ANNEX 13

Structure's contribution to sustainability index

1 General considerations

The design, execution and maintenance of concrete structures are activities, falling within the general context of construction, which can contribute to achieving the conditions allowing adequate sustainable development.

Sustainability is a global concept, not specific to concrete structures, which requires a series of environmental criteria to be met, in addition to other economic and social criteria. The contribution to sustainability of concrete structures therefore depends on meeting criteria such as the rational use of energy (both in the manufacture of construction products and in the execution of structures), use of renewable resources, use of recycled products and minimisation of the impacts on nature as a result of the execution, and also creation of healthy work areas. In addition, the design, execution and maintenance of concrete structures can take account of other aspects such as amortising the initial impacts during the structure's working life, optimising the maintenance costs, incorporating innovative techniques resulting from corporate RDI strategies, ongoing training for staff participating in the various stages of the structure, and other economic and social aspects.

This Annex defines the structure's contribution to sustainability index (ICES) which is determined from the structure's environmental sensitivity index (ISMA), with procedures being established to estimate these indices when so decided by the Owner.

The criteria indicated in this Annex relate exclusively to activities connected with concrete structures. As these are elements which often form part of a much larger structural work (building, road, etc.), the Designer and the Project Management must ensure, where applicable, that these criteria are coordinated with those adopted for the rest of the structural work.

2 General criteria applied to concrete structures

The estimation of the sustainability indicators or, where applicable, the environmental indicators covered by this Code may be aimed at allowing:

- the comparison of two structural solutions for the same construction, or
- the establishment of a quantitative parameter for assessing the quality of the structure in relation to these aspects.

In general, a structure has higher value in terms of sustainability when it ensures compatibility of the requirementa in epigraph 5 in this Code with:

- optimal consumption of materials, by using smaller quantities of concrete and reinforcements,
- extension of the structure's working life, resulting in higher amortisation during this life of the possible impacts caused during the execution stage,
- use of cements:
    - o which incorporate industrial by-products, such as the mineral additions permitted by the applicable regulations,
    - o which are obtained through processes incorporating raw materials which release fewer CO_2 emissions into the atmosphere,
    - o which are obtained through processes consuming less energy, particularly through the use of alternative fuels which save on other

primary fuels and allow the recovery of waste.

- use of aggregates originating from recycling processes,
- use of recycled water in the concrete-mixing plant,
- use of steels:
    - produced by recycling of ferric by-products
    - which are obtained through processes which release fewer CO_2 emissions into the atmosphere,
    - which are obtained through processes consuming less energy, particularly through the use of alternative fuels which save on other primary fuels and allow the recovery of waste.
- establishment of voluntary environmental certification systems in the manufacturing processes for all products used in the structure and, in particular, in the manufacturing processes for plant-mixed concrete and the reinforcement production processes at steelworks, including their transport to site, where applicable,
- use of products with officially recognised quality marks ensuring that the basic requirements of the structures are adequately met with the least possible degree of uncertainty,
- observance of preventive criteria in addition to the requirements laid down by the applicable regulations on health and safety at work,
- application of innovative criteria increasing the productivity, competitiveness and efficiency of structures and also user accessibility to these,
- minimisation of the potential impacts on the environment resulting from the execution of the structure (noise, dust, vibrations, etc.)
- in general, the less use possible of natural resources.

3 General method for taking account of sustainability criteria

The Owner shall decide on how sustainability criteria will be taken into account in a concrete structure and shall also:

- inform the Designer on this matter in order to incorporate the corresponding measures when preparing the design,
- take this into account when commissioning the execution,
- check compliance by the Constructor with the criteria during execution, and
- ensure that the appropriate maintenance criteria are conveyed to users, where applicable.

The Owner, where applicable, must inform the Designer of the sensitivity criterion which, in accordance with Article 5 of this Annex, must be met by the structure.

It is considered that a concrete structure meets the criterion defined by the Owner when, as applicable, the following conditions are met:

$$ICES_{owner} \leq ICES_{design} \leq ICES_{execution}$$

where:

"owner"	Indicates that this is ICES defined by the Owner when commissioning the work.
"design"	Indicates that this is the index established by the Designer.
"execution"	Indicates that this is the index achieved as a result of the control, in accordance with Article 98, of the actual conditions under which the structure was executed.

