

2.0 - 3.0 Tonne (manual)

Thwaites

HSS2039 (F08A/ST)

Mach 420
Mach 422
Mach 423
Mach 570
Mach 573

Operator's Instruction Manual



Mach 422 - 2 Tonne powerswivel



Mach 420 - 2 Tonne front tip

Thwaites Limited puts Safety First

It is the policy of Thwaites Limited to promote safety in the operation of its machines and to create a general awareness of site safety and safe working practices for the operators of its machines.

This Operator's Instruction Manual is intended for both new and experienced machine operators. It should remain with the machine at all times. All operators should be aware of its location and contents.

It is important that all operators are fully trained and familiar with the machine and that they have read and understood the information contained within this book before they attempt to operate in the site conditions for which the machine was designed.

This book details practices and operations which Thwaites Limited recommends. DO NOT operate this machine in ways other than those detailed within this book.

This machine is designed for customary construction site operations, and the transportation of bulk materials commonly carried on such sites; that is their 'intended use'. Under certain controlled conditions the dumper may be used for towing wheeled loads.

Due to the varied nature of the operation of site dumpers and the absence of an agreed test standard, any figures quoted by Thwaites in relation to vibration values and exposure are for reference purposes only. It is the responsibility of the employer to assess vibration exposure based on the actual site conditions, and operating practices, at the point of use.

Hand Arm Vibration - The daily exposure Action/Limit Values of between 2.5 - 5.0m/s² (A8) are unlikely to be exceeded in an eight-hour reference period.

Whole Body Vibration - The daily exposure can only be accurately determined at the point of use. This exposure must be managed in respect of the Action/Limit Values of 0.5 and 1.15 m/s² (A8) respectively.

Employers should not rely solely on published vibration figures when undertaking risk assessments. Depending on the site conditions, cycle times may need to be adjusted in order to reduce operator exposure levels.

Vibration values based on typical duty cycles are available on request from Thwaites. These may be used for reference purposes only.

Safety symbols



- Attention!
- Become alert!
- Your safety is involved



- Correct action



- Incorrect action/procedure which should NOT be carried out

Signal words:

Signal words are used on the machine and within this manual to identify levels of hazard seriousness



DANGER



WARNING



CAUTION

1 Before operating this machine

Thwaites



Read this operator's instruction manual



Thwaites
Distributor

- 1 Contact your Thwaites dealer in case of further questions
- 2 Learn to operate this machine
- 3 Ensure you are fit to operate
- 4 Wear correct safety clothing and ensure safety equipment is available

Complete checks in section

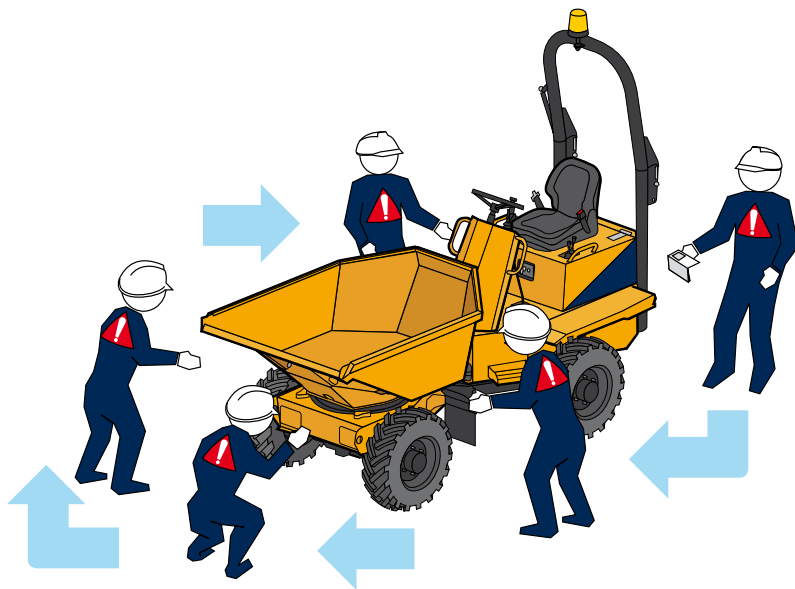


before starting the engine

1 Before operating this machine

Thwaites

Walk Around The Machine



Visually check the machine

- 1 Are the chassis lock and the skip lock disengaged?
- 2 Are the controls, crush zone or hydraulic rams clean, and clear of any debris?
- 3 Is the Roll-Over Protective frame (ROPS frame) secure, fully upright and undamaged?
- 4 Is the seatbelt anchorage secure and serviceable?
- 5 Are the covers and mudguards secure?
- 6 Are the hoses free from fluid leaks?
- 7 Are all safety decals legible?
- 8 Are the tyres free of cuts or splits?
- 9 Are all bolts tight and in position?
- 10 Are the steering wheel and the steering column undamaged?
- 11 **Have the daily maintenance tasks been performed? (See rear cover)**

Report all faults immediately.



DO NOT OPERATE THE MACHINE UNTIL ALL FAULTS HAVE BEEN RECTIFIED

Complete checks in section



before starting the engine

1 Before operating this machine

Thwaites



Mount the machine and check the controls

- 1 Use the grabrails and foot steps provided to manoeuvre into seating position. Face the machine at all times when mounting and dismounting
- 2 Is the engine cover secure and locked?
- 3 Adjust the seat position for comfort and easy access to controls
- 4 Fasten the seatbelt. Adjust accordingly for safety and comfort
- 5 Is the hand brake ON?
- 6 Set the transmission to neutral
- 7 Does the foot brake feel firm?
- 8 Do not operate the machine without understanding all its controls as described in the following pages



WARNING

Seatbelt **MUST BE WORN** when operating machines fitted with ROPS frame.

