

I - 4. URINE SPREADERS

I - 4 URINE SPREADER

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1. Scope

This standard specifies testing methods and procedures of inspection for power driven Urine Spreaders to spread of cattle urine, but stationary and piping type spreaders are excluded herefrom.

2. Classification of Urine Spreaders

2.1 The classification of urine spreaders shall be made according to the pump type as follows:

(1) Liquid-Pump Type

The liquid-pump type means the urine spreader which uses the liquid pump for sucking and spreading cattle urine.

(2) Vacuum-Pump Type

The vacuum pump type means the urine spreader which uses the vacuum pump for sucking and spreading cattle urine.

2.2 According to transporting method of the body, the urine spreaders shall be classified into two types as follows:

(1) Tank Vehicle Type

The tank vehicle type means that the body equipped with a urine tank which is tracted by a tractor or mounted on a tractor.

(2) Hand Cart Type

The hand cart type means the body is transported by man-power and equipped with the delivery hose over than 40 meters long.

3. Definition of Terms

The meaning of terms to be used in this standard shall be defined as follows:

(1) Weight of Full-Equipment

The full-equipment weight means the state of machine can do the field work with 80% of fuel tank capacity and regular amount of lubricating oil filled, but the urine tank shall be empty. However, the tractor, in case of the equipments are mounted on, shall be included therein.

(2) Pump Datum Level

The pump datum level shall mean the level of water surface involving the axis of pump-shaft for the horizontal type pump, but it shall be involved the level of center-line for the inlet-tip of impeller for the vertical type pump.

(3) Degree of Vacuum

Degree of vacuum shall mean the absolute pressure which is under the atmospheric pressure to be presented by the head (mm) of mercury manometer.

(4) Reaching Degree of Vacuum

Reaching degree of vacuum means the lowest degree of vacuum being obtained by the pump under its normal and stable conditions.

(5) Specified Revolutions

The specified revolutions mean the number of pump-shaft revolutions which is indicated in the specification submitted by a manufacturer.

(6) Normal Delivery Rate of Liquid Pump Type

The normal delivery rate means the delivery volume of pump at the time of spreading which is indicated in the specification. However, the urine spreader which can not adjust the delivery volume shall be determined its normal rate of delivery as follows:

1) Hand Cart Type

The normal delivery rate for the Hand cart type shall mean the delivery volume of nozzle in case when there exist 2 meters difference in height between the pump datum level and the liquid level of suction.

2) Tank Vehicle Type

The normal delivery rate for the Tank vehicle type means the delivery volume of pump when the liquid level of suction is considered the same level with the center height of tank.

(7) Normal Delivery Pressure and Normal Degree of Vacuum for the Vacuum Pump Type

The normal delivery pressure shall mean the delivery pressure of pump at the time of spreading and the normal degree of vacuum shall mean the degree of vacuum at the time of starting the suction which are indicated on the specification respectively.

(8) Normal Spreading Width

The normal spreading width means the spreading width in line with right angle against the line of spreading direction as given in numerical value on the specification.

1. Procedures of Inspection

4.1 Items to be Inspected

The inspection shall be carried out by the following tests and investigations:

- (1) Verification of the Specification
- (2) Spreading Performance Test
- (3) Performance Test of Pressure Regulating Valve
- (4) Leaking Amount Test
- (5) Pump Performance Test
- (6) Handling Test
- (7) Continuous Running Test
- (8) Investigation after Disassembling

4.2 General Conditions for Inspection

(1) Preliminary Running

The urine spreader to be put on the test (hereinafter referred to as the "Urine Spreader on test") shall be considered to have been run-in enough prior to the test.

The preliminary running for each test shall be within 30 minutes.

(2) Measuring Instruments

The measuring instruments to be used for measuring shall have been checked and calibrated prior to the

measurements, and shall be capable of taking the accurate measurement required as follows:

| Main purpose of use | Kind of instrument | Required minimum scale and accuracy |
|--------------------------------------|--|--|
| Measurement of number of revolutions | digital tachometer | within the range of error ± 1 rpm |
| Measurement of hours | chronometer | within minimum scale not more than 0.2 sec. |
| Measurement of load | electric dynamometer (plate scale) | capable of reading at least down to 1% of the maximum measured value |
| Measurement of pressure | resistant-wire, pressure measuring apparatus | within the range of error $\pm 1\%$ of the rating value |
| Measurement of pressure | Bourdon pressure gauge | Minimum scale: below 0.2 kg/Cm ² |
| | U-tube of liquid column | below 1 mm |
| Measurement of water volume | electric-magnet type, flow meter | within the range of $\pm 1\%$ of the rating value |
| Measurement of temperature | centigrade thermometer | capable of taking finer scale than 2°C |
| Measurement of weight | platform scale | capable of reading down to 2% of load |

(3) Suspension of Test

When one of each test stops more than 3 times or longer than 30 minutes, the test shall be stopped. However, the test which may be stopped irrespective of manufacturer's responsibility shall be recovered.

4.3 Methods of Testing and Investigation

4.3.1 Verification of Structure

(1) Object

The object of this investigation is to ascertain the main dimensions, weights, materials, equipments and so forth in comparison actual things of the Urine Spreader on test with the said items indicated on the specification.

(2) Items to be Investigated

- 1) Dimension:
 - Overall length
 - Overall width
 - Overall height
 - Weight of the full-equipment

2) Type

- (a) The investigation shall be made to see either Tank vehicle type or Hand cart type
- (b) Liquid pump type or vacuum pump type

3) Liquid Pump

(The investigation of liquid pump shall be made only for the liquid pump type.)

- (a) Type of pump
- (b) Priming type or self-priming type

- (c) Diameters of the suction pipe and the delivery pipe
- (d) Number of specified revolutions
- (e) Normal rate of delivery
- 4) Vacuum Pump (only for the vacuum pump type)
 - (a) Type of pump
 - (b) Number of specified revolutions
 - (c) Theoretical exhausting speed
 - (d) Normal speed of vacuum
 - (e) Normal delivery pressure
 - (f) Kind of lubricating oil
- 5) Hose
 - (a) Inside diameter and length of suction pipe
 - (b) To ascertain whether the hose has a strainer or not, and mesh of wire-net for the strainer shall be checked, if any
 - (c) To ascertain whether it has a foot valve or not
- 6) Nozzle Pipe
 - (a) Type of nozzle pipe
 - (b) Diameter of orifice on the nozzle cap or plate
 - (c) Number of nozzles and space between nozzles
 - (d) Normal width of spreading
- 7) Pressure Regulating Valve
 - (a) Type of pressure regulating valve
 - (b) Range of pressure adjustment
- 8) Urine Tank (only for the Tank Vehicle Type)
 - (a) Capacity

- (b) To ascertain whether it has a agitator or not, and adjusting method, if any
 - (c) To ascertain whether it has a device of automatic suction stopper or not
 - (d) To ascertain whether it has a strainer or not, and mesh of strainer, if any
 - (e) Anti-corrosive measure for the inner-surface of tank
- 9) Transport Wheel (only for the Tank Vehicle Type - Pull Type)
- (a) Type and size of wheel
 - (b) Track or tread range
 - (c) Vertical static load on the hitching part under the working condition
- 10) Prime Mover
- (a) Name of type
 - (b) Horsepower and number of revolutions
 - (c) Kind of lubricating oil
 - (d) Cooling system
- 11) Tractor (only for the Tank Vehicle Type)
- (a) Name of type
 - (b) Riding type or walking type
 - (c) Mounted engine
 - i) Name of type
 - ii) Horsepower and number of revolutions
 - iii) Kind of fuel
 - iv) Cooling system
 - (d) r. p. m. for power take-off shaft
 - (e) Shape and size of power take-off shaft

12) Power Transmission Mechanism

(a) Power transmission system and speed ratio

13) Other necessary items

4.3.2 Spreading Performance Test

(1) Object

The object of this test is to ascertain the spreading performance of the Urine Spreader on test.

(2) Testing Equipment

1) The Urine Spreader on test shall be run under the condition of equipments mounted on it for the field work.

2) Actual suction head shall be approx. 2 meters.

3) Delivery hose shall be rolled in circular form with the diameter of 5 meters.

(3) Liquid to be Used for the Test

Fresh water shall be used for this test, and here water temperature ranges from 0° to 40°C.

(4) Testing Method

1) Number of revolutions for the test shall conform to the specified number of pump shaft revolutions.

2) The measurement of time required for the suction-preparation. The time required for the suction preparation shall be self-priming or priming hours for the liquid type pump and pressure decreasing hours for the vacuum type pump.

3) Required hours for suction shall be measured (only for the Tank Vehicle Type) from the time of

opening a suction valve until closing it, but the required hours for setting of suction pipe and reducing pressure of pump are not included therein.

4) Delivery volume of nozzle shall be measured in terms of weight after collecting discharged volume for a limited time by a water meter. However, liquid level of suction for the Tank Vehicle Type shall be at intermediate level of liquid in the tank.

5) Spreading Volume

The measurement of spreading uniformity and working efficiency shall be made by the following methods:

(a) Spreading speed shall mean the speed can be able to spread more than 400 ℓ of liquid per 10 ares (hereinafter referred to as the "spreading speed for test").

The spreading speed for the test shall be obtained by the following formula:

$$V_t = \frac{16.7q}{Q' 10a L}$$

where,

V_t : spreading speed for test (m/sec)

$Q' 10a$: volume of liquid which is desired to be spread in 10 ares (ℓ)

q : delivery volume of nozzle (ℓ/sec)

L : normal width of spreading (m)

(b) Number of nozzle-swings on both sides shall be left to a manufacturer's option.

(c) The spreading uniformity shall be investigated by measuring of absorbed liquid amount in a blotter, which shall be placed at 20 points within the range of normal spreading width through the arrangement of cutting each blotter in 5 Cm square, (one set of blotting pad consists of 5 sheets of cut-blotter for this test purpose).

(d) A total number of operators shall be less than 4 persons. However, in case when the hose is longer than 40 meters, it shall be allowed to increase one operator for every 20 meters' extension of its length.

(5) Items to be Measured

- 1) Required horsepower for suction
- 2) Delivery rate of nozzle
- 3) Spreading speed
- 4) Number of nozzle-swings from side to side
- 5) Spreading amount per 10 ares
- 6) Fluctuating coefficient of spreading amount
- 7) Working efficiency

(6) Calculating Method

The calculation of spreading volume per 10 ares, fluctuating coefficient of spreading volume and working efficiency shall be calculated by the following formulae:

$$Q_{10a} = 16.7 \frac{q}{L V}$$

where,

Q_{10a} : spreading volume (ℓ)

q : delivery volume of nozzle (ℓ/min)

L : normal width of spreading (m)

V : spreading speed (m/sec)

$$C = \sqrt{\frac{\sum (X_i - \bar{X})^2}{20 \bar{X}}} \times 100$$

where,

C : fluctuating coefficient of spreading volume (%)

X_i : absorbed liquid volume in blotters (g)

\bar{X} : mean value of X_i (g)

$$T_1 = \frac{Q_{10a}}{q}$$

$$T_2 = Q_{10a} \left(\frac{t}{C} + \frac{1}{q} \right)$$

where,

T_1 : working efficiency for the Hand cart type (min/10a)

T_2 : working efficiency for the Tank vehicle type (min/10a)

t : suction hours of the Tank vehicle type (min)

C : capacity of urine tank (ℓ)

4.3.3 Performance Test of Pressure Regulating Valve

(1) Object

The object of this test is to ascertain the accuracy and safety of the pressure regulating valve.

(2) Testing Equipment

A resistant-wire type pressure measuring apparatus or a Bourdon tube type - pressure gauge shall be placed near to the fitting position of the pressure regulating valve on the Urine Spreader on test.

(3) Testing Method

- 1) The pressure for the test shall be the normal or maximum delivery pressure.
- 2) The adjustment shall be required to keep the functioning of pressure regulating valve under the normal or maximum delivery pressure.
- 3) The fluctuation percentage shall be obtained by measuring the working pressure of pressure regulating valve after giving the pressure to the tank prepared for the normal running under full-filling of water in the tank, but the measurement should be taken 10 times under the same pressure.

(4) Items to be Measured

- 1) The fluctuating percentage of working pressure

(5) Calculating Method

$$A = \frac{|P_i - P_k| \max}{P_k} \times 100$$

where, A : fluctuating percentage of working pressure (%)

$|P_i - P_k| \text{ max.} :$ maximum of the absolute value of [working pressure (P_i) - regulating pressure (P_k)]

4.3.4 Leaking Amount Test

This test shall be carried out for the Urine Spreader (Vacuum Type) on test.

(1) Object

This test is made for the purpose of ascertaining the functioning conditions of air tightening in the piping arrangements and urine tank.

(2) Testing Equipment

Vacuum gauge shall be fitted near to the fitting position of pressure regulating valve of the Urine Spreader on test and cut-off valve shall be coupled to the air inlet port of pump.

(3) Testing Method

1) For this test, the full capacity of tank shall be filled with fresh water and the test shall be carried out immediately after discharging fresh water from the urine tank.

2) The pressure increased for a limited time shall be measured following to the arrangement of decreasing the pressure in the urine tank down to 200 mm Hg of vacuum degree and closing the cut-off valve in delivery port of the urine tank.

(4) Items to be Investigated

1) Amount of liquid leakage in the piping arrangements and the urine tank

(5) Calculating Method

The calculation of leaking amount shall be made by the following formula:

$$Q_e = \frac{C_{TP} (\gamma_2 - \gamma_1)}{1.2t}$$

where,

Q_e : leaking amount converted to the standard condition (cc/min)

C_{TP} : capacity of piping arrangement and urine tank (cc)

γ_1 : unit volumetric weight at the time of starting measurement (kg/m³)

γ_2 : unit volumetric weight at the time of measuring-end (kg/m³)

t : measuring time (min)

4.3.5 Pump Performance Test

(1) Object

The object of this test is to ascertain the pump performance of the Urine Spreader on test.

(2) Performance Test of Liquid Pump

This test shall be carried out for liquid pump type of the Urine Spreader on test.

1) Testing Equipment

(a) Required horsepower shall be measured by an electric dynamometer.

(b) Power transmission shall, as a rule, be the same system as the final position of power transmission system of the Urine Spreader on test.

(c) Actual suction head shall be approx. 1 meter.

(d) For the measurement of pressure, a Bourdon tube-pressure gauge or a resistant wire type-pressure measuring apparatus fitted to the suction and delivery ports shall be used.

(e) Delivery volume shall be measured by a flow meter which is coupled to the delivery port through the throttle valve.

(f) A throttle valve must be fitted to the inlet port of suction pipe.

2) Liquid to be Used

The pumps shall be tested with fresh water, the temperature of water ranges from 0° to 40°C and the weight per unit volume considered as 1 kg/ℓ for fresh water.

3) Testing Method

(a) Number of pump-shaft revolutions shall be the specified revolutions.

(b) The performance test of pump shall be carried out against five or more different delivery volume, including the one with the normal delivery volume by regulating of delivery volume in the state of cut-off, gradually toward increase of delivery volume, but only centrifugal pump is included herein.

(c) The measurement of actual head for maximum suction shall be made under the condition of nozzle-delivery volume at work 40 ℓ/min for the Hand cart type and 80 ℓ/min for the Tank vehicle

type.

4) Items to be Measured

- (a) Delivery volume
- (b) Head
- (c) Required horsepower
- (d) Actual head of maximum suction

5) Calculating Method

Head, hydraulic power, required horsepower, pump efficiency and actual head of suction shall be calculated by the following formulae:

(a) Head

$$H = H_d - H_s$$
$$H_d = h_d + \frac{V_d^2}{2g}$$
$$H_s = h_s + \frac{V_s^2}{2g}$$

where,

H : total head (m)

H_d : delivery head (m)

H_s : suction head (m)

h_d : delivery pressure converted to datum level of pump (m)

V_d : average speed of liquid passing through the section at the position of pressure measuring hole drilled on the delivery port of pump (m/sec)

V_s : average speed of liquid passing through the section at the position of pressure measuring hole drilled on the suction port of pump (m/sec)

(b) Hydraulic power

$$W = \frac{H \cdot QW}{4,500}$$

where,

W : hydraulic power (Ps)

QW : delivery volume (ℓ /min)

(c) Required horsepower

$$B = \frac{W N}{K}$$

where,

B : required horsepower (Ps)

W : load applied on the end of dynamometer (kg)

N : number of dynamometer revolutions (rpm)

K : coefficient of dynamometer

(d) Pump efficiency

$$\eta_w = \frac{W}{B} \times 100$$

where,

η_w : pump efficiency (%)

(e) Actual suction head

$$H_{SR1} = 13.6 (P_{s1} - P_{s2}) + H_{SR2}$$

where,

H_{SR1} : actual head of suction
when the reading of
suction-side vacuum
gauge is P_{s1} (m)

P_{s1} : reading of suction-side
vacuum gauge when the
inlet port of suction pipe
is closed (mm Hg)

P_{s2} : reading of suction-side
vacuum gauge in case of
no fitting the throttle
valve to the suction pipe
(mm Hg)

H_{SR2} : height difference between
datum level of pump and
liquid level of suction
(m)

$$H_{SR} = \frac{(760 - 9.2) H_{SR1}}{P_d - P_{VP}}$$

H_{SR} : actual head of suction
converted to the standard
condition (atmospheric
pressure 760 mm Hg,
water temp. 10°C) (m)

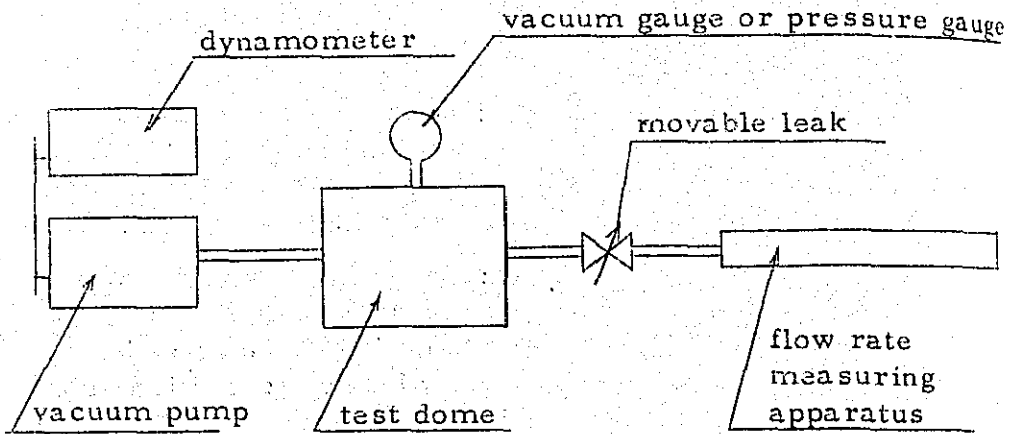
P_d : atmospheric pressure at
the time of testing
(mm Hg)

P_{VP} : saturated vapour pressure
of water at the time of
testing (mm Hg)

3) Performance Test of Vacuum Pump

This test shall be carried out for the Vacuum type
pump of the Urine Spreader on test.

1) Testing Equipment



(a) The measurement of required horsepower shall be made by an electric-dynamometer.

(b) Power transmission shall, as a rule, be the same system as the final position of power transmission system of the Urine Spreader on test.

(c) Vacuum gauge and pressure gauge, U-tube of liquid column, resistant-wire type pressure measuring apparatus or Bourdon tube pressure gauge shall be used.

(d) The measurement of flow rate shall be made by orifice or nozzle, or it can be calculated by the pressure changing speed in the test dome.

2) Testing Method

(a) Number of pump-shaft revolutions for testing shall be the specified revolutions.

(b) The measurements shall be done for the suction performance and pressuring performance.

The measurement of suction performance shall be made against five or more different degrees of vacuum, including the one with normal vacuum degree, furthermore, against reaching degree of vacuum.

The measurement of pressuring performance shall be carried out against five or more different pressures including the one with normal delivery pressure.

(c) The measurements should be carried out after confirming that temperature of each part reaches nearly to the fixed degree.

3) Items to be Measured

(a) Air exhausting speed

(b) Degree of vacuum

(c) Suction air volume

(d) Delivery pressure

(e) Required horsepower

4) Calculating Method

Air exhausting, suction air volume, adiabatic air power and adiabatic pump efficiency shall be computed from the following formulae:

(a)

(a) Air exhausting speed

i) In the case when a orifice or a nozzle is used,

$$Q_{so} = 6 \times 10^4 \alpha A \sqrt{2 gh / \gamma}$$

where,

Q_{so} : suction air volume in flow rate measuring apparatus (ℓ/min)

α : flow coefficient of orifice or nozzle (ℓ/min)

A : area of opening for orifice or nozzle (m)

g : acceleration of gravity
 $g = 9.8 \text{ m/sec}$

h : pressure difference between just front and just rear of orifice or nozzle (mm Aq)

γ : unit volumetric weight (kg/m)

$$S_1 = \frac{Q_{so} \cdot P_{so}}{P - P_o}$$

where,

S_1 : air exhausting speed at degree of vacuum (ℓ/min)

P_{so} : absolute pressure just front of orifice or nozzle (mm Hg)

P : absolute pressure inside of test dome (mm Hg)

P_o : reaching degree of vacuum (mm Hg)

ii) Calculation by changing speed of pressure

$$S_2 = 60 \times \frac{2.3 Vt}{t} \log \frac{P_1 - P_0}{P_2 - P_0}$$

where,

S_2 : air exhausting speed under the vacuum degree
 $\left(\frac{P_1 + P_2}{2} \right)$ (ℓ/min)

Vt : volume of test dome and connecting pipe

t : measuring time (sec)

P_1 : absolute pressure inside of test dome at the time of measuring-start
 (mm Hg)

P_2 : absolute pressure inside of test dome at the time of measuring-end
 (mm Hg)

(b) Suction air volume

$$Q_{do} = 6 \times 10^4 \partial A \sqrt{2 gh / \gamma}$$

where,

Q_{do} : delivery air volume in the flow measuring apparatus
 (ℓ/min)

$$Q_s = Q_{do} \frac{\gamma}{\gamma_s}$$

where,

Q_s : air volume converted to the suction condition
 (ℓ/min)

γ_s : unit volumetric weight of suction air (kg/m³)

(c) Adiabatic air power

$$W_{ad} = \frac{K}{K-1} \frac{13.6 P_s Q_s}{4.5 \times 10^6} \left\{ \left(\frac{P}{P_s} \right)^{\frac{K-1}{K}} - 1 \right\}$$

where,

W_{ad} : adiabatic air power in of delivery pressure (Ps)

K : adiabatic index of air = 1.4

P_s : absolute pressure of suction air (mm Hg)

(d) Adiabatic pump efficiency

$$\eta_{ad} = \frac{W_{ad}}{B} \times 100$$

where,

η_{ad} : adiabatic pump efficiency (%)

4.3.6 Handling Test

(1) Object

This test is made for the purpose of ascertaining ease or otherwise of operational handling for the Urine Spreader on test.

(2) Work to be Tested

- 1) Fresh Water Disposal Work
- 2) Sewage Disposal Work

The test of 2) shall be made for the Urine Spreader on test which can be able to do the work of sewage disposal.

(3) Liquid to be Used in Test

The liquid to be used in the test of fresh water disposal work shall be fresh water.

In the test of sewage disposal work, the following materials shall be used after mixing with water as mentioned hereunder:

| <u>Quantity</u> | <u>Treatment</u> |
|------------------|--|
| Water 1 l | |
| Rice straw 0.5 g | To chop rice-straws into 2 - 5 Cm in length before mixing with water |
| Wood meal 10 g | |
| Soil 10 cc | To sift wood meal and soil with a siever (approx. 3 mm) |

(4) The investigation should be made by more than two investigators through the operation of the Urine Spreader on test.

(5) Items to be Investigated

- 1) Easiness of transportation
- 2) Easiness of steering when the urine spreader is travelling
- 3) Easiness of sucking operation
- 4) Easiness of spreading operation
- 5) To ascertain that there is no development of irregularities, such as blocking, oil leakage, etc.
- 6) Easiness of adjustment of each part
- 7) Other necessary items

3.7 Continuous Running Test

(1) Object

The object of this test is to ascertain the operating condition and that there is no development of irregularities and troubles under the continuous running of the Urine Spreader on test.

(2) Testing Equipment

- 1) The Urine Spreader on test shall be operated under the condition of the full-equipment.
- 2) The measuring part of thermometer shall be placed on the surface of the bearing parts and other necessary parts.

(3) Liquid to be Used in Test

Rice straws (0.5 g) chopped into approx. 2 Cm long and wood meal (10 g) sifted by a sieve of 3 mm shall be mixed with water of 1ℓ. However, the temperature of liquid should be kept within the range from 0° to 40°C.

(4) Testing Method

- 1) Number of pump-shaft revolutions shall be the specified revolutions.
- 2) Delivery volume of nozzle shall be at the rate of normal delivery.
- 3) Suction actual head shall be held from 1 to 2 m.
- 4) In case of the Urine Spreader on test is tank vehicle type, suction and delivery operations should be made repeatedly.
- 5) The time of operation shall be for 3 hours.

