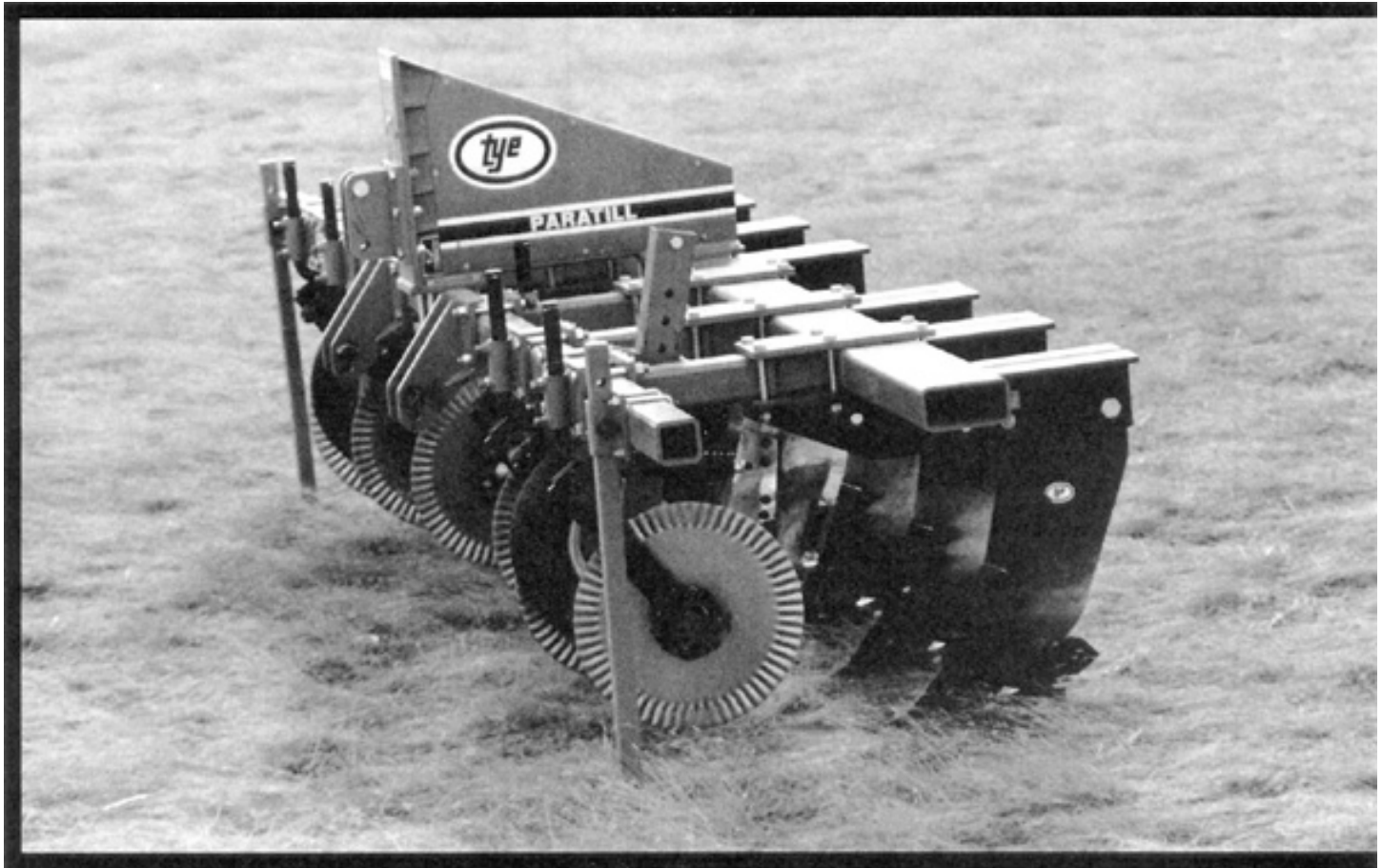


Evaluation Report

641



Tye Paratill Model 118-610

A Co-operative Program Between



TYE PARATILL MODEL 118-610

MANUFACTURER AND DISTRIBUTOR:

The Tye Company
P.O. Box 218
Lockney, Texas 79241
Phone: (806) 652-3367

RETAIL PRICE: U.S. \$10,116 (January 1991, f.o.b. Lethbridge, Alberta)

