

墙体改革

与可持续发展

• 丁大钧 编著

INNOVATION OF WALLS
AND SUSTAINABILITY
OF DEVELOPMENT



机械工业出版社
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本书是我国著名学者丁大钧先生关于墙体改革与可持续发展的最新著作。主要内容包括：结论，墙体改革的大方向，砌体结构的试验研究和计算，墙体改革途径，建筑节能，国外墙体材料生产和应用简介以及技术展望等。并着重对墙体改革途径中的烧制品、蒸压制品和胶凝制品进行了介绍。

本书适合建筑结构设计、施工及监理相关人员使用，也可供高等院校建筑结构相关专业师生参考。

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上海新华名苑别墅



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天山二村住宅(试点)



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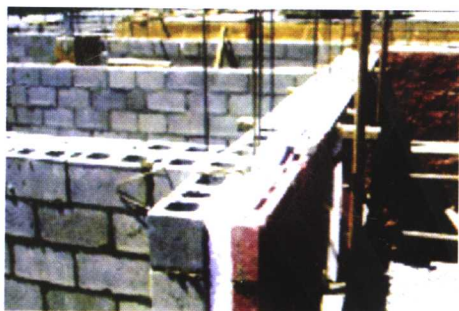


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前 言

编者从 1953 年开始学习前苏联先进的砖石结构以及配筋砖石结构按破坏阶段的计算方法,认为它的先进性体现在不是静止地看问题,而是辩证地看待事物的本质。如对无筋砌体的偏心受压,考虑截面物理重心轴随荷载的变化而偏移向荷载一边,即实际偏心距不断地减小而导致承载力比按初始偏心矩确定的要增大很多,有时可高达 1 倍;至于对网状配筋砖砌体,考虑其结构的纵向压缩,横向膨胀使水平钢筋起作用而间接提高砌体轴向承载力,比拟螺旋钢筋混凝土柱,因而提出“三向受压理论”,编者一直也在有关编著中引用,在此却未考虑砌体的特点而导致“三向受压理论”的错误。编者也一直到了 20 世纪 80 年代中才发觉并经试验证实,因无筋砌体的破坏是在发生纵向裂缝延长后导致小砖柱失稳而引起的,并不是因为砖块被压碎而引起砌体破坏,那些横向配筋的作用正是拉住被裂缝分开的小砖柱以避免过早失稳而导致承载力提高这一新的原理。编者曾进行过无筋砌体乃至空斗墙的试验研究和网状配筋砌体的试验研究以及其他的砌体理论研究。

我国《砌体结构设计规范》是世界先进规范之一,有些内容在国际有关领域居领先地位,这是很多从事有关工作的同行努力的结果。编者在很多方面也得到他们的帮助和支持。

编者从 1956 年起连续担任《砖石结构》教材主编。1965 年完成的初稿在我校印出若干样本送 14 所兄弟高校征求意见,后因文化大革命而未正式出版。中华人民共和国国家标准《砖石结构规范》(GBJ3—1973)颁布后,1981 年主编出版了《砖石结构》教材第 1 版,《砌体结构设计规范》(GBJ3—1988)和 (GB50003—2001),陆续颁布,因而 1990 年出版了《砌体结构》教材第 2 版,并于 2004 年出版了《砌体结构》教材第 3 版。在主编教材中,编者从相应规范中学到很多东西。

往往说“有中国特色的”，那么什么是有中国特色的砌体结构（包括混凝土结构）呢？编者认为，在此即是：计算简单，符合实际，构造先进，方便可行。

从《砌体结构设计规范》（GBJ3—1988）颁发后，我国正式开始发展砌块砌体结构，十几年来发展是迅速的，虽然还有许多工作要做，不少缺点待克服，但把“禁实”工作大大向前推进了一大步。

编写本书是本人在 2003 年发表同名论文后承机械工业出版社约稿的，在原编写提纲的基础上，进一步学习有关文献后，特别是《砖瓦》（月刊）、《建筑砌块与砌块建筑》（双月刊）后，觉得墙体结构的发展途径不仅有“烧结制品”和“水泥制品”（扩大改为“凝结制品”），还必须加“蒸压制品”，而且这是很重要的途径，因为“蒸压”较“烧结”可减轻对大气的污染，应特别提出来。此外应增加“建筑节能”和“国外墙体材料生产应用情况简介”。虽然学习不深，写得不多，但必须列出以作今后补充的基础。最后增加“展望”一章，这只是个人学习的体会，可能会存在一些错误。

为了增加感性知识，使其对墙体改革增加决心和信心，书中列出一些有关建筑照片，这是获得有关同志授权的，在这方面得到了国内外很多同行和朋友的热情支持，在此谨表示衷心的感谢。应编者要求，出版社会刊出少量彩照。限于成本，大部分只能割爱了，敬乞赠照片同志鉴谅。

墙体改革现在已呈百家争鸣，百花齐放的大好局面。

本书稿四易其稿并一一打印出，在打印出“定稿”后，又感到某些章节安排不合适，又作了重要调整，即打印了第五次。在誊清章节目录时，发现第 2 章有些节是欠妥的，因不足以称“大方向”，故又作了局部改写。连同手稿，堆叠高至盈尺，使编者深有感触，觉得如不是众多朋友帮助，以编者个人力量，完成此稿是很难想像的！

