Krypton User Guide

Document Revision 1.0

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1 Initial Setup and File Saving/Opening

It is important to ensure that the web version of Krypton is accessed through the Google Chrome web browser as the compatibility of the program works the best with that specific web browser.

Krypton provides the user with a fibrillation curve once a calculation has been completed. This curve can be exported as a CSV file and once it is opened in Excel, it is able to provide the user with the values of the current, voltage, time, mean and sigma associated with that specific curve.

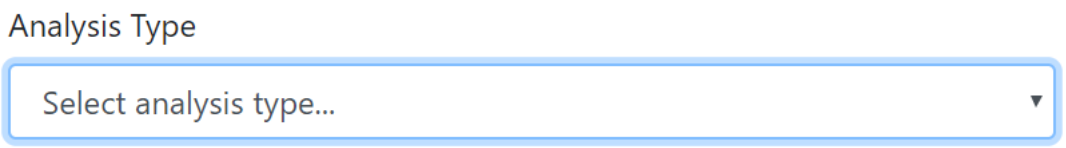
2 Safety Criteria Derivation Process

The following section outlines the steps required to carry out the safety criteria derivation process.

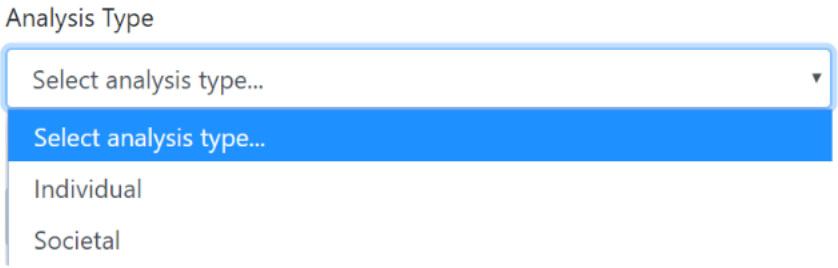
2.1 Part A – Determine Probability of Coincidence

2.1.1 Analysis Type

The user must first identify the type of analysis he/she will be preforming a calculation on as the outcome will be very different depending on his/her requirements.

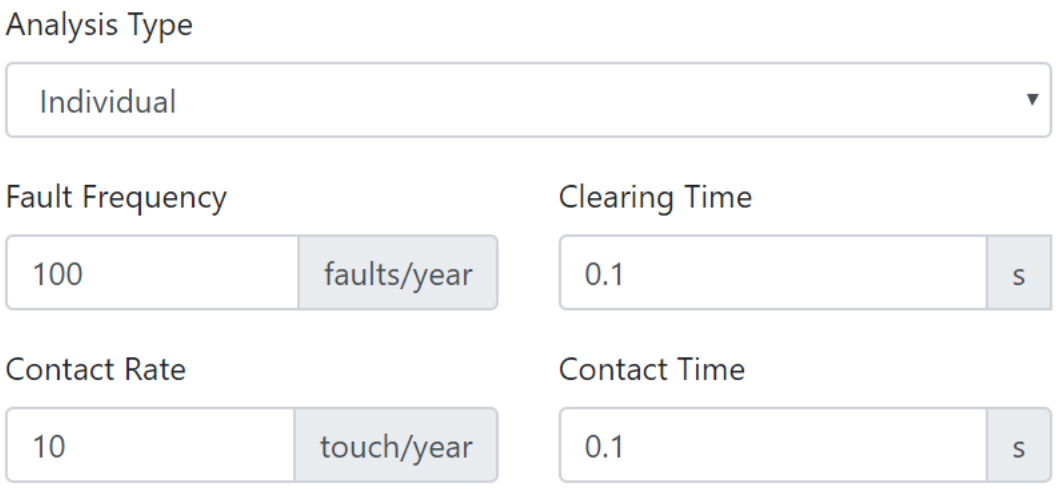


The user can choose between an individual case or a societal case. Once selected, the user will notice the input parameters change depended on the type of analysis they want to preform.



2.1.2 Individual Case

Assuming the user has selected to preform a calculation for an individual case he/she will see the following input parameters below. Otherwise, the user should skip ahead to **Part 2.1.3 Societal Case**.