(5) Items to be Measured and Investigated

- 1) Atmospheric temperature
- 2) Liquid temperature
- 3) Surface temperature of each part
- 4) Oil leakage
- 5) Vibration and noise
- 6) To ascertain that there is no development of irregularities in the spreader
- 7) Other necessary items

4.3.8 Investigation after Disassembling

This investigation shall, as a rule, be carried out after having made all kinds of tests.

(1) Object

The object of this test is to ascertain that there is no development of irregularities on the Urine Spreader on test after having done all kinds of tests.

(2) Items to be Investigated

This investigation shall be made for ascertaining of any abnormalities on the Urine Spreader on test after disassembling it completely, and if necessary, the measurement and investigation shall be taken for fitting condition, hardness, processing, touch degree of finishing and balancing of rotating parts, etc.

Standards to Pass the Inspection

The decision of inspection for the Urine Spreaders shall conform to the following standards:

5.1 Performance Inspection

- (1) The result of test in 4.3.2, fluctuating coefficient of spreading volume should be below 150%.
- (2) The result of test in 4.3.2, working efficiency for the Hand cart type - urine spreader should be below 10 min/10 ares and below 15 min/10 ares for the Tank vehicle type-urine spreader.
- (3) The result of test in 4.3.3, fluctuation percentage of working pressure should be below 30%.
- (4) In the test of 4.3.4, leaking volume should be below 100 cc/min in term of leaking volume converted into the standard condition.
- (5) In the test of 4.3.5-(2), pump efficiency under the condition of normal rate of delivery should be over 25% for the centrifugal pump.
- (6) In the test of 4.3.5-(2), actual head of maximum suction under the normal condition should be over 3 meter
- (7) In the test of 4.3.5-(3), adiabatic pump efficiency under the normal delivery pressure should be over 30%.
- (8) In the test of 4.3.5-(3), reaching degree of vacuum should be below 200 mm Hg.

5.2 Durability Inspection

- (1) The durability inspection shall be required to safety the requirements specified hereunder, particularly in principal parts and parts which may be difficult to replace easily.
- (2) No abnormal abrasion

(3) No oil leakage

(4) To have the necessary measure against corrosion

5.3 Handling Inspection

(1) In the test of 4.3.6, it should be free from the defects which may give much fatigues to the operator.

(2) In the test of 4.3.6, it should not show any defects that may bring much dangerous feelings to the operator.

(3) In the test of 4.3.6, no defects that shall be the cause of much difficulties to replace and adjust the parts.

INSPECTION RECORD SHEET

Date:

Certificate No.

THE INSTITUTE OF AGRICULTURAL
INSTITUTE

Kind of agricultural
machinery

Urine Spreader (

Liquid Pump Type)

Manufacturer's type
designation

Manufacturer's name and add.

1. Main Structure
(1) Dimension

| Overall length | Overall width | Overall height | Gross Weight | Remarks |
|----------------|---------------|----------------|--------------|---|
| mm | mm | mm | kg | The weight shall be included 80% of fuel and regular amount of lubricating oil. |

(2) Pump

| Type | Self-priming type or priming type | Dia. of delivery part | Specified revolutions | Normal delivery rate |
|------|-----------------------------------|-----------------------|-----------------------|----------------------|
| | | mm | rpm | ℓ/min. |

(3) Hose

| Suction hose | | | | Delivery hose | | |
|-----------------|--------|-----------|--------------------------|-----------------|--------|-----------|
| Inside diameter | Length | Materials | With strainer or without | Inside diameter | Length | Materials |
| mm | m | | | | | |

(4) Nozzle

| Type | No. of nozzles | Normal spreading width |
|------|----------------|------------------------|
| | | m |

(5) Urine Tank

| Capacity | Corrosion proof inner surface | With agitator or without | With liquid level gauge or without |
|----------|-------------------------------|--------------------------|------------------------------------|
| l | | | |

(6) Prime Mover

| Type | Rated horsepower | Rated r.p.m. | Kind of fuel | Cooling system |
|------|------------------|--------------|--------------|----------------|
| | Ps | rpm | | |

(7) Transport Wheel

| | | | |
|---------------|----------------|-----------------------|---|
| Size of wheel | Range of track | With break or without | Vertical static lead on the hitching part at work |
| | mm | | kg |

(8) Tractor Used at the Time of Inspection

| | | | | | |
|--------------|------------------------------|-------------------------------|--------------|---------------|---------------------------|
| Name of type | Walking type or driving type | Engine mounted on the tractor | | | Use of P. T. O. or no use |
| | | Rated horse power | Rated r.p.m. | Kinds of fuel | |
| | | Ps | rpm | | |

3. Summary of Inspection Record

(1) Spreading Performance Test

The result of test made under the following conditions has shown little unevenness of liquired distribution and the working hours per 10 ares has been within (min.) (inspection Standard).

| Pump shaft r. p. m. | Required hours for suction | Delivery volume of nozzle | Spreading speed | Width of spreading | Spreaded volume per 10 ares | Method of spreading | No. of operators |
|------------------------|----------------------------------|---------------------------------|--------------------|-----------------------|--------------------------------------|------------------------|---------------------|
| rpm | min. | ℓ/min. | m/s | m/s | m | ℓ | persons |

Note (1) The hours required for hose carrying and handling shall not be included in the working hours converted into 10 ares.

(2) Pump Performance Test
Conditions of Test

| Atmospheric pressure | Room temp. | Used liquid | | Pump shaft r.p.m. | Transmission system | Remarks |
|----------------------|------------|-------------|-------|-------------------|---------------------|---------|
| | | Kind | Temp. | | | |
| mmHg | °C | Fresh water | °C | rpm | | |

Test Records

The result of pump performance test under the normal delivery rate of volume has been recorded as follows:

| Total head | Delivery volume | Required power | Remarks |
|------------|-----------------|----------------|-----------------------------|
| m | l/min. | Ps | Approx. 2 m of suction head |

In the test, the actual head of max. suction has been marked as follows:

| Actual head of max. suction | Required power | Remarks |
|-----------------------------|----------------|--|
| m | Ps | In case when the delivery volume is l/min. |

(3) Continuous Running Test

The result of test made under the following conditions has not shown any abnormalities after the continuous running test for 3 hours.

| Mean room tem. | Kind of liquid used | Mean liquid temp. | Pump shaft r. p. m. | Suction head | Delivery volume of nozzle | Remarks |
|----------------|---------------------|-------------------|---------------------|--------------|---------------------------|---------|
| °C | Note (3) | °C | rpm | 1 - 2 in | ℓ /min. | |

Note (2) For the Tank vehicle type, suction operating (min.) and delivery operating (min.) have been made alternately.

Note (3) Materials used in this test after mixing the following items; 1 ℓ of water, 0.5 g of straws cut into 2 Cm long and 10 g of wood meal.

(4) Handling Test

The results of testing for urine disposal and adaptability for feces and urine disposal made under the following conditions have shown the satisfactory records for performing the proper work in the said operations.

| Test Plot | Used liquid | Pump shaft r. p. m. | Suction head | Method of disposal | Remarks |
|-----------|-------------|------------------------|--------------|-----------------------|--|
| Test 1 | Fresh water | rpm | | | To ascertain the adaptability for urine disposal work. |
| Test 1 | Note (4) | rpm | | | To ascertain the adaptability for feces and urine disposal work. |

Note (4) Materials for this test after mixing are as the following items; 1 1/2 of water, 0.5 g of straws cut into 2 Cm long, 10 g of wood meal about 10 cc of soil.

Reference Records concerning the Handling

| Fuel filling place and method | (Cock) position and shape | Coupling method to the tractor | Min. turning area (Diameter) | Others |
|----------------------------------|------------------------------|-----------------------------------|---------------------------------|--------|
| | | | m | |

3. Additional Remarks

INSPECTION RECORD SHEET

Date:

Certificate No.

THE INSTITUTE OF AGRICULTURAL
MACHINERY

Kind of agricultural
machinery

Urine Spreader (Tank Vehicle, Vacuum Pump Type).

Manufacturer's type
designation

Manufacturer's name and add.

1. Main Structure
(1) Dimension

| Overall length | Overall width | Overall height | Gross weight | Remarks |
|----------------|---------------|----------------|--------------|---------|
| mm | mm | mm | kg | |

(2) Pump

| Type | Theoretical exhausting speed | Specified revolutions | True degree of vacuum (1) | Normal delivery pressure | Kinds of oil |
|------|------------------------------|-----------------------|---------------------------|--------------------------|--------------|
| | ℓ /min. | rpm | mmHG | kg/cm ² | |

Note (1) The Term of Vacuum degree used in the inspection record shall mean the numerical value shown by absolute pressure for the pressure which is lower than atmospheric pressure.

(3) Hose and Nozzle

| Suction hose | | | Delivery hose | | | Nozzle | | | |
|--------------|--------|------------|----------------------------|-------------|--------|------------|------|----------------|--------------------------|
| Inside dia. | Length | Ma-terials | With strainer or with- out | Inside dia. | Length | Ma-terials | Type | No. of nozzles | Normal spread- ing width |
| mm | m | | | mm | m | | | | m |

(4) Urine Tank

| Capacity | Corrosion-proof of inner surface | With agitator or without | Automatic suction suspension device (with or without) | Liquid level gauge (with or without) | Delivery pressure regulating valve (with or without) | Vacuum safety valve (with or without) |
|----------|----------------------------------|--------------------------|---|--------------------------------------|--|---------------------------------------|
| ℓ | | | | | | |

(5) Prime Mover

| Type | Rated horse-power | Rated r.p.m. | Kind of fuel | Cooling system |
|------|-------------------|--------------|--------------|----------------|
| | Ps | rpm | | |

(6) Transporting Wheel

| | | | |
|---------------|----------------|-----------------------|---|
| Size of wheel | Range of track | With break or without | Vertical static load on hitching part at work |
| | mm | | kg |

(8) Tractor Used at the Time of Inspection

| Name of type | Walking type or driving type | Mounted engine | | | Use of P. T. O. or no use | Vertical static load on the hitch part at work |
|--------------|------------------------------|-------------------|----------------|---------------|---------------------------|--|
| | | Rated horse power | Rated r. p. m. | Kinds of fuel | | |
| | | Ps | rpm | | | kg |

| Name of type | Walking type or driving type | Engine mounted on the tractor | | | Use of P. T. O. or no use |
|--------------|------------------------------|-------------------------------|----------------|--------------|---------------------------|
| | | Rated horse power | Rated r. p. m. | Kind of fuel | |
| | | Ps | rpm | | |

2. Summary of Inspection Record

(1) Spreading Performance Test

The result of test made under the following conditions has shown little unevenness of liquid distribution and the working hours (2) per 10 ares has been within 15 minutes (Inspection Standard).

| Pump shaft r.p.m. | Required hours for suction | Delivery volume of nozzle | Spreading speed | Width of spreading | Spreaded volume per 10 ares | Method of spreading | No. of operators |
|-------------------|----------------------------|---------------------------|-----------------|--------------------|-----------------------------|---------------------|------------------|
| r pm | min. | ℓ /min. | m/s | m/s | m | ℓ | persons |

Note (2) The hours required for hose carrying and handling shall be included in the working hours converted into 10 ares.

(2) Pressure Regulating Performance Test

The test result of pressure regulating performance under the adjustment of pressure regulating valve to work at the normal delivery pressure and maximum delivery pressure (conducting the test for 10 time against the same pressure) has been recorded within the range (adjusted pressure $\times (1 \pm 0.3)$, (Inspection Standard).

(3) Leaking Volume Test

The result of test made under the keeping of vacuum degree at 200 mm Hg has been recorded less than 100 cc/min. of air leaking volume.

(4) Pump Performance Test

Conditions of Test

| Atmospheric temp. | Wet-bulb temp. | Dry-bulb temp. | Weight of air | Pump shaft r. p. m. | Reaching degree of vacuum | Trans-mission system | Remarks |
|-------------------|----------------|----------------|-------------------|---------------------|---------------------------|----------------------|---------|
| mmHg | °C | °C | kg/m ³ | rpm | | | |

Test Records

| Suction performance under the normal degree of vacuum | | Reaching degree of vacuum | Pressuring performance under the normal delivery pressure | |
|---|------------------|---------------------------|---|--------------------|
| Vacuum degree | Exhausting speed | | Delivery pressure | Sucking air volume |
| mmHg | ℓ/min. | mmHg | kg/cm ² | ℓ/min. |
| | Ps | | | Ps |

(5) Continuous Running Test

The result of test for the continuous running made under the following conditions (3) has not shown any abnormalities.

| Mean room temp. | Kinds of liquid | Mean temp. of liquid | Pump shaft r. p. m. | Suction head | Delivery volume of nozzle | Remarks |
|-----------------|-----------------|----------------------|---------------------|--------------|---------------------------|---------|
| °C | Note (4) | °C | rpm | m | ℓ /min. | |

Note (3) Suction operating (about min.) and delivery operating (about min.) have been made alternately.

Note (4) Straws (0.5g) cut into 2 Cm long and 10 g of wood meal have been mixed with 1ℓ of water.

(4) Handling Test

The result of testing for urine disposal and adaptability for feces and urine disposal made under the following conditions have shown the satisfactory records for performing the proper work in the said operations.

| Test plot | Used liquid | Pump shaft r. p. m. | Suction head | Method of disposal | Remarks |
|-----------|-------------|---------------------|--------------|--------------------|--|
| Test 1 | Fresh water | rpm | | | To ascertain the adaptability for urine disposal work. |
| Test 1 | Note (5) | rpm | | | To ascertain the adaptability for feces and urine disposal work. |

Note (5) Materials used: Straws (0.5g) cut into 2 - 5 Cm long, 10 g of wood meal and about 10 cc of soil mixed with 1 l of water.

Reference Records concerning the Handling

| Fuel filling place and method | (Cock) position and shape | Coupling method to the tractor | Min. turning area (Diameter) | Others |
|----------------------------------|------------------------------|-----------------------------------|---------------------------------|--------|
| | | | m | |

3. Additional Remarks

I - 5. SELF-FEEDING TYPE, POWER THRESHERS

1 - 5 SELF - FEEDING TYPE, POWER THRESHERS

(Date of Public Notice in Official Gazette: September 26, 1963):

1. Scope

This standard specifies testing methods and procedures of inspection for self-feeding type, power threshers.

2. Definition of Terms

The meaning of terms to be used in this standard shall be defined as followings:

(1) Transporting Weight

The transporting weight shall mean the weight of thresher at the time of transporting it, but exclusive of a feeding table and a straw discharging device.

(2) Specified Revolutions

The specified revolutions means the range of normal number of threshing drum-shaft revolutions at the time of paddy rice threshing which is indicated on the specification submitted by a manufacturer.

(3) Width of Threshing Drum

The width of threshing drum shall mean the overall width of threshing drum, including the head of threshing drum, but exclusive of the boss of threshing drum herefrom.

(4) Threshed Mature Grains

The term of the "threshed mature grains" within the meaning of this standard shall be a generic name given for

the threshed mature grains, unthreshed ears and damaged grains.

(5) Threshed Grains

The threshed grains shall mean the general term for the threshed mature grains involving the threshed immature grains.

(6) Scattered Grains

The term of the "scattered grains" within the meaning of this standard shall be the scattered grains in front of the Power Thresher on test or the dropped grains near the place where the threshed sheaves drop.

(7) Damaged Grains

The term of the "damaged grains" within the meaning of this standard shall be of those involving the improperly hulled grains, improperly half-hulled grains and crushed grains during the threshing.

(8) Stuck Grains

The stuck grains shall mean the threshed grains stuck in the sheaves and being discharged along with the threshed sheaves from the thresher, in case there is no such a device, the stuck grains shall mean the stuck grains in the bottom part of threshed sheaves.

(9) Unthreshed Ears

The unthreshed ears shall mean the grains on ear discharged from the thresher due to the grains are not threshed out in the threshing chamber.

(10) Percentage of Grain-Weight

The term of the "percentage of grain-weight" within the meaning of this standard shall be the weight ratio of threshed grains to the total weight of paddy rice sheaves or to the weight of sampled paddy rice sheaves from the said materials used for this test.

3. Procedures of Inspection

The inspection shall be made by the following tests and investigations:

3.1 Items to be Inspected

- (1) Verification of the Specification
- (2) Performance Test
- (3) Efficiency Test
- (4) Handling Test
- (5) Investigation after Disassembling

3.2 General Conditions for Inspection

(1) Preliminary Running

The self-feeding type power thresher to be put on the test (hereinafter referred to as the "Power Thresher on test") shall be considered to have been run-in enough prior to the test. The preliminary running for each test shall be within 30 minutes.

(2) Lubricating Oil

Lubricating oil to be used for this test shall conform to the specification and be easily available at the market.

(3) Materials to be Used in Test

Seed-grains of paddy rice to be used in the test shall be of those having quality of no deciduous character, and moisture content shall be within the range from 15 to 18%.

(4) Measuring Instruments

Main instruments to be used for measuring shall have been checked and calibrated prior to the measurements, and shall be capable of taking the following minimum scale and accuracy:

| Main purpose of use | Kind of instrument | Required minimum scale and accuracy |
|--|-----------------------------|--|
| Measurement of number of drum-shaft revolutions | Hasler tachometer | Capable of reading down to $\pm 1\%$ of the measured value |
| Measurement of drum-shaft revolutions | digital tachometer | Minimum scale: less than 1 r. p. m. |
| Measurement of hours | stop watch | Minimum scale: not more than 0.2 sec. |
| Measurement of gross weight for the materials used in the test | platform scale | Minimum scale: below 100 g |
| Measurement of weight according to the classified articles | precision automatic balance | Minimum scale: below than 1 mg |

| Main purpose of use | Kind of instrument | Required minimum scale and accuracy |
|--|--------------------|---|
| measurement of weight according to the classified articles | automatic scale | Capable of reading below 1% of the measured value |
| Measurement of horse-power required | dynamograph | Capable of taking the accuracy below $\pm 1\%$ of the precision rated value |

(5) Suspension of Test

When one of each test stops more than 3 times or longer than 30 minutes, the test shall be stopped. However, the test which may be stopped irrespective of manufacturer's responsibility shall be recovered.

3.3 Methods of Test and Investigation

3.3.1 Verification of Structure

(1) Object

The object of this investigation is to ascertain the main dimensions, weights, materials, equipments and so forth in comparison actual things of the Power Thresher on test with the said items indicated on the specification.

(2) Items to be Investigated

- 1) Dimension:
- Overall length
 - Overall length
 - Overall width
 - Overall height

Gross weight

Weight at the time of transporting it

- 2) Feeding Table
 - (a) Length, width and height
 - (b) Dimension, (in case of the feeding table is fitted to the body)
- 3) Chain Transmission Part
 - (a) Transmission mechanism
 - (b) Change-gear and suspensive mechanism
 - (c) Worm and worm wheel (size and materials used)
 - (d) Adjusting method of clearance between the feeding chain and the guide rail.
- 4) Threshing Drum
 - (a) Diameter and width
 - (b) Threshing teeth (materials used, shape and fitting method)
 - (c) Kinds of bearings
- 5) Dust Exhausting Drum and Treatment Drum
 - (a) Diameter and width
 - (b) Shape of tooth
- 6) Thrower
 - (a) Type
 - (b) Number of vanes and its shape
- 7) Winnower
 - (a) Classified type
 - (b) Mechanism of adjusting part and its adjusting method
 - (c) Number of vanes and its shape

8) Dust Outlet

- (a) Adjusting mechanism
- (b) Adjusting method and adjustable range

9) Sifter

- (a) Arrangement of spoke
- (b) Number of spokes, length and thickness
- (c) To check that there is any angle adjustor

10) Threshing Chamber

- (a) Materials used
- (b) Methods of fitting to the body and taking out from the body

11) Screen

- (a) Area of screen
- (b) Materials used for the screen and its mesh

12) Number of Revolutions for Each Shaft

- (a) The specified revolutions of threshing drum-shaft and other shafts' revolutions
- (b) Power transmission mechanism

13) Threshed Sheaves Discharging Device

- (a) Mechanism
- (b) Length and height
- (c) Fitting method to the body

14) Other Necessary Items

3.3.2 Performance Test

(1) Object

This test is carried out for the purpose of ascertaining the separating performance, required horsepower,

processing performance, straw disposal performance of the Power Thresher on test under the way of materials supplying by the fixed method.

(2) Testing Equipment

- 1) The prime mover shall be coupled to the Power Thresher on test with a plain belt power transmission and the output shall be taken by an electric-dynamometer.
- 2) The measurement of horsepower required shall be made by a dyanmo-graph or an integrating watt-meter.
- 3) The selection of grains for the purpose of article grouping into mature grains and immature grains shall be done by using of a power thresher for testing use well adjusted previously, a winnower and a sample-homogenizer.

(3) Materials to be Used in Test

Paddy rice of same quality as stipulated in 3.2-(3) shall be used for this test.

(4) Testing Method

- 1) The number of drum-shaft revolutions for the test shall be run at the specified revolutions.
- 2) Feeding work of materials shall be done by members of manufacturer's side.
- 3) Size of sheaf: 1.2 kg of bundle, only one size of sheaf shall be used for over 400 mm of threshing drum width, and 1.2 kg and 0.8 kg of bundles (two sizes of sheave) shall be used for less than 400 mm of threshing drum width.

- 4) The interval of feeding shall be kept for 2 seconds.
- 5) The adjustments for wind-power, dust forcing out and others shall be left at manufacturer's option.

However, no adjustment shall, as a rule, be permitted during the test.

- 6) The duration of sheaf-feeding shall be as computed from the starting of the first sheaf threshing to the end of the last sheaf threshing, and the Power Thresher on test shall be stopped at the time of 15 seconds after the end of the last sheaf threshing.

- 7) The sheaves remained on the feeding table shall be treated by inserting them into the threshing chamber within the running time.

- 8) The number of tests shall, as a rule, be made twice. However, the choice of bundle-size for each test shall be manufacturer's option for less than 40 mm of threshing drum.

- 9) The feeding hours for each test shall be longer than 2 minutes.

- 10) The samples shall be collected from the 1st outlet at regular interval.

(5) Items to be Measured and Investigated

- 1) Feeding amount
- 2) Feeding hours
- 3) Required horsepower
- 4) Weight of threshed grains for each outlet

- 5) Weight of threshed grains at the 1st, 2nd and 3rd outlets shall be measured. In this case, the winnower specified in (2)-3) shall be used. However, it requires collecting samples enough at the 1st outlet for the purpose of converting it into the total weight of threshed grains separated out from the same outlet.
- 6) The threshed grains sampled at the 1st outlet shall be classified into the following articles; threshed mature grains (inclusive of the threshed mature grains with "Petit brachis"), damaged grains, unthreshed ears and straw chips. The threshed mature grains separated by the winnower and sample homogenizer specified in (2)-3) shall be selected by hands in order to obtain the necessary amount of specimen for the sample homogenizer use.
- 7) Weight of threshed grains, the power thresher for test use and the winnower specified in (2)-3) shall be used.
- 8) Weight of stuck grains, the winnower specified in (2)-3) shall be used.
- 9) Weight of scattered grains, the winnower specified in (2)-3) shall be used.
- 10) Blocking and any other abnormal or irregular developments.
- 11) Vibration, noise, sheaf-conveying, discharging of threshed sheaves, back-blow, occurring degree of dust and other running conditions.

12) Entanglement of straws around the shaft, blocking of screen-mesh, remained amount of threshed grains inside of the body and generation of heat in the parts.

13) Degree of straw damage (chopped or crushed into a mess of pieces).

14) Moisture contents of materials used for the test (straws and grains), percentage of threshed grain-weight and other necessary items.

(6) Calculation

1) Percentage of threshed grain-weight at the 3rd outlet (%)

$$= \frac{\text{weight of threshed grains at the 3rd outlet (kg)}}{\text{total weight of threshed grains at the 1st, 2nd and 3rd outlets (kg)}}$$

2) Percentage of threshed grain-weight at the 1st and 2nd outlets (%)

$$= \frac{\text{weight of threshed grains at the 1st (and 2nd outlets) (kg)}}{\text{total weight of threshed grains at the 1st, 2nd and 3rd outlets (kg)}}$$

3) Percentage of unthreshed ears (%)

$$\frac{\text{weight of unthreshed grains (kg)}}{\left(\begin{array}{l} \text{total weight} \\ \text{of threshed} \\ \text{grains at} \\ \text{the 1st,} \\ \text{2nd and} \\ \text{3rd outlets} \end{array} \right) + \left(\begin{array}{l} \text{weight} \\ \text{of un-} \\ \text{thresh-} \\ \text{ed ears} \end{array} \right) + \left(\begin{array}{l} \text{weight} \\ \text{of} \\ \text{stuck} \\ \text{grains} \end{array} \right) + \left(\begin{array}{l} \text{weight (kg)} \\ \text{of} \\ \text{scat-} \\ \text{tered} \\ \text{grains} \end{array} \right)} \times 100$$

4) Percentage of stuck grains (%)

$$\frac{\text{weight of stuck grains (kg)}}{\left(\begin{array}{l} \text{total weight} \\ \text{of threshed} \\ \text{grains at} \\ \text{the 1st,} \\ \text{2nd and} \\ \text{3rd outlets} \end{array} \right) + \left(\begin{array}{l} \text{weight} \\ \text{of un-} \\ \text{thresh-} \\ \text{ed} \\ \text{grains} \end{array} \right) + \left(\begin{array}{l} \text{weight} \\ \text{of} \\ \text{stuck} \\ \text{grains} \end{array} \right) + \left(\begin{array}{l} \text{weight} \\ \text{of} \\ \text{scat-} \\ \text{tered} \\ \text{grains} \end{array} \right) \text{ (kg)} \times 100$$

5) Percentage of scattered grains (%)

$$\frac{\text{weight of scattered grains (kg)}}{\left(\begin{array}{l} \text{total weight} \\ \text{of threshed} \\ \text{grains at} \\ \text{the 1st,} \\ \text{2nd and} \\ \text{3rd outlets} \end{array} \right) + \left(\begin{array}{l} \text{weight} \\ \text{of un-} \\ \text{thresh-} \\ \text{ed} \\ \text{grains} \end{array} \right) + \left(\begin{array}{l} \text{weight} \\ \text{of} \\ \text{stuck} \\ \text{grains} \end{array} \right) + \left(\begin{array}{l} \text{weight} \\ \text{of} \\ \text{scat-} \\ \text{tered} \\ \text{grains} \end{array} \right) \text{ (kg)} \times 100$$

3.3.3 Efficiency Test

(1) Object

This test is mainly made for the purpose of ascertaining the efficiency and that there is no development of irregularities or abnormalities of the Power thresher on test.

