|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | | |  |
|  |  | | |  |
|  | Overhead Lighting (Map/Dome Lights) | | |  |
|  | (F000058) | | |  |
|  |  | | |  |
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| Date Issued | **2021/03/02** | | |  |
| Date Revised | **yyyy/mm/dd** | | |  |
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|  | | | | |
|  | | | | |
| Document Approval | | | | |
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| Ken Cunningham | Functional Safety | | kcunni16@ford.com |  |

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**How to Use this Template**

Follow the [RE process definition](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_S-Rj8EHW_KKHa9Bz6IpdSw)) in Stages for [Creating a Feature Definition](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_VsOScGqJVwi5zd82DgHb6g)) to derive the information relevant for this document.

To get more information about the RE information model and the Concept, Logical and Technology abstraction level refer to the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+for+SW+Enabled+Features). For details on the Ford Functional Safety (ISO26262) process refer to the [Ford Functional Safety SharePoint](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Pages/default.aspx).

**Important:**

Use only these RE specification macros to create/insert requirements in this specification. Use of RE specification macros is a prerequisite for seamless VSEM import of the specification content.

Download RE\_SpecificationMacroTemplate.dotm from chapter “Utilities” on [page “Specification Templates” in the RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Specification+templates) and follow instructions at “[How to use the Specification Templates](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates?src=contextnavpagetreemode)” on how to enable and use the macros and the requirements templates in this specification.

Once the specification is complete it should be imported to VSEM (refer to ["How to import specifications into VSEM as separate requirements"](http://wiki.ford.com/pages/viewpage.action?pageId=104991616&src=contextnavpagetreemode)).

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# Introduction

## Document Purpose

A Feature Document (FD) document defines a Feature on [Concept Level](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_Y6ftAPI2VsW5zd82DgHb6g)). It specifies **what** the feature shall do and how it shall behave from customer perspective. It should also provide reasoning and background **why** we have the feature in the vehicle.

The FD also serves as an Item Definition as defined by ISO26262 for those features, which follow the Ford Functional Safety process. Refer [FFSG01.10 Feature Document Guideline](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Released%20Templates%20Guidelines%20and%20Examples/Guidelines/FFSG01.10_FeatureDocument_Guideline.pdf) for how to apply the Feature Doc template for Functional Safety.

## Document Scope

This Feature Document (FD) specifies the following features:

|  |  |  |  |
| --- | --- | --- | --- |
| **Feature ID** | **Feature Name** | **Owner** | **Reference** |
| F000058/D | Overhead Lighting (Map/ Dome Lights) | jgajjar@ford.com | <Add VSEM Link> |
|  |  |  |  |

Table 1: Features described in this FD

## Document Audience

The FD is written by the feature owner of <Map/Dome Lights / Body Interiors>. All Stakeholders, i.e., all people who have a valid interest in the feature should read and, if possible, review the FD. It needs to be guaranteed, that all stakeholders have access to the currently valid version of the FD.

**#Hint:** The FD template has the IP Classification “Proprietary” by default. IP Classification “Confidential” might be required in some cases, e.g. by Ford Functional Safety.

**#Macro:** [Add Ins -> Edit Document Properties macro](https://wiki.ford.com/pages/viewpage.action?pageId=174654255) (select “Proprietary” for “Document Classification”)

### Stakeholder List

For the latest list of stakeholders of the feature and their influence refer to <Put VSEM Link here>.

**#Hint:** Refer to [Ford RE Wiki – Stakeholder List](http://wiki.ford.com/display/RequirementsEngineering/Stakeholder+Analysis) on how to create a stakeholder list. The stakeholder list should be stored in VSEM in the pseudo folder “General Data Artifacts” of the corresponding feature.

**#Link:** [Stages - RE Identify Sources of Feature Requirements](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_M73_YEgVeAOY2aIJCaFfcg))

Table List of Stakeholders

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  |
| **Name** | **CDSID/phone** | **Description of Stake** | **Contact date** | **Elicitation response** | **Review worksheet** | **Review meeting** |
| Herta Llusho | hllusho | Core Feature Supervisor |  |  |  |  |
| Ken Cunningham | kcunni16 | Body Functional Safety |  |  |  |  |
| Steven Antilla | santilla | Interior Lighting Supervisor |  |  |  |  |
| Dave Bergen | dbergen5 | Interior Lighting D&R |  |  |  |  |
| Elizabeth Wickey | ewickey | Interior Lighting Electrical |  |  |  |  |
| Jason Emrich | jemrich | Optics Engineer |  |  |  |  |
| Bill Crafts | wcrafts1 | OZM D&R |  |  |  |  |
| James Baker | jbake286 | OZM D&R |  |  |  |  |
| Mark Dewitt | Mdewitt9 | BCM D&R |  |  |  |  |
| John Barrs | jbarrs | BCM Software |  |  |  |  |
| Brinda Ganesan | fbrinda | CIED Engineer |  |  |  |  |
| Demetrius Gault | Djohn840 | Sync Wireframe Engineer |  |  |  |  |
| Trupti Masurkar | Tmasurka | SYNC Product Engineer |  |  |  |  |
| Neelima Majjiga | Nmajjiga | SYNC Engineer |  |  |  |  |

## Document Organization

### Document Context

Refer to the [Specification Structure page](http://wiki.ford.com/display/RequirementsEngineering/Specification+templates) in the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+for+SW+Enabled+Features) to understand how the FD relates to other Ford Requirements Documents and Specifications.

### Document Structure

The structure of this document is explained below:

**Introduction** – Explains how to use this document including responsibilities and requisite documents. Explains the terminology. Gives a clarification of the definitions, concepts and abbreviations used in the document.

**Feature Overview** – States briefly the background and the purpose of the feature, feature variants and corresponding regions and markets. Also includes input requirements, assumptions and constraints.

**Feature Context** – describes all external entities, which have an influence on the feature.

**Feature Modeling** – Contains Use Case, Driving Scenarios, State Charts to describe the functional behavior of the feature.

**Feature Requirements** – Lists functional and non-functional requirements of the feature.

**Functional Safety** – Lists System Behaviors, Safety Goals and Safety Requirements of the feature.

**Cybersecurity**  – Lists Security Goals and Security Requirements of the feature.

**Architecture** – Shows the coarse architecture, which the feature requirements are deployed to. Describes the elements and the boundary of the feature as well as the decomposition and distribution of associated functions.

**Traceability Matrix** – Traceability Matrix.

**Open Concerns** – List of Open Concerns

**Revision History** – Document Change History including a list of new or modified requirements. The requirements in this document are tagged, and this section contains different types of tables listing all, new, or changed requirements by their title and page no.

**Appendix** – Appendix

## Document Conventions

### Classification of Chapters

A chapter is considered mandatory, unless the chapter or its parent chapter(s) are categorized by using the tag:

**#Classification:** Some Condition

If no requirement/other content is known for a mandatory chapter, leave a statement “Not Applicable”

Some chapters have a follow certain rules in context of specific Ford processes, e.g. Functional Safety. This is indicated at the beginning of the corresponding chapter by the tags:

**#Functional Safety:** Some process specific explanation

**#Cybersecurity:** Some process specific explanation

### Requirements Templates

Refer to “[How to use the Specification Templates](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates?src=contextnavpagetreemode)” on how to use the specification templates and the VBA macros to create/edit the requirements in the specifications.

#### Requirements Attributes

The templates provided by *Specification\_Macros.dotm* define a list of attributes for each requirement. This helps to classify the requirement. The attributes are explained at [RE Wiki - Requirements Attributes](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes?src=contextnavpagetreemode).

## References

### Ford Documents

List here all Ford internal documents, which are directly related to the feature.

| **Reference** | **Title** | **Doc. ID** | **Document Location** | **Revision** |
| --- | --- | --- | --- | --- |
|  | Internal Lighting Specification | **RQT-170200-020520** | <https://www.fede.ford.com/awc/#/teamcenter.search.search?searchCriteria=ID:RQT-170200-020520&filter=SE4_Req_StandardRevision.se4_RequirementState%3DReleased~~Categorization.category%3DRequirements~~WorkspaceObject.object_type%3DSE4_RequirementRevision> |  |
|  | BCM Functional Specification | **FS-MU5T-14B476-AAB002** |  |  |
|  |  |  |  |  |

Table 3: Ford internal Documents

### External Documents and Publications

The list of external documents could include books, reports and online sources.

