

The Complete Guide to Blender Graphics

Supplement-04

Shattering a Glass Pane

In this example, a Glass Pane will be shattered by a projectile. The projectile will be a **UV Sphere** object which could represent a bullet or a baseball.

The demonstration will be conducted in **Cycles Render** mode.

The UV Sphere will be used to determine how the glass shatters (the number, size and position of Shards) and it will also be animated to represent the object causing the pane to shatter (bullet or ball).

In the **3D window** delete the default **Cube** and add a **Plane** object. Scale up four times and give it thickness in Edit mode. Rotate to stand on edge. This Plane will represent the glass pane, therefore, the thickness only has to be slight (Figure 3.1).

In all simulations think about proportion, how big or small one object is in relation to other objects and how objects will fit into a Scene.

Add a **UV Sphere** to the Scene. Scale and position as shown in Figure 3.1.

The UV Sphere will determine how, where and how large **Shards** will be when the glass pane shatters.

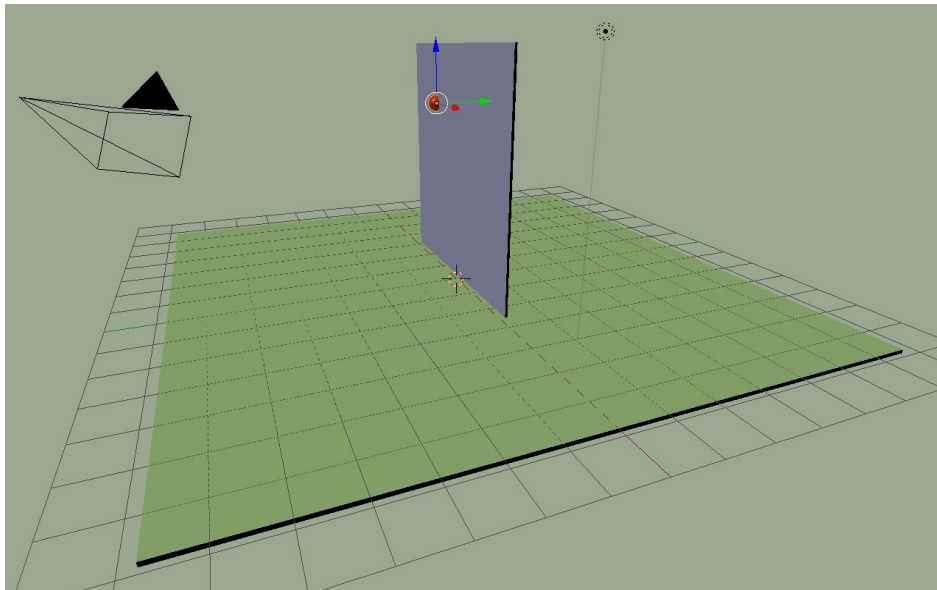
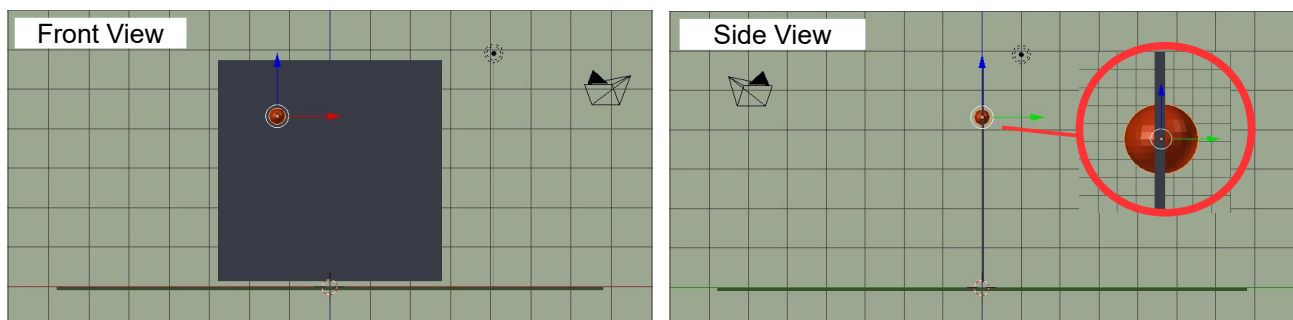


Figure 3.1



With the UV Sphere scaled down as shown, press **Ctrl + A** key and select **Apply Scale**. Do this periodically during the exercise.