(2) Testing Equipment

The testing apparatus to be used for this test shall be of the same items as stipulated in 3.3.2-(2), but exclusive of the sample homogenizer herefrom.

(3) Materials to be use in Test

Seed-grains of paddy rice specified in 3.2-(3) shall be use for this test.

(4) Testing Method

1) In this test, the threshing drum-shaft shall be run at specified speed.

- 2) The feeding work shall be carried out by members of manufacturer's side.
 - 3) With regard to the size of sheaf shall conform to the traditional binding size of sheaf employed in the producing area of materials used in this test, but uniformed sheaves in size shall be used as far as practicable.
 - 4) The feeding speed shall be set as a manufacturer's like.
 - 5) The adjustments of wind power, dust forcing out shall be left at a manufacturer's option.
 - 6) With regard to the feeding hours, methods of running stop after the end of feeding and disposal for remained sheaves on the feeding table shall conform to the methods stipulated in 3.3.2-(4)-6) and 7) for the efficiency test.
 - 7) The number of tests shall, as a rule, be made once.
 - 8) The feeding hours shall be longer than 15 minutes.
 - 9) During the feeding hours, the threshed grains thrown out from each outlet and threshed stalks shall be collected for a fixed hour and the sampling shall be made more than twice.
- (5) Items for Measurement and Investigation
- 1) Feeding amount
 - 2) Feeding hours
 - 3) Required horsepower

- 4) Weight of materials thrown out from the 1st and 2nd outlets.
- 5) Weight of threshed grains sampled at each outlet. With regard to the method of measurement for the said weight shall conform to the method stipulated in (5)-5).
- 6) Weight of unthreshed ears and stuck grains among the threshed stalks sampled, and the measuring method shall conform to (5)-7).
- 7) Blocking and any other abnormal developments.
- 8) Vibration, noise, sheaf-conveying, discharging threshed sheaf, back-blow, occurring degree of dust and other running conditions.
- 9) Entanglement of straws around the shaft, blocking of screen-mesh, remained amount inside of the body and generation of heat in the parts.
- 10) Degree of straw damage (chopped or crushed into a mesh of pieces).
- 11) Moisture contents of materials used for the test (straws and grains), percentage of threshed grain-weight and other necessary items.

(6) Calculation

$$1) \quad Q = \frac{W_1 + W_2}{T}$$

$$2) \quad Q_S = \frac{m_s}{m} Q$$

$$3) \quad Q_S \sqrt{D} = \frac{Q_S}{\sqrt{D}}$$

$$4) \quad Q_P = \frac{Q}{P}$$

$$5) \quad Q_{PS} = \frac{Q_S}{P}$$

$$6) \quad Q_{PS} = \frac{Q_S}{P}$$

where,

Q: available working volume
per hour (kg/hr)

W_1 : gross weight of the 1st
outlet (kg)

W_2 : gross weight of the 2nd
outlet (kg)

T: feeding hours (hr)

Q_S : corrected available working
volume per hour (kg/hr)

m: threshed grain-weight per-
centage for the materials
used

m_s : corrected percentage of
threshed grain-weight,
($m_s = 0.45$)

$Q_S D$: threshing drum-width
standard corrected avail-
able working volume
per hour

D: width of threshing drum (Cm)

Q_P : available working volume
per horsepower hour (kg/hr-Ps)

P: average required horsepower (Ps)

Q_{PS} : corrected available working volume per horsepower hour (kg/hr-Ps)

7) Percentage of threshed grain loss (%)

$$\frac{\text{total weight of threshed grains sampled at the 3rd outlet, unthreshed ears and stuck grains sampled at the 3rd outlet (kg)}}{\text{total weight of threshed grains sampled out at the 1st, 2nd and 3rd outlets and also threshed sheaves sampled (kg)}} \times 100$$

3.3.4 Handling Test

(1) Object

This test is made for the purpose of ascertaining ease or otherwise of handling for the Power Thresher on test.

(2) Testing Method

The investigation shall be done by more than two investigators using and adjusting the Power Thresher on test.

(3) Items to be Investigated

- 1) Easiness of transporting the power thresher
- 2) Easiness of feeding operation
- 3) Easiness of treatment for each outlet
- 4) Easiness of wind power regulating
- 5) Easiness of dust outlet handling
- 6) Easiness of taking-out or fitting a threshing chamber, a shifter and other parts
- 7) Easiness of adjustment and replacement of parts in the case when the trouble happens on the machine

- 8) Safety
- 9) Other necessary items

3.3.5 Investigation after Disassembling

(1) Object

The object of this investigation is mainly to ascertain that there is no development of irregularities and abnormalities inside of the Power Thresher on test after having carried out all the tests.

(2) Items to be Investigated

This investigation shall be made for checking of any abnormalities on the Power Thresher on test after disassembling it completely, and if necessary, the measurement and investigation shall be taken for the points of fitting condition, hardness, processing, finishing and balancing of the threshing drum, etc.

4. Standards to Pass the Inspection

The decision of inspection for self-feeding type, power threshers shall conform to the following standards, and shall be required to satisfy the requirements respectively stipulated hereunder:

4.1 Performance Inspection

(1) The result of performance test in 3.3.2, at least one of the two times of testing, must satisfy the following specified requirements.

- 1) In the case when 1.2 kg of sheaf is use, the average required horsepower shall be less than 3.5 Ps and

2.5 Ps for using of 8.8 kg sheaf.

2) The percentage of grain-weight at the 3rd outlet shall be below 0.8%.

3) The percentage of straw-chip mixing at the 1st outlet shall be below 2.8%.

4) The percentage of damaged grains shall be below 0.8%.

5) The percentage of unthreshed grains shall be below 0.8%.

6) The percentage of stuck grains shall be below 0.7%.

7) The percentage of scattered grains shall be below 2.6%.

(2) In the efficiency test of 3.3.3, the result of test must satisfy the following requirements:

1) The calculated value by the formula in (6)-3 for threshing drum width standard corrected available working volume per horsepower hour must be over 130 kg/hr.

2) The percentage of threshed grain loss shall be less than 25%.

(3) In the performance test of 3.3.2 and the efficiency test of 3.3.3, there shall not be any appreciable development of irregularities and blocking.

4.2 Durability Inspection

The durability inspection shall be required to satisfy the requirements specified hereunder, particularly in principal parts which may be difficult to replace easily.

- (1) No abnormality and failure in the above mentioned parts
- (2) No abnormal abrasion
- (3) No seizure
- (4) To have the necessary measures for "Dust-proof" in the above mentioned parts

4.3 Handling Inspection

- (1) The result of handling test in 3.3.4 shall not show any defects that may bring much dangerous feelings to the operator during the operation of the power thresher.
- (2) The result of test in 3.3.4 shall not show any defects that may cause of difficulty to adjust or replace of parts.

INSPECTION RECORD SHEET

Date:

Certificate No. THE INSTITUTE OF AGRICULTURAL MACHINERY

Kind of agricultural machinery Self-Feeding Type, Power Thresher

Manufacturer's type designation

Manufacturer's name and add.

- Main Structure
- Dimensions

| Overall length | Overall width | Overall height | Gross weight | Size of threshing drum | | Remarks |
|----------------|---------------|----------------|--------------|------------------------|------------------|--|
| | | | | Width (mm) | Outside Dia (mm) | |
| mm | mm | mm | kg | | | Gross weight is including the weight of feeding table. |

(2) Specified Drum-Shaft Revolutions

| Specified revolutions of threshing drum-shaft | | Remarks | |
|---|------------------|--|---------------------------|
| In case of Rice | In case of Wheat | Relationship between main shaft and drum shaft | Belt pulley of main shaft |
| | | | |

(3) Structure of Body

| With the 2nd outlet or without it | With the 2nd disposal or without it | Winnower | The 3rd outlet | Dust forcing out or disposal cylinder | Chain | | Remarks |
|-----------------------------------|-------------------------------------|----------|----------------|---------------------------------------|--------------|-------------------|---------|
| | | | | | Transmission | Suspension device | |
| | | | | | | | |

(4) Feeding Table

| Length (mm) | Width (mm) | Height (mm) |
|----------------|---------------|----------------|
| | | |

(5) Threshed Sheaves Discharging Device

| Type | Length measured from the end of threshing |
|------|---|
| | |

2. Summary of Inspection Record

(1) Performance Test

The conditions of test and test results have been recorded as follows:

The results of performance for required horsepower, selection, processing and straw disposal have been considered which are proper and suitable to satisfy the requirements respectively.

1) Conditions of Test (Date of Test:)

| Test Plot | Ma-terials used | Feeding method | | Amount of feeding | r. p. m. of threshing drum shaft | | Position of dust outlet adjustment | Position of wind power adjustment | Other adjustments |
|-----------|-----------------|-----------------|------------------|-------------------|----------------------------------|---------|------------------------------------|-----------------------------------|-------------------|
| | | Weight of sheaf | Feeding interval | | No load | On load | | | |
| I | Note (1) | kg | sec | kg | rpm | rpm | | | |
| II | Note (1) | | | | | | | | |

2) Test Record

| Test plot | Average required horse-power | Weight of total grains | Weight of grains for each outlet | | | Weight of grains | | | | | |
|-----------|------------------------------|------------------------|----------------------------------|-------------|-------------|--|---|--------------------|--------------|------------------|----|
| | | | 1st out-let | 2nd out-let | 3rd out-let | Mixed straw chips and grains at 1st outlet | Damaged grains among the matured grains (1st) | Un-threshed grains | Stuck grains | Scattered grains | |
| | | | | | | | | | | | kg |
| I | Ps | kg | kg | g | g | g | g | g | g | g | g |
| II | | | | | | | | | | | |

Note (1) The following materials have been used for this test:

Variety: SASASHIGURE (name of paddy rice variety)

Characters: None-deciduous, medium size of grain, and panicle type characters.

Length of stem: (Cm) Moisture Content: Grains %
 Length of ear: (Cm) Straws %
 Percentage of Grain-Weight: (%) Others: %

(2) Test of Efficiency

The test conditions and results have been recorded as follows:

The effective working volume per hour (weight of 1st outlet + weight of 2nd outlet per hour) have been considered as suitable from the stand-point of the width of threshing-drum for the Power Thresher on test.

1) Conditions of Test (Date of Test:)

| Ma- terials used | Feeding method | | Hours of threshing | r. p. m. of threshing shaft | | Position of Dust forcing out ad- justment | Position of wind power adjust- ment | Other adjust- ment |
|------------------------|---|---------------------|-----------------------|--------------------------------|---------|---|---|--------------------------|
| | Size of sheaf | Feeding interval | | No load | On load | | | |
| Note (2) | Tradition- al binding size in producing area mean: 8 | - free - | min. sec. | rpm | rpm | | | |

2) Test Record

| | | | | |
|-----------------------------------|-------------------------|-------------------------|---|---|
| Average required horsepower | Weight of 1st outlet | Weight of 2nd outlet | 45% of grain- weight percent- into the effec- tive working volume per hr. - Ps | Remarks |
| Ps | kg | kg | kg/hr | The percentage of loss for unthreshed ears and stuck grains at the 3rd outlet in this test have been marked % in all. |

Note (2) The following materials have been used in this test:

Variety and Characteristics: Same as stated in Note (2).

Length of ear: Cm

Length of stem: Cm

Moisture Content: Grains %

Straws %

Percentage of Grain-Weight: %

Others:

3. Reference Records concerning Handling

| Consideration for transportation | Adjusting system of wind power | | Adjusting system of dust forcing out | Consideration for cleaning | Others |
|----------------------------------|--------------------------------|--|--------------------------------------|----------------------------|--------|
| | | | | | |
| | | | | | |

4. Additional Remarks:

This sheet shows the test records which have been carried out conforming to the stipulations in the inspection methods and standards established by the Minister of Agriculture and Forestry, and the numerical values thereof have obtained under the fixed condition. However, the numerical values for the test shall be subjected to be fluctuated in accordance with the materials' characters, varieties and different way of operation which may be used in the test.

I - 6. FORAGE CUTTERS

I - 6 FORAGE CUTTERS

(Date of Public Notice in Official
Gazette: July 25, 1963)

1. Scope

This standard specifies testing methods and procedures of inspection for power-driven forage cutters to be used for cutting roughages, such as corn, pasture and rice straw, etc., but the special purposed cutter for rice straw and wheat stalk are excluded herefrom.

2. Classification of Forage Cutters

2.1 The forage cutters shall be classified according to the type of cutting part into the followings:

(1) Cylinder Type

The cutters of this type shall have spiral revolving knives fixed on the cylindrical surface formed between two round side-plates fitted on the main shaft, the spiral-edge revolves round the main shaft parallel to axis of the main shaft, When the spiral revolving knives revolve round the main shaft, forage crops shall be cut between the spiral revolving knife and the stationary shear bar.

(2) Fly-Wheel Type

The fly-wheel type cutters shall have a fly wheel or have the same balance as functioning of a fly-wheel, and revolving surface of spiral-edge shall be crossed at right angle with the revolving axis of main shaft. Forage crops

shall be chopped between the revolving knife fitted on the wheel and the stationary shear bar.

2.2 The forage cutters shall be classified according to the cutting treatment part as follows:

(1) Let-Fall Type

The let-fall type of forage cutter means the materials chopped are dropped down to the bottom of machine.

(2) Throw-Away Type

The throw-away type of forage cutter means the materials chopped are thrown away to the frontward of machine.

(3) Blow-Up Type

The blow-up type of forage cutter means the materials chopped are blown up through the blow-up pipe.

3. Definition of Terms

The meaning of terms to be used in this standard shall be defined as follows:

(1) Transporting Weight

The transporting weight shall mean the weight at the time of transporting a forage cutter with regular amount of lubricating oil (but exclusive of a supply conduit and a blow-up pipe herefrom).

(2) Specified Revolutions

The specified revolutions shall mean the number of main-shaft revolutions which is indicated in the specification.

(3) Main Shaft

Main shaft means the first shaft to which power is transmitted from a Prime Mover.

(4) Effective Roll-Width

The effective roll-width shall mean the roll-width which is not included the entangle preventive side-wall, however, in case there is no preventive side-wall, the roll-width is considered as the effective roll-width.

(5) Standard Cutting Length

The standard cutting length means the standardized length of materials to be chopped. Here, the standard cutting length is specified 20 mm in length.

(6) Standard Working Volume

The standard working volume means the standardized volume of working specified in accordance with dimension, structure, number of main-shaft revolutions and other mechanical conditions.

4. Procedures of Inspection

The inspection shall be made by the following items:

4.1 Items to be Inspected

- (1) Verification of the Specification
- (2) Running Test
- (3) Cutting Performance Test
- (4) Blowing-Up Performance Test
- (5) Handling Test
- (6) Rigidity Test

(7) Investigation after Disassembling

4.2 General Conditions for Inspection

(1) Preliminary Running

The forage cutter to be put on the test (hereinafter referred to as the "Cutter on test") shall be considered to have been run-in enough prior to the test. The preliminary running for each test shall be within 30 minutes.

(2) Lubricating Oil

Lubricating oil to be used for the Cutter on test shall conform to the specification and be easily available at the market.

(3) Materials to be Used in Test

1) Dent-Corn

Soiling dent-corn harvested around the same stage of growth shall be used for the running test of 4.1-(2) and the handling test of 4.1-(5). As to the moisture content of soiling dent-corn shall be within the range from 75 to 85%.

2) Pasture

For the handling test, 4.1-(5), pre-dried orchard grass or clovers shall be used.

3) Rice-Straw

Rice-straws to be used in the test of cutting performance, 4.1-(3), blowing-up performance, 4.1-(4) and handling, 4.1-(5) shall be of those having almost same amount of moisture contents and similar size of straw-length.

(4) Measuring Instruments

Main instruments to be used for measuring shall have been checked and calibrated prior to the measurements, and shall be capable of taking the following minimum scale and accuracy:

| Main purpose of use | Kind of instrument | Required minimum scale and accuracy |
|---|-----------------------------|--|
| Measurement of number of revolutions | Hasler tachometer | capable of reading down to $\pm 1\%$ of the measured value |
| Measurement of number of revolutions | digital tachometer | Minimum scale: below 1 r.p.m. |
| Measurement of hours | stop watch | Minimum scale: below 0.2 sec. |
| Measurement of Dent corn amount used in the test | platform scale | Minimum scale: below 500 g |
| Measurement of moisture content in the materials used | precision automatic balance | Minimum scale: below 1 mg |
| Measurement of rice straws' weight used in the test | automatic scale | capable of reading below 1% of the measured value |
| Measurement of weight (the Cutter on test) | plate scale | |

| | | |
|---|-----------------|-------------------------------------|
| Measurement of horsepower required | dynamograph | |
| Measurement of clearance between spiral revolving knives and stationary shear bar | thickness gauge | Minimum thickness: below 0.05 mm |

(5) Suspension of Test

When one of each test stops more than 3 times or longer than 30 minutes, the test shall be stopped. However the test which may be stopped irrespective of manufacturer responsibility shall be recovered.

4.3 Methods of Test and Investigation

4.3.1 Verification of Structure

(1) Object

The object of this investigation is to ascertain the main dimensions, weights, materials, equipments and so forth of the Cutter on test in comparison actual things with the said items indicated on the specification.

(2) Items to be Investigated

1) Dimension: Overall length

Overall width

Overall height

Height from ground surface to the main shaft

Weight of body at the time of transporting

2) Type

To investigate either cylinder type or fly-wheel

type in accordance with the stipulation in 2.1, and also to check the classification into "let-fall", "throw-away" and "blow-up type" according to the stipulation in 2.2.

- 3) Feeding Roll
 - Width of roll
 - Effective width of roll
 - Diameter and shape
 - Materials used
 - Maximum and minimum spaces between the axis of upper roll and the axis of lower roll
- 4) Feeding Mechanism
 - Intermittent feeding or continuous feeding
- 5) Feeding Conduit
 - Length, width and height
 - Angle of inclination
 - To check whether it has a conveyer or not, kinds of conveyers, if any
- 6) Revolving Knife
 - Type
 - Number of blades
 - Materials used
- 7) Adjusting Mechanism for Cutting Size
 - Adjusting mechanism
 - Number of adjusting positions
 - Range of adjustment
- 8) Power Transmission Part
 - Specified revolutions of main shaft

Size of (main shaft) pulley

Driving system of roll, reversible mechanism, if any

Type of clutch

Kind of lubricating oil and regular amount of filling

9) Treatment - Part

Size of sliding plate (for the Let-fall type)

Mechanism for "Throw-away" (for the Throw-away type)

Shape of fine blade

Diameter of circular to be formed by the edge of fine blade

Outside diameter of outlet port

10) Other Necessary Items

4.3.4 Running Test

(1) Object

The object of this test is to ascertain the running condition and the working volume (Dent-corn cutting) of the Cutter on test, and also to see that there has no trouble or abnormality on the Cutter.

(2) Testing Equipment

The cutter on test shall be fixed on the bench and driven by a Prime Mover (a motor or oil engine) through the plain-belt power transmission.

(3) Materials to be Used

Dent-corn shall be used as material for this test as stipulated in 4.2-(3).

(4) Testing Method

- 1) Number of main-shaft revolutions for the test shall be at the specified revolutions.
- 2) The cutting length of material shall be 20 mm long, and for this test, the cutting must be done at the position where is the closest point to the specified cutting length of material through adjustment.
- 3) Duration of running shall be longer than 30 minutes.
- 4) The cutting blades to be used for this test shall conform to the indicated type by a manufacturer.
- 5) In the case of the Cutter (Throw-away type or Blow-up type) has a throw-away pipe, the vertical height of the pipe shall be subjected to keep 1 meter from the main shaft, and elbow must be used on the top of pipe.

(5) Items to be Measured and Investigated

- 1) Cut weight of materials
- 2) Duration of cutting
- 3) Cut length
- 4) Moisture content
- 5) Clearance between the revolving knife and the fixed knife
- 6) Number of operators engaged in the feeding work
- 7) Surface temperature on the various points of the cutter
- 8) Cutting condition
- 9) Entanglement

- 10) Wearing out state of the blade
- 11) Duration of troubled hours
- 12) To check that there has no development of irregularities and abnormalities.

(6) Calculating Method

The standard working volume and available cutting volume per hour shall be computed by the following formulae:

$$Q = \frac{W}{T} \times \frac{20}{CL} \dots\dots\dots [A]$$

$$Q_d = \frac{100 - m}{100} \times Q \dots [B]$$

$$Q_s = A \times \frac{N. Z. D.}{1,000} \dots\dots [C]$$

Where,

Q : standard length converted into available cutting volume / hr.
(kg / hr)

W: cut weight (kg)

T: required hours for cutting (hr)

CL: average length of cutting

Q_d : standard length converted into available dry-matter volume / hr.
(kg / hr)

m: mean percentage of moisture content in the materials (%)

- Qs: standard working volume
(standard available dry-matter
volume per hour in case of the cutting
material into 20 mm long)
- A: coefficient according to the materials
(in the case when dent-corn contains
about 80% of moisture; A = 25)
- N: main-shaft revolutions (rpm)
- Z: Number of blades
- D: effective width of feeding roll (mm)

4.3.3. Cutting Performance Test

(1) Object

This test is for the purpose of ascertaining, in case of rice straw is used, the cutting performance characteristics of the Cutter on Test.

(2) Testing Equipment

1) The prime mover shall be connected with the Cutter on test through plain-belt power transmission. For the measurement of power, an electric-dynamometer shall be used.

2) The measurement of required power shall be made by a dynamograph.

(3) Materials to be used in Test

Rice straws stipulated in 4.2-(3) shall be used.

(4) Testing Method

1) Number of main-shaft revolutions for the test shall be at the specified revolutions.

2) Feeding work shall be performed by members of manufacturer's side.

3) Binding size of rice straws for the feeding purpose shall be grouped as follows:

200 g, 300 g, 400 g, 500 g, 600 g, 700 g, 800 g,
900 g, 1,000 g (9 sizes of rice-straw bundles)

The rice-straw bundles to be used for this test shall be selected 3 sizes of bundle from among the above listed bundles optionally.

4) Cutting length of rice straw shall be grouped into 3 sizes as mentioned hereunder:

Cutting length: 10 mm, 20 mm and 30 mm.

The adjustment in order to cut the materials into the required length shall be made at the nearest position to the said required length.

5) The testing time for each bundle-size shall be longer than 30 minutes. In the case when the number of feeding bundles is less than 5 bundles, it shall be required to feed 5 bundles.

6) The feeding method of rice-straw bundle shall be fed one by one from the foot part of bundle, but the piling position should be fixed.

7) Cutting knives to be used for the test shall be chosen by a manufacturer.

8) When the blow-up type or the throw-away type has a throw-away pipe, height of pipe shall conform to 4.3.2-(4)-5).

9) For the measurement of cutting length, a certain length of vinyl pipe shall be inserted into rice-straw bundle in order to get more than 50 pieces of the section for the measuring purpose of cutting length.

(5) Items to be Measured and Investigated

- 1) Feeding quantity
- 2) Power required for cutting
- 3) Required hours
- 4) Clearance between revolving knife and fixed knife
- 5) Adjusting position for cutting length and actual cut length
- 6) Moisture content of rice straw
- 7) Operating condition

(6) Calculating Method

The cutting characteristics shall be obtained from the following methods and formulae:

$$Q = \frac{W}{T} \dots\dots\dots [A]$$

$$Q_d = \frac{100 - m}{100} \times Q \dots [B]$$

$$Q = \frac{Q_d}{P} \dots\dots\dots [C]$$

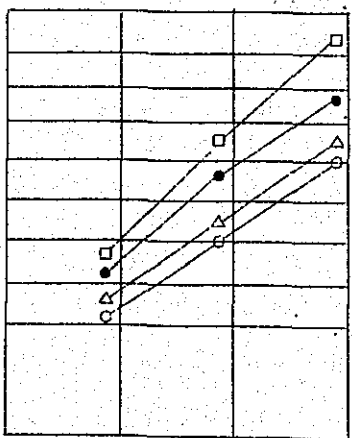
$$C L = \frac{LT}{n} \dots\dots\dots [D]$$

Where,

Q : available volume per hour (kg / hr)

- W : weight of cut materials (kg)
- T : required hours for cutting (hr)
- Qd : available dry matter per hour
- m : mean percentage of moisture content in the materials (%)
- Qp : available working volume per horsepower hour (kg/hr - Ps)
- P : average horsepower required (Ps)
- LT : effective cutting length of a vinyle pipe (mm)
- n : number of cutting sections of a vinyl pipe
- Qp₂₀ : available working volume per horsepower hour calculated from the standard length (kg/hr - Ps)

Qp₂₀ shall be obtained from a diagram referring to the following graph:



- a bundle of 800 g
- " 600 g
- △ " 400 g
- " 300 g

4.3.4 Blowing - Up Performance Test

This test shall be carried out for the blow-up type cutters.

