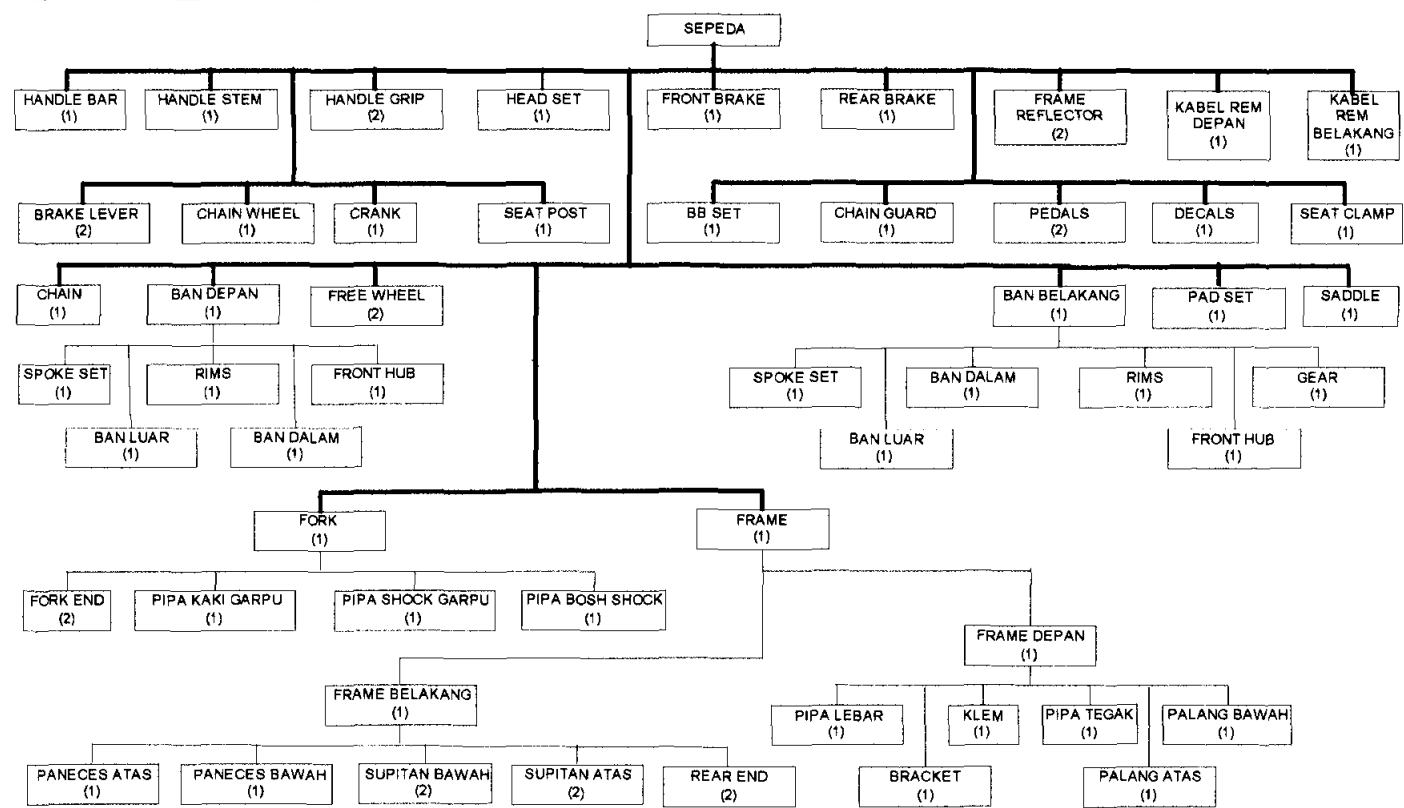


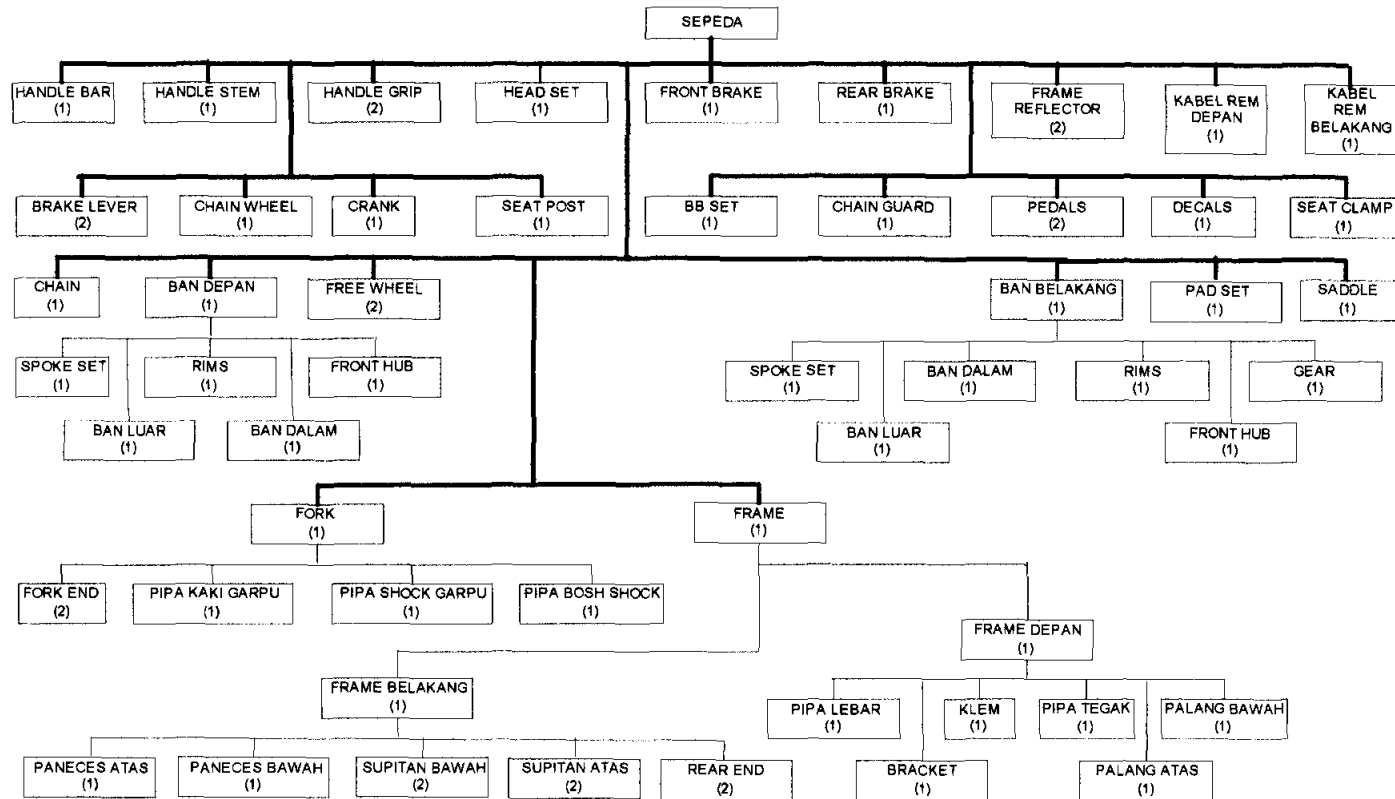
LAMPIRAN A

Bill of Material
Tipe produk : BMX 16" "ACTION ZONE"



Bill of Material

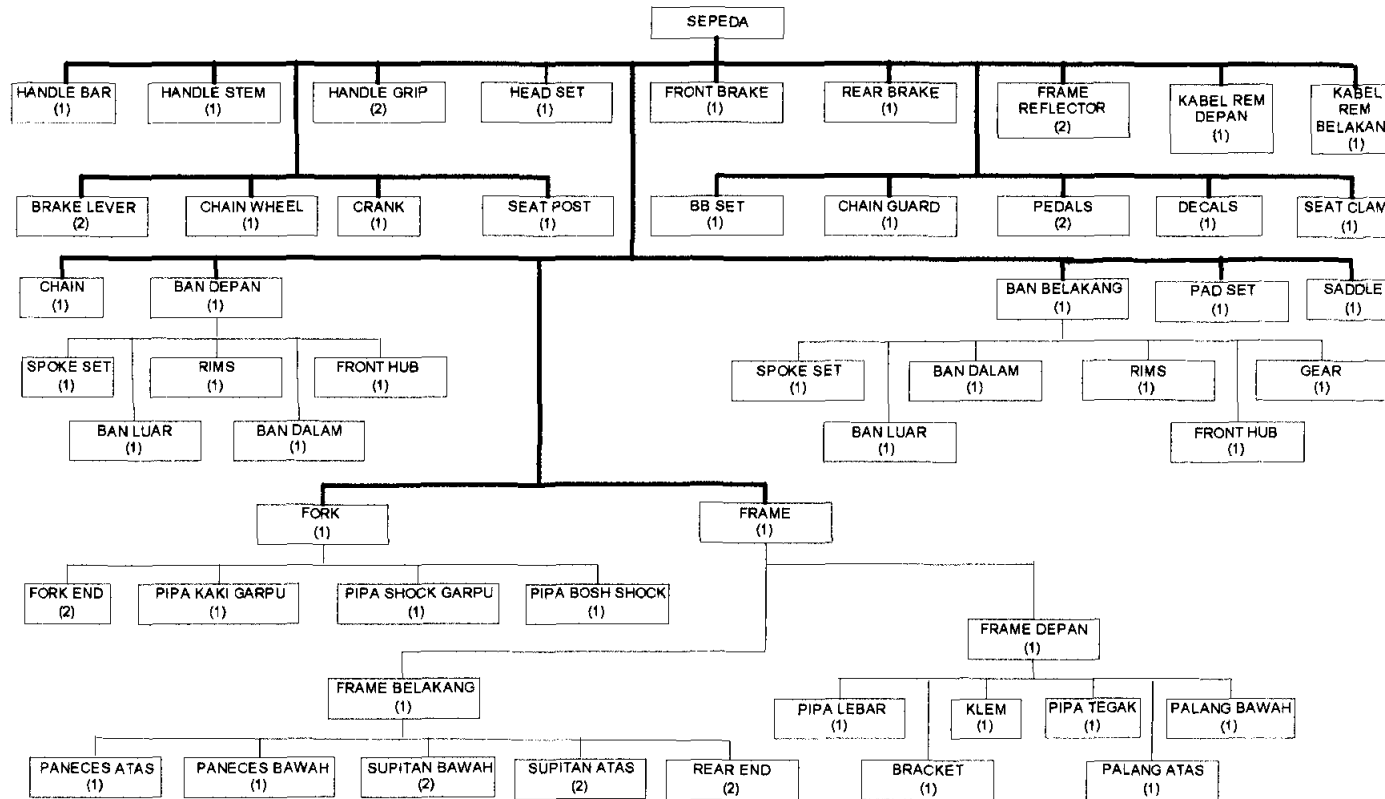
Type produk : BMX 16" "ROADTECH"



