations of 5.1.3, the completeness requirement of 5.2, the application and incorporation records of 5.3 and 5.4, the manure pathway of 5.5, the small consignment provision of 5.6, and the endorsement and integrity requirements of 5.7 are not restated here and apply in full.

7.1 Determination of dry matter

7.1.1 The dry matter content of biochar is determined on site under 5.1.3(c) in accordance with Annex G for at least every 10 m^3 of biochar.

7.1.2 The determination and the individually weighed fresh mass of each transport unit together establish the dry mass of that unit. The dry mass is recorded against the unit under 7.5 and is the mass entering Qbiochar under 10.5.

7.1.3 The frequency of determination may be reduced where the operator demonstrates that the dry matter content of the production line does not vary by more than the tolerance in Annex G over extended periods and production quantities.

> *Rationale.* The dry matter content of biochar varies with quenching intensity, with the absorption of atmospheric humidity, and with air drying, and can change materially between production and dispatch. A single laboratory determination per batch cannot establish the dry mass of a packaging unit formed months later. Since the dry mass multiplies directly into total carbon removals under 10.3.1, a determination that is not contemporaneous with the formation of the packaging unit is not a determination of the quantity the calculation requires.

7.2 Determination of organic carbon content

7.2.1 The organic carbon content of biochar is determined on site under 5.1.3(c) in accordance with Annex H, daily or weekly according to the measured variation.

7.2.2 The organic carbon content used in the quantification under 10.4 is the value established by the reference analysis under 6.3, corrected where the on-site series departs from it by more than the tolerance in Annex H, in accordance with that Annex.

7.2.3 A departure of the on-site series from the reference value beyond the tolerance in Annex H leads to a correction of the carbon content according to Annex H.

> *Rationale.* The organic carbon content and the dry matter content carry the largest measurement uncertainty in the calculation of total carbon removals, and a single value per batch cannot detect drift within a batch while the process is running. A frequent on-site series correlated to the laboratory determination closes the material balance in near real time and shows when the laboratory value has ceased to be representative. The on-

site determination does not replace the laboratory value but applies a correction factor to it.

7.3 Formation and identification of the Transport Unit

7.3.1 Biochar is formed into transport units (TU). A TU is the smallest physically separable quantity of biochar carrying its own identifier. A bulk consignment (e.g., a lorry load) is equally considered a TU.

7.3.2 Each TU receives a unique identifier issued by the Global C-Sink Registry under 20.2.2, linked to the batch identifier and to the dry mass and C-content it carries.

7.3.3 The identifier is affixed to the TU and accompanies it on every transport. It carries or resolves to the batch identifier, the date of production, the dry mass, the organic carbon content, the track and permitted application routes under 1.3 and 1.4, and the chain of custody to date.

7.3.4 Registration proceeds continuously while the batch is open and is not affected by the closure of the batch. A registered unit of a closed batch retains the properties established under 6.3 and may be applied or incorporated after closure.

7.4 Post-production tracking

7.4.1 From the factory gate to the point of application or incorporation, the chain of custody of every registered unit is recorded under 5.1.3(e) and 5.7. This Section states the quantities that must accrue on the unit in the course of that tracking, in addition to the events Chapter 5 requires to be recorded.

7.4.2 The following are recorded against the registered unit as they occur:

(a) each transport leg from the factory gate, with mode, distance, and either the fuel consumed or the applicable default under Annex F;

(b) any processing, intermixing, or repackaging, with the energy consumed;

(c) each storage event, with its location and duration;

(d) the energy consumed in applying or incorporating the material.

7.4.3 Where a registered unit passes into the custody of a processor, a trader, or an applier, the obligation to record continues to fall on the Co-Operator, and the Co-Operator must have made arrangements sufficient to discharge it before the unit leaves its custody.

7.4.4 The emissions arising from the events recorded under 7.4.2 are calculated under Chapters 14 and 15 and accumulate on the registered unit.

7.4.5 As the production emissions are already deducted by the producer, registered unit carries a production emission term of zero.

Rationale. Clause 7.4.3 restates for the registered unit what 1.1.7 establishes for the activity: the Co-Operator's account runs to the point of application, and responsibility does not transfer with ownership of the biochar. It transfers only with the accountable carbon. Under the Delegated Regulation there is no party other than the Operator and the Co-Operator to whom transport and application emissions can be charged, so the arrangements by which the Co-Operator obtains the data must exist before the material is dispatched rather than being sought afterwards.

7.5 Division and pooling

7.5.1 Where a registered unit is divided, each resulting quantity receives its own identifier linked to the identifier of the unit divided. The dry mass, the carbon content, and the accumulated post-gate emissions are apportioned to the resulting units in proportion to dry mass.

7.5.2 Where registered units of the same production batch are pooled, the resulting quantity receives an identifier linked to the identifiers pooled, and the accumulated post-gate emissions are summed.

7.5.3 Where registered units of more than one production batch are pooled, 20.2.5 applies and the resulting quantity is recorded as consisting of fractions of the constituent batches in proportion to the dry matter and carbon masses pooled. The properties of the resulting quantity are the mass- and carbon- weighted means of the properties of the constituent batches, and the accumulated post-gate emissions are summed.

7.5.4 Where registered units of more than one batch cannot be demonstrated to be well mixed, they must be kept in segregated supply and must not be pooled.

> *Rationale.* Division and pooling are the ordinary commercial operations of the biochar trade, and a unit of account that could not survive them would not be usable. Apportionment of accumulated emissions by dry mass is the only basis consistent with the way those emissions arose, since a transport leg is incurred by the mass carried and not by the number of packages.
>
> Clause 7.5.3 keeps the pooling rule of 20.2.5 and adds what follows for the quantification: where batches with different organic carbon contents or different permanence fractions are pooled, the removal of the resulting quantity is computed on the mass- and carbon weighted means.

7.6 Closure of the application or incorporation record

7.6.1 The application record under 5.3 and the incorporation record under 5.4 are made against the identifiers of the registered units applied or incorporated, and state the dry mass and carbon content of each.

7.6.2 A record closes when the requirements of 5.3.3 or 5.4.2 are satisfied and the accumulated post-gate emissions of every unit named in it are complete.

7.6.3 On closure the units named in the record move from the Registered state to the Stored state under 20.3.2, and the deduction under 8.4 is performed.

7.6.4 For the manure pathway under 5.5 and for consignments below one tonne under 5.6, the record closes against the identifiers and dry masses recorded under those Sections, and 7.6.2 and 7.6.3 apply.

> *Rationale.* Clause 7.6.2 adds one condition to the closure requirements already stated in Chapter 5. Under those Sections a record closes when the evidence of the application event is complete. Under this Standard the record is also the moment at which post-gate emissions are deducted from the established C-sink, so it cannot close while any of them

is outstanding. A unit whose transport record is incomplete has an unquantified emission and cannot be credited with a removal net of it.

8. Emissions

(Delegated Regulation, Annex Sections 2.2.1, 2.2.2, 2.2.4, 2.2.5, 2.2.6, 2.2.7.2)

This Chapter identifies the emission sources and carbon sinks a BCR activity must account for, fixes the baseline, states how the net carbon removal benefit is assembled, quantifies each stage of emissions, and establishes where and when each is deducted.

In regard to emissions, this standard distinguishes between two stages:

i. The production of biochar at the facility which covers all emissions from feedstock procuration, storage, preparation to biochar production, post-production and packaging. This is covered by all emission data assessed for the batch and reaches the factory gate. The biochar producer is responsible for these emissions, their assessment and their deduction from a certified C-sink.

ii. The transport unit (TU) (i.e. big bags, palettes, container, lorries) is defined by its dry weight and carbon content which is assessed by the producer before the packaging unit leaves the production facility. The transport unit (TU) has a unique ID registered at the CS Carbon Register and is linked to the batch and all respective production data. The TU is geographically tracked from the factory gate to the final C-sink passing all transformation and trade steps. When sold, the TU changes its registered owner. The owner of the accountable carbon of the TU (i.e., the C-sink potential) may differ from the owner of the TU; both owner types are registered in the CS Carbon Register. The owner of the accountable carbon is responsible for the assessment of all emissions occurring between the factory gate and the final C-sink. Before the registration of the C-sink, all TU-related emissions are deducted from the certified C-sink.

8.1 Sources and sinks

8.1.1 The activity must consider the sources and sinks listed in Table 8.1.

Table 8.1 - Sources and sinks

Phase	Sources	Gases
Biochar production	Equipment used to produce biochar	all GHG
	Biochar processing equipment used before shipping	all GHG
	Associated energy generation equipment geographically contiguous with the facility	all GHG
	Treatment equipment for wastes or byproducts of production	all GHG
	Production, collection, and transport of biomass and biomass fuel	all GHG
	Production and supply of inputs	all GHG
	Processing and treatment of wastes, including wastewater and exhaust gases	all GHG
	Construction and installation of the production facility	all GHG

Phase	Sources	Gases
Transport of biochar	Fuel combustion and electricity consumption in land, maritime, and other transport	all GHG

Phase	Sinks	Gases
Application or incorporation	Quantity of CO_2 permanently stored as biochar	CO_2
	Energy consumption or generation associated with application or incorporation	all GHG

8.1.2 Where the operator or the certification body identifies a material source associated with the activity that is not listed in Table 8.1, that source must be included in GHGassociated.

8.2 Baseline

8.2.1 In accordance with Section 2.2.2 of the Delegated Regulation, a standardised baseline set to 0 tCO2 per year applies to BCR activities.

8.2.2 Additionality is considered to be complied with by virtue of the standardised baseline, in accordance with Article 5(2) of the CRCF Regulation. No activity-specific additionality test applies.

8.2.3 Where the activity is financed through a combination of public and private funding, the operator must state in the activity plan every form of public financing received or applied for. This information is carried onto the certificate of compliance.

> *Rationale.* A baseline is the carbon removal that would have occurred without the activity. It enters 8.3.1 with the same sign as CRtotal and is deducted from it, so that an activity is credited only with the removal it adds compared to hypothetical alternatives. In principle a baseline could account for what else might have been done with the same biomass. Wood residues pelletised and stored dry underground would, at least initially, retain more of their carbon than the same residues pyrolysed, since more or less half of the feedstock carbon leaves a pyrolysis reactor as gas. A baseline constructed on that footing would deduct the alternative and credit only the difference.
>
> The Delegated Regulation does not construct the baseline that way. Article 4(8) of the CRCF Regulation requires a standardised baseline to be highly representative of the standard performance of comparable practices and processes in similar social, economic, environmental, technological and regulatory circumstances, and recital 4 of the Delegated Regulation applies that test to BCR: these activities face a funding gap, operators lack an economic reason to invest in them, and the standard performance is accordingly no removal at all. Alternative dispositions of the biomass are not treated as comparable practices, and the baseline is, therefore, set to zero.
>
> Zero is not a statement about emissions. A baseline of zero says only that no removal would have occurred without the activity; it says nothing about what would have been emitted.
>
> The question the baseline does not ask is answered instead by eligibility. Biogenic combustion CO_2 is zero-rated under 9.4.3, following the convention of Directive (EU) 2018/2001, and the fate of the feedstock is governed by the waste and residue restriction in 1.7.2, the exclusions in Annex

B.4, and the cascading use principle. The feedstock list therefore carries weight in this Standard that a baseline calculation would carry in a methodology built differently.

8.3 Net carbon removal benefit

8.3.1 The net carbon removal benefit is:

$$\text{Net carbon removal benefit} = CR_{baseline} - CR_{total} - GHG_{associated}$$

where $CR_{baseline}$ is zero under 8.2, CR_{total} is negative and calculated under Chapter 10, and $GHG_{associated}$ is positive and calculated under this Chapter.

8.3.2 The greenhouse gases associated with the activity are:

$$GHG_{associated} = GHG_{production} + GHG_{transport} + GHG_{use}$$

where:

$GHG_{production}$ is the emissions arising up to the factory gate, calculated under 6.6;

$GHG_{transport}$ is the emissions of transport from the factory gate to the point of application or incorporation, calculated under 6.7;

GHG_{use} is the emissions of application or incorporation, calculated under 6.8.

8.3.3 Units are issued only where the net carbon removal benefit is greater than zero.

Rationale. Removals carry a negative sign throughout the Delegated Regulation and emissions a positive sign. The double negative in 8.3.1 is the Regulation's own convention and is retained to avoid divergence in the calculation tools.

The term $GHG_{biochar}$ used in Section 2.2.4 of the Delegated Regulation is rendered here as $GHG_{production}$. The two are the same quantity. The name is changed because the stage names in 8.3.2 should be parallel, and because the Delegated Regulation itself uses $GHG_{biochar}$ site for a different quantity in Section 2.2.7.2, which is a collision this Standard does not reproduce.

8.4 The deduction of associated emissions

The greenhouse gases associated with the activity are quantified in three stages: production, transport, and application or incorporation. All three are assessed in full and all three are deducted from total carbon removals, as Article 4(1) of the CRCF Regulation requires. The Delegated Regulation does not prescribe at what moment, or against which object, the deduction is performed. This standard deduces emissions in two instances as introduced above, each chosen so that no deduction waits on a determination that is not yet available.

Production emissions are deducted from the batch, at closure. Everything up to the factory gate is the responsibility of the producer: feedstock supply and storage, the conversion itself, process methane, energy and inputs, waste treatment, and the amortised emissions of the installation. These quantities are averages over a production run and are complete only when the run is complete. They are therefore not attributed to individual quantities of biochar as those quantities are produced.

During the very first batch produced by a facility which is usually produced between two and three months, the producer builds a C-sink reserve. This is a registered biochar carbon sink

owned by the producer that cannot be sold to third parties and must be kept as reserve for the deduction of future production emissions. At the closure of each following batch, the register cancels from the production emission reserve a quantity of certified removal equal to the production emissions of the batch. The removal cancelled has been verified at audit, and the cancellation extinguishes it: it is not issued, not transferred, and not attributable to anyone. The cancellation is performed by the register as a condition of closure. It is not a declaration by the operator, and it cannot be deferred.

The consequence is that the production emission term attaching to any registered unit of a closed batch is zero. Not because the emissions were small, and not because they were disregarded, but because they have been deducted in full from the same activity, in the same register.

The C-sink reserve of the biochar producer must be increased during each batch in order to provide always a sufficient mass for the emission deduction at batch closure. The size of the reserve is determined by CS based on the technical audit and the production data of preceiding batches.

Post-gate emissions are deducted from the unit, at the crediting event. Transport from the factory gate, any processing or intermixing, and the energy consumed in applying or incorporating the material are recorded against the registered unit as they occur, under Chapter 7. Each is known at the moment it happens and none requires an average. They accumulate on the unit and are deducted from the removal of that unit when its application or incorporation record is closed. A unit whose post-gate account is incomplete does not close and generates no certified C-sink.

Registration is continuous within an open batch. Because the reserve is constituted before the mechanism begins and is sized in advance of each batch, the removal an activity holds free of the reserve is at every moment already net of the production emissions of its open batches. Registration of units, their transfer, their application, and the closure of application records therefore proceed continuously while a batch is open. They do not wait on the closure of the batch, and no unit carries a provisional emission figure.

Every emission quantified under this Chapter is deducted once, in carbon, from removal generated by the same activity. No emission is deducted twice and none is left undeducted.

> *Rationale.* The initial certification period exists because a reserve cannot be constituted before any removal has been certified, and removal cannot be certified before a batch has closed and been audited. In that period none of the difficulties the reserve exists to remove are present: the batch closes, the audit follows, and every quantity is known, so the ordinary apportionment applies. Its length is set by the operator because what governs it is the date of first application, not the date of first production. It also places a verification audit on a new installation within months rather than after a year, which is where such an audit does most good.
>
> The deduction is made from the activity's own removal and from nothing else. No unit issued under another standard and no unit issued to another activity may discharge an emission of this activity. The mechanism is therefore not the voluntary compensation contemplated by Section 4.3.3 of the Delegated Regulation, which is reportable but quantification-neutral, and it does not touch any quantity represented as a carbon sink under the Global Biochar C-Sink Standard.

8.5 Revision of a production emission parameter

8.5.1 Where a parameter entering the calculation of GHGproduction is redetermined during the activity period, whether by re-measurement, by correction of an error, by the identification of a source under 8.1.2 not previously assessed, or by a materiality assessment repeated under 21.4.8, the redetermined value applies from the production batch in which it is established.

8.5.2 Where the redetermined value is higher than the value applied to production batches closed since the parameter was last determined, the aggregate shortfall for those batches is added to the quantity cancelled from the reserve at the closure of the batch in which the redetermination is established. Where no batch of that production unit is then open, the shortfall is cancelled from the reserve on the establishment of the redetermined value.

8.5.3 Where the redetermined value is lower, no adjustment is made in respect of batches already closed and no cancelled removal is restored.

8.5.4 Batches already closed are not reopened. A correction under 8.5.2 is made in the batch then current, and the register records the batches to which the shortfall related, the parameter concerned, and the quantity cancelled. Carbon removal units already issued are not affected.

9. Production emissions

9.1 General Formula and GHG allocation

9.1.1 The emissions caused by the production of the biochar C-sink is calculated with the following equation:

$$GHGproduction = Falloc \times (GHGfacility + GHGinputs)$$

where:

Falloc is the fraction of GHG emissions from the production process attributable to biochar rather than to the other energy-bearing outputs of that process (e.g., electricity, heat, charcoal), determined under 9.1.3 to 9.1.5;

GHGfacility is the emissions arising at the production facility. It is calculated as the sum of the following eight terms, each explained in the individual subchapters below:

$$\begin{aligned} GHGfacility = {} & GHGbio + GHGbio\text{-}storage + GHGcombustion + \\ & CH4release + GHGelec + GHGheat + \\ & GHGcapital + GHGdisposal \end{aligned}$$

GHGinputs is the emissions of producing and supplying the inputs consumed by the facility. It is calculated as the sum, over all inputs, of the quantity consumed multiplied by its emission factor:

$$GHG\_(inputs) = \sum(Q\_(input) \times EF\_(input))$$

Inputs are materials consumed by the process other than biomass and fuels, such as catalysts, binders, activation agents, water treatment chemicals, filter media, and packaging. Fuels are accounted under GHGcombustion and construction materials under GHGcapital. The GHGinputs are determined in chapter 9.10 below.

9.1.2 The production facility comprises the equipment used to produce biochar, any equipment used to treat or process biochar before dispatch, any energy generation equipment geographically contiguous with the facility, and any equipment for treating wastes or by-products of the production process. The boundary of the facility is the factory gate.

9.1.3 The allocation fraction is:

$$F_{alloc} = \frac{E_{biochar}}{E_{biochar} + \sum Ecoproducts}$$

where $E_{biochar}$ is the chemical energy of the biochar produced and Ecoproducts the energy of each co-product, both on a lower heating value basis and expressed in MJ per kg of biochar produced.

9.1.4 Where the chemical energy of the biochar produced is less than 10% of the total energy of the co-products, the biochar is treated as a residue of the process, F_{alloc} is zero, and $GHG_{facility}$ and GHG_{inputs} need not be calculated.

9.1.5 An output is a co-product only where it is used outside the activity and contains at least 10% of the total energy in all outputs of the process. Electricity, useful heat, and materials containing chemical energy are co-products where they meet those conditions. Use outside the

activity includes supply to a grid, network, or third party, and use by another operation of the same undertaking at the same site.

9.1.6 Electricity or heat generated by the process and consumed by the activity itself is not a co-product. This covers biomass drying, feedstock handling and preparation, the operation of the reactor and its ancillaries, biochar treatment and packaging, and any other consumption within the production facility boundary under 9.1.2.

9.1.7 Where energy from the process serves both the activity and a use outside it, the quantity used outside the activity must be metered separately and only that quantity is a co-product. Where it is not metered separately, none of it is a co-product.

9.1.8 A co-product subject to further processing before export is included on its energy content before that processing. An output with no heating value, and an output sent for disposal, are excluded from the allocation.

9.1.9 $E_{biochar}$ and the chemical energy of material co-products are determined by laboratory testing on a lower heating value basis. The energy of exported electricity and heat is the quantity supplied to a grid, network, or user outside the activity.

9.1.10 The energy share of the biochar in the outputs of the facility is F_{alloc}. Where F_{alloc} is 0.5 or greater, the biochar accounts for 50% or more of the total energy output and the feedstock restriction in 1.7.2 applies.

> ***Rationale.*** Allocation is stated before the emission terms because 9.1.4 may dispose of the whole of them. A facility whose biochar is a minor output by energy is treated by the Delegated Regulation as producing a residue, and the emissions of the process belong to its principal products rather than to the biochar.
>
> Clause 9.1.5 treats energy used by another operation at the same site as a co-product. The Delegated Regulation speaks of export from the facility, wording which suits a standalone pyrolysis plant. Where a pyrolysis unit is installed within a larger works and supplies heat or power to a process that is not part of the biochar activity, that energy has been delivered to a user outside the activity in the same sense, and the emissions of producing it should be shared. Reading the provision otherwise would make the allocation turn on whether the consuming process sits inside or outside a boundary fence, which bears no relation to the energy accounting.
>
> Clause 9.1.6 is what keeps three calculations apart that concern the same physical quantity of drying heat. It is not a co-product here, because it is not exported. It is not in Qheat under 9.7.3, because it is generated and consumed on site and its fuel is already counted under 9.4. And it does count towards the utilisation of process heat under 1.2.6, because a facility that dries its feedstock with recovered heat is using its energy well. The three answer three questions and no figure may be carried between them.

9.2 GHGbio: Supply of biomass and biomass fuel

9.2.1 The emissions associated with the production and supply of the biomass and biomass fuel used at the facility are:

$$GHG_{bio} = \sum Q_{biomass} * EF_{biomass}$$

where Qbiomass is the quantity of each biomass or biomass fuel consumed in the certification period, excluding any non-biomass contamination such as soil or stones, and EFbiomass is its emission factor determined under 9.2.3.

9.2.2 Emissions of transport of the biomass to the production facility are part of GHGbio and are not accounted under Qtransport. They are calculated from the actual distance travelled and mode of transport.

9.2.3 EFbiomass is composed according to the class of the feedstock. Classes are assigned to each Annex B entry in that Annex.

Table 9.1 Compostion of $EF_{biomass}$ by feedstock class

Feedstock class	e_{ec} cultivation	e_l land-use change	e_p processing	Collection	Transport
W Wastes, and residues other than agricultural, aquaculture, fisheries and forestry residues	0	0	0	counted	counted
AR Agricultural residues	0	0	0	counted	counted
FR Forestry residues	0	0	0	counted	counted
P Purpose-grown biomass	counted	counted	counted	counted	counted

Feedstock classes

W wastes, and residues other than agricultural, aquaculture, fisheries and forestry residues, such as processing residues, post-consumer wood, sewage sludge, and the biogenic fraction of municipal waste

AR agricultural residues arising directly in agriculture, such as straw, stover, husks, and prunings

FR forestry residues arising directly in forestry, such as tops, branches, and thinnings

P purpose-grown biomass, including energy crops, short-rotation coppice, dedicated plantations, and roundwood

Emission terms, as defined in Part C of Annex V to Directive (EU) 2018/2001

e_{ec} emissions from the extraction or cultivation of the raw material, including fuel, fertiliser, pesticides, and irrigation

e_l annualised emissions from carbon stock change caused by land-use change

e_p emissions from processing the material before it is consumed, such as chipping, drying, or pelleting

Collection the first operation performed to recover the material, as defined in 9.2.4

Transport carriage of the material to the production facility, calculated under 9.2.2

0 the term is zero and need not be assessed. **counted** the term is quantified and included in EFbiomass.

9.2.4 For classes W, AR, and FR the material is treated as having zero lifecycle greenhouse gas emissions up to the process of collection. Collection is the first operation performed for the purpose of recovering the material, such as baling, gathering, chipping in the field, or loading at the point of arising. For municipal waste, post-consumer wood waste, and sewage sludge, collection is treated as beginning when the material is deposited at the biochar production facility.

9.2.5 For class P, the terms e_{ec}, e_l, and e_p are calculated in accordance with Annexes V and VI to Directive (EU) 2018/2001, taking emissions up to the point of consumption. The credits

available under those Annexes for soil carbon accumulation, carbon capture, and excess electricity are not applied.

9.2.6 Emissions from indirect land-use change are zero.

Land and sustainability criteria

9.2.7 Certification schemes may provide guidance for feedstocks without disaggregated default values in the Annexes to Directive (EU) 2018/2001. Default factors provided under Annex F are conservative and carry no uncertainty in the assessment.

