



TECHNICAL NOTE

Forest Pest Management Institute

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APPLICATION EQUIPMENT

Adaption of a Personnel Lift for use in Forestry

Introduction

Access to tree crowns is necessary for the study of the growth and development of cones. Crowns of trees less than 5m tall are easily reached with orchard-type ladders, but trees larger than this require an elevated work platform (Figure 1). Several types of work platform are commercially available and range from simple scaffolding to hydraulically operated machinery.

If several trees are to be sampled, especially over a wide area and a short time, scaffolding is impractical. Self-propelled elevators or heavy trucks equipped with either boom and platform or telescoping ladder offer easy maneuverability around the tree crown, but, they are costly and require a large working and maneuvering space. Personnel lifts, on the other hand, are comparatively inexpensive, lightweight, and require less working space. In their original form, personnel lifts are suitable only for slow short-distance transportation on hard level surfaces (Figure 2). A special carriage is needed to adapt a personnel lift for rapid transportation and use in forest plantations, where terrain is uneven.

This report describes the construction of the carriage adapted for the Genie PLC-36P Personnel Lift. A list of specifications is included. The construction of the carriage consists of four stages:

- I. The adaptation of the PLC-36P base weldment to fit the carriage base plate.
- II. Attachment of the base plate to the lift.



Figure 1. Portable personnel lift system used to assess the upper crown levels of trees.

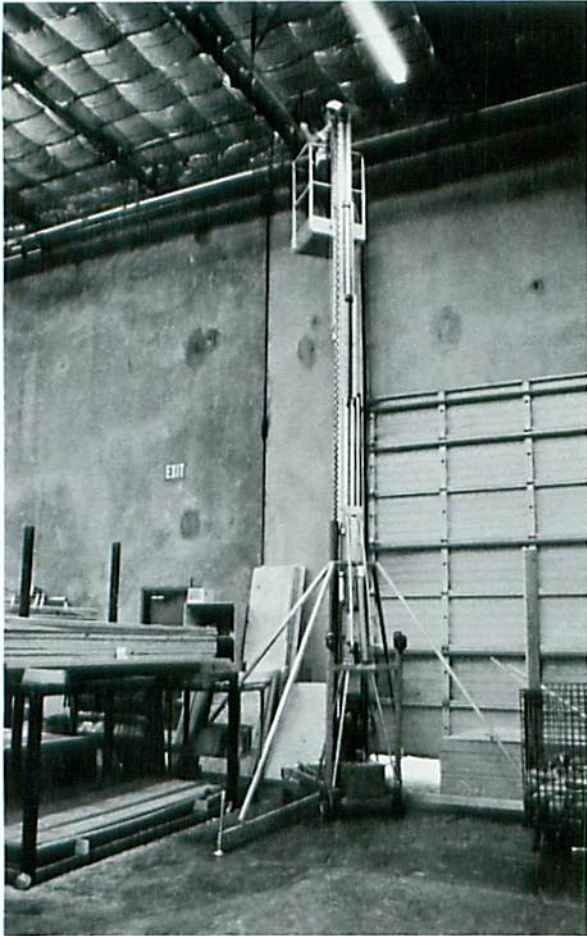


Figure 2. A typical application of the Genie PLC-36P Personnel Lift in its original form (photo courtesy of Genie Industries).

III. Construction of the carriage frame.

IV. Attachment of the carriage frame to the base plate.

I. Adaptation of Base Weldment

Aluminum flanges are welded onto various congruent points of the aluminum base weldment of the lift so that the PLC-36P can be attached to a custom-built carriage. The flanges are made of 6061-T6 aluminum angle with 3 in. flange width and 1/4 in. thickness.*

1. Cut six pieces into 3 in. lengths and one piece to 18 in. length.
2. Drill a 1/2 in. bolt-hole through the center of the bottom flange of each 3 in. piece.
3. Drill one 1/2 in. hole 1-1/2 in. in from each end of the 18 in. long flange piece.
4. Weld each flange piece onto the congruent locations (Figure 3) flush with the bottom of the base weldment of the lift.
5. For extra support, weld a 1/4 x 2 1/4 x 2 1/4 in. square gusset of 6061-T6 aluminum flat bar onto each of the six 3 in. long flanges.

