

## Chapter 2 Inspection

### 2.1 Type of Inspection

#### 2.1.1 Routine Inspection

The routine inspection of airport maintenance equipment aims to check the existence of failure and defects and to judge the succeeding action, i.e., adjustment or repair.

This inspection shall be conducted regularly at scheduled intervals.

### 2.2 Performance

The purpose of performance inspection for airport maintenance equipment is to check the necessity of renewal of an equipment in deteriorated condition.

This inspection shall be conducted at scheduled time intervals after certain period from the installation of an equipment or when an equipment experiences a major breakdown.

### 2.2 Routine Inspection

#### 2.2.1 Mowers

##### (1) Main Frame

##### a) Frame

##### <Daily Inspection>

- Inspect for soiled conditions, and if the frame is severely soiled, clean with water and waste rags.
- Inspect for loose bolts and nuts by tamping lightly with test hammer. Loose fasteners will give a dull sound.

##### <Bimonthly Inspection>

- Inspect frame for damage, bents or cracks. Bent or cracked frame can be noticed by the rag catching on the frame. Cracks can be inspected with a test hammer and dull sounds can be heard when detected. Damaged, bent or cracked frame shall be repaired.
- Frame shall be inspected for rust, and the rust shall be checked for their depth and extent. If surface rust not reaching base metal, remove rust and repaint.

##### <Six Month Inspection>

- Loose bolts shall be checked, and tightened. Bolt-nut assemblies

shall be tightened to the following standards:

- . Bolts less than M6: grip spanner with first 3 fingers and tighten with wrist. (l=10cm.....F=5kg approx.)
- . Bolts M12 to M14: grip end of spanner tightly and tighten with arm. (l=15cm....F=50kg approx.)
- . Bolts larger than M20: turn spanner by holding support with other arm and turn with full force of body. (l more than 20cm....F=100kg approx.)

b) Conveyor Belt

<Bimonthly Inspection>

- Inspect V-belt for cracks. Replace V-belt when crack reaches the belt tension portion (fabric).
- Inspect V-belt for wear, and signs of wear in bottom of V-groove in pulley due to belt wear. Replace V-belt when bottom of V-groove in pulley shows signs of rubbing.
- Inspect for proper tension in V-belt by checking sag when a force of 9kg is applied at midpoint between pulleys. Adjust belt tension when sag is larger than 20mm.

c) Pulley

<Daily Inspection>

- Inspect for any unusual sound from bearing when operating. Oil bearing when unusual sound occurs, and repair if the noise does not go away.

d) Belt Cover

<Daily Inspection>

- Inspect for soiled condition, and if severely soiled, clean with water and waste rags.
- Inspect bolt-nut assembly loosening by tapping with test hammer. Loose assemblies will give dull sound.

<Bimonthly Inspection>

- Inspect for damage, dents and any dent in cover. Damaged, bent or dented cover shall be repaired.
- Inspect for rust. Remove any rust with sandpaper, etc., and repaint.

<Six Month Inspection>

- Inspect for loose bolts, and tighten if any found. Bolt-nut assembly tightening standards are as follows:
  - . Bolts less than M6: grip spanner with first 3 fingers and tighten with wrist. (l=10cm.....F=5kg approx.)
  - . Bolts M12 to M14: grip end of spanner tightly and tighten with arm. (l=15cm....F=50kg approx.)
  - . Bolts larger than M20: turn spanner by holding support with other arm and turn with full force of body. (l more than 20cm....F=100kg approx.)

e) Hydraulic Cylinder

<Daily Inspection>

- Inspect for soiled conditions, if soiled clean with water and waste rags, etc.
- Test for loose bolt-nut assemblies with test hammer. Loose assemblies will give dull sound.

<Bimonthly Inspection>

- Inspect for damage, buckling or cracks, and repair them as necessary.
- Inspect oil pressure lines for leaks. Oil leaks in pressure lines shall be repaired by tightening joints, or replacing lines.

<Six Month Inspection>

- Loose bolts shall be inspected, and tightened if found. Tightening standards are as follows:
  - . Bolts less than M6: grip spanner with first 3 fingers and tighten with wrist. (l=10cm.....F=5kg approx.)
  - . Bolts M12 to M14: grip end of spanner tightly and tighten with arm. (l=15cm....F=50kg approx.)
  - . Bolts larger than M20: turn spanner by holding support with other arm and turn with full force of body. (l more than 20cm....F=100kg approx.)

## (2) Cutter Bar

### <Daily Inspection>

- Inspect for soiled condition, if soiled clean with water or waste rags.

### <Bimonthly Inspection>

- Inspect for damage, buckling or cracks. Damage, buckling or cracks can be detected by fabrics catching on them. Cracks can be checked with test hammer since they will give dull sound. Cutter bars with such defects shall be repaired.
- Inspect for rust, their depth and extent. Surface rust not reaching into base metal shall be removed and repainted.

## (3) Disc

### <Daily Inspection>

- Bolt-nut assemblies shall be checked with test hammer for looseness, and tightened if found. Loose assemblies give a dull sound.
- Inspect blade knife for cracks or missing portions. Cracks will give off a dull sound when tapped with test hammer. Damaged blade or cracked ones shall be replaced.

### <Bimonthly Inspection>

- Check bolt-nut assembly holding knife for wear or damage, and measure diameter and height of bolt holding knife. Replace bolts worn more than 3mm from the original diameter. Replace nuts worn more than one-half of their original height.
- Measure the bolt-hole of the knife for wear and change in shape, and measure the knife hole diameter. Replace knife when the knife hole diameter has widened more than 2mm.

### <Six Month Inspection>

- Inspect the bolt holding the disc and knife blade for looseness with a torque wrench. Tighten when required. Refer to torque recommended by manufacturer.

## (4) Gear Box

### <Daily Inspection>

- Inspect if any unusual sound emits from gear box. Investigate the causes and request a specialist for repair as necessary.

- Inspect for oil leaks. Tighten any oil leaks, or change oil seals.

<Bimonthly Inspection>

- Inspect oil level. Add oil when oil level is lower than limit.
- Check lubrication oil for any mixture of residue, viscosity, and impurities. Change lubrication if there are any residue, change in viscosity, or impurities.
- Check the temperature of the gear box by operating the engine. If the gear box case can be touched with the hand it is running normally.

(5) PTO Shaft

<Bimonthly Inspection>

- Inspect the PTO shaft for any out-of-shape, damage or breakage. Replace any PTO shaft damaged or out-of-shape.

2.2.2 Tractors

(1) Main Body

<Trimonthly Inspection>

- Inspect for damages and dents. Repair them if found.
- Inspect for rust, their depth and extent. Surface rust not reaching base metal shall be removed and repainted.
- Inspect for soiled condition. Severe soiled condition shall be cleaned with water or waste rag. etc.

<Six Month Inspection>

- Inspect for loose bolts. Loose bolts shall be tightened. The standards for tightening bolt-nut assemblies are as follows:
  - . Bolts less than M6: grip spanner with first 3 fingers and tighten with wrist. (l=10cm.....F=5kg approx.)
  - . Bolts upto M10: grip head of spanner, and turn with forearm. (l=12cm .... F=20kg approx.)
  - . Bolts M12 to M14: grip end of spanner tightly and turn with arm. (l=15cm....F=50kg approx.)
  - . Bolts larger than M20: grip support firmly with one arm, place both feet firmly on the ground, and turn spanner with other arm by applying full force of body. (l=20cm .... F=100kg or more)

Note: Since it is troublesome to inspect all loose bolt-nut

assemblies, mark with paint of appropriate color, and make it easy to detect loose assemblies.

(2) Engine

a) Lubricating Oil System

<Daily Inspection>

- Place tractor on level ground, and check whether oil is between high and low level gauges lines. Add lube oil if under the low level line of the gauge. Reduce oil if over upper gauge line.

Note:

- . If lube oil has increased, there could be cooling water mixed with the oil, and time must be allowed for observation.
- . Allow more than 5 minutes after adding oil to check oil level.

<Trimonthly Inspection>

- Inspect for leaks in the oil pan, oil filter, piping, hose (especially at joints). Check the ground where tractor was parked to check for oil leaks. Tighten bolts if there are leaks at oil pan, and if leak persists change packing.
- Rub off lube oil on dip stick on the finger to check for cleanliness, residues and viscosity. Change oil if oil loses viscosity or oiliness, or if the oil takes on a darker color when engine is running.

b) Cooling Water System

<Daily Inspection>

- Inspect the volume of cooling water. When there is a reserve tank, check level of water so that it is between the high and low gauge lines. When there is no reserve tank, confirm that water is full to the fill cap.

i) Reserve Tank Type: Add water when water is below low level line.

ii) Non-Reserve Tank Type: Add water when water level is below fill cap.

- Check to see that the cooling water is clean. Replace water when water is not clear and contaminated (i.e. rust colored). If oily water is noticed, there may be engine oil mixed into the water, and should be investigated.

- Check for leaks in radiator and radiator hose. Also, check where tractor is parked to check for leaks. Repair any leaks from the radiator core, when radiator hose leaks are detected, replace hose.

<Trimonthly Inspection>

- Check radiator core for soiled condition. When the radiator core is clogged with dust and grime, wash out the core with water under pressure.
- Check fan belt for cracks. Replace fan belt when cracks are found in the tension member (fabric portion).
- Check fan belt for wear, and any rubbing on bottom of V-groove of pulley. Repair pulley when wear is noticed in the V-Groove of the pulley.
- Check for any looseness in fan belt by applying a force of 10kg at mid point of belt between pulleys. Retention V-belt when there is more than 10 to 15mm sag noticed in the belt.

c) Air Cooling System

<Trimonthly Inspection>

- Inspect air filter for contamination with dust and dirt. Clean air filter every 3 months by blowing out dust, dead insects and other debris with compressed air (less than 3kg/cm<sup>2</sup>) from the inside.

d) Fuel System

<Trimonthly Inspection>

- Inspect fuel pipe, pipe joint, fuel filter, fuel tank, etc. for leaks. When leaks persist, tighten flange, replace seals, and/or gaskets, or replace parts.

e) Exhaust System

<Daily Inspection>

- Inspect the color of the exhaust gas. The exhaust gas will be almost colorless under normal operating conditions and will be white or black when abnormal, and the odor will be foul. The cause shall be checked, and when the condition persists, the tractor should be sent to a repair garage.

