

# LAMPIRAN

## A. Perhitungan *Bar Bending Schedule* Konvensional

Bar No.	Bar Shape	Location	Bar Member	Bar Type	a (m)	b (m)	c (m)	Dia (mm)	Spacing (mm)	Cutting Length (m)	No. of each Bar	Length of each Bar (m)	No. of Member	Total Length (m)
1	[Diagram]	Pondasi (1800x1200x450)	Atas X	Ulir	0.192	0.922		16	125	1.482	15	22.228	9	200.048
			Atas Y	Ulir	0.192	1.522		16	125	2.082	10	20.818	9	187.366
			Bawah X	Ulir	0.192	0.922		16	125	1.482	15	22.228	9	200.048
			Bawah Y	Ulir	0.192	1.522		16	125	2.082	10	20.818	9	187.366
													775.828	

Lampiran A.1. Perhitungan BBS pada fondasi

Bar No.	Bar Shape	Location	Bar Member	Bar Type	Bar Length (m)	a (m)	b (m)	c (m)	Dia (mm)	Spacing (mm)	l/d (mm)	l/b (mm)	l/t (mm)	l/c (mm)	Bend (mm)	Cutting Length (m)	No. of each Bar	No. of Member	Length of each Bar (m)	Total Length (m)
1	[Diagram]	Balok 15m (300x600)	Tul. Longi Atas	Ulir	15	0.192	14.65		16		609.58	481.58	792.455	384	192	15.484	2	15	32.97	494.52
			Tul. Longi Bawah	Ulir	15	0.192	14.65		16		609.58	481.58	792.455	384	192	15.484	2	15	32.97	494.52
			Sengkang Tumpuan	Ulir		0.142	0.442	13	125			156	305.15	1.63	30	30		48.9045	1497.14	
			Sengkang Lapangan	Ulir		0.142	0.442	33	175			156	305.15	1.63	22	30		35.8633	1075.9	
2	[Diagram]	Balok 8m (300x600)	Tul. Longi Atas	Ulir	8	0.192	7.65		16		609.58	481.58	792.455	384	192	8.691	2	15	17.38	260.74
			Tul. Longi Bawah	Ulir	8	0.192	7.65		16		609.58	481.58	792.455	384	192	8.691	2	15	17.38	260.74
			Sengkang Tumpuan	Ulir		0.142	0.442	13	125			156	305.15	1.63	17	30		27.7128	811.377	
			Sengkang Lapangan	Ulir		0.142	0.442	33	175			156	305.15	1.63	11	30		17.9317	537.85	
																				3423.88

Lampiran A.2. Perhitungan BBS pada balok

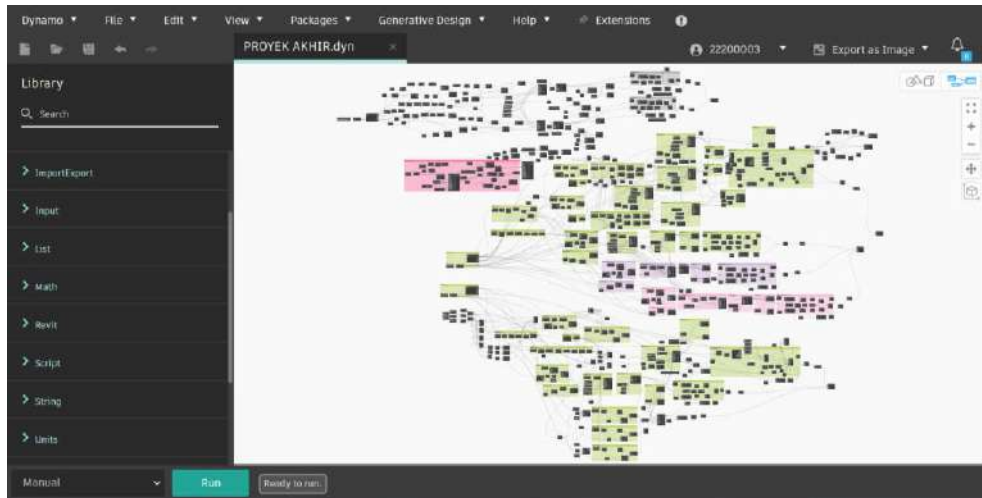
Bar No.	Bar Shape	Location	Bar Member	Bar Type	Bar Length (m)	a (m)	b (m)	c (m)	Dia (mm)	Spacing (mm)	Id (mm)	ht (mm)	lwt (mm)	Brsd (mm)	Cutting Length (m)	No. of each Bar	No. of Member	Length of each Bar (m)	Total Length (m)
1		Pedestal + Lt. 1	Tulangan Longitudinal	Upr	5.2	5.2		0.192	16		104.701	396.228	192	96	6.18	4	9	24.72	222.51
2		Lt. 2	Tulangan Longitudinal	Upr	3.5		3.5		16			396.228			3.90	4	9	15.58	140.26
3		Lt. 3	Tulangan Longitudinal	Upr	3.5		3.5		16			396.228			3.90	4	9	15.58	140.26
4		Lt. 4	Tulangan Longitudinal	Upr	3.5		3.46		16			396.228			3.46	4	9	13.84	124.56
5		15.7 m	Tulangan Sengkalang	Upr		0.192	0.192		13	200			150	306.15	1.23	80	9	98.41	885.71
																			1513.31

Lampiran A.3. Perhitungan BBS pada kolom

Bar No.	Bar Shape	Location	Bar Member	Bar Type	Bar Length (m)	a (m)	b (m)	c (m)	Dia (mm)	Spacing (mm)	Id (mm)	ht (mm)	lwt (mm)	Brsd (mm)	Cutting Length (m)	No. of each Bar	No. of Member	Length of each Bar (m)	Total Length (m)
5		15.7 m	Tulangan Sengkalang	Upr		0.192	0.192		13	200			150	306.15	1.23	80	9	98.41	885.71
																			1513.31
Bar No.	Bar Shape	Location	Bar Member	Bar Type	Bar Length (m)	a (m)	b (m)	c (m)	Dia (mm)	Spacing (mm)	Id (mm)	ht (mm)	lwt (mm)	Brsd (mm)	Cutting Length (m)	No. of each Bar	No. of Member	Length of each Bar (m)	Total Length (m)
1		Horizontal	Atas	Upr	11.3		11.22		13	150	789.095	1025.77			17.01	55	5	918.92	4594.58
			Bawah	Upr	11.3		11.22		13	150	789.095	1025.77			17.01	55	5	918.92	4594.58
2		Vertikal	Atas	Upr	8.3		8.22		13	150					8.22	101	5	838.22	4191.10
			Bawah	Upr	8.3		8.22		13	150					8.22	101	5	838.22	4191.10
																			17571.30

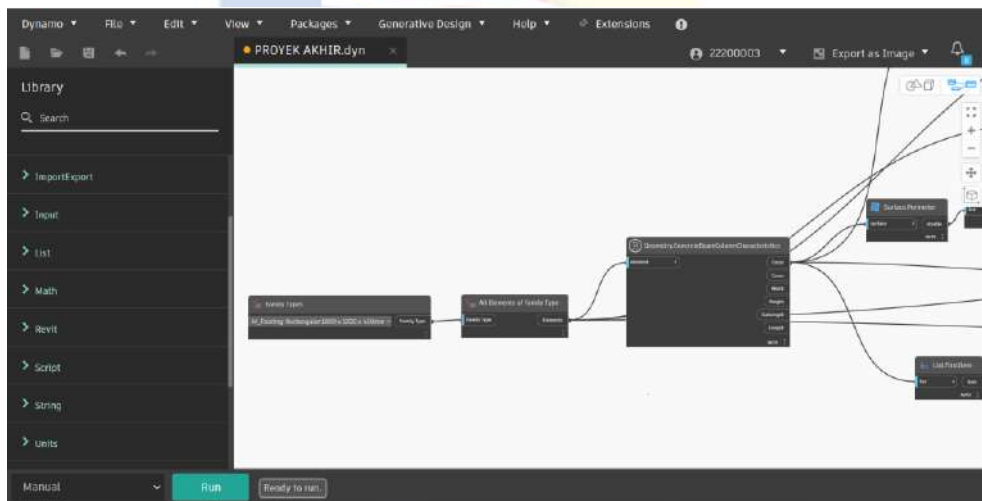
Lampiran A.4. Perhitungan BBS pada pelat lantai