For best results in welding aluminum, use a gas-shielded metal arc-welding process. Ensure that excessive heat will not distort the outrigger socket and that finish welds do not impair entry of outrigger placement into the outrigger socket. Bevel and deburr all sharp edges and corners.

* Industry standard for steel measurement is imperial units. For the sake of clarity this Technical Note is written in imperial units.

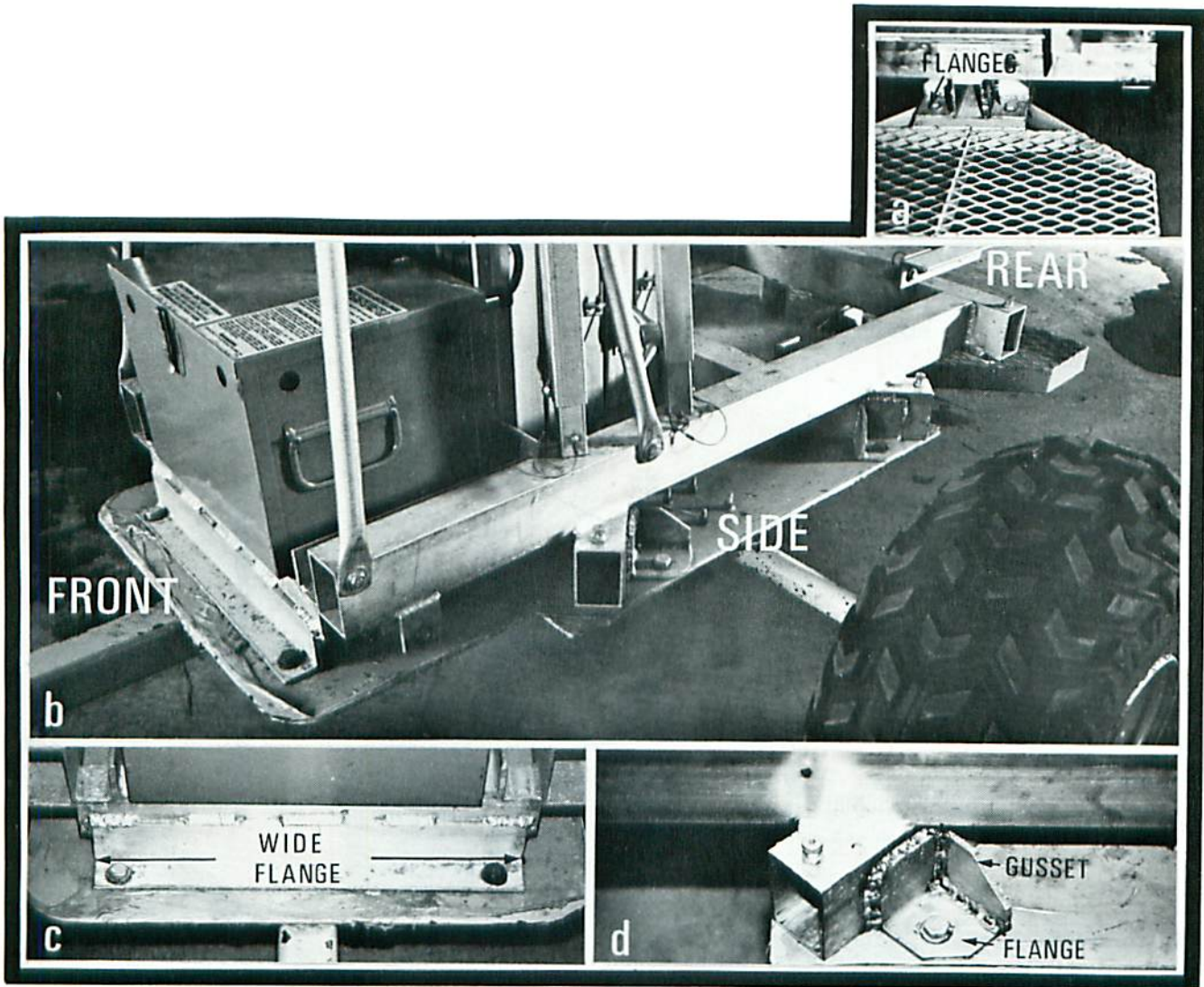


Figure 3. Two three-inch wide flanges shown at rear (a), overall view (b), one 18-inch wide front flange (c), and a side flange with close-up of gusset (d).

