NPQP Category 4

Product Development

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4 - Product Development

Category Purpose:

- **Design** a product to meet Group Nissan's technical specifications and requirements.

Activities:

4.1 Product and Process Design Review

4.2 Design Failure Mode and Effects Analysis

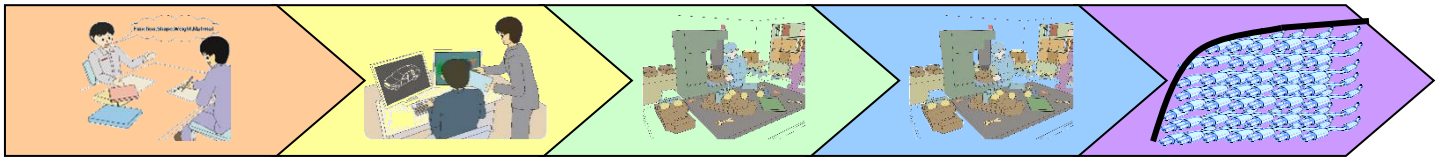
4.3 Identification and Development of Special Characteristics and Key features

4.4 Engineering Product Specifications / Drawing Study and Completion

4.5 Special Characteristics Management

4 - Product Development

Timing:



	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
4.1 Product and Process Design Review					
4.2 Design failure mode and effects analysis					
4.3 Identification and Deployment of Special Characteristics and Key Features					
4.4 Engineering Product Specifications / Drawing Study and Completion					
4.5 Special Characteristics Management					

4 - Product Development

4.1 Product and Process Design Review

4.2 Design Failure Mode and Effects Analysis

4.3 Identification and Development of Special Characteristics and Key features

4.4 Engineering Product Specifications / Drawing Study and Completion

4.5 Special Characteristics Management

4 – Product Development
4.1 – Product and Process Design Review

Activity Purpose:

- **Ensure** that the Product and Process design and development activities meet Nissan requirements.
- **Identify** any problems and implement countermeasures.

Notes:

- All suppliers **shall** conduct product and process design reviews.
- Suppliers may be required to participate in joint product and process design reviews.

4 – Product Development
4.1 – Product and Process Design Review

Output Documents & Submission Timing:

	Phase 1			Phase 2			Phase 3			Phase 4			Phase 5		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
Suppliers Internal Design Review Record (SIDRR)				3	3	3	3	3	3	3	3	3			
Full Process DR Record (FPDRR)						2			2			2			2
Quick DR Record (QDRR)					2			4			4			4	

Suppliers Internal Design Review

- **What is the purpose of this process?**
  - **To confirm** that the **product and process targets** in each phase of NPQP were **achieved**
  - **To confirm** all **issues/concerns** have been **resolved**

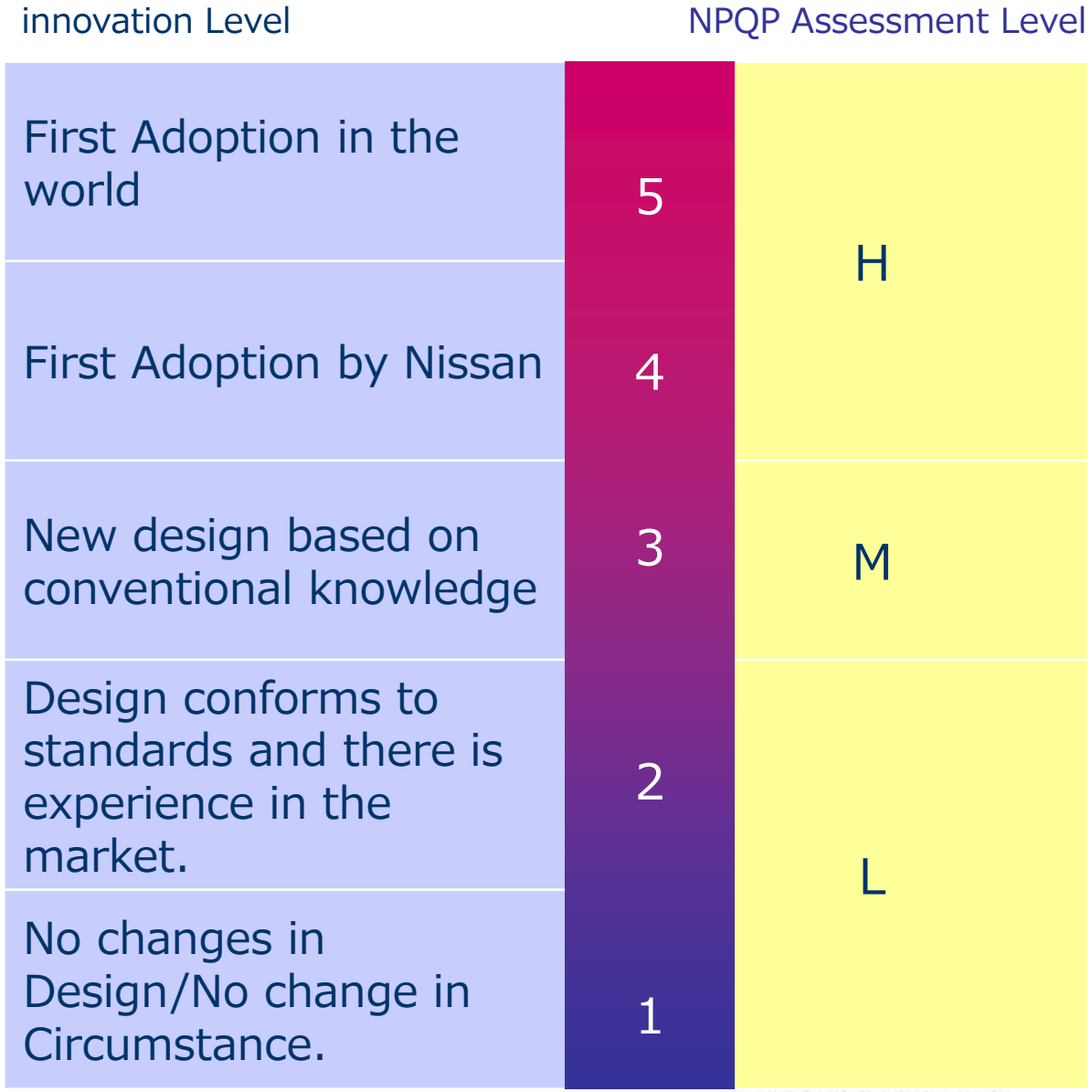
- **What is the output of the process?**
  - A **record** of **actions, timing, responsibilities & agreements** identified during the design review process.

