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Small Element Paving Technologists (SEPT)

VOLUNTEER CERTIFICATION PROGRAM FOR CONCRETE BLOCKS AND PAVERS, SEAL OF CONFORMITY AABH - INTI - ICPA

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Note: The following is the notation used in this paper: (.) for decimals and ( ) for thousands.

Summary

Three Argentinean institutions signed a Cooperation Agreement on April 18, 2005, in order to bring to a higher level the quality standards of the construction materials, specially the precast concrete units.

The Argentinean Concrete Block Association (AABH), the National Institute of Industrial Technology (INTI) and the Argentinean Portland Cement Institute (ICPA) agreed to produce a draft for a Technical Regulation and set-up the Certification Committee with the aim to establish a technical team that could talk with the producers and make them conscious of the requirements to get the certification.

The phases of this process include initially, one audit of the quality system and two samplings, which culminate with the evaluation of the INTI and the granting of certificate in the INITIAL CATEGORY seal. The second stage corresponds to five (5) samplings and the lifting of the "No conformities" encountered in the initial audit, with which the company gets the FULL CATEGORY seal. This seal is valid for two (2) years, and includes a phase of MAINTENANCE of five (5) samplings and continuous monitoring of the system.

Concrete pavers must comply with the requirements contained in IRAM 11656 Standard Concrete pavers for pavements, and with the plan of sampling and testing contained in Technical Regulation already mentioned.

This paper describes this program, whose antecedent and inspiration was the Brazilian Certification Program.

1. INTRODUCTION

The program certification volunteer of blocks and CONCRETE PAVERS arose from a signed agreement of cooperation the 18 April 2005, between the three institutions involved: the AABH, the INTI and ICPA.

The background of this program corresponds to the system existing in Brazil since 2002, with more certification of 40 certified products.

Subsequently to the signing of the Convention, the parts agreed to write the drafting of the Technical Regulation adopted on June 14, 2005, with an effectively start on September 30, 2005 with the first visits to the plants of the companies subscribed to this initiative.

The recognition of the INTI as certification agency, in the regulated field by means of Regulation No. 775 of 1999, produced by the National Direction for Inner Trade, gave rise to the INTI Certification Agency, through the Resolution of the Steering Council No. 32 of 2001, for the certification of products within the voluntary and regulated space. In September 2002, the Argentine Accreditation Agency awarded INTI the accreditation for the areas: toys, electrical equipment and cements.

A Certification Committee was convened for the treatment of voluntary certification of blocks and pavers, with representatives of the AABH, the INTI and ICPA, adopting as Third Party laboratories those belonging to Technical Units of Masonry, Rocks and Ceilings and Concrete Technology of INTI CONSTRUCCIONES.

The Certification Committee intends to update the Technical Regulation for 2010 to suit the requirements to the current needs and experience gained from the first phase carried out within the program.

Such Technical Regulations are available on the web pages of the three institutions:

- http://www.inti.gov.ar/certificaciones/index.html (INTI)
- http://www.icpa.org.ar/index3.php (ICPA)
- http://www.aabh.org.ar/notastec.asp (AABH)

Parallel to the realization of visits, sampling and audits, begun the WIDESPREAD PROCESS OF THE TECHNICAL REGULATION, in different occasions, as well as the technical assistance in topics related with quality and certification, in order to push the producers to go ahead in the different required steps to access the certification programs.

2. BACKGROUND AND DESCRIPTION OF THE PROCESS

The system has its precedent in the Brazilian Portland Cement Association (ABCP) through its program Bloco Brazil. In this neighbor country, the need to raise the quality levels was understood, by regulating a seal for precast products as concrete blocks and pavers.

The Brazil regulation is available on the web page www.blocobrasil.com.br. When the program was started, Eng. Paulo Grossi from ABCP presented the characteristics of the seal in his country of origin. Currently more than 40 companies have their pavers certified in Brazil, which can infer the success of the program since its launch in 2002.

