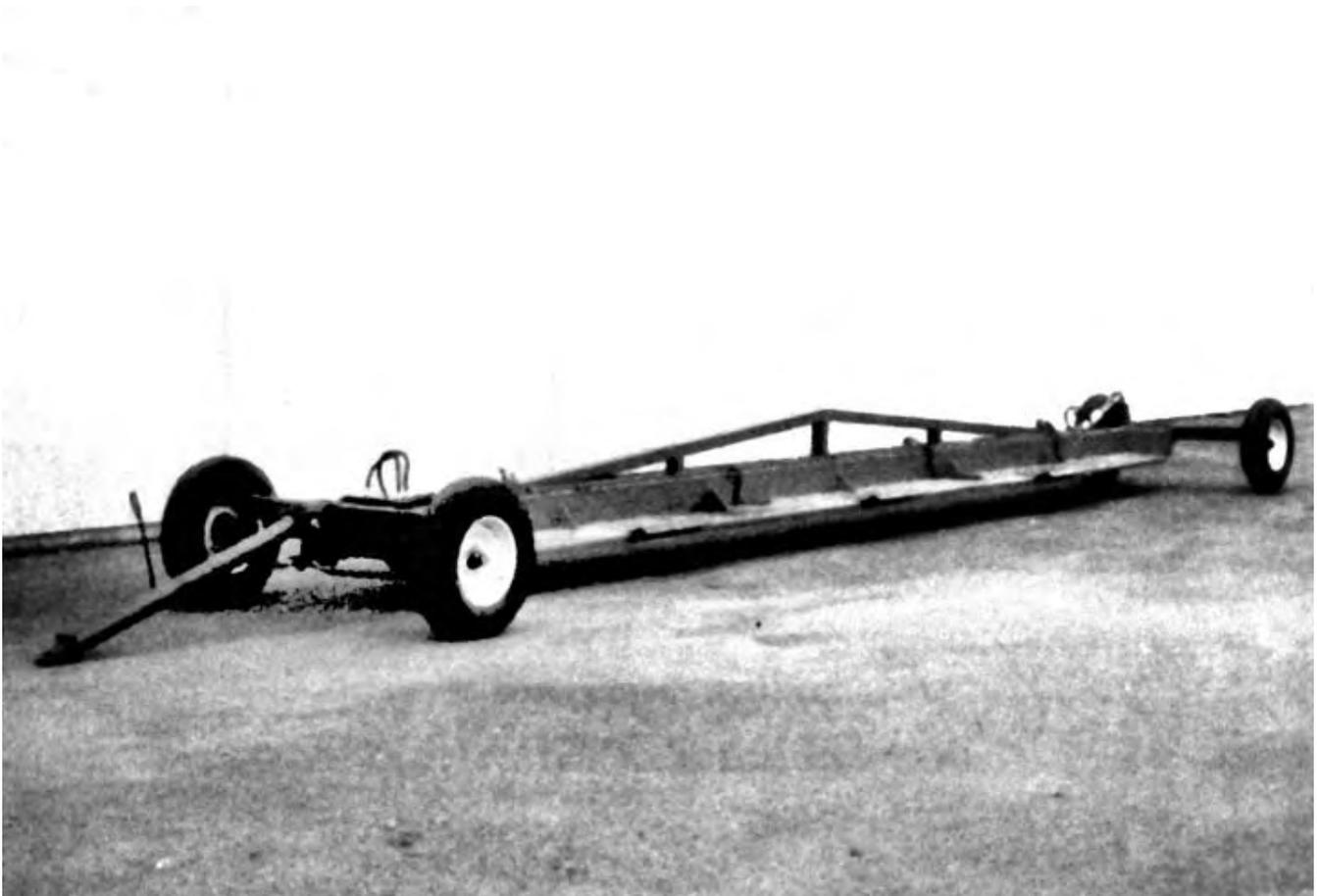


Evaluation Report

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Doepker 8.25 m Grain Drill and Windrower Transporter

A Co-operative Program Between



DOEPKER 8.25 m (27 ft) GRAIN DRILL AND WINDROWER TRANSPORTER

MANUFACTURER AND DISTRIBUTOR:

Doepker Industries Ltd.
Annaheim, Saskatchewan
S0K 0G0

RETAIL PRICE:

\$2,250.00 (January, 1978, f.o.b. Humboldt with 8.25 m (27 ft) bed, hydraulic cylinders, hoses and windrower loading ramps.)

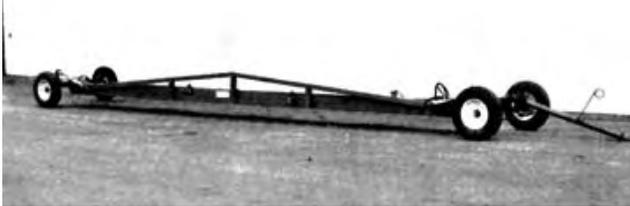


FIGURE 1. Doepker Transporter.

