



3-SECTION CHISEL FLEX 20 SERIES

OPERATOR'S MANUAL

LIMITED WARRANTY:

Mandako Agri Marketing (2010) Ltd. ("MANDAKO") warrants for a period of one (1) year from the date of delivery to the purchaser that any new machinery purchased from MANDAKO (the "Product") will be free of manufacturing and materials defects (the "Covered Defects"). Before using the Product, the purchaser shall determine the suitability of the Product for its intended use. This Limited Warranty is non-transferable and valid to the purchaser of the Product only.

Except for the Covered Defects, this Limited Warranty shall not apply to any other defects or problems in the Product, including without limitation: (i) alterations, changes, replacements or repairs to the Product made by anyone other than MANDAKO or MANDAKO authorized Dealers; (ii) accessories, attachments, tools or parts sold or operated with the Product, if they have not been manufactured by MANDAKO; (iii) application or installation of accessories, attachments, tools or parts not completed in accordance with MANDAKO's operator's manual, specifications or printed instructions; (iv) defects or problems caused by misuse, abuse, neglect, improper testing, improper storage, improper handling or abnormal conditions; and (v) defects caused by wear and tear from ordinary use of the Product.

During the one (1) year warranty period, provided that written notice of the Covered Defects is given to MANDAKO within seven (7) days from the date that the defect was, or ought to have been, discovered, the liability of MANDAKO under this Limited Warranty shall be limited to the repair or replacement of any defective Product. For clarity, the purchaser shall be responsible for all expenses incurred as a result of any repairs, labour, parts, transportation or any other work, unless MANDAKO has otherwise authorized reimbursement of such expenses. In order to obtain repair or replacement, the written notice provided by the purchaser must contain full details of the Covered Defects and submitted online at www.mandako.com/warranty-claim or be sent to:

Mandako
Box 379, 12159B, Hwy 306
Plum Coulee, Manitoba, R0G 1R0

MANDAKO reserves the right to inspect the defective Product prior to repair or replacement. If MANDAKO determines that a defect in the Product is not a Covered Defect, it shall not have any obligation to repair or replace the Product.

No one is authorized to make oral warranties or representations on behalf of MANDAKO regarding the Product. The Product is subject to design changes and MANDAKO shall not be required to retro-fit or exchange items on previously sold Product, except at its own option.

THIS LIMITED WARRANTY IS DEEMED ACCEPTED BY YOU UPON YOUR PURCHASE OF THE PRODUCT. TO THE EXTENT PERMITTED BY LAW, THIS LIMITED WARRANTY IS EXCLUSIVE, AND IN LIEU OF ANY AND ALL OTHER WARRANTIES, CONDITIONS OR REPRESENTATIONS RESPECTING THE PRODUCT, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, SUITABILITY, OR ANY OTHER WARRANTIES, REPRESENTATIONS OR CONDITIONS THAT MAY ARISE FROM USAGE OF TRADE OR COURSE OF DEALING.

MANDAKO'S OBLIGATION SHALL NOT EXTEND BEYOND THE OBLIGATIONS EXPRESSLY UNDERTAKEN ABOVE AND IN NO EVENT SHALL MANDAKO OR ITS SUPPLIERS, AGENTS, OFFICERS, DIRECTORS, CONTRACTORS AND EMPLOYEES BE LIABLE TO THE PURCHASER OR ANY THIRD PARTY FOR ANY INDIRECT, PUNITIVE, EXEMPLARY, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSSES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS, LOSS OF PROFITS OR SALES, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION, LOSS OF GOODWILL, WORK STOPPAGE, COMPUTER FAILURE OR MALFUNCTION OR ANY OTHER PECUNIARY LOSS OR COMMERCIAL DAMAGE OR LOSS) ARISING FROM ANY CLAIM WHATSOEVER, INCLUDING ANY TORT, EQUITY, NEGLIGENCE, GROSS NEGLIGENCE, WILFUL MISCONDUCT OR STRICT LIABILITY CLAIM, EVEN IF MANDAKO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR LOSSES OR THEY ARE FORESEEABLE. THE PURCHASER WAIVES ANY CLAIM AGAINST MANDAKO FOR PUNITIVE OR EXEMPLARY DAMAGES.

**WARRANTY VOID IF NOT REGISTERED
PLEASE REGISTER AT www.mandako.com/registration**

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Section 1: INTRODUCTION

Congratulations on your choice of a Mandako 3-Section Chisel-Flex to complement your farming operation. This equipment has been designed and manufactured to meet the needs of a discerning agricultural industry.

Safe, efficient, and trouble-free operation of your Mandako Chisel-Flex requires that you and anyone else who will be using or maintaining the 3-Section Chisel-Flex, read and understand the Safety, Operation, Maintenance, and Troubleshooting information contained within this Operator's Manual.

This manual covers all sizes of the Mandako 3-Section Chisel-Flex. Keep this manual handy for frequent reference and to pass on to new operators or owners. Call your Mandako dealer if you need assistance, information, or additional copies of the manual.

NOTE:

The directions left, right, front, and rear - as mentioned throughout this manual - are as seen from the tractor driver's seat and facing in the direction of travel.

1.1 SERIAL NUMBER LOCATION



Fig. 1 Model/Serial Number Location

Always give your dealer the serial number of your Chisel-Flex when ordering parts or requesting service or other information.

The serial number plate is located where indicated above. Please mark the number in the space provided for easy reference.

Model Number _____

Serial Number _____

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Section 2: SAFETY

Why is SAFETY important to you?

3 Big Reasons:

- ▲ Accidents Disable and Kill
- ▲ Accidents Cost
- ▲ Accidents Can Be Avoided

This Safety Alert symbol means:
ATTENTION!
BECOME ALERT!
YOUR SAFETY IS INVOLVED!



The Safety Alert symbol identifies important safety messages on the Chisel-Flex and in this manual.

When you see this symbol, be alert to the possibility of personal injury or death.

Follow the instructions in the safety message.

SIGNAL WORDS:

Note the use of the signal words DANGER, WARNING, CAUTION and ATTENTION along with the accompanying safety messages. The appropriate signal word for each message has been selected using the following guidelines:

DANGER

DANGER - Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

This signal word is to be limited to the most extreme situations typically for machine components which, for functional purposes, cannot be guarded.

WARNING

WARNING - Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

It identifies hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.

CAUTION

CAUTION - Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

It may also be used to alert against unsafe practices.

ATTENTION

ATTENTION - Indicates practices or situations which may result in the malfunction of, or damage to, the equipment.

2.1 SAFETY ORIENTATION

You are responsible for the SAFE operation and maintenance of your Mandako Chisel-Flex Tillage Tool. Ensure that you and anyone else who will use, maintain or work around the Chisel-Flex be familiar with the Safety, Operating, and Maintenance procedures in this manual.

This manual will take you step-by-step through your working day and alerts you to all good safety practices that should be used while operating the Chisel-Flex.

Remember, you are the key to safety. Good safety practices not only protect you but also the people around you. Make these practices a working part of your safety program. Be certain that everyone using this equipment follows all safety precautions, as well as the detailed operating and maintenance procedures.

Most accidents can be prevented. Do not risk injury or death by ignoring good safety practices:

- Chisel-Flex owners must give operating instructions to operators or employees before allowing them to operate the machine, and review annually thereafter.
- The most important safety device on this equipment is a SAFE operator. It is the operator's responsibility to read and understand ALL Safety and Operating instructions in the manual and to follow them. Most accidents can be avoided.
- A person who has not read and understood all operating and safety instructions is not qualified to use the machine. An untrained operator exposes himself and bystanders to the possibility of serious injury or death.
- Do not modify the equipment in any way. Unauthorized modification may impair the function and/or safety of the unit and could affect the life of the equipment.
- Think SAFETY! Work SAFELY!

2.2 GENERAL SAFETY

- Read and understand the Operator's Manual and all safety signs before using, maintaining, adjusting or cleaning the Chisel-Flex.



- Have a first-aid kit available for use should the need arise and know how to use it.



- Have a fire extinguisher available for use should the need arise and know how to use it.

- Do not allow riders.

- Wear appropriate protective gear. This list includes but is not limited to:

- Hard hat
- Protective shoes with slip resistant soles
- Protective glasses, goggles or face shield
- Heavy gloves
- Hearing Protection



- Install and secure all guards before starting.

- Wear suitable ear protection for prolonged exposure to excessive noise.



- Lower machine to ground, place all controls in neutral, set park brake, stop engine, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.

- Clear the area of people, especially small children, before operating the unit.

- Review safety related items annually with all personnel who will be operating or maintaining the Chisel-Flex.

2.3 EQUIPMENT SAFETY GUIDELINES

- Safety of the operator and bystanders is one of the main concerns in the design and development of equipment. However, every year many accidents occur, which could have been avoided by a few seconds of thought and a more careful approach to handling equipment.
- You, the operator, can avoid many accidents by following the precautions in this section. Insist that those working with you, or for you, follow them also.
- In order to provide a better view, certain photographs or illustrations in this manual may show an assembly with a safety shield removed. Equipment should never be used in this condition. Keep all shields in place. If shield removal becomes necessary for repairs, replace the shield prior to use. 
- Replace any safety or instructional signs that are missing or illegible. The location of these safety signs are indicated in this manual.
- Never use alcoholic beverages or drugs which can hinder alertness or coordination while using this equipment. Consult your doctor about using this machine while taking prescription medications.
- Under no circumstances should young children be allowed to work with this equipment.
- The operator should be a responsible, properly trained and physically able person. They should be familiar with machinery and trained in this equipment's operations.
- If the elderly are assisting with work, their physical limitations need to be recognized and accommodated.
- If the tow vehicle is a tractor, it should be equipped with a Roll Over Protective Structure (ROPS) and a seat belt. 
- Never exceed the limits of the Chisel-Flex. If its ability to do a job, or to do so safely, is in question - DON'T TRY IT.
- Do not modify the equipment in any way. Unauthorized modification may impair the function and life of the equipment, and may result in serious injury or death.

2.4 SAFETY DECALS

2.4.1 GENERAL INFORMATION:

- Keep safety decals clean and legible at all times.
- Replace decals that are missing or have become illegible.
- Replaced parts that displayed a safety decal should also display the current sign.
- Safety decals displayed in Section 2.13 each have a part number located below the sign. Use this part number when ordering replacements.
- Safety decals are available from your authorized Distributor or Dealer Parts Department.

NOTE:

Call Mandako directly if you are unfamiliar with who your local Dealer/Distributor is.

2.4.2 HOW TO INSTALL SAFETY DECALS:

1. Be sure that the installation area is clean and dry.
2. Be sure temperature is above 50°F (10°C).
3. Determine exact position before you remove the paper backing. (See Section 2.14)
4. Remove the smallest portion of the split backing.
5. Align the decal over the specified area and carefully press the small portion with the exposed adhesive in place.
6. Slowly peel back the remaining paper and carefully smooth the rest of the decal in place.
7. Small air pockets can be pierced with a pin and smoothed out using the piece of the paper backing.

2.5 SAFETY TRAINING

- Safety is a primary concern in the design and manufacture of our products. Unfortunately, our efforts to provide safe equipment can be wiped out by a single careless act of an operator or bystander. 
- Accident prevention and identifying hazards are dependent upon the proper training of personnel. Their awareness, concern and common sense are crucial when involved with the operation, transport, maintenance and storage of the equipment.
- Working with unfamiliar equipment can lead to careless injuries. Read this manual to become acquainted with the machine.
- Whether the machine owner is the operator, loans or rents it out, it is their responsibility to make certain that the borrower reads and understands the operator's manuals.
- Know your controls, how to stop the tow unit, the engine, and machine quickly in an emergency.
- Train all new personnel and review instructions frequently with existing workers. Be certain only a properly trained and physically able person will use the machinery.
- A person who has not read and understood all operating and safety instructions is not qualified to use the machine. An untrained operator exposes himself and bystanders to the possibility of serious injury or death.
- If the elderly are assisting with the work, their physical limitations need to be recognized and accommodated.

