

NOTE: End thrust from over length shafts (or seized telescopic tubes) can destroy your tractors internal PTO drive or implement clutch and gearbox, voiding your machine warranty.

- 1) Measure groove to groove distance from implement shaft to tractor shaft with implement in shortest position.

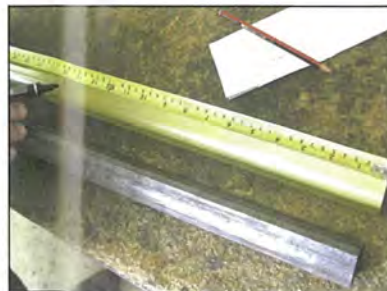
NOTE: Length will vary as implement is raised or lowered



- 2) Remove safety guard from new shaft and measure length between shaft lock buttons or clamp bolts with shaft in closed position.



- 3) Required length of shaft is groove to groove length (step 1) **less a minimum of 76mm (3")** to allow for disconnection from tractor and prevent end thrust damage. If shaft is shorter than this, ensure that 50% of telescopic tubes overlap.



- 4) **Amount to cut off shaft;**
Length of new shaft (step 2)
Less groove to groove measurement (step 1)
plus 76mm (3").
Cut this amount off both inner and outer drive tubes. Remove burrs and grease tubes.



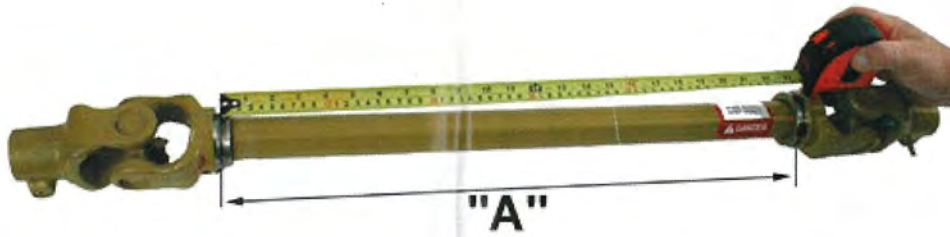
E.g. New shaft
Less groove to groove requirement
plus clearance 76mm
Amount to cut off
This is example only

1194mm (47")
- 890mm (35")
+ 76mm (3")
380mm (15")

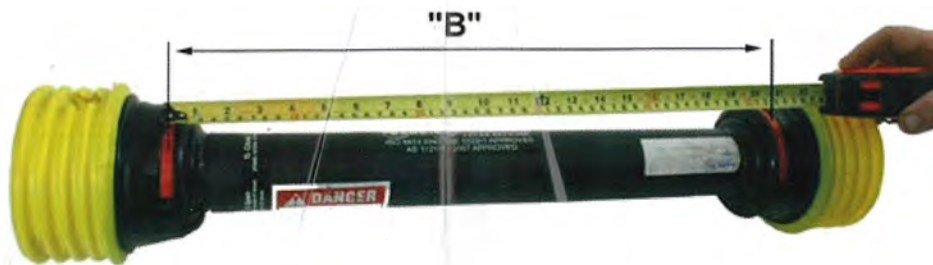


Insert your own measurements.

1



2



3



4



"B" = "A" - 76mm (3")
("B" is 76mm (3") less than "A")

5



6



Shaft Operating Angle

Adjust tractor hydraulic control to minimise lift height. High lift and large shaft angle will destroy universal joint.

All Bare-Co PTO shafts (single universal joint)

Short time running: Maximum angle 25 degrees

Continuous operation: Maximum angle 17 degrees

All Bare-Co Wide Angle PTO shafts (double universal joint)

Short time running (or stationary): Maximum angle 80 degrees

Continuous operation: Maximum angle 25 degrees



LUBRICATION

Sliding Members

Use high temperature grease similar to HP multi-purpose chassis grease.

Grease sliding members prior to assembly and after every 20 hours of use. For applications with high telescoping movement grease every 8 hours.

Bare-Co shafts from 8 series upwards are equipped with a grease nipple which can be accessed by releasing the patent guard to align access hole.

Universal Joints

Grease standard joints every 20 hours or 8 hours for severe conditions. Wide angle joints every 8 hours under wide angle conditions. Operating standard shafts at greater than 10 degrees angle or wide angle shafts at greater than 18 degrees angle dramatically reduces cross bearing life and requires more frequent lubrication.



IMPORTANT: Grease follows the easiest path through internal ports to the four cross bearings. Over heating and poor quality grease baked in one port will prevent grease reaching that bearing, resulting in failure of individual cross bearings.

← Typical cross failure due to blocked internal grease port

MOST IMPORTANT!

Fully open guard covers to ensure grease flows to all cross bearings
Greasing through small guard access holes is not good enough!



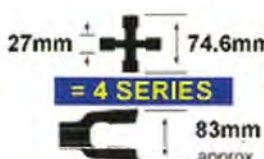
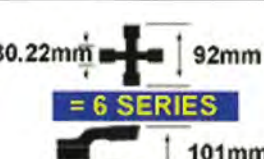
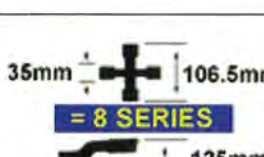


How to prevent wide angle shaft failures:

- 1) If 80 degree wide angle shafts are angled at greater than 80 degrees (Jack knifing implement with shaft stationary or rotating), the centre support ball and socket will break (not covered by warranty). To avoid over angling, fit turn limiters to your implement draw bar. Correctly fitted turn limiters will contact tractor tyre prior to over angling.
- 2) The very large centre disc lubrication cavity must be completely full before any grease transfers from the cavity to the centre support ball and socket. More than half a cartridge of grease is required to fill this cavity on initial shaft installation.
- 3) Wide angle covers should be completely removed to ensure grease flows to the centre support ball and all eight cross bearings

Dynamic Capacity Minimum Life.

Standard Shaft At 5 Degrees 1000HRS. At 10 Degrees 100 HRS.