4 Environmental sensitivity index (ISMA) of the concrete structure

4.1 Definition of the environmental sensitivity index

The "environmental sensitivity index" of a structure is defined as the result of applying the following expression:

$$ISMA = \sum_{i=1}^{i=11} \alpha_i . \beta_i . \gamma_i . V_i$$

where:

α_i, β_i and γ_i	Weighting factors for each requirement, criterion or indicator in accordance with Table A.13.4.1.a.
V_i	Value factors determined for each criterion, in accordance with the following expression, according to the representative parameter in each case.

$$V_i = K_i . \left[1 - e^{m_i \left(\frac{P_i}{n_i} \right)^{A_i}} \right]$$

where:

K_i, m_i, n_i and A_i	Parameters whose values depend on each indicator in accordance with Table A.13.4.1.b.
P_i	Value taken by the representative function for each indicator, as indicated in section 4.3 of this Annex.

Table A.13.4.1.a Weighting factors

<table>
<tr><th rowspan="2">Environmental requirement</th><th colspan="3">Weighting factor</th></tr>
<tr><th>α</th><th>β</th><th>γ</th></tr>
<tr><td>Environmental characteristics of concrete</td><td rowspan="8">0,60</td><td rowspan="2">0,22</td><td>0,50</td></tr>
<tr><td>Environmental characteristics of reinforcements</td><td>0,50</td></tr>
<tr><td>Optimal reinforcement of elements</td><td rowspan="3">0,33</td><td>0,17</td></tr>
<tr><td>Optimal environment of reinforcements</td><td>0,33</td></tr>
<tr><td>Level of execution control</td><td>0,50</td></tr>
<tr><td>Use of recycled aggregates</td><td rowspan="3">0,45</td><td>0,33</td></tr>
<tr><td>Optimal use of cement</td><td>0,50</td></tr>
<tr><td>Optimal use of concrete</td><td>0,17</td></tr>
<tr><td>Specific measures for controlling impacts</td><td rowspan="3">0,40</td><td>0,25</td><td>1,00</td></tr>
<tr><td>Specific measures for managing waste</td><td rowspan="2">0,75</td><td>0,67</td></tr>
<tr><td>Specific measures for managing water</td><td>0,33</td></tr>
</table>

Table A.13.4.1.b

Environmental requirement	K_i	m_i	n_i	A_i
Environmental characteristics of concrete	1,02	-0,50	50	3,00
Environmental characteristics of reinforcements	1,02	-0,50	50	3,00
Optimal reinforcement of elements	1,06	-0,45	35	2,50
Optimal environment of reinforcements	10,5	-0,001	1	1,00
Level of execution control	1,05	-1,80	40	1,20
Use of recycled aggregates	1,10	-0,20	2	1,10
Optimal use of cement	10,5	-0,001	1	1,00
Optimal use of concrete	10,5	-0,001	1	1,00
Specific measures for controlling impacts	10,5	-0,001	1	1,00
Specific measures for managing waste	1,21	-0,40	40	1,60
Specific measures for managing water	1,10	-0,40	50	2,60

4.2 Environmental classification of facilities

For the purposes of this Code, it is understood that a facility has an environmental mark when it is in possession of a quality mark complying with UNE-EN ISO 14001 or an EMAS.

Although not in possession of an environmental mark, it is considered that a facility has made an environmental commitment for the purposes of this Code when it meets the following conditions:

a) in the case of a ready-mixed concrete plant

- waste management or recycling processes are controlled and recorded (for example, through the use of containers, waste management plans, etc.),
- equipment is used to minimise impacts on the environment, such as filters, silencers, dampers, dust retaining screens, etc.,

b) in the case of an off-site steelworks

- it holds an officially recognised quality mark, in accordance with Article 81 of this Code,
- steel products are used which have an officially recognised quality mark,

c) in the case of a precasting plant

- equipment is used to minimise impacts on the environment, such as filters, silencers, dampers, dust retaining screens, etc.,
- waste management or recycling processes are controlled and recorded (for example, through the use of containers, waste management plans, etc.),
- specific measures are applied to optimise the concrete composition used,
- reinforcements are used:
    - o which originate from steelworks that hold an officially recognised quality mark, or
    - o which are produced within the precasting plant in accordance with systems for managing the waste produced and specific measures for reducing the noise produced in the steelwork processes,