DIGAMBAR OLEH: WILLYARTO DAN SOFFIE

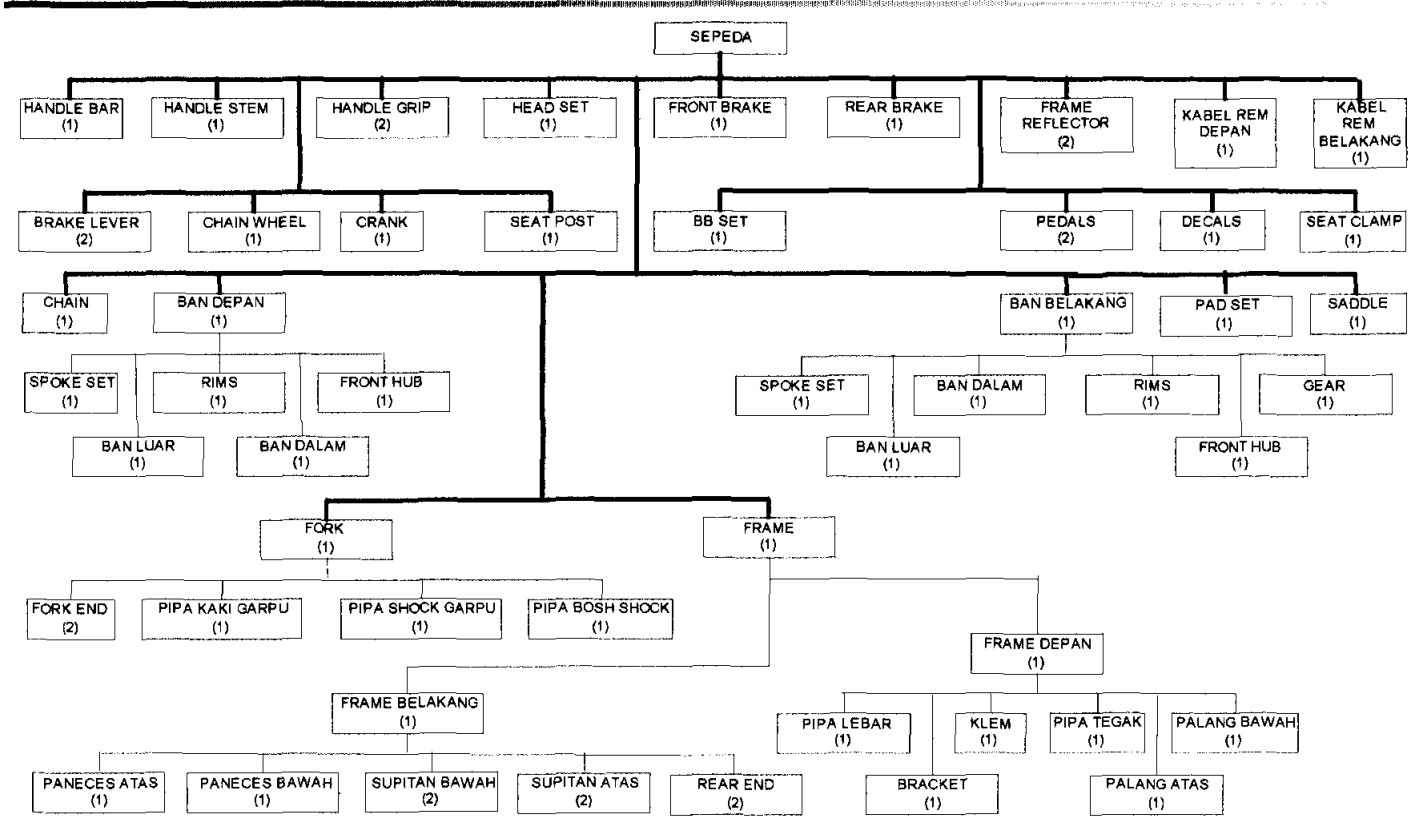
Bill of Material

Tipe produk : BMX 18" "ROADTECH"



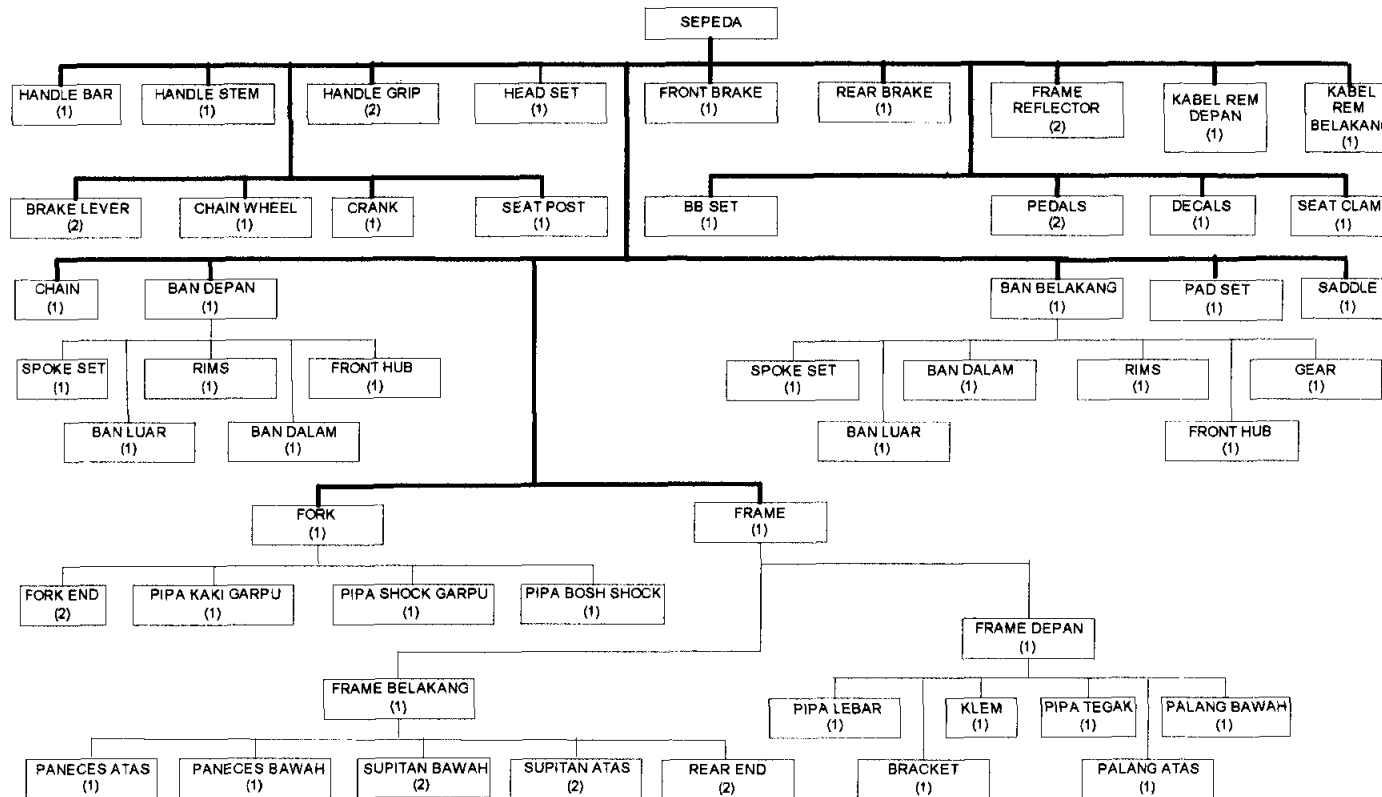
DIGAMBAR OLEH: WILLYARTO DAN SOFFIE

Bill of Material
Tipe produk : BMX 20" "BULLDOG"