**#Hint:** You may refer to [IEEE Citation Reference](http://www.ieee.org/documents/ieeecitationref.pdf) on how to format a reference.

| **Reference** | **Document / Publication** | **Document Location** |
| --- | --- | --- |
| **REG-130101-003390** | FMVSS 102 |  |
|  |  |  |

Table 4: External documents and publications

## Glossary

**#Hint**: Terms, concepts and abbreviations used in the document shall be defined and illustrated here. Note that changes to terms and/or concepts described in this section tend to cause major updates to this document.

The tables below have feature specific definitions and abbreviations. For additional, non-feature specific terms please refer to the [RE Glossary](https://wiki.ford.com/display/RequirementsEngineering/RE+Glossary)

### Definitions

| **Definition** | **Description** |
| --- | --- |
| Global On/OFF | This switch is a request to TURN ON/OFF all map/dome lamps. Activation of this switch will cause the Master Lamp to toggle between the available states depending upon what state the Master Lamp was in when Global On/Off was activated. |
| Door Defeat/Auto Mode | This switch makes the interior lighting system suppresses the Courtesy & Embrace ramp ON/OFF functions when disabled. This feature is 100% controlled by the User/passenger. |
| Local On/OFF | These button(s) are a request to TURN ON/OFF individual Map/Dome Lamps. |

Table 5: Definitions used in this document

### Abbreviations

| **Abbr.** | **Stands for** | **Description** |
| --- | --- | --- |
| OHC | Overhead Console |  |
| ML | Map Lamp |  |
| LML | Left Map Lamp |  |
| RML | Right Map Lamp |  |
| DD | Door Defeat |  |
| W/F | Welcome Farewell |  |

Table 6: Abbreviations

### Parameters / Values

| **Name** | **Description** | **Range / Resolution** |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

Table 7: Parameters / Values used in this document

# Feature Overview

## Purpose and Description of Feature

**#Hint:** Some descriptive text to explain the purpose and functionality of the feature.

**#Link:** [Stages – RE Write a Feature Description](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_SwnFgNkr2BSXFOeCKnyqmw))

The dome lights are interior lighting features which comprises of the lights located in Rear Dome (Between first and second row, optional between second and third row). They are provided to light the cabin. The feature has multiple ways of input like Global ON/OFF, Door Defeat/Auto Mode.

The map lights are individual reading lights which are either part of front dome and rear dome or available on side roof panel. The user can access them by button press (Local ON/OFF). They light up individual region so as not to disturb other people in vehicle.



Figure Feature Image

## Feature Variants

**#Hint:** List all known variants of the feature applying to current and upcoming programs. Reference each variant by a descriptive name. If no variant exists, state “No Feature Variants”. The “Variant Description” table column should give a short informative text, which describes the variant of the feature.

Requirements in chapter “Feature Requirements”, which do not apply for all variants, should clearly state, which variants they are applicable for.

|  |  |  |
| --- | --- | --- |
| Variant Name | Variant Description | Remarks |
|  | No Feature Variants |  |
|  |  |  |
|  |  |  |

Table 8: Feature Variants

### Regions & Markets

**#Hint:** Description of purpose and functionality of the feature. If there is no variant, give feature name in first column.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Market /**  **Region**  Variant Name | **North America** | **South America** | **Europe** | **Middle East / Africa** | **Asia / Pacific** | **China** |
| **Dome Lights** | *<Mandatory>* | *<Mandatory>* | *<Mandatory>* | *<Mandatory>* | *<Mandatory>* | *<Mandatory>* |
| **Map Lights** | *<Optional>* | *<Optional>* | *<Optional>* | *<Optional>* | *<Optional>* | *<Optional>* |

Table 9: Regions & Markets

## Input Requirements/Documents

**#Hint:** List relevant documents or requirements, which should be considered when considered when specifying the requirements in chapter “Feature Requirements” of this document. When finalizing the spec, the feature owner should check, if all inputs have been properly considered by derived/outgoing requirements.

**#Link:** Refer to “Forward Traceability” at [Stages – RE Traceability Record](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/artifact/_ZbIhsK4EkzaN49uPh7SLuQ))

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reference**  (Reference as listed in Ch. “References) | **Section/Requirement** | **Description** | **Derived Requirement**  (optional – reference to requirement in Ch. “Feature Requirements”) | |
| **Attribute Requirements** | | | | |
| **F001002** | Lincoln Embrace Ford Welcome Farewell |  |  | |
| **RQT-002004-704098** | Ford Welcome/Farewell and Lincoln Embrace Strategy |  |  | |
| **RQT-191001-009906** | ELCOMP Requirement |  |  | |
| **Ford Engineering Standards** | | | | |
| [**RQT-170200-020520**](https://www.fedewb.ford.com/#/object-viewer?uid=00ctqKYqoPHwuB&tab=Overview) | Interior Lighting System Specification |  |  | |
|  |  |  |  | |
| **Legal Regulations** | | | | |
|  |  |  |  | |
|  |  |  |  | |
| **Industry Standards** | | | | |
| ISO26262 | Functional safety | Functional safety | The system must be implemented according to Ford’s implementation of functional safety. |
| Design Failure Mode Analysis (DFMEA) | DFMEA | DFMEA | The system must be implemented according to Ford’s DFMEA. |
|  |  |  |  | |
| **Other Sources** | | | | |
|  | <Example: some stakeholder document> |  |  | |
|  |  |  |  | |

Table 10: Input Requirements/Documents

## Lessons Learned

**#Hint:** Additional information and lessons learned from previous development or related features. A typical source for Lessons Learned is the FMA Quality History.

**#Functional Safety:** Insert (or reference) additional safety information and lessons learned from previous development of related items /features or legacy features, e.g., potential consequences of behavior shortfalls including known failure modes and hazards, already known safety requirements.

**#Link:** [FFSG01.10 Feature Document Guideline](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Released%20Templates%20Guidelines%20and%20Examples/Guidelines/FFSG01.10_FeatureDocument_Guideline.pdf)

## Assumptions

**#Hint:** A list of known assumptions concerning the effects of the feature’s behavior on other features or elements (i.e., dependencies) as well as assumptions on the behavior expected by the feature (e.g. known limitations). During the course of the feature development most of those assumptions are typically either converted into actual requirements or discarded at some point – such that this chapter remains mostly empty.  
**#Functional Safety:** For assumptions, which are relevant for the Functional Safety process refer to chapter 6.2 “Functional Safety Assumptions”

# Feature Context

## Feature Context Diagram

**#Hint:** High level diagram of feature interactions with the environment, people or other feature or other external entities.

**#Functional Safety:** The Context Diagram is not required, if the Feature Document is only used as an Item Definition (not as a requirements specification). In that case the Item Boundary is defined in chapter “Logical Architecture”.

**#Link:** [*Stages- RE Model the Context*](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_RwbBQG35kpCMg85u0m-tig))

**

Figure 2: Sample Context Diagram

## List of Influences

|  |  |  |
| --- | --- | --- |
| **ID** | **External Entity** | **Influence Description** |
| I1 | User | When the user presses Global ON/OFF button, all Map/Dome lights would be activated or deactivated based on their current status.  User can also access individual Map Lights via Local ON/OFF button press as well.  User can also enable or disable Door Defeat to suppress and allow Courtesy and Welcome/Farewell. |
| I2 | Door Ajar Switch | The door ajar switch input will illuminate map/dome light to enhance visibility while vehicle door or liftgate or liftgate glass is open or ajar.  The door ajar switch input initiates turning OFF Map/Dome Lights when vehicle door or lift gate or liftgate glass is closed. |
| I3 | Ignition Switch | Ignition status along with Door Ajar switch status influence turn on/off Map/Dome light. |
| I4 | Vehicle Speed | Vehicle speed input along with Door Ajar switch status influence the turn on/off Map/Dome Light. |
| I5 | Welcome/Farewell | Map/Dome Lights perform Ramp On/OFF when requested by Welcome/Farewell command under its different substate: Approach, Illuminated Entry, Courtesy, Courtesy Delay & Illuminated Exit. |
| I6 | Battery SOC | If the user forgets to turn OFF Global ON or Local ON, the battery SOC will trigger TURN OFF. |
| I7 | Perimeter Alarm | Perimeter Alarm command the Map/Dome Light to turn on when the alarm sets On. |
| I8 | Crash Courtesy | Post-Crash Courtesy triggers the Map/Dome light to turn on after crash. |
| I9 | Silent Mode | Silent Mode or Police Dark Mode when activated, allows the Map/Dome lights to be controlled only when requested by user. |

Table 11: List of Influences

# Feature Modeling

**#Hint:** Use at least one of the modelling techniques listed in this chapter – and additionally a functional decomposition (refer to chapter 8.1 “Functional Decomposition”) – to gather and analyze the feature requirements.

