

# Definition of “Lazy Part”

Revised Jan. 30, 2009

## Definition of the term “Lazy Part”

A Lazy Part describes a system (part, assembly, device...) in an automobile, whose mass (or a portion of the mass) is unnecessary because:

- 1) **the system is only required during the assembly process,**
- 2) the system satisfies no functional requirement,
- 3) the system’s function(s) can be replaced by a redesigned system (change of solution principle),
- 4) the system’s function(s) can be transferred to another system by integration, or
- 5) the system’s function can be conducted by an optimized (e.g., geometry, material) system.

The focus of this project is primarily to address the first point in this definition.

The goal must be to avoid and reduce the number of Lazy Parts, using certain established methods, in order to reduce the vehicle’s weight.

## Indicators

Indicators are used to determine if a system of interest may be lazy and therefore has potential for mass reduction and should be investigated further. Since the indicators are not mutually exclusive, a system can be identified by multiple indicators. However, there may be underlying constraints that prohibit the reduction of mass. The indicators are based on iterative observations of the assembly line in the BMW-Spartanburg plant.

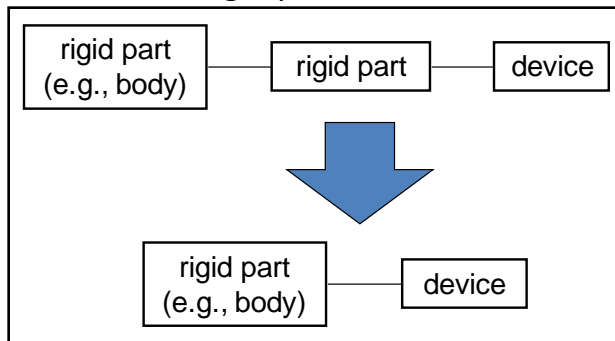
- Rigid-to-rigid connection
- Support for a flexible, non-moving part
- Positioning feature
- Duplicate geometry
- Fastener
- Bridging Systems
- Material flow restriction

## Rigid-to-rigid connection

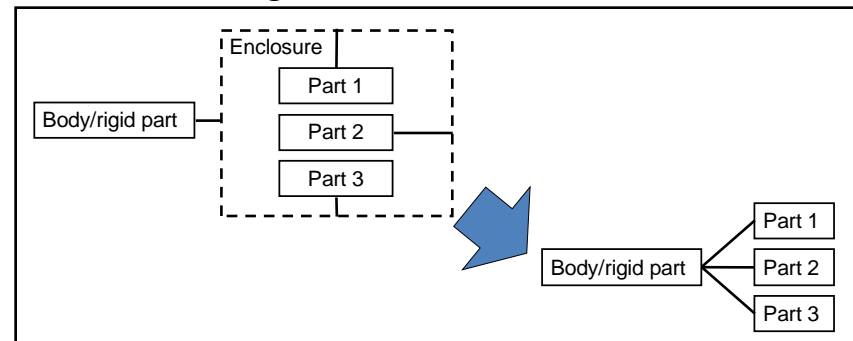
A rigid part that transfers a force from one (non-flexible) part to another part with zero relative displacement between the two parts.

- The intermediate rigid part should be marked with the indicator
- Laziness reduction ideas
  - Direct connection of part to body
- Common occurrences
  - Bracket
  - Enclosure acting as a bracket
- Examples
  - rear luggage cover mount (file: 7145941\_rear\_luggage\_cover\_mount.pdf)
  - bluetooth bracket (file: 6922719\_bracket\_Bluetooth.pdf)
  - headlight assembly (file: headlight\_assembly.pdf)

