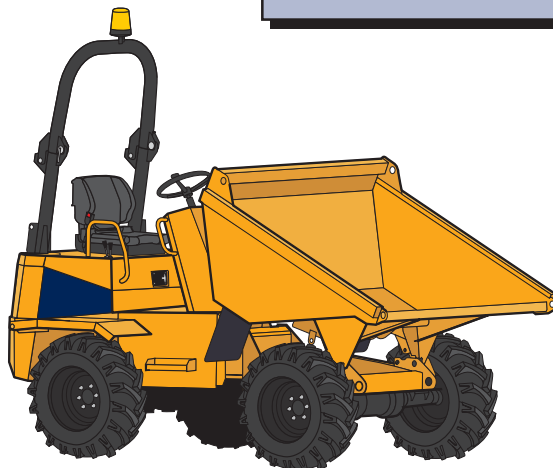


3 – 4 Tonne (Manual)

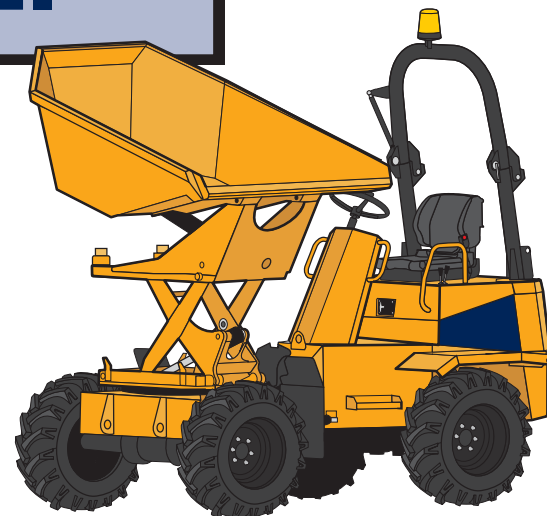
Thwaites

Mach 440, Mach 445, Mach 470,
Mach 473, Mach 479

Operator's Instruction Manual



Mach 470 - 3 Tonne Front Tip



Mach 479 - 3 Tonne Hi-Swivel



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!
- Be 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



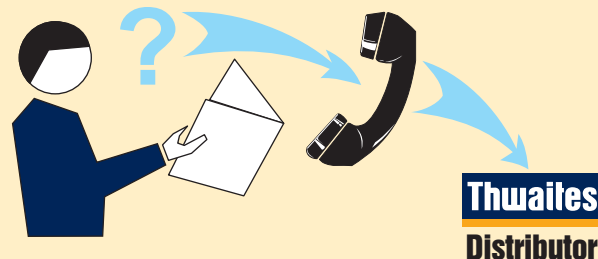
CAUTION

1 Before operating this machine

Thwaites



Read this manual



- 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

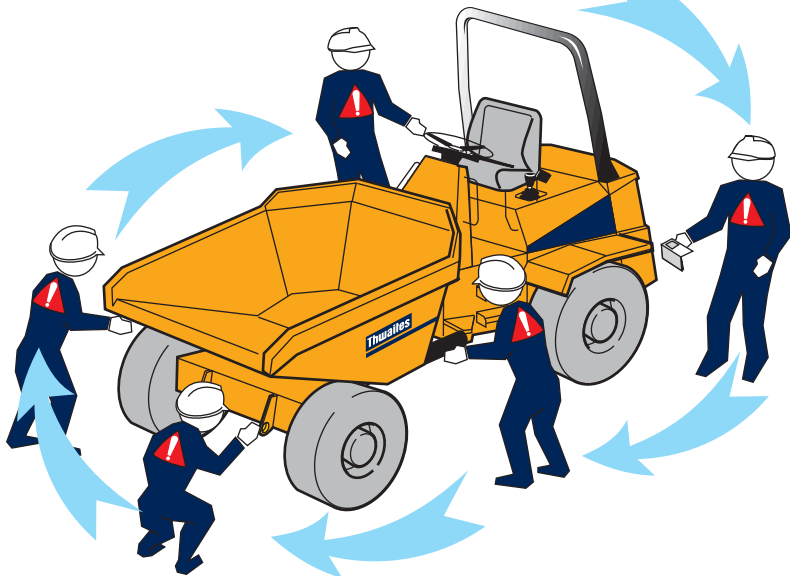


Before Starting The Engine

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 and hydraulic rams clean, and clear of 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 **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 the 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 a ROPS frame.