**#Link:** [*Stages- RE Analyze Feature Requirements*](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_E_h9QKJNeBGY2aIJCaFfcg))

## Operation Modes and States

**#Classification:** Optional (Mandatory for Functional Safety)

**#Hint:** Insert (or reference) a description of the feature’s operation modes and states by one or multiple state machine diagrams. The purpose of the state machine is to help analyze the requirements, i.e., if the behavior described in the requirements is consistent and complete. Therefore, the state machine should not provide details, which are not referenced in feature level requirements. It should typically show only those states and transitions, which describe the high-level behavior facing or impacting the user.

**#Link:** [Stages - RE Model the States and Modes](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_iKH7oFMNkpOMg85u0m-tig))



Figure 3: Feature Operation Modes and States

|  |  |  |
| --- | --- | --- |
| **State** | **Description** | **Requirements Reference** (optional) |
| S1 | **OFF State:**  All lights are OFF  OFF state can be reached from DD Disabled or DD Enabled mode by W/F Trigger.  OFF state can also be reached when User/Passenger forgets to turn OFF Map and/or Dome Lights and the engine is in OFF state, Battery saver TURNs OFF the lights. |  |
| S2 | **Door Defeat Disabled:**  DD Disable state allows welcome farewell / Courtesy input.  DD Disabled mode can be reached from OFF state if the user set lights in DD Disabled mode in last trip or by HMI switch input in DD Enable mode. |  |
| S2 A | **DD Disable Global ON: Welcome Farewell / Courtesy/ Manual:**  All Lights Turn ON in this mode.  In DD Disable State, triggers from Courtesy Lighting and W/F will Ramp ON all Lights.  If Lights are not in Ramp active mode via courtesy, then Global On mode can be reached using HMI input. |  |
| S2 B | **DD Disable Global OFF:**  All lights TURN OFF in this state.  This state can be reached from Global On state either via Courtesy Ramp OFF or Global OFF switch using HMI based on the arbitration.  Individual Map Lights can be activated/deactivated in this state. |  |
| S3 | **Door Defeat Enabled State:**  DD Enable mode suppresses Courtesy and W/F.  This state can be reached from OFF state if the user has kept the lights in DD Enable state during last trip or from DD Disable using switch in HMI. |  |
| S3A | **DD Enable Global OFF**  In this state, All Map/Dome lights Turn OFF.  This state can be reached from DD Enable Global ON using switch in HMI.  This state can also be reached from DD Disabled Global ON by pressing DD Disable switch in HMI when lights are in Ramp Active.  Individual Map/Dome Lights can be activated/deactivate. |  |
| S3B | **DD Enable Global On**  In this state, All Map/Dome Lights Turn On.  This state can be reached from DD Enable Global OFF using switch in HMI.  This state can also be reached from DD Disable Global ON mode by pressing DD Enable switch in HMI when the lights are in Global On via Global on button press. |  |

Table 12: Operation Modes and States

|  |  |  |
| --- | --- | --- |
| **Transition ID** | **Description** | **Requirements Reference**  (optional) |
| T1 | DD Disabled Mode set in previous trip. |  |
| T2 | DD Enabled Mode set in previous trip. |  |
| T3 | HMI input for Global ON in DD Disable state. |  |
| T4 | Welcome/Farewell Ramp ON. |  |
| T5 | Courtesy Input (Cabin Door Ajar) for Ramp ON |  |
| T6 | Trigger Global On or Ramp On based on arbitration. |  |
| T7 | Courtesy Input (Cabin Door Close) for Ramp OFF |  |
| T8 | HMI Input for Global OFF in DD Disable state. |  |
| T9 | Trigger Global OFF or Ramp OFF based on arbitration. |  |
| T10 | HMI Request Local ON in DD Disable state. |  |
| T11 | HMI Request Local OFF in DD Disable state. |  |
| T12 | Manual activation from DD Disabled Global OFF to DD Enable Global OFF via HMI DD Enable input. |  |
| T13 | Manual activation from DD Enable Global OFF to DD Disable Global OFF via HMI DD Disable input. |  |
| T14 | HMI input for Global On in DD Enable state. |  |
| T15 | HMI input for Global OFF in DD Enable state |  |
| T16 | HMI Request Local ON in DD Enable state. |  |
| T17 | HMI Request Local OFF in DD Enable state. |  |
| T18 | DD Enable Global On to DD Disable Global On via HMI DD Disable Input |  |
| T19 | HMI DD Enable Input in DD Disable Global On State. |  |
| T20 | If DD Disable Global ON == Courtesy Ramp ON, Trigger DD Disable Global OFF. |  |
| T21 | If DD Disable Global ON== Manual Global On, state change to DD Enable Global ON. |  |
| T22 | Battery Saver trigger in DD Enable Global ON |  |
| T23 | Battery Saver trigger in DD Enable Local On |  |
| T24 | Battery Saver trigger in DD Disable Local On |  |
| T25 | Battery Saver trigger in DD Disable Global On |  |
| T26 | All Lights Turn OFF based on Battery Saver trigger. |  |
| T27 | Welcome Farewell Ramp OFF trigger in DD Enable Global OFF. |  |
| T28 | Welcome/Farewell Ramp OFF trigger in DD Disable Global On. |  |

Table 13: Transitions between Operational Modes and States

## Use Cases

**#Classification:** Optional (Mandatory for Functional Safety)

**#Hint:** Describe (or reference) the ways the user interacts with the system

**#Link:** [Stages - RE Model a Use Case](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_A8UUYPnykpCMg85u0m-tig))

### Use Case Diagram

**

Figure 4: Use Case Diagram

### Actors

| Actor | Description |
| --- | --- |
| User | 1. User can press the Global ON/OFF to activate all Map and/or Dome Lights using HMI. 2. User can press the Local ON/OFF switch to access individual Map Light using HMI. 3. User can activate or deactivate DD Defeat using HMI. 4. User can also activate or deactivate Map/Dome Lights through Door Ajar, Vehicle Lock/Unlock or Vehicle speed, Ignition Switch. |
| Battery Saver | Battery Saver feature triggers Turn off Map/Dome lights to avoid battery drain below threshold. |

Table 14: List of Actors

### Use Case Descriptions

**#Classification:** Optional (Mandatory for Functional Safety)

**#Macro:** [Add Ins -> Add Requirement macro](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates#HowtousetheSpecificationTemplates-AddNewRequirement) (select “Use Case” as type)

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00001### Manual Lighting Request\_DD Defeat Enabled

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To Enable Door Defeat |
| **Actors** |  | User |
| **Precondition** |  | Door Defeat in Disable Mode |
|  |  |  |
| **Main Flow** | M1 | User presses DD Defeat Button using HMI to activate DD Defeat. |
|  |  |  |
| **Alternative Flow 1** |  |  |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  | Lights go in Door Defeat Enable Mode. Under this mode, Lights do not perform courtesy ramp. Light only perform global and local on/off. |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00002### Manual Lighting Request\_DD Defeat Disabled

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To Disable Door Defeat. |
| **Actors** |  | User |
| **Precondition** |  | Door Defeat in Enable Mode |
|  |  |  |
| **Main Flow** | M1 | User presses Door Defeat Button using HMI to deactivate DD Defeat. |
|  |  |  |
| **Alternative Flow 1** |  |  |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  | Lights go in Door Defeat Disable Mode. Under this mode, Lights perform courtesy ramp on/off when triggered by courtesy or welcome/farewell. Light also perform global and local on/off. |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00003### Manual Lighting Request\_Global On