Laziness of rigid part



Enclosure acting as a bracket



## Rigid-to-rigid connection (ex. Rear luggage cover mount)



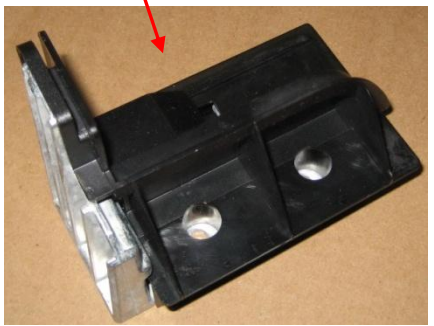
Lazy Part in red circles



release button



left side, without trim



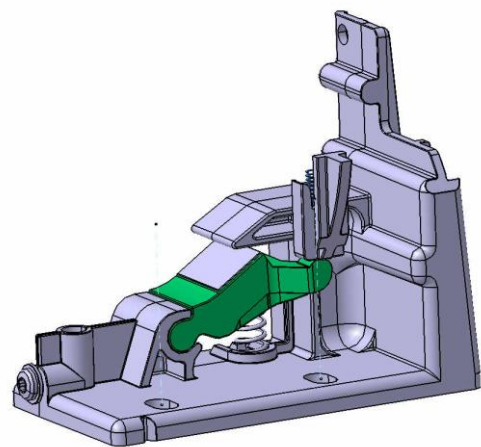
Left side, no release function



right side, release function



right side, snap in mechanism

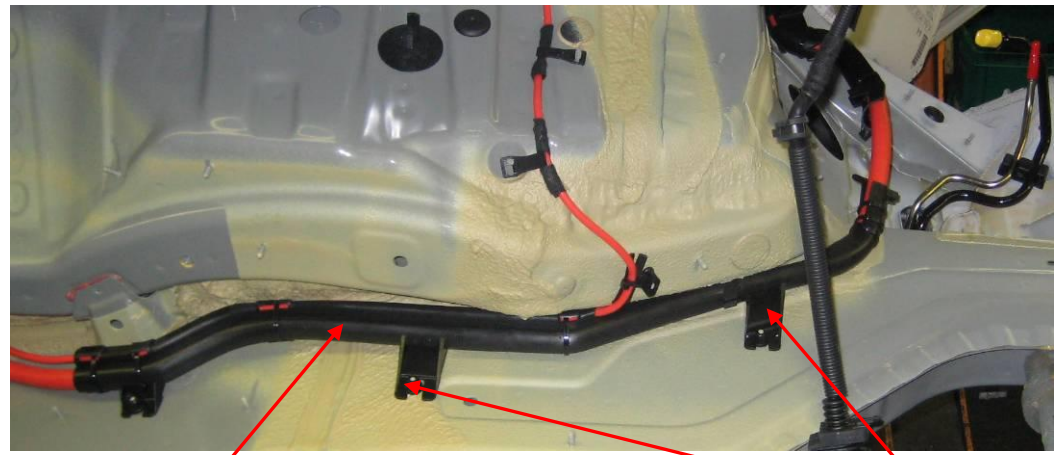


## Support for a flexible, non-moving part

A part that holds and/or supports flexible parts that do not require movement during vehicle operation (flexible, non-moving)

- The fasteners should be marked with the indicator, not flexible, non-moving part
- Laziness reduction ideas
  - These parts may be integrated with surrounding parts to reduce laziness
  - The flexible, non-moving part may be made rigid to reduce laziness
- Common occurrences
  - Wire harness clips, channels
- Examples
  - wire harness guide (file: 9154713\_wire\_harness\_batt\_pos.pdf)