Fault Frequency

The user can dial-up the fault frequency from 0 faults/year by increments of 10 faults/year. It is also possible for the user to manually enter the exact fault frequency they desire.

Contact Rate

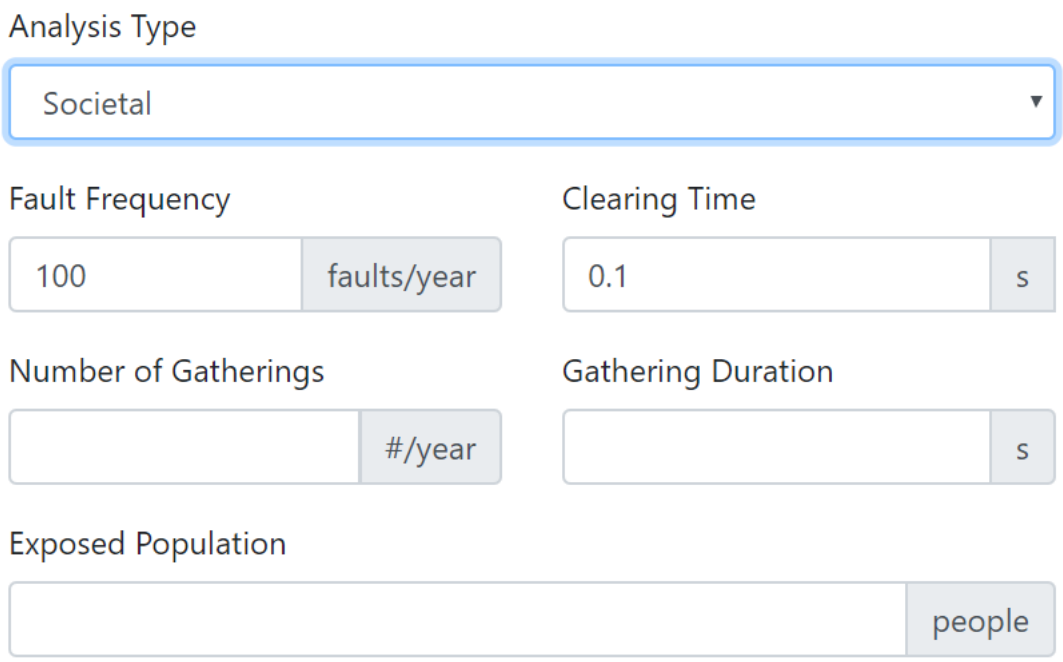
The user can dial-up the contact rate from 0 touch/year by increments of 10 touch/year. It is also possible for the user to manually enter the exact contact rate they desire.

Clearing Time

The user can dial-up the clearing time from 0 sec by increments of 0.1 to 1.0 sec. It is also possible for the user to manually enter the exact clearing time they desire. The default clearing time is set to 0.1 sec and the maximum value of the clearing time is 1.0 sec. This value is used both for determining the probability of coincidence and for the probability of fibrillation in **Step B**.

2.1.3 Societal Case

Assuming the user has selected to perform a calculation for a societal case he/she will see the following input parameters below.



Fault Frequency

The user can dial-up the fault frequency from 0 faults/year by increments of 10 faults/year. It is also possible for the user to manually enter the exact fault frequency they desire.

Clearing Time

The user can dial-up the clearing time from 0 sec by increments of 0.1 to 1.0 sec. It is also possible for the user to manually enter the exact clearing time they desire. The default clearing time is set to 0.1 sec and the maximum value of the clearing time is 1.0 sec. This value is used both for determining the probability of coincidence and for the probability of fibrillation in **Step B**.

Number of Gatherings

The user can dial-up the number of gatherings from 0 #/year by increments of 10 #/year. It is also possible for the user to manually enter the exact number of gatherings they desire.

Gathering Duration

The user can dial-up the gathering duration from 0 sec by increments of 1 sec. It is also possible for the user to manually enter the exact gathering duration they desire.