9.2.8 All biomass and biomass fuel used by the activity, whether as feedstock or for energy, must satisfy the applicable criteria of Article 29 of Directive (EU) 2018/2001, as follows:

Criterion	Subject	W	AR	FR	P
29(2)	Soil quality and soil carbon where agricultural residues are removed	-	yes	-	yes
29(3)	Land with high biodiversity value: primary and highly biodiverse forest, protected areas, highly biodiverse grassland	-	yes	yes	yes
29(4)	Land with high carbon stock: wetlands, continuously forested land, land with 10 to 30% canopy cover	-	yes	yes	yes
29(5)	Peatland	-	yes	yes	yes
29(6)	Forest biomass: legality of harvesting, regeneration, protection of designated areas, soil quality and biodiversity, maintenance of long-term production capacity	-	-	yes	yes, where forest biomass
29(7)	Country or sourcing-area LULUCF criteria	-	-	yes	yes, where forest biomass
29(10)	Greenhouse gas saving thresholds	verified only where the facility produces heat, electricity, a biofuel, a bioliquid, or biogas, and only in respect of that output			

9.2.9 The status of land under criteria 29(3), 29(4), and 29(5) is assessed as at January 2008.

9.2.10 Feedstock identified as being, or as being produced from, a high indirect land-use-change-risk feedstock under Directive (EU) 2018/2001 must not be used.

9.2.11 Where biomass is sourced from an area designated for conservation by the competent national authority, including an area covered by a national restoration plan under Regulation (EU) 2024/1991, or from a protected habitat, the sourcing must accord with the conservation and restoration objectives for that area.

9.2.12 The operator must disclose the feedstock or feedstock mix consumed, and the feedstock used to produce any biofuel, bioliquid, or biomass fuel consumed, disaggregated to the level required in reporting under Directive (EU) 2018/2001.

Evidence

9.2.13 Compliance with 9.2.8 to 9.2.11 may be demonstrated through a voluntary scheme approved by the Commission under Article 30(4) of Directive (EU) 2018/2001, a national scheme recognised under Article 30(6) of that Directive, or a scheme recognised by the competent national authority of the state in which the production facility is located. Data provided by such a scheme is treated as accurate.

9.2.14 Where the facility is regulated under Directive (EU) 2018/2001, a periodic assessment of sustainability compliance by a Member State competent authority does not prevent the issuance of units. Any non-conformity subsequently established under Article 29 of that Directive must be notified to the certification body.

9.2.15 Where the facility produces energy that is taken into account under Directive (EU) 2018/2001, the certification body verifies that the entity operating the facility complies with the national implementation of that Directive, including any national measure giving effect to the order of priorities for woody biomass in Article 3(3), and that it does not receive direct financial support for the use of saw logs, veneer logs, industrial grade roundwood, stumps, or roots to produce energy.

> *Rationale.* Section 2.3.4.3 of the Delegated Regulation carries the whole of the biomass supply calculation into Annexes V and VI to Directive (EU) 2018/2001, and imports with it the rule that wastes and residues bear no emissions before collection. For a dedicated biochar plant that is the end of the matter, since Section 4.3.2 confines such activities to waste and residual feedstock. This Standard also admits activities in which biochar is less than half of the energy output, which are a substantial part of the certified population, and for those the cultivation route in 9.2.5 and the land criteria in 9.2.8 are operative rather than formal.
>
> The exclusion of the RED II credits in 9.2.5 follows from Section 2.3.4.3, which admits only e_{ec}, e_l, and e_p. A credit for soil carbon accumulation under improved agricultural management would in any event overlap with the removal being certified.
>
> Clause 9.2.4 states the collection point for municipal waste, post-consumer wood waste, and sewage sludge by reference to the biochar production facility. The Delegated Regulation expresses the same rule by reference to the facility at which the capture activity is implemented, wording drawn from the DACCS and BioCCS methodologies and not adjusted for BCR. The reading adopted here applies the rule to the facility that in fact consumes the material.
>
> The Delegated Regulation sets indirect land-use-change emissions to zero and justifies this by reference to Section 4.3.1, which states requirements for BioCCS. The corresponding BCR provision is Section 4.3.2. Recital 11 addresses BCR expressly, and 9.2.6 follows the recital.

9.3 GHGbio-storage: Methane from biomass storage

9.3.1 Biomass stored in bulk under conditions that become anaerobic may emit methane. The term covers storage of the feedstock at any point before processing, whether at the production facility or elsewhere.

9.3.2 GHGbio-storage is zero for a quantity of feedstock where any of the following applies:

(a) the biomass is coarse woody material that naturally remains well aerated;

(b) the biomass is stored for no more than four weeks before processing;

(c) the biomass is stored with a residual moisture content of no more than 20%;

(d) the biomass is pelleted for storage;

(e) the operator demonstrates that the use of advanced storage methods (e.g., forced aeration) prevents methane emissions from anaerobic decomposition.

9.3.3 Where 9.3.2 does not apply, the emission is calculated for each quantity of feedstock of a given type harvested or collected at the same time and stored in the same way:

$$GHG_{biostorage} = \sum 1.335 * k * Q_{feedstock} * C_{Feedstock} * \left(T_{storage} - 1\right) * GWP_{CH4}$$

$Q_{feedstock}$ is the quantity of feedstock stored, on a dry matter basis

$C_{feedstock}$ is its carbon content, as a mass fraction

$T_{storage}$ is the storage period in months, rounded up, counted from harvest, chipping, or pressing. The first month is excluded by the term $(T - 1)$ because the onset of anaerobic conditions is not immediate.

k is the monthly fractional loss of biomass carbon under 9.3.5

1.335 is the mass ratio of a methane molecule to a carbon atom

GWP_{CH4} is the global warming potential of methane on a 100-year basis, from Annex F.2

9.3.5 The monthly fractional loss k is:

Feedstock	k
Wood chips and sawdust	0.0013
All other biomass, including straw, crop residues, pomace, and green waste	0.0025

Rationale. Section 2.2.5.4.1 of the Delegated Regulation applies a single factor of 0.0013 to all feedstocks. That figure is the rate derived for moist woody chips and sawdust. For non-woody material the corresponding rate is approximately twice as high, and applying the woody rate to straw or pomace understates the emission by about half. The present standard distinguishes between these two feestock types and is thus more conservative than the Delegated Regulation.

Note that the moisture threshold in 9.3.2(c) is 20%, whereas the Delegated Regulation uses 30%. Anaerobic decomposition remains appreciable at 30% residual moisture, so an exemption set at that level admits stores that do emit. The threshold of 20% is closer to the point at which the emission becomes negligible, and the present standard is thus more conservative than the Delegated Regulation.

9.4 $GHG_{combustion}$: Fuel consumption at the facility

9.4.1 The emissions of fuel consumed at the production facility are:

$$GHG_{combustion} = \sum (Q_{fuel} * EF_{fuel}) - fossil\_CO2\_captured$$

where Q_{fuel} is the quantity of each fuel consumed in the certification period and EF_{fuel} is its emission factor under 9.4.3. If CO2 from fossil fuel combustion is captured and stored, it can be deduced as fossil_CO_2_captured.

9.4.2 The term covers all fuel burned at the facility for the purposes of the activity, whether brought in from outside or co-produced by the process itself. It includes fuel consumed in start-up and shut-down, in drying the feedstock where drying is directly fired, and by mobile machinery operating at the facility such as loaders feeding the reactor.

9.4.3 Emission factors are composed as follows.

Table 9.2 - Treatment of fuels

Fuel	CO_2 of combustion	CH_4 and N_2O of combustion	Upstream supply
Fossil fuels	counted	counted	counted in EF_{fuel}
Biomass, biogas, and bioliquid brought in from outside	0	counted	counted under 9.2
Process gas co-produced by the pyrolysis or gasification process	0	counted	not applicable
Fossil-carbon material present in a mixed feedstock and oxidised to CO_2	counted	counted	not applicable

9.4.4 Fossil fuel factors are lifecycle factors covering supply and combustion, taken from Annex F. The supply of biomass fuel is accounted under 9.2 and must not be counted again here.

9.4.5 Where fossil CO_2 arising from combustion at the facility is captured and permanently stored at a site permitted under Directive 2009/31/EC, that CO_2 does not reach the atmosphere and is not an emission. Fossil_CO_2_captured is the quantity so stored, and is subtracted from the fuel emissions calculated under 9.4.1. It is the quantity actually placed in storage, net of any loss in capture, transport, or injection. Where no such capture takes place the term is zero.

9.4.6 Capture of biogenic CO_2 at the production facility is not deducted under 9.4.5 and is not otherwise counted as a negative emission. It may be eligible for separate certification as a BioCCS activity.

> *Rationale.* Clause 9.4.2 counts start-up fuel. The Delegated Regulation excludes it for BioCCS activities, on the ground that starting the combustion cycle is not part of the capture process specifically. No equivalent exclusion exists for BCR, and none would be appropriate because for a biochar activity the reactor is the process, and the fuel that brings it to temperature is a cost of producing the biochar.
>
> Mixed organic-fossil feedstock is addressed in the last row of Table 9.2 because where it is oxidised it is an emission, and where it remains in the char it is excluded from the removal instead.

9.5 $CH_{4release}$: Methane flue gas emissions

9.5.1 $CH_{4release}$ is the methane generated by the pyrolysis process and released with the flue gas to the atmosphere unburned. Methane that is combusted is accounted under 9.4.

9.5.2 Methane emissions are measured at least twice per production unit during the initial certification period, with an interval of at least one third of that period between measurements, and expressed in grams of methane per kilogram of biochar produced.

9.5.3 Measurements are taken under operating conditions representative of normal production. The operator declares in the monitoring plan the date on which commissioning of the production unit ended. No measurement taken before that date may be used.

9.5.4 Measurements may be made directly, or inferred conservatively from a measurement of total hydrocarbons in the flue gas under EN 12619, in which case all measured hydrocarbon carbon is reported as methane and converted by the factor 1.333, being the mass ratio of methane to carbon. Carbon monoxide may be used as a screening indicator to establish whether gas handling is functioning, but not to quantify methane.

9.5.5 Two measurements are consistent where either:

> (a) both demonstrate that methane is emitted only at trace level, meaning a level which, if maintained across the whole certification period, would amount to less than 1% of CRtotal expressed in tCO2e; or
>
> (b) the higher measurement is not more than 40% above the lower.

Where they are not consistent, further measurements are taken until a reliable estimate of the average is established.

9.5.6 All measurements taken for a production unit form a single series. The emission factor of the unit is the arithmetic mean of the series plus one standard deviation. A measurement enters the series when it is made, and the revised factor applies from the production batch then current. Batches already closed are not reopened.

9.5.7 Where a modification is made to the production unit or to its gas handling for the purpose of reducing methane emissions, measurements taken before the modification are excluded from the series and the series begins again. At least two measurements are required after the modification before a new factor is determined.

9.5.8 Where methane is emitted above trace level, the operator prepares and implements a methane reduction plan to eliminate the emission, and methane is measured again for the batch opened after the gas treatment modification.

9.5.9 An emission factor determined wholly from measurements taken in the initial certification period applies to the initial and the second certification period and does not start the period under 9.5.10.

9.5.10 Where methane is emitted only at trace level, the measured level may be taken as representative of the production unit for five years, after which measurement is repeated.

9.5.12 The emission is calculated as follows:

$$CH4_{release} = Q_{biochar} * EF_{CH4} * GWP_{CH4}$$

The unit of $CH_{4release}$ is ton CO2e.

> *Rationale.* Under 1.2.2 the production process must be designed to capture or destroy the methane it generates, so a well-functioning unit emits at trace level and this term is small. It is measured rather than assumed because the design requirement is a design requirement, and a flare or thermal oxidiser that is not working will not announce itself.

Section 2.2.5.4.1 of the Delegated Regulation requires two measurements in the first certification period and permits a trace-level result to stand for five years. Under this Standard the first certification period is short, because it exists to constitute the reserve, so both measurements fall within the first months of operation. A figure established there is unlikely to characterise the unit over five years in either direction. Clause 9.5.9 therefore requires a further measurement in the second period and starts the five-year clock from it. This is stricter than the Delegated Regulation, which sets a minimum, and it is affordable because the revision it produces is absorbed by the C-sink reserve rather than falling on units already issued.

Clause 9.5.6 sets the factor at the mean plus one standard deviation rather than at the mean. The Delegated Regulation permits the average to be taken; it does not require it. The convention follows the Global Biochar C-Sink Standard and the conservatism principle in F.1.3.

Reporting all measured hydrocarbon carbon as methane is conservative against any real flue gas, since every non-methane hydrocarbon carries more carbon per molecule than methane and none is counted as a greenhouse gas in this accounting. Carbon monoxide is admitted only for screening because the ratio of methane to carbon monoxide in pyrolysis off-gas varies by more than an order of magnitude with combustion conditions and cannot be given a defensible conservative factor.

9.6 GHG_{elec}: Electricity consumption

9.6.1 The emissions of electricity consumed at the production facility are:

$$GHG_{elec} = \sum Q_{elec} * EF_{elec}$$

summed over each source of electricity, where Q_{elec} is the net quantity consumed in the certification period from that source and EF_{elec} is its emission factor.

9.6.2 Q_{elec} is a net quantity. It is the electricity imported from outside the facility for use by the activity, less any electricity recovered from a process directly required for the activity and exported. Electricity both generated and consumed on site is excluded, and the fuel from which it was generated is accounted under 9.4 instead. Electricity generated specifically for export, rather than recovered from a necessary process, is not deducted.

9.6.3 Where the net quantity is lower than the gross quantity and electricity is drawn from more than one source, the net quantity is apportioned across sources in proportion to gross consumption.

9.6.4 Where recovery exceeds import, Q_{elec} becomes negative. In that case EF_{elec} is zero, so that GHG_{elec} is never negative.

9.6.5 EF_{elec} is determined under paragraphs 5 and 6 of Part A of the Annex to Delegated Regulation (EU) 2023/1185. Bidding-zone default values are given in Annex F.3. The operator may choose the approach independently for each source of consumed electricity.

9.6.6 An operator claiming a zero factor on the basis that the electricity is fully renewable must demonstrate temporal correlation between consumption and generation on an hourly basis.

Rationale. Netting under 9.6.2 exists so that a facility recovering energy from its own process is not charged for electricity it did not import. The line it draws is between

recovery and generation: heat or power taken from a process that has to run anyway is recovery, and a generating set installed to sell power is not. The distinction matters for gasification CHP, where much of the output is deliberate generation and only a part is recovery.

Clause 9.6.4 prevents an exporting facility from earning a negative emission here. Export of renewable electricity displaces generation elsewhere, but that displacement is not a carbon removal and belongs to the electricity system, not to this activity.

Note that electricity consumed after the factory gate, in transport, processing, or application, is not accounted here. It falls under transport and application and attaches to the registered unit.

9.7 GHG_{heat}: Consumption of thermal energy

9.7.1 The emissions of thermal energy consumed at the production facility are:

$$GHG_{heat} = \sum Q_{heat} * EF\_heat$$

summed over each source of heat, where Q_{heat} is the net quantity consumed in the certification period from that source and EF_{heat} is its emission factor under 9.7.5.

9.7.3 Q_{heat} is a net quantity, determined on the same basis as electricity under 9.6.2. It is the heat imported from outside the facility for use by the activity, less any heat recovered from a process directly required for the activity and exported. Heat both generated and consumed on site is excluded, and the fuel from which it was generated is accounted under 9.4 instead. Heat generated specifically for export, rather than recovered from a necessary process, is not deducted.

9.7.4 Where the net quantity is lower than the gross quantity and heat is drawn from more than one source, the net quantity is apportioned across sources in proportion to gross consumption. Where recovery exceeds import, Q_{heat} is negative, EF_{heat} is zero, and GHG_{heat} is not negative.

9.7.5 EF_{heat} is determined by the source of the heat as listed in table 9.3:

Table 9.3 - Emission factors for consumed heat

Source of heat	EF_{heat}
Recovered from a process that is part of the activity	0
Recovered from a process from which heat was not previously recovered, that process having begun recovery no earlier than three months before the start of the activity	0
Non-biomass renewable sources	0
Nuclear energy	0
Combustion of fossil fuel	lifecycle factor for supply and combustion of that fuel, divided by the thermal efficiency of the heat generation process

Combustion of biomass, biofuel, bioliquid, or biomass fuel	factor for supply and combustion of that fuel excluding the CO_2 of combustion, calculated under Annex VI to Directive (EU) 2018/2001, divided by the thermal efficiency of the heat generation process
Recovered from a process from which heat was already recovered, or from a process coming into operation less than six months before the start of the activity and not directly related to it	EU ETS benchmark emission factor for heat
Supplied from a heat network	EU ETS benchmark emission factor for heat

9.7.6 Lifecycle factors for fossil fuels under 9.7.5 are taken from Annex F.4 or, where not published there, from the Joint Research Centre document on input data for GHG default emissions from biofuels in EU legislation.

Rationale. Table 9.3 turns on whether the heat would have existed but for the activity. Heat recovered from a process the activity itself runs has no separate emission, because the fuel is already counted under 9.4. Heat that another process was already recovering and now diverts to the activity does have one, because the activity has taken it from a use that must now be met some other way, and the ETS benchmark stands as the price of that displacement. The three-month and six-month windows in the table are the tests the Delegated Regulation uses to tell the two apart.

The exclusion of on-site generated and consumed heat in 9.7.3 is what keeps 9.4 and 9.7 from overlapping. A pyrolysis unit burning its own process gas to dry feedstock accounts for that under 9.4 and records nothing here.

Note that the same quantity of drying heat is treated in three places, in three different ways, and none may be substituted for another. It is excluded from the co-products in the allocation at 9.1.5, because heat consumed by the activity is not exported. It is excluded from Q_{heat} here, because it is generated and consumed on site. And it is credited in the assessment of energy efficiency under 1.2.6, because a facility that dries its feedstock with recovered heat is using its energy well. The three calculations answer three questions and the App must not carry one figure between them.

9.8 $GHG_{capital}$: Emissions associated with Construction and Installation

(Delegated Regulation, Annex Section 2.3.5)

9.8.1 Capital emissions are the emissions associated with the construction and installation of the biochar production facility, including the equipment listed as within the production facility boundary in 9.1.2: the pyrolysis unit, any equipment used to treat biochar before dispatch, any geographically contiguous energy generation equipment, and any equipment for treating wastes or by-products of the production process.

9.8.2 Capital emissions must be considered where a production facility first came into operation, or was expanded or refitted, within fifteen years before the certification date, or will be expanded or refitted within the activity period. For any other facility capital emissions are

zero. An expansion or refit opens a separate fifteen-year period in respect of that expansion or refit alone.

9.8.3 The following are excluded:

(a) non-biomass renewable energy generating equipment;
(b) any part of a facility or item of equipment not directly required for the biochar production activity;
(c) emissions arising after the point of installation, including maintenance, replacement parts, decommissioning, and any end-of-life treatment or recovery of construction materials.

Rationale for 9.8.3(c). Emission factors under 11.3 reflect the supply of an input up to the point of use by the activity. The Delegated Regulation sets the boundary at the factory gate, and no credit is available for the recovery or recycling of steel or other construction materials at the end of the facility's life, whatever the actual recovery rate.

9.8.4 The operator must undertake a materiality assessment for the sum of capital emissions across all facilities to which 9.8.2 applies. The assessment is made on the unallocated figure, before the application of F_{alloc} under 9.1.

9.8.5 The materiality assessment must present a high-end estimate of capital emissions over the activity period, expressed both in tonnes of CO_2e and as a percentage of the gross carbon removals expected over that period.

9.8.6 Where the high-end estimate is below 2% of expected gross carbon removals, capital emissions are not material. GHGcapital is then zero and enters the calculation of GHGfacility under 9.1 as zero. No inventory of construction materials or construction energy is required, and no further assessment of capital emissions is undertaken during the activity period.

9.8.7 Where the high-end estimate is equal to or above 2% of expected gross carbon removals, capital emissions must be calculated under 9.8.8. The value entered is the calculated figure. The 2% is a threshold for determining materiality and is never itself entered as an emission.

9.8.8 Where capital emissions are material, the operator must take an inventory of the construction materials used and of the fuel and energy consumed in construction, and sum the associated emissions on a full lifecycle basis in accordance with equations [73] and [74] of the Delegated Regulation. The amortised emission is added to GHGfacility in each certification period until the fifteenth year following the year in which the facility came into operation, was expanded, or was refitted.

9.8.9 The amortisation period T is fifteen years.

Open item. The Delegated Regulation directs the selection of emission factors for construction materials to the hierarchy of 2.3.4.4, which begins with Part B of the Annex to Delegated Regulation (EU) 2023/1185. That Part contains fuels and process chemicals only, and the methodology it belongs to excludes the manufacture of machinery and equipment from its scope. No Union-level emission factors for steel, concrete, or refractory materials are therefore available at the first level of the hierarchy. Emission factors for construction materials are therefore selected at the second level of that hierarchy under Annex F.8. CSI will raise the gap in the review under Article 16 of Regulation (EU) 2024/3012.

9.9 GHGdisposal: Emissons from waste treatment or disposal

(Delegated Regulation, Annex Section 2.2.5.4.1)

9.9.1 GHGdisposal covers emissions from the treatment or disposal of wastes generated by the biochar production facility. It includes emissions from the supply of any energy and inputs consumed in the course of disposal, emissions from transport to the point of treatment, and any N_2O and CH_4 arising from aerobic or anaerobic degradation of biogenic wastes.

9.9.2 An output that is sold or otherwise used rather than disposed of is not a waste. Where it carries chemical energy it is treated as a co-product under 9.1.

9.9.3 Disposal emissions are not subject to a materiality assessment and must be assessed irrespective of their magnitude.

9.9.4 Emissions from the oxidation of pyrolysis gases and vapours in the production process are covered by GHGcombustion and CH4release and are not disposal emissions.

9.10 GHG_{inputs}: inputs to the facility

For most activities the emissions of inputs are immaterial, and the operator applies the flat term of 2% of CRtotal (c.f., 9.10.4) rather than accounting for each input separately.

9.10.1 The emissions of the inputs consumed by the facility in the certification period are:

$$GHG\_(inputs) = \sum(Q\_(input) \times EF\_(input))$$

where Qinput is the quantity of each input consumed and EFinput is its lifecycle emission factor of each input material.

9.10.2 Inputs are the materials consumed by the production process other than biomass and biomass fuel, which are accounted under 9.2, fuels, which are accounted under 9.4 [GHGcombustion], and materials used in construction, which are accounted under 9.8 [GHGcapital].

9.10.3 Emission factors for inputs are lifecycle factors covering supply up to the point of use. Where a factor includes carbon contained in the input material itself, and that carbon is oxidised and emitted in a process associated with the activity, the factor is adjusted to exclude it and the emission is accounted directly at the point of oxidation.

9.10.4 The operator may group any number of inputs whose collective emissions are immaterial and substitute for them a single term equal to 2% of CRtotal. The grouping is permitted where a high-end estimate of the emissions of the grouped inputs is below that figure:

$$\sum Q_{input} * EF_{input} < CRtotal$$

9.10.5 The basis on which inputs are grouped under 9.10.4 is stated in the activity plan and is reassessed at re-certification where operating conditions have deviated significantly from those declared.

9.10.6 Packaging is considered an input. Where biochar is dispatched in big bags, sacks, or other containers, the emissions of the packaging are attributed to the biochar it contains, and for bagged product they will commonly exhaust the grouping allowance in 9.10.4 on their own. Where big bags or containers are returned and refilled, the operator may divide its emission factor by the number of fillings achieved over its service life, on evidence of the return rate.

Where a container is made from recycled material, the factor for that material applies. Bulk dispatch carries no packaging emission.

> *Rationale.* The grouping allowance in 9.10.4 exists so that a long tail of small consumables does not have to be individually metered and factored. It is not a de minimis exemption: the 2% is added as an emission, not disregarded, and it will in most cases exceed the true figure. An operator with material input emissions, such as a facility using activation agents, gains nothing by grouping and must account for them directly.
>
> Packaging is singled out in 9.10.6 because it is the input most likely to break the grouping allowance and the one most readily reduced. A single-use polypropylene big bag can account for something in the order of half the allowance per tonne of biochar. A bag returned and refilled ten times carries a tenth of that, which restores the operator to the flat term and removes the accounting burden along with the emission

10. Total carbon removals

(Delegated Regulation, Annex Section 2.2.3)

This Chapter quantifies the gross carbon removal of a BCR activity. The removal is determined from the mass of biochar applied to soil or incorporated in a product, its organic carbon content, and the fraction of that carbon which is permanent. Chapter 12 determines the permanence fraction, Chapters 9, 14, and 15 determine the associated emissions, and Chapter 16 assembles the net carbon removal benefit.

10.1 Basis of quantification

10.1.1 Carbon removals are quantified per transport unit (TU), not per production batch. A TU is the registered physical consignment of biochar defined in Chapter 7.

10.1.2 A TU passes through three states:

(a) **Registered.** The TU is entered in the Global C-Sink Registry on filling, with its dry mass, its parent batch or batches, and its permanent carbon fraction under 10.2.3. A registered TU carries no carbon removal. Nothing is quantified and nothing is issued at this stage.

(b) **Stored.** On application to soil or incorporation in a product, the carbon removal of the TU is quantified under 10.3.1 from its own dry mass and its own permanent carbon fraction. This is the point at which a gross carbon removal comes into existence.

(c) **Issued.** Once application or incorporation has been demonstrated under 17.6 and all other requirements of this Standard are met, CRCF units are issued in respect of the TU, in the certification period in which it was applied or incorporated.