Wide Angle Shaft At 10 Degrees 1000HRS. At 18 Degrees 100 HRS.

SHAFT SERIES	NOMINAL POWER		NOMINAL TORQUE	MAXIMUM SPEED
	@540RPM	@1000RPM		
 <p>= 1 SERIES</p>	12KW 16HP	19KW 26HP	210NM	1100 RPM
 <p>= 2 SERIES</p>	16KW 21HP	26KW 35HP	270NM	1100 RPM
 <p>= 4 SERIES</p>	26KW 35HP	42KW 56HP	460NM	1100 RPM
 <p>= 6 SERIES</p>	48KW 64HP	77KW 102HP	830NM	1100 RPM
 <p>= 8 SERIES</p>	79KW 106HP	126KW 170HP	1390NM	1100 RPM
 <p>= W2500 SERIES</p>	79KW 106HP	126KW 170HP	1390NM	1100 RPM
 <p>= W2600 SERIES</p>	90KW 120HP	144KW 192HP	1400NM	1100 RPM



Your Safety is Our Business!



THE MANUAL of FARM TRACTOR and ALLIED MACHINERY - SAFE WORK PRACTICES

Tenth Edition – *completely revised.*

About this publication

THE MANUAL of FARM TRACTOR and ALLIED MACHINERY SAFE WORK PRACTICES has been written and published by Ian M Johnston J.P. in the interest of tractor owners and drivers, but in particular those who are relatively inexperienced with the usage of agricultural tractors and machinery.

The Manual's main objective is to prevent a serious accident and avoid the possibility of resultant litigation.

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WARNING !!!

**Farm Tractors and
Allied Machinery
if operated incorrectly
can cause
serious injury or death !**



Do not attempt to operate the equipment until this operator's manual has been thoroughly read and understood – even although the safety features have been explained to you verbally.

Some FACTS YOU SHOULD KNOW

- 90%** of farm fatalities involve a tractor !
- 25%** of those killed are children !
- 75%** of fatalities are caused by a tractor turning over !
- 90%** of tractor accidents occur whilst traveling less than 5 miles per hour !
- 60%** of accidents occur on level or near level surfaces !
- 75%** of tractor drivers involved in accidents have more than 5 years tractor driving experience !

A tractor can take only one second to capsize !

DO NOT BECOME A STATISTIC !

Driving tractors can be fascinating, fulfilling and fun.

Live to enjoy and benefit from the experience.

* The above information has been made available by Work Cover Authority.

TRACTOR HAZARDS and PROCEDURES

WHICH SHOULD BE THOROUGHLY UNDERSTOOD BY ALL OPERATORS

FIRE

WARNING: on early Ferguson and Ford tractors spilt fuel can run directly onto the distributor resulting in fire if the engine is operating while refueling.

CLIMBING ON BOARD

Most modern tractors are fitted with non-slip steps and handgrips, making climbing into the seat a safe and easy operation. However older tractors sometimes require a degree of dexterity to climb on board. In either instance beware of muddy or wet boots which can easily cause your foot to slip. Also, muddy or wet footwear can slide off a depressed clutch or brake pedal, *with disastrous results*.

Should the tractor be unfamiliar to you, identify the location of the brake, clutch and gear control – also the engine stop control. If a seat belt is fitted – use it !

DISMOUNTING

Accidents can be caused by a foot of knee knocking a gear shift lever or unintentionally releasing a parking brake, whilst dismounting from a tractor. There is usually one side from which it is easier and safer to dismount.

When parking your tractor on a slope, in addition to applying the parking brake, point the front wheels in the direction that if the tractor moved off it would self turn and come to a stop.

MOVING OFF

Prior to engaging the clutch and moving off, make certain that there are no obstructions close to the tractor and that other people present are well clear. The clutch should be engaged gently, without undue engine revolutions, particularly if starting off on an incline. If a heavy implement is mounted on the rear of the unit, an abrupt start could cause the tractor to rear.

When driving a clutchless or hydrostatic type transmission, it is first necessary to select "drive" or a gear and then forward or reverse motion is commenced by simply depressing a foot pedal. When moving off, the pedal should be depressed gently at first and the pressure gradually increased, until the desired operating speed has been achieved. Some hi-tech tractors in this category change gears automatically, in a similar manner to an automatic transmission in a car.

SHUTTLE CONTROL

Many tractors are fitted with a directional control lever (often hydraulically or electrically actuated). This is known as a shuttle control. The forward or reverse direction of a tractor with shuttle control may thus be achieved without the necessity of conventionally shifting from a forward to a reverse gear.

The tractor should be brought to a standstill before changing its travel direction, even when it is fitted with a hydraulic or electrically actuated clutch. However some sophisticated transmissions incorporate a pressure modulating valve which enables a smooth change of direction even under full power, without the necessity of first bringing the tractor to a standstill.

Clarification of the type of shuttle control (if fitted) should be obtained from the dealer and a thorough understanding of its operating controls obtained.

CARRYING PASSENGERS

This is absolutely forbidden by law in most States and is a most dangerous practice. The exception to this is when a tractor is equipped with a factory fitted passenger seat that provides full body support. Such an approved seat is generally found only in the cabins of some of the larger broadacre tractors.

Each year numerous fatal accidents are caused by passengers becoming dislodged from tractors. Generally they were balanced on a fender or standing on the mounting step. It is the driver's responsibility to absolutely refuse to carry a passenger!

The temptation to comply with the beseeching pleas of a child, who is quite naturally wanting a ride on the tractor, is often hard to resist.

REMEMBER – a child's loss of life in a tractor accident is always the result of an adult's irresponsibility !

DO NOT CARRY PASSENGERS! If an accidental injury occurs to a passenger on a tractor, it is unlikely that the tractor owner's insurance coverage would apply.

APPLYING THE BRAKES

To facilitate tight turns, tractors are fitted with dual brake pedals which enable one rear wheel to be braked independently from the other. Apart from during field work, the two pedals should be coupled together by the catch provided, preventing the independent action. **THIS IS AN IMPORTANT CONSIDERATION.** In the event of an emergency stop, sudden foot pressure on an individual brake could cause the tractor to broadside and roll over.

