LEAR CORPORATION	Lear SSD Special Characteristics Guideline	SSD-DPM 20.3
Release Date: May 12, 2006 Effective Date: May 12, 2006	Owner: SSD Divisional Quality Department	Page: 1 of 10

1.0) Scope/Purpose: This document is intended to define special characteristics for use within Lear Seating Systems Divisions and provide guidelines for appropriate controls and PPAP submission for the special characteristics to Lear Seating Systems Division Plants. This process could be used for component parts or sub-assemblies. All Customer unique assembly could use the customer symbols.

2.0) Responsibility

2.1) Advanced Product Quality Planning (APQP) Team: Which shall include but is not limited to, design responsible engineers; manufacturing and process engineers; manufacturing, operations and quality engineers; is responsible for the deployment of special characteristics including validation, PPAP, control methods and periodic review.

2.2) Design Responsible Engineer: Is responsible for identifying potential special characteristics during the design phase and incorporating the special characteristics into the design failure mode and effects analysis (DFMEA). The Design Responsible Engineer should use of sound engineering methods to, when possible, develop robust designs to eliminate the need for special characteristics; validating potential special characteristics during the design validation (DV) of a product; insuring special characteristics are incorporated into the design record and assist the APQP team in efforts to improve the design and process to eliminate special characteristics.

2.3) Manufacturing and/or Process Engineer: Is responsible for incorporating the special characteristics into the process failure mode and effects analysis (PFMEA); the use of sound engineering methods to, when possible, develop robust processes to eliminate the need for special characteristics; and developing capable processes and controls for Special Characteristics that cannot be eliminated.

2.4) Quality Engineer: Is responsible for developing robust controls for all special characteristics and insures that they are included in the Control Plan; conducting initial process studies for capability analysis; compiling documents and information to prepare PPAP; and submitting PPAP to the customer.

2.5) Manufacturing and/or Operations: Is responsible to produce the product in accordance with the controlled process documented in the PPAP and working with the APQP team to improve processes to eliminate the need for special characteristics.

3.) Definitions

3.1) Special Characteristic: A product characteristic or manufacturing process parameter that can affect safety or compliance with regulations, fit, function, performance, or subsequent process of product. Special Characteristics are also known as Key Characteristics.

3.2) Standard Characteristic: A product characteristic that is not noted as a Special Characteristic.

3.2.1) Notes: Standard characteristics shall have appropriate controls; the absence of a special characteristic does not waive the requirement to control the characteristic.

3.2.2) Loss Function: The loss function for the standard characteristic shows no incremental economic or customer satisfaction within the tolerance. Further, it shows no significant increase immediately outside the tolerance.

3.3) <LK-SC> Lear Key Safety Characteristic: A special characteristic related to those product requirements (Dimensions, Specifications, Tests or process parameters) which can affect compliance with government regulations or safe Vehicle/Product Function.

3.3.1) Notes: Normally these characteristics are a 9 or 10 for severity on FMEA. The term is synonymous with the AIAG APQP manual term *Key Characteristic with Safety or Legal Considerations*.

3. 3.2) Correlation to OEM Special Characteristics: The <LK-SC> correlates to Ford's Critical Characteristic, CC and DCX's Shield <S>.

3.4) <LK-PC> Lear Key Product Characteristic: A special characteristic that identifies those product parameters and requirements that are important for customer satisfaction with a focus on capability to maximize customer satisfaction.

3.4.1) Notes. Normally these characteristics are a 6, 7 or 8 for severity on FMEA. The term is synonymous with the AIAG APQP manual term *Key Characteristic without Safety or Legal Considerations*.

3.4.2) Correlation to OEM Special Characteristics: <LK-PC> correlates to GM's KPC, Ford's Significant Product Characteristics, (SC) and DCX's Diamond <D>.

3.4.3) Loss Function: A <LK-PC > Is a characteristic that has shown that the reasonable anticipated variation is likely to significantly affect customer satisfaction.

