2.0 - 3.0 Tonne (manual)

Thwaites

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

Tier 2: issue 3
T0545

Introduction

Thwaites

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

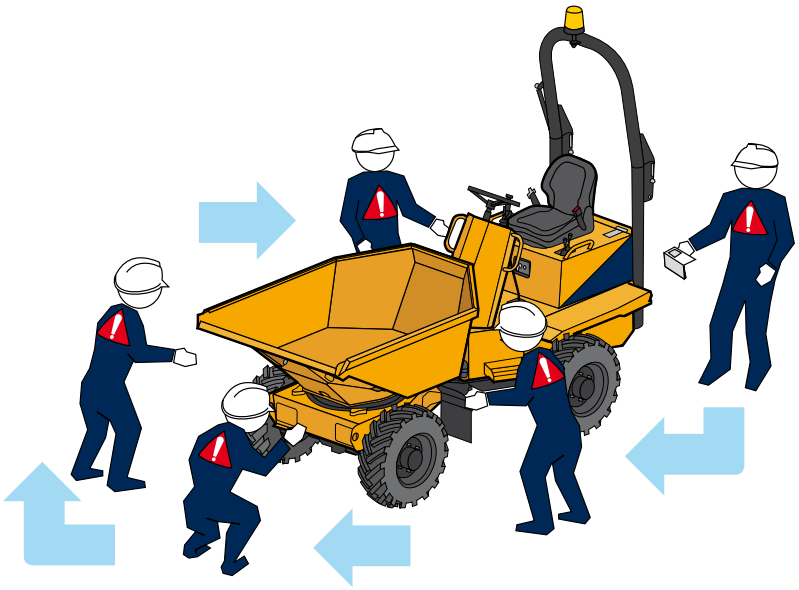
1 Contact your Thwaites dealer in case of further questions
2 Learn to operate this machine
3 Ensure you are fit to operate
4 Wear correct safety clothing and ensure safety equipment is available

Complete checks in section 1 *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)**

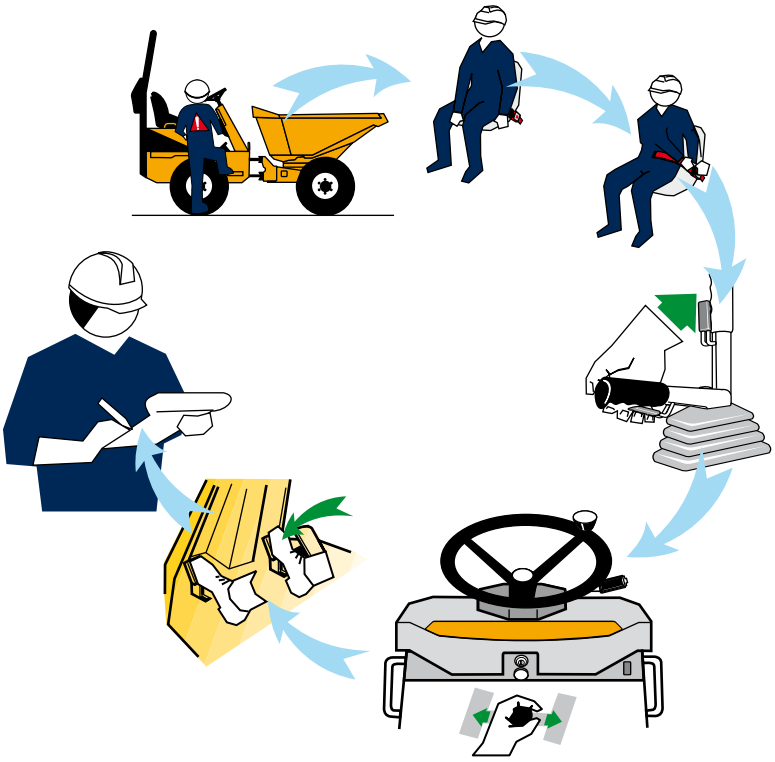
Report all faults immediately.

DO NOT OPERATE THE MACHINE UNTIL ALL FAULTS HAVE BEEN RECTIFIED

Complete checks in section 1 *before starting the engine*

1 Before operating this machine

Thwaites



Mount the machine and check the controls

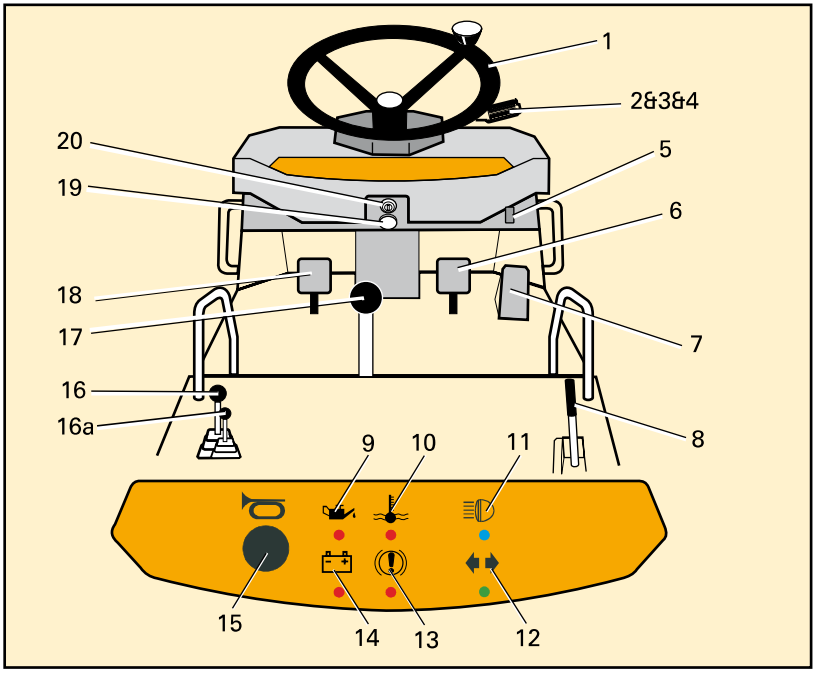
1. Use the grabrails and foot steps provided to manoevre into seating position. Face the machine at all times when mounting and dismounting
2. Is the engine cover secure and locked?
3. Adjust the seat position for comfort and easy access to controls
4. Fasten the seatbelt. Adjust accordingly for safety 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 1 *before starting the engine*

