Research on Warehouse Management and Inventory Counting for Small and Medium-sized Projects

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Abstract

This paper systematically elaborates on the key processes, on-site management methods, and data processing standards of warehouse inventory management. In terms of inventory procedures, it proposes the integration of dynamic and static inventory counting, directional inventory counting, and sealing principles to improve inventory efficiency and accuracy. At the level of on-site management, it introduces practical measures such as bidirectional verification of physical labels, coordinate-based storage location coding, the establishment of odd-lot areas and transfer areas, and measurement using standard containers. In the data processing section, it emphasizes the standardization of modifications to original records, the principles of blind recounting, and recommendations for material use and disposal. These methods help optimize warehouse management, reduce human errors, and enhance information system integration capabilities.

Full Text

Research on Warehouse Management and Inventory Counting for Small and Medium-sized Projects

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Abstract: This paper systematically expounds the key processes of warehouse inventory-counting management, on-site management methods, and data-processing standards. With respect to the inventory-counting process, it proposes integrating dynamic and static inventory counts, directional counting, and sealing principles in order to improve counting efficiency and accuracy. At the level of on-site management, it introduces practical measures such as two-way verification of physical labels, coordinate-based storage-location coding, the establishment of broken-lot areas and transfer areas, and measurement by standard containers. In the data-processing section, it emphasizes the standardization of modifications to original records, the principle of blind recounts during rechecking, and recommendations for material use and disposal. These methods help optimize warehouse management, reduce human error, and improve the ability to interface with information systems.

Keywords: Construction engineering; resource management; warehouse management; inventory-counting process

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Research on Inventory Management and Counting for Small and Medium-sized Projects

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Abstract: This paper systematically elaborates the key procedures of warehouse inventory management, on-site management methods, and data processing standards. In terms of inventory process, it proposes combining dynamic and static counting, directional counting, and sealing principles to improve efficiency and accuracy. For on-site management, it introduces measures such as dual verification of physical labels, coordinated location coding, dedicated broken-case zones and transit areas, and standard container measurement. In data processing, it emphasizes standardized modification of original records, blind recount principles, and suggestions for material usage and disposal. These methods help optimize warehouse management, reduce human errors, and enhance the ability to interface with information systems.

Key Words: Construction Engineering; Resource Management; Warehouse Management; Inventory Process

0 Introduction

The textbook for first-class constructors points out that material management falls under resource management and includes material planning and on-site material management (including material procurement, acceptance and storage of materials entering the site), among other content. It particularly emphasizes the ABC classification method based on the relationship between the amount of funds tied up in inventory materials and the number of varieties. In this method, Class A varieties account for 5–10% of the total number of varieties, but their monetary value accounts for 70–75% of the total funds.[1]

Peng Zhan pointed out in his paper such problems as insufficient personnel assigned to warehouse inventory positions, relatively large discrepancies between the system and physical items, and an insufficient number of people participating in inventory counts, and put forward recommendations such as daily inventory counting.[2]

In summary, in current research, the strategies and principles for inventory counting in project warehouse management remain a research gap. Taking Plot 40-0 in Jinhui Town as an example, this paper describes inventory-counting strategies and principles for reference.

1 Project Inventory-Counting Strategy

1.1 Inventory-Counting Process

The design of the inventory-counting process is one of the key elements in overall planning for stocktaking. It directly determines the efficiency and accuracy of the count, and mainly includes combining dynamic and static counting, counting from one direction to another, and applying sealing principles.

1.1.1 Combining Dynamic and Static Inventory Counts

Traditional warehouse management adopts a static full-count model. This approach has the following characteristics: inbound and outbound warehouse operations must be stopped during the count; short-term, high-intensity work increases the probability of counting and statistical errors; and the timeliness of traceability is limited.

For an inventory count that combines dynamic and static methods: for high-frequency materials or high-value materials, establish a dynamic cycle count before the end of work each day. Only 10–20 types of materials and materials with inbound or outbound activity on the previous day are counted. This approach makes it possible to distribute the workload evenly, discover discrepancies easily and in a timely manner, and conduct the count without requiring work stoppage.

1.1.2 Directionality of Inventory Counting

To avoid duplicate counts and omissions when counting large quantities of materials, the count should proceed from one area to another and from one direction to another, avoiding random counting. In actual operation, basic routes such as "from inside to outside, from left to right, and from top to bottom" may be used.

1.1.3 Sealing Principles for Inventory Counting

For boxes, racks, or pallets that have already been counted and verified, physical sealing should be performed using disposable cable ties, seals, or numbered self-adhesive labels. This is helpful when multiple people participate in the count: it avoids duplicated labor, clearly defines boundaries, and prevents abnormal removal or use.