3.5) <LK-FF> Key Fit and Function Characteristic: A special characteristic where deviation of the characteristic outside of the specified tolerances may severely affect subsequent operations. Key Fit and Function Characteristics are related to parameters that severely affect the operation of the process or subsequent operations if they are outside of specification tolerance. It is limited to highlighting characteristics where verification is mandatory, but where ongoing process control is not automatically mandated.

3.5.1) Notes: Normally these characteristics are a 6, 7 or 8 in severity on FMEA. There is no synonymous term in the AIAG APQP manual.

3.5.2) Correlation to OEM Special Characteristics: The <LK-FF> correlates to the Ford High Impact (HI) Characteristic and the GM Product Quality Characteristic (PQC). There is no similar DCX characteristic.

3.5.3) Loss Function: The loss function represented by the <LK-FF> is when the customer is equally satisfied across the entire specification, but the loss function is steep just outside of the specification.

4.0) Procedure: APQP teams work together in each phase of the APQP process to deploy special characteristics. The PPAP process is used to communicate the initial process capabilities for special characteristics.

4.1) Concept, Development, and Planning Phase (Pre Award): During this phase, the APQP team focuses on using historical warranty and quality data and customer specifications to identify preliminary special characteristics. These preliminary special characteristics should be considered

as targets for elimination through robust design practices or improved manufacturing processes. The team considers the preliminary special characteristics in the Feasibility Review, Engineering and Manufacturing Analysis, and Design Validation Plan.

4.2) Planning (Post Award) – Selection of Potential Special Characteristics: During this phase, the APQP team focuses on the characteristics and their elimination through robust design practices. The team reviews the product design and manufacturing process requirements for characteristics that affect regulatory compliance, safe vehicle or product function, customer satisfaction and machine/assembly operator safety. The APQP and product design team identifies the system or a component feature that may require special actions or controls to insure the product meets these requirements. These actions and controls are documented in the APQP section of LPMP.

4.2.1) <LK-SC>: Design analysis is required to establish design margin and validate with testing. This characteristic represents a regulated product safety requirement. Design Validation (DVP&R) testing and reporting is required.

4.2.2) <LK-PC>: Design analysis is required to establish design margin and validation with testing. This characteristic represents an element of the design that defines a unique characteristic that is essential to the design intent. This characteristic should be controlled in the design and may be applied based on best practice, warranty data or experience with similar products. Design Validation (DVP&R) testing and reporting is required.

4.2.3) <LK-FF>: Design analysis is required in establishing variation between mating parts and validation testing.

4.2.4) Additional Care: Some parts may require additional care, including product verification and traceability, special handling, functional checks, and safety/compliance certification. Any requirements for additional care shall be included in the design record.

4.3) Prototype Phase – Validation of Potential Special Characteristics: The development of a Design FMEA (DFMEA) will identify actions that reduce or eliminate risk through employing robust design practices and the identification of potential Special Characteristics. The design goal is to eliminate Special Characteristics through design actions that improve the product robustness. Special Characteristics are confirmed only after all design and process alternatives are exhausted and when special controls are identified.

4.3.1) <LK-SC>: Design Validation (DVP&R) testing and reporting is required. The APQP team must identify special controls. Special controls, especially those for surrogate characteristics, may have to be included in design notes.

4.3.2) <LK-PC>: Design Validation (DVP&R) testing and reporting is required.

4.3.3) <LK-FF>: Notes.

4.3.4) Additional Care: For parts that require additional care, as specified in the design record, conformance and capability to those requirements should be checked during the prototype builds.

4.4) Pilot – Process Development for Capability and Control of Special Characteristics: Characteristics are cascaded to the manufacturing process if the design is unable to fully control the characteristic. The development of a Process FMEA (PFMEA) will identify actions that reduce or eliminate risk through robust process practices and characteristics controls. The goal is to design and define Special Characteristics controls that will always be employed until the design process

removes the “Special Characteristic” requirement from the FMEA through design and testing exercises. Process design standards, machine design standards, and process FMEA’s will be appropriately populated with the Lear symbols defined herein.

Local manufacturing facilities are engaged in the application of Special Characteristics as defined on drawings, design and process FMEA’s. Local manufacturing facilities develop control plans, work instructions, records of inspection, plant layouts and visual controls that are consistent with this procedure.