10.1.3 The production of biochar generates no carbon removal. A production batch has no gross carbon removal of its own. The removal attributable to a batch at any point in time is the sum of the removals of the TUs filled from that batch which have reached state (b).

10.1.4 Quantities in this Chapter are expressed as positive magnitudes. Where the Delegated Regulation expresses total carbon removals as a negative quantity, the two differ in sign only.

10.1.5 Gross carbon removals for a period or an activity means the sum of the carbon removals of the TUs concerned, determined under 10.3 and before application of the conservatism factor.

10.2 Permanent carbon fraction of a transport unit

10.2.1 Fperm and Corg are properties of the production batch and apply to every TU filled from that batch. They are not determined per TU. The only TU-level adjustment is the ash correction under 10.4.4.

10.2.2 Where a TU is filled from more than one production batch, the batches must be well mixed within the meaning of Section 3.2 of the Delegated Regulation, and the TU is registered with the mass fraction originating from each batch. Where the batches cannot be demonstrated to be well mixed, a TU must be filled from a single batch.

10.2.3 The permanent carbon fraction of a TU is:

$$P_{perm,TU} = k_{TU} * \sum b \left(f_b * F_{perm,b} * C_{org,b}\right),$$

where *b* indexes the production batches from which the TU was filled, f_b is the mass fraction originating from batch *b*, with $\Sigma f_b = 1$, $F_{perm,b}$ is the permanence fraction of batch *b* under Chapter 12. $C_{org,b}$ is its organic carbon content under 10.4, and k_{TU} is the ash correction factor under 10.4.4.

10.3 Carbon removal of a transport unit and of the activity

10.3.1 The carbon removal of a TU is:

$$CR_{TU} = 3.664 * m_{TU} * P_{perm,TU}$$

where m_{TU} is the dry mass of the TU in tonnes under 10.5, $P_{perm,TU}$ is determined under 10.2.3, and 3.664 is the mass ratio of a CO_2 molecule to a carbon atom.

10.3.2 Total carbon removals for a certification period are:

$$CR_{total} = FC * \sum CR_{TU}$$

summed over all TUs applied to soil or incorporated in a product during that period, where FC is the conservatism factor determined under Chapter 13.

10.3.3 Removals are recorded in the certification period in which the TU is applied or incorporated, irrespective of the period in which the biochar it contains was produced. The associated emissions of that biochar are recorded in the same period.

> *Rationale for the placement of FC.* Equation [44] of the Delegated Regulation omits the conservatism factor, while equations [7] and [8] for DACCS and BioCCS carry it explicitly. The omission is an apparent oversight rather than an exemption. Section 2.3.6 requires uncertainty to be assessed wherever measured, estimated, or default data underlie the calculation of sources or sinks; Section 2.2.7.1.1 provides an uncertainty formula for Fperm expressly for the purposes of Section 2.3.6, which would have no effect if no conservatism factor applied to a BCR activity; and recital 6 refers to the use of a conservatism factor in quantifying the permanent fraction of the biochar. Recital 6 would place FC on F_{perm} rather than on CR_{total}. Because every term enters as a product the two placements are numerically identical, and this Standard places FC on CR_{total} for consistency with equations [7] and [8] and because a single conservatism factor is determined for the certification period as a whole rather than per batch. A consequence is that TUs from one batch may be issued at different unit rates in different certification periods, since F_{perm} is fixed at production and FC is not.

10.4 Organic carbon content

10.4.1 Corg is the organic carbon content of the biochar, determined by laboratory analysis as the ratio of the mass of organic carbon to the total mass of the biochar, on a dry matter basis. Total organic carbon and total inorganic carbon are determined separately for every production batch under the EBC analytical requirements, together with the ash content of the same sample.

10.4.2 Total organic carbon and total inorganic carbon are determined separately for every production batch under the EBC analytical requirements. The discretion under Section 2.2.3 of

the Delegated Regulation to treat inorganic carbon as zero without direct assessment is not exercised under this Standard, the measurement being in any case mandatory.

10.4.3 The organic carbon content of biochar varies within a production batch with feedstock composition and process conditions. Ash content is determined on site at intervals of not more than one week during production, by the method specified in Annex H, and recorded in the Registry. Each TU carries the on-site ash content of the production interval in which it was filled, or its own ash content where determined per TU.

10.4.4 The ash correction factor of a TU is:

$$k_{TU} = \frac{1 - a_{TU}}{1 - a_b}$$

where a_{TU} is the on-site measured ash content of the TU and a_b is the laboratory ash content of its parent batch, both on a dry matter basis.

> *Rationale.* Within a production batch the ash-free fraction of the biochar has a substantially constant carbon content, so ash content is an inverse tracer of organic carbon and the ratio Corg / (1 − ash) is stable across the batch. The laboratory establishes that ratio for the batch by determining Corg and ash on the same sample. The on-site ash determination applies the laboratory-established ratio to each TU, and is therefore an interpolation within the laboratory determination required by Section 2.2.3, not a substitute for it. Because the correction is symmetrical and referenced to the mass-weighted laboratory ash content of the batch, it reallocates organic carbon between the TUs of a batch rather than altering the total, and cannot systematically increase issuance. Its purpose is to ensure that each TU is certified for the carbon it contains rather than for a batch average.

10.5 Dry mass

10.5.1 The mass of a TU is recorded in the Registry on a dry matter basis in tonnes, determined at filling from the weighed mass of the TU and the dry matter content applying under 10.5.2.

10.5.2 Dry matter content is determined on site at least once per production day, by the method specified in Annex H. Each TU carries the dry matter content of the day on which it was filled. The laboratory dry matter determination of the parent batch is not used for this purpose.

10.5.3 Where the operator demonstrates that dry matter content varies by not more than 2 percentage points across a week of production, dry matter may be determined once per week and applied to all TUs filled in that week. The demonstration requires daily determination over at least six consecutive production weeks and must be repeated where feedstock, quenching, or storage conditions change. Where a weekly determination is in use and any subsequent determination departs from the preceding one by more than 2 percentage points, daily determination resumes until the demonstration is re-established.

10.5.4 Where the feedstock may be expected to contain a fraction of non-biogenic carbon greater than 2% of the total carbon feedstock by mass, the biogenic carbon fraction of the biochar must be determined by ^{14}C testing and the mass reduced accordingly. Feedstocks eligible under Annex B of this Standard are wholly biogenic, and ^{14}C testing is not required for a batch produced solely from listed feedstocks.

Rationale. Dry matter content of biochar changes after production with quenching, handling, storage, and weather, and the value determined on the laboratory sample of a production batch is not representative of the TUs filled from it. Dry matter is therefore determined on site at the point that governs it, while organic carbon remains a laboratory determination interpolated to the TU under 10.4. Inert non-biogenic material carried in a TU such as stones reports as ash and is removed from the carbon accounting by the correction under 10.4.4. It requires no separate treatment on the mass side, since the dry mass of the TU is multiplied by an organic carbon content that already excludes it.

11. Production of biochar

(Delegated Regulation, Annex Sections 1.1.2, 1.1.2.1, 2.2.5.2, 2.2.5.3, 3.2)

Chapter 7 defines the production batch and the transport unit. This Chapter sets the requirements on the production process and on the determination and verification of the properties of each batch.

11.1 Production process requirements

11.1.1 The production process must heat the biomass or biomass fuel to a temperature of at least 350 °C. The temperature is that of the material undergoing treatment at its highest treatment temperature, not the temperature of the process gas or of the reactor wall, and the point and method of measurement must be recorded in the monitoring plan.

11.1.2 The process must be designed with the intention of fully capturing or destroying any methane produced with the biochar. The operator must document the means by which this is achieved, whether by thermal oxidation of the process gases, by flaring, or by capture. Methane actually released is quantified under 9.5.

11.1.3 Heat co-produced by the process must be used for the drying of biomass or to satisfy another economically justifiable demand for heat, for heating or cooling purposes.

11.2 Properties determined per production batch

11.2.1 EBC certification of the production facility is a condition of certification under this Standard. The following are determined for every production batch under the EBC analytical requirements and are used without further determination:

(a) the organic carbon content, Corg, and the inorganic carbon content, each under 10.4;
(b) the ash content, determined on the same sample as (a);
(c) the molar ratio of hydrogen to organic carbon, H/Corg;
(d) the analytical determinations underlying compliance with the contaminant thresholds of Chapter 19.

11.2.2 The following are determined for every production batch in addition to the EBC requirements:

(a) the permanent organic carbon fraction Fperm as the fraction FRo≥2%, and the reactive organic carbon fraction defined as the fraction FRo<2% under 12.1.15;
(b) the energy density on a lower heating value basis, for the purposes of the allocation under 9.1.

11.2.3 The determination of the permanence fraction by random reflectance assessment under 12.1 is obligatory. The decay function route provided in Section 2.2.7.1.2 of the Delegated Regulation (based on the H/C ratio) is not available under this Standard.

11.2.4 Dry matter content is determined on site under 10.5

11.2.5 No carbon removal units may be issued in respect of any batch measured to have an H/Corg ratio greater than 0.7. Transport units filled from such a batch are removed from the Registry as ineligible.

12. Permanence

(Delegated Regulation, Annex Section 2.2.7.1.1)

The permanence fraction Fperm is the fraction of the organic carbon in a production batch treated as permanently stored when applied to soil or incorporated in cement, concrete or asphalt. It is the only term in the quantification established by measurement on the biochar itself rather than by accounting. Section 12.1 establishes the random reflectance of each production batch and tests whether the measurement is valid. Section 12.2 derives the permanence fraction from it.

The method is the Inertinite Benchmarking method (IBRo2) of Sanei et al. (2024), as consolidated in Sanei et al. (2025), with the reactive fraction deducted by the reflectance threshold rather than by separate thermochemical analysis.

> **Note on the meaning of Fperm.** The permanence fraction of the Delegated Regulation and the geologically persistent carbon (GPC) fraction of the Global Biochar C-Sink Standard are not the same quantity and are not interchangeable.
>
> GPC is the portion of biochar carbon expected to persist beyond 1 000 years after soil application and thereby to enter the geological carbon cycle. It is a probabilistic allocation. Its size cannot be determined from biochar analysis alone, because long-term persistence depends on soil mineralogy, drainage, biological activity, and climate as well as on the structure of the carbon itself. It is therefore estimated from measurable structural proxies, and the Global Biochar C-Sink Standard sets it conservatively at 75% for biochar with H/Corg $\leq$ 0.40 and at 90% for the upper persistence class. The remainder is assigned to the semi-persistent carbon pool and modelled as decaying over the millennium. No biochar is assigned a GPC fraction of 100%, because no fraction of biochar carbon is regarded as completely inert.
>
> Fperm as defined by the Delegated Regulation is a classification. Organic carbon above the reflectance benchmark is treated as permanently stored, without a time horizon, without a decay rate, and without an associated probability. Environmental conditions at the place of application play no part. A fully carbonised biochar receives a permanence fraction of 100%.
>
> The scientific basis for treating any fraction of biochar carbon as incapable of decay is not established. Inertinite persists over geological timescales with high probability, which is a different statement from permanence in the sense the Delegated Regulation uses. This Standard certifies Fperm as the Delegated Regulation requires, for the purpose of issuing CRCF units. It does not thereby adopt the underlying claim. Where a quantity expressing the probability of persistence over a defined horizon is required, the GPC and SPC pools of the Global Biochar C-Sink Standard apply, and the two frameworks must not be substituted for one another.

12.1 Random reflectance

12.1.1 Random reflectance is measured for every production batch. The H/Corg based route of Section 2.2.7.1.2 of the Delegated Regulation is not available under this Standard. No thermochemical determination of reactive carbon is required.

12.1.2 At least three samples are taken over the course of the production of each batch and submitted to a laboratory recognised under 12.1.7.

12.1.3 The operator may submit more than three samples per production batch. Where more than three samples are submitted, the permanence fraction under 12.2.1 and the relative standard deviation under 12.1.19 are determined across all samples submitted for that batch.

12.1.4 Samples are drawn under the sampling requirements of Chapters 6 and 7 and must be representative of the batch. Grab samples are not sufficient.

12.1.5 A sample must not combine material from separate production runs of a discontinuous unit, nor from production intervals separated by a change in feedstock or process conditions.

12.1.6 The sample is dried at 40 °C and crushed to a particle size below 0.2 mm, so that internal cross sections of the particles are exposed.

12.1.7 The crushed material is embedded in a cold-setting epoxy resin pellet of 2.54 cm diameter, in two stages. A minimal quantity of resin is first mixed thoroughly with the biochar to concentrate the fragments at the base of the pellet, biochar otherwise tending to float. Once the first layer has cured, a second layer is poured to increase the pellet height for handling.

12.1.8 After curing, the base of the pellet is ground and polished in accordance with ISO 7404-2:2009 to a scratch-free, relief-free, highly polished surface.

12.1.9 The pellet is prepared from the whole crushed sample. No fraction is separated before preparation.

12.1.10 Reflectance is measured by incident white light microscopy in accordance with ISO 7404-5:2009, using an enhanced-contrast oil immersion 50× objective and a camera-based photometric system.

12.1.11 The microscope is calibrated with reflectance standards close to the expected Ro range of the sample, preferably with standards of higher value.

12.1.12 The smallest available light-probe diameter is used, and the probe must not exceed the area intended for measurement.

12.1.13 Up to three point measurements are taken per field of view, each on a distinct carbonised fragment located in a different quadrant of the field. Fields are distributed evenly across the entire polished surface.

12.1.14 At least 500 individual point measurements are taken per sample, corresponding to approximately 170 fields.

12.1.15 Each point measurement is classified by its reflectance value. Measurements with Ro above 2.0% are considered inertinite. Measurements with Ro at or below 2.0% are considered reactive.

12.1.16 The inertinite fraction of a sample is:

$$F_{Ro>2,s} = N_{inertinite,s} / (N_{reactive,s} + N_{inertinite,s})$$

being the number of measurements above 2.0% divided by the total number of measurements of that sample.

12.1.17 The mean reflectance of a sample, $\bar{R}o,s$, is the arithmetic mean of the inertinite measurements only. Measurements at or below 2.0% are not included.

12.1.18 FRo>2,s and R̄o,s are determined on the raw point measurements.

Rationale for 12.1.15: The Inertinite Benchmarking method of Sanei et al. (2024, 2025) resolves the reflectance distribution into three populations: poorly carbonised material with Ro at or below 1.2%, semi-inertinite between 1.2% and 2.0%, and inertinite above 2.0%. The thermochemical step of that method measures the reactive organic carbon, a chemical quantity consisting of condensates, semi-liquid tars, and bituminous substances. That quantity is smaller than the optical population below the benchmark, because semi-inertinite is not reactive in the thermochemical sense while it is nevertheless excluded from the inertinite class.

The Delegated Regulation retains the benchmark and not the three classes. Carbon above 2.0% is permanent and carbon below it is not, and there is no intermediate class in which semi-inertinite can be held. A two-step determination under that framework therefore deducts a reactive fraction smaller than the material the benchmark excludes, and leaves an undefined remainder that is neither counted as permanent nor accounted as reactive.

This Standard closes that remainder by treating every point measurement at or below 2.0% as reactive. The deduction is by construction at least as large as the thermochemical deduction, and larger by the semi-inertinite fraction. It is therefore more conservative than the two-step determination in every case, and the permanence fraction it produces cannot exceed the fraction the Delegated Regulation would produce on the same measurements.

Rationale for 12.1.16. Section 2.2.7.1.1 of the Delegated Regulation prescribes kernel density estimation and integration by Simpson's rule for the determination of the fraction above the benchmark. Those are laboratory data quality procedures and are not specified in this Standard, which determines the fraction by direct point counting.

12.1.19 The relative standard deviation of R̄o,s across the samples of a batch is:

$$\mathrm{RSD} = \sigma(\bar{R}o,s) \,/\, \mathrm{mean}(\bar{R}o,s) \times 100\%$$

12.1.20 A batch is validated where either:

(a) R̄o,s exceeds 2.4% in every sample; or

(b) R̄o,s is at or below 2.4% in one or more samples, and the RSD under 12.1.19 is not more than 20%.

12.1.21 Where a batch is not validated under 12.1.20, the operator may submit further samples and repeat the assessment, or withdraw the batch. No carbon removal units are issued in respect of a batch that is not validated.

12.1.22 The reflectance measurement of a validated batch contributes no uncertainty term to the determination of the conservatism factor under Chapter 13. The conservatism factor applying to permanence is applied to Fperm directly under 12.2.2.

Rationale for 12.1.20: The two criteria answer different questions. The inertinite fraction establishes how much of the organic carbon is above the benchmark and enters the quantification directly. The mean reflectance of the inertinite measurements establishes whether that carbon sits clear of the classification boundary or immediately upon it, and therefore whether its classification is robust to measurement variation.

Where the mean exceeds 2.4% in every sample, the retained material is unambiguously within the inertinite domain. Where it does not, agreement between samples decides, and a batch whose samples disagree by more than 20% is not sufficiently characterised for certification. Thresholds follow Sanei et al. (2024, 2025), Mastalerz et al. (2025), and Alami Sounni et al. (2026).

Rationale for 12.1.22. Equation [62] of the Delegated Regulation derives the uncertainty of the permanence fraction from the scatter in mean reflectance between samples, although mean reflectance does not enter the calculation of that fraction. Where the fraction above the benchmark is high it becomes insensitive to the position of the mean, so the formula returns values that rise with the degree of carbonisation and penalise most heavily the material whose permanence fraction is most precisely determined.

12.1.23 Random reflectance assessment is undertaken by a laboratory recognised by CSI for that purpose. CSI maintains and publishes the list of recognised laboratories.

12.1.24 Recognition requires demonstrated competence in petrographic analysis under ISO 7404-2:2009 and ISO 7404-5:2009, application of the procedures of 12.1.6 to 12.1.18, and participation in inter-laboratory comparison exercises.

12.1.25 The laboratory reports, for each sample: the 500 point measurements.

12.1.26 The operator reports, for each batch: $F_{Ro>2,s}$ and $\bar{R}_{o,s}$ for every sample, the RSD under 12.1.19, and which limb of 12.1.20 the batch was validated under.

12.2 Permanence fraction

12.2.1 The mean inertinite fraction of a production batch is the arithmetic mean of $F_{Ro>2,s}$ across the samples assessed for that batch.

12.2.2 The permanence fraction of the batch is:

$$F_{perm} = F_{margin} * \text{mean}(F_{Ro>2,s}) * 100\%$$

where F_margin is 0.975.

Rationale. Section 2.2.7.1.1 of the Delegated Regulation applies a fixed conservatism factor of 2.5% to the permanence fraction determined by reflectance, additional to a sampling term derived from the scatter in mean reflectance between samples. This Standard retains the fixed conservatism factor and does not apply the sampling term, for the reasons given in 12.1.22. The conservatism factor is applied to F_{perm} directly rather than through the conservatism factor FC.

12.2.3 F_{perm} is expressed as a percentage of the organic carbon of the batch. Where it enters a calculation it is used as the corresponding decimal fraction. C_{org} under 10.4 is a ratio between 0 and 1 and is used as such.

12.2.4 F_{perm} is a property of the production batch, determined at production. It applies unchanged to every transport unit filled from that batch under 10.2.3, and does not depend on the place of application or incorporation.

12.2.5 The permanent carbon content of a production batch is:

$$C_{perm} = F_{perm} * C_{org}$$

expressed as a mass percentage of the biochar on a dry matter basis. C_{perm} is a reporting quantity. It is not used in the quantification of carbon removals, which applies F_{perm} and C_{org} as separate factors under 10.2.3.

12.2.6 The operator reports, for each production batch: the mean inertinite fraction, F_{perm}, C_{org}, and C_{perm}.

> ***Deviation from the Delegated Regulation.*** Section 2.2.7.1.1 determines the permanence fraction as $(1 - F_{reactive}) * F_{Ro} > 2\%$, with $F_{reactive}$ from thermochemical analysis, determines the fraction above the benchmark by kernel density estimation and numerical integration, and assigns an uncertainty under equation [62]. This Standard determines the permanence fraction from the reflectance measurement alone under 12.1.15, by direct point counting under 12.1.16, and validates it under 12.1.20 in place of the sampling term of equation [62], retaining the fixed conservatism factor under 12.2.2. CSI has notified this treatment and will submit it in the review under Article 16 of Regulation (EU) 2024/3012.

13. Uncertainty and the conservatism factor

(Delegated Regulation, Annex Section 2.3.6)

Total carbon removals are reduced by a conservatism factor reflecting the uncertainty of the measurements on which they rest. This Chapter identifies the parameters that carry uncertainty, states how their uncertainties are combined, and derives the factor. The factor is determined once for each certification period and applies to all transport units applied or incorporated in that period.

13.1 Scope

13.1.1 The conservatism factor FC applies to total carbon removals under 10.3.2. It does not apply to GHGassociated.

13.1.2 Uncertainty in the quantification of associated emissions is addressed by the conservative default values of Annex F, by the convention in 9.5.6 under which the methane emission factor is set at the mean of the measurement series plus one standard deviation, and by the grouping term in 9.10. Those emissions are not reduced by FC and are not increased by an uncertainty term.

13.1.3 All measurements entering the quantification must be made in accordance with Article 42 MRR, and any aggregation of measured data in accordance with Article 44 MRR.

13.2 Parameters carrying uncertainty

13.2.1 The carbon removal of a transport unit under 10.3.1 is the product of its dry mass, its organic carbon content, its ash correction factor, its permanence fraction, and the stoichiometric factor 3.664. Uncertainty attaches to five measurements underlying the first three:

Parameter	Clause	Uncertainty
Dry mass of the transport unit, m_{TU}	10.5	assessed under 13.2.2
Organic carbon content, Corg	10.4	assessed under 13.2.3
Ash correction factor, k_{TU}	10.4.4	assessed under 13.2.3
Permanence fraction, F_{perm}	12.2.2	zero, under 12.1.22
Mass fractions of constituent batches, f_b	10.2.2	zero
Stoichiometric factor 3.664	10.3.1	zero, exact

13.2.2 The permanence fraction carries no uncertainty term, under 12.1.22. The mass fractions of constituent batches under 10.2.2 and the stoichiometric factor 3.664 are exact.

13.2.3 The values of the five uncertainties are given in Table F.9 of Annex F.11. An operator may substitute a lower value for any of them where it demonstrates, from its own calibration and repeatability data, that its measurement achieves it. A substituted value is stated in the monitoring plan and verified at audit.

13.2.4 Where a measurement is made by more than one method, by more than one laboratory, or with more than one instrument within a certification period, the higher uncertainty applies to the whole period.

13.2.5 All uncertainties are expressed as relative uncertainties on a 95% confidence basis. Where a source states a value on another basis, it is converted before use under F.11.4.

13.2.6 The uncertainties of the ash determinations are those of the term $(1 - a)$, where a is the ash content on a dry matter basis, and not those of a itself. The ash content enters the quantification only through the correction factor of 10.4.4, in which it appears as $(1 - a)$.

13.3 Combination

13.3.1 Uncertainties are combined in accordance with Section 3 of Chapter 6 of the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories.

13.3.2 The carbon removal of a transport unit is a product of the quantities in 13.2.1, so their relative uncertainties combine in quadrature:

$$U_{total} = \sqrt{(U_{weigh}^2 + U_{DM}^2 + U_{Corg}^2 + U_{ashlab}^2 + U_{ashsite}^2}$$

13.3.3 U_{total} is the total uncertainty of the activity for the certification period. It is not reduced by the number of transport units, by the number of production batches, or by the quantity of biochar applied or incorporated in the period.

Rationale for 13.3.2. Equation 6.3 of the IPCC Good Practice Guidance gives the rule for a product: the relative uncertainties of the factors combine as the square root of the sum of their squares. The five terms sit at three levels. Weighing is performed on each transport unit. The dry matter content is determined per production day, or per week where 10.5.3 applies, and is shared by the units filled in that interval. The organic carbon content and the laboratory ash content are determined per production batch and are shared by every unit filled from it. The on-site ash content is determined per unit or per production interval. The combination is nevertheless performed once, on the five base values, because each enters the removal of every transport unit as a factor irrespective of the level at which it was determined.

Rationale for 13.3.3. Whether the uncertainty of a sum is smaller than the uncertainty of its terms depends on whether their errors are independent. Here they are only partly so. The organic carbon content and the laboratory ash content do not vary between the transport units of a batch at all, and where one laboratory and one method serve the activity, which comparability in practice requires, they do not vary between batches either. The dry matter content is shared across a production day. Only the weighing and the on-site ash determination vary from unit to unit. A rigorous treatment would separate the systematic components, which do not diminish with the number of units, from the random components, which do. This Standard does not make that separation and carries every term at full value. The result overstates the total uncertainty by the part attributable to the random components and is therefore conservative. It also removes an artefact that a per-unit treatment would create, since dividing the same biochar into more packages would otherwise appear to reduce uncertainty without any measurement having improved.

