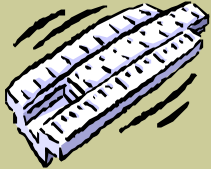




# Four-X Hint Setting & Using Units



*This hint is part of a semi-regular series 'published' on the Whittle User's Email Discussion Group*

I guess by now everyone has found that the addition of units into the Four-X analyser is a really welcome feature. Better still, they are simple to set up (normally when you start the project), so why is a hint necessary. Well this is more a discussion about their use rather than a hint.

The units are set within the Block Model or Import Pitshell node under the format tab. There are three groupings of unit definitions.

The first group deals with the units and formats used for rock, that is anything in the ground (it will be applied to both ore or waste). There are only three tonnage units relevant in the pick list for units of mass, Tonnes, Short Tons & Long Tons. The next two items are related to the format used to display the mass units, for small tonnages like the tonnage of a block. The pick list gives examples of the number of decimal places displayed. The final item is a scaling factor of displaying totals (and subtotals) generated in various reports. The pick list show that scaling factor, eg x1,000 will report total tonnages rounded to the closest 1000, x1,000,000 will report totals to the nearest million. The zero (0) at the top of the pick list is not truly a scale factor, but is used when no scaling is desired (ie. total will be to the nearest tonne/ton).

The second group deals with units and format of currency. There is not a currency converter function and the units selected are just used for formatting value amounts in reports. The reporting units follows the same conventions used under rock mass.

For those that are interested, this information is still stored on line 12 of the Four-X parameter file, with the addition of the code for units of rock mass in character position 73-80

The third section, the element data is in the form of a table. Each element (or metal) in your model will have a line that contains the metal units that are stored in your model. Then the formats used to display that metal content for the block, next the format for metal totals and finally the format used to display grades.

The units in the pick list for elements mass includes grams, kilo, oz, pound and again the three tonnage measures.

The pick list also contains units like %m (percent mass =  $\text{Mass metal} \times 100 / \text{Mass of Rock}$ ), ppm (parts per million = grams/tonne), and ppb (parts per billion), which are really units of grade not units of metal. It is important to remember that it is metal that is stored in the Four-X model (not grade). Further when a grade is displayed by Four-X in a report or summary table, it calculates that grade by dividing the contained metal by the total mass. This is easy to follow when the rock mass units are tonnes and the metal is gold stored in grams, then the grade will be in grams/tonne. However defining some other units can be more taxing on the grey matter.

A common riddle for new users has been how to represent grade units for metals represented as percent. Percent is a measure of the mass of contained metal divided by the rock mass (multiplied by 100). The answer was always simple, and still is, just let the software exporting the model multiply the grade times the tonnage and use this as your metal units. Then when Four-X divides contained metal by the total mass the answer will be a grade as percent again. The only tricky bit was that the units of metal were actually in a 100<sup>th</sup> of the tonnage (in the metric system this would be 1 tonne/100 = 10 kilograms). So it was neces-

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sary to provide the metal price for 10kg lots. *[I trust everyone working in base metals is already well aware of this]* It is easier now you can define this as the %m unit; however it is worth remembering that this is not logically correct because percent is not a unit of mass (it is a measure of grade). When it comes to defining the units for Price and Selling Costs it is really better to use 10kg instead of the %m unit.

Remembering now you can just as easily use pounds (eg. \$/lb is very common way to express the copper price) or per tonnes. The units for price no longer have to match the units of metal in the model. Now you can specify the prices in a different unit and Four-X will use appropriate conversion factors when computing values. For example you might have gold stored in gram metal units but now you can now specify your price in value per ounces. These must be defined under the Selling Tab in both the Pit Shells Node and any associated Scenario nodes. Normally you only define this information once and it will be inherited down.

Units are also displayed in the Time Cost and Limits Tab under the Operation Scenario nodes. The units cannot be changed here but are displayed so correct costs and throughputs can be defined (eg if the units of metal in a block are defined in grams you must supply throughput limits also in grams)

Finally the last option on the units pick list is 'unit' which can be used for any other unit to like. Then Four-X works exactly as in previously versions and you must make sure that the mass, grade, prices, costs and throughputs are all consistent. The unit coding is particularly useful if you are using an element field as a variable within an expression (eg a value used in the calculation of recovery)

Again for the luddites *[pardon, experienced users]* these element unit definitions are stored on line type 18 in character positions 49-55. The price and selling cost unit are stored in line type 20 again in position 49-55, but on this line four-X also stores the conversion factor, in position 57-65, it will use to convert to metal units as stored in the model.

The only time for any real concern over units will arise is when loading old models, or previous optimisations, with old parameter files (ie Four-X version 2.0 or earlier). Since these do not contain all the unit codes and when they are loaded Four-X Analyser will assume tonnes for rock mass and grams for all element metals contents. *[But now you know the unit definition are pretty easy to locate and change.]*

This hint is part of a semi-regular series published on the Whittle e-community  
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