2.6 PREPARATION

- Never use the Chisel-Flex until you have read this Manual, and the tow unit's Operator's Manual. Take note of each Safety Message found on the safety decals on the Chisel-Flex and the power unit. 
- Personal protective equipment including a hard hat, safety glasses, safety shoes and gloves are recommended during assembly or installation, operation, adjustment, maintaining or repairing, cleaning or moving the unit. 
- Do not allow long hair, loose fitting clothing or jewelry to be around equipment.
- **PROLONGED EXPOSURE TO LOUD NOISE MAY CAUSE PERMANENT HEARING LOSS!**
- Power equipment with or without equipment attached can often be noisy enough to cause permanent or partial hearing loss. We recommend that you wear hearing protection on a full-time basis if the noise in the Operator's position exceeds 80db. 
- Noise over 85db on a long-term basis can cause severe hearing loss. Noise over 90db adjacent to the Operator over a long-term basis may cause permanent, total hearing loss.

NOTE:
Hearing loss from loud noise (from tractors, chain saws, radios, and other such sources close to the ear) is cumulative over a lifetime without hope of natural recovery.
- Any tractor used to tow the Chisel-Flex must be equipped with an approved Roll-Over-Protective-Structure (ROPS). Always wear a seat belt. Serious injury or even death could result from falling off the tractor. If a roll-over occurs, the operator could be pinned under the ROPS or inside the tractor. 
- Clear working area of stones, branches or hidden obstacles that might be hooked or snagged, causing damage or injury.
- Be sure the machine is properly attached, adjusted and in good operating condition.
- Ensure that all safety shielding and safety decals are properly installed and in good condition.

2.7 OPERATING SAFETY

- Read and understand the Operator's Manual and all safety signs before using. Review safety instructions annually. 
- Lower machine to the ground, place all controls in neutral, stop engine, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.
- Install and secure all guards and shields before starting or operating.
- Keep hands, feet, hair, and clothing away from all moving and/or rotating parts. 
- Do not allow riders on the Chisel Flex or tow vehicle during operation or transporting.
- Clear the area of all bystanders, especially children, before starting.
- Stay away from all frames and components when folding or extending. Keep others away.
- Clean reflectors, SMV (Slow Moving Vehicle) emblem and lights before transporting. Be sure you are in compliance with all federal and local regulations regarding transport of equipment on public roads and highways. 
- Install cylinder stops/transport lock brackets and close ball valves in hydraulic lines before transporting or working under the frame.
- Do not exceed a safe travel speed.
- Use hazard flasher on tow vehicle when transporting.
- Before applying pressure to the hydraulic system, make sure all components are tight and that steel lines, hoses and couplings are in good condition.
- Fold wings and install transport lock brackets with its retainer over wheel lift cylinder before transporting.
- Stay away from overhead power lines when folding or extending wings. Electrocutation can occur without direct contact.
- Attach securely to towing unit using a hardened pin with a retainer and a safety chain.
- Review safety instructions annually.
- Do not drive while impaired.

2.8 TIRE SAFETY

- Failure to follow proper procedures when mounting a tire on a wheel or rim can produce an explosion which may result in serious injury or death. 
- Do not attempt to mount a tire unless you have the proper equipment and experience to do the job.
- Have a qualified tire dealer or repair service perform required tire maintenance.
- When replacing worn tires, make sure they meet the original tire specifications. Never under size.

2.9 STORAGE SAFETY

- Store the unit in an area away from human activity
- Store the unit in a dry, level area. Support the frame with planks if required.
- Place the machine into its transport configuration relieve the pressure from off of the Wheel Lift Cylinder and onto the Cylinder Stops
- Block tires.
- Do not allow children to play on or around the stored machine.

2.10 HYDRAULIC SAFETY

- Always place all tractor hydraulic controls in neutral before dismounting.
- Make sure that all components in the hydraulic system are kept in good condition and are clean.
- Replace any worn, cut, abraded, flattened or crimped hoses and steel lines.
- Relieve pressure from hydraulic circuit before servicing or disconnecting from tractor.
- Do not attempt any makeshift repairs to the hydraulic lines, fittings or hoses by using tape, clamps or cements. The hydraulic system operates under extremely high-pressure, such repairs will fail suddenly and create a hazardous and unsafe condition.
- Wear proper hand and eye protection when searching for a high-pressure hydraulic leak. Use a piece of wood or cardboard as a backstop instead of hands to isolate and identify a leak. 
- If injured by a concentrated high-pressure stream of hydraulic fluid, seek medical attention immediately. Serious infection or toxic reaction can develop from hydraulic fluid piercing the skin surface. 
- Before applying pressure to the system, make sure all components are tight and that lines, hoses and couplings are in good condition.

2.11 MAINTENANCE SAFETY

- Good maintenance is your responsibility. Poor maintenance is an invitation for trouble.
- Follow good shop practices.
 - Keep service area clean and dry.
 - Be sure electrical outlets and tools are properly grounded.
 - Use adequate light for the job at hand. 
- Lower machine to the ground. Place all controls in neutral, stop engine, set the park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.
- Place stand or blocks under the frame before working beneath the machine or when changing tires.
- Always use personal protective equipment such as safety glasses, gloves, and hearing protection, when performing any service or maintenance work. 
- Where replacement parts are necessary for periodic maintenance and servicing, genuine factory replacement parts must be used to restore your equipment to original specifications.
- A fire extinguisher and first aid kit should be kept readily accessible while performing maintenance on this equipment. 
- Relieve pressure on the hydraulic system before servicing or disconnecting from tractor. 
- Before applying pressure to a hydraulic system, make sure all components are tight and that steel lines, hoses and couplings are in good condition. 
- When completing a maintenance or service function, make sure all safety shields and devices are installed before placing unit in service. 

2.12 TRANSPORT SAFETY

- Read and understand ALL the information in the Operator's Manual regarding procedures and SAFETY when operating the Chisel-Flex in the field and/or on the road. 
- Maintain wheel bolts to specified torque.
- Check with local authorities regarding Chisel-Flex transport on public roads. Obey all applicable laws and regulations.
- Always travel at a safe speed. Use caution when making corners or meeting traffic.
- Clean reflectors, SMV (Slow Moving Vehicle) emblem and all the lights before transporting. Be sure you are in compliance with all federal and local regulations regarding transport of equipment on public roads and highways. 
- Install additional lights on the rear of the machine to safeguard against rear end collisions. Daybreak and dusk are particularly dangerous and pilot vehicles are recommended.
- Install cylinder stops/transport lock brackets and close valves in hydraulic lines before transporting or working under the frame.
- Be sure that the machine is securely hitched to the towing vehicle and a retainer is used through the drawbar pin. Always attach a safety chain between the frame and the towing machine.
- Stay away from overhead power lines when raising wings. Electrocutation can occur without direct contact.
- Raise wings and install lock brackets over wheel cylinders before transporting.
- Keep to the right and yield the right-of-way to allow faster traffic to pass. Drive on the shoulder of the road, if permitted by law.
- Do not exceed 32 km/h (20 mph) on highway transport. Reduce speed on rough roads and surfaces.
- Always use hazard warning flashers on tow vehicle when transporting unless prohibited by law.
- Do not drive while impaired.

2.13 SAFETY DECALS

The various safety decals and their locations on the equipment are shown in the illustrations to follow.

Good safety practices require familiarizing yourself with the decals. Read the warning messages and note the area, or particular function related to that area, that the decal highlights.

If safety decals have been damaged, removed, become illegible, or replacement parts do not have the decal, new ones must be applied. Safety decals are available from your authorized dealer.

Mandako reserves the right to update safety decals without notice. Safety decals may not be to scale or exactly as shown.



WARNING

TO PREVENT SERIOUS INJURY OR DEATH:

- Read and understand the Operator's Manual and all safety signs before using. Review safety instructions annually.
- Place all controls in neutral, stop tractor engine, set park brake and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging implement.
- Install and secure all guards and sheilds before starting or operating.
- Keep hands, feet, hair and clothing away from all moving and / or rotating parts.
- Do not allow riders on the implement or tractor during operation or transportation.
- Stay away from all extending or folding frames and components. Keep others away.
- Ensure reflectors, SMV and lights are clean and visible before transporting. Be sure lights are working.

- Stay away from overhead power lines when folding or extending frames and components. Electrocutation can occur without direct contact.
- Attach to towing unit securely using a hardened pin with retainer and a safety chain.
- Do not exceed a safe travel speed.
- Use hazard flashers on tractor when transporting.
- Before applying pressure to the hydraulic system, make sure all components are tight and that steel lines, hoses and couplings are in good condition.
- When repairing or servicing implement, refer to Operator's Manual.



R9913114

Part No. R9913114 (A)



WARNING

COLLISION HAZARD

TO PREVENT SERIOUS INJURY OR DEATH:

**Do not exceed 32 KPH
(20 MPH)**

Slow down for corners and rough terrain.

R9913073

Part No. R9913073 (B)

ATTENTION

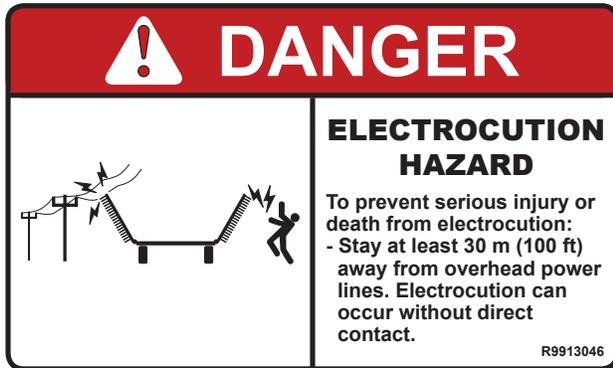
CHECK AND RE-TORQUE LUG NUTS

BEFORE & AFTER EVERY 50 MILES

R9913103

Part No. R9913103 (C)

Remember - Safety Decals are for your protection! If they have been damaged, removed, become illegible, or replacement parts do not have the decal; new ones must be applied. Safety decals are available from your authorized dealer.



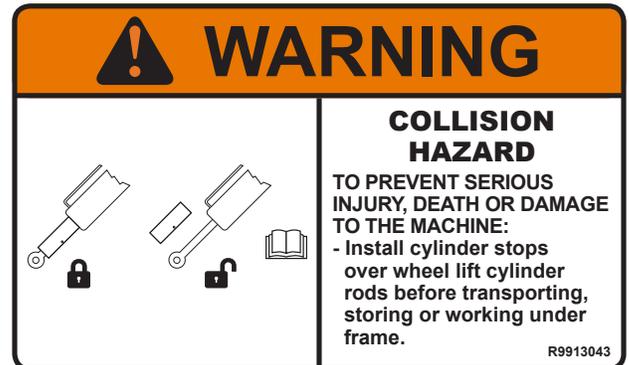
Part No. R9913046 (D)



Part No. R9913045 (E)



Part No. R9913110 (F)



Part No. R9913043 (G)



Part No. R9913113 (H)



Part No. R9913124 (I)



Part No. R9913004 (J)



