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European Technical Assessment

ETA 23/0131
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English translation prepared by IETcc. Original version in Spanish language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc)
Trade name of the construction Product:	AGINTECO – Products and Anchoring Systems for Geotechnics
Product family to which the construction product belongs:	Reinforcing and prestressing steel for concrete and ancillaries, post tensioning kits
Manufacturer:	AGINTECO CONSULTING E INGENIERIA S.L. C/ Sierra de Guadarrama, 37, San Fernando de Henares, Madrid (Spain) www.aginteco.com
Manufacturing plant(s):	AGINTECO CONSULTING E INGENIERIA S.L. C/ Sierra de Guadarrama, 37, San Fernando de Henares, Madrid (Spain)
This European Technical Assessment contains:	13 pages including 15 annexes which form an integral part of this assessment.
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	European Assessment Document (EAD) 160071-00-0102 – Kit for rock and soil anchors using prestressing steel strand

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

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Specific parts

1. Technical description of the product

The European Technical Assessment – ETA – applies to the kit, the rock and soil anchor:

AGINTECO - PRODUCTS AND ANCHORING SYSTEMS FOR GEOTECHNICS

The rock and soil anchor kit comprises a set of components designed to establish a secure anchorage to the ground. This kit is installed in a predrilled hole in either rock or soil and is intended to anchor an auxiliary structure to the ground by post-tensioning a tendon that connects the soil or rock to the auxiliary structure. The anchorage system is divided into three parts: the anchor head (the structure's attachment point), the free length (the length of the anchor between the bulb and the anchor head that transmits forces), and the bond length or bulb zone (the anchoring point to the ground). Furthermore, depending on the application and specifically the duration of its placement in the ground, which is strongly related to corrosion resistance, the kit shall be classified as follows:

- **Temporary anchor:** according to EAD 160071-00-0102 with limited corrosion protection, PLL type (see Figure 1 and Annex 1). In this type, each length is protected from corrosion as follows:

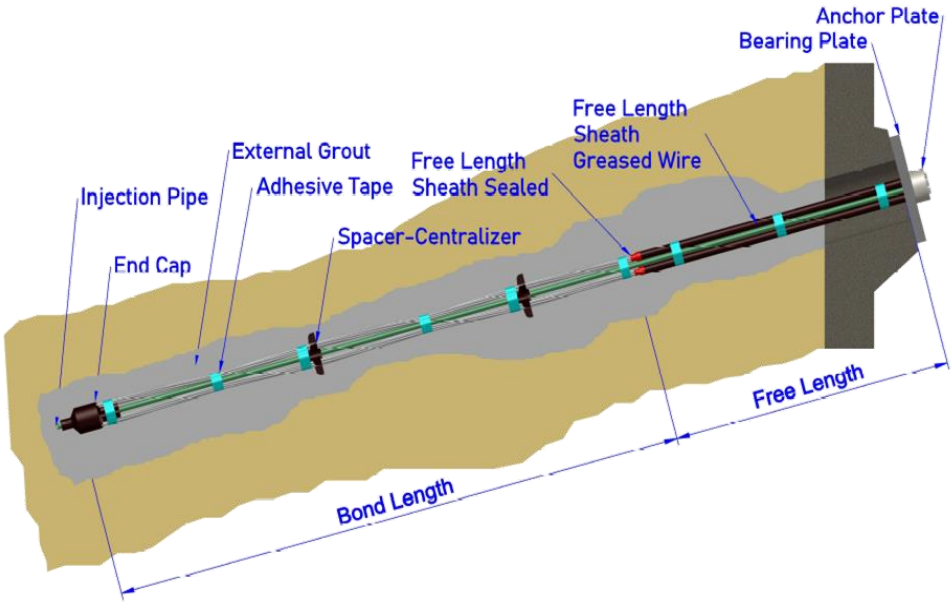


Figure 1. Definition of temporary anchor

  - **Tendon bond length:** To protect the strands, a minimum of external grout cover between the strands and the contour of the borehole will be used. The grout surrounding the strands must have at least 10 mm thick.
  - **Tendon free length:** To protect the strands, each strand shall be enclosed in a 1.5 mm thick PE sheath filled with grease or wax for extra protection.
  - **Tendon transition from free length to bond length:** Plastic butyl sealant consisting of a non-hardening plastic sealant, moldable and applied to a grease-free, dust-free, and dry surface.