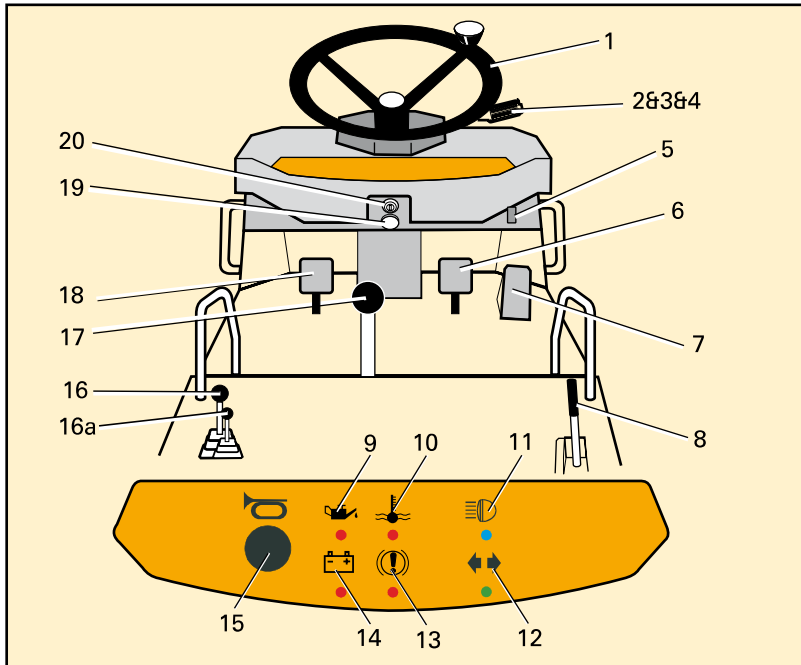
Complete checks in section



before starting the engine

1 Layout of controls

Thwaites



Control location & functions

- 1 Steering wheel
- 2 Direction indicator selector - forward = left turn - back = right turn*
- 3 Lights – twist 1 = sidelights ON
twist 2 = dipped headlights ON*
- 4 Lights – up = flash. Down = main beam*
- 5 Hazard warning light switch*
- 6 Foot brake pedal
- 7 Throttle pedal
- 8 Hand brake lever
- 9 Engine oil pressure warning light
- 10 Water temperature warning light
- 11 Headlamp main beam pilot light*
- 12 Direction indicator pilot light*
- 13 Heat/start pilot light
- 14 Battery charging warning light
- 15 Horn push
- 16 Tip-skip lever (Fwd tip model)
Tip-skip and rotate-skip lever (powerswivel and hi swivel models)
- 16a Raise-skip lever (hi swivel model only)
- 17 Gear lever
- 18 Clutch pedal (start inhibitor)
- 19 Ignition & hand brake warning buzzer
- 20 Ignition switch

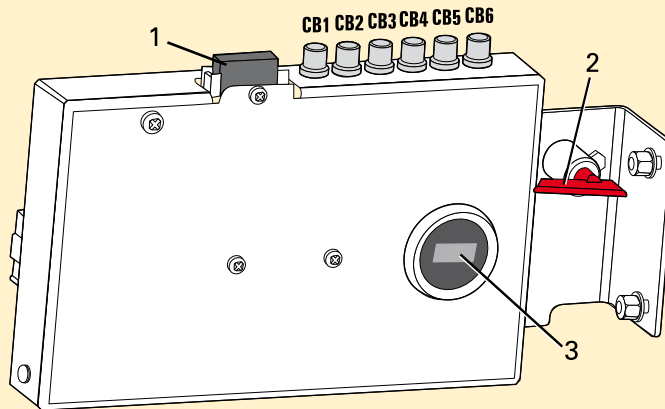
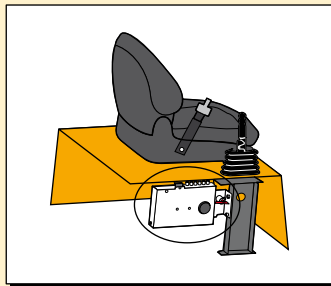
* Optional items

Complete checks in section



before starting the engine

1 Layout of battery



- 1 Maxi fuse
- 2 Isolater switch
- 3 Hour meter

- CB1 Power
- CB2 Ancilliaries
- CB3 Brake light*
- CB4 Lights*
- CB5 LH side lights*
- CB6 RH side lights*

** Optional items*

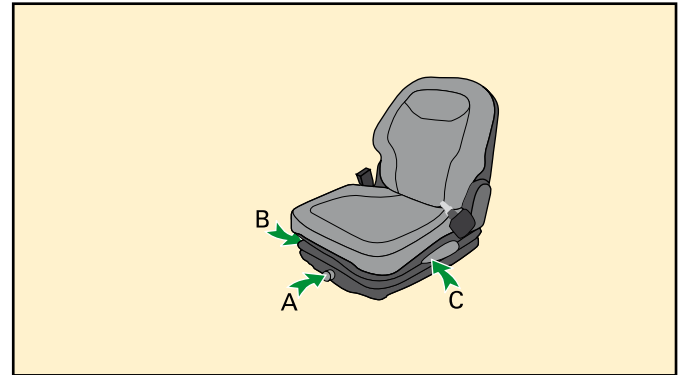
Complete checks in section  before starting the engine

1 Control functions – explained

Thwaites


Seat Adjustment

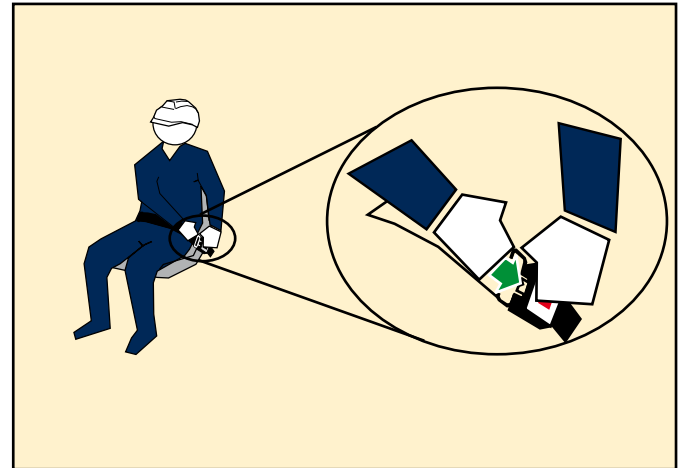
- A – Turn knob to set driver weight
- B – Lift to slide seat assembly forwards/backwards
- C – Lift handle to adjust backrest



Seatbelt

- Adjust length of belt when seated on machine
- Press buckle blade into buckle lock
- Pull belt webbing through buckle blade to remove slack

 *Seatbelt should not be worn loose, it should pass comfortably across hip bones and not the abdomen*



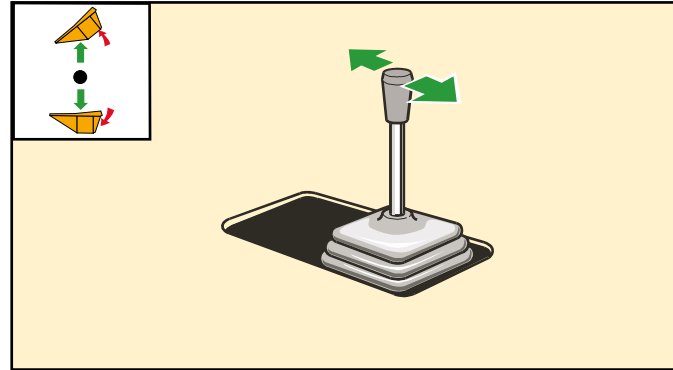
Complete checks in section  before starting the engine

1 Control functions – explained

Thwaites


Tip-skip lever (front tip models)