(1) Object

This test is made for the purpose of ascertaining the performance of blowing-up for the Cutter on test.

(2) Testing Equipment

1) The Cutter on test shall be fixed on the bench and driven by a prime mover (a motor or oil engine) through the plain-belt power transmission.

2) For the measurement of blowing-up height, a tower or like sorts of tower shall be used.

(3) Materials to be Used

Rice-straw stipulated in 4.2-(3)-3) shall be used.

(4) Testing Method

1) The number of main shaft revolutions for the test shall be at the specified speed.

2) A rice-straw bundle to be used for the test shall be chosen 2 sizes of bundle from among the 9 bundle-sizes as classified in 4.3.2-(4) after calculating by the following formula, and the above 2 bundles shall be chosen from the nearest ones to W_1 and W_2 calculated value.

$$W_1 = 4 \cdot D$$

$$W_2 = 3 \cdot D$$

W_1, W_2 : standard value of bundle size (g)

D : effective roll-width (mm)

3) With regard to the cutting length, 20mm long shall

be considered as the standard length of cutting, and adjustment of cutting in order to cut materials into the required length shall be made at the nearest position to the above required length.

- 4) The feeding method shall conform to 4.3.3.
- 5) Cutting knives to be used for this test shall be the same knives that the cutting performance test used in 4.3.3.
- 6) A blow-up pipe shall be connected in keeping 0.5m interval at the measuring position and an elbow shall be fitted on the top.

(5) Items to be Measured and Investigated

- 1) Time for cutting
- 2) Height of blowing-up
- 3) State of blowing-up and other operating conditions
- 4) Clearance between revolving knife and fixed knife

(6) Calculation

The blowing-up efficiency shall be obtained from the following formula:

$$H_{th} = \frac{(d \cdot N)^2}{7.16 \times 10^9} = \left(\frac{v^2}{2g} \right) \dots \dots \dots (A)$$

$$= \frac{H}{H_{th}} \times 100 \dots \dots \dots (B)$$

where,

H_{th} : theoretical blowing-up height (m)

N : number of main shaft revolutions (rpm)

- d : diameter to be formed by the tip of fine blade (mm)
- η : blowing-up efficiency (%)
- H : height of blowing-up (m)
- V : circumferential speed of the fine-tip (m/s)
- g : acceleration of gravity ($g = 9.8\text{m/s}^2$)

4.3.5 Handling Test

(1) Object

The object of this test is to ascertain ease or otherwise of handling for the Cutter on test.

(2) Materials to be Used in Test

Dent-corn, pasture and rice-straws stipulated in 4.2-(3) shall be used for this test.

(3) Sorts of Cutting Work to be Tested

- 1) Cutting work of dent-corn
- 2) Cutting work of pasture
- 3) In case when the cutter is capable of cutting rice-straws longer than 50 mm, the long-size cutting test rice-straws shall be made.
- 4) For the throw-away type, if it has a throw-away pipe, the test of throwing away the chopped straws shall be made.

(4) Testing Method

The test shall, as a rule, be carried out by more than two investigators operating the Cutter on test and adjusting top.

(5) Items to be Investigated

- 1) Entanglement, blocking, vibration, noise and other operational conditions in the cutting work test of (3).
- 2) Easiness of clutch handling and stability
- 3) Easiness of material feeding work
- 4) Easiness of cutting length adjustment
- 5) Easiness of adjustment for cutting knives and its replacement
- 6) Easiness of fitting or getting off the parts
- 7) Safety

4.3.6 Rigidity Test

(1) Object

This test is for the purpose of ascertaining the rigidity of the Cutter on test.

(2) Testing Equipment

The Cutter on test shall be fixed firmly on the bench and a heavy weight shall be used as load.

(3) Testing Method

1) Loading on belt-pulley of main-shaft of the Cutter on test at right angle against main-shaft and line of horizontal direction.

2) Load shall be determined in accordance with size of the Cutter on test and be calculated by the following formula:

$$W = \frac{1}{K} \times \frac{N. Z. D.}{1,000}$$

where,

W : load (kg)

N : number of main shaft revolutions (rpm)

Z : number of knives

D : effective roll-width of feeding (mm)

K : coefficient for each type

K = 4 for the Let-fall type

K = 35 for the Throw-away type

K = 3 for the Blow-up type

3) The direction of load application shall be made on both directions, front and rear (or right and left) respectively.

4) The clearance between revolving knife and fixed knife (which means the spiral revolving knife and stationary shear bar) shall be measured before or after load application and measuring points should be more than 3 points.

(4) Calculating Method

Relative displacement between revolving knife and fixed knife shall be obtained from the following formula:

$$C = C_1 - C_2$$

where,

C : relative displacement between revolving knife and fixed knife (mm)

C_1 : clearance between revolving knife and fixed knife before application of load (mm)

C_2 : clearance between revolving knife and fixed knife after being applied the load (mm)

4.3.7 Investigation after Disassembling

(1) This investigation shall, as a rule, be made after having made all the tests.

(2) Items to be Investigated

This investigation shall be made for ascertaining of any abnormalities on the Cutter on test after disassembling it completely, and if necessary, the measurement and investigation shall be taken for fitting condition, hardness, processing and touch degree of finishing, etc.

5. Standards to Pass the Inspection

The decision of inspection for forage cutters shall conform to the following specified standards, and shall be required to satisfy the respective requirement stipulated hereunder:

5.1 Performance Inspection

(1) Available dry matters per hour calculated from the standard cutting length shall be over 80% of the standard working volume in the test of 4.3.2.

(2) In the test of 4.3.2, the maximum working volume per horsepower calculated from the standard cutting length

shall be over 400 kg/hr. -Ps for the Let-fall type, 350 kg/hr. -Ps for the Throw-away type and 300 kg/hr. -Ps for the Blow-up type.

(3) In the test of 4.3.3, the difference of cutting length between maximum and minimum at the nearest adjusting position to cut the materials into 20mm long shall be within 80% against the average cutting length.

(4) In the test of 4.3.4, the maximum efficiency of blowing must be over 30%.

(5) In the test of 4.3.2, stems, leaves and rubbish shall not get entangled and blocked around the main-shaft or with other parts of the cutter.

5.2 Durability Inspection

The durability inspection shall be required to satisfy the requirements specified hereunder:

- (1) No failure or abnormality in principal parts and parts which may be difficult to replace easily
- (2) No abnormal abrasion
- (3) No seizure
- (4) To have the necessary measures taken against corrosion
- (5) In the test of 4.3.6, the relative displacement value between revolving knife and fixed knife should be less than 3 mm.

5.3 Handling Inspection

- (1) Handling condition shall not show a defects that may bring much dangerous feeling to the operator during the operation of the forage cutter in the test of 4.3.5.

(2) No defects that shall be the cause of difficulty to replace or adjust them during operation of the cutter in the test of 4.3.5.

Form 1. Fly-wheel and Blow-up Type

INSPECTION RECORD SHEET

Date:

THE INSTITUTE OF AGRICULTURAL
MACHINERY

Certificate No.

Kind of agricultural
machinery

Manufacturer's type
designation

Manufacturer's name and add.

1. Main Structure
(1) Dimensions

| Overall length | Overall width | Overall height | Height from ground to main shaft | Weight | Remarks |
|----------------|---------------|----------------|----------------------------------|--------|--|
| mm | mm | mm | mm | kg | exclusive of supply conduit, blow-up pipe and elbow. |

(2) Power Transmission Part

| | | | | | |
|-------------------------------------|---|-------------------------------|---|-------------------------------|-----------------------------------|
| Specified revolutions of main shaft | Belt pulley of main shaft Dai. x width | With clutch or without clutch | With roll reverse or without roll reverse | Transmission system | |
| | | | | From main shaft to lower roll | Between upper roll and lower roll |
| rpm | mm | | | | |

(3) Cutting Knife

| | |
|------|----------------------|
| Type | No. of fitted knives |
| | |

(4) Feeding Roll

| | | | | |
|----------------|------|---------------|-------------------------|---|
| Upper or lower | Kind | Width of roll | Effective width of roll | Max. and min. space between upper roll axis and lower roll axis |
| Upper | | mm | mm | mm |
| Lower | | | | |

(5) Feeding Conduit

| | | |
|--------|------------------------|-----------------------------------|
| Length | Height of feeding side | With conveyor or without conveyor |
| mm | mm | |

(6) Cutting Size and Adjusting Mechanism

| | | |
|---------------------|-------------------------------|------------------|
| Adjusting mechanism | Number of adjusting positions | Indicated length |
| | positions | mm |

(7) Blow-up Part

| | | |
|-----------------|--|--------------------------------------|
| Number of vanes | Dia. of circular formed by the tip of vane | Outside diameter of discharging part |
| | mm | mm |

2. Summary of Inspection Record

(1) Running Test (Dent-corn stated in Note (1) has been used in this test.)

The conditions of test and results have been recorded as follows:

The working volume of cutting per hour has been as proper and suitable as compared with the standard value calculated from the factors of the effective width, number of blades and main shaft revolutions of the Forage Cutter on test.

| Date of test | Number of main shaft revolutions | Indicated length of cutting | Kinds of Knives | Height of blow-up pipe | Cutting hours | Weight of cut materials |
|--------------|----------------------------------|-----------------------------|-----------------|------------------------|---------------|-------------------------|
| | rpm | mm | | From the main shaft /m | min. | kg |

| Working volume/hr (converted into 80% of moisture content) | Average length of cutting | Moisture content of cut materials |
|--|---------------------------|-----------------------------------|
| kg/hr | | % |

Remarks:

Note (¹) The following materials have been used in this test:

Kind: White dent corn

Area of producing:

Plant height: Cm

Dia. of lower part of stalk: Cm

Weight: g/plant

Thickness of seed: Cm

(2) Cutting Performance

(Rice Straws stated in Note (²) have been used as material in this test.)

The measuring results of required horsepower made under the following method (combined testing plot according to the sheaf size and cutting length) have been recorded as follows:

Furthermore, the effective working volume per hr-Ps converted into 20 mm of cutting length has been marked kg/hr-Ps and shown the maximum in the test plot of g/sheaf.

1) Conditions of Test (Date of Test:)

| Number of main shaft revolutions | Kinds of knives | Clearance between cutting knife and fixed knife | Height of blow-up pipe | Belt of power transmission | Feeding method |
|----------------------------------|-----------------|---|------------------------|----------------------------|--|
| rpm | | | | leather belt | Feeding one sheaf from the side of root Note (4) |

Note (4) About 30% of sheaf laps over another one.

| Size of straw sheaf (g) | Indicated length of cutting In case of | | | | Indicated length of cutting In case of | | | |
|--------------------------------------|---|---------------------------|-------------------------|--------------------------------------|---|---------------------------|-------------------------|--------------------------------------|
| | Average cutting length (mm) | Feeding amount (kg) | Cutting hours (s) | Average required power (Ps) | Average cutting length (mm) | Feeding amount (kg) | Cutting hours (s) | Average required power (Ps) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| Average cutting length (mm) | Indicated length of cutting In case of | | | Average required power (Ps) |
|--------------------------------------|---|-------------------------|--------------------------------------|--------------------------------------|
| | Feeding amount (kg) | Cutting hours (s) | Average required power (Ps) | |
| | | | | |
| | | | | |
| | | | | |

Remarks:

Note (2) The following materials (rice straws) have been used in this test:

Variety: Length of stem:

Moisture Content: Average %

(3) Blowing-up Performance Test

The materials stated in Note (2) have been used (rice straws).

The measuring results of blowing-up height test have been recorded as follows:

The results have been recognized which is a suitable one as compared with the theoretical blow-up height regulated by the circumferential speed of vaines' tip on the

Cutter on test.

| Size of sheaf | Indicating length of cutting | Number of main shaft revolutions (Average on load) | Operating hours | Height of blowing up from the main shaft | Cutting knife and method of feeding | Remarks |
|---------------|------------------------------|--|-----------------|--|---|---------|
| g | mm | rpm | s | m | same as the test of cutting performance | |
| g | mm | rpm | s | m | - ditto - | |

(4) Handling Test

The materials stated in Note (2) and (3) have been used in this test.

The results of pasture and rice straws cutting tests under the following conditions have been recognized that it can be able to do the suitable work.

| Test Plot | Number of main shaft revolutions (no load) | Indicated length of cutting | Kinds of knives | Size of sheaf | Feeding method | Others |
|-----------------------------|--|-----------------------------|-----------------|---------------|----------------|--------|
| Pasture cutting | rpm | mm | | - | - | |
| Long cutting of rice straws | rpm | mm | | g | | |

Note (3) Pre-dried orchard grass has been used in this test.

Reference concerning the Handling

| Position of clutch lever and shape | Eliminating method of blocking and entanglement | Adjusting method of cutting length | Taking-off method of cutting knives | Adjusting method of clearance between cutting knife and fixed knife | Consideration for safety | Others |
|------------------------------------|---|------------------------------------|-------------------------------------|---|--------------------------|--------|
| | | | | | | |

(5) Rigidity Test

The result of test made by measuring the relative displacement of clearance between the fixed knife and the cutting knife under the applying kg of load horizontally on the belt pulley of main shaft has been marked within 0.3 mm and recognized to have enough rigidity.

3. Additional Remarks:

Form 2. Cylinder-Throw-away Type and Fly-wheel and Throw-away Type

INSPECTION RECORD SHEET

Date:

THE INSTITUTE OF AGRICULTURAL
MACHINERY

Certificate No.

Kind of agricultural machinery Forage Cutter (Type Throw-away Type)

Manufacturer's type designation

Manufacturer's name and add.

- 1. Main Structure
(1) Dimensions

| Overall length | Overall width | Overall height | Weight | Remarks |
|----------------|---------------|----------------|--------|----------------------------------|
| mm | mm | mm | kg | exclusive of the feeding conduit |

(2) Power Transmission Part

| | | | | | | |
|------------------------------------|-----|---|----|-------------------------------|-------------------------------|-----------------------------------|
| Specified revolution of main shaft | rpm | Belt pulley of main shaft Dai. x width | mm | With clutch or without clutch | Transmission system | |
| | | | | | From main shaft to lower roll | Between upper roll and lower roll |

(3) Cutting Knife

| | |
|------|----------------------|
| Type | No. of fitted knives |
| | |

(4) Feeding Roll

| | | | | |
|----------------|------|---------------|-------------------------|---|
| Upper or lower | Kind | Width of roll | Effective width of roll | Max. and min. space between upper roll axis and lower roll axis |
| | | | | |
| Upper | | | | |
| Lower | | | | |

(5) Feeding Conduit

| Length | Height of feeding side | Height of end |
|--------|------------------------|---------------|
| mm | mm | mm |

(6) Cutting Size and Adjusting Mechanism

| Adjusting mechanism | Number of adjusting positions | Indicated length |
|---------------------|-------------------------------|------------------|
| | positions | mm |

(7) Throwing Away Part

| Number of vanes | Direction of throwing away | Discharging port |
|-----------------|----------------------------|------------------|
| | | |

2. Summary of Inspection Record

(1) Running Test (Dent-corn stated in Note (1) has been used in this test.)

The conditions of test and results have been recorded as follows:

The working volume of cutting per hour has been the proper and suitable compared with the standard value calculated from the factors of the effective width, number of blades and main shaft revolutions of the Forage Cutter on test.

| Date of test | Number of main shaft revolutions | Indicated length of cutting | Kinds of knives | Cutting hours | Weight of cutting | Working volume per hour (converted into 80% of moisture) |
|--------------|----------------------------------|-----------------------------|-----------------|---------------|-------------------|--|
| | rpm | mm | | min. | kg | kg/hr |

| Average length of cutting | Moisture content of cut materials | Others |
|---------------------------|-----------------------------------|--------|
| mm | | |

Remarks:

Note (1) The following materials have been used in this test.

Kind: White dent corn

Area of producing:

Plant height: Cm

Dia. of lower part
of stalk: Cm

Weight: g/plant

Thickness of seed: Cm

(2) Cutting Performance

(Rice straws stated in Note (2) have been used in this test.)

The measuring results of required horsepower made under the following method (combined testing plot according to the sheaf size and cutting length) have been recorded:

kg/hr - Ps and show the maximum in the test plot of g/sheaf.

1) Conditions of Test (Date of Test:)

| Number of main shaft revolutions | Kinds of knives | Clearance between cutting knife and fixed knife | Belt of power transmission | Feeding method | Others |
|----------------------------------|-----------------|---|----------------------------|---|--------|
| rpm | | mm | leather belt | Feeding one sheaf from the side of root and about 30% of sheaf laps over another one. | |

| Size of straw sheaf (g) | Indicated length of cutting In case of | | | | Indicated length of cutting In case of | | | |
|----------------------------------|---|---------------------------|-------------------------|--------------------------------------|---|---------------------------|-------------------------|--------------------------------------|
| | Average cutting length (mm) | Feeding Amount (kg) | Cutting hours (s) | Average required power (Ps) | Average cutting length (mm) | Feeding amount (kg) | Cutting hours (s) | Average required power (Ps) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| Indicated length of cutting In case of | | | |
|---|---------------------------|-------------------------|--------------------------------------|
| Average cutting length (mm) | Feeding amount (kg) | Cutting hours (s) | Average required power (Ps) |
| | | | |
| | | | |
| | | | |

Remarks:

Note (2) The following materials (rice straws) have been used in this test.

Variety: Length of stem: Cm

Moisture Content: Average %

(3) Handling Test

The materials stated in Note (2) and (3) have been used in this test. The results of pasture and rice straws cutting tests under the following conditions have been recognized that it can be able to do the suitable work.

| Test Plot | Number of main shaft revolutions (no load) | Indicated length of cutting | Kinds of knives | Size of sheaf | Feeding method | Others |
|-----------------------------|--|-----------------------------|-----------------|---------------|----------------|--------|
| Pasture cutting | rpm | mm | | - | - | |
| Long cutting of rice straws | rpm | mm | | g | | |

Note (3) Pre-dried orchard grass has been used in this test.

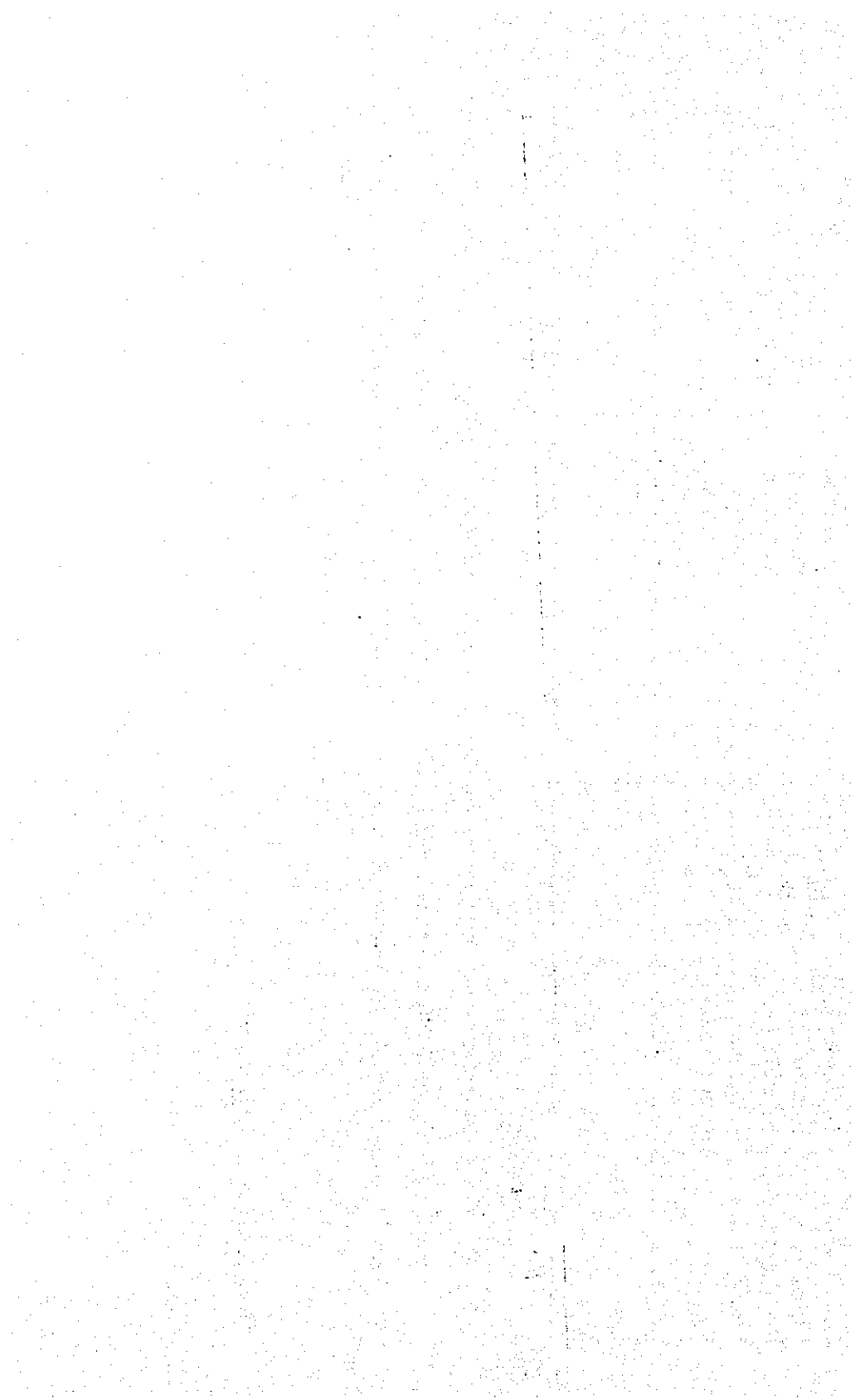
Reference concerning the Handling

| Position of clutch lever and shape | Eliminating method of blocking and entanglement | Adjusting method of cutting length | Taking-off method of cutting knives | Adjusting method of clearance between cutting knife and fixed knife | Consideration for safety | Others |
|------------------------------------|---|------------------------------------|-------------------------------------|---|--------------------------|--------|
| | | | | | | |

(4) Rigidity Test

The result of test made by measuring the relative displacement of clearance between the fixed knife and the cutting knife under the applying kg of load horizontally on the belt pulley of main shaft has been marked within 0.3 mm and recognized to have enough rigidity.

3. Additional Remarks:



I - 7. BLOWERS FOR VENTILATING TYPE DRYER USE

I - 7 BLOWERS FOR VENTILATING TYPE DRYER USE

(Date of Public Notice in Official Gazette: December 9, 1963.)

1. Scope

This standard for inspection specifies testing methods and procedures of inspection of blowers to be used for the ventilating type - dryers, which are not required to transfer the objective materials for drying, and the blower shall be fitted to an air heating furnace, (hereinafter referred to as the "furnace"). This standard shall be applied only to the furnace for which solid substances are used as fuel, but the following types are excluded herefrom.

- (1) Indirect heating type furnace
- (2) Blower which includes an electric motor inside of its body

2. Definition of Terms

The meaning of terms to be used in this standard shall be defined as follows:

2.1 Range of Specified Revolutions

The range of specified revolutions means the revolution-range of blower's shaft which is indicated in the specification submitted by a manufacturer.

2.2 Normal Spacing Range between Furnace and Blower

The normal spacing range between the furnace and blower means the range of space which shall be kept normally between the furnace and the blower as indicated in the specification.

3. Procedures of Inspection

3.1 Items to be Inspected

The inspection shall be carried out by the following tests and investigations:

- (1) Verification of Structure
- (2) Blower Performance Test
 - 1) Solo-Blower Performance Test
 - 2) Furnace Juxtaposed Blower Performance Test
- (3) Test of Temperature Regulating Performance
- (4) Continuous Running Test
- (5) Handling Test
- (6) Investigation after Disassembling

3.2 General Conditions for Inspection

(1) Preliminary Running

The blower for ventilating type dryer use to be put on the test, (hereinafter referred to as the "Blower on test") shall be considered to have been run-in enough prior to the test. The preliminary running for each test shall be within 30 minutes.

(2) Materials to be Used in Test

Fuel to be used in the test shall conform to the specification and be easily available at the market. Property of fuel to be used in the test shall be informed to a manufacturer prior to the test.