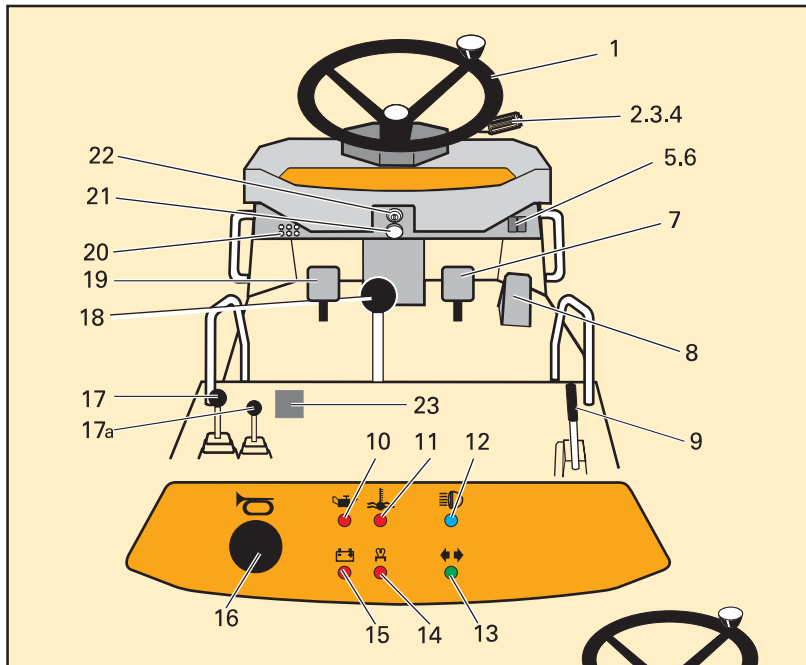
Complete Checks in Section



Before Starting The Engine

1 Layout of controls

Thwaites



Control locations & 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 Up = Flash. Down = main beam*
- 5 Hazard warning light switch*
- 6 Beacon switch*
- 7 Foot brake pedal
- 8 Throttle pedal
- 9 Hand brake lever
- 10 Engine oil pressure warning light
- 11 Water temperature warning light
- 12 Headlamp main beam pilot light*
- 13 Direction indicator pilot light*
- 14 Heat/start pilot light
- 15 Battery charging warning light
- 16 Horn push
- 17 Skip-tip lever (Front Tip model)
Skip-tip and rotate-skip lever (Powerswivel model)
- 17a Skip-raise lever (Hi-Swivel model only)
- 18 Gear lever
- 19 Clutch pedal
- 20 Circuit breakers (push to reset)
- 21 Ignition & hand brake warning buzzer
- 22 Ignition switch
- 23 Maxi fuse (under engine cover)

* Optional items

- | | |
|-----|--------------------------|
| CB1 | Fuel/direction solenoids |
| CB2 | Instrumentation/warning |
| CB3 | Lights* |
| CB4 | Flash* |
| CB5 | L/H sidelights* |
| CB6 | R/H Sidelights* |



Complete Checks in Section **1** Before Starting The Engine

1 Control functions - in depth

Thwaites

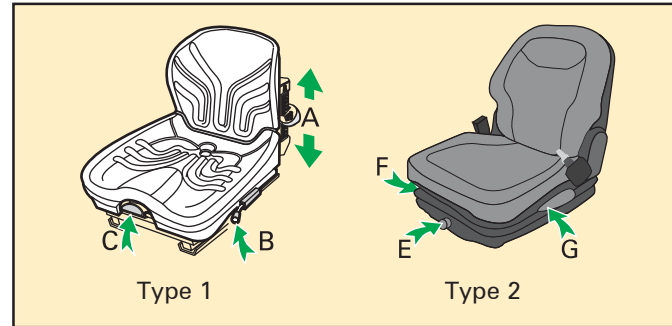
Seat adjustment

Type 1:

- A – Push down to set driver weight (seat empty)
Push fully down and release to reset (seat empty)
- B – Lift to slide seat assembly forwards/backwards
- C – Lift to slide cushion forward and set backrest


Type 2:

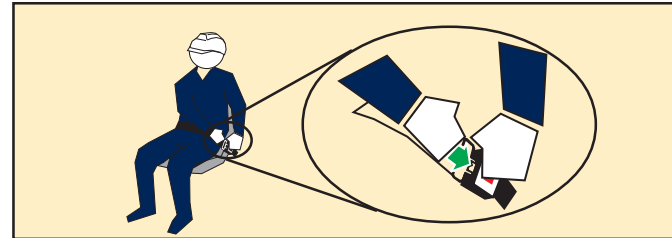
- E – Turn knob to set driver weight
- F – Lift to slide seat assembly forwards/backwards
- G – Lift handle to adjust backrest



Seatbelt (if fitted)

- 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 the hips and not the abdomen*



Throttle pedal - right foot

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

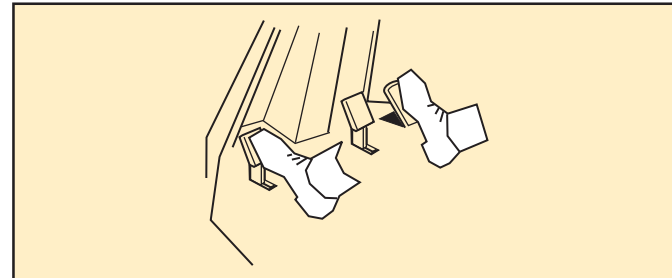
Foot brake pedal - right foot

- Push down on the pedal to slow/stop the machine

Clutch pedal - left foot

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

 *Start inhibitor fitted - press down clutch pedal before starting engine*



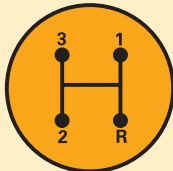
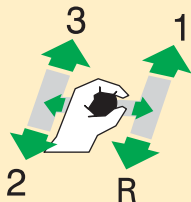
Complete Checks in Section

