

Certificate in Cold Chain Management Training Course for Vegetables

Details of the Training Programme:

Module 1: Introduction to Cold Chain Management

- by Singapore Polytechnic

(3 hours) [Day 1, 9.00am to 12 noon]

- General principles & laboratory work including definition of various terms to be used in cold chain management, integrated cold chain management, hygienic & sanitary condition, observing good & proper handling practices, the integrity of cold chain, the environmental & personal hygiene.
- Responsibilities of whole cold chain.
- Time temperature profiling & recording.

Module 2: Cold Chain for Vegetables at Farm / Pre-harvest & Harvesting Practices

- by AVA

(3 hours) [Day 1, 2.00pm to 5.00pm]

- **Vegetable Farm** must have good management and farming practices to start with. The farm must observe and adhere to the principles of good agricultural practices, and should be well maintained. The farm must be free from potential sources of contamination. The soil and water used in the farm should be from good sources where there is no contamination from pesticide residues, heavy metals and toxic waste, and pollution. All vegetables should be clean and should not contain pesticide residual levels that exceed the national limits for human consumption.
- **Pre-Harvest** treatment and condition of the vegetables will affect the management of the subsequent stages in the cold chain, as well as the quality and shelf life of the vegetables. Pre-harvest quality of vegetables is affected by both intrinsic and extrinsic factors. These factors will affect the external qualities such as morphological aspects (e.g. shape and size), physical aspects (texture or dry matter content) and chemical aspects (e.g. disaccharides / monosaccharides), as well as the quality and shelf life of vegetables.
- **Harvesting** – The quality of vegetables should be evaluated before harvest to determine the timing for harvest. In addition, the quantity of vegetables ready for harvesting should be estimated before they are harvested to ensure that sufficient manpower, logistics, tools and equipment are deployed so as to have a seamless harvesting process. Vegetables to be harvested should be of good quality, at the right maturity (neither too old nor too young), of the right size, with no or little pests and absence of rot. The time taken to transport the produce from production area to the market either local or overseas market, should be taken into consideration to determine the harvesting age.

Module 3: Cold Chain for Vegetables at Packing Room

- by Singapore Polytechnic

(3 hours) [Day 2, 9.00pm to 12 noon]

- The packing process involves trimming, sorting, grading and packing. Temperature of the packing room should be maintained between 15°C to 18°C during operation to preserve the benefits of pre-cooling. This temperature range is recommended to make the working environment conducive for the workers. The processing time shall not exceed 30 minutes to minimise any increase in temperature of the vegetables.

Module 4: Cold Chain for Vegetables at Warehouse

- by Singapore Polytechnic

(3 hours) [Day 2, 2.00pm to 5.00pm]

- Vegetables: Temperature to be kept from a range of -1 deg C to 15 deg C depending on different types of vegetables as listed in Appendix C.3 of TR24: 2007 on Cold Chain Management of Vegetables.
- Proper circulation of cold air to be maintained at all times.
- Temperature fluctuation should be avoided.
- Stock rotation first-in-first-out.
- All cold room shall be equipped with accurate temperature measuring device to record the actual temperature of the rooms.
- Defrosting of refrigerated unit in warehouse.
- Automatic alarm system linked to security room in event of a breakdown.
- For vegetables, relative humidity need to be maintained between 65% to 100% depending on different types of vegetables as listed in Appendix C.3 of TR24: 2007 on Cold Chain Management of Vegetables.
- For vegetables, ethylene production by vegetables and ethylene sensitivity of vegetables as listed in Appendix C.3 of TR24:2007 on Cold Chain Management of Vegetables need to be observed.

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Module 5: Cold Chain for Vegetables for Land, Sea & Air Transportation

- by Singapore Polytechnic

(3 hours) [Day 3, 9.00am to 12 noon]

- Land transport using refrigerated truck; Cross-sectional of truck (insulating material) Sensor for return air, top air delivery condenser unit, temperature meter at dashboard.
- Temperature measurement.
- Air circulation inside refrigerated truck.
- The cleaning of refrigerated truck & the record of each cleaning with date & time.
- Temperature profile of the inside of refrigerated truck need to be recorded, documented & made available for inspection.
- For vegetables, the temperature and humidity of the refrigerated truck needs to be set at according to recommendations for different types of vegetables as set up in Appendix C.3 of TR24: 2007 on Cold Chain Management of Vegetables.
- Extraneous odours should be absent in refrigerated truck.
- The time to unload the chilled products from the refrigerated truck at supermarkets should not exceed 30mins.

Module 6: Cold Chain for Vegetables at Retail Level

- by Singapore Polytechnic

(3 hours) [Day 3, 2.00pm to 5.00pm]

- Hygienic & sanitary condition.
- Critical temperature for vegetables as per Appendix C.3 in TR24: 2007 need to be maintained with no break of cold chain.
- Strategic location to site chilled display cabinets for vegetables in supermarkets.
- Proper stacking of goods in refrigerated cabinets.
- Recording of temperature of refrigerated display cabinets.
- Separation of chilled vegetables in refrigerated display cabinet.
- Temperature profile of products in refrigerated display cabinet need to be recorded.
- Stock rotation to be practiced.
- Defrosting.
- For sales of chilled vegetables in supermarkets, vegetables can be displayed in a wide variety of chilled display cabinets. Operators should implement measures to avoid product overloading i.e. loading beyond the load line and blocking of cool air circulation. Care must taken to avoid cross contamination by micro-organism that may cause food poisoning. All equipment should be thoroughly cleaned after each use.

Module 7: Singapore Standards / Technical Reference TR24: 2007

- by Singapore Polytechnic

(3 hours) [Day 4, 9.00am to 12 noon]

- Cold Chain Management of Vegetables based on Technical Reference TR24: 2007 with emphasis on non-regulatory sections from Annex A to Annex J.

Module 8: Regulatory Issues

- by AVA

(1 hour) [Day 4, 1:30pm to 2.30pm]

- Regulatory issues on Cold Chain Management of Vegetables by officers from AVA. This will cover General regulation of Cold Chain Management & detailed regulation for Cold Chain Management of Vegetables.