(3) Measuring Instruments

The instruments to be used for measuring shall have

been checked and calibrated prior to the measurements, and shall be capable of taking the following minimum scale and accuracy.

| Main purpose of use | Kind of instrument | Required minimum scale and accuracy |
|---|---|--|
| Measurement of blower shaft revolutions | Hasler tachometer | capable of reading down to $\pm 1\%$ of the measured value |
| Measurement of blower shaft revolutions | digital tachometer | capable of reading down to $\pm 1\%$ of the measured value |
| Measurement of required horsepower | electric dynamometer (table scale is to be used for the measurement of brake load) or dynamograph | capable of reading down to $\pm 1\%$ of the maximum value |
| Measurement of volume and air pressure | Pilot tube | capable of having the accuracy to measure below than $\pm 1\%$ of the measured value |
| Measurement of temperature | centigrade thermometer | capable of taking finer scale than 1°C |
| Measurement of hours | stop watch | Minimum scale less than 0.2 sec. |
| Measurement of weight | platform scale | capable of taking the measurement of less than 0.5 kg. |

(4) Adjustment of "Blower on test" During Test

No adjustment shall, as a rule, be permitted for the Blower on test during the entire test.

(5) Suspension of Test

When one of each test stops more than 3 times or longer than 30 minutes, the test shall be stopped. However, the test which may be stopped irrespective of manufacturer's responsibility shall be recovered.

3.3 Methods of Testing and Investigation

3.3.1 Verification of Structure

(1) Object

The object of this investigation is to ascertain the main dimensions, weights, materials, equipments and so forth in comparison actual things of the Blower on test with the said items indicated on the specification.

(2) Items to be Investigated

1) Blower

(a) Dimension: Overall length

Overall width

Overall height

Gross weight

(b) To investigate either axial flow type or radial flow type

(c) Range of specified revolutions of blower-shaft

(d) Diameter of discharge port

- (e) Diameter of impeller
- (f) Number of rotating impeller-vanes and materials used
- (g) Number of guide vanes
- (h) Kind of lubricating oil and lubricating system for the bearing parts
- (i) Diameter of pulley and type of belt
- (j) Other necessary items

2) Heating Furnace

- (a) Dimension: Overall length
Overall width
Overall height
Gross weight
- (b) Kind of fuel to be used mainly for the furnace
- (c) Fuel supplying system
- (d) Capacity of combustion chamber and materials used
- (e) Area of fire-grate and materials used
- (f) Normal spacing range between furnace and blower
- (g) Temperature regulating system
- (h) Method of settling down the fire after using of the furnace and extinguishing
- (i) Other necessary items

3) Air-flow Guide Race

- (a) Length and area of section (blower side and dryer side)

(d) Connecting method between blower and drying-tray

(e) Materials used

(f) Other necessary items

4) Drying-Tray

(a) Dimension: Overall length

Overall width

Overall height

Gross weight

(b) Capacity, (length x breadth x height)

(c) Mesh of wire net

(d) Method of assembly

(e) Taking out method of the objective substances for drying

(f) Materials used for the drying-tray

(g) Other necessary items

3.3.2 Blower Performance Test

3.3.2-A Solo-Blower Performance Test

(1) Object

The object of this test is to ascertain the performance of the solo-blower on test.

(2) Testing Equipment

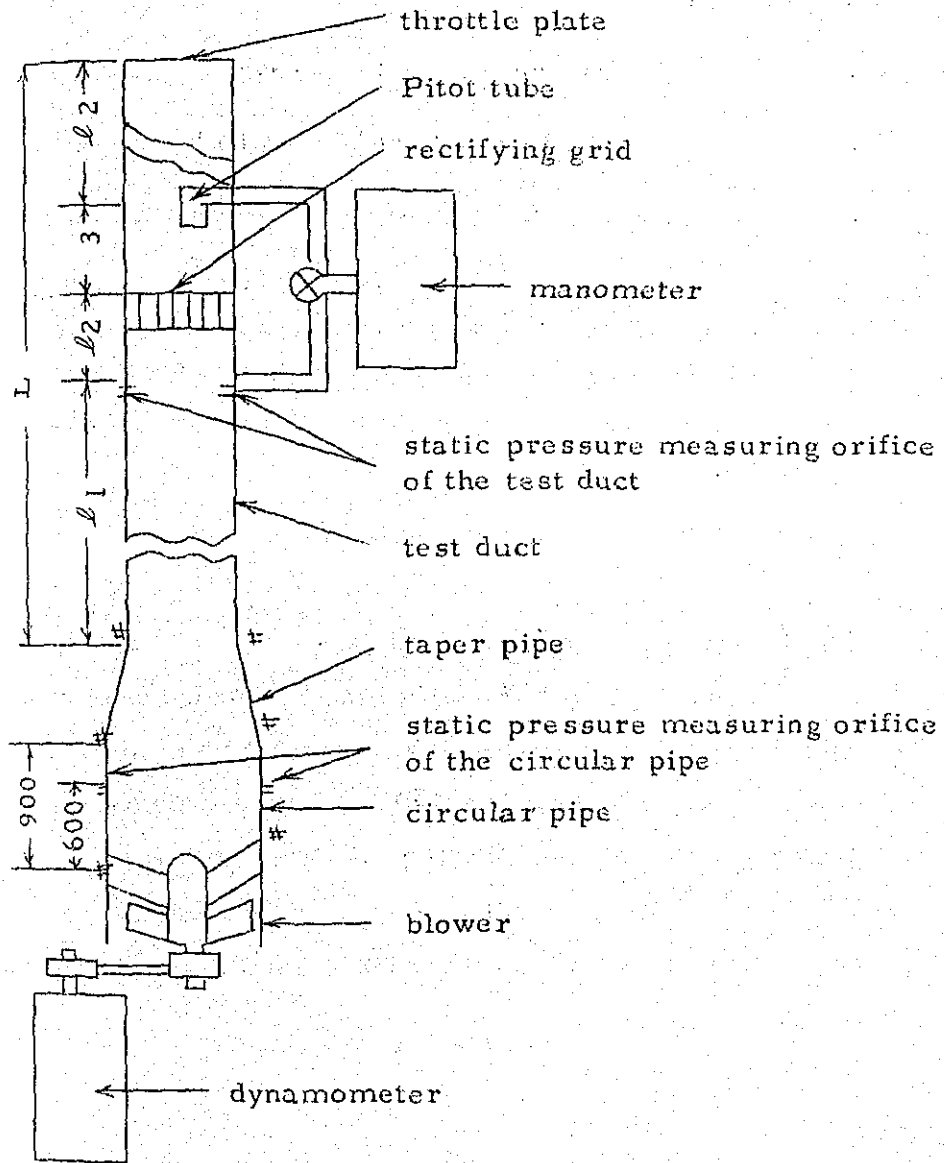


Fig. 1

Table 1. Different Diameters of the Test Duct to be Used for the Performance Test.

| Test Duct No. | d | L | l_1 | l_2 | l_3 | l_4 |
|---------------|-----|--------|-------|-------|-------|-------|
| No. 1 | 850 | 10,000 | 4,600 | 1,150 | 950 | 3,300 |
| No. 2 | 580 | 6,300 | 3,090 | 510 | 600 | 2,100 |
| No. 3 | 480 | 5,400 | 2,560 | 420 | 590 | 1,830 |
| No. 4 | 300 | 4,000 | 1,800 | 350 | 600 | 1,250 |

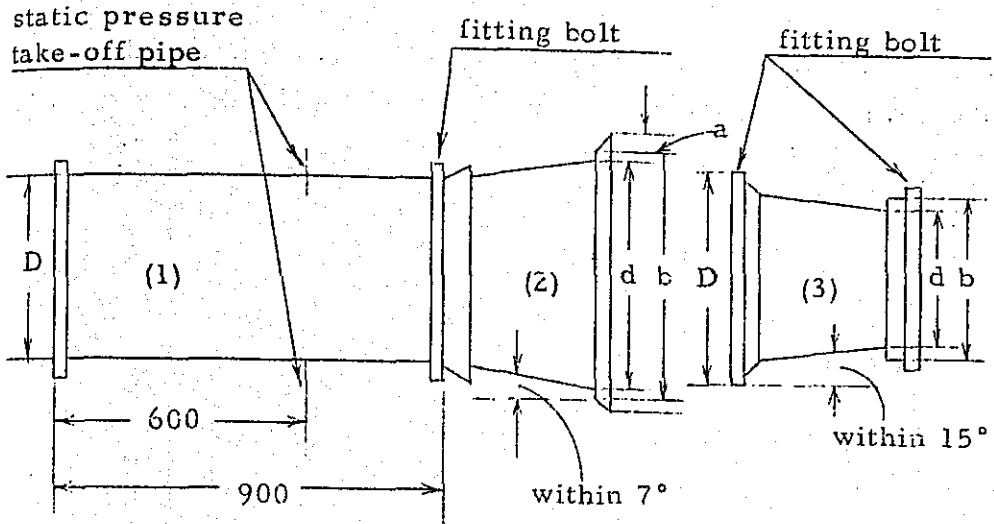
1) The above mentioned four different test ducts with the different size of inside diameter as shown below shall be used.

viz. 850 ϕ , 580 ϕ , 480 ϕ and 300 ϕ

The center of test duct should be kept at the same level from the floor of test room.

2) When the diameter difference between the blower and the test duct is over than 1% against the diameter of test duct, the circular pipe shall be interposed between the blower and the test duct for coupling, but the diameter of circular pipe must be the same that of taper pipe and blower as shown in Fig. 2 and Table 2.

Fig. 2



- Remarks: (1) = circular pipe
(2) = bell-mough pipe
(3) = reducing pipe (reducer)

Table 2. Different Diameters of the Duct to be Used for the Performance Test

| Diameter of discharge port for blower (D) | Diame-ter of test duct (d) | Width of flange (a) | Space between bolt hole's center(b) | Number of bolts | Diame-ter of bolt hole |
|--|-------------------------------|------------------------|-------------------------------------|-----------------|------------------------|
| 640 < | 850 | 50 | 910 | 12 | 12 |
| 530~640 | 580 | 35 | 624 | 12 | 10 |
| 350~530 | 480 | 35 | 524 | 12 | 10 |
| \leq 350 | 300 | 30 | 334 | 8 | 10 |

3) The measurement of required horsepower shall be made by an electric dynamometer, which shall be driven through V-belt transmission of power.

4) The measurement of air volume shall be made by a Pilot tube. For the measurement of pressure, the Göttingen manometer shall be used.

(3) Testing Method

1) Number of blower shaft revolutions for the test shall be at the speed of the maximum revolutions within the range of specified revolutions.

2) Air flow shall be obtained from air velocity calculated by the mean value of dynamic pressure with 20 measuring points on the measuring section inside of the test duct.

On the other hand, static pressure shall be obtained from the mean of static pressure measuring value taken at the two points of the test duct.

3) Unless otherwise specified, other tests shall conform to JIS ⁽¹⁾ (Testing Methods for Fans and Blowers).

Note ⁽¹⁾ JIS = Japanese Industrial Standard

(4) Items to be Measured and Investigated

- 1) Required horsepower
- 2) Air volume
- 3) Static pressure and stagnation pressure of blower
- 4) Static pressure efficiency of blower
- 5) Fluctuation percentage for required horsepower
- 6) Vibration and noise
- 7) Operating condition and any troubles or abnormalities in the parts
- 8) Other necessary items

(5) Calculation

Calculating formula of each measured value shall conform to the followings:

1) Required Horsepower

$$B = \frac{WN}{K}$$

where,

B : required horsepower (Ps)

W : load applied on the end of dynamometer (kg)

N : number of dynamometer's revolutions (rpm)

K : coefficient given to the dynamometer

2) Air Volume

$$V = \sqrt{\frac{2g}{\rho}} \text{hd}$$

where,

V : mean air velocity (m/sec)

g : acceleration of gravity

$$(g = 9.8 \text{ m/sec}^2)$$

hd : mean dynamic pressure (mm Aq)

ρ : unit volumetric weight of air per 1 m³
at the time of test (kg/m³)

P : air pressure in the test duct (mm Aq)

$$j = 0.342 \times \frac{P - 5.14\phi Fd}{273.2 + td} = P_a \left(\begin{array}{l} \text{atmospheric} \\ \text{pressure} \end{array} \right) + h_s \left(\begin{array}{l} \text{static pressure} \\ \text{in the test duct} \end{array} \right)$$

ϕ : relative humidity of air

Fd : saturated vapour pressure at td^oC
(mm Hg)

Td : dry-bulb temperature (°C)

$$Q = AV$$

Q : air volume (m³/sec)

A : sectional area of test duct (m²)

3) Static Pressure and Stagnation Pressure

$$P_t = h_s + h_d (1.15 + \xi)$$

$$P_s = P_t - h_d \left(\frac{D'}{D} \right)^4$$

where,

P : pressure at discharge port of blower
(mm Aq)

h : pressure of the test duct (mm Aq)

ξ : coefficient of loss when a circular form changes into other circular form (mm)

D : diameter of discharge port of blower (mm)

D' : diameter of the test duct (mm)

The suffix t, d and s shall mean "stagnation pressure", "dynamic pressure" and "static pressure" of the blower respectively.

4) Static Pressure Efficiency and Stagnation Pressure Efficiency

$$\eta_s = \frac{Q P_s}{75 B} \times 100$$

$$\eta_t = \frac{Q P_t}{75 B} \times 100 \quad \eta : \text{efficiency (\%)}$$

5) Fluctuation Percentage of Required Horsepower

$$f = \frac{B_{\max} - B_{\min}}{B_{\max}} \times 100$$

where,

f : fluctuation percentage of required horsepower

B max : maximum value of required horsepower

B min : minimum value of required horsepower

Remarks: Conversion to Standard Condition

In converting the calculated values of

1) and 3), the calculated values shall be

multiplied by 1.2/ to convert of 1) and

3) into the standard conditions respectively

3.3.2-B Furnace Juxtaposed Blower Performance Test

(1) Object

This test is made for the purpose of ascertaining the blower performance when the blower is juxtaposed with the furnace.

(2) Testing Equipment

The arrangement of testing equipment for this test shall conform to the test of 3.3.2, but the furnace should be juxtaposed with the blower.

(3) Testing Method

1) The blower shall be juxtaposed with the furnace and be kept under the condition of normal use after filling fuel, but fuel shall not be burnt down. The spacing between the furnace and the blower shall be kept at the minimum of normal spacing range.

2) Other methods shall be the same as stipulated in the test of 3.3.2-A.

(4) Calculation, Items to be Measured and Investigated

Calculating method and items to be measured and investigated shall conform to the method and items in the test of 3.3.2-A.

3.3.3 Test of Temperature Regulating Performance

(1) Object

The object of this test is made for the purpose of ascertaining the temperature regulating performance of the furnace.

(2) Testing Equipment

The equipment of temperature measuring shall be attached to that of 3.3.2-A. For the measurement of temperature, thermoelectric couple shall be put on the suction side of the test duct and ventilation shall be kept on for measuring of room temperature. Then, five pieces of thermoelectric couple shall be placed vertically on the discharge side where airflow was tightened by a throttle plate and measure the discharge air temperature.

(3) Testing Method

- 1) Number of blow-shaft revolutions shall conform to the case of 3.3.2-A.
- 2) The position of furnace shall be a manufacturer's option within the normal spacing range.
- 3) The furnace shall be juxtaposed with the blower and the blower shall be operated without fuel combustion. Airflow shall be adjusted by a throttle plate in order to keep at one half of open airflow as seen in the case of 3.3.2-A, (in case that open air volume cannot be measured, it shall be obtained from the efficiency curve).
- 4) The test shall be carried out as to the following two kinds of temperature regulating.
 - (a) The Temperature regulation shall be conducted to make the temperature-rise of discharge air to reach 10°C and the blower shall be operated for 30 minutes. Under this circumstance, as soon as

the temperature-rise of discharge air reaches within the range of $10^{\circ}\text{C} \pm 2^{\circ}\text{C}$, temperature regulating shall be conducted only for 10 minutes.

Thereafter, no regulating shall be conducted.

(b) The temperature regulation to obtain the highest of the temperature-rise of discharge air by burning fuel shall be carried out first (but temperature regulating, in case of the discharge air volume is smaller and more decreasing than the test case of 3.3.3.-B, shall be excluded, to be the same hereafter) and the blower shall be operated for 30 minutes. Hereupon, the temperature-rise and temperature unevenness can be measured. This measurement shall be started within 60 minutes after regulating the temperature-rise of discharge air to make it at the maximum.

(4) Items to be Measured and Investigated

- 1) Temperature-rise of discharge air
- 2) Unevenness of temperature of discharge air
- 3) Easiness of temperature regulating operation and handling
- 4) Running condition and abnormalities or troubles in respective part
- 5) Other necessary items

(5) Calculating Method

$$A = \frac{T_{\text{max}} - T_{\text{min}}}{\bar{T}} \times 100$$

where,

- A : temperature unevenness of discharge air (%)
- T max : mean temperature-rise for 30 minutes of the maximum temperature measuring point (°C)
- T min : mean temperature-rise for 30 minutes of the minimum temperature measuring point (°C)
- \bar{T} : total average of temperature-rise (°C)

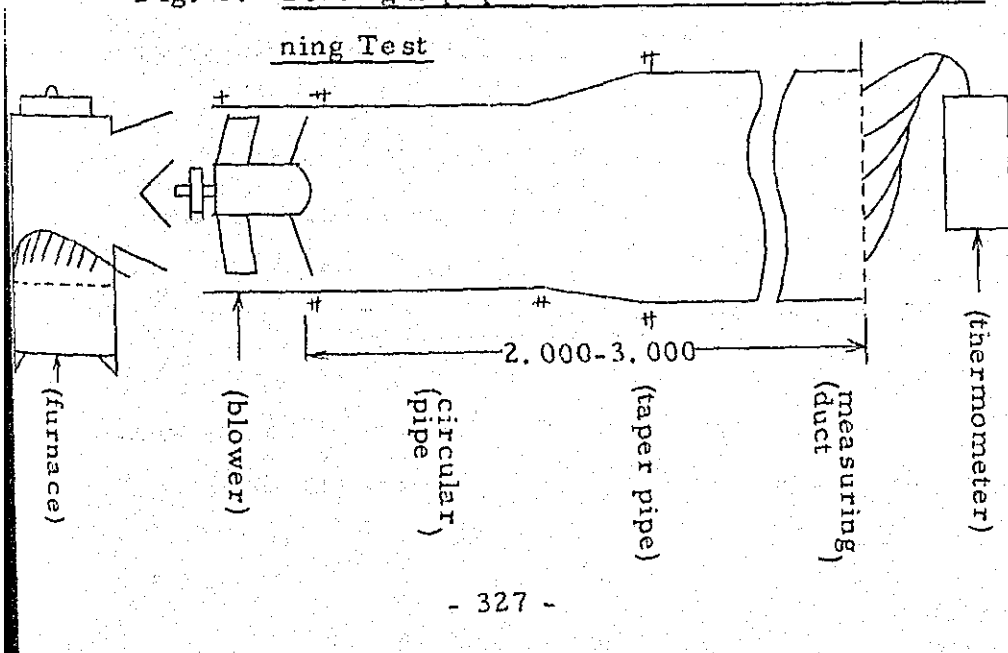
3.3.4 Continuous Running Test

(1) Object

The object of this test is to ascertain the running condition and that there is no development of irregularities, abnormalities and troubles under the continuous running test.

(2) Testing Equipment

Fig. 3. Testing Equipments for the Continuous Running Test



- 1) In the arrangement of the testing equipment, a circular pipe shall first be fitted to the blower as shown in Fig. 3, then, the same diameter of the measuring duct shall be connected to it. The lower air stream side of blower shall be kept 2-3 meters long. If it is necessary to use a taper pipe, it shall be connected to the following of a circular pipe.
- 2) A thermoelectric-couple shall be fitted to the discharge-end of the measuring duct.

3.3.5 Handling Test

(1) Object

This test is made for the purpose of ascertaining ease or otherwise of handling the Blower on test.

(2) Testing Method

The investigation shall be done by more than two investigators using the Blower on test successively after the continuous running test.

(3) Items to be Investigated

- 1) Easiness of temperature regulating operation
- 2) Safety
- 3) Easiness of transporting the Blower on test
- 4) Easiness of adjustment and maintenance
- 5) Other necessary items

3.3.6 Investigation after Disassembling

(1) Object

The object of this investigation is mainly to ascertain that there is no development of irregularities and

abnormalities on the Blower on test after having carried out the continuous running test.

(2) Items to be Investigated

This investigation shall be made for checking of any abnormalities on the Blower on test after disassembling it completely, and if necessary, the measurement and investigation shall be taken on the points of hardness, treatments in processing, finishing, balancing of fan, etc.

(3) Testing Method

- 1) Number of blower-shaft revolutions shall be half of the number of maximum revolutions within the range of specified revolutions.
- 2) The position of the furnace shall be manufacturer's option within the range of normal spacing.
- 3) The discharge-end of measuring duct shall be kept in the state of leaving open.
- 4) The temperature regulation shall be carried out to make the temperature-rise of discharge air, rise up more than 20°C (the blower which can not reach 20°C shall be arranged to keep its maximum temperature).
- 5) Running hours shall be for 5 hours

(4) Items to be Measured and Investigated

- 1) Mean temperature-rise of discharge air
- 2) Quantity of fuel consumption
- 3) Temperature of each part
- 4) Running condition and any abnormalities or troubles in the part

- 5) Safety
- 6) Other necessary items

4. Standards to Pass the Inspection

The decision of inspection for blowers for ventilating type-dryers use shall conform to the following standards, and shall be required to satisfy the respective requirement stipulated as follows:

4.1 Performance Inspection

(1) The result of test in 3.3.2-B must give a satisfactory result at least to one of the following specified requirements at the low speed revolutions rather than the number of blower-shaft revolutions at the time of test.

1) Static pressure efficiency shall be over 35% at the point of 10 mm Aq of static pressure and $2.8 \text{ m}^3/\text{sec}$. of air volume.

2) Static pressure efficiency shall be over 35% at the point of 10 mm Aq of static pressure and $14 \text{ m}^3/\text{sec}$. of air volume.

3) Static pressure efficiency shall be over 35% at the point of 10 mm Aq of static pressure and $0.7 \text{ m}^3/\text{sec}$. of air volume.

4) Static pressure efficiency shall be over 35% at the point of 10 mm Aq of static pressure and $0.35 \text{ m}^3/\text{sec}$. of air volume.

(2) Fluctuation percentage of required horsepower shall be below 30% in the test of 3.3.2-B.

(3) Temperature-rise of discharging air shall be within the range of $10 \pm 5^{\circ}\text{C}$ in the test of 3.3.3-(3)-4)-(a).

(4) Mean maximum temperature-rise of discharging air for 30 minutes shall be higher than 15°C in the test of 3.3.3-(3)-4)-(a).

(5) Temperature-unevenness of discharging air in the test of 3.3.3 shall be below 30%.

4.2 Durability Inspection

The durability inspection shall be required to satisfy the requirements specified hereunder, particularly in principal parts and parts which may be difficult to replace easily.

(1) No abnormality and failure in the above mentioned parts

(2) No abnormal abrasion

(3) No seizure

(4) To have the necessary measures for "Dust-proof" in the bearing part

(5) No oil leakage from the bearing part

4.3 Handling Inspection

(1) Handling condition shall not show any defects that may bring much dangerous feelings to the operator during the operation of the blower.

(2) No defects that shall be the cause of difficulty to adjust parts of the blower.

(3) Quality of the objective substances for drying shall not be much degraded.

(4) No dangerous case of breaking fire

INSPECTION RECORD SHEET

Date:

Certificate No.

THE INSTITUTE OF AGRICULTURAL
MACHINERY

Kind of agricultural
machinery

Blower for Ventilating type dryer use

Manufacturer's type
designation

(Blower) (Heating Furnace)

Manufacturer's name
and add.