The Argentine Regulation sets two phases for the certification:

PHASE I: CERTIFICATE OF CONFORMITY, INITIAL CATEGORY.

This period consists of two sampling visits and one audit accompanied by technical assistance, in order to achieve progress according with the established conditions in the Regulation.

PHASE II: SEAL OF CONFORMITY, FULL CATEGORY.

The condition for moving to the full phase and to achieve the seal is a prerequisite that the company implements a QUALITY SYSTEM, covering this point with the technical assistance program already mentioned, including the basic guidelines to comply with as the drafting of the manual for quality, procedures, instructions, organization of records, etc. This is complemented by five (5)

inspections to the plant, ant the taking of samples. In this case, four (4) out of the five (5) requirements must be fulfilled. Each inspection involves a monitoring of progress in the cancelling of the "No Conformities" up to the moment they complete all of them. The Certification Agency evaluates the audit reports, recommending the granting of the Full Category seal.

PHASE III. MAINTENANCE.

The Maintenance Phase must be reached in order to maintain the continuity of the process. It consist of five (5) annual sampling, testing and tracking of both results and the company's quality system.

It should be clarified that it is requirement that the company be equipped with a self-control of its production, and perform tests on the samples of inspection remaining in factory. Each of these stages is synthesized in Figures 1 and 2.

3. PROGRESS OF THE PROGRAM

As part of the dissemination and training of producers in this topic, several seminars were lectured in Buenos Aires and Córdoba, the cities with the largest amount of producing companies. The seminars are summarized below:

SEMINARS OF DIFFUSION OF THE TECHNICAL REGULATION

- Headquarters of the ICPA, Buenos Aires, April 19, 2005.
- FEMATEC, October 19, 2005.
- INTI Córdoba: Advances in the certification process Full Category, May 15, 2008.
- INTI Córdoba: Revision of the progress and maintenance in the Certification Process.

QUALITY AND CERTIFICATION SYSTEM

- Headquarters of the ICPA, Buenos Aires, November 22, 2005.
- INTI Córdoba: April 2006.
- Visit to the laboratories of INTI CONSTRUCCIONES and Personalized Meeting with the producers, August 2006.

To date four (4) companies have obtained the FULL CATEGORY seal and two (2) are in the initial phase for concrete blocks. Paver manufacturers have not yet adhered to the program because the revision of the IRAM 11656 standard, a process that started in the year 2006. However, there is growing interest in incorporating this product as soon as possible to the certification system.

Understanding the needs of the producers based in the inner provinces of the country, for a laboratory where to perform the tests, in order to avoid the transport of the samples and their eventual deterioration, new audit visits began to diagnose the laboratories with a potential for this. They are the Structures Laboratory of the School of the Exact, Physical and Natural Sciences of the University of Cordoba and the Research Laboratory for Soils, Concretes and Asphalts (LISHA) of the National University of the Patagonia San Juan Bosco.

4. Particular aspects of the Concrete pavers certification

The actual version of the IRAM 11656 standard is the one published in 998 and is currently under discussion. The Subcommittee for concrete pavers regularly deals with it. Changes were suggested in the following testing methods and their corresponding requirement.

- Compression strength to be changed for flexural strength, Technical Colombian Standard (NTC) 2017.
- Abrasion, Dorry method for abrasion, British/European Standard BS EN 1338/NTC 5147.

Figure 1. Phase 1 of Qualification.