Bill of Material

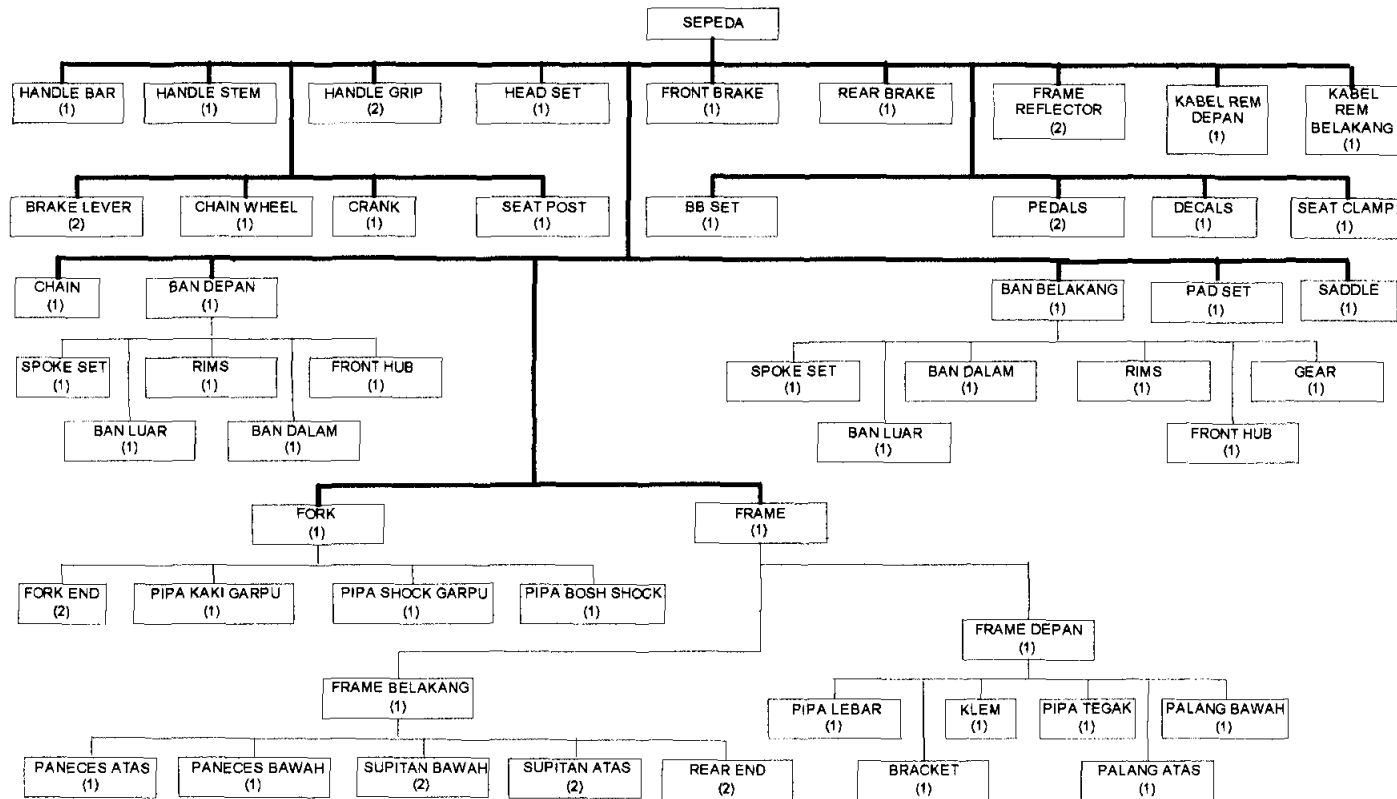
Tipe produk : BMX 20" "NEW BIG DADDY"



DIGAMBAR OLEH: WILLYARTO DAN SOFFIE

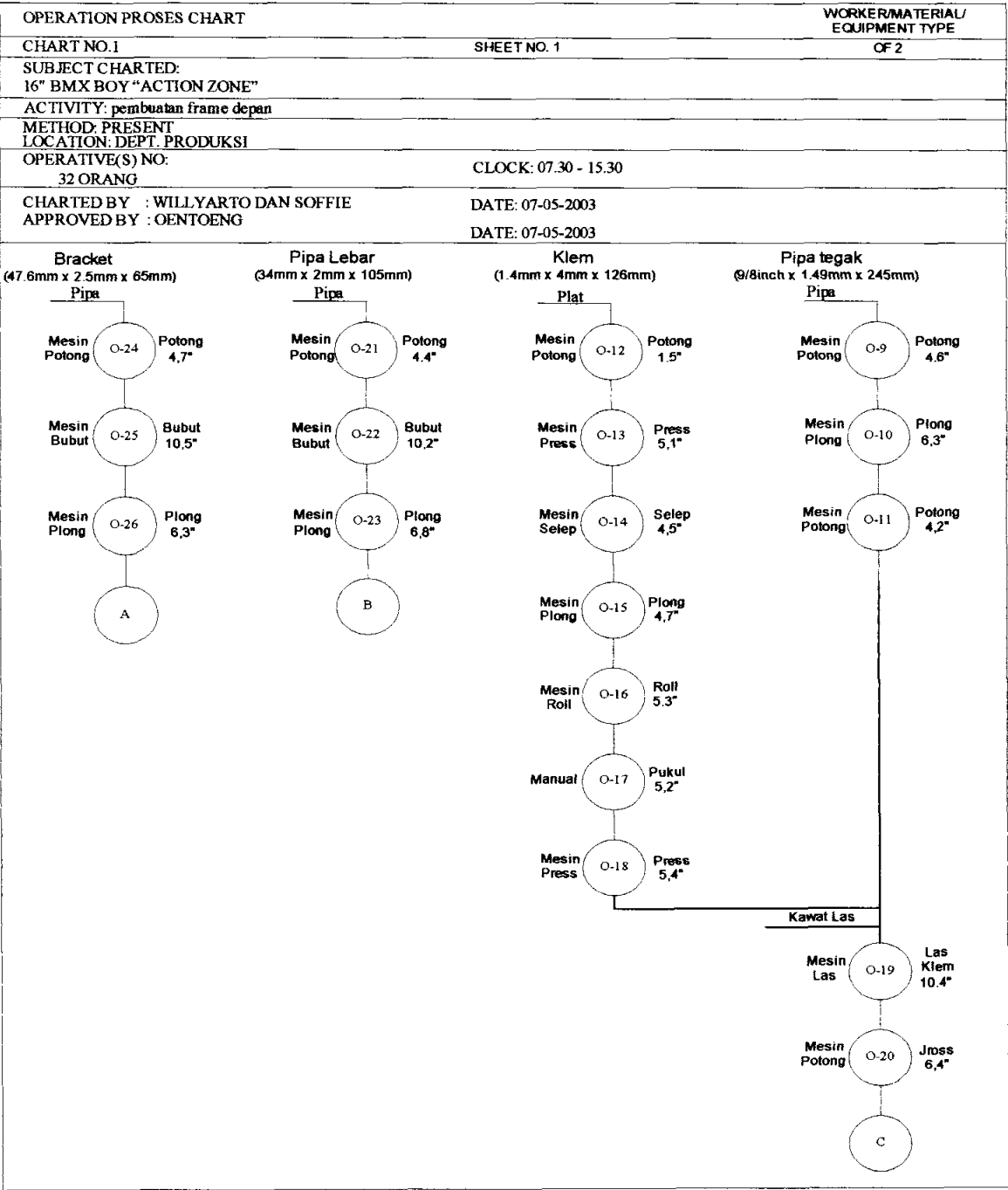
Bill of Material

Tipe produk : BMX 20" "NEW ROADTECH"



DIGAMBAR OLEH: WILLYARTO DAN SOFFIE

LAMPIRAN B



OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.1	SHEET NO. 2	OF 2
SUBJECT CHARTED: 16" BMX BOY "ACTION ZONE"		
ACTIVITY: pembuatan frame depan		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 32 ORANG	CLOCK: 07.30 - 15.30	
CHARTED BY : WILLYARTO DAN SOFFIE	DATE: 07-05-2003	
APPROVED BY : OENTOENG	DATE: 07-05-2003	

Palang Bawah
(3/2inch x 1.2mm x 374mm)

Pipa

Mesin Potong O-4 Potong 4.9"

Mesin Press O-5 Cemet 9.3"

Mesin Potong O-6 Jross 6.3"

Mesin Potong O-7 Cuwil 6.9"

Manual O-8 Pukul 7.3"

Palang Atas
(5/4inch x 1.2mm x 362mm)

Pipa

Mesin Potong O-1 Potong 4.5"

Mesin Press O-2 Cemet 9.7"

Mesin Potong O-3 Jross 6.2"

A

B

C

Kawat Las

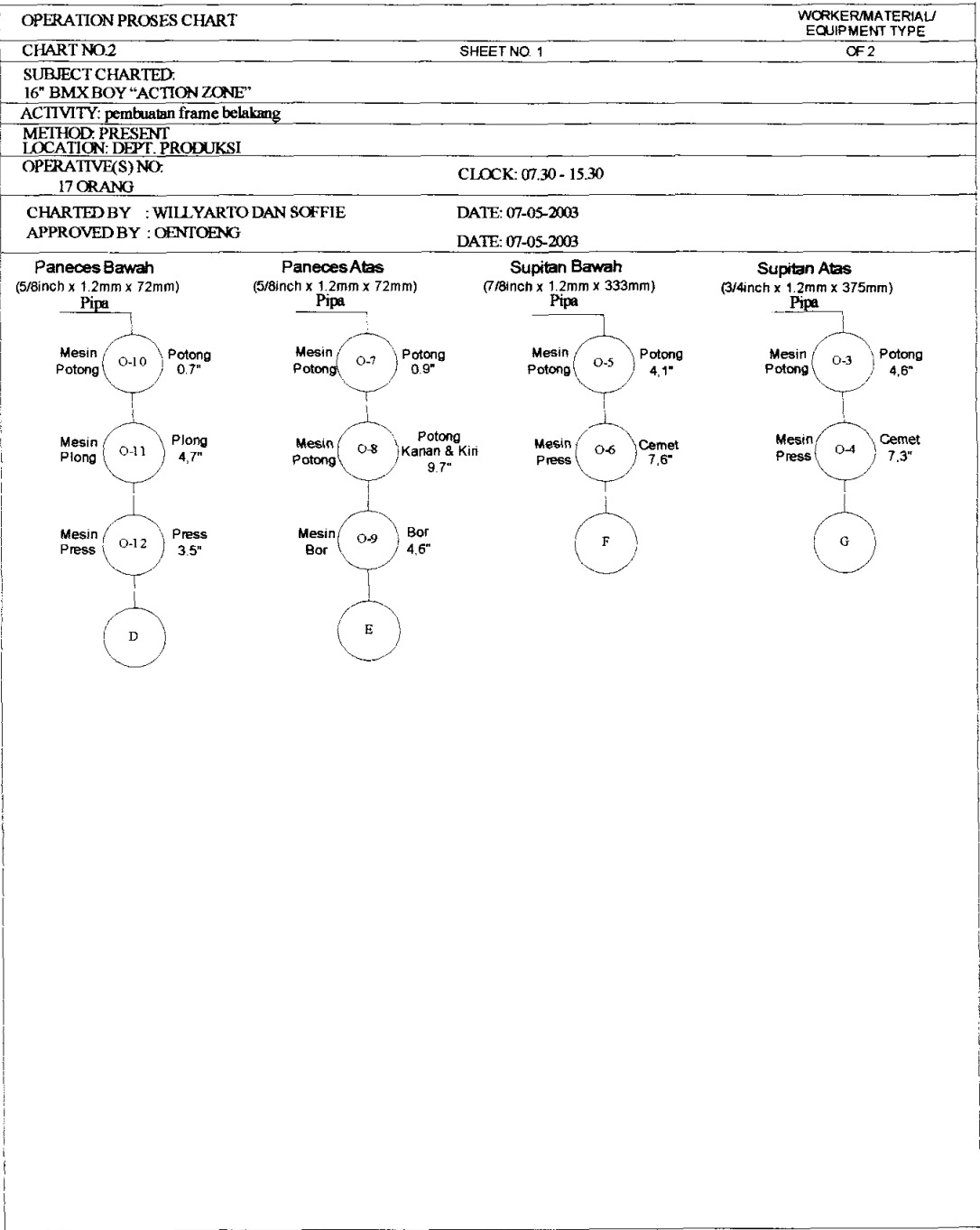
Mesin Las O-27 Las Frame Depan 50.7"

