KETIVAMA
AUTODESK MANUFACTURING ACADEMY

Sheet metal Design

1-A | 9:00 – 10:15 am
Instructor: Jonathan Landeros

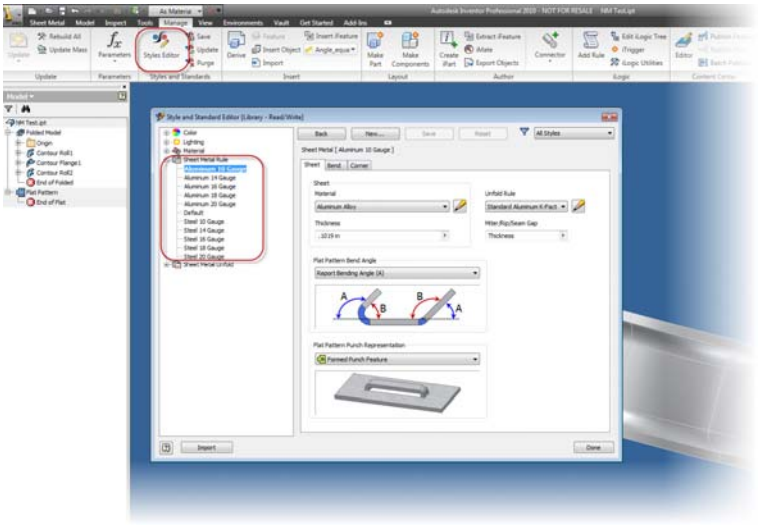
Introduction

Autodesk Inventor sheet metal contains a collection of tools designed with the purpose of facilitating the creation of sheet metal parts. These tools record critical parameters such as thickness and bend radius, as well as k-factor for obtaining the correct flat pattern. With these values recorded, they can be recalled for the creation of sheet metal features, instead of having to be entered every time.

Styles

The foundation of creating sheet metal components are the sheet metal rules that define them. Creation of accurate sheet metal rules can save an enormous amount of preliminary work when designing sheet metal parts. Sheet metal rules are set in the Standards and Styles editor. A good set of standards addressing both industry standards (such as standard sheet metal gauges), and company standards (such as bend allowances) can save time in the creation of a part.

When saved to the Styles library, the style can be used as a standard to create as many sheet metal components as possible (Ideally all of them!). Then the time savings multiplies across the entire organization.



Workflow, and the outside worlds implications on Inventor

Sheet metal has several workflows that can be adapted to fit several different design criteria and conditions. These can include:

- How to define parts, including when to create a new part for ease of manufacture
- Exporting parts for ease of downstream use in other systems
- How to document parts to ensure they can be efficiently constructed

Something the designer may encounter is that the capabilities of Inventor may exceed the manufacturing capabilities available when the components are built, also known as the 'unbuildable' model. This is where there is no substitute for communication. Keeping abreast of what the shop is capable of building cannot be overlooked.
Manufacturing capabilities that can affect a design are:

- Manufacturing may not have all the tooling to build the part as designed. This may mean that the part cannot be manufactured, may have to be subcontracted out, or may require that special tooling be made.
- Fixtures in many cases, for processes such as assembly, welding, plating, may be required. The construction of these can also be time consuming. When to use, (and not use) fixtures can have an enormous impact on how quickly, and accurately, a part can be built.
- Material choice, as with any designs, can impact the manufacturability of a design. For example, low carbon steel is easier to bend than high carbon steel. Some materials may crack if the bend angle is too large, or the bend radius to narrow.

Documentation

While more steps are being automated as the sophistication of software presses forward, good documentation cannot be underestimated.
Things to consider for documentation:

- If a bend chart is used, are the numbering system going to be used as references to call out the bends, or as a bend sequence. If the latter, it's necessary to ensure that the bends are correctly numbered. If the bend sequence is incorrect, a critical feature may not be able to fit in a tool or fixture due to previous operations.
- As a rule of thumb, it's preferable to dimension to the inside of a bend, as these are the areas of the part most easily controlled by the tooling.

Additional Sources

www.engineersedge.com – Engineering site with formulae and design suggestions

Die Makers Handbook by Jerry Arnold – Book with guidelines for building sheet metal dies, as well as designing parts for manufacturability.