II. Attachment of Base Plate to the Lift

The base plate is attached as follows:

1. Place and center the lift on the $\frac{1}{4}$ x 36 x 55 in. sheet of ASTM A-36 steel plate.
2. Mark the position of all eight flange bolt holes on the plate with a marker or center-punch.
3. Remove the lift from the plate and drill $\frac{1}{2}$ in. holes through the marked positions of the plate.

4. Replace the lift on the plate; align flange holes with plate holes, and bolt together with 2 in. long $\frac{1}{2}$ in. UNF stainless steel hexagon cap screws and $\frac{1}{2}$ in. UNF locknuts with $1\frac{1}{2}$ in. (outside diameter) flat washers. Use 2 washers per bolt, one at the head and one at the locknut.

III. Carriage Frame Construction

The frame is constructed of $2\frac{1}{2}$ x $2\frac{1}{2}$ in. ASTM A-36 square steel tube with $\frac{1}{4}$ in. wall thickness.

1. Cut frame members to the following lengths:

Rear brace -	31 in.
Axle -	59 in.
Tongue -	63 in.

2. Weld all frame members into the "cross" configuration depicted in Figure 4a.

NOTE: Grind the top surface of the finished frame flat and level. This ensures a gap-free, smooth surface to which the base plate can be welded.