Turning brakes are designed to be used in soft earth situations, where a tractor is required to turn tightly at the end of a work run. The pivoting on one rear wheel and consequently dragging the front wheel across the soft earth is acceptable. However if this type of turning is practiced in hard ground then excessive forces are applied to tires, axles and steering mechanism.

The tractor parking brake should always be applied when the driver dismounts from his unit and on steep country the front wheels should be turned facing up the incline, in case the parking brake should accidentally release.

NEGOTIATING STEEP INCLINES

This can be extremely hazardous and care must be exercised. TRACTORS ROLLING OVER ON HILLS ACCOUNT FOR NUMEROUS LIVES EACH YEAR ! Tractors operating in such conditions should where possible have the wheels water ballasted (in order to lower the tractor's centre of gravity) and fully extended to provide as stable a base as possible.

A low gear should be selected before commencing to climb up or down a steep grade. This avoids having to stop the motion of the tractor for the purpose of having to select a lower gear during the operation.

Avoid driving diagonally across a slope as it is in this circumstance that a tractor is most likely to slide and lose control.

Linkage mounted implements should be carried on or close to the ground thus providing the lowest possible centre of gravity to the tractor.

Do not allow speed to build up when driving down hill. Regularly apply the brakes to steady the descent. But refrain from 'riding' the brake pedals as this could create brake fade. Remember to select a low gear before commencing the descent, as this will serve to 'save' your brakes.

IF IN DOUBT ABOUT NEGOTIATING STEEP TERRAIN – DON'T.

BACKING UP TO AN IMPLEMENT

Select low gear with the engine idling and then carefully reverse into the position required for attaching the implement. Under no circumstances permit a person to stand between the reversing tractor and the implement !

TRAVELING IN HIGH GEAR

Unlike cars, most tractors are unsprung and as such can readily become out of control if a rough surface or a sharp turn is encountered. This factor is greatly increased when the tractor is being driven at speed. High gears and traveling speed should therefore be restricted to usage on flat road surfaces and due care exercised. Remember to couple the turning brake pedals.

TOWING TRAILERS AND PULLING

The hitch point of a tractor tow bar should be located below the centre line of the rear axle. Towing from other than the prescribed location can readily cause the tractor to rear over backwards. *Never tow or pull from the top link position of the 3-point linkage.* By so doing there is a very real likelihood of the tractor rearing over backwards.

Remember - when towing a trailer a tractor's braking efficiency is greatly reduced.

When pulling a log etc gently take up the slack of the tow rope prior to moving off with the towed item.

TRACTOR TRAILERS

Tractor trailers come in all shapes and sizes. They range from lightweight single axle units to custom built heavy duty round bale transporters and cotton module trailers. Some are fitted with tipping mechanisms, either mechanical or (usually) hydraulic.

The ideal general purpose farm trailer is one where the axle is located towards the rear of the deck. This causes the weight upon the trailer drawbar to be transferred to the rear of the tractor, thus providing down pressure on the tractor rear wheels, resulting in additional traction for the tractor, particularly when hauling a loaded trailer up or down an incline in slippery conditions.

The hydraulic system of a hydraulic tipping trailer is connected to the inbuilt hydraulic system of the tractor by high pressure hoses fitted with quick release fittings, and may be single or double acting.

Single acting provides only energy for raising the trailer deck and relies upon the weight of the deck to return it to the horizontal position.

Double acting additionally provides energy for lowering the deck.

WHEN OPERATING A FARM TRAILER THE FOLLOWING GOLDEN RULES MUST BE APPLIED.

- 1 Position the trailer on flat ground when tipping, in order to prevent a catastrophic capsize.
- 2 Never ever permit any person to stand in close proximity to a raised, raising or lowering deck.
- 3 When maintenance is required to be carried out whilst the trailer is in the raised position, turn off the tractor engine and secure the deck with a suitable prop, thus preventing it from dropping unexpectedly and possibly causing serious injury.
- 4 Use only an appropriate solid drawbar pin, which has provision for a securing lynch pin, to prevent it from riding up and releasing the trailer.
- 5 Regularly check all towing fixtures and hydraulic fittings.
- 6 A trailer may be fitted with air, over-riding or electric powered brakes.
If so fitted, make sure they are properly adjusted.
Note: trailers employed solely on a farm are not required to be equipped with brakes.
- 7 Balance the load on your trailer and secure it thoroughly.
- 8 Make certain the wheels of a parked trailer are chocked and any jockey wheel properly adjusted. Children and farm animals should be kept well clear.

BE AWARE! The braking efficiency and handling characteristics of a trailer can be significantly reduced when pulling a loaded trailer.

SAFETY ATTACHMENTS

Removing or altering the design of a certified ROLL OVER PROTECTION SYSTEM (ROPS) frame is illegal. Apart from lightweight mini tractors, all working tractors are required by law to be equipped with a ROPS frame. As the regulations pertaining to ROPS frames are constantly being revised – it is the responsibility of each tractor owner to determine the current requirements in the relevant state or territory. ROPS FRAMES ARE DESIGNED TO SAVE LIVES.

Tractors and implements are required to be fitted with other safety attachments – such as PTO shaft covers, etc. Despite this, loose clothing and long hair can be caught up in shafts, chains, belts and pulleys with devastating results. Appropriate clothes should always be worn.

Tractor Master PTO shaft guard must be in place. Power take off (PTO) shafts must be fitted with an approved cover that fully covers the shaft and is free to rotate on the shaft.

