

APPENDIX A CEMENT QUALITY MANAGEMENT SYSTEM

A-1. Introduction

a. The Cement Quality Management System (CQMS) is intended to provide the U.S. Army Corps of Engineers, and other Federal or governmental agencies that wish to participate, with a quality assurance program for hydraulic cements (portland cement, blended cement, expansive cement, and ground granulated blast-furnace slag) by establishing qualified sources of cements. The procedures by which qualified sources are established and maintained are intended to give the using agency reasonable assurance that a lot of cement purchased without prior testing of that lot, other than the manufacturer's quality-control testing, will comply with specification requirements. The system is based on an evaluation of the manufacturer's quality-control data, along with some testing of samples obtained from the manufacturer by the U.S. Army Engineer Waterways Experiment Station (WES). The evaluation procedure seeks to screen those manufacturers whose product appears likely to exceed specification requirements, because some properties vary excessively. The system is based fundamentally on faith that the quality-control data supplied by the manufacturer are an unbiased reflection of the product. It is intended that the product be verified by sampling at the project and by testing at WES.

b. The responsibility for monitoring this system is assigned to the Director, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

A-2. Procedures for the Establishment of a Qualified Source of Cement

a. The using agency shall request that the producing plant be designated by WES as a qualified source. WES will then contact the producer, soliciting a formal request from the producer to be designated a qualified source. The formal request is to be made to the Director, WES, at the address shown in paragraph 7*b*(1), in a letter certifying that

the plant maintains a quality-control program and that each cement, by type and option for which a qualified source under this system is requested, will meet the current American Society for Testing and Materials (ASTM) specification requirements. The designation of a plant as a qualified source will be made separately for each type of cement. Qualification may be discontinued for one type without changing the supplier's status for other types. The letter requesting qualification as a source shall be signed by a representative of the producer having legal authority to bind the company. The letter will give the name, position, address, and telephone number of an individual at each production location who may be contacted for data and shipping information and to whom reports of tests shall be directed.

b. The cost for establishing qualified-source status will be negotiated between WES and the using agency. The cost will be based on the amount of work necessary to develop the required quality history.

c. The producer requesting status as a qualified source shall provide WES with the following:

(1) A brief outline of the procedures used to control the quality of the finished product; sampling and testing frequency, test sample preparation employed, and chemical analysis methods used, such as X-ray diffraction, atomic absorption spectroscopy, or wet chemistry.

(2) Evidence that the laboratory that produced the mill test data is inspected on each inspection tour of the Cement and Concrete Reference Laboratory (CCRL) by submission of a copy of the inspection report or reports.

(3) Results of all applicable chemical and physical tests generated as a result of quality-control testing required by the relevant ASTM specification for the last 40 samples tested. For cements

purporting to comply with the heat-of-hydration requirement of Table 4 in ASTM C 150 (70 cal/g max for Type II; or 60 or 70 cal/g max for Type IV), 40 analyses of the producer's regular-production Type II or IV cement and a minimum of 10 analyses of the heat-of-hydration cement, including heat-of-hydration data generated by the producer's quality-control laboratory, will be acceptable. Critical limits must be calculated as described in ASTM C 183. If the producer is not equipped to determine heat-of-hydration, then an alternative procedure for monitoring this property must be developed and verified. WES will assist in the process as part of the work necessary to establish qualified-source status referenced in paragraph A-2*b*.

Note: ENG Form 5034, Report of Cement Quality History, on which test data may be tabulated is available upon request from WES.

(4) A 2-kg sample of each type of cement for which qualified status is requested, along with a mill certificate that represents the properties of that sample.

(5) A list of the distribution terminals and marketing points served by each producing plant.

A-3. Acceptance of a Producer as Qualified Source

a. Quality-history data in accordance with paragraph A-2*c*(3) will be evaluated for acceptance according to the following criteria:

(1) The frequency with which test results for any single property exceed the applicable specification requirements for that property shall be less than or equal to 5 percent of test results submitted for that property. Further, the amount by which these exceed the specification limit shall be no more than 5 percent of the limit.

(2) The frequency with which test results for any single property exceed the critical limit for that property shall not exceed 30 percent of test results submitted for that property.

