



KETTLEBELL PENDULUM TEST SETUP

PURPOSE

To test obstacles with frangible fence equipment to ensure that the fence will collapse when impacted under appropriate conditions. This information can be used to develop a low cost easily constructed testing system.

CONSTRAINTS

1. This setup applies to a pendulum test where the impact with the fence rail is horizontal, or angled upwards, or angled downwards. For horizontal impact angle, it is generally easier to use the preload distance (D) from table. For impact angles other than horizontal, the drop height (H) of release from rest must be used.

OBJECTIVES

1. FEI no-release impact energy test, whereby the fence remains fully intact and standing per design shape and dimensions
2. Energy level for release of frangible elements of the fence

MATERIALS NEEDED FOR PENDULUM HITCHED TO A TRACTOR BUCKET

1. Kettlebell (*fig 1*) from suppliers such as www.KettlebellsUSA.com, Dick's Sporting Goods, and Amazon.com
2. 10ft (3m) stainless steel chain of 5/32" (4mm) diameter (*fig 2*) from hardware stores such as Home Depot
3. Hooks and clevis' as needed (*fig 2*) from hardware stores such as Home Depot



Figure 1. 40 kg kettlebell from www.KettlebellsUSA.com



Figure 2. Stainless steel 5/32" (4mm) chain and hooks etc. Load capacity >500lb.

TEST SETUP

Steps to set up. Figure 3.

1. Set the pendulum length at $L=1.5\text{m}$ from the upper chain hitch point on the tractor, to mass center of the kettlebell. The rest position for the kettlebell should be against the fence rail at the desired location of the test impact
2. Select the energy test level, and related drop height (H) or preload distance (D) from table 1. For horizontal impact it is easier to use preload distance (D). For upward or downward impact, always use drop height (H).
3. For safety, ensure that the pendulum has enough sway space for the full test arc fore and aft and laterally, without contacting any other objects or people

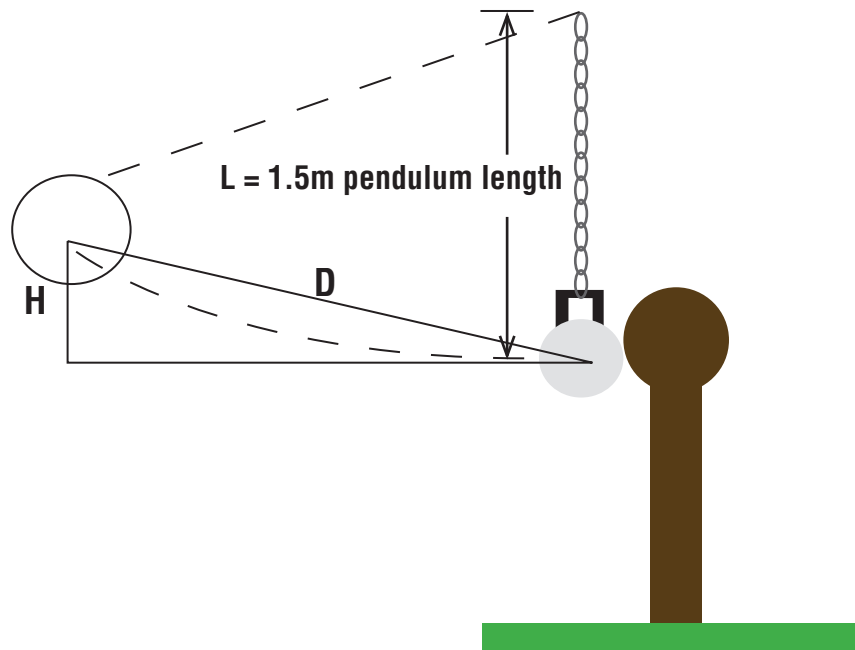


Figure 3. Pendulum test setup diagram. Preload distance (D) can be used for horizontal impact tests. Use drop height (H) for test cases where the impact angle is downward or upward from horizontal.

Test Energy Level (J) Pendulum length $L=1.5\text{m}$	Drop height H	Preload distance D for horizontal impact
160J (FEI no-release test)	0.41m	1.11m
250J	0.51m	1.24m

Table 1. Test energy levels and related drop height (H) and preload distance (D)

TEST EXECUTION

See video example here: <https://vimeo.com/297723522>