4.4.1) <LK-SC>: Efforts should be directed at measuring the specific safety parameter of the characteristic. If this parameter cannot be directly measured, a surrogate characteristic that correlates (with verified testing) may be used. It is not intended for the manufacturing or assembly facility to possess testing equipment that is certified or capable of performing regulated safety testing. Key Safety Characteristics or surrogate characteristics must be included in the control plan.

4.4.2) <LK-PC>: If the specific parameter cannot be directly measured, a surrogate characteristic that correlates (with verified testing) may be used. Special Characteristics or surrogate characteristics must be included in the control plan.

4.4.3) <LK-FF>: Manufacturing controls are required to verify conformance through measurement, error proofing or functional testing.

4.5) Launch – Control the Special Characteristics: The APQP team executes the control plan and reviews the PFMEA during launch to insure the control and capability of special characteristics.

4.6) Post Launch – Reduce Variation, Review, and Eliminate Special Characteristics: After launch, the APQP team works to reduce variation and improve controls. The APQP process is done in advance of the actual production process, additional characteristics may be found during the manufacturing process. These characteristics must be identified by the team and appropriate controls and documentation shall be implemented. The manufacturing process may demonstrate higher levels of capability than anticipated and may support the reduction of the frequency of special controls with customer approval.

The design responsible engineers shall review their lists of preliminary, potential, and identified special characteristics for use in future programs.

4.7) PPAP: Special characteristics require initial process studies for PPAP. Special characteristics that do not follow the methods established in the AIAG manuals for PPAP, Measurement Systems Analysis, and Statistical Process Control require customer approval.

4.7.1) <LK-SC> - Variable Data: Surrogate characteristics shall be noted in the design record. For characteristics that have a loss function that follow that of a <LK-PC>, submission and controls follow the guidelines for the <LK-PC>

4.7.2) <LK-SC> - Attribute Data: Surrogate characteristics shall be noted in the design record.

4.7.3) <LK-PC> - Variable Data: By their nature, <LK-PC>s should be made capable. Where they are not capable, then errorproofing or 100% inspection strategies that control the characteristic to a fraction of the available tolerance are required to optimize customer satisfaction.

4.7.4) <LK-PC> - Attribute Data: Normally attribute data should not be used to control <LK-PC>s. When this is not possible, then error proofing and 100% inspection strategies that control the characteristic to a fraction of the available tolerance are required to optimize customer satisfaction. Calculations for process capability shall have customer approval.

4.7.5) <LK-FF>: Manufacturing controls are required to verify conformance through measurement, error proofing or functional testing once capability has been demonstrated. Calculations for process capability shall have customer approval

5.0) History

5.1) Revision History.

6.0) Forms / Examples

6.1) Customer – Lear Special Characteristics Cross Reference
6.2) Special Characteristics Management Model
6.3) Special Characteristics Recommended Controls Cross Reference / Preferred Controls
6.4) Loss Function Matrix
6.5) Special Characteristics – Recommended Controls Cross Reference

7.0) Reference

7.1) Ford Motor Company Customer Specific Requirements ISO/TS 16949 November 2003
7.2) GM Customer Specifics – ISO/TS 16949 December 2003
7.3) DaimlerChrysler (Chrysler Group) Customer Specific Requirements February 2005
7.4) FMEA Handbook Version 4.1, Ford motor Company, © 2004
7.5) Key Characteristics Designation System, 3rd Revision, GM1805 QN, General Motors Corporation, March 2003
7.6) Reference Notes for Customer & Industry Specifications

5.1) Revision History

Revision Date	Description of Revision	Approved By
Released 5/12/06	This procedure has been developed to meet Quality System requirements for SSD divisions and supersedes any similar procedure issued to date.	Margaret Lewis