1. Dimensions

(1) Size of Body and Weight

| Item | Dimensions | | | Weight | Remarks |
|-----------------|----------------|---------------|----------------|--------|--|
| | Overall length | Overall width | Overall height | | |
| Blower | | | | | (inclusive of frame base of a prime mover, if any) |
| Heating furnace | | | | | (exclusive of fuel) |

(2) Specification and Structure

(a) Blower

| | | | | |
|--|--------------------------|-------------------------------|------------------|----------------|
| Classification Axial flow or Radial flow | Specified revolutions | Diameter of discharge port | Impellers | |
| | | | No. of Impellers | Materials used |
| | rpm | mm | | |

| | | | | | | |
|--------------|----------------|----------------|-------------------|-------------------------|--------------|--------------|
| Guide Vane | | Bearings | | Power Transmission Part | | |
| No. of vanes | Materials used | System of lub. | Kind of lubricant | Outside Dia. of pulley | Kind of belt | No. of belts |
| | | | | | | |

(b) Heating Furnace

| | | | |
|---|--------------|-----------------------|------------------------|
| Normal spacing between the furnace and the blower | Kind of fuel | Fuel supplying system | Volume of fuel filling |
| ~ mm | | | |

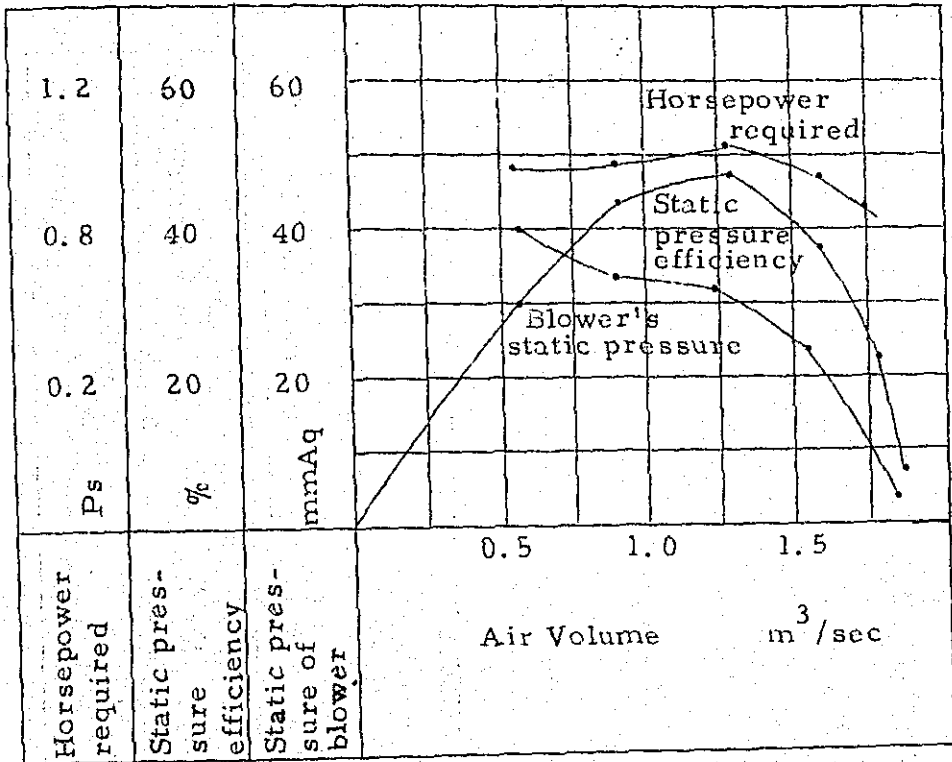
| | | | |
|--------------|--------------------|------------|--|
| Materials | | | Remarks |
| Outside wall | Combustion chamber | Fire-grade | |
| | | | To indicate the maximum volume of fuel filling |

2. Summary of Inspection Record

(1) Blower Performance Test (Heating furnace juxtaposed)

| Item | Atmospheric condition | | | | Number of blower shaft revolutions | Space between the furnace and the blower |
|--------------------|-----------------------|----------------|--------------------|-------------------|------------------------------------|--|
| | Dry bulb temp. | Wet bulb temp. | Atmospheric press. | Weight air volume | | |
| Conditions of test | °C | °C | mmAq | kg/m | rpm | Cm |

| Item | Horsepower required | Air volume | (Blower) Stagnation pressure | (Blower) Static pressure |
|----------------|---------------------|-------------------|------------------------------|--------------------------|
| Measuring Unit | Ps | m ³ /s | mm Aq | mm Aq |
| No. 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |



(2) Temperature Regulating Performance Test

| Atmospheric condition | | Aiming temperature | Space between blower and furnace | Temperature rise | Air volume | Remarks |
|-----------------------|----------------|--------------------|----------------------------------|------------------|-------------------|--|
| Dry bulb temp. | Wet bulb temp. | | | | | |
| °C | °C | Max. temp. - rise | Cm | | m ³ /s | Variation of temperature measured 5 times has been recorded less than 30%. |
| | | 10°C rising | Cm | Within 10 ± 5°C | | |

(3) Continuous Running Test

The result of test made under the following conditions has not shown any abnormalities after carrying out the continuous running test for 5 hours.

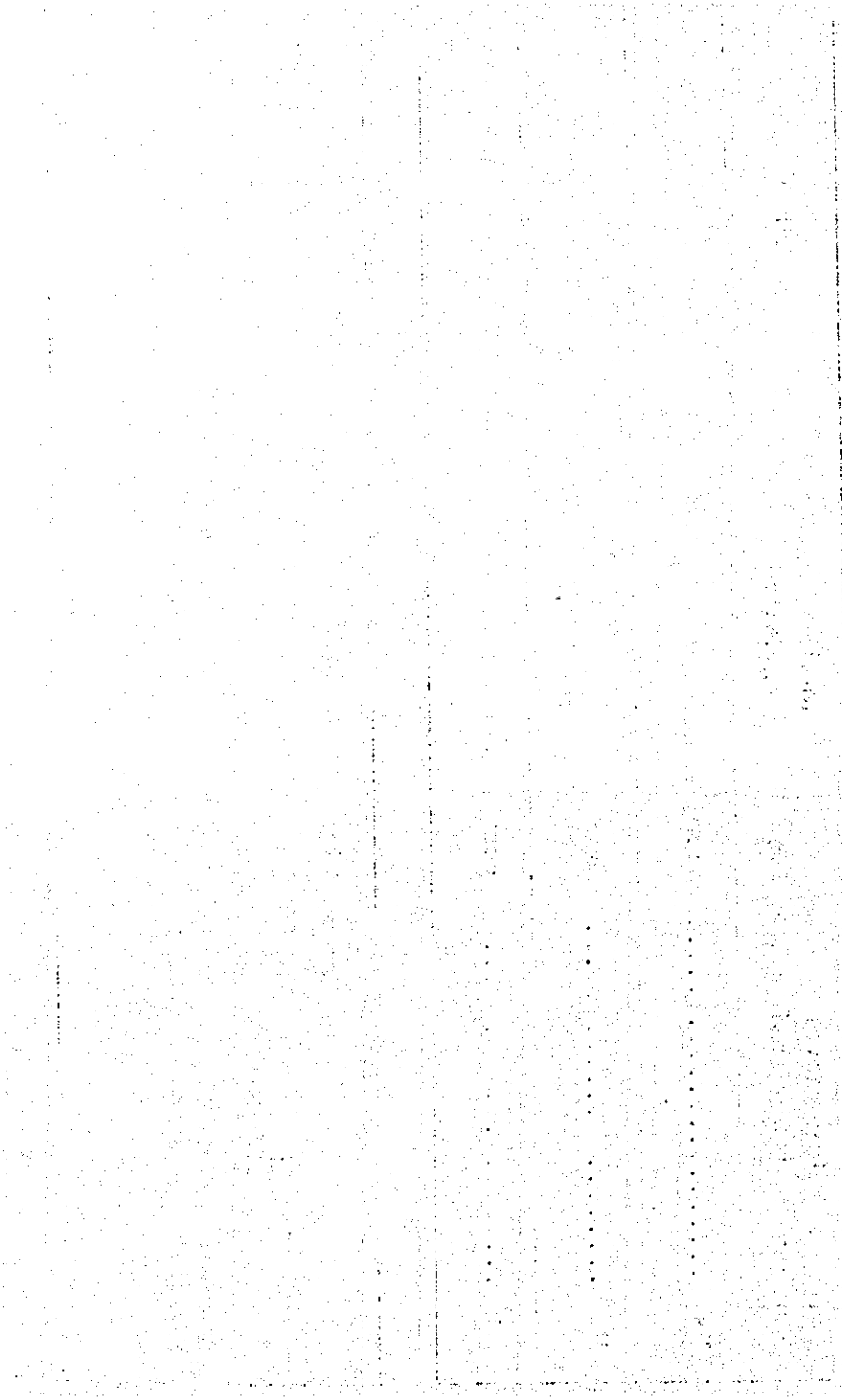
| Number of blower shaft revolutions | Measured air volume | Space between blower and furnace | Mean temperature-rise | Volume of fuel consumption |
|------------------------------------|---------------------|----------------------------------|-----------------------|----------------------------|
| rpm | m ³ /s | Cm | °C | kg/hr |

(4) Reference Items to the Handling

| Output of prime mover Number of blower shaft revolutions | Method of temp. regulation | Others |
|---|-------------------------------|--------|
| Ps rpm | | |
| Ps rpm | | |
| Ps rpm | | |

| Drying-Tray Assembled with the Body | | | | | |
|-------------------------------------|------------------|--------|--|-----------|------------------|
| Dimensions | | Weight | Capacity length x breadth x height | Materials | Attach- ments |
| Overall length | Overall width | | | | |
| mm | mm | kg | | | |
| | mm | | | | |

3. Additional Remarks



I - 8. GRAIN DRYERS (VENTILATING TYPE)

I - 8 GRAIN - DRYERS (VENTILATING TYPE)

(Date of Public Notice in Official Gazette: November 6, 1964.)

1. Scope

This standard specifies testing methods and procedures of inspection for ventilating type, grain-dryers which can dry cereals without transferring the objective substances for drying, and also shall be applied to the dryers fitted with the furnace, blower and drying-tray. However, the following types are excluded herefrom.

- (1) Indirect heating furnace
- (2) Blower which includes an electric motor inside of its body
- (3) Wire-net which supports cereals in the drying-tray is not leveled.

2. Definition of Terms

The meaning of term to be used in this standard shall be defined as follows:

(1) Range of Specified Revolutions

The range of specified revolutions means the revolution-range of blower-shaft which is indicated in the specification submitted by a manufacturer.

(2) Normal Spacing Range between Furnace and Blower

The normal spacing range between the furnace and the blower means the range of space which shall be kept normally between the furnace and blower as indicated in the specification.

(3) Standard Accumulation Volume

The standard accumulation volume means the standard amount of grains to be accumulated on the drying-tray, which is calculated basing upon the inter-relative factors, accumulation area of the drying tray, blowing performance of the furnace juxtaposed type blower, etc.

(4) Air Leakage

The air leakage means the air leaks out from the air-flow guide race or under the wire-net hurdle of the drying-tray.

3. Procedures of Inspection

3.1 Items to be Inspected

The inspection shall be carried out by the following tests and investigations:

- (1) Verification of Structure
- (2) Performance Test
 - 1) Furnace juxtaposed Blower Performance Test
 - 2) Cereals Accumulation Test
 - 3) Temperature Regulating Test
- (3) Continuous Running Test
- (4) Handling Test
- (5) Investigation after Disassembling

3.2 General Conditions for Inspection

(1) Preliminary Running

The grain-dryer to be put on the test, (hereinafter referred to as the "Dryer on test") shall be considered to

have been run-in enough prior to the test. The preliminary running for each test shall be within 30 minutes.

(2) Materials to be Used in Test

1) Fuel

Fuel to be used in the test shall conform to the specification and be easily available at the market. Property of fuel to be used in the test shall be informed to a manufacturer prior to the test.

2) Cereals

The dried grains shall be used as air-resistant substances for the following test:

Cereals accumulation test

Temperature regulating test

Continuous running test

(3) Measuring Instruments

The instruments to be used for measuring shall have been checked and calibrated prior to the measurements, and shall be capable of taking the following minimum scale and accuracy.

| Main purpose of use | Kind of instrument | Required minimum scale and accuracy |
|--------------------------------------|--------------------|--|
| Measurement of number of revolutions | Hasler tachometer | capable of reading down to $\pm 1\%$ of the measured value |
| Measurement of number of revolutions | digital tachometer | capable of reading down to $\pm 1\%$ of the measured value |

| Main purpose of use | Kind of instrument | Required minimum scale and accuracy |
|--|------------------------------|--|
| Measurement of air volume and air pressure | Pilot tube | capable of having below $\pm 1\%$ of the accuracy for the maximum measured value |
| Measurement of hours | stop watch | Minimum scale: below 0.2 sec. |
| Measurement of weight | platform scale | Minimum scale: below 0.5 kg |
| Measurement of temperature-rise | thermograph | Minimum scale: below 2°C |
| Measurement of temperature | mercury-in-glass thermometer | Minimum scale: below 2°C |
| Measurement of humidity | dry-wet-bulb thermometer | Minimum scale: below 2°C |
| Measurement of atmospheric pressure | Fortune type, barometer | Minimum scale: 0.0 mm Hg |

(4) Adjustment of the "Dryer on test" During Test

No adjustment shall, as a rule, be permitted while carrying out the test.

(5) Suspension of Test

When one of each test stops more than 3 times or longer than 30 minutes, the test shall be stopped. However, the test which may be stopped irrespective of manufacturer's responsibility shall be recovered.

3.3 Methods of Test and Investigation

3.3.1 Verification of Structure

(1) Object

The object of this investigation is to ascertain the main dimensions, weights, materials, equipments and so forth in comparison actual things of the Blower on test with the said items indicated on the specification.

(2) Items to be Investigated

1) Blower

(a) Dimension:

Overall length

Overall width

Overall height

Gross weight:

(b) To investigate either axial flow type or radial flow type

(c) Range of specified revolutions of blower-shaft

(d) Diameter of discharge port

(e) Diameter of impeller

(f) Number of rotating impeller-vanes and materials used

(h) Lubricating system for the bearing parts and kind of lubricating oil

(i) Diameter of pulley and type of belt

(j) Other necessary items

2) Heating Furnace

(a) Dimension:

Overall length

Overall width

Overall height

Gross weight

(b) Kind of fuel to be used mainly for the furnace

(c) Fuel supplying system

(d) Capacity of combustion chamber and materials used

(e) Area of fire-grate and materials used

(f) Normal spacing range between the furnace and the blower

(g) Temperature regulating system

(h) Methods of settling down the fire after using of the furnace

(i) Other necessary items

3) Airflow Guide Race

(a) Length and area of section (blower side and dryer side)

(b) Connecting method between the blower and the dryer

(c) Materials used

(d) Other necessary items

4) Drying-Tray

(a) Dimension:

Overall length

Overall width

Overall height

Gross weight

(b) Capacity, (length x breadth x height)

(c) Mesh of wire net

(d) Taking-out method of the objective substances
for drying from the drying-tray

3.3.2 Performance Test

3.3.2-A Heating Furnace Juxtaposed Blower Performance Test

(1) Object

This test is made for the purpose of ascertaining the blower performance when the blower is juxtaposed with a furnace.

(2) Testing Equipment

Fig. 1 Testing Equipment for Blower Performance Test

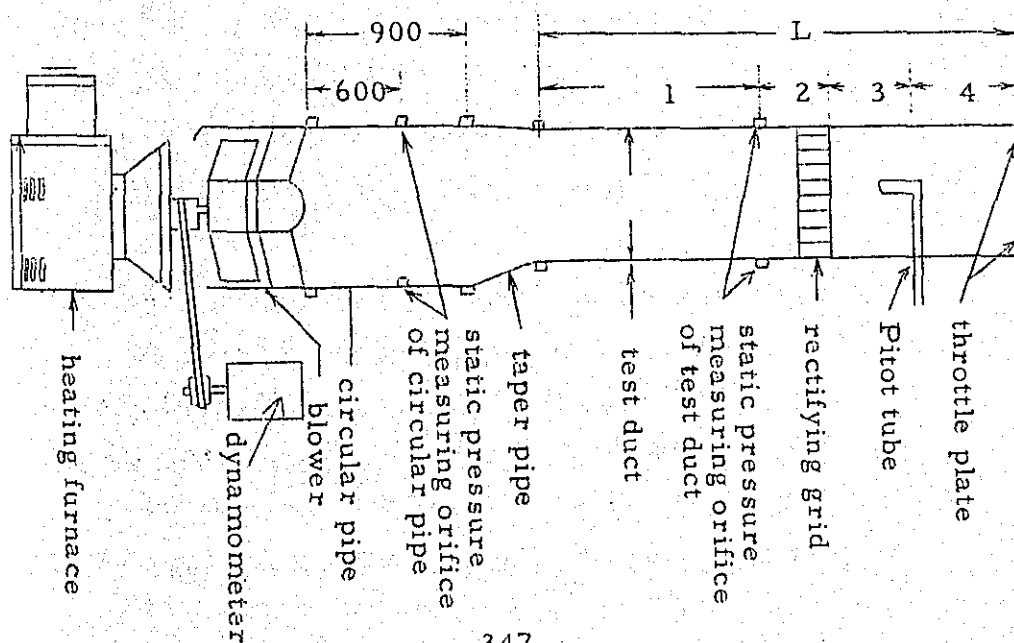


Table 1. Different Diameters of the Test Duct to be Used for the Performance Test

| Test Duct No. | d | L | l_1 | l_2 | l_3 | l_4 |
|---------------|-----|--------|-------|-------|-------|-------|
| No. 1 | 850 | 10,000 | 4,500 | 1,100 | 900 | 3,500 |
| No. 2 | 580 | 6,300 | 3,090 | 510 | 600 | 2,100 |
| No. 3 | 480 | 5,400 | 2,560 | 420 | 590 | 1,830 |
| No. 4 | 300 | 4,000 | 1,800 | 350 | 600 | 1,250 |

- 1) The testing equipment shall, as a rule, conform to Fig. 1, and the axis of the pipe should be the same level from the floor of test room.
- 2) When the diameter difference between the blower and the test duct is over than 1% against the diameter of test duct. The circular pipe of 900 mm in length shall be interposed between the blower and the test duct for coupling, but diameter of circular pipe should be the same as that of taper pipe (¹) and blower.

Note (¹) The angle between the connecting pipe and the axis of taper pipe shall not exceed 7° when the pipe is used as a bellmouth pipe and not exceed 15° when the pipe is used as a reducer.

- 3) The measurement of required power shall be made

by an electric dynamometer or a dynamograph, which shall be driven through V-belt transmission of power.

4) The measurement of air volume shall be made by a Pilot tube and a "Gottingen type, manometer shall be used for measuring the pressure.

(3) Testing Method

1) Number of blower-shaft revolutions shall be at the speed of maximum revolutions within the range of specified revolutions.

2) The blower shall be juxtaposed with the furnace and be run under the normal condition after filling fuel, but fuel shall not be burnt down. The spacing between the furnace and the blower shall be kept at the minimum of normal spacing range.

3) Airflow shall be obtained from air velocity calculated by the mean value of dynamic pressure with 20 measuring points on the measuring-section inside of the test duct. On the other hand, static pressure shall be obtained from the mean value of static pressure measuring value taken at the two points of the test duct.

4) The fluctuation percentage of required power shall be computed from the required power at the measuring point for leaving open air volume within the range from 30 to 90% of air volume under the leaving open condition, (in the case when the leaving open air volume cannot be measured, it can be obtained from the efficiency curve).

5) Besides the methods stipulated in (3), the testing methods shall, unless otherwise specified, conform to JIS (Testing Methods for Fans and Blowers).

(4) Items to be Measured and Investigated

- 1) Required horsepower
- 2) Air volume
- 3) Static pressure and stagnation pressure of blower
- 4) Static pressure efficiency of blower
- 5) Fluctuation percentage for required horsepower
- 6) Vibration and noise
- 7) Operating condition and any troubles or abnormalities in the parts
- 8) Other necessary items

(5) Calculating Method

Calculation of each measured value shall be computed from the following formulae:

- 1) Required Horsepower

$$B = \frac{W N}{K}$$

Where,

B : required horsepower (Ps)

W : load given to the end of dynamometer (kg)

N : number of dynamometer revolutions (rpm)

K : coefficient given to the dynamometer

2) Air Volume

$$\bar{V} = \sqrt{\frac{2g}{\gamma} \overline{hd}}$$

Where,

\bar{V} : mean air velocity (m/sec)

g : acceleration of gravity
(g = 9.8 m/sec²)

\overline{hd} : mean dynamic pressure
(mm Aq)

γ : unit volumetric weight of
air in the test duct (kg/m³)

$$= 0.0342 \times \frac{P - 0.378 \phi Fd}{273.2 + td}$$

P : air pressure in the test
duct

(mm Aq) = Pa (atmospheric
pressure) + hs (static pres-
sure in the test duct)

ϕ : relative humidity of air

Fd : saturated vapour pressure
at td °C (mm Hg)

td : dry-bulb temperature (°C)

Q : air volume (m³/sec)

A : sectional area of the test
duct (m²)

3) Static Pressure and Stagnation Pressure

$$P_t = h_s + h_d (1.15 + \xi)$$

$$P_s = P_t - h_d \left(\frac{D'}{D} \right)^4$$

where,

P : pressure at discharge port
of blower (mm Aq)

h : pressure in the test duct
(mm Aq)

ζ : coefficient of loss when a
circular form changes into
other circular form

D : diameter of discharge port
of blower (mm)

D' : diameter of the test duct
(mm)

The suffix t, d and s shall mean "stagnation pressure", "dynamic pressure" and "static pressure" of the blower respectively.

$$\eta_s = \frac{QP_s}{75 B} \times 100$$

where,

η ; efficiency (%)

$$\eta_t = \frac{QP_t}{75 B} \times 100$$

5) Fluctuation Percentage of Required Horsepower

$$= \frac{B \text{ max} - B \text{ min}}{B \text{ max.}}$$

where,

: fluctuation percentage of
required horsepower

B max : maximum value of required
horsepower

B min : minimum value of required
horsepower

Remarks: Conversion to Standard Condition

In converting the calculated values
of (1) and (3), the calculated values
shall be multiplied by $1.2/\ell$ to
convert of (1) and (3) into the
standard condition respectively.

3.3.2-B Cereals Accumulation Test

(1) Object

This test is made for the purpose of ascertaining the
condition of drying-tray when it is filled with cereals.

(2) Testing Equipment

For this test, the Dryer on test shall be kept under
the condition of normal use.

(3) Testing Method

Grains of the standard accumulation volume shall be
piled up on the drying-tray, and as to the standard ac-
cumulation volume shall be the rate obtained by the follow-
ing calculation in accordance with the blower performance

and accumulation area of the Dryer on test.

Relationship between the air-resistance of grains and the air volume shall be shown with the following equation :

$$P_s = 2200 \left(\frac{Q}{A} \right)^{2.4}$$

where,

P_s : air-resistance of grains (mmAq)

Q : air volume passing through grains (m³/sec)

A : area of accumulation (m²)

The standard accumulation volume, which is obtained from air volume at the intersection of blower efficiency curve after putting the above equation on a diagram of Efficiency Curve, shall be obtained from the following equation:

$$V_s = \frac{Q_f}{0.39}$$

where,

V_s : standard accumulation volume (m³)

Q_f : air volume at the intersection between efficiency curve and relative curve (between air volume and air-resistance of grains) (m³/sec)

However, in case of it is impossible to accumulate the amount of V_s , the capacity of drying tray shall be considered as capable one of accumulating the standard accumulation volume of cereals.

2) Number of blower-shaft revolutions, the state of furnace and spacing between the blower and the furnace shall conform to 3.3.2-A.

(4) Items to be Investigated

- 1) Available quantity of grains for accumulation
- 2) Air leakage
- 3) Rigidity of drying-tray
- 4) Other necessary items

3.3.2-C Test of Temperature Regulating Performance

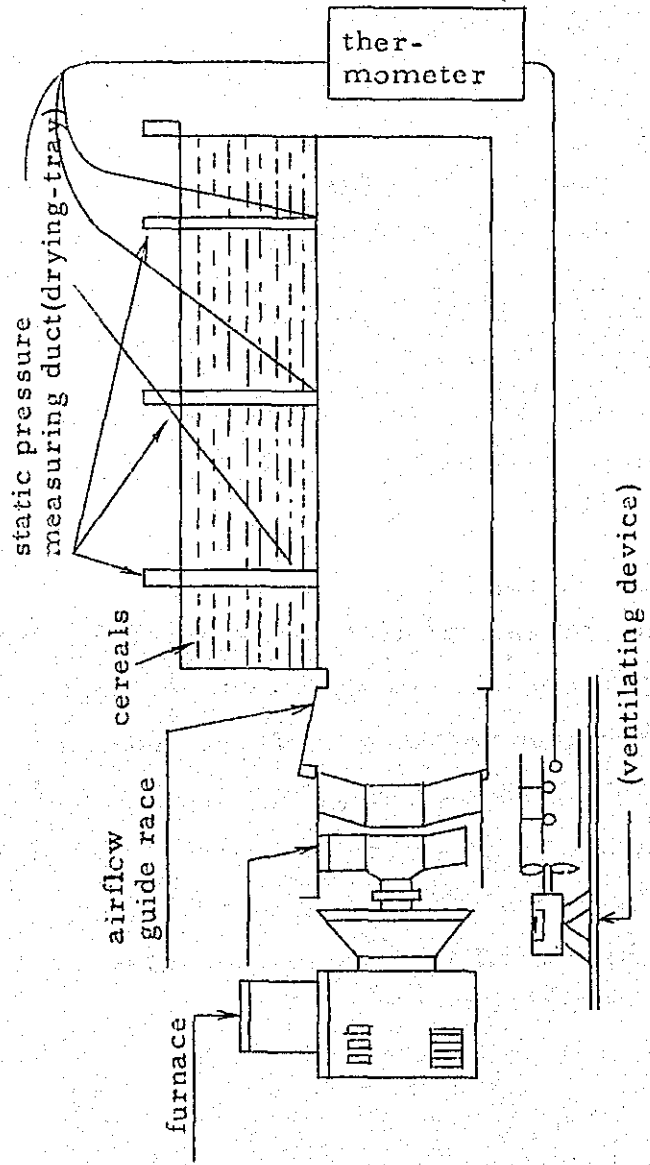
(1) Object

The object of this test is made for the purpose of ascertaining the temperature regulating performance of the furnace.

(2) Testing Equipment

Static pressure measuring ducts and thermometers shall be fitted on the surface of accumulation wire net of the Dryer on test, which is arranged under the condition of actual usage as shown in Fig. 2. The measuring instruments shall be placed at the center of each divided square of 9 in arrangement of dividing into 3 in a line of lengthwise direction and 3 in a line of crosswise direction.

