



MEMÓRIA DE CÁLCULO

1 - ADMINISTRAÇÃO/SERVIÇOS PRELIMINARES

1.1 – ENGENHEIRO – $5 \times 4 = 20 \times 2 \text{ meses} = 40 \text{ horas}$

1.2 – ENCARGADO – $10 \times 4 = 40 \times 2 \text{ meses} = 80 \text{ horas}$

1.3 – PLACA DE OBRA – $3 \times 2 = 6,00 \text{ m}^2$

1.4 – REMOÇÃO DE TELHA – $15 \times (2,00 \times 2,00) = 60,00 \text{ m}^2$

1.5 – REMOÇÃO DE RIPAS – $15 \times (2,00 \times 2,00) = 60,00 \text{ m}^2$

2 - COBERTURA

2.1 – ESTRUTURA METÁLICA

ESTRUTURA 01

*P01 – $h = 2,15 \text{ m}$

U 127X50 # 3,35 $\rightarrow P = 33,80 \text{ kg/6m} \rightarrow 5,63 \text{ kg/m}$

$= 2,15 \times 2 + 0,50 \times 2 = 5,30 \text{ m} \times 5,63 = 29,84 \text{ kg}$

U 120x40 # 2,65 $\rightarrow P = 23,60 \text{ kg/m} \rightarrow 3,93 \text{ kg/m}$

$= 0,60 \times 4 + 0,50 = 2,90 \text{ m} \times 3,93 = 11,40 \text{ kg}$

*P02 – $h = 1,70 \text{ m}$

U 127X50 # 3,35 $\rightarrow P = 33,80 \text{ kg/6m} \rightarrow 5,63 \text{ kg/m}$

$= 1,70 \times 2 + 0,50 \times 2 = 4,40 \text{ m} \times 5,63 = 24,77 \text{ kg}$

U 120x40 # 2,65 $\rightarrow P = 23,60 \text{ kg/m} \rightarrow 3,93 \text{ kg/m}$

$= 0,60 \times 4 + 0,50 = 2,90 \text{ m} \times 3,93 = 11,40 \text{ kg}$

*P03 – $h = 1,00 \text{ m}$

U 127X50 # 3,35 $\rightarrow P = 33,80 \text{ kg/6m} \rightarrow 5,63 \text{ kg/m}$

$= 1,00 \times 2 + 0,50 \times 2 = 3,00 \text{ m} \times 5,63 = 16,89 \text{ kg}$

U 120x40 # 2,65 $\rightarrow P = 23,60 \text{ kg/m} \rightarrow 3,93 \text{ kg/m}$

$= 0,60 \times 2 + 0,50 = 1,70 \text{ m} \times 3,93 = 6,68 \text{ kg}$

Peso Pilares Estrutura 01 = $29,84 + 11,40 + 24,77 + 11,40 + 16,89 + 6,68 = \underline{100,98 \text{ kg}}$