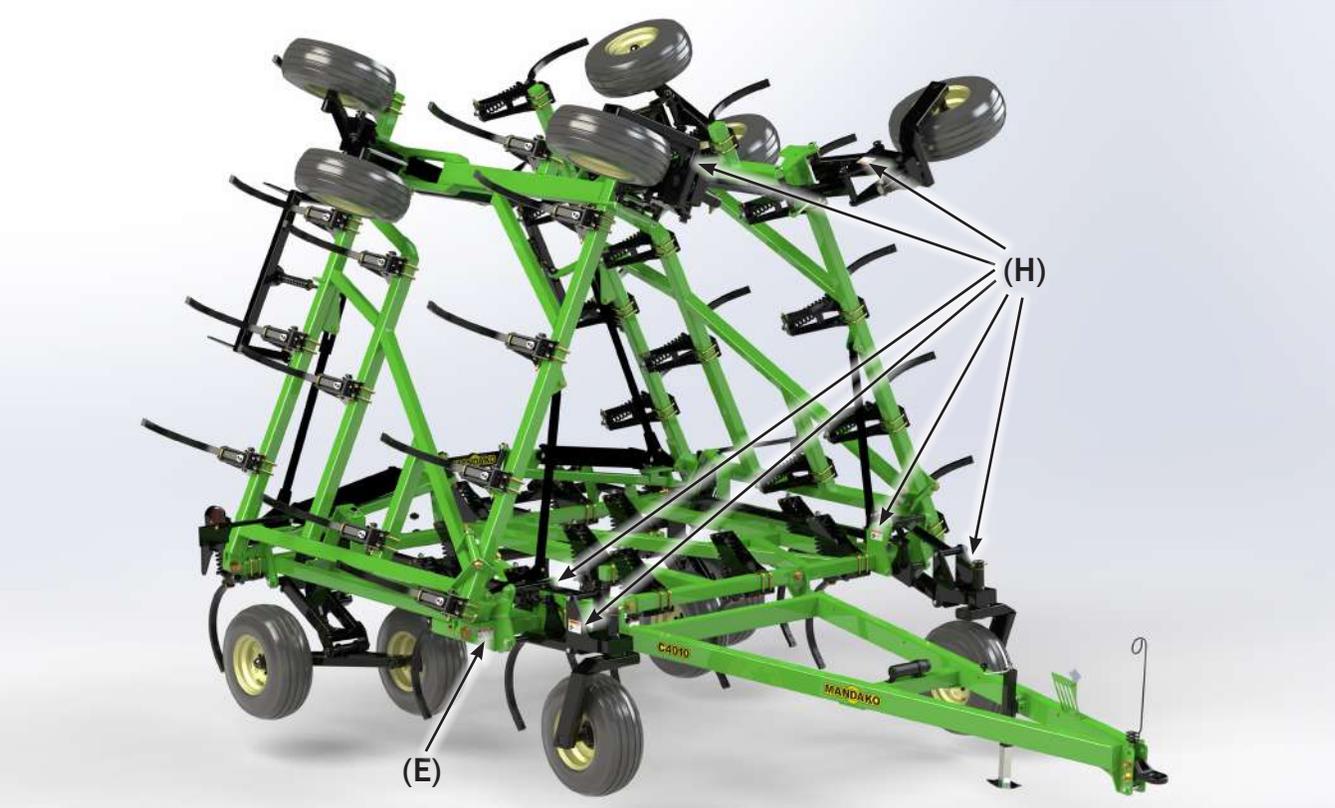
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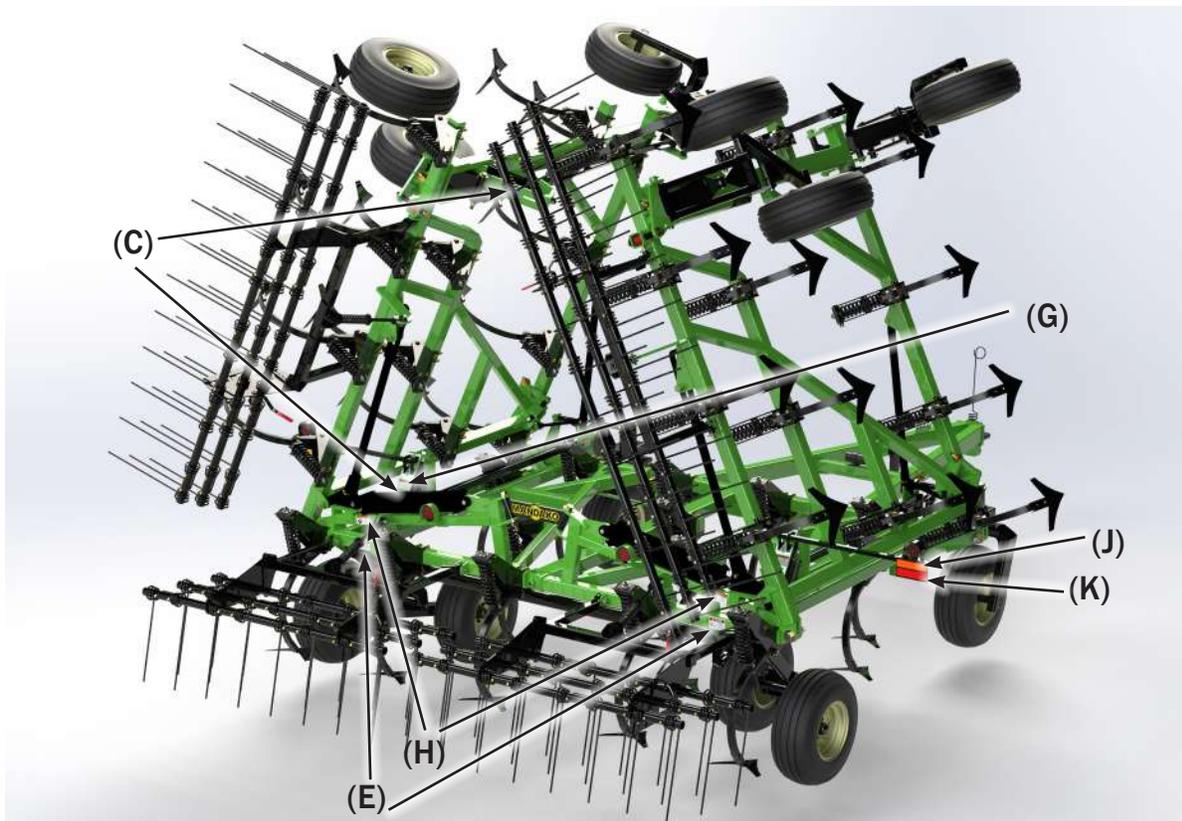
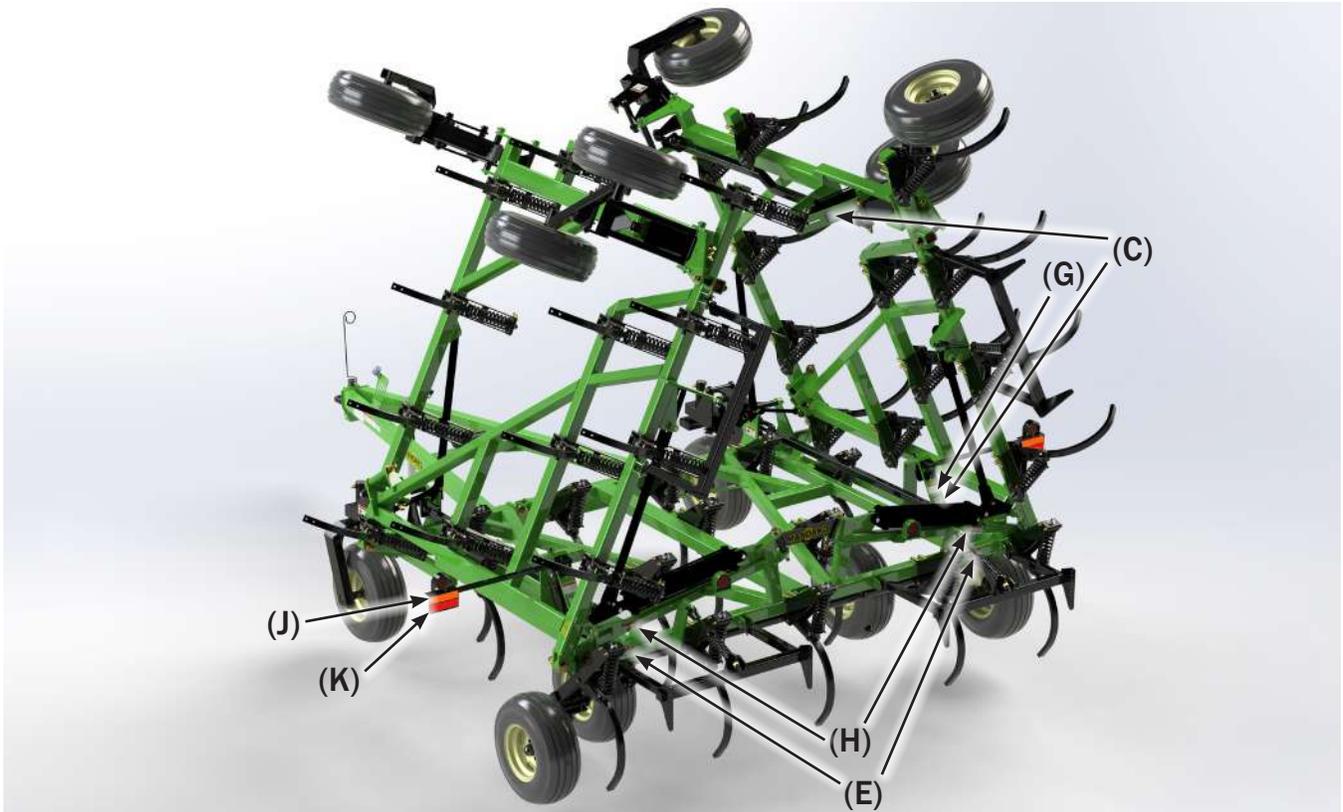


Part No. R9913003 (L)

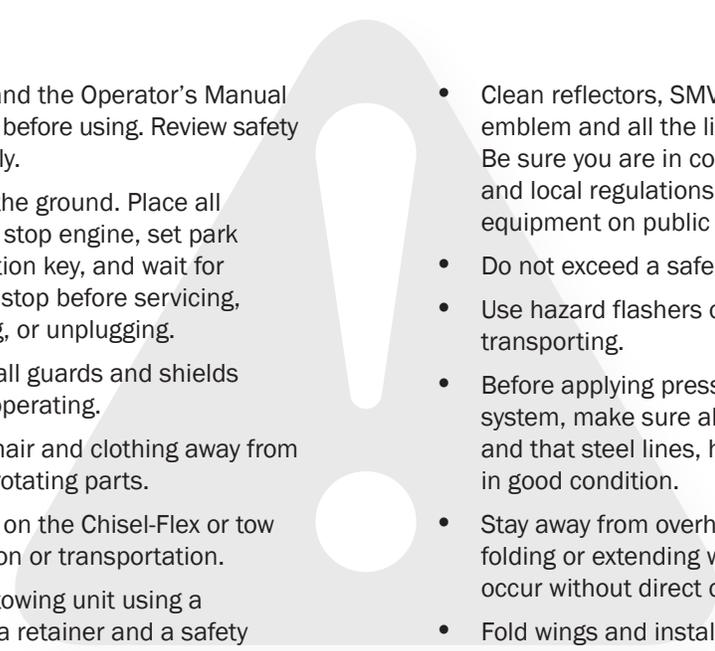


2.14 SAFETY DECAL LOCATIONS





Section 3: OPERATION

- 
- Read and understand the Operator's Manual and all safety signs before using. Review safety instructions annually.
 - Lower machine to the ground. Place all controls in neutral, stop engine, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, or unplugging.
 - Install and secure all guards and shields before starting or operating.
 - Keep hands, feet, hair and clothing away from all moving and/or rotating parts.
 - Do not allow riders on the Chisel-Flex or tow unit during operation or transportation.
 - Attach securely to towing unit using a hardened pin with a retainer and a safety chain.
 - Clear the area of all bystanders, especially children, before starting.
 - Stay away from frames and components when folding or extending wings. Keep others away.
 - Clean reflectors, SMV (Slow Moving Vehicle) emblem and all the lights before transporting. Be sure you are in compliance with all federal and local regulations regarding transport of equipment on public roads and highways.
 - Do not exceed a safe travel speed.
 - Use hazard flashers on tractor when transporting.
 - Before applying pressure to the hydraulic system, make sure all components are tight and that steel lines, hoses, and couplings are in good condition.
 - Stay away from overhead power lines when folding or extending wings. Electrocutation can occur without direct contact.
 - Fold wings and install cylinder stops/transport lock brackets with its retainer over wheel lift cylinder before transporting.
 - Attach securely to towing unit using a hardened pin with a retainer and a safety chain.
 - Do not drive while impaired.
-

It is the responsibility of the owner and operator to read this manual. They must train all others before starting to work with the machine. Follow all safety instructions exactly. Safety is everyone's business. By following recommended procedures, a safe working environment is provided for the operator, bystanders and the area around the work site.

Many features incorporated into this machine are the result of suggestions made by customers like you.

This manual will describe how to set the Chisel-Flex to provide maximum field efficiency. By following the operating instructions in conjunction with a good maintenance program, your Chisel-Flex will provide many years of trouble-free service.

3.1 MACHINE COMPONENTS

The Mandako 3-Section Chisel-Flex consists of three main sections: a main frame and two wings that can be controlled hydraulically to lift for transport or lower for field operation. These sections are broken down further into seven sub-sections that allow the machine to flex while following the contour of the ground. All sections are designed with shank assemblies for shovels that will engage the soil and cultivate the land. It is the responsibility of the operator to monitor the job being done and adjust the machine to provide the desired performance.

Due to the complexity of the machine there are multiple points of adjustment.
See Section 4.4.