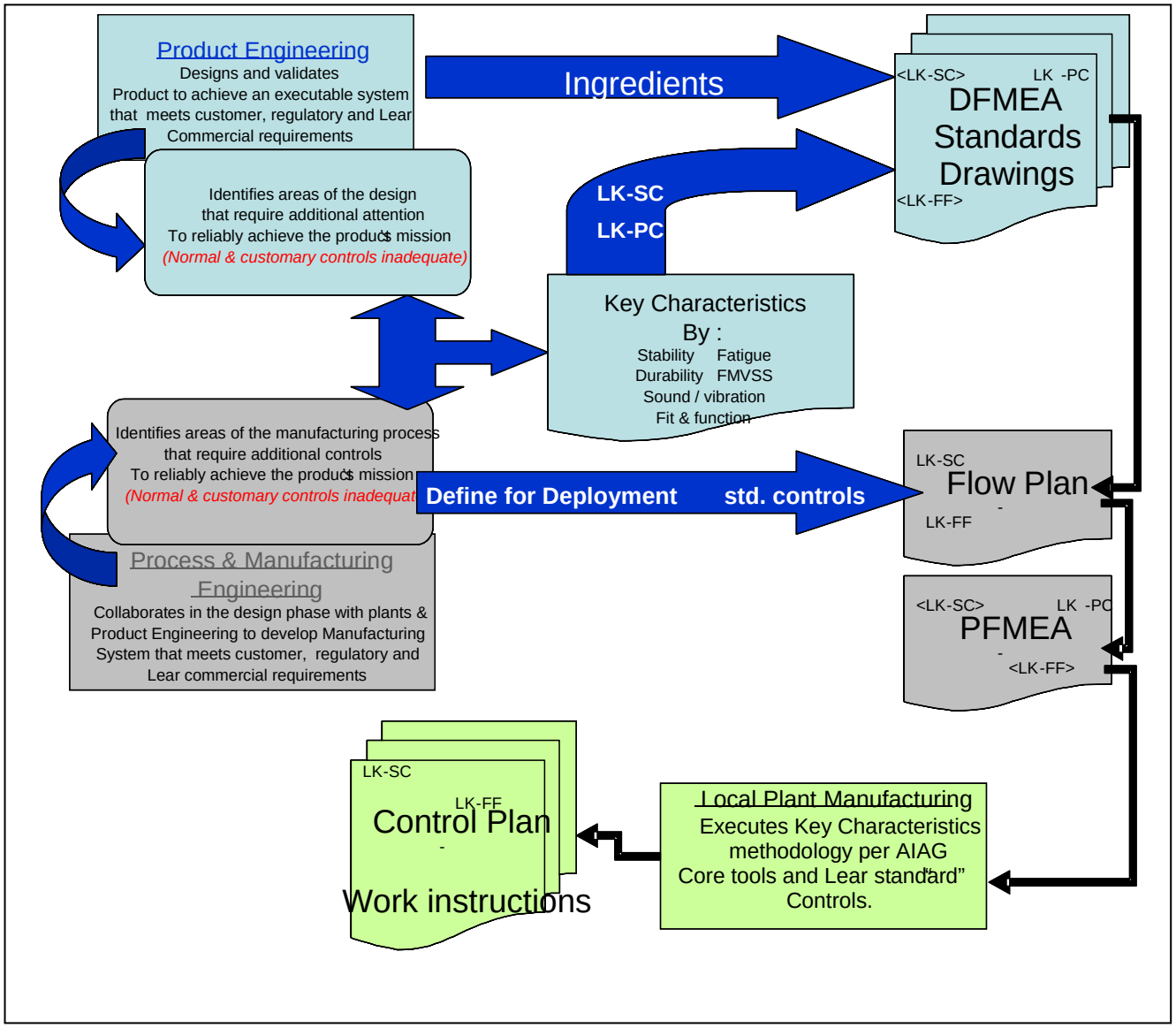
6.1) Customer – Lear Special Characteristics Cross Reference

