Operating Techniques

for the Tractor-Loader-Backhoe

Gary J. Ober
Operating Techniques for the Tractor-Loader-Backhoe Revised

by Gary J. Ober
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The tractor-loader-backhoe (or “TLB” as I’ll call it here) is a highly versatile, productive piece of equipment. It’s ideal for most of the trenching that’s done on a building site. It’s perfect for loading soil and heavy objects into a truck. It handles light demolition well. And, of course, it backfills trenches and does minor grading much faster than could be done by hand.

**What You Need to Know**

This book isn’t a technical manual. And it doesn’t cover any particular type of TLB. The various manufacturers have all the technical manuals you’ll need on the equipment they manufacture and sell. Nor does this book recommend one brand of TLB over any other. They’re all good. What this book does is explain in the most concise and direct way possible what you should know for safety productivity of the TLB. Without this information, you would not be aware of the potential for accidents, and the safety hazards that can cause serious damage to people or property.

I’ve written this book for both the beginning and the experienced operator. It begins with the basics, of course. But there’s plenty of useful information in later chapters for even veteran operators. And I’ve never met an operator who couldn’t learn a little more or get rid of a few bad habits. Certainly I haven’t stopped learning about the TLB. In fact, during the writing and illustrating of this revised edition, my own knowledge has been stretched into new areas of understanding, and that information is presented in this book for all to learn from. This highly technical information has been distilled into easy to understand terms, and generously illustrated for your ease of understanding and for safe operation of these machines in the future.

**Steps Toward Your Goal**

As you read through the first chapters, you may feel that my descriptions seem to cover a series of unrelated subjects and procedures. Be patient – and learn these important principles as they are presented. As you read further, you will notice that each bit of information becomes a part of a larger process.

Later sections of this book emphasize the more technical aspects and difficult job situations, such as: tight work space, working around utilities, precision excavation and many more complicated tasks. Although many jobs do not demand the highest degree of operating skills, mastering the machine provides safety as well as the necessary skills to do precision work.
Learn the more demanding tasks and everything else will seem like a piece of cake. That’s why I’ve emphasized techniques and work procedures that cover “worst-case” situations.

Get Started Right

A word to beginners: There’s no substitute for practice, practice and more practice. Just reading this book isn’t enough. It’s practicing what you’ve learned here that makes you an expert. With time, operating a backhoe safely and productively will become as natural to you as driving a car or tying your shoe.

And don’t be discouraged when you run into difficulty. The TLB is among the most difficult pieces of heavy equipment to operate. There are two reasons: First, it’s really two machines in one, with separate controls and operating principles for each. Second, the TLB is used for so many different tasks and procedures, that there’s a lot to learn. No matter how experienced you are, there’s always another job yet to be attempted and mastered. And remember, it is the operator’s job to find an intelligent, safe, workable solution to the job at hand.

Instructors, please note...

The Answer Key on pages 285–296 is perforated for easy removal, if desired. If you choose to remove these pages, please return them to the students at the end of the course as they are an excellent review of the material.

IMPORTANT

These machines are commonly called on for wide range of tasks, procedures, and applications. Because of these wide ranging uses, I have used terminology that will convey the exact thought of the author to the reader.

When “TLB” is used in this book, I am referring to the machine in general.

When the word loader is used in this book, I am referring to the machine being used as a loader, moving on the site and using the loader bucket to perform work. The machine could be grading, leveling, moving material, or loading trucks.

When the word backhoe is used in this book, I am referring to the machine being used as a backhoe, with the stabilizers down and the machine in a set position.
1. TLB Dimensions

**General**

The modern tractor-loader-backhoe is the most versatile machine on today’s construction site. It can dig trenches, carry heavy materials in bulk, transport large objects, and work the earth in whatever way required for all modern construction, demolition or excavation projects. It has become a common sight on city streets as well as in rural locations.