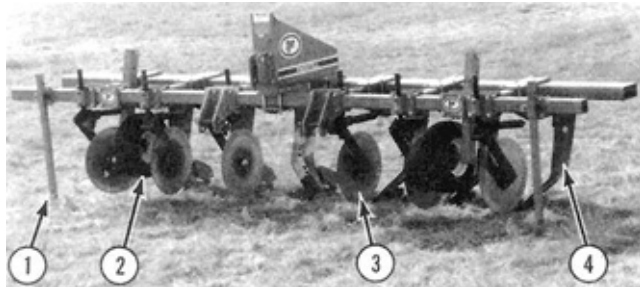


FIGURE 1. Tye Paratill (1) Support Stand, (2) Depth Control Wheels, (3) Disk Coupler and (4) Shear Bolt Leg.

SUMMARY AND CONCLUSIONS

QUALITY OF WORK

Penetration was very good. The Paratill penetrated into all soil conditions.

The soil fracturing pattern was good. The depth of soil fracture was reduced in moist soil and previously tilled conditions.

Working in untilled conditions caused very little soil surface disturbance. The majority of the straw was left standing.

Trash clearance was very good. The 9 in (229 mm) working clearance from the leg mount to the soil surface at the maximum tillage depth allowed for trash to clear in all field conditions.

Operation in subsurface stony conditions was poor. Continuous replacement of the shear bolts made operation of the Paratill impractical in subsurface stony conditions. The manufacturer recommended that using a Paratill equipped with mechanical trip legs was more suitable for operation in subsurface stony conditions.

EASE OF OPERATION AND ADJUSTMENT

Ease of performing routine maintenance was very good. The grease fittings on the disk couplers were easily accessible.

Ease of hitching was good. One person could hitch up the unit in ten minutes. Ease of hitching was increased if the tractor was equipped with quick hitches.

Ease of transporting was very good. Transport width of 17.5 ft (5.3 m) and weight of 4110 lbs (1868 kg) required care to be used when transporting the unit.

Maneuverability of the Paratill was good. Cornering required the unit to be raised out of the ground.

Ease of levelling the frame was good providing the operator had assistance.

Ease of setting the tillage depth was good. Tillage depth was changed by adjusting the height of the depth control wheels and the three-point hitch hydraulics.

Ease of changing the reversible points and wear parts was very good.

POWER REQUIREMENTS

The overall tractor size required to operate the test unit at all tillage depths and shatter plate angles varied from 94 PTO hp (70 kW) to 246 PTO hp (183 kW).

OPERATOR SAFETY

The paratill was safe to operate if normal safety precautions were observed. The weight of the Paratill required the operator to transport the unit at a safe operating speed.

OPERATOR'S MANUAL

The operator's manual was very good. A detailed parts list was also provided.

MECHANICAL HISTORY

Two welds failed on the disk coulters. The points were replaced after 336 ac (138 ha) or 56 ac (23 ha) per point. Replacement cost of the ductile point was U.S. \$31.05. The shear bolt bushings were replaced at the end of the test.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Indicating safe operating speeds and ballasting required when transporting the Paratill.
2. Supplying a slow moving vehicle sign as standard equipment.
3. Modifying the coulters assembly to eliminate weld failure.
4. Improving the durability of the shear bolt bushings.

Manager: R.P. Atkins

Project Engineer: L.W. Papworth

Project Technologist: G.A. Magyar

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. With so many makes and models of tractors that could be used to operate the Paratill, it is almost impossible for implement manufacturers to recommend safe operating speeds and, more specifically, the individual ballasting required for every combination. The safe operating speed and ballasting requirements information for a particular tractor model is usually included in the operator's manual for that tractor. Included in the Paratill Operator's and Repair Parts Manual on Page 2 under Safety Precautions you will find the following recommendations: Consult the Tractor Manufacturer's Manual for instructions on safe mounting of implements, operating methods and keep operating speeds at a safe level. With reference to ballasting, on Page 12, Choosing the Proper Tractor, No. 6, Ensure tractor has sufficient front end weight to permit constant positive steering at all times.
2. ASAE Standard S277.2 #7.6 states that the tractor S.M.V. emblem when visible from the rear would fulfil the requirement. S.M.V. emblems are readily available from Tye and local implement dealers.
3. The coulters spindle welding procedures have been reviewed. Our history of repair parts replacement requirements shows that replacement is well within industry guidelines.
4. Shearbolt bushing hardness has been reviewed and amended by the vendor. Shearbolt protected legs are not recommended for stony conditions. Mechanical trip leg protection models are available and should be used in such conditions.

