Technical Standards and Protocol for the Special Equipments for Refrigerated Transport of Perishable Food Commodities Including Fresh Horticulture produce and Additional Information

(Technical Standards Number NHB-CS-Type 05-2011)

25 Years

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NATIONAL HORTICULTURE BOARD

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PREFACE

A Task Force on development of cold chain in India had been set up by the Ministry of Agriculture vide its order dated 3rd May 2007. The said Task Force had recommended revised normative cost for cold storages and subsidy norms for ensuring technology up gradation in cold storages. It has, therefore, been felt necessary to define appropriate technical standards in respect of various components of cold storages/claim without which exercise of quantification of revised normative cost, subsidy norms etc cannot be substantiated; nor can the desired results of effecting technology up-gradation be achieved. Therefore, Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India, vide its communication No. 22011/5/2007-M-II dated 16th June 2009 constituted a Technical Standards Committee**.** Terms of Reference of the Technical Standards Committee **(TSC)** is to give recommendations on the following issues-

(i) Suitable technical standards and protocols for cold chain infrastructure in the Country

(ii) The mechanism of implementation of such standards and protocols

(iii) Any other issue that the Committee may consider important or relevant for the subject or may be assigned to it by the Government.

The Committee was given initial time frame of two months for submitting its recommendations. However, extension up to end of November 2009 was formally granted at a later stage.

Indian Cold Chain Industry is going through transformation, to fall in harmony with the World Standards, & to improve the overall economics. The entrepreneurs and end users are seeking information on appropriate technologies & specifications for other critical components of cold chain like ripening units, reefer trucks & pack houses etc. It was felt necessary to define appropriate technical standards in respect of other components & cold chain as under maintaining product quality from the field to the consumer. Board has now finalized the Technical Standards in respect of *Specialized Transport Vehicles including insulated and or refrigerated transport vehicles for perishable food items including fresh fruits & vegetables.*

Work was initiated with input from M/s Carrier India informing us about the European Standards: *(ATP Agreement) Agreement on the international carriage of perishable foodstuffs and on the special equipment to be used for such carriage,* Prescribed by UNECE United Nations Economic Commission for Europe & Inland Transport Committee of Economic Commission for Europe. The same with necessary modifications in respect of ambient temperature conditions and conditions inside the transport vehicle were circulated among the members of the committee for inputs based on which the first meeting of the committee was held on 13.08.2010 in SFAC, New Delhi. The draft standards were displayed on NHB website followed by a public notice (8th September 2010) inviting suggestions/ objections from stake-holders within a period of 30 days. Separate communications had

also been sent to ICAR, BIS, BEE, NHM, TMNE, CII etc. It was followed by a workshop to refine the standards held on 23rd October 2010 at National Academy of Agriculture Sciences, New Delhi involving TSC members and stake-holders who have offered comments and members of the industry.

These Standards cover Transportation of Perishable Foodstuff in Indian conditions, for Indian variety of fresh fruits and vegetables in addition to processed food items. The list of technical experts consulted by us is at Annexure I.

These standards and recommendations are intended to serve as minimum requirement, and are not to be construed as limiting good practice. Relevant ISO standards too may also be followed where applicable. The responsibility for deciding whether other requirements additional to the ones listed in the technical standard document are necessary to ensure system integrity, efficiency and overall safety, including operation, maintenance and servicing and/or the necessity to adopt additional requirements in the system design and construction to guarantee the overall performance, still rests with the supplier / manufacturer.

Nonetheless, these also have provision for scope of variation, through a Variation and Amendment Clause, to take care of new concepts, innovations, and R&D in building design etc. so that improvements coming along the way are not stopped but analysed and incorporated in the design.

We acknowledge the valuable contribution made by experts in firming up its recommendations listed in **Annexure-I** to the report. I gratefully acknowledge the basic documents from UNECE. We also acknowledge contribution made by Dr. R. K. Sharma - Senior Deputy Director NHB who has functioned as Member-Secretary to the Committee.