1 Layout of controls



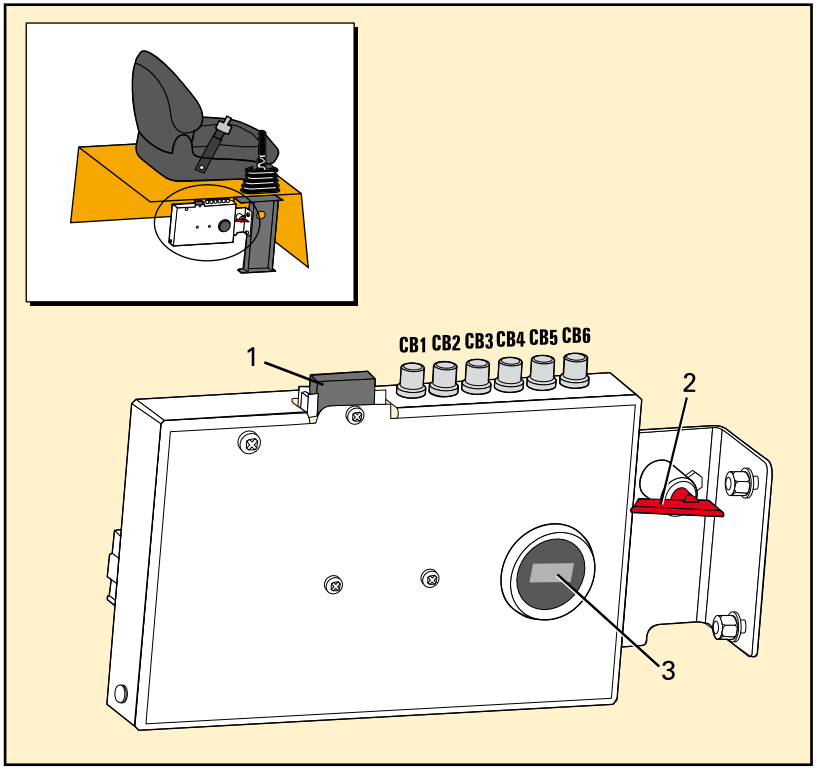
Control location & functions

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 1 *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*

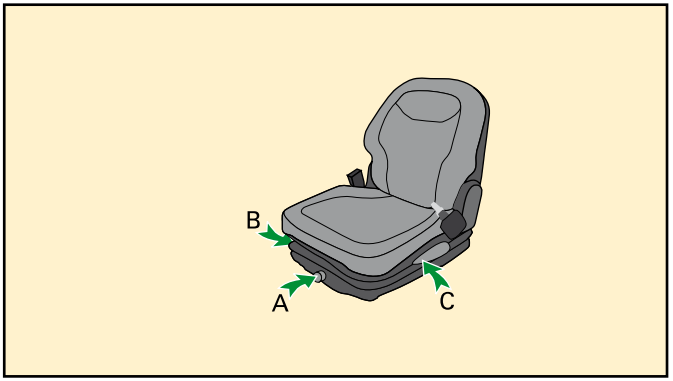
Complete checks in section 1 *before starting the engine*

1 Control functions – explained

Thwaites

Seat Adjustment

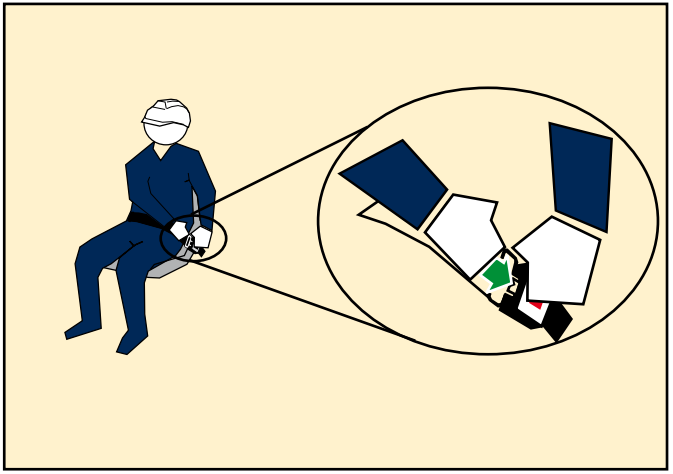
A – Turn knob to set driver weight
B – Lift to slide seat assembly forwards/backwards
C – Lift handle to adjust backrest



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



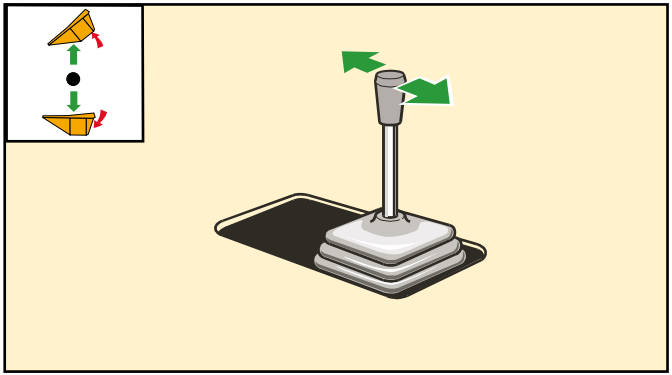
Complete checks in section 1 *before starting the engine*

1 Control functions – explained

Thwaites

Tip-skip lever (front tip models)

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



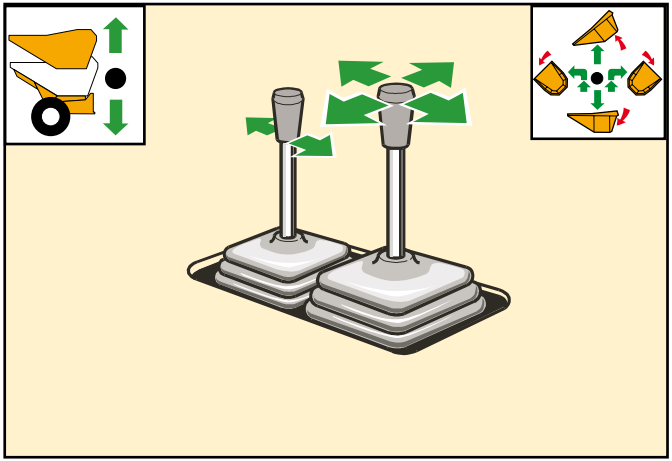
Rotate-skip lever (swivel models)

- 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).

