

**LAMPIRAN A**  
**PERHITUNGAN**

## Lampiran A. Perhitungan

### A1. Pengujian Radiografi

- E420-13 Lokal (120 A)

$$T_{\text{material}} = 10,47 \text{ mm}$$

$$T_{\text{las}_1} = 13,45 \text{ mm}$$

$$T_{\text{las}_2} = 15,17 \text{ mm}$$

$$T_{\text{las}_3} = 11,75 \text{ mm}$$

$$\text{Rata-rata Tlas} = 13,46 \text{ mm}$$

Lama waktu dihitung dengan melihat diagram *exposure time*,

$$\text{Dengan Tlas} = 13,46 \text{ mm}$$

$$\text{Mesin} = 140 \text{ kV}$$

Waktu penyinaran = 72 detik.

- E6013 Impor (120 A)

$$T_{\text{material}} = 10,25 \text{ mm}$$

$$T_{\text{las}_1} = 13,15 \text{ mm}$$

$$T_{\text{las}_2} = 13,17 \text{ mm}$$

$$T_{\text{las}_3} = 13,11 \text{ mm}$$

$$\text{Rata-rata Tlas} = 13,14 \text{ mm}$$

Lama waktu dihitung dengan melihat diagram *exposure time*,

$$\text{Dengan Tlas} = 13,14 \text{ mm}$$

$$\text{Mesin} = 140 \text{ kV}$$

Waktu penyinaran = 78 detik.

**A2. Pengujian Tarik**

- E420-13 Lokal (120 A)

$$A_0 = 184,55 \text{ mm}^2$$

$$F_y = 60 \text{ kN}$$

$$F_m = 85 \text{ kN}$$

$$\sigma_y = \frac{F_y}{A_0}$$

$$\sigma_y = \frac{60}{184,55}$$

$$\sigma_y = 325 \text{ N/mm}^2$$

$$\sigma_y = 3314 \text{ Kgf/cm}^2$$

$$\sigma_m = \frac{F_m}{A_0}$$

$$\sigma_m = \frac{85}{184,55}$$

$$\sigma_m = 461 \text{ N/mm}^2$$

$$\sigma_m = 4695 \text{ Kgf/cm}^2$$

- E6013 Impor (120 A)

$$A_0 = 178,88 \text{ mm}^2$$

$$F_y = 67,5 \text{ kN}$$

$$F_m = 90 \text{ kN}$$

$$\sigma_y = \frac{F_Y}{A_0}$$

$$\sigma_y = \frac{67,5}{178,88}$$

$$\sigma_y = 377 \text{ N/mm}^2$$

$$\sigma_y = 3844 \text{ Kgf/cm}^2$$

$$\sigma_m = \frac{F_m}{A_0}$$

$$\sigma_m = \frac{90}{178,88}$$

$$\sigma_m = 503 \text{ N/mm}^2$$

$$\sigma_m = 5129 \text{ Kgf/cm}^2$$

### A3. Pengujian Impak

- Pada variasi temperatur  $-20^\circ$

E6013 Impor 120 A

$$A = 0,7699 \text{ cm}^2$$

$$E = 35 \text{ J}$$

$$\text{Harga Impak} = \frac{E}{A}$$

$$\text{Harga Impak} = \frac{35}{0,7699}$$

$$\text{Harga Impak} = 45,46 \text{ J/cm}^2$$

E420-13 Lokal 120 A

$$A = 0,7958 \text{ cm}^2$$

$$E = 10 \text{ J}$$

$$\text{Harga Impak} = \frac{E}{A}$$

$$\text{Harga Impak} = \frac{10}{0,7958}$$

$$\text{Harga Impak} = 12,57 \text{ J/cm}^2$$

- Pada variasi temperatur 0°

E6013 Impor 120 A

$$A = 0,8099 \text{ cm}^2$$

$$E = 43 \text{ J}$$

$$\text{Harga Impak} = \frac{E}{A}$$

$$\text{Harga Impak} = \frac{43}{0,8099}$$

$$\text{Harga Impak} = 53,09 \text{ J/cm}^2$$

E420-13 Lokal 120 A

$$A = 0,8047 \text{ cm}^2$$

$$E = 38 \text{ J}$$

$$\text{Harga Impak} = \frac{E}{A}$$

$$\text{Harga Impak} = \frac{39}{0,8047}$$

$$\text{Harga Impak} = 47,22 \text{ J/cm}^2$$

- Pada variasi temperatur 20°

E6013 Impor 120 A

$$A = 0,8041 \text{ cm}^2$$

$$E = 64 \text{ J}$$

$$\text{Harga Impak} = \frac{E}{A}$$

$$\text{Harga Impak} = \frac{64}{0,8041}$$

$$\text{Harga Impak} = 79,59 \text{ J/cm}^2$$

E420-13 Lokal 120 A

$$A = 0,7824 \text{ cm}^2$$

$$E = 42 \text{ J}$$

$$\text{Harga Impak} = \frac{E}{A}$$

$$\text{Harga Impak} = \frac{42}{0,7824}$$

$$\text{Harga Impak} = 53,68 \text{ J/cm}^2$$

**LAMPIRAN B**  
**DATA HASIL PENELITIAN**

Lampiran B. Data Hasil Penelitian

No.	NAMA BENDA UJI	DIMENSI (mm)	DIAHMETER PELENGKUNG (mm)	BUKIT TEKUK (°)	GAYA Maksimal (kg/KN)	KODE / MEREK	PENAMPILAN	KETERANGAN
1	E420-13	18.87 x 9.78	120	60.0	325	3314	Tidak Ratak	120 A
2	E420-13	18.87 x 9.78	120	72.5	400	4077	Tidak Ratak	120 A
3	E420-13	18.87 x 9.78	120	72.5	406	4136	Tidak Ratak	120 A
4	E420-13	18.87 x 9.78	120	72.5	405	4127	Tidak Ratak	120 A