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To Turn ON all Lights |
| **Actors** |  | User |
| **Precondition** | P1 | Lights are not in Courtesy Ramp ON Or individual map/dome light is ON |
|  |  |  |
| **Main Flow** | M1 | User press All Lights Button or Global On button using HMI to activate turn on all overhead lights. |
|  |  |  |
| **Alternative Flow 1** |  | If some map/dome lights are already ON using Local ON and user presses Global On, then remaining lights Turn ON. |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  | All Lights Turn ON |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00004### Manual Lighting Request\_Global Off

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To Turn Off all Lights. |
| **Actors** |  | User |
| **Precondition** |  | Lights are not in Courtesy Ramp ON. |
|  |  |  |
| **Main Flow** | M1 | User press All Lights Button or Global Off button using HMI to activate turn Off all overhead lights |
|  |  |  |
| **Alternative Flow 1** |  | If some map lights are ON using Local ON and user presses Global Off, the lights which were On. |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  | All Lights Turn OFF |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00005### Manual Lighting Request\_Local On

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To Turn On individual overhead lights. |
| **Actors** |  | User |
| **Precondition** | P1 | Lights are not in Courtesy Ramp On or Global On |
|  | P2 | Lights are in Global OFF position. |
| **Main Flow** | M1 | User presses Local On button using HMI to turn individual overhead lights On. |
|  |  |  |
| **Alternative Flow 1** |  |  |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  |  |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00006### Manual Lighting Request\_Local Off

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To Turn Off individual overhead lights. |
| **Actors** |  | User |
| **Precondition** |  | Lights are not in Courtesy Ramp On or Global On |
|  |  |  |
| **Main Flow** | M1 | User presses Local Off button using HMI to turn individual overhead lights Off. |
|  |  |  |
| **Alternative Flow 1** |  |  |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  |  |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00007### Courtesy Ramp ON

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To illuminate vehicle’s interior when user opens the door. |
| **Actors** |  | User |
| **Precondition** |  | 1. Door Defeat in Disable Mode. 2. Door Switch in Ajar position 3. Vehicle Ignition in Run Mode 4. Vehicle Speed less than 15kph. |
|  |  |  |
| **Main Flow** | M1 | Lights Ramp ON when either User or passenger door is/are opened or if the vehicle lift gate is opened. |
|  |  |  |
| **Alternative Flow 1** |  |  |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  |  |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00008### Courtesy Ramp OFF

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To Ramp off all lights when the user shuts the door or speed greater than 15kph. |
| **Actors** |  | User |
| **Precondition** |  | 1. Door Defeat in Disable Mode. 2. Vehicle Ignition in Run 3. Vehicle Speed greater than 15 kph. |
|  |  |  |
| **Main Flow** | M1 | Lights Ramp Off when user shuts the vehicle door or liftgate while the vehicle is in motion. |
|  |  |  |
| **Alternative Flow 1** |  | Lights Ramp Off when vehicle speed is greater than 15 kph and door is ajar state. |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  |  |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00009### Welcome/Farewell

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To illuminate vehicle’s interior during Welcome/Farewell Trigger |
| **Actors** |  | User |
| **Precondition** |  | 1. Ignition in OFF State. 2. User approaches vehicle or vehicle unlock, or user opens the door 3. Door Defeat in Disable Mode |
|  |  |  |
| **Main Flow** | M1 | Lights Ramp On when the vehicle detects user approach. |
|  |  |  |
| **Alternative Flow 1** |  | Lights Ramp On when the user unlocks the vehicle. |
|  |  |  |
| **Alternative Flow 2** |  | Lights Ramp On when the user opens the door or liftgate when ignition is in OFF State. |
|  |  |  |
| **Post-condition** |  |  |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00010### Battery Saver

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | Turn Off Overhead Lights when ignition is in OFF state to prevent battery drain. |
| **Actors** |  | Batter Saver |
| **Precondition** |  | 1. Vehicle ignition is in OFF state. 2. Courtesy Timeout timer has Elapsed. |
|  |  | 1. Ignition is OFF |
| **Main Flow** | M1 | Battery Saver command request light to Turn OFF. |
|  |  |  |
| **Alternative Flow 1** |  |  |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  |  |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00011### Manual Lighting Request\_Cargo Defeat Enabled

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To enable Cargo Defeat |
| **Actors** |  | User |
| **Precondition** |  | Cargo Defeat in Disable Mode |
|  |  |  |
| **Main Flow** | M1 | User presses Cargo Defeat Button using HMI to enable Cargo Defeat. |
|  |  |  |
| **Alternative Flow 1** |  |  |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  | Under Cargo Defeat Mode, A smart Cargo lamp when it receives a Cargo Lamp Defeat message will ignore all Courtesy On commands from the master lamp. |

###UC\_F\_Overhead Lighting (Map/Dome Lights)\_00012### Manual Lighting Request\_Cargo Defeat Disable

|  |  |  |
| --- | --- | --- |
| **Purpose** |  | To Disable Cargo Defeat |
| **Actors** |  | User |
| **Precondition** |  | Cargo Defeat in Enable Mode. |
|  |  |  |
| **Main Flow** | M1 | User presses Cargo Defeat Button using HMI to disable Cargo Defeat. |
|  |  |  |
| **Alternative Flow 1** |  |  |
|  |  |  |
| **Alternative Flow 2** |  |  |
|  |  |  |
| **Post-condition** |  |  |

## Driving and Operation Scenarios

**#Classification:** Optional (Mandatory for Functional Safety)

**#Hint:** “Driving Scenario” is a storyboard like technique, which focusses on the feature interacting with its environment.

**#Functional Safety**: Describe (or reference) driving and operating scenarios that impact the functionality of the item/feature, including potential operational and environmental constraints. The objective of this section is to describe the environment of the feature in order to understand its impact on the feature. Concept FMEA and P-diagram may be an input for this section.

**#Macro:** [Add Ins -> Add Requirement macro](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates#HowtousetheSpecificationTemplates-AddNewRequirement) (select “Scenario” as type)

**#Link:** [Stages - RE Model a Driving Situation](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_KC_OMN4hkpGMg85u0m-tig))

## Decision Tables

**#Classification:** Optional (Remove, if not used)

**#Hint:** Use decision table, if behavior is not state based (in that case prefer state chart from Ch. 4.1) and based purely on current inputs.

**#Link:** [RE Wiki – Decision Tables](http://wiki.ford.com/display/RequirementsEngineering/Decision+Table).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input 1** | **Input 2** | **Input 3** | **Input 4** | **Output** |
| Value I1 | Value I2 |  |  | Value O1 |
|  |  |  |  |  |

Table 15: Sample Decision Table

# Feature Requirements

**#Hint**: Include functional requirements specifying quality, performance and availability of the functionality.   
The subsections contained in this chapter help not to forget aspects, which are typically relevant on Concept Level. It is not possible and not required to always strictly classify a requirement according to the subsections.

Alternatively, this chapter could be structured according to the functions derived in chapter “Functional ”, i.e., each function comes with its own heading and related requirements are listed beneath.

**#Functional Safety:** In general, safety requirements are not listed here. However, it is possible that later in the development process, a non-safety requirement becomes a safety requirement. In such a case it may remain on this list.

**#Macro:** [Add Ins -> Add Requirement macro](https://wiki.ford.com/pages/viewpage.action?pageId=174654231) (select “Requirement” as type)

**#Link:** [Stages - RE Specify Feature Requirements](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_Q_2kYJ6ceBKY2aIJCaFfcg)).

## Functional Requirements

**#Hint:** Functional requirements specify the functionality of the feature, i.e., what the feature shall do. Functional requirements should not only specify the normal flow/behavior, but also exceptional cases/error handling.