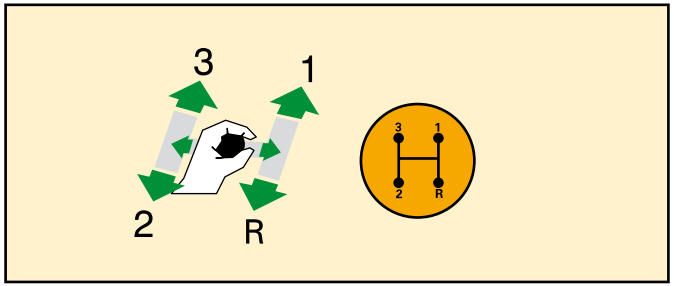


Raise-skip lever (Hi-Swivel model only)

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

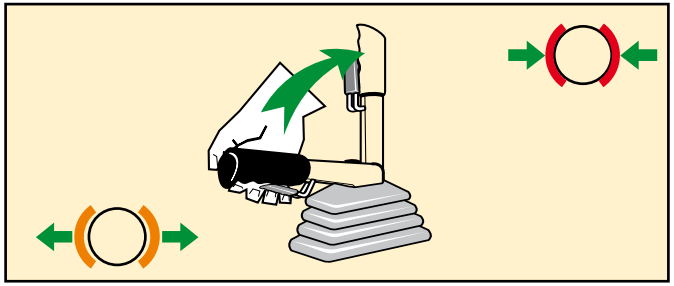
1 Control functions – explained

Thwaites



Gear lever – left hand

Forward-left Third gear		Forward-right First gear
	Neutral	
Back-left Second gear		Back-right Reverse

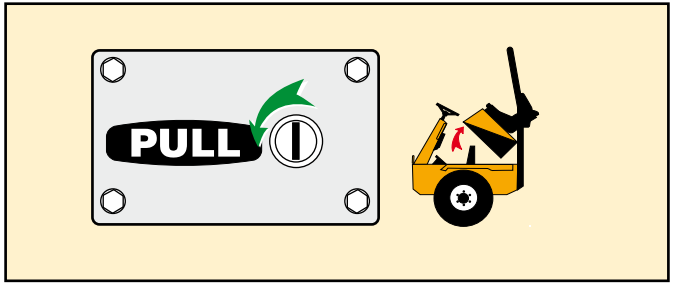


Hand brake lever – right hand

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 1 *before starting the engine*

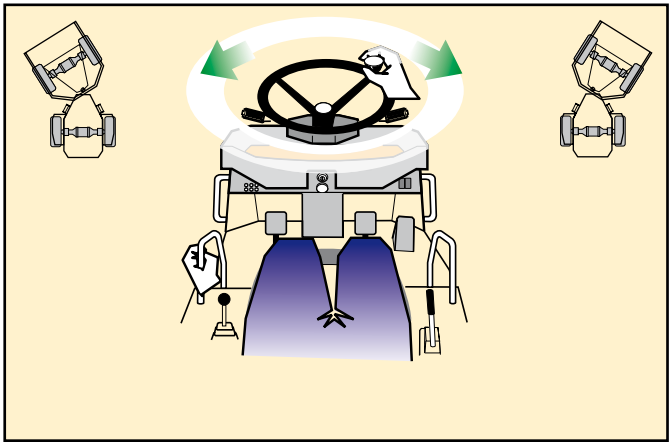
1 Control functions – explained

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

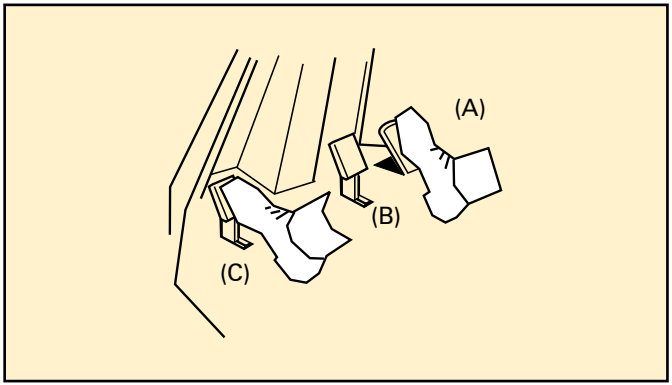
Foot brake pedal - right foot (B)

- 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

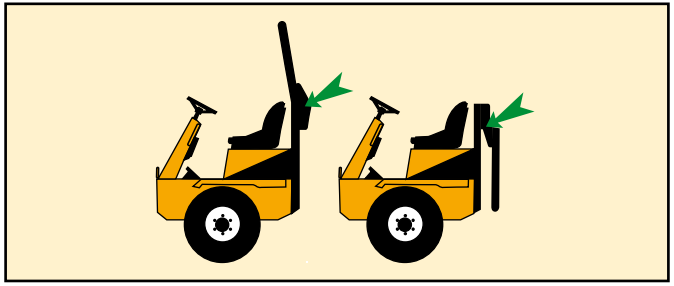
Start inhibitor fitted - press down clutch pedal before starting engine



Complete checks in section 1 *before starting the engine*

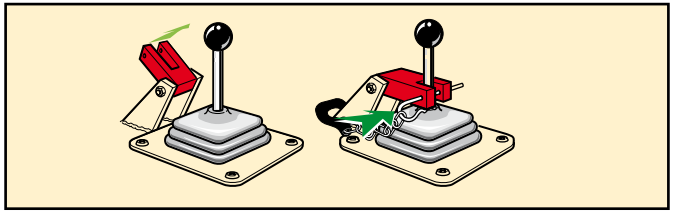
1 Control functions – explained

Thwaites



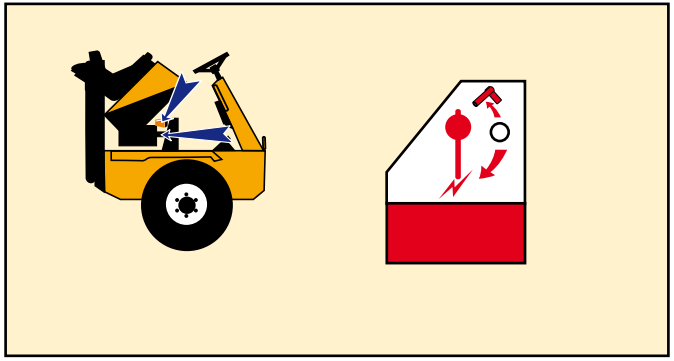
Lowering and raising the folding ROPS frame

- Remove linch pins and withdraw frame lock pins
- Lower frame and insert lock pins and linch 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 linch pin



Beacon stowage

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

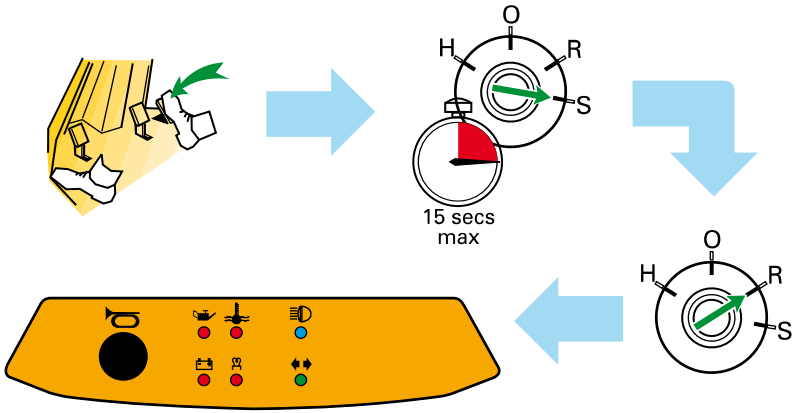
Battery isolator *(beneath engine cover)*

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

Complete checks in section 1 *before starting the engine*

2 How to START and STOP the engine

Thwaites



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.