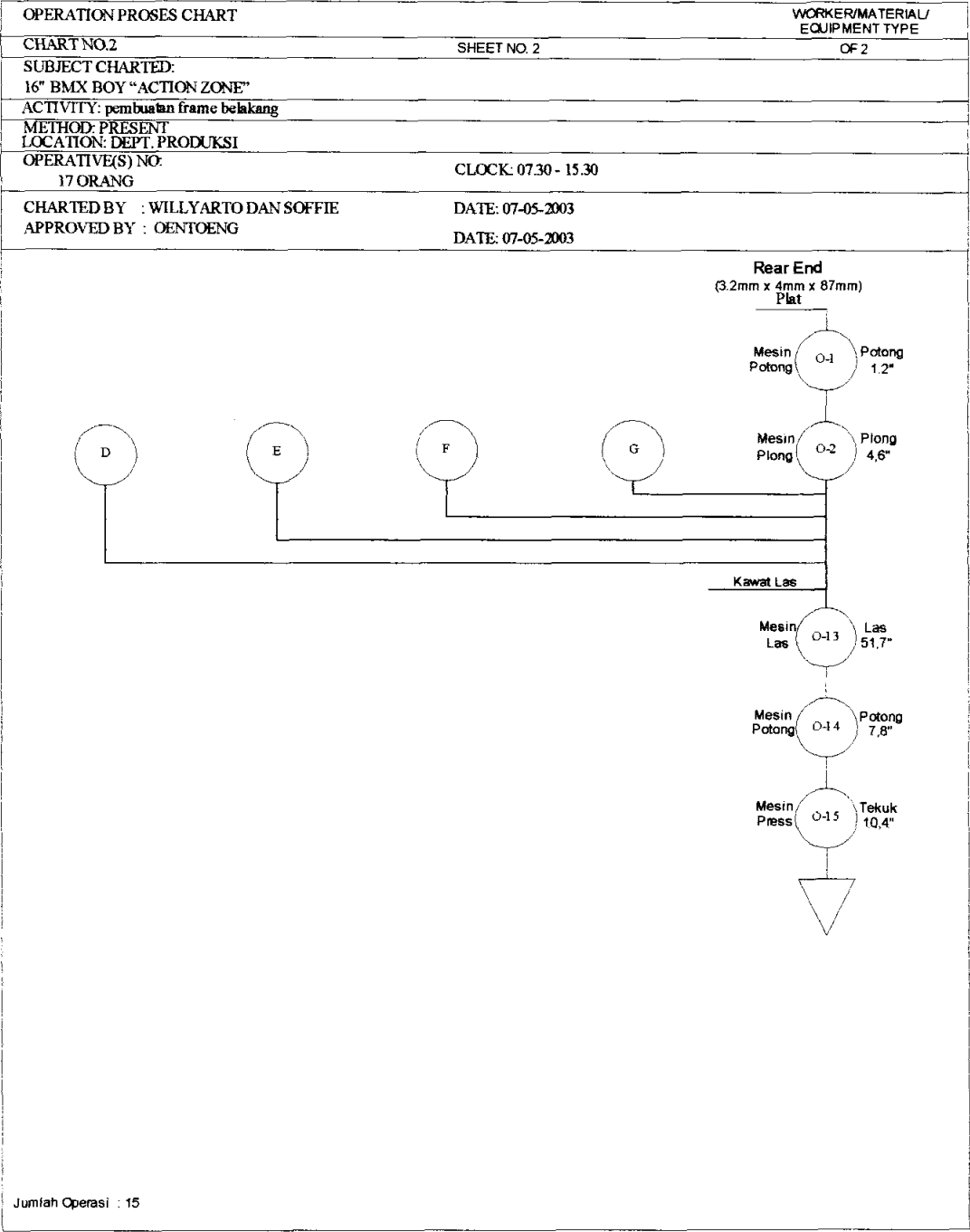
Mesin Gerinda OI-1 Sortir 15.8"

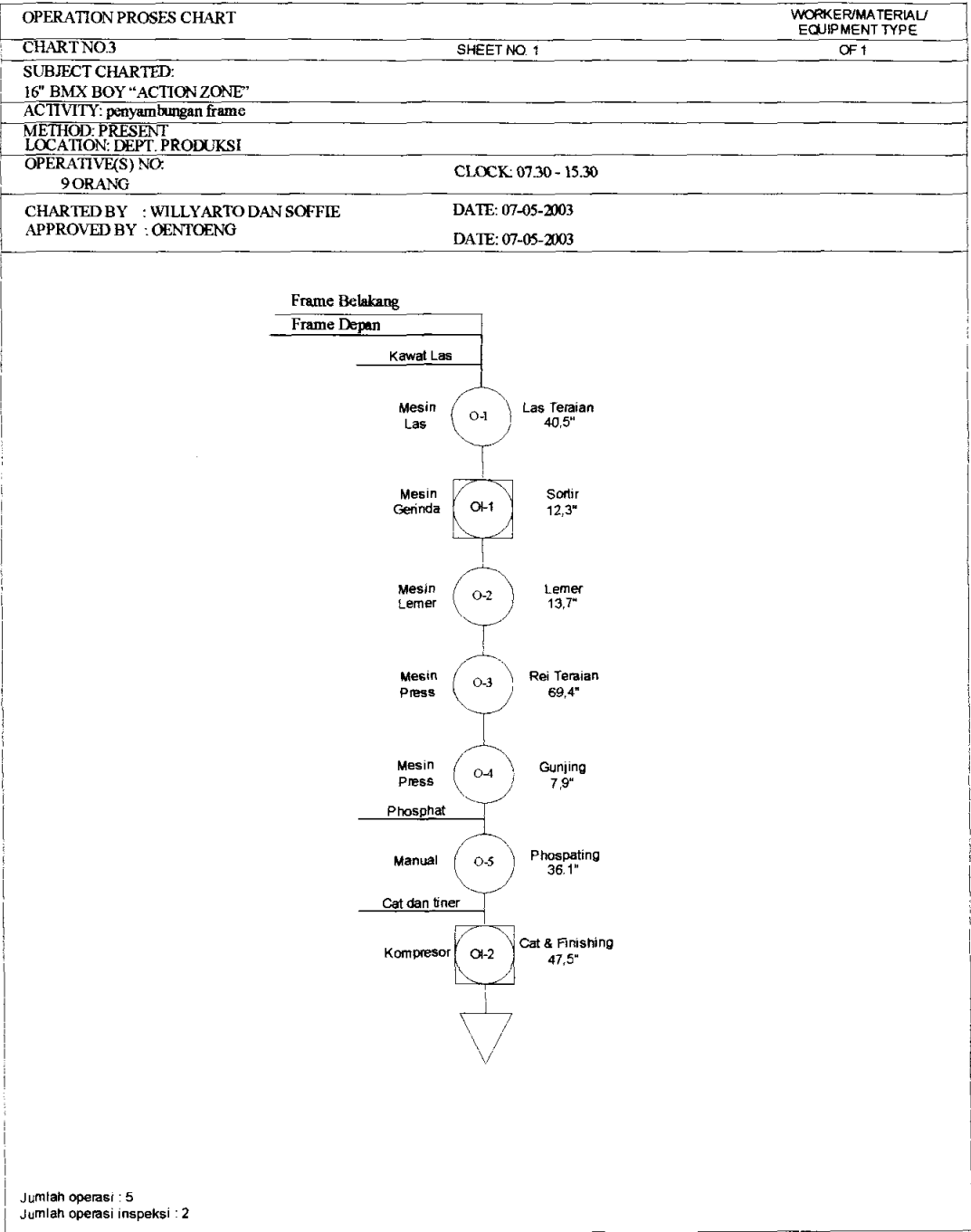
Mesin Press O-28 Rei Frame 9.2"