SUMMARY AND CONCLUSIONS

Overall functional performance of the Doepker transporter was very good for transporting press drills and poor for transporting self-propelled windrowers.

Ease of loading and unloading was very good for press drills. Windrowers were awkward to load due to inadequate clearance between the windrower headers and the transporter arch. This necessitated intricate blocking under the loading ramps and transporter bed to raise headers above the transporter arch.

Maneuverability was very good while transporting press drills and was good while transporting windrowers. The large turning radius, long wheelbase, and limited ground clearance necessitated careful maneuvering on sharp corners and irregular ground surfaces.

The Doepker transporter could safely be operated at maximum tractor road speeds when used as a drill transporter. When towed with a truck as a windrower transporter, maximum possible transport speed varied from 15 to 40 km/h (10 to 25 mph) and was usually limited by shimmy of the windrower castor wheels. Transport speed usually depended upon the make and model of windrower being transported.

The Doepker transporter was supplied with adequate tires. The tire load rating permitted safe transport of loads of 2045 kg (4500 lb) at speeds up to 30 km/h (20 mph). This permitted the safe transport of three sections of 2.5 m (8 ft) press drills with empty grain and fertilizer boxes, or any common self-propelled windrower at speeds up to 30 km/h. The tires were overloaded 34% if the grain and fertilizer boxes were half-filled and 55% if the boxes were completely filled when transporting at 30 km/h (20 mph).

Rear visibility was good when transporting drills with a tractor, but was restricted when transporting windrowers with a one-half ton truck. Operator safety was good if accepted safety procedures were followed.

Only minor mechanical problems occurred during functional evaluation and load testing.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifying the steering system to reduce tie rod bending.
2. Modifications to increase the clearance between windrower headers and the transporter arch to permit loading of windrowers without blocking the loading ramps and transporter bed.
3. Supplying a slow moving vehicle sign as standard equipment.
4. Supplying safety recommendations with the transporter, outlining items such as tire load ratings, tire pressures, maximum transport speeds, the use of slow moving vehicle signs and other pertinent safety considerations.

Chief Engineer -- E. O. Nyborg

Senior Engineer -- L. G. Smith

Project Engineer -- G. E. Frehlich

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The tie rods have been modified and reinforced on the 1978 productions.
2. The transporter arch has been lowered to permit windrower loading without header interference.
3. Supplying a slow moving vehicle sign and mounting bracket is being considered as recommended.
4. Instructions will be provided giving the recommended items including safety precautions and tire load ratings.

GENERAL DESCRIPTION

The Doepker drill and windrower transporter is designed for transporting either press drills with front castor wheels or self-propelled windrowers. The hydraulically operated 8.25 m (27 ft) long bed is carried on four wheels and is equipped with automotive steering.

Grain drills are backed onto the lowered bed until the press wheels rest in the bed cradle and are towed sideways with the drill castor wheels on the ground. Self-propelled windrowers are driven onto the bed until the drive wheels rest in the bed cradle and are also towed sideways with the windrower castor wheels on the ground. Optional loading ramps are available to permit loading of self-propelled windrowers without lowering the bed. The 8.25 m (27 ft) model is suitable for transporting three 2.5 m (8 ft) press drills or one self-propelled windrower.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Doepker transporter was operated in a wide range of conditions, varying from rough field trails to paved roads, while transporting a variety of grain drills and self-propelled windrowers. It was used as a drill transporter for about 240 km (150 mi), as a windrower transporter for about 30 km (20 mi) and was towed unloaded for about 730 km (460 mi). It was evaluated for ease of operation, and operator safety. In addition, it was subjected to a load test¹ on an obstacle track.

RESULTS AND DISCUSSION

EASE OF OPERATION

Hitching: The Doepker transporter was equipped with automotive steering and a 1.5 m (5 ft) tongue with a flat plate hitch. A properly sized hitch pin with suitable locking device made a safe hook-up.

Towing Vehicle: When used as a drill transporter, the tractor hydraulic system was required to raise and lower the bed.

When used as a windrower transporter, a tractor would be needed as a towing vehicle if the bed were to be lowered for loading or unloading. The transporter could be towed with a one-half ton truck when equipped with the windrower loading ramps. In this mode the bed remained in a raised position and a hydraulic system was not required. Care had to be taken to use a truck with adequate weight and brakes to permit safe stopping in emergency situations.

