

## WI 1062: Straightening Requirements

### Ballot 4436 Comment Resolution – Final changes in red

#### 6.4 Straightening

**6.4.1** When straightening is necessary after heat treatment, Group 1 product may be hot rotary straightened or cold straightened. If hot rotary straightened, the minimum temperature at the exit of rotary straightening shall be 400°C (750°F), unless a higher minimum temperature is specified on the purchase agreement. If cold rotary straightened, then the product shall be stress relieved after straightening. The minimum stress relieving temperature shall be 510°C (950°F). For gag straightening see 6.4.3.

**6.4.23** When gag straightening is used for Group 1 product, stress relieving after straightening is required only if the maximum fiber strain is greater than the value established by the manufacturer during process validation (see 6.5). The amount of fiber strain shall be calculated using the following formula:

$$\varepsilon = 6Dy/L^2$$

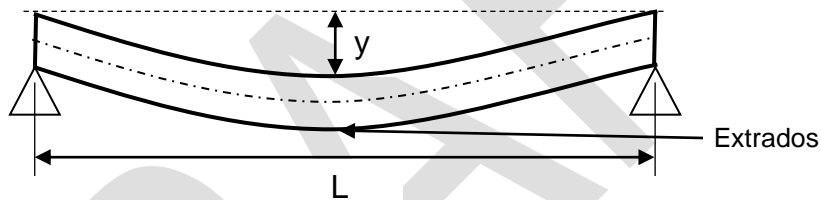
where (see Figure D.xx),

$\varepsilon$  = outer fiber strain

$D$  = pipe specified outside diameter for product

$L$  = distance between straightener product supports

$y$  = the maximum deflection distance



**Figure D.xx—Gag straightening fiber strain factors**

**6.4.32** When straightening is necessary for Group 2, 3, and 4 product, the product may be rotary or gag straightened utilizing the straightening process parameters established during validation of the product (see 6.5).

#### 6.5 Processes requiring validation

**6.5.1** Final operations performed during product manufacturing that affect attribute compliance as required in this International Standard (except chemical composition and dimensions) shall have their processes validated.

Those processes requiring validation are:

- non-destructive examination (see 9.16.8);
- final heat treatment (including final heat treatment before any cold hardening);
- cold hardening (if applicable);
- cold straightening (if applicable, see 6.5.2).

**6.5.2** Validation of cold hardening and cold straightening shall address the range of product manufactured and the method used. Validation shall include verification of mechanical properties at the middle and both ends. Validation of gag straightening shall also include validation of mechanical properties in the tension region of the extrados with the highest possible induced fiber strain (see Figure D.xx).