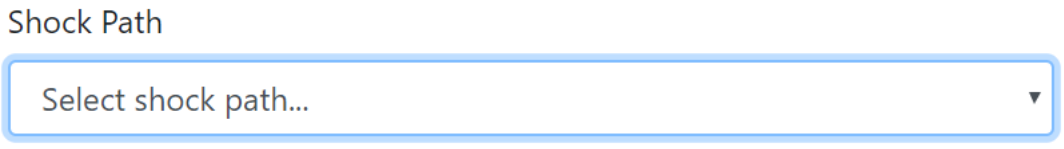
Exposed Population

The user can dial-up the exposed population from 0 people by increments of 10 people. It is also possible for the user to manually enter the exact exposed population they desire.

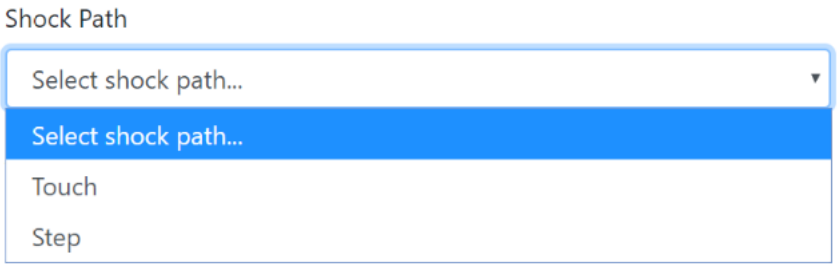
2.2 Part B – Determine Probability of Fibrillation

2.2.1 Shock Type

The user must first identify the type of shock path he/she will be looking at for their analysis before preforming a calculation as the outcome will be very different depending on his/her requirements.



The user can choose between a touch potential or a step potential. Unlike the probability of coincidence, the input parameters for the probability of fibrillation no matter which shock path the user selects.



Applied Voltage

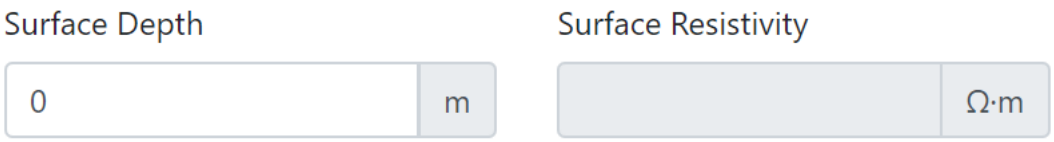
The user can dial-up the applied voltage from 0 Volts by increments of 10 Volts. It is also possible for the user to manually enter the exact applied voltage they desire.

Soil Resistivity

The user can dial-up the soil resistivity from 0 Ω×m by increments of 10 Ω×m. It is also possible for the user to manually enter the exact soil resistivity they desire.

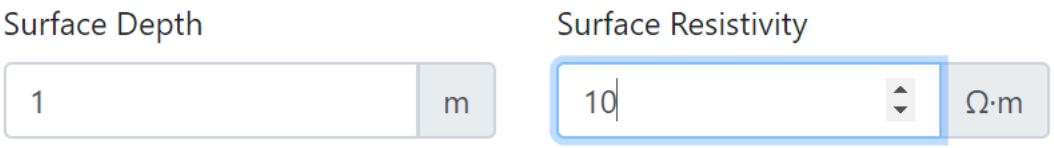
Surface Depth

The user can dial-up the surface depth from 0 meters by increments 1 meter. It is also possible for the user to manually enter the exact surface depth they desire. If the surface depth is left at 0 meters the surface resistivity is voided as seen below.



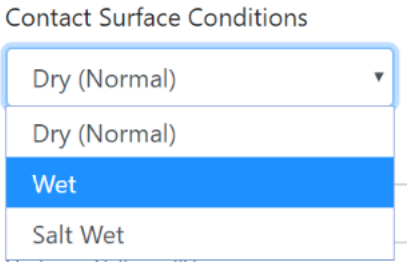
Surface Resistivity

As mentioned above, the surface resistivity can only be entered if a number larger than 0 is entered for the surface depth (as seen below). Once that number is entered, the user can dial-up the surface resistivity from 0 Ω×m by increments of 1 Ω×m. It is also possible for the user to manually enter the exact surface resistivity they desire.



