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Test Code for Hydraulic Bitumen Concrete

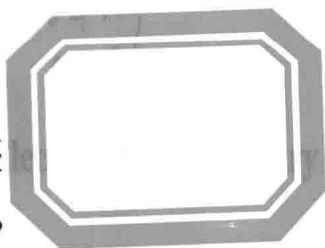


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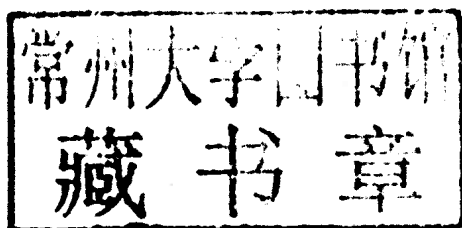
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Foreword

This Standard is prepared in accordance with the *Notice of 2003 year's Additional Planning of Professional Standard Establishment* referred to Document No. 2003-873 issued by General Office of the National Development and Reform Commission.

As a construction material, bitumen concrete has been widely used in construction of different hydraulic structures both in China and abroad. The bitumen concrete technology has been well developed through its application in past decades. In China, bitumen concrete has been used in construction of large-scale hydraulic structures of many projects, such as the Tianhuangping pumped-storage project, the Maopingxi earth and rock-fill dam of Three Gorges Project, the Yele Hydropower Station, the Nierji Water Resources Project and others. With its successful application on these projects, rapid progress has been made in bitumen concrete technology. In order to meet the development of construction of hydropower and water resources projects and coordinate the improvement of similar standards in China and abroad, this Standard is prepared through widely seeking comments and referring to relevant domestic and foreign standards. As a result, some relevant contents applicable to hydraulic bitumen concrete from both domestic and foreign standards have been adopted in this Standard. Furthermore, attention has been paid to specific features of the hydraulic bitumen concrete.

This Standard is proposed by China Electricity Council.

This Standard is under jurisdiction of the Standardization

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1 Scope

This Standard specifies the test methods for bitumen, filler, fine aggregate, coarse aggregate and bitumen concrete.

This Standard is applicable to bitumen concrete used for hydropower and water resources projects.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 260 *Determination of Water Content in Petroleum Products*

GB/T 3536 *Petroleum Products-Determination of Flash and Fire Points-Cleveland Open Cup Method*

GB/T 4507 *Standard Test Method for Softening Point of Bitumen (Ring-and-ball Apparatus)*

GB/T 4508 *Standard Test Method for Ductility of Bitumen*

GB/T 4509 *Bitumen-Determination of Penetration*

GB/T 4510 *Test Method for Determination of Breaking Point of Bitumen*

GB/T 5304 *Asphalt thin-film Oven Test Method*

GB/T 6003.1 *Test Sieves of Metal Wire Cloth*

GB/T 6003.2 *Test Sieves of Perforated Metal Plate*

GB/T 11147 *Asphalt Sampling Method*

GB/T 11823 *Marshall Test Machine for Bituminous Mixtures*

GB/T 17671 *Method of Testing Cements-Determination of Strength*

3 Terms and Definitions

The following terms and definitions are applicable to this Standard.

3.0.1

Bitumen density

The bitumen mass per unit volume at specified temperature range.

3.0.2

Bitumen penetration

The depth that a standard needle vertically penetrates a sample of the material under known conditions of loading, time and temperature.

3.0.3

Bitumen penetration index

A temperature sensibility parameter that describes the variation degree of bitumen penetration in accordance with temperatures; this index is calculated by a stipulated method based on the penetrations obtained at different temperatures.

3.0.4

Bitumen ductility

The distance to which it will elongate before breaking when two ends of a briquette specimen of the material are pulled apart at a specified speed and at a specified temperature.

3.0.5

Bitumen softening point

The temperature at which the deformation of bitumen specimen, under a given load applied with a specified method at specified

temperature-rising rate, reaches a given value.

3.0.6

Bitumen solubility

The content of dissolved materials derived from bitumen samples immersed in specified solvent.

3.0.7

Bitumen flash point

The temperature of bitumen specimen at which the vapor of specimen heated at a specified temperature-rising rate is ignited by an ignition source under specified conditions of test and the flame flashes out right away.

3.0.8

Bitumen fraass breaking point

The temperature of bitumen coat applied on a metal sheet, at which the cracks and fissures appear on the surface of the bitumen coat chilled and bended under specified conditions.

3.0.9

Filler

The fine mineral particles or mineral powder with grain size less than 0.075 mm used for filling in bitumen mixture, and generally processed from alkaline rocks such as limestone by means of crushing and grinding. Cement, slaked lime and fly ash may also be used sometimes as filler.

