

Standard Operating Procedure

 (SOP)

# Storage of Cement and Fly Ash (or other supplementary cementitious materials) in Multi-Compartment Silos for NCDOT Compliance

## 1. Purpose

This SOP establishes the requirements and procedures for the proper storage of Portland cement and Fly Ash (or other supplementary cementitious materials) in a single silo divided by a bulkhead partition, ensuring compliance with NCDOT, NRMCA, AASHTO, and CPMB standards.

## 2. Scope

This SOP applies to all NCDOT-approved Ready-Mixed Concrete Plants that utilize a multi-compartment silo for cementitious materials.

## 3. References

- NCDOT Standard Specifications for Roads and Structures – Section 106.

- AASHTO M 157 – Ready-Mixed Concrete Specifications

- NRMCA Plant Certification Checklist (Section 2: Materials Storage)

- Concrete Pavement Manufactures Bureau (CPMB) Standard 100 (Concrete Plant Standards) – Latest Edition

- ACI 232.2R-96 – Use of Fly Ash in Concrete

- ASTM C94 – Specification for Ready-Mixed Concrete

## 4. Definitions

* Bulkhead Partition: A robust structural divider, typically double-wall steel, used to separate compartments within a silo.
* Multi-Compartment Silo: A single silo structure divided into separate compartments for storing different cementitious materials.
* Unloading Line Verification: The process of ensuring that material discharge lines are correctly connected to prevent cross-contamination.

## 5. Responsibilities

* Plant Operator: Ensure silo meets design and maintenance requirements.
* Quality Control Technician: Conduct inspections and maintain records.
* NCDOT Inspector: Verify compliance during plant audits and annual certification.

## 6. Requirements

6.1 Partition Design

* The divider must be a full-height, full-width double-wall bulkhead, airtight and structurally sound, extending continuously from the top of the silo to the discharge opening. Include an inspection hatch or walkway for visual verification.
* Bulkhead must be airtight/gas-tight to prevent cross-contamination.
* Include an inspection hatch or walkway for visual verification.

6.2 Leak Detection

* Provide access for manual inspection of partition integrity.
* Inspect for any signs of leakage or material crossover.

6.3 Labeling & Dust Control

* Compartments must be clearly labeled as Cement and Fly Ash (or other SCM).
* Install level sensors for each compartment.
* Use dust collection systems (baghouses or equivalent) to prevent emissions and contamination.

6.4 Certification & Inspection

* Perform annual inspection of silo structure and bulkhead.
* Perform additional inspections after major maintenance or modifications.
* Maintain documentation of unloading line verification at least once per year.
* Record corrective actions if deficiencies are found.

## 7. Procedures

7.1 Before Use

* Verify that bulkhead is intact, airtight, and free from leaks.
* Check labeling and confirm compartments are properly designated.
* Confirm sensors and dust collection systems are operational.

7.2 During Operation

* Ensure correct material is delivered to the designated compartment.
* Verify unloading lines before and after each delivery to prevent cross-contamination.

7.3 Periodic Inspection

* Conduct monthly visual inspections of bulkhead integrity.
* Perform annual comprehensive inspection and document findings.
* Complete NCDOT Compliance Checklist (see Appendix A).

## 8. Documentation

* Maintain inspection logs for at least 3 years.
* Keep unloading line verification forms in plant records.
* Store NCDOT audit reports in compliance file.

## 9. Non-Compliance

 If any requirement is not met:

* Immediately halt storage operations in the affected silo.
* Notify NCDOT Materials & Tests Unit.
* Implement corrective action and document resolution.

## Appendix A: NCDOT Compliance Checklist

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| --- | --- | --- | --- |
| Requirement | Details | Pass  | Comments/Findings |
| Partition Type | Double-wall bulkhead extends the full height and width, airtight, includes inspection hatch/walkway. | [ ]  |  |
| Leak Detection | Manual inspection capability, no cross-contamination observed. | [ ]  |  |
| Labeling & Dust Control | Compartments labeled, level sensors, dust collectors operational. | [ ]  |  |
| Certification & Inspection | Annual inspection and unloading line verification documented. | [ ]  |  |

Inspector Name and Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_