13.4 The conservatism factor

13.4.1 The conservatism factor is determined from U_{total} as follows:

U_{total}	FC
below 2.5%	1
2.5% to 20% inclusive	1 − U_total
above 20%	no units are issued for the certification period

13.4.2 Where U_{total} exceeds 20%, no carbon removal units are issued in respect of any transport unit applied or incorporated in that certification period. Transport units not yet applied are unaffected and may be applied in a later period.

13.4.3 FC is determined per batch. A transport unit filled from a production batch in one period and applied in another takes the factor of the period in which it is applied.

13.5 Assessment and reporting

13.5.1 The operator states in the activity plan the parameters carrying uncertainty, the value applied to each, whether it is the Annex F.11 default or a substituted value, and the resulting U_{total} and FC expected over the activity period.

13.5.2 The operator states in each monitoring report the values actually applied in the certification period for the calculation of U_{total} and FC.

13.5.3 Where a change during a certification period alters the uncertainty of a parameter, the higher value applies to the whole period under 13.2.5.

13.5.4 FC is recorded against every unit issued and is published under 15.5.2.

14. Transport of Biochar

(Delegated Regulation, Annex Section 2.2.6)

This Chapter quantifies the emissions of moving biochar from the factory gate to the point of application or incorporation. The emissions accumulate on the transport unit as each leg occurs, under 7.4.2(a), and are deducted from the removal of that unit when its application or incorporation record closes.

14.1 Scope

14.1.1 GHGtransport covers every movement of a transport unit from the factory gate to the point of application or incorporation, including movements to and from a processor, a trader, or an intermediate store.

14.1.2 Transport of biomass and biomass fuel to the production facility is not accounted here. It is part of GHGbio under 9.2.2.

14.1.3 Movements within the production facility before the factory gate are not accounted here. Fuel consumed by mobile machinery at the facility is accounted under 9.4.2.

14.1.4 Energy consumed in processing, intermixing, repackaging, or storing a transport unit between the factory gate and the point of application is not transport. It is recorded under 7.4.2(b) and (c) and accounted under 14.5.

14.1.5 Emissions of a journey travelled empty are accounted under 14.4.

14.2 Method

14.2.1 The emissions of a transport leg are calculated either from the fuel consumed under 14.3.1 or from the distance travelled under 14.3.2. The Co-Operator may use different methods for different legs and for different modes, and must state in the monitoring plan which method applies to which.

14.2.2 The fuel-based method is used where the Co-Operator has access to the fuel consumption of the specific vehicle and journey. The distance-based method is used otherwise.

14.2.3 Where the distance-based method is used and no measured vehicle factor is available, the default factors of Annex F.6 apply.

14.3 Calculation

14.3.1 Fuel-based method:

$$GHG_{leg} = Q_{fuel} * EF_{fuel}$$

where Q_{fuel} is the volume of fuel consumed on the leg and EF_{fuel} is its lifecycle emission factor under 9.4.3 and Annex F.4.

14.3.2 Distance-based method:

$$GHG_{leg} = K * EF_{vehicle}$$

where K is the distance of the leg in kilometres and $EF_{vehicle}$ is the emission factor of the vehicle. For road transport $EF_{vehicle}$ is stated per vehicle-kilometre and the whole of the leg emission

attaches to the biochar carried. For rail, inland waterway, and maritime transport $EF_{vehicle}$ is stated per tonne-kilometre and is multiplied by the dry mass carried.

14.3.3 Emission factors under 14.3.2 include upstream fuel supply.

14.3.4 Where a road vehicle carries the transport units of more than one activity, or carries biochar together with other goods, the leg emission is apportioned to the biochar in proportion to mass.

14.3.5 Where a road vehicle carries less than its rated payload and carries no other goods, the Co-Operator may apportion the leg emission to the biochar in proportion to the ratio of the mass carried to the rated payload of the vehicle, provided the remaining share is not attributed to any other activity. Where the Co-Operator does not so apportion, the whole leg emission attaches to the biochar.

14.3.6 Where a transport unit is divided or pooled under 7.5, the accumulated transport emissions are apportioned or summed in accordance with that Section.

14.4 Empty journeys

14.4.1 Where a vehicle travels empty on a leg that exists only because of the movement of biochar, that leg is accounted to the activity. This includes both the empty outbound journey of a vehicle travelling to collect biochar and the empty return journey of a vehicle that has delivered it.

14.4.2 An empty leg is not accounted where the Co-Operator demonstrates that it provided another transport service.

14.4.3 An empty leg is calculated under 14.3.2 using the unloaded factor of Annex F.6. Where no unloaded factor is available for the vehicle, the loaded factor applies.

14.4.4 No empty leg is accounted for rail, inland waterway, or maritime transport, where the factor is stated per tonne-kilometre.

> ***Rationale.*** The Delegated Regulation states the rule for the return journey of a delivering vehicle, that being the case its drafting had in view. The same journey occurs in reverse where the recipient collects the biochar, and it exists for the same reason. Accounting one and not the other would make the emission depend on who owns the vehicle rather than on how far it travelled empty.

14.5 Processing, intermixing, and storage between the gate and the point of use

14.5.1 The energy consumed in processing, intermixing, repackaging, or storing a transport unit between the factory gate and the point of application or incorporation is accounted as:

$$GHG_{handling} = \sum Q_{fuel} * EF_{fuel} + \sum Q_{elec} * EF_{elec} + \sum Q_{heat} * EF_{heat}$$

with emission factors determined under 9.5.3, 9.7.5, and 9.8.5.

14.5.2 Where biochar is intermixed with another material, the emissions of producing and supplying that other material are not accounted. The emissions of the mixing operation are apportioned on a mass basis to the biochar and to the other constituents.

14.5.3 $GHG_{handling}$ accumulates on the transport unit under 7.4.2(b) and (c) and is part of $GHG_{transport}$ for the purposes of 8.3.2.

> *Rationale.* Section 2.2.6 of the Delegated Regulation names transport only, and Section 2.2.7.2 names application and incorporation. Neither names the operations that occur in between, although a substantial part of certified biochar is granulated, blended into a substrate, or repackaged before it reaches the soil. Those operations consume energy attributable to the activity and are within the definition of associated GHG emissions in the Annex, so they are accounted. They are placed here rather than in Chapter 15 because they occur before the point of use and attach to the transport unit in transit.

14.6 Default factors and evidence

14.6.1 Default transport factors are given in Annex F.6.

14.6.2 Where a default factor is used, it carries no uncertainty under 13.1.2 and is not subject to the substitution rule of 13.2.3.

14.6.3 The distance of a leg is the distance actually travelled. Where it is not recorded, the road distance between the two addresses by the shortest practicable route is used, and the basis is stated.

14.6.4 The Co-Operator must hold, for every leg, either the fuel record or the distance and vehicle type, together with the date and the identifiers of the transport units carried.

14.7 Recording

14.7.1 Each transport leg is recorded against the transport unit under 7.4.2(a), with mode, distance, and either the fuel consumed or the applicable default.

14.7.2 A transport unit whose transport record is incomplete does not close under 7.6.2 and generates no units.

15. Application and incorporation

(Delegated Regulation, Annex Section 2.2.7.2)

This Chapter quantifies the emissions of placing biochar in its permanent store: application to soil under Track A, and incorporation in cement, concrete, or asphalt under Track B. The emissions accumulate on the transport unit under 7.4.2(d) and are deducted from its removal when the application or incorporation record closes.

15.1 Scope

15.1.1 GHG_{use} covers the energy consumed in the operation by which biochar is applied to soil or incorporated in a product, including the energy of the machinery performing it.

15.1.2 Only emissions directly related to the use of the biochar are accounted. Where biochar is intermixed with another material before application or incorporation, the emissions of producing and supplying that other material are not accounted.

15.1.3 Transport to the site of application or incorporation is accounted under Chapter 14, and processing, intermixing, and storage before that point under 14.5. This Chapter begins at the site.

15.1.4 Under Track A, the operation ends with the incorporation into the soil profile or the covering required by 1.6.1. The energy of that operation is accounted here.

15.1.5 Under Track B, only the additional energy attributable to handling and dosing the biochar at the batching or mixing plant is accounted. The energy of producing the cement, concrete, or asphalt is not.

15.1.6 No emissions are accounted after the point of application or incorporation. The operator is not subject to monitoring requirements after the end of the monitoring period under 2.6.

15.2 Calculation

15.2.1 The emissions of application or incorporation at a site are:

$$GHG_{site} = \sum Q_{fuel} * EF_{fuel} + \sum Q_{elec} * EF_{elec} + \sum Q_{heat} * EF_{heat}$$

with emission factors determined under 9.5.3, 9.7.5, and 9.8.5.

15.2.2 Where biochar is applied or incorporated as part of a mixture, the emissions of the operation are apportioned to the biochar on a mass basis:

$$\mathbf{GHG_{use} = F_S \times GHG_{site}}$$

where F_S is the dry mass of the biochar of the activity divided by the total mass of the material applied or incorporated at that site. The total mass includes the biochar of the activity, any biochar from other activities, and every other material in the mixture.

15.2.3 Where the biochar is applied or incorporated without intermixing, F_S is 1.

15.2.4 GHG_{use} is apportioned across the transport units named in the application or incorporation record in proportion to their dry mass.

15.3 Default values

15.3.1 Default values for the energy of application and incorporation are given in Annex F.9, expressed per tonne of material applied or incorporated.

15.3.2 The Co-Operator may use a default value in place of measuring Q_{fuel}, Q_{elec}, or Q_{heat} for an operation listed in Annex F.9.

15.3.3 Where a default value is used, it is applied to the total mass of material placed at the site and then apportioned under 15.2.2. It is not applied to the mass of biochar alone.

15.3.4 Where a default value is used, it carries no uncertainty under 13.1.2.

15.3.5 Where an operation is not listed in Annex F.9, the Co-Operator measures the energy consumed, or derives it from the fuel consumption per hectare of the machinery and the application rate, and states the basis in the monitoring plan.

> ***Rationale.*** Section 2.2.7.2 of the Delegated Regulation permits the certification scheme to provide default values for the quantities of fuel, electricity, and heat consumed, for specified application or incorporation methods. Application to soil is performed by farm machinery whose fuel consumption per hectare is well characterised and which the Co-Operator has no practical means of metering at each event, so a default is the ordinary case and a measurement the exception. Clause 15.3.3 is stated because the defaults of Annex F.9 are per tonne of material placed, and a spreader consumes the same fuel per hectare whether the material is biochar or a biochar-compost blend. Applying the default to the biochar mass alone and then apportioning would deduct the same emission twice.

15.4 Manure pathway

15.4.1 Where biochar is fed to animals or directly applied to manure, the emissions of applying the manure to soil are accounted under 15.2, apportioned to the biochar under 15.2.2 on the basis of its dry mass in the manure.

15.4.2 Where the manure is deposited in situ by grazing animals, GHGuse is zero.

15.4.3 The emissions of feeding the biochar to the animals, and of housing and managing them, are not accounted.

> *Rationale.* Manure is applied to soil for its own agronomic purpose and would be applied whether or not it contained biochar, so the mass apportionment in 15.2.2 will assign the biochar a small share of a spreading operation the farm performs in any event. That is the treatment the Delegated Regulation prescribes for any intermixed material and it is applied here without modification. Feeding and animal husbandry lie outside the activity and are not associated emissions of it.

15.5 Recording

15.5.1 The energy consumed in applying or incorporating the material is recorded against the transport unit under 7.4.2(d), or the default value used is recorded in its place.

15.5.2 The application record under 5.3.1 and the incorporation record under 5.4.1 state the total mass of material placed, the mass of biochar of the activity within it, and F_S.

15.5.3 A transport unit whose application or incorporation energy is not recorded does not close under 7.6.2 and generates no units.

16. Net Carbon Removal Benefit

(Delegated Regulation, Annex Section 2.2.4; CRCF Regulation Article 4(1))

This Chapter assembles the quantities determined in Chapters 9 to 15 into the net carbon removal benefit, and states the relationship between that quantity and the units issued. Chapter 10 determines total carbon removals, Chapters 9, 14, and 15 determine the three stages of associated emissions, and Chapter 13 determines the conservatism factor.

16.1 The formula

16.1.1 The net carbon removal benefit of the activity for a certification period is:

$$\text{Net carbon removal benefit} = CR_{total} - GHG_{associated}$$

where CR_{total} is determined under 10.3.2 and $GHG_{associated}$ under 16.2.

16.1.2 The baseline is zero under 8.2 and is omitted from 16.1.1.

16.1.3 Both terms are expressed as positive magnitudes, following 10.1.4. Article 4(1) of the CRCF Regulation states the same relation as $CR_{baseline} - CR_{total} - GHG_{associated}$, with removals carried as negative quantities. The two differ in sign convention only.

16.2 Associated emissions

16.2.1 The greenhouse gases associated with the activity are:

$$GHG_{associated} = GHG_{production} + GHG_{transport} + GHG_{use}$$

16.2.2 $GHG_{production}$ is determined under Chapter 9 and covers everything to the factory gate.

16.2.3 $GHG_{transport}$ is determined under Chapter 14 and covers movement, processing, intermixing, and storage from the factory gate to the site of application or incorporation.

16.2.4 GHG_{use} is determined under Chapter 15 and covers the operation by which the biochar is applied or incorporated.

16.2.5 No emission is accounted in more than one of the three terms. Where a quantity could fall in two, the scope clauses 14.1 and 15.1 govern.

> ***Rationale.*** The term $GHG_{biochar}$ used in Section 2.2.4 of the Delegated Regulation is rendered here as $GHG_{production}$. The two are the same quantity. The name is changed so that the three stage names are parallel, and because the Delegated Regulation uses $GHG_{biochar\text{-}site}$ for a different quantity in Section 2.2.7.2.

16.3 What a transport unit carries

16.3.1 The three stages are deducted at two different moments and against two different objects, in accordance with 8.4.

16.3.2 $GHG_{production}$ is deducted from the production emission reserve at the closure of the production batch, by cancellation of certified removal under 8.4. A registered transport unit therefore carries a production emission term of zero, under 7.4.5.

16.3.3 $GHG_{transport}$ and GHG_{use} accumulate on the transport unit as they occur and are deducted from its removal when its application or incorporation record closes under 7.6.

16.3.4 The net removal of a transport unit is:

$$Net_{TU} = FC * CR_{TU} - GHG_{transportTU} - GHG_{useTU}$$

where CR_{TU} is determined under 10.3.1 and FC under 13.4.

16.3.5 Where Net_{TU} is not greater than zero, no units are issued in respect of that transport unit.

16.4 The period account

16.4.1 The net carbon removal benefit of a certification period is:

$$Net\ carbon\ removal\ benefit = \sum Net_{TU} - GHG_{production,period}$$

summed over all transport units whose application or incorporation record closed in the period, where $GHG_{production,period}$ is the aggregate production emissions cancelled from the reserve at the closure of production batches during that period.

16.4.2 The quantity in 16.4.1 is identical to the quantity in 16.1.1. The first states it as it is executed in the register, the second as the Delegated Regulation states it.

16.4.3 Units issued in respect of transport units applied in the period, less units cancelled from the reserve in the period, equal the net carbon removal benefit of that period.

16.4.4 Over the activity period, every emission quantified under Chapters 9, 14, and 15 is deducted once, in carbon, from removal generated by the same activity.

16.5 Issuance

16.5.1 Units are issued only where the net carbon removal benefit is greater than zero.

16.5.2 One unit corresponds to one tonne of net carbon removal benefit.

16.5.3 Units are issued at re-certification under 17.1, in relation to transport units applied or incorporated during the certification period audited.

16.5.4 No unit is issued in respect of a transport unit whose parent batch is not validated under 12.1.20, whose H/Corg ratio exceeds 0.7 under 11.2.5, or whose record has not closed under 7.6.2.

16.6 Reporting

16.6.1 The monitoring report states, for the certification period: CR_{total}; FC; the three terms of 16.2.1; $GHG_{associated}$; the net carbon removal benefit; the units issued; and the removal cancelled from the reserve.

16.6.2 The report states the same quantities per production batch and, where the certification body requires it, per transport unit.

PART III - STORAGE, LIABILITY, SUSTAINABILITY

17. Storage, chain of custody, and liability

(Delegated Regulation, Annex Section 3.2)

17.1 The H/Corg ratio of each production batch must be measured. No units may be issued in respect of a batch with an H/Corg ratio greater than 0.7.

17.2 The use of produced biochar must be monitored up to the point of application to soil or incorporation in a product. Units are issued in relation to the quantity applied or incorporated.

17.3 Biochar from the activity must be segregated in the supply chain from biochar produced by non-certified activities, from the factory gate to the point of application, incorporation inclusive. No unit is issued in respect of a quantity of certified biochar that has been mixed with biochar from a non-certified activity at any point, including at the point of application or incorporation.

17.4 A segregated supply is mandatory for each production batch unless batches can be demonstrated to be well mixed. Where batches are well mixed, the mixture is treated as consisting of fractions of the original batches in proportion to the quantities mixed.

17.5 The chain of custody must ensure that biochar is used only in ways appropriate to its production and characteristics, and in particular only in a track and application route for which its feedstock is eligible under Annex B and its analyses under Chapter 19.

17.6 Where biochar is applied to soil, the Co-Operator must grant access to the location of application, on request and during the monitoring period, to CS, to certification bodies, and to competent national authorities, to allow the soil to be tested to confirm that biochar has been applied. After the end of the monitoring period the application is treated as demonstrated.

17.7 The access right under 17.6 must be secured before application through the confirmation recorded under 5.3.1(g) or 5.5.1(e). The confirmation must:

(a) name CS, certification bodies, and competent national authorities as beneficiaries;

(b) run for the full monitoring period;

(c) bind the applier or livestock keeper to notify the Co-Operator of any change of tenure or ownership of the parcel or holding within the monitoring period, and to procure the transfer of the access right or to enable the Co-Operator to secure it afresh.

17.8 The operator is not subject to monitoring requirements after the end of the monitoring period. The risk of reversal is characterised through the permanence fraction.

18. Sustainability

(Delegated Regulation, Annex Sections 4.1 to 4.3)

18.1 Climate change mitigation

The eligibility requirements of Chapter 1 prevent significant harm to the objective of climate change mitigation. No further demonstration is required.

18.2 Climate change adaptation

The operator must comply with the criteria in Appendix A to Annex I to the Taxonomy Delegated Act.

18.3 Water and marine resources

18.3.1 The operator must evaluate and address any potential risk from the activity to the good status or good ecological potential of bodies of water, including surface water and groundwater, and to the good environmental status of marine waters.

18.3.2 Where pollutants scrubbed from flue gases may be released to a body of water, the air pollution benefit and the availability of alternative discharge strategies must be taken into account in evaluating the impact on water quality.

18.4 Circular economy

The operator must evaluate and address any potential risk to the circular economy objectives, considering the types of significant harm set out in Article 17(1), point (d), of the Taxonomy Regulation.

18.5 Pollution prevention and control

18.5.1 The operator must evaluate and address any potential risk of a significant increase in emissions of pollutants to air, water, or land. Facilities within the scope of Directive 2010/75/EU must comply with all requirements arising from that Directive.

18.5.2 Where biochar is applied to agricultural, forest, or urban soils, the operator must demonstrate that:

(a) the biochar complies with the limits in 14.1;

(b) the biochar meets all requirements relating to pyrolysis and gasification materials in the EU Fertilising Products Regulation (EU) 2019/1009, including the limitations on permissible input materials, as implemented in Annex B.

18.6 Biodiversity, ecosystems, and soil health

18.6.1 The operator must evaluate and address any potential risk from the activity to the good condition or resilience of ecosystems, to the conservation status of habitats and species including those of Union interest, and to the achievement of targets or obligations in national restoration plans under Regulation (EU) 2024/1991.

18.6.2 Where biochar is applied to agricultural or forest soils, the operator must demonstrate that the local context has been considered and that it is reasonable to expect:

(a) no overall negative effect on biomass production, site condition, or soil health;

(b) no significant reduction in the storage of other soil organic carbon through positive priming effects.

18.6.3 The demonstration under 18.6.2 must address soil type and texture, existing soil organic carbon content, pH, the application rate, and the cumulative application under 1.5. It is made once per soil and cropping context and applies to all applications in that context during the activity period.

18.6.4 Where the certification body considers significant loss of other soil organic carbon likely, or deleterious impacts likely on agricultural productivity, on biodiversity, on receiving ecosystems or those downstream in the watershed, on soil health, or on any other environmental aspect, no units are issued in relation to the applied quantity.

18.7 Biomass sustainability

18.7.1 All biomass, biofuel, bioliquid, or biomass fuel used as feedstock for biochar production, and any additional biomass consumed to produce energy for the activity, must meet the requirements of Article 29 RED II that apply for the purposes referred to in Article 29(1), points (a), (b), and (c), of that Directive. Those requirements apply even where the activity does not generate renewable energy taken into account under RED.

18.7.2 The operator must disclose the biomass feedstock or feedstock mix consumed, and the feedstock used to produce any consumed biofuels, bioliquids, or biomass fuels, disaggregated to the level required in RED II reporting, in national guidance, and in relevant industrial standards.

18.7.3 Compliance with Article 29(10) RED II must be verified only where biochar production takes place at a facility producing heat, electricity, a biofuel, a bioliquid, or biogas, and only with regard to that output.

18.7.4 Biomass, biofuel, bioliquid, or biomass fuel produced from wastes or residues other than agricultural, aquaculture, fisheries, and forestry residues is not subject to Article 29(2) to (7) RED.

18.7.5 Voluntary schemes approved by the Commission under Article 30(4) RED, national schemes recognised under Article 30(6) RED, and schemes recognised by the competent national authority of the Member State in which the production facility is located, are treated as providing accurate data for the demonstration of compliance with 18.7.1.

18.7.6 Feedstock must not be identified as, or as produced from, a high indirect land-use change risk feedstock under RED.

18.7.7 Where biomass is sourced from areas designated by the national competent authority for conservation, including areas covered by a national restoration plan under Regulation (EU) 2024/1991, or in protected habitats, the sourcing must be in accordance with the conservation and restoration objectives for those areas.

18.8 Avoidance of unsustainable demand for biomass

Where the biochar of a production batch is expected to account for 50% or more of the total energy output in the co-products of the facility, calculated under 8.4, the batch may be produced only from waste or residual feedstocks, or from biofuel, bioliquid or biomass fuel produced from waste or residual feedstocks, within the meaning of Article 2, points (23) and (43), RED. Eligible feedstocks are marked in Annex B.

18.9 Voluntary compensation of biomass use

The quantity of carbon farming sequestration units purchased by the operator in relation to the activity, which may be zero, is stated in the monitoring report and carried onto the certificate of compliance.

> ***Note.*** Section 4.3.3 of the Delegated Regulation permits operators to purchase carbon farming sequestration units to support the regeneration of natural carbon stocks used by the activity, and requires the quantity to be reported. The purchase is voluntary and quantification-neutral: it does not enter the calculation of total carbon removals or of associated emissions, and it does not discharge any emission of the activity. This Standard reports the quantity as required and attaches no consequence to it.

19. Contaminant limits

(Delegated Regulation, Annex Section 4.4)

Biochar must comply with limits on heavy metals and organic contaminants appropriate to the track and application route for which it is intended. This Chapter states those limits, the testing regime by which compliance is established, and the consequence of exceeding a limit. The route for which a batch is eligible on feedstock grounds is determined under Annex B; this Chapter determines whether the biochar as produced is eligible on analytical grounds.

19.1 Testing

19.1.1 Laboratory testing against the limits applying to the intended track and application route is carried out for each production batch.

19.1.2 Testing is carried out by a laboratory endorsed by CS, on the reference analysis sample of the batch under 6.3. For an initial batch this is the representative sample taken in the first week under 6.3.1. For every subsequent batch it is the sample drawn from the aggregated daily retention samples under 6.3.3.

19.1.3 For Track A biochar intended for agricultural and forest soils, the sampling frequency must in no case be lower than that required by the FPR.

19.1.4 Compliance is assessed against the measured value as reported by the laboratory. The analytical uncertainty is not deducted from the measured value. A measured value equal to the limit complies.

19.1.5 Where a limit of this Chapter and the corresponding EBC threshold differ, both apply and the lower governs.

> *Note.* Section 4.4 of the Delegated Regulation permits a certification scheme to allow a reduced testing regime justified by the properties of the feedstock and process or by the distribution of historical samples. This Standard does not offer that option, and every production batch is tested.

19.2 Consequence of exceeding a limit

19.2.1 Where a production batch exceeds a limit applying to its intended track and application route, no carbon removal units are issued in respect of that batch on that route. Transport units filled from it are recorded under 5.2.2.

19.2.2 A batch that exceeds a limit closes under 6.3.7, with effect from the production date of the sample concerned.

19.2.3 The operator may test a further sample of the same batch only where it demonstrates that the first sample was not representative. A result obtained on a further sample does not displace the first result. Both results are recorded in the register and both are available to the certification body.

19.2.4 Where a batch exceeds a limit of 19.3 or 19.5 but complies with every limit of 19.6, the batch may be redirected to Track B. Redirection requires that the feedstock of the batch is eligible for the Material route under Annex B and that the biochar holds a valid EBC-Material

certificate. The redirection is recorded in the dMRV system against every transport unit of the batch, and the track recorded under 1.3.5 is amended accordingly.