TRACTOR CABINS CAN CREATE PROBLEMS

Noise insulation within the cabins of modern tractors has reached a high degree of efficiency. The negative result of this is that an operator becomes somewhat insulated from engine and transmission sounds. A mechanical problem that would be audible immediately to the operator of an open tractor, may not be heard within the confines of a decibel reducing cabin. To compensate, the operator must be especially alert to what his instruments are telling him. Even high tech computer digital warnings may not become immediately obvious if the operator is peering into a low sun. A good practice is to constantly scan the instruments, plus, every two or three hours climb down from the tractor and visually inspect its externals for indications of developing problems

HEAVYWEIGHT TRACTORS

Modern high powered heavyweight broad-acre tractors have different operating characteristics to their light or medium weight counterparts. Their sheer physical mass and dimensions add to the list of possible operating hazards which may be encountered.

Many of these big machines are equipped with eight or even twelve driving wheels. The torque transmitted from the engine, through the drive train and axles to the wheels, is immense. Accordingly, wheel attaching hardware must be vigilantly and frequently checked to avoid a potentially dangerous situation.

It is not always easy on a multiple tire tractor to detect if any one tire has lost pressure. This is particularly so if the tire is in the centre of a group of three. A good principal is to adopt the truckies practice of regularly "sounding" each tire with a heavy hammer.

When operating a heavyweight tractor for the first time, it can take a day or so to automatically compensate for the considerable width of the wide-line implement towed. There would be few operators of this sort of equipment who could not confess to having clipped a fence. A good safety rule is to refrain from being nonchalant about the size of the machine you are operating.

Take care when climbing up into, or down from, the cabin. Muddy boots and a dew covered tractor can form a dangerous alliance. Many of the accidents involving heavyweight tractors are caused by the operator slipping whilst carrying out refueling or maintenance operations.

If the steering wheel is turned, whilst a tractor with articulated steering is stationary, a person standing in the hinged section could be crushed.

OWNER OBLIGATIONS

Possessing a tractor involves the owner and operator in certain responsibilities relative to the unit's safety and efficiency.

Some of these are outlined hereunder:

- A Regularly check all nuts and bolts – particularly those relating to the attachment of wheels, steering and brake assemblies.
- B Tires should be routinely inspected for cuts, cracks and tread wear. Correct inflation pressures have a direct relationship to safety.
- C Any oil leaks should be attended to immediately in order to avoid the risk of fire and to prevent a major problem developing.
- D Any indication of brake deterioration should be treated as serious and the tractor taken out of action, whilst the trouble is rectified by a competent mechanic.
- E A change in clutch "feel" should be immediately investigated and if necessary repairs or adjustments carried out.
- F Ascertain that all safety attachments are in place.
- G If the tractor is under warranty it is the owner's obligation to immediately report any problems to the dealer from whom the tractor was purchased.
- H When a tractor is not in use it should be immobilized by removing the key to prevent unauthorized operation.
- I The tractor's electrical equipment requires regular inspection to prevent the possibility of a loose or frayed wire causing a dead short with the chance of a resultant fire developing.
- J Many tractors and attachments create potentially injurious high decibel levels. In these instances quality ear muffs are essential. Prolonged exposure to noise hazards will cause permanent hearing damage.

With non cab tractors it is recommended that safety glasses be worn particularly during slashing (rotary cutting), mulching and mowing operations. Safety glasses also give eye protection against insects attracted to tractor lights when driving at night.

CONSIDERATIONS WHEN BUYING A USED TRACTOR

When a used tractor (or allied machine) is purchased and no operator's manual is available, certain guidelines if followed will ensure that the unit will perform as well as possible. (See ... "Tractor General Maintenance" page 13).

However it must be remembered that a used tractor or implement, which may have changed hands several times in its lifetime, will definitely and obviously have incurred mechanical wear and structural stresses. *It therefore cannot be expected to perform as well or reliably as a new unit.*

Bear in mind, there is no such thing as a "good as new" used machine, and whilst the seller may have gone to considerable lengths to ensure the tractor performs satisfactorily for the new owner at the time of hand over (giving due regard to the age and general condition of the unit) it is impossible for either party to be positive as to its condition.

Where practical, the buyer should arrange with the seller to have a demonstration of the intending purchase and providing the results of this prove acceptable then a sensible price should be negotiated which will be reasonable for both parties.

The responsibility for the future performance of the unit lies with the purchaser, providing the selling agent has not deliberately disguised or failed to reveal problems of which he is aware, but that may not be obvious to the purchaser.

(The above should be construed in conjunction with existing rights and obligations according to prevailing government statutes).

TRACTOR GENERAL MAINTENANCE

The manufacturer's manual of maintenance should be strictly adhered to at all times. Failure to do so could result in a negation of warranty (where applicable) plus a deterioration of performance and a reduction in componentry life.

In the absence of an original manual for the unit described hereunder, the following regular maintenance should be carried out. *(Details to be filled in by the selling agent).*

UNIT DESCRIPTION ... Type: _____
 Make: _____ Model: _____
 Eng. No.: _____ Serial No. _____

ENGINE OIL CHANGE... Interval in hours: _____
 Oil Specification: _____
 Filter Hours: _____
 Filter Specification: _____

**TRANSMISSION
OIL CHANGE ...** Interval in hours: _____
 Oil Specification: _____
 Filter Hours: _____
 Filter Specification: _____

**FINAL DRIVE OIL
CHANGE ...** Interval in hours: _____
 Oil Specification: _____
 (may be shared with
main transmission)

FRONT AXLE OIL CHANGE ... Interval in hours: _____
Oil Specification: _____

HYDRAULIC OIL CHANGE ... Interval in hours: _____
(may be same as transmission oil) Oil Specification: _____
Filter Hours: _____
Filter Specification: _____

POWER STEERING OIL CHANGE ... Interval in hours: _____
(may be same as hydraulic oil reservoir) Oil Specification: _____
Filter Hours: _____
Filter Specification: _____

AIR CLEANER ... Service daily in extreme dust or inspect regularly. Check all hoses, joints and clamps for tightness.

HYDRAULIC BRAKE & CLUTCH FLUID ... Check reservoir levels regularly. If fluid has to be added, inspect system for leaks. Note: before adding fluid confirm type of fluid required e.g. hydraulic oil or brake fluid. This is important. Do not guess !

GREASE POINTS ... Clean nipples and grease regularly.