d) in the case of an on-site concrete plant

- equipment is used to minimise impacts on the environment, such as silencers, dust barriers, hoppers with rubber tubes, etc.,
- waste generated is adequately controlled by using containers, and
- specific measures are applied to optimise the composition used,

e) in the case of an on-site steelworks

- cutting is analysed and, where applicable, alternatives are proposed to the Project Management which optimise the quantity of reinforcement,
- recycling of the scrap produced in the form of crops and waste is managed, and
- measures are adopted to reduce noise emissions caused by the processes used to produce the reinforcement,

f) in the case of the construction company, in relation to placing the concrete

- equipment is used to reduce the noise and control the vibrations, such as silencers, noise barriers, hopper dampers, etc,
- concrete rejects are managed, where applicable, with no inappropriate dumping being permitted, and
- the use of dust retaining screens, containers for recycling materials and leaktight formwork is ensured,

g) in the case of the construction company, in relation to assembling the reinforcements

- waste (wire rods, crops, rejects, etc.) is collected in independent containers for recycling,
- defined areas are established for storing the products and reinforcements, where applicable,

h) in the case of the construction company, in relation to water management

- a procedure is established for preventing uncontrolled discharges of water and soil contamination hazards.

4.3 Environmental criteria and representative functions

4.3.1 Environmental criterion of concrete characteristics

This criterion assesses the environmental sensitivity of the concrete-mixing plant and the procedures for placing the concrete. It has the following objectives:

- to reduce the quantity of waste originating from the production of concrete,
- to encourage greater recycling of waste whose generation is unavoidable,
- to reduce the impacts during the placing of concrete.

The representative function of this criterion is defined by

$$P_1 = \frac{1}{100}\sum_{i=1}^{i=3} p_{1i} \cdot \lambda_{1i}$$

where p_{1i} is the percentage of each type of concrete in question (ready-mixed, on-site plant or precast) used in the structure and λ_{1i} is the sum of the values applying according to the environmental conditions of the facilities, for the corresponding column of Table A.13.4.3.1.

Table A.13.4.3.1.

Facility	Environmental condition	Value factor (λ_{1i})		
		Case 1: Ready-mixed concrete (λ_{11})	Case 2: On-site plant concrete (λ_{12})	Case3: Precast elements (λ_{13})
Ready-mixed concrete plant	With environmental mark	70	-	-
	With environmental commitment	40	-	-
	Other cases	15	-	-
On-site concrete plant	With environmental mark	-	70	-
	With environmental commitment	-	30	-
	Other cases	-	0	-
Precasting plant	With environmental mark	-	-	80
	With environmental commitment	-	-	50
	Other cases	-	-	20
Construction company	With environmental mark	30	30	20
	With environmental commitment	15	15	10
	Other cases	0	0	0

The values in the above table correspond to a maximum transport distance of 45 km and 300 km for ready-mixed concrete and precast elements respectively. Where this distance is greater, the value of the factor λ_{13} corresponding to the precasting plant will be reduced by 5 and that corresponding to the construction company will be increased by 5, except in the row corresponding to "Other cases" which will remain as 0.

4.3.2 Environmental criterion of reinforcement characteristics

This criterion assesses the environmental sensitivity with which steelwork processes for the production of reinforcements are developed and also that of the on-site assembly procedures. It has the following objectives:

- to reduce the quantity of waste originating from the production of reinforcements,
- to encourage the optimal use of reinforcements and the recycling of any waste whose generation is unavoidable, and
- to reduce the impacts during the on-site assembly of reinforcements.

The representative function of this criterion is defined by

$$P_2 = \frac{1}{100}\sum_{i=1}^{i=3} p_{2i} \cdot \lambda_{2i}$$

where p_{2i} is the percentage represented by each of the possible origins of the reinforcements used in the structure (off-site steelworks, on-site steelworks or precasting plant) and λ_{2i} is the sum of the values applying according to the environmental conditions of the facilities, for the corresponding column in Table A.13.4.3.2.

Table A.13.4.3.2.