GENERAL DESCRIPTION

The Tye Paratill is a Category II - III three-point hitch, 45 degree angled leg deep soil loosener suitable for primary tillage operations. The unit is equipped with disc coulters, ductile cast points, two support stands and either shearbolt or mechanical trip legs. The Paratill is available in 2, 4, 6 and 8 leg models and leg spacing is infinitely adjustable from 22 to 40 in (560 to 1020 mm).

Tillage depth is set by adjusting the two depth control wheels and the tractor's three-point hitch. The right and left hitch lift arms are used to laterally level the toolbar. The top link levels the unit fore and aft. The reversible wear points are secured to the legs by roll pins.

The replaceable wear parts (upper shins, lower shins, insteps, landsides and shatter plates) are bolted onto the legs.

The unit tested was equipped with three right and three left hand legs. The legs were shearbolt protected and spaced at 26 in (660 mm) intervals. Chrome carbide alloy points were also used during the test.

Optional equipment includes chrome carbide points, UHMV reversible landsides, pull type models and third bar kits.

FIGURE 1 shows the location of major components while detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Tye Paratill Model 118-610 was operated in the field conditions shown in TABLE 1 for 91 hours while deep tilling 477 ac (193 ha). The test tractor was equipped with an automatic three-point hitch depth control. The Paratill was evaluated for quality of work, ease of operation and adjustment, power requirements, operator safety and suitability of the operator's manual.

TABLE 1. Operating Conditions

FIELD CONDITIONS	HOURS	FIELD AREA	
		ac	(ha)
SOIL TYPE			
Sand	31.5	179	(72)
Loam	48.5	245	(99)
Clay	11.0	53	(22)
TOTAL	91.0	477	(193)
SUBSURFACE STONES			
Occasional Stones	21.0	106.0	(43)
Moderately Stony	70.0	371.0	(150)
TOTAL	91.0	477.0	(193)

RESULTS AND DISCUSSION

QUALITY OF WORK

Penetration: Penetration was very good. The Paratill legs (FIGURE 2) were able to penetrate into untilled clay, loam and sand soil conditions. Worn points caused poor penetration.

Uniform penetration across the width of the toolbar required proper levelling using the tractor's three-point hitch lift arms and top link. The automatic hydraulics of the three-point hitch were set to maintain a constant draft while deep tilling. In heavy draft areas the three point hitch raised the Paratill to maintain a constant draft.

Soil Fracturing: The soil fracturing pattern was good. Soil was fractured across the width of the unit in all field conditions. Average minimum fracture depth was 10 in (254 mm) at a tillage depth of 16 in (406 mm). Depth of soil fracture was reduced in moist soil conditions and in secondary tillage conditions.

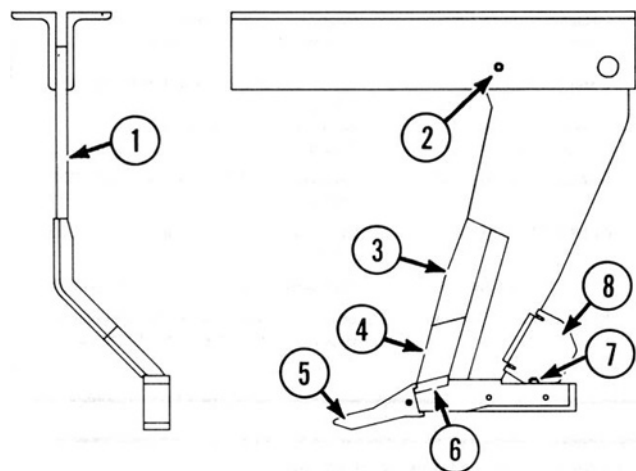


FIGURE 2. Paratill Leg (1) 45° Leg, (2) Shear Bolt, (3) Upper Shin, (4) Lower Shin, (5) Reversible Point, (6) Instep, (7) Wedge, and (8) Shatter Plate.

FIGURE 3 shows the soil fracture pattern in an untilled soil condition. The dry and hard soil provided ideal deep tillage conditions. The tillage depth measured 16 in (406 mm). Average soil fracture depth between the centre legs was 11 in (279 mm), resulting in 5 in (127 mm) of undisturbed soil. The average depth of soil fracture

between the other legs was 10 in (254 mm), leaving 6 in (152 mm) of undisturbed soil. Adjusting the angle of the Shatter plates had little effect on the soil fracturing pattern.

