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Draft Sri Lanka Standard
SPECIFICATION CODE OF PRACTICE FOR STORAGE OF PADDY
(FIRST REVISION) (DSLS 686 :)

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මෙම කෙටුම්පත ශ්‍රී ලංකා ප්‍රමිතියක් ලෙස නොසැලකිය යුතු මෙන් ම භාවිතා නොකළ යුතු ද වේ.
இவ்வரைவு இலங்கைக் கட்டளையெனக் கருதப்படவோ அன்றிப் பிரயோகிக்கப்படவோ கூடாது
This draft should not be regarded or used as a Sri Lanka Standard.

අදහස් එවිය යුත්තේ : ශ්‍රී ලංකා ප්‍රමිති ආයතනය, 17, වික්ටෝරියා පෙදෙස, ඇල්විටිගල මාවත, කොළඹ 08.

Comments to be sent to: SRI LANKA STANDARDS INSTITUTION, 17, VICTORIA PLACE,
ELVITIGALA MAWATHA, COLOMBO 08.

හැඳින්වීම

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අදාළ අංශ භාර කමිටු මාර්ගයෙන් ආයතනයේ මහා මණ්ඩල වෙත ඉදිරිපත් කිරීමට පෙර , ලැබෙන සියලුම විවේචන ශ්‍රී ලංකා ප්‍රමිති ආයතනය විසින් සලකා බලා අවශ්‍ය වෙනස්කම් කෙටුම්පත සංශෝධනය කරනු ලැබේ.

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XX

Introduction

This Draft Sri Lanka Standard has been prepared by the Sri Lanka Standards Institution and is now being circulated for technical comments to all interested parties.

All comments received will be considered by the SLSI and the draft if necessary, before submission to the Council of the Institution through the relevant Divisional Committee for final approval.

The Institution would appreciate any views on this draft which should be sent before the specified date. It would also be helpful if those who find the draft generally acceptable could kindly notify us accordingly.

All Communications should be addressed to:

The Director General
Sri Lanka Standards Institution,
17, Victoria Place,
Elvitigala Mawatha,
Colombo 08.

**Draft Sri Lanka Standard
CODE OF PRACTICE FOR STORAGE OF PADDY
(First Revision)**

DSLS 686:

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17, Victoria Place,
Elvitigala Mawatha,
Colombo 8,
Sri Lanka.**

Draft Sri Lanka Standard
CODE OF PRACTICE FOR STORAGE OF PADDY
(First Revision)

FOREWORD

This Standard was approved by the Sectoral Committee on Agriculture and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on

The seasonal nature of paddy production, in conjunction with year-round consumer requirements had always made it necessary to store paddy for long periods. However, inherent metabolic activities of the paddy and also external agents of deterioration result in substantial qualitative and quantitative losses in storage. Storage losses are considerable, especially in Sri Lanka with a damp tropical climate favourable for paddy deterioration. The principal causes of loss of quality and quantity are metabolic changes (respiration, sprouting) in the paddy and the attack of microorganisms (bacteria and moulds) and of invertebrates (insects and mites) and vertebrate animals (rodents, birds). The magnitude of these losses highlights the need for promoting a rapid improvement in techniques of conservation of paddy. The proper storage of paddy is essential for obtaining an acceptable rice produce that meets requirements of specification.

This code of practice is subjected to the provisions of the Food Act No. 26 of 1980, the Control of Pesticides Act No. 33 of 1980 and the regulations framed thereunder.

In the preparation of this code of practice the valuable assistance derived from the publications of the International Organization for Standardization and the Codex Alimentarius Commission is gratefully acknowledged.

1 SCOPE

This code of practice prescribes the general practices in the processing of paddy from harvesting, threshing, drying, cleaning and storage of paddy in order to arrive at rice that is safe and of good quality for desired use.