<Trimonthly Inspection>

- Operate the engine, and check the exhaust pipe and muffler for leaking exhaust gas. When exhaust gas leak is great, and abnormal sounds are emitted, the parts causing the problem shall be replaced.

### (3) Steering Mechanism

#### a) Power Steering Mechanism

##### <Trimonthly Inspection>

- Inspect for oil leaks in the oil tank, hose, hose joint in the hydraulic system. Tighten the flange of the hydraulic pipe and hose when leaks are detected. When leaks persist, replace seals or gaskets, or replace parts.
- Check the oil level to be within the upper and lower oil level gauge lines. Add fluid when oil is below low gauge level line.

### (4) Power Transmission Assembly

#### a) Transmission

##### <Trimonthly Inspection>

- Inspect for leaks in the casing connection or seal of the power output shaft. Tighten plug when oil leaks from plug are detected. When other leaks are detected request repairs to be made in garage.
- Check oil level by placing tractor on level ground. Add oil when level is low.
- Check to see whether there are any unusual sounds. Check the cause of other troubles, and request repair to be made in garage as required.
- Check the soiled condition of the transmission. Excessive soiled conditions shall be cleaned with waste rags.

##### <Annual Inspection>

- Check the play of the main clutch pedal. Depress clutch pedal until there is a resistance, and when the stroke is more than 40 to 50mm, adjust clutch rod play.
- Check the play of the PTO clutch level. When the PTO clutch level is manipulated and the stroke is more than 40 to 50mm, adjust the clutch rod play with the adjustment nut.

### (5) Brake Mechanism

##### <Daily Inspection>

- Check the brake oil level in the reserve oil tank. Add brake oil when level is below lower gauge line. Check cause of brake oil leaks when detected, and if it cannot be completely repaired, request repair by garage.



- Apply brake while operating the tractor in a safe and open space to check the brakes and confirm that the brake operates evenly. Apply hand brake, and check to see whether the engine stalls when the 3rd gear is engaged. If brake wire is troublesome make adjustments, and if the trouble persists, send to garage for repairs.

<Trimonthly Inspection>

- Check for oil leaks in the brake pipe, hose and/or cylinder. Tighten flange of brake pipe or hose if brake oil leaks are detected. When leak persists, send to garage for repair.

<Annual Inspection>

- Check the play of the brake pedal. Push until resistance is felt, and if the stroke is more than 3 to 9mm, adjust brake adjustment nut.
- Check the play of the parking brake. When the brake lever is pulled all the way (with force of  $F = 30\text{kg}$ ) and the stroke is more than 70 to 120mm, make adjustments.

(6) Undercarriage

a) Tires

<Six Month Inspection>

- Check tires for cracks and damage. Change tire when cracks and damage reach the carcass.
- Check tires for wear and tear. Change tire when the center tread wears out.
- Check for tire inflation pressures. The proper tire inflation pressures are as follows:
  - . 4.00-15, 5-14, 6-14: 2.0kg/cm<sup>2</sup>
  - . 8.3-22, 8.3-24, 9.5-24, 12.4-16: 1.0kg/cm<sup>2</sup>
- Inspect tires when the inflation pressure is less than the standard.

b) Wheel

<Daily Inspection>

- Check Wheels mounting bolt by tamping with test hammer. Loose bolts will give a dull sound. Tighten bolts when wheels become loose.

<Six Month Inspection>

- Loose nuts will be tightened with a torque wrench. The proper torque will be in accordance with the manufacturer's manual.

(7) Hydraulic Lift

<Trimonthly Inspection>

- Inspect hydraulic cylinder and hose for oil leaks. Replace packing when any oil leaks are detected in the piston rod packing. Replace piston rod with a new one when any damage is sustained. Tighten bolts when leaks are detected in the oil hose. When leaks persist, replace with new parts.
- Check the mechanical linkage of the components for damage and bends. Check the cause of any malfunction, and replace parts when required.

(8) Electrical Power System

a) Storage Battery

<Daily Inspection>

- Inspect the battery water level. Replenish battery water when the level is below the low gauge line.

<Trimonthly Inspection>

- Inspect the specific gravity of the battery water. Add battery water when the specific gravity falls below 1.2. When the specific gravity does not rise and the battery is not recharging, replace battery with a new one. Clean battery terminal parts with lukewarm water. After cleaning the parts, apply grease lightly to preserve.

Note: Be careful to prevent battery water from spilling on to the skin or clothing since the liquid can cause burns and eat fabric.

(9) Other Miscellaneous Items

<Daily Inspection>

- Check the head lamp, turn indicator, tail lamp, brake lamp, and small lamp by turning on the switch. Replace burnt out lamp, when the lamp does not light, change the fuse and check the wiring and switches.
- Check the speedometer, fuel gauge, air pressure gauge, and water temperature meter to see that they are operating properly. When the needle does not move, check the meter, sensor and wiring. When the fault cannot be repaired, send to factory for repair.

- Operate windshield wiper to check if they are working properly. When the windshield wiper does not operate, check the motor switch and wiring for faults. If it cannot be repaired, send to factory for repair.
- Sound the horn to check its condition. When the horn does not sound, check the wiring and battery, and the horn itself. When the fault cannot be repaired, send to factory for repair.
- Check the rearview mirrors to see if they work properly, not soiled, and have no damage. If the back view mirror is broken and the rear cannot be seen, replace with a new one. The mirror shall be adjusted so that all sides can be viewed by sitting in the drivers seat.

### 2.2.3 Handy Mowers

#### (1) Main Pipe

##### <Daily Inspection>

- Inspect damage or bends (out of shape). Damaged pipe shall be repaired.
- Check for any unusual sounds when operating. Check the cause of the fault and replace with new one if it cannot be repaired.

#### (2) Handle

##### <Bimonthly Inspection>

- Inspect for loosening of the mounting bolt of the handle throttle. Loose bolts shall be tightened.
- The standard for tightening shall be as follows:
  - . Bolts smaller than M6: Grip spanner with first 3 finger and turn with wrist. (l=10cm.....F=5kg approx.)
  - . Bolts up to M10: Grip end of spanner and turn with forearm. (l=12cm.....F=20kg approx.)

#### (3) Engine

##### <Daily Inspection>

- Check for fuel leaks. Tighten fuel hose connection if leaks are detected. If leak persists, replace the parts.
- Check for any unusual sounds when operating. When unusual sounds are heard, check the cause of fault and repair.

(4) Gear Case

<Daily Inspection>

- Check for any unusual sounds when operating. If unusual sounds come from gear case, investigate the cause of faults and repair.
- Check the soiled condition of the gear case. Severe soiled conditions shall be cleaned with water and waste rags.

<Bimonthly Inspection>

- Inspect for any loose bolts. Loose bolts shall be tightened. The standards for tightening bolts are as follows:
  - . Bolts smaller than M6: Grip the spanner with first 3 finger and turn spanner with wrist. (l=10cm.....F=5kg approx.)
  - . Bolts to M10: Grip end of spanner and turn with forearm. (l=12cm.....F=20kg approx.)

(5) Knife Blade

<Daily Inspection>

- With a special socket wrench for the knife blade attached to the machine, tighten the knife blade.
- Inspect for missing section of blade, crack, and eccentricity. Cracks in the knife blade can be checked by tamping with test hammer and a dull sound will be heard. If blade is not balanced, the knife blade will cause abnormal vibrations. Replace with new blade if knife blade is not working well.
- Check the safety cover for any damage or dents. Replace parts if there are missing blade sections, cracks, or eccentricity, etc.
- Inspect the soiled condition. If the blade is dirty, clean with water or waste rags.

<Bimonthly Inspection>

- Check for any loose bolts on the safety cover. Tighten knife blade bolt if loose.

(6) Shoulder Belt

<Daily Inspection>

- Inspect the belt and buckles for wear and damage. Repair if there are any faults.

## 2.2.4 Sweepers

### (1) Main Body

#### <Daily Inspection>

- Inspect soiled condition of equipment. When excessively soiled, clean with water or waste rags.

#### <Six Month Inspection>

- Check for damage and deformation. Repair any damage or deformed places.
- Check for rust, and investigate depth and extent. Surface rust that has not penetrated the base metal shall be removed and repainted. When the rust has penetrated the base metal enough to cause holes, repair.

#### <Annual Inspection>

- Check for loose bolts. Loose nuts shall be tightened. The standard for tightening bolt-nut assemblies are as follows:
  - . Bolts smaller than M6: Grip spanner with first 3 fingers and turn spanner with wrist. (l=10cm .... F=5kg approx.)
  - . Bolts up to M10: Grip end of spanner and turn spanner with forearm. (l=10cm.....F=5kg approx.)
  - . Bolts up to M10: Grip end of spanner handle firmly and turn spanner with forearm. (l=12cm.....F=20kg approx.)
  - . Bolts M12 to M14: Grip end of spanner handle firmly and turn spanner with arm. (l=15cm .... F=50kg approx.)
  - . Bolts larger than M20: Grip support with one arm, place feet firmly on ground and turn spanner with other arm applying full force of body. (l=20cm or more .....F=100kg or more)

Note: Since it is not possible to check all nut-bolt assemblies, mark bolt-nuts with paint to enable easy determination of looseness at a glance.

### (2) Traction Engine

#### a) Lubrication System

#### <Daily Inspection>

- Place the sweeper on level ground and check oil level. Add engine lube oil when oil is below low level line. Remove oil when over oil level line.

Note:

- . If oil increases there could be cooling water mixed into the oil: take oil sample in glass container to confirm.
- . After adding oil, allow more than 5 minutes before checking oil level.