###R\_F\_ Overhead Lighting (Map/Dome Lights) \_00001### Battery Saver

The feature shall Turn OFF lights when battery voltage is below threshold (Refer ELCOMP RQT-191001-009906) or after the Courtesy Battery Save Timer has elapsed.

|  |  |  |
| --- | --- | --- |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | 6.1b | End of Requirement |

###R\_F\_ Overhead Lighting (Map/Dome Lights) \_00002### Compliance with Welcome Farwell/Courtesy Feature

The feature shall accept the commands from Welcome/Farewell and Courtesy in DD Disable Mode.

|  |  |  |
| --- | --- | --- |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | 6.1b | End of Requirement |

[Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version

###R\_F\_ Overhead Lighting (Map/Dome Lights) \_00003### Manual Operation

The feature shall have means to TURN ON/OFF through HMI Interface. (Refer FMVSS 102 **REG-130101-003390**)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: ###R\_F\_Map/Dome Lights\_00003### | | | | | | | |
| **Rationale** |  | | | | | | | |
| **Acceptance Criteria** |  | | | | | | | |
| **Notes** |  | | | | | | | |
| **Source** |  | | | | | **Owner** |  | |
| **Source Req.** |  | | | | | **V&V Method** |  | |
| **Type** | Choose an item. | | | **Priority** | Choose an item. | **Status** | Choose an item. | |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1b | End of Requirement | | | | |

###R\_F\_ Overhead Lighting (Map/Dome Lights) \_00004### Fading Capability

The feature shall have Ramp ON/OFF capability during Welcome/Farewell and Courtesy Trigger.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: ###R\_F\_Map/Dome Lights\_00003### | | | | | | | |
| **Rationale** |  | | | | | | | |
| **Acceptance Criteria** |  | | | | | | | |
| **Notes** |  | | | | | | | |
| **Source** |  | | | | | **Owner** |  | |
| **Source Req.** |  | | | | | **V&V Method** |  | |
| **Type** | Choose an item. | | | **Priority** | Choose an item. | **Status** | Choose an item. | |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1b | End of Requirement | | | | |

###R\_F\_ Overhead Lighting (Map/Dome Lights) \_00005### Door Defeat Enabled

The feature shall avoid trigger from Welcome/Farewell and Courtesy when Door Defeat is Enabled.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: ###R\_F\_Map/Dome Lights\_00003### | | | | | | | |
| **Rationale** |  | | | | | | | |
| **Acceptance Criteria** |  | | | | | | | |
| **Notes** |  | | | | | | | |
| **Source** |  | | | | | **Owner** |  | |
| **Source Req.** |  | | | | | **V&V Method** |  | |
| **Type** | Choose an item. | | | **Priority** | Choose an item. | **Status** | Choose an item. | |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1b | End of Requirement | | | | |

###R\_F\_ Overhead Lighting (Map/Dome Lights) \_00007### Manual Control during Ramp

Global and Local control of Map/Dome lights are inactive during Courtesy & W/F ramp ON.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: ###R\_F\_Map/Dome Lights\_00007### | | | | | | | |
| **Rationale** |  | | | | | | | |
| **Acceptance Criteria** |  | | | | | | | |
| **Notes** |  | | | | | | | |
| **Source** |  | | | | | **Owner** |  | |
| **Source Req.** |  | | | | | **V&V Method** |  | |
| **Type** | Choose an item. | | | **Priority** | Choose an item. | **Status** | Choose an item. | |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1b | End of Requirement | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Requirement ID: ###R\_F\_Map/Dome Lights\_00004### | | | | | |
| **Rationale** |  | | | | | |
| **Acceptance Criteria** |  | | | | | |
| **Notes** |  | | | | | |
| **Source** |  | | | **Owner** |  | |
| **Source Req.** |  | | | **V&V Method** |  | |
| **Type** | Choose an item. | **Priority** | Choose an item. | **Status** | Choose an item. | |

###R\_F\_ Overhead Lighting (Map/Dome Lights) \_00008### Local Control during Global

Local Map/Dome light control is deactivated during Global On.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: ###R\_F\_Map/Dome Lights\_00008### | | | | | | | |
| **Rationale** |  | | | | | | | |
| **Acceptance Criteria** |  | | | | | | | |
| **Notes** |  | | | | | | | |
| **Source** |  | | | | | **Owner** |  | |
| **Source Req.** |  | | | | | **V&V Method** |  | |
| **Type** | Choose an item. | | | **Priority** | Choose an item. | **Status** | Choose an item. | |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1b | End of Requirement | | | | |
|  | |  |  | | | | |

###R\_F\_Overhead Lighting (Map/Dome Lights) \_00010### Global On

All Overhead Lights should turn ON when the user presses Global On or All Lights On command. If an individual light is already when user presses global on, then remaining lights should turn On.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: ###R\_F\_Overhead Lighting (Map/Dome Lights)\_00010### | | | | | | | |
| **Rationale** |  | | | | | | | |
| **Acceptance Criteria** |  | | | | | | | |
| **Notes** |  | | | | | | | |
| **Source** |  | | | | | **Owner** |  | |
| **Source Req.** |  | | | | | **V&V Method** |  | |
| **Type** | Choose an item. | | | **Priority** | Choose an item. | **Status** | Choose an item. | |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1a | End of Requirement | | | | |

###R\_F\_Overhead Lighting (Map/Dome Lights) \_00011### Global OFF

All Overhead Lights should turn Off when the user presses Global Off or All Lights Off command. If an individual light is already on when user presses global on, than remaining lights should turn Off.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: ###R\_F\_Overhead Lighting (Map/Dome Lights)\_00011### | | | | | | | |
| **Rationale** |  | | | | | | | |
| **Acceptance Criteria** |  | | | | | | | |
| **Notes** |  | | | | | | | |
| **Source** |  | | | | | **Owner** |  | |
| **Source Req.** |  | | | | | **V&V Method** |  | |
| **Type** | Choose an item. | | | **Priority** | Choose an item. | **Status** | Choose an item. | |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1a | End of Requirement | | | | |

###R\_F\_Overhead Lighting (Map/Dome Lights) \_00012### Local On

Individual Map/Dome light can be turn on using Local On/OFF button using HMI.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: ###R\_F\_Overhead Lighting (Map/Dome Lights)\_00012### | | | | | | | |
| **Rationale** |  | | | | | | | |
| **Acceptance Criteria** |  | | | | | | | |
| **Notes** |  | | | | | | | |
| **Source** |  | | | | | **Owner** |  | |
| **Source Req.** |  | | | | | **V&V Method** |  | |
| **Type** | Choose an item. | | | **Priority** | Choose an item. | **Status** | Choose an item. | |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1a | End of Requirement | | | | |

###R\_F\_Overhead Lighting (Map/Dome Lights) \_00013### Local OFF

Individual Map/Dome light can be turn off using Local On/OFF button using HMI.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Requirement ID: ###R\_F\_Overhead Lighting (Map/Dome Lights)\_00013### | | | | | | | |
| **Rationale** |  | | | | | | | |
| **Acceptance Criteria** |  | | | | | | | |
| **Notes** |  | | | | | | | |
| **Source** |  | | | | | **Owner** |  | |
| **Source Req.** |  | | | | | **V&V Method** |  | |
| **Type** | Choose an item. | | | **Priority** | Choose an item. | **Status** | Choose an item. | |
| [Req. Template](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) Version | | 6.1a | End of Requirement | | | | |

## Non-Functional Requirements

***#Hint:*** *Non-functional requirements specify quality attributes in addition to the pure functional behavior given by the functional requirements. Examples for quality attributes: Performance (e.g. data throughput), timing (if not already included in the functional requirements), security (e.g. how secure does an algorithm have to be), reliability (e.g. mean time between failure) or maintainability.*

### Safety

**#Classification:** Optional (Remove, if not used)

**#Functional Safety:** Only those safety requirements, which are not related to Functional Safety (ISO26262) should go here. For Functional Safety refer to chapter 6 “Functional Safety”.

### Security

**#Classification:** Optional (Remove, if not used)

**#Cybersecurity:** Only those security requirements, which are not related to the Cybersecurity (ISO21434) should go here. For Cybersecurity requirements refer to chapter 7 “Cybersecurity”.