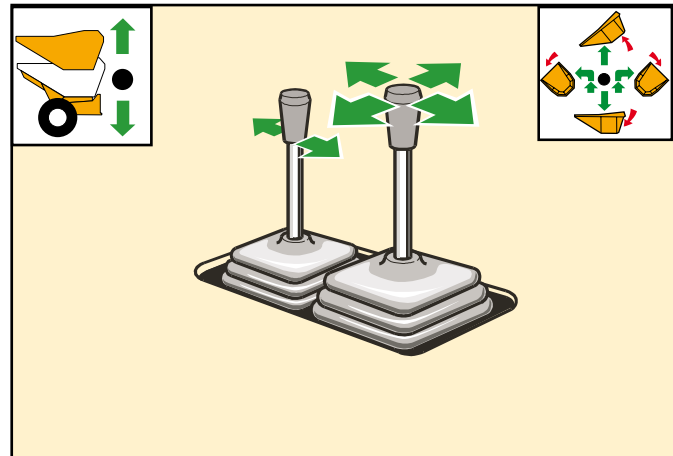
- Push forward to discharge skip
- Push backwards to park skip



Rotate-skip lever (swivel models)

- Raise skip 100 mm to disengage pivot centring lock.
- Rotate skip, fully lowered, to automatically engage centring lock.
- Raise skip and push lever to the right to rotate skip to right
- Raise skip and push lever to the left to rotate skip to left
- An increased engine speed will reduce cycle times

 Movement of the skip is disabled if the steering wheel is moved (priority steering).



Raise-skip lever (Hi-Swivel model only)

- Push forward to raise skip
- Push backwards to lower skip

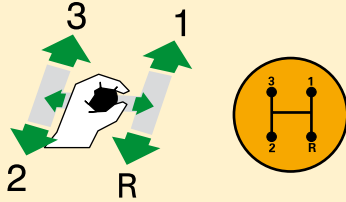
Complete checks in section



before starting the engine

1 Control functions – explained

Thwaites



Gear lever – left hand

Forward-left
Third gear

Neutral

Forward-right
First gear


Back-left
Second gear

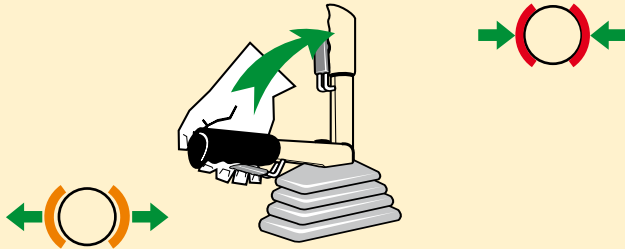
Back-right
Reverse

Hand brake lever – right hand

Use only when the machine is stationary (or in an emergency):

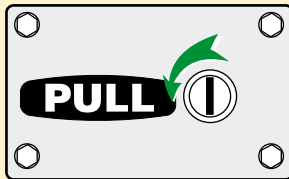
- Pull lever up to apply
- Pull catch and lower lever to release

 An audible warning device is fitted to your machine. This will sound when the parking brake is engaged.



Engine cover open/close

- Insert ignition key and turn anti-clockwise to unlock
- Pull handle to release and raise cover
- Lower cover, secure and lock before driving




Complete checks in section  before starting the engine

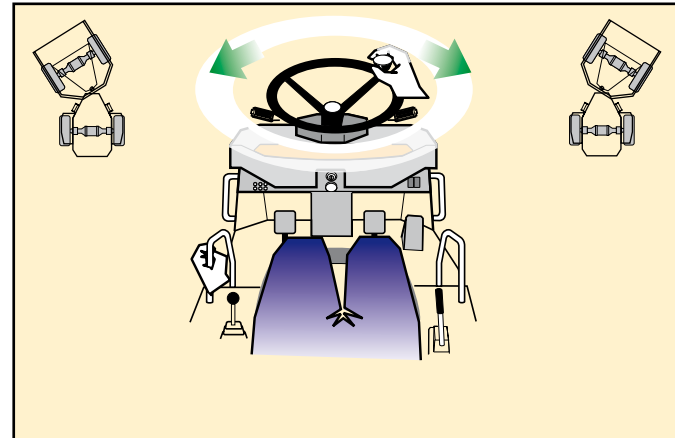
1 Control functions – explained

Thwaites

Steering wheel

- Turn the wheel clockwise to turn machine to right
- Turn the wheel anti-clockwise to turn machine to left

 Ensure the non-steering hand is on the engine cover grab rail when using the spinner knob for low-speed single-handed steering.



Throttle pedal - right foot (A)

- Apply pressure to increase speed
- Reduce pressure from the pedal to reduce speed

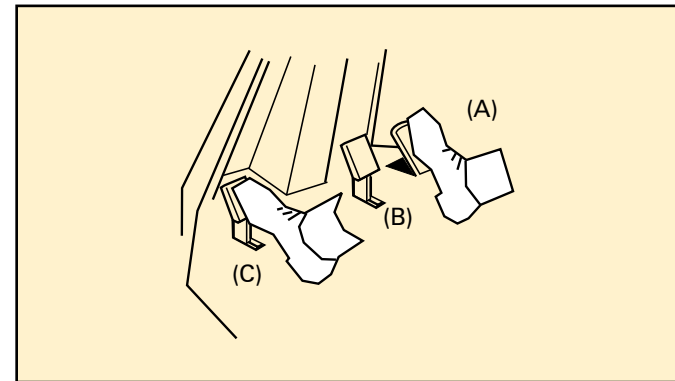
Foot brake pedal - right foot (B)

- Apply pressure down on the pedal to slow/stop the machine

Clutch pedal - left foot (C)

- Press down before each gear change - select gear and release

 Start inhibitor fitted - press down clutch pedal before starting engine



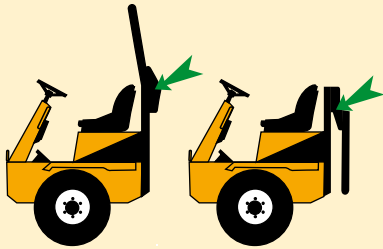
Complete checks in section



before starting the engine

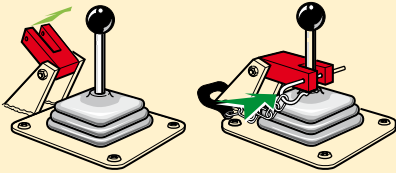
1 Control functions – explained

Thwaites



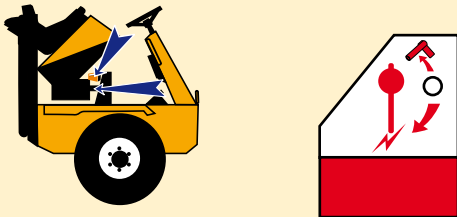
Lowering and raising the folding ROPS frame

- Remove lynch pins and withdraw frame lock pins
- Lower frame and insert lock pins and lynch pins in new position
- Reverse the procedure to raise the frame
- Ensure all pins are secure before driving



Tipping lever lock (*optional*)