- **Permanent anchors:** according to EAD 160071-00-0102 with improved corrosion protection, PLE1 type (see Figure 2 and Annex 3). In this type, each length is protected from corrosion as follows:

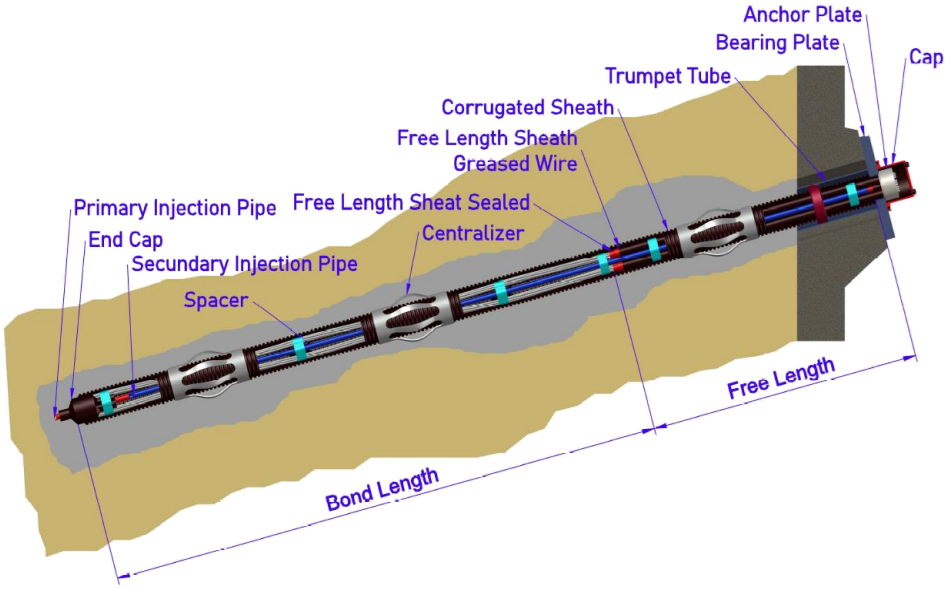


Figure 2. Definition of permanent anchor

  - **Tendon bond length:** To protect the strands, a continuous corrugated plastic duct extends over bond length and free length. Along bond length the corrugated plastic duct is injected with grout, providing a cover of 5 mm on bare prestressing steel strands to corrugated plastic duct. Concentric position of tendon and minimum cover of grout are ensured by a plastic Spacer. At the bottom end, the corrugated plastic duct is closed with an plastic or metallic end cap. The annular void of corrugated plastic duct to drillhole wall is filled with grout with a cover of 10 mm on corrugated plastic duct to drillhole wall. Concentric position of corrugated plastic duct and minimum thickness of body of cement mortar are ensured by centralizers. The grouting is performed on-site by the drilling contractor responsible for the anchor installation.
  - **Tendon free length:** To protect the strands, each strand shall be enclosed in a 1.5 mm thick PE sheath filled with grease or wax for extra protection. A corrugated plastic duct extends over bond and free length.
  - **Anchor head:** The plastic or galvanized steel protection cap with elastic joint and adjustment screw will be completely filled with a non-flowing anticorrosive compound, such as grease or wax. In addition, the anchor head and bearing plate also coated with the same material. If not fully embedded in concrete, steel tube, square plate, and protection cap are provided with an appropriate corrosion protection according to EN ISO 12944-5.
  - **Tendon transition from free length to anchorage:** A metallic trumpet is attached to the bearing plate covering the corrugated plastic duct in the free zone of the anchor. A tight O-ring seals over the external diameter of the anchor's corrugated sheath, ensuring a secure fit.
  - **Tendon transition from free length to bond length:** Plastic butyl sealant consisting of a non-hardening plastic sealant, moldable and applied to a grease-free, dust-free, and dry surface.

Rock and soil anchor kit can be classified under the ground anchor category as defined in EN 1537.

