Deltares

Enabling Delta Life

BM Asfalt Golfklap

Functional Design

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1230095-002

Deltares

Title
BM Asfalt Golfklap

Client	Project	Reference	Pages
RWS WVL	1230095-002	1230095-002-HYE-0019	21

Keywords
User Interface, WTI-kernels, Wave Impact kernel

Summary
This document contains the functional design Basis Module Asfalt Golfklap, a User Interface application that enables the computation of the rate of fatigue of an asphalt revetment due to wave impact loading. It determines the scope and describes the assumptions and the restrictions. The functional design is defined by functional as well as non-functional requirements. All functional requirements are specified and elaborated upon. Finally, the error handling is described.

Samenvatting (NL)
Dit document bevat het functioneel ontwerp voor de Basis Module Asfalt Golfklap. Dit is een User Interface applicatie die een gebruiker in staat stelt om berekeningen uit te voeren voor het berekenen van de mate van vermoeiing van een asfaltbekleding belast door golfklappen. Het bepaalt de scope en beschrijft de aannames en restricties. Het functionele ontwerp is vastgelegd middels zowel functionele als niet functionele ontwerpeisen. De functionele eisen zijn hierbij verder uitgewerkt en gespecificeerd. En ten slotte wordt de wijze van foutafhandeling beschreven.

References
KPP 2016 WK02 Waterveiligheidsinstrumentarium - VTV Tools.

Version	Date	Author	Initials	Review	Initials	Approval	Initials
1.0	July 2016	Tom The		Hans van Putten		Marcel van Gent	
				Robert 't Hart			
1.3	Oct 2016	Tom The		Hans van Putten		Marcel van Gent	
		John Bokma		Robert 't Hart			
1.4	Nov 2016	Tom The		Robert 't Hart		Marcel van Gent	
				Hans van Putten			

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final

Contents

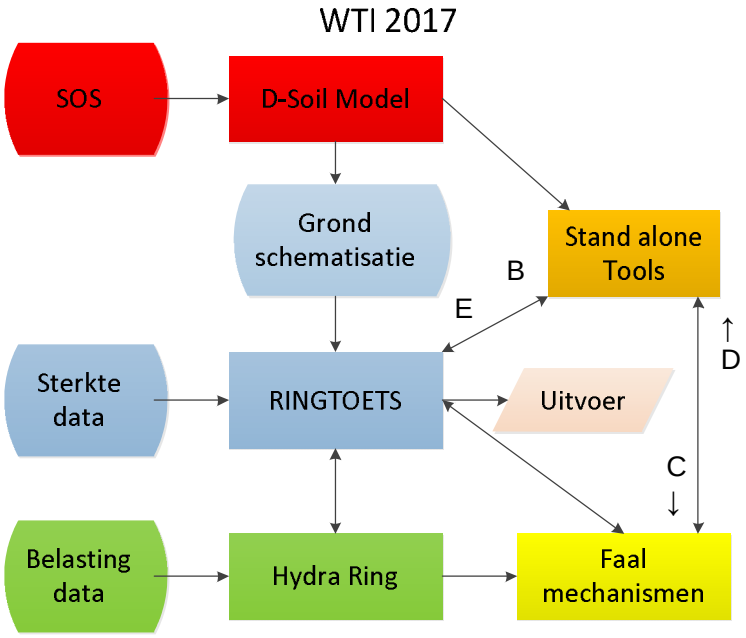
1 Introduction

1.1 Purpose and scope of this document

This document contains the functional design of the User Interface for the Asphalt Wave Impact kernel. This User Interface enables the use of the Asphalt Wave Impact kernel by providing a program for the input of all required data and the display of the calculation results.

The document will not provide any background on the kernels itself. For this purpose the reader is referred to the documentation thereof.

This document will also refer to the document [3], which describes the implementation in Ringtoets of this kernel. Because the implementation in Ringtoets has been postponed, this standalone user interface will be provided as a substitute. This document will refer to parts of the document [3].
In the total scope of the WTI-project, this application itself is part of the Stand-alone Tools:



The Stand alone tool BM – Asfalt Golfklap needs information from Ringtoets about hydraulic load (B); this is a manual connection. Together with manual entered data a schematization is made in BM – Asfalt Golfklap and send to Faalmechanismen (C), the calculation kernel WaveImpact. This returns the result of the calculation (D). Both C and D take place in the BM – Asfalt Golfklap.
The user has to process this result to a ‘toetsoordeel per dijkvak’, which is manually imported in Ringtoets (E).

1.2 Assumptions and constraints

It is assumed that the User Interface is developed in C# and communicates with the Asphalt Wave Impact Assessment as described in the technical design documents of the Wave Impact kernel [1]. This means that the User Interface needs the following assemblies:

- Deltares.Mathematics.dll
- Deltares.Standard.dll
- Deltares.WaveImpact.dll
- MathNet.Numerics.dll

For now the User Interface the “must have” requirements will only provide the simplest direct options needed to provide the required input. This means that all data will be provided using input fields and/or tables. Only a simple graphical view of the dike profile will be provided as extra feedback for the user. More elaborate options such as import of data from other sources, are described as optional features.

Also the results of the calculations are displayed in the simplest (i.e. as text) way as a “must have” requirement. More elaborate options such as export of data to other sources, graphical display are described as optional features.

The User Interface performs the calculation of a whole dike profile as far as it is covered by the asphalt revetment. This means that the kernel will be called for each relevant part of the dike profile. Afterwards the results will be aggregated for the whole dike profile.

Finally it is assumed that the User Interface is limited to the most basic functionality. It must only be able to handle the input, validate the input, perform the calculations, display the results and be able to read and write its data.

CNS 1 As a general constraint, the software design needs to comply with the general design description for WTI software, contained in separate documents: De Waal, 2015 (4).

CNS 2 As a general constraint, the User Interface needs to comply with the relevant general requirements and further rules for the programming, documentation and testing of WTI software. This set of requirements and rules is contained document in Knoeff, De Waal, 2014 (4).

CNS 3 The User Interface is developed in C# and communicates with the Wave Impact module.

CNS 4 The User Interface only provides the simplest direct options needed to provide the required input.

CNS 5 The User Interface only provides the simplest direct options needed to display the results.

CNS 6 The User Interface performs a calculation for a whole dike profile (a combination of multiple calls to the kernel).

CNS 7 The User Interface is limited to the most basic functionality. It must only be able to handle the input, validate the input, perform the calculations, display the results and be able to read and write its data.

CNS 8 Displaying graphical feedback is optional.

CNS 9 Determination of an assessment result is optional.

1.3 Use Cases

All use cases for this application are in fact part of and laid down in the test scripts. These test scripts are part of the test report (8). For such a simple application as this, all requirements are translated here directly into use cases.

1.4 Changes of versions of this document

1.4.1 Version 1.3

- Issues in errata document (Lit 9) processed in this document.
- Improved description of chart displays.
- Improved description of Safety Assessment module.

1.4.2 Version 1.4

- Replaced “Faalkans van het dijktraject” with “Terugkeertijd op basis van trajectnorm” in input for safety assessment.

2 Functional Design

The functional design of the User Interface is defined by its requirements, both non-functional as well as functional.

2.1 Non-functional requirements

In this paragraph the non-functional requirements are further specified for BM Asfalt Golfklap.The non-functional requirements (NFR) are the same as required for WTI software. The following overview contains the non-functional requirements with priority ‘must have’. All non-functional requirements (NFR) are given in the spreadsheet that lists all WTI requirements [6]. The following overview contains the non-functional requirements with priority ‘must have’:
Since the stand alone tools are developed as fall back option for Ringtoets, some of the requirements are phrased for Ringtoets, but are also applicable for BM – Asfalt Golfklap.

NFR2 The regular conventions, standards, tools and libraries for Deltares Systems software will be used. (must have).