(Bijay Kumar)
Managing Director
National Horticulture Board
(Ministry of Agriculture, Govt. of India)

Dated: February 21, 2011

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SECTION - 1

TECHNICAL STANDARDS

Technical Standards for Special Equipments for Carriage of Perishable Food Stuff Including Fresh Horticulture Produce

1. Scope

These Technical Standards have been prepared by adoption, with certain modifications, of relevant provisions of **ECE/TRANS/219 as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe** and are applicable for special equipments such as refrigerated and mechanically refrigerated lorries, trailers, semi-trailers, Wagons, containers and other similar equipment used for carriage of fresh horticulture produce including fresh fruits; vegetables i.e. which have only been washed, peeled or simply cut in half and flowers; cut vegetables i.e. raw vegetables which have been diced, sliced or otherwise and cut flowers, in addition to any other perishable food stuff. *It does not preclude application of relevant ISO standards for freight containers.*

2. Harmonising with of provisions of provisions of ECE/TRANS/219 as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe

ECE/TRANS/219 deals with special equipments for carriage of perishable food stuff. However, it provides for technical standards for special equipments in respect of mean outside temperature of +30°C **which in Indian condition may be as high as +35°C with maximum outside temperature may be to the tune of +48° C;** similarly UNECE standards prescribes upper range of inside chamber temperature as +12°C without any reference to relative humidity, whereas in case of fresh fruits & vegetables in side body of equipment temperature may be required to go up to 20°C and relative humidity as high as 95% plus. It is stipulated that relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, may be adopted as far as applicable with above mentioned modification of temperature and humidity ranges.

3. Definitions

Definitions of certain terms as provided in ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, have been generally adopted with modification in respect to outside mean temperature and temperature and humidity inside the body of equipment.

3.1 Insulated Equipment

Equipment of which the body i.e. Body of Wagons, Lorries, trailers, semi-trailers, containers and other similar equipment is built with insulating walls, doors, floor and roof, by which heat exchanges between the inside and outside of the body can be so limited that the overall coefficient of heat transfer (K coefficient), is such that the equipment is assignable to one or other of the following two categories:

I_N = normally insulated equipment specified by: -	a K coefficient equal to or less than 0.70 W/ m^2.K;
I_R = heavily insulated equipment specified by: -	a K coefficient equal to or less than 0.40 W/ m^2.K and by sidewalls with a thickness of at least 45 mm for transport equipment of a width greater than 2.50 m.

3.2 Refrigerated equipment

Insulated equipment which, using a source of cold (natural ice, with or without the addition of salt; eutectic plates; dry ice, with or without sublimation control; liquefied gases, with or without evaporation control, etc.) other than a mechanical or absorption unit, is capable, with a mean outside temperature of **+ 35 °C**, of lowering the temperature inside the empty body to, and thereafter maintaining it:

At + 7 °C maximum in the case of class A;

At - 10 °C maximum in the case of class B;

At - 20 °C maximum in the case of class C; and

At 0 °C maximum in the case of class D

The K coefficient of refrigerated equipment of classes B and C shall in every case be equal to or less than 0.40 W/m^2.K.

3.3 Mechanically refrigerated equipment

Insulated equipment either fitted with its own refrigerating appliance, or served jointly with other units of transport equipment by such an appliance (fitted with a mechanical compressor, or an absorption device, etc.). The appliance shall be capable, with a mean outside temperature of **+ 35 °C**, of lowering the temperature Ti inside the empty body to, and thereafter maintaining it continuously in the following manner at:

In the case of classes A, B and C, any desired practically constant inside temperature Ti in conformity with the standards defined below for the three classes:

Class A- Mechanically refrigerated equipment fitted with a refrigerating appliance such that Ti may be chosen between + 20 °C and 0 °C inclusive;

Class B- Mechanically refrigerated equipment fitted with a refrigerating appliance such that Ti may be chosen between + 20 °C and - 10 °C inclusive;

Class C- Mechanically refrigerated equipment fitted with a refrigerating appliance such that Ti may be chosen between + 20 °C and - 20 °C inclusive.

In the case of classes D, E and F a fixed practically constant inside temperature Ti in conformity with the standards defined below for the three classes:

Class D- Mechanically refrigerated equipment fitted with a refrigerating appliance such that Ti is equal to or less than 0 °C;

Class E- Mechanically refrigerated equipment fitted with a refrigerating appliance such that Ti is equal to or less than - 10 °C;

Class F- Mechanically refrigerated equipment fitted with a refrigerating appliance such that Ti is equal to or less than - 20 °C.