Key Characteristics Cross Reference Matrix

Lear Key Characteristics	Ford Special characteristics	DCX	GM KCDS
<LK-SC> Key Safety / Compliance Characteristic A product characteristic with reasonable anticipated variation may affect regulatory compliance or safe vehicle or product function. This characteristic may drive either capability or errorproofing and usually implies additional requirements such as traceability and product verification.	**(CC) – Critical Characteristic** Are those product requirements (Dimensions, Specifications, Tests or process parameters) that can affect compliance with government regulations or safe Vehicle/Product Function. Special controls are identified on the Control plan and are defined as assembly process methods, administrative actions, techniques and tests, beyond normal and customary controls used to detect and contain defects.	**Shield - <S>** Safety characteristics are defined as engineering designated specifications or product requirements applicable to component material, assembly operation(s) which require special manufacturing control to assure compliance with governmental vehicle safety, emissions, noise, or theft prevention requirements	***No equivalent.*** GM KCDS requires that parts (not characteristics) be reviewed for requirements for additional care. Additional care may include testing for safety/compliance, functional checks, product verification and traceability, and special handling practices.
<LK-PC> Key Product Characteristics **–** A product characteristic with reasonable anticipated variation, including variation within tolerance, is likely to affect customer satisfaction or subsequent operations. This characteristic drives a focus on process capability.	**(SC) – Significant Product Characteristic** The product parameters and requirements that are important for customer satisfaction. Special controls are identified on the Control plan and are defined as assembly process methods, administrative actions, techniques and tests, beyond normal and customary controls used to detect and contain defects.	**Diamond - <D>** Application of a Diamond to key design characteristic mandates that the inspection method, sample size and frequency be documented in a Control Plan. It does not define how measurements should be made and does not automatically invoke SPC. The Control Plan is the governing document as the methodology of conformance.	**KPC – Key Product Characteristic** A product characteristic with anticipated variation is likely to significantly affect customer satisfaction. The loss function within the tolerance drives a focus capability to minimize customer dissatisfaction. Requires minimizing variation within tolerance.
<LK-FF> Key Fit and Function Characteristic A product characteristic which variation outside of tolerance may significantly affect the customer satisfaction or subsequent operations. This characteristic drives a focus on errorproofing.	**(HI) – High Impact Characteristic** Are related to parameters that severely affect the operation of the process or subsequent operations if they are outside of specification tolerance. (Related to improper manufacturing or assembly operations affecting down stream activities)	***No equivalent.*** The Pentagon is no longer used.	**PQC – Product Quality Characteristic** A product characteristic which variation outside of the tolerance may significantly affect customer satisfaction.

6.2) Special Characteristics Management Model

KC Deployment Flow



6.3) Special Characteristics – Recommended Controls Cross Reference

Safety or Non Safety	Loss Function	Characteristics	Preferred Controls	Capability Methods For PPAP
Non Safety	Loss Function	LK-PC	Mistake proofing device with a tightened tolerance that does not allow the defect to pass thru process, 100% automated inspection with a tightened tolerance. The tightened tolerances need to be constructed to reduce the loss.	100% inspection strategies that control the characteristic to a fraction of the available tolerance are required to optimize customer satisfaction. Calculations for process capability shall have customer approval. * See Below
			Ongoing continuous improvement with statistical control to continually reduce the loss function.	Process capability to CPK of 1.67 or customer approval.
Safety	Loss Function	LK-SC	Ongoing continuous improvement with statistical control to continually reduce the loss function.	Process capability to CPK of 1.67 or customer approval.
	No Loss Function		Mistake proofing device that does not allow the defect to pass thru process, 100% automated inspection with a lock box for defects.	100% inspection strategies that control the characteristic. Calculations for process capability shall have customer approval. * See below.
Non Safety	No Loss Function	LK-FF	Mistake proofing device that does not allow the defect to pass thru process.	100% inspection strategies that control the characteristic. Calculations for process capability shall have customer approval. * See below.
			Ongoing statistical control to insure defects are not manufactured,	Process capability to CPK of 1.67 or customer approval.

*Variable methods of proving capability are preferred but when not practical alternative strategies should be used.

