ETAP Arc Flash Analysis

The purpose of this tutorial is to introduce the Arc Flash Analysis module of ETAP and provide instructions on how to setup Arc Flash (AF) calculations. For this section of the tutorial, you should select the "Example Project (ANSI)" option when starting the ETAP Demo.

There are two options to perform AF calculations:

- Using the Quick Incident Energy Calculator for a single bus (location)
- Running a Global AF calculation for all Buses (global AF calc)

Using the Quick Incident Energy Calculator at any Bus

This is the simplest way to get some quick AF results and make labels. The following steps show how to accomplish this:

🖰 ETAP Arc Flash has typical equipment gap and X-factors built into the rating page of the bus. You can take advantage of these typical values to perform a quick Arc Flash calculation. Open the editor for Bus1 and go to the rating page of the bus and select the type of equipment that is represented by that bus. This can be enclosed equipment such as MCC, switchgear, or open-air equipment, i.e., not enclosed in a box. Once you have selected the equipment type, select typical gap and boundary values by clicking on the "Typical Data" button. This will bring all the required gap and x-factor information as well as approach boundaries as defined by NFPA 70E. To change the Arc Flash Analysis Data and Shock Hazard Analysis Data press the "Data Options" button.
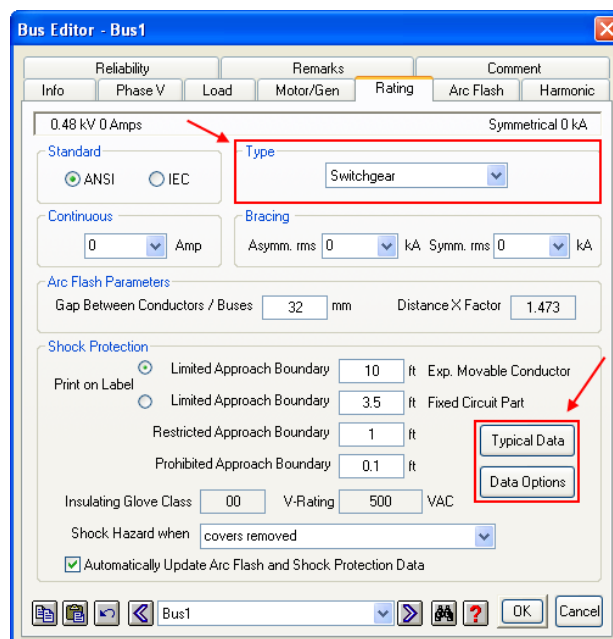
🖱 Go to the Arc Flash page and select the working distance. This distance is automatically populated based on the voltage level and type of equipment. The working distance is defined as the distance from the person's torso and face to the energized equipment (typically 18 inches for low voltage equipment). You may also define the system grounding configuration of the equipment feeder, i.e., transformer grounding / source grounding like solidly grounded or delta. If you do not know the system grounding, assuming the system is ungrounded will yield conservative results (default). You can change the default user-defined system grounding by selecting it from the dropdown list. ETAP can also be configured to automatically determine the system grounding.

🖱 Enter the available User-Defined Bolted Fault Current. If you know how long it will take the protective device to clear the arc, enter this information in the User-Defined Arc Fault Clearing Time (FCT).

🖱 Select the User-Defined Arc Flash calculation by selecting the User-Defined radio button and you will get the incident energy, flash protection boundary, and the hazard/risk level according to NFPA 70E with the version selected previously.
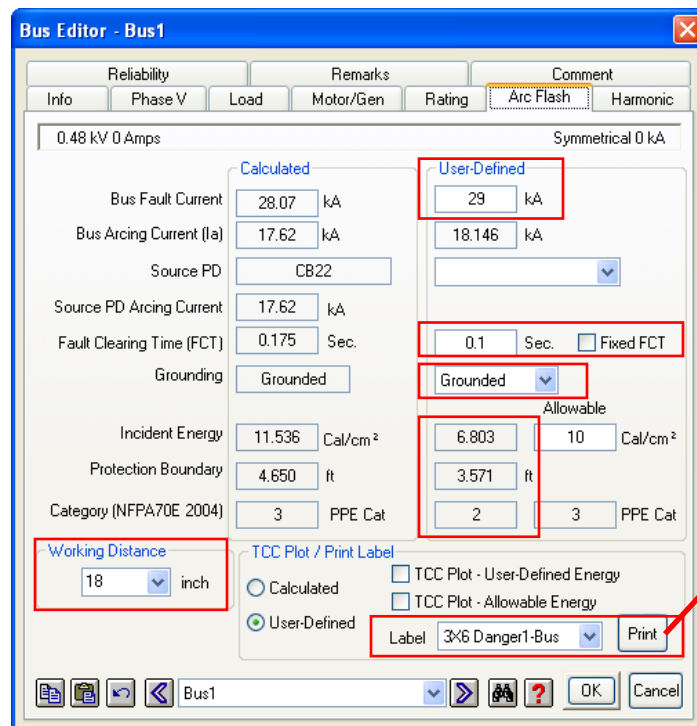

🖱 Select the arc flash label template that you want and click on the Print button. A Crystal Reports viewer window will open with a label that is ready for printing. The bus Arc Flash page allows you to get Arc Flash results instantly.