Specific items which must be covered during this process are detailed in the **DCI** for the **Suppliers Internal Design Review Record**.

Nissan and Supplier Joint Design Reviews

- **Nissan** will **identify** the suppliers required to participate in a **joint product and process design review.**
- These joint reviews will be either a **"Full Process DR"** or **"Quick DR".**
- A **Full Process Design Review** is applied to the parts/systems which newness is high.
- A **Quick Design Review** focuses only on what has changed.

Concept of NPQP: Relationship between innovation Level and NPQP Assessment Level



Full Process DR

- FMEA
- FTA
- QA **Table**

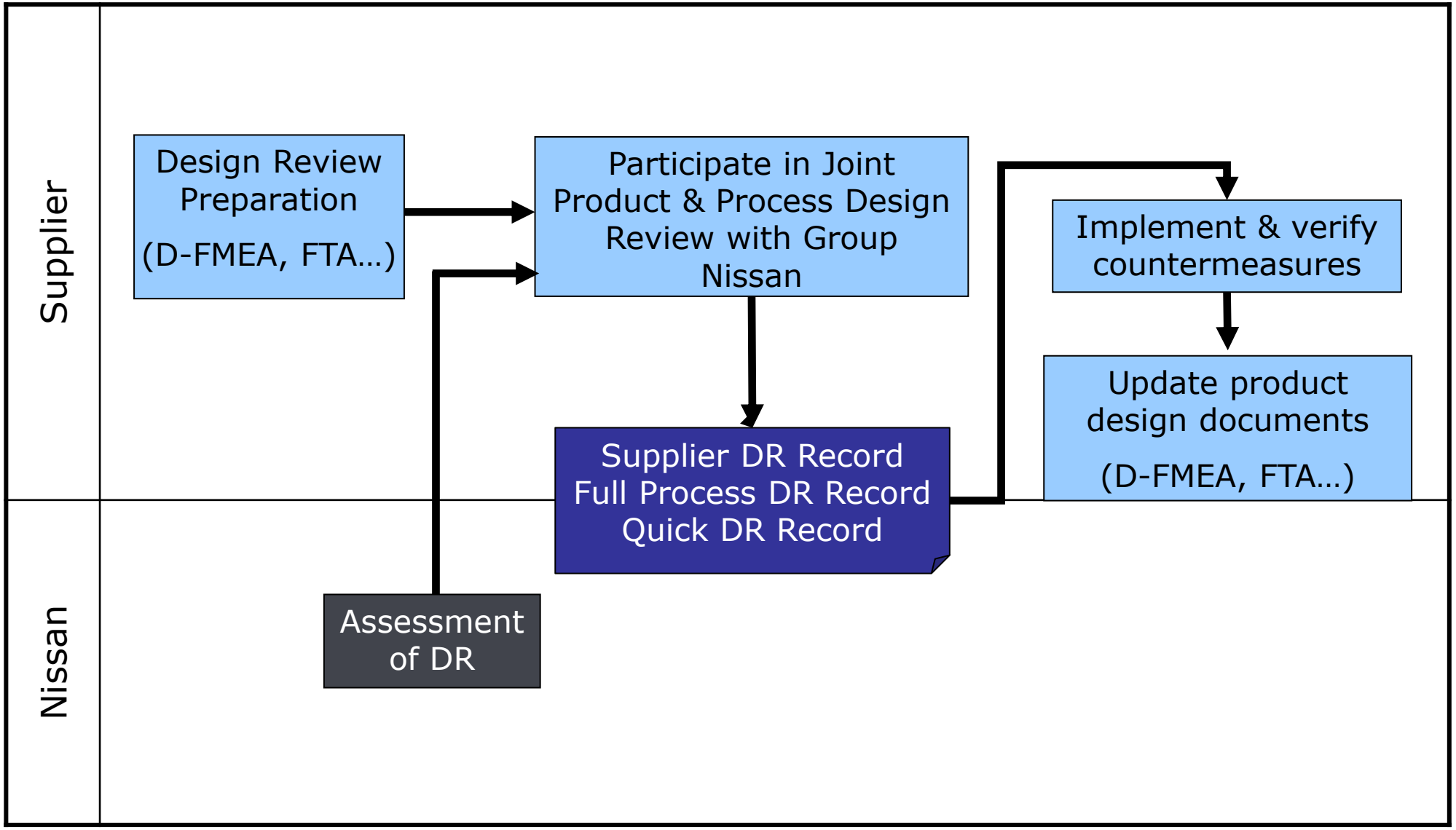
Etc.