Parent the UV Sphere to the pane. Select the UV Sphere + Shift select the Pane. Press **Ctrl + P**, select **Parent to Object**.

Select the **Plane**. Make sure you have only the Plane selected and not both Plane and UV Sphere.

Activate the Object – Cell fracture in the User Preferences window, Add-ons.

In the **Tools Panel** click **Cell Fracture** to open the **Presets window** (Figure 3.2). Apply the settings as shown in the diagram.

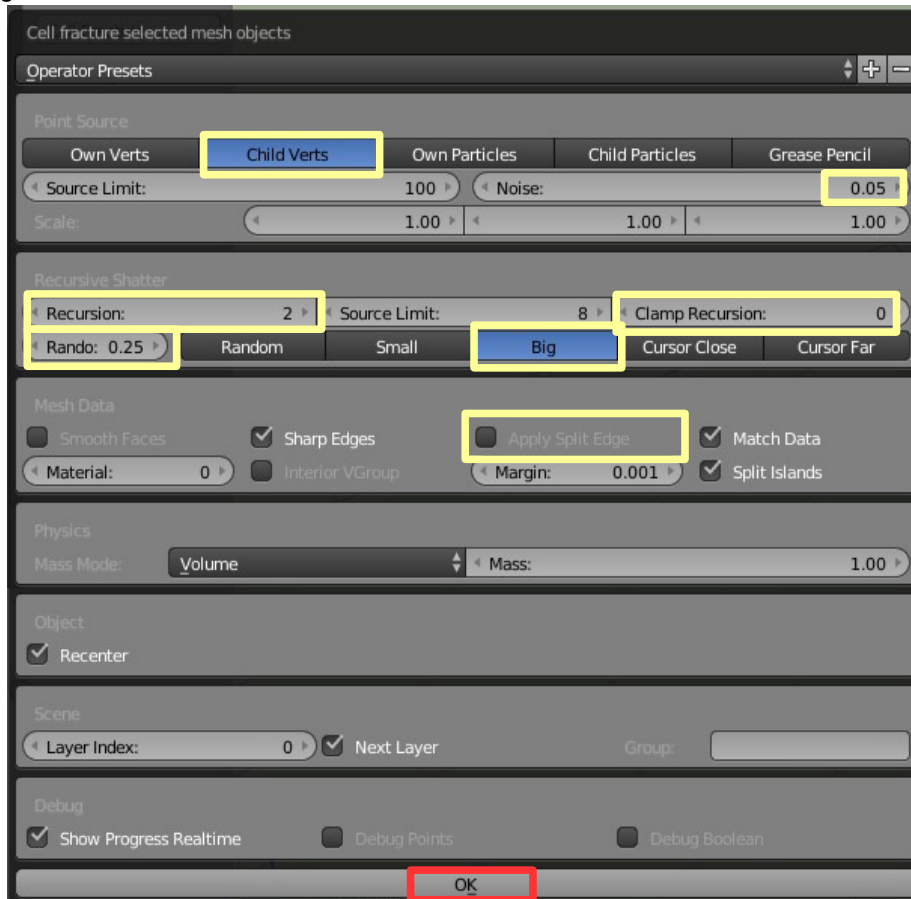


Figure 3.2

Child Vertices: Uses the number of vertices on the surface of the Child object (UV Sphere) to determine the number of Shards generated.

Note: Source Limit: 100 limits the number to 100

Noise: Creates a random generation of Shards.

Recursion: Re-fractures the Shards that are generated (this produces a better result increasing the number of Shards exponentially). With value = 2 the pane is fractured then the shards are fractures with the limitations set as follows.

Rando: Random recursion. 25% of the Shards will be re-fractured.

Big: Only Big Shards will be re-fractured.

