Example Design FMEA on a Pencil System, for training purposes (incomplete)

Function(s)	Failure Mode(s)	Effect(s)	Sev	Cause(s)	Occ	Design Controls (Prevention)	Design Controls (Detection)	Det	RPN	Recommended Action(s)
To provide a safe and easy-to-use tool to write on paper, according to usages defined in technical requirements	Pencil wood shaft breaks during normal usage	User unable to write, with potential for minor injury from wood splinters	10	Type of wood too soft for high-force users	4	Pencil system design guide #123	Pencil shaft strength test #456	2	80	1. Review pencil wood supplier process and ensure actions are in place to control the hardness of supplied wood to requirements. 2. Add pencil hardness requirements to pencil system design guide #123. 3. Develop wood hardness test regimen and add to pencil test plans.
				Wood shaft diameter too small	1		Pencil system Finite Element Analysis	1	10	
	Pencil lead breaks during normal usage	User unable to write	8	Type of lead material too brittle	3	Graphite material specification #789	User writing test #abc	3	72	
				Sharpened pencil lead extends too far from wood enclosure due to improper sharpening	2		Pencil sharpening test #def	4	64	
	Pencil is not easy to use by an average writer	User able to write but with reduced performance and comfort	7	Wood exterior finish is too rough due to improper finish specification	7	Pencil wooden shaft finish specification #1234	User writing test #abc	2	98	1. Modify pencil wooden shaft finish specification #1234 to include wood exterior finish requirement for smoothness. 2. Perform Process FMEA on pencil exterior paint and finish processes. 3. Conduct customer clinic with typical pencil users to verify ergonomics.
				Wood exterior finish is too smooth due to wrong paint coating specified	1	Pencil wooden shaft finish specification #1234	User writing test #abc	2	14	
To provide an easy way to completely erase mistakes	Eraser does not erase graphite inscriptions on writing paper	User cannot erase resulting in customer dissatisfaction	8	Eraser material has wrong synthetic formula	5	Pencil eraser design guide #123	User writing test #abc	7	280	1. Perform Design of Experiment on eraser composition to optimize erasing performance. 2. Add erasing evaluation to user writing test #abc. 3. Review eraser design guide #123 and modify based on results of DOE.
				Excessive eraser wear due to insufficient soy-based composition in eraser material	3		User writing test #abc	5	120	
	Eraser falls off pencil during normal use	User cannot erase resulting in customer dissatisfaction	8	Eraser ferrule too large for eraser size	1		Geometric Dimensioning and Tolerancing of eraser ferrule and pencil eraser	1	8	
				Eraser ferrule has insufficient strength due to inadequate crimp configuration	6		User writing test #abc	6	288	1. Perform Finite Element Analysis on ferrule crimp configuration and modify number and location of crimps based on results of FEA. 2. Perform Process FMEA on ferrule crimp process. 3. Add periodic eraser checks to user writing test #abc
	Eraser makes objectionable markings on paper	User able to erase but may be dissatisfied with markings	6	Eraser material composition contaminated with foreign particles	2		Supplier design review of eraser material composition	2	24	
The pencil wood and lead must be easily sharpened using a normal pencil sharpener bringing the pencil back to full operation	Pencil wood does not sharpen	User unable to use pencil after it needs sharpening	8	Wood shaft is too hard	1	Pencil system design guide #123	Pencil wood hardness test #456	2	16	
				Diameter of wood shaft is too large for normal pencil sharpener	2	Pencil sharpening test #def		1	16	
	Lead breaks off during sharpening	User unable to use pencil after it needs sharpening	8	Diameter of lead too small	1		Pencil sharpening test #def	1	8	
				Type of lead material too brittle	6		Pencil lead strength test #789	4	192	1. Conduct joint Design Review with pencil lead manufacturer to examine causes and solutions to brittle lead problem. 2. Require pencil lead manufacturer to perform Pencil lead Design FMEA and Process FMEA. Review the results for proper quality. 3. Modify pencil lead strength test #789 regimen to include strength tests after pencil sharpening.

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