Quick DR

- DRBFM

Etc.

4 – Product Development
4.1 – Product and Process Design Review



4 - Product Development

4.1 Product and Process Design Review

4.2 Design Failure Mode and Effects Analysis

4.3 Identification and Development of Special Characteristics and Key features

4.4 Engineering Product Specifications / Drawing Study and Completion

4.5 Special Characteristics Management

4 – Product Development
4.2 – Design Failure Mode and Effects Analysis

Activity Purpose:

- **Identify** potential design failure modes, their associated causes and their effects.
- **Implement** effective countermeasures to minimise the probability of failure occurring.

Notes:

- The supplier must consider recurrence prevention for historical concerns (including by design changes) and customer satisfaction targets on assemblies and sub-assemblies/components.
- Significant system faults shall be analyzed using FTA (Fault Tree Analysis) to identify all possible causes and implement countermeasures for them.
- The scope of this activity will be decided through discussion between Nissan and suppliers.

4 – Product Development
4.2 – Design Failure Mode and Effects Analysis

Output Documents & Submission Timing:

	Phase 1			Phase 2			Phase 3			Phase 4			Phase 5		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
System Structure Diagram (SSD)				4	4	2									
Function Block Diagram (FBD)				4	4	2									
Design FMEA (DFMEA)				3	3	2									
Fault Tree Analysis (FTA)				4	4	4									
Change List (CL)				4	2	4	4	4	4	4	4	4	4	4	4
DRBFM Work Sheet				4	2	4	4	4	4	4	4	4	4	4	4

4.2 – Design Failure Mode and Effects Analysis

『System configuration diagram』

- A diagram which system's components with newness are shown by layer.