Facility	Environmental condition	Factors λ_{2i}		
		Case 1: Off-site steelworks (λ_{21})	Case 2: On-site steelworks (λ_{22})	Case 3: Precast elements (λ_{23})
Off-site steelworks	With environmental mark	80	-	-
	With environmental commitment	60	-	-
	Other cases	30	-	-
On-site steelworks	With environmental mark	-	70	-
	With environmental commitment	-	30	-
	Other cases	-	0	-
Precasting plant	With environmental mark	-	-	80
	With environmental commitment	-	-	60
	Other cases	-	-	30
Construction company	With environmental mark	20	30	20
	With environmental commitment	10	15	10
	Other cases	0	0	0

The values in the above table correspond to a maximum transport distance of 45 km and 300 km for the reinforcements and precast elements respectively. Where this distance is greater, the value of the factor λ_{13} corresponding to the precasting plant will be reduced by 5 and that corresponding to the construction company will be increased by 5, except in the row corresponding to "Other cases" which will remain as 0.

4.3.3 Environmental criterion of optimal use of reinforcement

This criterion assesses the environmental contribution due to the reduction in resources consumed to produce the reinforcement by favouring structural solutions which optimise the reinforcement quantities and simplify their on-site assembly.

The representative function of this criterion is defined by

$$P_3 = \sum_{i=1}^{i=4} \lambda_{3i}$$

where λ_{3i} represents the values obtained from Table A.13.4.3.3.

Table A.13.4.3.3

Sub-criterion		Case 1: Prestressed concrete				Case 2: Reinforced concrete			
		λ_{31}	λ_{32}	λ_{33}	λ_{34}	λ_{31}	λ_{32}	λ_{33}	λ_{34}
% of reinforced slabs with electrically welded mesh or welded mat reinforcement of a size not less than 6,00x6,00 m^2	0	0	-	-	-	0	-	-	-
	20	7	-	-	-	7	-	-	-
	40	14	-	-	-	14	-	-	-
	60	21	-	-	-	21	-	-	-
	80	28	-	-	-	28	-	-	-
	100	34	-	-	-	34	-	-	-
Assembly sistem	welding	-	0	-	-	-	25	-	-
	Tied, mechanical and others	-	16	-	-	-	32	-	-
% of reinforcements produced with forms according to UNE 36831	0	-	-	0	-	-	-	0	-
	20	-	-	7	-	-	-	7	-
	40	-	-	14	-	-	-	14	-
	60	-	-	21	-	-	-	21	-
	80	-	-	28	-	-	-	28	-
	100	-	-	34	-	-	-	34	-
Has active reinforcement?	no	-	-	-	-	-	-	-	0
	yes	-	-	-	16	-	-	-	-

4.3.4 Environmental criterion for optimization of the steel for reinforcement

This criterion assesses the environmental contribution due to the recycling of ferric waste products and the decrease of CO_2 emisions in the steel production , as well as the use of the sub-products generated in the process.

The representative function of this criterion is defined by

$$P_4 = \frac{1}{100}\frac{A}{100}\sum_{i=1}^{i=5} p_{4i}\lambda_{4i}$$

where λ_{4i} values from table A.13.4.3.4.

A steel percentage with officially recognized quality mark

p_{4i} percentage of use in the structure of each of the cases defined in Table A.13.4.3.4

Table A 13.4.3.4

Optimal use of resources in the production of steel	In accordance with or through	Points
No certification	Neither standard ISO 14001 nor the EMAS system is applied, or the product is not certified by a voluntary quality mark which is officially recognised, or the product certificate does not prove that this cement is subject to the requirements of the Kyoto Protocol	λ_{41}= 0
Production subject to environmental certification	Standard ISO 14001	λ_{41}= 10
	Standard ISO 14001 and EMAS Registration, or EMAS Registration without standard ISO 14001	λ_{41}= 15
With product certification	The steel certifies with a quality mark officially recognized that its production origen is, at least in an 80% , recicled steel.	λ_{42}= 30
	The steel certifies by mean of a quality mark officially recognized that the production complies with Kyoto requirements	λ_{43}= 20
	The steel certifies by mean of a quality mark officially recognized that recycles the produced blast-furnace slags in a percentage greater than 50%.	λ_{44}= 15
Others	The steel certifies that, the ferric raw materials used in siderurgy, as well as the steel products , have been submitted to radiologic emission controls verifiable and reported.	λ_{45}= 20
Total maximum score		$\sum_{i=1}^{4} \lambda_{4i} \leq 100$

4.3.5 Environmental criterion of execution control system

This criterion assesses the environmental contribution due to the reduction in resources consumed to produce the reinforcement as a result of an intensive level of execution control and the use of products with an officially recognised quality mark.