<Six Month Inspection>

- Check oil pan, oil filter, oil piping, hose, and other lube system items (especially joints) for leaks. Also, check the ground where the sweeper was parked to check for oil leaks on the ground. Tighten bolts when there is leaked oil in the oil pan, and when leaks persist, change packing. Tighten flange when there are leaks from the oil filter, pipe, or hose; and when leaks persist, change seals, gasket, etc.
- Rub oil from the dip stick onto the hand to check for contamination, impurities and viscosity. Change lube oil when oil loses its viscosity, or when it becomes contaminated and takes on extreme colours.

b) Cooling System

<Daily Inspection>

- Check the water level in the radiator. When there is a reserve tank, check the water level gauge on the tank. When there is no reserve tank, water level should be up to the cap of the radiator.
  - . Reserve Tank Type: Add coolant when level less than low level line.
  - . Without Reserve Tank: Add coolant when less than filling cap.
- Check that the cooling water is clean. Change coolant water when it is no longer clear (such as rusty water). If there is oil detected in the coolant water, investigate cause of leak into the water.
- Check the radiator core and hose for leaks. Also, check the ground where the sweeper was parked to check for leaks. Repair leaks from the core. Change water hose when leaks are detected coming from the hose.

<Six Month Inspection>

- Inspect the radiator core for soiled conditions. Clean core by water when core becomes excessively dirty.
- Check fan belt for cracks. Change fan belt when cracks reach tension members (fabric).
- Inspect the fan belt for wear and check the V-groove of the pulley.

Change fan belt when the V-groove starts to show signs of belt wear.

- Check fan belt tension by testing the sag when a force of 10kg is applied midway between the pulleys. Adjust fan belt tension when the sag is more than 10 to 15mm.

#### c) Air Cleaning System

##### <Six Month Inspection>

- Inspect air filter for fouling with dirt. Remove dirt, insects, etc. from air cleaner with compressed air (less than 3 kg/cm<sup>2</sup>).

#### d) Fuel System

##### <Six Month Inspection>

- Check fuel pipe, pipe joints, fuel tank, fuel filter, etc., for leaks. When gas leaks cannot be stopped, tighten flange or replace seals and gaskets, or replace component parts altogether.

#### e) Exhaust System

##### <Daily Inspection>

- Check the colour and odour of the exhaust gas. Exhaust air is almost colourless when engine is operating in normal condition, and turns into a white or black fume when abnormal. The odour will also change. Check cause of fault and if exhaust remains foul, send to repair garage.

##### <Six Month Inspection>

- Inspect for exhaust gas leaks from exhaust pipe. Change parts if exhaust gas leaks or if exhaust sounds larger than normal.

### (3) Steering System

#### a) Power Steering System

##### <Six Month Inspection>

- Check oil reservoir, gear box, hose, hose joint for leaks in the hydraulic system. Tighten pipe, hose flange if there are leaks from the hydraulic system. If leaks persist, change seals or gaskets, or replace the part outright.
- Check oil level with level gauge. Add hydraulic oil when the oil is below the low gauge line.

#### (4) Power Transmission System

##### a) Transmission

###### <Six Month Inspection>

- Check for oil leaks from the casing joint, power shaft seal, etc. Tighten Plug if oil leaks are noticed from the plug. For any other fault, send to repair garage.
- Place the sweeper on level ground and check oil level by removing the transmission case plug to see if oil level is up to the plug level. Add transmission oil if oil level is less than fill level.
- Check for unusual sounds when the engine is running. Investigate cause of faults, and send to garage for repairs.
- Check for play in the clutch pedal. Push clutch rod with hand all the way until there is resistance, and for a stroke more than 35 to 45mm, adjust play with adjusting nut.

##### b) Differential

###### <Six Month Inspection>

- Check for oil leaks from the plug. Tighten plug if any oil leaks are noticed, and for any other malfunction, send to the repair garage for repairs.

#### (5) Brake Equipment

###### <Daily Inspection>

- Check oil level in the reserve tank. Add brake oil if less than low level gauge. Investigate the cause of brake oil leak, and if cannot be repaired completely, send to repair garage for repairs.
- With the hand brake on, shift engine in 3rd gear and check if the engine stalls. In a wide and safe space apply brake while running and check the effectiveness of the brake, or whether it swerves. If brake does not operate properly, adjust brake wire. If malfunction persists, send to repair garage for repairs.

###### <Six Month Inspection>

- Check for oil leaks from the brake pipe, hose, brake cylinder and other brake components. Tighten piping, hose flange for brake oil leaks, and if leak persists, send to garage for repairs.
- Inspect for air leaks from the air brake components (compressor, air tank). Repair leaks by brazing, tightening flanges, or replacing parts. If necessary replace hose pipe or tubing.



- Check for unusual sound from the compressor. Investigate cause of fault, and send to garage for repairs.
- Check the play in the brake pedal. Push brake by hand until a resistance is felt, and if the stroke is not 3 to 9mm, adjust brake with nut.
- Inspect the play in the parking brake. When the brake lever is pulled (FJ=J30kg), and the stroke is not 70 to 120mm, adjust the brake.

(6) Suspension System

<Six Month Inspection>

- Inspect for cracks or deformation of the chassis spring. Investigate the cause for faults, and send to repair garage for repairs.

(7) Running Equipment

a) Tyres

<Six Month Inspection>

- Inspect tyres for cracks, damage, and lodging of foreign objects. Change tyre when crack or damage reaches the carcass of the tyre.
- Check the condition of wear. Change tyres when the tread is less than 6mm.
- Check inflation pressure of tyres. Check tyre inflation pressure, and add air if insufficient. Standard pressures are as follows:
  - . 7.5-16-14PRLT tyres-6.5kg/cm<sup>2</sup>
  - . 8.25-16-14PRLT tyres-5.75kg/cm<sup>2</sup>

b) Wheel

<Daily Inspection>

- Lightly tap nut with test hammer for looseness. Loose nuts will give a dull sound, and shall be tightened.

<Six Month Inspection>

- Inspect wheel mounting nut for looseness. The standard torque for both the front and rear wheels are 38 to 42kg.

(8) Electrical System

a) Storage Battery

<Daily Inspection>

- Check battery water level. Add battery water when level is low.

Note: Prevent battery water from spilling on the skin or clothing since it is extremely corrosive.

<Six Month Inspection>

- Check the specific gravity of the battery water. Recharge battery when battery water specific gravity is less than 1.2. If the specific gravity does not increase or the battery does not charge properly, change the battery for a new one.

Note: Care should to prevent battery water from spilling onto the skin or clothing, since it is extremely corrosive.

- Clean the battery terminals with lukewarm water and brush if they become dirty or corroded. After cleaning, apply a thin coat of grease to the terminal to prevent corrosion.

(9) Accessories

<Daily Inspection>

- Inspect head lamp, turn indicator, tail lamp, brake lamp, and clearance lamp to see that they light up and operate properly. Change lamps that do not light up. If this does not correct the fault, check the fuse, and investigate the wiring and switches.
- Inspect speedometer, fuel gauge, air pressure meter, and water temperature gauge to see that they operate properly. When meters do not move, investigate the cause by checking the sensor and wiring. If repairs cannot be made, send to factory for repairs.
- Inspect windshield wiper for proper operation. When windshield wipers will not function, check the motor, switch and wiring for faults. If repairs cannot be made, send to plant for repairs.
- Check warning horn for proper operation. When the horn does not operate, check the wiring, battery voltage, and the horn mechanism. If repair cannot be made, send to factory for repairs.
- Inspect rearview mirror for proper reflection, soiled condition, and any damage. Change rearview mirror with a new one if it is broken. Adjust mirror so that all sides can be viewed when seated in the operator's seat.

## (10) Auxiliary Work Engine

### a) Lubrication System

#### <Daily Inspection>

- Place sweeper on level ground and check the oil level with the level gauge, and add as required. When oil level exceeds high level line drain oil.

#### Note:

- . When the oil level increases, coolant water could have mixed with the oil and so take samples of the oil in a glass test tube.
- . Allow more than 5 minutes for the oil to settle before checking oil level after adding oil.

#### <Six Month Inspection>

- Inspect for oil leaks in the oil pan, oil filter, piping, hose and related components (especially joints). Also, check the ground where the sweeper was parked to check for leaks. Tighten bolts if there is oil leaking from the oil pan. If leak persists, replace packing. When oil leaks are found from the oil filter, pipe or hose, tighten flanges, and if leak persists, change seals, gaskets and other parts as necessary.
- Rub the oil on the dip stick to check the contamination by dust, dirt, water or dilution by fuel, and the viscosity. Change oil if oil loses its viscosity, or takes on a extremely dark colour.

### b) Cooling System

#### <Daily Inspection>

- Check the water level in the radiator. If there is a reserve tank, check the level with gauge. When there is no reserve tank, the level shall be up to the radiator cap.
  - . Reserve Tank Type: Add water when low.
  - . No Reserve Tank Type: Add water when level is less than the radiator cap level.
- Check the cooling water for its cleanliness. Change coolant water if it becomes discoloured (such as with rust). If oil is noticed in the water, investigate the cause.
- Check the radiator core and hose for leaks. Also, check the ground where the sweeper was parked to check for cooling water leaks. Repair leaks in the radiator core. Change parts when there are leaks from the radiator hose.

<Six Month Inspection>

- Inspect the radiator core for clogging up of the radiator with dust. Clean radiator core if extremely dirty with hose water.
- Inspect the fan belt for cracks. Change fan belt if cracks reach the tension member (fabric).
- Check for wear in the V-groove of the pulley from worn fan belt. Change fan belt if it wears down to where it starts rubbing the bottom of the V-groove of the pulley.
- Check the fan belt tension by testing the sag with a force of 10kg applied between the pulley. Adjust fan belt tension if the sag is more than 10 to 15mm.

c) Suction Air System

<Six Month Inspection>

- Inspect air filter for contamination with dirt and dust. Remove dirt, insects and other dust with compressed air (less than 3kg/cm<sup>2</sup>) from the inside of the air filter.

d) Fuel System

<Six Month Inspection>

- Inspect fuel piping, pipe joints, fuel tank, fuel filter, and other components for leaks. When leaks cannot be stopped, tighten flange or replace seals and gaskets, or replace component parts altogether.

e) Exhaust System

<Daily Inspection>

- Check the colour of the exhaust gas. There will be almost no colour if engine is functioning properly, and the exhaust will be white or black if not functioning properly. Investigate the cause, and if the fault is serious, send to a repair garage for repairs.