BRAKE & CLUTCH ADJUSTMENTS ... Any change in pedal pressure or efficiency, should be immediately investigated by a competent person.

BATTERY ... Inspect electrolyte regularly – particularly in hot weather. Add distilled or uncontaminated water if necessary. Terminals should be cleaned and connections made tight. **AS WET CELL BATTERIES EMIT EXPLOSIVE SULPHURIC GAS, CARE SHOULD BE TAKEN TO KEEP BATTERIES WELL CLEAR OF FLAME OR SPARKS !**

TIRE PRESSURES ... Front: _____ Rear: _____

AIR CONDITIONER ... The system should be regularly checked for leaks and recharged each spring.

ENGINE COOLING... In the instance of a liquid cooled engine, the radiator and engine block should be drained and flushed annually. When refilling, add an appropriate amount of coolant conditioner, as specified on the container. Add an anti-freeze if appropriate.

In the instance of an air cooled engine, all dust and debris should be removed from the fan, screens and from between the cooling fins of the cylinders.

NOTES & OTHER MAINTENANCE ...

FRONT END LOADERS

including silage forks, high reach stackers, etc

A **FRONT END LOADER (FEL)** attached to an agricultural tractor is an extremely useful and versatile tool on a farm, but according to some state laws must not be used as a crane, unless specifically tested and approved by the relevant government authority.

BE WARNED – normally an agricultural front end loader is *not so approved* !

Further – a person operating a front end loader may be required to be licensed in order to comply with government regulations. This does not usually apply to farmers, however operators should check the prevailing regulations in their State.

SAFE OPERATING PRACTICES for FRONT END LOADER DRIVERS

When fitted to an agricultural tractor a FEL alters the stability of the tractor. The higher the bucket is raised the more the centre of gravity of the tractor is unfavorably altered. A loaded bucket at full height renders the unit at its *most unstable situation*. Accordingly, when the vehicle is being driven between two points, the bucket should be transported as close to the ground as possible to reduce the risk of capsizing.

Observe overhead electrical wires. If touched by a loader bucket *fatal electrocution can result* !

When servicing the tractor and the bucket cannot practically be rested on the ground, it should be physically propped and secured in the raised position. Thus if a control lever be accidentally nudged the bucket would be prevented from dropping and possibly causing an injury.

With a FEL it is particularly important that constant vigilance be maintained to make certain that nuts and bolts, pins and hydraulic connections are torsioned correctly. A dislodged pin or a loose mounting bolt could cause a serious accident. **REMEMBER** – *It is the operator's responsibility to continually check his machine. Bolts do come loose as a result of vibration and stretching and do require tightening or replacing.*

Leaking or damaged hydraulic hoses must be replaced. *A burst hose can expel hot oil at great pressure and cause severe injury and burning.*

Hydraulic oil should be kept free from contaminants. A speck of dirt lodged under a relief valve can render the hydraulics inoperable.

A front end loader is NOT A BULLDOZER and is not designed to doze out stumps.

If hard material, such as dry compacted soil, is required to be excavated – it is a good practice to first rip or loosen it, thus making the work easier for the tractor.

Very important !

Some modern loaders are fitted with parallelogram lifts (bucket leveling systems) but many are not, including most older type loaders. The majority of serious accidents involving front end loaders (or high lift silage forks, etc.) are caused by the load rolling backwards out of the bucket (or fork) onto the operator as the bucket is being raised to dump height.

IT IS ESSENTIAL with non self leveling loaders that as the bucket is raised its angle of roll back is reduced. The correct operating procedures, required to avoid this lethal hazard, should be discussed at length with the machinery dealer who will explain how to avoid such an occurrence.

NOTE: The front tires of tractors fitted with front end loaders must be of sound construction. Tire pressures usually have to be increased to accommodate the additional loading.

FRONT END LOADER QUICK RELEASE ATTACHMENTS

Some loaders are designed to be removed rapidly from the tractor and thus incorporate quick release pins and hydraulic couplings.

It is important that the tractor be placed on a level clear area to facilitate the safe uncoupling of the loader. Care must be exercised that the self standing loader is properly secured. Children and inquisitive animals must be prevented from gaining access to the loader thus eliminating the risk of it toppling upon them.

Buckets, forklifts and bale spikes are often equipped with quick hitch fittings, enabling them to be readily attached and detached to the loader arms. If (for example) a bucket is required to be replaced by a set of forks, even for just a few minutes work, do not neglect to ensure that all retaining pins are in place.

MORE ON SAFETY DURING MAINTENANCE

To properly carry out preventative maintenance on a tractor equipped with a loader attachment, it is frequently necessary to have the bucket in the raised position. During this procedure there is always the risk of the loader arms dropping unexpectedly. Such an occurrence could very seriously injure the person carrying out the maintenance.

A new loader is generally provided with a removable strut, designed to prevent a raised loader from dropping. The strut may be of the design which is placed over the exposed rod of one of the lift cylinders. Alternatively, a pair of vertical uprights may be provided which serve to prop the arms in the upright position.

In any event, it is extremely foolish to carry out work on a front end loader without some method of preventing the bucket from dropping.

TO BE ABLE TO OPERATE A FRONT END LOADER EFFICIENTLY AND SAFELY REQUIRES A DEGREE OF SKILL THAT HAS TO BE LEARNED. EXPERIENCE, UNDER THE GUIDANCE OF AN EXPERT OPERATOR, IS THE BEST TEACHER !

BULLDOZER ATTACHMENTS

FITTED TO WHEELED TRACTORS

A bulldozer blade attached to a wheeled agricultural tractor is a versatile tool around the farm. If used sensibly it is capable of safely leveling, excavating, scraping and pushing. It can be used to build roads, excavate dams and so forth.

As with all tractor/implement combinations, a dangerous element can be introduced by an inexperienced or thoughtless operator. It should be remembered at all times that an agricultural tractor fitted with a bulldozer blade has very real limitations ! Some operators drive their wheeled bulldozer aggressively and seem to think they are in control of a heavyweight industrial bulldozer and that NOTHING can stop or restrict the ability of the machine.