The representative function of this criterion is defined by

$$P_5 = \frac{1}{100} \sum_{i=1}^{i=3} p_{5i} \cdot \lambda_{5i}$$

where p_{5i} is the percentage of use in the structure of each of the cases defined in Table A.13.4.3.5 and λ_{5i} is the factor indicated in the table for each case.

Table A.13.4.3.5

Sub-criterion	Value factor
Ready-mixed concrete The reduction of γ_s, in accordance with Article 15.3.1, cannot be applied	λ_{51} = 0
Ready-mixed concrete The reduction of γ_s, in accordance with Article 15.3.1, can be applied	λ_{52} = 65
Precast concrete with a quality mark The reduction of γ_s, in accordance with Article 15.3.1, can be applied	λ_{53} = 100

4.3.6. Environmental criterion of aggregate recycling

This criterion assesses the environmental contribution due to the use of recycled aggregates. Its representative function is defined by

$$P_6 = \frac{1}{100}\sum_{i=1}^{i=2} p_{6i} \cdot \lambda_{6i}$$

where p_{61} and p_{62} are the percentages of site-cast concrete elements and precast concrete elements respectively used in the structure, and where the factors λ_{61} and λ_{62} are the percentages of recycled aggregate corresponding to each of said types of element. Each one of these percentages (λ_{61}) is limited to the value 20.

4.3.7 Environmental criterion of optimal use of cement

This criterion assesses the environmental contribution due to the use of industrial by-products and, in particular in the case of cement, due to the use of cement incorporating these by-products and also using other raw materials which minimise the CO_2 emissions into the atmosphere or which are obtained through processes consuming less energy, particularly through the consumption of alternative fuels which save on other primary fuels and allow the recovery of waste.

The representative function of this criterion is defined by

$$P_7 = \frac{1}{100}\frac{100-H}{100}\sum_{i=1}^{i=n} p_{7i} \cdot \lambda_{7i}$$

where:

- H — Percentage of concrete with an officially recognised quality mark, with the addition of fly ash or silica fume
- P_{7i} — Percentage of each type of cement identified according to Table A.13.4.3.7 used in the structure
- λ_{7i} — Factor obtained from Table A.13.4.3.7
- *n* — Represents the number of different types of cement supplied to the site, identified according to Table A.13.4.3.7

Table A.13.4.3.7

Optimal use of resources in the production of cement	In accordance with or through	Points
No certification	Neither standard ISO 14001 nor the EMAS system is applied, or the product is not certified by a voluntary quality mark which is officially recognised, or the product certificate does not prove that this cement is subject to the requirements of the Kyoto Protocol	0
Production subject to environmental certification	Standard ISO 14001	10
	Standard ISO 14001 and EMAS Registration, or EMAS Registration without standard ISO 14001	15
With product certification	From the types of cement appropriate for the corresponding use, those cements are used which contain additions in accordance with the applicable standards and in a percentage less than or equal to 20%. In addition, they are certified by a voluntary quality mark which is officially recognised (*)	35
	From the types of cement appropriate for the corresponding use, those cements are used which contain additions in accordance with the applicable standards and in a percentage greater than 20%. In addition, they are certified by a voluntary quality mark which is officially recognised	50
	From the types of cement appropriate for the corresponding use, those cements are used which are subject to the requirements of the Kyoto Protocol, as proven by the product certificate consisting of a voluntary quality mark which is officially recognised	20
	From the types of cement appropriate for the corresponding use, those cements are used in which raw materials are used which produce fewer CO_2 emissions, or alternative fuels are used (non-fossil fuels), or waste of any kind is recovered as fuel, all of which is proven by the product certificate consisting of a voluntary quality mark which is officially recognised	15
Maximum total score		100

(*) When the most appropriate cement for the project in question, according to this Code, is type CEM I or type I, a minimum score of 35 points will be awarded, provided that the product is certified by a voluntary quality mark which is officially recognised, as these types of cement cannot contain any quantities of additions.

4.3.8 Environmental criterion of optimal use of concrete

This criterion assesses the environmental contribution due to the use of industrial by-products which, in the form of additions, are directly incorporated in the concrete, in accordance with the specifications contained in this Code.