<Six Month Inspection>

- Check for leaks from the exhaust pipe and muffler by running the engine. When there is a large amount of exhaust air leaking, and the engine noise is abnormally large, change exhaust system parts.

(11) Cleaning Water System

a) Water Pump

<Trimonthly Inspection>

- Inspect for water leaks. If leaks are found tighten the piping or change the parts.
- Check for unusual noise when running engine. Investigate the cause of faults, and change the parts as necessary.
- Check V-belt of cracks. Change the V-belt when cracks reach the tension member (fabric).
- Check if there is any rubbing of the V-groove bottom from wear of the V-belt. Change the V-belt when it has worn to where it starts to rub the bottom of the pulley.
- Check V-belt tension by applying a force of 10kg at midpoint of the pulleys. Adjust the V-belt tension if the sag is not 10 to 15mm.

b) Water tank, Piping System

<Trimonthly Inspection>

- Check water tank welds, plumbing hose, hose joints, valves for leaks. Tighten the piping if there are leaks, or change parts as necessary.

(12) Sweeper Brush System

a) Main Brush System

<Daily Inspection>

- Inspect hydraulic motor, buffer, brush case for breakage, cracks, and wear. Change them if not operating properly.

<Trimonthly Inspection>

- Inspect for loose bolts. Tighten loose parts of the brush assembly.

Note: Since it is not possible to check all bolts and nuts, paint bolts and nuts so that any loose ones can be easily detected.

- Measure the width of contact of the brush. The proper width of brush contact with the pavement is 90 to 100mm. Adjust brush for the proper contact, and if this can not be made, change parts to reach this level.
- Measure the length of the brush. The use limit of the brush is 60%

of the diameter of a new brush. Change brush if it reaches this limit.

b) Side Brush Assembly

<Daily Inspection>

- Inspect the oil pressure motor, buffer brush, brush case for damage, cracks and wear. If any defects are detected, replace with new ones.

<Trimonthly Inspection>

- Inspect for loose bolts. Loose bolts shall be tightened.

Note: Since it is impossible to check all bolts and nuts, it is recommended to paint the bolts and nuts for easy identification of loose nuts and bolts.

- Measure the contact width of the brush with the pavement surface. The proper contact width is 30% of the brush diameter. Adjust brush for the proper contact, and if this cannot be made, replace with new ones.
- Measure the length of the brush. The use limit of the brush is 60% of the diameter. Change brush if it reaches this limit.
- Check the inflation pressure of the supporting tyre. Inflate tyres with the proper amount of air.

(13) Dust Suction Equipment

a) Suction System

<Daily Inspection>

- Inspect for damage, cracks, and wear. Malfunctioning parts shall be replaced.

<Trimonthly Inspection>

- Inspect for loose bolts, and tighten any bolts found to be loose.
- Inspect tear in the flexible hose and loosening of the metal band connections. Repair leaks if detected, and tighten connecting equipment bands.
- Measure the distance of the suction opening from the ground. The standard distance of the opening is 20-30mm from the runway surface. Adjust if standard distance is not maintained.

## b) Blower System

- Inspect for cracks in the V-belt. Change V-belt if cracks reach the tension member.
- Check for wear marks in the V-groove of the pulley due to wear of the V-belt. Change V-belt if there are signs of the belt rubbing on the V-groove of the pulley.
- Check V-belt tension by applying a force of 10kg midway between the pulleys and measure the sag. Adjust V-belt tension if there is a sag of more than 10 to 15mm.
- Check for unusual sounds and vibration when operating. Grease bearings when there are unusual sounds coming from the equipment. If sound persists, send to specialty shop for repairs.
- Check for loose bolts. Tighten loose spots when found.

## c) Dust Tank

### <Trimonthly Inspection>

- By entering the dust tank, inspect the tank interior wall, filter, baffle plate for damages, cracks and rust. Faults shall be repaired by welding, reinforcing, or replacing with new parts. When rust spots are found, repair and repaint.
- Check for air leaks from the tank seams. Replace packing if leaks are found, and sealing compound applied as necessary.

## (14) Hydraulic System

### a) Oil Tank

#### <Daily Inspection>

- Check the oil level for proper charging. Add oil when level reaches low level line. Replace oil level gauge if it becomes soiled.

#### <Six Month Inspection>

- Check for oil leaks from the welds, oil gauge mountings, and pipe joints with equipment. When leaks are found in the oil tank, repair metal parts by brazing, and tighten flange bolts. Replace pipe and hose with new parts. Tighten bolts if leaks are found coming from plugs. Other repairs shall be made by sending to a repair factory.

## b) Oil Pump

### <Six Month Inspection>

- Inspect for oil leaks from the shaft seals, packing. Leaks from the oil pump shall be repaired by sending to a repair shop. Pipe and hose shall be replaced. Tighten plug when leaks are found coming from plugs. Confirm that there are no leaks coming from the shaft seal.
- Check for unusual sounds and vibration when the equipment is running. Investigate all faults, and if any are found send to a repair shop for repairs.
- Inspect for abnormal heating of the case by touching it with the hand. If the case can be touched with the hand, the pump is operating in a normal fashion.
- Inspect the V-belt for cracks. Change V-belt when cracks reach the tension member (fabric) of the belt.
- Check for friction marks in the bottom of the V-groove of the pulley due to V-belt wear. When there are signs of the V-belt rubbing the bottom of the V-groove of the pulley, change the V-belt.
- Check V-belt tension by applying a force of 10kg midpoint between the pulleys and measure the sag. Adjust V-belt tension when the sag is not 10 to 15mm.

## c) Lift System

### <Six Month Inspection>

- Check for oil leaks from the piston rod packing, also for any damage to the piston rod. Change the packing if leaks are found coming from the rod packing. Change the sealing if damage is found on the piston rod. Tighten bolts if leaks are found coming from the hose connections. If leak persists, change with new hose.
- Check the raising and lowering response of the lift. If there are malfunctions with the lift, send the sweeper to factory for repairs.

Note: When inspecting the bottom side of the dust tank, raise the bed to the highest position and place a safety rod and other wood prop under the tank.

## d) Piping, Hose, Valves, etc.

### <Six Month Inspection>

- Check for oil leaks from the piping, hose, and valves. Tighten



joints and connections when leaks are found, and replace parts are required.

(15) Control Box

<Daily Inspection>

- Check the pilot lamps, warning lamps, work lamps to see if they light up. When they do not light up, investigate the cause and make necessary repairs.
- Inspect switches and meters to see if they function properly. Investigate the cause of switches and meters not functioning properly, and make the necessary repairs.

<Six Month Inspection>

- Inspect the wiring terminals and tighten as necessary.
- Check the installation of relays, contact, and check for any odd noise, odours, heating up, or change in colour. Inspect fuses and fuse outage. Replace parts when there are troubles with the relays and contactors. When fuses burn out check the cause and make necessary repairs.

2.2.5 Dump Trucks

(1) Main body

<Daily Inspection>

- Inspect the truck for soiling. If the truck is extremely dirty, wash with water, waste rags, or other similar methods.

<Six Month Inspection>

- Check the truck for damage and battering from wear inducing forces. Repair if there are any damage or deformation to the truck body.
- Inspect for rusts, their depth and extent. Surface rust which has not reached the base material shall be removed and repainted. When the rust is deep and there are holes in the body, repair.

<Annual Inspection>

- Inspect the chassis, body, and bed for loose mounting nuts. Loose bolts shall be tightened. The standards for tightening bolts and nuts are as follows:
  - . Bolts smaller than M6: Grip the spanner with the first 3 fingers and turn with the wrist. (l=10cm....F=5kg approx.)

- . Bolts up to M10: Grip end of spanner and turn with the forearm. (l=12cm...F=20kg approx.)
- . Bolts M12 to M14: Grip handle of spanner firmly and turn with the arm forcefully. (l=15cm...F=50kg)
- . Bolts larger than M20: Grasp a support with one arm, and with both feet firmly on the ground, turn the spanner with the other arm while applying body weight. (l=20cm, more than ..... F=100kg and more.)

Note: Since it is not possible to inspect all the nuts and bolts, it is recommended to mark the bolts-nuts with paint for easy identification should any turn loose.

## (2) Engine

### a) Lubrication System

#### <Daily Inspection>

- Inspect the oil level by placing the truck on level ground and checking the oil level gauge. Add oil when oil level falls under the lower gauge lines. When the oil level goes over the upper gauge line, remove the oil.

#### Note:

- . If the oil increases, the cooling water could have gotten mixed with the oil, and it is recommended to take samples of the oil in a glass container to check this out.
- . When checking the oil level after adding oil, allow the oil to settle for more than 5 minutes.

#### <Six Month Inspection>

- Check the oil pan, oil filter, oil pipe and hose (especially the joints) for oil leaks. Also, check the ground where the truck was parked to confirm if there are any oil leaks. Tighten bolts when there are oil leaks, and when the leak persists, change the packing. When there are leaks from the oil filter, pipe and/or hose, tighten the flange nuts, and when the leak persists, replace the seals and gaskets.
- Rub off some of the oil on the dipper stick to check the contamination of the oil from dust, mixing with other fluids, and their viscosity. Change oil when the oil loses its viscosity or when the oil becomes excessively dirty or black when the engine is operating.

### b) Cooling System

#### <Daily Inspection>

- Check the cooling water level. When there is a reserve tank, check

the water level gauge mounted on the tank for the proper level. When there is no reserve tank, the water level should be up to the radiator cap level.