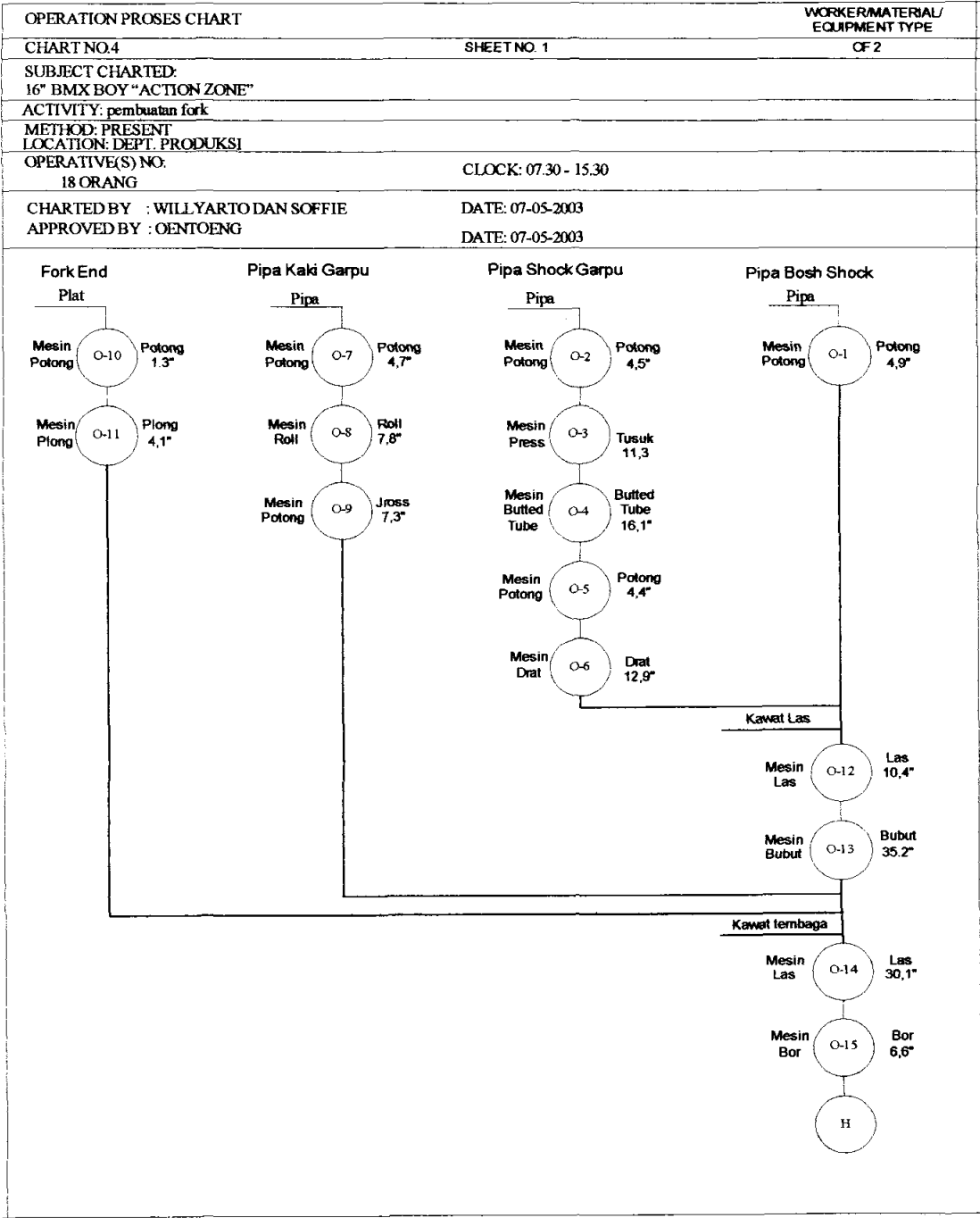
Jumlah Operasi : 28

Jumlah operasi dan inspeksi : 1





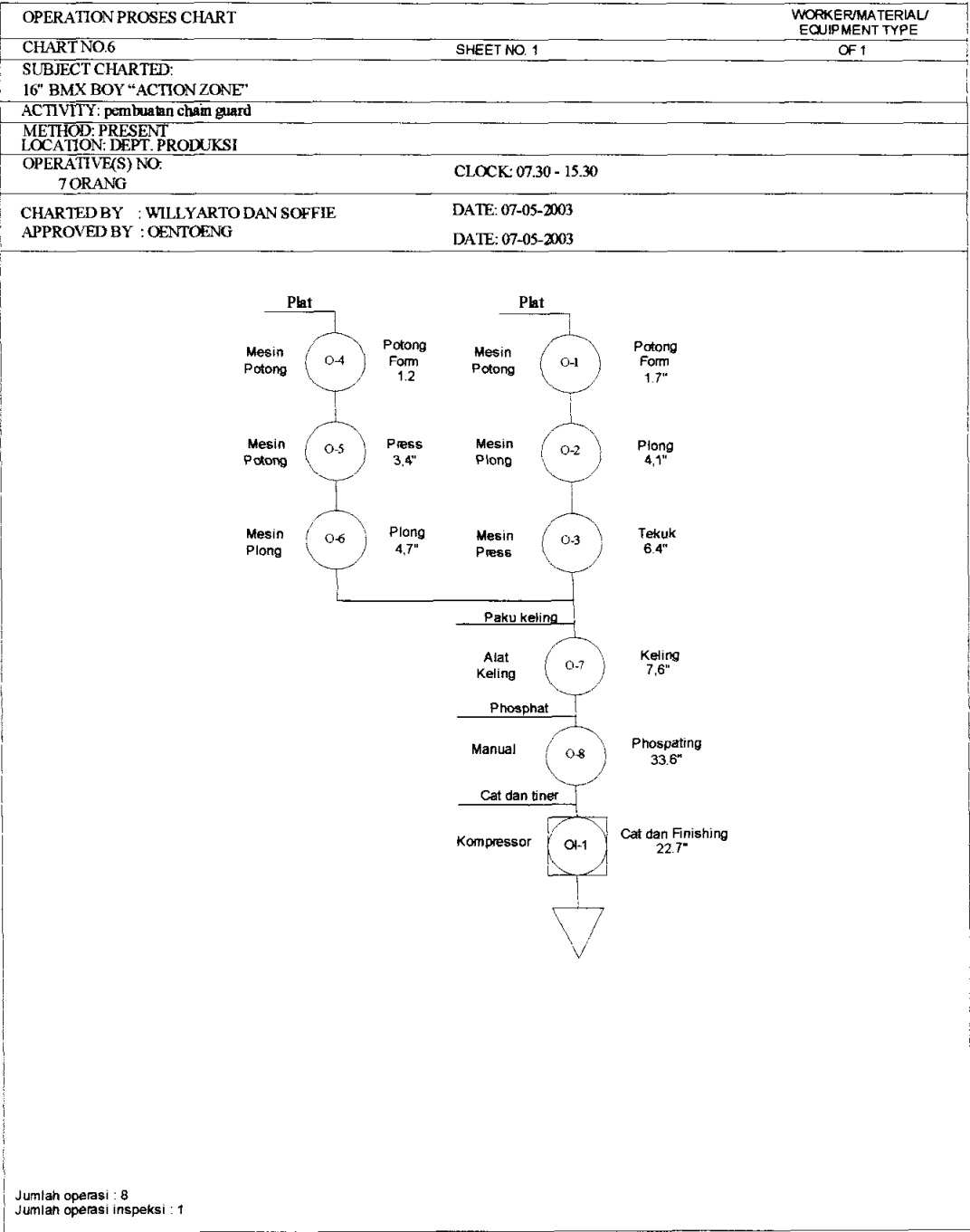




OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.4	SHEET NO 2	OF 2
SUBJECT CHARTED: 16" BMX BOY "ACTION ZONE"		
ACTIVITY: pembuatan fork		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 18 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003

Jumlah operasi : 16
Jumlah oprasi inspeksi : 2

OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.5	SHEET NO. 1	OF 1
SUBJECT CHARTED: 16" BMX BOY "ACTION ZONE"		
ACTIVITY: pembuatn chain wheel		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 5 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003
Plat <pre>graph TD; Plat --> O1((O-1)); O1 --> O2((O-2)); O2 --> O3((O-3)); O3 --> O4((O-4)); O4 --> O5((O-5)); O5 --> End[End];</pre>		
Jumlah operasi : 5		