- Place yolk over tipping lever and secure with lynch pin



Beacon stowage

- Unplug and remove beacon
- Secure beacon on bracket provided beneath bonnet

Battery isolator (*beneath engine cover*)

- Turn key anti-clockwise to isolate the battery power supply

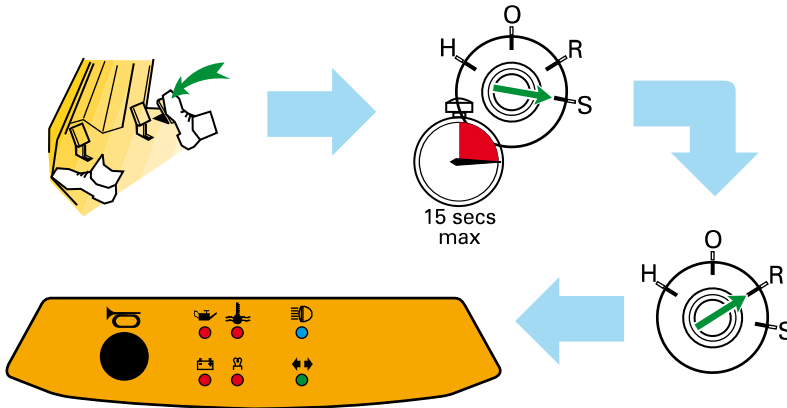
Complete checks in section



before starting the engine

2 How to START and STOP the engine

Thwaites



To start the engine

- Depress clutch pedal
- Cold start aid (when required)-

Turn key to position 'H'. When panel light extinguishes start engine (as above).

Depress accelerator pedal fully and turn the key clockwise to the start position 'S'.

All panel lights self-test (illuminate) and should extinguish on start-up.

- Allow the engine to turn for a maximum of 15 seconds.

If the engine does not start within 15 seconds, return key to position 'O' and wait 30 seconds before turning to 'S' again.

- When the engine fires, release key.
(Springs back to 'Run' position 'R').
- Reduce accelerator pedal pressure to prevent over revving.

To stop the engine

- Turn key to position 'O'.



WARNING

DO NOT START THE ENGINE UNLESS SEATED IN THE DRIVING POSITION.

CAUTION

If a panel light remains on switch off engine (key to 'O') and investigate the problem.

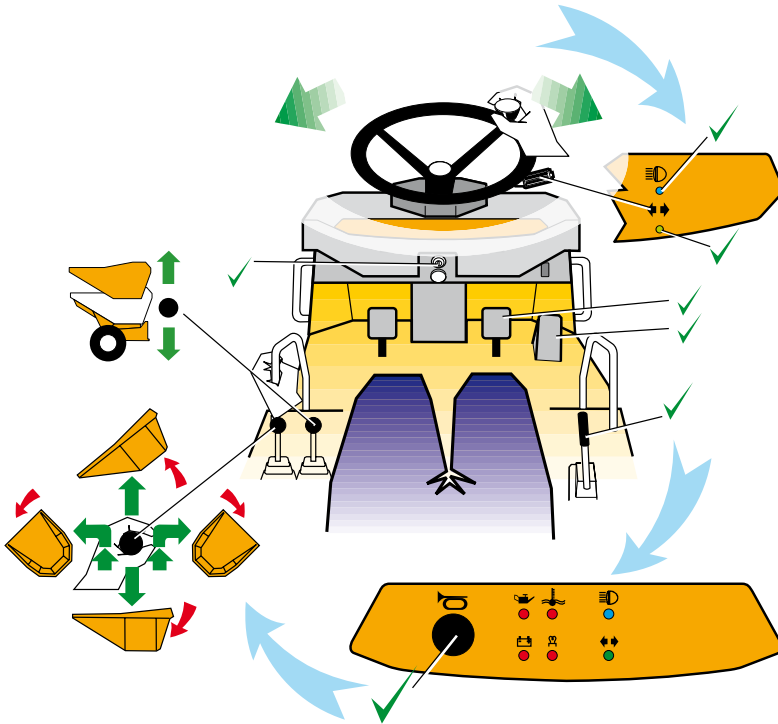
CAUTION

- Do not use unauthorised starting aids
- Do not tow or bump start

Complete checks in section  before loading the machine

2 Preliminary checks

Thwaites



Function checks - engine ON

Brakes

- Does the foot brake pedal feel firm?
- Hand brake – carry out hand brake test (*described on next page*).

Steering

- Rotate steering wheel clockwise and anti-clockwise

Electrics

- Does the horn sound correctly?
- Does the reverse alarm sound correctly? (optional).
- Is the beacon flashing?
- Are the lamps working correctly? (optional) –
 - * Side
 - * Main
 - * Stop
 - * Indicators
 - * Hazards

Tip-skip lever/Rotate-skip lever

- Discharge/park skip
- Rotate - right to left/left to right. (powerswivel and Hi-Swivel models).

Raise-skip lever

- Raise/lower skip. (Hi-Swivel model only)



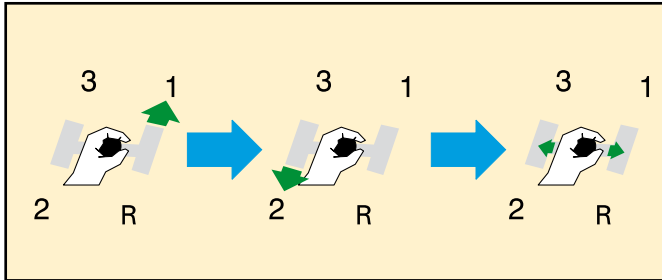
Complete checks in section



before loading the machine

2 How to test the hand brake

Thwaites



WARNING

- Before testing handbrake, ensure that the machine is on firm, level ground and that the area is clear of people.
- Do not operate a machine that has failed the handbrake test.
- The handbrake must not be over-tightened, as this may cause damage to the axle.

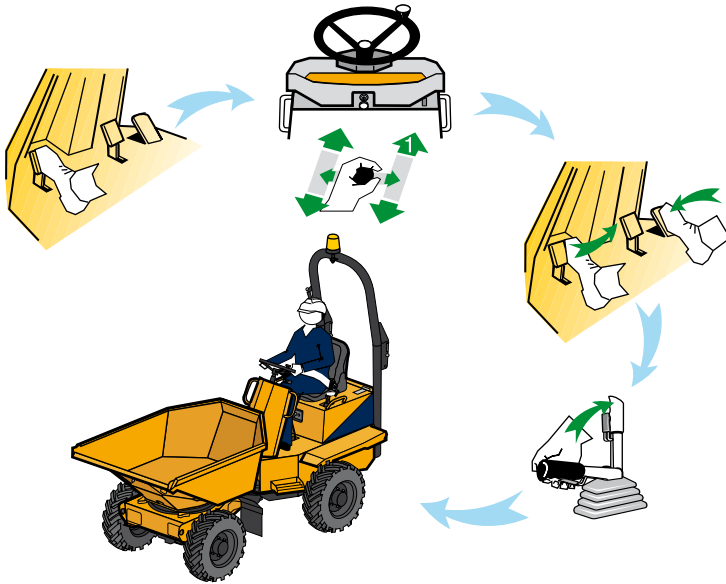
If any of the following tests result in failure, consult the service book for instructions for hand brake adjustment.