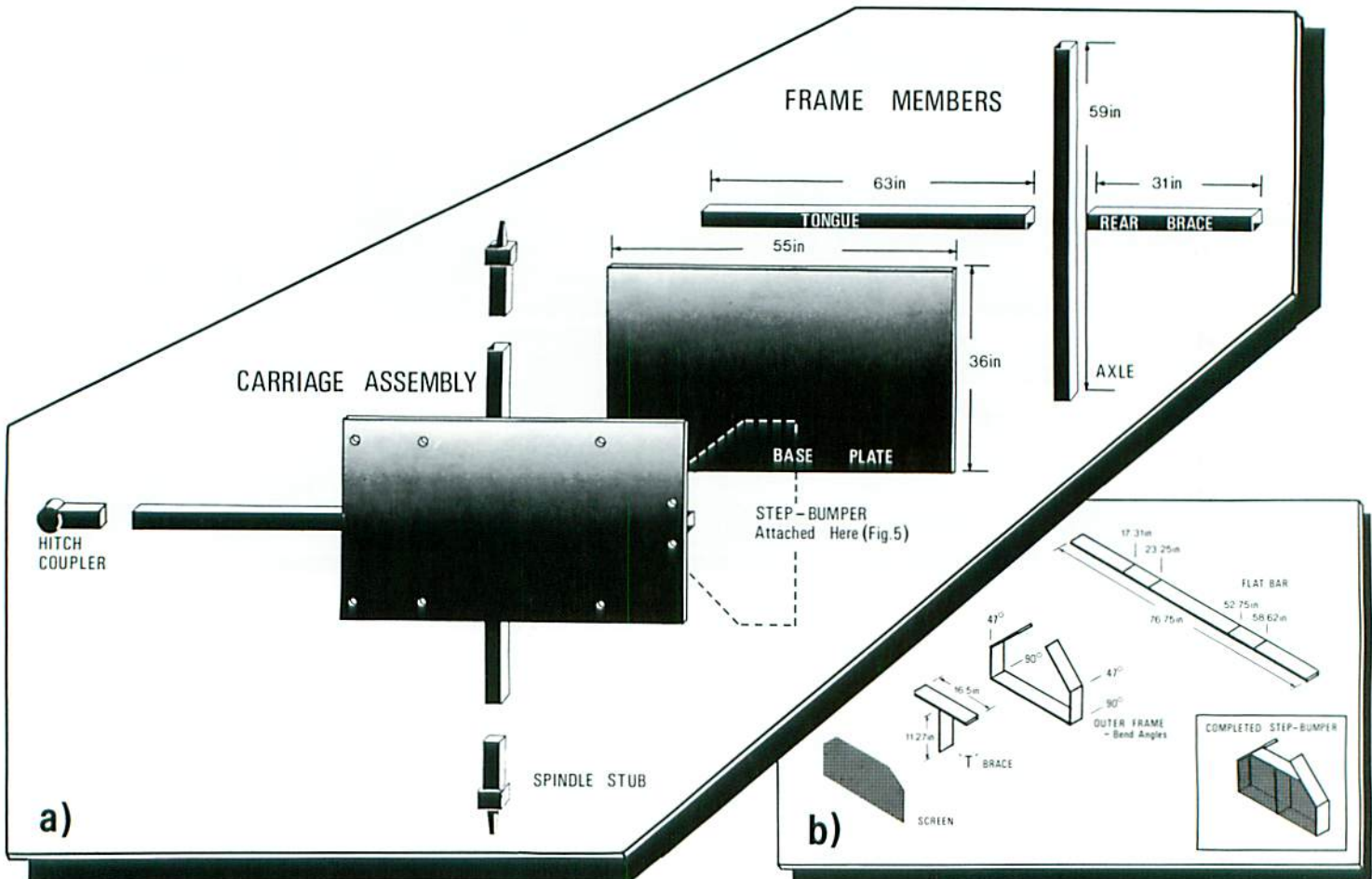


Figure 4. a) Diagram showing dimensions and placement of base plate on frame members. b) Diagram showing step bumper frame bending positions and assembly.

3. Weld stub of wheel hub assembly into each axle end.

NOTE: Bolt patterns are in four or five bolt configurations. Use a wheel hub assembly that matches the bolt pattern of the all-terrain rims.

4. Install the 9 in. all-terrain wheels and 25 x 12 x 9 in. tires on each hub.
5. Bolt a standard 2 in. ball-type trailer coupler on the end of the tongue.

IV. Lift Attachment

1. Center the lift (with base plate attached) on the frame until it is balanced evenly with the floor.

At this point, the total weight is applied only to the wheels and no weight is applied at either the front or rear end of the frame. The desired weight to be applied to the tongue member of the frame can now be determined. This tongue weight, is required to apply a downward pressure on the ball hitch of the tow vehicle to minimize side to side sway (fishtailing) and reduce the risk of the trailer hitch detaching.

2. While the frame is balancing level, elevate and stabilize a standard bathroom weigh scale so that the middle surface of the scale just touches the underside of the trailer coupler of the tongue.
3. Keep the frame stationary and shift the lift forward until 70 lbs. is indicated on the scale.

A 70 lb. weight limit was chosen as a suitable compromise between exceeding the

maximum tongue weight capacity of the tow vehicle (Honda TRX 250 ATV-30 lbs.) and the lifting capacity of an average person.

4. Ensure that the frame members, tongue and rear brace, are aligned with the center-line of the base plate. Tack-weld the axle to the edge of the base plate.
5. Remove the PLC-36P from the base plate and flip the carriage upside-down.
6. Weld all the frame members to the underside of the base plate until they are securely attached.
7. Clean all the surfaces, bevel and deburr all the sharp edges and corners.

A rear step-bumper (Figure 4b) is constructed to aid in platform entry. The bumper also prevents the lift from tipping backwards while it is being hitched to a tow vehicle. The frame of the stepbumper is made from 3/16 in. thick by 2 in. wide steel flat bar cut in three pieces: 76 $\frac{3}{4}$ in., 16 $\frac{1}{2}$ in., and 11-3/8 in. in length.

- 8a. Measure from one end of the 76 $\frac{3}{4}$ in. piece and mark the following four locations on the side of the flat bar: 17-5/16 in., 23 $\frac{1}{4}$ in., 52 $\frac{1}{4}$ in., and 58-5/8 in.
- b. Clamp the flat bar in a bench vise.
- c. Use an oxy-acetelene torch flame to heat the marked locations for bending the flat bar to the following inside angles: 47 degrees for locations 17-5/16 in. and 58-5/8 in., 90 degrees for locations 23 $\frac{1}{4}$ in. and 52 $\frac{1}{4}$ in. Use the two remaining pieces of the flat bar to construct a "T"-shaped reinforcing brace for the step-bumper (Figure 4b).