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'**.

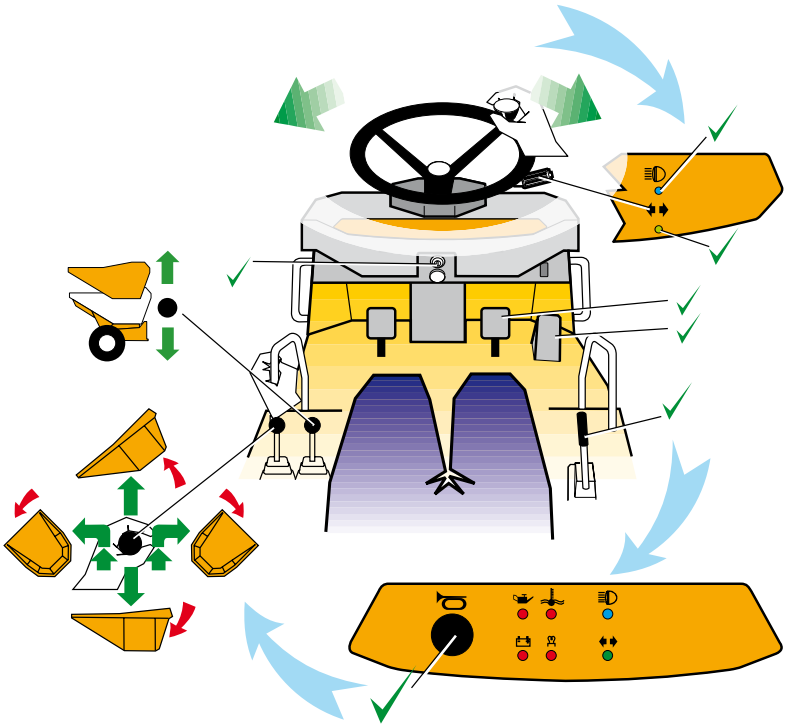
CAUTION

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

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?
- 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).

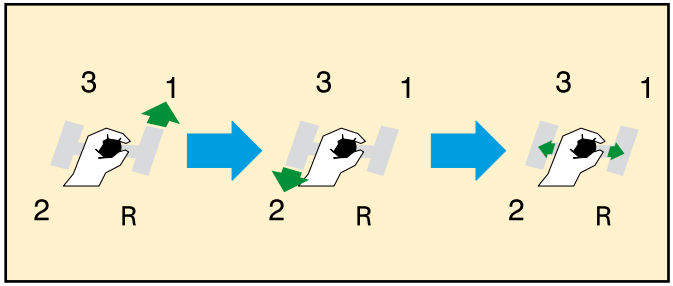
Raise-skip lever

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

Complete checks in section 2 *before loading the machine*

2 How to test the hand brake

Thwaites



WARNING

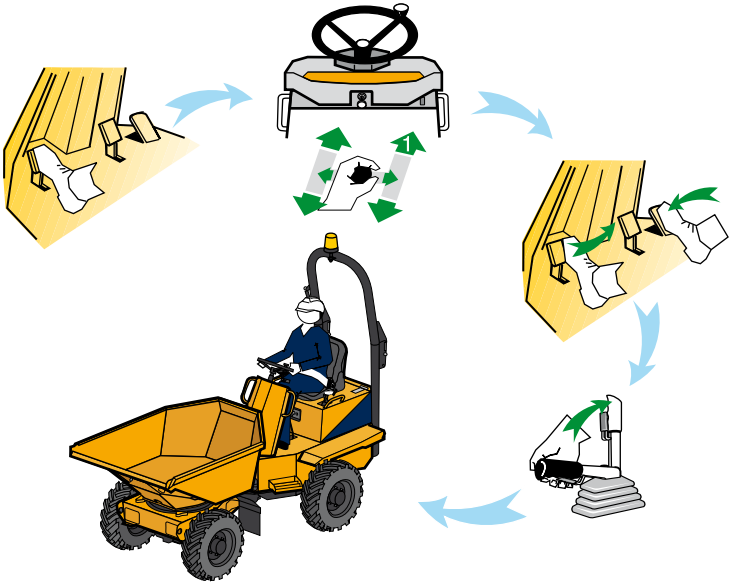
- Before testing handbrake, ensure that the machine is on firm, level ground and that the area is clear of people.
- Do not operate a machine that has failed the handbrake test.
- The handbrake must not be over-tightened, as this may cause damage to the axle.

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.

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

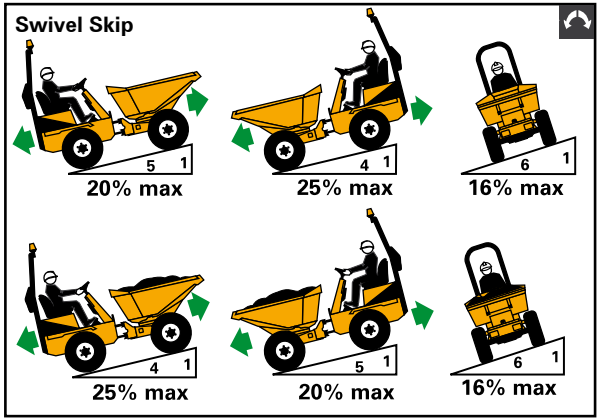
Changing speed/direction

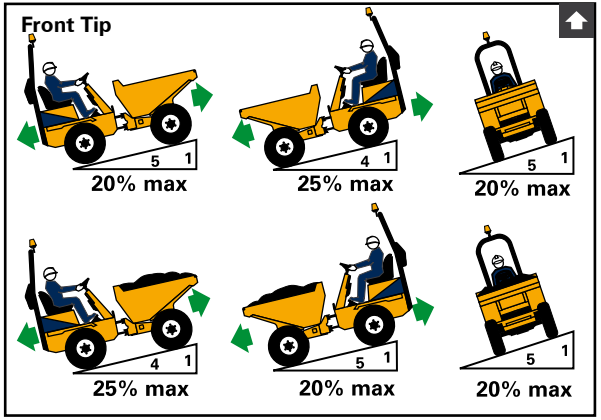
- Release accelerator pedal
- Depress clutch pedal
- Select an alternative gear
- Release clutch pedal and press accelerator pedal
- Before changing direction (forward/reverse), stop the machine and engage the hand brake