1

Before Starting The Engine

1 Control functions - in depth

Thwaites



Gear lever - left hand

Forward-left
Third Gear

Back-left
Second Gear

Neutral

Forward-right
First Gear

Back-right
Reverse

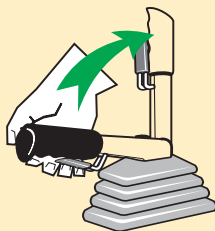
Hand brake lever - right hand

When the machine is stationary (or in an emergency):

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



An audible warning device is fitted to your machine. This will sound when the hand brake is engaged and the engine is running



Opening and closing the engine cover

- 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

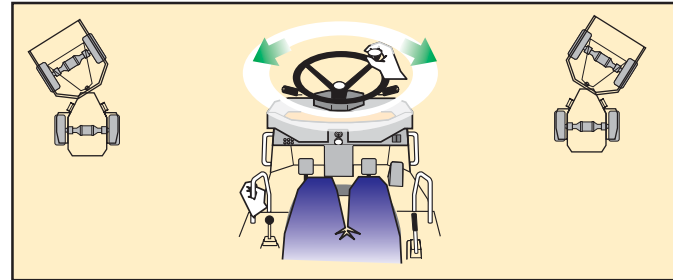
1 Control functions – in depth

Thwaites

Steering wheel – both hands

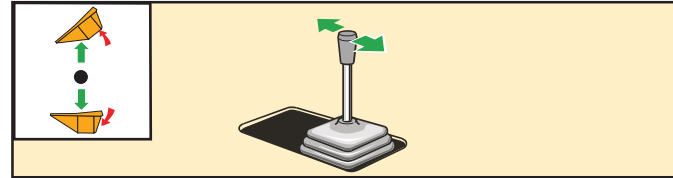
- Turn the wheel clockwise to turn machine right
- Turn the wheel anticlockwise to turn machine left

 *When using the spinner knob for low-speed single-handed steering ensure the non-steering hand is on the engine cover grabrail*





Skip-tip lever (Front tip and Powerswivel models) – left hand

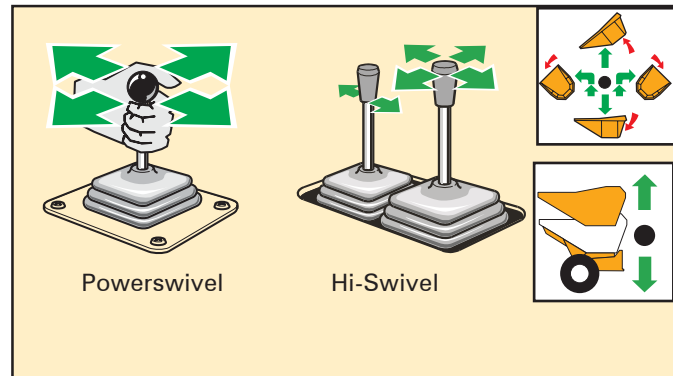
- Push forward to raise skip
- Push backwards to lower skip



Skip-rotate lever (Powerswivel and Hi-Swivel model) – left hand

- Tip skip 100 mm (4") to disengage pivot centring lock
-  *Rotate skip, fully lowered to centre to automatically engage centring lock.*
- Push lever to the right to rotate skip to right
- 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)*



Skip-raise lever (Hi-Swivel model) – left hand

- push forward to raise skip
- push backwards to lower skip

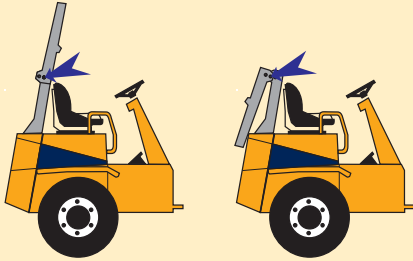
Complete Checks in Section

1

Before Starting The Engine

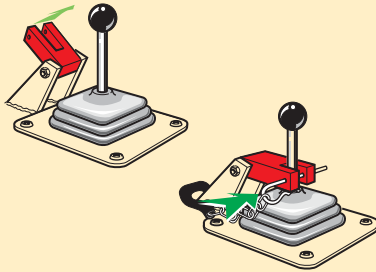
1 Control functions – in depth

Thwaites



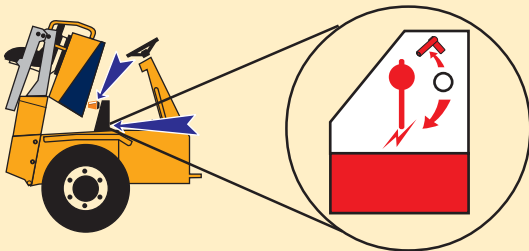
Lowering and raising the folding ROPS frame

- 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



Skip-tip lever lock (if fitted)

- Place yoke over tipping lever and secure with lynch pin to lock
- Fold back the yoke and secure using lynch pin when not in use