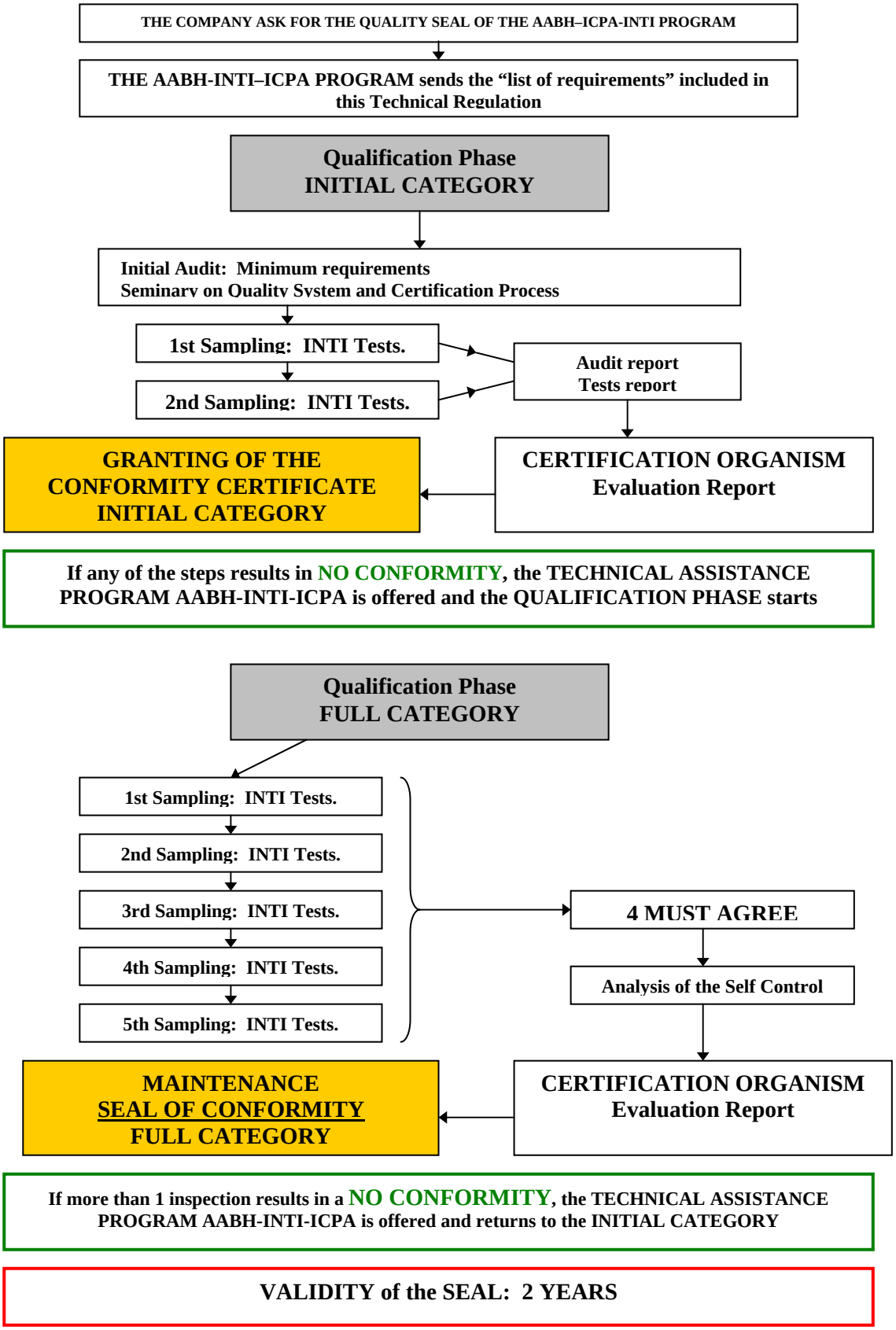
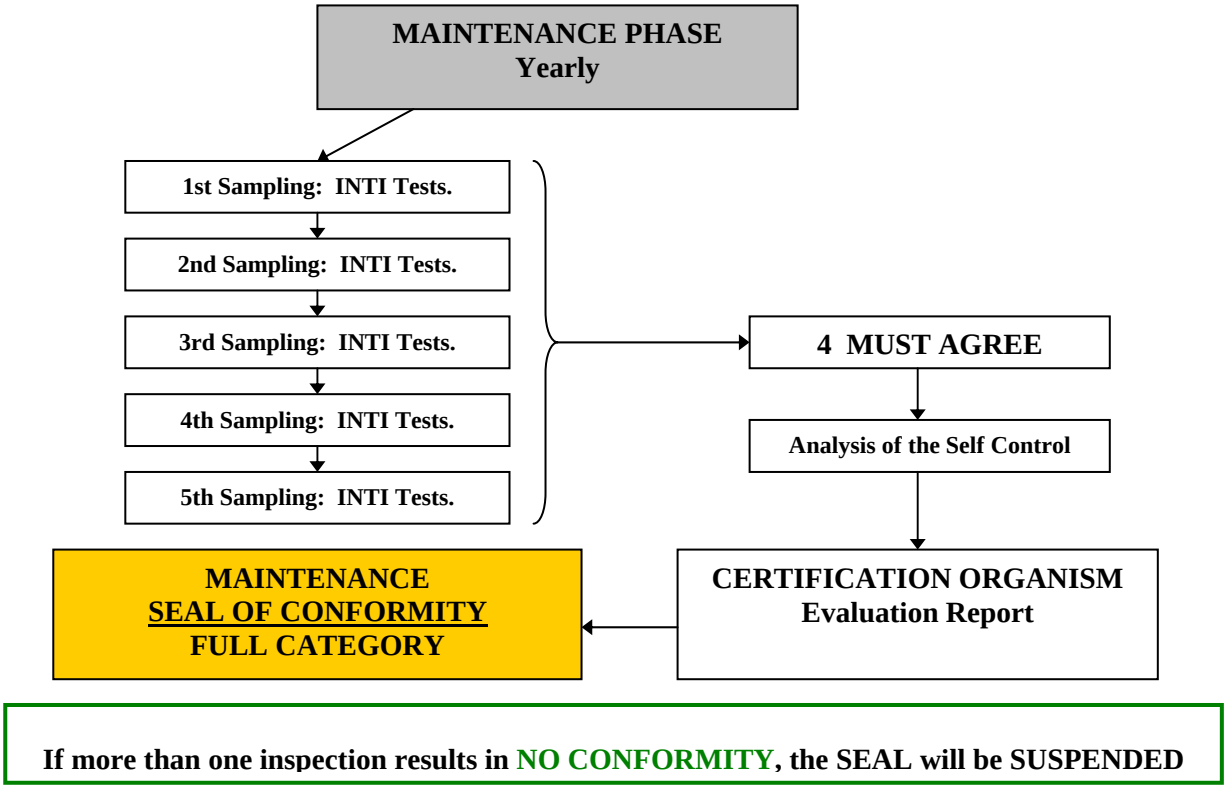


