Bulletin 011 - Protect-it ™ versus BOLTED STEEL PALLET RACK GUARDS

Q: What happens when a forklift collides with pallet racking?

A: When a forklift or a reach truck collides with a pallet racking column it carries kinetic energy that must be absorbed by the objects involved in the collision including the forklift, the column guard and the racking. The kinetic energy is typically absorbed by conversion into one or more of the following three forms of energy:

FRICTION, SOUND & HEAT	TEMPORARY ELASTIC DISTORTION	PERMANENT DEFORMATION
Friction is generated in most collisions resulting in heat and sound. You will hear a loud banging or creaking noise. This typically absorbs only a small amount of energy.	This involves temporary distortion of an object involved in the collision (think of a spring compressing and extending as it stores and releases energy). This distortion can store a significant amount of energy which is converted back into kinetic energy as the forklift rebounds. Examples include flexing or spring compression.	This occurs when any object involved in the collision reaches its limit for elastic distortion and begins to yield, leading to permanent bending, buckling, crushing or fracture (think of the crumple zone in a car). This deformation can absorb a significant amount of energy. Permanent deformation of the column is highly undesirable as it creates a danger of racking collapse. Examples include yielding, bucking, crushing or fracture.

The following table shows how the kinetic energy of the forklift is likely to be absorbed in various collision scenarios.

Energy Type	Sound and Heat	Temporary (elastic) distortion	Permanent deformation
Low energy collision			
Forklift	✓	✓	
Guard	✓	✓	
Racking	✓	✓	
Medium energy collision (400Nm) with FEM compliant column guard			
Forklift	✓	✓	
Guard	✓	✓	
Racking	✓	✓	
Medium energy collision without FEM compliant column guard			
Forklift	✓	✓	
Racking	✓	✓	✓
High energy collision			
Forklift	✓	✓	✓
Guard	✓	✓	✓
Racking	✓	✓	✓

Q; Why is it important to use a Column Guard to protect you pallet racking?

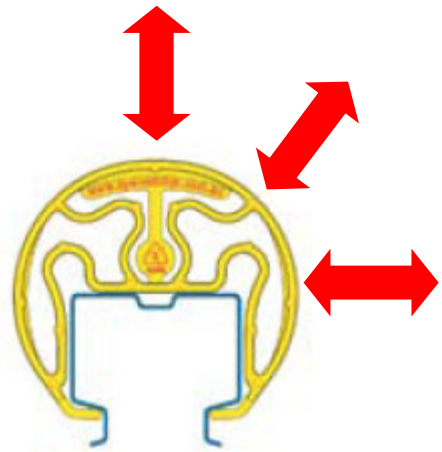
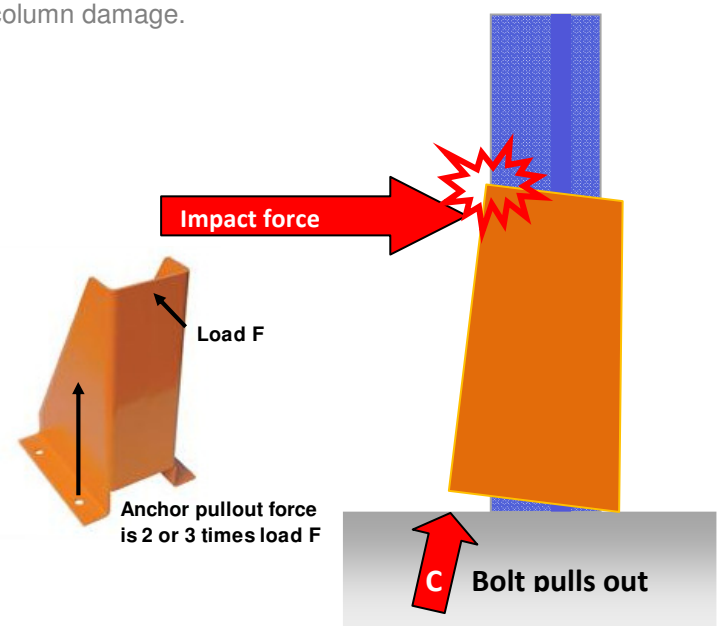
A: A well designed column guard plays a crucial role in minimising permanent deformation of the column and that is why it is becoming mandatory in many countries A pallet rack guard will absorb impact energy through elastic distortion and permanent deformation to achieve the following three goals:

Goal 1	Goal 2	Goal 3
Reduction of the amount of energy transmitted to the racking. (any energy absorbed by the guard doesn't have to be absorbed by the racking).	Reduction of the peak forces experienced during the collision (the peak force is reduced because the guard slows the forklift and extends the time-span of the collision).	Minimisation of 'hot spots' as forces are transmitted to the column (the guard spreads the load and avoids localised contact pressures that can lead to 'kinking' effects)

Q: How does Protect-it ™ deliver these benefits better than a typical bolted steel column guard?