Beacon stowage

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

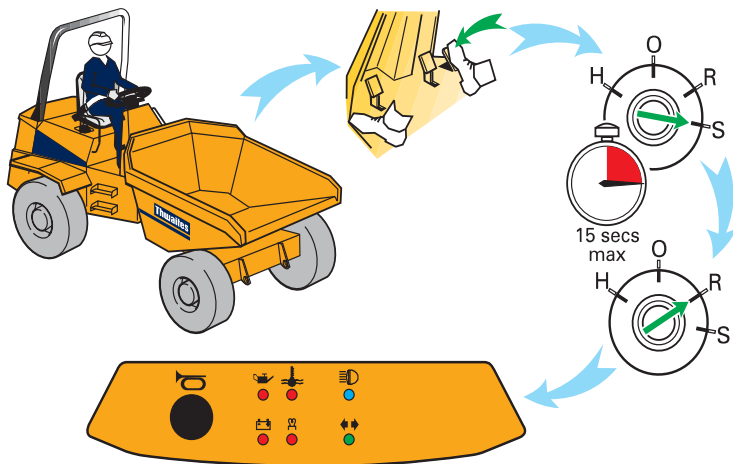
Battery isolator (beneath engine cover)

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

Complete Checks in Section **1** Before Starting The Engine

2 How to START and STOP the engine

Thwaites



CAUTION

- Do not use unauthorised starting aids
- Do not tow or bump start
- If a panel light remains on, switch off engine (key to 'O'), and investigate the problem

To start the engine

- Depress clutch pedal
(Start inhibitor fitted)
- 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 15 seconds max
If the engine does not start within 15 seconds return key to 'O' and wait 30 seconds. Turn to 'S' again
- When the engine fires, release key
(the key will automatically turn to 'Run' position 'R')
- Reduce accelerator pedal pressure to prevent over-revving
Cold Start Aid -
Turn key to position 'H'. When panel light extinguishes, start the engine (as above)

To stop the engine

- Turn key to position 'O'

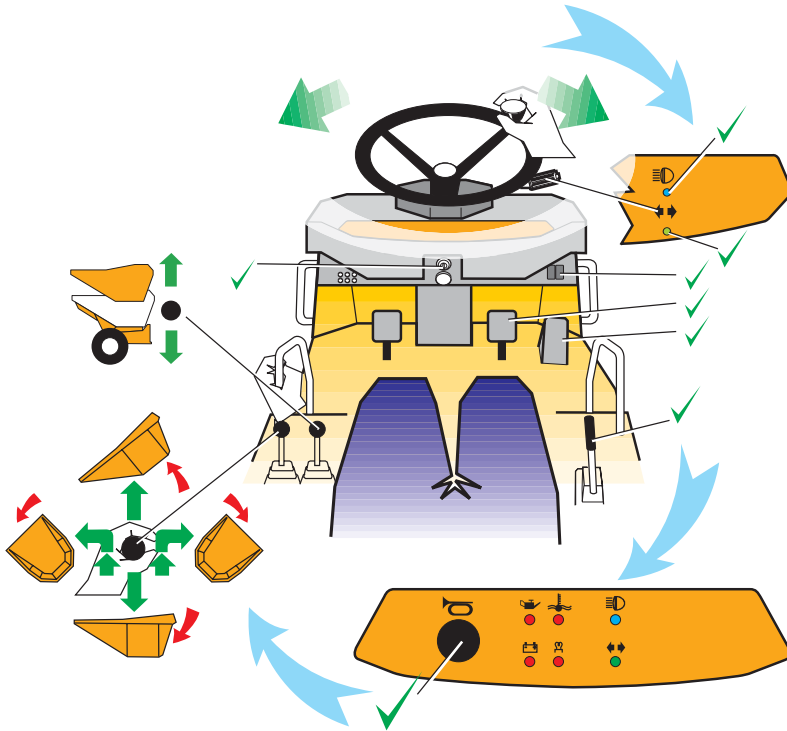
WARNING

Do not start the engine unless you are sitting in the driver's seat.

Complete Checks In Section **2** Before Loading The Machine

2 Preliminary checks

Thwaites



Function checks – engine ON

Brakes

- Does the foot brake pedal feel firm?
- Carry out hand brake test (*Described on next page*).

Steering

- Rotate steering clockwise and anti-clockwise

Electrics

- Does the horn sound?
- Does the reverse alarm sound? (Optional).
- Does the beacon flash?
- Do all the lights function correctly? (Optional):
 - * Side
 - * Main
 - * Stop
 - * Indicators
 - * Hazards

Skip-tip and skip-rotate lever

- Tip and return skip
- Rotate skip clockwise and anti-clockwise (Powerswivel and Hi-Swivel models).

Skip-raise lever (Hi-Swivel model)

- Raise and lower skip

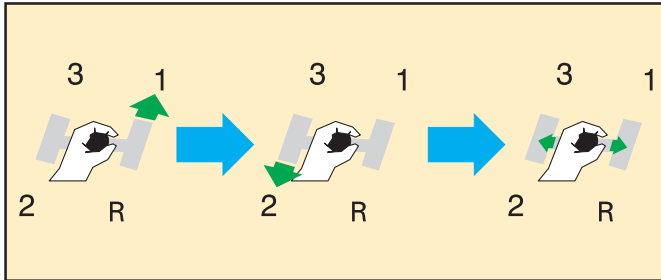
Complete Checks In Section



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.

Alternatively the handbrake can be checked by measuring the load required to apply the handbrake. The required force for applying the handbrake is a 12 kg pull (+/- 0.5 kg), measured from the end of the grip handle.