Loading: The Doepker was easy to load when used as a drill transporter. Drills were backed on to the transporter, with the bed lowered to ground level. The press wheels were then chained to the transporter arch and the bed raised with the tractor hydraulic system. Press wheel tie-down chains were supplied with the transporter and were adjusted to length with a simple slotted connector on the transporter arch. Toe plates on the bed were adjustable to suit various press wheel sizes. FIGURE 2 shows three press drills loaded for transport.

Windrowers could be loaded in two ways. The bed could be lowered for loading, as with press drills, or windrower loading ramps could be installed permitting windrowers to be loaded on the raised bed, eliminating the need for a hydraulic power supply. Windrower loading ramps (FIGURE 3) were attached by drilling four holes in the transporter bed for each ramp and bolting the ramps to the bed at an appropriate spacing to suit windrower wheel tread.

¹PAMI T773, Detailed Test Procedures for Drill Transporters.



FIGURE 2. Doepker Transporter Loaded with Three Press Drills.



FIGURE 3. Windrower Loading Ramps Showing Spacer Added to Increase Header Clearance.

For most windrowers, there was insufficient header clearance for loading. The raised windrower header would strike the transporter arch as the windrower was driven on to the bed. A 50 mm (2 in) high spacer (FIGURE 3) was added at the top of each ramp to increase header clearance. This increased header clearance was adequate for loading some windrowers but for most windrowers, additional wooden blocks had to be placed on the bed and under the bottom of the ramp to achieve sufficient clearance.

When a windrower had been driven onto the bed, the ramps had to be folded up by hand and chained as shown in FIGURE 4, to hold the windrower in place during transport. The chains and load binders used were not supplied with the optional loading ramps.

Transporting: When used as a drill transporter, the Doepker transported well at maximum tractor road speeds. Trailing was stable, steering was positive, and little bounce occurred, even on rough roads.

The Doepker trailed well and was quite stable, when used as a windrower transporter. Maximum transport speed depended upon the model of windrower being transported and was limited by shimmy of the windrower castor wheels. On smooth roads, with some windrowers, maximum transport speed, without castor wheel shimmy was only 15 km/h (10 mph) while with other windrowers speeds up to 40 km/h (25 mph) were possible before shimmy

occurred. On rough roads, castor wheel shimmy occurred at speeds below 25 km/h (15 mph) for all windrowers.

The unloaded transporter could be towed at high speeds with no trailing problems.

Maneuverability: The Doepker had a 9 m (30 ft) wheelbase and about a 25 m (80 ft) turning radius. As a result, long gradual turns were necessary on corners and it was sometimes difficult to negotiate narrow road approaches. Loaded transport width was narrow enough to permit safe travel on most public roads especially if the tractor drawbar was pinned to the right side of the tractor. Visibility, when used as a drill transporter was good, as the tractor operator was high enough to have a clear view. Rear visibility when towed with a small truck, as a windrower transporter was obstructed by the loaded windrower.

Ground clearance was only 110 mm (5.5 in) when loaded. As a result, due to the long wheelbase, the transporter bed bottomed out on high railway crossings, high road crossings, knolls and field ridges. It was also not possible to cross shallow ditches without ground interference.

Unloading: The Doepker was easy to unload when used either as a drill transporter or a windrower transporter.

OPERATOR SAFETY

The Doepker transporter was safe to operate if normal safety precautions were observed. It was equipped with locking brackets to hold the hydraulic lift cylinders in a raised position during transport. Since the transporter is not equipped with brakes, the towing vehicle must be heavy enough and have adequate brakes to be able to safely stop in emergency situations. Since the tractor used for seeding is the towing vehicle and speed is limited by the tractor road gear, few problems can be anticipated when used as a drill transporter. When used as a windrower transporter, however, a one-half ton truck may not be adequate for certain emergency situations.

The Doepker was not equipped with a slow moving vehicle sign. Since the rear of the transporter is not obscured by the equipment being transported, it is recommended that the manufacturer supply a permanently affixed SMV sign.

Since the rear lights of a towing truck may be obscured by the loaded windrower, the operator should ensure that adequate signal devices are installed when transporting windrowers on public roads.

The Doepker transporter was equipped with four 7.50 x 14, 4-ply agricultural implement tires. Tire manufacturer's specifications indicate that the transporter is capable of carrying 2045 kg

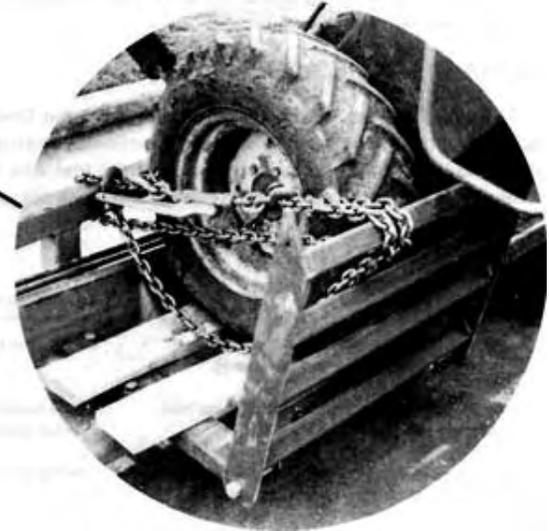


FIGURE 4. Loaded Windrower Illustrating Tie-Down Procedure.