FITTED TO TRACK OR CRAWLER TRACTORS

Usually a track type agricultural tractor is a more stable mount for a bulldozer blade. Tracks offer better grip and the centre of gravity of a track tractor is invariably lower than that of a wheeled unit. However even this can prove a hazard owing to a degree of over confidence on behalf of an operator.

Precisely the same situations outlined for wheeled tractors apply to track machines. Plus there can be an additional danger owing to the track unit's ability to pivot through an arc of 360°. In this circumstance there is always the chance of side swiping an object or a person standing close by.

THE MOST COMMON ACCIDENT SITUATIONS INCURRED BY FARM BULLDOZERS ARE AS FOLLOWS:

- * Working across a steep incline and the unit rolling over sideways.
- * Working up or down a steep incline and the unit "taking off" out of control.
- * Excavating into the side of a hill and the ground giving way.
- * Bulldozing at speed and the blade hitting an immovable object.
- Limbs or whole trees falling on the tractor during scrub or forest clearing.
- Piling material at the edge of a sheer drop and misjudging distance.

INDUSTRIAL TRACK BULLDOZERS

This category of bulldozer, custom built for earthmoving and construction work, comprises the units with the greatest degree of "built in" safety. Equipped with fast reacting sensitive hydraulics plus torque converter and power shift transmissions they are infinitely more controllable than either wheeled or track type farm tractors. Despite this, accidents with these machines occur regularly.

LEGISLATION

Some government authorities have introduced legislation stating that in many circumstances (if not all) a bulldozer operator must be in possession of an appropriate certificate of competence. It is usually necessary to be tested by the relevant authority to obtain such a certificate. It is the responsibility of an intending bulldozer operator to check out the prevailing regulations. Remember, that a violation of whatever regulations might apply, can render an operator without insurance coverage in the event of an accident.

IMPORTANT NOTE

No bulldozer may be engaged in tree pushing or scrub clearing unless it is fitted with a certified ROPS (Role Over Protection System) frame and a certified FOPS (Falling Objects Protective Structure) canopy.

As with a front end loader, a bulldozer attached to a farm tractor can cause stresses to the tractor frame or body which were never intended by the manufacturer. Accordingly, the mounting brackets of the attachment should be professionally designed and customized for each particular model of tractor. It is essential that all mounting bolts are regularly torsioned for tightness and welds inspected for cracks.

COMMONSENSE !

Driving a tractor with a bulldozer attachment does not necessarily mean that the tractor has to be operated at maximum available power. In applications such as leveling, compacting or grading, often the best results can be obtained by driving the tractor slowly at low engine revs. The slower the work speed, the higher degree of control sensitivity resulting in a greater accuracy of the job.

SLASHERS, MULCHERS, MOWERS and ROTARY CULTIVATORS

The above tractor implements are grouped together as they are among the most potentially hazardous of all mounted implements – by virtue of their high revolutions and exposed blades.

The following safety factors should be well understood by tractor operators

- * These units should NEVER EVER be used in areas where people are present. Flying missiles (stones, timber, glass etc.) may travel large distances and can cause serious injury.
- * It is important that the operator frequently check all nuts and bolts for security. A FLYING BLADE CAN BE FATAL.
- * The tractor operator should never dismount from his machine until first disengaging the PTO (power take off) shaft drive and waiting until the blades come to a standstill. A slowing PTO shaft can create a false sense of security. As long as the shaft continues to turn the blade tips are still rotating at extreme high speed.
- * All safety covers must be in place – as dictated by law. Australian & U.S. regulations permit the PTO safety cover to rotate with the shaft, until light pressure is applied, thus prolonging the life of the safety guard bearings. New Zealand and European Community regulations insist that the cover be secured by a light chain to prevent it from rotating, with the result that the cover bearings require regular replacement.
- * PTO shaft safety covers should be free of splits and sharp edges and checked frequently to determine that when light pressure is applied, the covers will remain stationary.
- * A rigid 3 point linkage top link affords protection against a tractor rearing backwards when operating a slasher (rotary cutter) up a steep incline. A chain top link is not recommended except in certain applications. (This matter should be discussed with the relevant dealer and or manufacturer.)
- * Loose clothing and long hair (as previously mentioned in page 9) can be caught up in rotating PTO shafts and blades. Wear figure hugging clothing and secure long hair under a cap.
- * By raising the implement off the ground, when a sharp turn is executed, stresses are reduced on the 3 point linkage arms.

- * Whilst mulchers and rotary cultivators are less likely to pelt flying missiles, such as stones etc. than slashers (rotary cutters) – care should never the less be exercised.
- * When raising an implement make certain that the height of lift does not create too severe an angle for the drive shaft universal joints. This is a common cause of universal joint failures.
- * The telescopic drive shaft connecting the PTO shaft of the tractor to the gearbox of the implement should be of the correct length. That is, during raising or lowering, the implement travels through an arc. At the point where the drive shaft is in its shortest position, there should still be a minimum of 2" (50mm) of free telescopic movement. When the drive shaft is at its fullest extended situation, there should be ample insertion of the inner section into the outer section to give sufficient strength to the torsional demands of the PTO horsepower required. This will vary depending on the tractor and implement in use.
- * The drive shaft should be regularly pulled apart and lubricated. The gearbox oil level requires regular checking. Also, in the instance of belt drives it is important that the correct tensioning be observed.

The most common cause of accidents, associated with implements with blades, is the insertion of feet or hands by inattentive operators.

RIDE-ON LAWN MOWERS

A ride-on lawn mower is essentially just a mini tractor equipped with a rotary grass cutter. (Indeed, in some regions these units are often referred to simply as *LAWN TRACTORS*).

Each of the hazards outlined on pages 19 & 20, relating to rotary slashers, apply equally to ride-on mowers. These should be read in conjunction with this page. All the points referring to the accidental insertion of fingers and toes into the region of the cutters should be well understood. Also the importance of bringing the rotary blades to a complete stop prior to dismounting from the unit.