## Support for a flexible, non-moving part (ex. Wire harness guide)



Casings

Figure 1: Front casing

Built-in lugs



Figure 2: Rear casing

Clips

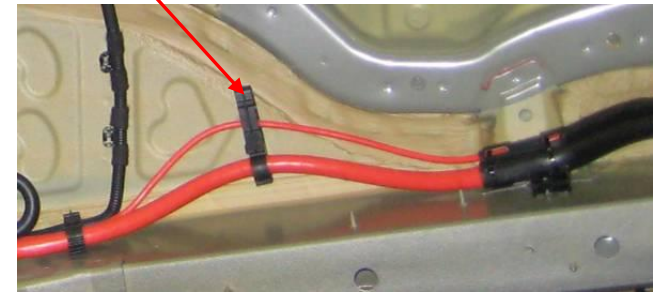


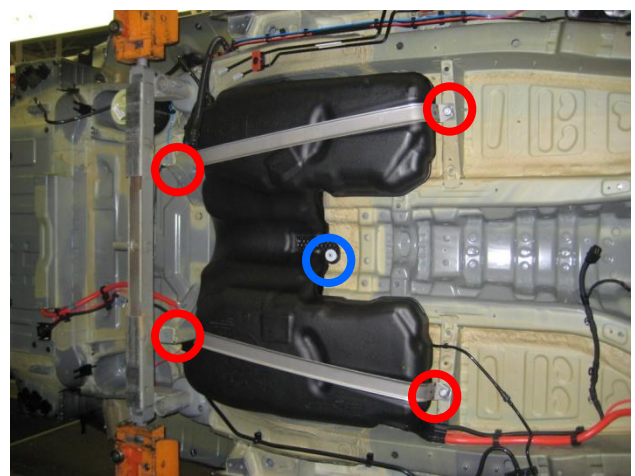
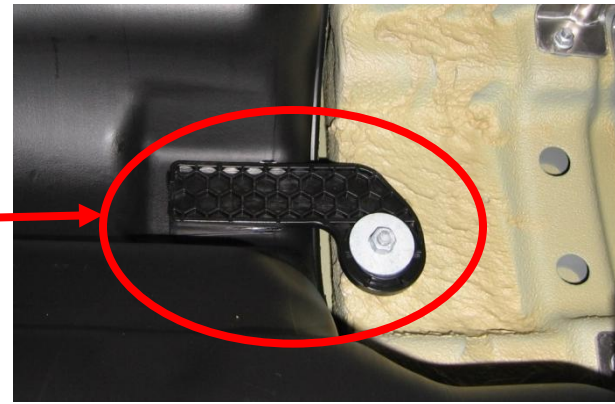
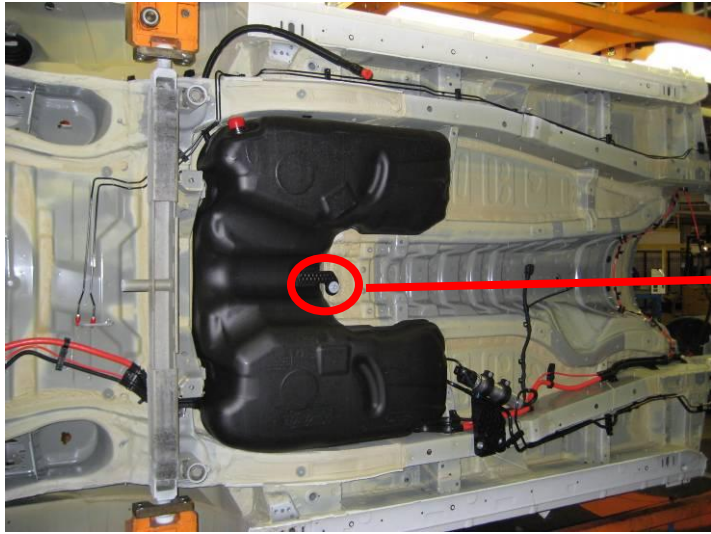
Figure 3: Clips

## Positioning Feature

A feature (or part) that helps position another part; if the feature is removed, the vehicle would behave exactly the same after full assembly

- The part containing the positioning feature should be marked with the indicator
- Laziness reduction ideas:
  - Use a removable fixture during the assembly process to eliminate the need for the feature
- Common occurrences
  - Near parts with tight tolerances
  - Alignment tabs
- Examples
  - fender pin (file: Fender\_Locating\_Pin.pdf)
  - Gas tank (file: 7164211\_gas\_tank.pdf)
  - rear bumper support (file: 7158445\_rear\_bumper\_support.pdf)
  - Console upper frame (file: Console\_Parts\_Indicated\_Lazy.pdf, Slide 2)