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

Complete checks in section 2 before loading the machine





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

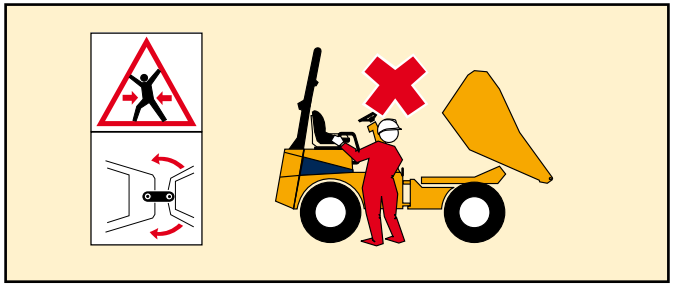
Keep speed to a minimum and use the foot brake to reduce speed when travelling down gradients

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)

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

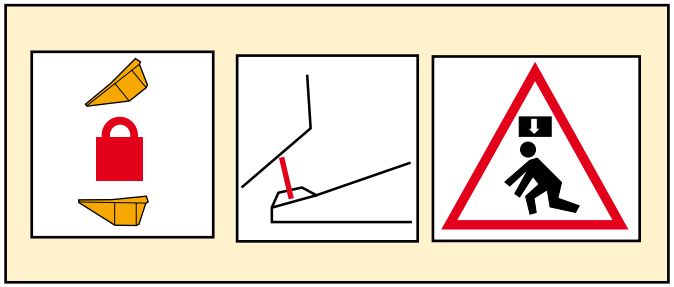
Thwaites



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)

Attention! Section 3 *correct and incorrect working practices*

VISIBILITY

The visibility maps show machines in standard build and travel configuration.

The maps provide an approximate indication of what can be seen by the operator and any blind spots when seated in the driving position wearing a seatbelt.

The maps have been provided to assist the operator / user and may be used as part of a risk assessment for the safe operation of the machine.

The machines are compliant with the visibility requirement given in EN 474-1 with regards to the rectangular boundary and a test object of 1.2m high and 0.3m wide and the 12m circular boundary.

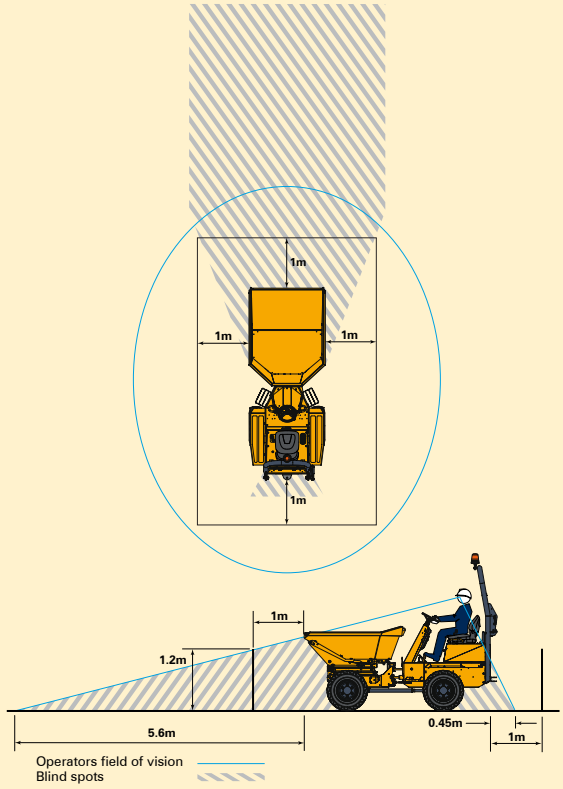
- Check all around the machine before operation.
- Be sure all mirrors are adjusted before operating the machine (if fitted).
- All cameras and mirrors must be kept clean (if fitted).
- Be aware of all blind spots.

The blind spot areas marked on the plan views of these maps are ground plane only

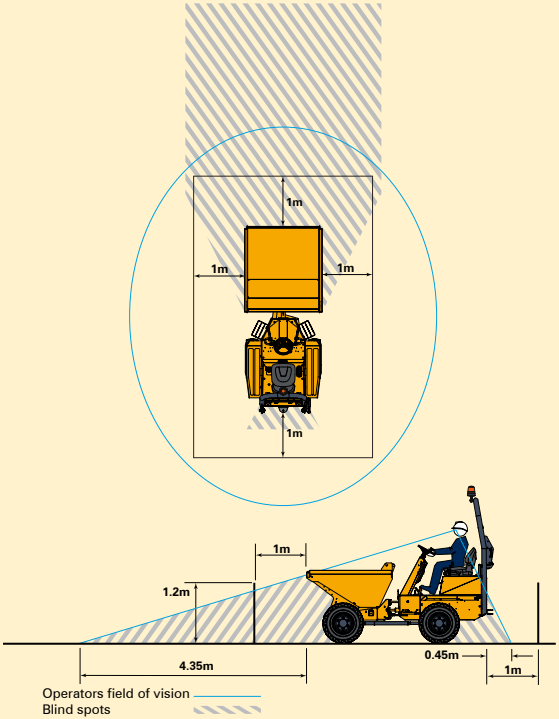
⚠ WARNING

Camera angles are factory set, any modifications to the machine configuration by any end user that my result in the restriction of visibility and will require a new risk assessment to be performed.

