

## Pembahasan Hasil Uji Tarik Material Baja SS 400 Las SMAW

### 1. Perhitungan Kekuatan Tarik *Maximal*

$$\sigma_u = \frac{P_u}{A_o}$$

Dimana:  $P_u$  = beban (kg)

$\sigma_u$  = tegangan *ultimate* (MPa)

$A_o$  = luasmula-mula ( $\text{mm}^2$ )

#### a. *Raw Materials*

$$P_u = 10000 \text{ kg} \times \frac{54.42}{100} = 5442 \text{ kg}$$

$$\sigma_u = \frac{5442}{125.83} = 43.249 \text{ kg/mm}^2 = 432.49 \text{ MPa}$$

#### b. E6013

Spesimen 1

$$P_u = 10000 \text{ kg} \times \frac{42.96}{100} = 4296 \text{ kg}$$

$$\sigma_u = \frac{4296}{126.92} = 33.849 \text{ kg/mm}^2 = 338.49 \text{ MPa}$$

Spesimen 2

$$P_u = 10000 \text{ kg} \times \frac{34.60}{100} = 3460 \text{ kg}$$

$$\sigma_u = \frac{3460}{124.74} = 27.738 \text{ kg/mm}^2 = 277.38 \text{ MPa}$$

Spesimen 3

$$P_u = 10000 \text{ kg} \times \frac{29.80}{100} = 2980 \text{ kg}$$

$$\sigma_u = \frac{2980}{126.52} = 23.553 \text{ kg/mm}^2 = 235.53 \text{ MPa}$$

c. E7018

Spesimen 1

$$P_u = 10000 \text{ kg} \times \frac{55.32}{100} = 5532 \text{ kg}$$

$$\sigma_u = \frac{5532}{15.037} = 44.243 \text{ kg/mm}^2 = 442.43 \text{ MPa}$$

Spesimen 2

$$P_u = 10000 \text{ kg} \times \frac{47.48}{100} = 4748 \text{ kg}$$

$$\sigma_u = \frac{4748}{125.235} = 37.913 \text{ kg/mm}^2 = 379.13 \text{ MPa}$$

Spesimen 3

$$P_u = 10000 \text{ kg} \times \frac{55.47}{100} = 5547 \text{ kg}$$

$$\sigma_u = \frac{5547}{124.74} = 44.468 \text{ kg/mm}^2 = 444.68 \text{ MPa}$$

## 2. Perhitungan Tegangan Luluh

$$1 \text{ mm} = \frac{P_u}{t_u}$$

$$P_y = \frac{t_y \times 1 \text{ mm}}{100} \times P$$

$$\sigma_y = \frac{P_y}{A_o}$$

Dimana:  $P_u$  = beban *ultimate* (kg)

$\sigma_y$  = tegangan *yield* (MPa)

$A_o$  = luasmula-mula ( $\text{mm}^2$ )

$t_y$  = tinggi *yield* (mm)

$t_u$  = tinggi *ultimate* (mm)

$P$  = beban yang digunakan (kg)

$P_y$  = beban *yield* (kg)

a. *Raw Materials*

$$1 \text{ mm} = \frac{54.42}{78.5} = 0.6932$$

$$t_y = 56$$

$$P_y = \frac{56 \times 0.6932}{100} \times 10000 = 3881,92$$

$$\sigma_y = \frac{3881.9}{125.83} = 30.853 \text{ kg/mm}^2$$

$$= 308.53 \text{ MPa}$$

b. E6013

$$1 \text{ mm} = \frac{42.96}{62.5} = 0.6873$$

$$t_y = 52.5$$

$$P_y = \frac{52.5 \times 0.6873}{100} \times 10000 = 3608.325$$

$$\sigma_y = \frac{3608.325}{126.92} = 28.433 \text{ kg/mm}^2$$

$$= 284.33 \text{ MPa}$$

c. E7018

Spesimen 1

$$1 \text{ mm} = \frac{55.32}{80} = 0.6915$$

$$t_y = 54$$

$$P_y = \frac{54 \times 0.6915}{100} \times 10000 = 3734.1$$

$$\sigma_y = \frac{3734.1}{125.037} = 29.864 \text{ kg/mm}^2$$

$$= 298.64 \text{ MPa}$$

Spesimen 2

$$1 \text{ mm} = \frac{47.48}{68.5} = 0.6931$$

$$t_y = 54$$

$$P_y = \frac{54 \times 0.6931}{100} \times 10000 = 3742.95$$

$$\sigma_y = \frac{3742.95}{125.235} = 29.887 \text{ kg/mm}^2$$

$$= 298.87 \text{ MPa}$$

Spesimen 3

$$l = \frac{55.47}{80} = 0.6934$$

$$t_y = 54$$

$$P_y = \frac{54 \times 0.6934}{100} \times 10000 = 3744.225$$

$$\sigma_y = \frac{3744.225}{124.74} = 30.016 \text{ kg/mm}^2$$

$$= 300.16 \text{ MPa}$$

### 3. Perhitungan Perpanjangan

$$\varepsilon = \frac{\Delta L}{L_0} \times 100\% = \frac{L - L_0}{L_0} \times 100\%$$

Dimana :  $\varepsilon = \text{elongation (\%)}$

L = panjang setelah ditarik (mm)

$L_0$  = panjang sebelum ditarik (mm)

a. *Raw Materials*

$$\varepsilon = \frac{(67.45 - 49.76)}{49.76} \times 100\% = \frac{17.69}{49.76} \times 100\% = 35.6 \%$$

b. E6013

Spesimen 1

$$\varepsilon = \frac{(52.66 - 49.07)}{49.07} \times 100\% = \frac{3.59}{49.07} \times 100\% = 7.3 \%$$

Spesimen 2

$$\varepsilon = \frac{(51.31 - 49.34)}{49.34} \times 100\% = \frac{1.97}{49.34} \times 100\% = 4.0\%$$

Spesimen 3

$$\varepsilon = \frac{(51.21 - 49.57)}{49.57} \times 100\% = \frac{1.64}{49.57} \times 100\% = 3.3 \%$$

c. E7018

Spesimen 1

$$\varepsilon = \frac{(61.36-49.22)}{49.22} \times 100\% = \frac{12.14}{49.22} \times 100\% = 24.7 \%$$

Spesimen 2

$$\varepsilon = \frac{(54.35-50.04)}{50.04} \times 100\% = \frac{4.31}{50.04} \times 100\% = 8.6 \%$$

Spesimen 3

$$\varepsilon = \frac{(64.65-50.21)}{50.21} \times 100\% = \frac{14.44}{50.21} \times 100\% = 28.8 \%$$