Fig. 2. Testing Equipment for Temperature Regulating Performance Test



(3) Testing Method

- 1) Number of blower-shaft revolutions shall conform to the case of 3.3.2-A.
- 2) The position of furnace shall be a manufacturer's option within the normal spacing range.
- 3) In accordance with the standard rate of air volume for the test shall be obtained from the following equation:

$$Q_t = 0.39 VS$$

Air volume shall be adjusted through the accumulation of grains in the drying-tray, arranging the accumulation volume to keep air volume at Q_t . However, in case when the capacity of drying tray is considered as the standard rate of accumulation, air volume shall not be stipulated particularly.

- 4) The test shall be carried out for the following two kinds of temperature regulating.

(a) Temperature regulation shall be conducted to make the temperature - rise of discharge air reaching 10°C and the blower shall be operated for 30 minutes. Under this circumstance, the variance of temperature-rise shall be measured. This measurement shall be started when the temperature-rise shall be measured. This measurement shall be started when the temperature-rise of discharge air reaches within the range of $10^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and temperature regulating shall be conducted only for

10 minutes. Thereafter, no regulation shall be made.

(b) The temperature regulation to obtain the highest of the temperature-rise of discharge air shall be made at first, (but temperature regulating, in case of the discharge air volume is smaller and more decrease than the test case of 3.3.2-A, shall be excluded, and it is to be the same hereafter) and the blower shall be operated for 30 minutes. Hereupon, the temperature-rise and temperature unevenness can be measured. This measurement shall be begun within one hour after regulating the temperature of discharge air to reach its maximum.

(4) Items to be Measured and Investigated

- 1) Temperature-rise of discharge air
- 2) Temperature unevenness at the surface of accumulation-wire net
- 3) Easiness of temperature regulating operation and handling
- 4) Running condition and any abnormalities or troubles
- 5) Other necessary items

(5) Calculating Method

$$A = \frac{T_{\max} - T_{\min}}{\bar{T}} \times 100$$

where,

A : temperature unevenness of discharge
air (%)

T max : mean temperature-rise for 30 minutes
at the maximum temperature measuring
point (°C)

T min : mean temperature-rise for 30 minutes
at the minimum temperature measuring
point (°C)

\bar{T} : total average of temperature-rise
(°C)

3.3.3 Continuous Running Test

(1) Object

The object of this test is to ascertain the running condition and that there is no development of irregularities, abnormalities and troubles under the continuous running test.

(2) Testing Equipment

This test requires having of same testing equipments as stipulated in 3.3.2-C.

(3) Testing Method

- 1) Number of blower-shaft revolutions for the test shall be the same revolutions as stipulated in 3.3.2-A.
- 2) The position of furnace shall be a manufacturer's option within the range of normal spacing.
- 3) The temperature regulation shall be made to get the temperature-rise at the surface of accumulation-wire net, rise up more than 20°C, (the dryer which can not rise up to 20°C shall be arranged to get its

maximum temperature-rise).

(4) Items to be Measured and Investigated

- 1) Mean temperature-rise of discharge air
- 2) Quantity of fuel consumption
- 3) Temperature of each part
- 4) Running condition and any abnormalities or troubles in the parts
- 5) Safety
- 6) Colouring and ordering effects on grains
- 7) Other necessary items

3.3.4 Handling Test

(1) Object

This test is made for the purpose of ascertaining ease or otherwise of handling for the Dryer on test.

(2) Testing Method

The investigation shall be made by more than two investigators using the Dryer on test successively after the continuous running test.

(3) Items to be Investigated

- 1) Easiness of the operational practice for temperature regulation
- 2) Safety
- 3) Easiness of transporting the Dryer on test
- 4) Easiness of adjusting various parts of the dryer and maintaining them in a good condition
- 5) Other necessary items

3.3.5 Investigation after Disassembling

(1) Object

The object of this investigation is mainly to ascertain that there is no development of irregularities and abnormalities on the Dryer on test after having undergone the continuous running test.

(2) Items to be Investigated

This investigation shall be made for checking of any abnormalities of the Dryer on test after disassembling it completely, and if necessary, the measurement and investigation shall be taken on the points of hardness, treatment in processing, finishing, balancing of fan, etc.

4. Standards to Pass the Inspection

The decision of inspection for grain-dryers of ventilating type shall conform to the following standards, and shall be required to satisfy the respective requirement stipulated hereunder:

4.1 Performance Inspection

(1) The result of test in 3.3.2-(2) must give a satisfactory result at least to one of the following specified requirements at the low speed revolutions rather than the number of revolutions of blower shaft at the time of test.

1) Static pressure efficiency shall be over 35% at the point of 10mm Aq of static pressure and $2.8 \text{ m}^3/\text{sec}$. of air volume.

2) Static pressure efficiency shall be over 35% at the

point of 10mm Aq of static pressure and $2.8 \text{ m}^3/\text{sec}$. of air volume.

3) Static pressure efficiency shall be over 35% at the point of 10mm Aq of static pressure and $0.7 \text{ m}^3/\text{sec}$. of air volume.

4) Static pressure efficiency shall be over 35% at the point of static pressure and $0.35 \text{ m}^3/\text{sec}$. of air volume.

(2) In the test of 3.3.2-(2), the standard accumulation volume must satisfy the following conditions:

1) In case of the drying-tray is combined with the blower which satisfies the requirements stipulated in 4.1-(1)-1), the standard accumulation volume shall be over 4 m^3 .

2) In case of the drying-tray is combined with the blower which satisfies the requirements stipulated in 4.1-(1)-2), the standard accumulation volume shall be over 2 m.

3) In case of the drying-tray is combined with the blower which satisfies the requirements stipulated in 4.1-(1)-3), the standard accumulation volume shall be over 1 m.

4) In case of the drying-tray is combined with the blower which satisfies the requirements stipulated in 4.1-(1)-4), the standard accumulation volume shall be over 0.5 m.

(3) Fluctuation percentage of required horsepower shall be below 30% in the test of 3.3.2-(2).

- (4) In the test of 3.3.2-(2), the leakage of air must be slight.
- (5) Temperature-rise of discharging air shall be within the range of 10°C in the test of 3.3.2-C-(3)-4)-(a).
- (6) Mean maximum temperature-rise of discharging air for 30 minutes shall be higher than 15°C in the test of 3.3.2-C-(3)-4)-(b).
- (7) Temperature-unevenness of discharging air in the test of 3.3.3 shall be below 30%.
- (8) In the test of 3.3.3, colouring and odoring effects on grains must be slight.

4.2 Durability Inspection

The durability inspection shall be required to satisfy the requirements specified hereunder, particularly in principal parts and parts which may be difficult to replace easily.

- (1) No abnormality and failure in the above mentioned parts
- (2) No abnormal abrasion
- (3) No seizure
- (4) To have the necessary measures for "Dust-proof" in the bearing part
- (5) No oil leakage from the bearing part

4.3 Handling Inspection

- (1) Handling condition shall not show any defects that may bring much dangerous feelings to the operator during the operation of the dryer.
- (2) No defects that shall be the cause of difficulty to replace and adjust the various parts of dryer.

(3) No dangerous cases of breaking fire.

INSPECTION RECORD SHEET

Date:

Certificate No.

THE INSTITUTE OF AGRICULTURAL
MACHINERY

Kind of agricultural
machinery

Cereal Dryer (Ventilating Type)

Manufacturer's type
designation

(Blower)
(Heating Furnace)
(Drying-Tray)

Manufacturer's name and add.

1. Main Structure
(1) Dimension

| Item | Overall length | Overall width | Overall height | Weight | Remarks |
|-----------------|----------------|---------------|----------------|--------|---|
| Blower | mm | mm | mm | kg | The base of prime mover shall be included, if any (exclusive of fuel) |
| Heating furnace | mm | mm | mm | kg | |
| Drying-tray | mm | mm | mm | kg | |

(2) Blower

| Classification Axial flow or radial flow | Number of specified revolutions | Dia. of discharge port | Dia. of boss | Impeller (rotating vane) | |
|--|---------------------------------------|---------------------------|--------------|--------------------------|----------------|
| | | | | No. of vanes | Materials used |
| | rpm | mm | mm | | |

| Guide vane | | Bearings | | Power transmission part | |
|--------------|-------------------|--------------------------|------------------------------|--------------------------------|------------------------------|
| No. of vanes | Materials used | System of lubrication | Kind of lubri- cation oil | Outside dia. of belt pulley | Type of belt No. of belts |
| | | | | mm | Type No. |

(3) Heating Furnace

| Space between blower and furnace | Kind of fuel | Fuel supplying system | Tank capacity and volume of fuel filling | Materials | |
|----------------------------------|--------------|-----------------------|--|--------------|--------------------|
| | | | | Outside wall | Combustion chamber |
| ~ mm | | | | | |

(4) Drying-Tray

| Capacity of accumulation | | | Materials | | Attachments |
|--------------------------|---------|--------|------------|---------------------|-------------|
| Length | Breadth | Height | Side plate | Accumulation net | |
| mm | mm | mm | | | |
| | | | | Air flow guide race | |

2. Summary of Inspection Record

(1) Blower Performance Test (Heating furnace juxtaposed)

| Item | Atmospheric conditions | | | | Number of main shaft revolutions | Space between blower and furnace |
|--------------------|------------------------|----------------|--------------------|-------------------|----------------------------------|----------------------------------|
| | Dry bulb temp. | Wet bulb temp. | Atmospheric press. | Weight of air | | |
| Conditions of test | °C | °C | mmHg | kg/m ³ | rpm | Cm |

| Item | Horsepower required | Air volume | (Blower) Stagnation pressure | (Blower) Static pressure |
|-------------------|---------------------|-------------------|------------------------------|--------------------------|
| Unit Measuring | Ps | m ³ /s | mm Aq | mm Aq |
| No. 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |

(2) Temperature Regulating Performance Test

| Atmospheric conditions | | Aiming temp. | Space between blower and furnace | Temperature-rise | Estimated air volume | Remarks |
|------------------------|----------------|------------------|----------------------------------|------------------|----------------------|--|
| Dry bulb temp. | Wet bulb temp. | | | | | |
| °C | °C | Max. temp. -rise | Cm | | m/s | Unevenness of temp. at the surface of accumulation net: less than 30%. |
| | | 10°C rising | Cm | Within 10 ± 5°C | | |

(3) Continuous Running Test

The result of test made under the following conditions has not shown any abnormalities after carrying out the continuous running test for 5 hours.

| Number of blower shaft revolutions | Estimated air volume | Space between blower and furnace | Mean temperature - rise | Volume of fuel consumption |
|------------------------------------|----------------------|----------------------------------|-------------------------|----------------------------|
| rpm | m ³ /s | Cm | °C | kg/hr |

(4) Reference Items to the Handling

| Base position of Prime Mover | Ignition system for furnace | Method of temperature regulation | Type of automatic control | Take-off method of cereals | Others |
|------------------------------|-----------------------------|----------------------------------|---------------------------|----------------------------|--------|
| | | | | | |

3. Additional Remarks

I - 9. RUBBER ROLLS FOR RICE HULLING USE

I - 9 RICE HULLING RUBBER ROLLS

(Date of Public Notice in Official Gazette: July 25, 1963.)

1. Scope

This standard specifies testing methods and procedures of inspection for rice hulling rolls.

2. Classification of Rubber Rolls

The rubber rolls to be used for a rice huller shall be classified as follows:

(1) Black Colour - Rice Hulling Rubber Roll

The black colour-rice hulling rubber roll means the rubber part of roll shows a black complexion.

(2) White Colour - Rice Hulling Rubber Roll

The white colour-rice hulling rubber roll means the rubber part of roll shows a white complexion.

3. Procedures of Inspection

3.1 Items to be Inspected

The inspection shall be carried out by the following items:

- (1) Verification of the Specification
- (2) Quality Test

3.2 General Conditions for Inspection

(1) Roll

The rice hulling rubber rolls to be put on the test (hereinafter referred to as the "Roll on test") shall be

sampled out from among the ordinarily manufactured rubber rolls for a rice huller, and the number of rolls to be sampled for this test shall be 10 pieces for each type.

(2) Measuring Instruments

Main instruments to be used for measuring shall have been checked and calibrated prior to the measurements, and shall be capable of taking the accurate measuring as follows:

| Main purpose of use | Kind of instrument | Required accuracy and minimum scale |
|---------------------------------|------------------------------|---|
| Hardness test | spring type, hardness tester | The accuracy must satisfy the requirements of JIS 6301/5.2.2. |
| Tension test | rubber tension tester | Minimum Scale: less than 0.5 kg. |
| Heating test | electric thermostat | allowable difference in temperature, below $\pm 1^{\circ}\text{C}$ Minimum Scale: |
| Measurement of specific gravity | Young's hydrometer | Minimum scale: below 0.01 |

3.3 Methods of Test and Investigation

3.3.1 Verification of Structure

(1) Object

The object of this investigation is to ascertain the structure of the Roll on test comparing the actual things

with the indicated figures on the specification.

(2) Items to be Investigated

The investigation shall be made on the following items for each different shaped roll among the sampled rolls.

- 1) Shape
- 2) Inside surface of roll
- 3) Appearance

(3) Methods of Investigating

1) Shape

In this investigation, the shape of the roll on test shall be checked in comparison with a diagram submitted a manufacturer.

2) Inside Surface of Roll

The investigation shall be made on the materials used for inside part of the Roll on test.

3) Appearance

The following items shall be observed.

- (a) Wall thickness of rubber part
- (b) Adhesive state between the rubber part and the casting iron drum
- (c) Flaws, honeycombs and irregular flow of foreign matters

3.3.2 Quality Test

(1) Object

The object of this test is for ascertaining whether the roll is capable of being used under the practical running condition in order to make the decision after carrying out

the Physical Property Test for checking quality of rubber part.

(2) Items of Testing and Measuring

- 1) Hardness Test
- 2) Tension Test
- 3) Heating Test
- 4) Measurement of Specific Gravity

(3) Methods of Test and Investigation

1) Hardness Test

This test shall conform to the methods as stipulated in JIS K 6301/5.2 (Physical Testing Methods for Vulcanized Rubber). The measurement shall be taken at five points selected optionally on the side of rubber roll, however, it can be represented by the mean value after checking 5 points.

2) Tensile Test

The tensile test shall be carried out in accordance with the methods as stipulated in JIS K 6301/3 (Physical Testing Methods for Vulcanized Rubber) by using the pieces of Pattern No. 1 (Dumb-bell shaped test piece), but the test pieces shall be sampled from three layers of rubber blankets, which shall be taken out from external, intermediate and internal layers respectively (exclusive of ebonite layer) lengthwise in line with the direction of grains of rubber roll surface. The testing results shall be represented by the lowest value after calculating the results of testing for three layers respectively.

3) Heating Test

The test pieces shall be taken out from the Roll on test in suitable size, and the spring hardness shall be measured in accordance with the methods as stipulated in JIS K 6301/5.2 (Physical Testing Methods of Vulcanized Rubber), then, it shall be put in the air thermostat for 1 or 2 hours under $80^{\circ}\text{C} \pm 2$ degrees, immediately after taking out the test pieces from the air thermostat, the measurement shall be taken again. However, care must be taken for temperature change at the time of measurement to be taken.

4) Measurement of Specific Gravity

The measurement of specific gravity shall be made by a Young's hydrometer and reading shall be taken down to two decimal places.

4. Standards to Pass the Inspection

The decision of inspection for rice hulling rubber rolls shall conform to the following standards, and more than 9 pieces among 10 test-pieces must satisfy the requirements stipulated hereunder:

4.1 Structure Inspection

- (1) When the casting iron drum is used for inside of the rubber roll, the casting iron drum shall be of those having quality stipulated in JIS G 5501 (Gray Pig Casting Iron FC-15) or superior thereto.
- (2) When the fabric is used for inside of the rubber roll,

the fabric shall be of those having quality stipulated in JIS L 3104 (Cotton Fabric, Thick Woven No. 9 - 2 Layers Roll) or superior thereto.

(3) When the iron sheet is used for inside of the rubber roll, the iron sheet shall be of those having quality stipulated in JIS G 3308 (Cold Rolled Carbon Steel Hoop, 0.6 mm Steel Sheet) or superior thereto.

4.2 Appearance Inspection

(1) The rubber roll shall be of those having the uniformed and symmetrized appearance in wall thickness.

(2) The rubber roll shall be well to adhere firmly between the casting iron drum and the rubber roll.

(3) The rubber roll shall be free from any defects such as flaws, honeycombs, irregular flow of foreign matters.

4.3 Performance Inspection

(1) In the test of 3.3.2-(3)-1), the result of spring type hardness test shall be 75 - 85 for a black colour-rice hulling rubber roll and 75 - 90 for a white colour rice hulling rubber roll.

(2) In the test of 3.3.2-(3)-2), the tensile strength¹⁾ should be over 120 kg/Cm^2 for a black colour rice hulling rubber roll. The elongation should be over 130% for a black colour rice hulling rubber roll and 150% for a white colour roll.

(3) In the test of 3.3.2-(3)-4), the result of spring hardness for both black colour and white colour rice hulling rubber rolls should be over 67 and the decreasing of spring hardness after heating test should be below 10.

(4) In the test of 3.3.2-(3)-5), black colour and white colour rice hulling rubber rolls shall not be appreciable large value as compared with the standard value set up as 1.3.

INSPECTION RECORD SHEET

Date:

THE INSTITUTE OF AGRICULTURAL
MACHINERY

Certificate No.

Kind of agricultural machinery Rice Hulling Rubber Roll (Colour:)
Mark (adhesived to the drum, fabric lining, iron-sheet
lining and iron-sheet adhesived to the drum)

Manufacturer's type designation

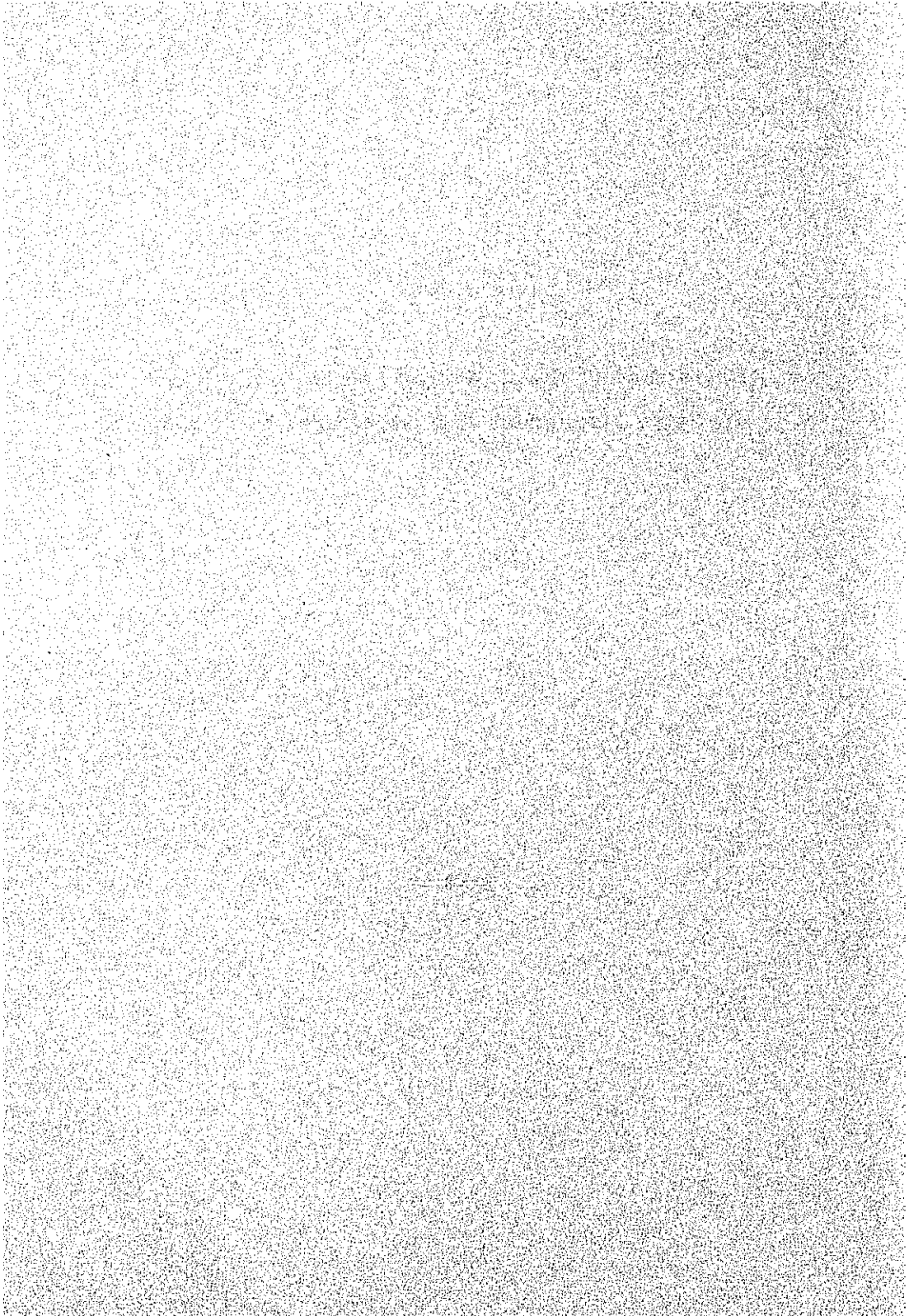
Manufacturer's name and add.

1. Investigation of Appearance
 - (1) Thickness of roll's wall
 - (2) Adhesived part
 - (3) Irregular-flow of foreign matters

2. Quality Test

| Tests and Measuring Items | Spring Hardness | | | | | |
|---|---------------------------|-----------------|---------------------------|--------------------|---------------------------|-----------------|
| | Max. Min. Mean | Outer layer | | Intermediate layer | | Internal layer |
| | Tensile strength kg/Cm | Elongation % | Tensile strength kg/Cm | Elongation % | Tensile strength kg/Cm | Elongation % |
| Max. | | | | | | |
| Min. | | | | | | |
| Mean | | | | | | |
| Spring Hardness | | | | | | |
| Tension test | | | | | | |
| Heating test | | | | | | |
| Decrease of Spring hardness after heating | | | | | | |
| Specified Gravity | | | | | | |

II **Extraction of the Laws and Regulations Concerning
the State Inspection of Agricultural Machinery**



II - 1. EXTRACTION OF THE AGRICULTURAL
MECHANIZATION PROMOTION LAW

II - 1 THE AGRICULTURAL MECHANIZATION LAW

(Law No. 525 of 1953)

Extracted from,

Chapter II. Inspection of Agricultural Machinery

(Inspection)

Article 6. The State shall execute the inspection of agricultural machinery for the purpose of promoting the agricultural mechanization under the provisions of this law.

2. The inspection specified in the preceding Article shall be both an inspection for the type of agricultural machinery by the application (hereinafter referred to as the "Type Inspection") and an ex post facto inspection to secure the result thereof (hereinafter referred to as the "Ex post facto Inspection").

3. The execution of Type Inspection shall be made by the Institute of Agricultural Machinery.

(Type Inspection)

Article 7. The Minister of Agriculture and Forestry must specify and make public notice of the kinds of agricultural machinery for the Type Inspection in every and fiscal year concerned.

2. The Type Inspection shall be execute against performance, mechanism, durability and ease or otherwise of operational

condition (hereinafter referred to as the "performance and others") of the agricultural machinery belonging to the kinds of them provided in public notice specified in the preceding Article and of which type is submitted by the person who intends to apply for the Type Inspection (hereinafter referred to as the "manufacturer").

3. Principal testing methods and standards of Type Inspection shall be established by the Minister of Agriculture and Forestry.
4. The Minister of Agriculture and Forestry, in case he has established the testing methods and standards specified in the preceding paragraph, must make public notice thereof without delay as well as in case he has altered them.
5. Agricultural machinery which is submitted to apply for Type Inspection must be one of which is extracted from those manufactured ordinarily.

Article 8. The application for Type Inspection shall be performed by submitting an application for Type Inspection to the Institute of Agricultural Machinery.

2. The manufacturer, in case he submits an application for Type Inspection under the provision of the preceding paragraph, must pay the amount of charge which the Institute of Agriculture of Machinery determines in the letter of business management to the Institute of Agricultural Machinery.

(Inspection Record Sheet)

Article 8-2. As the result of Type Inspection, the Institute of Agricultural Machinery must not only inform success or failure in the inspection to the manufacturer, in case the type of agricultural machinery applied for the said inspection stand for the standards specified in Article 7, par. 3, with the Certificate of Inspection and the Inspection Record Sheet, but also report to the Minister of Agriculture and Forestry with Type's name of agricultural machinery, Inspection Record Sheet and the manufacturer's full name or designation and the number of success in the inspection to the manufacturer.

2. The Minister of Agriculture and Forestry, in case he has accepted report on the type of agricultural machinery referring to success in the inspection under the provision of the preceding paragraph, must make public notice of type's name of agricultural machinery thereof, summary of the inspection record sheet, success number in the inspection and the manufacturer's full name or designation.
3. The person who is dissatisfied with the test result by the notice under the paragraph 1 has the right to file his written opinion with the Minister of Agriculture and Forestry within thirty days as computed from the day following the day of acceptance of the notification concerned.

