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NATIONAL STANDARD OF
THE PEOPLE'S REPUBLIC OF CHINA

中华人民共和国国家标准 **GB**

Code for Design of Reinforced Concrete Silos
钢筋混凝土筒仓设计规范

GB 50077-2003

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Chief Edition Department: China Coal Industry Construction Society
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NOTE

This code is the English translation of Code for Design of Reinforced Concrete Silos GB 50077-2003. In the event of any inconsistency between the Chinese-language text of the Code and the present English-language text of the Code, the Chinese-language text shall be taken as ruling.

**Announcement of the Ministry of Construction of People's Republic of
China
No. 203**

**Announcement Concerning Promulgation of the National Standard
*Code for Design of Reinforced Concrete Silos***

The *Code for Design of Reinforced Concrete Silos*, with the code number of **GB50077-2003**, has been approved as a national standard, and shall become effective as of January 1st, 2004. In this code, clause 3.1.6, 3.1.7, 3.1.9, 5.1.1, 5.2.1(1), 5.4.1(4), 5.4.2(2), (3), 5.4.3, 6.1.11, 6.8.5, 6.8.7, A.1.3, A.1.5 are compulsory articles, which must be implemented. At the same time, the former national code, *Code for Design of Reinforced Silos GBJ77-85*, shall be annulled immediately.

This code is organized by the Standardization Institute under the Ministry of Construction, and issued by the China Planning Press.

**The Ministry of Construction The People's Republic of China
December 11, 2003**

Foreword

This code is revised based on the previous version of the national standard of People's Republic of China, *Code for Design of Reinforced Concrete Silos* GBJ77-85, in accordance with JZH [1992] No.490 document issued by China Planning Committee and the JBJ No. 10 document issued by the Ministry of Construction in 1992.

This code is revised in accordance with the rules of national standards of People's Republic of China, *Uniform Standard for Design of Reliability Degree of Architecture* GB 50068 and *Uniform Standard for Reliability Degree of Engineering Structures* GB 50153.

This code consists of 6 chapters, 8 appendixes & clause explanations. The texts include: general, terms and symbols, arrangement and structure selection, loads on structure, structure calculation and configuration. The appendixes include: physical characteristic parameter for stored materials, stress around the hole opening and calculation of wall of interstice silos, values of coefficients ξ , k , λ , internal force of thin film of rotating shell under the symmetrical loads, rectangular silo to-be-calculated in accordance with the internal forces of plane members, pressure calculation equations for stored materials in groove silo and shallow-circular silo, impact coefficient for stored materials, and strength reduction coefficient of concrete and reinforcements under the high temperature actions, strength of pre-stressed reinforcements, friction coefficient, calculation coefficient of secondary bending moment and secondary shearing force, and explanations for terms in the code.

The revised contents in this time include: add a chapter of terms and symbols; revise and supplement the contents of Chapter three of arrangement rules and structure selection of silos in accordance with the development and practices of silos in China; add the sub-item coefficient of permanent loads, variable loads and accidental loads, combination of loads and combination coefficient into Chapter four of loads on structures, and add the additional pressure on the silo wall due to eccentric discharge, homogenization silo and air pressure transferring, ambient temperature difference; in Chapter five, define the rates of deformation and fissures of structural members of silos under the normal critical use states clearly in the structure calculation, and clearly stipulate the hole opening in the shallow circular and silo wall, and using the weight of stored materials to pre-compress subgrade and pre-stress strength ratio for silos; in Chapter six, except for revising part clauses, add the pre-stress contents for circular silo; in the appendixes, the calculation equations for width of fissures in silo wall and silo bottom in the original Appendix II has been deleted, and add the calculation equations for stress around hole opening and wall of interstice silos, at the same time, add articles for design of trough bunker, over-loading pressure calculation equation for stored materials in shallow circular bin, compact coefficient of stored materials, reduction coefficient of design strength of concrete and reinforcements under the high-temperature actions and other contents.

The clauses highlighted with bold face later of the code are compulsory clauses that shall be implemented strictly.

With the development of national economy, the structure and type of reinforced concrete silo have developed somehow; however, because the application scope and engineering practice experiences are very limited, all the changes have not been added into the new code. All the organizations and departments shall sum up experiences gradually during the use of the code so as to supplement, better and approve the code; please offer the related advice and data to the management office of silo code of

Beijing Huayu Engineering Co. Ltd., China Coal International Engineering Corporation. The management office is responsible for the interpretation of the code. The address is No. 67 of Ande Road of Dawai Street, Beijing, China; the postal code is 100011; the organization is General Institute of China Coal International Engineering.

The main compilation organization in this revision is Sino-coal International Engineering Design & Research Institute, i.e., previous General Conceptual Design Institute of the Ministry of Coal; whereafter renamed Beijing Coal Design Institute. Because the previously-determined compilation organizations and staffs have changed greatly, this time of revision has got assents from the original compilation organizations and staffs which have been involved in the revision of the code in recent years and still have been the compilation organizations of the code in this time.

Main compilation organization, participation organization and main drafters:

Main compilation organizations: General International Engineering Design Institute of China Coal Industry

Participation organization: Changsha metallurgy design institute

Zhengzhou cereals and oilseeds food engineering institute

Xi'an design institute of coal industry

Han'dan design institute of coal industry

Original foreign loan affair management office of national domestic trading bureau

Tianjin cement industrial design institute

National trading engineering design institute

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North China electrical institute

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1 Generals

1.0.1 In order to implement the present national technical and economic policies during the reinforced concrete silos to materialize the advanced technologies, safety, appliance, economy, rationality and to assure the quality, establish this code.

1.0.2 This code is applicable to the design of the cast-in-place reinforced concrete silos for storage of granular materials and the mixture silos for blending powder materials with compressed air, with the plane shape of circle or rectangle. This code is not applicable to the design of silos for storing succulence and fibrous granular materials.

1.0.3 The designs of silos can be divided into designs of deep bin and shallow bin. For the rectangular shallow bin, the silos can be classified into hopper bin, low-wall shallow bin and high-wall shallow bin. The classification standards shall comply with the following specifications:

1 When the ratio of the calculation height h_n of stored materials in silo to the internal diameter d_n of circular silo or to the short side length b_n of rectangular silo is greater than or equivalent to 1.5, the silo is a deep bin; when the ratio is less than 1.5, the silo is a shallow bin.

2 For a rectangular silo, when there are no walls of silo, it is a hopper silo; when the ratio of wall height of silo h to the shallow side length b is less than 0.5, the silo is a short-wall shallow bin; when the ratio is greater than or equivalent to 0.5, the silo is a high-wall shallow bin.

1.0.4 The design of reinforced concrete silos, except that it shall comply with this code, shall observe the specifications of the related active national compulsory standards.

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