The K coefficient of equipment of classes B, C, E and F shall in every case be equal to or less than 0.40 W/ m^2.K.

3.4 Heated equipment

Insulated equipment, which is capable of raising the inside temperature of the empty body to, and thereafter maintaining it for not less than 12 hours without renewal of supply at, a practically constant value of not less than **+ 20 °C** when the mean outside temperature, as indicated below:

- 10 °C in the case of class A heated equipment;
- 20 °C in the case of class B heated equipment.

The K coefficient of equipment of class B shall in every case be equal to or less than 0.40 W/m2.K.

4. Provisions Relating to the checking of Insulated, Refrigerated, Mechanically Refrigerated or Heated Equipment for Compliance with the Standards

For this purpose, relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, are to be adopted with modifications in test conditions required in view of modifications in definition of classes of equipment.

5. Methods and procedures for measuring and checking the insulating capacity and the efficiency of the cooling or heating appliances of special equipment for the carriage of perishable foodstuffs including fresh horticulture produce

For this purpose, relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, are to be adopted with modifications in method and procedure required in view of modifications in definition of classes of equipment.

6. Form of certificate for insulated, refrigerated, mechanically refrigerated or heated equipment used for the international carriage of perishable foodstuffs including fresh horticulture produce by land

For this purpose, relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as

amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, are to be adopted with modifications in formats required in view of modifications in definition of classes of equipment.

7. Certification Plate Of Compliance Of Equipment

With regard to certification plate etc for types of carriages suitable for perishable food stuff including fresh horticulture produce, relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, are to be adopted with modification that the letters **ATP** shall be substituted by the letters **NHB**

8. Distinguishing Marks To Be Affixed To Special Equipment

The distinguishing marks prescribed in relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, are to be adopted. It shall consist of capital letters in dark blue on a white ground. The height of the letters shall be at least 100 mm for the classification marks and at least 50 mm for the expiry dates. For special equipment, such as a laden vehicle with maximum mass not exceeding 3.5 t, the height of the classification marks could likewise be 50 mm and at least 25 mm for the expiry dates. The classification and expiry marks shall at least be affixed externally on both sides in the upper corners near the front. The marks shall be as follows:

Equipment	Distinguishing mark
Normally insulated equipment	IN
Heavily insulated equipment	IR
Class A refrigerated equipment with normal insulation	RNA
Class A refrigerated equipment with heavy insulation	RRA
Class B refrigerated equipment with heavy insulation	RRB
Class C refrigerated equipment with heavy insulation	RRC
Class D refrigerated equipment with normal insulation	RND
Class D refrigerated equipment with heavy insulation	RRD
Class A mechanically refrigerated equipment with normal insulation	FNA
Class A mechanically refrigerated equipment with heavy insulation	FRA
Class B mechanically refrigerated equipment with heavy insulation	FRB
Class C mechanically refrigerated equipment with heavy insulation	FRC
Class D mechanically refrigerated equipment with normal insulation FND	
Class D mechanically refrigerated equipment with heavy insulation FRD	

Equipment	Distinguishing mark
Class E mechanically refrigerated equipment with heavy insulation	FRE
Class F mechanically refrigerated equipment with heavy insulation	FRF
Class A heated equipment with normal insulation	CNA
Class A heated equipment with heavy insulation	CRA
Class B heated equipment with heavy insulation	CRB

If the equipment is fitted with a removable or non-independent thermal appliance and if special conditions exist for the use of the thermal appliance, the distinguishing mark or marks shall be supplemented by the letter **X** in the following cases:

A. For Refrigerated Equipment:

Where the eutectic plates have to be placed in another chamber for freezing;

B. For Mechanically Refrigerated Equipment

B.1 Where the compressor is powered by the vehicle engine;

B.2 Where the refrigeration unit itself or a part is removable, which would prevent its functioning.

9. Monitoring of Air Temperatures For Transport of Perishable Food Stuff Including Fresh Horticulture Prouce

For this purpose, relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, may be adopted as far as applicable.

10. Procedure For The Sampling And Measurement Of Temperature For Carriage Of Perishable Food Stuff Including Fresh Horticulture Produce

For this purpose, relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, may be adopted as far as applicable.