Contact Surface Conditions

This input is automatically set to "Dry (Normal)" whenever entering Krypton or when resetting the program. The user can choose between the three options shown below. Each surface condition will change the body resistance of the person present during the fault, which will ultimately affect the outcome of what the probability of fibrillation calculates to.

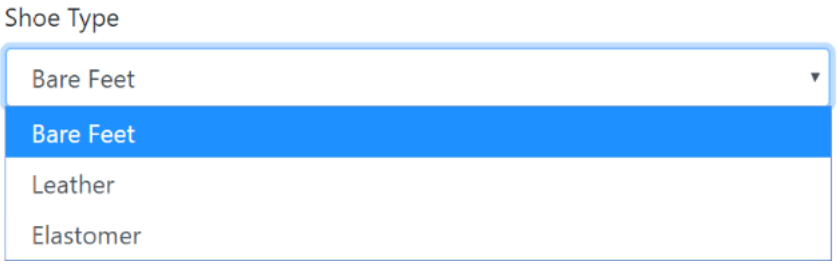


Additional Contact Resistance

This resistance is automatically set to 0 Ω and can be dialed up by increments of 10 Ω. It is also possible for the user to manually enter the exact contact resistance they desire. This resistance accounts for the resistance a person's hand. **– Not sure of this, should this contact resistance only be for the touch case.**

Shoe Type

This input is automatically set to "Bare Feet" whenever entering Krypton or when resetting the program. The user can choose between the three options shown below. Each shoe type will change the total body resistance of the person present during the fault, which will ultimately affect the outcome of what the probability of fibrillation calculates to.

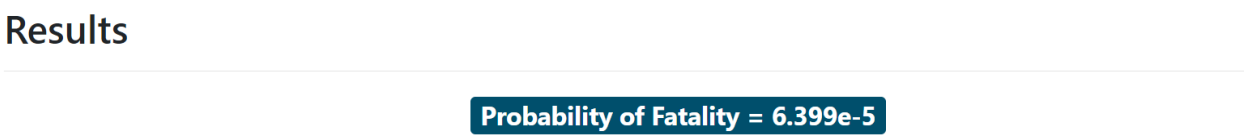


2.3 Results

Once the user is completely satisfied with the input parameters that they have entered into Krypton, they can either press the "enter" key or they can press the "Calculate/View Results" button at the top of the page as shown below. Once the user has done that, a variety of results will appear on the user's screen. If the user has decided to perform a risk assessment regarding a societal case, please read Sections **2.3.4** and **2.3.5** as well.

2.3.1 Probability of Fatality

The probability of fatality will be highlighted under the heading "Results".



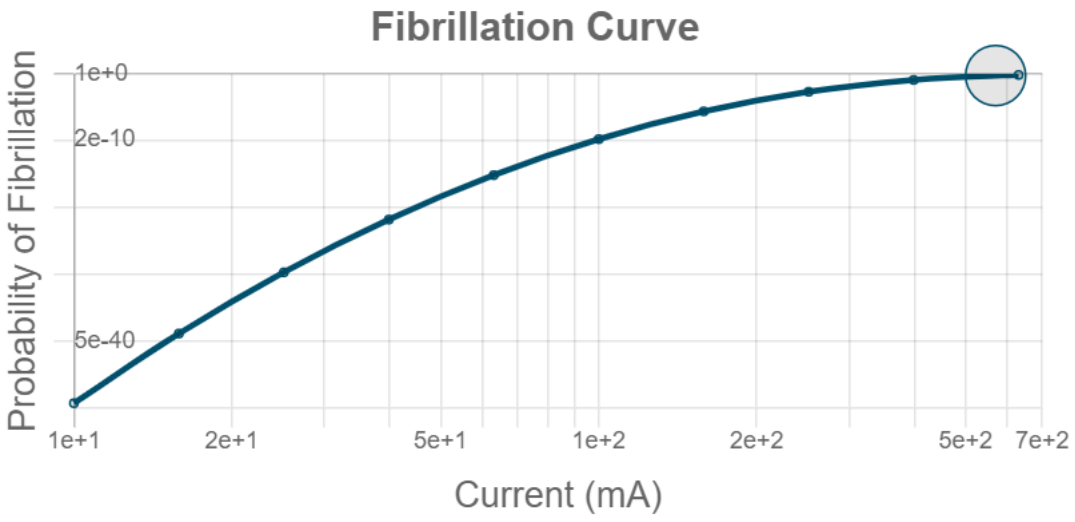
Above the probability of fatality, the user will be able to see the respect values of the probability of coincidence (denoted as P_C) and the probability of fibrillation (denoted as P_F).