19.2.5 Redirection under 19.2.4 applies to the whole of a batch. It is not a split of a batch between tracks within the meaning of 1.3.5.

Rationale for 19.2.4. Section 4.4.3 of the Delegated Regulation sets no limits on heavy metals for biochar incorporated in cement, concrete, or asphalt, and limits only four organic contaminants. A batch failing on lead, cadmium, or zinc is therefore fully compliant for the Material route. Redirection is the Delegated Regulation's own position rather than a concession, and it is stated expressly because the alternative is that an operator writes off a batch that the framework regards as eligible.

19.3 Track A: biochar applied to soils

19.3.1 The biochar must not exceed the following concentrations, in grams per tonne dry matter:

Substance	Limit
Lead	120
Cadmium	1.5
Copper	100
Nickel	50
Mercury	1
Zinc	400
Chromium	90
Arsenic	13
Benzo[e]pyrene	1
Benzo[j]fluoranthene	1
PCB	0.2
PCDD/F	0.000020 g TE (WHO-TEQ 2005)
16 EPA PAH	6
8 EFSA PAH	1
Chlorine	30 000

19.3.2 16 EPA PAH is the sum of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene, and benzo[ghi]perylene. PAH8 is the subset comprising benzo[a]pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene, and benzo[ghi]perylene.

19.3.4 The biochar must in addition comply with any relevant national or local requirement.

19.3.5 The thresholds of 19.3.1 apply to all Track A applications to soils and not only to agricultural and forest soils.

> ***Rationale.*** The chlorine limit is not in the Delegated Regulation. It is imposed by CMC 14 point 6(a), compliance with which is a condition of soil application under Section 4.1.5.1(b), and it is stated here rather than left to be discovered in the FPR. The remaining values are the Delegated Regulation's own and correspond closely to the EBC-Agro thresholds.
>
> Biochar used in urban soils, gardens, growing media, and landscaping enters soil in which food is grown and to which people and animals have direct access. This Standard applies the full limits of 19.3 to all soil application, and reserves the reduced list to incorporation in cement, concrete, or asphalt, where the biochar is bound in a matrix and does not enter a biologically active medium. Section 4.4.3 of the Delegated Regulation applies the reduced list of five organic contaminants to Track A applications other than to agricultural and forest soils, alongside Track B. This Standard is stricter and applies the full limits of 19.3.1 to all soil application.

19.4 Track A: biochar incorporated into a matrix before application to soil

19.4.1 The limits of 19.3 apply to the biochar itself, irrespective of the material into which it is incorporated before soil application.

19.4.2 Mixtures must consist of biochar and of component materials complying with the relevant component material category requirements under the FPR. Such materials may include manure, compost, liquid fertiliser, anaerobic digestate, and other substrates.

19.4.3 Mixtures must be identified in a Product Function Category and must comply with the requirements for that category under the FPR.

19.5 Track A: biochar used as a feed additive and recovered in manure

19.5.1 In addition to the limits of 19.3, the following apply:

(a) the feedstock must consist only of pure plant biomass or biomass fuel produced from pure plant biomass;

(b) the requirements of the Feed Hygiene Regulation must be met;

(c) the H/Corg ratio must not exceed 0.4;

(d) the biochar must hold a valid EBC-Feedplus certificate.

19.5.2 The biochar must not exceed the following concentrations, in grams per tonne on an 88% dry matter basis:

Substance	Limit
Lead	10
Cadmium	0.8
Mercury	0.1
Arsenic	2

PCDD/F	0.00000075 g TE (WHO-TEQ 2005)
PCDD/F + dl-PCB	0.00000125 g TE (WHO-TEQ 2005)
Sum of 6 DIN PCB	0.00001
Fluorine	150

19.5.3 The sum of 6 DIN PCB comprises PCB-28, PCB-52, PCB-101, PCB-138, PCB-153, and PCB-180.

19.5.4 The operator must obtain and record in the dMRV system the livestock keeper's declaration that all manure produced by the animals receiving the biochar will be applied to soil, whether in situ by the animal or by collection and application.

19.6 Track B: biochar applied to cement, concrete, and asphalt

19.6.1 The biochar must not exceed the following concentrations, in grams per tonne dry matter:

Substance	Limit
PAH8	4
Benzo[e]pyrene	1
Benzo[j]fluoranthene	1
PCB	0.2
PCDD/F	0.000020 g TE (WHO-TEQ 2005)

19.6.2 The biochar must in addition comply with any relevant national or local requirement.

PART IV - REGISTER, UNITS, AND SCHEME OPERATION

20. The C-Sink Register

(Delegated Regulation, Annex Section 3.2; Implementing Regulation)

The Registry is the authoritative record of certified biochar and of the land to which it has been applied. The dMRV system under Chapter 5 observes and transmits; the Registry holds the record and the state of every quantity; the CS-BCR-App reads from both and calculates. This Chapter sets out what the Registry holds, the three states a quantity passes through, the records it keeps at activity level, the land register that forms part of it, and who may see what.

20.1 Function

20.1.1 CS maintains the Global C-Sink Registry. The Registry is the authoritative record of biochar certified under this Standard, from production to the issuance of units, and of the land to which that biochar has been applied.

20.1.2 The Registry is maintained at scheme level and independently of this Standard. Its entries are retained indefinitely and are carried forward unchanged where this Standard is amended or replaced.

20.1.3 The dMRV system captures observations and events and transmits them to the Registry. The Registry holds the authoritative record and the state of every quantity. The CS-BCR-App reads from the Registry and from the dMRV record and performs the calculations required by this Standard. A record held only in a dMRV system, or only in the App, is not authoritative.

> ***Rationale.*** An operator may use its own dMRV system or that of a third party under 5.7.2. Were the custody record held there, the evidence on which issuance depends would sit in a system CS does not control and the operator may replace, and a change of system would break the chain of a consignment in transit. The App is operator-facing and versioned with this Standard. Only the Registry has the properties the record requires: authoritative, at scheme level, persistent beyond the activity period and beyond this Standard, and visible across operator boundaries when a consignment passes from producer to trader to applier.

20.2 Registered objects, identifiers, and chain of custody

20.2.1 Each production batch receives a unique batch identifier, issued by the Registry on registration of the batch under 6.2.1.

20.2.2 Each transport unit receives a unique identifier, linked to the identifier of its parent batch or batches and to the dry mass and organic carbon content it carries.

20.2.3 Every transfer of physical custody, every change of ownership, every processing step, every storage event, and every application or incorporation is recorded in the Registry against the identifier before the following event is recorded.

20.2.4 The Registry records, for every transport unit, the owner of the biochar and the Carbon Owner under 1.1.6, and every change in either.

20.2.5 Where transport units of more than one certified batch are pooled, 7.5.3 applies and the resulting quantity is recorded as consisting of fractions of the constituent batches in proportion to the masses pooled. Where pooling cannot be demonstrated to be homogeneous, each batch is kept in segregated supply.

20.2.6 The Registry carries, for every quantity at every point in the chain, a segregation state distinguishing certified from non-certified material, and the track under 1.3.

20.2.7 Biochar produced by non-certified activities must not enter the certified chain at any point, including at the point of application or incorporation. A quantity of certified biochar mixed with non-certified biochar is recorded under 5.2.2 and generates no units.

20.2.8 Where biochar is incorporated into compost, growing media, substrate, or another material destined for soil, the identifier and the recorded mass carry through into the mixed product, and the chain of custody continues to the point of application. The mixed product must state on its packaging the mass of certified biochar it contains.

20.3 States of a registered quantity

20.3.1 Every quantity registered under 20.2 holds one of three states.

(a) **Registered.** The biochar has been produced and registered and has not been applied or incorporated. No permanent storage has occurred and no removal is issued.

(b) **Stored.** The biochar has been applied to soil or incorporated in a product and the application or incorporation record has closed under 5.3.3 or 5.4.2. The record has not yet been approved by the certification body.

(c) **Issued.** The certification body has approved the register entry of the application or incorporation on the dMRV data transmitted under 5.1.4, and the removal has been issued under 21.1.

20.3.2 A quantity moves from Registered to Stored on closure of its record, and from Stored to Issued on approval by the certification body. Approval is performed as records close and does not wait on the end of a certification period, on the closure of the production batch, or on the annual audit.

20.3.3 A removal in the Issued state is final as to quantity, may be transferred, and may be retired. It is subject to forward correction under 21.3.

20.3.4 The Registry records, for every issued removal, whether a certificate of compliance under 21.2 has been issued for the certification period in which the removal arose. A removal for which no such certificate has yet been issued is displayed as pending certification.

20.3.5 A removal is reported to the Union registry as a permanent carbon removal unit under Regulation (EU) 2024/3012 on the issuance of the certificate of compliance for the certification period in which it arose.

20.3.6 Where a quantity does not proceed to the Issued state, the Registry records the quantity and the reason.

Rationale. Approval and issuance are performed continuously because the evidence is complete when the record closes. Production emissions have already been deducted from the reserve under 8.4, post-gate emissions are complete as a condition of closure

under 7.6.2, the removal of the transport unit is fixed at production, and the conservatism factor is fixed for the activity period under 13.4.3. Nothing in the calculation of a transport unit's net removal depends on any event later than the closure of its record, and the certification body verifies every record rather than a sample, under 21.4.7.

Section 2.2.5.1 of the Delegated Regulation provides for units to be issued at re-certification in relation to quantities applied during the certification period. This Standard issues the removal on approval of every discrete application of TUs and attaches the CRCF representation on the issuance of the certificate of compliance for the period. The removal is therefore available to the market from approval. The annual audit confirms the approvals performed during the period, produces the certificate, and gives rise to any forward correction under 21.3.

20.4 Records at activity level

20.4.1 The Registry records, against the activity and not against an individual quantity:

(a) the production emission reserve constituted under 8.4, and every cancellation performed from it;

(b) every forward correction under 21.3, with the quantity, the certification periods and production batches to which it related, and its cause;

(c) any outstanding quantity under 21.3.6 that could not be extinguished;

(d) every suspension or withdrawal of a certificate with its date and its cause;

(e) every certificate of compliance issued under 21.2.

20.4.2 A record under 20.4.1(b), (c), or (d) does not alter the state of any quantity and does not affect units already issued.

20.4.3 Records under 20.4.1 are retained indefinitely and are not removed on the expiry of an activity period, on the withdrawal of an operator from the scheme, or on the withdrawal of a certificate.

Rationale. Chapter 21 corrects an overstatement discovered after issuance by cancelling removal forward rather than by revoking the unit. That mechanism is only as good as the record of it. Without a permanent, published account of what was corrected and why, a forward correction would be indistinguishable from no correction at all, and the outstanding quantity under 21.3.6 would have no consequence of any kind.

20.5 The land register

20.5.1 CS maintains a land register recording every location to which biochar has been applied under 1.4.1.

20.5.2 The land register is maintained by CS at scheme level and forms part of the Registry. The dMRV system writes an entry on closure of each application record and queries the register before closing one.

20.5.3 Each entry records the geometry of the application area, its area in hectares, the mass of biochar applied in tonnes dry matter, the date or period of application, the application method

under 1.6, the Carbon Owner, and whether the application was certified under this Standard, certified under another scheme, or uncertified.

20.5.4 The geometry of an application area must be submitted as a KML file delimiting the boundary of the area that actually receives the biochar. A single coordinate point is not sufficient. Where a national land parcel identifier exists for the land concerned, it can be recorded in addition to the geometry and does not replace it.

20.5.5 Cumulative loading at a point of land is the sum, over all entries whose geometry covers that point, of the mass of each entry divided by its area. A location complies with 1.5.1 where the maximum cumulative loading at any point within it does not exceed 50 tonnes per hectare. The calculation is performed by the register.

20.5.6 Where an application would take the maximum cumulative loading above 50 tonnes per hectare, units are issued only for the mass that can be applied without exceeding it, and the application record must state the reduced mass.

20.5.7 Prior applications declared under 5.3.1(h) and 5.5.1(f) are entered with the geometry, area, and mass declared. Where the applier states a mass but cannot state an area, the prior application is entered as covering the area of the application then being recorded.

20.5.8 For biochar recovered in manure or digestate under 5.5, the entry geometry is the holding or the receiving area and the area is its utilised agricultural area. Cumulative loading is not resolved to points within it.

20.5.10 The land register records applications of biochar to land irrespective of the standard under which the biochar was certified, and irrespective of whether it was certified at all. Entries are retained indefinitely and are carried forward unchanged where this Standard is amended or replaced. They are not deleted on the expiry of an activity period, on the withdrawal of an operator from the scheme, or on the withdrawal of a certificate.

20.5.11 The land register is not public. CS makes the cumulative loading at a stated location available on request to certification bodies, to competent national authorities, to the Commission, and to other certification schemes recognised under the CRCF Regulation, without disclosing the identity of operators or the commercial terms of any application.

> ***Rationale.*** The limit in 1.5.1 is a loading limit on land, not a limit on a bookkeeping unit, and successive applications rarely align with one another or with a parcel boundary. Averaging over a parcel conceals concentration: thirty tonnes on one hectare followed by thirty tonnes spread over the two hectares containing it averages to thirty tonnes per hectare across the parcel while the overlap has in fact received forty-five. Clause 20.5.5 computes the quantity the Delegated Regulation actually limits. Recording the boundary of the area that received the biochar, rather than a point or an administrative identifier, is what makes that computation possible, and it makes overlap the ordinary case the register handles rather than an exception requiring judgement.
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> Clause 20.5.9 accepts an area average for the manure and digestate pathways. Biochar fed at typical inclusion rates and recovered in manure reaches the land at well under one tonne per hectare per year, so the pathway cannot approach the limit within any plausible period and a point calculation would be spurious.

20.6 Access, publication, and data protection

20.6.1 The Registry operates on a single database with differentiated access.

20.6.2 The Registry records, and publishes, for each issued unit: the activity, the Operator, the Carbon Owner, the production batches, the track, the certification period, the permanence fraction, the conservatism factor, the certification body, and the certificate of compliance.

20.6.3 The Registry publishes the records under 20.4.1(b), (c), and (d).

20.6.4 The chain of custody recorded under 20.2, at the level of production batches and transport units, is available to the Operator concerned, to the Carbon Owner concerned, to its certification body, to CS, and to competent national authorities.

20.6.5 The land register under 20.5 is not public. Access to it is governed by 20.5.11.

20.6.6 The Registry is interoperable with the Union registry in accordance with the Implementing Regulation and supplies to it the data that Regulation requires.

20.6.7 The Registry is the platform through which CS enables knowledge sharing between operators. Data gathered by operators in the course of any post-application monitoring is disseminated through it.

20.6.8 Data transferred to the Registry is held under access control, is protected against loss by backup with a defined recovery procedure, and carries an audit trail. CS states the applicable measures in its scheme documentation.

20.6.9 Personal data, including the geometry of application locations, land parcel and holding identifiers, and the identity of appliers and livestock keepers, is processed in accordance with Regulation (EU) 2016/679 and is not published.

20.6.10 Commercially sensitive data is disclosed only as provided in 5.8.1 and in this Section.

> *Rationale.* Publication and confidentiality are properties of a view and not of a separate system. Parcel geometries are personal data of the appliers and cannot be published, while issued units must be public if the Registry is to serve its purpose. Building one store with differentiated access, rather than a public ledger with a private annex attached, is also the arrangement the Union registry will require, which needs internal granularity finer than it publishes.

21. Units, issuance, and audit

(CRCF Regulation Articles 9 and 12; Implementing Regulation)

Chapter 16 determines the net carbon removal benefit and states the conditions under which a unit may be issued. This Chapter states how issuance is performed, what the certificate of compliance records, how the activity is audited, and what happens where a defect is found after units have been issued.

21.1 Issuance

21.1.1 Units are issued by CS on the issuance by the certification body of a certificate of compliance following an annual audit, in respect of the transport units whose application or incorporation record closed during the certification period audited.

21.1.2 Units are issued into the Global C-Sink Registry against the activity, and the transport units concerned move from the Stored state to the Issued state under 20.3.

21.1.3 Units are issued to the Carbon Owner recorded under 1.1.6 at the time the application or incorporation record closed.

21.1.4 Where only part of a production batch has been applied or incorporated at the time of a re-certification audit, units are issued for that part. Units may be issued for the remainder at a later re-certification.

21.1.5 Where a transport unit was applied or incorporated during a certification period but its record had not closed at the time of the audit, units may be issued in respect of it at a later re-certification once the record closes.

21.1.6 Units are recorded to the precision maintained by the Registry. No minimum issuance quantity applies.

21.2 Certificate of compliance

21.2.1 On completion of a certification or re-certification audit the certification body issues a certificate of compliance in the form required by the Implementing Regulation.

21.2.2 The certificate records, in addition to the matters required by the Implementing Regulation:

(a) the activity, the Operator, the Carbon Owner, and the production facilities;

(b) the certification period covered;

(c) the tracks and application routes used;

(d) the total carbon removals, the associated greenhouse gas emissions, and the net carbon removal benefit;

(e) the conservatism factor applied under Chapter 13;

(f) every form of public financing received or applied for, under 8.2.3;

(g) the quantity of carbon farming sequestration units purchased under 18.9, which may be zero.

21.2.3 The certificate is recorded in the Global C-Sink Registry and published under 20.6.2.

21.3 Correction after issuance

21.3.1 A carbon removal unit issued under this Standard is not cancelled, revoked, or adjusted after issuance.

21.3.2 Biochar applied to soil or incorporated in a product is not subject to reversal. Section 3.2 of the Delegated Regulation provides that the risk of reversal is characterised through the permanence fraction, that reversals cannot practically be identified after the point of application or incorporation, and that no monitoring obligation arises after the end of the monitoring period. This Standard accordingly provides no reversal mechanism.

21.3.3 Where, after units have been issued, it is established that a quantity of removal was overstated, the overstatement is corrected forward under 21.3.4. This applies however the overstatement arises, and in particular where:

(a) a demonstration of application fails on testing under 17.6;

(b) a laboratory result is corrected or is overturned on the analysis of a retention sample;

(c) an error is found in a dry mass, an organic carbon content, an ash determination, or a reflectance assessment;

(d) a non-conformity identified at audit affects a quantity already issued;

(e) a parameter entering the quantification is redetermined and the redetermined value is higher, beyond the cases already provided for in 8.5.

21.3.4 A forward correction is made by cancelling from the production emission reserve of the activity, under 8.4, a quantity of certified removal equal to the overstatement. Where the reserve is insufficient, the shortfall is deducted from the net carbon removal benefit of the certification period then current, and from subsequent periods until it is extinguished.

21.3.5 Units already issued are not affected by a forward correction. The Registry records the correction, the quantity, the certification periods and production batches to which it related, and its cause.

21.3.6 Where an overstatement cannot be extinguished under 21.3.4 because the activity has ceased, the certificate has been withdrawn, or the activity period has ended without renewal, the Registry records the outstanding quantity against the activity and publishes it. Units already issued are not affected.

21.3.7 A forward correction does not discharge any obligation of the operator(s) arising from the non-conformity that gave rise to it.

Rationale. Post-issuance cancellation would require every holder of a unit to carry a reserve against the possibility of a defect being found in an activity it does not control and cannot inspect. The unit would cease to be fungible, since its value would depend on the residual risk attaching to its issuer, and the cost of that risk would fall on buyers rather than on the party able to prevent it. Forward correction places the consequence on the activity that caused it, extinguishes the same quantity of removal, and leaves the issued unit undisturbed.

The principle is that of 8.5, which provides that batches already closed are not reopened, that a correction is made in the batch then current, and that units already issued are not

affected. 21.3 applies that principle to every post-issuance discovery rather than to production emission parameters alone.

The consequence is accepted that a buyer holding a unit issued on an overstated removal retains it, and that the environmental integrity of that tonne is recovered from a subsequent tonne rather than from the one at fault. The quantities reachable in this way are analytical and clerical, and are bounded by the measurement uncertainties of Chapter 13.

21.4 Audit

21.4.1 The activity is subject to a certification audit during the initial batch (at the beginning of each activity period), and to an annual audit in each year of that period.

21.4.2 The annual audit is the re-certification audit within the meaning of Section 1.2.2.3 of the Delegated Regulation. It closes the certification period and is the event on which units are issued.

21.4.3 Certification audits and annual audits are carried out by certification bodies accredited and endorsed in accordance with the Implementing Regulation and with the scheme rules of CS.

21.4.4 At the certification audit the certification body verifies:

(a) the eligibility of the activity, the production process, the intended tracks, application routes, and feedstocks, under Chapter 1 and Annex B;
(b) the activity plan and the monitoring plan, and their conformity with Chapters 3 and 4;
(c) that an endorsed dMRV system is in place and configured to record the parameters of 5.1.3;
(d) the materiality assessment for capital emissions under 9.8, made on expected emissions over the activity period;
(e) the uncertainty assessment and the expected conservatism factor under 13.5.1;
(f) the expected quantification stated in the activity plan;
(g) the arrangements for the constitution of the production emission reserve under 8.4;
(h) the demonstrations required under Chapter 18.

21.4.5 The initial production batch is audited on its closure. The certification body verifies the batch registration, the reference analysis, the conditions of closure, the realised production emissions, and the constitution of the reserve. A part of the units issued in respect of the initial batch constitutes the reserve under 8.4.

21.4.6 At each annual audit the certification body verifies:

(a) the operator's procedures and their conformity with the activity plan and the monitoring plan;
(b) the operator's use of the dMRV system, including the recording of the parameters listed in 5.1.3, the completeness of the chain of records under Chapter 5, the segregation states recorded, and the entries written to the land register;
(c) the production batches of the period, the reference and subset analyses, and the conditions of batch closure, under Chapter 6;
(d) every application and incorporation record closed during the period, and the transport units named in each;

(e) the sampling and the laboratory analyses under Chapters 6, 12, and 19;
(f) the quantification under Chapters 9 to 16, including the uncertainty assessment and conservatism factor under Chapter 13;
(g) the cancellations performed from the production emission reserve under 8.4;
(h) compliance with the sustainability requirements of Chapter 18.

21.4.7 The verification under 21.4.6(d) is performed on every application and incorporation record closed during the period. It is not performed on a sample.

21.4.8 At each annual audit the certification body assesses whether operating conditions have deviated significantly from those declared at the certification audit. Where they have, the materiality assessment under 9.8 and the uncertainty assessment under Chapter 13 are made again.

21.4.9 The certification body does not attend individual applications of biochar to soil. Applications are verified through the records under 21.4.6(d) and, where the certification body requires it, through soil testing under the access right in 17.6.

21.4.10 A certification audit or an annual audit under this Standard may be conducted together with an audit under the GBCS and with an EBC inspection, on a single visit and a single set of records.

21.4.11 CS conducts technical audits of production facilities. The findings of a technical audit inform the pyrolysis system certificate under 1.2.2 and the guidance and training provided to certification bodies.

ANNEX A - Compliance matrix

This Annex maps the requirements of the Delegated Regulation to the provisions of this Standard, and records where this Standard exercises a discretion the Delegated Regulation confers, where it requires more than the Delegated Regulation requires, and where it departs from it.

Tables A.1 and A.2 are the demonstration of the claim in the Scope that compliance with this Standard is sufficient to demonstrate compliance with Article 4 of the Delegated Regulation. Tables A.3 to A.5 are the record on which a certification body, a competent national authority, and the Commission may assess how the discretions have been used.