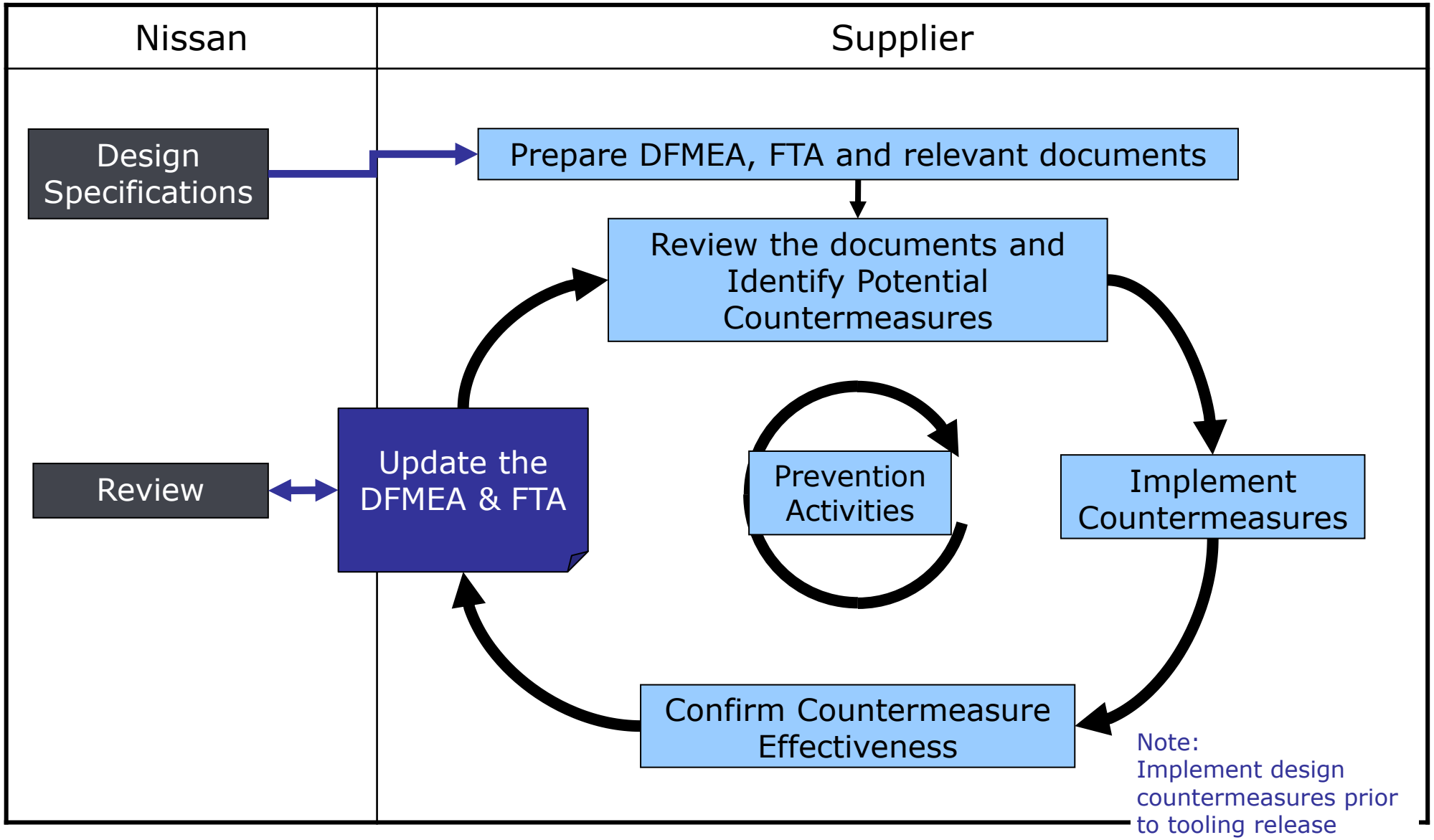
『Function block diagram』

- A diagram focused on the relation of the function in system's components.
- To extract the focused points of the function, failure mode, design countermeasure in FMEA (Failure Mode and Effects Analysis).

⇨No specific format for these two, please follow Nissan engineer's instruction.

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4 – Product Development
4.2 – Design Failure Mode and Effects Analysis



What happens if the activity is not carried out correctly?

Failure to identify and action potential concerns at the correct timing leads to:

- **Increased potential** to manufacture and deliver **non-conforming product.**
- **Failure** to meet **reliability** and **durability** requirements
- **Increased necessity** to **modify product design** during manufacturing process development

Failure to Achieve Customer Requirements

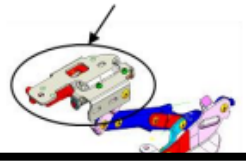
4.2 – Design Failure Mode and Effects Analysis 『Changes List』(Quick DR)

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NPQP - CHANGES LIST

Project:	432	Safety ☐ Nissan Impt A ☐ Impt B☐ Impt C ☐ OBD☐ Regulation ☐		Doc Ref. No. / Ver.:	ABC-010-9 / Ver.2
				Doc. Rev. Date:	Apr 4th 2019
				Doc. Origin Date:	Apr 1st 2019
Supplier Name:	ABC Corporation Ltd.	Supplier Code:	A010	E-mail:	taro@abc.com
Supplier Plant:	Atsugi-Plant	Author:	A. Taro	Tel:	+81-(0)46-270-XXXX
Part Name:	Hood hinge	Remark			
Part No. :	654XX XXXX				
Design Note No. :	T04322				

※ Potion for performing a function

System/ Functional Portion/ Part name	Function	Base Design	New Design	Changes in Design or Circumstance	Purpose of the Change	Newness
Hood	-Popping up by input force from an actuator	Hood without mechanism for pop-up function (G37 sedan)	Hood with mechanism for pop-up function (G37 coupe)	-Strengthened hood inner reinforce (shape & thickness)	Strength up against for input force from actuator.	3
				-moving the hinge fixing position to 0Y direction (--mm)	To make a part that receives the force from actuator.	3
Hood Hinge	-Connecting a hood to body with openable and closable motions -Popping up a hood	Hood hinge without pop-up mechanism (G37 sedan) 	Hood hinge with pop-up mechanism (G37 coupe) Pop-up mechanism 	-Adding the pop-up mechanism	To improved pedestrian protection performance.	4

Clarify changes and newness from base design in advance of DRBFM

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4.2 – Design Failure Mode and Effects Analysis 『DRBFM Worksheet』(Quick DR)

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DRBFM worksheet

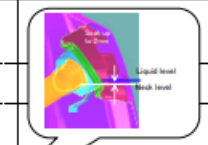
Design Review Based on Failure Mode

Project		Safety ▫ Nissan Impt A ' Impt B ⊏ Impt C ⊏ OBD '' Regulation ⊏	Doc Ref. No. / Ver.: Doc. Rev. Date: Doc. Origin Date:
Supplier Name: Supplier Plant:		Supplier Code: Author:	E-mail: Tel:
Part Name: Part No. Design Note No.		Remark	

Preparation Participants

Design Section :
Associated Section :
Supplier :

Preparation		
Section	Manager	PIC

System/ Functional Portion/ Part name	Changes in Design or Circumstance	New-ness	Function	Concerns related to the change		Vehicle Level Failure Customer Dissatisfaction	Failure Grade	Actions taken to eliminate the concerns by		
				System/Part Failure Concerns that could cause Customer Dissatisfaction	Potential Causes of the Concern/ Situation or Condition of the Occurrence			Design	Test	Manufacturing
Cap protector	Shape (Narrower opening area)	3	Protection of cap at the time of crash							
			Fix filler tube in body							
	Layout (Low angle opening area)	3	Keep space for opening/ closing cap	It becomes difficult to open or close a fuel cap	The space to insert a finger becomes narrower		C	Xmm >NDS Ymm		
				The neck of filler tube is soaked if the water piles up in cap protector ↓ The neck of filler tube is rusted	The neck level is lower than the liquid level	Water gets into the fuel tank when cap is opened.	C	The weep hole is enlarged.	Confirm heap of splashed mud from weep hole by	
Mud cover	Material (from rubber to steel)	3	Protection against mud splashed by tires to prevent clogging the weep hole	A mud cover corrodes and drops off						
	Shape (Wider clearance from tube)	3		Splashed mud is heaped on the mud cover and clogged the weep hole	Mud co					

Find concerns related to the changes
and decide countermeasures through intensive discussion

➢ **DRBFM : Design Review Based on Failure Mode**

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4 - Product Development

4.1 Product and Process Design Review

4.2 Design Failure Mode and Effects Analysis

4.3 Identification and Deployment of Special Characteristics and Key features

4.4 Engineering Product Specifications / Drawing Study and Completion

4.5 Special Characteristics Management

Activity Purpose :

- **Determine** all Special Characteristics and Key Features related to product.
- **Determine** the relationship between these characteristics and features and the manufacturing processes.
- Conduct a comprehensive activity to **ensure** that all of these characteristics and features are incorporated into the manufacturing process and are controlled.