- d. Butt one end of the 11-3/8in. piece to the side and at a right angle to the center of the 16½ in. length of flat bar to form the "T".
- e. Clamp the pieces together and weld.
- f. Weld the three ends of the "T" brace to the inside of the bent flat bar.
- g. While the carriage is still upside down, slip the open end of the step-bumper frame on the end of the carriage rear brace until the "T" brace abuts it.
- h. Clamp the step-bumper frame to the carriage base plate.
- i. Weld each end of the step-bumper frame to the corresponding side of the carriage rear brace.
- j. Weld the upper edges of the bumper frame to the bottom surface of the carriage base plate. Continue the welds to where the rear edge of the base plate meets the "T" brace.
- k. Flip the carriage right side up and weld across the end of the rear brace and top edge of the "T" brace, connecting the two together.
- l. Weld a 12 x 36 in. piece of mesh screen on the top edges of the step-bumper frame. Cut off all excess screen and deburr all the sharp edges and corners.
9. Apply 3 to 4 coats of a deep-penetrating rust inhibiting metal paint.
10. Line the base plate with a sheet of 1/16 in. thick vinyl matting.
11. Bolt the lift back on the base plate.

NOTE: Aluminum corrosion is accelerated by electrolosis caused by the contact of aluminum with steel, moisture, and air. The vinyl mat separates the two metals, thus preventing electrolosis.

FIELD USE

We have used the modified Genie PLC-36P Personnel Lift in red pine, *Pinus resinosa* Ait. plantations. To transport the lift and tow vehicle, we have used a trailer and flat bed truck. The truck flatbed should be no smaller than 8 ft. wide and 11 ft. long. We prefer a trailer to keep the overall cargo height to a minimum. Our trailer has a "beavertail" loading ramp and a tandem axle suspension. The unit measures 8 ft. wide and 12 ft. long. The lift set-up is identical to the manual instructions except we use pedestals under each leveling jack foot. The pedestals are expired aluminum air bag pedestals used in transport trailer suspension systems. Since the tilt feature is no longer required, it is removed to reduce the total weight of the personnel lift system.

Acknowledgments

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MATERIALS FOR THE MODIFICATION OF THE PLC-36P

<u>Specifications</u>	<u>Quantity</u>	<u>Specifications</u>	<u>Quantity</u>
		PAINT	
		Rust-inhibitive	4 L
ALUMINUM BASE WELDMENT ADAPTATION MATERIALS		VINYL MAT	
6061-T6 Aluminum Angle 1/4 in. thick x 3 in. wide	42 in.	Black ribbed inert	
		1/16 in. thick x 36 in. wide x 40 in. long	1 pc
Flat bar		TRAILER HITCH	
1/4 in. thick x 3 in. wide	20 in.	Standard 2 in. ball coupler	1 pc
CARRIAGE CONSTRUCTION MATERIALS		WHEEL HUB ASSEMBLY	
ASTM A-36 Steel Plate		4-bolt configuration for 9 in. ATV wheels	1 pr
1/4 in. thick x 36 in. wide x 40 in. long	1 pc		
Square tube		ATV TIRES	
1/4 in. thick x 2-1/2 in. x 2-1/2 in.	13 ft	25 x 12 x 9 in. square block tread	1 pr
Flat bar		ATV WHEELS	
1/4 in. thick x 1 in. wide	108 in.	9 in. 4-hole rear drive	1 pr
Screen		SPECIFICATIONS OF THE MODIFIED PLC-36P	
Flattened expanded metal with 1 in. S.W.D. (Short Way Diamond) mesh and 16 ga thickness x 12 in. wide	36 in.	WEIGHT	900 lb
		Tongue	70 lb
		Maximum platform capacity	250 lb
FASTENERS		DIMENSIONS	
Hex socket cap screws		Length	7 ft
Stainless steel		Width	6 ft
1/2 in.-UNF thread x 2 in. long	8 pcs	Height	9 ft
Stainless steel		OTHER INFORMATION	
1/2 in.-UNRF thread x 4 in. long	2 pcs	Maximum extension	36 ft
Lock nuts		Time to full extension	30 s
Stainless steel 1/2 in	10 pcs	Extended outrigger radius	12 ft
		Carriage ground clearance	8 in.
		100CCA maintenance-free battery	12 v
		Maximum tire pressure	7 psi
WASHERS			
1/2 in. flat for all 2-1/in. bolts	20 pcs	A. Obarymskyj, P. de Groot	



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