Figure 2. Phase 2, of Maintenance.



The laboratories in INTI CONSTRUCTIONS and the School of Engineering of the University of Córdoba have developed the equipment necessary to adjust to changes and are in the calibration of the methods, through the inter-laboratory comparisons.

Table 1 shows the requirements which must be evaluated in accordance with the actual standard (IRAM 11656: 1998).

The control program is based on the tests made by the laboratory of the third party (in this case INTI CONSTRUCCIONES) called "samples of verification", of the test of contrast samples remaining with the company during the sampling and self-control of the producer, according with Table 2.

5. DOCUMENTATION AND MINIMUM RECORDS

The regulation includes a listing of the minimum procedures to include in the quality system that are audited in their content and implementation. This documentation covers all the activities of the company that relate to the final product.

Table 1. Requirements for concrete pavers.

STANDARD IRAM 11.656: 1998. REQUIREMENTS AND TESTING METHODS - CONCRETE PAVERS FOR PAVEMENTS.		
DENOMINATION	**PARAGRAPHS**	**REQUIREMENT**
Defects	4.2	Fins-Hair cracks-Damaged surfaces-Damage to the edges or corners-Discontinuity of concrete.
Dimensions	4.3	Upper and lower bases (sides)-Lateral faces-Thickness. Discrepancies: Length and width-Thickness.
Water absorption	4.4	Average ≤ 5 %, Single ≤ 7 %
Wear (Dorry Method)	4.5	<1.5 mm
Compressive strength	4.6	**Type I** Average > 45 MPa, Individual >40 MPa **Type II** Average > 35 MPa, Individual >30 MPa

Table 2. Sampling for testing of verification, contrasting and manufacturer self-control.