Note(s) :

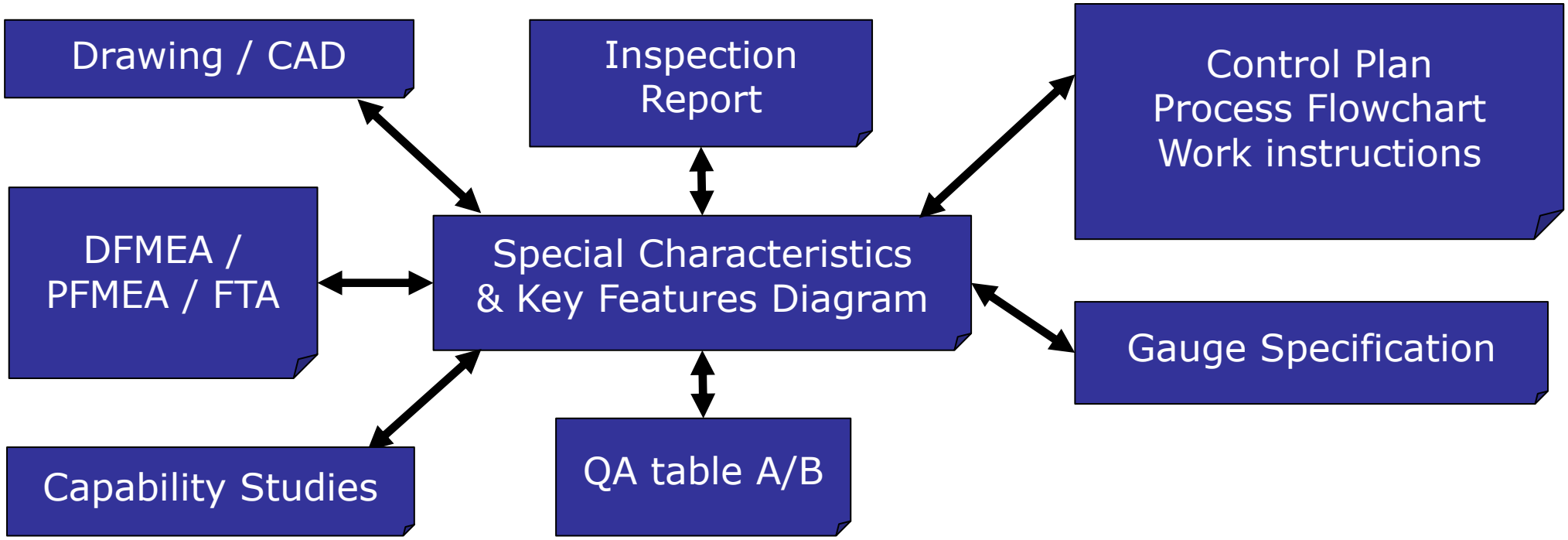
- Special Characteristics are identified by Nissan. For Nissan, these include Important A, B, C and OBD.
- Key Features are identified by both the supplier and Nissan.
- These are features that have a significant effect upon fit, function, performance, reliability, appearance and serviceability and include all features affecting type approval (homologation).

Output Documents & Submission Timing

	Phase 1			Phase 2			Phase 3			Phase 4			Phase 5		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
QA Table A				4	4	4									
QA Table B										4	4	4			
Special Characteristics and Key Features Diagram (SCKFD)				3	3	3	3	2	2	2	2	2			

Special Characteristics and Key Features Diagram

It is used to document all Special Characteristics and Key Features related to the product.



4.3 Identification and Deployment of Special Characteristics and Key Features
『Special Characteristics and Key Feature Diagram (SCKFD)』

- **Ensure that there are no inconsistencies in the product characteristics and specifications/tolerances across all related documents (Special Characteristics and Key Feature Diagram , inspection reports, etc.).**

