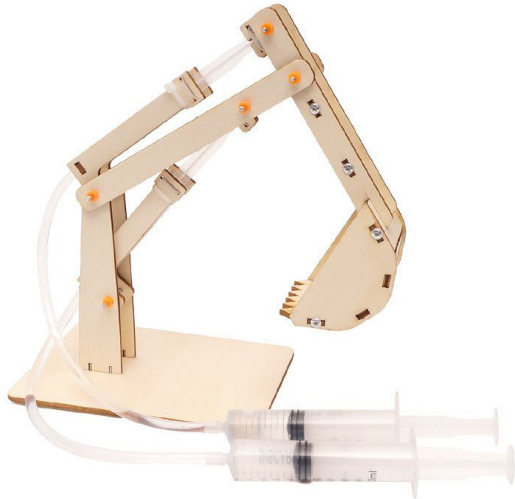


# HYDRAULIC EXCAVATOR

CAT# 80-50-W143



The excavator is closely connected with hydraulic transmission, and its development is mainly based on the application of hydraulic technology. Its structure is mainly composed of an engine, hydraulic system, working device, walking device, and electric control. The hydraulic system is the main system in the excavator, determining its working performance.

## JUNIOR DIVISION: GRADES 4-6

### Overall Expectation: STEM, Structures, Matter and Energy Focus

Investigate the principles of forces, energy, and control in simple machines and structures.

### Specific Expectation

Explore the relationships between the components of simple machines and the forces acting on them.

### Activity

With the Hydraulic Excavator, students investigate how hydraulic systems can amplify force. They experiment with different fluid levels and piston sizes to see how they affect the movement and power of the excavator's arm. This helps them understand the relationship between force, pressure, and area in hydraulic systems.

## INTERMEDIATE DIVISION: GRADES 7-8

### Overall Expectation: STEM, Structure and Mechanisms Focus

Investigate how technological problem-solving meets human needs and leads to innovation.

### Specific Expectation

Analyze the impact of friction and lubrication on the efficiency of mechanisms.

### Activity

Students use the Hydraulic Excavator to explore how friction impacts its performance. They experiment with different types of hydraulic fluids and lubricants to see how these factors affect the efficiency and smoothness of the excavator's movements. This activity highlights the importance of material science and engineering in designing efficient hydraulic systems.

## SECONDARY DIVISION: GRADES 9-12

### Overall Expectation: Physics Focus

Apply principles of physics to understand the operation and efficiency of mechanical systems.

### Specific Expectation

Analyze mechanical advantage and efficiency in simple and compound machines.

### Activity

Using the Hydraulic Excavator, students delve into the concepts of fluid dynamics, pressure, and mechanical advantage. They calculate the force generated by different hydraulic configurations and discuss how efficiently this force is converted into mechanical work. This activity ties in principles of physics and engineering, providing a comprehensive understanding of how hydraulic systems operate and are optimized.

## CROSS-CURRICULAR CONNECTIONS

### Mathematics

Students can calculate the hydraulic pressure and force using mathematical formulas based on the size and area of the pistons.

### Technology

They explore different designs and materials to optimize the excavator's performance.

### Language Arts

Students can write reports or presentations on the principles of hydraulic systems and their applications in various engineering fields.

### Summary

By experimenting with the Hydraulic Excavator, students engage in hands-on learning experiences that deepen their understanding of fluid mechanics, hydraulic systems, and mechanical principles while meeting curriculum expectations. This project promotes critical thinking and curiosity in STEM disciplines, encouraging students to explore the potential of hydraulic technology and the importance of innovative problem-solving in engineering.