### Reliability

**#Classification:** Optional (Remove, if not used)

## HMI Requirements

**#Hint:** Requirements in this section could specify details of e.g. the icons, the GUI or the sounds.



Figure Icon for Dome Lamps



Figure Icon for Left and Right Map Lamps



Figure Icon for Door Defeat

## Other Requirements

### Design Requirements

**#Classification:** Optional (Remove, if not used)

***#Hint:*** *Requirements of a Logical Function should be typically agnostic of their SW/HW implementation*. If for *specific reasons the function owner needs to define explicitly design constraints on the solution, it can be done in this chapter.*

### Manufacturing Requirements

### Service Requirements

***#Hint:*** *Requirements in this section could specify, e.g. what needs to be considered, if individual ECUs are* *replaced or new SW is flashed to ECUs (parameter set in non-volatile memory might get inconsistent and needs also to be updated).*

#### Cloud Connectivity Data Analytics Requirements

**#Hint:** All features must consider opportunity for prognostics using cloud connectivity and data analytics. Use the Feature Data Analytics Creation Tool to identify the list of data elements that could help with the following:

* Confirm customer usage of the feature
* Early identification of feature failure modes and causes
* Data elements that help with feature reductive design

**#Link:** Feature Data Analytics Creation Tool (work in progress, no link available yet).

### After Sales Requirements

**#Hint:** Requirements in this section could specify, e.g. input for the Owner’s Manual could be gathered.

### Process requirements

**#Hint:** Requirements in this section are relevant for the development process of the feature, e.g. ISO26262 compliance.

# Functional Safety

**#Classification**: Functional Safety only – leave a statement “Not Applicable” otherwise and remove subchapters.

**#Hint:** This section is dedicated to the Ford Functional Safety (ISO26262) process. For details of this process refer **#Link:** [RE Wiki – RE Alignment with Functional Safety (ISO26262)](http://wiki.ford.com/pages/viewpage.action?pageId=176397025), [Ford Functional Safety SharePoint](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Pages/default.aspx)

**#Contact:** [*RE Wiki Roles & Responsibilities page – Role: Application Functional Safety Engineer*](http://wiki.ford.com/display/RequirementsEngineering/Default+Contacts+for+Stakeholder+Roles#ApplicationFunctionalSafetyEngineer)

## System Behaviors for HARA

**#Hint:** List selected system behaviors for the HARA and give a rationale why other system behaviors or functions are not considered. Depending on the granularity, not all system behaviors but the ones that have influence on the function associated output (mainly physical actuators) shall be analyzed in the HARA. Grouping (of system behaviors according to their function associated outputs) support this step.

**#Link:**  [*FFSG01.10 Feature Document Guideline*](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Released%20Templates%20Guidelines%20and%20Examples/Guidelines/FFSG01.10_FeatureDocument_Guideline.pdf)*,* [*FFSG02 Hazard Analysis and Risk Assessment Guideline*](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Released%20Templates%20Guidelines%20and%20Examples/Guidelines/FFSG02_HazardAnalysisAndRiskAssessment_Guideline.pdf)

|  |  |  |
| --- | --- | --- |
| **ID** | **Name** | **Description** |
|
| SB001 | Illuminate All Map and/or Dome Lights | Lights Turn ON according to configuration based on Global ON input from User. |
| SB002 | Illuminate Map Lights | Only requested Map Light Turn ON based Local ON input from User. |
| SB003 | Ramp on Map/or Dome Lights | Light follow configured Ramp Profile during W/F and Courtesy. |

Table 16: System Behaviors for HARA

## Functional Safety Assumptions

**#Hint:** During the initial creation of the Feature Document this section generally remains empty, since assumptions are stated later, during performing the HARA. Once and if stated, assumption shall be inserted in this section. The purpose of this section is to provide the reader of the Feature Document, who is generally looking for a high-level overview of the feature, also with significant information on the feature’s safety.

**#Link:**  [*FFSG01.10 Feature Document Guideline*](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Released%20Templates%20Guidelines%20and%20Examples/Guidelines/FFSG01.10_FeatureDocument_Guideline.pdf)*,* [*FFSG02 Hazard Analysis and Risk Assessment Guideline*](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Released%20Templates%20Guidelines%20and%20Examples/Guidelines/FFSG02_HazardAnalysisAndRiskAssessment_Guideline.pdf)

|  |  |  |
| --- | --- | --- |
| ID | Assumption | |
| **1** | **Name** |  |
| **Description** |  |
| **Purpose** |  |
| **Category** |  |
| **Related Requirements IDs** |  |
| **2** | **Name** |  |
| **Description** |  |
| **Purpose** |  |
| **Category** |  |
| **Related Requirements IDs** |  |

Table 17: Functional Safety Assumptions

## Safety Goals

**#Hint:** During the initial creation of the Feature Document this section generally remains empty, since safety goals are developed later, after performing the HARA. Once and if created, safety goals shall be inserted in this section. The purpose of this section is to provide the reader of the Feature Document, who is generally looking for a high-level overview of the feature, also with significant information on the feature’s safety.

**#Link:** [*FFSG01.10 Feature Document Guideline*](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Released%20Templates%20Guidelines%20and%20Examples/Guidelines/FFSG01.10_FeatureDocument_Guideline.pdf)*,* [*FFSG02 Hazard Analysis and Risk Assessment Guideline*](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Released%20Templates%20Guidelines%20and%20Examples/Guidelines/FFSG02_HazardAnalysisAndRiskAssessment_Guideline.pdf)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ID | Goal | | | |
| **1** | **Goal Name** |  | | |
| **Description** |  | | |
| **Safety Goal Concept** | <fill in Safety Goal Concept incl. the Warning & Recovery Concept and the Safe State> | | |
| **ASIL** |  | **FTTI** | <fill in Fault Tolerant Time Interval (if applicable)> |
| **Related FSR IDs** |  | | |
| **2** | **Goal Name** |  | | |
| **Description** |  | | |
| **Safety Goal Concept** | <fill in Safety Goal Concept incl. the Warning & Recovery Concept and the Safe State> | | |
| **ASIL** |  | **FTTI** | <fill in Fault Tolerant Time Interval (if applicable)> |
| **Related FSR IDs** |  | | |

Table 18: Functional Safety Goals

## Functional Safety Requirements

**#Hint:** The section lists the Functional Safety Requirements (FSRs) derived from

* a Safety Goal (list in subsections “<Goal 1 Name>” and following)   
  in this case each FSR should trace back to a safety goal in Ch. “Safety Goals”
* and Assumptions (list in subsection “Derivation of Functional Safety Requirements on Assumptions”).   
  in this case each FSR should trace back to an assumption in Ch. “Functional Safety Assumptions”.

In section “ASIL Decomposition” the initial FSRs from chapters “<Goal 1 Name>” to “Derivation of Functional Safety Requirements on Assumptions” may be decomposed, if required.

**#Macro:** [Add Ins -> Add Requirement macro](http://wiki.ford.com/pages/viewpage.action?pageId=174654231) (select “**Func./Tech. Safety Requirement**” as type)

**#Link:**

* [*Functional Safety SharePoint*](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Pages/default.aspx) – Functional Safety Concept
* [*RE Wiki - Requirements Attributes*](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes)

### <Goal 1 Name>

### <Goal n Name>

### Derivation of Functional Safety Requirements on Assumptions

**#Hint:** Derive FSRs from the Assumptions (refer to section “Safety Assumptions”

### ASIL Decomposition of Functional Safety Requirements

***#Hint:*** *For ASIL D features additional measures like a requirements decomposition might be required. Fill out the following table for each ASIL D decomposition applied in the feature.*

*The decomposed FSRs should be listed beneath each table and referenced inside the table by ID and Title*

**#Macro:** [Add Ins -> Add Requirement macro](https://wiki.ford.com/pages/viewpage.action?pageId=174654231) (select “**Func./Tech. Safety Requirement**” as type)

