

JUMBO BLOCK ENGINEERING SUITE

# JUMBO BLOCK Game

User Manual · Version 9.0.4

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## 1. Overview

JUMBO BLOCK Game is a browser-based engineering game centred on building an underground modular JUMBO BLOCK system. The objective is to build compactly, make intelligent use of road areas, respect obstacles and achieve a high score.

Each displayed module represents one real JUMBO BLOCK measuring  $2.50 \times 2.50 \times 2.50$  m with  $13.9 \text{ m}^3$  net storage volume. The game combines entertainment with technical indicators and changing Engineering Facts.

The supplied file declares version 9.0.4 in its program header.

## 2. Getting Started

After opening, the game is ready. “Start” begins the automatic fall of the active modules. “Pause” stops the sequence, while “New plant” resets the playfield, score, obstacles and career display.

The playfield and number of grid units adapt to the available screen size. A reset generates a new road layout and new obstacles.

## 3. Objective

The system is built module by module. An active module falls from the top of the playfield and is placed at the selected position. The construction should be as dense and connected as possible.

Roads may be built under and provide extra points. Trees, pipes and buildings should be kept clear or successfully bypassed. Enclosed gaps in the system body affect the final bonus.

## 4. Keyboard Controls

- ← moves the active module left.
- → moves the active module right.
- ↓ advances the falling module faster.
- Space places the module immediately at its current position.
- P toggles Start/Pause.
- Horizontal positioning uses half-module increments, allowing offset construction.

## 5. Touch Controls

On touch devices, the playfield is divided into control zones. Tapping the left or right half moves the module. The upper zone starts a new plant; the lower zone toggles Start/Pause.

The touch layout adapts to portrait and landscape orientation. In compact landscape views, non-essential sections are hidden to preserve playfield usability.

## 6. Playfield, Roads and Obstacles

For every new plant, the game creates one horizontal and one vertical road. Up to four hard obstacles are also placed randomly using the types Tree, Pipe and House.

Roads are buildable. Hard obstacles are treated as blocked positions during normal movement. The scoring logic additionally evaluates contacts and special bypass situations.

## 7. Placing Modules and Completing Rows

Every placed module is worth +5 points. After placement, a new active module appears at the top centre. If this spawn position is no longer free, the plant is complete and the game ends.

A fully occupied row receives a one-time +100 point bonus. Row completion respects the half-grid positioning and accepts either of the two complete alignments across the playfield.

## 8. Scoring System

The visible scoring agenda uses the following base values:

- Module placed: +5 points.
- Road built under: additional +55 points for each road object covered for the first time.
- Obstacle successfully bypassed: +20 points.
- Tree, pipe or building struck: -5 points for each obstacle first counted as a hit.
- Complete row: +100 points.
- Final gap bonus: 0-3 gaps +30; 4-7 +15; 8-12 0; more than 12 -15.

## 9. Successfully Bypassing Obstacles

For hard obstacles, the game checks whether placed modules bypass or wrap the object using its half-module logic. A successfully bypassed obstacle adds +20 points.

If an obstacle was previously counted as a hit and is later recognised as successfully bypassed, the earlier hit can be corrected by the program.

## 10. Gaps and Final Bonus

At game end, the application determines enclosed free areas inside the plant body. The calculation considers occupied module cells, site objects, free areas reachable from outside and notches around hard obstacles.

The resulting gap count produces the final bonus: up to 3 gaps +30 points, 4 to 7 +15, 8 to 12 no change, and more than 12 gaps -15 points. The final score is never reduced below 0.

## 11. Current Plant and Indicators

The “Current plant” panel calculates its values directly from the number and spatial extent of placed modules.