The representative function of this criterion is defined by:

$$P_8 = \frac{1}{100}\frac{H}{100}\sum_{i=1}^{i=n} p_{8i} \cdot \lambda_{8i}$$

where:

- H Percentage of concrete with an officially recognised quality mark, with the addition of fly ash or silica fume
- P_{8i} Percentage of the total quantity of concrete with additions incorporated at the concrete plant, which corresponds to concretes produced with each type and proportion of addition according to Table A.13.4.3.8
- λ_{8i} Factor obtained from Table A.13.4.3.8
- n Represents the number of different types of addition used, identified according to Table A.13.4.3.8

Table A.13.4.3.8

Case	Applicable sub-criteria		λ_{7i}
Use of CEM I or type I cement	In accordance with the criteria laid down in Table A.13.3.2.6		35
Concrete plant without ISO 14000 certification	Any percentage of addition		0
Concrete plant with ISO 14001 certification	Fly ash (in % of cement weight)	12%	22
		24%	44
		35%	65
	Silica fume (in % of cement weight)	4%	22
		8%	44
		12%	65

Note: In practice it is not usual to combine several additions but, if this case arises, the score can be determined by linear interpolation of the percentages expressed in the table.

4.3.9 Environmental criterion of impact control

This criterion assesses the environmental contribution due to the structure being executed in a manner which minimises the impacts on the environment and, in particular, the emission of particles and generation of dust.

The representative function of this criterion is defined by

$$P_9 = \sum_{i=1}^{i=5} p_{9i} \cdot \lambda_{9i}$$

where p_{9i} and λ_{9i} are the parameters obtained from Table A.13.4.3.9.

Table A.13.4.3.9

Sub-criterion	p_{8i}	λ_{8i}
Use of sprinklers on site to prevent dust	1	20
Paving of site accesses or inclusion of pneumatic cleaning systems	1	20
Use of dust retaining screens or other devices	1	20
Use of chemical stabilisers to reduce the production of dust	1	20
Use of canvas and tarpaulins to cover material exposed to the weather, including during transport	1	20

4.3.10 Environmental criterion of waste management

This criterion assesses the environmental contribution due to the structure being executed in a manner ensuring the adequate management of waste generated during this process. In particular, it takes account of the existence of an excavation material management plan, a construction and demolition waste management plan and the reduction of waste caused by the concrete control, as a result of using cubic test pieces.

The representative function of this criterion is defined by

$$P_{10} = \sum_{i=1}^{i=4} \lambda_{10i}$$

where λ_{10i} is the value obtained from Table A.13.4.3.10.

Table A.13.4.3.10

Sub-criterion		Case		λ_{101}	λ_{102}	λ_{103}	λ_{104}
Management of excavation products		No controlled actions		0	-	-	-
		Everything sent to dumps		3	-	-	-
		A percentage recycled, as indicated in the next column, and the rest to dumps	20%	10	-	-	-
			40%	15	-	-	-
			60%	20	-	-	-
			80%	25	-	-	-
			100%	30	-	-	-
Management of construction and demolition waste (RCD)		No controlled actions		-	0	-	-
		Everything sent to dumps		-	5	-	-
		A percentage recycled, as indicated in the next column, and the rest to dumps	20%	-	12	-	-
			40%	-	21	-	-
			60%	-	30	-	-
			80%	-	39	-	-
			100%	-	50	-	-
Minimisation of sulphur waste as a result of using cubic test pieces	Concrete without an officially recognised quality mark, according to section 5.1 of Annex 19.	All cylindrical test pieces		-	-	0	-
		Cubic test pieces used to control some concrete according to the percentage indicated in the next column out of the total number of test pieces	20%	-	-	4	-
			40%	-	-	8	-
			60%	-	-	12	-
			80%	-	-	16	-
			100%	-	-	20	-
	Concrete with an officially recognised quality mark, according to section 5.1 of Annex 19, as a percentage of the total placed concrete which is indicated in the next column	33%	Cylindrical (*)	-	-	-	6
			Cubic (**)	-	-	-	20
		67%	Cylindrical (*)	-	-	-	12
			Cubic (**)	-	-	-	20
		100%	Cylindrical (*)	-	-	-	17
			Cubic (**)	-	-	-	20

(*) Concrete without an officially recognised quality mark is controlled using cylindrical test pieces.
(**) Concrete without an officially recognised quality mark is controlled using cubic test pieces.