***#Link:***[*Functional Safety SharePoint*](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Pages/default.aspx) *- Functional Safety Concept*

| **Input FSR** | <Give the ID of a FSR from sections above which shall be decomposed> | |
| --- | --- | --- |
| **Decomposition Rationale** | <Give a reason why the decomposition was performed> | |
| **Method for Decomposition** | Choose a Method | |
| **FSR 1 after Decomposition** | **FSR ID** | <Give the ID of the decomposed FSR> |
| **FSR Title** | <Give the title of the decomposed FSR> |
| **ASIL** |  |
| **Rationale** | <Give a rreason and thought behind that requirement. Should include how the requirement is able to independently fulfill the needs of the parent requirement> |
| **Satisfied by** | <Logical Function/Signal from Functional Architecture in chapter 8.1 “Functional Decomposition”. This element shall be independent of the element satisfied by the other half of the ASIL decomposition.> |
| **FSR 2 after Decomposition** | **FSR ID** | <Give the ID of the decomposed FSR> |
| **FSR Title** | <Give the title of the decomposed FSR> |
| **ASIL** |  |
| **Rationale** | <Give a reason and thought behind that requirement. Should include how the requirement is able to independently fulfill the needs of the parent requirement> |
| **Satisfied by** | <Logical Function/Signal from Functional Architecture in chapter 8.1 “Functional Decomposition”. This element shall be independent of the element satisfied by the other half of the ASIL decomposition.> |
| **FSR for Independence**  *Note: should consider commonly used input, output and processing*  *Note: additional row should be added if additional* *requirements for Independence are necessary* | **F-S-Req.-ID** |  |
| **F-S-Req. Title** |  |
| **ASIL** |  |
| **Rationale** |  |

# Cybersecurity

**#Classification**: Cybersecurity only – leave a statement “Not Applicable” otherwise and remove subchapters.

## Security Goals

**#Hint:** The list of Cybersecurity Goals are an output of the Threat Model. The CAL attribute is not used yet.

**#Link:** [Alignment with Cybersecurity](http://wiki.ford.com/display/RequirementsEngineering/Alignment+with+Cybersecurity) – RE Wiki

|  |  |  |
| --- | --- | --- |
| ID | Goal | |
|  | **Goal Name** |  |
| **Description** |  |
| **CAL** |  |
| **Related CSR IDs** |  |
|  | **Goal Name** |  |
| **Description** |  |
| **CAL** |  |
| **Related CSR IDs** |  |
|  | **Goal Name** |  |
| **Description** |  |
| **CAL** |  |
| **Related CSR IDs** |  |

Table 19: Cybersecurity Goals

## Cybersecurity Requirements

**#Hint:** Cybersecurity requirements derived from the Cybersecurity Goals. Those requirements should be granular enough to be satisfied by a single Logical Function in the Functional Architecture.

**#Link:** [Alignment with Cybersecurity](http://wiki.ford.com/display/RequirementsEngineering/Alignment+with+Cybersecurity) – RE Wiki

**#Macro:** [Add Ins -> Add Requirement macro](https://wiki.ford.com/pages/viewpage.action?pageId=174654231) (select “**Requirement**” as type)

Table Checklist for Cybersecurity Requirement



Table Applicable Cybersecurity Critieria



# Architecture

## Functional Decomposition

**#Hint:** Techniques like Activity Diagrams, Data Flow or Function Tree Diagrams help the feature owner to analyze the behavior of the feature. The goal of functional decomposition is to gain a complete understanding of the desired functionality, independent of technological solutions. The Feature Owner may group the requirements in chapter “Feature Requirements” according to the functions derived from this decomposition. The Feature Owner may take the Functional Architecture for related features (if it exists) into consideration for this decomposition. This would ease cascading of feature requirements later. Since feature requirements are input requirements for the Logical Functions, it helps, if the feature requirements are grouped by functions when cascaded to Logical Functions of the Functional Architecture.

**#Link:**

* [Stages - RE Model the Functional Analysis](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/activity/_4KsyQPmOkqGMg85u0m-tig))
* [SysML – Activity Diagrams](https://azureford.sharepoint.com/sites/SystemsEngineering/SEC/sysml-teamsite/SysML%20Wiki/Activity%20Diagram%20Basics.aspx)
* **Functional Safety for the Overhead Lighting (Map/Dome Lights) is QM. Therefore, functional architecture not required in Feature Document.**

Figure : Activity Diagram/Data Flow Diagram of Feature

### Functions

**#Hint:** The functions derived by functional decomposition should be listed and described in the table below

| Function Name | Description | Comments |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Table 22: List of Functions

## Logical Architecture

**#Classification:** Functional Safety only

**#Hint:** Describe (or reference):

* the logical boundary (if known)
* the elements/components/subsystems within the boundary of the item/feature.
* The interaction of features with other features or elements

The logical boundary of the item/feature can be described by using a boundary diagram, block diagram, etc. The elements of the feature can also be based on other technology.

**#Link:** [Ford Functional Safety SharePoint](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Pages/default.aspx)

Figure 9: Logical Boundary Diagram

### Logical Elements

**#Hint:** Lists the elements of the Logical Architecture and the functions from the Functional Architecture, which are allocated to those elements.

|  |  |  |  |
| --- | --- | --- | --- |
| **Element Name** | **Description** | **Allocated Functions** | **Comments** |
| e.g. Active Tilt Controller | … | e.g. Control Value |  |
|  |  |  |  |
|  |  |  |  |

Table 23: Logical Elements

### Logical Interfaces

**#Hint:** Describe the interactions of the feature with other features or elements.

|  |  |  |  |
| --- | --- | --- | --- |
| **Interface Name** | **Direction** | **Description** | **Value Range** |
| e.g. Vehicle tilt angle | e.g. Tilt angle sensor to ATC | … | e.g. -45deg to +45deg |
|  |  |  |  |
|  |  |  |  |

Table 24: Logical Interfaces

# Traceability Matrix

**#Hint:** The traceability matrix is ideally generated from a Requirement Management tool (e.g. VSEM RM) once the specification is imported to the tool and all trace links are drawn in the tool.

**#Link:** Refer to “Backward Traceability” at [Stages – RE Traceability Record](https://bd101001.pd2.ford.com/stages/#/workspace/209/_vv/(process/artifact/_ZbIhsK4EkzaN49uPh7SLuQ))

# Open Concerns

**#Hint:** The following list presents open concerns, which must be discussed or clarified over the course of the on-going requirements engineering.

| ID | Concern Description | e-Tracker / Reference | Responsible | Status | Solution |
| --- | --- | --- | --- | --- | --- |
| 1 |  |  |  |  |  |
| 2 |  |  |  |  |  |
| 3 |  |  |  |  |  |
| 4 |  |  |  |  |  |
| 5 |  |  |  |  |  |
| 6 |  |  |  |  |  |
| 7 |  |  |  |  |  |
| 8 |  |  |  |  |  |
| 9 |  |  |  |  |  |

Table 25: Open Concerns

# Revision History

| Revision | Date | Description | Approved by | Responsible |
| --- | --- | --- | --- | --- |
| A |  | Initial version |  | Jbaden1 |
|  |  |  |  |  |