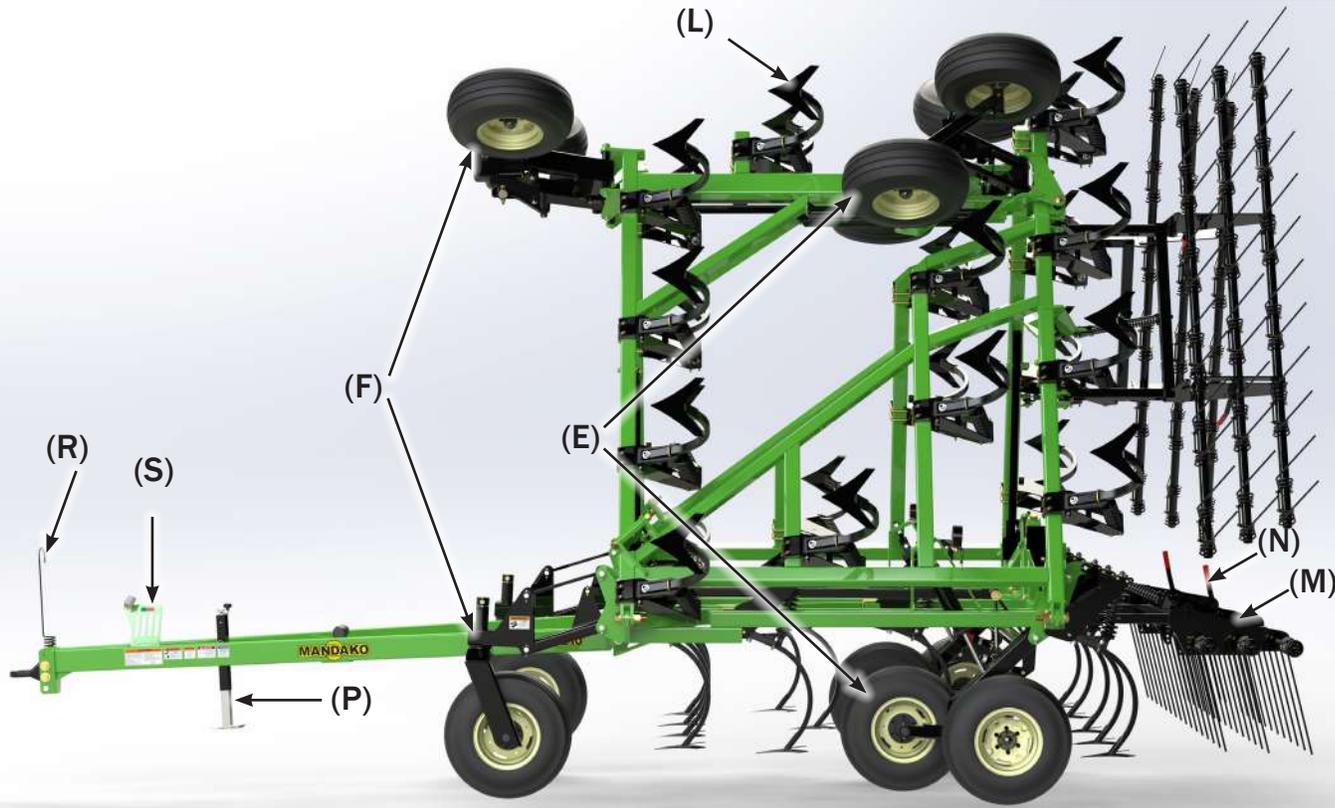
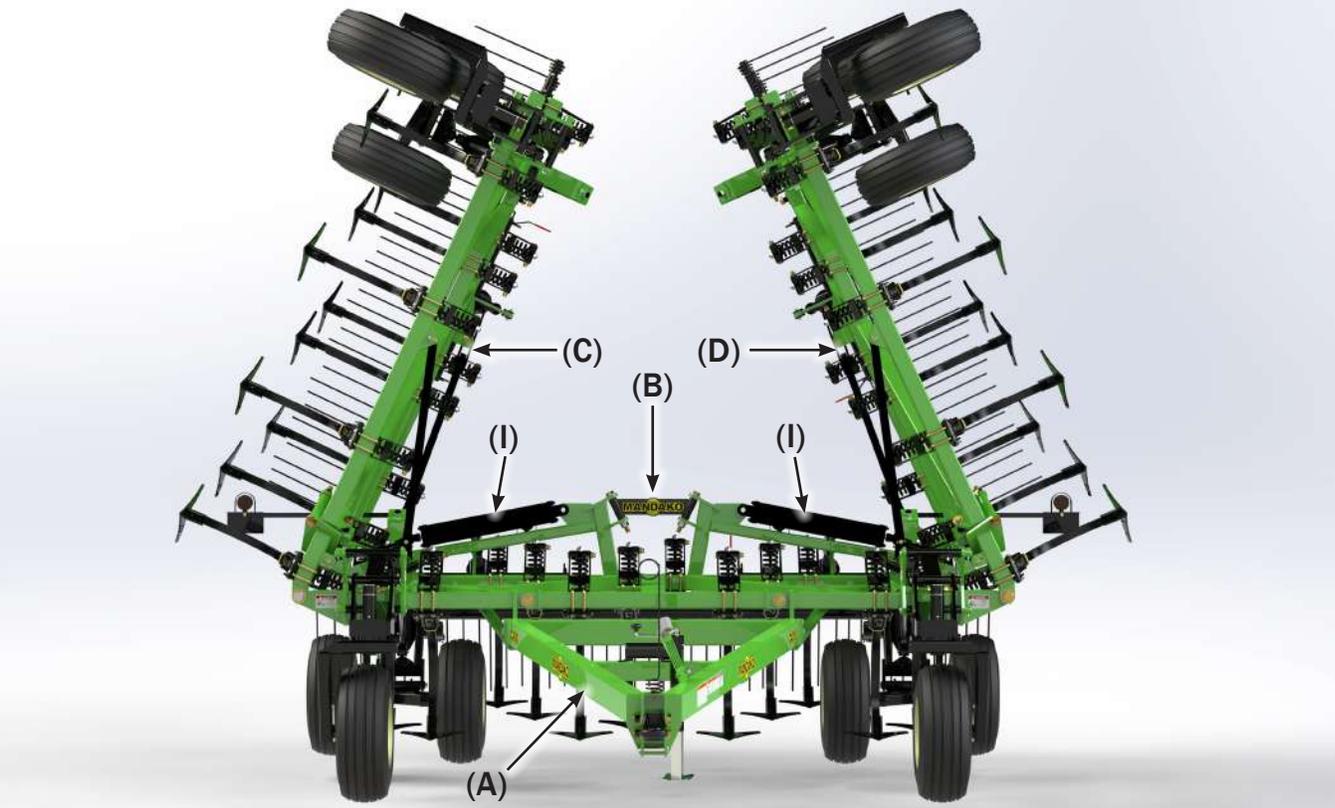
Optional harrows are available to mount to the back of each section.

Cylinder Stops/Transport Lock Brackets are included on every machine. These are used over the wheel lift cylinder rams on the main section while transporting.

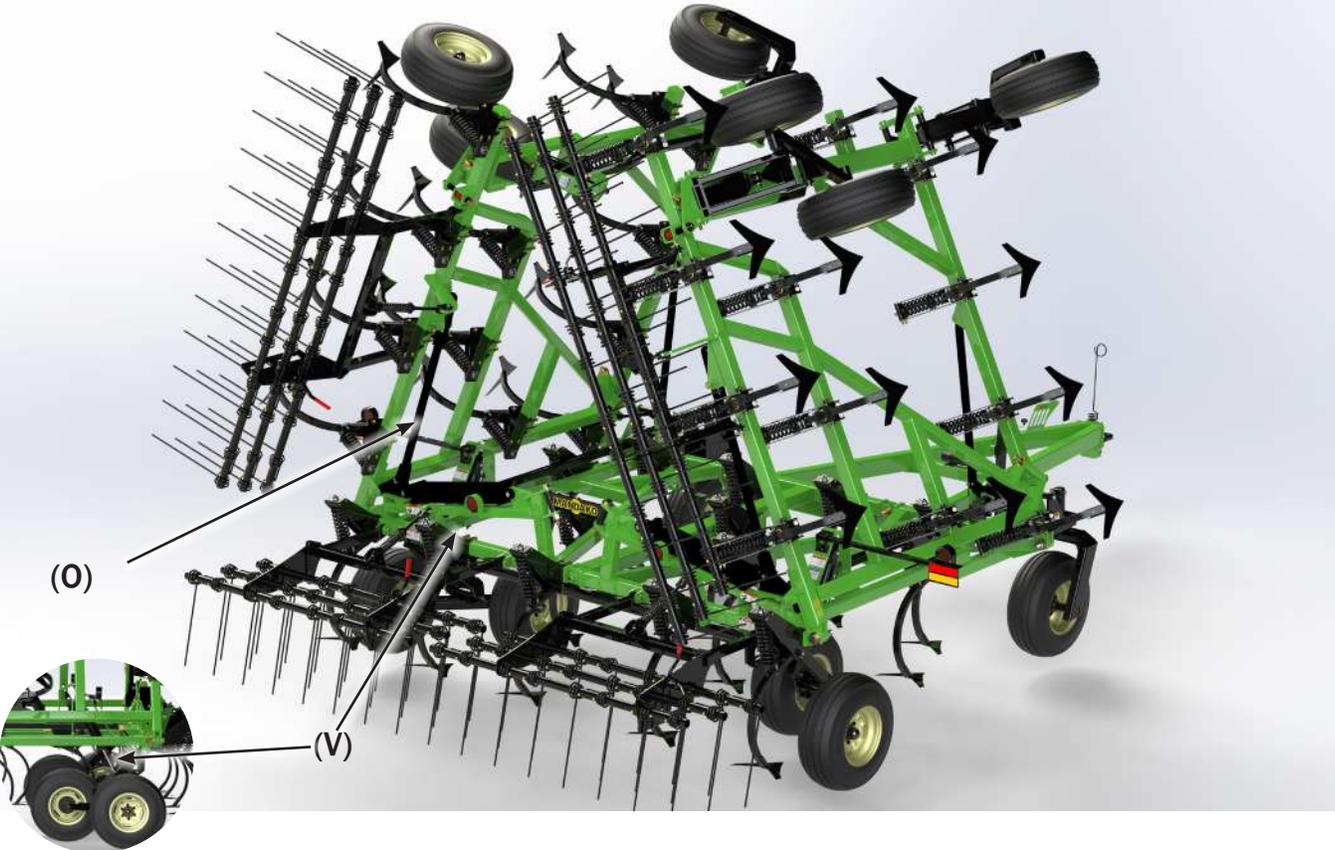
A single point depth control is mounted at the front of the frame on the main section and plumbed into the wheel lift hydraulic circuit. This controls the height of the machine and ensures the shovels always return to the same pre-set depth when lowered.

The main Chisel-Flex components are as follows:

- A. Hitch
- B. Center Section
- C. Right Wing Section
- D. Left Wing Section
- E. Rear Wheel Lift Assemblies
- F. Front Wheel Lift Assemblies
- G. Front to Rear Wheel Lift Connecting Arm
- H. Wheel Lift Cylinders
- I. Wing Lift Cylinders
- J. Single Point Depth Control
- K. Shank Assembly
- L. Shovels/Sweeps
- M. Harrow Assemblies
- N. Harrow Angle Adjuster
- O. Slotted Wing Lift Brackets
- P. Hitch Jack
- Q. Operators Manual Cannister
- R. Hydraulic Hose Retainer
- S. Hydraulic Hose Storage Plate
- T. Hydraulic Couplers/Male Tips (NOT SHOWN)
- U. Caster Transport Wheel Locks (NOT SHOWN)
- V. Cylinder Stops/Transport Lock Brackets







3.2 MACHINE BREAK-IN

There are no operational restrictions on the Chisel-Flex when using for the first time.

However, it is recommended that the following mechanical items be checked:

After operating for 1/2 hour:

1. Re-torque all wheel bolts.
2. Re-torque all fasteners and hardware.
3. Check that no hydraulic lines are being pinched or crimped. Re-route as required.
4. Inspect all hydraulic lines, hoses, fittings and couplers for leaks. Tighten any leaking fittings.
5. Check for, and remove all entangled material.
6. Lubricate all grease fittings with one shot of grease.

NOTE:

See Section 7 for specifications.