Like any piece of complicated machinery, the TLB requires a skilled operator who is proficient in the use and control of the machine’s various functions. Becoming a skilled TLB operator requires a thorough understanding of the machine’s capabilities, the principles behind its operation, and thousands of hours of practice.

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**Fig 1-1** Typical dimensions of a TLB
The primary step toward this understanding between man and machine is in learning the TLB’s dimensions. The TLB is generally more difficult to maneuver than other types of heavy equipment because it is over-long, over-high, and over-wide. Depending on the make and model, the TLB usually has an overall length of twenty-three feet with the boom drawn in. With the boom extended, the machine may stretch out to a length of thirty-five feet or more. It is at least twelve feet high with the backhoe in transport position. With the two stabilizer arms lowered, the TLB takes up ten feet from side to side. In short, the TLB can be an awkward machine. Depending on the operator’s skill, however, this awkwardness can be minimized and even made to work to their advantage. One way operators can do this is by understanding the TLB’s weight distribution.

**Weight Distribution**

The TLB consists of three major components: 1) the tractor itself, which houses the diesel-powered engine, the hydraulic pump and the cab; 2) the front loader assembly; and 3) the backhoe assembly, mounted on the rear. Because of the flexibility of these components, particularly the backhoe itself, how the machine’s seven tons are distributed frequently plays a major role in the planning and completion of many jobs.

Approximately one-third of the total weight of the TLB is in the two-ton backhoe assembly, whose main components include the boom, the crowd (or stick), the bucket and the stabilizer units (see Fig. 1-2). Because of its location high above the ground and far behind the wheelbase, the TLB’s weight transfers the entire machine’s center of gravity upward as well as to the rear, when compared to other machines. This, in turn, makes the machine lighter on the front end and somewhat top-heavy. The positioning of this weight when maneuvering around a job can be a constant source of trouble for even an experienced operator, since each job presents different demands and hazards.
Fig. 1-4 Center of gravity comparison
“The high weights involved in operating heavy equipment bring with them the unbending laws of physics.” — Gary J. Ober 1999

Universal Forces and Principles
Operating a TLB, or any other type of heavy equipment, is a construction trade that is unique in the industry. This is because of the great weights involved with the equipment and the materials being handled. The high weights involved in operating “heavy” equipment bring with them the unbending laws of physics.

If we were to look at a TLB in operation strictly from a physics viewpoint, it would be: a very HEAVY MACHINE… MOVING around the job site… and moving very HEAVY materials.

The weight of a working TLB can vary from 14,000 to well over 25,000 lb. That’s 7 to 12 tons of machine and materials, working and moving through a busy job site, all day, every day.

In order for this to be accomplished with safety and productivity, the operator must understand the UNIVERSAL FORCES AND PRINCIPLES that govern weight and movement.

**UNIVERSAL FORCES AND PRINCIPLES** apply to operating the TLB in the following ways:

1. There are physical forces and principles that act on a TLB.
2. These forces have both a constant and a variable effect on the machine.
3. These forces have a strong effect on the control and safety of the machine.
4. These forces can and must be limited, controlled and counteracted by the operator for safety and control.

In order for you to safely move both machine and materials, you must first understand the UNIVERSAL FORCES AND PRINCIPLES and how they relate to operating heavy equipment.
The modern Tractor-Loader-Backhoe has become the most useful machine in general construction, and it has gained that reputation since its introduction in the late 1950s. This reputation as the “most useful” is due to the wide-ranging tasks that the machine is capable of performing. These wide-ranging jobs, in turn, demand that operators have the knowledge, skills, and experience required for safety and productivity.

The first edition of this book, Operating Techniques for the Tractor-Loader-Backhoe, published in 1983, was written simply as an information source covering standard machine operations and procedures. Over the years, training programs sought it out for its practical and detailed information. This Revised Edition has been greatly expanded to provide even more detailed information for operators and training programs, such as: the physics of operation, machine control guidelines, safety considerations, and preventing damage to existing utilities.