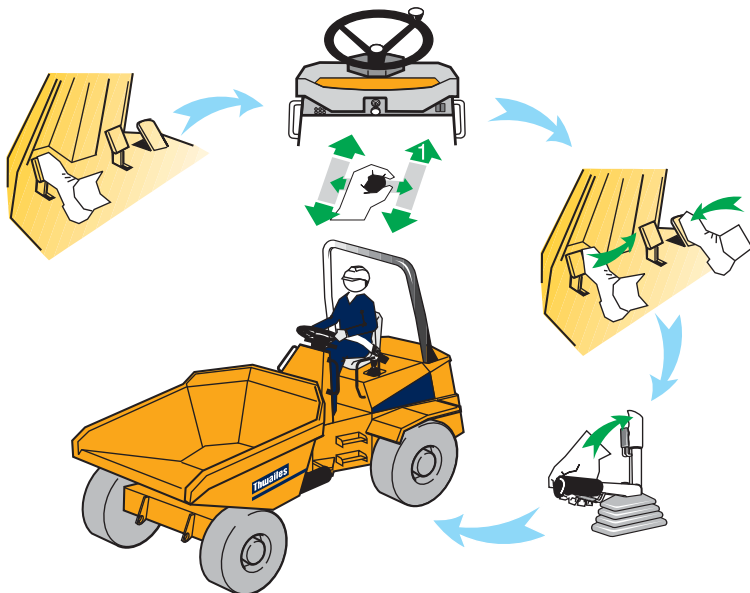
Complete Checks In Section



Before Loading The Machine

2 Driving procedure and safe parking

Thwaites



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.

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 when stationary

Changing speed/direction

- Release accelerator pedal
- Depress clutch pedal
- Select next gear
- Release clutch pedal and press accelerator pedal
- The machine must be stationary and the hand brake must be engaged before changing direction (forward/reverse).

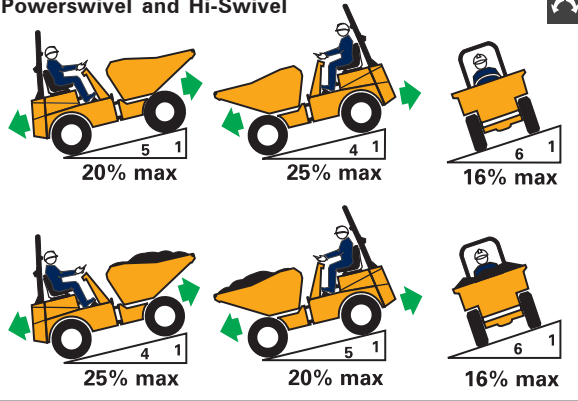
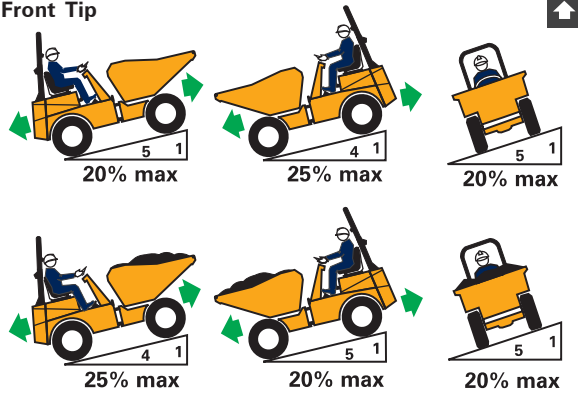
After operating – park safely

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

Complete Checks In Section



Before Loading The Machine

3**ANGER****IMMEDIATE HAZARDS WHICH WILL RESULT IN SEVERE PERSONAL INJURY OR DEATH****Thwaites****Powerswivel and Hi-Swivel****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 down hill with controls in neutral



DO NOT operate raise mechanism on sloping ground (Hi swivel model) - Check spirit-level 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



Always engage hand brake when stopped on sloping ground to prevent movement, and, in addition, chock wheels securely when leaving the machine unattended



Always position swivel skip in central lock

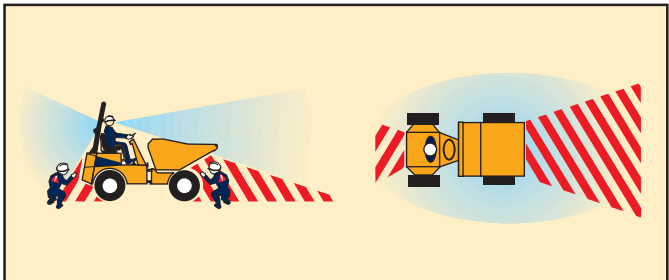
Attention! Section*Correct and Incorrect Working Practices*

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

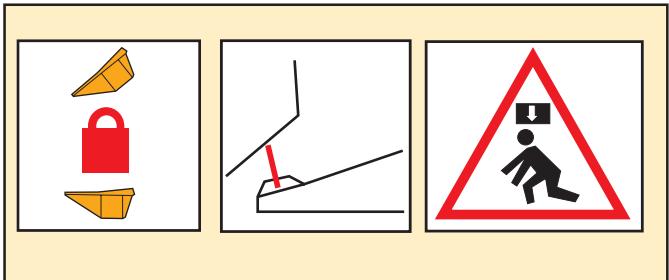


CRUSH ZONE

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 un-propped skip



When using skip safety prop engage skip-tip lever lock (*If fitted*)