After 5 hours and 10 hours of operation:

7. Re-torque all wheel bolts, fasteners and hardware.
8. Inspect all hydraulic lines, hoses, fittings and couplers for leaks. Tighten any leaking fittings.
9. Go to the normal servicing and maintenance schedule as defined in the Service and Maintenance Section.

3.3 PRE-OPERATION CHECKLIST

Efficient and safe operation of the Mandako Chisel-Flex requires that each operator reads the manual. They must understand the procedures and all related safety precautions.

A pre-operation checklist is provided for the operator. It is important for personal safety, and to maintain the good mechanical condition of the Chisel-Flex that this checklist is followed.

Before operating the Chisel-Flex and each time thereafter, the following areas should be checked off:

1. Lubricate the machine according to the schedule outline in Section 4.2.
2. Use a tractor of adequate power and weight to operate the Chisel-Flex. See Section 3.4 for recommendations.
3. Be sure that the Chisel-Flex is properly hitched to the tractor. Use a hardened drawbar pin with a retainer. Attach safety chains.
4. Inspect all hydraulic lines, hoses, fittings and couplers for leaks. Tighten any leaking fittings.
5. Check the tires. Ensure they are inflated to their specified pressure.
6. Check the wheel bolts. Ensure they are tightened to their specified torque.
7. Remove all entangled material.
8. Be sure that all lights, reflectors and SMV (Slow Moving Vehicle) emblem required by the local highway authorities are installed, clean and in good working order.
9. Ensure the machine is level
 - a. Place machine on clean, level ground.
 - b. Perform a full re-phasing. See section 4:3:2.
 - c. Measure from the ground to the sweeps to ensure they are all equal distance away from the ground.
10. Set harrow assemblies appropriately for desired application (See section 3:8:10)

3.4 EQUIPMENT MATCHING

To ensure the safe and reliable operation of the Chisel-Flex, it is necessary to use a tractor with appropriate specifications.

Be certain that these requirements are met:

1. **Horsepower:**
The Chisel-Flex needs both power and mass to pull and stabilize the unit in all operating conditions.

The power required to pull the Chisel Flex depends on the soil conditions as well as the contour of the land. See Table 1 for suggested horsepower recommendations.

2. **Hydraulic System:**
The tractor's hydraulic system must be capable of a minimum 10 gpm (38 lpm) at 1800 psi (12,420 kPa) but not exceed 2800 psi (19,320 lpm).

All 3-Section Chisel-Flex units require 2 hydraulic circuits. These circuits are used to lift and lower the machine and lift and lower the wing sections.

Size	Horsepower
38'	380+
40'	400+

Table 1 - Suggested Horsepower Recommendation



Fig. 2 Two Hydraulic Circuits

3.5 CONTROLS

Before starting to work, all operators should familiarize themselves with the location and function of all controls (Fig. 3).

1. Single Point Depth Control:
Turning the depth adjuster adjusts when the plunger will come in contact with the depth control valve.

When the frame is lowered (wheel assemblies raised), the 'return to depth' system should be set so the sweeps always return to the desired operating depth throughout the field.

The system consists of:

- a. Depth Control Valve
- b. Depth Gauge
- c. Plunger
- d. Marker
- e. Depth Adjuster
- f. Wheel Assembly Linkage

To adjust:

- a. Using the wheel lift hydraulic circuit raise the machine to its maximum height.
- b. Turn the depth adjuster clockwise or counterclockwise until the marker is at the desired depth on the depth gauge.
- c. Monitor the machine performance and re-adjust as required (Fig. 4).

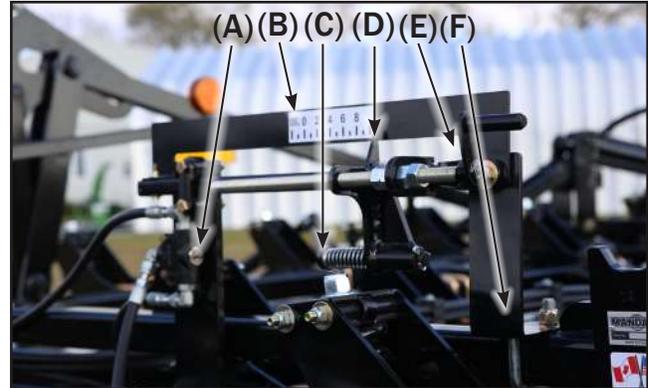


Fig. 3 Depth Control Components



Fig. 4 Monitor Field

3.6 ATTACHING/UNHOOKING

3.6.1 ATTACHING CHISEL FLEX TO A TRACTOR

Follow this procedure when attaching the Chisel-Flex to a tractor.

1. Clear the area of all bystanders, especially small children.
2. Make sure there is enough room and clearance to safely back up to the machine (Fig. 5).
3. While backing up, use the jack to align the hitch and the drawbar (Fig. 6).
4. Stop tractor, set park brake, remove ignition key and wait for all moving parts to stop before dismounting.
5. Use a drawbar pin with provisions for a mechanical retainer. Install the retainer (Fig. 7).



Fig. 5 Backing Up



Fig. 6 Aligning



Fig. 7 Drawbar Pin and Retainer

6. Safety Chain:
Attach the safety chain around the drawbar cage to prevent unexpected separation (Fig. 8).



Fig. 8 Safety Chain

7. Connect Hydraulic System:

Warning:

High Pressure Fluid

Wear eye and hand protection when searching for leaks. Relieve pressure before adjusting. Keep components in good repair.

Note:

Ensure hoses and wires are properly routed through the hydraulic hose retainer to prevent dragging on the ground.

- a. Use a clean cloth or paper towel to clean the dirt and build-up from around the couplers and male tips.
 - b. Insert the male tips into the couplers. Be sure they are locked in place.
 - c. Route the hoses through the metal hose retainer on the hitch to prevent the hoses from dragging on the ground. Make sure there is enough slack to prevent hoses from being pinched when turning.
 - d. Check the function of each circuit. Be sure they function according to expectations. Reverse hoses if they do not.
8. Connect the wiring harness by inserting the terminal into plug on tractor.



Fig. 9 Stored



Fig. 10 Connected



Fig. 11 Wiring Harness

9. Stow the jack (Fig. 12):

- Lift jack by turning crank.
- Pull out pin.
- Rotate 90°
- Re-insert pin.



Fig. 12 Jack: Stowed

3-Section Chisel-Flex Operator's Manual

The Chisel-Flex can be attached to a highway tractor depending on the application. Since the Chisel-Flex generates a vertical load on the hitch, care must be taken to properly attach the tow vehicle.

3.6.2 ATTACHING CHISEL FLEX TO A HIGHWAY TRACTOR

Follow this procedure when attaching a 3-Section Chisel-Flex to a highway tractor.

1. Ensure all bystanders, especially small children are clear of the working area (Fig. 13).
2. Make sure there is enough room and clearance to safely back up to the 3-Section Chisel-Flex.
3. Use the jack to move the hitch to the required height.
4. Slowly back the tow vehicle until the clevis and hitch are aligned (Fig.14).
5. Lower the hitch into position (Fig. 15).
6. Install the safety pin or locking bolt. Tighten to its specified torque (Fig. 16).



Fig. 13 Clear Working Area



Fig. 14 Aligning

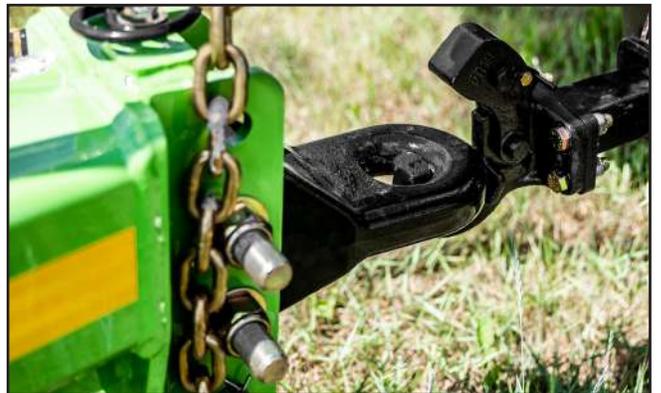


Fig. 15 Hitch Lowered



Fig. 16 Lock Pin/Bolt

- Attach the safety chain to the pickup truck frame to prevent unexpected separation (Fig. 17).



Fig. 17 Safety Chain

- Connect the wiring harness plug to the highway tractor outlet. Use the optional adaptor to convert 7-pin terminal to plug on highway tractor if necessary (Fig. 18).

Note:

Adaptors are available from your Mandako dealer.



Fig. 18 Wiring Harness

- Stow the jack (Fig. 19).

- Lift jack by turning crank.
- Pull out the pin.
- Rotate 90° and store in stowed position.
- Install the pin.



Fig. 19 Stowed Jack

3.7 TRANSPORT TO FIELD CONVERSION

The Chisel-Flex is designed to be easily converted from transport to field configuration with minimal effort.

When converting, follow this procedure:

1. Clear the area of bystanders, especially small children.
2. Move the machine into an open area large enough to have space to lower the Chisel-Flex wings. Do not move it into an area with overhead power lines or obstructions (Fig. 20).
3. Raise the frame into its fully raised position.
4. Stop engine, set park brake, remove ignition key and wait for all moving parts to stop moving.
5. Remove the cylinder stops from the rear wheel assembly cylinders on the center section and place on storage rod holders (Fig. 21, 22).
6. Unlock/open pivot pin (see Fig. 23 for unlocked position) on both front wheel assemblies. Doing this will ensure the wheel assemblies move freely when making turns.

See section 4.5 for information regarding brake casters.



Fig. 20 Transporting



Fig. 21 Cylinder Stop: Pinned/Pin Removed



Fig. 22 Cylinder Stop: Installed/Removed and Stored



Fig. 23 Brake Caster Assembly

7. Use the hydraulic lever in the cab to slowly lower wings until they are completely down (Fig. 24).

8. Hold hydraulic lever until the hydraulic system goes over relief to ensure the cylinders are fully extending into the slotted bracket on each wing. This allows the wings to follow the ground contour (Fig. 25, 26, 27).



Fig. 24 Lower Wings: Lowering



Fig. 25 Lower Wings: Lowered



Fig. 26 Anchor Bracket Slots - Left



Fig. 27 Anchor Bracket Slots - Right

3.8 FIELD OPERATION

Although the Chisel-Flex is easy to use, each operator should review this manual to familiarize themselves with the Safety and Operating procedures.

When using this machine, follow this procedure:

1. Clear the area of bystanders, especially small children.
2. Attach the machine to the tractor. See section 3.6.
3. Review and follow Pre-Operation Checklist. See section 3.3.
4. Perform any relevant maintenance or servicing required. See section 4.2.
5. Transport to the working area.
6. Convert to field configuration (Fig 29). See section 3.8.
7. Starting (Fig. 30):
 - a. With tractor engine at approximately 1/3 throttle position, release clutch and move forward.
 - b. Lower machine into ground.
 - c. Increase throttle position until desired engine RPM or ground speed is reached.
8. Stopping (Fig. 30):
 - a. Raise machine out of ground by lowering wheel frame.
 - b. Reduce the engine RPM.
 - c. Press clutch to stop forward motion of the Chisel-Flex.



Fig. 28 Transporting to Field



Fig. 29 Field Configuration



Fig. 30 Starting/Stopping

9. Wing Position:

The Wings are designed to float or move up and down as the machine moves across a field. Always extend the cylinders fully when lowering the wings. Each wing is designed with a slotted anchor bracket for the wing cylinder attachment (See Fig. 31). Fully extending cylinders allows the frames to move up and down to follow the contour of the ground (Fig. 29).



Fig. 31 Anchor Bracket Slots

10. Tine Harrows:

Harrows are mounted on the back of the frame to distribute and break up any piles of trash or debris that has formed behind the Chisel-Flex. Each harrow assembly can have its angle or stiffness changed appropriately for the application (Fig. 32).



Fig. 32 Harrows

a. Angle:

Use the adjusting hole options on the top of the harrow frame to adjust and set the angle of the harrows. Always set all harrows to the same angle to obtain consistent field performance (Fig. 33, A).

b. Height:

As the tines wear off the assemblies can be lowered using the various bolt holes (Fig. 33, B).

c. Stiffeners:

The harrow frames are each held in position by a compression spring preset with down pressure. This is set in factory to resist the tines moving back when they encounter an obstruction in the field. Adjust the nuts to level out the frame and increase/decrease the down pressure (Fig. 34).