The kit comprises the following components:

- **Tendon:** prestressing steel strand element that transmits the force and comprises the specific layout of 2 to 12 tensile elements. See details in Annexes 2 and 4.
- **Tensile Element:** 7-wire prestressing steel strand with nominal diameter and maximum characteristic tensile strength as given in Annexes 2 and 4.
- **Anchor Head:** component that serves as the structure's attachment point, where the tensioning force from the tendon is transferred to the structure being anchored. It is located at the surface and is designed to hold and secure the tendon, ensuring that the force generated by the post-tensioning process is effectively applied to stabilize or support the auxiliary structure. The anchor head includes fixtures such as bearing plates and wedges that grip the tensile elements and distribute the load. Further details can be found in Annex 10.
- **Bearing Plates:** square steel plates (see details in Annex 7) supported on:
    - Structural concrete typically with helix reinforcement in the region of the anchorage, which design is not part of the kit.
    - Steel member dedicated for this purpose, which design is not part of the kit.
- **Anchor plate:** Anchor plates are manufactured from C45 steel grade according to EN 10083-2 and contain regularly arranged and parallel-drilled conical holes to accommodate prestressing steel strands and wedges. On the back of the anchor plate, there may be a step to facilitate centring of the anchor plate on the bearing plate. Retensionable anchor plates have the particularity of being externally threaded to facilitate tension checks. To perform retensioning, the appropriate hydraulic retensioning jack system should be selected based on the specific anchor type design. The geometry defined for this purpose is detailed in Annexes 5 and 6.
- **Capot:** Protective cap made of galvanized steel or polyethylene used to protect the exposed end of the anchor head and tendon from environmental factors such as moisture, dirt, and mechanical damage. The capot ensures the longevity and durability of the anchor kit by preventing corrosion and other forms of deterioration at the critical junction where the anchor connects to the structure. It is an essential part of the kit, especially in environments where the anchors are exposed to harsh conditions. Further details can be found in Annex 9.
- **Wedges:** elements used to grip the tendon tightly and hold it in place after it has been tensioned. The wedges are tapered and fit into a conical section of the anchor head, which helps them to lock more securely as the tension increases. This mechanism ensures a reliable and robust anchoring solution, critical for the safety and effectiveness of the anchorage system. Further details can be found in Annex 8.
- **Grout:** A fluid form of concrete according to EN 447 that is injected into the drilled hole to encapsulate the tendon. It creates a bond between the tendon and the surrounding ground, ensuring that the tensile forces in the tendon are effectively transferred to the rock or soil. Additionally, grout fills the annular space around the tendon, preventing water ingress and sealing the system against external elements, thereby mitigating corrosion risks. Once cured, the grout forms a solid mass that supports the structural integrity of the anchor kit, ensuring that the anchor remains securely in place even under significant loads. Furthermore, grout helps distribute the load uniformly along the bond length, reducing the risk of localized stress concentrations that could lead to failure. The grouting is performed on-site by the drilling contractor responsible for the anchor installation.

- **Trumpet tube:** A metallic component connecting the anchor body to the bearing plate. Primarily designed to protect the anchor from external factors like corrosion. Further details can be found in Annex 10.2.
- **Seal:** The transition tube system includes a gasket made of spongy rubber material, installed within the transition tube to provide a seal between the anchor head and the corrugated sheath of the permanent anchor. Further details can be found in Annex 10.2.
- **Corrugated Sheath:** A protective corrugated plastic duct for the anchor tendon that safeguards the tendon from corrosion and external damage while providing a conduit for grout injection. The duct's corrugated structure enhances its flexibility and adaptability to varying ground conditions. Further details can be found in Annex 12.1.
- **Smooth sheath:** a non-textured duct used to protect the steel cable in the free zone. Made of LDPE material with a minimum thickness of 1.25 mm, it is internally coated with specialized anti-corrosion grease, providing corrosion protection and acting as an adhesion barrier. Further details can be found in Annex 12.2.
- **Grouting Tubes:** A conduct within the anchor kit through which grout is pumped to fill the space between the anchor body (primary grouting) and the drilled hole and the space bare prestressing steel strands to inner corrugated plastic duct (secondary grouting). This component is crucial for achieving adequate bond between the anchor and the surrounding soil or rock, ensuring optimal load transfer and long-term anchor performance. Further details can be found in Annex 11.
- **Spacer:** a device installed within the corrugated plastic duct of a rock and soil anchor kit to center and organize the cables internally. This component prevents tendon misalignment, optimizes stress distribution, and enhances the anchor's overall performance and durability. Further details are provided in Annex 13.
- **Centralizer:** a device installed outside the corrugated plastic duct of a rock and soil anchor kit, positioned in the bond length section, to keep the tendon centered relative to the walls of the drilled ground. This component ensures proper alignment of the anchor within the borehole, preventing tendon eccentricity, optimizing stress distribution, and enhancing overall anchor performance and durability. Further details are provided in Annexes 13 and 14.
- **End cap:** There are two types of end caps, made of steel and polyethylene (HDPE).
    - The **steel end cap** is secured to the end of the cable with reinforced tape and is designed to facilitate the insertion of the anchor into the borehole.
    - The **polyethylene (HDPE) end cap** is attached differently depending on the type of anchorage. For temporary anchoring, it is fixed directly to the end of the cable, while for permanent anchoring, it is attached to the corrugated sheath using suitable adhesive tape. In both cases, it integrates seamlessly into the assembly and facilitates the insertion of the anchor into the borehole.