## Positioning Feature (ex. Gas tank)



## Duplicate geometry

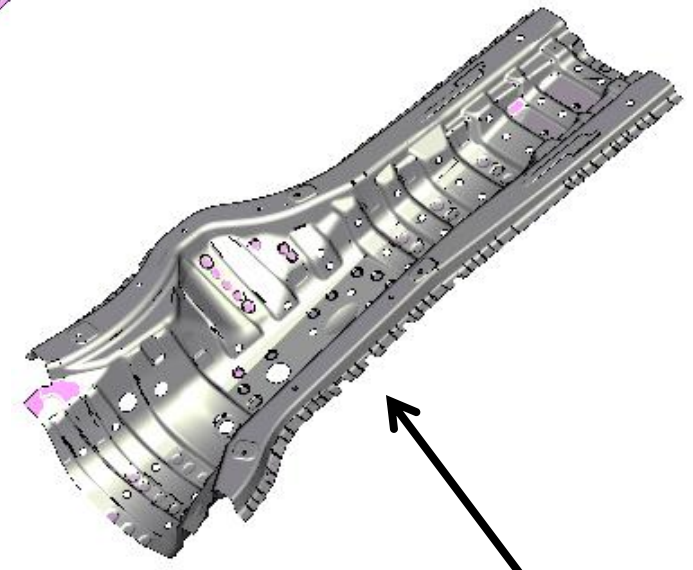
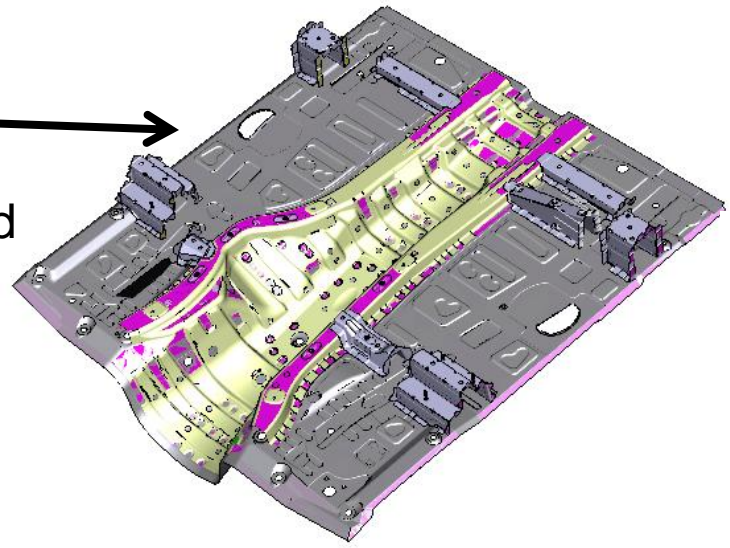
Two or more similar geometries in close proximity to each other.

- All parts that share the duplicate geometry should be marked with the indicator
- Laziness reduction ideas
  - share the duplicate geometry by integrating the parts
- Common occurrences
  - Sound insulation/Heat shields
  - Air ducts
  - Trim
- Examples
  - e-box/u-wall (file: U-Channel Bracket for Cables.pdf)
  - Console layers (file: Console\_Laziness\_Evaluation\_Report.pdf)