## B. Alur Kerja Program pada Dynamo

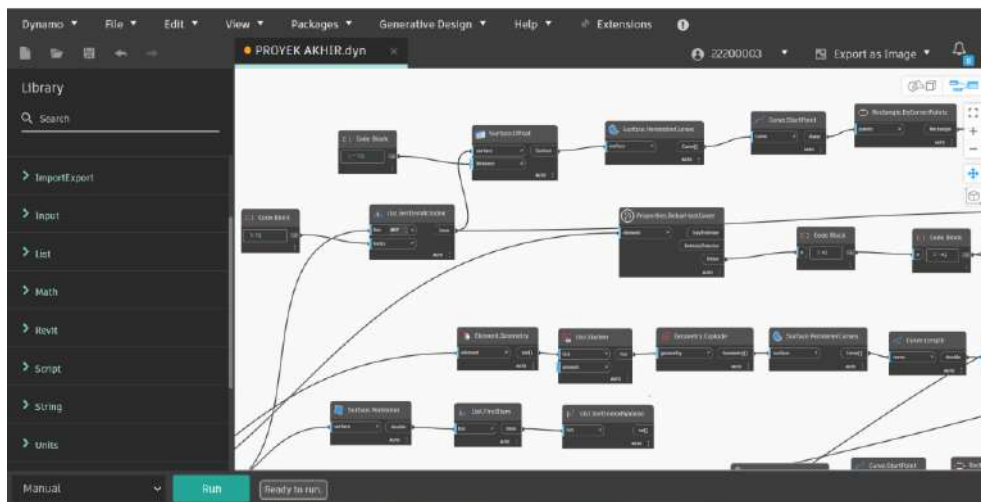


Lampiran B.1. Alur kerja keseluruhan program

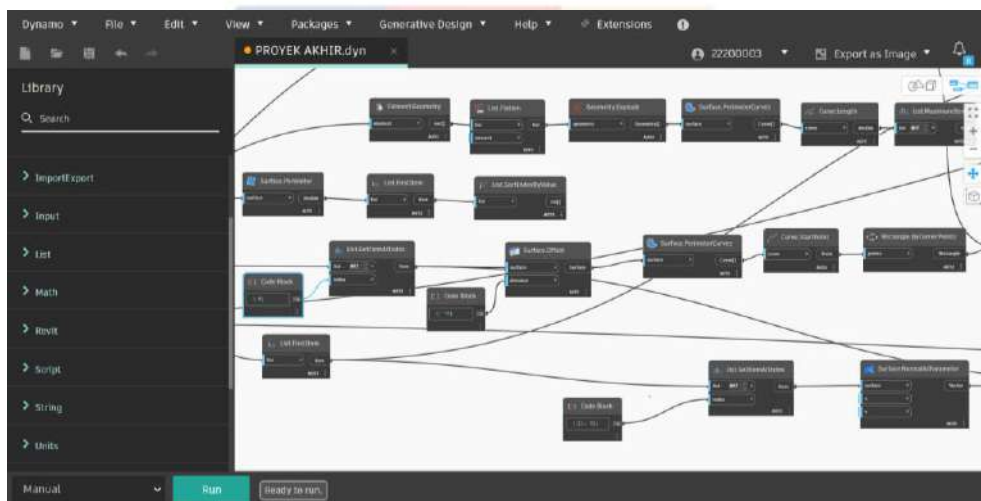
### a. Alur Kerja Fondasi



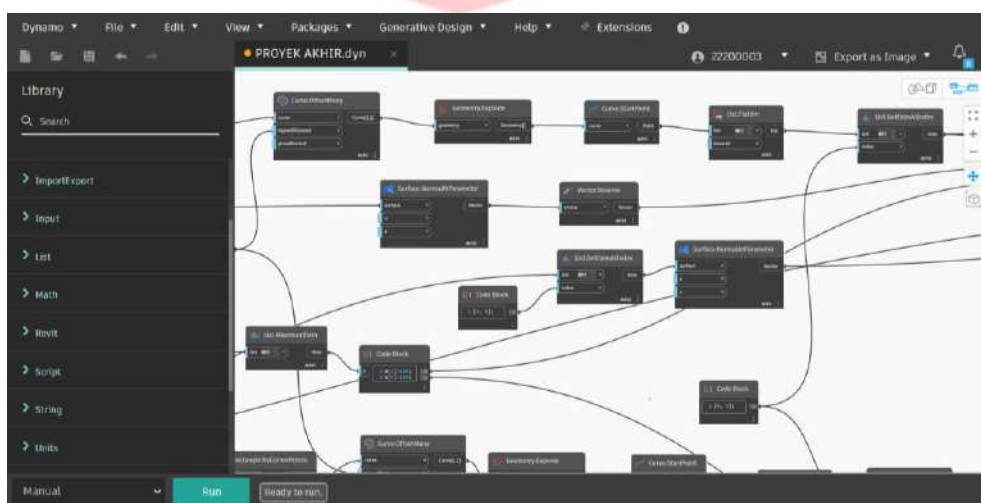
Lampiran B.a.1. Alur kerja fondasi



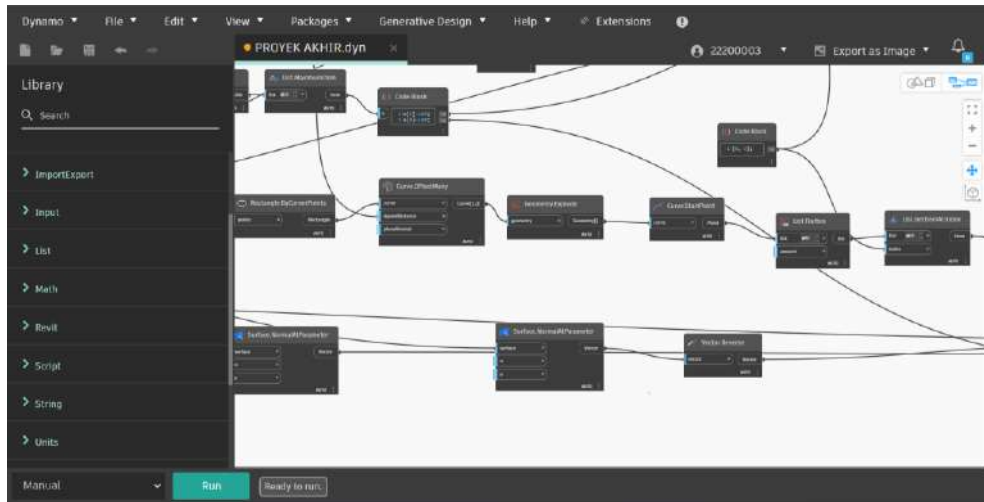
Lampiran B.a.2. Alur kerja fondasi



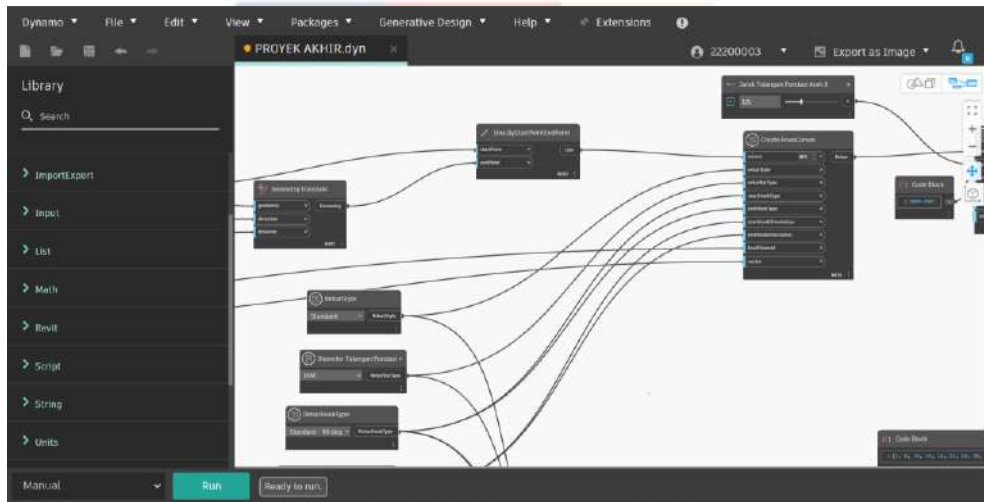
Lampiran B.a.3. Alur kerja fondasi



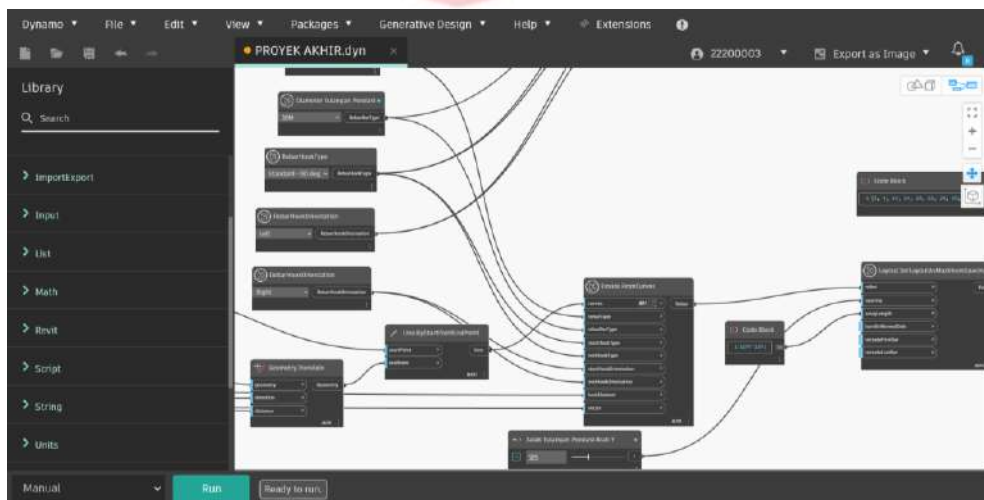
Lampiran B.a.4. Alur kerja fondasi



Lampiran B.a.5. Alur kerja fondasi



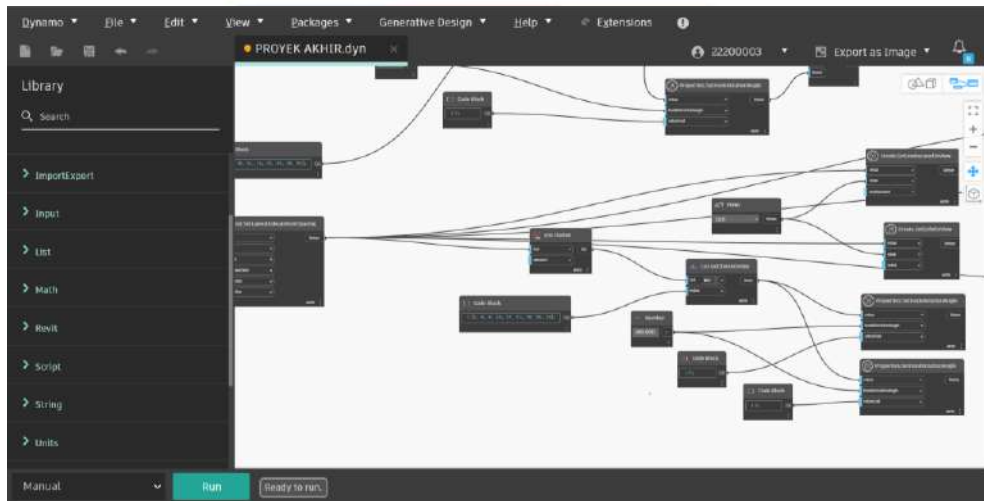
Lampiran B.a.6. Alur kerja fondasi



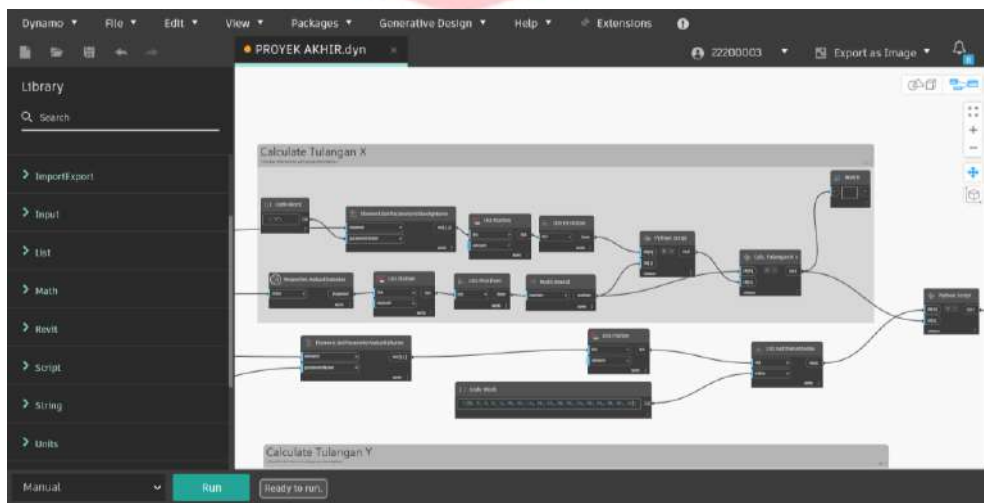
Lampiran B.a.7. Alur kerja fondasi



Lampiran B.a.8. Alur kerja fondasi



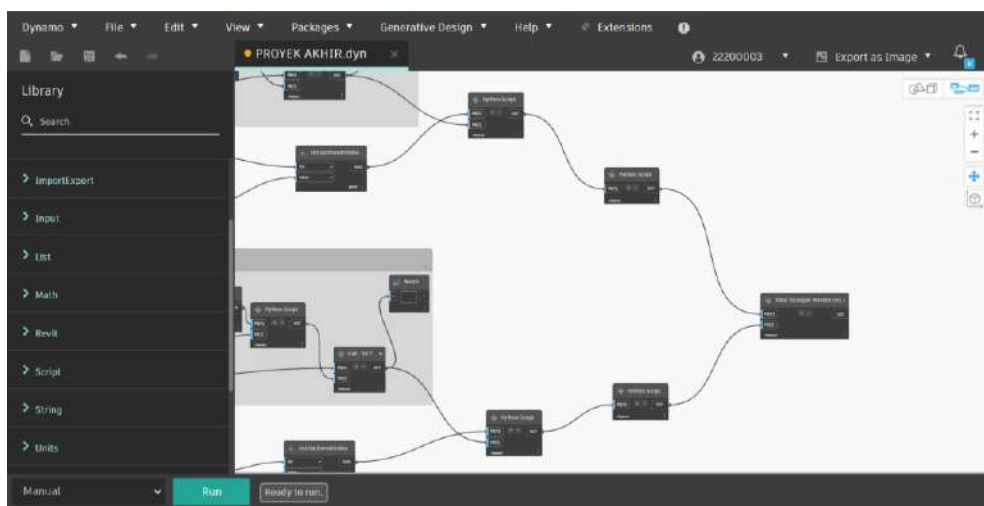
Lampiran B.a.9. Alur kerja fondasi



Lampiran B.a.10. Alur kerja fondasi

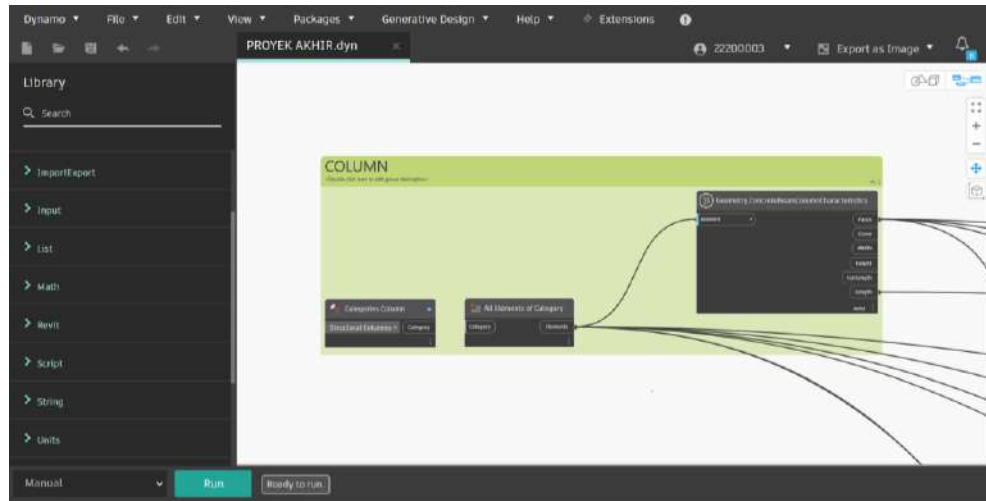


Lampiran B.a.11. Alur kerja fondasi

