

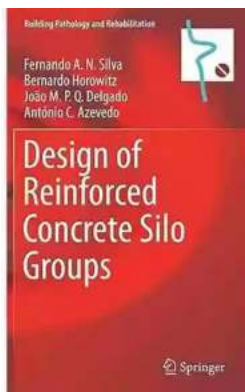
Design of Reinforced Concrete Silo Groups: Building Pathology and Rehabilitation

Reinforced concrete silos are prominent structures used in various industries for storing bulk materials such as grains, cement, and chemicals. These silo groups often play a crucial role in the functioning of industrial facilities, ensuring a steady supply of raw materials for production. However, over time, these silos can deteriorate due to various factors, such as weathering, chemical exposure, or structural deficiencies.

Understanding the building pathology of reinforced concrete silo groups is essential to ensure their longevity and structural integrity. This article will discuss the design principles, common pathology issues, and potential rehabilitation techniques employed for these structures.

Design Principles for Reinforced Concrete Silo Groups

The design process for reinforced concrete silo groups involves careful consideration of several factors, including functional requirements, structural stability, and material properties.



Design of Reinforced Concrete Silo Groups (Building Pathology and Rehabilitation Book 10)

by Mohammed Dib(1st ed. 2019 Edition, Kindle Edition)

★★★★★ 5 out of 5

Language	: English
File size	: 22448 KB
Text-to-Speech	: Enabled
Screen Reader	: Supported
Enhanced typesetting	: Enabled
Word Wise	: Enabled
Print length	: 124 pages



Functional requirements:

- The volume of material to be stored
- The flow characteristics of the stored material
- The required discharge rate

Structural stability:

- Load calculations, including dead loads and live loads
- Design of foundations and support structures
- Analysis of lateral pressures due to granular material

Material properties:

- Properties of concrete, including strength and durability
- Reinforcement detailing and placement
- Surface finishes and protective coatings

Building Pathology of Reinforced Concrete Silo Groups

Despite design considerations, reinforced concrete silo groups can develop various pathology issues over time. Some common problems include:

- Concrete corrosion: Exposure to moisture and chemical substances can lead to the corrosion of reinforcing steel, weakening the structure.

- **Cracking:** Incorrect design or poor construction practices can result in cracks, allowing moisture and other contaminants to penetrate the concrete.
- **Structural failures:** Overloading, settling of foundations, or inadequate maintenance can lead to structural failures, endangering personnel and assets.
- **Material degradation:** Stored materials can chemically react with the concrete, causing degradation and affecting the integrity of the silo.

Rehabilitation Techniques for Reinforced Concrete Silo Groups

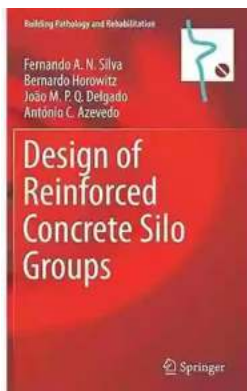
When facing building pathology issues, rehabilitation techniques can be employed to restore the functionality and structural integrity of reinforced concrete silo groups:

- **Corrosion control:** Applying protective coatings or cathodic protection systems can prevent or slow down the corrosion process.
- **Crack repair:** Various methods such as epoxy injections or polyurethane sealants can be used to seal cracks and prevent further moisture ingress.
- **Strengthening and retrofitting:** To address structural deficiencies, techniques such as carbon fiber reinforcement or external post-tensioning can be applied.
- **Material compatibility:** Selecting appropriate materials for repairs and implementing chemical-resistant surface coatings can mitigate further degradation issues.

Designing reinforced concrete silo groups involves considering several important factors to ensure their functional and structural reliability. However, building pathology issues can develop over time, requiring proper rehabilitation

techniques to restore their integrity. By understanding these issues and employing appropriate rehabilitation methods, the lifespan of these silo groups can be prolonged, contributing to efficient industrial operations.

Keywords: reinforced concrete silo groups, building pathology, rehabilitation techniques, design principles, corrosion control, crack repair, strengthening, retrofitting, material compatibility



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This book offers a new calculation procedure of the structural behavior of grouped layout of silos, easy to use and with satisfactory responses.

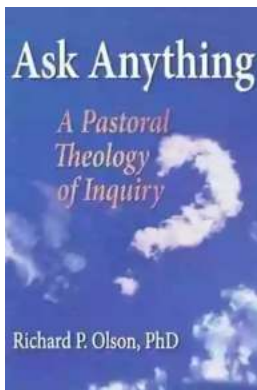
Groups of reinforced concrete silos are structures commonly used in the food industry, where it is usually necessary to separate the storage of different types and sources of grain.

The grouped layout of silos has numerous benefits when compared with single-cell silos in which the emphasis is on creating further space for silage, normally referred to as interstice – a space formed between the edges of the group's cells.

This economic benefit, on the other hand, raises a structural problem for the designer of this type of building, which is to assess the magnitude of bending moments and hoop forces due to the structural continuity of the walls in the interstice region of the cells. Bending moments assume extreme values exactly when the interstice is loaded and the other cells in the group are empty.

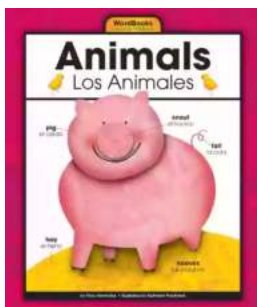
To develop the formulation of the proposed analysis models, a parametric study was carried out that allowed the adequate consideration of the variables involved.

The idea is to help professionals, engineers, industrials and academics involved in this advanced interdisciplinary field as a comprehensive guide for courses offered at different levels of learning (undergraduate and postgraduate).



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