Operating depths less than 16 in (406 mm) resulted in decreased soil fracture between the legs. A closer lateral spacing between the legs would increase the depth of soil fracture.

For proper soil fracturing between tillage passes, the couler of the outside leg was positioned in the furrow left by the outside leg from the previous pass.



FIGURE 3. Soil Fracture Pattern In Primary Loam Soil.

Soil Surface: FIGURE 4 shows the soil surface after deep tilling into an untilled loam soil condition. Very little soil surface disturbance occurred, with the majority of the straw left standing. Increased soil disturbance occurred by increasing the shatter plate (FIGURE 2) angle.

The furrows left by the legs were the same size in every field condition. The coulters effectively cut the trash ahead of the legs. The field surface was left smooth after deep tillage by the Paratill.



FIGURE 4. Soil Surface Left by Tye in Primary Loam Soil.

Trash Clearance: Trash clearance of the Paratill was very good. A working clearance of 9 in (229 mm) from the leg mount to the soil surface at a 16 in (406 mm) tillage depth and a 26 in (660 mm) lateral leg spacing allowed for large amounts of trash to clear in all field conditions.

Stony Conditions: Operation in subsurface stony conditions was poor. Continuous replacement of the shear bolts was required during the test. It was impractical to operate the shearbolt protected Paratill in soil conditions with subsurface stones for an extended period of time. The manufacturer recommended that using a Paratill equipped with mechanical trip legs was more suitable for operation in subsurface stony conditions.

EASE OF OPERATION AND ADJUSTMENT

Maintenance: Ease of performing routine maintenance on the Tye Paratill was very good. Daily servicing of the two grease nipples per disk took one person five minutes. Depth gauge wheel bearings required annual cleaning and repacking.

Hitching: Ease of hitching to the Tye Paratill was good. One person could hitch or unhitch the Tye Paratill from the test tractor in ten minutes. Ease of hitching was increased if the tractor was equipped with quick hitches. The top hitch could be adjusted to accommodate

Category II three-point hitches. The sway bars or stabilizing chains on the tractor were adjusted to minimize lateral toolbar movement. Two support stands allowed for safe unhitching of the unit. As with all rear-mounted implements, careful backing of the tractor was required to hitch the Paratill quickly.

Transporting: Ease of transporting the Tye Paratill was very good. The unit was placed into transport position (FIGURE 5) by the tractor's hydraulics. The transport lock on the tractor's three-point hitch hydraulic system locked the unit in transport position.

The transport width was 17.5 ft (5.3 m). The overall weight of the unit was 4110 lbs (1868 kg). Caution had to be taken when transporting because of the width and weight of the unit. When travelling above 18 mph (29 km/h) the front tires of the test tractor would bounce making transporting unsafe. It is recommended the manufacturer consider indicating safe operating speeds and proper ballasting required while transporting the Tye Paratill.



FIGURE 5. Transport Position.

Maneuverability: Maneuverability of the Paratill was good. The unit was raised out of the ground when turns were made to prevent leg damage. Visibility of the outside legs was obstructed by the tractor tires. The outside legs were 28 in (711 mm) in from the edge of the unit, which did not allow for close tillage to fence lines or obstacles. The outside legs were closer to the edge of the unit with wider leg spacings.

Frame Levelling: Ease of levelling the frame of the Paratill was good provided the operator had assistance. The right and left hitch links controlled the lateral levelling. The top link controlled the fore-and-aft levelling. The frame level was checked after changing fields or adjusting the depth.

Depth Adjustment: Ease of setting the tillage depth was good. Tillage depth was set by adjusting the height of the depth control wheels (FIGURE 6) and the three-point hitch hydraulics. Five adjustment holes on the control arm and three on the support bracket gave a total of eleven depth settings.

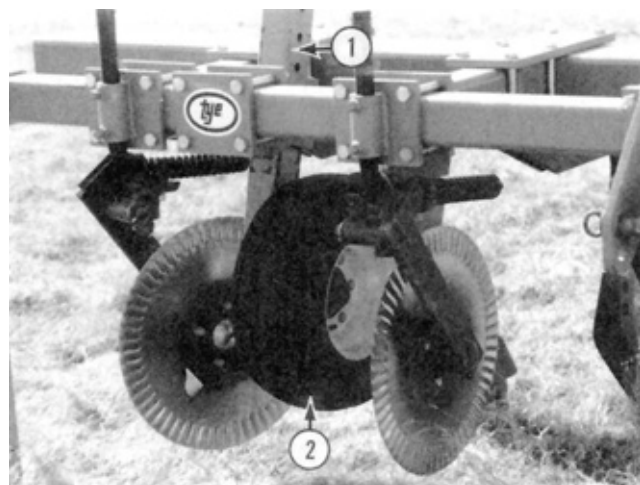


FIGURE 6. Depth Control Wheel: (1) Control Arm and (2) Gauge Wheel.