3.0.10

Mineral materials

A general term for coarse aggregate, fine aggregate and filler.

3.0.11

Hydrophilic coefficient of filler

The ratio of the volume of filler deposited in water to that in

kerosene, representing the adhesiveness of filler with bitumen.

3.0.12

Bitumen mixtures

The mixture of bitumen and mineral materials, mixed but not hardened.

3.0.13

Bitumen concrete

The mixture of bitumen and mineral materials, mixed, cooled down and set.

3.0.14

Bitumen mortar

The mixture of bitumen, fine aggregate and mineral materials, mixed, cooled down and set.

3.0.15

Maximum density of bitumen concrete

The mass of bitumen concrete without porosity per unit volume.

3.0.16

Bitumen concrete density

The dry mass of bitumen concrete per unit volume.

3.0.17

Bitumen concrete Marshall stability

The maximum allowable load applied to bitumen mixture and measured by Marshall test apparatus under the specified conditions.

3.0.18

Bitumen concrete Marshall flow value

The radial deformation of bitumen concrete specimen with maximum load applied during Marshall test.

3.0.19

Stiffness of bitumen material

The stress required to cause unit strain inside bitumen specimen under certain test conditions, defined as a function of temperature and loading duration.

3.0.20

Bitumen content

The ratio of the bitumen mass in bitumen mixture to the total mass of bitumen mixture.

3.0.21

Bitumen aggregate ratio

The ratio of the bitumen content to the mineral material mass in the bitumen mixture.

3.0.22

Repeatability test

Tests on the same object conducted independently in a short period by the same operator with the same equipment in the same laboratory with the same test method.

3.0.23

Reproducibility test

Tests on the same object conducted independently by different operators, with different equipment in different laboratories with the same test method.

4 General

4.0.1 This Standard adopts the square opening sieves in compliance with GB/T 6003.1 and GB/T 6003.2, with the aperture size of 31.5 mm, 26.5 mm, 19.0 mm, 16.0 mm, 13.2 mm, 9.5 mm, 4.75 mm, 2.36 mm, 1.18 mm, 0.60 mm, 0.30 mm, 0.15 mm and 0.075 mm. The square opening sieves for hydraulic concrete aggregate may be used for the test, provided that it is proven to satisfy design requirements.

4.0.2 Bitumen samples shall be kept hermetically, prevented from sunning, moisture and pollution, and marked with their original sources, types, dates, places and personnel of sampling. Emulsified bitumen samples shall be stored and protected from freezing in winter. Sampling for quality arbitration shall be conducted by the personnel of suppliers and users together. After sampling the sample shall be sealed up and marked with stamp and signature of representatives of the two parties concerned. The reheating of bitumen samples shall not be conducted for more than two times.

4.0.3 The sampled mineral materials shall be typical. Samples may be taken consecutively, and also may be obtained from different locations as required by the test. Then the samples shall be mixed thoroughly and divided by the quartering method to the required quantity. Varieties, sources and sampling dates shall be recorded. The filler shall be stored in well-sealed state.

4.0.4 The bitumen mixture sample shall be marked with the project name and locations, sampling time, sampling places, number of samples, sampling personnel, bitumen types and grades, varieties of mineral materials and mixture temperature.

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4.0.5 In case the result of test is not consistent with the precision of the corresponding repeatability test, the test shall be re-conducted.

4.0.6 Besides the specifications of this Standard, the test shall also comply with the compulsory provisions of relevant national standards.

5 Bitumen

5.1 Sampling

5.1.1 Purpose and scope

This section stipulates the bitumen sampling method and is applicable to all bituminous materials.

5.1.2 Apparatus

1 Sampler: a means used to take samples, conforming to the stipulations in GB/T 11147.

2 Container: a can used to hold bitumen which is selected subject to the state of bituminous materials; wide-mouth seal metal cans with caps for liquid bitumen or viscous bitumen, wide-mouth PVC barrels with caps for emulsified bitumen and plastic sacks for solid bitumen.

5.1.3 Procedures

1 Preparation:

Samplers and containers shall be clean and dry with caps tightly fitted.

2 Quantity:

For liquid bitumen, not less than 1 L; for emulsified bitumen, not less than 4 L; for viscous bitumen and solid bitumen, not less than 1.5 kg.

3 Sampling:

1) Sampling from storage tank.

Storage tanks without agitator: for liquid bitumen or viscous bitumen made liquid by heating, close filling valve