Clamp Recursion: When set to 0.000 Shards within the parameter set will be fractured

Apply Split Edge: When unchecked assures that there are no doubles.

Click the **OK button** at the bottom of the Presets panel start the Fracture process. With the parameters as set, this may take a while to process depending on the speed of your computer.

Using **Child vertices** also concentrates the generation of Shards where the Child object (UV Sphere) is located.

When Fracture is complete go to Layer 2 to see the Shard Cluster generated (Figure 3.3).

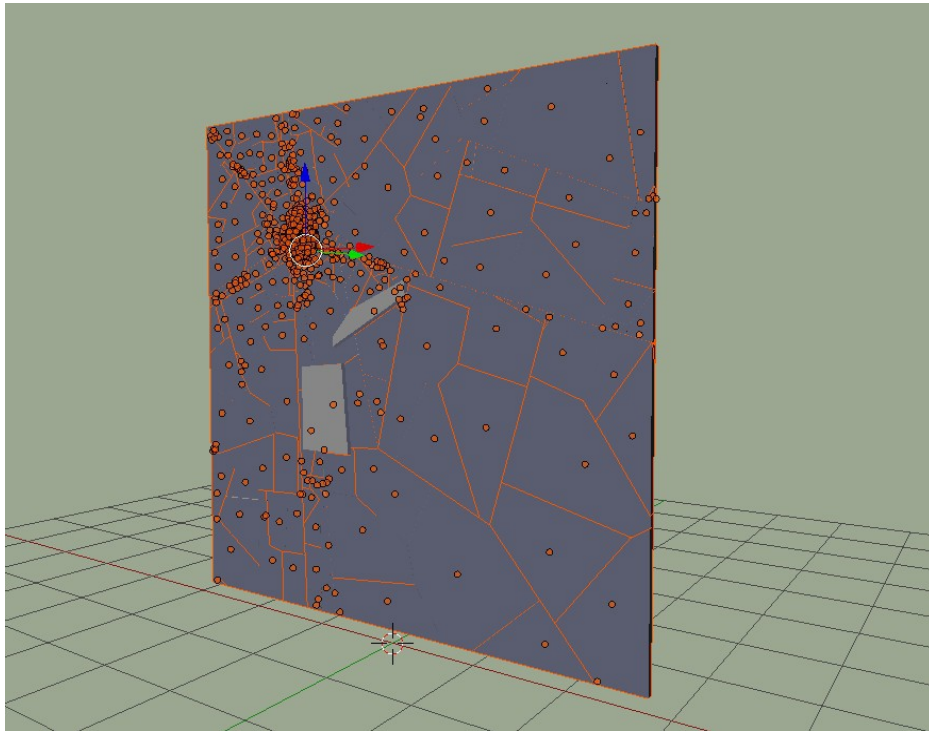


Figure 3.3

You will see a better view in **Wireframe mode** (Figure 3.4).