- . With Reserve Tank: Add water when level is below low gauge lines.
- . Without Reserve Tank: Fill water up to radiator cap level.
- Check if the cooling water is clean. Change cooling water when it is not clear and becomes dirty (i.e. rusty coloured). When there is a film of oil in the water, investigate the cause for engine oil mixing.
- Inspect the radiator core and hose for leaks. Also, check the ground where the truck was parked to confirm within there are any leaks. Repair leaks in the radiator core. Change the hose when there are leaks from the hose.

#### <Six Month Inspection>

- Inspect the radiator core for clogging with dust, dirt and grime. Wash the radiator core with hosed water when it becomes extremely dirty.
- Check the fan belt for cracks. Change fan belt when cracks reach the tension member (fabric).
- Inspect the V-groove of the pulley to see whether the fan belt is rubbing the bottom due to wear. Change V-belt when the belt is worn down to where it starts to rub the bottom of the pulley V-groove.
- Check the fan belt tension by applying a force of 10kg at the midpoint of the pulleys and check the sag. Adjust the fan belt tension when the amount of sag is more than 10 to 15mm.

#### c) Suction Air System

##### <Six Month Inspection>

- Check the air filter for clogging with dirt and dust. Clean the air cleaner by blowing out dirt and insect bodies with compressed air (less than 3kg/cm<sup>2</sup>) from inside the filter.

#### d) Fuel System

##### <Six Month Inspection>

- Check the fuel piping, pipe joints, fuel tank, fuel filter, etc. for leaks. Tighten flange if gas leak will not stop, or replace seals or gaskets, including changing of parts.

e) Exhaust Gas System

<Daily Inspection>

- Check the color and odour of the exhaust gas. The exhaust gas is almost colourless under normal conditions but will give white fumes or black smoke when abnormal. The odour will also give off odd smell when malfunctioning. The cause should be investigated and when it is bad, send the truck to a repair garage for repairs.

<Six Month Inspection>

- Check the exhaust pipe and muffler for leaks. When the exhaust gas leaks and engine sound is excessive and the exhaust gas noise is large, check the cause and replace parts as necessary.

(3) Steering System

a) Power Steering System

<Six Month Inspection>

- Check the oil tank, gear box, hose, and hose joints for leaks in the power steering system. Tighten the flange when there are oil leaks from the pipe and hose. When the leak persists, change the seal or gasket, or change the parts.
- Inspect the oil level gauge to see that proper level is maintained. Add oil when the level is less than the low level gauge line.

(4) Power Transmission System

a) Transmission

<Six Month Inspection>

- Check for oil leaks from the transmission casing seams, power shaft seal, plug, etc. Tighten plug when leaks are noticed. When other leaks are detected, send the truck to the garage for repairs.
- Place the truck on level ground and remove the oil plug cap on the transmission casing, and check to see that oil is up to the level of the cap. Add oil when the level is less than the fill level line.
- Run a road test and check for unusual sounds. Investigate the cause of problems with the transmission, and send the truck to the garage for repairs.
- Check the play of the clutch pedal. Push the clutch all the way in until there is some resistance felt, and when the stroke is more than 35 to 45mm for the clutch rod, adjust the play with the adjust nut.

## b) Differential

### <Six Month Inspection>

- Check for oil leaks from the differential plug. Tighten plug when leaks are detected from the plug, and if there are any other troubles noticed, send the truck to a garage for repairs.

## (5) Brake System

### <Daily Inspection>

- Check the oil level gauge on the reserve tank to see that the proper level is maintained. Add brake oil when the oil level is less than the low gauge line. Investigate the cause of the oil leak, and if it cannot be completely repaired, send to a garage for repairs.
- With the engine running, apply the handbrake and engage the 3rd gear and see whether the engine will stall. In a wide and safe area apply the brakes while running and check the condition of the brakes, to see if there are any side-pulling effects. Adjust wire when there is any malfunction. When the fault persists, send the truck to a garage for repairs.

### <Six Month Inspection>

- Check for brake oil leaks from the pipe, hose, cylinder and other components. Tighten parts when oil leaks are detected from the pipe, and hose flange. When the leak persists, send the truck to a garage for repairs.
- Check for air leaks from the air brake system components (air compressor, air reservoir tanks). When leaks are noticed, repair by brazing, or tighten flange, or replace parts. Hose shall be replaced with a new one.
- Check for unusual sounds from the air compressor. Investigate the cause of any faults, and send the truck to a garage for repairs.
- Check the play in the brake pedal. Push the brake lever all the way in until there is some resistance felt, and when the stroke is more than 3 to 9mm, adjust the brake with the adjust nut.
- Check the play in the parking brake. Adjust the brake when the stroke is more than 70 to 120mm when the brake level is pulled (with a force of FJ=J30kg).

## (6) Suspension System

### <Six Month Inspection>

- Inspect for cracks and deformation in the chassis spring.

Investigate the cause of faults with the suspension system, and send the truck to a garage for repairs.

(7) Running Equipment

a) Tyres

<Six Month Inspection>

- Inspect the tires for cracks, breakage, and lodging of foreign objects. Change tyres when cracks and damage reaches the carcass.
- Check the wear of tyres. Change tyre when the tread is less than 1.6mm.
- Inspect the inflation pressures of tyres, and add air if pressure is low. Standard tyre pressures are as follows:
  - . 7.5-16-14PRLT: 6.5kg/cm<sup>2</sup>.
  - . 8.25-16-14PRLT: 5.75kg/cm<sup>2</sup>.

b) Wheels

<Daily Inspection>

- Lightly tap the wheel nuts with a test hammer for looseness. Loose nuts will give a dull sound, and shall be tightened.

<Six Month Inspection>

- Check for loose nuts and tighten. The standard torque is 38 to 42kg for both the front and rear wheels.

(8) Electrical System

a) Battery

<Daily Inspection>

- Check to see that the battery water level is at the correct level range. Add battery water when less than the low level line.

Note: Prevent battery water from spilling on the skin and clothing since the water is extremely corrosive.

<Six Month Inspection>

- Check the specific gravity of the battery water. Recharge battery when battery water specific gravity is less than 1.2. If the specific gravity does not increase or the battery does not charge properly, change the battery for a new one. Clean the battery terminals with lukewarm water and brush if they become dirty or

corroded. After cleaning, apply a thin coat of grease to the terminals to prevent corrosion.

(9) Accessories

<Daily Inspection>

- Check to see that the head lamps, turn indicators, tail lamps, brake lamps, and clearance lamps properly light up. Replace lamps that do not light up. When this does not improve the situation, check the fuse, wiring and switch.
- Check to see that the speedometer, fuel gauge, compressed air gauge, and water temperature gauge operate properly. When meters are inoperative, check the sensor, switch and wiring for shortages. If repairs cannot be made, send to a factory for repairs.
- Check the windshield wipers to see that they operate properly. When windshield wipers are inoperative, check the wiper motor, switch and wiring. If repairs cannot be made, send to factory for repairs.
- Inspect the klaxon horn to see that they operate properly. When the horn does not work, check the wiring, battery, or the wiper itself. If repairs can not be made, send to the garage for repairs.
- Inspect the rearview mirror to see that they operate properly and are not dirty or damaged. Change rearview mirror if it does not work. Adjust mirror so that all four directions can be seen when sitting in the driver's seat.

(10) Dump Mechanism

a) Subframe

<Annual Inspection>

- Inspect the sub-frame bolts to see that there is no looseness. Loose bolts shall be tightened. The standard for tightening bolt-nuts are as follows:
  - . Bolts smaller than M6: Grip spanner with first 3 fingers and turn with wrist. (l=10cm....F=5kg approx.)
  - . Bolts up to M10: Grip spanner end and turn with forearm. (l=12cm....F=20kg approx.)
  - . Bolts larger than M20: Grip support one arm place both feet firmly on the ground, and turn spanner with arm applying body weight on the spanner. (l=20cm and over ....F=100kg and over)

Note:

- . Since it is not possible to check all the nuts and bolts, it is recommended to mark the bolt head with paint for easy identifying if they loosen
- . When checking raised dump bed from underneath, place a safety rod to support it, and place additional wood blocks underneath.

b) Oil Pump

<Six Month Inspection>

- Check for oil leaks. If oil leaks are found from the oil pump, replace pipe, hose with new parts. Tighten plug if leaks are found from the plug. Confirm that there are no leaks from the shaft seal. All other troubles should be repaired at a garage.
- Operate the pump and check the casing to see whether it heats up. Investigate the cause of troubles, and send to a garage for repairs.
- Check to see that there is no unusual sound when operating. Investigate the cause of other troubles with the oil pump, and send to a garage for repairs.

c) Oil Reservoir Tank

<Daily Inspection>

- Check to see that the oil level is in the correct range. Add oil when level is under low gauge line.

<Six Month Inspection>

- Inspect welds, oil gauge mounts, and oil piping connection for leaks. If leaks are detected, repair metal parts by brazing, tightening flange bolts, and replacing pipes and hose. Tighten plug if oil is noticed leaking from the plug. For other faults, send to a garage for repairs.

d) Cylinder

<Daily Inspection>

- Check the response of the cylinder when placed in the raised and lowered modes. Investigate cause of trouble with the cylinder and change with new parts.

<Six Month Inspection>

- Check the piston rod packing for leaks. Also check the piston rod for any damages. Change packing when leaks are found coming from rod packing. Change cylinder for a new one if the piston rod is damaged. Tighten bolts when leaks are found coming from the hose.



When the leak persists, change hose with new one.

e) Pipes, Hose

<Six Month Inspection>

- Check the piping, hose and valves for leaks. Tighten fasteners when leaks are found coming from the joints. Change parts if there are other leaks.

Examples of checklists for routine inspection together with routine maintenance are shown in Appendix - 1.

2.3 Performance Inspection

Whether an equipment in deteriorated condition and whether it can be further utilized with costly repairs or discarded for renewal shall be judged by the performance inspection.