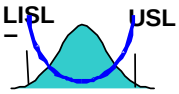
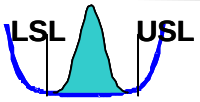
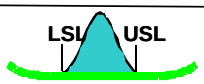
Example 1) Using a Statistical Z table we find +/- 3 sigma has of a probability of .0027. That means, assuming no inspection errors, 384 pieces with no defects is similar to a CPK of 1.00. Finding +/- 4 sigma on the Z table has a probability of .000063. That means (assuming no gage error) 15873 with no defects is similar to a CPK of 1.33

Example 2) Supplier installs a mistake proof that will insure that defective parts can not be made or can not leave the process. This mistake proof device must be qualified with an attribute gage study. The gage study should include a substantial number of defects in the sample group. See AIAG MSA.

6.4) Loss Function Matrix

The loss function establishes a measure of the user dissatisfaction with a product's performance as it deviates from a target value. Thus, both average performance and variation are critical measures of quality. Selecting a product design or a manufacturing process that is sensitive to controlled sources of variation improves quality.

Simply put, the loss function is a way to show how each non-perfect part produced, results in a loss of customer satisfaction. Deming states that it shows a minimal loss at the nominal value, and an ever-increasing loss with departure either way from the nominal value.
W. Edwards Deming Out of the Crisis. p.141.

		Symbol	Action Plan
Key Product Characteristic : **A key Product Characteristic is a Product Characteristic where the loss Function has shown that the reasonably Anticipated variation is likely to significantly Affect customer satisfaction with a product.**		LK-PC	**Reduce Variation about a Target Location**
Product Quality Characteristic: A product Quality Characteristic is one in which the customer is equally satisfied across the entire specification, but the loss function is steep just outside of the specification limits.		LK-FF	**Process Control +/- 3 σ**
Standard Product characteristic A Standard Product Characteristics is one in which the customer is equally satisfied across the entire specification. And the loss function is flat just outside of specification.		NONE	**Meet Tolerance (+/- 3 σ)** **(Standard Care)**

6.5) Special Characteristics – Recommended Controls Cross Reference

Definitions

- Ford: FMEA Handbook, pages 6-3. "Special Characteristics can be classified as Critical, Significant, Operator Safety, or High Impact."
- Ford: FMEA Handbook, pages 6-5 and 6-6. Definitions listed for each Ford special characteristic.

Importance to Eliminate Special Characteristics

- Ford: FMEA Handbook, pages 6-8. "Every effort must be made to eliminate Special Characteristics and Special Controls through design actions to improve product robustness, or through process improvements that focus on improving process capability and safety."

Hierarchy of Controls for Special Characteristics

- Ford: FMEA Handbook, pages 6-7. "Special Controls are those manufacturing and assembly process methods, administrative actions, techniques and tests beyond the normal and customary controls used to detect and/or contain Special Characteristic-related product defects. This type of controls will prevent the shipment of a product not acceptable to the end customer and is part of the quality system shown on the control plan."

Incorporation into PFMEA

- Ford: FMEA Handbook, page 6-4. A table provides criteria for selection of special characteristics based on the FMEA severity and occurrence scores.

Incorporation into Control Plan

- Ford: FMEA Handbook, pages 6-3. "Special Product Characteristics (<CC> and <SC>) must be designated and included in control plans."

Use of Customer Symbols

- Ford Customer Requirements, Nov 2003, Section 4.21 Symbols. "The organization is to contact Ford Engineering to obtain concurrence for the use of Ford Motor Company special characteristics symbols defined in the glossary of this document."
- GM Customer Requirements Dec 2003, Section 4.1.5 Special Characteristics. "The organization shall use General Motors Key Characteristic Designation System definitions and symbols to comply with ISO/TS 16949:2002 special characteristics requirements (e.g. cl. 7.2.1.1), and as provided in 4.2.2, General Procedures and Other Requirements, and 4.2.2.1 1, *Key Characteristic Designation System (KCDS)*, (GM1805 QN) which defines GM's approach to special characteristics.

PPAP Requirements

- Ford: TBD.
- GM Customer Requirements Dec 2003, Section 4.1.8 Part Approval Process. "The supplier shall comply with the Chrysler, Ford, GM Production Part Approval Process manual to comply with cl. 7.3.6.3".