2.3.2 Decision Level Indicator

The user will also be able to see the risk associated with the probability of fatality calculated by Krypton and gives the user the suggestion on which level of management should be consulted based on the results.

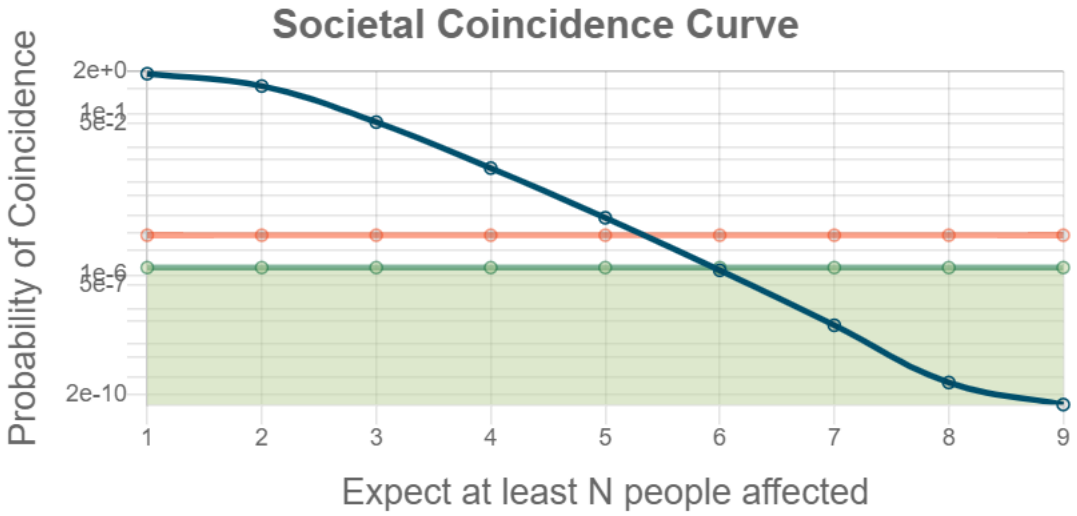
2.3.3 Fibrillation Curve

As the user scrolls through the results, they will notice a fibrillation curve (see below). This fibrillation curve will show the body current as a function of the probability of fibrillation. It helps the user understand exactly what the probability of fibrillation would be based on the body current of the person experiencing the fault.



2.3.4 Societal Curve

In the case that the user has chosen to perform a risk assessment on a societal case they we will see a societal curve within the results of their calculation (see below). This societal curve will show the expected number of people affected (N) as a function of the probability of coincidence. This helps the user to get a better understanding of how many people will have either a lower or higher chance of being affected by the fault.



2.3.5 Societal Fatality Curve

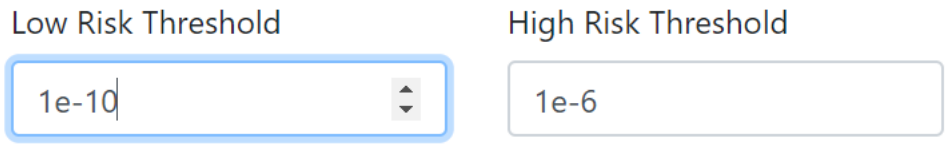
In the case that the user has chosen to perform a risk assessment on a societal case they we will see a societal fatality curve within the results of their calculation. This societal fatality curve will show the number of fatalities (N) as a function of the probability of fatality. This helps the user to get a better understanding of how many people will have either a lower or higher chance of being fatally injured by the fault.

3 Settings

The user can change the settings of the program by selecting the gear located at the top right of the page. Once the settings pop up (see below), the user will have the option of manipulating aspects like the risk threshold, population percentile rank, body resistance and the breaker failure to their choosing. Please see **Sections 3.1**, **3.2**, **3.3** and **3.4** for full details.