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SPECIAL CHARACTERISTICS AND KEY FEATURES DIAGRAM

Project: X1

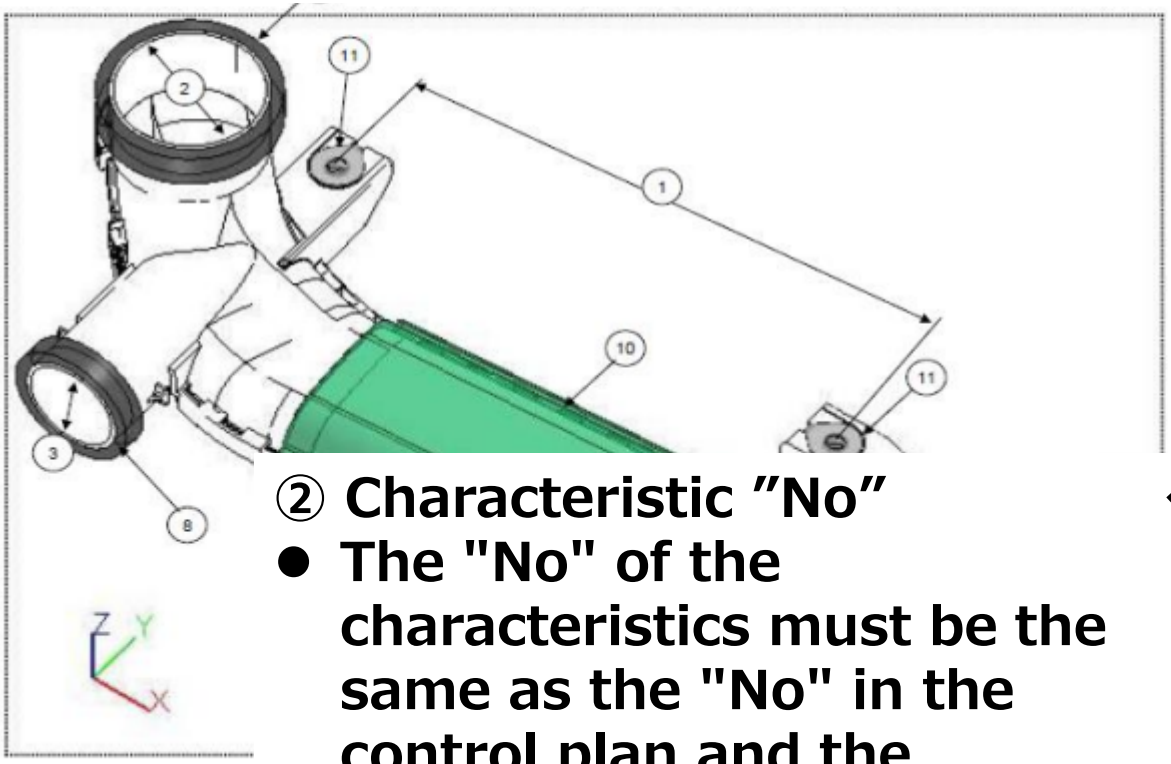
Supplier Name:
Supplier Plant Name:
Part Name:
Part No. :
Design Note No. :

Doc Ref. No. / Ver.: ABC-8/Ver.9
Doc. Rev. Date: 2019/8/10
Doc. Origin Date: 2019/8/10

E-mail: taro-k@abc.com
Tel. No: 046-1234-7777

①Product Characteristic

- **Select product characteristic from control plan and fill in the extracted characteristics.**



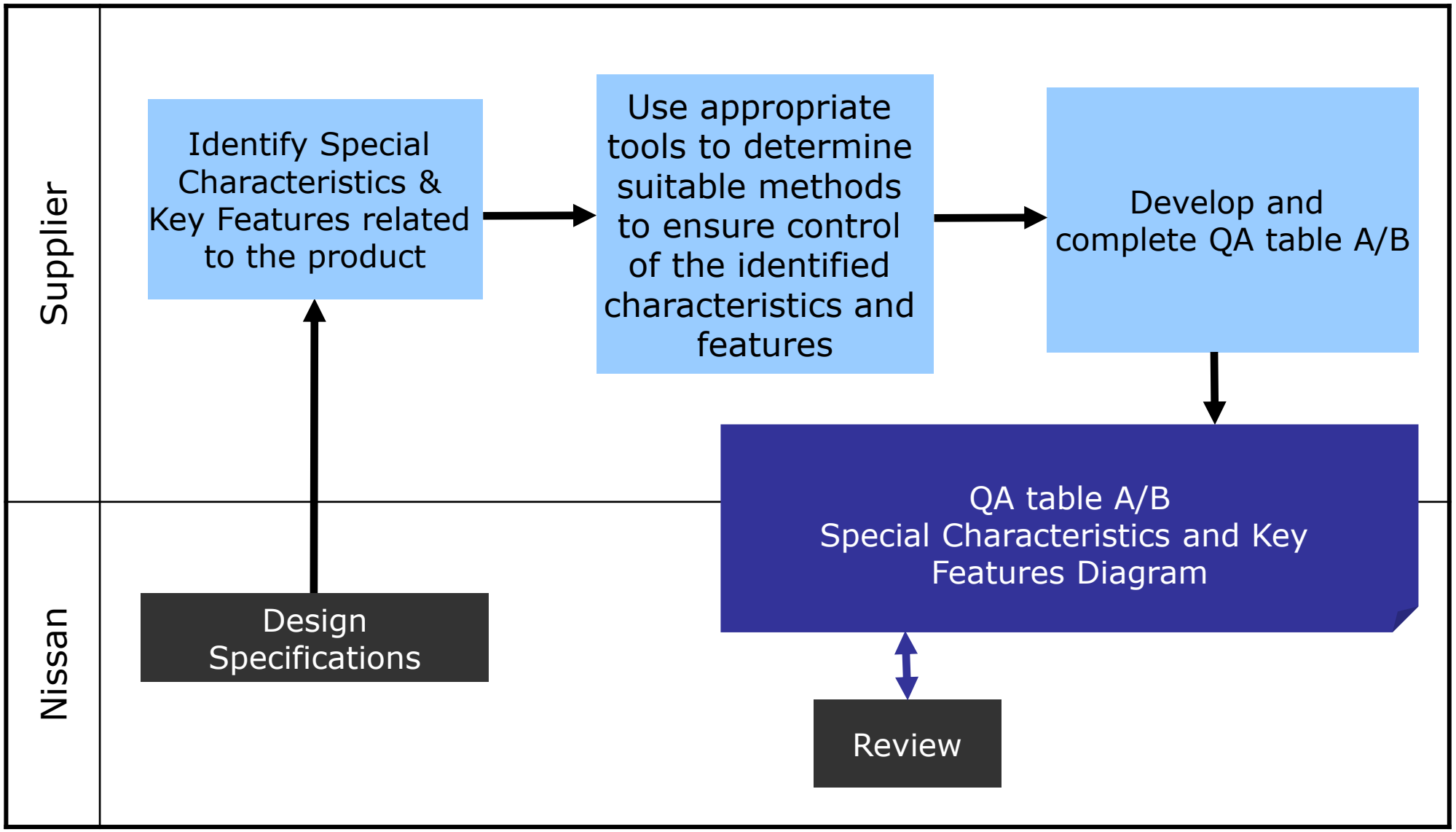
② Characteristic ”No”

