

Certification of Aggregate in Bituminous Bound Mixtures

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ABSTRACT: This article provides the framework of study for a dissertation presented to the Faculty of Architecture & Civil Engineering in part fulfillment of the requirements for the Degree of Bachelor of Engineering and Architecture at the University of Malta. The study is based on research conducted on the relevance of the Construction Products Directive 89/106/CE in Malta. CPD 89/106/CE requires the use of CE marking on any product produced for incorporation in a permanent manner in construction works. For the scope of the study, the construction product examined is aggregate for bituminous bound materials in road construction. The use of the CE mark undoubtedly affects Factory Production Control, making it not just an issue of free movement of goods, but one which will have an impact on local aggregate producers. The study highlights the most important steps needed towards harmonization of Maltese road construction specifications and regulations with European specifications, and presents some recommendations towards obtaining certification on aggregates to be used in bituminous bound materials.

1 INTRODUCTION

Membership in the European Union necessitates the introduction of new regulations in all Member States. Malta is no exception. Several local scenarios need to be upgraded and harmonized with European specifications in order to line up local methods with methods performed in other Member States i.e. harmonization must take place. The road construction industry in Malta is a typical example of this. Such a membership allows Malta to be part of the European Single Market, exposing local aggregates to competition with aggregates from other sources, local and foreign. The most important recently introduced document, regarding the construction industry is the Construction Products Directive (CPD) 89/106/CE. This Directive necessitates additional controls and enhances product conformity.

2 CONTEXT – THE QUARRYING INDUSTRY IN MALTA

The Maltese islands consist of merely 316 km². Within this confined space, the extraction of limestone for the construction industry is an integral part of the Maltese economy (MRA, 2005). One may find around 28 hard stone quarries (producing aggregate from Coralline Limestone) and another 66 soft stone quarries (producing dimension stone from

Globigerina Limestone) (MEPA, 2003). The professions involved in such a large industry vary considerably in the type of work and responsibility and include contractors, construction managers, architects and engineers, material suppliers, construction lenders and security companies. This industry is a very important sector for Malta.

3 HYPOTHESIS AND SCOPE OF STUDY

The objectives of the dissertation were the following:

- (i) to analyse the aggregate production scenario in Malta, in view of CPD 89/106/CE;
- (ii) to investigate Factory Production Control (FPC) and Initial Type Tests (ITT);
- (iii) to investigate CE marking of aggregate with particular reference to bituminous bound mixtures (MSA EN 13043);
- (iv) to investigate conformity of local aggregate for bituminous bound mixtures.

4 CONSTRUCTION PRODUCTS DIRECTIVE (89/106/CE)

The Construction Products Directive is a very important Council Directive published on 21st December 1988. It focuses on the “complex global market place, affected by multiple regulatory systems, international and national standards and certification

requirements” (BSI, 2005), leading to the possibility of CE marking of products to be placed on the European market, after a specific ITT programme and detailed inspections of factories, through FPC.

The main goal of the CPD “is the removal of technical barriers in the construction products sector...” (EOTA, 2005) “to complete the Single Market” (ODPM, 2005). Finally, the implementation of the CPD leads to compliance of products with harmonized standards, a European Technical Approval or a non-harmonized recognized technical specification, for all the Member States, meaning that products are now “fit for their intended use” (EOTA, 2005).

4.1 *The difference between the CPD and other New Approach Directives*

“The New Approach and European Standardization have contributed to the development of the Single Market” (New Approach, 2005). “CPD 89/106/CE differs greatly from all other New Approach Directives since it does not deal just with a single family of products or with a single risk category, but on the contrary encompasses multiple families of products and multiple types of risk” (NIST, 2004). The CPD is more complex since it also deals with the performance of construction products when these are incorporated permanently in built structures and civil engineering works, including prefabricated elements, materials and components.

Another important difference is that the CPD “calls for Interpretative Documents to lead the way from Essential Requirements to technical specifications.” (NIST, 2004)

4.2 *The scope of the CPD*

The CPD encompasses the CE marking of many construction products and documents which accompany their marking, leading to the harmonization process of the national standards concerning construction products and to the establishment of an Internal Market for construction products through technical harmonization. It imposes a clause that products must conform to technical specifications formulated within harmonized norms, or technical European agreements. The choice of the method to be used to obtain the specified performance of the product is still up to the supplier of that particular product.

It is worth noting that the CPD seeks to obtain compliance of certain construction products with predefined criteria. This is set individually by each of the Member States. More than one technical path is offered to the manufacturer so that compliance may be achieved.

Member States are also given responsibility in the preparation of the Interpretative Documents (issued to give “concrete form to each Essential Requirement” (NIST, 2004) of Directive 89/106/CE) on which technical specifications for that same country will be based.

Furthermore, Article 6 of the CPD emphasizes the concept of freedom of goods as set out by the CPD itself and restricts the Member States from impeding this freedom. Thus, all products which satisfy all provisions of the CPD may be placed on the market and used for the intended purpose without being hindered by laws and conditions. Other products which do not comply with the provisions of the Directive may be used within the Member State if they satisfy “national provisions consistent with the Treaty until the European technical specifications provide otherwise.” (EUROPA, 1988)

4.3 *Other legislation*

The legislation of each Member State of the EU is modified to allow all texts of the Directive to be adopted by that particular country. All other legislative texts are withdrawn from use once the CPD requirements are implemented.