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ESTRUTURA 02

* P04 – h= 1,00m

U 127X50 # 3,35 -> P= 33,80kg/6m -> 5,63 kg/m

= 1,00*2+0,50*2= 3,00mx5,63 = 16,89 kg

U 120x40 # 2,65 -> P= 23,60 kg/m -> 3,93 kg/m

= 0,60*2+0,50= 1,70m*3,93 = 6,68 kg

* P05 – h=2,20m

U 127X50 # 3,35 -> P= 33,80kg/6m -> 5,63 kg/m

= 2,20*2+0,50*2= 5,40mx5,63 = 30,40 kg

U 120x40 # 2,65 -> P= 23,60 kg/6m -> 3,93 kg/m

= 0,60*4+0,50= 2,90m*3,93 = 11,40 kg

* P06 – h= 1,00m

U 127X50 # 3,35 -> P= 33,80kg/6m -> 5,63 kg/m

= 1,00*2+0,50*2= 3,00mx5,63 = 16,89 kg

U 120x40 # 2,65 -> P= 23,60 kg/m -> 3,93 kg/m

= 0,60*2+0,50= 1,70m*3,93 = 6,68 kg

Peso Pilares Estrutura 02 = 16,89+6,68+30,40+11,40+16,89+6,68 = 88,94kg

ESTRUTURA 03

* P07 – h=1,00m

U 127X50 # 3,35 -> P= 33,80kg/6m -> 5,63 kg/m

= 1,00*2+0,50*2= 3,00mx5,63 = 16,89 kg

U 120x40 # 2,65 -> P= 23,60 kg/m -> 3,93 kg/m

= 0,60*2+0,50= 1,70m*3,93 = 6,68 kg

* P08 – h= 2,20m

U 127X50 # 3,35 -> P= 33,80kg/6m -> 5,63 kg/m

= 2,20*2+0,50*2= 5,40mx5,63 = 30,40 kg

U 120x40 # 2,65 -> P= 23,60 kg/6m -> 3,93 kg/m

= 0,60*4+0,50= 2,90m*3,93 = 11,40 kg

* P09 – h= 1,00m

U 127X50 # 3,35 -> P= 33,80kg/6m -> 5,63 kg/m

JP.



$$= 1,00 \times 2 + 0,50 \times 2 = 3,00 \text{ m} \times 5,63 = 16,89 \text{ kg}$$

$$U 120 \times 40 \# 2,65 \rightarrow P = 23,60 \text{ kg/m} \rightarrow 3,93 \text{ kg/m}$$

$$= 0,60 \times 2 + 0,50 = 1,70 \text{ m} \times 3,93 = 6,68 \text{ kg}$$

$$\text{Peso Pilares Estrutura 03} = 16,89 + 6,68 + 30,40 + 11,40 + 16,89 + 6,68 = \underline{88,94 \text{ kg}}$$

ESTRUTURA 04

$$* P07 - h = 1,00 \text{ m}$$

$$U 127 \times 50 \# 3,35 \rightarrow P = 33,80 \text{ kg/6m} \rightarrow 5,63 \text{ kg/m}$$

$$= 1,00 \times 2 + 0,50 \times 2 = 3,00 \text{ m} \times 5,63 = 16,89 \text{ kg}$$

$$U 120 \times 40 \# 2,65 \rightarrow P = 23,60 \text{ kg/m} \rightarrow 3,93 \text{ kg/m}$$

$$= 0,60 \times 2 + 0,50 = 1,70 \text{ m} \times 3,93 = 6,68 \text{ kg}$$

$$* P08 - h = 2,20 \text{ m}$$

$$U 127 \times 50 \# 3,35 \rightarrow P = 33,80 \text{ kg/6m} \rightarrow 5,63 \text{ kg/m}$$

$$= 2,20 \times 2 + 0,50 \times 2 = 5,40 \text{ m} \times 5,63 = 30,40 \text{ kg}$$

$$U 120 \times 40 \# 2,65 \rightarrow P = 23,60 \text{ kg/6m} \rightarrow 3,93 \text{ kg/m}$$

$$= 0,60 \times 4 + 0,50 = 2,90 \text{ m} \times 3,93 = 11,40 \text{ kg}$$

$$* P09 - h = 1,00 \text{ m}$$

$$U 127 \times 50 \# 3,35 \rightarrow P = 33,80 \text{ kg/6m} \rightarrow 5,63 \text{ kg/m}$$

$$= 1,00 \times 2 + 0,50 \times 2 = 3,00 \text{ m} \times 5,63 = 16,89 \text{ kg}$$

$$U 120 \times 40 \# 2,65 \rightarrow P = 23,60 \text{ kg/m} \rightarrow 3,93 \text{ kg/m}$$

$$= 0,60 \times 2 + 0,50 = 1,70 \text{ m} \times 3,93 = 6,68 \text{ kg}$$

$$\text{Peso Pilares Estrutura 04} = 16,89 + 6,68 + 30,40 + 11,40 + 16,89 + 6,68 = \underline{88,94 \text{ kg}}$$