2 REFERENCES

- SLS ISO 712 Method of test for determination of moisture content in cereals and derived products – reference method
- SLS 1528 Storage of cereals and pulses
 - Part 1: General recommendations for the keeping of cereals
 - Part 2: Practical recommendations
 - Part 3: Control of attack by pests

3 DEFINITIONS

For the purpose of this Standard the following definitions shall apply:

- 3.1 bag type storage:** Storing of paddy in bags usually made of jute, polyethylene, and other packaging materials.
- 3.2 bulk storage:** Storing grain in bulk, without the use of bags.
- 3.3 cleaning:** Separation of undesirable material from paddy.
- 3.4 drying:** The process of removing excess available water from the paddy through evaporation by the application of heat.
- 3.5 dunnage (pallet):** Wooden or plastic (food grade) frames used on concrete floors for stacking bags to prevent direct contact between the grains and the floor.
- 3.6 fumigation:** The process of using chemicals in the gaseous state to control pest in paddy in a form of fumes.
- 3.7 harvesting:** The process of cutting and collecting the crop from the field, either with the hand tools or with the use of machines and, bundling and piling of the crop in a dry place in preparation for threshing.
- 3.8 hermetic storage:** A sealed storage system based on the generation of an oxygen and moisture depleted and carbon dioxide enriched inter granular atmosphere by respiration of the living organisms in the dried paddy.
- 3.9 milling:** The process of
- a) dehulling (or dehusking) removing the hull (or husk) from the paddy grain, in order to get brown rice
and
 - b) polishing (or whitening) removing the bran, pericarp, testa and aleurone layers from the brown rice
- 3.10 paddy (paddy rice or rough rice):** Rice retaining its hull or husk after threshing.
- 3.11 pests:** Organisms that are capable of causing injury and economic/ commercial loss to paddy. These organisms include birds, rats and mice and any other vertebrates and insects or any other invertebrates, fungi, bacteria, viruses, mycoplasma and weeds.
- 3.12 silo:** A unit consisting of several tall bins having height greater than their diameter used for storage and handling of paddy in bulk and fitted with necessary equipment and accessories.
- 3.13 storage:** The provision of a place or space for the paddy to preserve its quality while waiting for a better market or for future use.

3.14 threshing: The process of removing the paddy grains from the panicles by means of rubbing, impact and stripping actions.

3.15 warehouse: The building used for storing paddy in bags.

4 PREPARATION OF PADDY FOR STORAGE

4.1 Harvesting

4.1.1 Correct timing at harvest should be practiced to avoid losses incurred by harvesting too soon or too late.

4.1.2 The optimum harvest time should be chosen depending on the variety planted. In general, indicators for optimum harvesting time for paddy are as follows:

- a) 80 – 85 percent of the grain have changed from green to golden yellow colour;
- b) the dryness of the flag leaves of the panicles;
- c) the grain moisture content is between 20 - 25 percent; and
- d) 30 days after 50 per cent flowering.

4.1.3 During harvesting operation, the moisture content should be determined in several spots of each load of the harvested grain.

4.1.4 Harvesting shall not be performed within the pre harvest safety period of application of any pesticide.

4.2 Threshing

4.2.1 Harvested paddy should be threshed simultaneously on the day of harvest.

4.2.2 Harvesting and threshing should be done separately for lodged, patches that have been attacked by pest and with contaminated grains.

4.2.3 Threshing machine should be properly cleaned and maintained to avoid contaminants.

4.2.4 Technical adjustments of the machine should be carried out according to the manufacturer specification and instructions.

4.3 Drying

4.3.1 When necessary pre-cleaning before drying should be carried out to remove large amounts of straw or other plant material.

4.3.2 Solar drying is allowed however drying in roads shall be prohibited.

4.3.3 The depth of grain for sun drying should be maintained from 30 mm to 50 mm. Proper tempering and mixing methods should be adopted during sun drying.

4.3.4 Surface of drying should be clean and free of contaminants.

4.3.5 Adequate monitoring and attention should be given to the grains dried to protect paddy from adverse weather conditions.

4.3.6 Manufacture guideline should be followed when mechanical drying machines are used.

4.3.7 Proper hygiene and sanitary practices should be followed to avoid contamination of paddy.

4.3.8 Paddy of different moisture contents should not be mixed.

4.3.9 Uniform drying should be done to avoid hot and wet spots and mechanical damage due to handling.

4.3.10 Paddy should not be subjected to excessively high drying temperatures in order to preserve nutritional quality and suitability for milling or other processing.

4.3.11 Excessive drying, fast drying and rewetting of grains should be avoided.

4.4 Cleaning

4.4.1 Grain should be cleaned properly using appropriate technique to remove damaged and immature kernels and other foreign matter and dead and live insects and to prevent any contamination.