4.3.11 Environmental criterion of water management

This criterion assesses the environmental contribution due to the structure being executed in a manner ensuring the adequate management of the water used during this process. In particular, it takes account of the provision of efficient concrete curing systems, the installation of water-saving devices and the collection and use of rainwater.

The representative function of this criterion is defined by

$$P_{11} = \sum_{i=1}^{i=4} \lambda_{11i}$$

where λ_{11i} is the value obtained from Table A.13.4.3.10.

Table A.13.4.3.11

Conditions		λ_{10i}
Type of company	With environmental commitment	0,20
	With ISO 9001 environmental mark	0,40
The design includes, and justifies in the budget, any technique allowing efficient curing to be achieved with regard to water consumption, e.g. use of covers to prevent evaporation (canvas), watering by spraying on a timer, etc.		0,20
The design proposes, and justifies in the budget, the use of water-saving devices at consumption points.		0,20
The design proposes, and justifies in the budget, the use of containers for collecting rainwater and the subsequent use of this. This water may subsequently be used in other applications without having to use resources from the mains water supply. This use must not be prejudicial to any other type of characteristic, for example durability.		0,20

5 Structure's contribution to sustainability index

The index of contribution to substainability (ICES) is defined as the result of applying the following expression:

$$ICES = a + b.ISMA$$

It must be also:

$$\text{ICES} \leq 1$$
$$\text{ICES} \leq 2.\text{ISMA}$$

where:

a Social contribution factor, determined as the sum of the factors indicated in Table A.13.5, according to the applicable sub-criteria.

$$a = \sum_{i=1}^{i=5} a_i$$

Table A.13.5

Sub-criterion	In design	In execution
The Constructor applies innovative methods which are the result of RDI projects carried out in the last 3 years	$a_1 = 0$	$a_1 = 0{,}02$
At least 30% of staff working on the execution of the structure have followed specific training courses in technical, quality or environmental aspects	$a_2 = 0$	$a_2 = 0{,}02$
Voluntary health and safety measures are adopted in addition to those required by law for the execution of the structure	$a_3 = 0$	$a_3 = 0{,}04$
A public web page devoted to the work is created in order to inform the population, including about its characteristics and completion deadlines and also its economic and social implications.	$a_4 = 0{,}01$	$a_4 = 0{,}02$
This involves a structure which is part of a structural work declared as being in the public interest by the competent public authority.	$a_5 = 0{,}04$	$a_5 = 0{,}04$

b Contribution factor due to the extension of the working life, determined by using the following expression,

$$b = \frac{t_g}{t_{g,\min}} \leq 1{,}25$$

where:

t_g Working life actually indicated in the design for the structure, within the ranges specified in Article 5, and

$t_{g,min}$ Value of the working life specified in Article 5.1 of this Code for the corresponding type of structure

Using the ICES, the structure's contribution to sustainability can be classified according to the following levels:

Level A: 0,81 < ICES < 1,00
Level B: 0,61 < ICES < 0,80
Level C: 0,41 < ICES < 0,60
Level D: 0,21 ICES < 0,40
Level E: 0,00 < ICES < 0,20

where A is the maximum end of the scale (maximum contribution to sustainability) and E is the minimum end of the scale (minimum contribution to sustainability)

6 Checking the contribution to sustainability criteria

6.1 Determination of the design value of the structure's contribution to sustainability index

Where the Owner decides to apply sustainability criteria to the structure, the Designer must define a strategy in the design in order to achieve these criteria, by determining the design value of the structure's contribution to sustainability index ($ICES_{design}$) and identifying the criteria, or sub-criteria where applicable, which must be met in order to achieve the value set.

To determine the $ICES_{design}$, the following will be adopted: $a_1 = a_2 = a_3 = 0$.

In addition, the Designer must indicate the measures which must be taken into account during the execution of the structure in the corresponding documents and, in particular, in the technical report, specific technical specifications and budget.

6.2 Determination of the actual value of the structure's contribution to sustainability index on execution

Where the Owner has decided to apply sustainability criteria to the structure, the Project Management must check, either directly or through a quality control body, that the actual value of the structure's contribution to sustainability index as a result of the actual conditions of its execution ($SCSI_{execution}$) is not less than the value of the index defined in the design.

The documents proving the final value of the $ICES_{execution}$ shall form part of the Final Work Documentation