Tillage depth during the test was measured from the reversible point to the undisturbed soil surface. Recommended tillage depth was 16 in (406 mm). The manufacturer indicated that when soil flow

was between the mounting bolts on the back of the leg a tillage depth between 14 and 16 in (356 and 406 mm) could be expected. Using this method to set the depth was difficult because the back of the legs could not be viewed from the tractor cab.

The manufacturer recommended that the Tye Paratill be lowered and raised while the tractor was moving. The tractor's three-point hitch lowered the Paratill until the depth control wheels came in contact with the soil surface. The manufacturer suggested, for correct three-point hitch operation, no substantial weight be put on the depth control wheels.

Wear Part Replacement: Ease of changing the reversible points and wear parts was very good. Turning the six points took one person twenty minutes. FIGURE 7 shows the location of the replaceable wear parts.

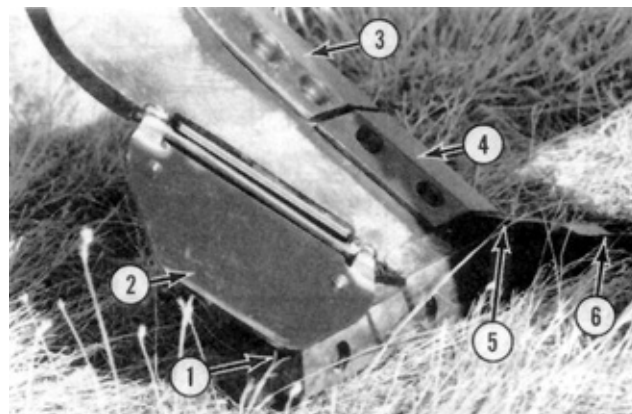


FIGURE 7. Wear Parts, (1) Landside, (2) Shatter Plate, (3) Upper Shin, (4) Lower Shin, (5) Instep and (6) Reversible Point.

POWER REQUIREMENTS

Draft Characteristics: Draft (drawbar pull) requirements depended on operating depth, field conditions, soil type and moisture content. Variation in speed did not affect draft. Average draft was 11905 lbs (53 kN) for the 12.2 ft (3.7 m) unit at a 16 in (406 mm) tillage depth and 4.5 mph (7.2 km/h) in an untilled loam soil with the shatter plates set at the minimum angle. Average draft was 13220 lbs (58.8 kN) with the shatter plates set to the maximum angle.

Tractor Size: The power take-off horsepower requirements per unit of working width for untilled soil conditions, with varying tillage depths and shatter plate angles for a 4.5 mph (7.2 km/h) speed, are given in FIGURE 8. Requirements varied from 7.7 PTO hp/ft (18.8 kW/m) at a 10.0 in (254.0 mm) tillage depth with a minimum shatter plate angle to 20.1 PTO hp/ft (49.2 kW/m) at a 16.0 in (406.4 mm) tillage depth with a maximum shatter plate angle. Overall tractor size needed to operate the Tye Paratill test unit at all tillage depths, varied from 94 PTO hp (70 kW) to 246 PTO hp (183 kW). Tractor sizes have been adjusted to include tractive efficiency and represent a tractor operating at 80 percent of maximum power take-off ratings as determined by Nebraska tests or as presented by the tractor manufacturer. Tractor size included ample power reserve to operate in the stated conditions.

OPERATOR SAFETY

The Tye Paratill was safe to operate if normal safety precautions were observed. The transport ground clearance varied depending on the tractor, but should be adequate with all three-point hitch tractors. The transport width of the test machine was 17.5 ft (5.3 m). Caution was required when transporting on public roads, over bridges and through gates. The heavy weight of the paratill required the operator to transport the unit at safe operating speeds. The operator's seat belt should be worn during operation.

A slow moving vehicle sign was not provided by the manufacturer. It is recommended that the manufacturer consider supplying a slow moving vehicle sign as standard equipment.