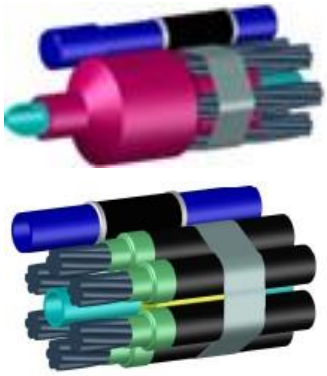
  Both types of end caps are equipped with a non-slip stop to secure the cables, which are then fastened to the end cap. The end cap is further secured with metal strapping to the end of the cable or corrugated sheath, providing protection against bending of the outlet pipe during primary injection. Further details are provided in Annex 15.

Additionally, depending on the type of injection, the rock and soil anchor kit can be as follows:

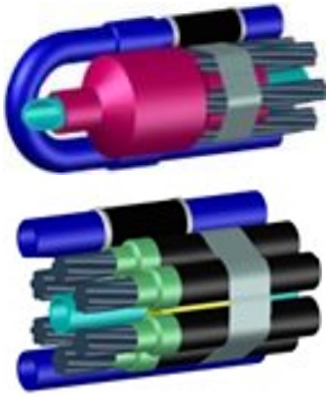
- **Temporary anchor**:
  - **For one injection (APRV-IU):**

  - **For repetitive injections (APRV-IR):**

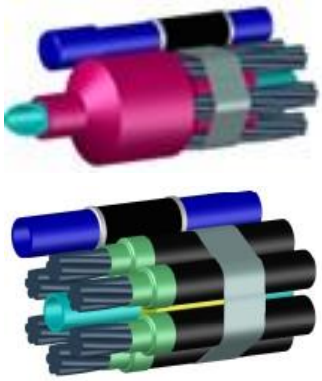
APRV-IR 20SV



APRV-IR 20CV



APRV-IR 16SV



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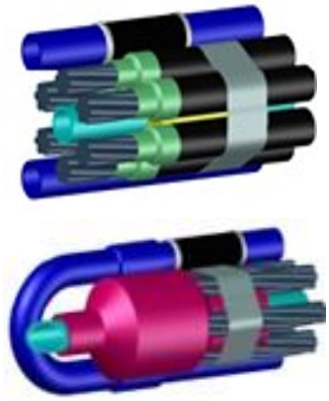
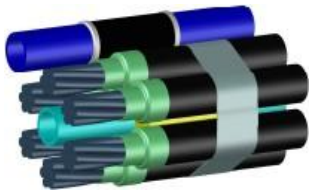
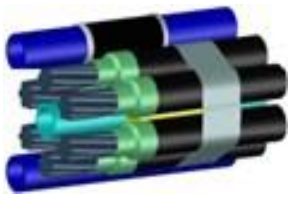