## Duplicate Geometry (ex. Heat Shield mounted on Body)

1

Heat Shield mounted on the Control Unit Bracket

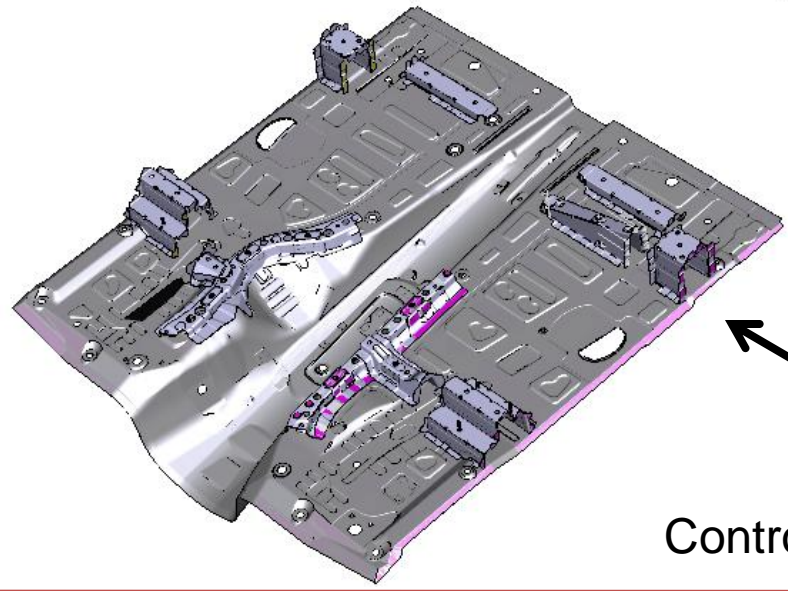


2

Heat Shield

3

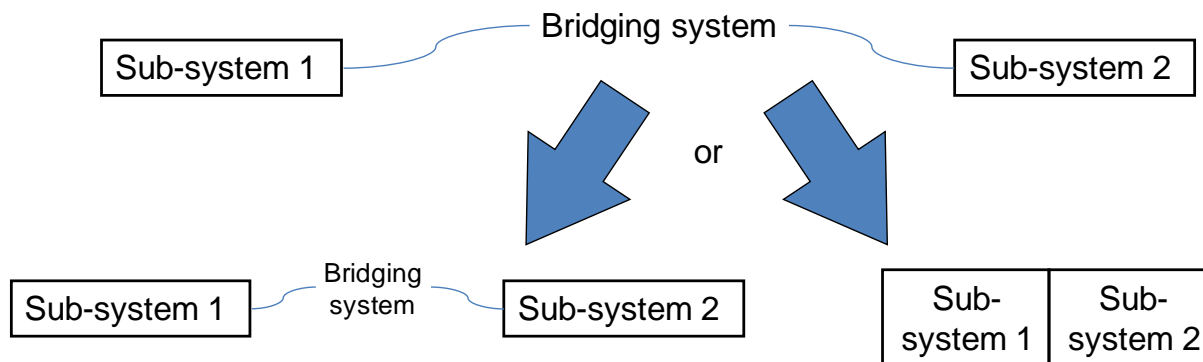
Control Unit Bracket



## Bridging systems

Parts that bridge the gap between two spatially disconnected sub-systems.

- The bridging part should be marked with the indicator
- Laziness reduction ideas
  - The length of bridging systems should be reduced or eliminated
- Common occurrences
  - Hoses
  - Wire harnesses
  - Air ducts
- Examples
  - Air ducts in console



## Bridging systems (ex. Various)

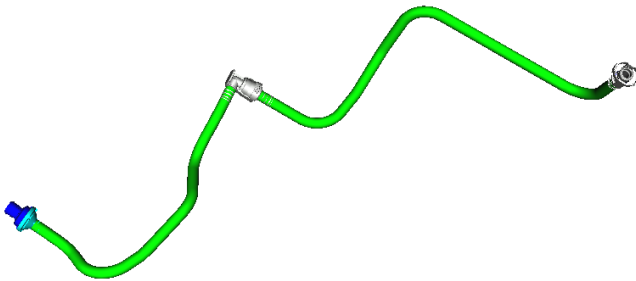


Figure 1: Vacuum lines

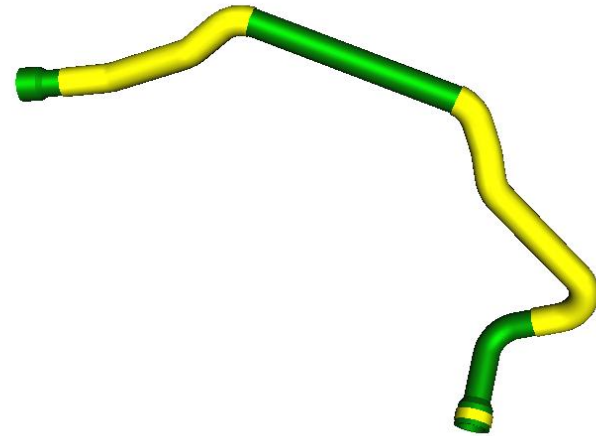


Figure 2: Radiator hose

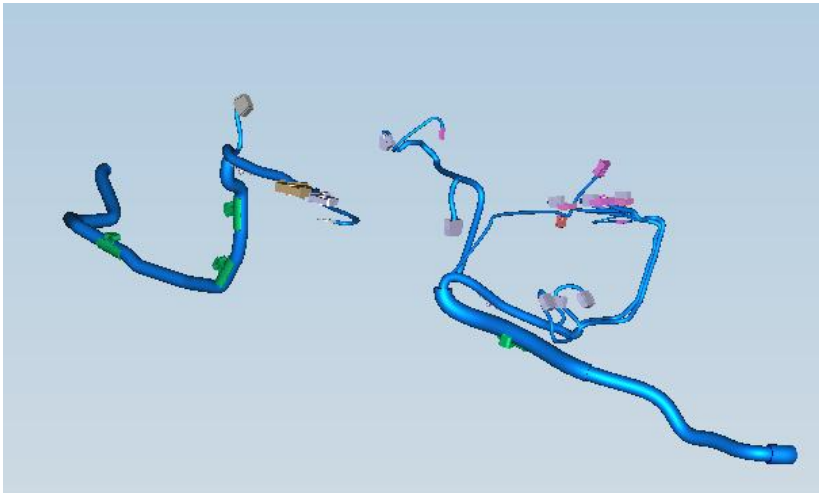


Figure 3: Console interior wiring harness

## Material Flow Restriction

Parts whose purpose is to restrict a material flow

- The restricting part should be marked with the indicator
- Laziness reduction ideas
  - Minimize the thickness of the restricting part
- Common occurrences
  - enclosures
- Examples
  - headlight assembly (file: headlight\_assembly.pdf)
  - e-box (file: U-Channel Bracket for Cables.pdf)