5 STORAGE

5.1 Paddy to be stored shall be clean, dry, free of foreign matters and uninfested with storage pests.

5.2 The optimum grain moisture content for safe storage of paddy should be 13 per cent to 14 per cent when tested by calibrated moisture meters in accordance with **SLS ISO 712**.

6 STORAGE IN WAREHOUSE

6.1 Bag Type Storage

6.1.1 The bags should facilitate aeration and should be made of nontoxic food-grade materials that do not attract pest and are sufficiently strong to resist storage for longer periods.

6.1.2 Empty bags should not be stored in the same warehouse as paddy or rice.

6.1.3 Bags once used should be carefully treated before storage. They should be turned inside out and brushed well. After spraying with an insecticide they should be dried thoroughly and stored for future use.

6.2 The warehouse

6.2.1 The warehouse should be designed and constructed with the following objectives;

- a) protection from weather;
- b) provision for closing up the whole store or opening it up as much as possible to protect the grain from high atmospheric humidity;
- c) provision with ample light and avoid the store should not be dingy;
- d) prevention of entry of pest, rats and birds; and
- e) prevention of damage to the building during loading and unloading of grain, especially by vehicles.

6.2.2 Site location and surrounding

6.2.2.1 There should be direct access to appropriate forms of transport system. There should be ample space to facilitate movement and maneuvering of vehicles within the location.

6.2.2.2 The site of the warehouse should be away from reservoirs and rivers. And also the water table should be low and it should not be a marshy land.

6.2.2.3 The site shall be dry and located at areas that are free from flooding or water logging.

6.2.2.4 The warehouse should be constructed away from sources of potential hazards that may affect the quality of produce and pose risk to the worker's health and safety.

6.2.2.5 The long axes of the warehouses should be oriented across the prevailing wind.

6.2.2.6 Warehouses shall not be located near busy public facilities.

6.2.2.7 The surroundings should be clear of vegetation to prevent mutual shading and pest entrance.

6.2.2.8 The load-bearing capacity, resistance to compaction and drainage characteristics of soil in which the warehouse is to be constructed should be considered.

6.2.2.9 The location and distance of the warehouse from other farm structures or the production area should also be considered during construction.

6.2.2.10 Space shall be provided for future expansion.

6.2.2.11 Electricity, communication, water services and drainage shall all be available.

6.2.3 Structural Requirements

6.2.4 Foundation

6.2.4.1 Foundation should be constructed at least 3 m above the peak water table and should be hermetically treated.

6.2.5 Floor

6.2.5.1 The floor should be adequately strong and capable of withstanding heavy loads and vibrations.

6.2.5.2 The floor shall be elevated or constructed higher than the existing ground. The floor should be 1m above the ground to permit easy loading or unloading into trucks at the sides of the warehouse.

6.2.5.3 There shall be provisions for wear resistance and safety (refractoriness and elimination of skidding risks).

6.2.5.4 The floor should be smooth and easy to clean.

6.2.5.5 Floor should be made from durable, nontoxic, and non-adsorbent materials.

6.2.5.6 Floor should be free from cracks and crevices and moisture proof.

6.2.6 Walls

6.2.6.1 The walls should be sound.

6.2.6.2 The wall should be made of durable, impervious, crack-resistant materials that can be cleaned easily.

6.2.6.3 The internal surfaces of the walls shall be smooth and free from projections to eliminate dust-laden surfaces.

6.2.6.4 The walls should be painted white or any light colored material.

6.2.6.5 Any openings in a store shall be doors or ventilators that can be opened and closed well.

6.2.6.6 A waterproof barrier should be incorporated into the base of the walls.

6.2.6.7 A concrete strip about 1 m wide shall be laid around the warehouse to prevent rain from eroding the base of the walls below the damp course.

6.2.6.8 Partition walls should be constructed to separate the stored bagged grains from other postharvest facilities installed in the warehouse.

6.2.7 Roof

6.2.7.1 Internal pillars supporting roof frames shall be avoided because it can interfere with the pest control and other stock management procedures.

6.2.7.2 Roof frames made of wood or steel shall be designed so that they transfer the weight of the roof to the supporting columns or to the walls.

6.2.7.3 Roof should be provided with the necessary lateral and vertical wind brace to resist forces due to strong winds and earthquakes.