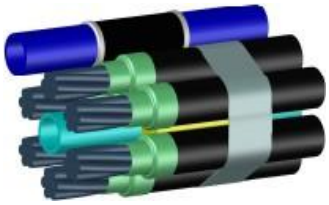
APRV-IR 21-15SV

APRV-IR 21-15CV



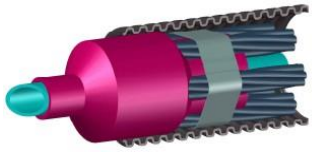


- **For repetitive selective injections (APRV-IRS 34/27):**



- **Permanent anchor:**
  - **For one injection (APMT-IU):**

APMT-IU

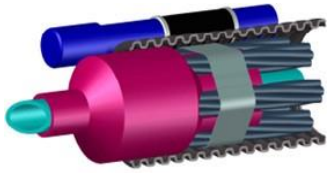


  - **For repetitive injections (APMT-IR):**

APMT-IR 20SV

APMT-IR 20CV

  - **For repetitive selective injections (APMT-IRS 34/27):**



2. Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD).

2.1 Intended use(s)

The intended use of the rock and soil anchor kit is intended to be used for anchoring of structures to rock and/or soil and to stabilize by active introduction of prestressing forces. The specific intended uses are given in Table 1:

Table 1. Intended uses

Designation	Intended uses
PLL AG IGU	Limited corrosion protection (PLL) in non-aggressive ground conditions and without exposure to critical stray currents. For temporary use.
PLE AG IGU	Enhanced corrosion protection (PLE1) in non-aggressive ground conditions but without exposure to critical stray currents. For temporary and permanent use.

2.2 Relevant general conditions for the use of the kit

The provisions outlined in this European Technical Assessment (ETA) are based on the expected service life specified in EAD 160071-00-0102. For temporary use, the assumed working life is up to 2 years, while for permanent use, it ranges from more than 2 years to up to 100 years from the time of installation. These assumptions hold true provided that the conditions for installation, packaging, transport, and storage are met. The effectiveness of this assessment is closely tied to both the design and execution phases, which are critical to ensuring the solution's longevity. These assumptions are based on current industry knowledge and established best practices.

The indications given on the working life cannot be interpreted as a guarantee given neither by the product manufacturer nor by EOTA nor by the Technical Assessment Body issuing this ETA but are regarded only as a means for choosing the right product in relation to the expected economically reasonable working life of the works.

Installation should be carried out according to the ETA holder’s specifications and using the specific application instructions of the product manufactured by the ETA holder or by suppliers recognized by the ETA holder. Installation should be carried out by appropriately qualified staff and under the supervision of the technical responsible of the site.

3. Performance of the product and references to the methods used for its assessment

The identification tests and the assessment for the intended use of the rock and soil anchor kit according to the Basic Work Requirements (BWR) were carried out in compliance with EAD 160071-00-0102.

3.1. Essential characteristic

Table 2 presents the essential characteristics and performances of the product in the order specified by EAD 160071-00-0102 Table 2.1.1, excluding those characteristics required for products other than PLL and PLE1.

Table 2. Essential characteristic and performances of the product

No.	Essential characteristic	Product performance
Basic requirement for construction works 1: Mechanical resistance and stability		
1	Resistance to static load	Clause 3.2.1.1
2	Resistance to fatigue	NPD
3	Load transfer to structure	NPD
5	Enhanced corrosion protection (PLE1)	Clause 3.2.1.2
8	Limited corrosion protection (PLL)	Clause 3.2.1.3
9	Effect of removability of anchor on resistance	NPD
10	Effect of means for adjustment and monitoring of anchor force on resistance	NPD
11	Individual PE or PP sheath and prestressing steel strand assembly filled with soft corrosion protection filling material – Mass of soft filling material per meter (filling degree) (PLE1)	NPD
12	Individual PE or PP sheath and prestressing steel strand assembly filled with soft corrosion protection filling material – Maximum pull-out force for strand from sheath of manufactured assembly (PLE1)	Clause 3.2.4
13	Individual PE or PP sheath and prestressing steel strand assembly filled with soft corrosion protection filling material – Sealing of end of individual smooth PE or PP sheath (PLE1)	NPD
14	Individual PE sheath and prestressing steel strand assembly filled with soft corrosion protection filling material – Monostrand	NPD
15	Particular sealing and electrically insulating systems – Resistance of corrugated PE pipe under internal pressure (PLE1)	NPD
16	Particular sealing and electrically insulating systems – Resistance of transition from smooth PE pipe to corrugated PE pipe and of end cap on corrugated PE pipe (PLE1)	Clause 3.2.5
18	Particular sealing and electrically insulating systems – Resistance of sealing of free length PE pipe to anchorage under external pressure (PLE1)	NPD
23	Particular sealing and electrically insulating systems – Filling of space outside of transition pipe from anchorage to free length for corrosion protection by cement grout (PLE1)	NPD