Particular emphasis should be given to the danger of flying missiles, as by its very nature, a ride-on lawn mower is likely to be used in the vicinity of household members, neighbors and passers-by. Thus it is essential that the cutting blade be instantly stopped if a person or domestic animal comes into close proximity of the mower.

The lawn area should be inspected for stones and sticks (potential missiles) prior to the commencement of grass cutting.

Also, under no circumstances, be tempted to operate a ride-on mower without the safety discharge chute or grass cutter being in place.

Ride-on lawn mowers also have their own specific characteristics which can render them particularly dangerous in the hands of a thoughtless operator.

CONSIDER THE FOLLOWING:

Ride-on lawn mowers are seldom equipped with a roll-over protection system. Yet they are extremely prone to rolling over sideways if operated along an incline! They have a *higher centre of gravity* than most conventional tractors owing to the relative weight of the operator being positioned well above the axles. Also, the ride-on mower's heaviest component (apart from the operator) is the engine and this again is largely located above the axles.

Whilst the actual degree of lean, at which a ride-on mower will capsize, is obviously dependant upon the individual model-type and the weight of the operator, be assured that any slope of more than 11° (equivalent to a 19% incline) should be considered unsafe. Please note, some manufacturers stipulate that the maximum safe working slope for their ride-on mower range is a mere 7° ! *Consult your selling agent on this matter.*

When a ride-on mower rolls – it happens within ONE SECOND ! There is no warning and no time for the operator to jump clear. The automatic engine cut-out switch should come into operation, but just visualize the machine upside down, with the operator pinned beneath it, and the blades continuing to rotate for a few seconds ! !

ENGINE CUT-OUT SWITCH

All new ride-on lawn mowers are required to be fitted with a series of switches, which will automatically stop the rotation of the blades and/or stop the engine in an emergency. Thus, in the event of an operator being thrown off, or thoughtlessly dismounting from the mower whilst it is in operation, the engine will cut-out. A switch, usually located under the seat, senses that the operator is no longer in position. Similarly, the blades will cease to rotate if the operator leaves the seat without first disengaging the cutter drive and applying the hand brake.

It is the operator's responsibility to regularly check the efficient operation of all safety switches. It would be irresponsible to disconnect or by-pass any safety switch.

Note: Older ride-on lawn mowers may not be equipped with safety switches. It is inadvisable to operate such machines.

OTHER HAZARDS

Most ride-on lawn mowers are driven by petrol (gasoline) powered engines. When re-fuelling, park the mower in the open and stop the engine prior to removing the fuel tank cap. Cigarettes should be extinguished.

Ride-on lawn mower tires are usually of the low pressure variety. Care should be exercised when inflating tires, as over inflation will cause a tire to burst.

Common sense dictates that children should never be carried as passengers on a ride-on lawn mower.

Also – eye protection goggles and decibel reducing ear muffs should be considered as mandatory protective measures.

NEVER REMOVE OR OBLITERATE SAFETY DECALS.

POST HOLE DIGGERS

By its very nature and design, a post hole digger must be operated with care.

When the auger is rotating, prior to it entering the ground or immediately upon emerging from the hole it has dug, there is a possibility it could whip out of control. Accordingly, no person should be allowed close whilst the auger is rotating. The tractor driver is in the safest position and he alone is the person responsible for the digging process.

It is seldom necessary to rotate the auger at high speed. The best and safest results are obtained by running the tractor engine at a fast idle with the PTO shaft engaged in the 540 r.p.m. mode. (It should be noted that under such circumstances the PTO shaft will be rotating at a speed well below 540 rpm)

The post hold digger drive shaft is required by law to be encased within a safety outer covering, which upon accidental contact will stop rotating. (See reference to PTO shaft safety covers on page 18) The inner shaft will continue to drive the auger.

The gearbox oil level and the safety clutch adjustment should be checked prior to commencement of post hole digging. If an operator is unfamiliar with the procedures involved in the safety clutch adjustment, guidance should be obtained from the selling agent.

IMPORTANT: The practice of a person attempting to lean on the post hole digger, in an endeavor to add additional downward thrust to the digging operation, is simply stupid and highly dangerous. The point is reiterated that *no person should be permitted close to the digger during its operation !*

Most accidents caused by tractor mounted
post hole diggers, are due to individuals
standing alongside the revolving
auger and articles of clothing
being caught by the
auger flights.

FENCE POST RAMMERS

POTENTIALLY THE MOST HAZARDOUS OF ALL TRACTOR MOUNTED IMPLEMENTS - IS THE FENCE POST RAMMER.

No person should operate a post rammer without having received special training from the dealer, from whom it was purchased. Further, a second competent person should also be present whilst the machine is engaged in work.

By law, the rammer must have relevant warning decals attached – clearly visible. As with all warning notices on tractors and tractor attachments, these must never be removed or defaced. The warning should be fully understood and observed by the operator and his assistant.

In the instance of a CABLE operated rammer, the cable should be examined frequently for fraying wires and the security of all fittings and pulleys. HYDRAULICALLY operated rammers should have their hoses and couplings regular inspected.

The rammer should be immediately taken out of work if any looseness, crack or other defect be detected.

A timber fence post which has been selected for ramming should be discarded if it is showing signs of splitting or other imperfections.

It is strongly recommended that a purchaser of a post rammer, who has had no previous experience of using such a machine, obtain training in its operation from an expert!

Used intelligently – a fence post rammer
is a very useful tractor attachment
and will dramatically reduce
the time and effort in
the erection of
a fence line.

**BUT BE CAREFUL, IT MUST BE HANDLED
WITH THE UTMOST RESPECT !**

TRACTOR POWERED LOG SPLITTERS

A log splitter is a useful tool for farmers who are engaged in the production of timber fence posts and/or firewood.

Usually a log splitter is connected to the tractor by the 3 point linkage (hitch) and the energy for the hydraulic cylinder is supplied by the tractor's remote hydraulic system.

