

## Scaling the Green Monster: Unveiling the Dimensions of Baseball's Stadiums

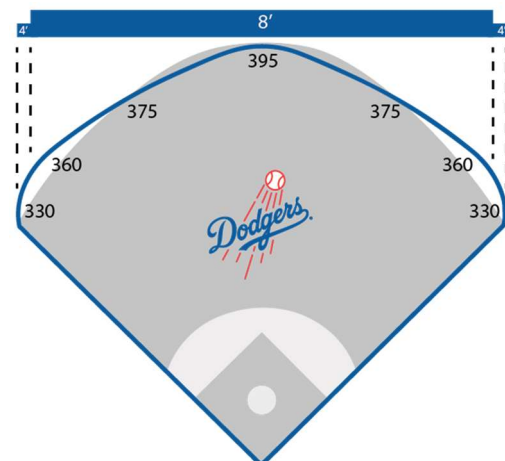
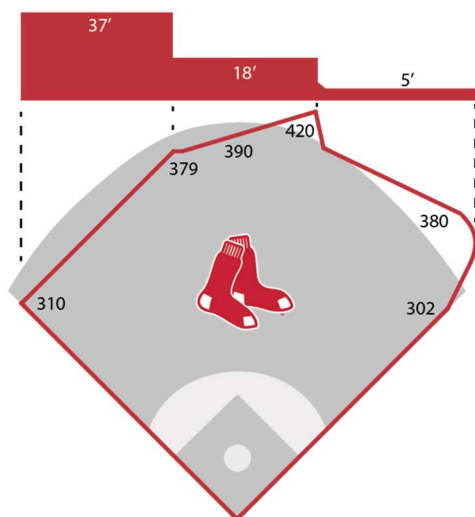
The Boston Red Sox secured a victory in the 2018 World Series against the Dodgers in a five-game series, receiving their fourth World Series title since 2004. The first two games were played at Fenway Park, where the Red Sox came away with two series wins, while the Dodgers managed to take away a win during the third game at Dodger Stadium.

Game three of the series is known in history as the longest games in World Series and MLB postseason history, both in terms of innings and duration. The game lasted a staggering 7 hours and 20 minutes. The game ended with a famous walk-off home run hit by Max Muncy, as his solo shot led off the bottom of the 18th inning to a victory.

Max Muncy's home run in left field at Dodger Stadium was hit 382 feet from home plate, clearing the 8-foot fence. However, the question arises: would this have still been a home run and ultimately ended the game if it took place at Fenway Park?

In Fenway, known for its towering Green Monster, the left field fence stands at a remarkable height of 37.167 feet, 29 feet taller than Dodger Stadium's. The dimensions and characteristics of Fenway Park create a considerable challenge for hitters, particularly left-handed ones like Muncy. To determine if his home run would have cleared the fence in Fenway, a detailed analysis considering both the distance and the height differential between the two ballparks is needed. This comparison would offer insights into how the features and dimensions of each stadium impact the outcome of such crucial plays and help mathematically define an element of "home field advantage".

When we look at Fenway Park, the 37-foot wall is high, however it is also exceptionally close. Fenway Park has two of the shortest outfield distances in all of baseball. The foul pole in left field is only 310 feet from home plate, however, the 37-foot-high fence adds to the challenge of hitting a home run in that direction.



The right field in Fenway features a foul line of 302 feet along with a much shorter wall. This gives lefties an opportunity to steal home runs that would have been foul at most other MLB stadiums.