- **The "No" of the characteristics must be the same as the "No" in the control plan and the inspection report.**

Special Char. / Key Feature Ident'n	No.	Product Characteristic	Specification /Tolerance	Remark (Freq. of check)
	1	Ctr Distance	184mm/±1.5	Initial／final products
	2	Inner Diameter	63mm/±1.0	Initial／final products
	3	Inner Diameter	45mm/+-1.0	Initial／final products
	4	Inner Dimension	50mm/±1.0	Initial／final products
	5	Inner Dimension	48mm/±1.0	Initial／final products
	6	PP material	Mold number: ABC	Initial products/shift
	7	Urethane material	Mold number: 1234	Initial products/shift
		Thickness of urethane material	5mm/±0.5	Initial／final products
		Width of urethane material	10mm/±0.5	Initial／final products
	8	Thickness of urethane material	5mm/±0.5	Initial／final products
		Width of urethane material	10mm/±0.5	Initial／final products
	9	Thickness of urethane material	5mm/±0.5	Initial／final products
		Width of urethane material	10mm/±0.5	Initial／final products
	10	Thickness of urethane material	5mm/±0.5	Initial／final products
		Width of urethane material	10mm/±0.5	Initial／final products
	11	Thread	M6x0.5	Thread gauge
	12	PP material color	Black PG05/ΔE1.5 max	100% visual inspection
	13	Adhesiveness of urethane material	10kPa/10sec 2kPa/drop	100% visual inspection
OBD	14	Pressure test	10kPa/10sec 2kPa/drop	100% poka-yoke

4 – Product Development

4.3 – Identification and Deployment of Special Characteristics and Key Features



4 - Product Development

4.1 Product and Process Design Review

4.2 Design Failure Mode and Effects Analysis

4.3 Identification and Deployment of Special Characteristics and Key features

4.4 Engineering Product Specifications / Drawing Study and Completion

4.5 Special Characteristics Management

Activity Purpose:

- **Design the product** to achieve the requirements of Nissan technical specifications

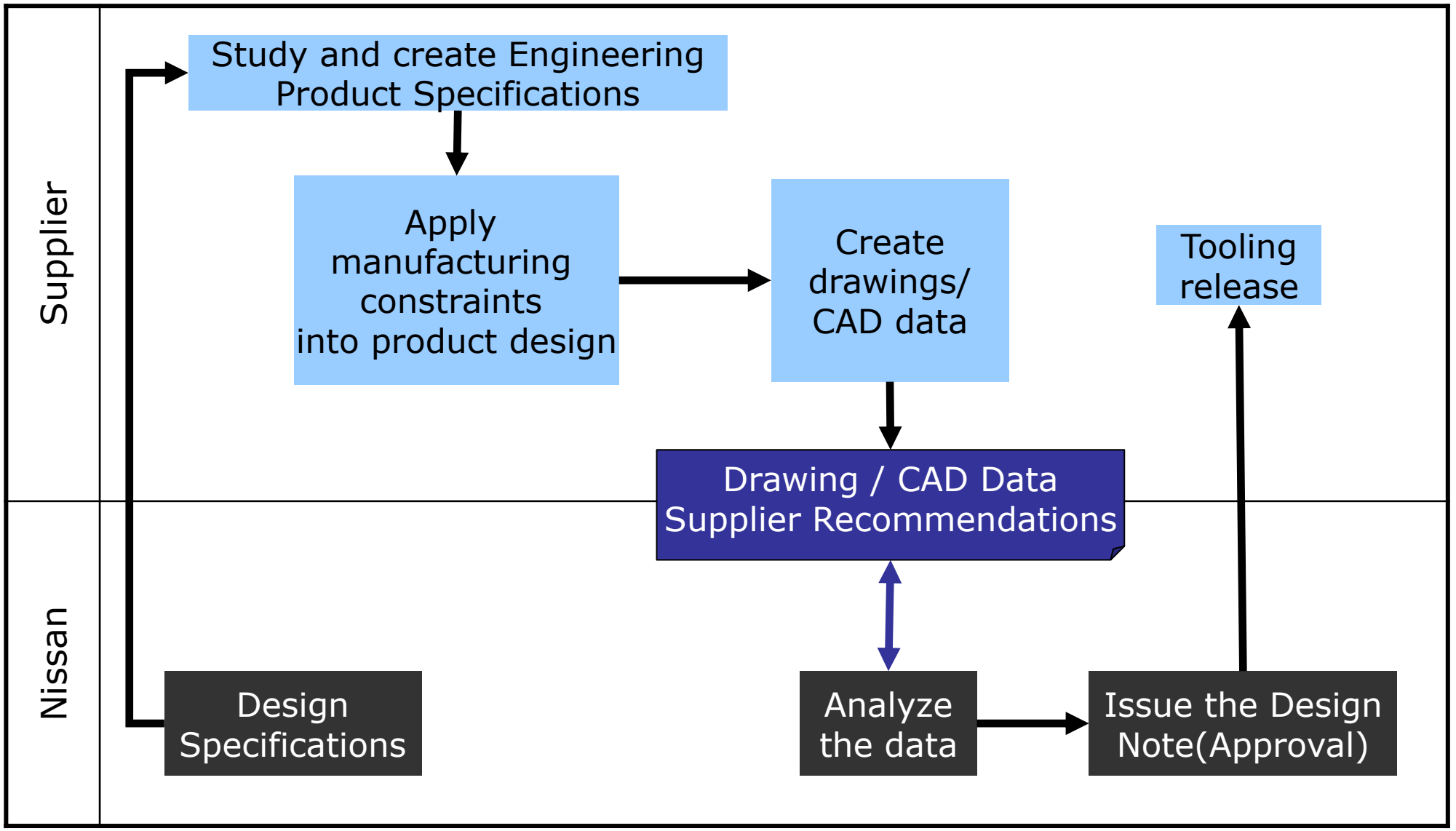
Key Points of Activity:

