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JAPANESE INDUSTRIAL STANDARD

Testing Method of Vehicles with Rotary Snow Plough

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Testing Method of Vehicles with
Rotary Snow Plough

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1. Scope

This Japanese Industrial Standard specifies the testing method of vehicles with rotary snow plough, hereinafter referred to as the "rotary vehicles".

Remark: In this standard, the units and the numerical values given in { } are in accordance with the International System of Units (SI) and appended for reference.

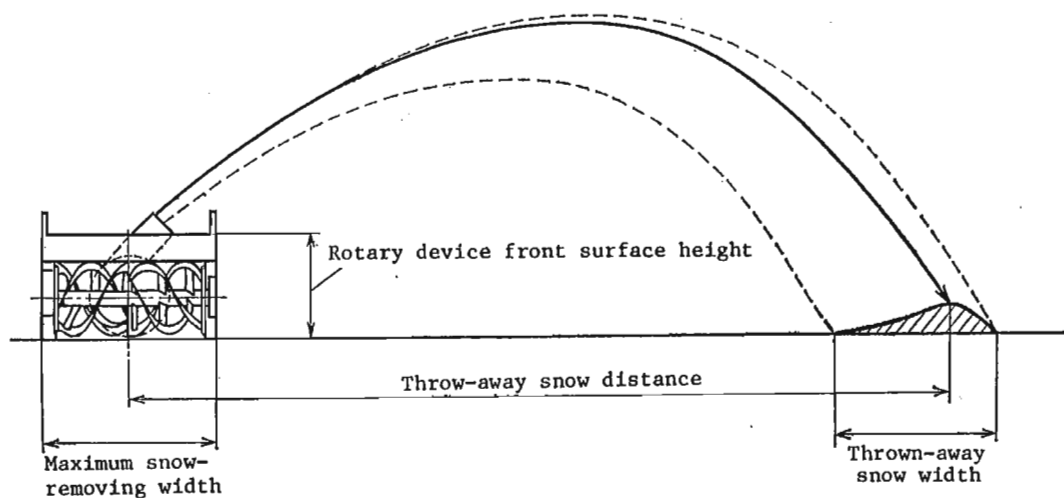
2. Definitions

For the purposes of this standard, main terms are in accordance with JIS D 0001, JIS D 0101, and JIS 0102, and otherwise the following definitions apply:

- (1) vehicles with rotary snow plough The vehicles equipped with a rotary device to carry out the snow removing work.
- (2) rotary device A device to rake-in snow by rotary movement of the machine to carry out throwing out the snow.
- (3) working condition The condition where the fuel is filled with not less than $\frac{2}{3}$ of tank capacity, the quantities of cooling water, lubricating oil, working oil are made the values specified in respective rotary vehicles, portable tools and other accessories are equipped, the adjustable parts are suitably adjusted and the driver and the assistant required for snow removing out of the riding capacity are rided.
- (4) snow removing figure The figure to carry out normal removing snow with placing the rotary device on the ground.
- (5) travelling figure The figure where the chute is stored in the minimum dimension with retaining horizontal at the middle of rotary vehicle with the rotary device at or higher than the ground clearance of undercarriage so as to be suitable for travelling of rotary vehicle.
- (6) snow-removing capacity The removing snow volume or removing snow mass per hour. The removing snow volume is expressed by the volume of snow before removing.
- (7) throw-away snow distance The distance from the body median plane to the place of highest fallen snow of thrown-away snow (see Figure).
- (8) thrown-away snow width The width of snow fallen band state by thrown-away snow (see Figure).
- (9) maximum snow-removing width The maximum width capable of being removed by one time advancing of the rotary vehicle (see Figure).

- (10) rotary device front surface height The height of the upper side of the construction which is so made that the removed snow does not run away rearward the rotary device under the snow removing figure (see Figure).
- (11) rotary device front surface area The front projection area of the construction which is so made that the removed snow does not run away rearward the rotary device under the snow-removing figure.
- (12) remaining snow height The height of snow remaining after snow-removing from the road surface. However, where the surface to be considered as the ice board exists, the height from the surface.
- (13) field of vision at operating The range of ground surface around the rotary vehicle where the operator of standard body build can see from the seat at operating posture under the travelling figure.

Figure



3. Test Items

The test shall be carried out, as a rule, on following each item. However, a part of test items or measuring items may be omitted according to the test purposes, style of rotary vehicle, or otherwise as required, items not shown in attached table may be added.