A: Consider how each column guard behaves in a collision and what this means for meeting the three goals described on the previous page.

Goal 1 - Reduction of energy transmitted to the column

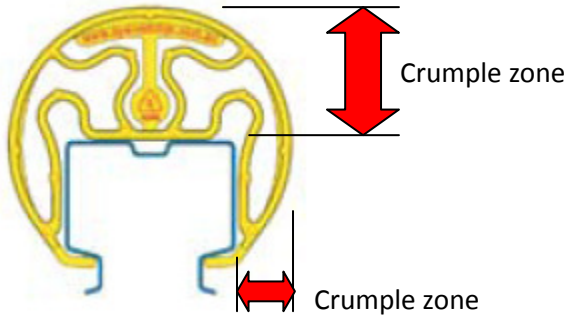
Protect-it Pallet Rack Guard	Typical bolted Steel Guard
Protect-it ™ is attached to the column and in everyday collisions Protect-it undergoes carefully designed elastic distortion, returning to its original shape after impact.  In more severe collisions Protect-it ™ is designed to absorb even more energy by undergoing permanent deformation. In these cases, the Protect-it will sacrifice itself to save the column and the Protect-it will need to be replaced at a much lower cost than that of a column or even a bolted steel guard. 	Steel guards of this type are bolted to the floor in front of the column. In everyday collisions the steel guard undergoes minimal elastic distortion which is limited by the physical properties of steel. Some steel guards claim to transfer energy to the concrete floor, but floor can only absorb energy by way of friction created by the concrete anchors. The anchors will gradually work loose of the floor over successive collisions or even damage the bolts and the floor. In more severe collisions the guard will undergo permanent deformation, and when combined with loosened concrete anchors, the guard usually contacts the column resulting in column damage. 

COLUMN AND RACK PROTECTION

PROTECT-IT™

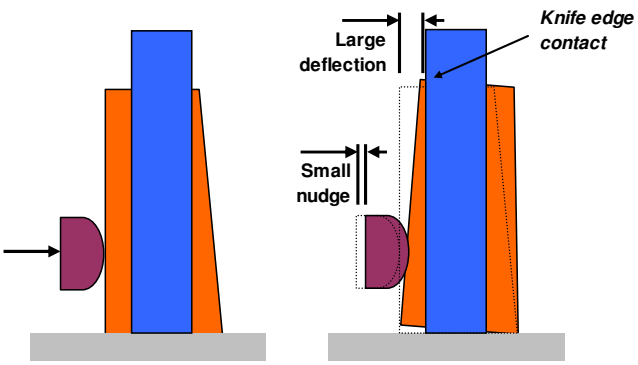
Goal 2 - Reduction of Peak forces

Protect-it Pallet Rack Guard	Typical bolted Steel Guard
The design of Protect-it ™ provides large 'crumple zones' which are necessary to absorb front and side collisions and the built in absorption qualities of the plastic, allows Protect-it to return to its original shape.	Steel guards have very limited capability to crumple, much like an old fashioned car chassis. This leads to much higher forces being transferred to the concrete anchors and the column. In many cases these forces cause the concrete anchors to pull out, damaging the floor and then transferring high loads to the column.



Goal 3 - Minimisation of 'hot spots'

Protect-it Pallet Rack Guard	Typical bolted Steel Guard
Protect-it ™ rack protectors spread the load over a broad area along the full length of the protected area irrespective of the number of Protect-it's used, making the most of the inherent strength of the steel column.	A bolted steel guard only has to pivot several degrees before its top edge forms a 'knife edge' contact with the column. Due to the small contact area a dangerous 'kink' is easily produced in the column. If the impact occurs close to the floor (eg typical fork height) then very little deflection is required to cause this knife edge contact.



Protect-it ™ is the world's smartest rack protector.

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