This inspection shall be conducted annually after 5 years from the installation of an equipment or when an equipment experiences a major breakdown.

A method to systematically evaluate the overall performance of the building ancillary equipment is shown in Appendix - 2 of this manual.

## Chapter 3 Routine Maintenance

### 3.1 General

Routine maintenance for airport maintenance equipment such as mowers, tractors, sweepers, etc., comprises of regular cleaning, oil change, greasing, and other routine works.

It shall be executed at regularly scheduled time intervals to prevent the equipment from malfunction and deterioration.

The frequency and sort of maintenance are described hereinafter for each type of equipment.

### 3.2 Mowers

#### 3.2.1 Cutter Bar

##### (1) Gear Box

<Six Month Maintenance>

- Change lubricating oil.

#### 3.2.2 PTO Shaft

<Bimonthly Maintenance>

- Apply grease to all grease points.

### 3.3 Tractors

#### 3.2.2 Engine

##### (1) Lubricating Oil System

<Trimonthly Maintenance>

- Change lubricating oil.

- Change oil filter.

##### (2) Cooling Water System

<Annual Maintenance>

- Replace cooling water.

### (3) Air Cleaning System

#### <Annual Maintenance>

- Replace air filter.

### (4) Fuel System

#### <Six Month Maintenance>

- Replace fuel filters.

### 3.3.2 Steering Mechanism

#### (1) Power Steering Mechanism

##### <Annual Maintenance>

- Change hydraulic fluid.

Note: Do not move handle while changing oil

- Change oil filter.

### 3.3.3 Power Transmission Assmbly

#### <Annual Maintenance>

- Change oil fluid

Note: The oil level should be checked after more than 10 minutes after changing of the oil fluid.

- Change oil filter.

### 3.3.4 Hydraulic Lift

#### <Trimonthly Maintenance>

- Grease mechanical linkage of the equipment.

- Replace section filter.

### 3.4 Handy Mowers

#### 3.4.1 Gear Case

##### <Bimonthly Maintenance>

- Apply grease to grease points. (Lithium-soap grease shall be used for high-temperature equipment)

### 3.5 Sweepers

#### 3.5.1 Traction Engine

##### (1) Lubrication System

<Annual Maintenance>

- Change oil fluid.

Note:

- . Do not mistake oil drain plug with transmission drain oil plug.
- . Allow 10 minutes after stopping engine after idling before checking oil level after adding oil.

- Change oil filter.

Note: Use filter wrench if oil filter is difficult to remove.

##### (2) Cooling System

<Annual Maintenance>

- Change coolant water.

##### (3) Air Cleaning System

<Annual Maintenance>

- Change air filter.

##### (4) Fuel System

<Annual Maintenance>

- Change fuel filter.

Note: Use filter wrench if fuel filter is difficult to remove.

#### 3.5.2 Steering System

##### (1) Power Steering System

<Annual Maintenance>

- Change hydraulic oil.

- Add grease.

Note: Wipe off dirt and mud from grease nipple before applying grease.

### 3.5.3 Power Transmission System

#### (1) Transmission

<Annual Maintenance>

- Change transmission oil.

#### (2) Differential

<Annual Maintenance>

- Change differential oil.

#### (3) Propeller Shaft

<Annual Maintenance>

- Add grease.

Note: Wipe off dirt and mud from grease nipples before adding grease.

### 3.5.4 Suspension System

<Annual Maintenance>

- Add grease to chassis springs.

Note: Wipe off dirt and mud from grease nipples before adding grease.

### 3.5.5 Auxiliary Work Engine

#### (1) Lubrication System

<Annual Maintenance>

- Change lubricating oil.

Note:

- . Do not mistake the drain plug for the transmission drain plug.
- . To check the oil level after adding oil, let the engine to idle for several minutes, allow the engine to settle for some 10 minutes.

- Change the oil filter

Note: Use filter wrench if oil filter is difficult to remove.

#### (2) Cooling System

<Annual Maintenance>

- Change coolant water.

(3) Suction Air System

<Annual Maintenance>

- Change air filter.

(4) Fuel System

<Annual Maintenance>

- Change fuel filter.

Note: Use filter wrench if fuel filter is difficult to remove.

3.5.6 Cleaning Water System

(1) Water Tank, Piping System

<Annual Maintenance>

- Clean strainer.

3.5.7 Sweeper Brush System

(1) Main Brush System

<Trimonthly Maintenance>

- Apply grease to all grease points.

(2) Side Brush Assembly

<Trimonthly Maintenance>

- Apply grease to all grease points.

3.5.8 Dust Suction Equipment

(1) Blower System

<Trimonthly Maintenance>

- Grease bearings of the drive shaft.

(2) Dust Tank

<Daily Maintenance>

- Clean interior of dust tank.

<Trimonthly Maintenance>

- Clean dust tank filter.

### 3.5.9 Hydraulic System

#### (1) Oil Tank

<Annual Maintenance>

- Change oil.

#### (2) Lift System

<Six Month Maintenance>

- Grease cylinder receptor.

### 3.6 Dump Trucks

#### 3.6.1 Engine

##### (1) Lubrication System

<Annual Maintenance>

- Change engine oil

Note:

- . Do not mistake transmission drain plug for the lube oil plug.
- . Allow the engine to set for 10 minutes after idling before checking oil level after adding oil.

- Change oil filter

Note: Use filter wrench if oil filter is difficult to remove.

##### (2) Cooling System

<Annual Maintenance>

- Change coolant water.

##### (3) Suction Air System

<Annual Maintenance>

- Change air filter.

##### (4) Fuel System

<Annual Maintenance>

- Change fuel filter.

Note: Use filter wrench if fuel filter is difficult to remove.

### 3.6.2 Steering System

#### (1) Power Steering System

<Annual Maintenance>

- Change the oil.
- Add grease.

Note: Wipe off dirt and mud from the grease nipple before adding grease.

### 3.6.3 Power Transmission System

#### (1) Transmission

<Annual Maintenance>

- Change the transmission oil.

#### (2) Differential

<Annual Maintenance>

- Change differential oil.

#### (3) Propeller Shaft

<Annual Maintenance>

- Add grease.

Note: Wipe grease nipple of dirt or mud when adding grease.

### 3.6.4 Suspension System

<Annual Maintenance>

- Add the grease to the chassis spring.

Note: Wipe dust and mud from the grease nipple before adding grease.

### 3.6.5 Dump Mechanism

#### (1) Subframe

<Annual Maintenance>

- Grease dump cylinder.

Note: When performing work on the dump bed from underneath, place a safety rod to support it. Also place additional wood blocks to



support the dump bed.

(2) Oil Pump

<Annual Maintenance>

- Grease propeller shaft.

Note: Wipe off dirt and mud from grease nipples before applying grease.

(3) Oil Reservoir Tank

<Annual Maintenance>

- Change oil.

**Appendix-1 Examples of Routine Inspection Maintenance Checklists  
for Airport Maintenance Equipment**

Appendix 1.1 Mower	- Daily Sheet -
Appendix 1.2 Mower	- Bimonthly Sheet -
Appendix 1.3 Mower	- Six Month Sheet -
Appendix 1.4 Tractor	- Daily Sheet -
Appendix 1.5 Tractor	- Trimonthly Sheet -
Appendix 1.6 Tractor	- Six Month Sheet -
Appendix 1.7 Tractor	- Annual Sheet -
Appendix 1.8 Handy Mower	- Daily Sheet -
Appendix 1.9 Handy Mower	- Bimonthly Sheet -
Appendix 1.10 Sweeper	- Daily Sheet -
Appendix 1.11 Sweeper	- Trimonthly Sheet -
Appendix 1.12 Sweeper	- Six Month Sheet -
Appendix 1.13 Sweeper	- Annual Sheet -
Appendix 1.14 Dump Truck	- Daily Sheet -
Appendix 1.15 Dump Truck	- Six Month Sheet -
Appendix 1.16 Dump Truck	- Annual Sheet -

Appendix 1.1 Mower - Daily Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part	Inspection & Routine Maintenance	Check	Remarks
Main frame	Frame	Soiled Condition	
		Looseness of bolts and Nuts	
	Pulley	Unusual sound	
	Belt cover	Soiled Condition	
		Looseness of bolts and Nuts	
	Hydraulic cylinder	Soiled Condition	
Looseness of bolts and Nuts			
Cutter bar	Cutter bar	Soiled Condition	
	Disk	Looseness of bolts and Nuts	
		Crack, Missing of knife	
Gear box	Unusual sound		
	Oil leak		

Check column should be filled as follows:  
 1) Inspection...Check(V) if satisfactory  
     ...Check(X) if unsatisfactory  
     Write details in remarks  
 2) Routine Maintenance...Check(V) if completed

Additional Remarks

Appendix 1.2 Mower - Bimonthly Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part	Inspection & Routine Maintenance	Check	Remarks
Main frame	Frame		Damage, dents, cracks
	V-belt		Rust
			Crack
			Wear
			Tension
	Belt cover		Damage, dents
		Rust	
Hydraulic cylinder		Damage, buckling, crack	
		Oil leakage from hydraulic hose	
Cutter bar	Cutter bar		Damage, buckling, crack
	Disk		Rust
			Wear, damage
			Diameter and height of bolt holding knife
		Bolt hole of knife for wear	
		Knife hole diameter	
Gear box			Oil level
			Mixture of residue, viscosity and impurities of oil
			Gear box temperature
PTO shaft			Out-of-shape, damage, breakage
			Greasing

Check column should be filled as follows:  
 1) Inspection...Check(V) if satisfactory  
                   ...Check(X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check(V) if completed

Additional Remarks

Appendix 1.3 Mower - Six Month Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part	Inspection & Routine Maintenance	Check	Remarks
Main frame	Frame	Looseness of bolts	
	Belt cover	Looseness of bolts	
	Hydraulic cylinder	Looseness of bolts	
Cutter bar	Disk	Looseness of bolts for holding disk and knife blade	
Gear box	Change oil		

