

# FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

The Failure Modes and Effects Analysis (FMEA) is a design process tool which helps a design team carefully consider the potential failures of the system or sub-system being designed. Specifically, the FMEA serves as a product evaluation tool and is concerned primarily with reliability, safety and quality. Broadview uses this process to identify and cover risks associated with product and process design project.

## WHY

FMEA is an important tool within a suite of design process tools and methods which ensure efficient, comprehensive and optimized design and engineering during the product development cycle. Cataloging and assessing reliability risks and can be used to document and demonstrate how countermeasures improve risks for individual aspects or features, or for the system as a whole.

## WHEN

It is one of many design process tools at a team's disposal during the broader design process, and is utilized after concept generation has finished and product development activity has begun. Using FMEA throughout the design process, from early concept ideation and generation, to iterative refinement, and after a product's launch, allows a team to proactively address the risks.

## WHO

It is important that the FMEA be considered a living document, which is influenced by multiple design team members, product "stakeholders," and decision makers.

### Steps in the Process

1. Identify Affected Functions
2. Failure Mode Identification
3. Document Effects for Each Failure Mode
4. Identify Root Causes for Each Failure Mode
5. Recommend, Assign, and Document Corrective Actions
6. Rate Each Function Before & After Actions

### Potential Failures

- Wear
- Fatigue
- Yielding
- Jamming
- Material Property Changes Over Time
- Buckling
- Etc.

**BROADER VIEWS  
MAKE BETTER  
PRODUCTS**



FMEA (FAILURE MODES AND EFFECT ANALYSIS) [TEMPLATE]						
<b>Product:</b> Bike Rack Broadview Product <b>Client:</b> Development Dave Miller, Matt <b>Project Team:</b> Ruster, Rick Arnold <b>FMEA Owner:</b> Dave Miller						
Function	Potential Failure Mode(s)	Potential Failure Effects	Potential Causes of Failure	Actions Recommended	Owner	Actions Taken
1 Attach to hitch	Extendable male hitch falls out of hitch receiver	Rack falls onto driving surface	Extendable male hitch pin falls out of locking position	1. Use an off-the-shelf vibration-tested wire lock pin to ensure pin remains in place. 2. Include vibration testing documentation from vendor into project file.	Dave M.	1. Use an off-the-shelf vibration-tested wire lock pin to ensure pin remains in place.
			Extendable male hitch pin is missing, not in place	1. Use a thin steel cable to attach wire lock pin to assembly. 2. Use red paint on hitch surfaces to alert user of missing pin (surfaces would be concealed by pin if properly installed).	Dave M.	1. Use a thin steel cable to attach wire lock pin to assembly. 2. Use red paint on hitch surfaces to alert user of missing pin (surfaces would be concealed by pin if properly installed).
2 Bike size adjustment	An inner tent leg fall out of main leg	Bike wheel tray falls off of rack, bike potential shakes off of rack	Absence or failure of stop mechanism	1. Use slotted inner tent legs to limit extension and avoid the integration of additional mechanisms.	Matt R.	1. Use slotted inner tent legs to limit extension and avoid the integration of additional mechanisms.
3 Rack rearward extension	Seizing	Rack cannot fully open and is thus non-operational	Hinge damage	1. 2.		1. 2.
			Hinge seizure	1. 2.		1. 2.
			Hinge corrosion	1. 2.		1. 2.
4 Clamp upper frame						