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NHB/HO/Rev. Standards/2011

May 17, 2012

Memorandum

Subject: Amendment in the Technical Standards No. NHB-CS-TYPE 01-2010 (Cold Stores)

Based on feedback of various stakeholders and consultative workshop, it has been decided to incorporate the following changes in Technical Standard No. NHB-CS-TYPE 01-2010 (Cold Stores) for immediate compliance for NHB assisted projects.

Sl.No.	Description	Presently reading	To be changed to
1.	Location of staircase – page 5	Layout of typical cold store – (OPTION A) (With staircase inside chambers, common entry and exit at ground floor for all floors of a chamber, no provision for elevators and fire escape route.)	(With provision for staircase in ante-room, doors for each chamber at each floor, provision for elevator and fire escape route”)
2.	Location of staircase – page 5	Layout of typical cold store – (OPTION B) (With provision for staircase outside chambers, doors for each chamber at each floor elevator and fire escape route etc.)	(With provision for staircase in ante-room, doors for each chamber at each floor, provision for elevator and fire escape route”)
3.	Loading Rate – Page 3 item 2ii) e	4% (at 25 °C) to 5% (at 20 °C) of the total storage capacity (equally split into chambers) per day so that the total loading period is about 20 days. Temperature during loading to be maintained at 15 °C which should be brought down to holding temperature @ 2 to3 °C per week subject to choice of adopting the CPRI recommendation mentioned above.	Loading rate : 4% (at 25 deg C product temperature) to 5% at (20 deg C) of the total storage capacity per day (equally split into chambers) so that total loading period is about 20 to 25 days.

4.	Pulldown Time – page 3 item 2 ii) f	24 hours for pull down to 15 ^o C and at 20 to 30 ^o C per week for pull down to holding temperature. CPRI recommends that seed potatoes should be cooled to 10 ^o C within 24 hours of arrival at cold store and its temperature should be further pulled down to holding temperature of 3 ^o C ± 1 ^o C within 8 to 10 days as sugar separation due to rapid cooling is not a matter of concern for seed potatoes/	CPRI recommends that seed potatoes should be cooled to 10degC within 24 hours of arrival at cold store and its temperature should be further pulled down to holding temperature of 3degC ± 1deg C within 8 days as sugar separation due to rapid cooling is not a matter of concern for seed potatoes.
5.	Chamber capacity – page 4 item 3	It is recommended to have at least two chambers and chamber size should be of capacity range of 1000MT to 1500 MT for ensuring uniform storage condition, proper capacity utilization and energy efficiency. This is not possible in single chamber/ lager chamber cold storages.	It is recommended to have at least two chambers and chamber size should be of capacity range of 1000MT to 1500 MT for ensuring uniform storage condition, proper capacity utilization and energy efficiency. This is not possible in single chamber/ lager chamber cold storages. In any case “Max capacity of each chamber should not be more than 2500 MT” for which suitable cost norms may be prescribed
5.	Chamber height - page 6 drgs	In drgs E= 12 – 14M	E=12 – 15M (Max height of a chamber should not exceed 15 M.) (Dimension E)
6.	Insulation Thickness of EPS - page 10 Table Density of EPS	EPS = 15 Kg/ Cu.M	(\$\$\$) Pl. see existing and revised table below (to be inserted on page nos. 10 & 50).
7.	Insulation Thickness of PUF - page 10 Table Density of PUF	PUF = 32 Kg/CuM	
8.	Page 10 Table of Min insulation thickness.	Thickness of partition wall	
9.	Page 10 Table of Min insulation thickness. Type of insulation column	Poly Isocyanurate (PIR) an upgraded version of PUF with better fire resistance qualities (to be included) “PUF”.	