5 CE MARKING OF CONSTRUCTION PRODUCTS

If and when all implications the CPD imposes will be completely adopted in Malta, all construction products may be CE marked in accordance with appropriate harmonized standards, and so, the product may be presumed to perform as stated with the CE mark. The initials CE stand for Conformité Européenne meaning European Conformity. “The CE Mark is not a quality mark but a European Safety Mark” (Moody Group, 2005; BRAB, 2006), showing “that the product satisfies the essential health and safety requirements of all applicable Directives” (BSI, 2005). The CE mark, a legally binding requirement, does not imply that the manufacturer may shed off all responsibility to ensure that the product is adequately in line with what is required in the design. Thus, the performance level of the material is not assured. It is applied when products perform in a way predicted by harmonized standards. “Products which bear a CE mark may be said to satisfy all provisions and conformity assessment procedures laid out by the CPD” (European Commission, 2000). The six essential product requirements are:

- (i) mechanical resistance and stability
- (ii) safety in case of fire
- (iii) hygiene and health of users
- (iv) safety during use
- (v) protection of users from excessive noise which may be hazardous to health

(vi) low amount of energy required when the product is in use (EUROPA, 1988).

“The introduction of CE marking will have direct tangible positive effects for the construction products industry but the indirect effects, through enhanced trade opportunities, will be far greater” (EUROPA, 2005).

6 OLD AND NEW TESTING METHODS

6.1 *Replacement of standards for aggregates*

The harmonization process with new European standards and regulations requires the withdrawal of previously used test methods and the introduction of new systems. Till now, the Maltese system has been based mainly on British and American testing procedures and local regulations, such as L.N. 364 of 2003 (Government of Malta, 2004), refer to both.

6.2 *Differences and similarities in methodologies*

A thorough analysis of the new testing methods was considered necessary for the identification of differences (if any) that the introduction of the EN standards will impose on the local industry. Certain testing techniques may differ considerably while others may not differ at all. A number of tables have been compiled and have been presented in the study, in order to compare BS / ASTM and EN test methods considered to be the most suited for use in Malta.

7 METHODOLOGY OF ANALYSIS

7.1 *Analysis of the situation in Malta*

Two local quarries, together with their relevant processing plants, were chosen for analysis. Aggregate extraction and processing methods were carefully studied for each plant. Plant managers and other persons involved in the construction industry, such as lab persons, were interviewed in informal settings to form a basic understanding of how the two plants perform day-to-day tasks.

7.2 *Auditing and testing programme*

A preliminary FPC system for the two chosen plants was set up together with an aggregate testing programme, on a small scale. The FPC programme was based on the requirements of MSA EN 13043:2002 (MSA, 2002). A number of aggregate tests (in BS/ASTM and EN procedures) were chosen for aggregate originating from both plants. A thorough analysis of differences and/or similarities between the two systems was performed, to identify what implications for Malta are to be expected, when the EN

system is introduced to the full. The programme of analysis was divided into three main parts:

- (i) The setting up of a preliminary FPC (with plant managers and lab persons);
- (ii) The performance of tests on aggregate utilizing:
 - (a) BS/ASTM procedures
 - (b) EN procedures

Aggregate used for analysis was specifically chosen as originating locally from the Coralline Limestone geological strata, and samples were taken from aggregate stock piles intended for construction of roads. Sampling methods for the old and new systems were analyzed and samples were collected accordingly.

7.3 *Testing methods used*

As mentioned above, the testing procedures used followed both the currently specified test methods required by the local authorities, and the newly introduced EN methods of testing, to investigate the harmonization issue in Malta. The choice of tests to be carried out was made after studying the relevant standards and regulations adopted in Malta, with respect to aggregate for use in bituminous bound mixtures, and after analyzing which of the new EN test methods feature changes from the currently used BS or ASTM. Testing methods which were found to be identical for the two systems, such as the Soundness Value Test, were not carried out. Test methods featuring significant changes, such as the Los Angeles Test and Sieving, were performed, where apparatus was available, to analyze any changes which might feature in the results. Aggregate test results have been presented in the dissertation. The results obtained using BS / ASTM procedures have been compared with results obtained using EN procedures.

7.4 *Problems Encountered*

The range of tests offered by the European Standard EN 13043 is very vast. This list was analyzed to find those tests relevant for Malta. The major difficulty was found to be the lack of adequate apparatus in Malta, since the EN system requires the use of special apparatus for certain tests, such as special bar sieves for elongation and flakiness indices. Several labs have not had the opportunity and the funds necessary to invest in this new apparatus, since this would imply high initial investment and regular calibration costs. The testing programme had to be flexible and was finalized after numerous amendments.

8 LITERATURE SOURCES

A large number of documents referring to the CPD, implications of FPC and the CE marking process, may be found from numerous reliable websites. Several discuss the Directive and publish facts as to how this new system will affect particular Member States. Many local publications discuss the construction industry in Malta, in general. Not much literature addressing the FPC issue in Malta has been found, since the process is still in its initial stages.

9 CONCLUSION

The study, of which framework has been described, was the first attempt in Malta to set up an inspection programme for local road construction plants, oriented towards the CPD. The main aim was to put together a number of recommendations for Malta, based on an analysis of the current situation in the industry, in order to improve Malta's position regarding aggregate certification.

Unfortunately, it seems that the issue of CE marking is not taken very seriously by most stakeholders in the road construction industry yet. On the other hand, the competent authorities such as ADT and MSA are trying to set out a plan of action. A number of harmonized European Norms have already been prepared. Currently, there are plans for the harmonization of national documents which will replace current specifications.

By the CE mark, local road construction products will be able to "compete" with other products of the same level on the European Single Market. Thus, it is essential that all stakeholders collaborate in this step towards harmonization. This will be a great improvement for the local industry. Once the Directive is fully implemented in Malta, the running of the local construction industry will be different for each and every stakeholder, especially for quarry owners and managers of processing plants.

10 REFERENCES

MSA (2002) MSA EN 13043: Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas. Malta: Malta Standards Authority