MECH 300 – Assignment #3

This assignment requires that you do the following CAST tutorials:

Design => Expressions => Creating Expressions, Using Expressions
Assembly Modeling => Assemblies => Assembly cloning and interpart expressions

Using your valve assembly design create a new set of part files and a new assembly file that will be a parametrically variable design (i.e. do not change your existing files, which are the base of your already submitted assignments #1 and #2, but rather create a duplicate set of your parts and a duplicate assembly and modify that duplicate).

The determining design parameter, controlled from the valve assembly level, called hole_dia is the diameter of the hole of the valve housing (main flow hole). Your design has to modify valve body, plate, and shaft for the assembly to work correctly with the hole_dia parameter changing from base 1.938 in. to 4.0 in. There should be the following design changes accompanying hole_dia changes:

1. The wall thickness of the cylindrical part of the body should stay constant with these dimensional changes, at its base value of 1.406-1.938/2 = 0.437 in.
2. The length (height) of the body, which is currently 2.25” in the base model should increase proportionally to the ratio: hole_dia/1.938
3. The length of the valve arm, which is currently 3.0” in the base model should increase proportionally to the ratio: hole_dia/1.938.
4. The retainer, and the body face it is attached to, will have their outside diameters changing from 2.0” in the base model, again increasing proportionally to the ratio: hole_dia/1.938.
5. The array of retainer holes has to change its diameter from base 1.5”, also proportionally to ratio of hole_dia/1.938. For hole_dia > 3.0” the retainer array should have four bolts rather than three. All standard parts will remain the same as used in assignment #1 and #2.

When done, you should be able to generate, from one assembly file, two extreme models of the valve assembly, for hole = 1.938” and hole = 4.0”, with the valve functioning correctly for any size between.

Submit assembly drawings documenting the small and large models of the valve.

Assembly drawings of the two extreme models of the valve are shown on reverse.
Base valve model shown below, **hole_dia=1.938”**, **body length=2.25”**, **arm length** (between hole centers) =**3.0”**, **retainer OD=2.0”**, **retainer bolt array with 3 bolts on 1.5” diameter**:

![Base valve model](image1)

Largest valve model, with **hole_dia =4.0”**, **body length=2.25”**(hole_dia/1.938), **arm length=3.0”**(hole_dia/1.938), **retainer OD= 2.0”**(hole_dia/1.938), retainer bolt **array of diameter 1.5”**(hole_dia/1.938). For **hole_dia > 3.0”** the retainer bolt array has 4 holes and bolts, positioned at 90 degrees rather than 3 bolts at 120 degrees (used in smaller models, for up to hole_dia=3.0”).

![Largest valve model](image2)

Setting the hole diameter between 1.938” and 4.0” should be possible from the assembly expressions panel, with the valve continuing to work correctly.

Note: tutorials parts can be found at: C:\Program Files\UGS\NX7.5\nxcast\parts