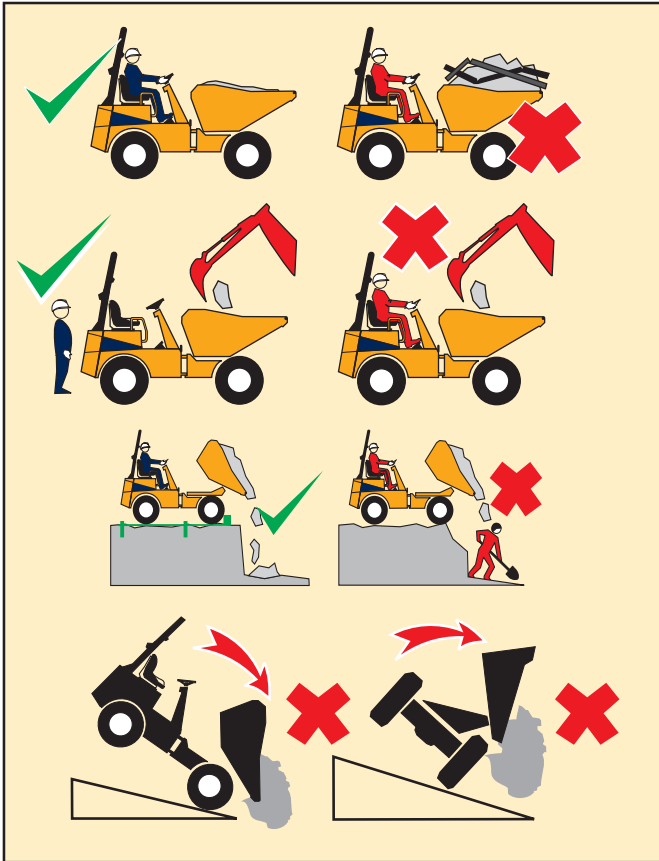
Attention! Section  **3** Correct and Incorrect Working Practices

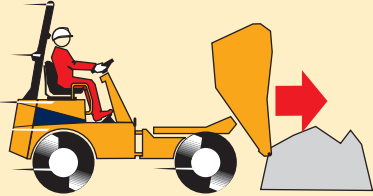
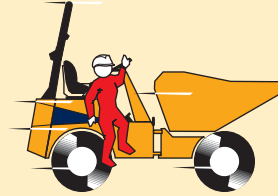
3**WARNING****HAZARDS OR UNSAFE PRACTICES WHICH COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH****Thwaites****LOADING THE MACHINE****DO NOT** exceed the machine's rated capacityApply hand brake, set transmission to **NEUTRAL**, turn engine **OFF**, disembark the machine and **STAND CLEAR**

Clear debris from controls

Ensure **SAFE STABLE LOW** load which allows good visibility

Reduce payload if materials being carried are not free flowing

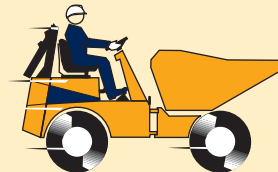
UNLOADING THE MACHINEUse **STOPBOARDS** and **SUPPORT** walls on trenches**DO NOT** tip skip if load is sticking**DO NOT** discharge load when working on sloping ground*Attention! Section***3***Correct and Incorrect Working Practices*

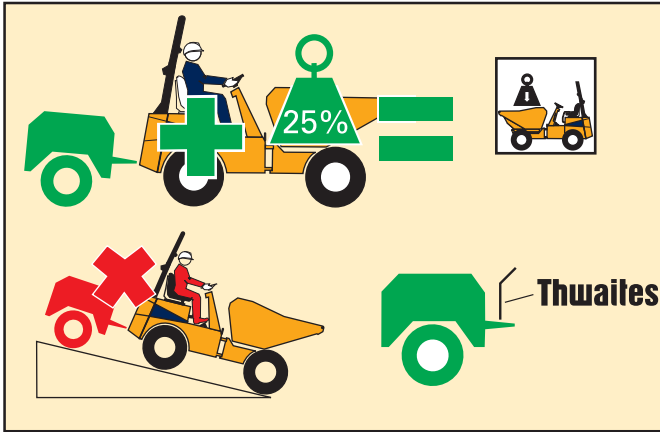
3**WARNING****HAZARDS OR UNSAFE PRACTICES WHICH COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH****Thwaites****DRIVING****DO NOT** drive with the skip tipped (bulldozing)**NEVER** dismount from a moving machine**DO NOT** carry passengers

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**Correct and Incorrect Working Practices*

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

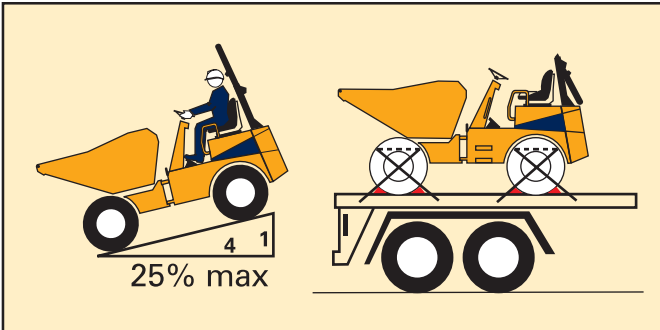
Place ballast load in skip. This load should be a minimum of 25% of the machine's rated payload.