# Material Flow Restriction (ex. Various)

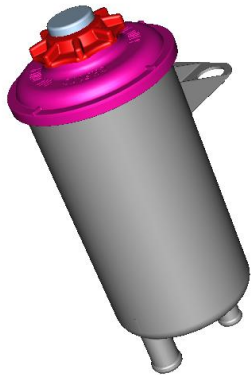


Figure 1: Oil reservoir

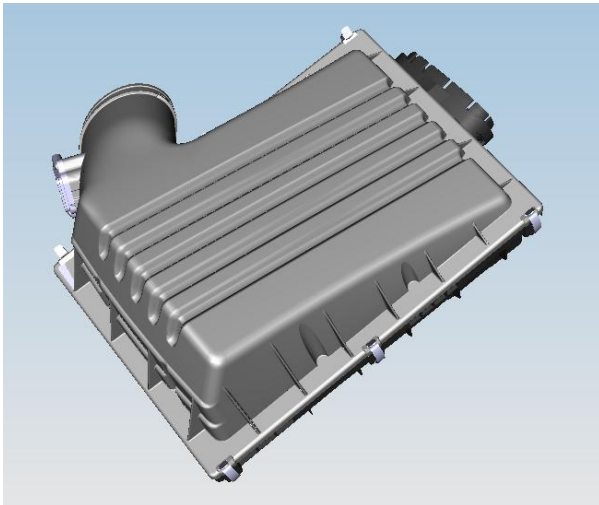


Figure 2: Air cleaner assembly



Figure 3: Fender seal

## Fastener

A part that physically joins two or more other parts and does not need to be removed for normal operation

- The fastener should be marked with the indicator
- Laziness reduction ideas
  - Glue, weld, etc. the parts together instead of using a fastener
- Common occurrences
  - Screws
  - Clips
  - Snap features
- Examples