Prior to putting the log splitter into operation, a clear level site should be selected and the tractor's wheels thoroughly chocked, in addition to the brakes being applied.

It is important that the moil (cutting head) be sharp in order to provide a smooth safe splitting operation.

Whilst there are generally two or more people involved during the splitting operation, the operator of the hydraulic control lever should be the only person in close proximity when the actual splitting takes place.

Full body protection, including safety helmet, ear muffs and goggles, should be worn by all members of the team.

OTHER TRACTOR IMPLEMENTS and MACHINERY

The range of equipment that can be operated in conjunction with an agricultural tractor, is extensive.

It includes machines that may be front, mid or rear mounted, attached to the tow bar and towed or pulled, hitched to the 3 point linkage, driven by a PTO shaft or belt, operated by on board hydraulics or remotes, etc.

Some are uncomplicated tools – such as a ripper. Others are complex machines such as a baler, silage wrapper, air seeder, PTO driven harvester, etc. But even the most basic can cause problems if not properly adjusted, maintained or operated.

Particular attention should be directed to the proper adjustment of belts, chains, press rollers, tension devices, etc.

In the instance of the more complex machinery, it is important that the operator observe all safety measures as outlined in this and the manufacturer's manual, plus as the law dictates !

Blockages do occur with harvesting machinery, including round and square balers, combine harvesters, cotton pickers, root harvesters, etc. DO NOT attempt to unblock such a machine whilst it is operating. Always first disengage the drive and stop the engine.

The correct respiratory protective equipment should be worn if spraying herbicides or pesticides.

IN THE FINAL ANALYSIS – COMMON SENSE IS WHAT SAFETY IS ALL ABOUT.

FINALLY

REMEMBER:

Carbon monoxide is a killer! Be mindful of the need for adequate ventilation if running an engine in a confined space.

Absolutely no smoking or naked flames in the vicinity of a refueling operation! Always stop the engine before refueling.

Expert training in both the operation and maintenance of machinery is of paramount importance.

Agricultural machinery is designed to enable a farmer to managed the various aspects of the farm efficiently. If looked after, understood and respected – the correct machine for the operation will do just that ! But if treated with disregard, it can seriously injure its operator

Any item of farm machinery, including a tractor, is in itself a collection of nuts, bolts and components. As such, it represents no danger. The ingredient required to render it dangerous is a dangerous operator !

LEGAL IMPLICATIONS

As a result of recent legal judgements, the following recommendations should be considered by the owners of tractors and allied machinery, and/or the person or persons responsible for the safe operation of the equipment.

- a) Insist that any member of your family, or any employee, who is likely to operate the relevant equipment, first read this Manual. You should then spend whatever time necessary to train that person in its safe operation.
- b) In the event you employ a non English speaking person to operate the equipment, then it is your responsibility to engage a translator capable of explaining the contents of this manual and the meaning of the warning decals. Appropriate training should be given where necessary.
- c) If you LEND or HIRE the equipment to a neighbor, friend or other individual, you are required to explain to that person, or his agent, the safe operating procedures of the relevant unit and you would be wise to insist this Manual be read prior to handing over the unit.
- d) Should you SELL the equipment, apply the same procedures as in c). Additionally, have the buyer sign a note stating that you have explained the safe operating procedures to him or her and all future responsibility for the equipment rests with the new owner.
- e) Maintain a Tractor Log Book and have each operator sign for and record the hours worked and any service checks carried out. This practice should also apply in the event of c).

Whilst the above might be interpreted as extreme measures by some, the fact is we now live in a litigious society. It is prudent to take precautions aimed at protection against possible future legal action which may involve your tractor and allied machinery.

DECLARATION

I, the purchaser, hereby state that I have thoroughly inspected the item/s described hereunder and have satisfied myself that the condition is acceptable to me.

In the instance of NEW MACHINERY, the terms of the warranty, plus my obligations relating to the need to thoroughly check the unit frequently and if necessary tighten loose nuts and bolts, connections, wiring, etc., have been explained to me and are acceptable.

In the instance of USED MACHINERY I understand and acknowledge that there will be general wear and tear commensurate with the hours worked and the nature of the work, and I agree to purchase the unit with any imperfections which may be in existence at the time of purchase.

The various safety procedures relating to the unit/s have been explained to me, together with operator instructions and service requirements.

I also hereby acknowledge that I have been handed a copy of the *Manual of Farm Tractor and Allied Machinery Safe Work Practices* by Ian M Johnston and in the interests of safety will read this manual prior to putting this unit described hereunder into operation. Should there be any aspect of this manual which is not absolutely clear to me, I shall seek clarification from the selling agent.

NOTE: References have been made in this manual to certain aspects of some statutory regulations. Whilst all care has been taken, the author and selling agent are obliged to disclaim any responsibility for the accuracy of such references and urges tractor owners and operators to seek qualified advice should they have any doubts regarding the precise legal requirements applying in their state or territory, relating to mandatory obligations pertaining to ownership and operation of farm tractors and allied machinery.

SIGNED BY BEING THE PURCHASER

DATE.....

IF A COMPANY OR PARTNERSHIP – CAPACITY TO SIGN

FULL NAME (printed)

ADDRESS

COMPANY NAME (if applicable)

UNIT/S DESCRIPTION

SERIAL No

NEW or USED

PURCHASED FROM

DECLARATION

I, the purchaser, hereby state that I have thoroughly inspected the item/s described hereunder and have satisfied myself that the condition is acceptable to me.

In the instance of NEW MACHINERY, the terms of the warranty, plus my obligations relating to the need to thoroughly check the unit frequently and if necessary tighten loose nuts and bolts, connections, wiring, etc., have been explained to me and are acceptable.

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SIGNED BY BEING THE PURCHASER

DATE.....

IF A COMPANY OR PARTNERSHIP – CAPACITY TO SIGN

FULL NAME (printed)

ADDRESS

COMPANY NAME (if applicable)

UNIT/S DESCRIPTION

SERIAL No

NEW or USED

PURCHASED FROM