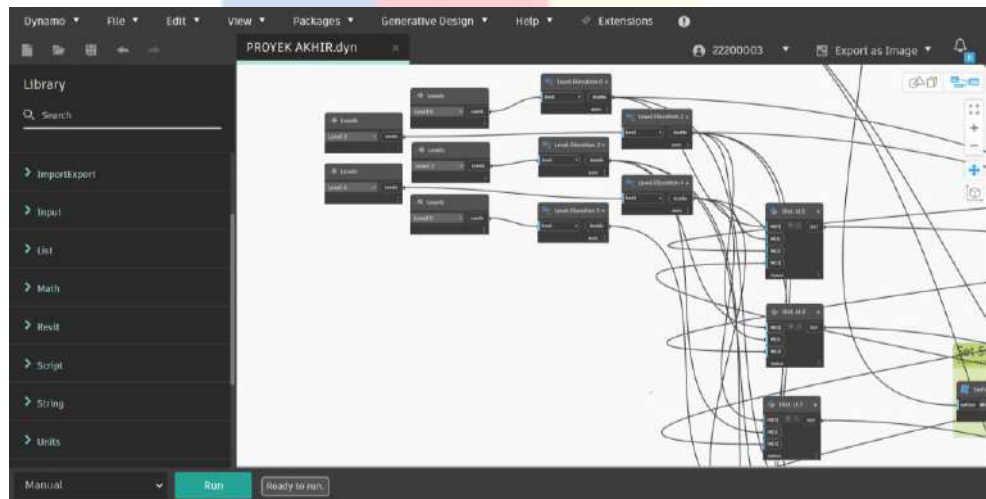


Lampiran B.a.12. Alur kerja fondasi

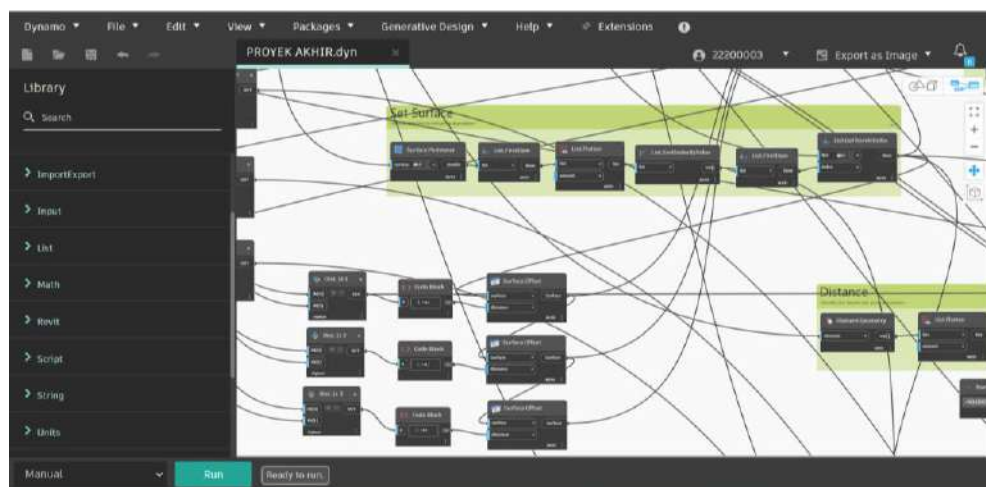
## b. Alur Kerja Kolom



Lampiran B.b.1. Alur kerja kolom



Lampiran B.b.2. Alur kerja kolom

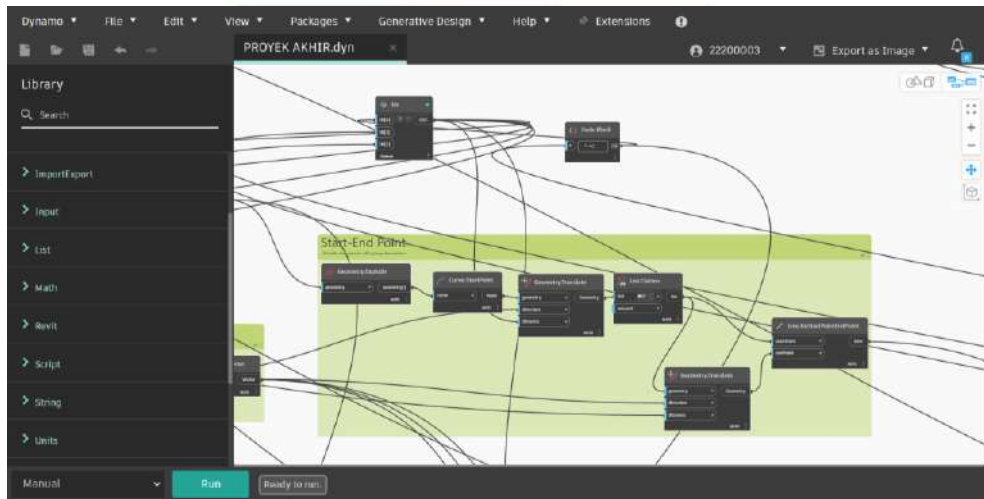


Lampiran B.b.3. Alur kerja kolom

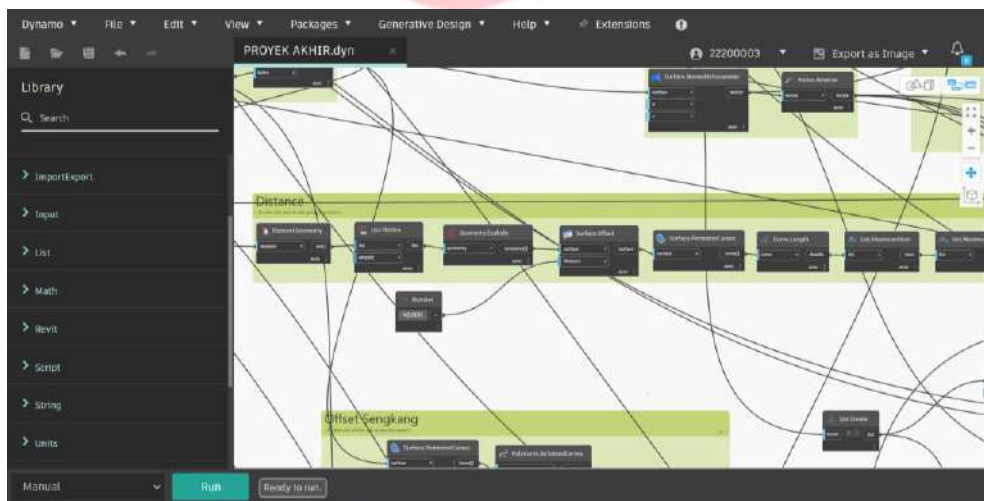




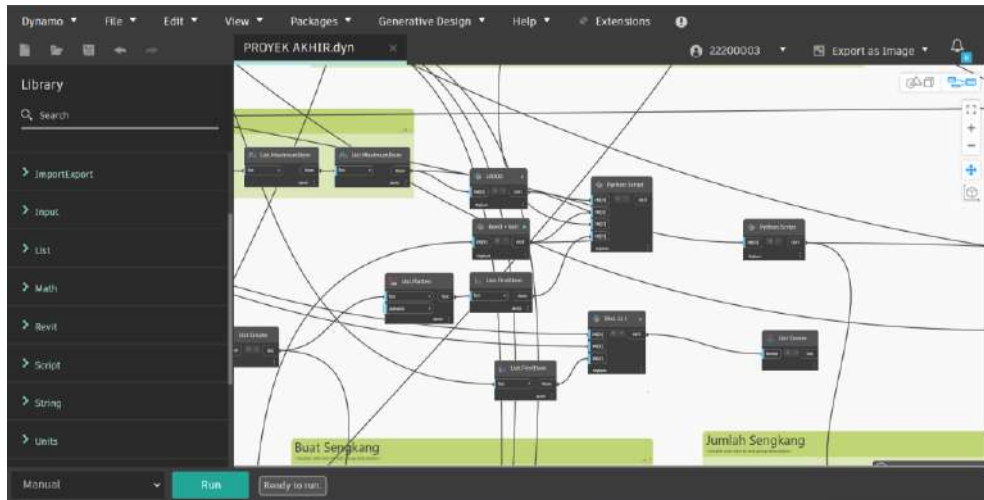
Lampiran B.b.4. Alur kerja kolom



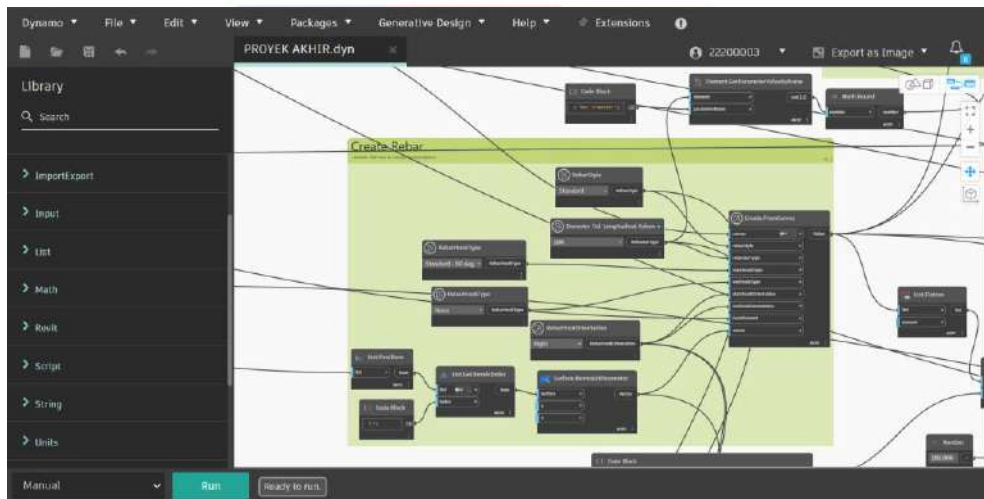
Lampiran B.b.5. Alur kerja kolom



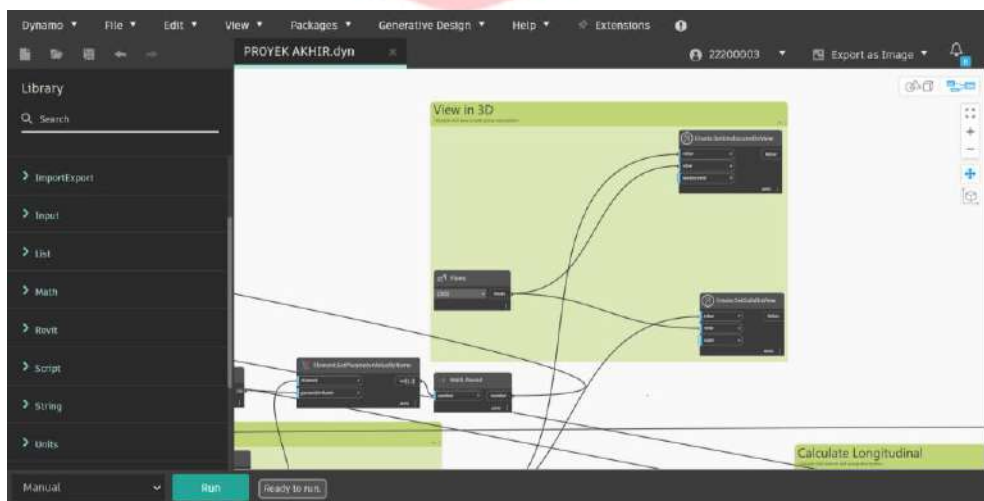
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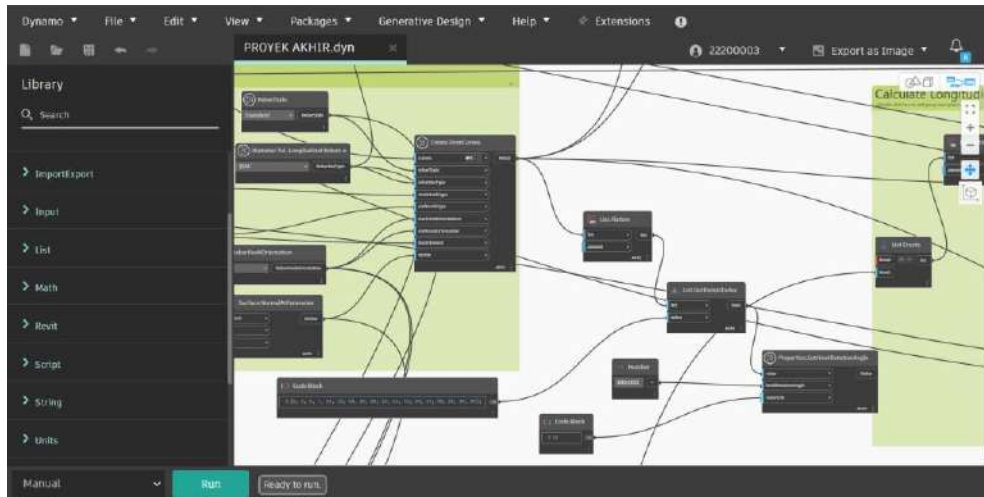
Lampiran B.b.7. Alur kerja kolom



Lampiran B.b.8. Alur kerja kolom



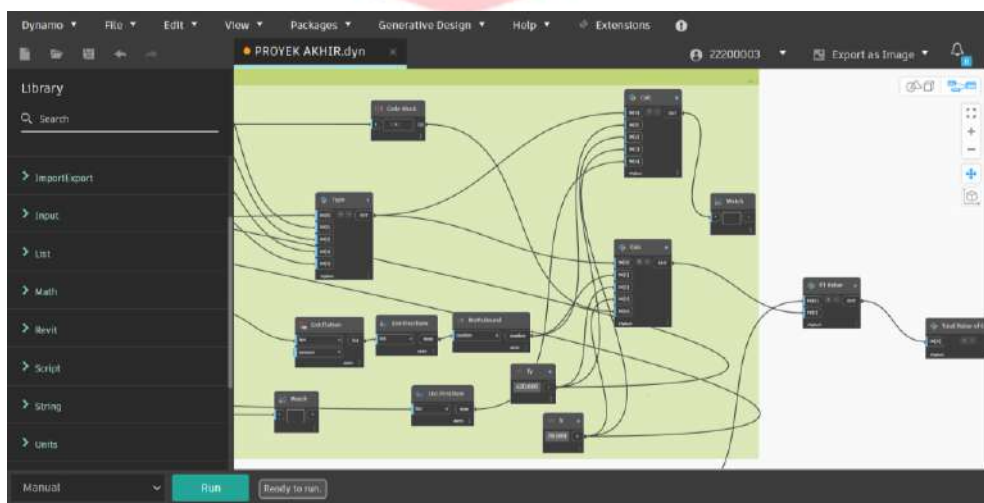
Lampiran B.b.9. Alur kerja kolom



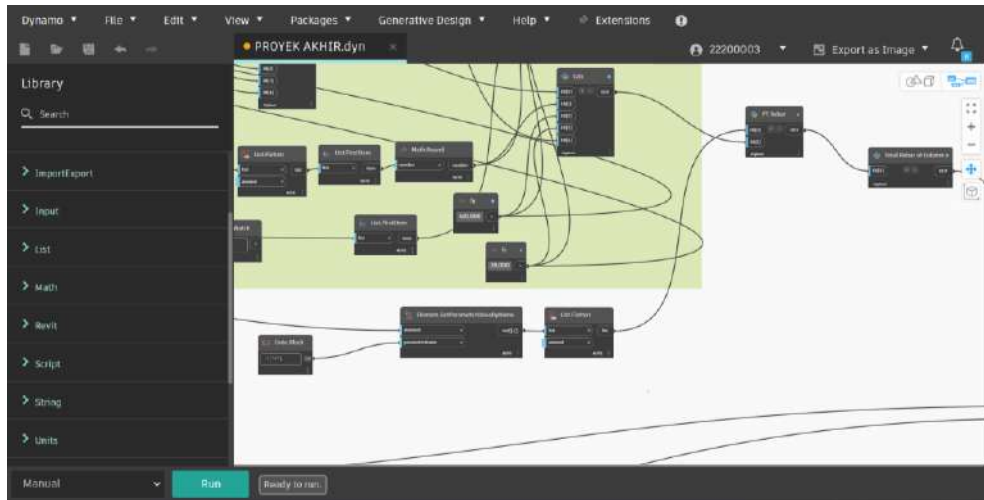
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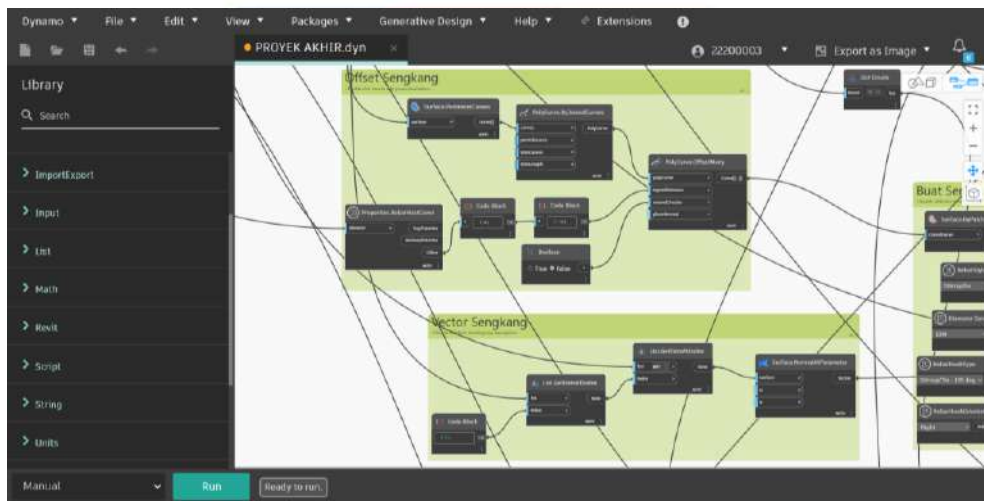
Lampiran B.b.11. Alur kerja kolom