# Identification Method

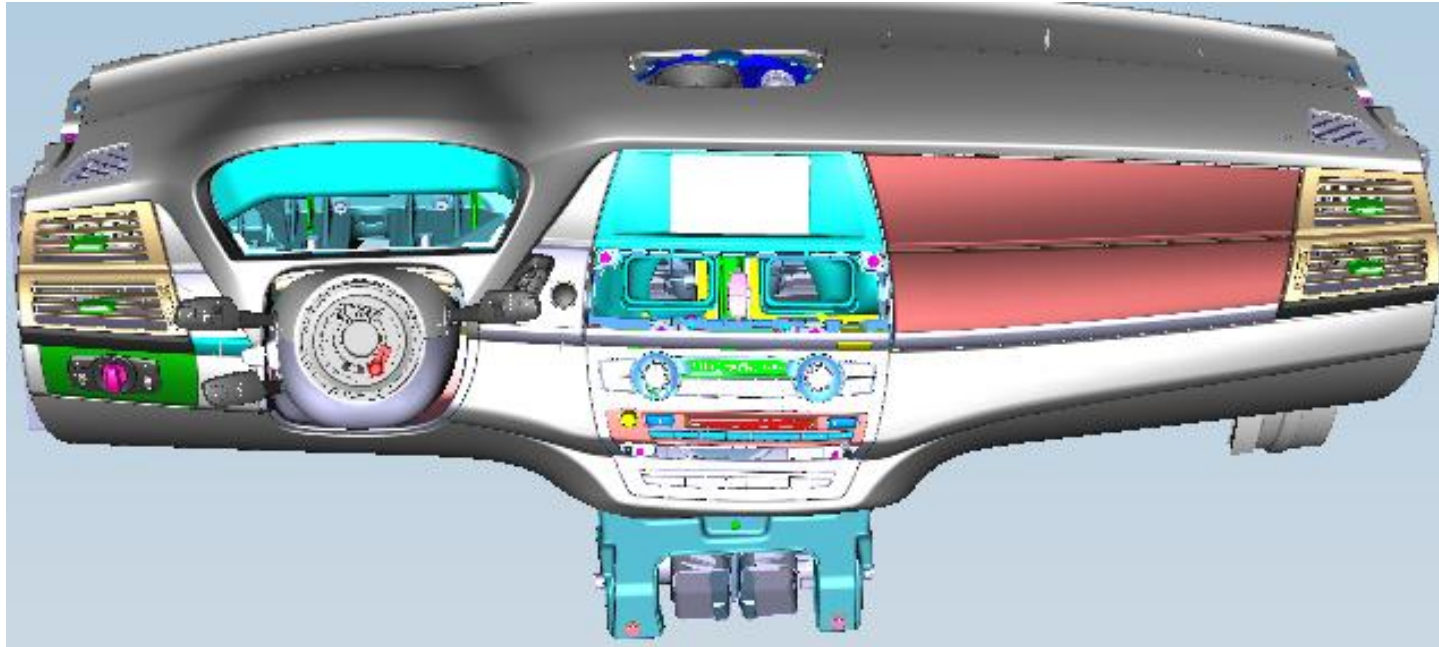
## Step 1: Selecting a Part for Review

1. Choose a subassembly for investigation.
2. Select part to review.
3. Obtain part description and mass
4. Update database with part information.

STEP 1		STEP 4						STEP 1	STEP 5		
Part Index	Description	rigid-to-rigid connection	support for a flexible, non-moving part	positioning feature	duplicate geometry	fastener	bridging system	material flow restriction	Mass (g)	Estimated Mass Savings Per Part	Estimated Mass Savings Per Part (g)
1											
...											
2											
...											
3											
...											
							Sum:				



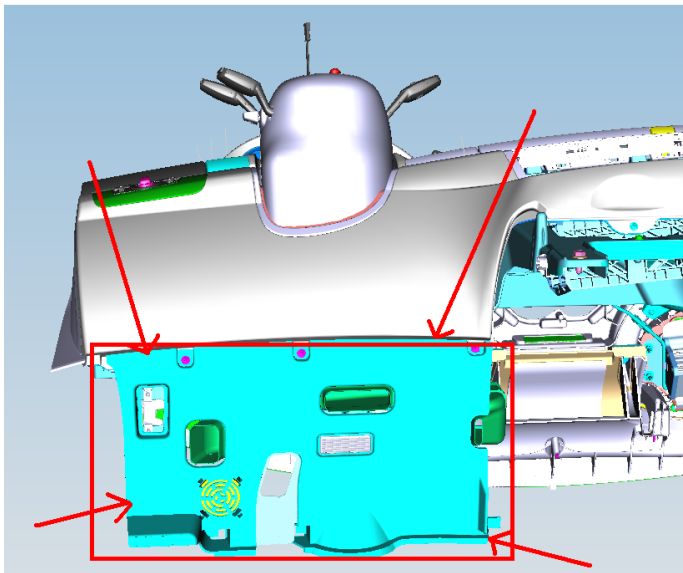
## Dashboard Example



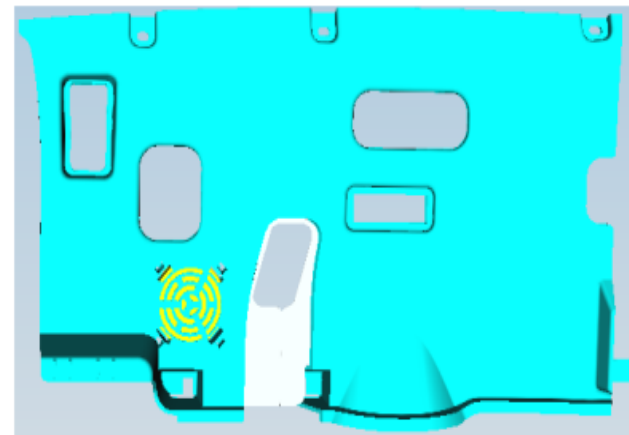


## Step 2: Understanding the Interactions of the Part

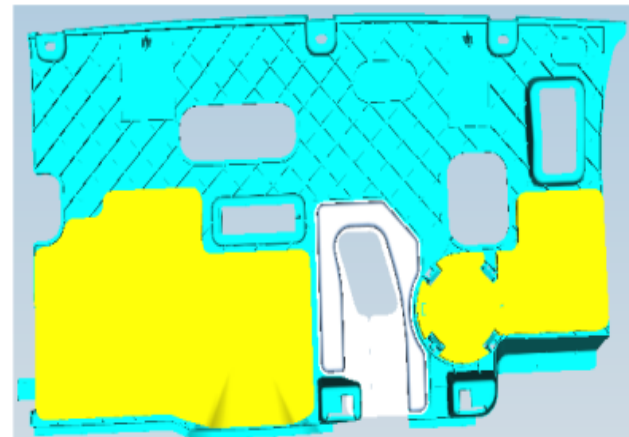
Add or remove the necessary components to see how the part is connected its surroundings.