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)

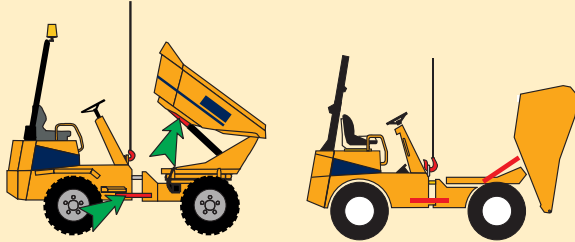
4 Engage chassis locking bar

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**

Hi-Swivel

Front Tip and Powerswivel

**USING A CRANE TO LIFT THE MACHINE**

Tip skip fully forward



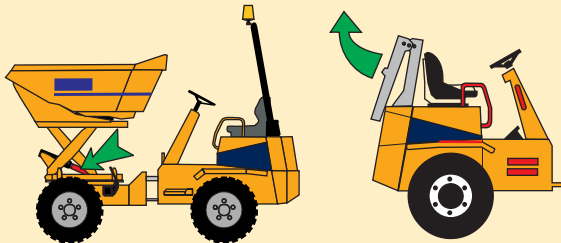
Place the locking channel over the tipping ram-rod, then reset the skip until it is impeded by the channel



Engage chassis locking bar



Lift using centre eye provided

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

In order to secure the skip in a raised position, place the locking channel over the lifting-ram rod

**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*

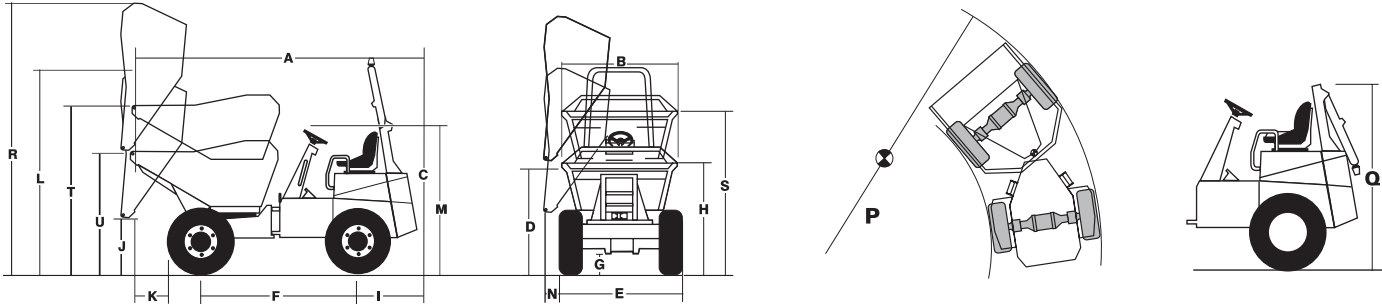
4 Troubleshooting


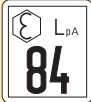
Problem	Reason	Solution
Engine will not start	Isolator switch is switched OFF Clutch Pedal not pressed Battery voltage too low Faulty fuel supply Electrical stop on fuel pump defective Circuit breaker tripped	Switch on the isolator switch Press Clutch Pedal Check battery and connections Check fuel level and connections Check connections Reset (Push to reset)
Complete loss of electrical functions	Maxi fuse blown	Rectify electrical fault and replace fuse
Maxi Fuse blown	Faulty starter motor/solenoid (Current drawn by solenoid exceeds 25A) Short circuit on main feed or starter solenoid cables	Replace 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 (Indicator 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	Low oil level Radiator choked. Low coolant level Defective or loose alternator belt	Top up engine oil Clean radiator Top up coolant Adjust, or, if necessary, replace alternator belt

Always investigate panel warning lights, tripped circuit breakers and a blown maxi fuse.