A.1 Article 4 of the Delegated Regulation

Article 4	Subject	Annex section	Chapter
4(1)(a)	Eligibility criteria	1.1.2	1
4(1)(b)	Activity and monitoring periods	1.2.2	2
4(1)(c)	Carbon removal sinks and GHG emission sources	2.2.1	8.1
4(1)(d)	Baseline	2.2.2	8.2
4(1)(e)	Total carbon removals	2.2.3	10, 12, 13
4(1)(f)	Associated greenhouse gases	2.2.4	9, 14, 15, 16.2
4(1)(g)	Long-term storage and liability	3.2	17
4(1)(h)	Minimum sustainability requirements	4.1	18, 19
4(1)(i)	Monitoring and reporting requirements	1.3.2, 1.3.3	4, 5
4(2)	Production facility and storage located in the Union	—	1.1.4

A.2 Annex to the Delegated Regulation

Annex section	Subject	Chapter
Definitions	Definitions	Glossary
1.1.2	Definition of the BCR activity	1.1
1.1.2.1	Eligibility criteria for the production	1.2
1.1.2.2.1	Biochar applied in soils	1.4.1, 1.4.2, 1.5, 1.6
1.1.2.2.2	Biochar incorporated in products	1.3.3, 1.4.4
1.2.2.1	Activity period	2.1
1.2.2.2	Monitoring period	2.5
1.2.2.3	Certification period	2.2, 2.3, 2.4
1.3.1	Activity plan	3
1.3.2	Monitoring plan	4.1
1.3.3	Monitoring report	4.2

2.2.1	GHG sources and sinks	8.1
2.2.2	Baseline	8.2
2.2.3	Quantification of total removals	10
2.2.4	Quantification of associated GHG	8.3, 16.2
2.2.5.1	Production batches	6.1, 6.2, 6.6, 6.7
2.2.5.2	Biochar properties	11.2
2.2.5.3	Biochar sampling	6.3, 6.4
2.2.5.4	Allocation between biochar and co-products	9.1
2.2.5.4.1	Emissions from the biochar facility	9.2 to 9.10
2.2.5.5	Emissions from inputs	9.10
2.2.5.5.1	CO2 capture at the production facility	9.4.6
2.2.5.6	Monitoring and reporting, production	4.2, Annex D
2.2.6.1	Quantification of transport emissions	14
2.2.6.2	Monitoring and reporting, transport	14.7, Annex D
2.2.7.1	Calculation of the permanence fraction	12
2.2.7.1.1	Random reflectance assessment	12.1, 12.2
2.2.7.1.2	Decay function	not offered; Scope, 12.1.1
2.2.7.2	Emissions of application and incorporation	15
2.2.7.2.1	Emissions from application or incorporation	15.2
2.2.7.3	Monitoring and reporting, application	15.5, Annex D
2.3.1	Completeness and materiality	8.1.2, 9.8.4 to 9.8.7, 9.10.4
2.3.2	Net consumption of useful heat or electricity	9.6.2, 9.7.3
2.3.3	Additional biomass consumption	not applicable, see note 1
2.3.4.1	Emission factors, electricity	9.6.5, Annex F.3
2.3.4.2	Emission factors, heat	9.7.5, Annex F.4
2.3.4.3	Emission factors, biomass	9.2.3, Annex F.5
2.3.4.4	Emission factors, inputs and fuels	9.4.3, 9.10.3, Annex F.4, F.8
2.3.4.5	Emission factors, transport	14.3, Annex F.6
2.3.5	Capital emissions	9.8
2.3.6	Measured data and uncertainties	13
2.3.7	Confirmation of origin of the CO2 stream	not applicable, see note 2
3.2	Storage, chain of custody, liability	17
4.1.1	Climate change mitigation	18.1
4.1.2	Climate change adaptation	18.2

4.1.3	Water and marine resources	18.3
4.1.4	Circular economy	18.4
4.1.5	Pollution prevention and control	18.5
4.1.5.1	Pollution prevention, BCR	18.5.2, 19
4.1.6	Biodiversity, ecosystems, soil health	18.6
4.1.6.1	Biodiversity, BCR	18.6.2 to 18.6.4
4.2	Biomass sustainability	9.2.8 to 9.2.15, 18.7
4.3.1	Unsustainable demand, BioCCS	not applicable, see note 2
4.3.2	Unsustainable demand, BCR	1.7.2, 18.8, Annex B.2.4
4.3.3	Voluntary compensation of biomass use	18.9
4.4	Sampling and testing for contaminants	19.1
4.4.1	Limit values, agricultural and forest soils	19.3
4.4.2	Biochar incorporated into a matrix, feed additive	19.4, 19.5
4.4.3	Limit values, products and other soils	19.6

Note 1. Section 2.3.3 defines additional biomass consumption as biomass consumed specifically to provide energy for a carbon capture process, and its sub-sections address bioenergy facilities consuming their own heat or electricity for capture. A BCR activity has no capture process. Biomass consumed by a biochar production facility, whether as feedstock or for energy, is accounted under 9.2 and 9.4.

Note 2. Sections 2.3.7 and 4.3.1 apply to DACCS and BioCCS activities only.

A.3 Discretions conferred by the Delegated Regulation

Annex section	Discretion	Exercised	Where
1.1.2.1(c)	Minimum heat utilisation efficiency	no threshold set; utilisation measured and reported	1.2.3, 1.2.6
1.3.2	Additional guidance on the monitoring plan	yes	4.1.4, Annex D
2.2.3	Inorganic carbon may be treated as zero without assessment	not exercised	10.4.2
2.2.5.1	Additional requirements on the definition of a production batch	yes	6.1, 6.6
2.2.5.1	Maximum size of a production batch	yes, 1 000 t	6.6
2.2.5.2	Properties to be reported	yes	11.2
2.2.5.3	Additional guidance on sampling protocols	yes	6.3, 6.4
2.2.5.4.1	Requirements for methane sampling	yes	9.5
2.2.5.4.1	Default values for disposal emissions	yes	Annex F.10

2.2.7.1.1(b)	Specification of the laboratory method for reflectance	yes	12.1
2.2.7.2	Detailed guidance on application and incorporation emissions	yes	15
2.2.7.2.1	Default values for application and incorporation energy	yes	15.3, Annex F.9
2.3.4.1	Electricity emission intensity values at bidding zone level	yes	Annex F.3
2.3.4.3	Guidance for feedstocks without disaggregated default values	yes	9.2.7, Annex F.5
2.3.4.4	Lists of conservative default emission factors	yes	Annex F
2.3.4.5	Conservative default transport factors	yes	Annex F.6
2.3.5	Conservative capital emission factors in place of assessment	not exercised	9.8
2.3.6	More detailed instructions on the calculation of uncertainty	yes	13
4.1.6.1	Best practice or soil health monitoring guidance	yes	18.6.3
4.4	Reduced testing regime on a risk basis	not exercised	19.1.1

A.4 Requirements exceeding the Delegated Regulation

Each provision in this table imposes a requirement, a restriction, or a conservatism beyond what the Delegated Regulation requires. None reduces a requirement.

Subject	This Standard	Where
Production monitoring	Continuous monitoring of production, including the mass of biochar produced, so that carbon input and output are reconciled	5.1.3
Dry matter	Determined on site at the formation of each transport unit, not once per batch in the laboratory	7.1, 10.5
Organic carbon	Laboratory value corrected to the transport unit by an on-site series	7.2, 10.4
Land record	Every application recorded as a geometry, and cumulative loading computed point-wise	1.5.2, 20.5
Permanence method	Random reflectance obligatory; the decay function route is not offered	Scope, 12.1.1
Audit coverage	Every application and incorporation record verified, not a sample	21.4.7
Contaminant testing	Every production batch tested; no reduced regime	19.1.1
Contaminant limits	The full limits of 19.3 applied to all Track A soil application, not only to agricultural and forest soils	19.3.5
Methane emission factor	Set at the mean of the measurement series plus one standard deviation	9.5.6

Methane re-measurement	A further measurement required in the second certification period before the five-year interval begins	9.5.9
Biomass storage methane	Loss factor differentiated by feedstock; 0.0025 for non-woody material against the single value of 0.0013	9.3.5
Biomass storage exemption	Residual moisture threshold of 20% against 30%	9.3.2(c)
Feedstock	Positive list, narrower than CMC 14 for several materials	Annex B
Non-certified biochar	Mixing with non-certified biochar not permitted at any point, including at application	17.3, 20.2.7
Track A feedstock	No non-biogenic input stream; physically separated production lines	1.7.3, 1.7.5
Application method	Incorporation into the soil profile or covering required; surface application not eligible	1.6.1, 1.6.2
Empty journeys	Empty outbound legs accounted as well as empty return legs	14.4.1
Handling emissions	Processing, intermixing, repackaging, and storage between the gate and the point of use accounted	14.5
Emission deduction	Every emission deducted in carbon from removal generated by the same activity	8.4

A.5 Departures from the Delegated Regulation

Subject	Delegated Regulation	This Standard	Where	Article 16
Reactive carbon fraction	Permanence fraction is $(1 - F_{reactive}) \times FRo > 2\%$, with $F_{reactive}$ by thermochemical analysis	Reactive carbon identified by the reflectance threshold; no thermochemical determination	12.1.15, 12.2.2	yes
Distribution processing	Fraction above the benchmark determined by kernel density estimation and Simpson integration	Determined by direct point counting	12.1.16	yes
Permanence uncertainty	Sampling term of equation [62], derived from the scatter in mean reflectance	Validity gate on mean reflectance and relative standard deviation; the fixed conservatism factor of 2.5% is retained	12.1.20, 12.2.2	yes
Conservatism factor	Determined for each certification period	Determined at the certification audit for the activity period, revised only on a change of method	13.4.3	no
Period of production emissions	Removals and associated emissions recorded in the period of application	Production emissions recorded in the period in which the batch closes; removals and post-gate emissions in the period of application	2.3, 2.4, 8.4	yes
Timing of issuance	Units issued at re-certification for the period audited	Removal issued on approval of the register entry of the application; the CRCF representation attaches on issuance of the certificate of compliance for the period	20.3, 21.1	yes

Small consignments	Application location recorded for every application	For consignments below one tonne dry matter, a declaration of the region of sale	5.6	no

Each departure is stated in the chapter concerned, with the reason. Where the entry in the final column reads yes, CSI will submit the treatment in the review under Article 16 of Regulation (EU) 2024/3012.

ANNEX B - Feedstock positive list

B.1 Application

B.1.1 Only feedstocks listed in Table B.1 may be used. A feedstock not listed is not eligible.

B.1.2 Determining eligibility. A feedstock is eligible for a production batch where all of the following hold:

(a) it appears in Table B.1;
(b) its entry is marked eligible for the intended route under 1.3 and 1.4;
(c) where its class is P, Falloc for the batch is below 0.5 under B.2.5;
(d) where Falloc for the batch is 0.5 or above, its class is W, AR, or FR under B.2.4;
(e) no exclusion in B.4 applies to it.

Where the production facility generates energy taken into account under RED, 9.2.15 applies in addition and is not a condition of feedstock eligibility.

B.1.3 Eligibility is stated for three routes:

Soil covers Track A applications under 1.4.1(i), (ii), and (iii), and under 1.4.2.

Feed covers Track A use as a feed additive with recovery in manure, under 1.4.1(iv).

Material covers Track B incorporation in cement, concrete, or asphalt, under 1.4.4.

B.1.4 A feedstock eligible for the Soil route is also eligible for the Material route. A feedstock eligible for the Feed route is also eligible for the Soil and Material routes.

B.1.5 Where a production batch is intended for more than one route, the most restrictive route governs the whole batch.

B.1.6 Where a production batch is produced from a mixture of feedstocks, every component of the mixture must be eligible for the intended route. The least eligible component governs the batch. Each component is recorded in the batch registration under 6.2.2 by its Table B.1 entry and by proportion.

B.1.7 Each entry in Table B.1 carries a feedstock class. The class determines the composition of the biomass emission factor under 9.2.3 and the sustainability criteria to be verified under 9.2.8. Classes W, AR, and FR are wastes or residues for the purposes of 1.7.2 and B.2.4. Class P is not.

B.1.8 Where a mixture contains components of more than one class, the emission factor is composed for each component separately under 9.2.3, and the sustainability criteria of 9.2.8 are verified for each class present.

B.2 Conditions attaching to the routes

B.2.1 Soil route. For every production batch intended for the Soil route:

(a) the input material must fall within the permissible input materials of CMC 14;

(b) the molar H/Corg ratio must be less than 0.7;

(c) the chlorine content must not exceed 30 g/kg dry matter;

(d) the pyrolysis or gasification material must be registered under Regulation (EC) No 1907/2006 with a chemical safety report covering use as a fertilizing product, unless exempt under Annex IV or points 6 to 9 of Annex V to that Regulation;

(e) the requirements of 1.7.3 to 1.7.5 on non-biogenic input streams and the separation of production lines must be met;

(f) the biochar must hold a valid EBC certificate of a class permitting the intended soil use;

(g) the limits of 19.3 apply.

B.2.2 Feed route. In addition to B.2.1: the feedstock must consist exclusively of pure plant biomass; it must be listed in the Feed Materials Catalogue; the Feed Hygiene Regulation must be met; the molar H/Corg ratio must not exceed 0.4; the biochar must hold a valid EBC-FeedPlus certificate; the limits of 19.5 apply; and the declaration under 19.5.4 must be recorded.

B.2.3 Material route. The biochar must hold a valid EBC-Material certificate; the limits of 19.6 apply; and where a non-biogenic input stream is used the operator must declare it and, where non-biogenic carbon may exceed 2% of total feedstock carbon, determine the biogenic fraction by 14C analysis under 10.5.4.

B.2.4 Waste and residue condition. Where F_{alloc} under 9.1.10 is 0.5 or greater, the batch may be produced only from feedstocks of class W, AR, or FR.

B.2.5 Energy condition. Feedstocks of class P are neither waste nor residue and may be used only where F_{alloc} under 9.1.10 is below 0.5. That requires the use of heat or electricity outside the activity within the meaning of 9.1.5. Energy consumed by the activity itself, including heat used for biomass drying, does not satisfy this condition.

B.2.6 Where stems are used under entry 1 on the ground of natural disturbance, the operator must hold evidence of the disturbance and of the designation of the harvest as salvage. Evidence means a felling authorisation, phytosanitary order, forest authority record, or equivalent official document identifying the affected stand and the cause. A declaration by the supplier is not sufficient.

B.3 Table B.1 - Positive list

#	Feedstock	Class	Soil	Feed	Material
Woody biomass					
1	Forestry residues and salvage wood: tops, branches, thinnings, bark, and stems harvested in consequence of storm, fire, drought, pest, or disease, or removed for wildfire prevention or phytosanitary control, from sustainable forest management	FR	●	●	●
2	Wood from agroforestry, field margins, and the removal of orchards and vineyards	AR	●	●	●
3	Wood from landscape conservation and urban tree care	W	●	●	●
4	Sawmill and wood-processing by-products: sawdust, shavings, chips, offcuts, slabwood, bark	W	●	●	●

5	Untreated wood residues from manufacture of solid wood products, free of adhesives, coatings, and preservatives	W	●	●	●
6	Short-rotation coppice and woody energy crops	P	●	●	●
7	Post-consumer recovered wood, untreated grades only	W	-	-	●
Agricultural plant biomass					
8	Straw, stover, husks, cobs, chaff, and comparable field residues	AR	●	●	●
9	Pruning and cutting residues from permanent crops	AR	●	●	●
10	Nut and seed shells, fruit stones, kernels, arising at processing	W	●	●	●
11	Herbaceous energy crops, including miscanthus and switchgrass	P	●	●	●
12	Plant residues from seed cleaning, drying, and grading	W	●	●	●
Food and beverage processing residues					
13	Vegetable waste from the food processing industry: pomace, marc, peelings, spent grains, spent coffee grounds, cocoa shells, not chemically modified	W	●	●	●
14	Olive pomace, two-phase or three-phase, not solvent-extracted	W	●	●	●
15	Distillers' grains and comparable fermentation residues from plant feedstock	W	●	●	●
16	Processing residues from bioethanol and biodiesel production derived from feedstocks 1 to 15	W	●	-	●
17	Solvent-extracted plant residues, including exhausted olive pomace	W	-	-	●
Fibrous residues					
18	Fibrous vegetable waste from virgin pulp production and from paper production from virgin pulp, not chemically modified	W	●	-	●
19	Paper and fibre sludge from recycled paper production	W	-	-	●
Separately collected bio-waste					
20	Green and garden waste from separate collection at source	W	●	-	●
21	Digestate and compost of feedstocks eligible for the intended route	W	●	-	●
22	Source-separated food and kitchen bio-waste	W	-	-	●
Other					
23	Manure, poultry litter, and agricultural digestate containing animal by-products	W	-	-	●

24	Sewage sludge, biosolids, industrial sludge, dredging sludge, and their digestates	W	-	-	●
25	Other animal by-products and derived products within the scope of the ABP Regulation	W	-	-	●
26	Non-biogenic input streams, declared	n/a	-	-	●

● eligible - not eligible

Classes. FR forestry residues arising directly in forestry. **AR** agricultural residues arising directly in agriculture. **W** wastes, and residues other than agricultural, aquaculture, fisheries, and forestry residues. **P** purpose-grown biomass. **n/a** not biomass; no biomass emission factor applies.

Feed route eligibility is in every case subject to the feedstock being listed in the Feed Materials Catalogue under B.2.2.

B.4 Excluded in all cases

(a) stemwood, other than:

(i) stems from thinning, being the selective removal of trees from a stand to favour the growth of those remaining;
(ii) stems from salvage harvesting under entry 1 of Table B.1;
(iii) stems from landscape conservation and urban tree care under entry 3 of Table B.1;
(iv) stems of short-rotation coppice and woody energy crops under entries 6 and 11 of Table B.1.
For this purpose stemwood means the bole of the tree, excluding crown material, branches, bark, stump, and roots.

(b) mixed municipal waste and any material originating from it;

(b) wood that has been treated, impregnated, painted, coated, or bonded, and demolition wood of unverified origin;

(c) food and feed crops, and biofuels, bioliquids, or biomass fuels produced from them;

(d) feedstock identified as high indirect land-use change risk under RED;

(e) any material intentionally modified or contaminated in order to fall within the definition of waste.

B.5 Basis of the list

CMC 14 admits, as its principal input class, living or dead organisms or parts thereof processed only by physical means, and excludes from that class three things by name: materials originating from mixed municipal waste, sewage and industrial and dredging sludge, and animal by-products within the scope of the ABP Regulation. Section 4.1.5.1(b) of the Delegated Regulation makes compliance with CMC 14, expressly including its input material limitations, a condition of applying biochar to agricultural, forest, or urban soils. The exclusion therefore transfers directly, and manure, which is Category 2 material, falls within it.

Incorporation in cement, concrete, or asphalt is governed by Section 4.4.3, which does not invoke the FPR. The CMC 14 input restrictions have no application there, and sludge-derived

and manure-derived biochars are eligible for the Material route subject to EBC-Material certification and the limits of 19.6.

The Soil route covers the anaerobic digestion additive route under 1.4.1(iii). The biochar is a feedstock of the digester and reaches soil in the digestate, so the conditions of B.2.1 apply to it as they apply to biochar applied directly. Entry 21 concerns digestate used as a pyrolysis feedstock and is a separate matter.

The class assigned to each entry follows the definitions in Article 2 of RED, as transposed in 9.2.3. Residues arising in the field or the forest are AR or FR; residues arising at a processing installation are W, whatever their biological origin. The distinction has no effect on the emission factor, since classes W, AR, and FR all carry zero emissions to the point of collection, but it determines which criteria of Article 29 RED II must be verified under 9.2.8. Class W attracts none of them, class AR attracts Article 29(2) to (5), class FR attracts Article 29(3) to (7), and class P attracts all of them.

Entry 1 includes stems harvested in consequence of natural disturbance. Article 2(43) RED II defines a residue as a substance that is not the end product a production process directly seeks to produce, that is not a primary aim of the process, and that the process has not been modified to produce. Silviculture seeks to produce mature merchantable timber. A storm, fire, drought, or pest outbreak is not a production process and produces nothing the process aimed at; the salvage harvest is a response to the loss of the intended product, not the pursuit of it. Wood arising in this way is therefore treated under this Standard as a forestry residue, and is available in both the biochar-dominant and the energy-dominant configuration.

The same reading is implicit in the treatment of natural disturbance elsewhere in Union law, where biomass from wildfire prevention, phytosanitary control, and natural disturbance is distinguished from ordinary primary woody biomass. Clause B.2.6 requires official evidence of the disturbance, so that the entry cannot be used to bring ordinary roundwood into the residue classes.

The Soil route under this Standard is narrower on feedstock than the Global Biochar C-Sink Standard. Biosolids, municipal waste and its digestate, manure, and post-consumer wood lose the Soil route here while remaining available under that Standard.

ANNEX C - Activity plan , monitoring plan, and monitoring report templates

C.1 Status and use

C.1.1 The activity plan under 3.1 and the monitoring plan under 4.1.1 are submitted using the templates in this Annex. The monitoring report under 4.2.1 is submitted using the template in C.4.

C.1.2 The three templates operate on one dataset. An item declared in the activity plan is not re-entered in the monitoring plan, and a parameter declared in the monitoring plan is not re-entered in the monitoring report. The CS-BCR-App implements this. Where the templates are used outside the App, the operator states for each item whether it is new, unchanged, or amended since the preceding submission.

C.1.3 Items marked **C** in the Configuration column of Table C.1 determine which parameters of Annex D apply to the activity. They must be completed before the monitoring plan can be assessed for completeness.

C.1.4 Where an item does not apply to the activity, the operator states that it does not apply and why. An item left blank is not a statement that it does not apply and renders the submission incomplete.

C.1.5 Evidence named in the Evidence column is attached to the submission. Where evidence is held in the dMRV system or the Registry, a reference to it is sufficient.

C.2 Activity plan

Table C.1 - Activity plan

Item	Clause	Required content	Evidence	C
1 Activity and operator	3.2(a), 1.1	Legal entity of the operator; registered address; contact for the certification body	Company registration	C
2 Production facilities	3.2(a), 1.1.1, 9.1.2	For each facility: location; production units; pyrolysis technology and reactor type; nominal annual biochar capacity; date first came into operation; date of any expansion or refit	Site plan; technology documentation	C
3 Location in the Union	1.1.4	Confirmation that every production facility and every place of storage is located in the Union	Addresses	
4 Process description	3.2(a), 1.2	Target process temperature; solid residence time; oxygen management technique; point and method of temperature measurement; means by which methane is captured or destroyed; use made of co-produced heat	Process flow diagram; pyrolysis system certificate under 1.2.2	C
5 Mobile facilities	1.2.7	Where heat is not utilised, the grounds on which utilisation is impractical	Statement of grounds	C
6 Value chain	3.2(b)	Every entity in the chain with its role: dMRV provider, processor, trader, applier, laboratory, anaerobic digestion plant, livestock holding. For each, the arrangements under 7.4.3 by which the operator obtains the data it is obliged to record	Contracts or data agreements	

7 Carbon Owner	1.1.6, 1.1.7	Whether the Operator is also the Carbon Owner; where not, the identity of the Carbon Owner and the arrangements by which the obligations from the factory gate are carried	Agreement	C
8 Legal compliance	3.2(c)	The local, regional, and national requirements applicable to the facilities and to the applications, and demonstration of compliance	Permits; authorisations	
9 Tracks and routes	3.2(k), 1.3, 1.4	The tracks the activity will use, and for Track A the application routes under 1.4.1 and 1.4.2		C
10 Application method	3.2(k), 1.6	The method or methods of incorporation or covering to be used, and confirmation that appliers have been informed of 1.6	Applier information material	C
11 Feedstocks	3.2(l), 1.7, Annex B	Each feedstock by Table B.1 entry, with its class, and the expected proportions of any mix	Supply agreements; feedstock declarations	C
12 Waste and residue condition	1.7.2, B.2.4	Expected Falloc under 9.1.10, and where it is 0.5 or greater, confirmation that all feedstocks are of class W, AR, or FR	Energy balance	C
13 Allocation	9.1	Expected Falloc; the co-products of the process and the basis on which each is a co-product under 9.1.5; the metering under 9.1.7 where energy serves both the activity and a use outside it	Energy balance; metering schematic	C
14 Sources and sinks	3.2(d), 8.1	The sources of Table 8.1 applicable to the activity, and any further material source identified under 8.1.2		
15 Expected quantification	3.2(e)	Expected total carbon removals and associated GHG emissions over the activity period, in accordance with points (k), (l), and (m) of Annex II to the CRCF Regulation	Calculation	
16 Capital emissions	9.8	The materiality assessment under 9.8.4 to 9.8.6, with the high-end estimate in tonnes CO2e and as a percentage of expected gross carbon removals	Assessment	C
17 Input emissions	9.10.4, 9.10.5	Whether the grouping term is used, and the basis on which inputs are grouped	High-end estimate	C
18 Uncertainty	3.2(g), 13.5.1	The five measurements of 13.2.1; for each, the Annex F.11 default or a substituted value with its basis; the resulting U_total and FC for the activity period	Calibration and repeatability data where a value is substituted	C
19 Laboratories	3.2(j), 12.1.23	The CS-endorsed laboratories for the reference analysis under 6.3, the reflectance assessment under 12.1, and the contaminant analyses under Chapter 19	Endorsement references	C
20 Sustainability	3.2(h), Chapter 18	The demonstrations required by 18.2 to 18.6, and the biomass sustainability evidence under 18.7 and 9.2.13	Voluntary scheme certificates; assessments	
21 Soil and cropping context	18.6.2, 18.6.3	For Track A, the demonstration for each soil and cropping context in which biochar will be applied	Assessment	

22 Contaminant compliance	Chapter 19	The limits applicable to the declared tracks and routes		
23 Public financing	3.2(i), 8.2.3	Every form of public financing received or applied for in respect of the activity, including pending applications	Award letters; applications	
24 Reserve	8.4	The intended length of the initial certification period; the intended size of the production emission reserve and its basis	Production plan	C
25 Activity period	2.1	The start date and the intended length of the activity period, not exceeding five years		C
26 Further information	3.2(m)	Anything further required by the certification body		

C.2.1 A change to any item during the activity period is submitted under 3.3, with the rationale, any recalculation of expected emissions and removals, and any consequence for Chapters 18 and 19.

C.2.2 A change to an item marked C may alter the parameters of Annex D applicable to the activity. Where it does, the monitoring plan is amended in the same submission.

