

**Invited Paper** ~~~~~

## **Recent Trends in Performance Test Methods for Transport Packages and Application to Fresh Produce**

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### **Abstract**

The functions of packaging include protection, containment, information, utility of use, and promotion. It is important in designing packaging to provide these functions with reduced cost and environmental loads. Performance tests of packaging can help realize it.

Performance test methods for transport packages are summarized based on current Japanese Industrial Standards (JIS Z 0200: 2023), which corresponds to the ISO 4180-2019. This test method is widely used for transport packages within the distribution system to ascertain their performance against hazards. Hazards include shock, vibration, stacking stress, low pressure, temperature and humidity, wetness, and dewing. There are many related test methods to be employed for each hazard.

In the case of fresh fruits and vegetables, special considerations are required to conduct performance tests depending on their unique characteristics. Research on several topics was presented, including 1) damage by repetitive shock (shock fatigue failure), 2) damage to the peach fruits that ripen after harvest, and 3) shock pulse analysis of the outer package for produce in the drop test.

### **Performance Test Methods for Transport Packages**

Performance test methods are widely used for transport packages within the distribution system to ascertain their performance against hazards. There are several test standards for the performance test, including ISO 4180, ASTM D4169, JIS Z 0200, etc. It is recommended that national standards be harmonized with corresponding international standards. A revision of JIS Z 0200 (2023) was established in 2023 based on its correspondence, ISO 4180-2019 (revised version of ISO 4180-2009). Japan Packaging Institute (JPI), the secretariat of ISO/TC 122, and Japanese experts have actively worked on revising both ISO 4180-2009 and ISO 4180-2019. In the previous revision of JIS Z 0200 (2020), the structure of this standard was unusual to make it possible to include the principles of ISO 4180-2009 and to avoid over-packaging (ISO was included in Annex A as normative in JIS). After revising the ISO 4180 with the leadership of Japanese experts, it became possible to harmonize JIS Z 0200 to ISO 4180-2019 as MOD (some differences will be proposed for future revision of ISO).

The scope of the JIS Z 0200: 2023 is "This standard specifies test methods for evaluating whether the packaging is adequately protected against vibration, shock, and compression that packaged goods are subjected to during distribution. Packaged goods that are subject to the Fire Service Act and other related laws and regulations are excluded."

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