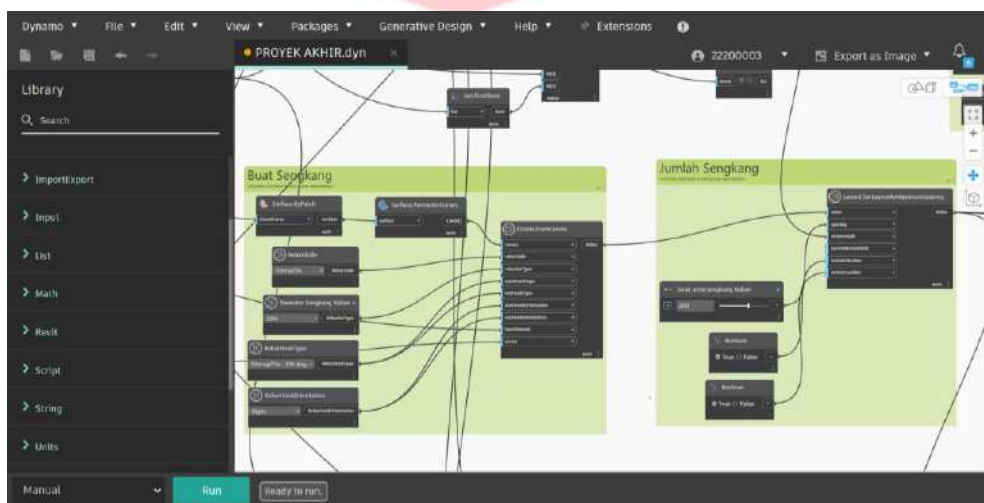
Lampiran B.b.12. Alur kerja kolom



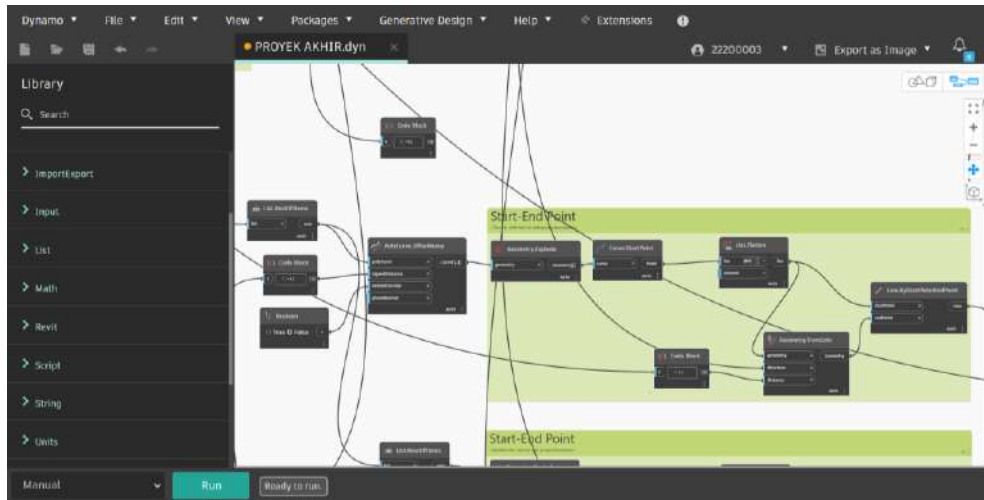
Lampiran B.b.13. Alur kerja kolom



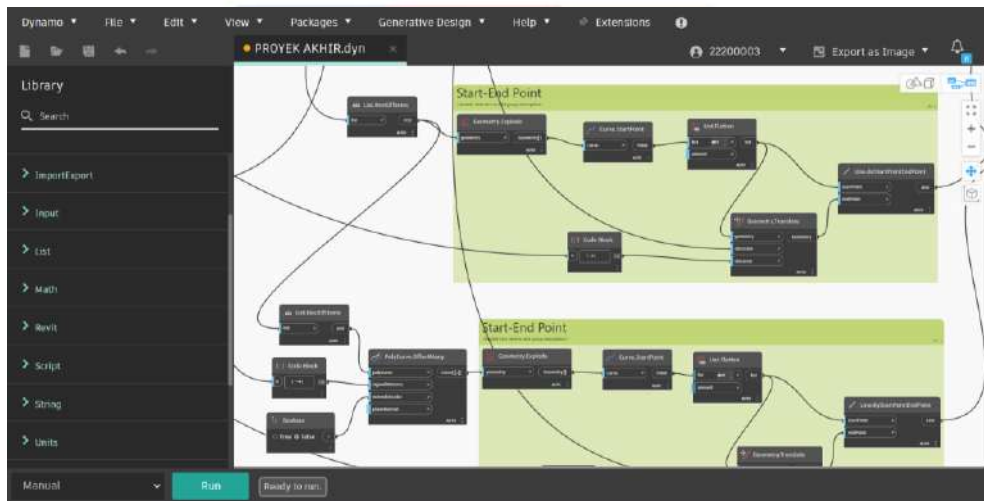
Lampiran B.b.14. Alur kerja kolom



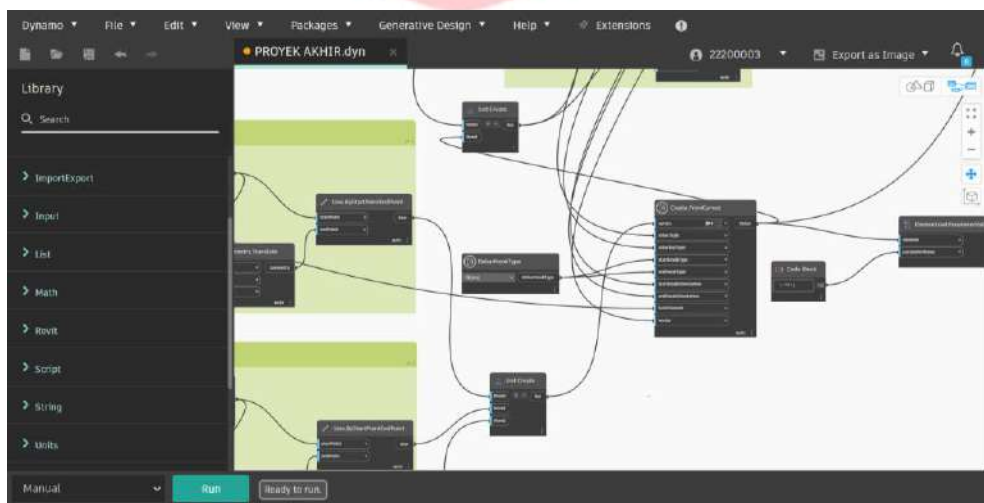
Lampiran B.b.15. Alur kerja kolom



Lampiran B.b.16. Alur kerja kolom



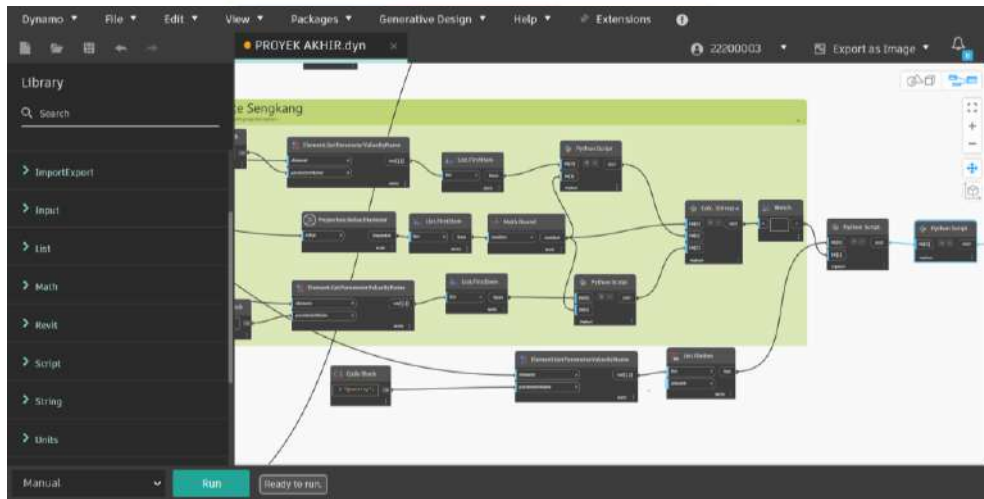
Lampiran B.b.17. Alur kerja kolom



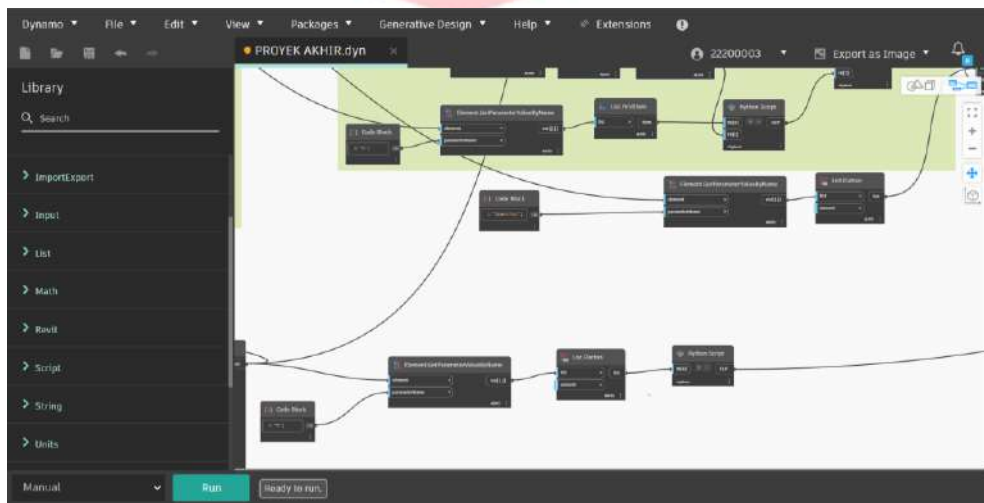
Lampiran B.b.18. Alur kerja kolom



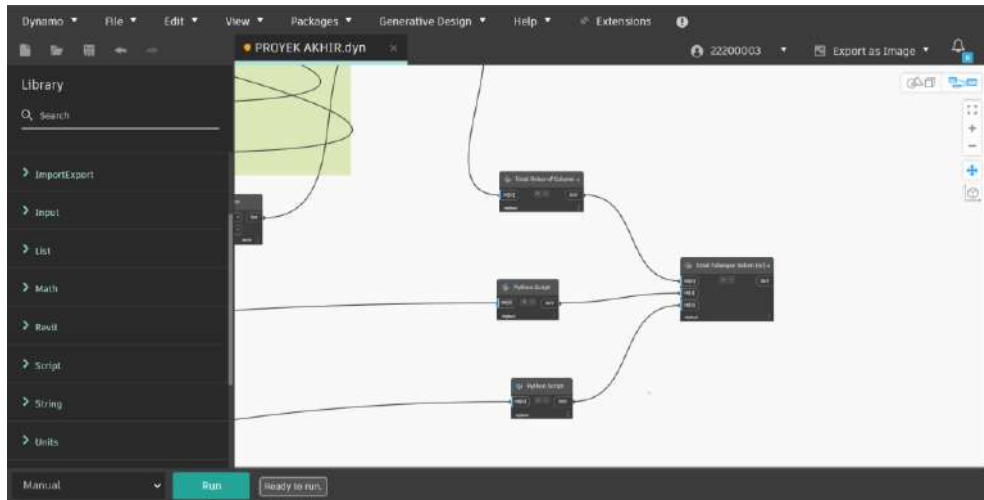
Lampiran B.b.19. Alur kerja kolom



Lampiran B.b.20. Alur kerja kolom

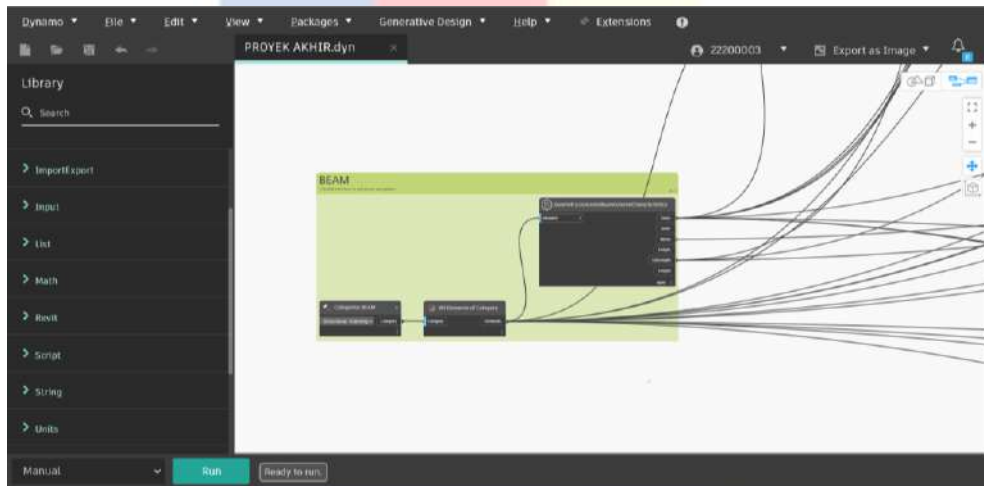


Lampiran B.b.21. Alur kerja kolom



Lampiran B.b.22. Alur kerja kolom

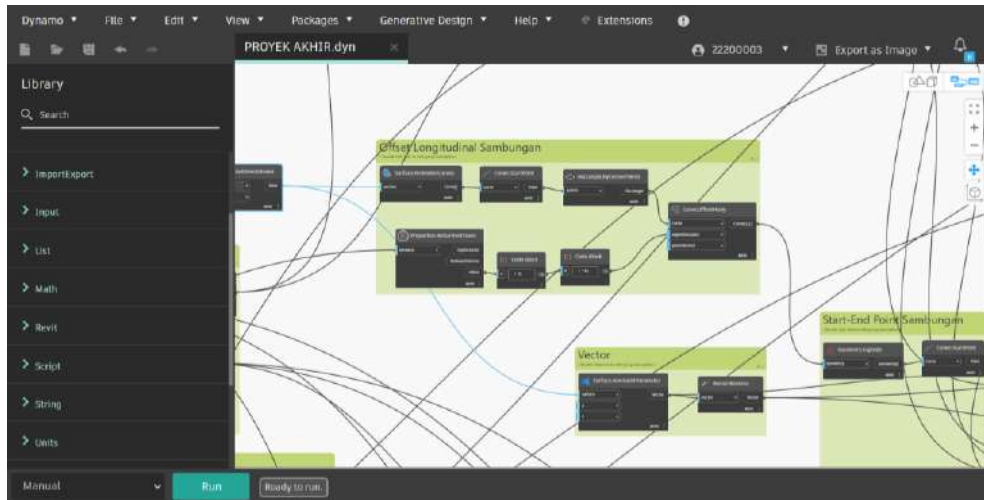
### c. Alur Kerja Balok



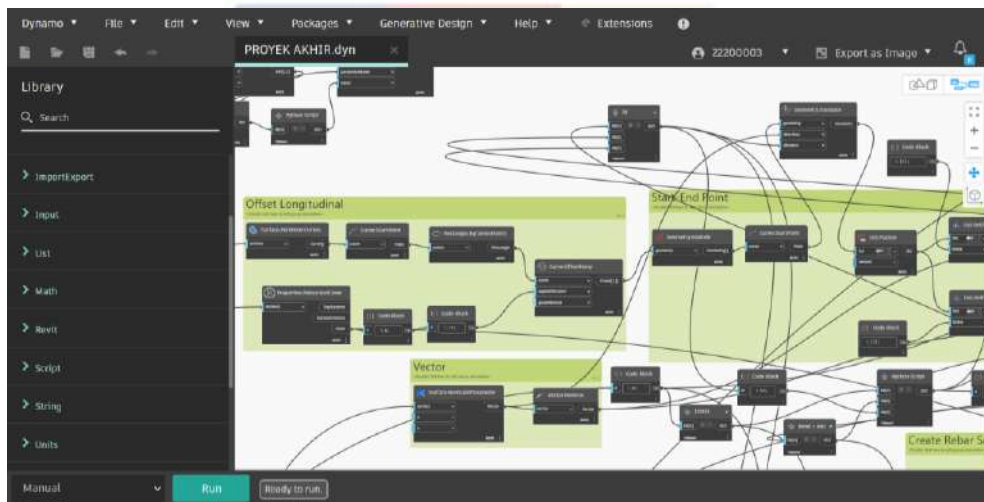