	TESTS		
DENOMINATION	**SAMPLES FOR INSPECTION**	**SELF-CONTROL**	**CONTRAST SAMPLES**
Defects	6	X	X
Dimensions	6	X	X
Water absorption	6	---	X
Wear	1	---	---
Compressive strength	6	X	X

Table 3. List of the procedures and the records.

PROCEDURES	
A. RAW MATERIALS	Arrival control
	Aggregates size distribution
	Control of the proportion of materials in the dosage
	Annual water control
	Aggregate humidity control
	Control of admixtures
B. PROCESS	Control of the homogenization of the mixture
	Control of production during the molding
	Control of the curing-sampling of production
C. PRODUCT	The final product quality control
	Packaging of the production
	Storage
D. EQUIPMENT	Machines operation
	Operation of the forming, mixing and palletizing equipment
	Concrete plants
E. LABORATORY	Use of scales
	Presses management
	Verification of the molds
	Verification of the sieves

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RECORDS	
A. RAW MATERIALS	Reception of cements
	Reception of admixtures
	Reception of aggregates
	Aggregates humidity control
	Annual control of water
	Control of admixtures
B. PROCESS	Registration of the control of the dosage of the mixture
	Registration of the humidity control of the mixture.
	Registration of the production during the molding
	Registration of the curing control
	Registration of the production sampling
C. PRODUCT	Registration of the final product quality control
	Registration of the packaging of the production
	Registration of storage
D. EQUIPMENT	Maintenance of machines
	Maintenance of mixers
	Maintenance of concrete plants
E. LABORATORY	Verification of scales
	Verification of presses
	Verification of molds
	Verification of sieves

Figure 3. Annexes 1 and 2. Audit report.

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AUDIT REPORT INTI Construcciones

COMPANY: REPORT DATE: ANNEX 1
PRECASTING PLANT: PAGE 1/1
DATE OF THE AUDIT:
PLANT PERSONE PRESENT DURING THE AUDIT:
AUDITOR:

PARTICULAR DESCRIPTION OF THE NO-CONFORMITY ACTIONS TO IMPLEMENT:	RESPONSIBLE FOR ITS RESOLUTION	PROPOSED DATE FOR THE RESOLUTION	SEND THE EVIDENCE BY 1-MAIL 2-REQUIRES VERIFICATION IN THE NEXT VISIT/AUDIT	TRACKING

«2009 Año de Homenaje a Raúl Scalabrini Ortiz»

AUDIT REPORT INTI Construcciones

COMPANY: REPORT DATE: ANNEX 2
PRECASTING PLANT: PAGE 1/1
DATE OF THE AUDIT:
PLANT PERSONE PRESENT DURING THE AUDIT:
AUDITOR:

OBSERVATIONS	NOTIFIED RESPONSIBLE

OPPORTUNITIES FOR IMPROVEMENTS/STRENGTHS	NOTIFIED RESPONSIBLE

It should be clarified that the tasks of INTI CONSTRUCCIONES audit consist of completing a questionnaire on the main aspects the factory system like the following:

1. GENERAL REQUIREMENTS.
- 1.1 The quality system.
- 1.2 Organization.
- 1.3 Documentation.
- 1.4 Internal audits.
- 1.5 Revision of the system.
- 1.6 Records.
- 1.7 Staff.

2. INTERNAL QUALITY CONTROL.
- 2.1 Control of raw materials.
- 2.2 Specifications of the components for the use in the production of blocks.
- 2.3 Dosage.
- 2.4 Manufactured products.
- 2.5 Products for which certification is looked for.
- 2.6 Inscriptions in the documentation for issuance.
- 2.7 Production control outside specifications.
- 2.8 Curing, palletizing and dispatch.