1.2 On-Site Management

On-site management work is very detailed and fragmented, but it also tests the competence of warehouse-management personnel. It mainly includes two-way verification of physical labels, coordinate-based storage-location coding, dedicated remnant-area boxes and transit areas, and standard-container measurement.

1.2.1 Two-Way Verification of Physical Labels

Use duplicate labels: one copy is affixed to the box as an "XX Date Counted" label, and the stub is attached to the inventory count sheet. Missing labels or missing stubs both indicate abnormalities, making the situation clear and explicit. A more routine method is cross-check confirmation.

At the same time, a red abnormality line should be set at locations such as shelves, so that during the count it is immediately clear whether stacking exceeds the height limit or safety standard.

1.2.2 Coordinate-Based Storage-Location Coding

Storage locations should be refined at least into three levels: "area–row–level." This is very user-friendly for warehouse keepers with ordinary comprehension ability, and also facilitates rapid outbound shipment and improves efficiency. It is a fault-tolerance measure against reduced efficiency and increased error rates caused by personnel turnover and material adjustments, and it can reduce the difficulty of memorizing locations.

1.2.3 Dedicated Remnant-Area Boxes and Transit Areas

Remaining materials from opened packages should be placed in transparent sealed bags and labeled as remnants. Materials found during the count that are damaged, unlabeled, pending scrapping, or otherwise problematic should be physically transferred to the transit area to avoid contaminating normal data. The supporting operating system for the transit area is as follows: all materials entering the transit area must be registered in a ledger, with the source, problem description, discovery date, and responsible person recorded, and a deadline for completion of processing specified.

1.2.4 Standard-Container Measurement

For large quantities of tiny standard parts, such as washers, standard containers should be used; for example, the quantity may be measured by weighing. This is an effective tool for replacing manual counting with physical methods. In actual operation, several standard containers with known weights should be prepared; a "quantity–weight" correspondence table for materials in the standard containers should be established; and calibration measures should also be provided.

1.3 Data Processing

Data processing is a core preliminary step for integration with the company' s OA system. It mainly includes measures for correcting original records, the blind recount principle for review counts, and principles for recommendations on material use and disposal.

1.3.1 Measures for Correcting Original Data Records For quantity statistics of some materials (for example, the number of sheets in a stack of paper), a two-round review method is adopted: if the two counts in forward and reverse order are consistent, the count is accepted; if the two counts are inconsistent, the item is counted five times, ensuring that the final three counts are consistent. Corrections to inventory-sheet recording errors are standardized: the erroneous number is crossed out with a single horizontal line, the correct number is written beside it, and the correction is accompanied by a signature and the time of modification. At the same time, all historical records are retained.

1.3.2 Blind Recount Principle for Review Counts After the initial count is completed, the reviewer must conduct the recount using a blank form. It is strictly prohibited to take the initial-count data and "check against" it. Only an independent and complete second checklist recorded through a blind recount can reveal the true errors in the initial count.

1.3.3 Principles for Recommendations on Material Use and Disposal Competent warehouse managers can, based on inventory conditions, provide relevant personnel with recommendations on material use (such as batches) and material disposal, thereby avoiding problems such as expiration, deterioration, and capital being tied up.

Where conditions permit, warehouse management should be equipped with specialized software.

At the same time, relevant parties should follow principles such as transporting small quantities in multiple trips.

2 Summary

Taking the small- and medium-sized project in Plot 40-04 of Jinhui Town as a practical case, this paper systematically reviews strategies for warehouse-management inventory counts. In terms of the inventory-count process, it proposes combining dynamic and static inventory counts, conducting directional path-based counts, and applying the principle of physical sealing, thereby effectively balancing the workload of inventory counting with operational continuity and reducing the risks of duplication and omission. In terms of on-site management, measures such as bidirectional verification of physical-item labels, coordinate-based location coding, the establishment of leftover and transfer areas, and measurement using standard containers improve the visualization level of on-site operations. In terms of data processing, the paper emphasizes standardized correction of original records, the blind recount principle for review counts, and recommendations on material use and disposal, thereby strengthening data traceability and decision-support capability.

The above methods are grounded in the practical constraints of small- and

medium-sized projects, such as limited resources, frequent personnel turnover, and a relatively low level of informatization. They therefore have strong operability and low-cost potential for wider application. Practice has shown that this inventory-counting system can significantly reduce discrepancies between accounts and physical stock, improve inventory-counting efficiency, and lay a foundation for subsequent integration with enterprise OA systems or warehouse-management software. In the future, semi-automated methods such as mobile-terminal QR-code scanning for inventory counts may be further explored to improve the efficiency of warehouse management in small- and medium-sized projects.

References:

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Author contribution statement:

Cui Lei: proposed the research idea, drafted the paper, and revised the final version.

Note: Figure translations are in progress. See original paper for figures.