Applicable for BM – Asfalt Golfklap.

This will be met by using these conventions, standards, tools and libraries during development and coding of the application.

NFR3 Data definitions will follow existing and emerging standards such as IRIS as much as possible. (must have)
Applicable for Asfalt Golfklap, though no standards are available (yet) for the BM – Asfalt Golfklap input.

For WBI there are agreements on data formats and parameter names from within the cluster datamanagement (see Lit 10). These are implemented in this application and checked with the testscripts.

NFR6 Ringtoets and its computational core must perform sufficient error checks on the validity and completeness of data during import or input, as well as during a computation. Ringtoets needs to show warnings and error messages in an error message dialog, and write them also to a log file. The message text needs to be clear in what went wrong and where it went wrong (context). The message finally needs to supply suggestions for improvement wherever possible. (must have)
Applicable for BM – Asfalt Golfklap. Read BM – Asfalt Golfklap for Ringtoets.

This will be met by a validation method which checks all input before a calculation takes place. All errors and warning found will be displayed in a validation table. Furthermore, all errors and warnings encountered during calculation will be passed on by the kernel to the application and will be displayed in a log table. All messages will contain the proper subject as well as a clear description of the error. Where possible, it will advise on suggestions for improvement.

NFR7 Ringtoets must support the selection of different logging modes for the computational core. The logging form should show the log information of the latest computation. This information can help the user when a computation does not succeed or when the user wants to analyse the quality of the calculation results. (must have)
Not applicable for BM – Asfalt Golfklap; the user interface supports only one calculation at the time.

NFR9 Output of intermediate probabilistic results, in combination with documentation of the theoretical background, must enable expert users to trace back the correctness of the probabilistic procedures. (must have)
Not applicable for BM – Asfalt Golfklap; the user interface supports only one deterministic calculation at the time.

NFR12 The user-interface may not cause crashes during regular usage. (must have)
Applicable for BM – Asfalt Golfklap

This will be met by continuous testing the application using unit test as well as by performing the test scripts that are part of the test plan (Lit. 7).

NFR14 Consistency between the input data and the output data must be guaranteed. (must have)
Applicable for BM – Asfalt Golfklap

This will be met by having a full copy of the input data as part of the output data each time a calculation is performed. This way, it is ensured to have a consistent set of input and result data that belong together. Furthermore, changes to the input data that are made after a valid calculation is performed, will result in a clearly visible message in the application informing the user that his results are outdated.

NFR15 The general required code coverage is 80%, except for the Delta Shell Light components, therefor the code coverage of 60% is required.
Applicable for BM – Asfalt Golfklap; 60% as it is built with Delta Shell Light components.

This will be met by reporting the results of the code coverage tests in the test report (Lit. 8).

NFR16 Additional evaluation and acceptance tests need to emphasize the following aspects:
a. The calculated boundary conditions should be comparable to those of the Hydra systems, if common procedures are used. (must have)
b. The results should be comparable to those of PC-Ring, for the water systems and probabilistic procedures common to both. (should have)
c. The results from deterministic mechanism models must be comparable to the results from existing VTV software for deterministic cross section analysis, as long as the schematization and boundary conditions are equal. (must have)
d. The practical applicability, robustness and performance under representative circumstances must be proven during the evaluation period. (must have)
Items a and b are not applicable for BM – Asfalt Golfklap; the user interface supports only one deterministic calculation at the time.
Items c and d are applicable for BM – Asfalt Golfklap

Item c will be met by making sure that the benchmarks that are used in the validation are comparable to the results as obtained with the current “Golfklap” application.

Item d will be met by having the application undergo rigorous test usage during the evaluation period.

2.2 Functional requirements

These cover all aspects of the required functionality. First a list of all requirements is presented followed by more elaborate specifications of each of them.

Note that for stand-alone applications such as this one, no general requirements (such as are available for the nonfunctional requirements) are specified.

The requirements will be split in several parts. The first part contains the “must have” requirements. The other parts are optional (“should have”) requirements.

2.2.1 Must have requirements

These are the minimal requirements that are needed to support the use of the Wave Impact kernel.

REQ 1 The User Interface must support the input of all required data for the calculation of a strip of a dike section.

REQ 2 The User Interface must support the validation of all required input data for a strip of a dike section.

REQ 3 The User Interface must be able to perform the Asphalt Wave Impact calculation for a strip. This will be done with a call to the calculation function of the kernel.

REQ 4 The User Interface must be able to retrieve the results of a call to the Asphalt Wave Impact calculation function.

REQ 5 The User Interface must support the display of the results of the Asphalt Wave Impact calculations in a table.

REQ 6 The User Interface must be able to read and write all data to its own file for storage and reuse of the data.

REQ 7 The User Interface must offer functionality to switch between all of its parts.

2.2.2 Optional requirement for reading Hydraulic Condition from Ringtoets

REQ 8 The User Interface must be able to read the hydraulic condition from a Ringtoets generated file.

2.2.3 Optional requirements for calculating full dike-section (with multiple strips)

The kernel will only calculate one strip of the dike with a constant slope. When the dike section has multiple strips, the kernel has to be called for every strip and the results have to be combined in a total result.

REQ 9 The User Interface must support the input of a dike section with multiple strips.

REQ 10 A module has to be built to make a combined validation and calculation of all the strips and aggregate the separate calculations to a total result.

REQ 11 The User Interface must support the display of the results of the combined calculation of the strips.

REQ 12 The User Interface must be able to read and write to its own file for storage and reuse of all the extra data that is needed for the full dike section data.

2.2.4 Optional requirement for graphical display of profile

REQ 13 The User Interface must support the graphical display of the profile of the whole dike section.

2.2.5 Optional requirements for graphical display of Hydraulic Condition

REQ 14 The User Interface can support the display of the Hydraulic Condition "Stillwaterlevel" in time

REQ 15 The User Interface can support the display of the Hydraulic Condition "Verblijftijden" in height.

2.2.6 Optional requirements for graphical display of results

REQ 16 The User Interface must support the display of the oputput MinerSom in Height

2.2.7 Optional requirements for determining the safety assessment result

REQ 17 The User Interface must support the extra input for the safety assessment

REQ 18 A module has to be built to perform a safety assessment

REQ 19 The User Interface must support the display of the results of the safety assessment

REQ 20 The User Interface must be able to read and write to its own file for storage and reuse of all the extra data that is needed for the safety assessment.

2.3 Out of scope

Because this document refers to the document where the Ringtoets implementation has been described [3], it is important to explicitly list the requirements in that document that will not be implemented in this application.

Chapter 4: Toepassingsvoorwaarden. In chapter 4 the conditions are described which have to be met, so the WaveImpact kernel can be used. For Ringtoets it was meant that Ringtoets would check on these conditions. For this application it is assumed that the user will check the conditions manually and only use this application if the conditions are met.

Chapter 5: Profielgegevens. In chapter 5 is described how a real profile (as was measured) can be automatically transformed to a profile that can be processed by the WaveImpact kernel (the schematized profile). In this application it is assumed that the user will enter the schematized profile. So any transformation from a real profile to a schematized profile has to be performed by the user.

2.4 Specification of the requirements

2.4.1 The User Interface must support the input of all required data for the kernel (REQ 1).
See document [**Error! Reference source not found.**] chapter 2.2 for the corresponding input values for the kernel. In appendix A of the same document the default values and min and max values can be found for all parameters.

See appendix [3B] for the names of the parameters as they should be shown in the User Interface. This list has been matched with document [5]. In case of discrepancies, document [5] will be the preferred option.

The required input data can be split into the next categories:

- Geometry: the geometrical properties of the part of the surface line that is to be considered as well as the asphalt revetment.
- Hydraulic conditions: the hydraulic properties including the storm surcharges and wave definitions.
- Asphalt construction: the properties defining the actual asphalt construction.
- Some general parameters.