3. TESTS FOR SELF-CONTROL OF SAMPLES.
- 3.1 Sampling and testing.
- 3.2 Records of self-control.
- 3.3 Equipment.

4. TESTS OF CONTRAST SAMPLES IN PLANT.

A copy of formats of the "No-conformities, Observations, Improvement opportunities and Strengths" detected during the audit, is delivered to the quality manager, signed by both sides of the program. In the Figure 3, it can be seen that in the format, as a sample, it is signaled the responsible for the corrective action, estimated date, form for later evaluation and follow-up.

6. BENEFITS OF HAVING THE SEAL

Both the INTI, as a certification agency, and the producers have capitalized a valuable experience, agreeing in the benefits that can bring the quality seal, such as:

- Approach to the implementation of a quality system.
- Incentive for work towards continuous improvement.
- Differentiation in the market, through quality.
- Increased competitiveness for contracts in public works.
- Forced accompaniment of the related items.
- Ingress of the certified products to the INTI CONSTRUCTIONS page. www.inti.gob.ar/Construcciones.

The particular and general needs of the producing companies for the advance in the process were detected, among them:

- Comply with the Technical Regulation.
- Implement the Quality system.
- Reception and control of raw materials: in their own or external laboratory.
- Control of the productive process.
- Control of the finished product: Self-control in own or external laboratories.
- Testing of contrasting samples in either the plant or external laboratories.

One of the emphasized topics, once the process begun, was that despite that, those samples meet the requirements of the standard, the producing companies did not understand the need to implement the quality system. In some cases, they fulfilled the requirement of drafting the procedures and instructive material but there was a lack of commitment and awareness at management level, about the importance of knowing and assimilating the process. Dissemination and discussion forums invite to clarify the benefits of the seal and the needs of the manufacturers.

7. CONCLUSIONS

It can be noted that while the first granted certificates correspond to concrete blocks, they revealed experiences that will be capitalized for the next quality seals that be granted, even to the same producing companies that make both products. These companies are waiting for the adoption of the new version of the standard for pavers, to proceed to the subscription to the program for these products, whose use is spreading out in Brazil in a growing pattern. Its ranking through the quality seal will benefit the industry as well as to the State and to the citizens.

The certification´s achievements, to date, have been very positive regarding the:

- Incorporation of new technology for process control.
- Construction of laboratories in factory.
- Purchase and calibration of instruments for laboratories.
- Traceability in the operation of their equipments.
- Prevention and detection of faults in a lesser period of time.

- Decrease of waste.
- Investment in human resources.
- Implementation of systematic training.
- Better communication between inspectors and plant workers.
- Greater motivation of the staff towards the improvement of products and processes.

The aspects to improve in the certification process include:

- Update of the technical regulation planned for 2010.
- Review of requirements for the initial stage.
- Formulation for the certification of a family of products.
- Further technical assistance for the acquisition of equipment for the plant laboratories.
- Review of the empirical controls.
- Improvement in the communication between companies and the certification bodies.
- Understanding of the benefits that involve investments in equipment and training.

8. REFERENCES

ABCP. (2002). Programa do Selo de Qualidade ABCP. Regulamento. Obtenção e Uso.

ARGENTINEAN CONCRETE BLOCK ASSOCIATION (AABH); NATIONAL INSTITUTE OF INDUSTRIAL TECHNOLOGY (INTI); ARGENTINEAN PORTLAND CEMENT INSTITUTE (ICPA). (2005). Certification program. Certification for concrete blocks and pavers. Technical regulation.

IRAM (1995) Norma IRAM 11656: 1995.

IRAM (1998) Norma IRAM 11656: 1998.

ICONTEC. Norma Técnica Colombian NTC 2017 Adoquines de concreto para pavimentos.

BRITISH STANDARDS INSTITUTE. British/European Standard BS EN 1338/NTC 5147.