```
ClearAll[A1, x1, A2, x2]

Sa = Sin[30 Degree]
Ca = Cos[30 Degree]
L2 = 100
L1 = L2 / Ca
Ym = 21 000
Hatf = 23.5
P = 100

GT = {{-Ca, -Sa}, {-1, 0}}
G = Transpose[GT]

q = {0, P}

F = DiagonalMatrix[{L1 / Ym / A1, L2 / Ym / A2}]

s = -Inverse[G].q
v = -Inverse[GT].F.s
```

$$\frac{1}{2}$$

$$\frac{\sqrt{3}}{2}$$

$$100$$

$$\frac{200}{\sqrt{3}}$$

$$21\,000$$

$$23.5$$

$$100$$

$$\left\{\left\{-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right\}, \{-1, 0\}\right\}$$

$$\left\{\left\{-\frac{\sqrt{3}}{2}, -1\right\}, \left\{-\frac{1}{2}, 0\right\}\right\}$$

$$\{0, 100\}$$

$$\left\{\left\{\frac{1}{105\sqrt{3}\ A1}, 0\right\}, \left\{0, \frac{1}{210\,A2}\right\}\right\}$$

$$\left\{200, -100\sqrt{3}\right\}$$

$$\left\{-\frac{10}{7\sqrt{3}\ A2}, \frac{80}{21\sqrt{3}\ A1} + \frac{10}{7\,A2}\right\}$$

```
uhat = Hatf L1 / Ym
A1hat = s[[1]] / Hatf
A2hat = Abs[s[[2]] / Hatf]
A2Ehat = Sqrt[4 Abs[s[[2]]] L2^2 / Ym / Pi] // N

NMinimize[{A1 / Ca + A2, A1 ≥ A1hat, A2 ≥ Max[A2hat, A2Ehat],
  v[[1]] ≤ uhat, v[[2]] ≤ uhat, A1 ≥ 0, A2 ≥ 0}, {A1, A2}]
```

```
0.129216

8.51064

7.37043

10.2477
```

NMinimize::incst : NMinimize was unable to generate any initial points satisfying the inequality constraints $\left\{-0.129216+\frac{80}{21\sqrt{3}\ \text{A1}}+\frac{10}{7\,\text{A2}}\leq 0,\ -0.129216-\frac{10}{7\sqrt{3}\ \text{A2}}\leq 0\right\}$. The initial region specified may not contain any feasible points. Changing the initial region or specifying explicit initial points may provide a better solution. ≫

```
{60.1918, {A1 → 29.7872, A2 → 25.7965}}
```

```
p1 = ContourPlot[A1 / Ca + A2, {A1, 0, 50}, {A2, 0, 50},
    ContourShading → None, FrameLabel → Automatic, ContourLabels → True];
p2 = ContourPlot[A1 / Ca + A2 == 60.191836299658405, {A1, 0, 50},
    {A2, 0, 50}, ContourStyle → {Green, Thick}];
p3 = ContourPlot[{A1 == A1hat, A2 == A2hat,  A2 == A2Ehat},
    {A1, 0, 50}, {A2, 0, 50}, ContourStyle → Red ];
p4 = ContourPlot[80/(21 Sqrt[3] A1) + 10/(7 A2), {A1, 0, 50}, {A2, 0, 50},
    ContourShading → None, FrameLabel → Automatic, ContourLabels → True];
p5 = ContourPlot[80/(21 Sqrt[3] A1) + 10/(7 A2) == 0.12921648881863054,
    {A1, 0, 50}, {A2, 0, 50}, ContourStyle → {Black, Thick}];
p6 = ContourPlot[{A1 == 29.78723490574166, A2 == 25.796501955210974},
    {A1, 0, 50}, {A2, 0, 50}, ContourStyle → {Blue }];
Show[p1, p2, p3, p4, p5, p6]
```