Note that there are some restrictions and requirements:

- all heights and levels must be towards the same reference level (e.g. NAP)
- all coordinates must share the same coordinate system
- Points of the surface line (see Geometry in above paragraph) must be defined from left to right with increasing X-coordinates.

The geometry data consists of:

In the case of a single strip calculation the following parameters are needed

- StartSurfaceLinePart: the start point of the strip that is part of a dike section. This point is defined by its local coordinates (X and Z).
- EndSurfaceLinePart: the endpoint of the strip that is part of a dike section. This point is defined by its local coordinates (X and Z). The endpoint must to the right and above the start point. The gradient between the start and endpoint should be between 1/7

and 1/2. The length of the strip must at least be 2 meter. If not then an error message will be shown when validating
- NumberRevetmentParts: the number of revetment parts for the strip.

In the case that the calculation is for a whole dikesection, the following parameters are needed
- A table of X-Z coordinates that defines the begin- and endpoint of the strips. The gradient between the start and endpoint of each strip should be between 1/7 and 1/2. The length of the strip must at least be 2 meter. If not then an error message will be shown in the validation.
- NumberRevetmentParts: the number of revetment parts for the whole asphalt-construction (from MinHeightAsphalt to MaxHeightAsphalt). When this value has been entered by the user, the program can distribute the NumberRevetmentParts between all strips in such a way that all revetmentparts have the same length (as much as possible).

The following data is common for single strip or dike section calculation
- LevelForeShore: the height of the surface level at river side. This must be at most 1 meter above the start point of the strip or the dikesection.
- CorrectionImpactFactor: the correction factor for the presence of a possible shoulder. This value is always the default value of the kernel and will not be shown in the User Interface
- MinHeightAsphalt: the minimum height of the asphalt revetment.
- MaxHeightAsphalt: the maximum height of the asphalt revetment.

In the case that the calculation is for a whole dikesection, the StartSurfaceLinePart and EndSurfaceLinePart will be replaced by
- A table of X-Z coordinates that defines the begin- and endpoint of the strips. The gradient between the start and endpoint of each strip should be between 1/7 and 1/2. The length of the strip must at least be 2 meter. If not then an error message will be shown in the validation.

The hydraulic data consists of:

- WaterSystem: The type of water system with as available options (only in Dutch): Waddenzee, Kust, Oosterschelde, Merengebied, Overig.
- AverageAmplitudeTide: The average amplitude of the tide. This value is only needed and used for water systems Waddenzee, Kust and Overig. For the other systems this value is assumed to be 0.
- OffsetTide: the offset of the tide. This value is only needed and used for water system Overig. For the other systems this value is 0.5 * the storm duration. The storm duration itself has a fixed value per the other water systems (Waddenzee: 45 hours, Kust, Oosterschelde, Merengebied: 35 hours).
- TestLevel : the test level (in Dutch “Toetspeil”) .
- AverageWaterLevel: The average water level.
- DurationTide: the duration of the tide.
- StormSurcharge: the storm surcharge.
- WaterDensity: the density of water (optional, default value = 1025).
- A boolean indicating whether the default ProbabilitiesImpactFactors should be used or a user defined one (see next parameter).

- A list of probabilities per impact factor (ProbabilitiesImpactFactors). This is an optional list enabling the user to use its own probabilities per (standard) impact factor. As there are 11 standard impact factors this list, when provided, must have 11 values in order to be used.
- The actual surcharge values as an optional list of storm surcharge definition records. These records are comprised of:
    - Time: the time of the surcharge
    - Surcharge: the value of the surcharge.

  In case the water system is Overig, the list of records must be provided .This list should at least hold two records and at most 20. Note that the time should increase per record at that all surcharge values must be greater than 0. In case of all other water systems, a predefined list of records will be used so no list is to be provided at all.
- The wave parameters as defined by:
    - SwlSteps: The number of steps for SWL
    - NumberOfImpactPoints: The number of points of impact.
    - The wave values as a list of wave definition records. These records are comprised of:
        - Level: the level for which this record is intended.
        - SignificantHeight: the significant height of the wave at this level.
        - PeakPeriod: the peak period of the wave at this level.

The asphalt construction is defined by the next data:

- UseTwoLayers : a (Boolean) indicator to specify whether the asphalt construction contains two layers (value = true) or just one layer (value = false).
- C_{spring}: the bedding constant
- ThicknessLayer1: the thickness of the first layer.
- ThicknessLayer2: the thickness of the second layer (only needed when UseTwoLayers = true).
- YoungsModulusLayer1: the Young's modulus for the first layer.
- YoungsModulusLayer2: the Young's modulus for the second layer (only needed when UseTwoLayers = true).
- Nu: the poison constant
- WearyingAlpha: the wearying parameter alpha.
- WearyingBeta: the wearying parameter beta.
- CrackTensionAsphalt: the crack tension value for asphalt.

The general parameters are:

- Description: a string identifying the calculation.

- Gravity: the value for the gravity (optional, default value = 9.810).

- SpecialHydraulicValidation: a boolean that will set the IsRingToets Boolean in the kernel. See kernel description what this setting means.

2.4.2 The User Interface must support the validation of all required input data for the kernel (REQ 2).

In order to prevent invalid calculations, all input data must be checked on their validity. This entails checking their limits as well as availability. The limits for each parameter can be found in Appendix A of document [**Error! Reference source not found.**]. If you use the validation method of the kernel, the input values will be validated against these limits.

All errors found during validation must be reported to the user. As long as there are validation errors, the user must not be able to start any calculation. The kernel module that is used to perform the actual calculation(s) offers a Validate method so use this method to perform the validation.

Next to the errors, validation can also lead to warnings, for instance when values are checked on their most likely minimum and maximum values. These warnings should also be reported to the user. However, warnings should not prevent the ability to perform a calculation.

2.4.3 The User Interface must be able to start the Asphalt Wave Impact Assessment calculation (REQ 3).

To enable the user to start a Wave Impact Assessment, an option must be provided to enable this. Note that before the start of the actual calculation, the validity of all required Wave Impact input must have been checked and found to be adequate.

2.4.4 The User Interface must be able to retrieve the results of the Asphalt Wave Impact Assessment calculation (REQ 4).

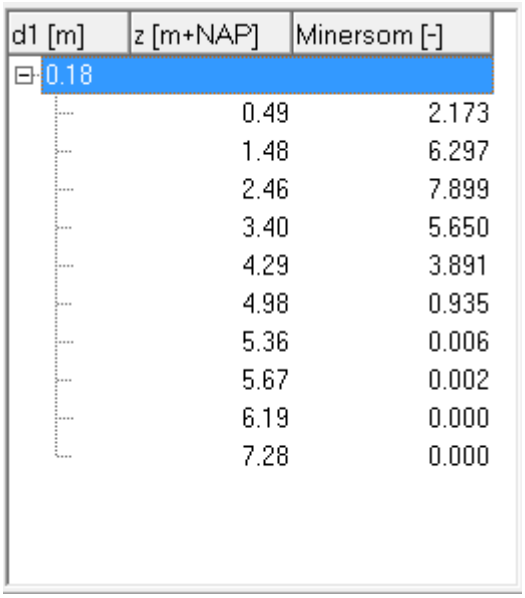
After a calculation is made using the Wave Impact Assessment Integration module, the results of that calculation should be retrieved. In order to do that, the results should be copied to the local result data classes.

In the event of an error during the calculation, the User Interface must be able to handle that error and display any error message to the user.

2.4.5 The User Interface must support the display of the results of the Asphalt Wave Impact Assessment calculation (REQ 5).

The values of the Minersom are the result of the calculation. Also the maximum value of the list will be presented as the result of the calculation.