## Template Revisions

*#Important: Do not change this section*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Version | Rev. | Date | Description | Responsible |
| 0 | 6 | 2015-05-26 | * Chapter “Feature Overview” and made a 2nd level heading. * Chapter “Feature Modeling” divided into 3 subchapter (“Scenarios”, “Use Cases”, “State Machines”) for different modeling methods | Jbaden1 |
| 0 | 7 | 2015-05-27 | * Table of Content updated * Template Revision History chapter added | Jbaden1 |
| 0 | 8 | 2015-07-02 | * Section “Unsettled Issues” added | Alevin7 |
| 0 | 9 | 2015-08-04 | * Section “Feature Variants” added * Section “Feature Boundary Diagram” renamed to “Feature Context Diagram” * Document Properties adapted to match needs of VBA macros | Jbaden1, Awegman1 |
| 1 | 0 | 2015-09-11 | * Section “Feature Variants” reworked * Feature Goals removed. Only “Safety Goals“ chapter remains. * Heading 2 formatting issues corrected. * Requirements / Use Cases Listing removed from traceability chapter. * Formatting of attribute table in Notation chapter corrected * Open Topics / Known Issues chapter moved to the end | Jbaden1 |
| 1 | 1 | 2015-11-16 | * Table-Styles removed (for smooth VSEM import) * Some clean-up of sections “Purpose” and “Audience” | Awegman1, jbaden1 |
| 1 | 2 | 2016-02-26 | * Minor corrections based on lessons learned from CC and PCL pilot (e.g. section market/regions) and discussion with Functional Safety Team (purpose of feature) * Footer corrected * Boundary diagram interface chapter renamed to influences. | Jbaden1 |
| 1 | 3 | 2016-02-26 | * Minor corrections after review with Whitney Keith from Functional Safety team | Jbaden1 |
| 1 | 4 | 2016-03-10 | * Some cleanup of meta-data in Word Properties | Jbaden1 |
| 1 | 5 | 2016-03-10 | * Footer formatting corrected (Issue 19) * Results from review with Functional Safety Team incorporated (Issue 20). | jbaden1 |
| 1 | 6 | 2016-04-18 | * Scenario Template added | Jbaden1 |
| 1 | 7 | 2016-04-18 | * Chapter “Operation Modes and States” moved before “Use Case” section. | Jbaden1 |
| 1 | 8 | 2016-04-18 | * Broken Wiki links repaired. | Jbaden1 |
| 2 | 0 | 2016-05-19 | * Adapted to Specification\_Macros.dotm V2.0 * Requirements Templates chapter (ch. 1.7.1) no longer has an attribute table, but refers directly to the Wiki.. | Jbaden1 |
| 2 | 1 | 2016-06-10 | * Table for Context Diagram modified (lists external entities and Influence Description only) | Jbaden1 |
| 2 | 2 | 2016-07-08 | * Template version added to footer * Several hints added to the various sections * Findings from Functional Safety Team incorporated. * RE\_SafetyRequirement style added | Jbaden1 |
| 2 | 3 | 2016-09-21 | * Update from Functional Safety Team incorporated (“Lessons Learned”, “System Behaviors for HARA”) | Jbaden1 |
| 2 | 4 | 2016-11-15 | * Update from Functional Safety Team incorporated (“Lessons Learned”, “System Behaviors for HARA”) * Explanatory notes made more formal | Jbaden1 |
| 3 |  |  | Skipped to synchronize with Specification\_Macros.dotm |  |
| 4 |  |
| 5 | 0 | 2017-01-13 | * Meta data updated for specification macros, version 3.1 * SW Unit chapter removed for the time being * Green boxes added for user hints | Jbaden1 |
| 5 | 1 | 2017-01-18 | * Minor editorial changes | Jbaden1 |
| 6 | 0 | 2017-02-03 | * CR48: Chapter 6 renamed from “Safety” to “Functional Safety”. New sub-chapter “Safety” introduced in Non-Functional Requirements section | Jbaden1 |
| 6 | 0 | 2017-04-28 | * CR7: “RequirementsTraceability” chapter removed | Jbaden1 |
| 6 | 0 | 2017-11-15 | * CR32/53: New Cover Sheet + Disclaimer replaces FAP-150 like ones. * CR75: Some rewording -> Terminology to Glossary, Notation -> Document Conventions * CR49: Rename “Assumptions & Constraints” to “Assumptions” * CR74: Safety Assumptions added to chapter 6. * CR58: Add function allocation column to Logical Architecture chapter | Jbaden1 |
| 6 | 0 | 2018-01-31 | * CR63: Updated links to Functional Safety Sharepoint | Jbaden1 |
| 6 | 0 | 2018-07-24 | * CR69: Add FSR to FeatureDoc * CR64: Add new section "Design Requirements" to Function Spec and Feature Spec | Jbaden1 |
| 6 | 0 | 2018-08-06 | * CR53: some corrections for metada and formatting | Jbaden1 |
| 6 | 0 | 2018-09-28 | * Broken links to RE Wiki repaired | Jbaden1 |
| 6 | 0 | 2018-10-31 | * Cover sheet and footer more GIS like. Functional Safety team feedback incorporated:   + New subsections “Functional Safety Requirements, (Decomposed) FSRs and Parameters / Values   + Removal of “Logical Architecture” | Jbaden1 |
| 6 | 0 | 2018-12-12 | * FSR template removed, now as a macro in the Specification\_Macros.dotm | Jbaden1 |
| 6 | 0a | 2019-05-23 | * Re-introduce “Logical Architecture” (for Functional Safety) | Jbaden1 |
| 6 | 0b | 2019-06-26 | * Chapter “Logical Elements” in “Logical Architecture” section added (FuSa CR 15136240) | Jbaden1 |
| 6 | 0c | 2019-03-22 | * Chapter “Decomposed FSRs” renamed to “ASIL Decomposition of Functional Safety Requirements” and moved beneath Chapter “Functional Safety Requirements”. Explanatory text improved. | Jbaden1 |
| 6 | 0c | 2019-04-05 | * Some wording in ASIL decomposition table modified. Description of fields in that table improved. | Jbaden1 |
| 6 | 0c | 2019-06-24 | * “Input Requirements” section modified (table approach as for the other RE templates). * “References” and “Glossary” chapter moved to the “Introduction” chapter. | Jbaden1 |
| 6 | 0c | 2019-07-02 | * "Important" box added on cover sheet which points to the macros | Jbaden1 |
| 6 | 0c | 2019-07-02 | * Subsection “Error Handling” removed form chapter “Feature Requirements”->”Functional Requirements” (teams are free to create their own substructure of that section). Note tells author not to forget about error handling. * Hint for chapter “Feature Variants” improved reworded upon request from Functional Safety Team. | Jbaden1 |
| 6 | 0c | 2019-05-11 | * Copyright notice shortened and moved to cover sheet and added to footer (to be compliant [with Ford copyright guidelines](http://www.fgti.ford.com/client/NewFGTI/CopyrightNotice.html)) * Term “Disclaimer” no longer used for what is actually only a copyright notice | Jbaden1 |
| 6 | 0c | 2019-22-11 | * Chapter “Input Requirements/Documentst: minor modifications (examples added), Word comment removed” | Jbaden1 |
| 6 | 0c | 2019-12-05 | * Upstream Documents section added to “Input Requirements/Documents” table * Custom style table formatting removed * Hint on system behaviors modified as requested from FuSa team | Jbaden1 |
| 6 | 0c | 2019-12-09 | * Term “Upstream Documents” replaced by “Attribute Requirements” in “Input Requirements/Documents” table * ASIL Decomposition table replaced by a version, which get not corrupted during VSEM import. | Jbaden1 |
| 6 | 0c | 2019-12-10 | * In ch. “Functional Safety Requirements” Word reference Id by Word reference text replaced.. | Jbaden1 |
| 6 | 1a | 2020-02-12 | * New chapter “Cybersecurity” added. | Jbaden1 |
| 6 | 1a | 2020-03-03 | * All User Hints formatted using style “RE\_UserHint” to enable automatic removal by a macro. | Jbaden1 |
| 6 | 1a | 2020-03-04 | * Chapter “Cloud Connectivity Data Analytics Requirements” added upon request by D. Crockett/J. Rawlings | Jbaden1 |
| 6 | 1a | 2020-03-09 | * Missing doc property “LatestSigMappingID” and “LatestAisInterfaceID” added * doc property “CopyrightDate” re-formatted to text and copyright date field in footer corrected * Version numbering re-initialized as 0.1 * Init value of version/revision date set to “yyyy/mm/dd” instead of “yyyy-mm-dd” to be in line with the “Edit Document Property” dialog * type of document property for latest IDs changed to number instead of text | Jbaden1 |
| 6 | 1b | 2020-03-17 | * Chapter “Functional Architecture” renamed to “Functional Decomposition” * New MBSE terminology introduced: “Feature Level”, “Function Level” and “Component Level” renamed to “Concept Level”, “Logical Level” and “Technology Level” | Jbaden1 |
| 6 | 1b | 2020-07-03 | * CR31: Chapter “Traceability Matrix” added. | Jbaden1 |
| 6 | 1b | 2020-23-09 | * CR28: Alignment to [*FFSG01.10 Feature Document Guideline*](https://azureford.sharepoint.com/sites/GlobalFunctionalSafety/Released%20Templates%20Guidelines%20and%20Examples/Guidelines/FFSG01.10_FeatureDocument_Guideline.pdf) for how to apply the Feature Doc template for Functional Safety. New section “Classification of Chapters” added. “Active Tilt Control” Example in section “Logical Architecture” updated based on input from HARA training. | Jbaden1 |
| 6 | 1b | 2020-25-11 | * Reference to process definition in Stages added to “How to Use” section on cover sheet. User hints removed from “Document Purpose” chapter. * RE-Wiki links mostly replaced by Stages links, links to Functional Safety Sharepoint updated | Jbaden1 |

# Appendix

Document ends here.