11. Sampling

For this purpose, relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, may be adopted.

12. Temperature Measurement Of Perishable Food Stuff Including Fresh Horticulture Produce

For this purpose, relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, may be adopted as far as applicable.

13. Selection Of Equipment And Temperature Conditions To Be Observed

For this purpose, relevant provisions of the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage **(ATP)** bearing reference No. ECE/TRANS/219 and as amended on 2nd January 2011 by Inland Transport Committee of Economic Commission for Europe, may be adopted. However, as **ATP** does not cover complete range of fresh horticulture produce, critical storage conditions prescribed by WFLO for fresh fruits and vegetables are recommended for adoption.

The temperature control of horticulture produce specified above should be such as not to cause freezing at any point of the load.

14. Some Desirable Construction Features *(not a part of UNECE Standards):*

- **Body of Reefer Van**- The outside sheet can be made of GRP (Glass Reinforced Plastic Fiber) outside and PU foam in the core or, FRP (Fiber-glass Reinforced Plywood) construction or, mild steel or the stainless steel,
- **Thermal Insulation for Walls and Ceiling**- 75 to 100 mm thick rigid polyurethane foam with density 42 Kg/M^3 insulations in walls and ceiling- incorporating a cam lock fixing system and silicone sealed tongue and groove joint;
- **Thermal Insulation on Floor**: 100 mm thick panels reinforced with 12 mm ply wood will be provided as insulation above the steel base.
- **Structure of Floor top**: it will be finished with 3 mm thick chequered aluminum tread plate floor and bottom with GI sheet. Floor should be non-corrosion, non-pollution, anti-brine, acid, and soda resisting type
- **Floor Drain**- Four Kazoo floor drains
- **Door**: Double wing rear doors and one side delivery door will be provided with stainless steel container type locking system.
- **Front Wall**- Reinforced front wall for reefer unit
- **Interior**- Washable glass board interior
- **Plastic Curtains** : Plastic curtains will be provided for the doors
- **Lights** : Vapor & frost proof

SECTION - 2

PROTOCOL FOR IMPLEMENTATION OF TECHNICAL STANDARDS

Protocol for Implementation of Technical Standards

Subject to provisions of *Variation Clause*, only those cold storage projects that are in conformity with the prescribed technical standards will be eligible for Central Government Subsidy. In order to verify this, a test report issued by accredited test laboratory will have to be submitted for the model proposed to be procured. Until accredited test laboratory is in place, the design details furnished by the manufacturer may be taken in to account with necessary scrutiny.

Annexure 1

List of Members / Experts in Technical Committee of NHB

1. Shri Bijay Kumar, Managing Director, National Horticulture Board, Gurgaon (Haryana)
2. Shri I.C. Chadha, DY. General Manager (Tech.), Central Planning Housing Corporation. New Delhi
3 Shri Naresh Kumar Jawa, Chief Executive Officer, Fresh & Healthy Enterprises Ltd., CONCOR HSIIDC Industrial Estate, Rai, Sonepat-131029 (Haryana)
4 Shri R.S.Rathore, Department of Horticulture & Food Processing, Govt. of Uttar Pradesh, Lucknow
5 Shri Suneeth Toteje, Scientist - C, Food & Agri Bureau of Indian Standards
6 Shri R.K.Boyal, General Manager (F&R), Agriculture & Processed Food Product Expert Development Authority(APEDA), 3rd Floor, NCUI Building, 3 Siri Institutional Area, August Kranti Marg, New Delhi
7 Shri Vinod Kaul, Dy. General Manager (F&R), Agriculture & Processed food Product Expert Development, Authority (APEDA), 3rd Floor, NCUI Building, 3 Siri Institutional Area, August Kranti Marg, New Delhi
8 Shri S.D.Sharma, AGM (Project) CWC, CO, New Delhi
9 Dr. S.K. Chauhan, Deptt. Of Horticulture & Food Processing, Lucknow (UP)
10 Dr. M.M.Mustaffa, Director, National Research Center of Banana, Trichi
11 Shri P. Saxena, Advisor, National Cooperative Development Corporation, New Delhi
12 Dr. D.K. Tandon, Scientist, Central Institute for subtropical Horticulture, Lucknow (UP)
13 Shri A.K. Verma, Central Institute for subtropical Horticulture, Lucknow (UP)
14 Dr. R. K. Sharma, Sr. Deputy Director, National Horticulture Board, Gurgaon
15 Shri Brijendra Singh, Deputy Director, National Horticulture Board, Gurgaon
16 Shri K. Vijay Singh, Rinac India Pvt. Ltd, 101-C, Ist Floor, Kudan House, Hari Nagar, Ashram Chowk, New Delhi 110 014.
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18 Shri Ekanath Gajare, At & Po-Chinawal, Tehsil- Raver, Dist- Jalgaon (MS)
19 Shri Ashish Srivatava, Chemtron Science Lab Pvt. Ltd., Lucknow (UP)
20 Shri V.S. Sunjay, Yes Bank Ltd., DLF-Phase II, Gurgaon (Haryana)
21 Shri Umesh C. Agrawal, Isopan Insulation Pvt. Ltd., T-11/90, Vipul Green, Sohana Road, Gurgaon (Haryana)