An example implementation of the Minersom table is shown below.



d1 [m]	z [m+NAP]	Minersom [-]
0.18		
	0.49	2.173
	1.48	6.297
	2.46	7.899
	3.40	5.650
	4.29	3.891
	4.98	0.935
	5.36	0.006
	5.67	0.002
	6.19	0.000
	7.28	0.000

Another result to be shown is whether the construction is cracked or not (a Boolean).

2.4.6 The User Interface must be able to read and write all data to its own file for storage and reuse of the data (REQ 6).

The User Interface must support reading and writing of all data to its own file for storage and reuse of the data. This encompasses the input as well as the output parameters. For this purpose, XML (de-)serialization is to be used. The extension of the resulting xml file type is ".asfx" (AsfaltGolklapXml).

2.4.7 The User Interface must offer functionality to switch between all of its parts (REQ 7).

In order to fulfill this requirement, the main body of the User Interface must provide menus in order to reach each and every part.

2.4.8 The User Interface must be able to read the hydraulic condition from a Ringtoets generated file (REQ 8).

Ringtoets can provide the Hydraulic Boundary as output of the Q-Variant calculations. See chapter 3 in document [3]. The output will be stored in a file that can be read in this application as the Hydraulic Boundary. The format of the file has still to be specified, and thus this requirement cannot be fulfilled yet.

2.4.9 The User Interface must support the input of a dike section with multiple strips (REQ 9).

The kernel can compute the Minersom of a strip. A dike section can be specified, which consists of multiple strips. This is just a table of X, Z coordinates, which must be specified from Left to Right, and all the next X and Z values must always be larger than the previous values. An example implementation of this table is shown below. The length of each strip has to be at least 2 meter (See document [3] chapter 5). This has to be validated before the calculation.

Geschematiseerd dwarsprofiel

x [m]	z [m+NAP]
0.00	0.00
13.50	3.00
23.50	5.00
38.50	6.00
44.50	8.00

2.4.10 A module has to be built to make a combined validation and calculation of all the strips and calculate a total result (REQ 10).

Validating a whole dike section is done by calling the kernel multiple times for each strip and aggregating the messages to one list,

Calculating a whole dike section is done by calling the kernel multiple times for each strip and combining the Minersom values of the strips in 1 list and determining the maximum value of the total list.

2.4.11 The User Interface must support the display of the results of the combined calculation of the strips (REQ 11).

The values of the Minersom of all the strips combined are the result of the calculation of the dike section. Also the maximum value of the list will be presented as the result of the calculation.

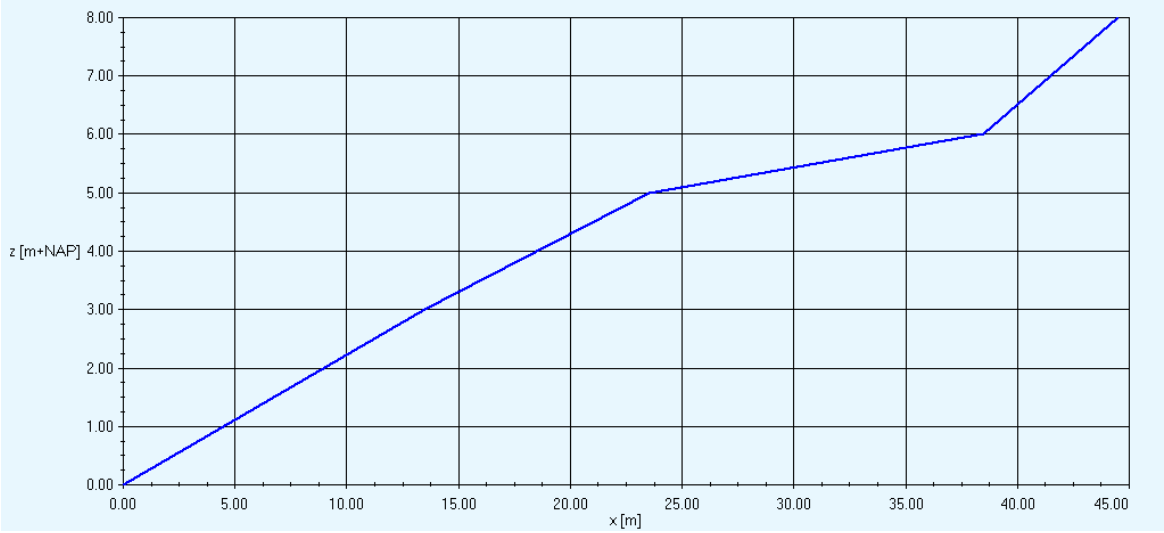
2.4.12 The User Interface must be able to read and write to its own file for storage and reuse of all the extra data that is needed for the full dike section data (REQ 12).

The User Interface must support reading and writing of all data to its own file for storage and reuse of all the extra the data that is required for full dike section computation. This

encompasses the input as well as the output parameters. For this purpose, XML (de-)serialization has to be extended.

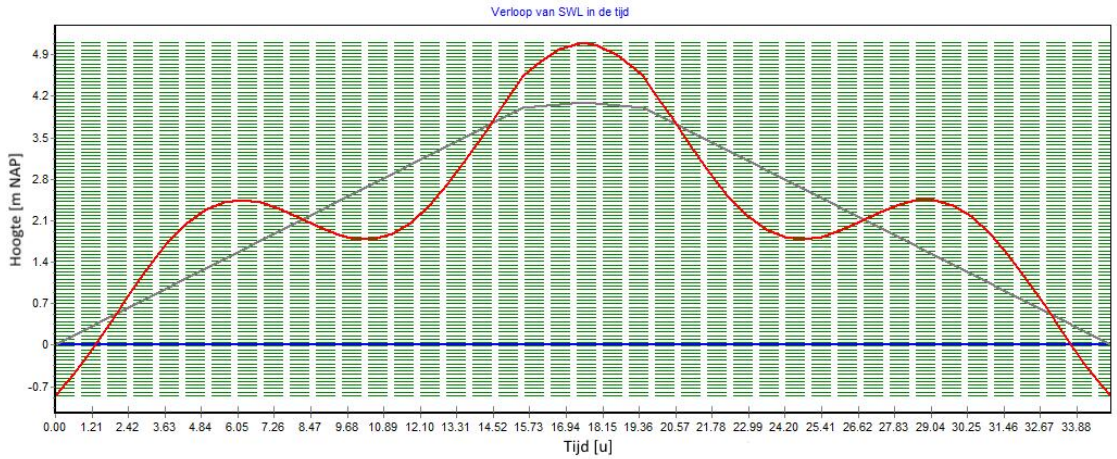
2.4.13 The User Interface must support the graphical display of the profile of the whole dike section (REQ 13).

The graphical display has to look something like shown below.



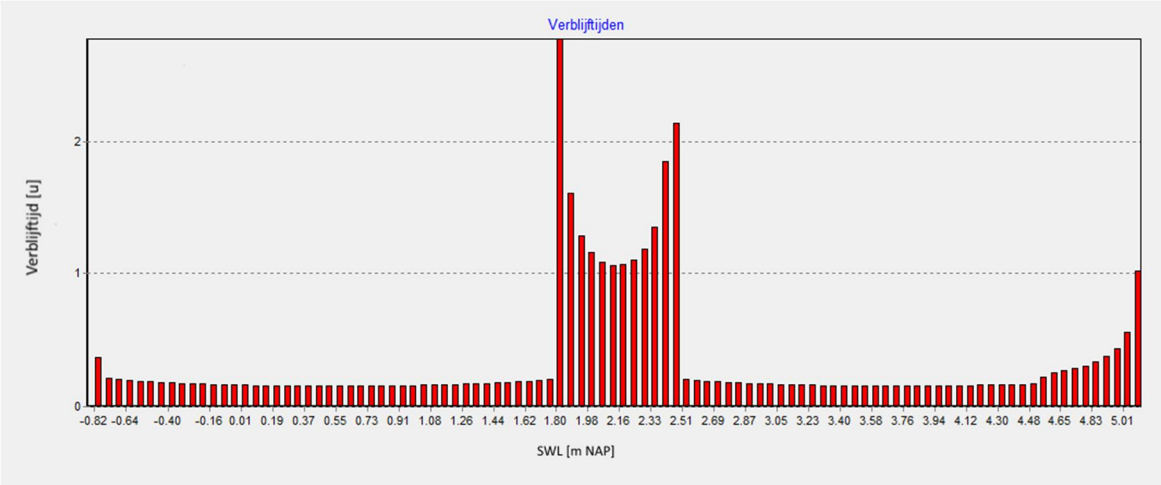
2.4.14 The User Interface must support the graphical display of the Hydraulic Condition Stillwaterlevel in time (REQ 14).