- 1 Start engine.
- 2 With the handbrake applied, engage first gear and release clutch slowly, with engine revs at tick-over; the machine should move forward.
- 3 Release throttle and apply clutch and footbrake.
- 4 With the handbrake applied, engage second gear and release clutch slowly, with full engine revs; the machine should stall.
- 5 If the machine moves forward, release throttle and apply clutch and footbrake.
- 6 Select Neutral
- 7 Switch engine off.

Complete checks in section  before loading the machine

2 Driving procedure and safe parking

Thwaites



Moving from rest and stopping

- Depress clutch pedal
- Select first gear
- Slowly depress accelerator pedal, release clutch pedal and hand brake lever and move slowly
- Hold steering wheel with both hands
- Remove foot from accelerator pedal
- Brake gently to a halt, using foot brake pedal, and press clutch pedal to prevent stalling
- Apply hand brake and select neutral

Changing speed/direction

- Release accelerator pedal
- Depress clutch pedal
- Select an alternative gear
- Release clutch pedal and press accelerator pedal
- Before changing direction (forward/reverse), stop the machine and engage the hand brake

After operating – park safely

- Always leave skip empty when not in use
- Ensure machine is on firm level ground
- Apply hand brake
- Engage neutral
- Hydraulic system at rest in a safe condition
- Stop engine and remove key
- Lock engine cover

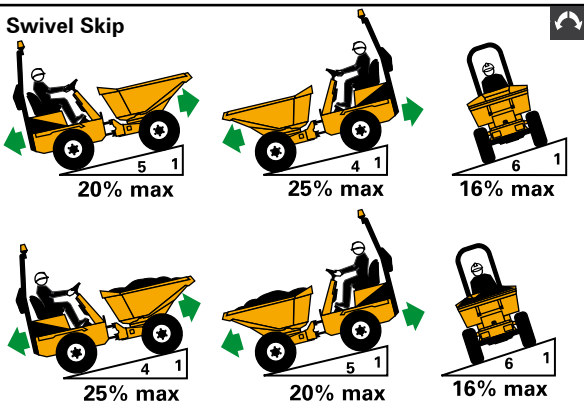
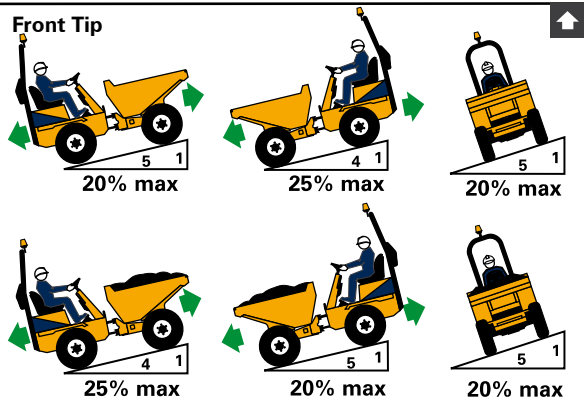


CAUTION

- Novice operators should always start with forward motion on clear, level ground.
- A low gear should always be selected when a driver is unfamiliar with machine type.

 2

Complete checks in section  before loading the machine

3**DANGER****IMMEDIATE HAZARDS WHICH WILL RESULT IN SEVERE PERSONAL INJURY OR DEATH****Thwaites****Swivel Skip****Front Tip****WORKING ON GRADIENTS**

DO NOT exceed maximum stated gradients



DO NOT turn across gradients



DO NOT brake suddenly in wet, muddy, icy conditions or when operating on loose surfaces



DO NOT run downhill with controls in neutral

DO NOT operate lift mechanism on sloping ground
(Hi-Swivel model only)

Check indicator



Travel straight up, down or along a gradient



Keep speed to a minimum and use the foot brake to reduce speed when travelling down gradients

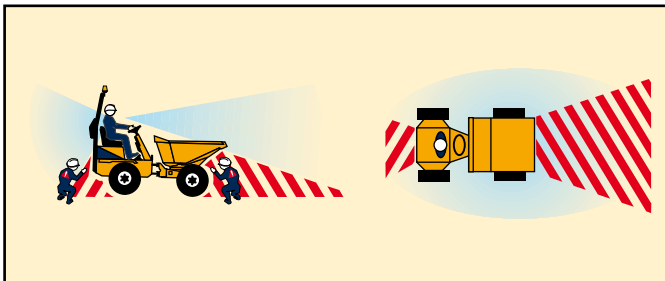


To prevent movement always engage parking brake when stopped on sloping ground. Chock wheels securely when leaving the machine unattended



Always position swivel skip in central lock (powerswivel and hi swivel models)

*Attention! Section 3 correct and incorrect working practices*

3**DANGER****IMMEDIATE HAZARDS WHICH WILL RESULT IN SEVERE PERSONAL INJURY OR DEATH****Thwaites****VISIBILITY**

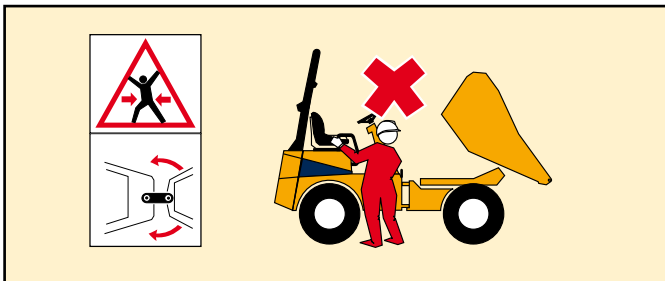
Check ahead and behind machine before operation



Be aware of low-visibility areas when operating



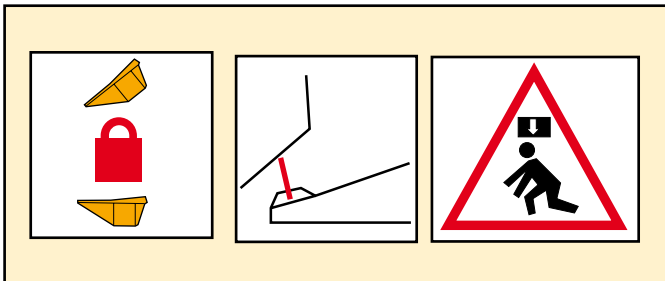
Before operating, sound the horn to warn people in the immediate area