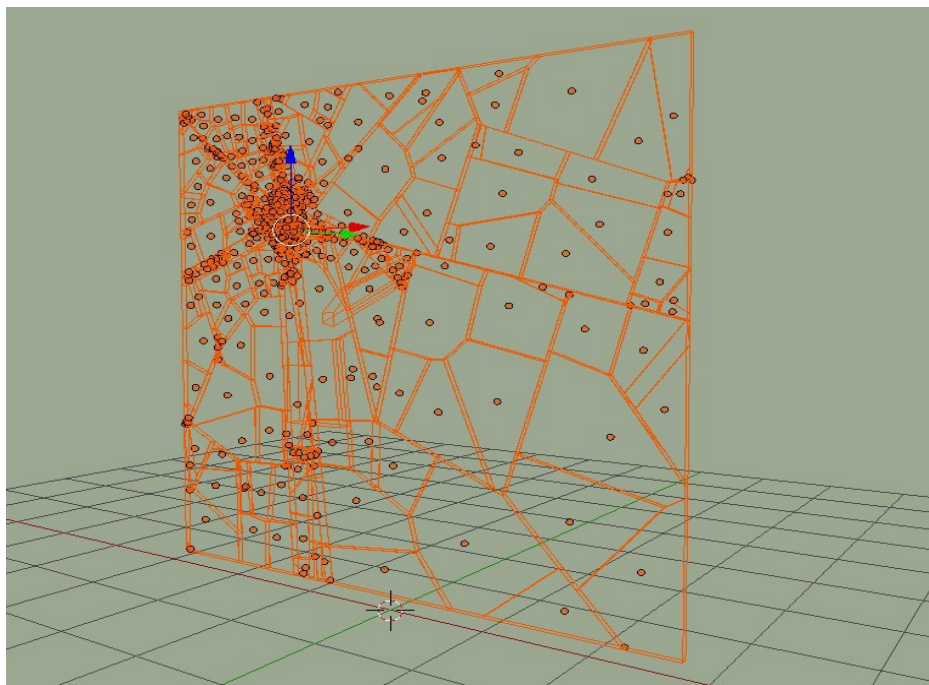


Figure 3.4

At this stage you may Clear the Parent relationship between the Plane and the UV Sphere. Select the UV Sphere (Remember the sphere is on Layer 1). Press **Alt + Pkey** and select **Clear Parent**.

After clearing the parent relationship you may delete Plane from Layer 1. From this point forward you will be working with the Shard Cluster on Layer 2.

Apply Physics

With Shards generated it is time to apply Physics.

At this point, you have the UV Sphere on Layer 1 and the Shard Cluster on Layer 2. In the Layers buttons **Shift select** Layer 1 and Layer 2.

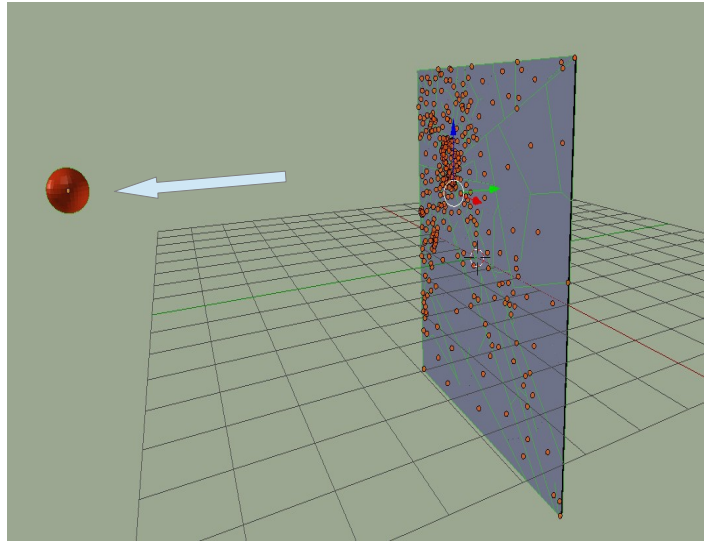
Figure 3.5

Select the UV Sphere and move it away from the Shard cluster (Figure 3.5). Deselect the sphere.

Select a single Shard in the cluster (each Shard is a separate object). In the Properties window, Physics buttons, click Rigid Body to apply Rigid Body Physics to the Shard. Leave the single Shard selected then **Box select** all Shards.

In the Tools panel Physics tab press **Copy from Active** to apply the Physics from the first shard to all the Shards. This takes a second to calculate.

Pressing Play in the Timeline window will show the Shard Cluster falling due to **Gravity** and crumbling.



The objective is, to have the Shard Cluster (representing a window pane) remain stationary and intact until an object (projectile) makes contact. To do this, select a single Shard then in the Physics buttons, Rigid body Dynamics tab under **Deactivation** check (tick) both **Enable Deactivation** and **Start Deactivated** (Figure 3.6).

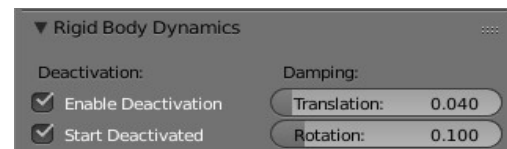


Figure 3.6

Box select all the Shards in the Cluster and press **Copy from Active** in the **Tools** panel to apply the setting to all Shards.