Lampiran B.c.1. Alur kerja balok



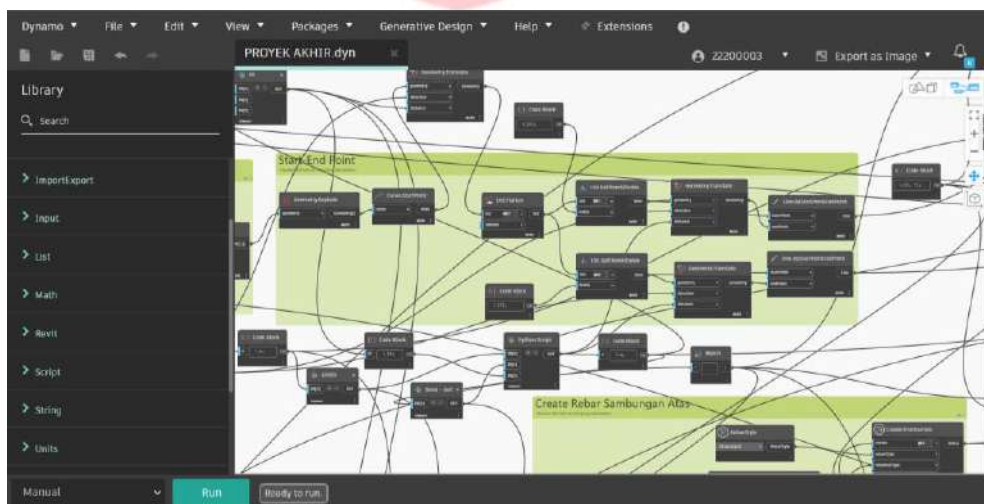
Lampiran B.c.2. Alur kerja balok



Lampiran B.c.3. Alur kerja balok

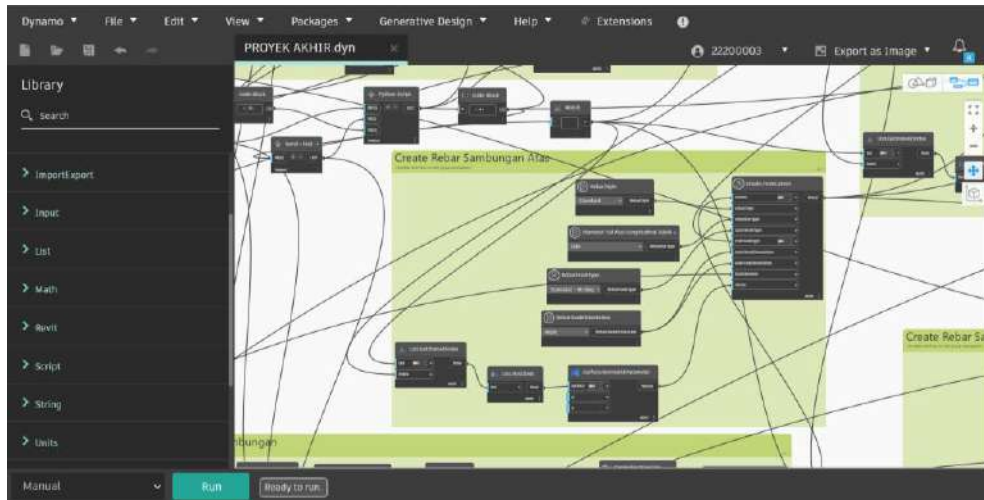


Lampiran B.c.4. Alur kerja balok

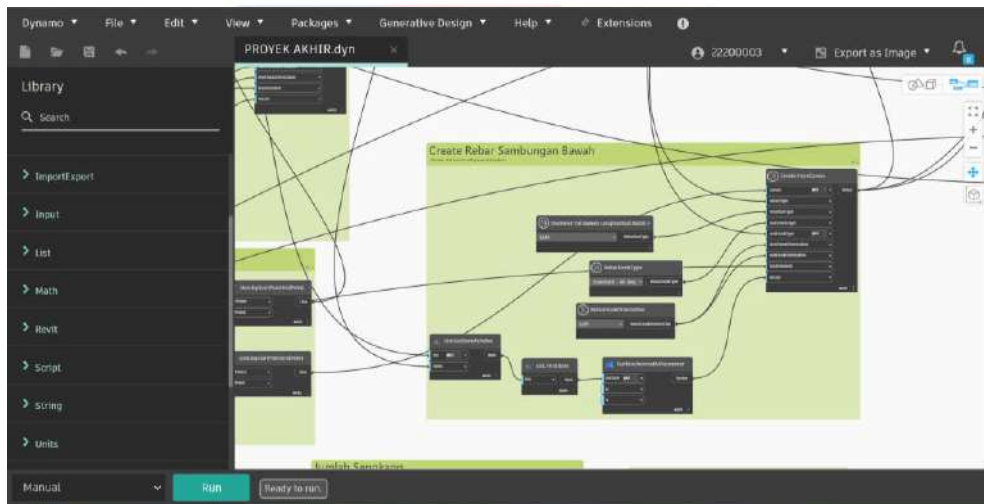


Lampiran B.c.5. Alur kerja balok

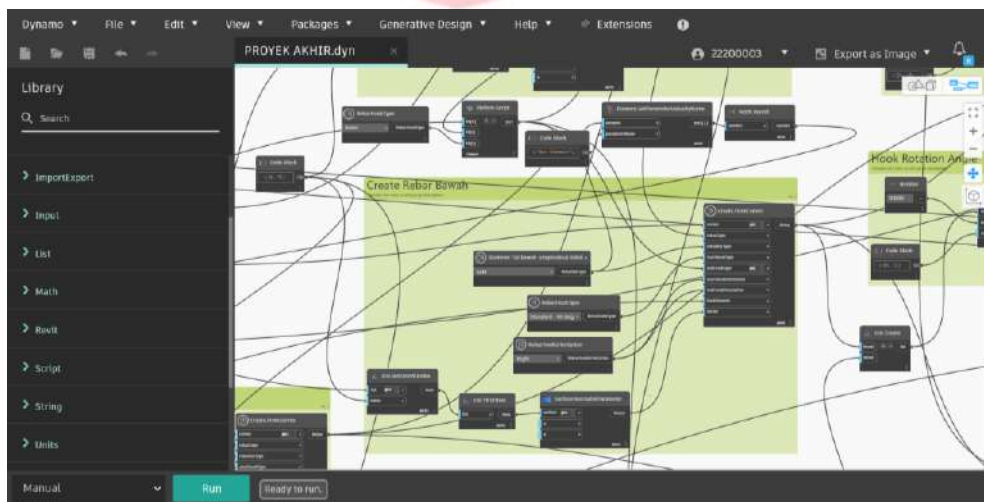




Lampiran B.c 6. Alur kerja balok



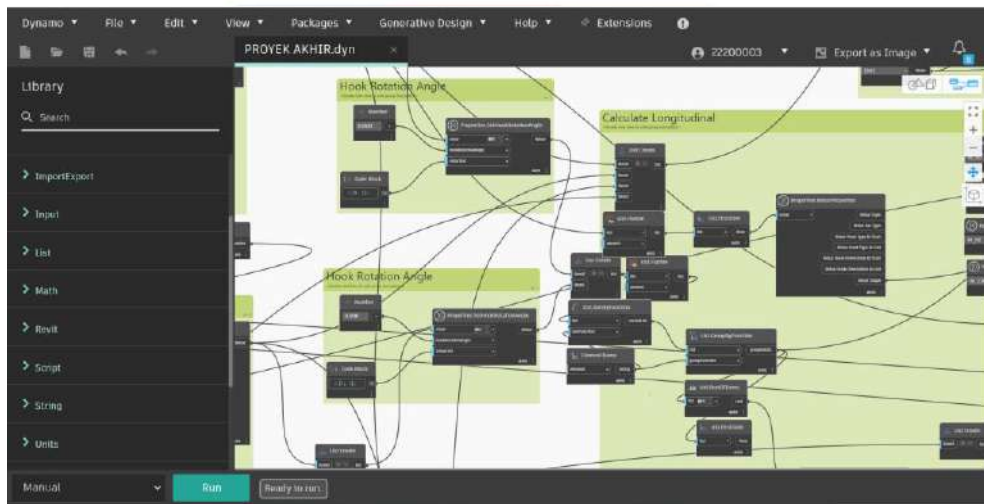
Lampiran B.c.7. Alur kerja balok



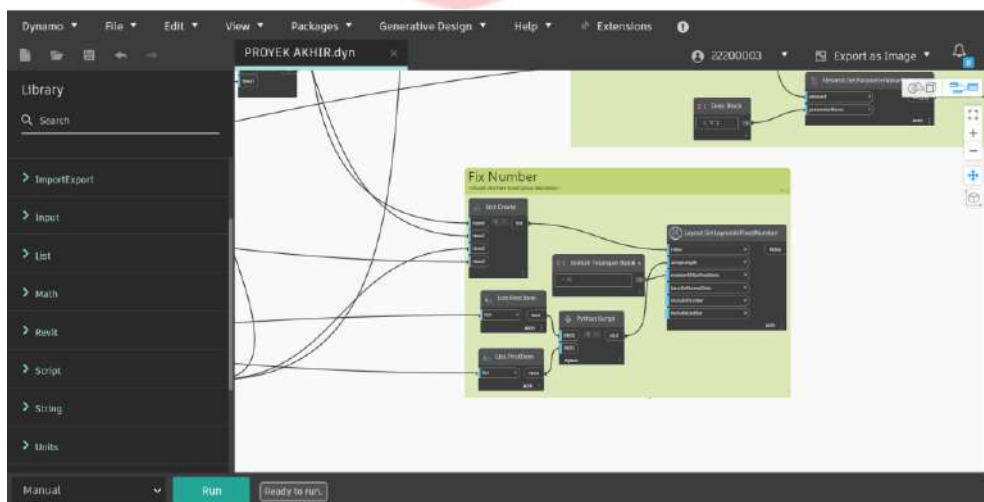
Lampiran B.c.8. Alur kerja balok



Lampiran B.c.9. Alur kerja balok



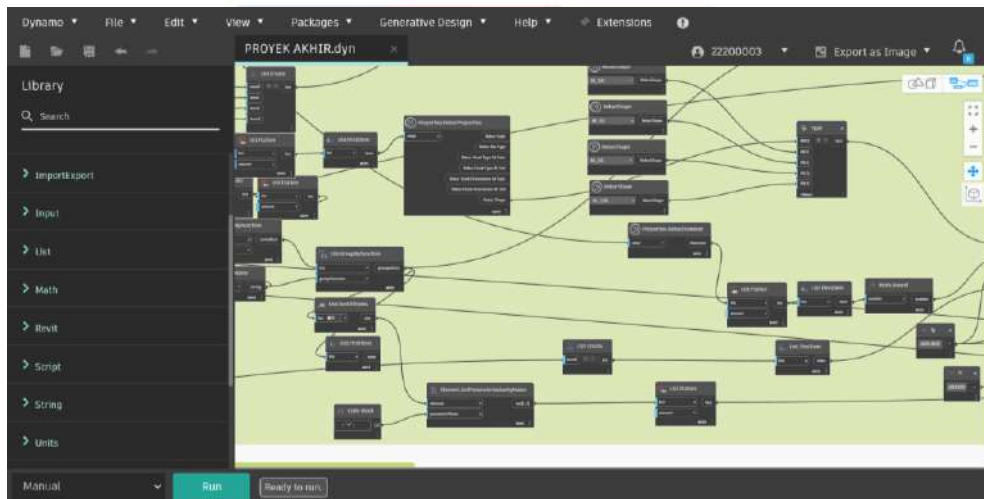
Lampiran B.c.10. Alur kerja balok



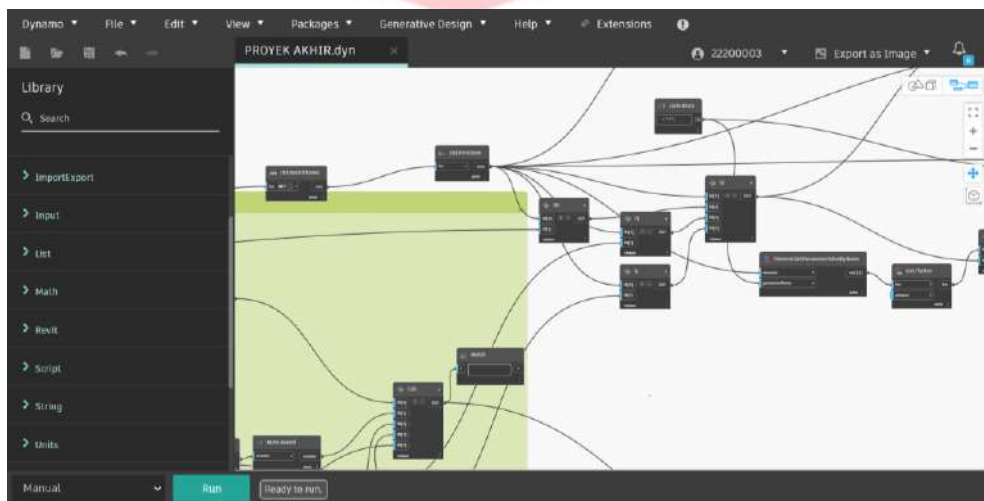
Lampiran B.c.11. Alur kerja balok



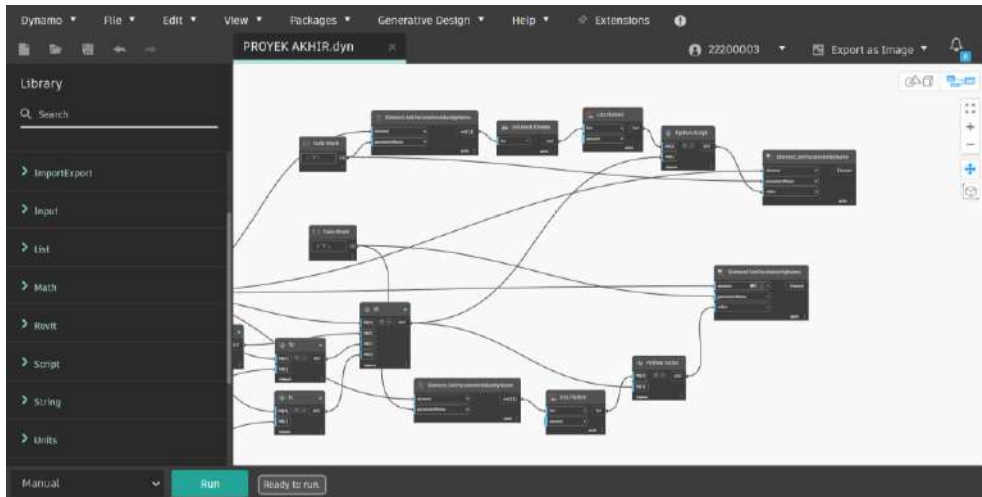
Lampiran B.c.12. Alur kerja balok



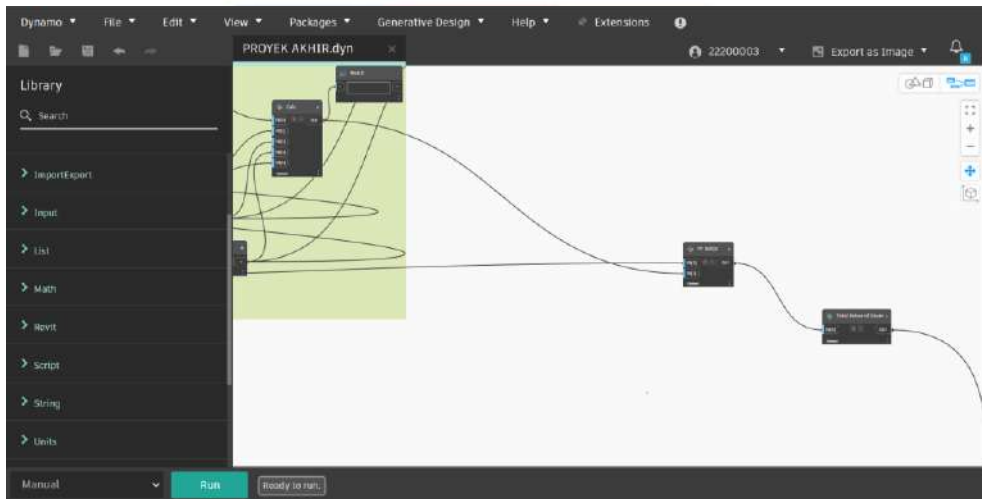