C.3 Monitoring plan

Table C.2 - Monitoring plan

Item	Clause	Required content
1 Activity monitored	4.1.4(a)	Description of what is monitored, by reference to the facilities and production units of Table C.1 item 2
2 Responsibilities	4.1.4(b)	For each monitoring task, the responsible role and person; the arrangement by which competence is maintained and evidenced
3 Parameter register	4.1.5, Annex D	For each applicable parameter of Annex D: responsible entity; data source; equipment; measurement method; accuracy and calibration; monitoring frequency; quality assurance and quality check procedure
4 Default values	4.1.4(c)	Every Annex F default used, with its table and version, and the source from which the value will be retrieved on revision
5 Laboratories	4.1.4(d)	Each laboratory, its endorsement, the analyses it performs, and the arrangement for direct transmission of results under 6.3.8
6 Comparability	12.1.24	Where more than one laboratory performs reflectance assessment, the demonstration of comparability
7 Measurement methods	4.1.4(e)	Every measurement method with its written procedure, including the on-site determinations under Annexes G and H
8 Analysis frequency	4.1.4(f)	The frequencies applied, and confirmation that they meet Annex VII MRR where applicable and 19.1.3 where applicable
9 Quality assurance	4.1.4(g), 4.1.6	The quality assurance arrangement under Article 60 MRR; the calibration regime under Article 42 MRR; the aggregation rules under Article 44 MRR
10 Record keeping	4.1.4(h), 5.7.5	The record keeping arrangement consistent with Article 67(1) MRR, and the retention period

11 Sampling protocol	4.1.4(i), 6.3, 6.4	The protocol for the reference analysis sample and for the retention samples; the number of reflectance samples per batch and how they are drawn over the production of the batch
12 dMRV system	4.1.4(j), Chapter 5	The system used; its endorsement; the operator's interface to it; the transmission arrangement under 5.7.2; the connection to the Registry under 5.1.4
13 Methane	4.1.4(k), 9.5	The quantification method; whether direct or inferred from total hydrocarbons under EN 12619; the measurement schedule; the declared end of commissioning under 9.5.3
14 Dry matter	10.5, Annex G	The determination method and frequency; where the weekly frequency of 10.5.3 is claimed, the demonstration supporting it
15 Organic carbon and ash	10.4, Annex H	The on-site determination method and frequency; the correlation to the laboratory determination; the correction rule applied
16 Transport	14.2.1	For each mode and leg type, whether the fuel-based or the distance-based method applies, and the source of the data
17 Application energy	15.3	Whether an Annex F.9 default is used for each operation, or the energy is measured, and on what basis
18 Non-final elements	4.1.7	Any element that cannot be fully detailed at submission, with the intended resolution and the date by which it will be finalised

C.3.1 The parameter register under item 3 is the operative part of the monitoring plan. Annex D states which parameters apply to which activity configurations, and the applicable set is derived from the items marked C in Table C.1.

C.4 Monitoring report

Table C.3 - Monitoring report

Item	Clause	Required content
1 Period	4.2.1	The certification period reported, and its boundaries
2 Parameters	4.2.5(a)	Every applicable parameter of Annex D, measured or calculated over the period
3 Production	Chapter 6	Each production batch of the period: identifier, feedstock and proportions, mass produced, date of opening and of closure, limb of 6.6.1 under which it closed
4 Batch properties	11.2, 12, 19	For each batch: Corg, inorganic carbon, ash, H/Corg, FRo>2,s and $\bar{R}o,s$ per sample, RSD, limb of 12.1.20 under which validated, Fperm, Cperm, and the contaminant results
5 Transport units	Chapter 7	Units registered, applied or incorporated, divided, pooled, and withdrawn during the period, with dry masses
6 Applications	5.3, 5.4, 20.5	Every application and incorporation record closed in the period, with location geometry, area, mass, method, and cumulative loading returned by the land register
7 Production emissions	Chapter 9	Each term of GHGfacility and GHGinputs; Falloc; GHGproduction per batch and its emission intensity
8 Reserve	8.4, 20.4.1(a)	The reserve at the start and end of the period; every cancellation performed; any correction under 8.5

9 Transport emissions	Chapter 14	GHGtransport for the period, by mode and method; empty legs accounted; handling emissions under 14.5
10 Application emissions	Chapter 15	GHGuse for the period; defaults used; F_S per site
11 Removals	Chapter 10	CRtotal for the period, and CR_TU per transport unit
12 Uncertainty	4.2.5(f), 13.5.2	The five values applied, U_total, and FC
13 Net benefit	Chapter 16	GHGassociated by stage; the net carbon removal benefit; removals issued during the period; the reconciliation under 16.4
14 Feedstock consumed	4.2.5(b), 18.7.2	The feedstock or feedstock mix consumed, disaggregated to the level required under 18.7.2
15 Financing	4.2.5(d)	Financing received or applied for during the period
16 Compensation	4.2.5(c), 18.9	Carbon farming sequestration units purchased, which may be zero
17 Laboratory results	4.2.5(e)	The results of every analysis under Chapters 6, 12, and 19
18 Deviations	4.2.3, 21.4.8	Any change to the monitoring plan during the period and the values it affects; whether operating conditions deviated significantly from those declared at the certification audit
19 Non-conformities	21.5	Any non-conformity identified during the period and its resolution
20 Corrections	21.3	Any forward correction made during the period, with quantity and cause

C.4.1 Emissions of greenhouse gases other than CO_2 are reported in mass by gas and converted to tonnes of CO_2e under 4.2.6.

ANNEX D - Parameter register

D.1 Status and function

D.1.1 This Annex lists the parameters of the quantification, states where each is defined, when each applies, and how each is treated in the uncertainty assessment under Chapter 13. Clause 4.2.5(a) requires every applicable parameter of this Annex to be reported in the monitoring report.

D.1.2 This Annex does not restate the definition, the unit, or the monitoring frequency of a parameter. Each is stated in the defining clause and governs.

D.1.3 This Annex demonstrates that the parameters required by Tables 7, 8, and 10 of the Delegated Regulation are determined under this Standard. Where this Standard names a parameter differently, the correspondence is stated. Where a parameter of those Tables is not determined, D.5 states why.

D.1.4 This Annex is the data model of the CS-BCR-App. The applicability conditions in the Applies column are resolved by the App from the activity configuration declared under Table C.1.

D.2 Notation

Source. M monitored under Chapter 5; L determined by an endorsed laboratory; O determined on site under Annex G or H; C calculated; D Annex F default.

Uncertainty. U one of the five measurements of 13.2.1, entering U_total under 13.3.2; **0** exact or carrying no uncertainty; **F** an Annex F default, carrying no uncertainty under F.1.2; **n** an emission quantity, outside the uncertainty combination under 13.1.2.

Applies. *all* means every activity. Other entries state the condition.

D.3 Parameters

D.3.1 Batch level

Parameter	DR name	DR table	Clause	Source	Applies	U
Batch identifier	—	—	6.2.1	M	all	0
Feedstock entries and proportions	—	—	6.2.2, B.1.5	M	all	0
Mass produced, dry	—	—	6.7	M	all	0
Corg	Corg	10	10.4.1	L	all	**U**
Inorganic carbon	—	—	10.4.2	L	all	0
Ash, laboratory	—	—	10.4.3	L	all	**U**
H/Corg	H/Corg	10	11.2.1(c)	L	all	0
Ebiochar	Ebiochar	7	9.1.9	L	Falloc calculated	0
FRo>2,s per sample	FRo>2%	10	12.1.16	L	all	0
R̄o,s per sample	—	—	12.1.17	L	all	0
RSD across samples	—	—	12.1.19	C	all	0

Validation limb	—	—	12.1.20	C	all	0
Fperm	Fperm	10	12.2.2	C	all	0
Cperm	—	—	12.2.5	C	all	0
Contaminant results	—	—	19.1	L	per route	0

D.3.2 Transport unit level

Parameter	DR name	DR table	Clause	Source	Applies	U
TU identifier	—	—	7.3.2	M	all	0
Parent batch and mass fractions	—	—	10.2.2	M	pooled TUs	0
Fresh mass	—	—	10.5.1	M	all	**U**
Dry matter content	—	—	10.5.2, Annex G	O	all	**U**
Dry mass m_TU	Qbiochar	10	10.5.1	C	all	0
Ash on site a_TU	—	—	10.4.3, Annex H	O	all	**U**
Ash correction k_TU	—	—	10.4.4	C	all	0
Pperm,TU	—	—	10.2.3	C	all	0
CR_TU	—	—	10.3.1	C	all	0
14C biogenic fraction	—	—	10.5.4	L	non-biogenic carbon may exceed 2%	0

D.3.3 Production emissions

Parameter	DR name	DR table	Clause	Source	Applies	U
Eco-products	Eco-products	7	9.1.9	L, M	co-products exist	0
Falloc	Falloc	7	9.1.3	C	all	0
GHGproduction	GHGbiochar	7	9.1.1	C	Falloc > 0	n
GHGfacility	GHGfacility	7	9.1.1	C	Falloc > 0	n
Qbiomass	Qbiomass	7	9.2.1	M	Falloc > 0	n
EFbiomass	EFbiomass	7	9.2.3	D, C	Falloc > 0	F
GHGbio	GHGbio	7	9.2.1	C	Falloc > 0	n
Qfeedstock stored	Qfeedstock	7	9.3.3	M	no 9.3.2 exemption	n
Cfeedstock	Cfeedstock	7	9.3.3	L	no 9.3.2 exemption	n
Tstorage	Tstorage	7	9.3.3	M	no 9.3.2 exemption	n
k, monthly loss	0.0013	7	9.3.5	D	no 9.3.2 exemption	F

GHGbio-storage	GHGbio-storage	7	9.3.3	C	Falloc > 0	n
Qfuel, facility	Qfuel	7	9.4.1	M	Falloc > 0	n
EFfuel	EFfuel	7	9.4.3, F.4	D	Falloc > 0	F
CO2 stored, fossil	CO2stored,fossil	7	9.4.5	M	fossil CO2 captured	n
GHGcombustion	GHGcombustion	7	9.4.1	C	Falloc > 0	n
EFCH4 of the production unit	—	—	9.5.6	M	all	n
CH4release	CH4release	7	9.5.12	C	Falloc > 0	n
Qelec, facility	Qelec	7	9.6.1	M	Falloc > 0	n
EFelec	EFelec	7	9.6.5, F.3	D	Falloc > 0	F
GHGelec	GHGelec	7	9.6.1	C	Falloc > 0	n
Qheat, facility	Qheat	7	9.7.1	M	heat imported	n
EFheat	EFheat	7	9.7.5	D	heat imported	F
GHGheat	GHGheat	7	9.7.1	C	Falloc > 0	n
Capital materiality estimate	—	—	9.8.5	C	facility within 9.8.2	n
Qmaterials	Qmaterials	7	9.8.8	M	capital emissions material	n
EFmaterials	EFmaterials	7	9.8.8, F.8	D	capital emissions material	F
GHGmaterials	GHGmaterials	7	9.8.8	C	capital emissions material	n
GHGcapital	GHGcapital	7	9.8.8	C	capital emissions material	n
GHGdisposal	GHGdisposal	7	9.9.1	M, D	Falloc > 0	n
Qinput	Qinput	7	9.10.1	M	grouping not elected	n
EFinput	EFinput	7	9.10.3, F.8	D	grouping not elected	F
GHGinputs	GHGinputs	7	9.10.1	C	Falloc > 0	n

D.3.4 Transport and handling

Parameter	DR name	DR table	Clause	Source	Applies	U
Qfuel per leg	Qfuel	8	14.3.1	M	fuel-based method	n
EFfuel	EFfuel	8	9.4.3, F.4	D	fuel-based method	F
Distance K per leg	KL	8	14.3.2	M	distance-based method	n
EFvehicle, loaded	EFvehicle,loaded	8	F.6	D	distance-based method	F
EFvehicle, unloaded	EFvehicle,unloaded	8	F.6, 14.4.3	D	empty leg accounted	F

Payload apportionment	—	—	14.3.5	M	elected	0
Qfuel, Qelec, Qheat, handling	—	—	14.5.1	M	handling occurs	n
GHGtransport	GHGtransport	8	14.3, 14.5	C	all	n

D.3.5 Application and incorporation

Parameter	DR name	DR table	Clause	Source	Applies	U
Total mass placed at site	—	—	15.2.2	M	all	0
F_S	FS	10	15.2.2	C	all	0
Qfuel, application	Qfuel	10	15.2.1	M, D	default not used	n
Qelec, application	Qelec	10	15.2.1	M, D	default not used	n
Qheat, application	Qheat	10	15.2.1	M, D	default not used	n
Application energy default	—	—	15.3, F.9	D	default used	F
GHGsite	GHGbiochar site,S	10	15.2.1	C	all	n
GHGuse	GHGuse	10	15.2.2	C	all	n
Application geometry and area	—	—	20.5.3	M	Track A	0
Cumulative loading	—	—	20.5.5	C	Track A	0

D.3.6 Period and activity level

Parameter	DR name	DR table	Clause	Source	Applies	U
U_weigh	—	—	13.2.1, F.11	D	all	**U**
U_DM	—	—	13.2.1, F.11	D	all	**U**
U_Corg	—	—	13.2.1, F.11	D	all	**U**
U_ash,lab	—	—	13.2.1, F.11	D	all	**U**
U_ash,site	—	—	13.2.1, F.11	D	all	**U**
U_total	—	—	13.3.2	C	all	0
FC	FC	—	13.4.1	C	all	0
CRtotal	CRtotal	—	10.3.2	C	all	0
GHGassociated	GHGassociated	—	16.2.1	C	all	n
Net carbon removal benefit	—	—	16.1.1	C	all	0
Reserve balance and cancellations	—	—	8.4, 20.4.1(a)	C	all	0
Public financing	—	—	8.2.3, 4.2.5(d)	M	all	0
Carbon farming units purchased	—	—	18.9	M	all	0

D.4 Parameters of the Delegated Regulation not determined under this Standard

Table D.1

Parameter	DR provision	Reason	Where stated
Freactive	2.2.7.1.1(a), eq [60]	Reactive carbon is identified by the reflectance threshold, and no thermochemical determination is made. Freactive does not appear in Table 10	12.1.15, A.5
Bandwidth h, fitted density, integration by Simpson's rule	eq [58], [59]	The fraction above the benchmark is determined by direct point counting	12.1.16, A.5
Uncertainty of Fperm	eq [62]	Replaced by the validity gate of 12.1.20; the fixed conservatism factor is retained in 12.2.2	12.1.22, A.5
m, c, temperature	2.2.7.1.2, eq [63], Table 9	The decay function route is not offered	Scope, 12.1.1
Qbiomass under 2.3.3	2.3.3, eq [70] to [72]	Additional biomass consumption is a capture-process construct with no application to BCR	A.2 note 1
Every DACCS and BioCCS parameter	Tables 2 to 5	Not applicable to a BCR activity	A.2 note 2

D.4.1 Table 8 of the Delegated Regulation states EFvehicle,unloaded in gCO2e/km and EFvehicle,loaded in tCO2e/km. Annex F.6 states both in tCO2e/km. The difference is one of unit only.

D.5 Uncertainty

D.5.1 Five parameters carry uncertainty, marked **U** in D.3. They are the five measurements of 13.2.1 and they combine under 13.3.2. No other parameter contributes to U_{total}.

D.5.2 A parameter marked **n** is an emission quantity. Emissions are not reduced by the conservatism factor and do not carry an uncertainty term, under 13.1.2. Conservatism on the emission side is achieved by the value of each quantity, not by a factor.

D.5.3 A parameter marked **F** is an Annex F default and carries no uncertainty under F.1.2. An operator determining such a parameter directly instead carries its uncertainty under F.1.5, and states it in the monitoring plan.

D.5.4 A parameter marked **0** is exact, is a stoichiometric or definitional constant, or is derived wholly from parameters already carrying their uncertainty. It contributes nothing further.

ANNEX E - Discretions, additional requirements, and departures

E.1 Status and categories

E.1.1 This Annex records every point at which this Standard exercises a choice in relation to the Delegated Regulation. Annex A maps the requirements of the Delegated Regulation to the chapters of this Standard. This Annex states how the discretions within those requirements have been used.

E.1.2 Entries fall into four categories, which are distinct in kind and should not be read as one list.

> **Discretions** are choices the Delegated Regulation expressly confers on a certification scheme. Exercising one is compliance, not deviation. E.2 records them.
>
> **Additional requirements** impose more than the Delegated Regulation requires. Every one of them narrows what may be certified, raises what must be measured, or increases a conservatism. None reduces a requirement. E.3 records them without argument, because none is needed.
>
> **Constructions** account for something the Delegated Regulation does not address. They add rather than substitute. E.4 records them with the reason the silence had to be filled.
>
> **Departures** apply a method or a timing other than the one prescribed. E.5 records them, each with the provision departed from, what is applied instead, the effect on the quantification, and whether the treatment will be submitted in the review under Article 16 of Regulation (EU) 2024/3012.

E.1.3 Each entry is stated in full in the chapter concerned. This Annex collects them; it does not replace them, and where this Annex and a chapter differ, the chapter governs.

E.2 Discretions

E.2.1 The discretions conferred by the Delegated Regulation and their exercise are listed in Table A.3. Three warrant explanation.

E.2.2 Capital emission defaults, Section 2.3.5, not exercised. The Delegated Regulation permits a scheme to publish conservative capital emission factors in place of the activity-specific materiality assessment. A default under that provision must be documented as exceeding actual capital emissions in at least 95% of cases, which requires material inventories for representative installations across the capacity range and a published derivation. Capital emissions for a biochar production facility fall between roughly 0.5% and 2.5% of gross removals depending on plant size and utilisation, so a single value conservative enough for the smallest installations would be several times the true figure for the largest, and those operators would perform the calculation instead. The materiality assessment under 9.8 is retained, which the Delegated Regulation makes available without further condition, and which will conclude that capital emissions are immaterial for the great majority of certified installations. CS intends to publish a derivation of capital emissions for pyrolysis facilities separately, and may revisit this discretion when it exists.

E.2.3 Reduced contaminant testing, Section 4.4, not exercised. The Delegated Regulation permits a scheme to justify a reduced testing regime by reference to the properties of the feedstock and

process or to the distribution of historical samples. Every production batch is tested under 19.1.1.

E.2.4 Minimum heat utilisation efficiency, Section 1.1.2.1(c), no threshold set. The Delegated Regulation permits a scheme to set one. Clause 1.2.3 requires co-produced heat to be used for biomass drying or another economically justifiable demand, and 1.2.6 requires the utilisation to be measured and reported. A numerical threshold is not set, because the demonstrable measure of good energy use in a pyrolysis facility is the fate of the process gas rather than a ratio, and the requirement to capture or destroy methane under 1.2.4 addresses that directly.

E.3 Additional requirements

E.3.1 The provisions listed in Table A.4 require more than the Delegated Regulation requires. They are not restated here.

E.3.2 Two are of a different order from the rest and are noted because a reader may take them for departures.

Random reflectance is obligatory and the decay function route is not offered. The Delegated Regulation offers the operator a choice of two methods for the permanence fraction. Removing an operator election is a restriction on the scope of service offered by CSI. The grounds are set out in 12.1.1.

Biochar certified under this Standard may not be mixed with non-certified biochar at any point. Section 3.2 permits mixing at the point of application or incorporation. The reason for declining that option is set out in 17.3.

E.4 Constructions

E.4.1 Emissions of handling between the factory gate and the point of use, Chapter 14.5. Section 2.2.6 addresses transport and Section 2.2.7.2 addresses application and incorporation. Neither addresses the operations in between. A substantial part of certified biochar is granulated, blended into a substrate, or repackaged before it reaches the soil, and those operations consume energy attributable to the activity. They fall within the definition of associated GHG emissions in the Annex, so they are accounted. The construction adds an emission source and does not substitute for a prescribed method.

E.4.2 Empty outbound legs, 14.4.1. Section 2.2.6.1 requires the return journey of a delivering vehicle to be treated as empty unless another transport service is shown. The same journey occurs in reverse where the recipient collects the biochar, which is the ordinary case in agriculture. Accounting one and not the other would make the emission depend on who owns the vehicle. The construction increases accounted emissions.

E.4.3 The anaerobic digestion additive route, 1.4.1(iii) and 5.5. Section 4.4.2 of the Delegated Regulation contemplates biochar reaching soil in digestate after use as an anaerobic digestion additive, and provides that the permanence fraction is unaffected, but Section 1.1.2.2.1 does not list the route among the eligible forms of application. The route is offered, on the ground that Section 4.4.2 could not provide for it if it were not eligible. It is tracked under the same period-level device as the manure pathway, because a digester is a mixing vessel with a residence time of weeks and consignment-level tracking is not available through it.

E.4.4 Consignments below one tonne, 5.6. The Delegated Regulation requires the location of application to be recorded and geographically specific application records to be maintained. It provides nothing for retail-scale sale, where the applier is unknown to the operator and the quantity is a bag. A declaration of the region of sale is recorded instead. This is the one construction that records less than the Delegated Regulation requires on its face, and it is stated as such in 5.6.

E.4.5 Salvage wood treated as a forestry residue, Annex B entry 1. Section 4.3.2 of the Delegated Regulation confines the biochar-dominant configuration to waste and residual feedstock as defined in Article 2, points (23) and (43), of RED. Neither definition addresses wood arising from natural disturbance. This Standard reads such wood as a residue, on the ground set out in B.5, and requires official evidence of the disturbance under B.2.6. The construction resolves a silence rather than substituting for a prescribed method. CSI will raise it in the review under Article 16 of Regulation (EU) 2024/3012.

E.5 Departures

E.5 Preamble

Each entry below states the provision departed from, what this Standard applies instead, the reason, the effect on the quantification, and whether the treatment will be submitted in the review.

Article 16. Article 16(4) of Regulation (EU) 2024/3012 requires the Commission to consult experts designated by the Member States before adopting a delegated act under that Regulation, and recital 3 of the Delegated Regulation provides for it to be reviewed at least every four years in all its aspects, taking account of technological and scientific progress and of experience with its implementation, with knowledge sharing events organised to collect feedback.

Where an entry below reads *to be submitted*, CSI will place the treatment, the reasoning, and the supporting evidence before the Commission Expert Group on Carbon Removals, in the consultation preceding any amending delegated act and in the periodic review. Where it reads *not to be submitted*, the departure has no effect on the quantification and no amendment is sought.

A submission is not a condition of the departure. This Standard applies each treatment from the date it enters into force.

E.5.1 Reactive carbon determined by the reflectance threshold

> **Prescribed.** Section 2.2.7.1.1 determines the permanence fraction as $(1 - \text{Freactive}) \times \text{FRo}{>}2\%$, with Freactive established by thermochemical analysis of part of each sample.
>
> **Applied.** Clause 12.1.15 classifies point measurements at or below 2.0% reflectance as reactive carbon and discards them. The permanence fraction is the fraction of measurements above the benchmark. No thermochemical determination is made.
>
> **Reason.** The Inertinite Benchmarking method of Sanei et al. (2024, 2025) resolves the reflectance distribution into three populations: poorly carbonised material with Ro at or below 1.2%, semi-inertinite between 1.2% and 2.0%, and inertinite above 2.0%. The thermochemical step of that method measures the reactive organic carbon, a chemical

quantity consisting of condensates, semi-liquid tars, and bituminous substances. That quantity is smaller than the optical population below the benchmark, because semi-inertinite is not reactive in the thermochemical sense while it is nevertheless excluded from the inertinite class.

The Delegated Regulation retains the benchmark and not the three classes. Carbon above 2.0% is permanent and carbon below it is not, and there is no intermediate class in which semi-inertinite can be held. A two-step determination under that framework therefore deducts a reactive fraction smaller than the material the benchmark excludes, and leaves an undefined remainder that is neither counted as permanent nor accounted as reactive.

This Standard closes that remainder by treating every point measurement at or below 2.0% as reactive. The deduction is by construction at least as large as the thermochemical deduction, and larger by the semi-inertinite fraction. It is therefore more conservative than the two-step determination in every case, and the permanence fraction it produces cannot exceed the fraction the Delegated Regulation would produce on the same measurements.

Effect. Conservative in every case. The permanence fraction determined under 12.1.15 is lower than, or at most equal to, the fraction the prescribed two-step determination would produce on the same measurements, the difference being the semi-inertinite fraction of the sample.

Article 16. To be submitted.

E.5.2 Direct point counting

Prescribed. Equations [58] and [59] determine the fraction above the benchmark by fitting a Gaussian kernel density estimate with a Silverman bandwidth to the 500 point measurements and integrating above 2.0% by the composite Simpson's 1/3 rule.

Applied. Clause 12.1.16 determines the fraction by direct point counting on the raw measurements.

Reason. Kernel density estimation and numerical integration are laboratory data quality procedures. In the inter-operator comparison of Sanei et al. (2025) the two procedures differed by 3.8% and 1.5% respectively for the inertinite fraction, which is the only class this Standard uses, against up to 30% and 10% for the intermediate class, which it does not. The reproducibility cost of direct counting is confined to the smaller of the two figures.