Fig. 33 Harrow Angle/Bolt Holes

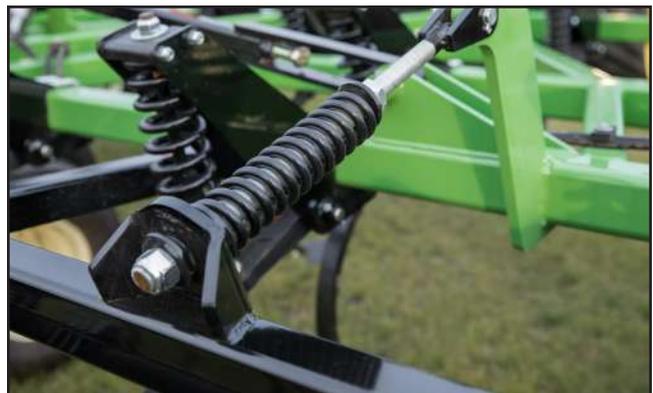


Fig. 34 Harrow Stiffeners

3-Section Chisel-Flex Operator's Manual

11. Soil Moisture:

Although the Chisel-Flex will work in most soil moisture conditions, it is the responsibility of the operator to monitor the condition of the soil after being tilled. Clay soils that are wet will compress and compact during tilling and not be satisfactory. Sandy soils are less likely to compact during tilling. Allow the soil to dry out before tilling if compacting or mudding up occurs.

NOTE:

If build-up occurs on tires, contact your Mandako dealer for scraper options.



Fig. 35 Field

12. Shovel/Sweep Wear:

All sweeps will wear as the Chisel-Flex moves through the fields while working. The rate of wear depends on how abrasive the soil is. Always replace the sweeps when they wear down and before the sweeps break off. Operating when the sweeps are gone means the sweeps are not tilling the soil as the Chisel-Flex passes over the field. Always replace all sweeps at the same time to keep the performance even over the width of the machine. Always replace when sweep is chipped, bent or worn down (Fig. 36).



Fig. 36 Shovel/Sweep

NOTE:

Failure to replace sweeps in time will cause wear to the shanks.

13. Shank Trip:

Each shank assembly in the Chisel-Flex is spring-loaded to allow the shank to move back if the sweep or shank hits an obstruction. By allowing the shank to trip you will incur a reduced amount of damage to the machine (Fig. 37).



Fig. 37 Shank Trip

14. Operating Depth:

The sweeps on the bottom of the shanks are designed to penetrate the soil 2 to 6 inches (50 to 150 mm) and cut off the plant roots while leaving the plant residue on top of the surface to minimize erosion. It is the responsibility of the operator to monitor the machine performance and set the sweep depth appropriate for the application.

15. Single Point Depth Control:

It is the responsibility of the operator to set the position of the wheel assemblies (sweep depth into the ground) to provide the desired performance (Fig. 38). See Section 3.5.

16. Fore-Aft Adjustment:

See section 4.4.

17. Travel Speed:

The operator must determine the appropriate speed for the terrain and field conditions but it is not recommended to travel faster than 7-10 kph (4-6 mph). Slow down for rough, hilly or rolling terrain. To be effective, the shovels must remain in the ground during operation to allow for the cutting of the weed roots but keeping residue cover in place on the surface of the field to minimize erosion. Select a speed that will keep the shovels in ground, however a minimum of 6.5 kph (4 mph) is required to obtain a desired performance.

NOTE:

Do not travel faster than 10 kph (6 mph) to prevent damaging the tines or the frame from overloading.

18. Field Operation:

The Following procedure should be used to monitor the tillage and residue work-up to get the best performance for the application. Monitor and adjust the machine per these steps:

- a. Lower the wings and lower shovels to the ground.
- b. Start moving across the field at 5-7 kph (3-4 mph).
- c. Lower the shovels into the ground.
- d. Drive 100 feet (30m) and observe the ground in front of the Chisel Flex and behind it.
- e. The residue on the surface should mostly remain on the surface.
- f. All weeds and plants should be cut off under the soil surface.
- g. Adjust/set the depth of the shovels in small increments to get the job done and minimize horsepower requirements (Fig. 41).
- h. Monitor performance in the field at operating speed.



Fig. 38 Wheel Position - Up/Down



Fig. 39 Travel Speed



Fig. 40 Field



Fig. 41 Single Point Depth Control

- i. Use the single point depth control system to set and control the depth of the shovels.
- j. Monitor the job as the conditions change and adjust the shovel depth as required.
- k. The residue should remain on top of the soil with roots of weeds and plants cut off below the surface.

19. Operating Tips:

- a. Be sure there is sufficient space and clearance to fully extend the wings. Do not stand next to frame when extending to prevent hitting something. Keep others away (Fig.42).
- b. Stay away from overhead power lines when raising or lowering the wings to prevent electrocution. Remember, electrocution can occur without direct contact.
- c. Always set the Single Point Depth Control linkage and valve system when the desired performance is obtained. In that way, the machine will always return to same settings when operating (Fig. 41).
- d. Always monitor field conditions behind the machine to determine the performance. Shovel depth, ground speed, soil conditions, and soil moisture all have an impact on performance. The machine should remove weeds and leave some of the crop material on the surface. Retaining some crop material on the surface is desirable to resist erosion and retain snow and moisture.
- e. Always replace the shovels when they wear, chip, bend or break. Always replace all the shovels at the same time to keep performance the same across the with of the machine (Fig. 43).
- f. Set the angle of the tine harrows towards the back of the machine if harrows are plugging up from too much crop material on the field. Angling harrows to the rear of the machine allows the material to be shed by the tines. Use the adjustment holes in the top of the tine harrow frame to adjust and set the tine harrow angle (Fig. 44).



Fig. 42 Clear Area Wings Lowering



Fig. 43 Shovels/Sweeps



Fig. 44 Harrows

3.9 FIELD TO TRANSPORT

The Chisel-Flex is designed to be easily converted from transport to field configuration with minimal effort.

When converting, follow this procedure:

1. Clear the area of bystanders, especially small children.
2. Move the machine into an open area large enough to have space to raise the Chisel-Flex wings. Do not move it into an area with overhead power lines or obstructions (Fig. 45).
3. Raise the frame into its fully raised position (Fig. 46).
4. Stop engine, set park brake, remove ignition key before dismounting.
5. Reinstall the cylinder stops from the storage rod holders to the wheel assembly cylinders on the center section (Fig. 47).
6. Lock/close the pivot pin (see Fig. 48 for locked position) on all front wheel assemblies. Doing this will ensure the wheel assemblies do not wobble during transport.

NOTE:

If travelling short distances without locking front wheel pivots, verify operation of front caster brakes. See section 4.5.



Fig. 45 Field Configuration



Fig. 46 Raised Position



Fig. 47 Cylinder Stop: Pin Removed/Pinned

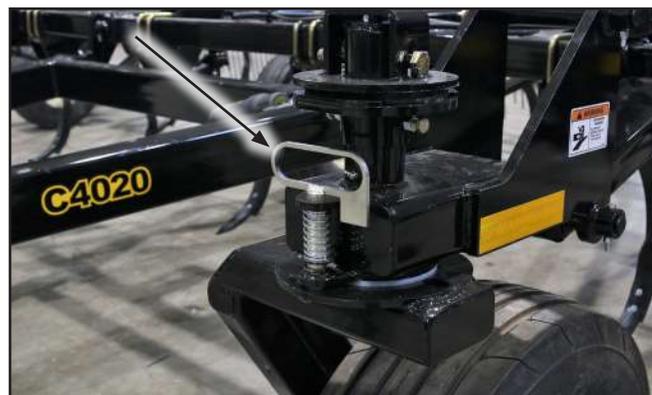


Fig. 48 Caster Wheel Pivot Pin: Closed

7. Use the hydraulic lever in the cab to slowly raise wings until they are completely folded up (Fig. 49, 50).



Fig. 49 Lift Wings: Lifting



Fig. 50 Lift Wings: Lifted

3.10 TRANSPORTING

The Mandako Chisel-Flex is designed to be easily and conveniently moved from field to field.

When transporting, follow this procedure:

1. Be sure all bystanders are clear of the machine.
2. Be sure the machine is hitched properly to the towing vehicle. Always attach the safety chain between the machine and the tractor and install a retainer through the drawbar pin. See section 3.6 (Fig. 51).
3. Ensure unit is in transport mode (Fig. 52). See section 3.9.
4. Keep to the right and yield right-of-way to allow faster traffic to pass. Drive on the road shoulder, if permitted by law.
5. Make sure the SMV (Slow Moving Vehicle) emblem, all lights and reflectors that are required by local highway and transport authorities are in place. Check that they are clean and can be seen clearly by all overtaking and oncoming traffic.
6. It is not recommended that the machine be transported faster than 32 kph (20 mph). Table 2 gives the acceptable transport speed as the ratio of tractor weight to unit weight.
7. Do not allow riders on the machine.
8. Always use hazard flashers on the tractor when transporting unless prohibited by law.
9. During periods of limited visibility, use pilot vehicles and use extra lights on the machine.
10. Ensure caster pivot pins are locked. See section 3.9. For short distance alternative, verify caster brake operation. See section 4.5.



Fig. 51 Safety Chain



Fig. 52 Transporting

Road Speed	Weight of Fully Equipped or Loaded Implement(s) relative to weight of tow vehicle
Up to 32 kph (20 mph)	1 to 1, or less
Up to 16 kph (10 mph)	2 to 1, or less
Do not tow	More than 2 to 1

Table 2 - Travel Speed vs Weight Ratio

3.11 STORAGE

3.11.1 PLACE IN STORAGE:

At the end of the season, the unit should be thoroughly inspected and prepared for storage. Repair or replace any worn or damaged components to prevent unnecessary down time at the beginning of the next season.

Follow this procedure before storing:

1. Remove all entangled material
2. Thoroughly wash the unit with a pressure washer or water hose to remove all dirt, mud or debris.
3. Lubricate all grease points as per Section 4. Ensure all grease cavities are full to remove any water residue from washing.
4. Inspect all hydraulic hoses, couplers and fittings. Tighten any loose fittings. Replace any hose that is badly cut, nicked, abraded or is separating from the crimped end of a fitting.
5. Touch up all paint nicks and scratches to prevent rusting.
6. Move the machine to its storage area.
7. Perform a full re-phase. See section 4:3:2.
8. Place the machine into its transport configuration. Relieve the pressure from off the Wheel Lift Cylinder and onto the Cylinder Stops.

NOTE:

Life expectancy of the cylinders is increased when cylinder rams are retracted. Extended rams over a long period of times can cause rust and pitting on the cylinder rams.

9. Place planks under the jack for added support if required.
10. Unhook the machine from the tractor.
(See Section 3.6)
11. Apply a seal safe rust inhibitor or heavy grease to the exposed hydraulic cylinder rams to prevent rusting.



Fig. 53 Unit Stored

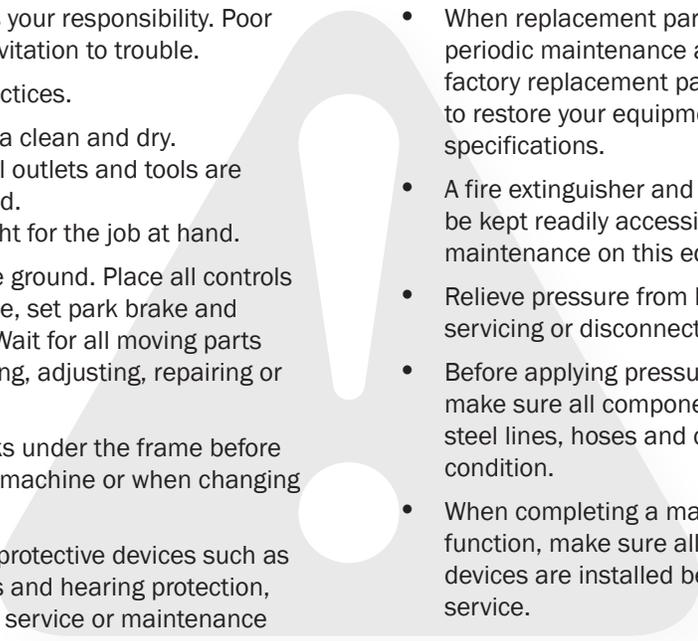
3.11.2 REMOVE FROM STORAGE:

When removing this machine from storage, follow this procedure:

1. Clear the area of bystanders, especially small children.
2. Attach the unit to the tractor (See Section 3.6).
3. Check:
 - a. Electrical harness connections and components.
 - b. All hardware. Tighten as required.
 - c. Tire pressure.
 - d. All hydraulic lines, fittings and connections.
4. Lubricate all grease fittings (as per Section 4).
5. Clean rust inhibitor or grease from exposed cylinder ram ends.
6. Replace any worn or defective parts.
7. Go through the Pre-Operation Checklist before using machine (See Section 3.3).