The graphical display has to look something like shown below. The data that is required to display the chart should be obtained from the WaveImpact kernel. See document [2] chapter 3 for a description of how the data is generated.
Legenda
Blue line: AverageWaterlevel (dutch: “Gemiddelde buitenwaterstand”).
Grey line: Surcharge (dutch: “Opzet”)
Red line: SWL (dutch: “SWL”)
The title of the chart is “Verloop van SWL in de tijd”, the horizontal axis has the title “Hoogte [m NAP]” and the vertical axis has the title “Tijd [u]”.



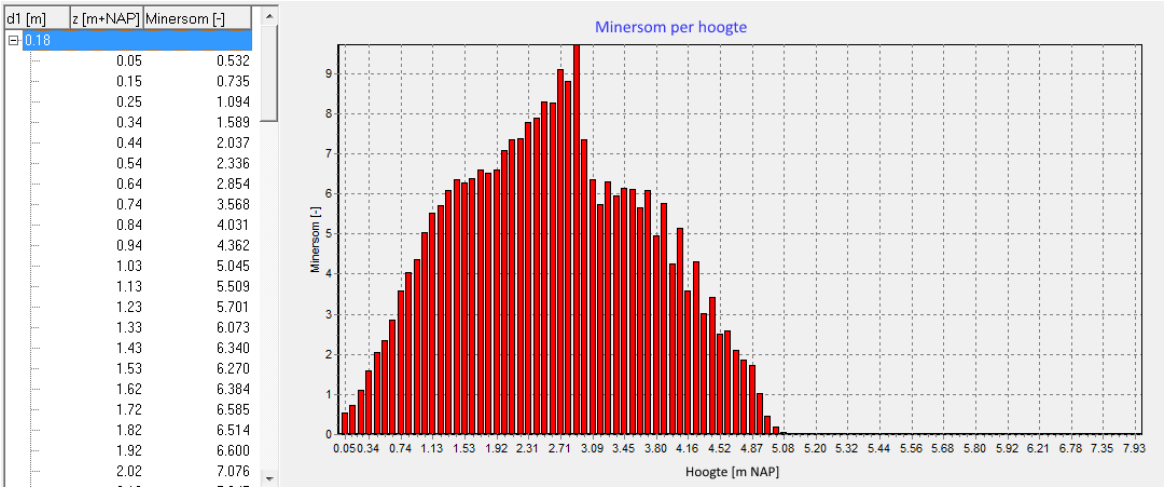
2.4.15 The User Interface must support the graphical display of the Hydraulic Condition Verblijftijden - height (REQ 15).

The graphical display has to look something like shown below. The data that is required to display the chart should be obtained from the WaveImpact kernel. The property in the WaveImpactOuput class containing the data is
List<ResultPerWaterLevelInterval> ResultsPerWaterLevelInterval.
The title of the chart is “Verblijftijden”, the horizontal axis has the title “SWL [m NAP]” and the vertical axis has the title “Verblijftijd [u]”.



2.4.16 The User Interface must support the graphical display of the MinerSom - Height (REQ 16).

The graphical display has to look something like shown below. The data that is required to display the chart should be obtained from the WaveImpact kernel. The title of the chart is “Minersom per hoogte”, the horizontal axis has the title Hoogte [m NAP] and the vertical axis has the title Minersom [-].



d1 [m]	z [m+NAP]	Minersom [-]
0.18		
	0.05	0.532
	0.15	0.735
	0.25	1.094
	0.34	1.589
	0.44	2.037
	0.54	2.336
	0.64	2.854
	0.74	3.568
	0.84	4.031
	0.94	4.362
	1.03	5.045
	1.13	5.509
	1.23	5.701
	1.33	6.073
	1.43	6.340
	1.53	6.270
	1.62	6.384
	1.72	6.585
	1.82	6.514
	1.92	6.600
	2.02	7.076

2.4.17 The User Interface must support the extra input for the safety assessment (REQ 17).

This is the list of extra input parameters for the safety assessment.

The table below is copied from document [3], chapter 7 and adapted in accordance with appendix C and is in Dutch as it is in its original source and appendix C.

Omschrijving	Para-Meter	[eenheid] type	Herkomst
variatiecoëfficiënt van de buigtreksterkte	$V_{\sigma b}$	[-] real	Invoer
Terugkeertijd op basis van trajectnorm	T	[jaar] integer	Invoer
lengte van het dijktraject	$L_{traject}$	[km] real	Invoer
modelfactor (model uncertainty factor)	γ_m	[-] real	Def = 1,77, alleen tonen
WaterSysteem	-	Set met opties: Westerschelde/Kust, Waddenzee, IJsselmeer, Geen	Zie NB hieronder

- Als (T <1) of (T > 1000000) → foutmelding: "waarde van T buiten bereik {1; 1000000}".

N.B.: Het watersysteem hier komt NIET overeen met het watersysteem zoals deze gebruikt wordt in de applicatie. Om hiermee om te kunnen gaan geldt het volgende:
- app.Kust geldt als Westerschelde/Kust (niet tonen in UI)
- app.Merengebied geldt als IJsselmeer (niet tonen in UI)
- app.Waddenzee geldt als Waddenzee (niet tonen in UI)
- app.Oosterschelde en app.Overig : de gebruiker moet via de UI de keus krijgen of hij hiervoor een van de systemen wil kiezen, zo nee dan blijft het watersysteem op Geen staan en kan er geen beoordeling plaatsvinden. Zo ja, dan wordt het gekozen watersysteem gebruikt.

N.B.: Parameter T (Terugkeertijd op basis van trajectnorm) komt niet voor in de beschrijving van het bepalen van het toetsoordeel in appendix C. De parameter die daar gebruikt wordt is P_{Norm} (faalkans van het dijktraject). Omrekenen kan met de volgende vergelijking:

$P_{Norm} = 1 / T$

2.4.18 A module has to be built to perform a safety assessment (REQ 18).

The description of how the safety assessment should be done can be found in document [3] chapter 7. This chapter is included in this document as Appendix [3C]

2.4.19 The User Interface must support the display of the results of the safety assessment (REQ 19).
The results that have to be displayed are
1) Assessment result ("voldoet", "voldoet niet") and the "Breuksom" (document [3] chapter 7 equation 7.1)
2) Safety Factor (SF_{asf}) (document [3] chapter 7 equation 7.4)

2.4.20 The User Interface must be able to read and write to its own file for storage and reuse of all the extra data that is needed for the safety assessment (REQ 20).

The User Interface must support reading and writing of all data to its own file for storage and reuse of all the extra data that is required for safety assessment. This encompasses the input as well as the output parameters. For this purpose, XML (de-)serialization has to be extended.

2.5 Error handling

The common error handling (validation of input data) is to be handled as described in NFR 6. This handling is supported in the DSL by logging all errors and warnings directly to a Log Manager. This log manager supports the categorization of the messages and shows the origin of messages.