- Modules: number of placed JUMBO BLOCK modules.
- Protected area: modules  $\times$  170.45 m<sup>2</sup>, based on 100 mm rainfall and 90% sealed surface.
- Storage volume: modules  $\times$  13.9 m<sup>3</sup>.
- Non-potable water: storage volume  $\times$  1,000 litres.
- Urban tree watering cycles: numerically modules  $\times$  13.9; orientation 1 m<sup>3</sup> per watering cycle.
- Footprint: modules  $\times$  6.25 m<sup>2</sup>.
- Plant width and length: derived from the actual extent of the placed modules using the 2.5 m module dimension.

## 12. Game End and Result

The game ends when the new spawn position at the top is no longer free after a module has been placed. Automatic movement stops, gap scoring is applied and the final score is displayed.

The result confirms the completed JUMBO BLOCK system and shows the protected area. The Engineering Career is updated from the final score.

## 13. Engineering Career

The career display marks achieved levels and highlights the highest currently reached level.

- 900 points: Engineering Apprentice.
- 1,600 points: Engineering Expert.
- 2,200 points: Master of Water Engineering.
- 2,700 points: JUMBO BLOCK Senior Engineer.
- 3,100 points: JUMBO BLOCK Grand Engineer.

## 14. Engineering Facts

A dedicated card displays changing technical facts during the game. Topics include module dimensions and storage, heavy-rain protection, non-potable water use, modular expansion, overbuilding, road integration, climate adaptation, evaporative cooling and urban heat.

These facts accompany the game as information and do not alter the score.

## 15. Integrated Music Player

The compact JUMBO BLOCK Music Player obtains its MP3 tracks from music\_catalog.js. It therefore uses the music library rather than a fixed track list embedded in game.html.

The player provides Back, Play/Pause, Next and Shuffle. Shuffle is enabled at startup and the interface explicitly states that there is no autoplay. Random selection avoids the current track and, where possible, up to 20 recently considered tracks. Back follows the accumulated playback history.

## 16. Game Sounds

In addition to music, the game generates short sound effects through the Web Audio API for actions such as movement, placement, hits, roads, completed rows, start, pause, reset and game over.

The audio context is activated only after user interaction, as commonly required by modern browsers. If Web Audio is unavailable, game sounds are disabled without stopping the game logic.

## 17. Language: German / English

The application contains German and English interface text. Switching language updates labels, Engineering Facts, status messages, result text, career names and Music Player text.

Numeric values are formatted for the selected language. Changing language does not reset the current plant or score.

## 18. Responsive Layout

The layout is designed for desktop, tablet and smartphone. On large screens, plant information, playfield and the right-hand information column appear side by side. On smaller or touch devices, sections are rearranged vertically or made more compact.

In touch landscape mode, the hero area, helper text, Music Player, result or supplementary cards may be hidden depending on available height. This is solely to keep the playfield usable.

## 19. Privacy, Limitations and Notes

- The interface states: no cookies, no tracking and no user account.
- According to the program header, the application contains no integrated third-party libraries.
- The game is a playful representation and is not an engineering sizing, planning or verification tool.
- The “Protected area” indicator uses a fixed game value of 170.45 m<sup>2</sup> per module at 100 mm rainfall and 90% sealed surface.
- Roads and obstacles are generated randomly for a new plant, so two rounds can differ.
- The Music Player requires music\_catalog.js and the MP3 files referenced by it.
- Browser restrictions may prevent music or sound from starting until the first user interaction.

## 20. Quick Reference of Icons and Buttons

| Icon / Button       | Meaning                                           |
|---------------------|---------------------------------------------------|
| Start               | Start automatic gameplay                          |
| Pause               | Pause gameplay                                    |
| New plant           | Reset playfield, score, career and site objects   |
| ← / →               | Move active module horizontally                   |
| ↓                   | Advance falling module faster                     |
| Space               | Place active module                               |
| P                   | Toggle Start/Pause                                |
| Road                | Buildable; awards additional points               |
| Tree / Pipe / House | Hard obstacles; keep clear or bypass successfully |
| Shuffle             | Toggle random music playback                      |
| Back / Play / Next  | Control the Music Player                          |
| Engineering Career  | Show achieved score level                         |