Lampiran B.c.13. Alur kerja balok



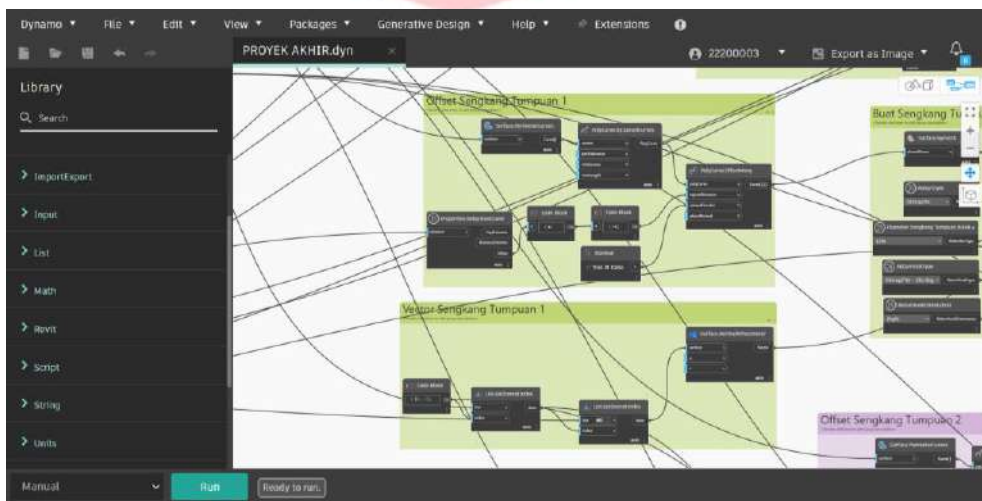
Lampiran B.c.14. Alur kerja balok



Lampiran B.c.15. Alur kerja balok



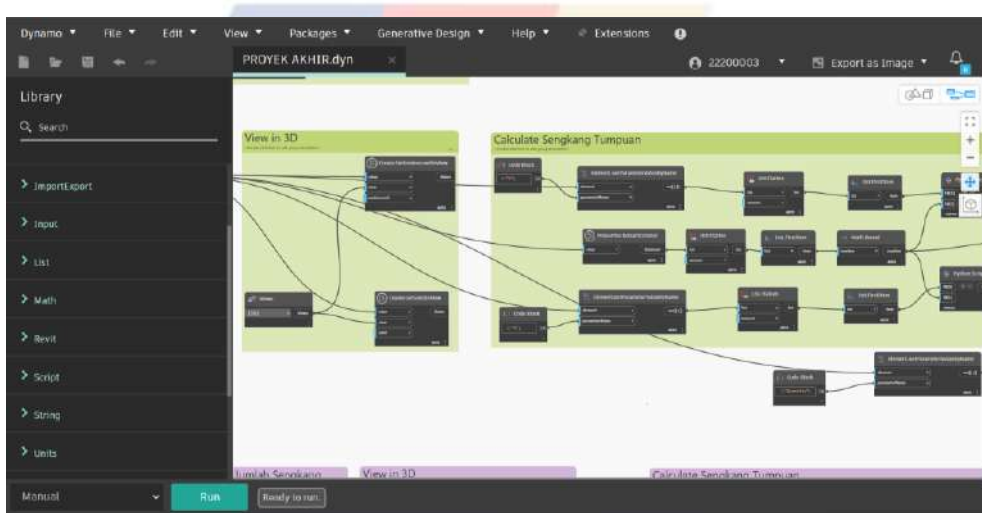
Lampiran B.c.16. Alur kerja balok



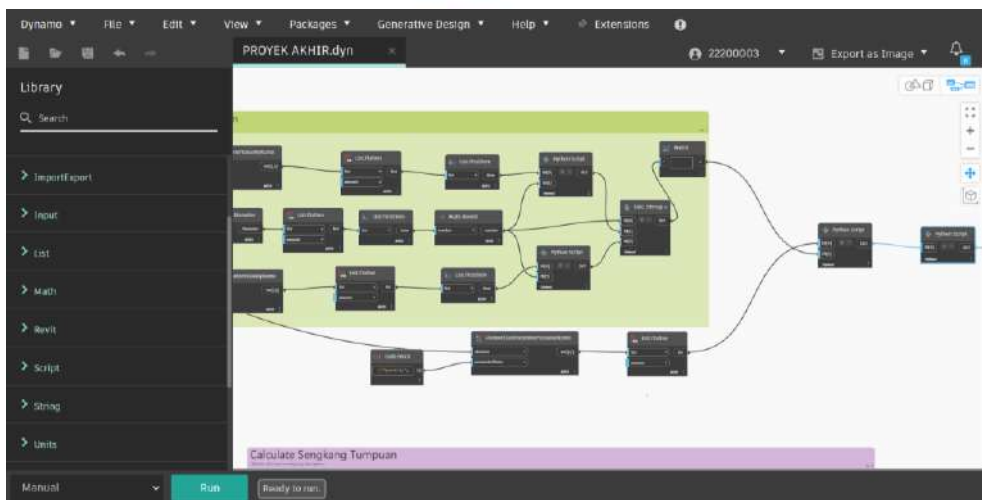
Lampiran B.c.17. Alur kerja balok



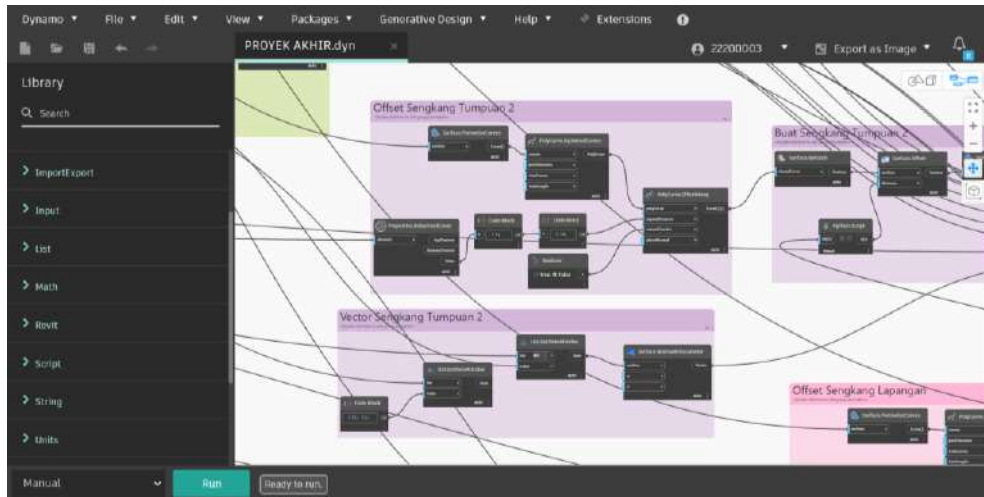
Lampiran B.c.18. Alur kerja balok



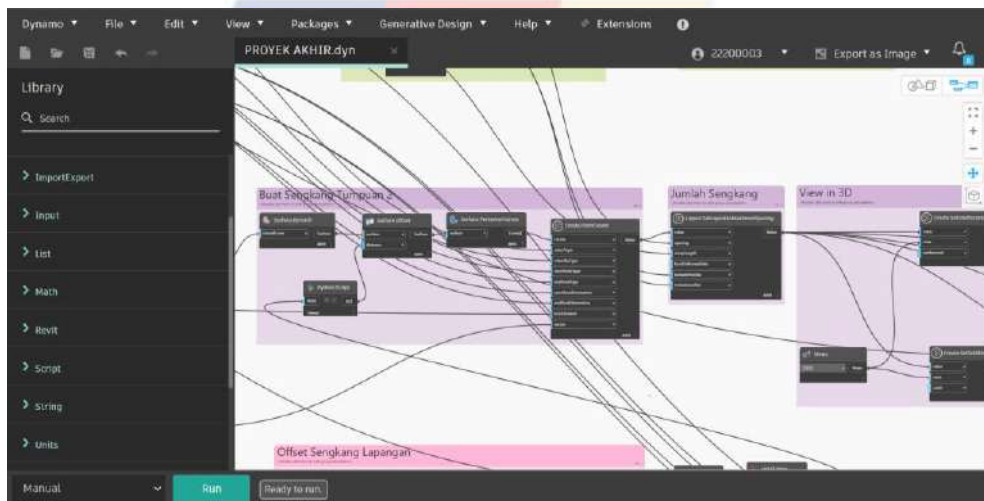
Lampiran B.c.19. Alur kerja balok



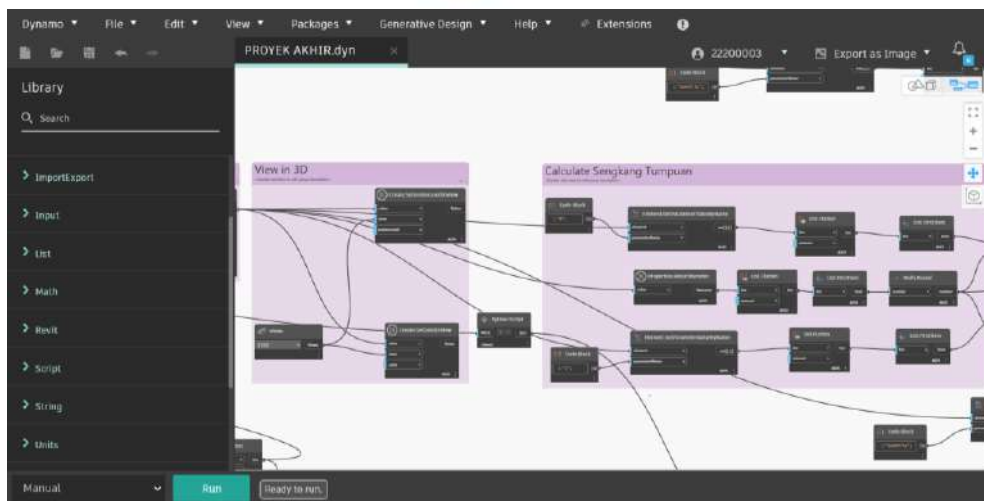
Lampiran B.c.20. Alur kerja balok



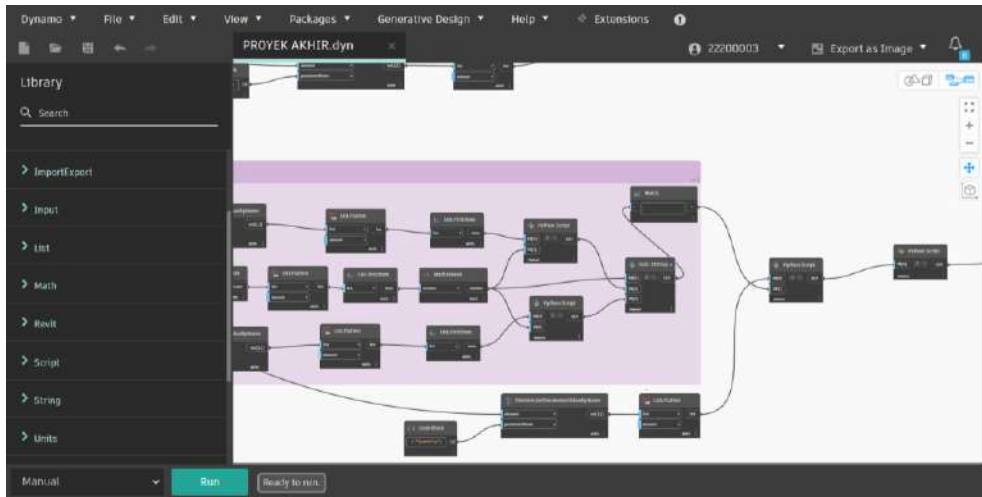
Lampiran B.c.21. Alur kerja balok



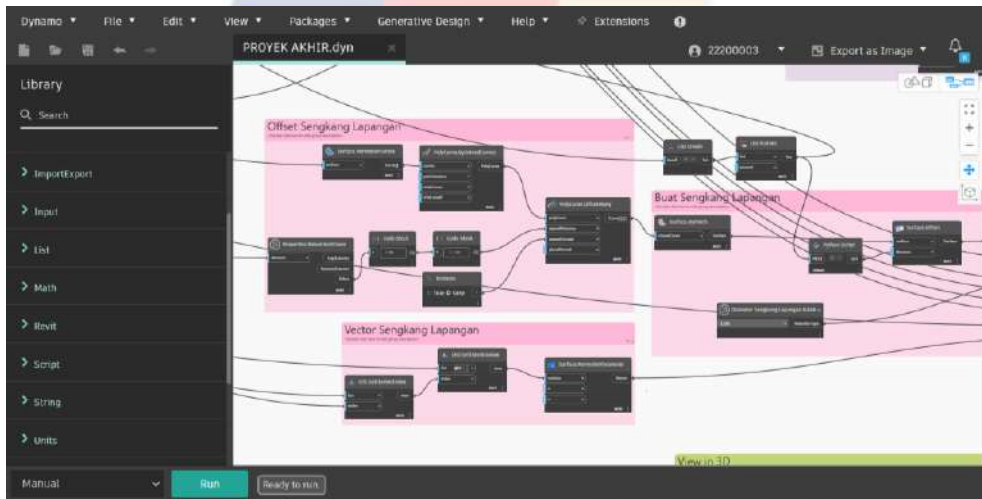
Lampiran B.c.22. Alur kerja balok



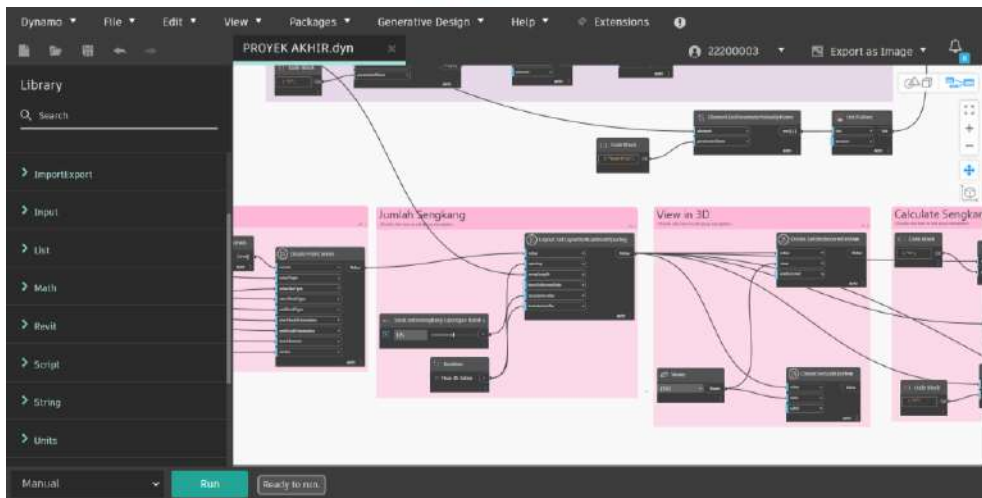
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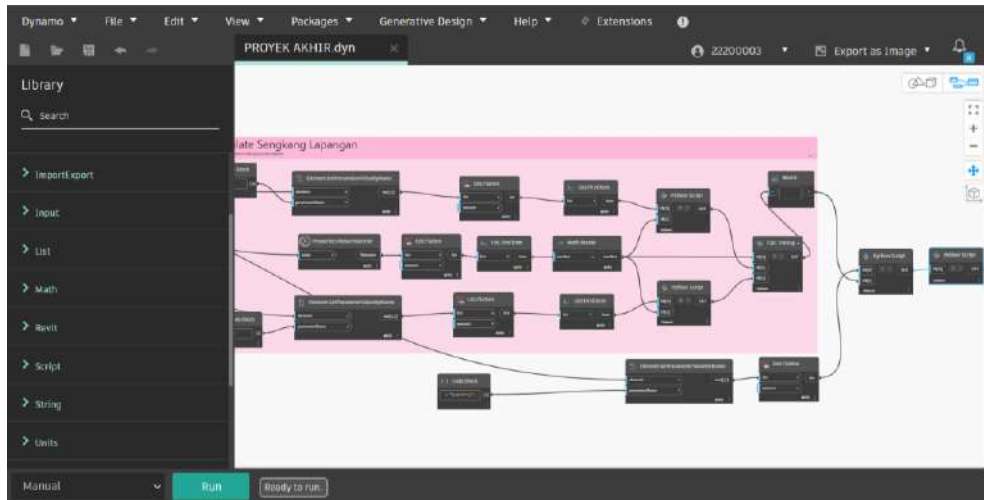
Lampiran B.c.24. Alur kerja balok