The test machine could be safely hitched and unhitched by one person. If additional help was required the person on the ground stayed behind the toolbar and away from the tractor for maximum safety.

OPERATOR'S MANUAL

The operator's manual was very good. The manual contained information on safety, leg spacing, operation, maintenance and trouble

shooting. A detailed parts list and list of options was provided. The manual was clearly written, with photographs and illustrations for explanation. Diagrams for leg spacings narrower than 26 in (660 mm) were not included.

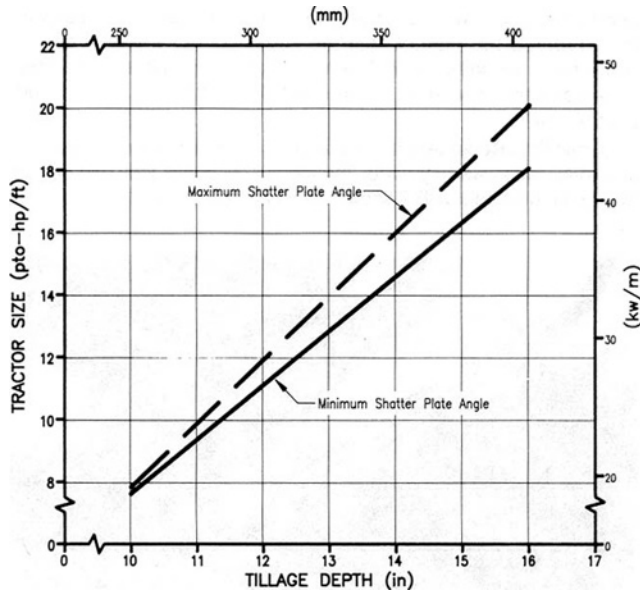


FIGURE 8. Average Horsepower Requirements for a 4.5 mph (7.2 km/h) Speed.

MECHANICAL HISTORY

The Tye Paratill was operated for 91.2 hours while deep tilling 475.7 ac (192.6 ha). The intent of the test was evaluation of functional performance. An extended durability evaluation was not conducted. TABLE 2 outlines the mechanical problems that occurred during the functional testing.

TABLE 2. Mechanical History

ITEM	OPERATING EQUIVALENT FIELD AREA		
	HOURS	ac	(ha)
Replaced approximately 100 shear bolts	Throughout the test		
Replaced lost lower shin and instep on one leg at	25.5	109	(44)
Rewelded failed coulter weld at	44.0	292	(82)
Replaced reversible point at	62.0	310	(126)
Broke chrome carbide points at	67.0	337	(136)
	79.0	407	(165)
	86.0	446	(181)
	89.5	468	(189)
Replaced shear bolt bushings at	End of Test		

DISCUSSION OF MECHANICAL PROBLEMS

Coulter Weld Failure: The weld securing the spindle to the coulter arms failed on two of the coulters. It is recommended the manufacturer consider modifying the coulter assembly to eliminate weld failure.

Wear Parts: FIGURE 9 shows a new point compared to a worn point. The worn points were changed after deep tilling 337 ac (135 ha) or 56 ac (22 ha) per point wear. The replacement cost of a ductile point was U.S. \$31.05. Three chrome carbide points broke in the sub-surface stony conditions after 61 ac (24.7 ha). The manufacturer recommended that the chrome carbide points not be used in sub-surface stony conditions. The other wear parts on the legs showed very little wear.

The measured diameter of the disk coulters at the end of the test was 21.5 in (546 mm) compared to 22 in (559 mm) for a new coulter.

Shear Bolt Bushing Failure: At the end of the test the three shear bolt bushings were replaced on each of the six legs. Continuous failure of shear bolts during the test eventually damaged the bushings (FIGURE 10). It is recommended that the manufacturer consider improving the durability of the shear bolt bushings.



FIGURE 9. Point Wear: Top - New Point, Bottom - Worn Point.

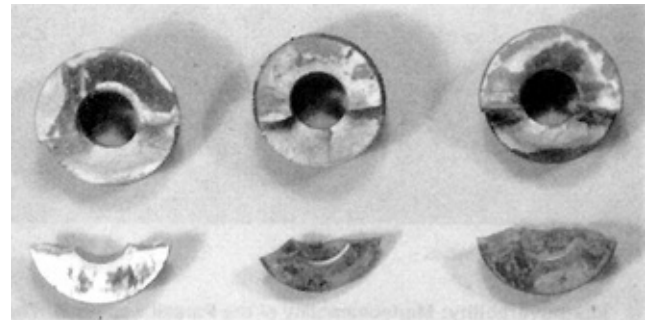


FIGURE 10. Shear Bolt Bushing Failure.