View of Dashboard Assembly from Accelerator Pedal Location



FRONT VIEW

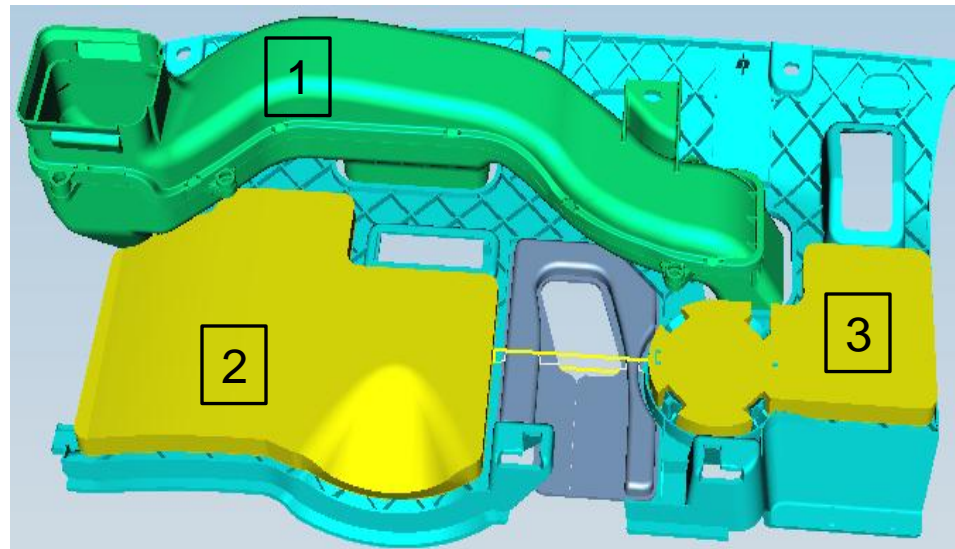


BACK VIEW

Trim Panel - Foot Control (Front and Back Views)

## Step 3: Understanding Function/Purpose of the Part

Analyze the actions and relationships with other parts in the model



Trim Panel Foot Controls with Internal Components

## Step 4: Review Part using the Laziness Indicators

Use the indicator checklist against the selected part.

STEP 1		STEP 4						STEP 1	STEP 5		
Part Index	Description	rigid-to-rigid connection	support for a flexible, non-moving part	positioning feature	duplicate geometry	fastener	bridging system	material flow restriction	Mass (g)	Estimated Mass Savings Per Part	Estimated Mass Savings Per Part (g)
1											
...											
2											
...											
3											
...											
							Sum:				

## Indicator Evaluation

1. Rigid-to-Rigid Connection – **NO**; The panel is only attached to the body on one side thus violating the rule of one rigid part being connected to another part via an immediate rigid part.
2. Support for a Flexible, Non-Moving Part – **NO**; The panel is not attached to a flexible part nor is support one.
3. Positioning Feature – **NO**; If the screws were removed after assembly, the paneling would not stay in place.
4. Fasteners – **NO**; The screws would fall under Indicator 7, Fastener. By the definition of the Fastener indicator, the screws attached would be marked as yes but the part would not be.
5. Bridging Systems – **NO**; Air ducts flow through the slot on the trim panel but the paneling is not transferring material. Air ducts themselves would be identified as a Bridging System instead.
6. Material Flow Restriction – **NO**; This is not present with the trim panel although there are parts attached to the paneling.
7. Duplicate Geometry – **YES**; There is overlapping on the back side of the trim because the geometry is similar especially around the curvature.

Part Name: Trim Panel - Foot Control			
No.	Indicators	Yes	No
1	Rigid-to-Rigid Connection		X
2	Support for a Flexible, Non-moving Part		X
3	Positioning Feature		X
4	Duplicate Geometry	X	
5	Bridging Systems		X
6	Material Flow Restriction		X
7	Fastener		X

## Evaluate Mass Percent Reduction

Estimate Mass Percent Reduction once the redesign is completed

STEP 1		STEP 4						STEP 1	STEP 5		
Part Index	Description	rigid-to-rigid connection	support for a flexible, non-moving part	positioning feature	duplicate geometry	fastener	bridging system	material flow restriction	Mass (g)	Estimated Mass Savings Per Part	Estimated Mass Savings Per Part (g)
1											
...											
2											
...											
3											
...											
Sum:											