3.1 Risk Threshold

The user will be able to manipulate how low and how high the risk threshold is based on the BC Hydro risk assessment matrix. The user can change the thresholds by dialing up or dialing down. It is also possible for the user to enter the exact thresholds they desire.

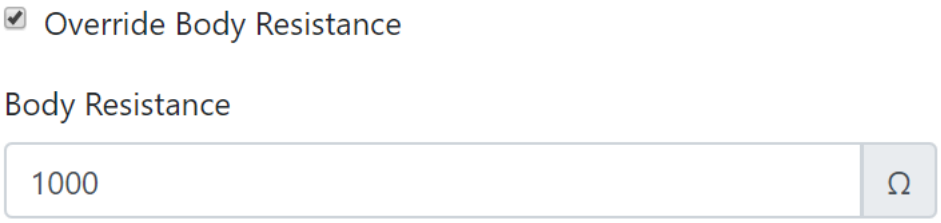


3.2 Population Percentile Rank

The percentile rank is automatically set to 50% whenever entering Krypton or when resetting the program. The user can choose between the three options shown below depending on how sensitive their study will be. Each percentage is directly related to a certain body resistance, which also depends on the type of moisture surface condition the user selected in **Section 2.2** under **"Contact Surface Conditions"**.

3.3 Body Resistance and Override

The body resistance override checkbox is automatically selected, and the default body resistance is set to 1000 Ω when starting up Krypton or when resetting the program. If the user chooses to override the body resistance, they may change it to any value. The user can change the body resistance by dialing up or dialing down. It is also possible for the user to enter the exact body resistance they desire. The user may also choose to de-select the override checkbox, in which case, Krypton will automatically set the body resistance 1000 Ω and cannot be changed.

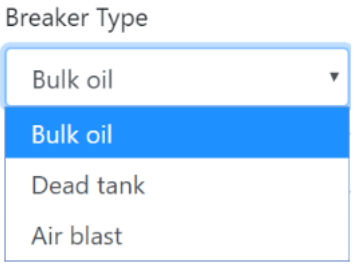


3.4 Breaker Failure Probability

The user can incorporate breaker failure probability into their analysis by selecting the checkbox labelled “Include breaker failure probability”.

3.4.1 Breaker Type

The breaker type is automatically set to “Bulk oil” when starting up Krypton or when resetting the program. The user can choose between three different types of breakers by selecting the drop-down menu. The type of breaker selected in their analysis will depend on the design of the system.

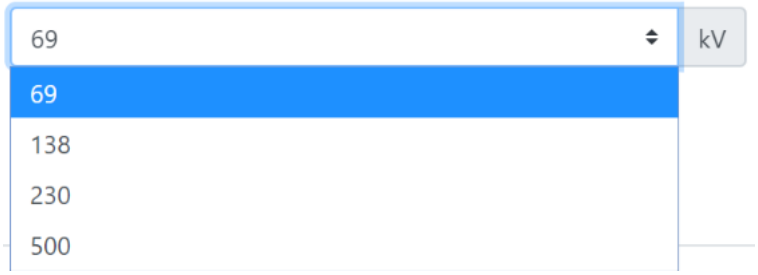


3.4.2 Number of Breakers

The number of breakers is automatically set to 1 when starting up Krypton or when resetting the program. The user can choose between using 1, 2, 4 or 6 breakers by selecting the drop-down menu. The number of breakers selected in their analysis will depend on the design of the system.

3.4.3 Breaker Size

The breaker size is automatically set to 69 kV when starting up Krypton or when resetting the program. The user can choose between using 69, 138, 230 and 500 kV breakers (standard sizes) by selecting the drop-down menu.



4 Reset

The user can reset Krypton at anytime by clicking the rotating arrow located at the top right of the page or alternatively, by simply refreshing the web browser.

5 Help/Support

The user can get support with understanding the technical side of Krypton at anytime by clicking the question mark at the top right of the page. Once selected, the user will receive information regarding Krypton and the standards used to create it, the probability of coincidence, the probability of fibrillation, and an explanation regarding the results.

6 Custom Template