(3) These criteria (paragraphs A-3*a*(1) and (2)) may be waived if convincing evidence is presented to indicate that materials that exceed specification or critical limit requirements can be detected and isolated and, hence, not shipped. This evidence, in addition to written explanations, may also include charts or graphs and must specifically address the properties in question. It is the responsibility of the producer to review these data prior to submittal to WES and to provide explanatory data or information if the requirements of paragraph A-3*a*(1) or (2) are not met.

b. The producer shall be advised in writing of acceptance.

A-4. Project Samples

a. Cement from a qualified producer delivered to the project site or concrete producing plant shall be sampled by a representative of the using agency and forwarded to WES for testing (paragraph A-4*d*). The recommended frequency for testing of project samples is: one sample per 1,000 Mg (1,000 tons) for conventional concrete construction and one sample per 2,000 Mg (2,000 tons) for roller-compacted concrete construction, but a minimum of one sample per project per year, or when, in the opinion of the using agency, the field performance of the cement indicates the need for a checktest.

b. Samples shall be sent to WES, Structures Laboratory (ATTN: CEWES-SC-E), 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, and identified on ENG Form 5035, Project Sample Identification, as follows: (1) project name, location, and contract number, (2) source of cement (manufacturer), (3) silo or lot number, (4) type and specification, (5) date shipped to project, (6) carrier identification (rail car number, truck name and number), and (7) description of the field performance problem, if any, for checktest samples. Necessary forms and sampling supplies are available upon request from WES.

c. Project samples will be tested for compliance with project specifications as noted on sample

identification, and results will be reported to the using agency.

d. The procedures for taking project samples will be in accordance with ASTM C 183 and supplementary instructions provided by WES to ensure that the material submitted to WES represents material shipped from the qualified source.

A-5. Retention of a Producer as Qualified Source

a. Quality-history data in accordance with paragraph A-2c(3) must be submitted every 6 months for evaluation in accordance with paragraph A-3a.

b. A 2-kg sample along with a mill certificate must be sent to WES with the 6-month quality history.

c. CCRL inspection reports on file at WES must be updated after each biannual CCRL inspection.

d. The producer shall be advised in writing of retention. An updated list of producers shall be maintained by WES.

A-6. Removal of a Producer from the Qualified Source List

a. Qualified-source status will be discontinued when the project, for which the using agency made the request, is completed.

b. Qualified-source status may be removed prior to the completion of the project if:

(1) Results of tests of any 3 of a series of 10 consecutive project samples of that type exceed the critical limit for any applicable specification property.

(2) An individual project sample fails to meet specification requirement by more than 5 percent of the value of the specification requirement.

(3) More than 1 in 10 project samples exceed any specification requirement by any amount.

c. A producing plant may also be removed for failure to submit data every 6 months as described in paragraph A-5.

d. Prior to removing a plant from the list of qualified sources, WES shall take appropriate measures to confirm the validity of the sampling procedures and the representativeness of the sample or samples that yielded the results prompting removal. In addition, WES shall confer with all relevant using agencies and the producer.

e. The producer and using agency shall be advised immediately by telephone followed by written notice of removal action. Test data, field performance data, or both will be provided to indicate the cause for such action.

A-7. Procedures for Reinstatement to Qualified List

Once a plant is removed from the qualified list as a source of a type of cement, reinstatement may be gained in the following manner:

a. Submit a written request for reinstatement to the Director, WES. This request shall present reasons why it is anticipated that the circumstances that led to removal will not be expected to recur.

b. Provide WES with samples of current production for test and evaluation, if requested.

c. If the data provided in paragraphs A-7a and b indicate that the reasons that led to removal are not expected to recur, WES shall reinstate the plant to the list of qualified sources of that type of cement.

A-8. Inspection of Producer Facilities

The plant and terminal facilities of a producer participating in this program may be visited periodically by a representative of WES to review procedures employed and project requirements and to provide guidance in the functional procedures of

the program. These visits should be conducted in a manner to promote better understanding and good working relationships between the laboratory and the producer company officials and to afford the laboratory an opportunity to maintain current knowledge of production and storage facilities of the cement mills and terminals.