6.2.7.4 The strength of the roof construction should be sufficient to handle the weight of the strongest winds that can be expected.

6.2.7.5 The roofing materials made of galvanized iron sheets and shall be in light colors. The external surface should be reflective or light colored to minimize the amount of heat that it can absorb.

6.2.7.6 The chosen roofing materials should be fire proof and with refractory.

6.2.7.7 Roofing tiles should not be allowed for large warehouses.

6.2.7.8 There should be no opening between the wall and the roof to avoid entry of pests and to minimize contamination. In the event that the existing warehouses have gaps between the roof and the wall, a mesh should be installed to prevent entry of animals, and pests.

6.2.7.9 The roof should be a good thermal insulator and should be tolerant to attacks by birds, pest and moulds. Further the roof should not provide harbourage for pests.

6.2.7.10 Translucent roofing sheets should be used at desired intervals which would eliminate the need of artificial lighting.

6.2.7.11 Eave should be wide enough and the pitch of the roof should be between 17° and 22° .

6.2.7.12 Roof overhang at eaves level should be sufficient to protect the walls from rain water.

6.2.7.13 Rainwater drainpipes should be closely spaced, of sufficient size and installed without bends.

6.2.7.15 Roof gutters and downpipes may be used to carry rain water, but downpipes should not be allowed to run down inside of the warehouse. Further, downpipes should be rodent proofed to keep away rodents.

6.2.8 Doors and windows

6.2.8.1 There shall be at least two doors so as to be able to rotate stocks on a first in, first out basis.

6.2.8.2 The door shall be wide for easy access and fit tightly for insect control and fumigation.

6.2.8.3 Preferably the door shall be made of steel or at least reinforced along their lower edges with metal plate as protection against rodents.

6.2.8.4 If sliding or folding doors are fitted, they shall be opened outwards in order not to reduce the storage capacity of the warehouse.

6.2.8.5 A canopy shall be constructed over every entry door to allow continuous loading and unloading even when it rains.

6.2.8.6 Openings leading to the exterior should be installed with mesh screen windows.

6.2.9 Functional Requirements

6.2.9.1 The internal layout of the warehouse should be designed in accordance with the First in -First out method of holding inventory.

6.2.9.2 Warehouse operations shall be identified and the in-out flow of stocks from one operation to another and identify the proper places of every operation.

6.2.9.3 Stacks should be inspected as often as possible to detect hot spots and pest infestation.

6.2.9.4 Operational procedure should ensure easy identification of different varieties and easy movement of stocks.

6.2.9.5 Operational procedure should minimize wide fluctuations in the temperature of the stored grain.

6.2.10 Stacking and piling system

6.2.10.1 Bags should be stacked in such a way that the stack is of manageable size and is in no danger of falling over.

6.2.10.2 Bags made of woven polypropylene have a tendency to slide on each other, and therefore shall not be stacked more than 3 m high. Jute sacks bind together better, and maybe stacked up to 6 m above the floor. No stacks should be larger than 6 m x 9 m.

6.2.10.3 Stacking around pillars or against walls should be avoided.

6.2.10.4 There should be an alleyway between stacks and between stack and wall, wide enough (minimum 750 mm). It is best to paint the stack plan on the floor as a permanent feature.

6.2.10.5 Stacks should not be more than 16 bags high. There should be at least 900 mm space between roof frame and top of the stack.

6.2.10.6 The piles shall be stacked in a tight, neat and squared off manner.

6.2.10.7 Space between piles shall be 1m wide. A minimum of 1m space between the edge of the pile and the wall shall be provided.

6.2.10.8 An updated bin card should be attached to every pile. The standard information in the bin card should be the following:

- a. Date received or procured
- b. Source of stock
- c. Moisture content
- d. Quantity of bags
- e. Variety

6.2.11 Dunnage

6.2.11.1 Bags should not touch the floor and should be stacked on pallets or incorporate a water impermeable layer between the bags and the floor.

6.2.11.3 Pallets, square timbers or any local substitute should be used as the base of all the stocks of grains. The pallets may be covered with clean empty sacks or plastic sheets to prevent accumulation of spilled grains beneath the pallets.