由于本人知识面的限制，和缺乏生产实践经验，挂一漏万，甚至对介绍的生产设计实践的经验，也可能有误，敬希读者指出以便再版时更正。

下面列出在编写本书时给予帮助与支持的单位和个人以表示衷

心的感谢。如有漏误，敬希指出以便更正，幸甚。

为了便于国际交流，英译了前言和章节目录。

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丁大钧于东南大学

2005年6月

Introduction

Since 1953, the author began to learn the advanced calculation method following failure stages of non-reinforced and reinforced masonries, used in the former SSCR. The author considered that its advantage embodies considering problems not following static view but following dialectical one to look at the essence of things, as an example, for the eccentrical compression of non-reinforced masonry, considering the change of physical gravity center axis with loading, i.e., the actual eccentrical distance e_0 is changed (decreased) and not kept with a constant to result in a larger increase of load-bearing capacity, as for comparison with that determined following the initial e_0 , sometimes to increase by one time. As for the brick masonry reinforced with fabric reinforcement, considering transverse expansion of masonry under longitudinal compression to make the horizontal reinforcement into action increasing indirectly the axial load-bearing capacity of masonry as in concrete column with spiral steel, therefore a "3-dimension compression" theory is suggested, cited by the author in relevant text books, where the character of masonry was not considered to lead a mistake in the "3-dimension compression" theory. Up to the 1980s the author discovered this problem and confirmed through tests. Because the failure of non-reinforced masonry occurs due to the instability of little columns of 1/2 brick separated by continuous longitudinal cracks and not due to the crush of bricks. The transverse steel will tie the little brick columns to avoid their instability in earlier time so as to increase the load-bearing capacity, therefore the author has established this new theory. The author has conducted a series of experimental studies on non-reinforced brick masonry, including on cavity brick wall masonry and reinforced brick masonry with fabric reinforcement as well as the other theoretical studies of masonry.

Chinese "Design Code for Masonry Structures" is one of the advanced

codes in the world, there are some contents occupy the leading position, it is the effort result by many colleagues being engaged in the relevant tasks. The author has also much help and support from them.

Since 1956, the author has undertaken continuously the Author-in-Chief of the text book on “Masonry Structures” . In 1965, he had finished the first manuscript of text book, which had been pressed at this university and offered 14 relevant universities for review, but finally it was not formally published due to the Great Cultural Revolution. Following the State Standards of the People’s Republic of China GBJ3—1973, in 1981, the author edited-in-chief the 1st Edition of the text book. Afterwards, GBJ3—1988 and GB50003—2001 were revised and published in succession, the 2nd and 3rd editions of this text book edited-in-chief by the author were published respectively in 1990 and 2004. Hence the author has learned very much from relevant Codes.

People say always a term “with Chinese character” . Then what is the meaning of this term? For an example, in the concrete, what is the meaning of “masonry structures (including concrete structures) with Chinese Character”? The author considers that Chinese Character means the calculations are simple and consistent with the actual, the construction is advanced and conveniently feasible.

After the publication of “Design Code for (brick/block) Masonry Structures” (GBJ3—1988), it was begun in China to develop block masonry structures. In more than 10 years, the development is rapid. Though there are many tasks wanted to do, and some defects in code should be overcome, yet the work on “prohibition to use solid clay bricks” has been greatly advanced.

After the publication of article in 2004 by the author with the same title as this book which was appointed by China Mechanical Industry Press to edit. The original edition outline was drawn out following the article. After having further learned relevant materials, especially the “Brick - Tile” (monthly) and “Building Block & Block Building” (bimonthly), the author considers in the development ways of walls, there are not only “fired products” and “cement

products" (expanded as "gelling products"), it is necessary to add "autoclaved products", which is a very important way, because the "autoclaving" will decrease pollution to atmosphere than "firing", so it should be specially put forward. Besides it is needful to add "energy savings of buildings" and "brief introduction to the production and application of wall materials in foreign countries", for these topics, the author learns not deeply more, but to give these subjects as the foundation of later compliment. Finally the chapter of "prospects" is added following the author's personal learning experience, there may be many mistakes.

For adding perceptual knowledge to increase the decision and confidence to the innovation of walls, in this book, many coloured photos of some relevant buildings are given, which must be obtained the authorizations to be cited from the relative persons, the author has kind help from many colleagues and friends, he wishes to express here his heartfelt thanks. Under author's demand the Press agrees to publish a few of the photos in colour, and to publish the main part in white-black due to the consideration of cost. The author begs the pardons from the friends to give him coloured photos.

Now in wall innovation there has emerged a good aspect that a hundred flowers blossom and a hundred schools of thought contend. Owing to the limitation of the author's knowledge, and the lack of practical experience in production, it is difficult to avoid the defect for one thing cited, ten thousand may have been left out. Even in the introduction of production experience and design practice, there may appear in mistakes, the author do hope the original authors and readers to point out so as to correct in the new edition.

This book manuscript has been changed for four times and typed out every time. After "the definitive draft" was typed, the author considered the arrangement of some section was not appropriate and made important adjustment, i. e., the 5th draft was typed. In writing the Catalogue of Chapters and Sections, the inappropriate sections in Chapter 2 was discovered, because they are not worthy to call the "general orientation", the author has to re-edit locally. To pile all the typed and the handwritten drafts reaches to a height of

one Chi (33cm) . The author has a deep feeling and is surprised that if there are not so much kind help from many friends, it is hard to imagine to finish this manuscript!

In the following, the name list of institutions and personals, from them the kind help has been obtained during editing this book, if there are some missed out, do hlp to point out so as to be completed. It will be very fortunate indeed.

For the international exchange, the author translates the Catalogue of Chapters and Sections as well as the Introduction into English.

The name list for thanks is given as follows:

The Editorial Boards of “Brick-Tile” (monthly) and “Building Block & Block Building” (bi-monthly) as well as the Museum of Nanjing City Wall History.

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