**CRUSH ZONE**

Stay clear of articulation area when the engine is running



Never operate the machine's controls when standing on either side of machine

**WORKING UNDER A RAISED SKIP**

Lock skip safety prop during maintenance



Never work under an unpropped skip



When using skip safety prop engage tipping lever lock (if fitted)

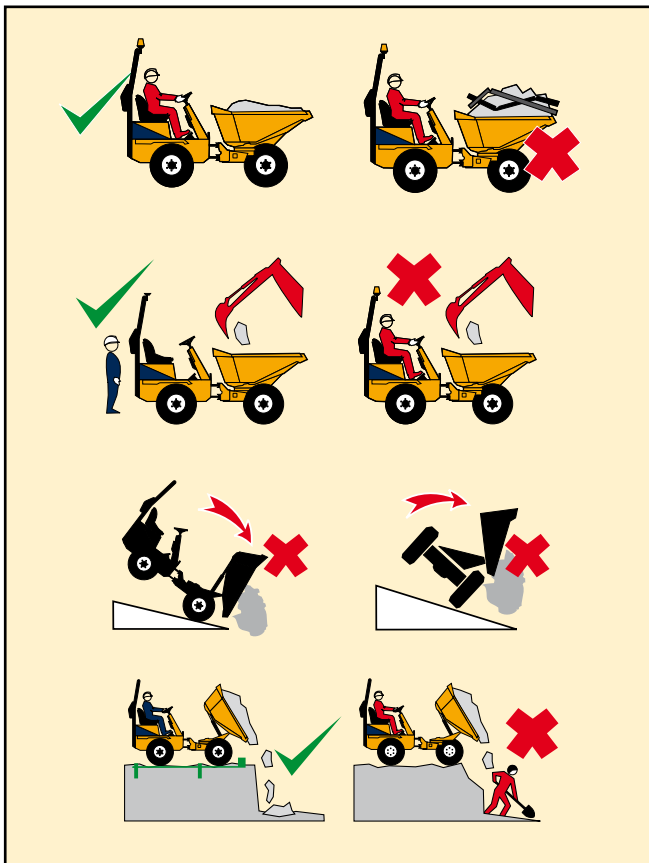
3*Attention! Section 3 correct and incorrect working practices*

3**WARNING****HAZARDS OR UNSAFE PRACTICES WHICH COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH****Thwaites****LOADING THE MACHINE****DO NOT** exceed the machine's rated capacityEnsure **SAFE, STABLE, LOW** load which allows good visibility

Reduce payload if materials being carried are not free flowing

Activate the hand brake, set drive to neutral, turn the engine off, disembark the machine, and stand clear.

Clear debris from controls

UNLOADING THE MACHINEUse **STOPBOARDS** and **SUPPORT** walls on trenches**DO NOT** tip skip if load is sticking**DO NOT** discharge load when working on sloping ground**3***Attention! Section 3 correct and incorrect working practices*

3

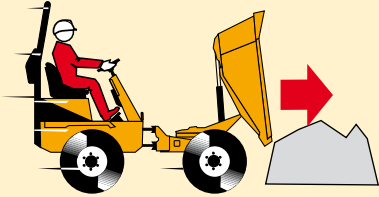


WARNING

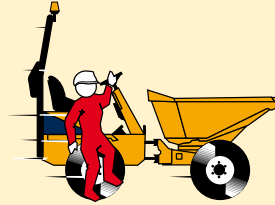
HAZARDS OR UNSAFE PRACTICES WHICH COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH

Thwaites

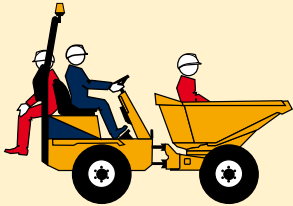
DRIVING



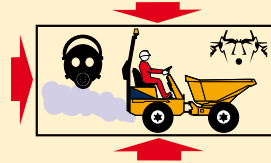
DO NOT drive with the skip tipped (bulldozing)



NEVER dismount from a moving machine



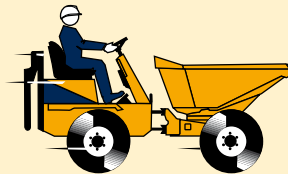
DO NOT carry passengers



Avoid confined work areas - exhaust fumes and noise can be a hazard



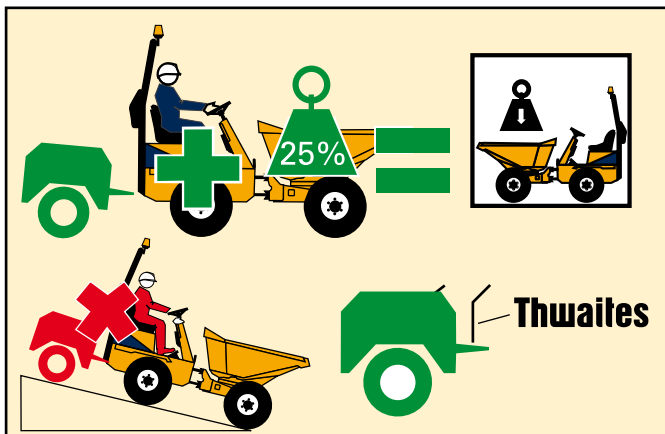
Site hazards to avoid: adverse weather conditions; icy surfaces; people



DO NOT operate with the ROPS frame folded



Attention! Section 3 correct and incorrect working practices

3**WARNING****HAZARDS OR UNSAFE PRACTICES WHICH COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH****Thwaites****TOWING A TRAILER**

Place ballast load in skip. This load should be a minimum of 25% of the machine's rated payload

The gross weight to be towed plus the ballast load **MUST NOT** exceed rated payload of machine**DO NOT** exceed maximum tow bar pull or vertical load

Towing must not be carried out on sloping ground



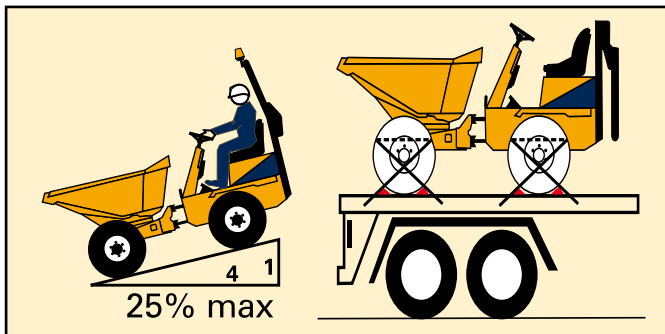
Always use a Thwaites-approved towing pin