Projectile Set UP

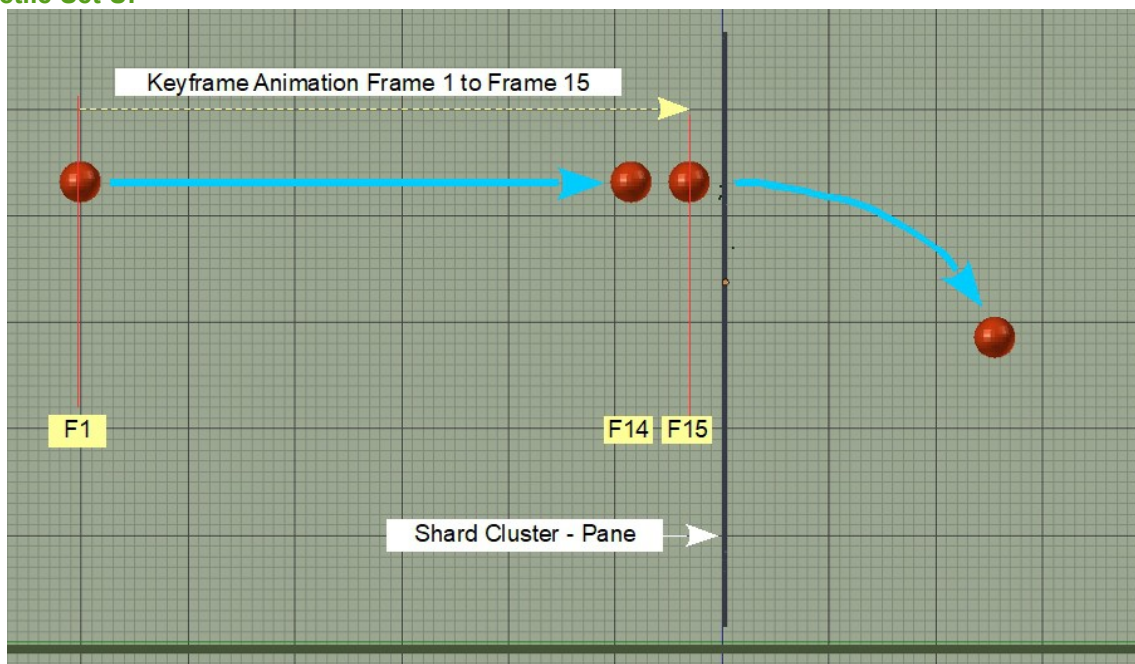


Figure 3.7

In Figure 3.7 the Projectile (Red UV Sphere) is animated, by inserting **Keyframes**, to move across the Screen in 15 Frames until it nearly makes contact with the Shard Cluster.

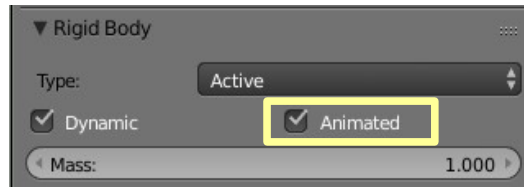
After animation, **select the UV Sphere** (projectile) and apply Rigid Body Physics type Active, Collision Shape: Convex Hull.

With Rigid Body Physics applied, if you play the animation in the Timeline window, the Sphere will ignore the animation and fall under the influence of **Gravity** due to the Rigid Body Physics.

To make it conform to the animation check (tick) **Animated** in the Physics buttons (Figure 3.8).

The Sphere will now move according to the animation.