**APPENDIX I
SPECIFICATIONS**

MAKE: Tye Paratill
MODEL: 118-610
SERIAL NUMBER: B-6-7639-SPT
MANUFACTURER: The Tye Company
 P.O. Box 218 Lockney, Texas 79241

OVERALL DIMENSIONS:
 - Width 17.5 ft (5.3 m)
 - Length 5.1 ft (1.6 m)
 - Height 5.5 ft (1.7 m)
 - Maximum Ground Clearance Varies with tractor
 - Working Width 12.2 ft (3.7 m) at 26 in (660 mm) spacing

HITCH:
 - Type Three Point
 - Linkage Category Category II or III

SHANKS:
 - Type 45° angle leg
 - Number Six
 - Spacing Variable
 - Number of Rows One
 - Row Pattern Three right hand legs and three left hand legs
 - Blade/Point Tip-to-Frame Clearance 36 in (914 mm) to frame, 29.5 in (749 mm) to leg mount
 - Shank Thickness 1.0 in (25.4 mm)
 - Overload Protection or Trip 0.5 in (13 mm) Grade 5 shear bolt
 - Lateral Adjustment Infinite
 - Wear Parts Upper shin, lower shin, instep, landside, shatter plate, point

GAUGE WHEELS:
 - Adjustment 3 holes at 1.25 in (32 mm) on support bracket, 5 holes at 2.5 in (64 mm) on control arm (11 total depth settings)

POINT:
 - Type Reversible
 - Mounting Roll pin
 - Width 2.37 in (60 mm)
 - Depth 3.0 in (76 mm)
 - Length 8.25 in (210 mm)
 - Rockwell Hardness 56 C (Ductile Point)

DEPTH CONTROL:
 - Type Three Point Hitch

FRAME:
 - Shape Rectangular tubing
 - Cross Section Front: 4 x 4 x 0.5 in (102 x 102 x 11 mm)
 Rear: 4 x 8 x 0.37 in (102 x 203 x 9.5 mm)

TIRES: 2-gauge wheels 20.5 x 8.0 - 10

NUMBER OF LUBRICATION POINTS:
 - Grease Fittings 12 - two per coultter
 - Wheel Bearings 12 - coultters
 4 - gauge wheels

COULTTER:
 - Type Rippled edge
 - Size 22 in (559 mm)
 - Number Six
 - Protection Spring-Cushion

WEIGHT: 4110 lb (1868 kg)

OTHER AVAILABLE ITEMS: Mechanical trip leg
 Third bar kits
 Chrome carbide points
 UHMV reversible landslides
 Pull type models.

APPENDIX II

The following rating scale is used:

- Excellent
- Very Good
- Good
- Fair
- Poor
- Unsatisfactory

**SUMMARY CHART
TYE PARATILL**

RETAIL PRICE: U.S. \$10,116.00
 (January 1991, f.o.b. Lethbridge, Alberta)
 17.5 ft unit complete with six shear bolt protected legs

QUALITY OF WORK:
 Penetration: **Very good;** penetrated in all soil conditions
 Soil Fracturing: **Good;** reduced in moist conditions and secondary soil conditions
 Soil Surface: Majority of straw left standing in primary conditions
 Trash Clearance: **Very good**
 Stony Conditions: **Poor;** impractical to operate in subsurface stony conditions

EASE OF OPERATION AND ADJUSTMENT:
 Maintenance: **Very good;** daily greasing of disk coultter, points turned in 20 min.
 Hitching: **Good;** takes one person about 5 min.
 Transporting: **Very Good;** easy to put into transport position
 Maneuverability: **Good;** unit raised out of the ground when turning
 Frame Levelling: **Good;** required assistance
 Tillage Depth: **Good**

POWER REQUIREMENTS: Varied from 94 PTO hp (70 kW) to 246 PTO hp (183 kW)

OPERATOR SAFETY: Safe; caution required at high transport speeds

OPERATOR'S MANUAL: **Very Good;** detailed parts list also provided

MECHANICAL HISTORY: 56 ac (22 ha) per point wear before replacing. Replacement cost U.S. \$31.05 for ductile point.



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