Check column should be filled as follows:  
 1) Inspection...Check(V) if satisfactory  
                   ...Check(X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check(V) if completed

Additional Remarks

Appendix 1.4 Tractor - Daily Sheet -

Airport:		Equipment No.:	
Date:		Inspector:	

  

Part	Inspection & Routine Maintenance	Check	Remarks
Engine	Lubricating oil system	Oil level	
	Cooling water system	Volume of cooling water	
		Cleanness of cooling water	
		Water Leak	
Exhaust system	Color of exhaust gas		
Brake mechanism	Oil level		
	Check Brake		
Under carriage	Wheel	Looseness wheel mounting bolt	
Electrical power system	Storage battery	Battery water level	
Miscellaneous items		Turn on lamps	
		Check meters and gauges	
		Check horn	
		Check rear view mirrors	

Check column should be filled as follows:  
 1) Inspection...Check(V) if satisfactory  
     ...Check(X) if unsatisfactory  
     Write details in remarks  
 2) Routine Maintenance...Check(V) if completed

Additional Remarks

Appendix 1.5 Tractor - Trimonthly Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part		Inspection & Routine Maintenance	Check	Remarks
Main Body		Damage, dent		
		Rust		
		Soiled condition		
Engine	Lubricating Oil system	Oil leak		
		Oil for cleanliness, residues, viscosity		
		Change oil		
		Change oil filter		
	Cooling water system	Radiator core for soiled condition		
		Fan belt for crack		
		Fan belt for wear		
	Air cleaning system	Contamination with dust and dirt		
Fuel system	Fuel leak			
Exhaust system	Exhaust gas leak			
Steering mechanism	Power steering mechanism	Oil leak		
		Oil level		
Power transmission assembly		Oil leakage		
		Oil level		
		Unusual sound		
		Soiled condition		
Brake mechanism		Oil leak		
Hydraulic Lift		Cylinder and hose for oil leaks		
		Mechanical linkage of the component for damage and bend		
		Greasing for mechanical linkage		
		Replace suction filter		
Electrical power system	Storage battery	Specific gravity of the battery water		

Check column should be filled as follows:  
 1) Inspection...Check (V) if satisfactory  
                   ...Check (X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check (V) if completed

Additional Remarks

Appendix 1.6 Tractor - Six Month Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part		Inspection & Routine Maintenance	Check	Remarks
Main body		Looseness of bolts		
Engine	Fuel system	Replace fuel filter		
Under carriage	Tyres	Crak, damage		
		Wear and tear		
		Inflation pressures		
	Wheel	Looseness of bolts		

Check column should be filled as follows:  
 1) Inspection...Check (V) if satisfactory  
                   ...Check (X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check (V) if completed

Additional Remarks



Appendix 1.7 Tractor - Annual Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part	Inspection & Routine Maintenance	Check	Remarks
Engine	Cooling water system	Replace cooling water	
	Air cleaning system	Replace air filter	
Steering mechanism	Power steering mechanism	Change hydraulic fluid	
		Change oil filter	
Power transmission assembly		Play of main clutch pedal	
		Play of PTO clutch lever	
		Change oil fluid	
		Change oil filter	
Brake mechanism		Play of brake pedal	
		Play of parking brake	

Check column should be filled as follows:  
 1) Inspection...Check(V) if satisfactory  
                   ...Check(X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check(V) if completed

Additional Remarks

Appendix 1.8 Handy Mower - Daily Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part.	Inspection & Routine Maintenance	Check	Remarks
Main pipe	Damage, bend		
	Unusual sound		
Engine	Fuel leak		
	Unusual sound		
Gear case	Unusual sound		
	Soiled condition		
Knife blade	Looseness of bolts of knife		
	Missing section of blade, cracks and eccentric		
	Safety cover for any damage or bend		
	Soiled condition		
Shoulder belt	Wear, damage		

Check column should be filled as follows:  
 1) Inspection...Check (V) if satisfactory  
                   ...Check (X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check (V) if completed

Additional Remarks

Appendix 1.9 Handy Mower - Bimonthly Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part	Inspection & Routine Maintenance	Check	Remarks
Handle	Looseness of mounting bolts for handle and throttle		
Gear case	Looseness of bolts		
	Apply grease		
Knife blade	Looseness of bolts of safety cover		

Check column should be filled as follows:  
 1) Inspection...Check (V) if satisfactory  
                   ...Check (X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check (V) if completed

Additional Remarks

Appendix 1.10 Sweeper - Daily Sheet -

Airport:		Equipment No.:	
Date:		Inspector:	

  

Part		Inspection & Routine Maintenance	Check	Remarks
Main body		Soiled condition		
Traction engine	Lubrication system	Oil level		
	Cooling system	Water level		
		Cleanliness of cooling water		
		Radiator core and hose for leaks		
Exhaust system	Color and odor of exhaust gas			
Brake equipment		Oil level		
		Check brake		
Running equipment	Wheel	Looseness of bolts		
Electrical system	Storage battery	Battery water level		
Accessories		Turn on lamps		
		Check meters and gauges		
		Check wiper		
		Check horn		
		Check rear view mirrors		
Auxiliary work engine	Lubrication system	Oil level		
	Cooling system	Water level		
		Cleanliness of cooling water		
		Radiator core and hose for leaks		
Exhaust system	Color and odor of exhaust gas			
Sweeper brush system	Main brush system	Hydraulic moter, buffer, brush case for breakage, cracks and wear		
	Side brush system	Oil pressure moter, buffer, brush, brush case for damage, cracks and wear		
Dust suction Equipment	Suction system	Damage, cracks, and wear		
	Dust tank	Clean tank		
Hydraulic system	Oil tank	Oil level		
Control box		Turn on lamps		
		Check meters		
Check column should be filled as follows: 1) Inspection...Check(V) if satisfactory ...Check(X) if unsatisfactory Write details in remarks 2) Routine Maintenance...Check(V) if completed				
Additional Remarks				

Appendix 1.11 Sweeper - Trimonthly Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part	Inspection & Routine Maintenance	Check	Remarks
Cleaning water system	Water pump	Water leaks	
		Unusual sound	
		Check V-belt for cracks	
		Check V-belt for wear	
	Water tank, Piping system	Water leakage at water tank welds, plumbing hose, hose joint, valves for leaks	
Sweeper brush system	Main brush system	Looseness of bolts	
		Measure the width of contact of the brush	
		Measure the length of the brush	
		Apply grease	
	Side brush system	Looseness of bolts	
		Measure the width of contact of the brush	
		Measure the length of the brush	
		Apply grease	
		Inflation pressure of supporting tire	
Dust suction equipment	Suction system	Looseness of bolts	
		Tear in the flexible hose and looseness of the metal band connections	
		Measure the distance of the suction opening from the ground	
	Blower system	Apply grease	
	Dust tank	Tank, interior wall, filter, baffle plate for damages, cracks, and rust	
		Check for air leaks from the tank seams	
		Clean dust tank filter	

Check column should be filled as follows:  
 1) Inspection...Check(V) if satisfactory  
                   ...Check(X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check(V) if completed

Additional Remarks

Appendix 1.12 Sweeper - Six Month Sheet (1) -

Airport:	Equipment No.:
Date:	Inspector:

Part		Inspection & Routine Maintenance	Check	Remarks
Main body		Damage, deformation		
		Rust		
Traction engine	Lubrication system	Oil leak		
		Oil for contamination impurities and viscosity		
	Cooling system	Radiator core for soiled condition		
		Fan belt for cracks		
		Fan belt for wear		
		Fan belt for tension		
Air cleaning system	Air filter for fouling with dirt and dust			
Fuel system	Fuel leak			
Exhaust system	Exhaust gas leak			
Steering system	Power steering system	Oil leak		
		Oil level		
Power transmission system	Transmission	Oil leak		
		Oil level		
		Unusual sound		
		Play of clutch pedal		
Differential	Oil leak			
Brake equipment		Oil leak		
		Air leak from air brake components		
		Unusual sound from compressor		
		Play of brake pedal		
		Play of parking brake		
Suspension system		Crack or deformation of chassis spring		
Running equipment	Tire	Damage, crack, lodging of foreign object		
		Wear		
		Inflation pressure		
	Wheel	Looseness of bolts		
Electrical system	Storage battery	Specific gravity of battery water		

Check column should be filled as follows:  
 1) Inspection...Check (V) if satisfactory  
                   ...Check (X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check (V) if completed

Additional Remarks

Appendix 1.12 Sweeper - Six Month Sheet (2) -

Airport:		Equipment No.:	
Date:		Inspector:	

  

Part	Inspection & Routine Maintenance	Check	Remarks
Auxiliary work engine	Lubrication system	Oil leak	
		Oil for contamination impurities and viscosity	
	Cooling system	Radiator core for soiled condition	
		Fan belt for cracks	
		Fan belt for wear	
	Suction air system	Fan belt for tension	
		Air filter for fouling with dirt and dust	
Fuel system	Fuel leak		
Exhaust system	Exhaust gas leak		
Dust suction equipment	Blower system	V-belt for cracks	
		V-belt for wear	
		V-belt for any looseness	
		Unusual sound and vibration	
		Looseness of bolts	
Hydraulic system	Oil tank	Oil leak	
	Oil pump	Oil leak	
		Unusual sound	
		Abnormal heating of the case	
		V-belt for crack	
		V-belt for wear	
	Lift system	V-belt for any looseness	
		Oil leak	
Piping, hose, valve, etc	Raising and lowering response of lift		
	Oil leakage		
Control box		Looseness of wiring terminal	
		Installation of relays, contacts, and check for any odd noise, odors, heating up, or change in color	
Check column should be filled as follows: 1) Inspection...Check (V) if satisfactory ...Check (X) if unsatisfactory Write details in remarks 2) Routine Maintenance...Check (V) if completed			
Additional Remarks			