## Setting Up and Running a Global Arc Flash Analysis

The previous section described a simple way to generate quick AF results. However, the bus calculator is simplified and it is not efficient when you need to run an analysis on hundreds of fault locations. For this you need to setup the global AF calculation.

The same input data is required if you use the quick incident energy calculator at the bus or if the global AF calculation is used; however, in ETAP there are quicker and easier ways to define the input data required by the calculation.

☞ Open the Arc Flash calculation study case and go to the AF Data page. In this page you can globally define the equipment's gaps between conductors, working distance, and other AF parameters to be used by the global AF calculation. This will save you a lot of time since you would be only required to define the type of equipment represented by each bus. The following image shows the recommended settings for a global AF calculation:
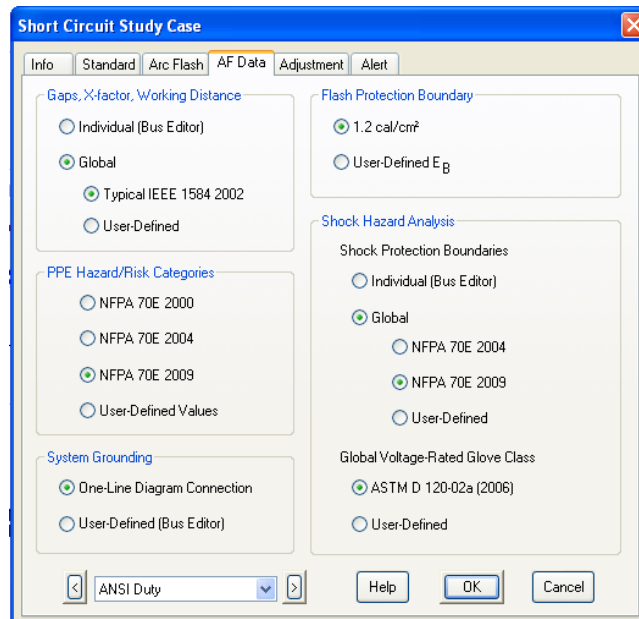

The global definitions for each set of input data parameters can be modified or reviewed by accessing the Project \ Settings \ Arc Flash \ menus as shown below:
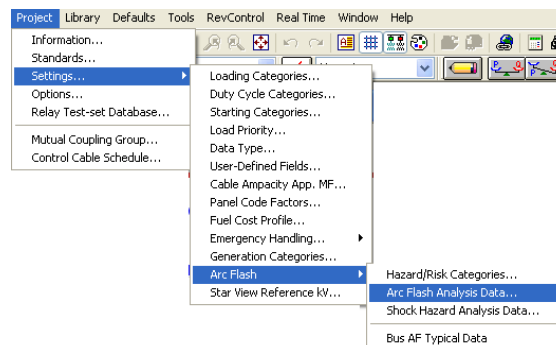
It is recommended that you use the options shown in the AF Data page image since they allow the use of the latest standards with typical values.

🖯 On the Info page of the Short Circuit Study Case editor, select the buses to be faulted through the Info as shown in the Short Circuit leaflet. You can also right-click on the bus and select Fault or Don't Fault.