However, it cannot be excluded that an “unexpected” error still occurs as it is hard to test for all possible scenarios during validation. In that case, the application must handle this by giving a general message to the user in Dutch, if possible followed by error information as generated by the system (usually in English). This message again is reported via the Log Manager. In this fashion all possible errors are handled neatly, are reported back to the user with as much useful information as possible and do not lead to a system crash.

3 Literature

1. John Bokma, Tom The, 2016, WTI2017 Failure Mechanisms – WaveImpact Asphalt Kernel, Technical Design, Deltares report 1230095-002-HYE-0025, October 2016.
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4. Knoeff, H., De Waal, J.P. de, 2014, Uitgangspunten WTI 2017, Deltares rapport 1209429-001-GEO-0011, 17 oktober 2014.
5. Lam, K.S., 2016, WTI Parameterlijst, Deltares rapport 1220081-005-GEO-0003, 2 februari 2016.
6. List of all functional and non-functional WTI software requirements. 20160428 fundament software.xlsx
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8. Markus, 2016, BM Asfalt Golfklap - Test Report, 2016
9. Tom The, 2016, BM Asfalt Golfklap – Functional Design – Errata, Deltares memo, 14 September 2016.
10. Cluster WTI datamanagement, 1220081-005-GEO-0003 - WTI Parameterlijst.pdf

A Glossary

English	Nederlands	Description
Strip	Strook	One linear part of a dike section
Asphalt geometry	Asfaltgeometrie	Multiple connected strips; all strips have the same construction properties
Hydraulic condtion	Hydraulische belasting	The definition of the waterlevel and wave loading on the structure
Asphalt construction	Asfalt constructie	The asphalt construction

B Description of the parameters

This text is in Dutch because it is copied from Appendix A of document [3] and adapted to parameters of WTI list [5]

Tabel B.1 Invoerparameters voor het rekenhart GOLFKLAP

Parameter omschrijving	symbool	Eenheid	Tonen in UI
Algemeen			
Beschrijving		geen	Ja
Geometrie			
Hoogte voorland	$h_{voorland}$	m t.o.v. NAP	Ja
Bermfactor voor drukstoot	C_{stoot}	-	Nee
Niveau onderrand asfalt [1]	h_{min}	m t.o.v. NAP	Ja
Niveau bovenrand asfalt [1]	h_{max}	m t.o.v. NAP	Ja
Aantal rekenpunten	n_3	geen	ja
Begin /Eind X i	X_i	m	Ja tabel i = 1; 2
Begin /Eind Z i	Z_i	m	
Hydraulische belasting - Algemeen			
Type watersysteem [1]	*Watersysteem*	-	Ja
Dichtheid water [1]	ρ_w	kg/m^3	Ja
Valversnelling	g	m/s^2	Nee (=9.81)
Hydraulische belasting – Getij (onzichtbaar voor Merengebied/Oosterschelde)			
Gemiddelde getijamplitude	*GGA*	n	Ja
Offset van getij tov halve stormduur (alleen zichtbaar voor Overig)	*GetijOffset*	uur	Nee (=0)
Duur getijperiode	T_{tij}	uur	Nee (=12.4)
Hydraulische belasting - Peil			
Waterstand bij de norm (voorheen Toetspeil)	*Toetspeil*	m t.o.v. NAP	Ja
Gemiddelde buitenwaterstand [1]	*GWS*	m t.o.v. NAP	Ja
Aantal SWL stappen	n_2	Geen	Ja
Hydraulische belasting – Opzet (watersysteem= Waddenzee, Kust, Merengebied)			
Opzet storm [m]	*Opzet*	m	Ja
Hydraulische belasting – Opzet (watersysteem= Overig)			
Opzet	*Opzet(j)*	m t.o.v. NAP	Ja, tabel
Tijd	*TijdOpzet(j)*	uur	
Offset van getij tov halve stormduur	*GetijOffset*	uur	Nee(=0)
Hydraulische gegevens-Kansverdeling			Nee
Kans behorende bij stootfactor r (= 1..11)	$Ps(r)$	-	Nee (=tabel 5.2 scientific document: WaveImpact Asphalt Kernel - Scientific

[1] *Adapted to WTI list*

			Doc.pdf)
Hydraulische gegevens-Golfdefinities			
Aantal inslagpunten	n_5	Geen	Ja
Waterstandsniveau *n* voor golfRVW: 'Niveau' in UI	$H(n)$	m t.o.v. NAP	Ja, tabel
Golfhoogte bij waterstand *n:* 'Significante golfhoogte' in UI	$H_s(n)$	m	
Golfperiode bij waterstand *n* [1] 'Piekperiode' in UI	$T_p(n)$	s	
Constructiegegevens			
Dikte asfalttoplaag [1]	d_1	m	Ja
Stijfheidsmodulus asfalttoplaag [1]	E_1	MPa	Ja
Dwarscontractiecoëfficiënt asfalt	ν	-	Ja
Breuksterkte asphalt [1]	σ_b	MPa	Ja
Vermoeiingsparameter 1	$\nu\alpha$	-	Ja
Vermoeiingsparameter 2	$\nu\beta$	-	Ja
Veerconstante ondergrond [1]	c	MPa/m	Ja
Constructieopbouw	*Tweelaag*	-	Nee (is uitgevinkt)
Dikte asfaltonderlaag [1]	d_2	m	Nee
Stijfheidsmodulus asfaltonderlaag [1]	E_2	MPa	Nee

Zoals in de laatste kolom te zien is hoeft een aantal parameters niet te worden getoond in de gebruikersschil.
Dit gaat enerzijds om parameters die voor de toetsing niet relevant zijn, omdat die parameters betrekking hebben op een optie van het rekenhart die niet wordt ondersteund.
Anderzijds gaat het om parameters waarvoor default waarden worden gebruikt waar in de toetsing niet vanaf mag/kan worden geweken.
Indien een parameter niet getoond wordt, staat in sommige gevallen tussen haakjes de waarde die standaard doorgegeven moet worden naar het rekenhart.

C Safety Assessment

*This text is in Dutch because it is copied from Chapter 7 of document [**Error! Reference source not found.**]. Note that it is adapted for use within this application rather than for use in RingToets as meant in the original text. This means that some additional fields must be entered by the user and that some existing fields now require input from the user too.*

De in dit hoofdstuk beschreven methodiek is hoofdzakelijk gebaseerd op de rapportage betreffende de kalibratie die is uitgevoerd voor asfaltbekledingen [Klerk en Kanning, 2014]. Daarnaast zijn elementen uit [Jongejan en Klerk, 2015] opgenomen.
De meldingen zoals die in dit hoofdstuk zijn opgenomen, zullen qua taalgebruik nog in overeenstemming moeten worden gebracht met de meldingen elders in de applicatie.

De (invoer)parameters die voor de beoordeling van de bekleding worden gebruikt, afgezien van de rekenresultaten van het rekenhart, zijn weergegeven in Tabel C.1.

Tabel C.1 Extra invoerparameters, nodig voor de beoordeling die in dit hoofdstuk worden geïntroduceerd. [1]de volgende herkomsten worden onderscheiden: DB = database; Def = defaultwaarde; Wet = voorgeschreven WTI; Invoer = op te geven door gebruiker. [2]tonen in UI heeft betrekking op wat de gewone gebruiker wordt getoond, tussen haakjes of deze waarde wel (j) of niet (n) door de gebruiker kan worden gewijzigd. [3]In de gebruikersschil $L_{traject}$/1000 tonen, dus in [km], in beschrijving is voor $L_{traject}$ uitgegaan van [m]. [4]Deze "Tonen in UI: Nee" of "Tonen in UI: Ja(n)" geldt niet voor de geautoriseerde gebruiker, die kan deze "vaste"-waarden altijd inzien en zo nodig wijzigen. Let er wel op dat deze stand alone applicatie alleen wordt gemaakt voor de gewone gebruiker en dus de geautoriseerde waarden nooit zichtbaar zullen zijn. [5] exacte waarde staat nog ter discussie, deze volgt uit het beoordelingsprocol.