- (1) Engine performance test
- (2) Torque converter practical use performance test
- (3) Stationary test
 - (a) Main dimension measurement

- (b) Vehicle mass and load distribution measurement
 - (c) Tilting limit angle measurement
 - (d) Rotary device operating performance measurement
 - (e) Operating vision field measurement
 - (4) Travelling test
 - (a) Travelling speed test
 - (b) Braking test
 - (c) Minimum turning radius test
 - (5) Snow removing test
 - (a) Maximum snow-removing capacity test
 - (b) Maximum throw-away snow distance test
 - (c) Expanding width snow-removing capacity test
 - (d) Chute loading test
 - (6) Continuous working test
 - (7) Other tests
 - (8) Noise and vibration measurements
 - (a) Noise measurement
 - (b) Vibration measurement
4. Preparation for Test
- The preparation for rotary vehicle to be tested shall be carried out as follows:
- (1) Elements Table of Rotary Vehicles Prior to test, prepare the specifications recorded according to JIS D 6510.
 - (2) History Table of Rotary Vehicle Prepare the history table from manufacture to the test, as required.
 - (3) Matching Carry out the test, as a rule, under the working condition, and preliminarily carry out sufficiently warming up operation. Where the driving engine for rotary device is different from the driving engine, unless specially designated, adjust to the condition of working load test and place the fuel lever at the highest position.
Furthermore, equip tyre chain and the like, as required, and append the effect.

- (4) Preparation for Measurement of Engine Rotational Speed and Fuel Consumption Prepare each engine so as to be able to measure the rotational speed and fuel consumption.
- (5) Instruments for Measurement Prior to the test inspect the instruments for measurement and correct, as required.

5. Measuring Devices

5.1 Engine Performance For the engine performance use the measuring devices specified in JIS D 1001 or JIS D 1005.

5.2 Torque Converter Performance For measurement of torque converter performance use the measuring device specified in JIS D 1007.

5.3 Dimensions For measurement of dimensions of each part of rotary vehicle, use the tape measures specified in JIS B 7512 or the rules specified in JIS B 7516.

5.4 Mass For measurement of mass, use a platform weighing machine or hanging balance.

5.5 Time For measurement of time, use a stop watch or electronic type counter. The minimum scale mark shall be 0.2 max.

5.6 Angle For measurement of angle, use an angle gauge with a level or the level specified in JIS B 7511 and rules specified in JIS B 7516.

5.7 Rotational Speed For measurement of rotational speed, use a tachometer specified in JIS B 7521 or electronic type counter.

5.8 Air Pressure For measurement of air pressure, use a tyre gauge specified in JIS D 8201.

5.9 Temperature For measurement of temperature, use the measuring device specified in JIS Z 8704 or JIS Z 8705.

5.10 Fuel Consumption For measurement of volume (ml) or mass (g) of fuel consumed and the time (s), use the measuring device which is able to obtain precision within 2% relative to the respective values.

5.11 Noise For measurement of noise level, use the sound level meter specified in JIS C 1502 or precision sound level meter specified in JIS C 1505.

5.12 Vibration For measurement of vibration, use the vibration level meter specified in JIS C 1510.

6. Measurement Test Method

6.1 General Round off the numerical values of the measurement test results to significant three figures according to JIS Z 8401.

6.2 Engine Performance Test For the engine to be equipped with the rotary vehicle to be tested, prior to each test, carry out the type test according to JIS D 1001 or JIS D 1005 or the test records.

6.3 Torque Converter Practical Performance Test For the torque converter to be equipped with the rotary vehicle, carry out the general performance test and stall performance test out of practical performance test according to JIS D 1007 or the test records.

6.4 Stationary Tests The stationary tests shall be as follows:

- (1) Test Conditions Carry out the stationary test on a flat paved road or the like where the wheel does not sink.
- (2) Main Dimension Measurement For the main dimensions, carry out the measurement on each item of Attached Table 2. However, measure the front overhang under the travelling figure and measure the others under snow-removing figure.
- (3) Measurement of Vehicle Mass and Load Distribution Measure the following items and enter in Attached Table 3.
 - (a) Vehicle Total Mass For the vehicle total mass, lade fully the fuel, make the quantities of cooling water, lubricating oil, working oil, etc. the values specified for the rotary vehicle and add the mass of riders (55 kg x riding capacity). Further, in the case of crawler type, append the contact ground area and ground pressure specified in JIS D 0003.
 - (b) Front-Rear Axle Load For the front-rear axle load place the rotary vehicle under the measuring condition of vehicle total mass, and measure on the travelling figure and snow-removing figure.
 - (c) Load Distribution Rate Calculate the load distribution rate from the measured results of front-rear axle loads according to the following formula:
 Load distribution rate (%)

$$= \frac{\text{front axle load or rear axle load (kgf)} \{N\}}{\text{gravity acting on vehicle total mass (kgf)} \{N\}} \times 100$$
- (4) Measurement of Tilting Limit Angle Measure the maximum tilting angle in right or left direction where the rotary vehicle maintain the stationary condition under the travelling figure or obtain according to the calculation and enter in Attached Table 3.
- (5) Measurement of Rotary Device Operating Performance Measure on the following items and enter in Attached Table 4, provided that the engine shall be at the rated rotational speed.