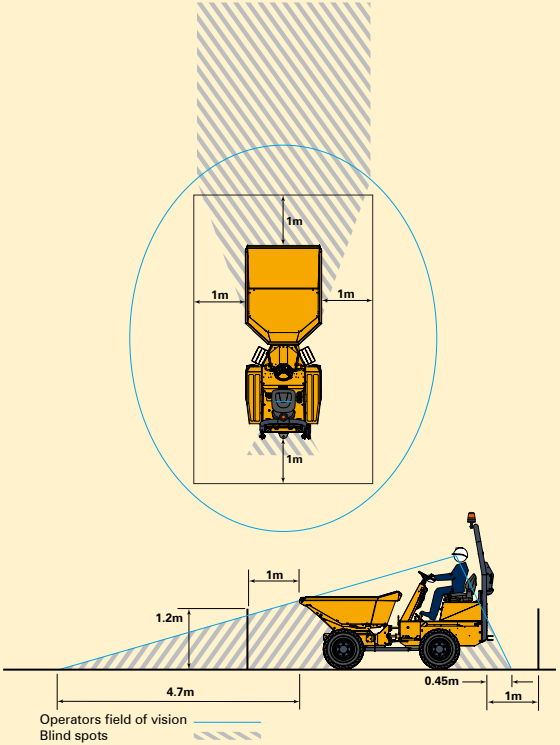
Mach 423



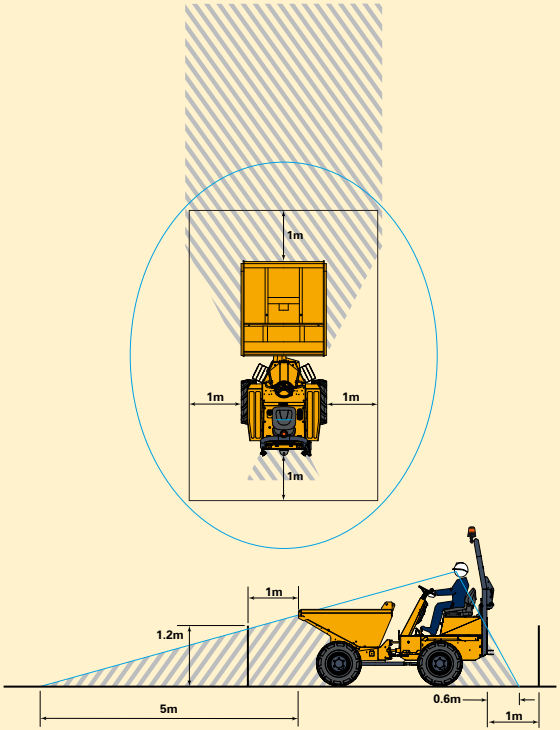
Mach 420



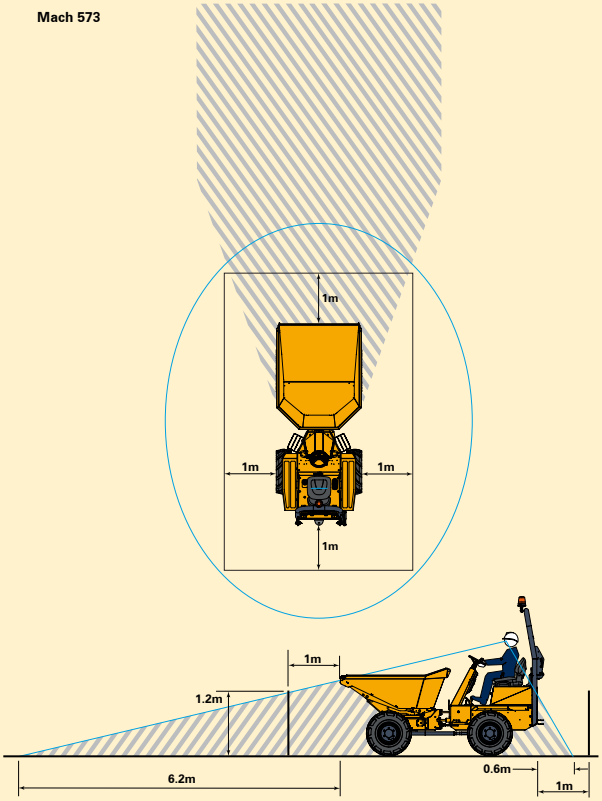
Mach 422



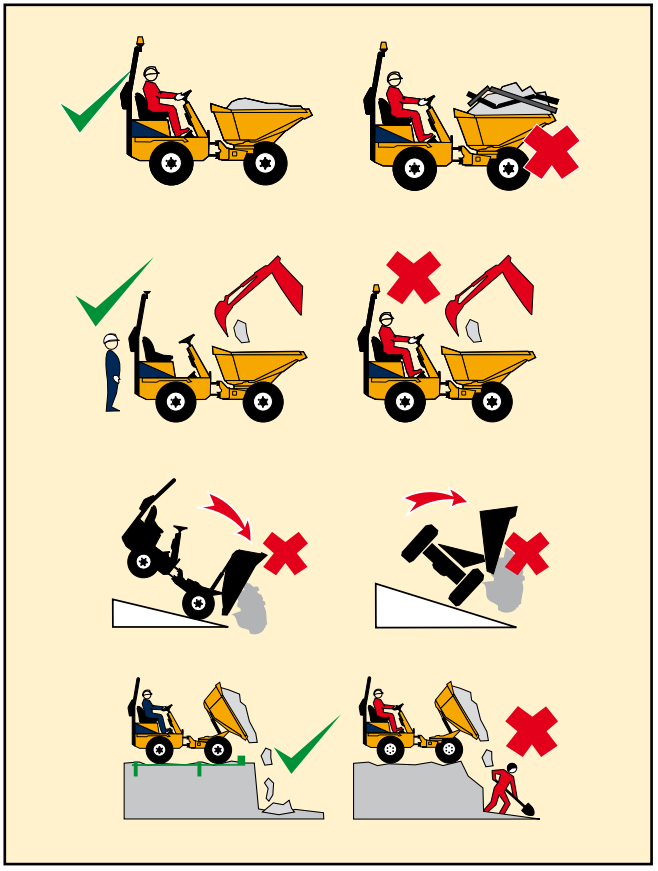
Mach 570



Mach 573



Attention! Section 3 *correct and incorrect working practices*



LOADING THE MACHINE

DO NOT exceed the machine's rated capacity

Ensure 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

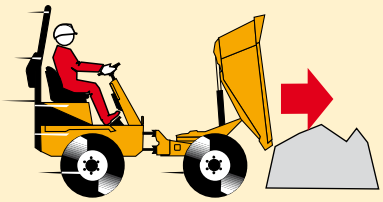
UNLOADING THE MACHINE

Use **STOPBOARDS** and **SUPPORT** walls on trenches

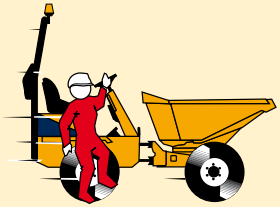
DO NOT tip skip if load is sticking

DO NOT discharge load when working on sloping ground

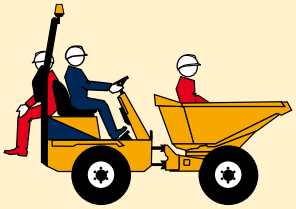
DRIVING



DO NOT drive with the skip tipped (bulldozing)