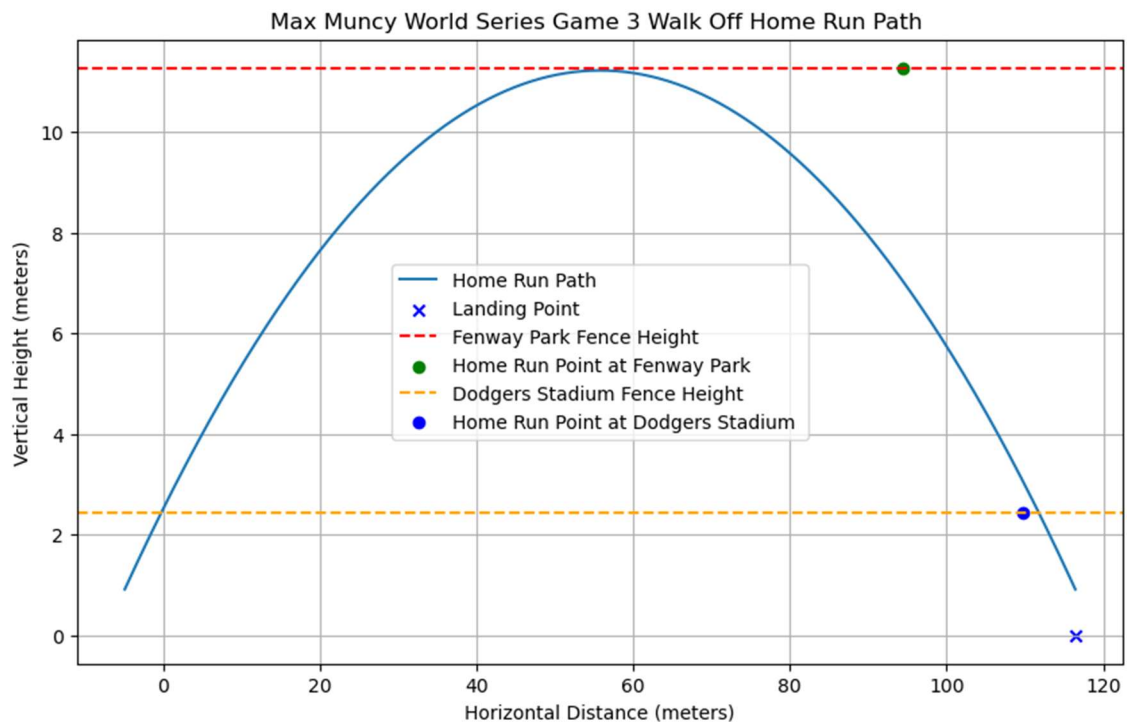
The Monster is tall, and the distance to hit a home run is relatively short, making it seem challenging. In many modern stadiums, the distance down the foul lines is around 320 to 325 feet. Since this field is only 310 feet to the wall, and the wall doesn't curve, it remains shorter even into the alleys. Therefore, hitting a home run here is easier than one might think. All you need is a high, lofty hit instead of a powerful shot to clear the wall.

On Fenway's other side, right field is quite different. Although equally short right along the foul line, it slopes downward rapidly. The left field area, especially the pull zone around 380 feet, typically has a gentler curve, ranging from 340 to 350 feet in most ballparks. While there's a slightly shorter wall in this area, if you're a left-handed hitter aiming for the pull zone, you'll need to really hit the ball hard to clear the fence.

In center field, the distances have evened out to be more typical for a ballpark. However, the center field fence remains at a height of 17 feet. This height is still higher than in many other parks, which is another challenge.

The dimensions of a baseball field undoubtedly play a significant role in shaping the frequency of home runs, with smaller ballparks witnessing a higher number of home runs. A statistical approach to this example was completed to determine if Max Muncy's infamous solo walk off home run would have been a homerun at Fenway or if playing at their home, Dodgers Stadium, gave them an advantage.

After running a python code to generate a visual of the trajectory of Max Muncy's hit, I have concluded that his homerun would not have ended the game if played in Fenway.



Pulling data from Statcast, the trajectory of his hit is calculated based on input parameters such as exit velocity (98.8mph), landing distance (382 feet), contact height (3 feet), and launch angle (33 degrees).

There are two horizontal lines across the visual that represent the height of the fences of both parks. The two dots on the plot demonstrate the distance and height a ball would need to cross for it to be considered a home run in either park.

As we can see from the visual, Max Muncy's hit would not have been hit with a great enough launch angle and exit velocity to have been a homerun at Fenway. The Dodgers had home field advantage in the end with a shorter back wall that allowed Max Muncy to hit a game winning shot.

In the heart of the 2018 World Series, Max Muncy's historical walk-off home run not only sealed a victory for the Los Angeles Dodgers, but also raised the question about the impact stadium dimensions have on baseball.

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