6.2.11.4 Plastic or treated wooden pallets should be allowed.

6.2.12` Environmental control

6.2.12.1 Warehouse should be well ventilated and prolonged exposure to sunlight should be avoided.

6.2.12.2 Ventilation and/or insulation systems should be designed and constructed to provide proper aeration and to maintain the desired temperature. Moreover, these should be maintained in normal conditions and cleaned regularly.

6.2.12.3 Ventilation openings should be fitted on the outside with anti-bird grills and on the inside with insect screens (removable for cleaning).

6.2.12.4 Adequate natural ventilation openings should be provided with shutters so that ventilation may be controlled.

6.2.12.5 In addition to natural ventilation exhaust fans should be installed.

6.2.13 Drainage

6.2.13.1 Proper drainage system should be installed to prevent water stagnation.

6.2.13.2 The drainage canals should be protected by a grille.

6.2.14 Lightings

6.2.14.1 Lightings should be provided to allow adequate and effective cleaning of the warehouse facility and to ensure that storage operations can be carried out in a hygienic manner.

6.2.14.2 Shatterproof materials should be used to enclose the lightings fixtures inside the warehouse to ensure that the paddy are protected from contamination due to breakages.

6.2.15 Good Warehouse-keeping

6.2.16 Warehouse maintenance

6.2.16.1 There should be a monthly scheduled inspection of warehouse for the presence of any holes, leakages or damages in the structure.

6.2.16.2 Structural defects should be immediately and properly repaired.

6.2.17 Warehouse hygiene and sanitation

6.2.17.1 The warehouse and its immediate surroundings shall be thoroughly cleaned and treated prior to storage operation.

6.2.17.2 Routine cleaning should be carried out in accordance with the cleaning schedule and be recorded.

6.2.17.3 The warehouse should be free from unnecessary materials like pieces of lumber and old machines.

6.2.17.4 The entire warehouse structure should be cleaned and brushed down at least once a month to prevent contamination from dirt.

6.2.17.5 The surrounding areas of the warehouse should be free of weed.

6.2.17.6 A weekly cleaning of the periphery of the piles should be done to remove dust and webs and to eliminate the possible breeding place of rats, birds, and insects.

6.2.17.7 Warehouse, as well as, pallets (used or unused) and machines should be cleaned immediately upon paddy disposal to remove accumulated grain residues, dust, and cobwebs.

6.2.17.8 After cleaning, residual spraying should be applied to the entire storage structure, which includes walls, floors and posts.

6.2.17.9 Torn bags should be immediately mended to avoid spillages, collapse of the pile, and further attack from pests.

6.2.17.10 Unserviceable empty bags and totally damaged grains should be properly disposed.

6.2.17.11 A separate room should be provided for pesticides and cleaning materials.

6.2.17.12 Bags and pallets should be properly stored in a separate portion of the warehouse and stacked neatly and orderly and provided with a physical separator.

6.2.17.13 Proper signage should be provided for all rooms.

6.2.17.14 No portion of the warehouse should be used as living quarters.

6.2.17.15 A pest monitoring and inspection program should be in place to prevent harborage and breeding of pests on the grounds and within the warehouse facility.

6.2.17.16 Whenever stocks are disposed and the warehouse is vacated, residual spraying of the whole or sections of the storage structure with chemical pesticides should be carried out after thorough cleaning.

6.2.17.17 Rodent control through the use of traps or poison baits should be carried out regularly.

6.2.18 Stock maintenance and preservation

6.2.18.1 Representative samples shall be taken randomly from a batch of bagged paddy and measured using calibrated moisture meters.

6.2.18.2 Newly received paddy with moisture content above 14% should be temporarily stored and subjected to drying to moisture content 14% and below.

6.2.18.3 Laborers shall be discouraged and prevented from using hook to maintain the integrity of the bags and avoid spillages.

6.2.18.4 The spillages shall be immediately collected. These collected grains may either be placed into bags and piled separately or cleaned and added to busted bags.

6.2.18.5 At least 100 g sample of every variety of stocks stored in the warehouse should be maintained at the warehouse office for easy reference.

6.2.18.6 The warehouse temperature, humidity as well as grain temperature should be checked and measured at regular interval.

Damaged grains that are no longer fit for consumption shall be disposed immediately.

6.2.18.7 Daily inspection of stocks should be done to detect signs of infestation so that pest control measures should be recommended and effected.