The residual concern with direct counting is the multimodal reflectance distribution, which arises where a sample contains material carbonised under more than one regime. Kernel density estimation addresses that concern by smoothing, which makes a bimodal sample yield a reproducible number without disclosing that it is bimodal. It treats the symptom. The Global Biochar C-Sink Standard addresses the cause, by computing a heterogeneity score from the reflectance distribution and excluding from its upper persistence class any biochar whose score indicates that the material is a mixture. An index of that kind is the more appropriate control on heterogeneity, and it operates whichever procedure is used to derive the fraction above the benchmark. It is not included in this Standard, which applies the classes and the thresholds of the Delegated

Regulation and not the persistence classification of the Global Biochar C-Sink Standard. The validity gate of 12.1.20 is a partial control: it establishes whether the carbon counted as inertinite sits clear of the classification boundary, and it does not establish whether the sample is a mixture.

Effect. Small in either direction. Larger for multimodal distributions, which are rare for industrial biochars, and the validity gate of 12.1.20 is the control on that case.

Article 16. To be submitted.

E.5.3 Validity gate in place of the sampling term of equation [62]

Prescribed. Equation [62] assigns the permanence fraction an uncertainty of $1.65 \times (\sigma\bar{R}o / \bar{R}o\sqrt{n}) + 2.5\%$, the first term derived from the scatter in mean reflectance between samples, and Section 2.3.6 voids issuance for the certification period where total uncertainty exceeds 20%.

Applied. Clause 12.1.20 validates a batch where the mean reflectance of the retained measurements exceeds 2.4% in every sample, or, failing that, where the relative standard deviation of those means across samples is not more than 20%. A batch that is not validated generates no units. The fixed conservatism factor of 2.5% is retained and applied to the permanence fraction directly, as F_margin of 0.975 under 12.2.2.

Reason. Mean reflectance does not enter the calculation of the permanence fraction, which depends on the fraction of the distribution above the benchmark and, under the Delegated Regulation, on the reactive fraction. Where the fraction above the benchmark is high, it becomes insensitive to the position of the mean, so scatter in the mean carries no information about the precision of the result. The formula therefore returns values that rise with the degree of carbonisation, and penalises most heavily the material whose permanence fraction is most precisely determined. A batch in which every sample returned an identical permanence fraction can exceed the 20% ceiling and void issuance for the whole certification period. The validity gate tests the concern the formula was intended to address, that the classification of carbon as inertinite should be robust, using the measurements that determine it.

Effect. Identical for most batches. They diverge only where a strongly carbonised batch has widely spread sample means: equation [62] would then void issuance for the whole certification period, while 12.1.20 validates the batch.

Article 16. To be submitted. The uncertainty framework of Sanei et al. (2025), which derives the required deduction from the coefficient of variation of the permanent carbon content itself, is proposed as the replacement.

E.5.4 Conservatism factor fixed for the activity period

Prescribed. Section 2.3.6 provides for the conservatism factor to be determined from the uncertainty of the activity, in a framework in which the quantification is stated per certification period.

Applied. Clause 13.4.3 determines the conservatism factor at the certification audit for the activity period, from the measurement methods declared in the monitoring plan, and revises it only where a method changes.

Reason. Under Chapter 13 the total uncertainty combines five measurement uncertainties, each a property of a declared method rather than of anything occurring within a period. Nothing in the combination varies with the period. Determining the factor per period would produce the same figure each time while making the net removal of a transport unit indeterminate until the period closed, which is incompatible with the continuous issuance of Chapter 21.

Effect. None on the value.

Article 16. Not to be submitted.

E.5.5 Production emissions recorded in the period of batch closure

Prescribed. Section 1.2.2.3 records carbon removals and associated emissions in the certification period in which the biochar is applied or incorporated.

Applied. Clauses 2.3 and 2.4 record removals and post-gate emissions in the period of application, and production emissions in the period in which the batch closes.

Reason. Production emissions are not attributed to quantities of biochar as a per-tonne figure under this Standard. They are deducted in carbon, by cancellation from the production emission reserve at the closure of the batch under 8.4. The cancellation is a condition of closure and cannot be deferred, because the removal against which it is made must be free of it before any transport unit of the batch is transferred.

Effect. Every emission is deducted once, from removal generated by the same activity. Over the activity period the total is identical to the total the Delegated Regulation would produce.

Article 16. To be submitted.

E.5.6 Timing of issuance

Prescribed. Section 2.2.5.1 provides for units to be issued at re-certification in relation to production batches applied or incorporated during the certification period.

Applied. Clause 21.1.1 issues the removal on approval by the certification body of the register entry of an application or incorporation, made on the transmitted dMRV data. Clause 20.3.5 reports the removal to the Union registry as a permanent carbon removal unit on the issuance of the certificate of compliance for the certification period in which it arose.

Reason. Every term in the net removal of a transport unit is fixed when its record closes. Production emissions have been deducted from the reserve, post-gate emissions are complete as a condition of closure, the removal is fixed at production, and the conservatism factor is fixed for the activity period. Nothing in the calculation depends on any event later than the closure of the record, and the certification body verifies every record rather than a sample. The timing rule of Section 2.2.5.1 serves the DACCS and BioCCS methodologies, in which the quantification aggregates over a period and genuinely cannot be completed before the period closes. Carried across to biochar carbon removal it defers a determination that is already complete.

Effect. The removal is available from approval rather than up to twelve months later. The annual audit confirms the approvals performed during the period, produces the certificate, and gives rise to any forward correction under 21.3.

Article 16. To be submitted.

ANNEX F - CS default values

Status of the values in this Annex. The values in this Annex are provisional. They are stated so that the structure of the Annex, the units, and the derivation basis of each value can be assessed. Each value carries a source. A value marked indicative has been derived from the stated source class but has not yet been traced to a specific published figure, and will be replaced before this Standard enters into force. A value marked sourced is taken from the publication named. CS reviews this Annex annually under F.1.4, and the version in force at the start of the certification period applies.

F.1 Status and derivation

F.1.1 The values in this Annex are default values within the meaning of Sections 2.3.4 and 2.3.5 of the Delegated Regulation. An operator may use them in place of an activity-specific determination.

F.1.2 Values in this Annex carry no uncertainty in the combination under 13.3.2.

F.1.3 Where the best estimate of a value is uncertain or variable, the value is set conservatively, so that its use is likely to lead to a marginal underestimation of net carbon removals. Where a standard deviation is quoted in the source, the value is set at the mean plus one standard deviation. Where a 95% confidence interval is quoted, the value is set halfway between the mean and the confidence limit. Adjustments are always made in the direction that reduces the net carbon removal benefit.

F.1.4 Each value states its source. Values are reviewed annually and revised where the source is updated. The applicable version of this Annex is the version in force at the start of the certification period.

F.1.5 An operator may always determine a parameter directly instead of using a default. A directly determined parameter carries its own uncertainty, which the operator states in the monitoring plan.

> **Rationale.** Clauses F.1.2 and F.1.5 create the trade this Annex exists to offer. A default removes both the measurement burden and the uncertainty contribution, at the cost of a conservative value. A direct determination may give a better value but re-enters the uncertainty combination and lowers the conservatism factor. Operators should be expected to use defaults for everything except the parameters that dominate their footprint.

F.2 Global warming potentials

F.2.1 The values in Annex I to the GWP Regulation apply. For the gases relevant to this Standard, on a 100-year basis:

Gas	GWP100
Carbon dioxide	1
Methane	28
Nitrous oxide	265

F.2.2 The values are sourced from Commission Delegated Regulation (EU) 2020/1044.

F.3 Electricity

F.3.1 EF_{elec} is determined under 9.6.5.

F.3.2 Where the operator applies a grid average rather than a contractual or on-site value, the default is the residual mix emission intensity of the bidding zone in which the facility is located, for the calendar year concerned.

F.3.3 CS publishes the applicable list of bidding zone values annually, derived under paragraphs 5 and 6 of Part A of the Annex to the Electricity EF Regulation from ENTSO-E generation data and the fuel-specific factors of Part B of that Annex. The list in force at the start of the certification period applies.

F.3.4 A published value is set at the higher of the value for the calendar year concerned and the value for the preceding calendar year.

F.3.5 Where no value is published for a bidding zone, the EU average value in the published list applies.

> **Rationale.** Bidding zone intensities change every year and in some zones by more than a factor of two over a certification period. A table in this Annex would be stale on the day it issued and would require the Standard to be reissued annually. Section 2.3.4.1 of the Delegated Regulation permits a certification scheme to provide a list of up to date values, and does not require the list to sit in the methodology.

F.4 Fuels

Table F.1 - Lifecycle fuel emission factors

Fuel	Unit	Value	Status	Source
Diesel, road and non-road	tCO2e/t	4.1	indicative	JEC WTW v5
Petrol	tCO2e/t	4.0	indicative	JEC WTW v5
Natural gas	tCO2e/GJ	0.070	indicative	JRC input data document
LPG	tCO2e/GJ	0.075	indicative	JRC input data document
Heavy fuel oil	tCO2e/GJ	0.085	indicative	JRC input data document
Wood chips, supply chain only	tCO2e/t dm	0.020	indicative	RED II Annex VI
Wood pellets, supply chain only	tCO2e/t dm	0.090	indicative	RED II Annex VI

F.4.1 Values include upstream supply and combustion. For biomass fuels the CO_2 of combustion is excluded and non-CO_2 combustion emissions are included.

F.4.2 Where the operator records fuel by volume, the density and net calorific value used for conversion are reported.

F.5 Biomass supply chain

F.5.1 Transport of biomass to the production facility is not covered by Table F.2 and is calculated under F.6 from actual distance and mode. The disaggregated default values for the etd term of RED II are not used.

F.5.2 For municipal waste, post-consumer wood waste, and sewage sludge, the process of collection starts when the material is deposited at the production facility, and emissions before that point are zero.

Table F.2 - Biomass supply chain factors by feedstock class

Class (Annex B)	Unit	Value	Status	Basis
W, AR, FR	tCO2e/t dm	0	sourced	RED: wastes and residues carry zero emissions to the point of collection
P	tCO2e/t dm	0.060	indicative	RED Annex VI, eec + el + ep for short-rotation coppice and herbaceous energy crops

F.5.3 Table F.2 is keyed to the feedstock class assigned in Table B.1 and applies to every entry of that class.

F.5.4 Where a class P feedstock is used, the operator may determine eec, el, and ep for the specific supply chain instead of using the default.

F.6 Transport

Table F.3 - Transport default factors

Mode	Unit	Loaded	Unloaded	Status	Source
Articulated truck, 40 t GVW	tCO2e/km	0.00110	0.00080	indicative	HBEFA
Rigid truck, 12 to 26 t GVW	tCO2e/km	0.00070	0.00050	indicative	HBEFA
Van, up to 3.5 t GVW	tCO2e/km	0.00030	0.00025	indicative	HBEFA
Tractor and trailer, agricultural	tCO2e/km	0.00090	0.00070	indicative	HBEFA
Rail freight, electric	tCO2e/t-km	0.000020	not applicable	indicative	EcoTransIT
Inland waterway	tCO2e/t-km	0.000030	not applicable	indicative	EcoTransIT

Short-sea shipping	tCO2e/t-km	0.000015	not applicable	indicative	EcoTransIT

F.6.1 Values are stated per vehicle-kilometre for road transport and per tonne-kilometre for other modes. Where a per-vehicle-kilometre value is used, an empty leg is accounted separately under 14.4.

F.6.2 Values include upstream fuel supply.

F.7 Reserved

Reserved. In earlier versions this Section carried conservative capital emission defaults by facility class. That discretion is not exercised, for the reasons given in E.2.2, and capital emissions are addressed by the materiality assessment under 9.8. The Section is retained empty so that the numbering of the following Sections is stable, and so that a default may be introduced here if CS publishes a derivation of capital emissions for pyrolysis facilities.

F.8 Inputs and construction materials

Table F.4 - Input and material emission factors

Input	Unit	Value	Status	Source
Structural steel	tCO2e/t	2.5	indicative	Environmental Footprint datasets
Stainless steel	tCO2e/t	6.8	indicative	Environmental Footprint datasets
Concrete, C25/30	tCO2e/t	0.15	indicative	Environmental Footprint datasets
Refractory lining	tCO2e/t	1.2	indicative	ECOINVENT
Polypropylene, big bags and packaging	tCO2e/t	2.0	indicative	Environmental Footprint datasets
Wooden pallet	tCO2e/unit	0.006	indicative	Environmental Footprint datasets
Process water	tCO2e/m3	0.0004	indicative	Environmental Footprint datasets
Quicklime, where used as an additive	tCO2e/t	1.2	indicative	Environmental Footprint datasets

F.8.1 Factors reflect emissions up to the point of use and exclude carbon contained in the input material itself. Where such carbon is oxidised as a result of the activity it is counted directly as an emission source.

F.8.2 The construction material factors are used only where capital emissions are found material under 9.8 and are calculated under 9.8.8. They are taken at the second level of the hierarchy in Section 2.3.4.4 of the Delegated Regulation, for the reason given in 9.8.9.

F.9 Application and incorporation

Table F.5 - Application and incorporation energy defaults

Operation	Unit	Value	Status	Basis
Broadcast spreading with tractor and spreader, followed by incorporation by tillage	tCO2e/t material applied	0.008	indicative	spreading and shallow incorporation pass at a nominal application rate of 1 t/ha, co-applied
Injection or banded application	tCO2e/t material applied	0.010	indicative	as above
Solid manure or digestate spreading	tCO2e/t material applied	0.004	indicative	spreading pass only, no separate incorporation
Slurry or liquid digestate spreading	tCO2e/t material applied	0.003	indicative	spreading pass only, no separate incorporation
Manual application, urban and landscaping	tCO2e/t material applied	0.002	indicative	handling energy only
Incorporation in concrete at batching plant	tCO2e/t biochar	0.005	indicative	additional handling and dosing energy only
Incorporation in asphalt at mixing plant	tCO2e/t biochar	0.005	indicative	additional handling and dosing energy only

F.9.1 Values cover only the energy directly attributable to handling and placing the material. Where biochar is intermixed, the value is applied to the total mass placed and allocated on a mass basis under 15.2.2.

F.9.2 The manure and digestate rows apply to the pathways under 1.4.1(iii) and 1.4.1(iv). Where manure is deposited in situ by grazing animals, GHGuse is zero under 15.4.2.

> **Rationale.** Field operations consume fuel per hectare rather than per tonne, while this Annex states the default per tonne of material placed so that it can be allocated on a mass basis under 15.2.2. The values are therefore derived at a nominal application rate and are conservative at that rate. An operator applying at a markedly lower rate, or placing biochar as a minor component of a large application that would have taken place in any event, may determine the energy directly under 15.3.5.

F.10 Waste disposal

F.10.1 Biochar production under this Standard does not generate a routine solid waste stream. Ash and carbonised fines are part of the biochar and are applied or incorporated with it. Solid material leaves the activity for disposal only where a production batch is disqualified, which is not an expected event.

Table F.6 - Disposal defaults

Waste stream	Unit	Value	Status	Basis
Scrubber, quench, or condensate effluent to treatment	tCO2e/m3	0.0006	indicative	municipal wastewater treatment energy, including transport where tankered
Filter media, spent refractory, and consumables to municipal waste	tCO2e/t	0.030	indicative	transport and inert landfill operation
Feedstock rejects, being stones, soil, metal, and comparable inert material, to landfill	tCO2e/t	0.030	indicative	transport and inert landfill operation
Disqualified biochar or ash to landfill	tCO2e/t	0.030	indicative	transport and inert landfill operation; applies only in the case described in F.10.1

F.10.2 An operator may take a default for one waste stream and determine another directly. Every stream must be accounted, whether by default or by determination, since disposal emissions are not subject to a materiality assessment under 9.9.3.

F.10.3 Organic material sent to landfill is not covered by Table F.6 and must be determined directly. Where a production facility rejects a wet organic fraction at intake, that fraction is returned to the process, composted, or otherwise treated aerobically, and is not sent to landfill.

> **Rationale.** The disposal streams of a pyrolysis facility are small and largely inert. The one stream capable of reaching a material emission is degradable organic material sent to landfill, which is why F.10.3 excludes it from the defaults and requires it to be determined. Ash is not a disposal stream under this Standard because it is part of the certified biochar and is applied with it; where a batch is disqualified the biochar ceases to be certified and the disposal of the whole quantity is accounted under the final row of Table F.6.

F.11 Measurement uncertainties

F.11.1 The values in Table F.7 are the uncertainties of the measurement methods prescribed by this Standard, expressed as relative uncertainties on a 95% confidence basis. They are used in the combination under 13.3.2.

F.11.2 This Section differs from the rest of this Annex. Elsewhere a default replaces a measurement. Here the value is a property of a measurement the operator does perform, so F.1.2 and F.1.5 do not apply. The values are not themselves assigned an uncertainty, and an operator does not determine one in place of a default. It may instead substitute a lower value under 13.2.3, on its own calibration and repeatability data, stated in the monitoring plan and verified at audit.

F.11.3 Where a source states a repeatability limit, a reproducibility limit, a standard deviation, or an accuracy class on another basis, the value in Table F.7 is the converted equivalent and the conversion is stated with the source.

F.11.4 Values are set conservatively under F.1.3. For an uncertainty the conservative direction is upward, since a higher uncertainty lowers the conservatism factor.

F.11.5 Where a parameter is determined by a method not listed in Table F.7, the operator establishes its uncertainty from that method's validation data and states it in the monitoring plan.

Table F.7 - Measurement uncertainties

Measurement	Method	Default U (95%)	Status	Source
Weighing of the transport unit	calibrated platform or crane scale	0.5%	indicative	OIML R76 accuracy class
Dry matter content	Annex G	1.5%	indicative	Annex G validation data
Organic carbon content	ISO 29541 with TIC deduction	2.0%	indicative	laboratory repeatability and reproducibility
Ash content, laboratory	EBC analytical requirements	1.0%	indicative	method repeatability
Ash content, on site	Annex H	2.0%	indicative	Annex H validation data

F.11.6 The uncertainties of the ash determinations are those of the term (1 - a), and not those of the ash content itself, under 13.2.6.

F.11.7 Two of the five values are fixed by the field procedures and tolerances of Annexes G and H. Because the five combine in quadrature and are compared against a threshold of 2.5%, they determine whether a conservatism factor of 1 is attainable for the certified population. On the values above the combined uncertainty is 3.4% and the conservatism factor is 0.966.

ANNEX G - On-site dry matter determination

This Annex specifies the field method for determining the dry matter content of biochar under 10.5 and 5.1.3(v). It states two permitted methods, the sampling required by each, how a determination is assigned to a transport unit.

G.1 Principle

G.1.1 The dry matter content of biochar cannot be measured directly. It is calculated from the fresh mass of the material and its measured water content.

G.1.2 The fresh mass of a transport unit is established by weighing. It must not be derived from volume and bulk density.

G.1.3 A determination made once per production batch in the laboratory is not used for the purposes of 10.5, under 10.5.2.

> **Rationale.** Two properties of biochar defeat the alternatives. Water content varies within a batch and after it, with the intensity of quenching at discharge, with absorption of air humidity, and with air drying in storage, so a single laboratory determination is not representative of the material in any given transport unit. Bulk density varies with the particle size distribution of the feedstock and with abrasion during transfer and transport, so a volumetric determination of dry mass is not reliable either. Both determinations must therefore be made on the material itself, on site, close in time to the weighing.

G.2 Method A - oven drying

G.2.1 Sampling. For each sub-quantity of not more than 10 m3 of biochar, at least 20 individual sub-samples are taken with a sampling stick. The sub-samples are combined and must yield a total sample of at least 10 litres. Sub-samples may be taken from a pile or container of not more than 10 m3, or from each of several big bags together presenting not more than 10 m3. The sampling stick must cover the full depth or height of the material sampled.

G.2.2 The combined sample is weighed on a balance with a resolution of not less than 1 gram.

G.2.3 The sample is dried at 110 °C for at least 16 hours.

G.2.4 The dried sample is weighed again within 60 seconds of removal from the drying oven.

G.2.5 The water content is the difference between the two masses divided by the fresh mass, and the dry matter content is one minus the water content.

G.2.6 This method is a simplification of DIN 51718 and ISO 589. Either of those standards may be followed instead.

> **Rationale for G.2.4**. Biochar is hygroscopic and condenses moisture from ambient air within minutes of leaving the oven. A delayed second weighing understates the water content and therefore overstates the dry mass and the removal.

G.3 Method B - moisture analyser

G.3.1 A moisture analyser may be used in place of Method A without further approval, subject to G.3.2.

G.3.2 The analyser must be calibratable on the basis of an ISO standard, and the stop criterion selected on the instrument must be a mass variation of not more than 20 milligrams within 60 seconds.

G.3.3 Sampling. One sample of at least 1 litre is taken with a sampling stick per 2 m3 of biochar, or per big bag or other packaged unit, whichever yields the greater number of samples. The sampling stick must cover the full height of the unit sampled. Where a packaged unit is materially larger than 2 m3, the rate remains one sample per 2 m3. Samples must be taken in a representative manner.

G.3.4 From each sample a representative subsample of approximately 100 millilitres is taken. The subsample must be reduced with a crusher or a sample divider so that no particle size fraction of the biochar is over-represented.

G.3.5 Sample preparation must not alter the water content of the material. Samples and subsamples must be kept closed and must be analysed without delay.

G.3.6 The subsample is placed in the analyser and the water content is read directly.

> **Rationale.** Method B was validated against Method A on a range of biochars under the Global Biochar C-Sink Standard, with close agreement, and is recognised on that basis. The two requirements that carry the equivalence are the stop criterion in G.3.2, without which the instrument may report before drying is complete, and the size reduction in G.3.4, without which a subsample of 100 millilitres drawn from a coarse biochar is not representative of the sample it came from.

G.4 Calculation and assignment to a transport unit

G.4.1 The dry mass of a transport unit is its fresh mass multiplied by one minus the water content applying to it:

$$m_{TU} = m_{fresh} * (1 - w)$$

G.4.2 Packaged units. Where a transport unit is a big bag or other packaged unit, it is weighed and its water content is determined at filling. Its dry mass is fixed at that point, is recorded against the unit, and is marked on the unit. A subsequent change in the water content of the material does not alter the dry mass of that unit.

G.4.3 Bulk quantities. Where a transport unit is formed as a bulk quantity and weighed at dispatch, the water content applying to it must be determined on the day of weighing, from a sample drawn from the quantity being loaded. The determination of an earlier production day may be used only where the operator has established a reduced frequency under G.5 and the conditions of that demonstration continue to hold.

G.4.4 A determination is assigned to every transport unit filled from the quantity sampled. Where a transport unit is divided or pooled under 7.5, the dry mass follows the mass fractions under that Section and no new determination is required.

> **Rationale for G.4.2 and G.4.3**. A packaged unit can be fixed at filling because its mass and its water content are determined on the same material at the same moment, and the unit is thereafter closed. Whatever the material does in storage, the two figures remain a

matched pair. A bulk quantity weighed at dispatch has no such pair: the mass is of the material as loaded and a water content determined days earlier is of material in a different condition. Biochar in an open pile can gain or lose several percentage points of water in a week. Requiring the determination on the day of weighing restores the pair; the alternative in G.4.3 is available only where the operator has shown that the content is stable.

G.5 Frequency

G.5.1 The water content is determined at least once per production day, under 10.5.2.

G.5.2 Where the operator demonstrates that the water content varies by not more than 2 percentage points across a week of production, it may be determined once per week under 10.5.3 and applied to all transport units filled in that week.

G.5.3 The demonstration requires daily determination over at least eight consecutive production weeks, and must be recorded in the monitoring plan.

G.5.4 The demonstration must be repeated on any change of feedstock, of quenching or discharge conditions, or of the manner in which biochar is stored before dispatch.

G.5.5 Where a weekly frequency is in use and any determination departs from the preceding determination by more than 2 percentage points, daily determination resumes until the demonstration under G.5.3 is re-established.

G.5.6 The determination of the water content may be made at a reduced frequency under G.5.2. The weighing of a transport unit may not.

G.6 Recording

G.6.1 Each determination is recorded with:

Item	Content
Date and time	of sampling and of determination
Method	Method A, Method B, DIN 51718, or ISO 589
Apparatus	balance and oven, or moisture analyser, with identification and last calibration
Sampling	number of sub-samples, total sample volume, and the quantity or unit sampled
Result	fresh and dry mass under Method A, or the water content read under Method B
Water content	as a mass fraction on a fresh basis
Assignment	the transport units or the production interval to which the determination applies

G.6.2 The record is transmitted to the dMRV system under 5.1.3(v) and forms part of the record of every transport unit to which it is assigned.

G.6.3 Where a packaged unit is marked with its dry mass under G.4.2, the marking must carry the unit identifier under 20.2.2 so that the marking and the register entry can be reconciled.

ANNEX H - On-site carbon content analysis

To be issued. Specifies the field method for determining the organic carbon content of biochar under 5.1.3(vi): apparatus, sample preparation, procedure, and recording; the correlation to be established against the laboratory determinations for the same production line; and the rule under which the laboratory value is corrected where the on-site determinations depart from it by more than the permitted tolerance, provisionally 5%.