ESTRUTURA 05

$$* P10 - h = 2,15 \text{ m}$$

$$U 127 \times 50 \# 3,35 \rightarrow P = 33,80 \text{ kg/6m} \rightarrow 5,63 \text{ kg/m}$$

$$= 2,15 \times 2 + 0,50 \times 2 = 5,30 \text{ m} \times 5,63 = 29,84 \text{ kg}$$

$$U 120 \times 40 \# 2,65 \rightarrow P = 23,60 \text{ kg/m} \rightarrow 3,93 \text{ kg/m}$$

$$= 0,60 \times 4 + 0,50 = 2,90 \text{ m} \times 3,93 = 11,40 \text{ kg}$$

$$* P11 - h = 1,70 \text{ m}$$

$$U 127 \times 50 \# 3,35 \rightarrow P = 33,80 \text{ kg/6m} \rightarrow 5,63 \text{ kg/m}$$

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$$= 1,70 \times 2 + 0,50 \times 2 = 4,40 \text{ m} \times 5,63 = 24,77 \text{ kg}$$

$$U 120 \times 40 \# 2,65 \rightarrow P = 23,60 \text{ kg/m} \rightarrow 3,93 \text{ kg/m}$$

$$= 0,60 \times 4 + 0,50 = 2,90 \text{ m} \times 3,93 = 11,40 \text{ kg}$$

$$* P12 - h = 1,00 \text{ m}$$

$$U 127 \times 50 \# 3,35 \rightarrow P = 33,80 \text{ kg/6m} \rightarrow 5,63 \text{ kg/m}$$

$$= 1,00 \times 2 + 0,50 \times 2 = 3,00 \text{ m} \times 5,63 = 16,89 \text{ kg}$$

$$U 120 \times 40 \# 2,65 \rightarrow P = 23,60 \text{ kg/m} \rightarrow 3,93 \text{ kg/m}$$

$$= 0,60 \times 2 + 0,50 = 1,70 \text{ m} \times 3,93 = 6,68 \text{ kg}$$

$$\text{Peso Pilares Estrutura 05} = 29,84 + 11,40 + 24,77 + 11,40 + 16,89 + 6,68 = \underline{100,98 \text{ kg}}$$

$$\text{TOTAL PESO PILARES: } 100,98 + 88,94 + 88,94 + 88,94 + 100,98 = \underline{468,78 \text{ kg}}$$

DETALHE 01 (TRELIÇA ENRIJECEDORA)-23,95m

$$U 100 \times 40 \# 2,65 \rightarrow P = 21,10 \text{ kg/6m} \rightarrow 3,52 \text{ kg/m}$$

$$= 23,95 \times 2 + 0,50 \times 2 = 48,90 \text{ m} \times 3,52 = 172,13 \text{ kg}$$

$$U 92 \times 30 \# 2,65 \rightarrow P = 17,60 \text{ kg/6m} \rightarrow 2,93 \text{ kg/m}$$

$$= 0,70 \times (2 \times 24) = 33,60 \text{ m} \times 2,93 = 98,45 \text{ kg}$$

$$\text{Peso Total: } 172,13 + 98,45 = \underline{270,58 \text{ kg}}$$

ESTRUTURA 01

$$* \text{TESOURA } 8,50 \text{ m}$$

$$U 100 \times 40 \# 2,65 \rightarrow P = 21,10 \text{ kg/6m} \rightarrow 3,52 \text{ kg/m}$$

$$= 9,10 + 8,50 + 0,50 \times 2 = 18,60 \text{ m} \times 3,52 = 65,47 \text{ kg}$$

$$U 92 \times 30 \# 2,65 \rightarrow P = 17,60 \text{ kg/6m} \rightarrow 2,93 \text{ kg/m}$$

$$= 0,50 \times 8 + 0,65 \times 15 = 13,75 \text{ m} \times 2,93 = 40,29 \text{ kg}$$

$$* \text{TESOURA } 1,00 \text{ m}$$

$$U 100 \times 40 \# 2,65 \rightarrow P = 21,10 \text{ kg/6m} \rightarrow 3,52 \text{ kg/m}$$

$$= 1,00 + 1,65 + 0,50 \times 2 = 3,65 \text{ m} \times 3,52 = 12,85 \text{ kg}$$

$$U 92 \times 30 \# 2,65 \rightarrow P = 17,60 \text{ kg/6m} \rightarrow 2,93 \text{ kg/m}$$

$$= 0,50 + 0,65 = 1,15 \text{ m} \times 2,93 = 3,37 \text{ kg}$$

$$\text{Peso Total Tesoura Estrutura 01} = 65,47 + 40,29 + 12,85 + 3,37 = \underline{121,98 \text{ kg}}$$