- To comply with homologation requirements and Nissan Engineering Standards

Output Documents & Submission Timing

	Phase 1			Phase 2			Phase 3			Phase 4			Phase 5		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
Engineering Product Specifications & Drawings / CAD data				1	1	1									
Supplier Recommendations				4	4	4	4	4	4						

4.4 – Engineering Product Specifications / Drawing Study and Completion



Supplier Recommendations

Supplier must inform Nissan on its recommendations for the use of the product. This covers :

- part in vehicle/powertrain location,
- driver's use,
- transport, storage, packaging,
- conditioning, de-conditioning,
- handling, fitting on assembly line,
- after-sale.

4 - Product Development

4.1 Product and Process Design Review

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4.5 Special Characteristics Management

4 – Product Development
4.5 – Special Characteristics Management

Activity Purpose:

- **Manage** all aspects of the manufacturing processes associated with Special Characteristics

Key Points of Activity:

- Management requirements for Special Characteristics **shall** be **incorporated** into the Supplier **Quality Management System**

Output Documents & Submission Timing

	Phase 1			Phase 2			Phase 3			Phase 4			Phase 5		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
Certificate of certification (COC) / certificate of Product(COP)										4	4	4	4	4	4

Special Characteristic Symbol Mark

	Safety		Regulation	Others
Nissan	A	B	OBD	C
	S	S R		

Note : For new projects from NPQP2.0 onwards, A, B, C, and OBD will be used.

Identification in		Significance of the symbol
Title block of the drawing (φ10-12mm) / Cover Page (φ12mm)	Body of the drawing (φ 6-7mm) / Related documents (φ 6 mm)	
n S	The symbol appears "n" times S	Product with "n" safety special characteristics.
n S m R	The symbols appear "n" times totally S + S R The symbols appear "m" times totally R + S R	Product with "n" safety special characteristics and "m" regulatory characteristic. Note : In case a safety characteristic is at the same time linked with Regulatory Characteristics defined by both Renault/Nissan.

4 – Product Development
4.5 – Special Characteristics Management

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Imp C, OBD will remain. Imp A/B remain as Nissan unique for a while. (current model, new vehicle project already started.)

Important A Part / Area

A basic product/ part/ area necessary to maintain **steering control**, **braking system** or **fuel system** integrity



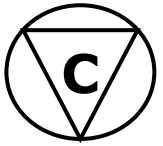
Important B Product/ Part / Area

A basic part/ area which must conform to **safety regulations** relating to **occupant protection** during and after a collision and the **transmission of information** necessary for safe driving.



Important C Product/ Part / Area

A characteristics that is necessary for control of manufacturing variation to achieve customer satisfaction.



OBD (On-Board Diagnostics)

A product/ part/ area where variance from design specification may affect compliance with **emissions regulations**.

OBD

Regulatory

A product/ part/ area that is restricted by **laws** and **regulations** for a specific country or region.

Certificate of certification (COC) / certificate of Product

Key Point:

- The Group Nissan purchased parts are under the responsibility of the supplier for their own certification/conformity.
- The certificate of certification, the marking and the inspection record are the evidence of the regulatory conformity of these parts. The supplier shall provide these related materials to Group Nissan along with project schedule.
- The supplier needs to report these elements to Group Nissan regularly by the end of mass production.

Note :

- The control items and actions to comply with regulatory requirements need to be fixed between Group Nissan and the supplier in phase 3 with Supplier Test Plan and Report.
- The **control items must be identified by an asterisk (*)** in the Control Plan an also identified on the Special Characteristics and Key Features Diagram.