Omschrijving	Para-Meter	[eenheid] type	Herkomst[1]	Tonen in UI[2]
variatiecoëfficiënt van de buigtreksterkte	$V_{\sigma b}$	[-] real	Invoer	Ja (j)
faalkans van het dijktraject	P_{Norm}	[-] real	DB/Wet?	Ja (j)
lengte van het dijktraject	$L_{traject}$	[m] real	DB/Wet?	Ja (j) [4]
modelfactor (model uncertainty factor)	γ_m	[-] real	Def = 1,77	Ja (n) [4]
faalkansruimtefactor bekledingen (failure probability factor)	f	[-] real	Def=0,1	Nee [4]
bijdrage van de asfaltbekleding aan dijkfalen als gevolg van falen een willekeurige bekleding	λ_1	[-] real	Def=0,33	Nee [4]
bijdrage de te evalueren mechanismen aan falen van de asfaltbekleding	λ_2	[-] real	Def=0,5	Nee [4]
bijdrage van mechanisme golfklappen aan falen van de asfaltbekleding	λ_3	[-] real	Def=0,7	Nee [4]
lengte van onafhankelijke dijkstrekkingen voor dit mechanisme	ΔL	[m] real	Def=1000	Nee [4]
factor voor berekening *ruim* goed- of afkeuren	Y	[-] real	Def=30 [5]	Nee [4]
Breuksom	$Breuksom$	[-] real	n.v.t.	Nee
Minersom voor het gehele dijkvak	$Minerdijkvak$	[-] real	n.v.t.	Nee
Golfhoogte	Hs	[m] Real	n.v.t.	Nee
WaterSysteem	-	Set met opties: Westerschelde/Kust, Waddenzee, IJsselmeer, Geen	Geen	Zie NB hieronder

N.B.: Het watersysteem hier komt NIET overeen met het watersysteem zoals deze gebruikt wordt in de applicatie. Om hiermee om te kunnen gaan geldt het volgende:

- app.Kust geldt als Westerschelde/Kust (niet tonen in UI)
- app.Merengebied geldt als IJsselmeer (niet tonen in UI)
- app.Waddenzee geldt als Waddenzee (niet tonen in UI)
- app.Oosterschelde en app.Overig : de gebruiker moet via de UI de keus krijgen of hij hiervoor een van de systemen wil kiezen, zo nee dan blijft het watersysteem op Geen staan en kan er geen beoordeling plaatsvinden. Zo ja, dan wordt het gekozen watersysteem gebruikt.

De routine die op grond van de GOLFKLAP-resultaten komt tot een toetsoordeel, dient een validatie van de te gebruiken parameters uit te voeren:

- Als (P_{Norm} <= 0) of (P_{Norm} >= 1) → foutmelding: “waarde van P_{Norm} buiten bereik {0; 1}”.
- Als (f <= 0) of (f >= 1) → foutmelding: “waarde van f buiten bereik {0; 1}”.
- Als (λ_1 <= 0) of (λ_1 >= 1) → foutmelding: “waarde van λ_1 buiten bereik {0; 1}”.

- Als (λ_2 <= 0) of (λ_2 >= 1) → foutmelding: “waarde van λ_2 buiten bereik {0; 1}”.
- Als (λ_3 <= 0) of (λ_3 >= 1) → foutmelding: “waarde van λ_3 buiten bereik {0; 1}”.
- Als ($L_{traject}$ < 1000) of ($L_{traject}$ > 200000) → foutmelding: “waarde van $L_{traject}$ buiten bereik {1; 200} km”.
- Als (ΔL < 100) of (ΔL > 20000) → foutmelding: “waarde van ΔL buiten bereik {0.1; 20} km”.
- Als $\Delta L >= L_{traject}$ → foutmelding: “ΔL moet kleiner zijn dan $L_{traject}$”.
- Als ($V_{\sigma b}$ < 0,05) of ($V_{\sigma b}$ > 1) → foutmelding: “waarde van $V_{\sigma b}$ buiten bereik {0,05; 1}”.

Vervolgens worden eventuele situaties die buiten het geldigheidsgebied vallen, afgevangen:

Het geldigheidsgebied van de kalibratie vereist dat de variatiecoëfficiënt van de buigtreksterkte kleiner dan of gelijk is aan 0,35. Oftewel:
Als $V_{\sigma b} > 0,35$ dan de melding geven: “Variatiecoëfficiënt buiten geldigheidsgebied van kalibratie, er kan geen beoordeling plaats vinden.”
Strikt genomen kan deze beoordeling ook worden afgehandeld zodra de materiaaleigenschappen zijn ingelezen en gecontroleerd door de gebruiker. Als de gebruiker vraagt om een berekening kan bovenstaande validatie plaatsvinden en hoeft er dus niet te worden gerekend door het rekenhart GOLFKLAP als $V_{\sigma b} > 0,35$. Er wordt hier echter gekozen om de beoordeling altijd pas na afloop van een succesvolle berekening aan te bieden.

Het rekenmodel GOLFKLAP kent een geldigheidsgebied ten aanzien van de golfhoogte. Als het rekenhart de error = “golfhoogte nr *i* te hoog” of warning = “golfhoogte nr *i* buiten geldigheidsgebied rekenmodel” voor een strook heeft opgeleverd, dan kan de bekleding niet worden beoordeeld in de gedetailleerde beoordeling en moet worden doorgegaan met de volgende toetsstap in het toetsproces de *toets op maat*. I.p.v. een oordeel vermelden: “H_s > 3,0 m ligt buiten geldigheidsgebied van rekenmodel: door naar *toets op maat*”.
Strikt genomen kan ook deze beoordeling worden afgehandeld voordat er met het rekenhart GOLFKLAP berekeningen worden uitgevoerd. Zodra de golfrandvoorwaarden zijn bepaald, kan deze beoordeling worden uitgevoerd. Er wordt hier echter gekozen om de beoordeling altijd pas na afloop van een succesvolle berekening aan te bieden.

Per dijkvak wordt voor één of meer asfaltstroken (aangeduid als *j*) de GOLFKLAP-kernel aangeroepen. Dat betekent dat *j*-maal er een set uitvoerwaarden van de kernel beschikbaar komt.

Als voor één of meerdere stroken de buigtreksterkte is overschreden (*Breuk* = 1) dan:
- moet de *Breuksom* worden berekend:

$$Breuksom = \max_{(i=1...n3)} \left\{ \sum_{tc=20}^{30} NBreuk(i,tc) \right\} \qquad \text{(C.1)}$$

N.b. in de formule wordt het maximum bepaald voor alle delen i van een asfaltstrook die zijn berekend. Als de bekleding uit meerdere stroken bestaat waarbij de buigtreksterkte is overschreden, dan moet het maximum over die betreffende stroken worden bepaald. M.a.w. de NBreuk(i, tc) waarde moet per asfaltstrookdeel (i) worden gesommeerd voor alle tc waarden die tussen de 20 en 30 vallen. En van alle asfaltstrookdelen moet dan de maximale gesommeerde waarde worden genomen als resultaat. Houd hierbij wel rekening met het feit dat bij meerdere stroken, de index (i) meerdere keren kan voorkomen maar dat dit wel afzonderlijke asfaltstrookdelen zijn!

Let er op dat de feitelijke berekening van Breuksom niet in de assessment module zelf plaatsvindt maar dat deze wordt bepaald in de applicatie zelf aan de hand van de beschikbare uitvoer vanuit de kernel. Anders zou ook alle relevante onderliggende data als invoer aan deze module moeten worden toegevoegd.