10.	Page 12 Item No.6 Refrigeration system & equipment selection – Condenser- atmospheric, evaporative, water cooled	“Condensers can be air cooled with water spray or with provision of pre-cooling of condenser air in case of HFC/HCFC or water cooled with S&T condenser and Plate Heat Exchanger with cooling tower arrangement in case of HFC/HCFC/Ammonia plant or of evaporative / atmospheric type in case of ammonia plant. Capacity of condenser shall be confirmed by data-sheet of manufacturer.”	“The condensers can be made a) Air Cooled b) Water cooled Eg. S & T condenser or PHE type with water cooling arrangement c) Air & Water cooled Eg. Atmospheric or evaporative Type. Incase of air cooled Condensers provision of precooling of condenser air is recommended in high ambient Temp regions for energy saving.”
11.	Page 12 Item No.6 Refrigeration system & equipment selection -Air cooling Unit	Air Cooling Unit – ceiling / wall mounted- for cold stores 4.4 deg C	Air Cooling Unit – ceiling / wall mounted- for cold stores 4.4 deg C
12.	Page 11. Item 6. Refrigeration system & Equipment selection.	Vapour compression systems are commonly used. However, absorption systems can also be used for cold storages, where heat is readily available instead of electricity eg. solar, geothermal , waste heat etc. A 7.5 TR ammonia – water Absorption was installed at Manikaran By IIT Delhi in 1980s. It worked Geothermal energy.	Add the following para (after the 1st para shown alongside) “The selection of plants will depend on the size, the location & other factors. Ammonia is generally not used in populated places but can certainly be used in industrial and other areas. Glycol chillers have high energy consumption than direct systems but are selected for specific applications like CA stores.”
1.	Page 10. Notes	All values rounded off in multiple of inch (25mm)	All thicknesses given are rounded off to nearest standard available thicknesses in mm”.
2.	Page 11. Point6. Type of system	Type of system – direct expansion (in case of HFC and others), liquid overfeed and gravity with surge drum in case of ammonia	Type of system – direct expansion (in case of HFC and others), liquid overfeed and gravity with accumulator in case of ammonia
4.	Page 12.Air purger (Manual or automatic)	Air Purger (Manual or Automatic)	Air Purger (Manual or Automatic) or Air Purging Valve
5.	Page 13 Item 7ii Suggested standard	ARI Std 490	AHRI 490-2003 or latest
6.	Page 14 1 st heading	Air /water cooled condenser for HFC/HCFC	Air /water cooled condenser for HFC/HCFC or Ammonia

7.	Page 14 (iii)	Horizontal Ammonia receiver complete	Horizontal / Vertical Ammonia receiver complete with necessary connection, reflex type level gauge etc.
8.	Page 54 Section IV.item 10 Typical Specification of refrigeration system – Table – Air Cooling Units	Estimated capacity each at (-) 3deg C Evaporating and 5 degC T.D (between evap temp & air entering temp.	Estimated capacity each at (-) 2deg C Evaporating and 4 degC T.D (between evap temp & air entering temp.

(\$\$\$) Existing Table (on page nos. 10 & 50)

**MINIMUM INSULATION THICKNESS FOR VARIOUS INSULATION MATERIALS BASED ON
RECOMMENDED U VALUES FOR -4 TO +2 ° COLD STORAGE**

Type of insulation	Material		Wall		Ceiling/ roof U value = 0.24 W/m ² K	Floor U value = 0.29W/m ² K
			External U value = 0.27W/m ² K	Partition U value = 0.58W/m ² K		
	ρ Density Kg/m ³	K (at 10 °C) W/mK	Thickness mm	Thickness mm	Thickness mm	Thickness mm
EPS	15	0.036	150	75	150	125
PUF	32	0.023	100	50	100	100
XPS##	30-35	0.025	100	50	100	100
Phenolic foam ***	50	0.026	100	50	125	100
Mineral wool ***	48	0.033	125	50	125	100
Bonded fibre glass/ glass wool***	32	0.033	125	50	125	100

*** Recommended only with vapour barrier and metal or FRP cladding min 0.5 mm TCT ##Recommended in conformance to ISO/FDIS 4898:2008(E) for properties of XPS used for thermal insulation of buildings, Categories II, III & IV only.

Revised Table (To be inserted in page no.10 and page no. 50)

**MINIMUM INSULATION THICKNESS FOR VARIOUS INSULATION MATERIALS BASED ON
RECOMMENDED U VALUES FOR -4 TO +2 ° COLD STORAGE**

Type of	Material	Wall	Ceiling/ roof	Floor
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insulation			External U value = 0.27W/m2K	Partition U value = 0.58W/m2K	U value = 0.24 W/m2K	U value = 0.29W/m2K
	ρ Density Kg/m3	K (at 10 0C) W/mK	Thickness mm	Thickness mm	Thickness mm	Thickness mm
EPS	15 Min.	0.036	150	75	150	125
PUF/PIR	38 Min.	0.023	100	50	100	100
XPS##	30-35	0.025	100	50	100	100
Phenolic foam ***	50	0.026	100	50	125	100
Mineral wool ***	48	0.033	125	50	125	100
Bonded fibre glass/ glass wool***	32	0.033	125	50	125	100

*** Recommended only with vapour barrier and metal or FRP cladding min 0.5 mm TCT

Recommended in conformance to ISO/FDIS 4898:2008(E) for properties of XPS used for thermal insulation of buildings, Categories II, III & IV only.

“Note for partition wall: Insulation thickness for partition walls should be provided on both the sides of walls. Incase of sandwich panel the insulation thickness shall be the total of the insulation provided on both the sides.”

This issue with the approval of MD, NHB.