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ESTRUTURA 02

* TESOURA 8,50m

$U 100 \times 40 \# 2,65 \rightarrow P = 21,10 \text{ kg/6m} \rightarrow 3,52 \text{ kg/m}$

$= 9,10 + 8,50 + 0,50 \times 2 = 18,60 \text{m} \times 3,52 = 65,47 \text{kg}$

$U 92 \times 30 \# 2,65 \rightarrow P = 17,60 \text{ kg/6m} \rightarrow 2,93 \text{ kg/m}$

$= 0,50 \times 8 + 0,65 \times 15 = 13,75 \text{m} \times 2,93 = 40,29 \text{kg}$

* TESOURA 8,40m

$U 100 \times 40 \# 2,65 \rightarrow P = 21,10 \text{ kg/6m} \rightarrow 3,52 \text{ kg/m}$

$= 8,45 + 8,40 + 0,50 \times 2 = 17,85 \text{m} \times 3,52 = 62,83 \text{kg}$

$U 92 \times 30 \# 2,65 \rightarrow P = 17,60 \text{ kg/6m} \rightarrow 2,93 \text{ kg/m}$

$= 0,50 \times 8 + 0,65 \times 15 = 13,75 \text{m} \times 2,93 = 40,29 \text{kg}$

Peso Total Tesoura Estrutura 02 = $65,47 + 40,29 + 62,83 + 40,29 = \underline{208,88 \text{kg}}$

ESTRUTURA 03

* TESOURA 8,50m

$U 100 \times 40 \# 2,65 \rightarrow P = 21,10 \text{ kg/6m} \rightarrow 3,52 \text{ kg/m}$

$= 9,10 + 8,50 + 0,50 \times 2 = 18,60 \text{m} \times 3,52 = 65,47 \text{kg}$

$U 92 \times 30 \# 2,65 \rightarrow P = 17,60 \text{ kg/6m} \rightarrow 2,93 \text{ kg/m}$

$= 0,50 \times 8 + 0,65 \times 15 = 13,75 \text{m} \times 2,93 = 40,29 \text{kg}$

Peso total Estrutura 03 = $(65,47 + 40,29) \times 2 = \underline{211,52 \text{kg}}$

ESTRUTURA 04

* TESOURA 8,50m

$U 100 \times 40 \# 2,65 \rightarrow P = 21,10 \text{ kg/6m} \rightarrow 3,52 \text{ kg/m}$

$= 9,10 + 8,50 + 0,50 \times 2 = 18,60 \text{m} \times 3,52 = 65,47 \text{kg}$

$U 92 \times 30 \# 2,65 \rightarrow P = 17,60 \text{ kg/6m} \rightarrow 2,93 \text{ kg/m}$

$= 0,50 \times 8 + 0,65 \times 15 = 13,75 \text{m} \times 2,93 = 40,29 \text{kg}$

Peso total Estrutura 03 = $(65,47 + 40,29) \times 2 = \underline{211,52 \text{kg}}$

ESTRUTURA 05

* TESOURA 8,50m

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U 100x40 # 2,65 -> P= 21,10 kg/6m -> 3,52 kg/m

= 9,10+8,50+0,50*2= 18,60m*3,52 = 65,47kg

U 92x30 # 2,65 -> P= 17,60 kg/6m -> 2,93 kg/m

= 0,50*8+0,65*15= 13,75m*2,93 = 40,29kg

* TESOURA 1,00m

U 100x40 # 2,65 -> P= 21,10 kg/6m -> 3,52 kg/m

= 1,00+1,65+0,50*2= 3,65m*3,52 = 12,85kg

U 92x30 # 2,65 -> P= 17,60 kg/6m -> 2,93 kg/m

= 0,50+0,65= 1,15m*2,93 = 3,37kg

Peso Total Tesoura Estrutura 05 = 65,47+40,29+12,85+3,37= 121,98kg

ESTRUTURA CAIXA D'ÁGUA

U 127x50 # 2,25 -> P= 23,10 kg/6m -> 3,85 kg/m

= 2,85*3= 8,25m*3,85 = 31,76kg

TOTAL PESO TESOURAS + TRELIÇA ENRIJECEDORA:

270,58+121,98+208,88+211,52+211,52+121,98+31,76 = **1.178,22kg**

*****PESO TOTAL ESTRUTURA METÁLICA: 468,78+1.178,22 = 1.647,00kg**

2.2 - TRAMA

TERÇAS METÁLICAS

U Enrijecido 100x50x17 # 2,25 -> P= 22,90 kg/6m -> 3,82 kg/m

= 23,85*(11+3)+15,00*11+7,55*3= 522,95m*3,82 = 1.997,67kg

Fechamento oitões

U Enrijecido 100x50x17 # 2,00 -> P= 22,90 kg/6m -> 3,42 kg/m

(17,10*1,50)*2+23,65*1,50= 86,78m*3,42 = 296,78kg

*****PESO TOTAL TERÇAS: 1.997,67+296,78 = 2.294,45kg**

2.3 - CONTRAVENTAMENTO

= 21,60*2+11,30 = 54,50m ÷ 12m = 5 barras*11,56= 57,80kg



2.4 - TELHA

* Fechamento oitões – $(17,10 \times 3) \times 2 + 23,65 \times 3 = 173,55\text{m}^2$

* Telhado – $1,65 \times (8,06 + 0,90) + 9,10 \times 15,00 + 9,10 \times 23,95 + 2,75 \times 7,85 = 390,82\text{m}^2$

Total telhas: $173,55 + 390,82 = 564,37\text{m}^2$

2.5 - CUMEEIRA – 23,95m / 24,00m

2.6 - CALHA – $7,85 \times 2 + 0,50 \times 2 = 16,70\text{m}$

2.7 – CURVA – 2unid.

2.8 – TUBO DE QUEDA – $3,50 \times 2 = 7,00\text{m}$

2.9 - RUFO – $7,85 + 2,40 \times 2 + 9,70 = 22,35\text{m}$

2.10 – PARAFUSO PARA CHUMBADORES – $5 \times 3 = 15$ chumb.*6 = 90pçs

2.11 - CHUMBADOR QUÍMICO – 3 Unid.

2.12 – PARAFUSO PARA FECHAMENTO OITÕES – $3 \times (86,78 \div 1) = 260$ pçs

2.13 - CANTONEIRA DE ALUMÍNIO PARA FECHAMENTO DE VÃOS – $81,50\text{m} \times 2 = 163,00\text{m}$

2.14 – SELANTE PARA ACABAMENTO E VEDAÇÕES – 3 LITROS

2.15 e 2.16 - SERRALHEIRO E AUXILIAR PARA FECHAMENTO DE TODAS ARESTAS – 5 dias*8 hrs
= 40hrs

2.17 – ANDAIME – $17,10 \times 4,50 = 76,95\text{m}^2$

2.18 – FORRO EM ABAS – $83,90 \times (0,47 + 0,13) = 50,34\text{m}^2$

2.19 – RODAFORRO – 81,50m

3 – REPARO EM ALVENARIAS/PINTURA

3.1 - REBOCO – $81,50 \times 0,50 = 40,75\text{m}^2$

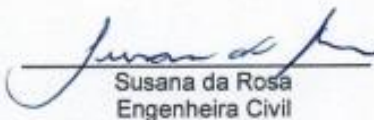
3.2 - PINTURA FACHADA – $81,50 \times 4,00 + 135,15 = 461,15\text{m}^2$

3.3 – PINTURA DE PISO – $28 \times 3 + 89,55 = 173,55\text{m}^2$

4 – SERVIÇOS FINAIS

4.1 - CARGA ENTULHO – 3 cargas * $6\text{m}^3 = 18,00\text{m}^3$


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