**TRANSPORTATION**

Reverse machine slowly onto a suitable trailer

**DO NOT** drive the machine forwards when loading

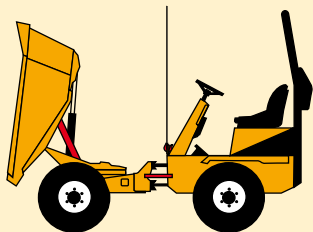
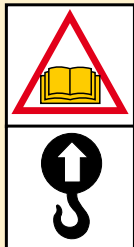
- 1 Apply parking brake
- 2 Stop engine
- 3 Chock wheels *(to prevent movement)*
- 4 Engage chassis locking bar
- 5 Secure to trailer
- 6 Ensure legal load *(height/weight)*



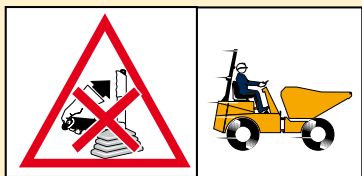
Attention! Section

3

correct and incorrect working practices

3**CAUTION**HAZARDS OR UNSAFE PRACTICES WHICH **COULD** RESULT IN MINOR PERSONAL INJURY OR PRODUCT OR PROPERTY DAMAGE**Thwaites****LIFTING (USING A CRANE)**

- Tip skip fully forward
- Engage skip safety prop
- Engage chassis locking bar
- Lift using centre eye provided

**HAND BRAKE****DO NOT** apply hand brake if machine is moving (except in an emergency)**SLOPING SURFACES****DO NOT** step on the rear mudguards' sloping surfaces**SCISSOR LIFT**

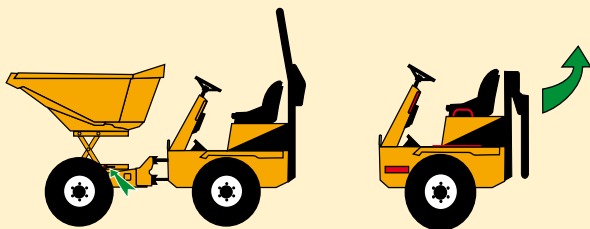
Insert locking pin when working beneath skip

**HINGED ROPS**

Use grab handles, tread grips (if fitted) and steps when standing on the machine to lower the ROPS frame.



Avoid wet surfaces.









Attention! Section



correct and incorrect working practices

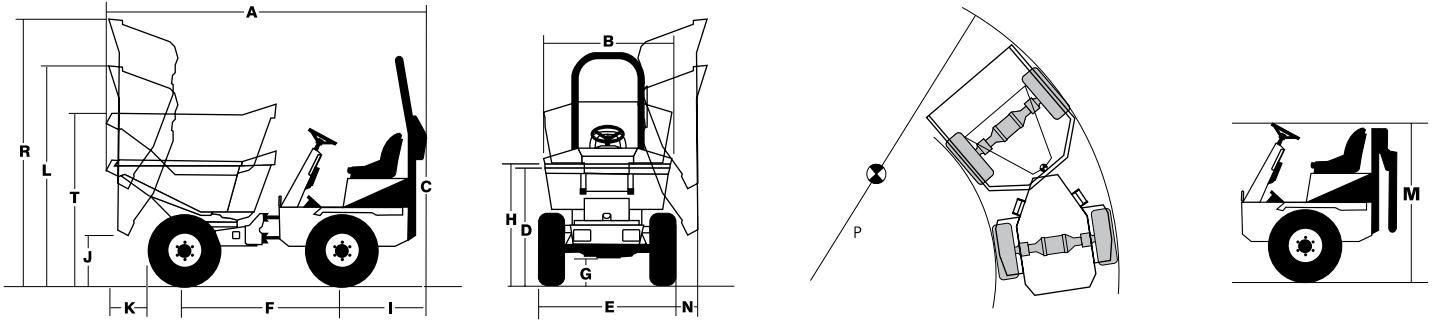
4 Troubleshooting



| Problem | Reason | Solution |
|---|--|--|
| Engine will not start | Isolator switch OFF FNR lever not in neutral Battery voltage too low Faulty fuel supply Electrical stop on fuel pump defective Circuit breaker tripped | Switch on Shift FNR lever to a neutral position Check battery and connections Check fuel level and connections Check connections Rectify electrical fault and reset (push to reset) |
| Complete loss of electrical functions | Maxi fuse blown | Rectify electrical fault and replace fuse |
| Starter motor will not operate | Faulty battery | Replace |
| Maxi fuse blown | Faulty starter motor/solenoid (Current drawn by solenoid exceeds 25A) Short circuit on main feed or starter solenoid cables | Replace starter motor/solenoid and maxi fuse (only replace with a 30 amp fuse) locate and repair |
| Engine stops soon after start-up | Blocked fuel or air filter Air in fuel system | Replace fuel or air filter Check fuel line connections |
| Black engine smoke | Air filter clogged (air filter indicator is red) Fuel system defect Wrong fuel | Replace or clean air filter Contact Thwaites dealer Replace fuel and filter |
|  ● Engine oil pressure  ● High engine temperature  ● Irregular alternator  ● Transmission oil temperature  ● Transmission oil pressure  ● Low brake oil Warning buzzer sounds | Low oil level Radiator choked Low coolant level Defective or loose alternator belt Oil cooler choked Over/under filled with oil Low transmission fluid level Check oil level/leaks Hand brake ON | Top up engine oil Clean radiator Top up coolant Adjust, or, if necessary, replace alternator belt Clean oil cooler Correct oil level Top up transmission fluid Top up brake oil Release hand brake |