(4500 lb) at speeds up to 30 km/h (20 mph). Speeds above 30 km/h (20 mph) are not recommended for implement tires. The tires were adequately sized to safely transport three sections of 2.5 m (8 ft) press drills, with empty grain and fertilizer boxes at speeds up to 30 km/h (20 mph). The tires were overloaded 34% when the grain and fertilizer boxes were half-filled and 55% when the boxes were completely filled. The tires were adequately sized for transporting all common self-propelled windrowers.

No operating instructions were supplied with the Doepker transporter and due to the simplicity of the machine, there may be little need for operating instructions. It is, however, recommended that safety instructions be supplied to the purchaser. These should include items such as tire and wheel load ratings, maximum transport speeds, tire pressures, recommended size of towing vehicle, attachment of an SMV sign and other pertinent safety considerations.

DURABILITY RESULTS

TABLE 1 outlines the mechanical history of the Doepker drill and windrower transporter during functional evaluation and dynamic load testing. Since the intent of the test was functional evaluation, an extended durability evaluation was not conducted.

TABLE 1. Mechanical History

Item	Time Of Occurrence
-the inner end of the left steering tie rod bent, requiring straightening and reinforcing	during load test
-the inner end of the right steering tie rod bent, requiring straightening and reinforcing	while backing the loaded transporter
-a weld connecting the front axle to the carrier bed failed, in tension, and was rewelded	during load test
-the weld holding the steering lug to the tongue broke and was rewelded	while lowering the bed with the front wheels turned at a sharp angle

DISCUSSION OF MECHANICAL PROBLEMS

Tie Rods: Both tie rods bent at the flat end section (FIGURE 5). It is recommended that the manufacturer modify the tie rods to reduce this problem.

Weld Failures: The weld failure on the front axle appeared to be caused by insufficient weld penetration. The weld failure on the steering lug was caused by lowering the bed with the tongue turned at a sharp angle and hitched to the towing vehicle. The tongue should be relatively straight when lowering the bed to avoid overloading the steering mechanism.



FIGURE 5. Bent Steering Tie Rod.

**APPENDIX I
SPECIFICATIONS**

MAKE:	Doepker Drill and Windrower Transporter
SIZE:	8.25 m (27 ft)
LOAD RATING (based on tires):	2045 kg @ 30 km/h (4500 lb @ 20 mph)
OVERALL DIMENSIONS:	
-- length	11,280 mm (444 in)
-- width	1715 mm (67 in)
-- height	775 mm (31 in)
-- ground clearance	205 mm (8.0 in)
-- tongue length	1500 mm (59 in)
-- turning radius	
-left	22.0 m (72 ft)
-right	25.0 m (80 ft)
-- wheel base	9090 mm (358 in)
-- wheel tread	
-front	1525 mm (60 in)
-rear	1370 mm (54 in)
BED:	
-- width	350 mm (14 in)
-- length	8230 mm (324 in)
WINDROWER LOADING RAMPS:	
-- length	760 mm (30 in)
-- width	610 mm (24 in)
-- angle	20°
WHEELS AND AXLES:	
-- number of axles	2
-- number of wheels	4
-- type of steering	automotive
-- tires	4, 7.50 x 14, 4-ply
-- hitch connection	pin to fit clevis drawbar
NUMBER OF LUBRICATION POINTS: 4	
NUMBER OF HYDRAULIC CYLINDERS: 2	
WEIGHT (unloaded):	
-- front axle	455 kg (1000 lb)
-- rear axle	<u>398 kg (875 lb)</u>
TOTAL	853 kg (1875 lb)

**APPENDIX II
MACHINE RATINGS**

The following rating scale is used in PAMI Evaluation Reports.

(a) excellent	(d) fair
(b) very good	(e) poor
(c) good	(f) unsatisfactory

**APPENDIX III
METRIC UNITS**

In keeping with the Canadian metric conversion program this report has been prepared in SI units. For comparative purposes, the following conversions may be used:

1 kilometre/hour (km/h)	= 0.62 miles/hour (mph)
1 metre (m) = 1000 millimetres (mm)	= 39.37 inches (in)
1 kilogram (kg)	= 2.2 pounds (lb)



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