Figure 3.8



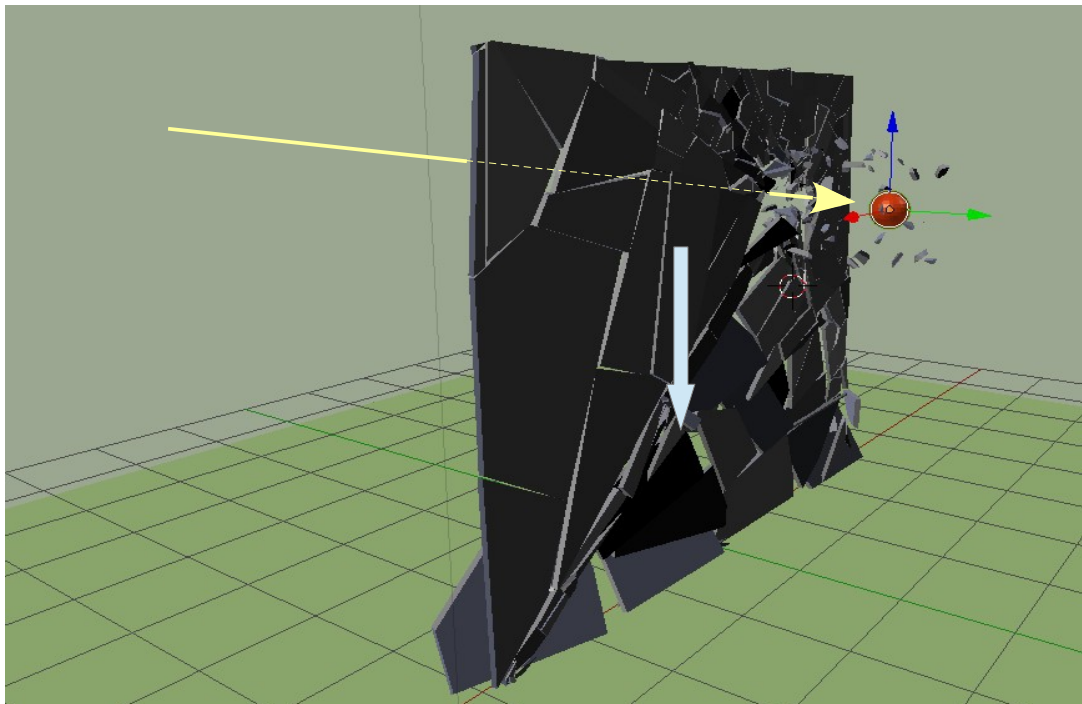
To simulate contact with the Shard cluster you want the sphere to move according to the animation ignoring Rigid Body Physics up to frame 14, then at frame 15, switch out of animation mode and be influenced by the Physics.

To achieve this have the Sphere positioned in the animation at Frame 14, hover the mouse cursor over the **Animated** button and press the **I key** (alternatively right click the button and select **Insert Keyframe**). This inserts a Keyframe for the checked **Animated function**. Move to Frame 15 (the last frame in the animation). Uncheck the **Animated** button, hover the mouse cursor over the unchecked button and press the **I key** (insert another Keyframe).

To summarise: You have the Sphere reacting according to the Keyframe animation up to Frame 14 then at Frame 15 it reverts to being influenced by Physics. At this point the Sphere has momentum, therefore, it will continue moving but due to gravity, will descend in an arc towards the ground plane. In this last phase, it contacts the Shard cluster activating the **Enable Deactivation** and **Start Deactivation** function previously set.

What? The sphere stopped when it contacted the cluster and fell down. **Increase its Mass in the Physics buttons**, say to 50 or for a more dramatic result to 200.

Figure 3.8



Yes! When the UV Sphere makes contact the cluster shatters and all the Shards fall due to Gravity.

To make the simulation more realistic Shards around the edges of the pane should remain in position when the projectile makes contact. This simulates shards sticking in a window frame after being broken. To do this select one Shard at the edge of the cluster. In the Rigid Body Physics, Rigid Body Dynamics tab increase **Damping** for both **Translation and Rotation** to 1.000. Box select Shards around the edges of the pane and in the Tools panel press **Copy from Active** to assign these values to all the selected edge Shards.

When the animation is played the edge Shards will remain in position (kinda!).

If you wish you may construct a frame around the pane. Give the frame Rigid Body Physics, Type: Passive.

Add a ground plane below the frame with Rigid Body Physics Type: Passive.

For a **Slow Motion Effect** when the animation is played, in the **Properties window, Scene buttons, Rigid Body World** change **Speed** to 0.250 or less. Change **Steps per Second** to 120 and **Solver Iterations** to 50.