🖯 Next select the analysis method from the Short Circuit Study Case Arc Flash page. This can be either NFPA 70E 2009 or IEEE 1584. The IEEE method is a more accurate model and is set as default.
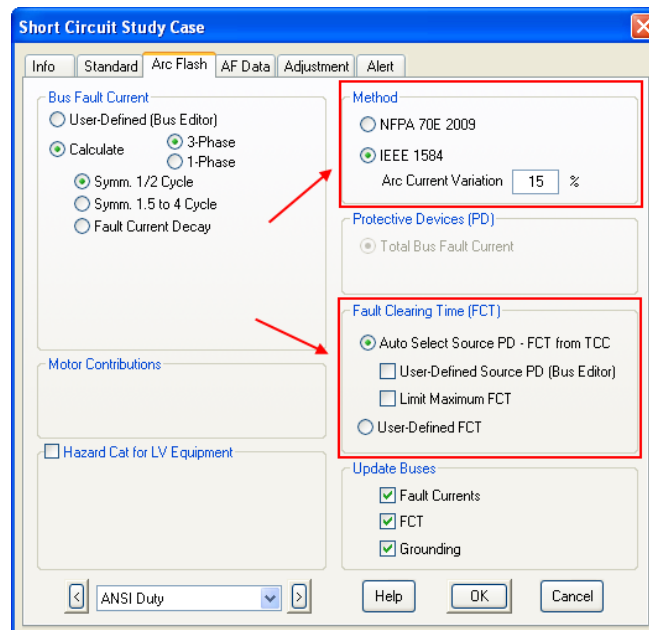
🖯 The next step requires the selection of the arc fault clearing time (FCT). The default is set to the automatic determination of the FCT from the Star protective device time current characteristics (TCC) of the protective devices (PD). In most cases, the most conservative solution is reached by selecting a TCC only for the main feeder PD since they take a longer time to operate. If you do not select a TCC for the bus, ETAP will use the user-defined FCT from the bus Arc Flash page.

🖯 The remaining options to be selected can be left as default and are self explanatory. For example, you can choose to update the global calculation results back to the Arc Flash page of the bus.

🖯 Once this information has been selected from the bus and Short Circuit Arc Fash pages, all you need to do is to click on the Arc Flash icon on the Short Circuit toolbar to launch the calculation. The program will provide a full set of reports for all the faulted buses as well as all the labels for every protective device location and for the faulted buses.
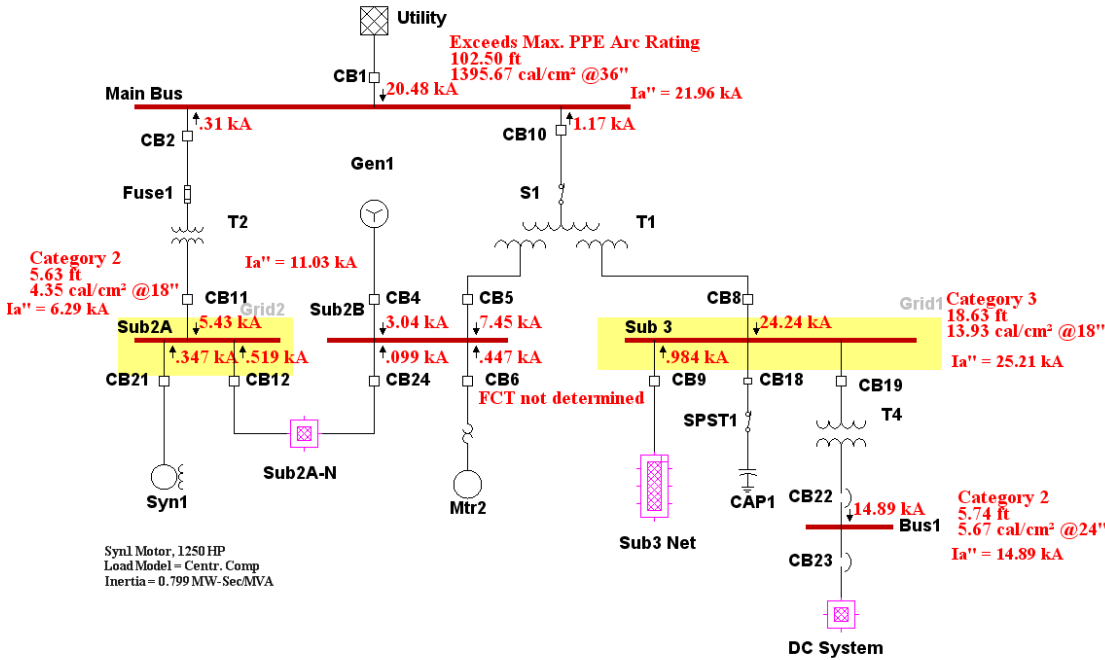
☞ The AF calculations can be repeated for all the different configurations in ETAP. The Scenario and Study Wizards can be used to keep track and repeat the different calculations as shown in the images below where two different AF calculations were performed and recorded:

The AF calculation results can be viewed using the AF Result Analyzer. This new tool in ETAP can be launched from the Short Circuit toolbar by clicking on the AF Result Analyzer icon. The AF Result Analyzer allows you to review results from several studies for comparison, finding potential problems in the system with ease, and determining worst case conditions. At the same time labels, work permits, and data sheets can be generated and printed from here.