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Section 4: SERVICE AND MAINTENANCE

- 
- Good maintenance is your responsibility. Poor maintenance is an invitation to trouble.
 - Follow good shop practices.
 - Keep service area clean and dry.
 - Be sure electrical outlets and tools are properly grounded.
 - Use adequate light for the job at hand.
 - Lower machine to the ground. Place all controls in neutral, stop engine, set park brake and remove ignition key. Wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.
 - Place stands or blocks under the frame before working beneath the machine or when changing tires.
 - Always use personal protective devices such as safety glasses, gloves and hearing protection, when performing any service or maintenance work.
 - When replacement parts are necessary for periodic maintenance and servicing, genuine factory replacement parts must be used to restore your equipment to its original specifications.
 - A fire extinguisher and first aid kit should be kept readily accessible while performing maintenance on this equipment.
 - Relieve pressure from hydraulic system before servicing or disconnecting from tractor.
 - Before applying pressure to a hydraulic circuit, make sure all components are tight, and that steel lines, hoses and couplings are in good condition.
 - When completing a maintenance or service function, make sure all safety shields and devices are installed before placing unit in service.

4.1 FLUIDS AND LUBRICANTS

4.1.1 GREASE:

Use an SAE multipurpose high temperature grease with extreme pressure (EP) performance. Also acceptable is an SAE multipurpose lithium base grease.

4.1.2 STORING LUBRICANTS:

Your machine can operate at top efficiency only if clean lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture and other contaminants.

4.1.3 GREASING:

Refer to Section 4.1.1 for the type of recommended grease.

Use the Maintenance Checklist provided to keep a record of all scheduled maintenance.

1. Use a hand-held grease gun for all greasing.
2. Wipe grease fitting with a clean cloth before greasing, to avoid injecting dirt and grit.
3. Replace and repair broken fittings immediately.
4. If fittings will not take grease, remove and clean thoroughly. Also, clean lubricant passageway. Replace fittings if necessary.

4.2 SERVICING INTERVALS

The periods recommended are based on normal operating conditions. Severe or unusual conditions may require more frequent checks of the equipment and lubrication.

4.2.1 EVERY 5 HOURS:

1. Perform a Brief Re-phase on all hydraulic circuits (see section 4:3:2).

4.2.2 EVERY 10 HOURS OR DAILY:

1. Check the machine for entangled material.
2. Check the machine for worn or damaged parts.
3. Check the machine for hydraulic fluid leaks.
4. Check for and replace missing sweeps.
5. Check tire pressure.
6. Perform a Full Re-phase on all hydraulic circuits (see section 4:3:2).

4.2.3 EVERY WEEK OR EVERY 1000 ACRES:

1. Grease wing section hinge locations with 3 shots of grease or until grease comes out of the sides (Fig. 57).

4.2.4 ANNUALLY OR EVERY 3000 ACRES:

1. Level and adjust the machine (see section 4.4).
2. Grease all wheel hubs (when applicable).
 - Remove plug and insert grease zerk located in the Operators Manual cannister.
 - Grease with one shot of grease for each wheel hub.

IMPORTANT:

The Chisel Flex is designed with sealed wheel hubs. DO NOT OVER GREASE!

Over greasing will destroy the seal and minimize the life of the wheel bearings.

NOTE:

Rebuild wheel hubs every 3 years.

- Disassemble
 - Clean
 - Inspect all parts
 - Replace worn or damaged parts
 - Repack with fresh grease
 - Assemble
3. Grease hitch jack with 2 shots of grease or until grease begins pressing out of the sides.
 4. Clean and wash machine.



Fig. 54 Caster Bushings



Fig. 55 Wheel Hubs



Fig. 56 Shovel/Sweeps

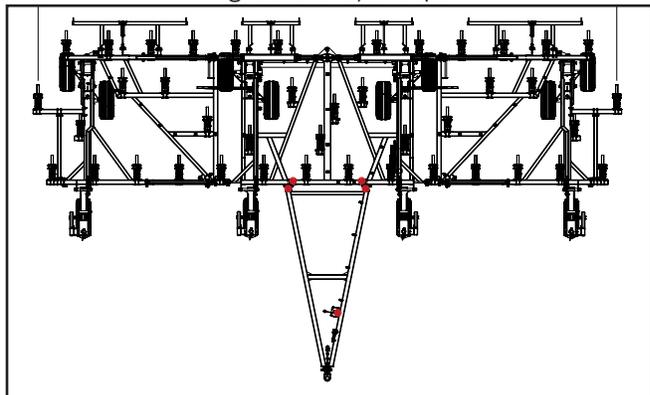


Fig. 57 Wing Hinge Sections

4.3 HYDRAULIC RE-PHASING CIRCUITS

The Chisel-Flex units are equipped with phasing cylinders on the wheel lift circuit. It is the responsibility of the operator to understand hydraulic phasing circuits to be able to use the machine properly and efficiently and maintain consistent results.

4.3.1 HOW RE-PHASING CYLINDERS WORK:

Phasing cylinders are plumbed in series with bores and rods sized in such a way so that all cylinders extend and retract equally. The hydraulic oil is forced out of the piston rod chamber of one cylinder and into the piston of the next cylinder. This process is repeated for however many cylinders are connected in that circuit. In the extended position the re-phasing orifices are exposed to allow the oil to flow into the next cylinder. The cylinders are filled with oil, vented, and aligned with the end stop.

4.3.2 RE-PHASING THE CIRCUIT:

A brief re-phase of the hydraulic circuit should be done every 5 hours or every 100 acres. A full re-phase should be done at the beginning of each use, every 24 hours or every 500 acres. Re-phasing the system allows all cylinders to fully extend by purging the system of any entrapped air.

Brief Re-phase - Activate the hydraulic circuit to be re-phased by fully extending the cylinders and continue holding them (keep the circuit engaged) for an additional 30 seconds.

Full Re-phase - Activate the hydraulic circuit to be re-phased by fully extending the cylinders and continue holding them (keep the circuit engaged) for an additional 5 minutes.

IMPORTANT:

Re-phasing cylinders use "hard surface" seals that are prone to acceptable bypass. It is not recommended to use the cylinders to support the machine in a lifted position for long periods of time. When storing the machine, ensure that the cylinder stops/transport lock brackets are installed and the weight of the machine is resting on the cylinder stops.

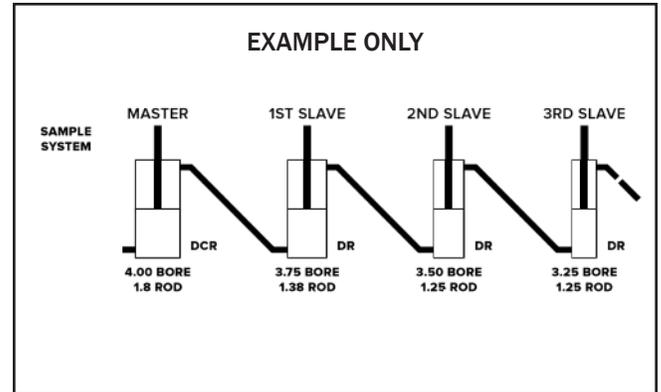


Fig. 58 Re-phasing Circuit Diagram



4.4 LEVELING AND ADJUSTING MACHINE

Having a level machine ensures you get optimal performance from your Chisel-Flex and maintain a consistent cutting depth. Regularly monitor the levelness of the machine by checking visually. Annually measure and adjust the levelness of the machine using the following instructions.

1. Move the Chisel-Flex onto a large, clean and level concrete pad.
2. Convert machine into field mode (See section 3.8).
3. Ensure machine is fully raised and measure each cylinder ram to ensure they are all equally extended. If not all cylinders are fully extended, see section 4.3 for assistance.
4. Check tire pressure to make sure all tires are equally inflated (see section 7.2)
5. Ensure all casters are facing to the rear of the machine. Drive a few feet forward to straighten casters if required.

4.4.1 LEVELING CYLINDERS:

6. Measure from the ground to the top of the frame (Fig. 59) in the scattered locations shown in Fig. 61.
7. Using the sequence shown in Fig. 60, adjust each rear adjustment rod while the rear of the machine is level (Fig. 61).

4.4.2 LEVELING FORE-AFT:

8. Using the nuts on the Front to Rear Wheel Lift Connecting Arm (Fig. 63), adjust until the front of the machine is level with the back of the machine.

IMPORTANT:

Monitor the performance of the Chisel-Flex after leveling the unit. Different soil types will cause the machine to perform differently. If the front of the machine goes in deeper than the rear of the machine the level will need to be adjusted accordingly to compensate.

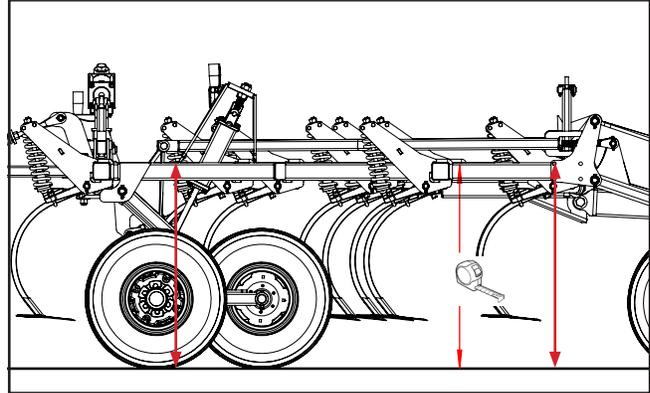


Fig. 59 Measuring: Ground to Frame

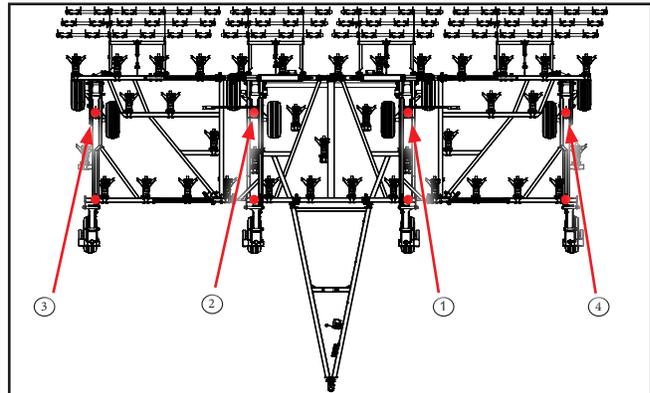


Fig. 60 Measuring Points



Fig. 61 Rear Adjustment Rods



Fig. 62 Front to Rear Wheel Lift Connecting Arm

4.5 ADJUSTING BRAKE CASTERS

The wheels on the Chisel-Flex may wobble when in transport mode. Adjusting the brake casters will significantly reduce the wobble.

To adjust for reducing wobble, increase pressure on brake casters by tightening nut in a clockwise direction. By increasing the pressure there will be more resistance in the turn.

To decrease pressure on brake casters, turn the nut in a counterclockwise direction.

The ability to adjust pressure on the brake casters acts as an alternative option to pinning the wheel assembly for short distance travel.



Fig. 63 Caster adjustment nut



Fig. 64 Brake caster assembly

4.6 SERVICE RECORD

The Servicing Intervals section is only a guide under good conditions. Under extreme or unusual circumstances, adjust service timing accordingly.

Copy this page to continue record.

Maintenance	Serviced By	Date											
EVERY 5 HOURS													
Perform a Brief Re-phase on hydraulic circuits													
EVERY 10 HOURS OR DAILY													
Check machine for entangled material													
Check for worn or damaged parts													
Check machine for hydraulic leaks													
Check for missing sweeps													
Check tire pressure													
Perform a Full Re-phase on hydraulic circuits													
EVERY WEEK OR EVERY 1000 ACRES													
Grease wing section hinges													
ANNUALLY OR 3000 ACRES													
Level and adjust machine													
Grease wheel hubs (when applicable)													
Grease hitch jack													
Clean and wash machine													
EVERY THREE YEARS													
Repack wheel hubs													

Section 5: TROUBLESHOOTING

This Chisel-Flex is a simple and reliable system that requires minimal maintenance.