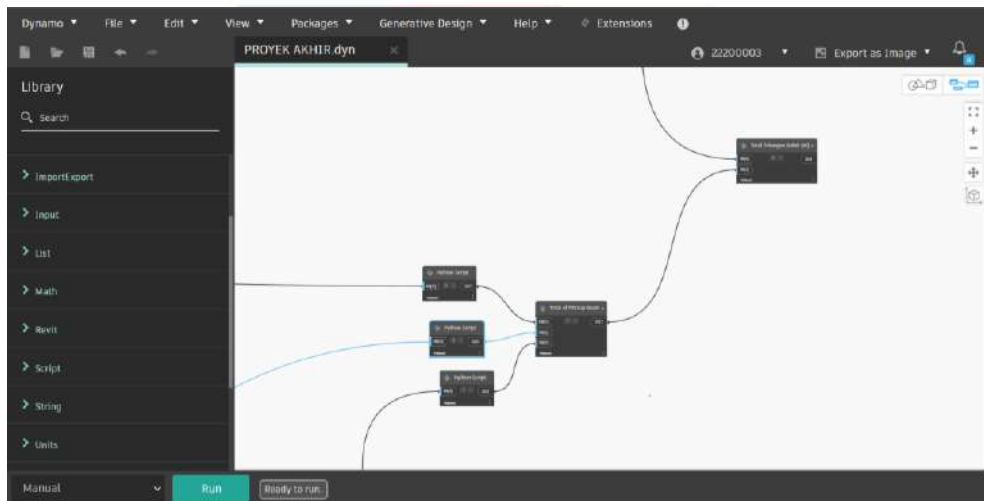
Lampiran B.c.25. Alur kerja balok



Lampiran B.c.26. Alur kerja balok



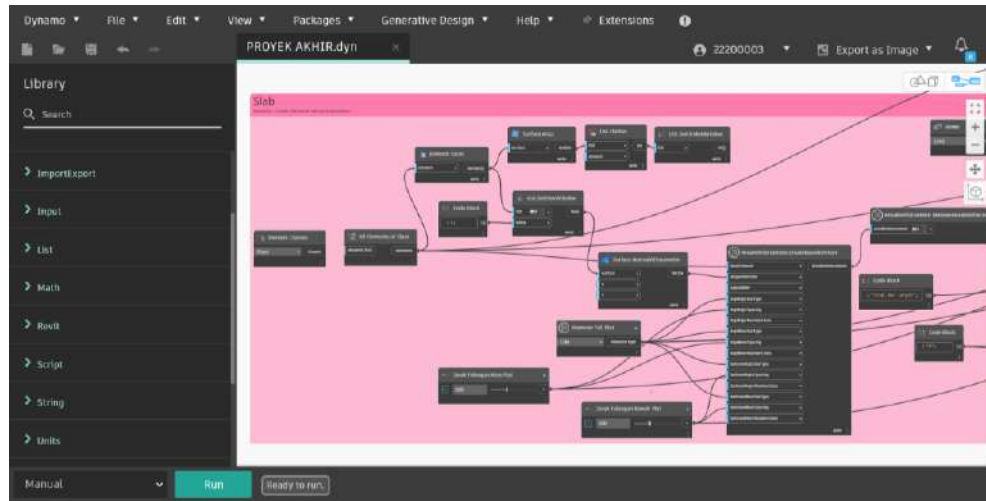
Lampiran B.c.27. Alur kerja balok



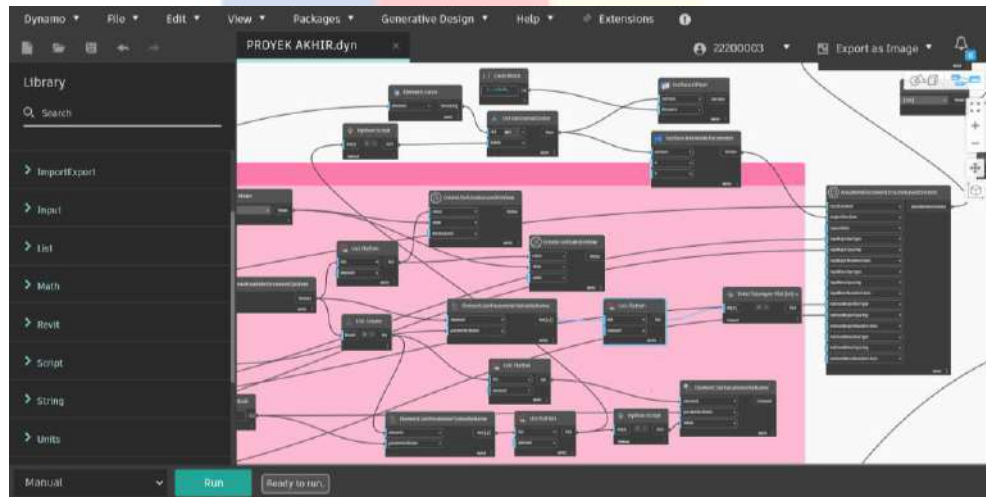
Lampiran B.c.28. Alur kerja balok



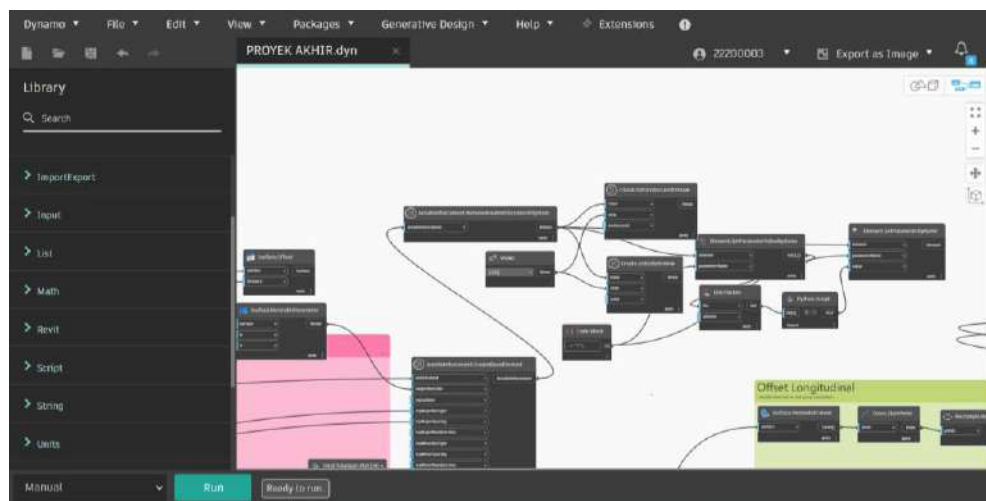
#### d. Alur Kerja Pelat Lantai



Lampiran B.d.1. Alur kerja pelat lantai



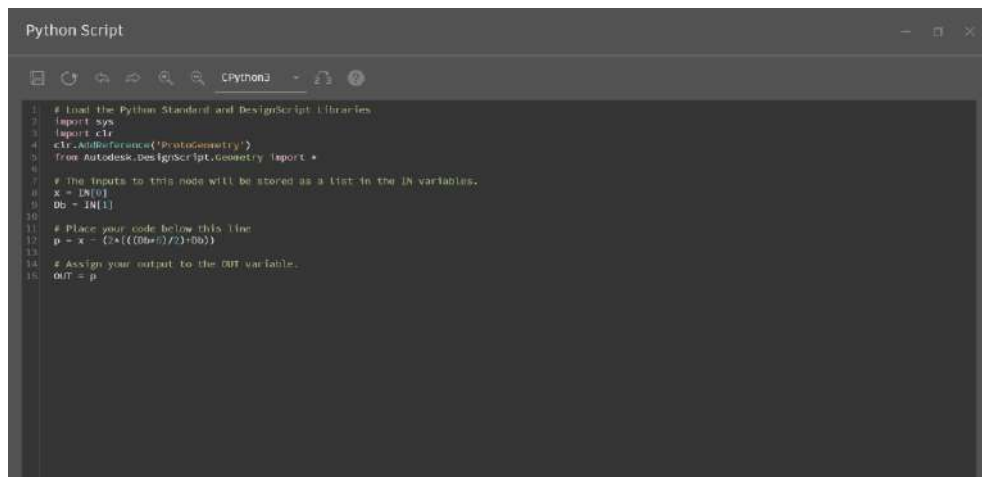
Lampiran B.d.2. Alur kerja pelat lantai



Lampiran B.d.3. Alur kerja pelat lantai

## C. Skrip Python pada Dynamo

### a. Skrip Python pada Fondasi



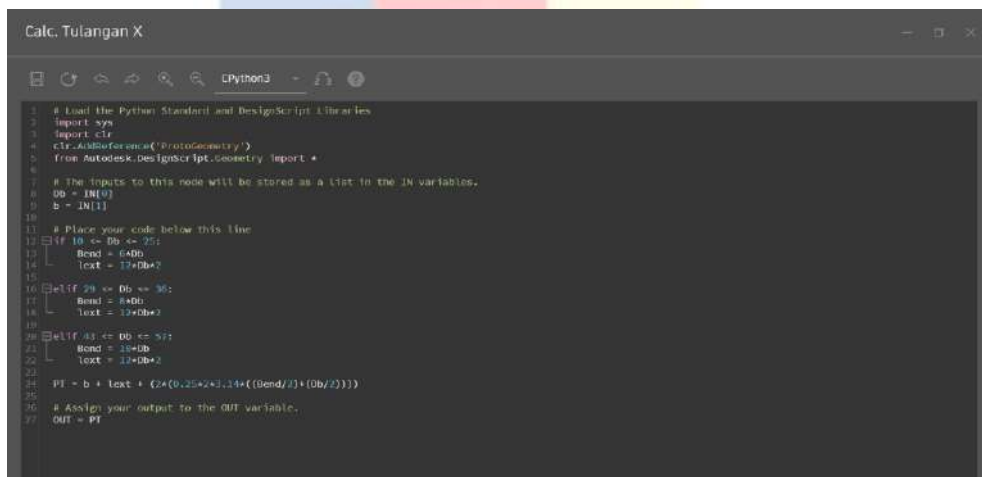
```
Python Script
# Load the Python Standard and DesignScript Libraries
import sys
import clr
clr.AddReference('ProtoGeometry')
from Autodesk.DesignScript.Geometry import *

# The inputs to this node will be stored as a list in the IN variables.
x = IN[0]
Db = IN[1]

# Place your code below this line
p = x - ((Db**2)/2+Db)

# Assign your output to the OUT variable.
OUT = p
```

Lampiran C.a.1. Menghitung panjang menerus tulangan



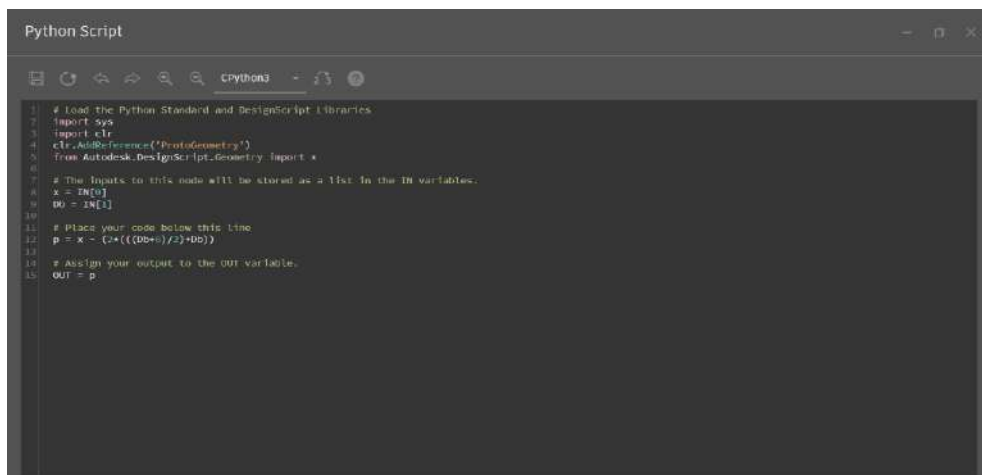
```
Calc. Tulangan X
# Load the Python Standard and DesignScript Libraries
import sys
import clr
clr.AddReference('ProtoGeometry')
from Autodesk.DesignScript.Geometry import *

# The inputs to this node will be stored as a list in the IN variables.
Db = IN[0]
b = IN[1]

# Place your code below this line
if Db <= 25:
    Bend = 4*Db
    text = 17*Db*2
elif 28 <= Db <= 35:
    Bend = 8*Db
    text = 12*Db*2
elif 38 <= Db <= 57:
    Bend = 13*Db
    text = 12*Db*2
PI = b + text + ((0.25*2+2.14+((Bend/11)*(Db/2)))

# Assign your output to the OUT variable.
OUT = PI
```

Lampiran C.a.2. Menghitung tulangan longitudinal arah x



```
Python Script
# Load the Python Standard and DesignScript Libraries
import sys
import clr
clr.AddReference('ProtoGeometry')
from Autodesk.DesignScript.Geometry import *

# The inputs to this node will be stored as a list in the IN variables.
x = IN[0]
Db = IN[1]

# Place your code below this line
p = x - ((Db**2)/2+Db)

# Assign your output to the OUT variable.
OUT = p
```

Lampiran C.a.3. Menghitung panjang menerus tulangan

```

Calc. Tul Y
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 Db = IN[0]
9 b = IN[1]
10
11 # Place your code below this line
12 if 10 <= Db <= 35:
13     Bend = 0*Db
14     text = 12*Db*2
15
16 elif 29 <= Db <= 36:
17     Bend = 8*Db
18     text = 12*Db*2
19
20 elif 43 <= Db <= 57:
21     Bend = 18*Db
22     text = 12*Db*2
23
24 PT = b + text + (2*(0.25*(3.14*((Bend/2)*(Db/2))))
25
26 # Assign your output to the OUT variable.
27 OUT = PT

```

Lampiran C.a.4. Menghitung tulangan longitudinal arah y

```

Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10 z = []
11
12 # Place your code below this line
13 for i in x:
14     a = 1*y
15     z.append(a)
16
17 # Assign your output to the OUT variable.
18 OUT = z

```

Lampiran C.a.5. Menyeragamkan nilai dengan jumlah tulangan

```

Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9
10 # Place your code below this line
11 T = sum(x)/len(x)
12
13 # Assign your output to the OUT variable.
14 OUT = T

```

Lampiran C.a.6. Menghitung total tulangan longitudinal atau sengkang

```
Total Tulangan Pondasi (m)
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference('ProtoGeometry')
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10
11 # Place your code below this line
12 t = x + y
13
14 # Assign your output to the OUT variable.
15 OUT = t
```

Lampiran C.a.7. Menghitung total tulangan fondasi

## b. Skrip Python pada Kolom

```
Dist. Lt 1
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference('ProtoGeometry')
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10 ld = IN[2]
11 dl = IN[3]
12
13 # Place your code below this line
14 d = y - x + ld + (1.3*ld)
15
16 # Assign your output to the OUT variable.
17 OUT = d
```

Lampiran C.b.1. Menghitung jarak *offset* lantai 1

```
Dist. Lt 2
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference('ProtoGeometry')
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10 ld = IN[2]
11
12 # Place your code below this line
13 d = x - y + (1.3*ld)
14
15 # Assign your output to the OUT variable.
16 OUT = d
```

Lampiran C.b.2. Menghitung tinggi jarak *offset* lantai 2 dan 3

```
Dist. L1 4
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10 ld = IN[2]
11
12 # Place your code below this line
13 d = x - y
14
15 # Assign your output to the OUT variable.
16 OUT = d
```

Lampiran C.b.3. Menghitung jarak *offset* lantai 4

```
Dist. L1 1
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10
11 # Place your code below this line
12 d = y - x
13
14 # Assign your output to the OUT variable.
15 OUT = d
```

Lampiran C.b.4. Menghitung tinggi lantai 1

```
Dist. L1 2
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10
11 # Place your code below this line
12 d = x - y
13
14 # Assign your output to the OUT variable.
15 OUT = d
```

Lampiran C.b.5. Menghitung tinggi lantai 2

```

ldc
Python3
25 # The inputs to this node will be stored as a list in the IN variables.
26 Db = IN[0]
27 fy = IN[1]
28 fc = IN[2]
29
30 ldc1 = ((0.2+fy)/(1+math.sqrt(fc)))*Db
31
32 ldc2 = 0.843*fy*Db
33
34 ldc3 = 200
35
36
37 if Db <= 25:
38     Bend = 0*Db
39     text = 1*Db
40
41 elif 29 <= Db <= 36:
42     Bend = 0*Db
43     text = 1*Db
44
45 elif 43 <= Db <= 57:
46     Bend = 1*Db
47     text = 1*Db
48
49 ld = max(ldc1, ldc2, ldc3)
50 lst = 1.3*ld
51
52 PT = ld + Bend + text
53
54 if PT > 12000:
55     PT = PT + lst
56
57 OUT = ld

```

Lampiran C.b.6. Menghitung panjang tulangan longitudinal

```

12000
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 l = []
10
11 # Place your code below this line
12 for i in x:
13     if i >= 12000:
14         i = 12000
15         l.append(i)
16
17 # Assign your output to the OUT variable.
18 OUT = l

```

Lampiran C.b.7. Menentukan panjang tulangan jika lebih dari 12 m

```

Bend + text
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 Db = IN[0]
9
10 # Place your code below this line
11 if Db <= 25:
12     Bend = 0*Db
13     text = 1*Db
14
15 elif 29 <= Db <= 36:
16     Bend = 0*Db
17     text = 1*Db
18
19 elif 43 <= Db <= 57:
20     Bend = 1*Db
21     text = 1*Db
22
23 # Assign your output to the OUT variable.
24 OUT = Bend + text

```

Lampiran C.b.8. Menjumlahkan panjang kait dan panjang bengkokan

```

Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10 ld = IN[2]
11 s = IN[3]
12 l = []
13
14 # Place your code below this line
15 for i in x:
16     L = l - y
17     if i < 12000:
18         L = i*ld - s
19         l.append(L)
20
21 # Assign your output to the OUT variable.
22 OUT = l

```

Lampiran C.b.9. Menentukan panjang tulangan jika lebih dari 12 m

```

Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 a = []
10
11 # Place your code below this line
12 for i in x:
13     a.append(i-40)
14
15 # Assign your output to the OUT variable.
16 OUT = a

```

Lampiran C.b.10. Menentukan panjang tulangan dikurangi selimut beton

```

Calc
Python3
10 d0 = IN[0]
11 fy = IN[1]
12 fc = IN[2]
13 cl = IN[3]
14
15 # Place your code below this line
16 ldc1 = ((6.34*fy*1)/(1+math.sqrt(fc)))+d0
17 ldc2 = 0.043*fy*1+d0
18 ldc3 = 2d0
19
20 if 10 <= d0 <= 25:
21     Bend = 64d0
22     text = 12*d0
23
24 elif 26 <= d0 <= 35:
25     Bend = 64d0
26     text = 12*d0
27
28 elif 43 <= d0 <= 57:
29     Bend = 104d0
30     text = 12*d0
31
32 ld = max(ldc1, ldc2, ldc3)
33 lst = 1.34*d0
34
35 PT = cl + ld + (0.25+2d0.14*((Bend/2)+(d0/2))) + text +lst
36
37 OUT = PT

```

Lampiran C.b.11. Menghitung panjang penyaluran

```

PT Rebar
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 Id = IN[1]
10 PI = 1
11
12 # Place your code below this line
13 for i in x:
14     pt = Id
15     PI.append(pt)
16
17 # Assign your output to the OUT variable.
18 OUT = PI

```

Lampiran C.b.12. Menyeragamkan nilai dengan jumlah tulangan

```

Total Rebar of Column
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9
10 # Place your code below this line
11 T = sum(x)/1998
12
13 # Assign your output to the OUT variable.
14 OUT = T

```

Lampiran C.b.13. Menghitung total tulangan

```

Calc. Stlrup
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 DB = IN[0]
9 b = IN[1]
10 c = IN[2]
11
12 # Place your code below this line
13 if 10 <= DB <= 18:
14     Bend = 4*DB
15     lext = 6*DB
16     if lext <= 75:
17         lext = 75
18
19 elif 19 <= DB <= 25:
20     Bend = 6*DB
21     lext = 6*DB
22     if lext <= 75:
23         lext = 75
24
25 CL = ((2*(b+c)) * (2*lext)) + ((+0.25*2*1.14*((Bend/2)+(DB/2)))) + ((2*0.25*2*1.14*((Bend/2)+(DB/2)))
26
27 # Assign your output to the OUT variable.
28 OUT = CL

```

Lampiran C.b.14. Menghitung panjang sengkang



```
Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10 z = []
11
12 # Place your code below this line
13 for i in x:
14     T = i * y
15     z.append(T)
16
17 # Assign your output to the OUT variable.
18 OUT = z
```

Lampiran C.b.15. Menyeragamkan nilai dengan jumlah tulangan

```
Total Tulangan Kolom (m)
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10 z = IN[2]
11
12 # Place your code below this line
13 T = x + y + z
14
15 # Assign your output to the OUT variable.
16 OUT = T
```