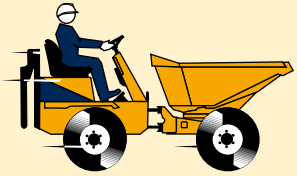
NEVER dismount from a moving machine



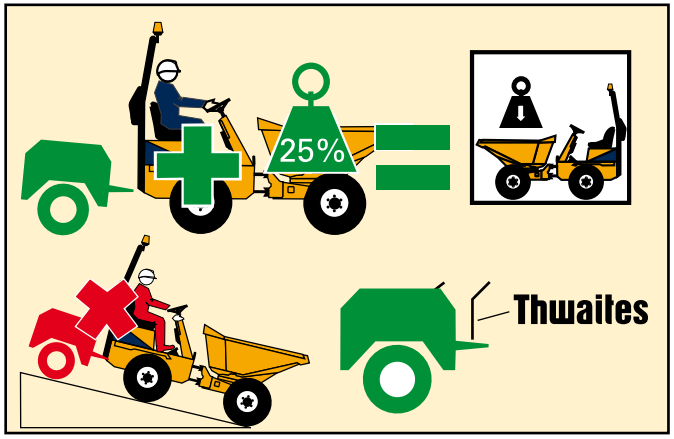
DO NOT carry passengers

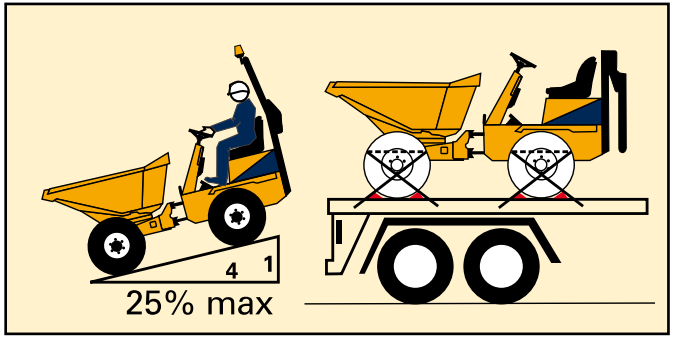
Avoid confined work areas - exhaust fumes and noise can be a hazard

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



DO NOT operate with the ROPS frame folded





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

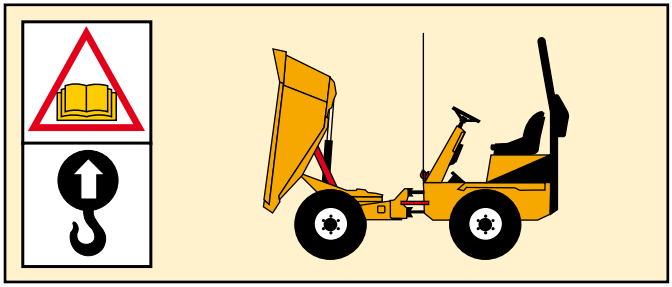
Reverse machine slowly onto a suitable trailer

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)*

3 **CAUTION** HAZARDS OR UNSAFE PRACTICES WHICH **COULD** RESULT IN MINOR PERSONAL INJURY OR PRODUCT OR PROPERTY DAMAGE

Thwaites



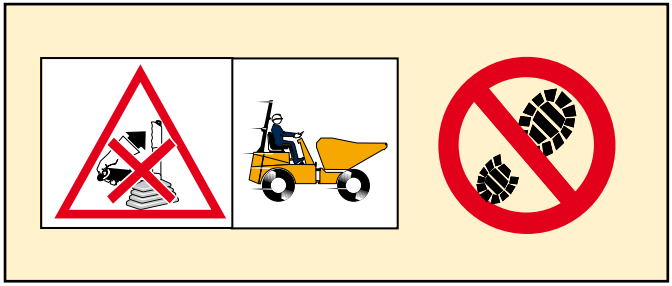
LIFTING (USING A CRANE)

Tip skip fully forward

Engage skip safety prop

Engage chassis locking bar

Lift using centre eye provided

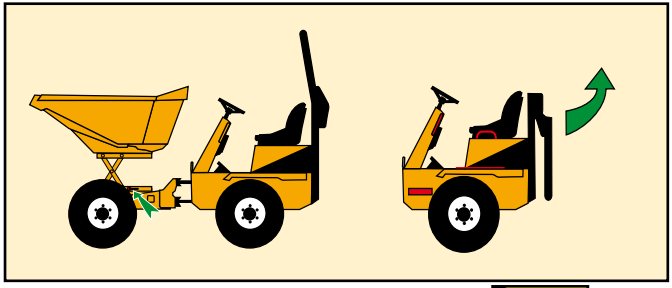


HAND BRAKE

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 **3** *correct and incorrect working practices*

4 Troubleshooting

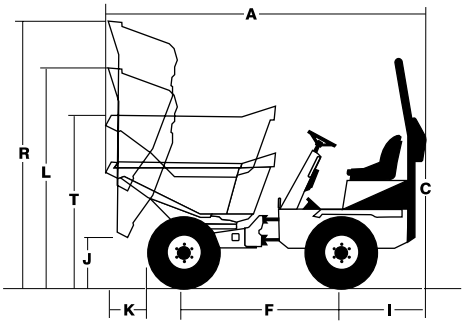
Thwaites

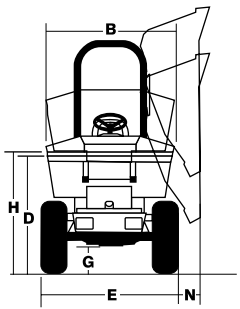
Problem	Reason	Solution
Engine will not start	Isolator switch OFF FNR lever not in neutral Battery voltage too low Faulty fuel supply Electrical stop on fuel pump defective Circuit breaker tripped	Switch on Shift FNR lever to a neutral position Check battery and connections Check fuel level and connections 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	Low oil level	Top up engine oil
 ● High engine temperature	Radiator choked Low coolant level	Clean radiator Top up coolant
 ● Irregular alternator	Defective or loose alternator belt	Adjust, or, if necessary, replace alternator belt
 ● Transmission oil temperature	Oil cooler choked Over/under filled with oil	Clean oil cooler Correct oil level
 ● Transmission oil pressure	Low transmission fluid level	Top up transmission fluid
 ● Low brake oil	Check oil level/leaks	Top up brake oil
Warning buzzer sounds	Hand brake ON	Release hand brake