Article 9. The person who has accepted the notification of success the inspection under the provisions of the preceding

Article, par. 1 in the result that the type of the agricultural machinery concerned has passed the Type Inspection or the general successor (in case the person has obtained the approval from the Minister of Agriculture and Forestry due to the special reasons or the fact that he has been transferred the rights of business activities in manufacturing, sales and so forth of the proper type of agricultural machinery from those above mentioned, the person who shall be entitled as the general successor) has the right to attach the voucher which certifies to have succeeded in the Type Inspection (hereinafter referred to as the "Inspection Passed Voucher") to the proper type of agricultural machinery. In case, the duplicate of inspection record sheet specified in the preceding Article, par. 1 which the agricultural machinery of the type concerned must be attached together on the proper agricultural machinery in accordance with the method established by the Minister of Agriculture and Forestry.

2. The Minister of Agriculture and Forestry, in case he has made an approval on the matter in the preceding paragraph, must make public notice to the effect.
3. The Minister of Agriculture and Forestry shall establish a form of the Inspection Passed Voucher and make public notice.

Article 10. The minister of Agriculture and Forestry, in case

he approves that there is no possibility for the agricultural machinery of the type which has already made success in the type which has already made success in the Type Inspection at the time when he has altered the standards specified under the Article 7, par. 3 to make success in the Type Inspection if the type inspection shall be performed based on the revised standards as well as to approve that leaving it as it is will give a trouble to the promotion of agricultural mechanization, has the right to restrict upon the duration in which the said voucher will be able to attached on for the person who has the right to attach the Inspection Passed Voucher on the agricultural machinery concerned under the provisions in the preceding Article, par. 1.

2. In case where the disposal has been made under the provisions in the preceding paragraph, the person who has been given the disposal shall not be granted the right to attach the Inspection Passed Voucher under the provisions in the preceding Article, par. 1 on the agricultural machinery of the proper type unless being in the duration restricted thereof.

3. The Minister of Agriculture and Forestry, in case he makes an restriction upon the duration in which the Inspection Passed Voucher is able to attach under the provisions in the same Article, par. 1 must make public notice.

(Notification and others for alternation in designation and others)

Article 10-2. The person who has the right to attach the Inspection Passed Voucher under the provision in Article 9, par. 1 must not only notify the items which the alternation concerned to the Institute of Agricultural Machinery, in case he has altered his full name or designation and type's designation concerned, but also submit the Certificate of Inspection and the Inspection Record Sheet, in case the alternation is concerned in the items mentioned therein and ask the delivery of the renewal for the said documents.

2. In case the person who has the right to attach the Inspection Passed Voucher under the provisions in Article 9, par. 1 died or amalgamated, the proper successor or the proper juridical person who shall be established or keep on existing after the proper amalgamation must not only notify to the Institute of Agricultural Machinery to the effect without any delay, but also submit the Certificate of Inspection and the Inspection Record Sheet, in case the alternation is concerned in the item mentioned therein under Article 8-2, par. 1 and ask the delivery of the renewal for the same documents.

3. The person who has been given the Minister of Agriculture and Forestry's approval under Article 9, par. 1 must not only notify to the Institute of Agricultural Machinery to the effect without any delay, but also ask the delivery of the Inspection Passed Certificate and the Inspection Record

Sheet under Article 8-2, par. 1 for the proper type of agricultural machinery.

4. The Institute of Agricultural Machinery must not only perform the delivery of the renewal or delivery of the Inspection Passed Certificate or the Inspection Record Sheet under Article 8-2, par. 1 which is the demand concerned, in case the Institute of Agricultural Machinery is in receipt of the demand under the provisions in the preceding Article. par. 3, but also report the alternated items to the Minister of Agriculture and Forestry in case the demand under the provisions in the same Article, par. 2 is made.
5. The Minister of Agriculture and Forestry, in case he was given the report under the provisions in the preceding paragraph, must make public notice to the effect.
6. The person who shall make the demands under the provisions from in the paragraph 1 to in the paragraph 3 must pay the amount of charge which is determined in the letter of business management by the Institute of Agricultural Machinery to the same Institute.

(Ex post facto Inspection)

Article 11. The Minister of Agriculture and Forestry, in case he recognizes the necessity of inspecting, has the right to perform at any time the Ex post facto Inspection for the agricultural machinery bearing the Inspection Passed Voucher on it.

2. The minister of Agriculture and Forestry, in case he recognizes the necessity to effect in performing the Ex post facto Inspection, has the right to make the officials (including the part-time service officials, the same shall be applied hereinafter) entering into the offices, stores, warehouse of whom has the right to attach the Inspection Passed Voucher under the provisions in Article 9, par. 1 and inspect the proper agricultural machinery or the parts thereof and ask questions to the parties concerned and submit the proper agricultural machinery to the place appointed by the Minister of Agriculture and Forestry. However, in case he makes them to submit the agricultural machinery to the place appointed, he must pay necessary charge thereof.
3. In case the officials make a spot-inspection under the provisions in the preceding paragraph, he must carry the voucher which certify his status and must present it to the parties concerned.

(Cancellation of the success in the Inspection)

Article 12. The Minister of Agriculture and Forestry, in case he recognizes that the performance and others of the agricultural machinery under the preceding Article, par. 1 do not stand for the standards under Article 7, par. 3 judging from the results of the Ex post facto Inspection, has the right to cancel the determination on the success in Type Inspection for the type of the proper agricultural machinery.

2. The Minister of Agriculture and Forestry, in case he made an disposal under the provisions in the preceding Article, must make public notice to the effect and must inform the person to the effect who has the right to attach the Inspection Passed Voucher to the proper agricultural machinery under the provisions in Article 9, par. 1.

3. In case where the disposal under the provisions in Article 9, par. 1 was made, any person who was given the disposal concerned does not have the right to attach the Inspection Passed Voucher to the type of agricultural machinery under the provisions in Article 9, par. 1.

(Restrictions concerning the indication of the Inspection Passed Voucher)

Article 12 - 2. None, excluding the case to attach the Inspection Passed Voucher to the agricultural machinery under the provisions in this Chapter, may attach the Inspection Passed Voucher or the misleading indication to the agricultural machinery.

(Disposal of a formal objection)

Article 13. The Minister of Agriculture and Forestry, in case a formal objection against the disposal under the provisions in Article 10, par. 1 or Article 12, par. 1 is made must make a determination within sixty days as computed from the day of the formal objection and must inform a determination to the demurrant.

2. The Minister of Agriculture and Forestry, in case he makes the determination under the preceding Article, must give previous notice of date and place to hold an open hearing to the demurrant and must give the chance of which the demurrant or his attorney to present evidence and state his opinion.

(Hearing opinion)

Article 14. The Minister of Agriculture and Forestry must hear the opinions of the Council of Agricultural Mechanization in the following cases:

(1) In case of establishing the kinds of agricultural machinery on which the Type Inspection shall be performed under the provisions in Article 7, par. 1.

(2) In case of establishing or alternating of Type Inspection methods and standards under the provisions in Article 7, par. 3.

(3) In case of the determination of success in the inspection is cancelled under the provisions in Article 12, par. 1.

(4) In case of making the determination against a formal objection under the provisions in the preceding Article, par. 1.

(Report collection)

Article 14 - 2. The Minister of Agriculture and Forestry, in case he deems the necessity in establishing or alternating the kinds of agricultural machinery on which the Type

Inspection shall be performed under the provisions in Article 7, par. 1 or Type Inspection methods and standards under the provisions in Article 7, par. 3, has the right to ask the necessary reports of kinds or Type and quantity of the agricultural machinery which manufactures or sales thereof concerned against the manufacturer or dealer of the agricultural machinery.

(Mandate to the provisions of Ministerial Ordinance)

Article 14 - 3. The procedure of Type Inspection and the necessary items to enforce the provisions in this Chapter, excluding items under the provisions in this Chapter, shall be specified by Ministerial Ordinance.

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II - 2. EXTRACTION OF THE ENFORCEMENT
 REGULATIONS OF THE AGRICULTURAL
 MECHANIZATION PROMOTION LAW

II - 2 ENFORCEMENT REGULATIONS
OF
THE AGRICULTURAL MECHANIZATION PROMOTION LAW

(Ministry of Agriculture and Forestry Ordinance No. 65, 1953.)

Extracted from,

(Application forms for inspection and attached documents)

Article 1. The application forms for inspection under the provisions in the Agricultural Mechanization Promotion Law, Article 8, par. 1 shall be the same as stated in the Form No. 1 as a separated one.

2. The person who intends to apply for the Type Inspection under Article 6, par. 2 in the Law (hereinafter referred to as "manufacturer"), in case he intends to submit the application for inspection, must attach the specification and drawing of the type of agricultural machinery of which the application concerned.

(Notification of Type Inspection)

Article 2. The Institute of Agricultural Machinery (hereinafter referred to as the "Institute"), in case it has accepted the application for inspection, must inform time and place for the inspection and time and place that agricultural machinery shall be transferred for the purpose of putting on the inspection to the proper manufacturer.

(Form of the Inspection Passed Voucher)

Article 3. The form of the Inspection Passed Voucher shall be the same as stated in the Form No. 2.

(Appeal for dissatisfaction)

Article 4. The contents under Article 8, par. 3 in the Law must be specified with the following items and must be sealed by the demurrant.

- (1) Full name or designation and residence of the demurrant
- (2) Full name or designation and residence of the manufacturer applied for the Type Inspection which the appeal for dissatisfaction concerned.
- (3) Kinds and Type's name of agricultural machinery which the appeal for dissatisfaction concerned.
- (4) Date of notification of the Inspection Record Sheet which the appeal for dissatisfaction concerned.
- (5) Intent and reason of the appeal for dissatisfaction
- (6) Date of the appeal for dissatisfaction

(Form of the Inspection Passed Voucher)

Article 5. The form of the Inspection Passed Voucher under Article 9, par. 1 in the Law shall be the same Form No. 3 as stated separately.

(Application for the approval of business transference and others)

Article 6. The application for the approval under Article 9, par. 1 in the Law must be made by presentation of the application specified in Form No. 4 stated separately.

(Notification of alternation in designation and others, and demand for delivery of the documents)

Article 7. Notification and demand under the provisions in Article 10-2, par. 1 in the Law must be made by presenting of the demand form specified in Form No. 5 stated separately within fifteen days as computed from the day following the day of the alternation under the same Article.

2. Notification or demand under the provisions in Article 9-2, par. 2 in the Law must be made by presenting the notification form specified in Form No. 6 stated separately or the demand form specified in Form No. 7 stated separately.

(Notification of alternation in shape and others)

Article 8. The person who has the right to attach the Inspection Passed Voucher under the provisions in Article 9, par. 1 in the Law, in case he has made any slight alternation in shape, measure, mechanism, outfit, material or manufacturing method of the agricultural machinery for which he has the right to attach the proper voucher of success in the inspection, must submit the notification form specified in Form No. 9 stated separately with documents in which

the contents of the alternation thereof are stated clearly to the Institute within fifteen days.

2. The Institute, in case the notification under the preceding Article is made, must report without any delay the contents thereof to the Minister of Agriculture and Forestry.

(Voucher to certify oneself)

Article 9. The voucher certify the status under Article 11, par. 2 in the Law shall conform to the Form No. 10 stated separately.

Article 10. In case where the hearing in public under the provisions in Article 13, par. 3 in the Law is made, the person whom the Minister of Agriculture and Forestry designated shall preside over as the chairman.

2. The chairman must designate the explainer from among the officials of the Ministry of Agriculture and Forestry.
3. The chairman has the right not only to restrict the allowable time of speaking of the demurrant or the explainer, but also to stop the speaking which is beyond the limits of the proper items.

APPLICATION FOR TYPE INSPECTION
OF
AGRICULTURAL MACHINERY

Date

To: The Director,
The Institute of Agricultural Machinery

Manufacturer's full name
or designation: seal

Residence:

I, hereby, would like to apply for the Type Inspection
under the provision of Article 6 in the Agricultural
Mechanization Promotion Law as follows;

Description

1. Kind of agricultural machinery
2. Manufacturer's type designation
3. Manufacturing plant's designation and location
for the type of agricultural machinery concerned
4. Starting date of production or sale the type of
agricultural machinery concerned

(JIS P 3102 B5)

Remarks: The application shall be submitted in
duplicate.

CERTIFICATE OF INSPECTION

Name of To, Do, Fu or
Prefecture:

Full name of manufacturer
or designation:

Certificate No.

Kind of agricultural machinery

Manufacturer's type designation

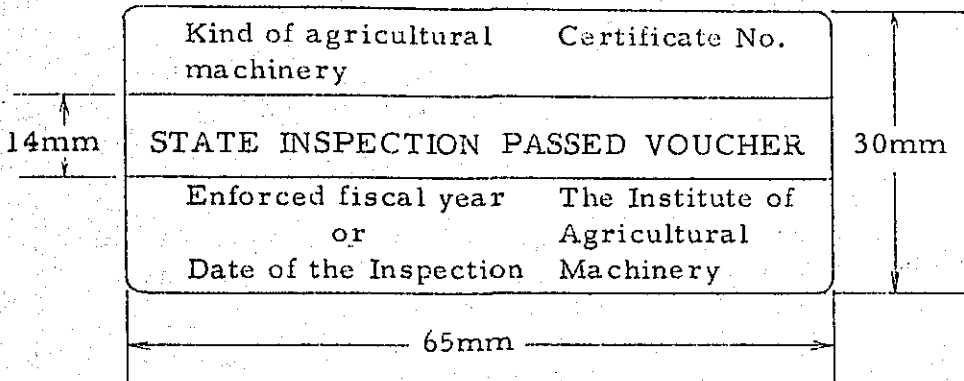
I, hereby, certify that the said type of agricultural
machinery has passed to inspection under the provision
of Article 6 in the Agricultural Mechanization Promotion
Law.

Date:

Director
of
The Institute of Agricultural
Machinery seal

(JIS P 3101 A3)

Form No. 3



Remarks:

Measure shall be available one, which length is 20 millimeters and width is 43 millimeters. In this case, the figure stated in the illustration "14mm" shall be "9mm".

APPLICATION FOR APPROVAL TO ATTACH
THE STATE INSPECTION PASSED VOUCHER

Date:

To: The Minister of Agriculture and Forestry

Manufacturer's full name or
or designation:

Residence: seal

I, hereby, would like to apply for the approval under the provision of Article 9, par. 1 in the Agricultural Mechanization Promotion Law as follows;

Description

1. Kind of agricultural machinery
2. Manufacturer's type designation
3. Transferrer's name or designation of the business rights
4. Transferee's name or designation of the business rights
5. Date of transference of the business rights
6. Contents of transference of the business rights
7. Reasons of transference of the business rights

(JIS P 3102 B5)

- Remarks:
1. The documents certify the deed of transference for the business rights must be attached to this.
 2. The application, in case of applying the approval by reasons excluding the transference of the business rights, shall conform to this form.
 3. The application shall be submitted in duplicate.

APPLICATION FOR DELIVERY OF RENEWED
CERTIFICATE OF INSPECTION AND OTHER DOCUMENTS

Date:

To: The Director,
The Institute of Agricultural Machinery

Manufacturer's full name
or designation: seal

Residence:

I, hereby, notify that the alternation has been made as described hereunder in compliance with the demand under the provisions of Article 10-2, par. 1 in the Agricultural Mechanization Promotion Law, and herewith, apply the delivery of the Renewed Certificate of Inspection and the Inspection Record Sheet.

Description

1. Kind of agricultural machinery
2. Manufacturer's type designation
3. Certificate No.
4. Altered items
5. Date of alternation
6. Reason of alternation

(JIS P 3102 B5)

Remarks: The application shall be submitted in duplicate.

NOTIFICATION OF SUCCESSION
(OR AMALGAMATION)

Date:

To: The Director,
The Institute of Agricultural Machinery

Manufacturer's full name
or designation: seal

Residence:

I, hereby, notify that the succession has been done as described hereunder in compliance with the demand under the provision of Article 10-2, par. 2 in the Agricultural Mechanization Promotion Law.

Description

1. Kind of agricultural machinery
2. Manufacturer's type designation
3. Certificate No.
4. Name of ancestor or designation of juridical person who has been amalgamated
5. Name of successor or designation of juridical person who has been established by an amalgamation or keep on exist after the amalgamation

(JIS P 3102 B5)

- Remarks:
1. The documents which certify the deed of succession or amalgamation must be attached to this.
 2. The notification shall be submitted in duplicate.

APPLICATION FOR DELIVERY OF RENEWED
CERTIFICATE OF INSPECTION AND OTHER DOCUMENTS

Date:

To: The Director,
The Institute of Agricultural Machinery

Manufacturer's full name
or designation: seal

Residence:

I, hereby, notify that the succession has been done as described hereunder in compliance with the demand under the provision of Article 10-2, par. 2 in the Agricultural Mechanization Promotion Law, and also, herewith, apply the delivery of the Renewed Certificate of Inspection and the Inspection Record Sheet.

Description

1. Kind of agricultural machinery
2. Manufacturer's type designation
3. Certificate No.
4. Name of ancestor or designation of juridical person who has been amalgamated
5. Name of successor or designation of juridical person who has been established by an amalgamation

(JIS P 3102 B5)

- Remarks:
1. The documents which certify the deed of succession or amalgamation must be attached to this.
 2. The notification shall be submitted in duplicate.

APPLICATION FOR DELIVERY
OF
CERTIFICATE OF INSPECTION AND OTHER DOCUMENTS

Date:

To: The Director,
The Institute of Agricultural Machinery

Manufacturer's full name
or designation: seal

Residence:

I, hereby, notify the approval by the Minister of Agriculture and Forestry under the provision of Article 9, par. 1 in the Agricultural Mechanization Promotion Law, and herewith, apply along with the notification as follows, in compliance with the demand under the provision of Article 10-2, par. 3 in the Agricultural Mechanization promotion Law, the delivery of the Certificate of Inspection and the Inspection Record Sheet.

Description

1. Kind of agricultural machinery
2. Manufacturer's type designation
3. Certificate No.
4. Reason of transference of the business rights
5. Date of transference of the business rights
6. Date of approval by the Minister of Agriculture and Forestry

(JIS P 3102 B5)

- Remarks:
1. Copy of written acknowledgment issued by the Minister of Agriculture and Forestry must be attached to the application.
 2. The application shall be submitted in duplicate.

NOTIFICATION FOR ALTERNATION
OF SHAPE AND OTHERS

Date: .

To: The Director,
The Institute of Agricultural Machinery

Manufacturer's full name
or designation: seal

Residence:

I, hereby, notify the alternations of shape and
others as followings under the provision of Article 8
in the Agricultural Mechanization Promotion Law.

Description

1. Kind of agricultural machinery
2. Manufacturer's type designation
3. Certificate No.
4. Contents of alternation

| Designation of altered part | Pre-alternation | Post-alternation |
|-----------------------------|-----------------|------------------|
| | | |

5. Date of alternation
6. Reason of alternation

(JIS P 3102 35)

Remarks: The notification shall be submitted in
duplicate.

Form No. 10

(The Back)

Extraction of the Agricultural Mechanization Promotion Law

(Ex post facto Inspection)

Article 11. The Minister of Agriculture and Forestry, in case he recognizes the necessity of inspecting, has the right to perform at any time the Ex post facto Inspection for the agricultural machinery bearing the Inspection Passed Voucher on it.

2. The Minister of Agriculture and Forestry, in case he recognizes the necessity to effect in performing the Ex post facto Inspection, has the right to make the officials (including the part-time service officials, the same shall be applied hereinafter) entering into the offices, stores, warehouses of whom has the right to attach the Inspection Passed Voucher under the provisions in Article 9, par. 1 and inspect the proper agricultural machinery or the part thereof and ask questions to the parties concerned and submit the proper agricultural machinery to the place appointed by the Minister of Agriculture and Forestry. However, in case he makes them to submit the agricultural machinery to the place appointed, he must pay necessary charge thereof.

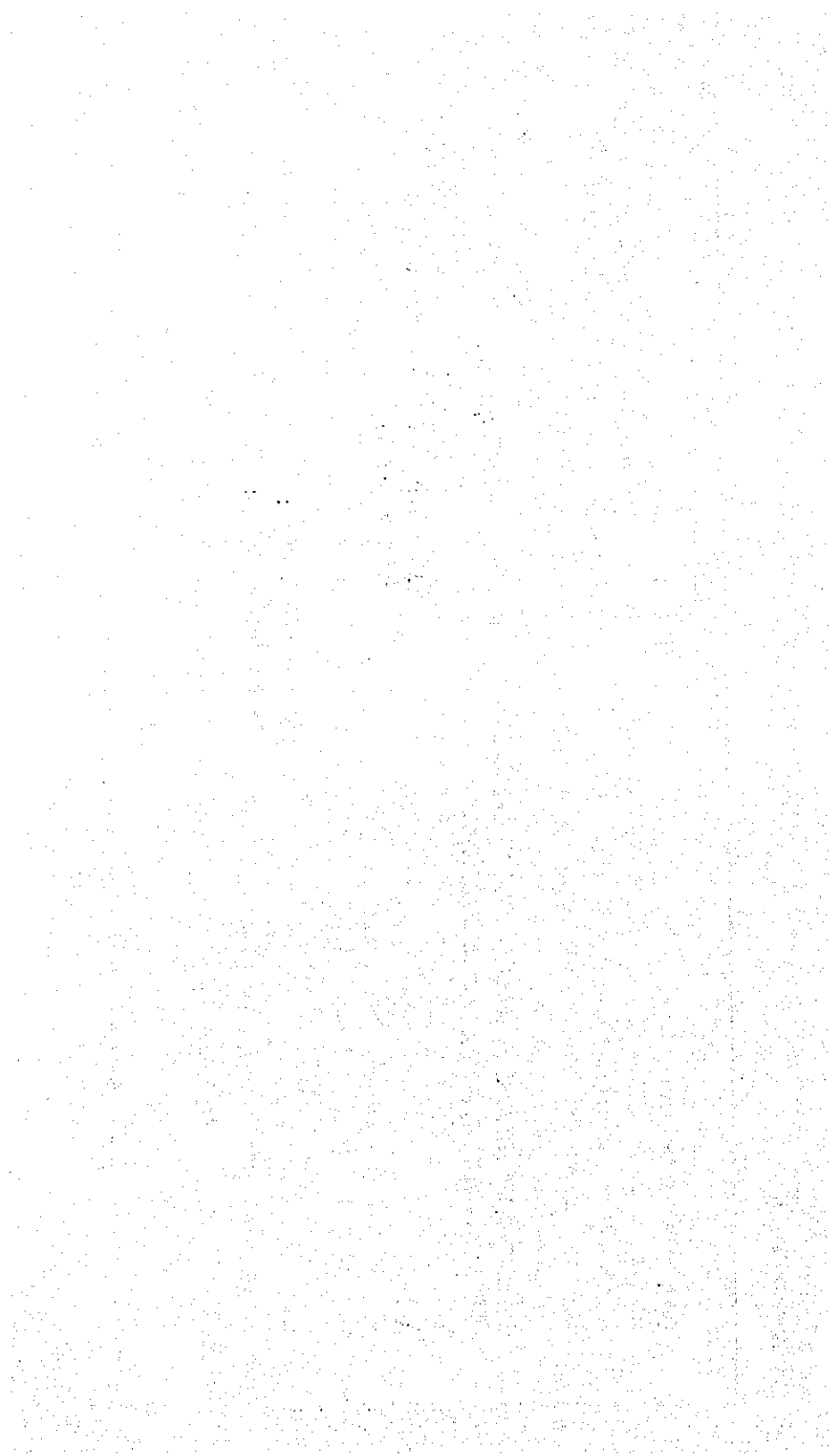
3. In case the officials make a spot-inspection under the provision in the preceding paragraph, he must carry the voucher which certify his status and must present it to the parties concerned.

Remarks: The size of this voucher shall be 13 Cm long and 9 Cm broad.

Form No. 10 (continued)

(The Surface)

| | |
|--|-------|
| No. | Date: |
| THE VOUCHER OF INSPECTION OFFICIAL FOR AGRICULTURAL MACHINERY | |
| SEAL of | |
| The Ministry of Agriculture and Forestry | |
| Name of official: Government post: | |



II - 3. PUBLIC NOTICE CONCERNING THE ATTACHING
METHOD OF DUPLICATE OF THE INSPECTION
RECORD SHEET

II - 3 PUBLIC NOTICE CONCERNING THE AT-
TACHING METHOD OF DUPLICATE OF
THE INSPECTION RECORD SHEET

Regarding the specifying the attaching method of dupli-
cate of the Inspection Record Sheet to the agricultural
machinery

(Ministry of Agriculture and Forestry Public Notice
No. 209, 1953.)

With regard to the attaching method of duplicate of the
Inspection Record Sheet to the agricultural machinery shall be
established, under the provisions of the later part of paragraph
1 of Article 9, as follows:

1. The method of binding the bag which contains the
proper duplicate of the Inspection Record Sheet to
the agriculture machinery or its container, or
packing.
2. The method of putting duplicate of the Inspection
Record Sheet in the container of agricultural
machinery or packing.