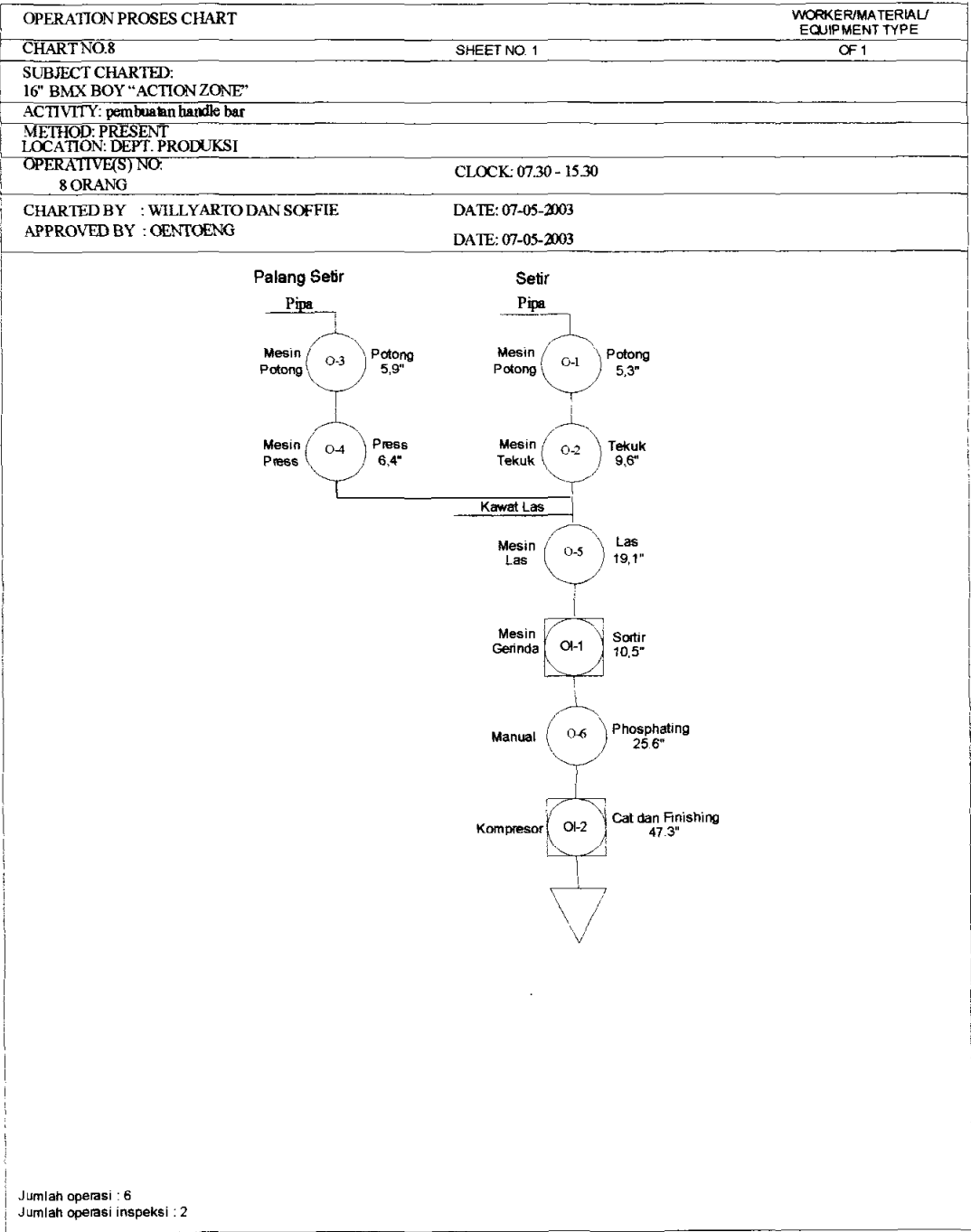


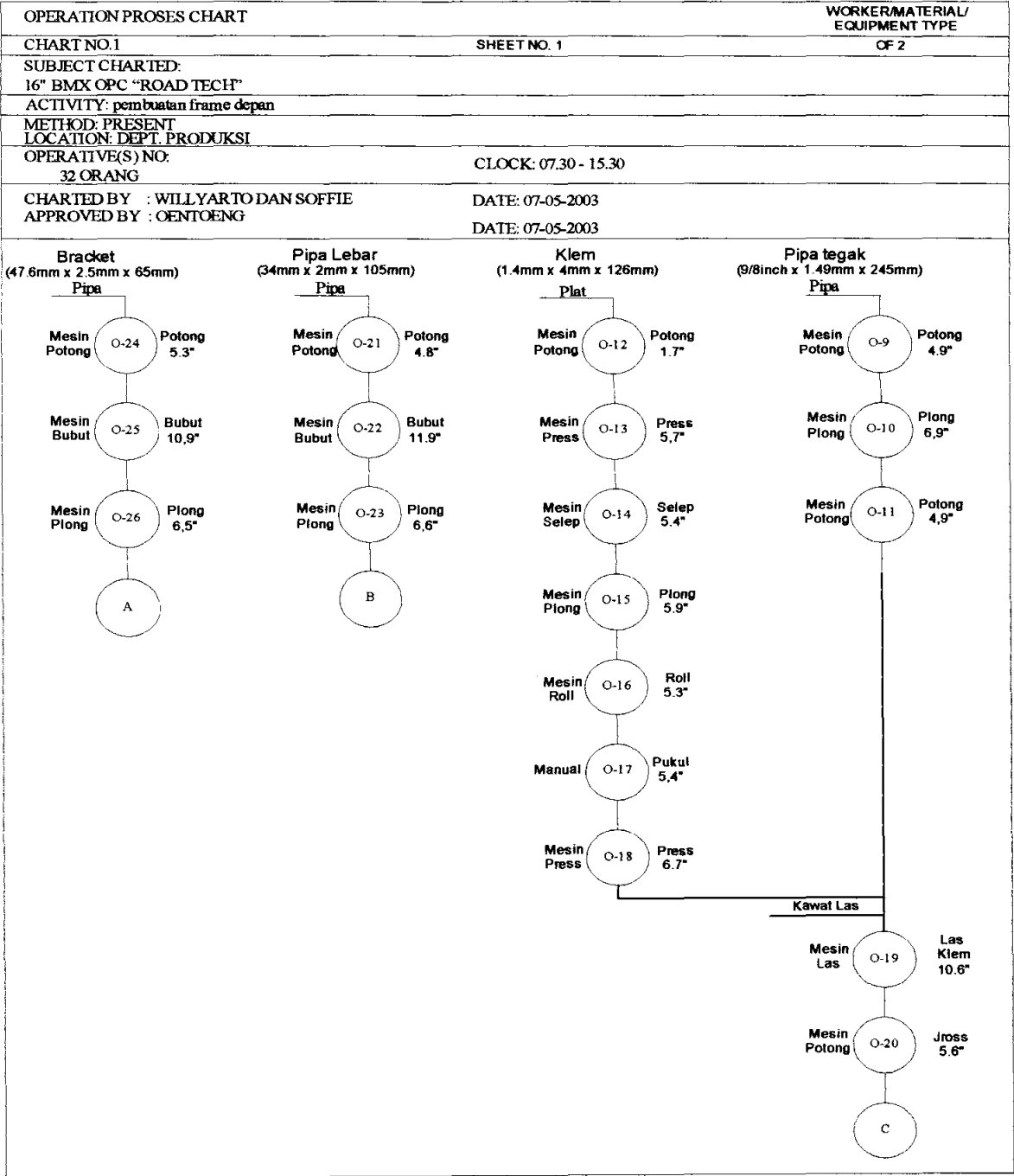
OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.7	SHEET NO. 1	OF 1
SUBJECT CHARTED: 16" BMX BOY "ACTION ZONE"		
ACTIVITY: pembuatan seat post		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 7 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003