6 BULK STORAGE

7.1 Bulk storage structures should have the basic requirements of warehouse mentioned in the clause 6.

7.2 The bulk storage structures should be aerated the grain by circulating air to maintain proper and uniform temperature, and minimize development of hotspots on grains.

7.3 Bulk storage in “flat stores”

7.3.1 The interior of premises and their surroundings and all handling equipment be cleaned and treated.

7.3.2 When bulk filling is done to the walls of the building, the walls should be strong enough to withstand the lateral pressure.

7.3.3 The surface of the bulk should be levelled to improve the air movement. And also adequate ventilation should be ensured.

7.4 Silo storage

7.4.1 The silo should be rigid enough to carry the designed load.

7.4.2 Materials used for construction should be appropriate to the size of the silo and also to the climatic conditions of the area.

- 7.4.3 All metal materials for construction shall be corrosion resistant.
- 7.4.4 The side wall of the silo should be insulated.
- 7.4.5 All parts in contact with the paddy should not be painted.
- 7.4.6 The silo shall be able to withstand the maximum wind speed observed in the area.
- 7.4.7 Weather proofing shall be done to prevent leaks.
- 7.4.8 Openings intended for aeration and grain inlet located at the roof shall be designed to prevent water leakage.
- 7.4.9 Roof should be constructed with access door.
- 7.4.10 Adequate hygienic precautions should be taken for handling grains in all types of conveyors.
- 7.4.11 Fumigation facilities, and cleaning, sampling, temperature control and monitoring, as well as ventilation systems, should be included when the installation plans are drawn up.

7.5 Temperature and Relative Humidity (RH) Measurement

- 7.5.1 The temperature and RH should be taken at regular interval using calibrated thermometer and RH sensors, placed at different locations inside the silo.
- 7.5.2 The sensors should be connected to reading instruments located outside the silo. If connected using cables, sensors should be insulated using materials that are resistant to abrasions, moisture, and chemicals.
- 7.5.3 There shall be at least one thermometer and RH sensor to measure the ambient temperature.

7.6 Grain Moisture Content Measurement

- 7.6.1 The moisture content of the stored grains should be measured at regular fixed time intervals.
- 7.6.2 Built-in moisture meters should be provided. If moisture meters are not built in, a calibrated portable moisture meter should be provided.

7.7 Operation and Maintenance

- 7.7.1 Easy cleaning, maintenance and pest control should be ensured by silo design.
- 7.7.2 An operator's manual should be provided.
- 7.7.3 Training on operation and maintenance should also be provided.

7.8 Safety Requirements

7.8.1 There should be a provision for fire control equipment.

7.8.2 Ladders should be installed inside and outside of the wall.

7.8.3 Facilities for harness attachments, which should be worn by all operators who are climbing and entering silos, should also be fitted.

7.8.4 An alarm shall be installed which will be actuated in case of malfunctions. An emergency stop button shall be provided.

7.8.5 Safety signs shall be set up in dangerous places.

7.8.6 Staff and workers shall also be provided with protective gears.

8 SPECIAL SYSTEMS OF STORAGE

8.1 Emergency storage

8.1.1 Stacks should be built in the usual way on an elevated ground. Dunnage should be used and cover the dunnage with polythene sheets or mats. Polythene or any other water proofing covers should be used to cover stacks.

8.1.2 Prolonged storage for more than 7 days shall not be recommended.

8.1.3 During dry weather, covers shall be lifted to facilitate aeration. If a sudden shower of rain wets the bags, the paddy should be either dried immediately or parboiled and milled.

8.1.4 Paddy stocks stored outdoor subjected to adverse weather condition should be treated accordingly before processing.

8.2 Hermetic storage

8.2.1 Regular monitoring of temperature, RH, oxygen and carbon dioxide concentration should be practiced.

8.2.2 Hermetic structures should control and prevent pest infestations in dry grain and prevent development of moulds in grain.

8.2.3 The walls and roof of the store should be watertight.

8.2.4 Emptying should be carried out at a predetermined rate to minimize the development of toxic microorganisms in the surface grain.