22 Shri Suresh Kumar, Blue Star Ltd., Block 2A, DLF Corporate Park, Gurgoan

23 Shri B. Thiagarajan, Blue Star Ltd, 9 Bazullah Road, T. Nagar, Cheenai-600017

24 Shri R M Iyengar, Blue Star Ltd.

25 Shri Dnyandeo Ganpati Mahajan, At & Po- Chinawal, Tehsil- Raver, Dist- Jalgaon (M.S)

26 Shri S.K.Sharma, Managing Director, Global Agri System Pvt. Ltd., K-13, Hauz Khas, Enclave, New Delhi

27 Shri M.S. Manjunath, Vice President (Business Development), Ingersoll Rand International (India), Bangalore

28 Shri M. Venkanna, Ranersonrand International India Ltd., Bangalore

29 Shri Sanjay Gupta, Infracool, 42-76, Sector 23 A, Gurgaon

30 Shri R. Anish Sinha, Rinac India Ltd., Bangalore

31 Shri Rajesh Kumar, Chemtron Science Lab Pvt. Ltd., EI-47, MSDC Mahape, Navi Mumbai.

32 Shri Dinesh Goswasy, Agritech Equipment & Services Pvt. Ltd., New Delhi

33 Shri A.K. Choudhary, Dev Bhumi Cold Chain Ltd.,17-18, Sabji Mandi, Azadpur, Delhi

34 Shri Subhash Kankan, Dev Bhumi Cold Chain Ltd., 17-18, Sabji Mandi, Azadpur, Delhi

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37 Shri Girish Bajaj, Bajaj Processor Machine Pvt. Ltd., 7/27, Jailaxmi Industrial, Estate site-4, Sahabad, Industrial Area, Gaziabad (UP)

38 Shri J.M. Gupta, MD, APC Polycoat (India) Pvt. Ltd. A1/296, Janakpuri, Pankha Road, New Delhi

39 Shri Mahavir Verma, Vice President, International Coil Company, A 21-24, Naraina, Industrial Area, Phase-II, New Delhi- 110028

40 Shri Mukesh Puri, President, ISHRAE, HQ, , 502, 5th Floor, DDA Building District Centre, Laxmi Nagar, Delhi 110092

41 Shri Girish Sachar, Executive Secretary, ISHRAE, HQ, 502, 5th Floor, DDA Building District Centre, Laxmi Nagar, Delhi 110092

42 Shri S. S. Malik, B 5 &6/4299, Vasant Kunj, New Delhi-110070

43 Shri Ashutosh C. Mali, Jain Irrigation System Ltd., Jalgaon (M.S)

44 NHB Officers from its HQ and different States.

National Horticulture Board, Gurgaon

An Organisation with a Vision for Appropriate Technology In Post Harvest Management Infrastructure

- Technical Standards for Cold Storages for Horticulture Produce not requiring Pre-Cooling
- Technical Standards for Cold Storages for Horticulture Produce requiring Pre-Cooling
- Technical Standards for Control Atmosphere Storages for Horticulture Produce
- Technical Standards for Specialised Transport Vehicles including Refrigerated Vans
- Technical Standards for Scientific Fruit Ripening Chambers
- Technology Solutions for Long Distance Bulk Transport of fresh Horticulture Produce

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