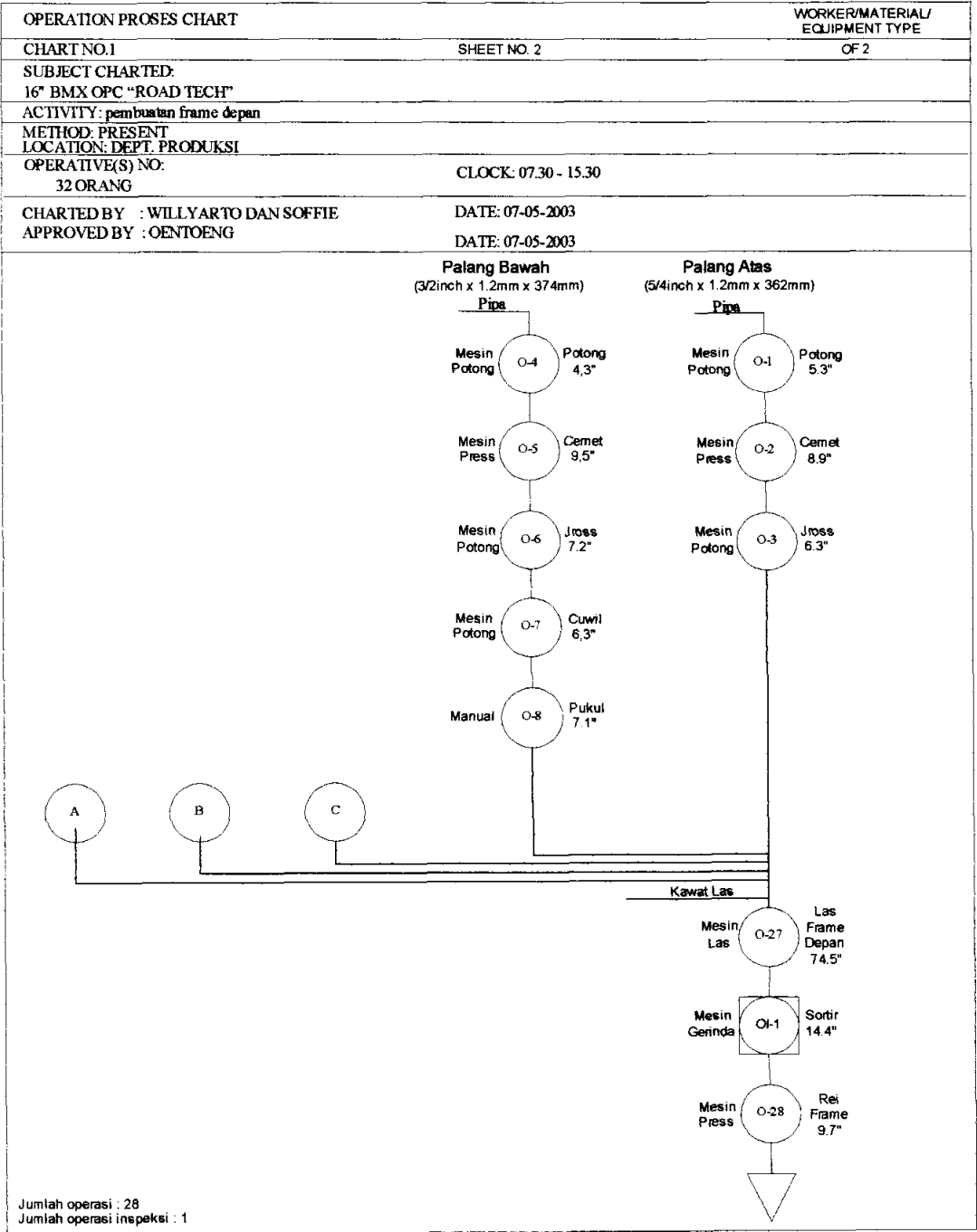

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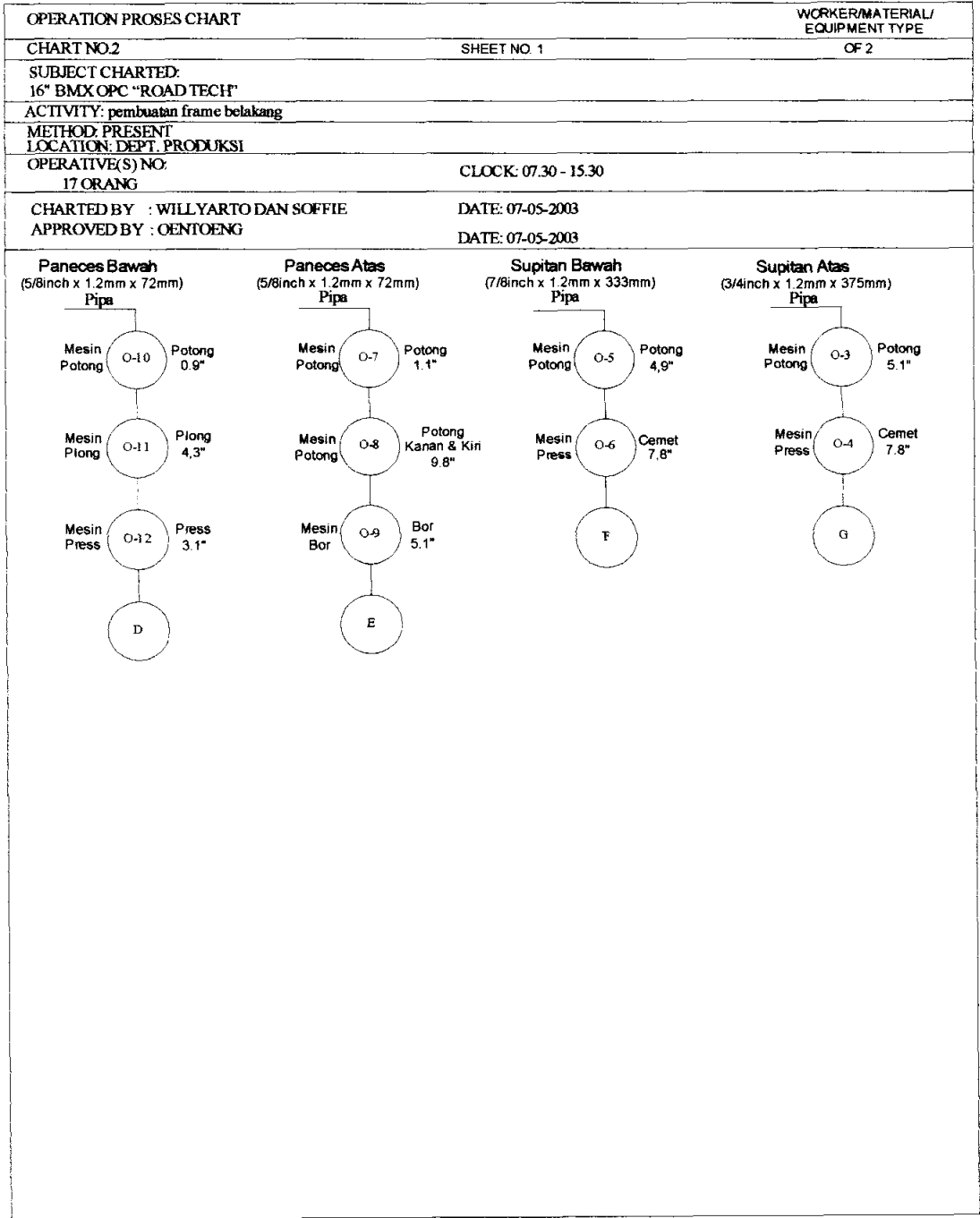
graph TD
    A[Pipa] --> B((O-1))
    B --- C[Mesin Potong]
    B --- D[Potong 4,3"]
    B --> E((O-2))
    E --- F[Mesin Hidrolis]
    E --- G[Hidrolis 8,3"]
    E --> H((O-3))
    H --- I[Mesin Serut]
    H --- J[Serut 10,7"]
    H --> K((O-4))
    K --- L[Manual]
    K --- M[Merk 8,6"]
    K --> N[▽]
  
```

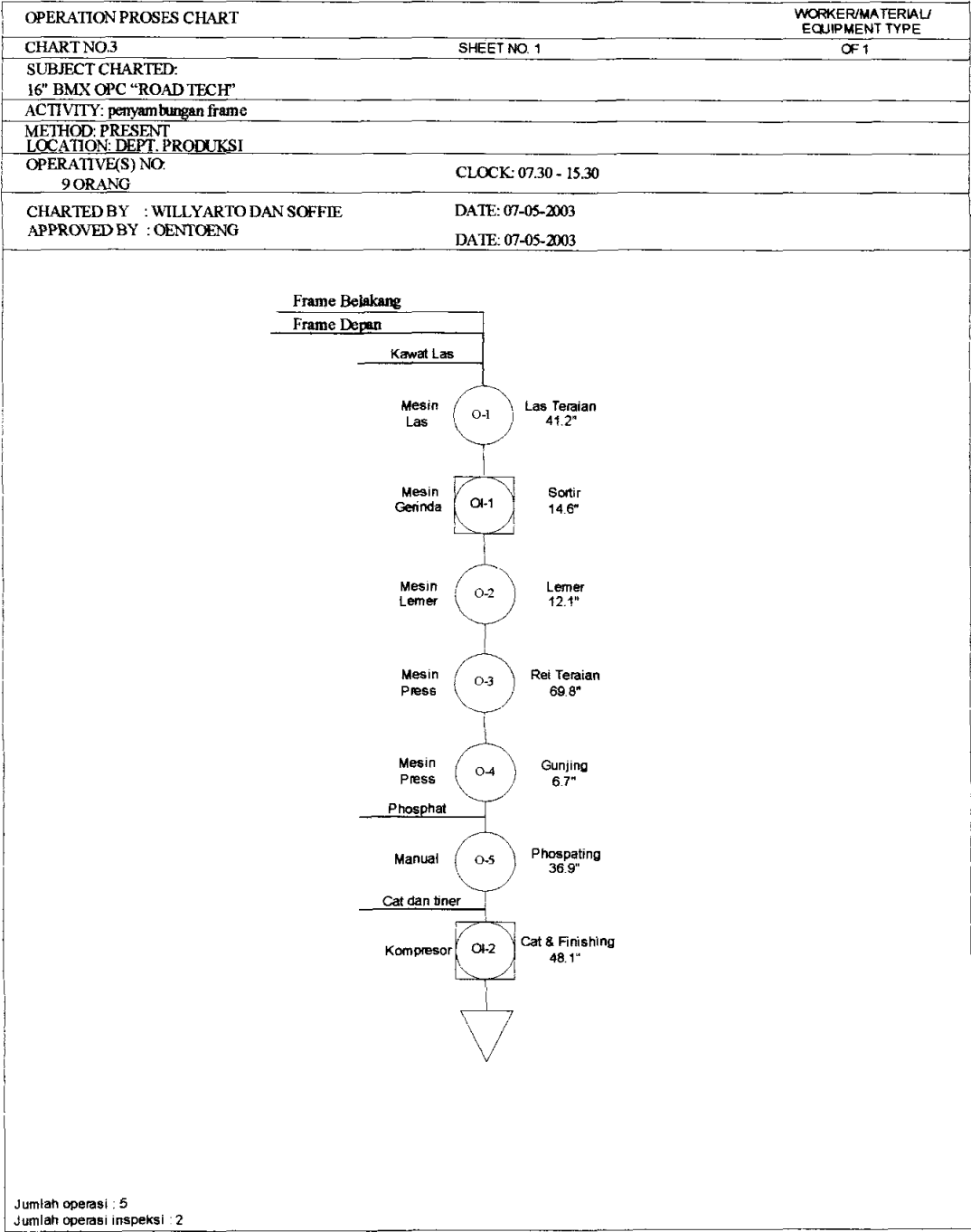
Jumlah operasi : 4

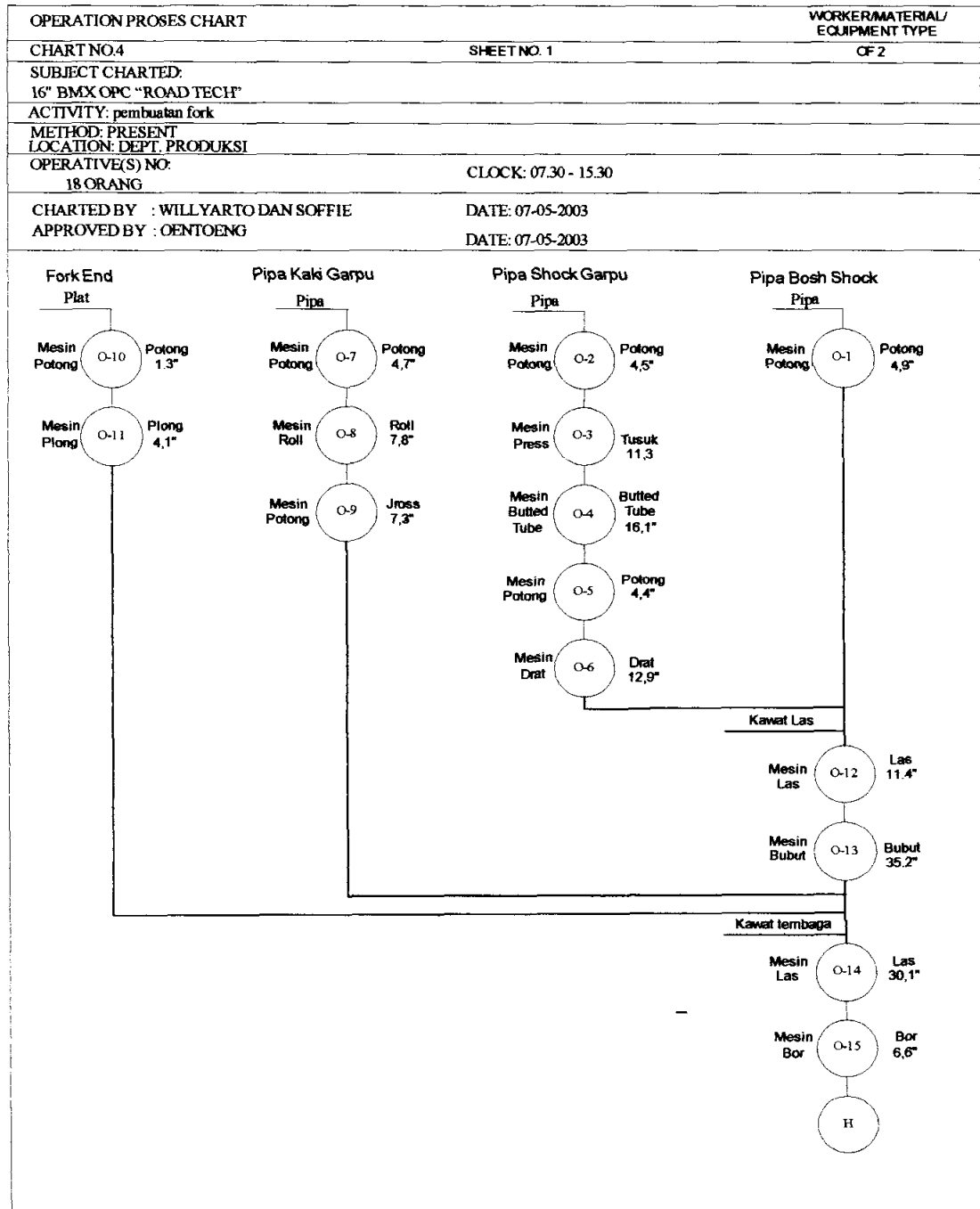






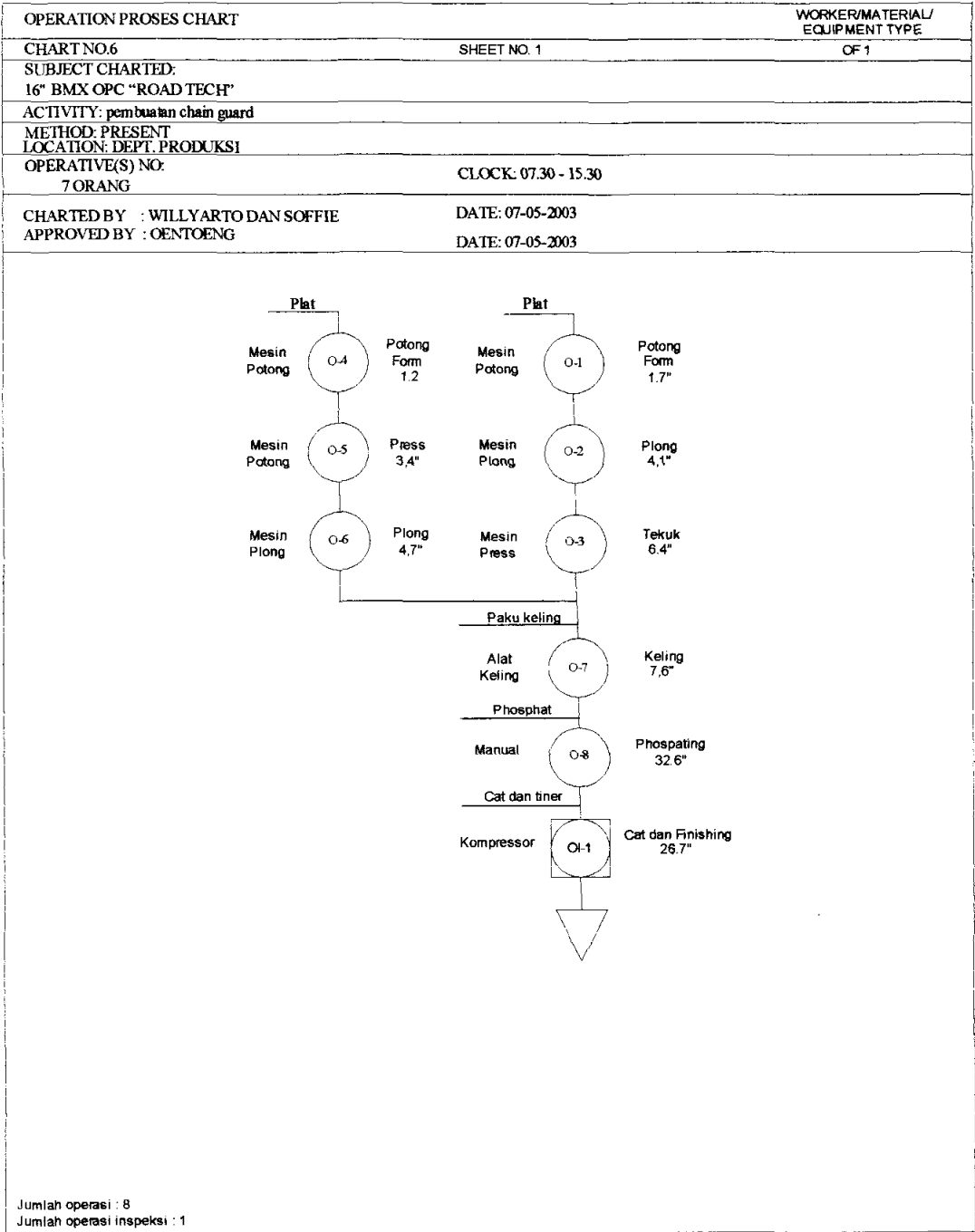