9 STORAGE DURING TRANSPORT

9.1 Short-term transport

9.1.1 The vehicles and the containers should be clean, dry and free of unobjectionable odours and of infestation.

9.1.2 Wetting by any form of precipitation should be prevented.

9.1.3 Transit time for movement from field to drying facility should be minimized unless the grain is already at acceptable storage moisture levels before harvest. When necessary, the vehicles and containers should be opened to increase aeration and minimize the condensation effects.

9.1.4 Prolonged storage during transportation should be avoided. The relative humidity (60 - 65 %) and temperature (25° C) should be monitored in case of unavoidable prolonged storage during transport.

9.2 Long-term transport

9.2.1 The cargo space should be clean, dry and free from infestation before loading under the normal voyages for 4 to 6 weeks but may be unexpectedly prolonged.

9.2.2 Various exporting countries employ different criteria for acceptable levels of infestation in export cargoes. Where regulations are laid down, cargoes of cereals should conform to these regulations. Where such regulations do not exist, two living adult stored-grain insects per kilogram should be the maximum level of infestation.

9.2.3 The cargo should be at a moisture content less than 13 % at the loading temperature of the grain to prevent the occurrence of significant microbiological activity prior to discharge.

9.2.4 The moisture content of the cargo should conform to regulations of the importing country or to the terms or commercial contracts.

9.3 Requirements for shipping

9.3.1 International shipping rules should be followed.

10 CONTROL OF PESTS IN STORAGE

10.1 Prevention and control of pest in accordance with the methods as prescribed in **Part 3** of **SLS 1528**.

10.2 Precautions should be taken to prevent the entry of pests, rodents, birds and bats to the building even at times when they are kept open for the purpose of loading and unloading or ventilation.

10.3 The appropriate pest control should be used for pests or microorganisms. Only pesticides for stored products approved by the competent authority shall be used.

10.4 Monitoring of the efficacy of the treatment used should be done at least one week after the application.

10.5 When the building needs to be fumigated, it should be sealed. If the building cannot be sealed, fumigation should be carried out under gas-proof sheeting.

10.6 During fumigation dosage of the chemical and airtight conditions shall be carefully observed.

10.7 After the required period of time, the system should be aerated to get rid of any residual gas.

10.8 Fumigants should be kept in a special locked storage room.

10.9 Fumigants should be handled with extreme care only by trained personnel. Gas masks should be used during the fumigation operation and rubber gloves should be used to handle the fumigant.

10.10 While handling fumigants, precautions as prescribed by the suppliers and manufacturers shall be exercised.

10.11 Proper disposal of pesticides and fumigants should be practiced.

10.12 Any trapping method should be correctly placed, used and regularly maintained.

10.13 Application of rodenticides shall be carried out only by properly trained persons and be recorded.

11 WORKER'S HEALTH, WELFARE AND TRAINING

11.1 Worker health

11.1.1 Accident and emergency procedures shall be available with clear instructions to all workers.

11.1.2 These procedures shall be displayed in the appropriate language for the workforce.

11.1.3 Instructions shall be supported by warning signs and symbols where appropriate.

11.1.4 First-aid boxes and other safety equipment shall be made available at permanent sites. All workers shall be informed of these locations and the personnel-in-charge of safety.

11.1.5 All hazards shall be clearly identified by warning signs and symbols where appropriate.

11.2 Welfare

11.2.1 All employment conditions shall comply with regulations.

11.3 Personnel training

11.3.1 All the warehouse personnel shall be trained on good warehousing practices and basic food hygiene and food safety.

11.3.2 Training and re-orientation of the warehouse personnel should be done at least every two (2) years.

11.3.3 Training shall be given to workers operating dangerous or sophisticated equipment and handling of chemicals.

11.3.4 Records of training for each employee shall be kept.

11.4 Workers' hygiene

11.4.1 There shall be a strict observance of the “no smoking”, “no spitting” and “no eating” policy inside the storage system.

11.4.2 Any person who has or appears to have an infectious disease, open lesion, including boils, sores, or infected wounds, or any other abnormal source of microbial contamination should be excluded from any operations.

11.4.3 Hygienic practices through established/documented procedures including specific instructions should be made for all workers.

12 DOCUMENTATION AND RECORDS

12.1 All cleaning, pest management and operational activities should be properly documented in a recommended form.

12.2 Appropriate records from all storage practices should be kept and retained for a period that exceeds the shelf life of the product.

12.3 Records should be to facilitate recalls and product safety investigations, if required.