Appendix 1.13 Sweeper - Annual Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part	Inspection & Routine Maintenance	Check	Remarks
Main body	Looseness of bolts		
Traction engine	Lubrication system	Change oil	
		Change oil filter	
	Cooling system	Change coolant water	
	Air cleaning system	Change air filter	
	Fuel system	Change fuel filter	
Steering system	Power steering system	Change hydraulic oil	
		Add grease	
Power transmisson system	Transmisson	Change transmisson oil	
	Differential	Change differential oil	
	Propeller shaft	Add grease	
Suspension system	Add grease		
Auxiliary work engine	Lubrication system	Change oil	
		Change oil filter	
	Cooling system	Change coolant water	
	Air cleaning system	Change air filter	
	Fuel system	Change of fuel filter	
Cleaning water system	Water tank, Piping system	Clean strainer	
Hydraulic system	Oil tank	Change oil	
	Lift system	Add grease cylinder receptor	

Check column should be filled as follows:  
 1) Inspection...Check(V) if satisfactory  
                   ...Check(X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check(V) if completed

Additional Remarks



Appendix 1.14 Dump Truck - Daily Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part	Inspection & Routine Maintenance	Check	Remarks
Main body	Soiling		
Engine	Lubrication system	Oil level	
	Cooling system	Water level	
		Cleanliness of cooling water	
		Radiator core and hose for leaks	
Exhaust system	Color and odor of exhaust gas		
Brake system	Oil level		
		Check brake	
Running equipment	Wheel	Looseness of bolts	
Electrical system	Battery	Battery water level	
Accessories		Turn on lamps	
		Check meters and gauges	
		Check wiper	
		Check horn	
Dump mechanism	Oil reservoir tank	Oil level	
	Cylinder	Response of cylinder	

Check column should be filled as follows:  
 1) Inspection...Check(V) if satisfactory  
                   ...Check(X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check(V) if completed

Additional Remarks

Appendix 1.15 Dump Truck - Six Month Sheet -

Airport:		Equipment No.:	
Date:		Inspector:	

  

Part	Inspection & Routine Maintenance	Check	Remarks	
Main body	Damage, deformation Rust			
Engine	Lubrication system	Oil leak Oil for and contamination, impurities, and viscosity		
	Cooling system	Radiator core for soiled condition		
		Fan belt for cracks		
		Fan belt for wear Fan belt for tension		
	Air suction system	Air filter for fouling with dirt and dust		
	Fuel system	Fuel leak		
	Exhaust system	Exhaust gas leak		
Steering system	Power steering system	Oil leak Oil level		
Power transmission system	Transmission	Oil leak Oil level Unusual sound Play of clutch pedal		
		Differential	Oil leak	
		Brake system	Oil leak Air leak at air brake components Unusual sound from compressor Play of brake pedal Play of parking brake	
	Suspension system	Crack or deformation of chassis spring		
Running equipment	Tire	Damage, crack, loading of foreign object Wear Inflation pressure		
		Wheel	Looseness of bolts	
Electrical system	Battery	Specific gravity of battery water		
Dump mechanism	Oil pump	Oil leak Heating up Unusual sound		
		Oil reservoir tank	Oil leak	
		Cylinder	Oil leak	
	Pipe, hose, valve, etc	Oil leak		
	<p>Check column should be filled as follows:                      1) Inspection...Check(V) if satisfactory                      ...Check(X) if unsatisfactory                      Write details in remarks                      2) Routine Maintenance...Check(V) if completed</p>			
Additional Remarks				

Appendix 1.16 Dump Truck - Annual Sheet -

Airport:	Equipment No.:
Date:	Inspector:

Part	Inspection & Routine Maintenance	Check	Remarks
Main body	Looseness of bolts		
Engine	Lubrication system	Change oil	
		Change oil filter	
	Cooling system	Change coolant water	
	Suction air system	Change air filter	
	Fuel system	Change fuel filter	
Steering system	Power steering system	Change hydraulic oil	
		Add grease	
Power transmisson system	Transmission	Change transmission oil	
	Differential	Change differential oil	
	Propeller shaft	Add grease	
Suspension system		Add greoase	
Dump mechanism	Sub-frame	Looseness of sub frame bolts	
		Add grease for support of dump cylinder	
	Oil pump	Add grease for propeller shaft	
	Oil reservoir tank	Change oil	

Check column should be filled as follows:  
 1) Inspection...Check(V) if satisfactory  
                   ...Check(X) if unsatisfactory  
                   Write details in remarks  
 2) Routine Maintenance...Check(V) if completed

Additional Remarks

## Appendix - 2 Evaluation Method for Equipment Performance

### 1. General

This evaluation method and criteria are prepared for evaluating systematically the overall performance of the airport maintenance equipment, such as mowers, tractors, handy mowers, sweepers and dump trucks.

### 2. Evaluation Items

Each type of airport maintenance equipment shall be evaluated for the evaluation items as tabulated in TABLE 2.1.

TABLE 2.1 Evaluation Items for Airport Maintenance Equipment

Evaluation Items		Mowers	Tractors	Handy Mowers	Sweepers	Dump Trucks
1. Operational Performance	1.1 Capacity	X	X	X	X	X
2. Reliability	2.1 Operational Conditions	X	X	X	X	X
	2.2 Energy Consumption	-	X	X	X	X
	2.3 Frequency of Replacement of Parts	X	X	X	X	X
	2.4 Frequency of Repairs	X	X	X	X	X
3. Economic Value	3.1 Availability of Spare Parts	X	X	X	X	X
	3.2 Deteriorated Condition	X	X	X	X	X
	3.3 Comparison with new product	X	X	X	X	X
	3.4 Service Year	X	X	X	X	X
4. Local Failure	4.1 Experience of Overhaul	X	X	X	X	X

TABLE 2.1 (Cont'd)

(4. Local Failure)	4.2 Rusting	X	X	X	X	X
	4.3 Breakdown	X	X	X	X	X
	4.4 Leakage	X	X	X	X	X
	4.5 Looseness of Joint or Crack	X	X	-	X	X
	4.6 Abrasion	-	-	-	-	-
	4.7 Smell	-	X	X	X	X
	4.8 Noise	X	X	X	X	X
	4.9 Stain	X	X	X	X	X

### 3. Evaluation Criteria

#### 3.1 Evaluation for Each Item

The performance of equipment shall be inspected for each evaluation item, and any of the evaluation ranking of A, B or C shown in TABLE 3.1 shall be assigned based on the equipment conditions:

TABLE 3.1 Evaluation Criteria for Auxiliary Equipment in Buildings

Evaluation Items	A	B	C
1. Operational Performance			
1.1 Capacity	- Original capacity at full power not able to be attained at any time	- Original capacity at full power not able to be attained at peak load	- No problems
2. Reliability			
2.1 Operational Conditions	- Unusual operation frequent due to various causes	- Unusual operation by single cause	- No problems
2.2 Energy Consumption	- Increase by 30% over previous year with no load increase	- Increase by 15% over previous year with no load increase	- No changes
2.3 Frequency of replacement of parts	- Not operational due to no availability of spare parts	- Extraordinarily frequent	- Reasonable frequency
2.4 Frequency of Repairs	- Increase by 30% over previous year	- Increase by 15% over previous year	- No changes
3. Economic Value			
3.1 Availability of Spare parts	- Impossible to procure due to discontinuation of production	- Production of spare parts scheduled to discontinue after 7 years, or - Production of equipment already stopped 3 years ago	- No problems
3.2 Deteriorated Condition	- Impossible to repair	- Repair by specialist necessary	- Able to be covered by maintenance
3.3 Comparison with new product	- New product with higher efficiency available in market	- Comparable with new product by improvement	- New product not available
3.4 Service year	- More than 10 years	- Between 5-10 years	- Less than 5 years

TABLE 3.1 (Cont'd)

Evaluation Items	A	B	C
4. Local Failure			
4.1 Experience of Overhaul	- More than twice in the past	- Once in the past	- No overhaul
4.2 Rusting	- Heavy rusting: holes in surface of main body	- Possible to maintain by rubbing off the rust and repainting with a rust preventive	- No problems
4.3 Breakdown	- Completely broken	- Possible to repair	- No problems
4.4 Leakage	- Leakage of water (or exhaust gas)	- Seepage of water (or exhaust gas)	- No problems
4.5 Looseness of joint or crack	- Dull sound	-	- Normal sound
4.6 Abrasion	- Already abraded	-	- No problems
4.7 Smell	- Unusual smell	-	- No problems
4.8 Noise	- Unusual sound	- Unusual sound is not so remarkable	- No problems
4.9 Stain	- No possibility to clean up	- Possible to clean up	- No problems

### 3.2 Scoring System

Assigning the following points to the respective evaluation ranks, total score (s) shall be calculated.

Rank A ..... 3 points  
 Rank B ..... 2 points  
 Rank C ..... 0 points

Total score (s) shall then be divided by number of evaluated items to enable objective evaluation.

$$K = S/M$$

where, S: Total score  
 M: Number of evaluated items

### 3.3 Overall Evaluation

The comprehensive evaluation shall be based on the following criteria.

TABLE 3.2 Comprehensive Evaluation Criteria

Equipment Type A	$K \geq 1.2$	Complete renewal of equipment required
	$K < 1.2$	Repair required
Equipment Type B	$K \geq 2.4$	Replacement of major parts, or complete renewal of equipment required
	$K < 2.4$	Repair required



**Appendix-3    Testing Equipment for Inspection of  
Airport Maintenance Equipment**

1.    Clamp ammeter ..... Measuring electric current
2.    Insulation resistance ..... Measuring insulation resistance  
meter (500 V)
3.    Torque wrench ..... Looseness of tie bolts
4.    Air pressure gauge ..... Air pressure of tire
5.    Inspection hammer ..... Looseness of joint (tie bolts) or crack
6.    Specific gravity gauge ..... Specific gravity of battery
7.    Steel tape ..... Deflection of belt
8.    Volt meter ..... Measuring electric voltage
9.    Circuit tester ..... Measuring current, voltage, resistance
10.   Camera ..... Recording of defects





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