4 Data Chart – Powerswivel and Hi-Swivel

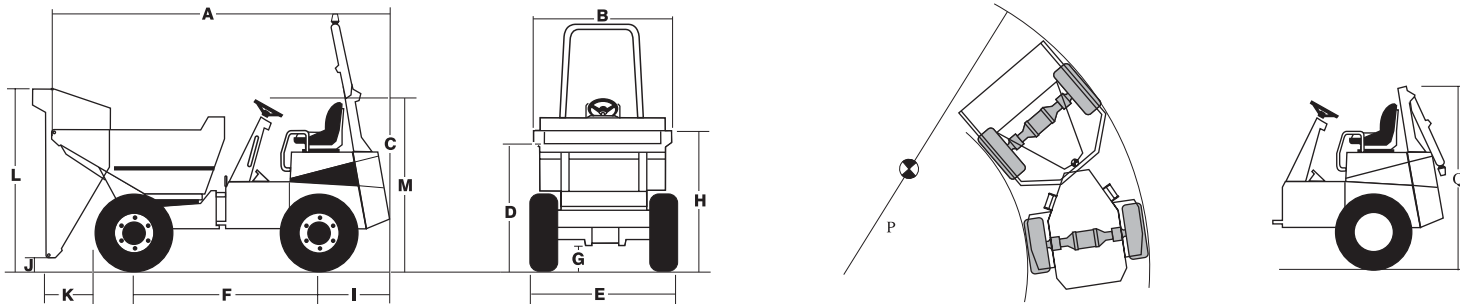
Thwaites





Dimensions (mm)	3T	4T	Hi-Sw	Weight (Kg)	3T	4T	Hi-Sw	Noise
A. Length	4010	4107	3972	Unladen				Airborne (10 m)
B. Width	1770	1859	1770	Front axle	880	990	1120	
C. Height (ROPS frame & Beacon)	3140	3213	3140	Rear axle	1530	1560	1590	
D. Skip lip height	1520	1595	1600	Total	2410	2550	2710	
E. Width over tyres	1750	1840	1750	Laden (including driver at 80 kg)				Operator
F. Wheelbase	1980	1980	1980	Rated payload	3000	4000	3000	
G. Ground clearance	250	310	280	Front axle	3580	4560	3820	
H. Skip load height	1600	1710	1650	Rear axle	1910	2070	1970	
I. Axle to rear	1130	1130	1130	Total	5490	6630	5790	
J. Tipping ground clearance	1110	1068	1260	Towbar (Max)				
K. Tipping tyre clearance	530	422	361	Pull load	2250	3000	2250	
L. Height tipped (Skip)	3290	3408	3440	Vertical load	580	800	580	
M. Max height without ROPS frame	2013	2040	2013	Tyre Pressure				
N. Tipping side clearance	190	220	220	Bar (psi) Front	3.4(49)	4.0(58)	4.2(61)	
P. Tyre clearance diameter (m)	8.2	8.4	8	Rear	2.0(29)	2.5(36)	2.2(32)	
Q. Height (ROPS frame folded)	2120	2180	2120					
R. Max height tipped (raised skip)			4030					
S. Skip load height (raised skip)			2240					
T. Skip lip height (raised skip)			2170					
U. Tipping ground clearance (raised skip)			1850					

4 Data Chart – Front Tip

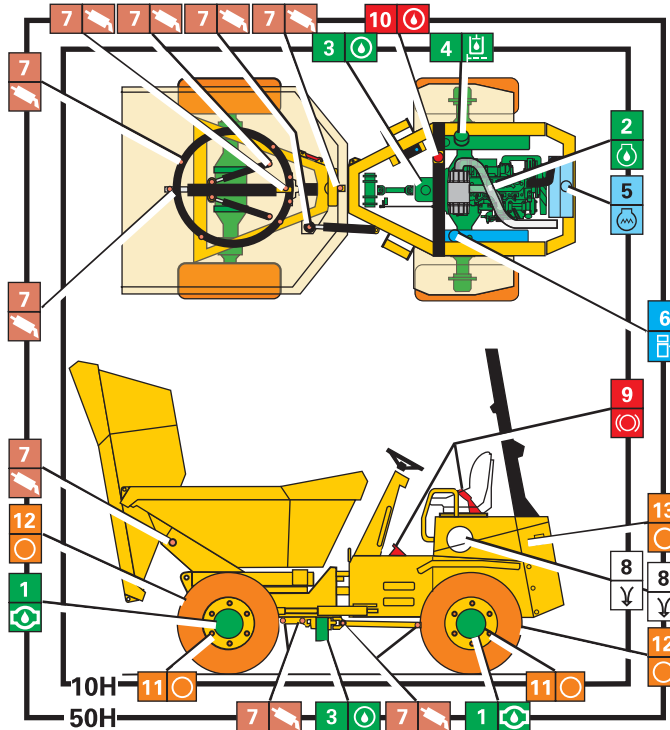
Thwaites



Dimensions (mm)	3T	4T	Weight (Kg)	3T	4T	Noise
A. Length	3848	3848	Unladen			Airborne (10 m)
B. Width	1930	1980	Front axle	690	740	
C. Height (ROPS frame & beacon)	3140	3213	Rear axle	1550	1590	
D. Skip lip height	1447	1467	Total	2240	2330	
E. Width over tyres	1750	1859	Laden (including driver at 80 kg)			Operator
F. Wheelbase	1980	1980	Rated payload	3000	4000	
G. Ground clearance	280	310	Front axle	3120	3980	
H. Skip load height	1470	1600	Rear axle	2200	2430	
I. Axle to rear	1130	1130	Total	5320	6410	
J. Tipping ground clearance	205	365	Towbar (Max)			
K. Tipping tyre clearance	620	596	Pull load	2250	3000	
L. Height tipped (skip)	2130	3408	Vertical load	580	800	
M. Max height without ROPS frame	2013	2040	Tyre Pressure			
P. Tyre clearance diameter (m)	0.93	0.95	Bar (psi) Front	3.4(50)	3.5(51)	
Q. Height (ROPS frame folded)	2120	2180	Rear	2.0(29)	3.0(44)	

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	BP Energear Hypo 80W 90
	HYDRAULIC OIL	4	BP 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 hand & foot brake
	BRAKE OIL	10	BP Bartran HV32
	WHEEL NUTS	11	330 Nm
	TYRE PRESSURE	12	See data chart
	FAN BELT	13	Check condition/tension

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

Note: failure to use Thwaites-approved lubricants may invalidate your warranty