- (a) Travel Amount of Rotary Device and Travelling Speed Measure the lifting, lowering and side shift performances of the rotary device. For lifting, place the rotary device on the ground, and measure until it reaches the lifting capability limit, and for lowering measure from the lifting capability limit until it reaches on the ground. For side shift, measure from the travelling figure to the maximum travelling positions in right and left of rotary device.
- (b) Maximum Height of Cutting Blade Lower End from the Ground and Maximum Cutting Depth For the maximum height above the ground, measure the height of rotary device cutting blade lower end where the rotary device is lifted up to the lifting capability limit with the rotary device made horizontal and vertical condition as it is. For the maximum cutting depth, place the rotary vehicle on a stand, and when the rotary device is lowered to the lower capability limit, measure the distance from the contact ground surface of tyre of rotary device cutting blade lower end.
- (c) Adjusting Angle of Rotary Device, Travel Amount of Chute and Snow Cutting Plate For the adjusting angle of rotary device and blower case, measure the adjusting capable angle on the front tilting angle, right-left tilting angle and angling from the condition of horizontal and vertical condition of rotary device, for travel amount of chute measure the elongation-shrinkage amount including chute cap, adjustable amount of slewing angle or the angle. Further for the maximum height of the chute, measure the height from the lower end of cutting blade of the rotary device to the upper end of chute cap at the time of maximum elongation of chute. For snow-cutting plate, measure the height from the lower end of cutting blade of the rotary device.
- Further, concerning the inclination of snow-throw away opening, chute slewing, chute elongation-shrinkage, and chute cap adjustment, measure the required time and enter in remark column.
- (d) Natural Lowering Amount of Rotary Device Lift the rotary device up to the lifting capability limit, carry out stopping operation according to the oil-hydraulic operating valve, and after lapse of time of 30 min as it is, measure the lowering amount and working oil temperature (or working oil tank temperature).
- (6) Measurement of Operating Field of Vision Measure the field of vision at operating, prepare the range figure and enter in Attached Table 5.

6.5 Travel Test The travel test shall be carried out as follows:

- (1) Test Conditions Carry out the test, as a rule, on a flat and dry linear paved road under the travelling figure.

- (2) Travelling Speed Test Take 50 m as the measuring section when the vehicle speed at test is 10 km/h or more, and 20 m when it is less than 10 km/h, provide suitable entrance section at both ends, travel in going and returning at each speed stage of forward and backward travel, calculate the travelling speed from the average value of the required time and enter in Attached Table 6.
- (3) Brake Test Measure according to JIS D 1013 and enter in Attached Table 7.
- (4) Minimum Turning Radius Test For the minimum turning radius test, make the steering angle the maximum, carry out right turning and left turning at the lowest speed, measure the following items and enter in Attached Table 8.
 - (a) Rotary Vehicle Outermost Side Measure the radius of circular arc drawn by the rotary vehicle outermost side (excluding snow-cut plate).
 - (b) Rotary Vehicle Innermost Side (Wheel Type) Measure the radius of circular arc drawn by the rotary vehicle innermost side (excluding snow-cut plate).
 - (c) Outermost Side Wheel Centre (Wheel Type) Measure the radius of trace centre of wheel passing through the outermost side.
 - (d) Innermost Side Wheel Centre Measure the radius of trace centre of the wheel passing through the innermost side.
 - (e) Outermost Side of Crawler Contacting Ground Surface (Crawler Type) Measure the radius of outermost side of crawler trace at the minimum turning.

6.6 Snow-Removing Test

6.6.1 Maximum Snow-Removing Capacity Test Test the capacity in the case where the remaining snow is little as far as possible and the snow is removed to be flat according to the operation of vehicle so as to be able to obtain the maximum snow-removing amount.

(1) Test Conditions and Preparation

- (a) Configuration of Ground It shall be a flat place without gradient. However, in inevitable case, it may be a inclined road surface.
- (b) Distance The distance of measuring section shall be not less than 20 m and the testing time be not less than 30 s in the distance. In front and rear of the measuring section, respectively suitable entrance sections shall be provided and legible mark shall be set.