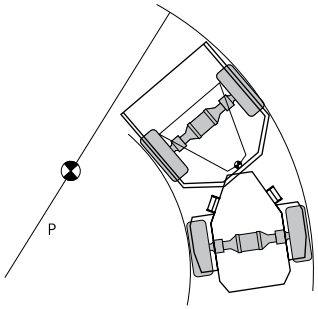
Always check panel warning lights, tripped circuit breakers or blown maxi fuse

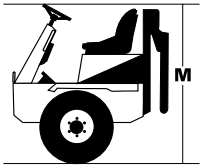
4 Powerswivel and Hi swivel – data chart

Thwaites









Dimensions (mm)		3T	2T	2T
A.	Length	3935	3735	3740
B.	Width	1650	1475	1475
C.	Height (ROPS & Beacon)	3092	3037	3037
D.	Skip lip height	1440	1340	1463
E.	Width over tyres	1650	1467	1467
F.	Wheelbase	1950	1850	1850
G.	Ground clearance	330	275	275
H.	Skip load height	1565	1400	1520
I.	Axle to rear	1032	1032	1032
J.	Tipping ground clearance	735	712	1220
K.	Tipping tyre clearance	510	430	422
L.	Height tipped (skip)	2825	2655	3136
M.	Height (ROPS folded)	1965	1910	1910
N.	Tipping side clearance	364	268	316
P.	Tyre clearance diameter (m)	9.2	7.5	7.5
R.	Max height tipped (raised skip)			3626
T.	Skip lip height (raised skip)			1955

Weight (Kg)	3T	2T	2T
Unladen			
Front axle	780	700	920
Rear axle	1300	1240	1280
Total	2080	1940	2200
Rated payload (including driver at 80 kg)			
Laden	3000	2000	2000
Front axle	3530	2510	2760
Rear axle	1630	1510	1520
Total	5160	3960	4280
Towbar (Max)			
Pull load	2250	1500	1500
Vertical load	375	375	375
Tyre Pressure			
Bar (psi) Front	3.6(52)	3.5(51)	3.5(51)
Rear	2.0(29)	2.3(33)	2.3(33)

Noise

Airborne (10m)

L_{WA} 101 dB

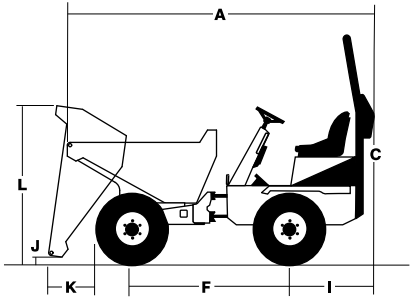
Operator

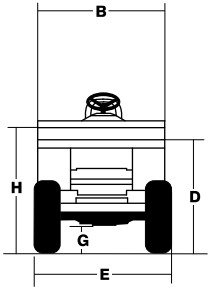
L_{pA} 84

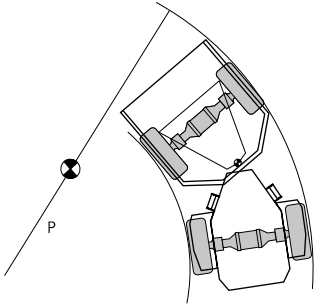
Typical vibration levels - whole body 0.7 - 0.8 m/s². Hand/arm less than 2.5 m/s².

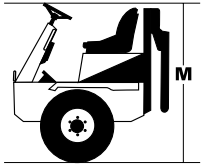
4 Forward tip – data chart

Thwaites









Dimensions (mm)		3T	2T
A.	Length	3774	3595
B.	Width	1650	1475
C.	Height (ROPS & Beacon)	3092	3037
D.	Bucket lip height	1365	1330
E.	Width over tyres	1650	1467
F.	Wheelbase	1950	1850
G.	Ground clearance	330	275
H.	Skip load height	1508	1415
I.	Axle to rear	1032	1032
J.	Tipping ground clearance	305	262
K.	Tipping tyre clearance	615	620
L.	Height tipped (skip)	2115	1985
M.	Height (ROPS folded)	1965	1910
P.	Tyre clearance diameter (m)	9.2	7.5

Weight (Kg)	3T	2T
Unladen		
Front axle	630	580
Rear axle	1300	1240
Total	1930	1820
Rated payload (including driver at 80 kg)		
Laden	3000	2000
Front axle	3380	2290
Rear axle	1630	1610
Total	5010	3900
Towbar (Max)		
Pull load	2250	1500
Vertical load	375	375

Tyre Pressure		
Bar (psi) Front	3.6(52)	3.5 (51)
Rear	2.0(29)	2.3 (33)

Noise

Airborne (10m)

L_{WA} 101 dB

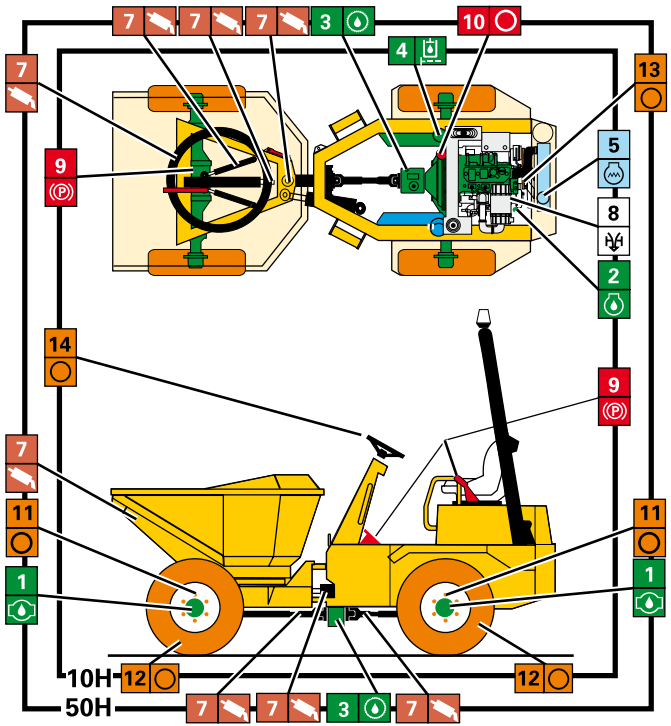
Operator

L_{pA} 84

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^2O + 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

Thwaites

Normal service intervals:
10hrs, 50hrs, (first 100hrs), 250hrs, 500hrs, 1000hrs, 2000hrs

Please refer to the Thwaites service manual for further maintenance information.

www.thwaitesdumpers.co.uk