The problems which you may encounter, their causes, and solutions are listed below.

If you encounter a problem which is difficult to solve, even after having read through this section, please contact your local distributor or dealer. Before you call, please have this Operator's Manual and the unit's serial number ready.

PROBLEM	POSSIBLE CAUSE	POSSIBLE CORRECTION
Machine settling	Tractor hydraulic leak	Fix leak on tractor Tip: Raise machine and disconnect hydraulic hoses from tractor to isolate cause
	Re-phasing cylinders	Due to the design of re-phasing cylinders it is normal for the machine to settle approximately 1/4" after raising the machine
	Air entrapped in the hydraulic circuit	Perform a Full Re-phase (see section 4.3)
Machine settling unevenly	Air entrapped in the hydraulic circuit	Perform a Full Re-phase (see section 4.3)
	Cylinder bypassing internal seal	Determine faulty seal. (Call local dealer or Mandako for repair instructions)
Machine lifts & lowers unevenly	Cylinder not in phase	Perform a Full Re-phase (see section 4.3)
	Machine not level	Level machine (see section 4.4.1)
Machine is not pulling straight (dog legging)	One side of the machine cutting deeper than the other side.	Inflate tires to the correct PSI Level machine (see section 4.4.1)
	One side of the machine is cultivating harder ground	Machine will correct itself when soil conditions improve
Insufficient tillage	Sweep concerns	Increase depth of sweeps Replace worn or broken sweeps
	Machine improperly adjusted	Level and adjust machine (see section 4.4)

PROBLEM	POSSIBLE CAUSE	POSSIBLE CORRECTION
Harrows plugging	Harrow angle set to steep	Adjust harrow angle
Wings not following ground contour	Cylinders not fully extended	Fully extend wing lift cylinders
Tractor incapable of operating hydraulics	Tractor hydraulic output is too low Hydraulic malfunction	Increase tractor output (consult your tractor dealer) Use a different tractor with adequate hydraulic output Check for hydraulic leaks or faulty cylinders
Rear sweeps cutting deeper than the front sweeps	Machine is not level Soil conditions cause machine to perform unevenly	Level machine (see section 4.4.1) Adjust level of the machine to compensate.
Right side cutting deeper than left side or vice versa	Machine not level	Level machine (see section 4.4.1)
Front casters wobble while transporting machine	Road Conditions Excessive speed	Lock casters with pivot pin (preferred) Adjust caster brake tighter to reduce wobble (See section 4.5) Reduce speed
Mud sticking to tires and lifting machine	Wet field conditions	Wait until field dries. Mud scrapers available from Mandako. See your local Mandako dealer for details.
Front casters not pivoting in the field when turning.	Caster brake adjusted too tight.	Loosen caster pivot brake (See section 4.5)

Section 7: REFERENCE

For information not included here, or for a digital copy of this manual, please call your dealer or Mandako directly for assistance (1-888-525-5892).

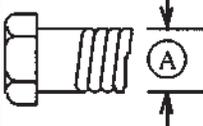
Specifications may change without notice.

7.1 BOLT TORQUE

CHECKING BOLT TORQUE

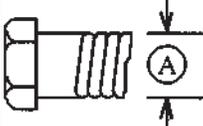
The tables shown below give correct torque values for various bolts and cap screws. Tighten all bolts to the torques specified in chart unless otherwise noted. Check tightness of bolts periodically, using bolt torque chart as a guide. Replace hardware with the same strength bolt.

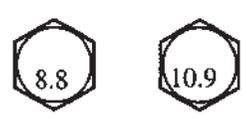
Bolt Diameter "A"	Bolt Torque •					
	SAE 2 (N.m) (lb-ft)		SAE 5 (N.m) (lb-ft)		SAE 8 (N.m) (lb-ft)	
1/4"	8	6	12	9	7	12
5/16"	13	10	25	19	36	27
3/8"	27	20	45	33	63	45
7/16"	41	30	72	53	100	75
1/2"	61	45	110	80	155	115
9/16"	95	60	155	115	220	165
5/8"	128	95	215	160	305	220
3/4"	225	165	390	290	540	400
7/8"	230	170	570	420	880	650
1"	345	225	850	630	1320	970
1-1/8"	651	480	1077	794	1939	1430
1-1/4"	508	375	1498	1105	2678	1975



SAE-2 SAE-5 SAE-8







Wheel hub lug bolts should be torqued to 103 lb-ft (6-bolt).

Torque figures indicated above are valid for non-greased or non-oiled threads and heads unless otherwise specified. Therefore, do not grease or oil bolts or cap screws unless otherwise specified in this manual. When using locking elements, increase torque values by 5%.

- Torque value for bolts and cap screws are identified by their head markings.

7.2 TIRE PRESSURE

The recommended tire pressure is specific to the tires on your machine. Match your tires to the table below to find the right tire pressure for your tire. Never exceed the manufacturers maximum tire pressure rating!

IF 320/70R15	65 PSI
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7.3 HYDRAULIC FITTING TORQUE

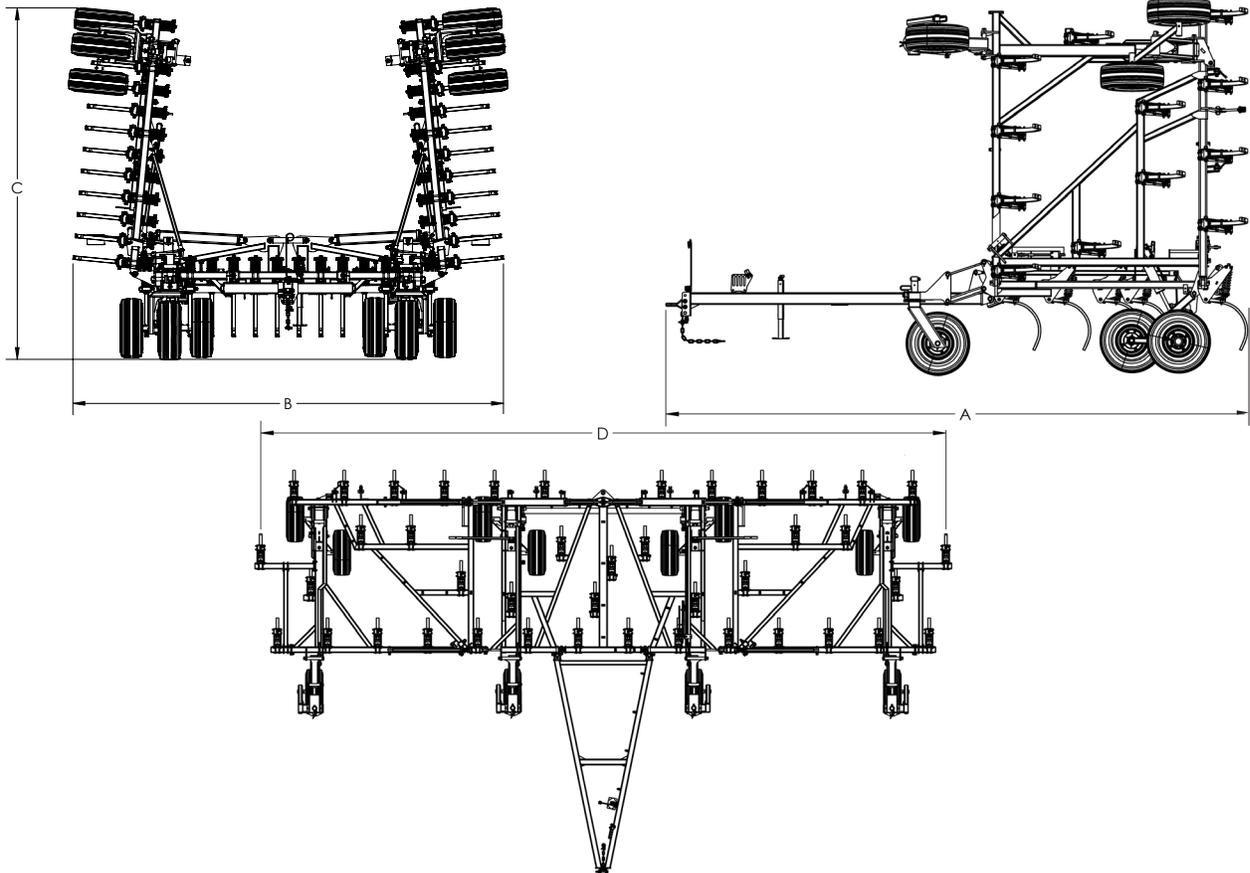
Pipe Rigid - Tapered Pipe Threads (NPTF, N/NF) - Carbon Steel			
Pipe Size	Turns-from-finger	Max ft-lbs	Max N-m
1/8" (-2)	3/4 - 1 3/4	12	16
1/4" (-4)	3/4 - 1 3/4	25	34
3/8" (-6)	3/4 - 1 3/4	40	54
1/2" (-8)	1/2 - 1 1/2	54	73
3/4" (-12)	1/2 - 1 1/2	78	106
1" (-16)	1/2 - 1 1/2	112	152
1 1/4" (-20)	1/2 - 1 1/2	154	209
1 1/2" (-24)	1/2 - 1 1/2	211	286
2" (-32)	1/2 - 1 1/2	300	407
For reference only, Source: Air-Way Manufacturing Co. - Carbon Steel Hydraulic			

Stud End O-Ring Boss (ORB) SAE (U/UF)			
		Carbon Steel	
Tube Size	Thread UNF-2A	Max ft-lbs	Max N-m
-2	5/16" - 24	6-7	8-9
-3	3/8" - 24	8-9	11-12
-4	7/16" - 20	13-15	18-20
-5	1/2" - 20	17-19	23-26
-6	9/16" - 18	22-24	29-33
-8	3/4" - 16	40-43	49-53
-10	7/8" - 14	43-48	59-64
-12	1 1/16" - 12	68-75	93-102
-14	1 3/16" - 12	90-99	122-134
-16	1 5/16" - 12	112-123	151-166
-20	1 5/8" - 12	146-161	198-218
-24	1 7/8" - 12	154-170	209-231
For reference only, Source: Air-Way Manufacturing Co. - Carbon Steel Hydraulic			

O-Ring Face Seal Fitting (ORFS) (F/FF)			
Tube Size	Turns-from-finger	Torque ft-lbs	Torque N-m
-4	9/16 - 18	10-12	14-16
-6	11/16 - 18	18-20	24-27
-8	13/16 - 16	32-35	43-47
-10	1 - 14	46-50	60-68
-12	1 3/16 - 12	65-70	90-95
-16	1 7/16 - 12	92-100	125-135
-20	1 11/16 - 12	125-140	170-190
-24	2 - 12	150-165	200-225
For reference only, Source: Air-Way Manufacturing Co. - Carbon Steel Hydraulic			

7.4 MECHANICAL SPECIFICATIONS

3 SECTION CHISEL-FLEX
Specifications



	38'	40'
Frame Sections	3	3
Flex Pivots	7	7
Chisel Spacing	12"	12"
# of Chisels	38	40
Trip lbs	600	600
3 Row Tine Spacing	4"	4"
4 Row Tine Spacing	3"	3"
5 Row Tine Spacing	2"	2"
Hyd. Req. (PSI)	10 GPM (38 LPM) @ 1800PSI	10 GPM (38 LPM) @ 1800PSI
Hyd. Req. (Ports)	2	2
Horsepower Req.	380+	400+
Depth Capabilities	1"- 6"	1"- 6"
Shank Angle	50°	50°
Transport Length (w/o harrows) (A)	24' 8"	24' 8"
Transport Width (w/o harrows) (B)	19' 5"	19' 5"
Transport Height (w/o harrows) (C)	16'	16'
Working Width (D)	38'	40'
Hitch Length	13' 8"	13' 8"
Tires	320/70/R15 (12.5L)	320/70/R15 (12.5L)
Hub Assembly	6-Bolt	6-Bolt
APPROX. Unit Weight (w/ 3-Row Tine Harrows)	16,365 lbs	16,565 lbs
APPROX. Unit Weight (w/ 4-Row Tine Harrows)	16,725 lbs	16,925 lbs



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