- krijgt de gehele asfaltbekleding het oordeel: “voldoet niet”. Deze kwalificatie houdt in dat doorgegaan moet worden met de volgende toetsstap in het toetsproces: de *toets op maat*.

Verder is voor de beoordeling van het dijkvak op AGK het maximum van de Minersom van de verschillende doorgerekende asfaltstroken van belang. Dus:

$$Miner_{dijkvak} = \max(Miner_{max1}; Miner_{max2}; \ldots; Miner_{maxj}) \quad \text{(C.2)}$$

Let er op dat de feitelijke berekening van Miner per dijkvak niet in de assessment module zelf plaatsvindt maar dat deze wordt bepaald in de applicatie zelf aan de hand van de beschikbare uitvoer vanuit de kernel. Anders zou ook alle relevante onderliggende data als invoer aan deze module moeten worden toegevoegd.

Op grond van:

$$\log_{10}(\gamma_m Miner_{dijkvak}) < -\gamma_s \quad \text{(C.3)}$$

moet worden bepaald of de bekleding ja/nee voldoet. Door Jongejan en Klerk [2015] is op deze ongelijkheid een stabiliteitsfactor gebaseerd. Die is gecorrigeerd tot:

$$SF_{asf} = \frac{-\log_{10}(\gamma_m Miner_{dijkvak})}{\gamma_s} \quad \text{(C.4)}$$

Waarin:

γ_m modelfactor voor waterbouwasfaltbetonbekledingen belast door golven

γ_s overall veiligheidsfactor te berekenen met de formules uit de Tabel C.2. Hierbij wordt onderscheid gemaakt in asfaltkwaliteit: “jong” = relatief goede kwaliteit; “oud” = relatief slechte kwaliteit.

Tabel C.2 Fit-functies voor de veiligheidsfactor voor verschillende watersystemen en materiaal-klassen

Watersysteem	**Klasse**	**β_T-afhankelijke veiligheidscoëfficiënt**
Westerschelde/ kust	Jong	$\gamma_{s,j} = 0.52\left(\beta_{T,cs} - 1.97\right) - 0.33\beta_{Norm}$
	Oud	$\gamma_{s,o} = 0.61\left(\beta_{T,cs} - 1.99\right) - 0.34\beta_{Norm}$
Waddenzee	Jong	$\gamma_{s,j} = 0.57\left(\beta_{T,cs} - 2.37\right) - 0.29\beta_{Norm}$
	Oud	$\gamma_{s,o} = 0.68\left(\beta_{T,cs} - 2.47\right) - 0.26\beta_{Norm}$
IJsselmeer	Jong	$\gamma_{s,j} = 0.74\left(\beta_{T,cs} - 1.28\right) - 0.66\beta_{Norm}$
	Oud	$\gamma_{s,o} = 0.82\left(\beta_{T,cs} - 1.37\right) - 0.68\beta_{Norm}$

Waarin:

$$\beta_{Norm} = -\Phi^{-1}(P_{Norm}) \tag{C.5}$$

en volgens Jongejan en Klerk [2015]:

$$\beta_{T,cs} = -\Phi^{-1}\left(min\left(\frac{f \cdot \lambda_1 \cdot \lambda_2 \cdot \lambda_3 \cdot P_{Norm}}{\frac{L_{mech}}{\Delta L}}; f \cdot \lambda_1 \cdot \lambda_2 \cdot \lambda_3 \cdot P_{Norm} \right) \right) \tag{C.6}$$

Waarin:

Φ Gauss kansfunctie [-]

P_{Norm} faalkans van het dijktraject, ongeacht het mechanisme [-] [maximum allowable probability of flooding (per year)]

f faalkansruimtefactor [-] [failure probability factor]

λ_1 bijdrage van de asfaltbekleding aan dijkfalen als gevolg van falen een willekeurige bekleding [-] [maximum allowable contribution of asphalt revetments to the probability of flooding due to revetment failures]

λ_2 bijdrage van de asfaltbekleding aan dijkfalen als gevolg van de te toetsen mechanismen [-] [maximum allowable contribution of asphalt revetments to the probability of flooding due to mechanisms evaluated in the assessment]

λ_3 bijdrage van mechanisme golfklappen aan falen van de asfaltbekleding [-] [maximum allowable contribution of wave impact to failure of asphalt revetments]

L_{mech} totale lengte van de dijkvakken met een asfaltbekleding (ongeacht type asfalt) binnen het dijktraject [m] [combined length of all asphalt revetments (all “asphalt sections”) within the segment]

ΔL maat voor de lengte van onafhankelijke dijkstrekkingen voor dit mechanisme [m] [measure for the intensity of the length effect within the part of the segment that is sensitive to the failure mechanism under consideration]

Aangezien het in de eerste opzet van de 2A-toets niet wenselijk is dat de uitkomst afhankelijk is van de bekledingen in de overige dijkvakken wordt vooralsnog de volgende formule gehanteerd:

$$\beta_{T,cs} = -\Phi^{-1}\left(\frac{f \cdot \lambda_1 \cdot \lambda_2 \cdot \lambda_3 \cdot P_{Norm}}{\frac{L_{traject}}{\Delta L}} \right) \tag{C.7}$$

Waarin:

$L_{traject}$ lengte van het dijktraject [m] [length of the dike segment]

Als er op een deel van het traject geen asfaltbekleding ligt, dan laat deze formule een deel van de voor asfalt gereserveerde faalkansruimte onbenut (is conservatief). In die gevallen verdient het voor de toets op maat (toetslaag 3) danook aanbeveling om de herverdeling van de faalkansruimte over de verschillende vakken te benutten.

Op basis van de variatiecoëfficiënt in de buigtreksterktegegevens ($V_{\sigma b}$) wordt de keuze voor 'jong' of 'oud' gemaakt. Met de rekenwaarde voor de variatiecoëfficiënt gaat dat als volgt:

- als $V_{\sigma b} \leq 0,2$, dan de formule voor 'jong' gebruiken $\gamma_s = \gamma_{s,j}$.
- als $0,2 < V_{\sigma b} \leq 0,35$, dan de γ_s bepalen op basis van een lineaire interpolatie tussen de waarden berekend met de formules voor 'jong' ($\gamma_{s,j}$) en 'oud' ($\gamma_{s,o}$).

Als de bekleding *niet* voldoet, oftewel als niet aan (C.3) wordt voldaan, dan moet de SF_{asfY} worden berekend uitgaande van een kans van P_{Norm}*Y.

Als SF_{asfY} < 1 dan het oordeel geven: "asfaltbekleding *voldoet zeker niet*";
anders: "asfaltbekleding *voldoet niet*".
Vervolgens moet worden doorgegaan met de volgende stap in het toetsproces.

Als de bekleding *wel* voldoet, oftewel als *wel* aan (C.3) wordt voldaan, dan moet de SF_{asfY} worden berekend uitgaande van een kans van P_{Norm}/Y.

Als SF_{asfY} < 1 dan het oordeel geven: "asfaltbekleding *voldoet*";
anders: "asfaltbekleding *voldoet ruim*".
Vervolgens moet worden doorgegaan met de volgende stap in het toetsproces.

Nb. de waarde van de factor Y staat nog ter discussie en de exacte formulering van de kwalificaties *voldoet zeker niet* en *voldoet ruim* ook. E.e.a. volgt uit het beoordelingsprotocol dat nog niet is vastgesteld. Mede daardoor is besloten deze aanvullende beoordeling vooralsnog niet uit te voeren.

D User Interface Design

This is a design sketch of what the User Interface of BM ASfalt Golfklap should look like. The User Interface is based on the general look and feel of Delta Shell Light. The picture should not be taken literally, but just as a sketch of the layout of the graphic and table input/ouput forms and the property window