Improved dimensional stability for laser welding with interlocking cutouts on the edges rather than internal return flanges.

Forming heavy gage 17-4 can be achieved by annealing to red hot 1900 F then air cool down to manageable 800 F rather than 800 F as suggest in the material data sheet. While plates were formed consideration for bulging, tolerance capabilities and slow throughput resulting in higher component costs. issue are inconsistent forms angles and variation of the material thickness through the bend and metal fatigue on over bends past 90 degrees.
Nu-Way Industries, Inc.

Final Report
Agreement 2011-303
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Parameters for stamping 17-4 with cutoff scrap only

Specify a generous tolerance to allow variation noting forming if required needs to be in direction of the grain.

Punched features such as holes need to be one and a half times material thickness or two to three depending on material hardness.
Forming heavy gage 17-4 can be achieved by annealing to red hot 1900 F then air cool down to manageable 800 F rather than 800 F as suggest in the material data sheet. While plates were formed consideration for bulging, tolerance capabilities and slow throughput resulting in higher component costs.
Heavy Gage 17-4 Forming

The forming fixture required weld gussets for support and plates had to be formed with a sub-plate to reduce stress and fracturing.
Heavy Gage 17-4 Forming

Some of the issue are inconsistent forms angles and variation of the material thickness through the bend and metal fatigue on over bends past 90 degrees.
Heavy Gage 17-4 Forming

Tolerances stack-up became a issue because of the inconsistent forms angles and variation of the material thickness through the bend.
The solution for the first six samples was to match each component of the tile by welding on strips to build back up the material to match the rails were the thickness variation resulted in gaps.
Transformation of Tile to Eliminate Forming

Flat 17-4 tile plates welded to .030” ¼ hard stainless steel
Transformation of Tile to Eliminate Forming

Flat 17-4 tile plates welded to .030” ¼ hard stainless steel with formed rails between for internal casing
Mating of Housing components with interlocking features and fit up edges and corners
Precision laser weld fixture

Weld fixture for precision feature location
20 inches per minute laser weld

Laser weld result that could be improved with interlocking cutouts on the edges rather than internal return flanges.