Lampiran C.b.16. Menghitung total tulangan sengkang

### c. Skrip Python pada Balok

```
ld
#
# clr.AddReference("RevitNodes")
#
9  import Revit
10  clr.ImportExtensions(Revit.Elements)
11
12  clr.ImportExtensions(Revit.GeometryConversion)
13
14  clr.AddReference("RevitServices")
15  import RevitServices
16  from RevitServices.Persistence import DocumentManager
17  from RevitServices.Transactions import TransactionManager
18
19  clr.AddReference("Autodesk")
20  import Autodesk
21  from Autodesk.Revit.DB import *
22  from Autodesk.Revit.DB.Structure import *
23
24  import math
25
26  doc = DocumentManager.Instance.CurrentDBDocument
27
28  # The inputs to this node will be stored as a list in the IN variables.
29  DB = IN[0]
30  FY = IN[1]
31  FC = IN[2]
32
33  # Place your code below this line
34
35  ld = ((0.24*fy*(1+xi))/(1+math.sqrt(fc)))*7*Db
36
37  OUT = ld/2
38
```

Lampiran C.c.1. Menghitung panjang penyaluran

```
12000
# Load the Python standard and DesignScript Libraries
#
2  import sys
3  import clr
4  clr.AddReference("ProtoGeometry")
5  from Autodesk.DesignScript.Geometry import *
6
7  # The inputs to this node will be stored as a list in the IN variables.
8  x = IN[0]
9  l = []
10
11  # Place your code below this line
12  for i in x:
13      if i >= 12000:
14          l = 12000
15
16      elif i < 12000:
17          l = i
18
19      l.append(i)
20
21  # Assign your output to the OUT variable.
22  OUT = l
```

Lampiran C.c.2. Menentukan panjang tulangan jika lebih dari 12 m

```
Bend + text
# Load the Python standard and DesignScript Libraries
#
2  import sys
3  import clr
4  clr.AddReference("ProtoGeometry")
5  from Autodesk.DesignScript.Geometry import *
6
7  # The inputs to this node will be stored as a list in the IN variables.
8  Db = IN[0]
9
10  # Place your code below this line
11  if Db <= 25:
12      Bend = 0*Db
13      text = 72*Db
14
15  elif Db <= 30:
16      Bend = 8*Db
17      text = 12*Db
18
19  elif Db <= 57:
20      Bend = 18*Db
21      text = 14*Db
22
23  # Assign your output to the OUT variable.
24  OUT = Db
```

Lampiran C.c.3. Menghitung jumlah panjang kait dan panjang bengkokan

```

Python Script
Python3

4  clr.AddReference('ProtoGeometry')
5  from Autodesk.DesignScript.Geometry import *
6
7  # The inputs to this node will be stored as a list in the IN variables.
8  x = IN[0]
9  y = IN[1]
10 ld = IN[2]
11 l = []
12
13 # Place your code below this line
14 if 10 <= y <= 25:
15     Bend = 6*y
16     Text = 3*y
17
18 elif 29 <= y <= 30:
19     Bend = 8*y
20     Text = 12*y
21
22 elif 43 <= y <= 47:
23     Bend = 16*y
24     Text = 12*y
25
26 for i in x:
27     if i == 12000:
28         l = i - (Bend + Text) + (Bend/2) + y
29
30     elif i < 12000:
31         l = i
32     l.append(i)
33
34 # Assign your output to the OUT variable.
35 OUT = l

```

Lampiran C.c.4. Menentukan panjang bentang tulangan

```

Python Script
Python3

1  # Load the Python Standard and DesignScript Libraries
2  import sys
3  import clr
4  clr.AddReference('ProtoGeometry')
5  from Autodesk.DesignScript.Geometry import *
6
7  # The inputs to this node will be stored as a list in the IN variables.
8  x = IN[0]
9  y = IN[1]
10 z = IN[2]
11 h = []
12
13 # Place your code below this line
14 for i in x:
15     if i == 12000:
16         i = z
17
18     elif i < 12000:
19         i = y
20     h.append(i)
21
22 # Assign your output to the OUT variable.
23 OUT = h

```

Lampiran C.c.5. Menentukan panjang tulangan jika lebih dari 12 m

```

Python Script
Python3

1  # Load the Python Standard and DesignScript Libraries
2  import sys
3  import clr
4  clr.AddReference('ProtoGeometry')
5  from Autodesk.DesignScript.Geometry import *
6  import math
7
8  # The inputs to this node will be stored as a list in the IN variables.
9  x = IN[0]
10 z = []
11 # Place your code below this line
12 for i in x:
13     z.append(i/4)
14
15 # Assign your output to the OUT variable.
16 OUT = z

```

Lampiran C.c.6. Menentukan panjang bentang sengkang tumpuan

```
Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 z = []
10
11 # Place your code below this line
12 for i in x:
13     a = (1/i)+(1/2)
14     z.append(a)
15
16 # Assign your output to the OUT variable.
17 OUT = z
```

Lampiran C.c.7. Menentukan panjang bentang sengkang lapangan

```
Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 z = []
10
11 # Place your code below this line
12 for i in x:
13     z.append(-1/i)
14
15 # Assign your output to the OUT variable.
16 OUT = z
```

Lampiran C.c.8. Menentukan panjang bentang sengkang tumpuan

```
Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6 import math
7
8 # The inputs to this node will be stored as a list in the IN variables.
9 x = IN[0]
10 z = []
11 # Place your code below this line
12 for i in x:
13     z.append(1/2)
14
15 # Assign your output to the OUT variable.
16 OUT = z
```

Lampiran C.c.9. Menentukan bentang panjang tulangan

```

Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference('ProtoGeometry')
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 Db = IN[1]
10
11 # Place your code below this line
12 p = x - (2*(Db+72)+Db)
13
14 # Assign your output to the OUT variable.
15 OUT = p

```

Lampiran C.c.10. Menghitung panjang menerus tulangan longitudinal

```

Calc. Stirrup
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference('ProtoGeometry')
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 Db = IN[0]
9 b = IN[1]
10 c = IN[2]
11
12 # Place your code below this line
13 if 10 <= Db <= 16:
14     Bend = 4*Db
15     text = 4*Db
16     if text <= 75:
17         text = 75
18
19 elif 18 <= Db <= 25:
20     Bend = 6*Db
21     text = 6*Db
22     if text <= 75:
23         text = 75
24
25 CL = (2*(b+c)) + (2*text) + (3*(.25*7*1.14*((Bend/2)+(Db/2))) + (2*(.375*7*1.14*((Bend/2)+(Db/2)))
26
27 # Assign your output to the OUT variable.
28 OUT = CL

```

Lampiran C.c.11. Menghitung panjang sengkang

```

Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference('ProtoGeometry')
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10 z = []
11
12 # Place your code below this line
13 for i in x:
14     T = i * y
15     z.append(T)
16
17 # Assign your output to the OUT variable.
18 OUT = z

```

Lampiran C.c.12. Menyeragamkan nilai dengan jumlah tulangan

```
Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9
10 # Place your code below this line
11 T = sum(x)
12
13 # Assign your output to the OUT variable.
14 OUT = T
```

Lampiran C.c.13. Menjumlahkan nilai tulangan

```
Total of Stirrup Beam
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10 z = IN[2]
11
12 # Place your code below this line
13 T = (x + y + z)/1990
14
15 # Assign your output to the OUT variable.
16 OUT = T
```

Lampiran C.c.14. Menghitung total panjang tulangan

```
Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 w = IN[0]
9 c = IN[1]
10
11 # Place your code below this line
12 a1 = w - (2*c)
13
14 # Assign your output to the OUT variable.
15 OUT = a1
```

Lampiran C.c.15. Menentukan jarak antartulangan

```

Type
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 s = IN[0]
9 a = IN[1]
10 b = IN[2]
11 c = IN[3]
12 d = IN[4]
13
14
15 # Place your code below this line
16 if s == 4:
17     OUT = "longi_polos"
18
19 elif s == 2:
20     OUT = "longi_kait_2_90"
21
22 elif s == 1:
23     OUT = "longi_kait_1_90"
24
25 elif s == 3:
26     OUT = "longi_kait_3_180"
27
28

```

Lampiran C.c.16. Menentukan tipe tulangan longitudinal

```

Calc
Python3
28 x = IN[0]
29 db = IN[1]
30 fy = IN[2]
31 fc = IN[3]
32 ct = IN[4]
33
34 # Place your code below this line
35 if x == "longi_polos":
36     if db == 25:
37         ld = ((fy*(1.3+1))/(2.1+math.sqrt(fc)))+db
38
39     elif db <= 19:
40         ld = ((fy*(1.3+1))/(2.1+math.sqrt(fc)))+db
41
42     PT = ct + ld
43
44     if PT > 12000:
45         PT = PT + (1.3*ld)
46
47     OUT = PT
48
49 elif x == "longi_kait_2_90":
50     if db <= 25:
51         Bend = 4*db*2
52         lext = 12*db*2
53
54     elif 29 <= db <= 36:
55         Bend = 4*db*2
56         lext = 12*db*2
57
58     elif 43 <= db <= 57:
59         Bend = 10*db*2
60

```

Lampiran C.c.17. Menghitung panjang tulangan longitudinal

```

Calc
Python3
56 Bend = 4*db*2
57 lext = 12*db*2
58
59 elif 43 <= db <= 57:
60     Bend = 10*db*2
61     lext = 12*db*2
62
63 ld = (((0.3+fy*(1+1))/(1+math.sqrt(fc)))+db)-(((Bend/2)+db))+2
64
65 PT = ld + lext + Bend
66
67 if PT > 12000:
68     PT = PT + (1.3*ld)
69
70 OUT = PT - db
71
72 elif x == "longi_kait_1_90":
73     ld = (((0.24*fy*(1+1))/(1+math.sqrt(fc)))+db)
74     lxt = 1.3*ld
75
76 if 19 <= db <= 25:
77     Bend = 4*db
78     lxt = 12*db
79
80 elif 29 <= db <= 36:
81     Bend = 4*db
82     lxt = 12*db
83
84 elif 43 <= db <= 57:
85     Bend = 10*db
86     lxt = 12*db
87

```

Lampiran C.c.18. Menghitung panjang tulangan longitudinal

```

Calc
Python3
88 elif 20 <= Db <= 30:
89     Bend = 5*Db
90     Text = 12*Db
91
92 elif 42 <= Db <= 57:
93     Bend = 10*Db
94     Text = 12*Db
95
96 PT = CL + ld + lst + Text + (0.25*2*3.14*((Bend/2)+(Db/2)))
97 OUT = PT
98
99 elif x == "Input ke [2,100%":
100     ld = ((0.24*ys+1*x)/(1+math.sqrt(fc)))*2*Db
101     lst = 1.3*ld
102
103 if 18 <= Db <= 25:
104     Bend = 4*Db*2
105     Text = 4*Db*2
106     if Text <= 65:
107         Text = 65
108
109 elif 20 <= Db <= 30:
110     Bend = 5*Db*2
111     Text = 4*Db*2
112
113 elif 42 <= Db <= 57:
114     Bend = 10*Db*2
115     Text = 4*Db*2
116
117 PT = CL + ld + lst + Text + (0.25*2*3.14*((Bend/2)+(Db/2)))
118 OUT = PT
119
120
121

```

Lampiran C.c.19. Mneghitung panjang tulangan longitudinal

```

PT Rebar
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 ld = IN[1]
10 PT = []
11
12 # Place your code below this line
13 for i in x:
14     pt = i + ld
15     PT.append(pt)
16
17 # Assign your output to the OUT variable.
18 OUT = PT

```

Lampiran C.c.20. Menghitung panjang tulangan

```

Total Tulangan Balok (m)
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10
11 # Place your code below this line
12 T = x + y
13
14 # Assign your output to the OUT variable.
15 OUT = T

```

Lampiran C.c.21. Menghitung total tulangan



```

Db
CPython3
4  clr.AddReference("RevitNodes")
5  import Revit
6  clr.ImportExtensions(Revit.Elements)
7
8  clr.ImportExtensions(Revit.GeometryConversion)
9
10 clr.AddReference("RevitServices")
11 import RevitServices
12 from RevitServices.Persistence import DocumentManager
13 from RevitServices.Transactions import TransactionManager
14
15 clr.AddReference("RevitAPI")
16 import Autodesk
17 from Autodesk.Revit.DB import *
18 from Autodesk.Revit.DB.Structure import *
19
20 import math
21
22 doc = DocumentManager.Instance.CurrentDBDocument
23
24 # The inputs to this code will be stored as a list in the IN variables.
25 x = IN[0]
26 d = IN[1]
27 Db = []
28
29 # Place your code below this line
30 for i in x:
31     db = d
32     Db.append(db)
33
34 # Assign your output to the OUT variable.
35 OUT = Db

```

Lampiran C.c.22. Menentukan diameter tulangan

```

fy
CPython3
4  clr.AddReference("RevitNodes")
5  import Revit
6  clr.ImportExtensions(Revit.Elements)
7
8  clr.ImportExtensions(Revit.GeometryConversion)
9
10 clr.AddReference("RevitServices")
11 import RevitServices
12 from RevitServices.Persistence import DocumentManager
13 from RevitServices.Transactions import TransactionManager
14
15 clr.AddReference("RevitAPI")
16 import Autodesk
17 from Autodesk.Revit.DB import *
18 from Autodesk.Revit.DB.Structure import *
19
20 import math
21
22 doc = DocumentManager.Instance.CurrentDBDocument
23
24 # The inputs to this code will be stored as a list in the IN variables.
25 x = IN[0]
26 y = IN[1]
27 fy = []
28
29 # Place your code below this line
30 for i in x:
31     fy = y
32     fy.append(fy)
33
34 # Assign your output to the OUT variable.
35 OUT = fy

```

Lampiran C.c.23. Menentukan nilai fy dan fc

```

ld
CPython3
14  clr.AddReference("RevitServices")
15  import RevitServices
16  from RevitServices.Persistence import DocumentManager
17  from RevitServices.Transactions import TransactionManager
18
19  clr.AddReference("RevitAPI")
20  import Autodesk
21  from Autodesk.Revit.DB import *
22  from Autodesk.Revit.DB.Structure import *
23
24  import math
25
26  doc = DocumentManager.Instance.CurrentDBDocument
27
28  # The inputs to this code will be stored as a list in the IN variables.
29  x = IN[0]
30
31  Db = IN[1]
32  db = Db[0]
33
34  fy = IN[2]
35  y = fy[0]
36
37  fc = IN[3]
38  c = fc[0]
39
40  # Place your code below this line
41  ld = ((0.2+fy)*1+1)/(1+math.sqrt(c))*db
42
43  OUT = ld

```

Lampiran C.c.24. Menghitung panjang penyaluran

```
Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 y = IN[1]
10 z = []
11
12 # Place your code below this line
13 for i in x:
14     if 1000 < i < 12000:
15         v = 1 + (i*y)
16         z.append(v)
17
18 # Assign your output to the OUT variable.
19 OUT = z
```

Lampiran C.c.25. Menentukan panjang tulangan

#### d. Skrip Python pada Pelat Lantai

```
Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9
10 # Place your code below this line
11 for i in x:
12     if 1 >= 12000:
13         s = 4
14
15 # Assign your output to the OUT variable.
16 OUT = s
```

Lampiran C.d.1. Skrip untuk memecah tulangan pelat jika panjangnya lebih dari 12 m

```

Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 L = []
10
11 # Place your code below this line
12 for i in x:
13     if i >= 12000:
14         L = 12000
15     elif i < 12000:
16         L = i
17
18     L.append(i)
19
20 # Assign your output to the OUT variable.
21 OUT = L

```

Lampiran C.d.2. Menentukan panjang tulangan jika kondisi < atau > 12 m

```

Total Tulangan Plat (m)
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9
10 # Place your code below this line
11 T = sum(x)/1000
12
13 # Assign your output to the OUT variable.
14 OUT = T

```

Lampiran C.d.3. Menghitung total tulangan pelat

```

Python Script
Python3
1 # Load the Python Standard and DesignScript Libraries
2 import sys
3 import clr
4 clr.AddReference("ProtoGeometry")
5 from Autodesk.DesignScript.Geometry import *
6
7 # The inputs to this node will be stored as a list in the IN variables.
8 x = IN[0]
9 L = []
10
11 # Place your code below this line
12 for i in x:
13     if i >= 12000:
14         L = i - 12000
15     elif i < 12000:
16         L = 0
17
18     L.append(i)
19
20 # Assign your output to the OUT variable.
21 OUT = L

```

Lampiran C.d.4. Menentukan panjang tulangan sambungan pada pelat