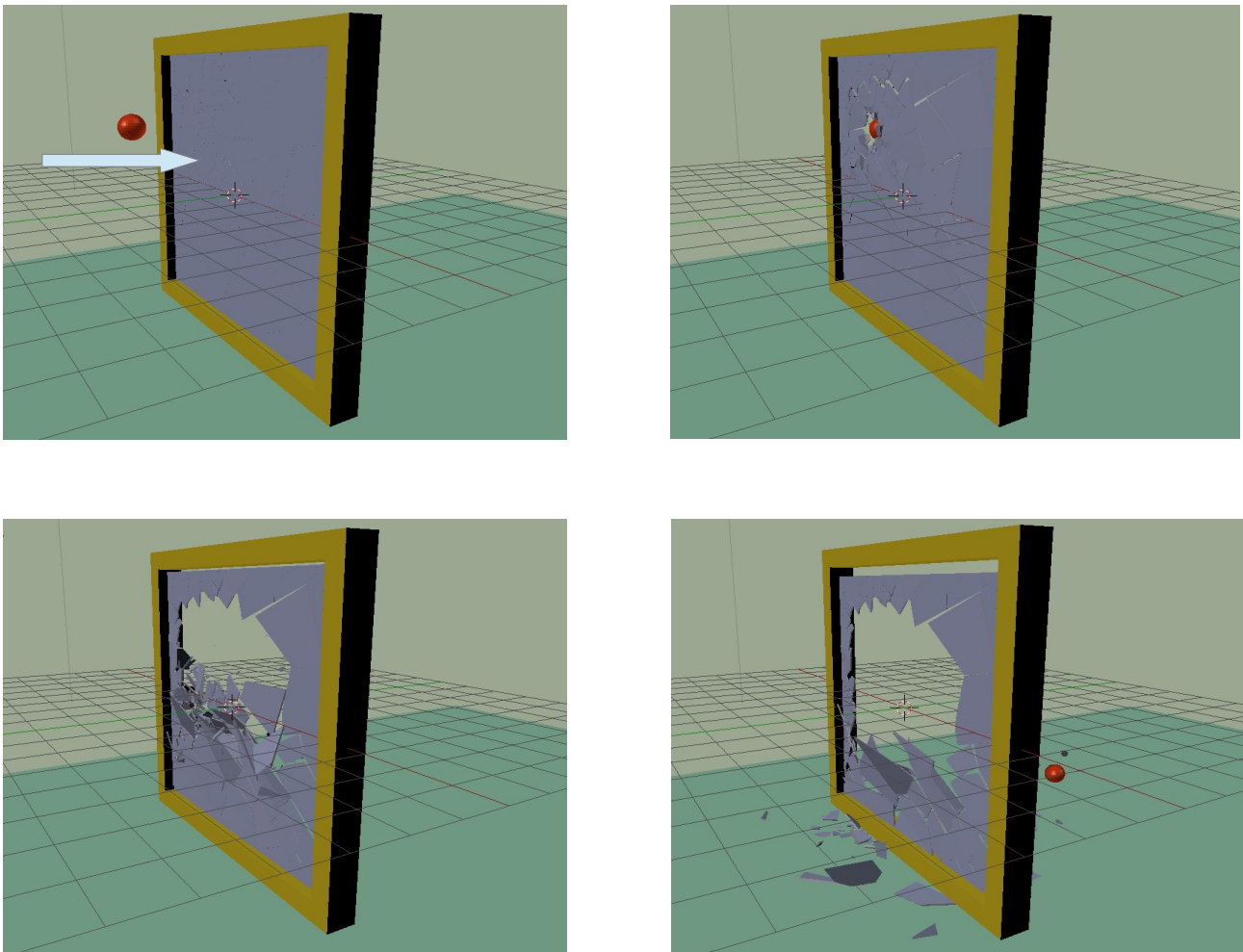


Figure 3.9

Figure 3.9 shows the sequence as the animation is played. The sphere moves towards the pane, makes contact, breaking through and shattering the pane.

In this exercise, the UV Sphere has been used to create the Shard configuration. In Supplement 2 the object's vertices determined how the Shard arrangement was produced. Another method is to use the Grease Pencil (see Supplement 07).