No.	Essential characteristic	Product performance
Basic requirement for construction works 2: Safety in case of fire		
--	Safety in case of fire	NPD
Basic requirement for construction works 3: Hygiene, health, and the environment		
--	Hygiene, health, and the environment	NPD
Basic requirement for construction works 4: Safety and accessibility in use		
--	Safety and accessibility in use	NR & NPD
Basic requirement for construction works 5: Protection against noise		
--	Protection against noise	NR & NPD
Basic requirement for construction works 6: Energy economy and heat retention		
--	Energy economy and heat retention	NR & NPD
Basic requirement for construction works 7: Sustainable use of natural resources		
--	Sustainable use of natural resources	NPD

Note: NPD means No Performance Determined and NR means Not Relevant

3.2. Product performances

3.2.1. Resistance to static load

The rock and soil anchor kit as described in the ETA meets the acceptance criteria according to EAD 160071-00-0102, Clause 2.2.1. The characteristic value of maximum force, F_{pk}, of the tendon with prestressing steel strands according to Annex 2 is given in Annex 4.

3.2.2. Enhanced corrosion protection (PLE1)

The rock and soil anchor kit with protection level PL1, as described in the ETA, meets the acceptance criteria according to EAD 160071-00-0102, Clause 2.2.5.

3.2.3. Limited corrosion protection (PLL)

The rock and soil anchor kit with protection level PLL, as described in the ETA, meets the acceptance criteria according to EAD 160071-00-0102, Clause 2.2.8.

3.2.4. Individual PE or PP sheath and prestressing steel strand assembly filled with soft corrosion protection filling material – Maximum pull-out force for strand from sheath of manufactured assembly (PLE1)

The rock and soil anchor kit as described in the ETA meets the acceptance criteria of EAD 160071-00-0102, Clause 2.2.12.

Pull-out force of prestressing steel strand from sheath is:

− Without grout injection ≤ 60 N/m

− With grout injection ≤ 500 N/m

3.2.5. Particular sealing and electrically insulating systems – Resistance of transition from smooth PE pipe to corrugated PE pipe and of end cap on corrugated PE pipe (PLE1)

The rock and soil anchor described in the ETA meets the suggested criteria of EAD 160071-00-0102, Clause 2.2.16, which states that the minimum electrical resistance over 2 hours under 1.0 bar of external pressure (R_2) must be at least 200 MΩ.

Table 3. Resistance of transition from corrugated PE pipe to end cap under pre-conditioning C.

Ø ref.	R_2 [MΩ]	P_{200} [bar]	P_u [bar]
Ø75	>200	3.5	3.5
Ø90	>200	3.5	3.5
Ø100	>200	3.5	3.5

Where,

- Ø ref. means diameter of the corrugated PE pipe under internal pressure
- R_2 means the minimum electrical resistance at 2 hours under 1.0 bar of external pressure
- P_{200} means the pressure at which the electrical resistance first drops below 200 MΩ
- P_u means the ultimate pressure at which the specimen fails

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

4.1 System of assessment and verification of constancy of performance

According to the decision 98/456/EC of the European Commission[1], system 1+ of assessment and verification of constancy of performance (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) Nº 305/2011) applies.

[1] Published in the Official Journal of the European Union (OJEU) L201/112 of 17/07/1998. See https://eur-lex.europa.eu/oj/direct-access.html

5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan which is deposited at IETcc[2].

For type testing, the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases, the necessary type testing has to be agreed between IETcc and the notified body.

Issued in Madrid on 2nd of January of 2025

By:

Director

on behalf of Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc – CSIC)

[2] The Control Plan is a confidential part of the ETA and only handed over to the notified certification body involved in the assessment and verification of constancy of performance.