No.	NAMA BENDA UJI	DIMENSI (mm)	DIAHMETER PELENGKUNG (mm)	BUKIT TEKUK (°)	KODE / MEREK	PENAMPILAN	KETERANGAN
1	E420-13	18.87 x 9.78	120	60.0	325	3314	Tidak Ratak
2	E420-13	18.87 x 9.78	120	72.5	400	4077	Tidak Ratak
3	E420-13	18.87 x 9.78	120	72.5	406	4136	Tidak Ratak
4	E420-13	18.87 x 9.78	120	72.5	405	4127	Tidak Ratak

Gambar B1. Data Uji Bending E6013

Gambar B2. Data Uji Bending E6013

No	Dimensi (mm)		Ao (mm <sup>2</sup> )	Fy (kN)	Fm (kN)	σ <sub>y</sub> (N/mm <sup>2</sup> )	σ <sub>u</sub> (N/mm <sup>2</sup> )	σ <sub>w</sub> (kgf/cm <sup>2</sup> )	
	Lebar	Tebal							
1	18,87	9,78	184,55	60,0	85,0	325	3314	481	4695
2	19,62	9,24	181,29	72,5	90,0	400	4077	496	5061
3	19,15	9,33	178,67	72,5	92,5	406	4136	518	5277
4	19,40	9,23	179,06	72,5	95,0	405	4127	531	5408

No.	NAMA BENDA UJI	DIMENSI (mm)	PALANG AWAL (mm)	PELUARAN PANJANG (mm)	GAYA YIELD (kg/KN)	GAYA Maksimal (kg/KN)	KODE / MEREK	KETERANGAN
1	E420-13	18.87 x 9.78	50	50	60.0	85.0	325	3314
2	E420-13	18.87 x 9.78	50	50	72.5	90.0	400	4077
3	E420-13	18.87 x 9.78	50	50	72.5	92.5	406	4136
4	E420-13	18.87 x 9.78	50	50	72.5	95.0	405	4127

Gambar B3. Data Uji Tarik E6013

Gambar B4. Data Uji Tarik E6013



Gambar B5. E420-13 Lokal 120 A



Gambar B6. E420-13 Lokal 155 A





**Gambar B7.** E420-13 Lokal 190A



**Gambar B8.** E6013 Impor 120A



**Gambar B9.** E6013 Impor 155A



**Gambar B10.** E6013 Impor 190A



**Gambar B11.** Mounting E420-13 Lokal



**Gambar B12.** Mounting E6013 Impor

**LAMPIRAN C**  
**GAMBAR ALAT DAN BAHAN**

**Lampiran C. Gambar Alat dan Bahan**

**C1. Alat Penelitian**



**Gambar C1. Apron Las**



**Gambar C2. Gerinda**



**Gambar C3. Helm Las**



**Gambar C4. Meja Las**



**Gambar C5. Mesin Cutting**



**Gambar C6. Mesin Grinding**



**Gambar C7. Mesin Las**



**Gambar C8. Mikroskop Optik**



**Gambar C9. Oven**



**Gambar C10. Palu**



**Gambar C11. Radiografi**



**Gambar C12. Sarung Tangan**



**Gambar C13.** Tang Ampere



**Gambar C14.** Thermogun



**Gambar C15.** Uji Bending



**Gambar C16.** Uji Impak

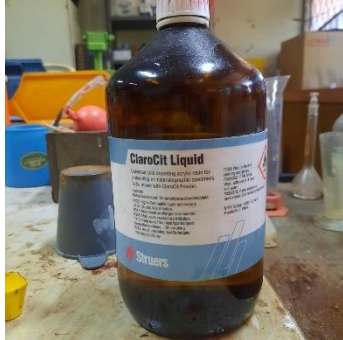


**Gambar C17.** Uji Tarik

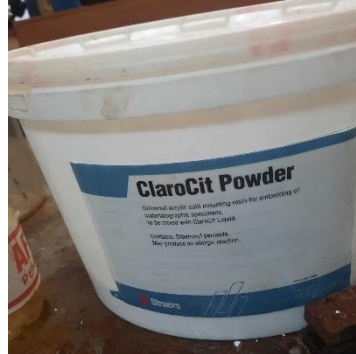


**Gambar C18.** Uji XRF

## C2. Bahan Penelitian



**Gambar C.19** *Clarocit Liquid*



**Gambar C20.** *Clarocit Powder*



**Gambar C21.** *Developer*



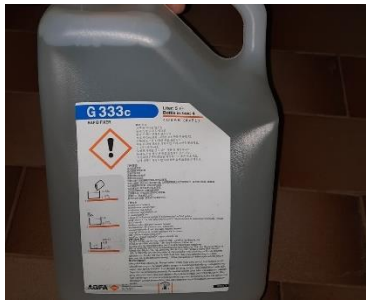
**Gambar C22.** *DP-Paste 6*



**Gambar C23.** *DP-Paste 1/4*



**Gambar C24.** *E420-13 Lokal*



**Gambar C25.** Fixer



**Gambar C26.** Plat ASTM A36