Always check panel warning lights, tripped circuit breakers or blown maxi fuse

4 Powerswivel and Hi swivel – data chart

Thwaites

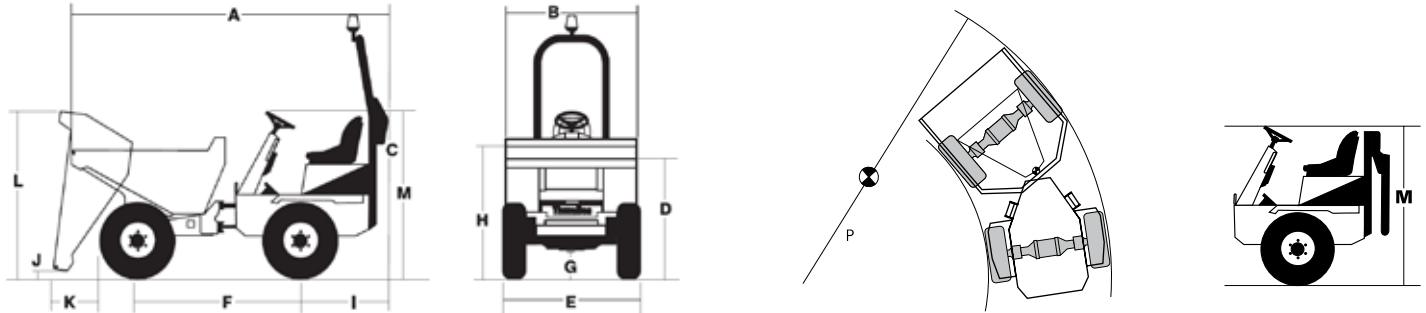


| Dimensions (mm) | 3T | 2T | 2T | Weight (Kg) | 3T | 2T | 2T | Noise |
|--|------|------|------|--|---------|---------|---------|---|
| A. Length | 3935 | 3735 | 3740 | Unladen | | | | Airborne (10m)  |
| B. Width | 1650 | 1475 | 1475 | Front axle | 780 | 700 | 920 | |
| C. Height (ROPS & Beacon) | 3092 | 3037 | 3037 | Rear axle | 1300 | 1240 | 1280 | Operator  |
| D. Skip lip height | 1440 | 1340 | 1463 | Total | 2080 | 1940 | 2200 | |
| E. Width over tyres | 1650 | 1467 | 1467 | Rated payload (including driver at 80 kg) | | | | |
| F. Wheelbase | 1950 | 1850 | 1850 | Laden | 3000 | 2000 | 2000 | |
| G. Ground clearance | 330 | 275 | 275 | Front axle | 3530 | 2510 | 2760 | |
| H. Skip load height | 1565 | 1400 | 1520 | Rear axle | 1630 | 1510 | 1520 | |
| I. Axle to rear | 1032 | 1032 | 1032 | Total | 5160 | 3960 | 4280 | |
| J. Tipping ground clearance | 735 | 712 | 1220 | Towbar (Max) | | | | |
| K. Tipping tyre clearance | 510 | 430 | 422 | Pull load | 2250 | 1500 | 1500 | |
| L. Height tipped (skip) | 2825 | 2655 | 3136 | Vertical load | 375 | 375 | 375 | |
| M. Height (ROPS folded) | 1965 | 1910 | 1910 | Tyre Pressure | | | | |
| N. Tipping side clearance | 364 | 268 | 316 | Bar (psi) Front | 3.6(52) | 3.5(51) | 3.5(51) | |
| P. Tyre clearance diameter (m) | 9.2 | 7.5 | 7.5 | Rear | 2.0(29) | 2.3(33) | 2.3(33) | |
| R. Max height tipped (raised skip) | | | 3626 | | | | | |
| T. Skip lip height (raised skip) | | | 1955 | | | | | |

Typical vibration levels - whole body 0.7 - 0.8 m/s². Hand/arm less than 2.5 m/s².

4 Forward tip – data chart

Thwaites

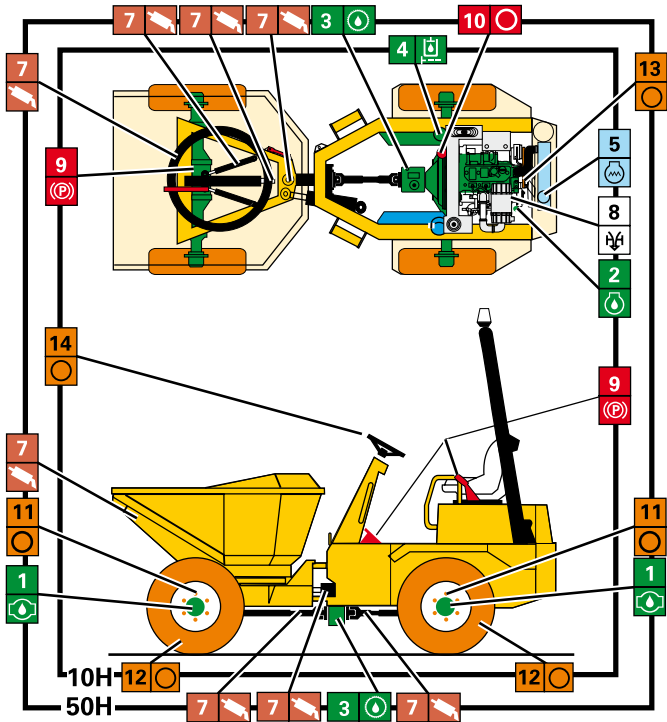


| Dimensions (mm) | 3T | 2T | Weight (Kg) | 3T | 2T | Noise |
|--------------------------------------|------|------|--|---------|----------|------------------------------------|
| A. Length | 3774 | 3595 | Unladen | | | Airborne (10m) Operator |
| B. Width | 1650 | 1475 | Front axle | 630 | 580 | |
| C. Height (ROPS & Beacon) | 3092 | 3037 | Rear axle | 1300 | 1240 | |
| D. Bucket lip height | 1365 | 1330 | Total | 1930 | 1820 | |
| E. Width over tyres | 1650 | 1467 | Rated payload (including driver at 80 kg) | | | |
| F. Wheelbase | 1950 | 1850 | Laden | 3000 | 2000 | |
| G. Ground clearance | 330 | 275 | Front axle | 3380 | 2290 | |
| H. Skip load height | 1508 | 1415 | Rear axle | 1630 | 1610 | |
| I. Axle to rear | 1032 | 1032 | Total | 5010 | 3900 | |
| J. Tipping ground clearance | 305 | 262 | Towbar (Max) | | | |
| K. Tipping tyre clearance | 615 | 620 | Pull load | 2250 | 1500 | |
| L. Height tipped (skip) | 2115 | 1985 | Vertical load | 375 | 375 | |
| M. Height (ROPS folded) | 1965 | 1910 | Tyre Pressure | | | |
| P. Tyre clearance diameter (m) | 9.2 | 7.5 | Bar (psi) Front | 3.6(52) | 3.5 (51) | |
| | | | Rear | 2.0(29) | 2.3 (33) | |

Typical vibration levels - whole body 0.7 - 0.8 m/s². Hand/arm less than 2.5 m/s².

4 Daily/Weekly Checks

Thwaites



| | | | |
|--|---------------------------------|----|-----------------------------------|
| | AXLE OIL (hubs and centre case) | 1 | Tractelf SF3 |
| | ENGINE OIL | 2 | BP Vanellus C5 Global 15W 40 |
| | TRANSMISSION OIL | 3 | Energear Hypo 80W 90 |
| | HYDRAULIC OIL | 4 | Energol HLP HM32 |
| | COOLANT LEVEL | 5 | H ₂ O + 50% Antifreeze |
| | FUEL LEVEL | 6 | Diesel |
| | GREASE | 7 | Fill All Points |
| | AIR CLEANER | 8 | Check Indicator |
| | BRAKES | 9 | Test Park & Foot Brake |
| | BRAKE OIL | 10 | BP Bartran HV32 |
| | WHEEL NUTS | 11 | 330 Nm |
| | TYRE PRESSURE | 12 | See Data Chart |
| | FAN BELT | 13 | Condition/Tension |
| | STEERING WHEEL/COLUMN | 14 | Check condition |

This machine must be serviced after first 50 hours

Normal service intervals:

250 hours 500 hours 1000 hours 2000 hours

Contact local Thwaites distributor for details or www.thwaitesdumpers.co.uk