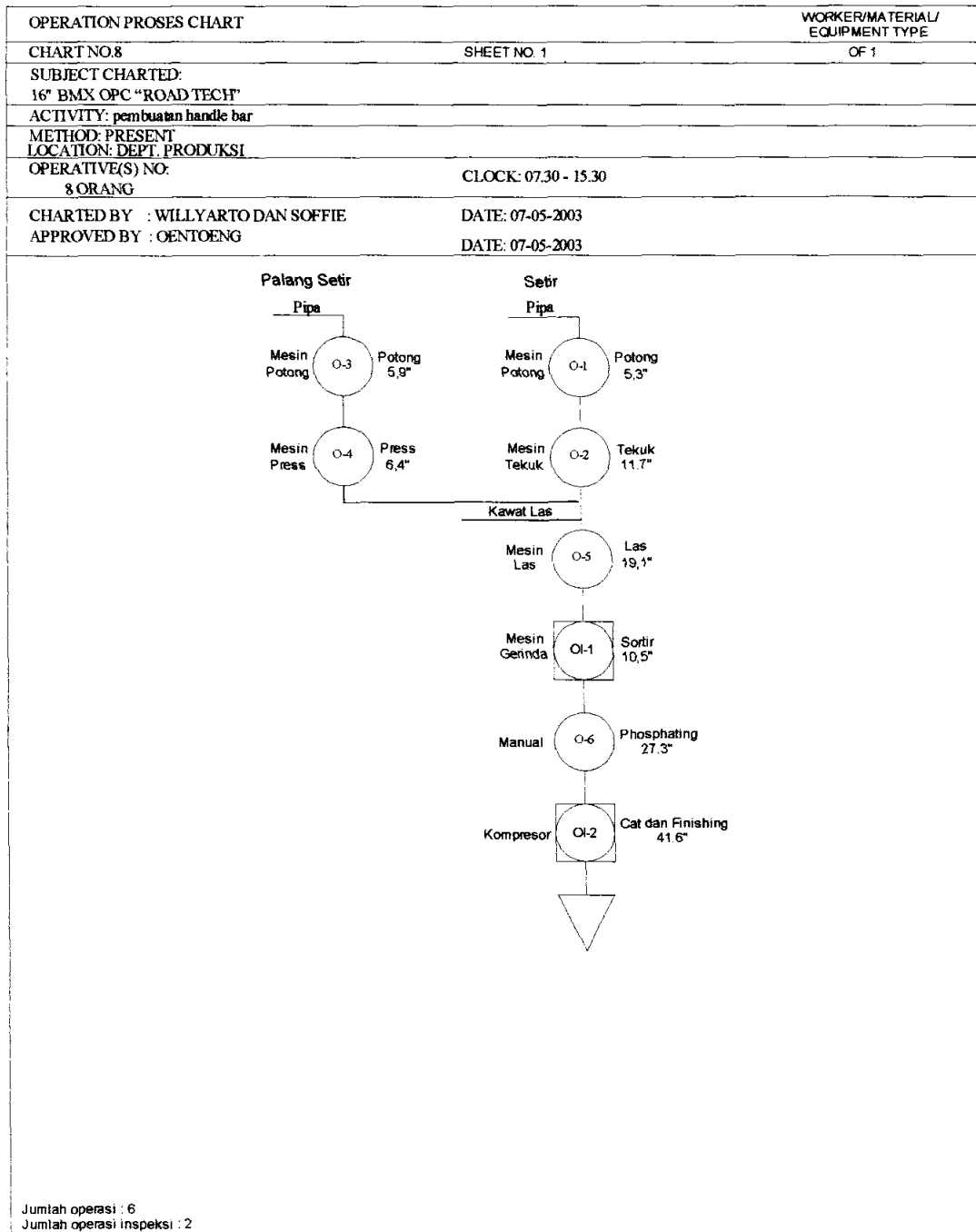
OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.4	SHEET NO. 2	OF 2
SUBJECT CHARTED: 16" BMX OPC "ROAD TECH"		
ACTIVITY: pembuatan fork		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 18 ORANG	CLOCK: 07.30 - 15.30	
CHARTED BY : WILLYARTO DAN SOFFIE	DATE: 07-05-2003	
APPROVED BY : OENTOENG	DATE: 07-05-2003	
<pre> graph TD H((H)) --> Ol1[Ol-1] Ol1 --> Phos1[Phosphating] Phos1 --> Ol16((O-16)) Ol16 --> CatTin[Cat dan tiner] CatTin --> Ol2[Ol-2] Ol2 --> End[] style End fill:none,stroke:none </pre>		
Jumlah operasi : 16 Jumlah operasi inspeksi : 2		

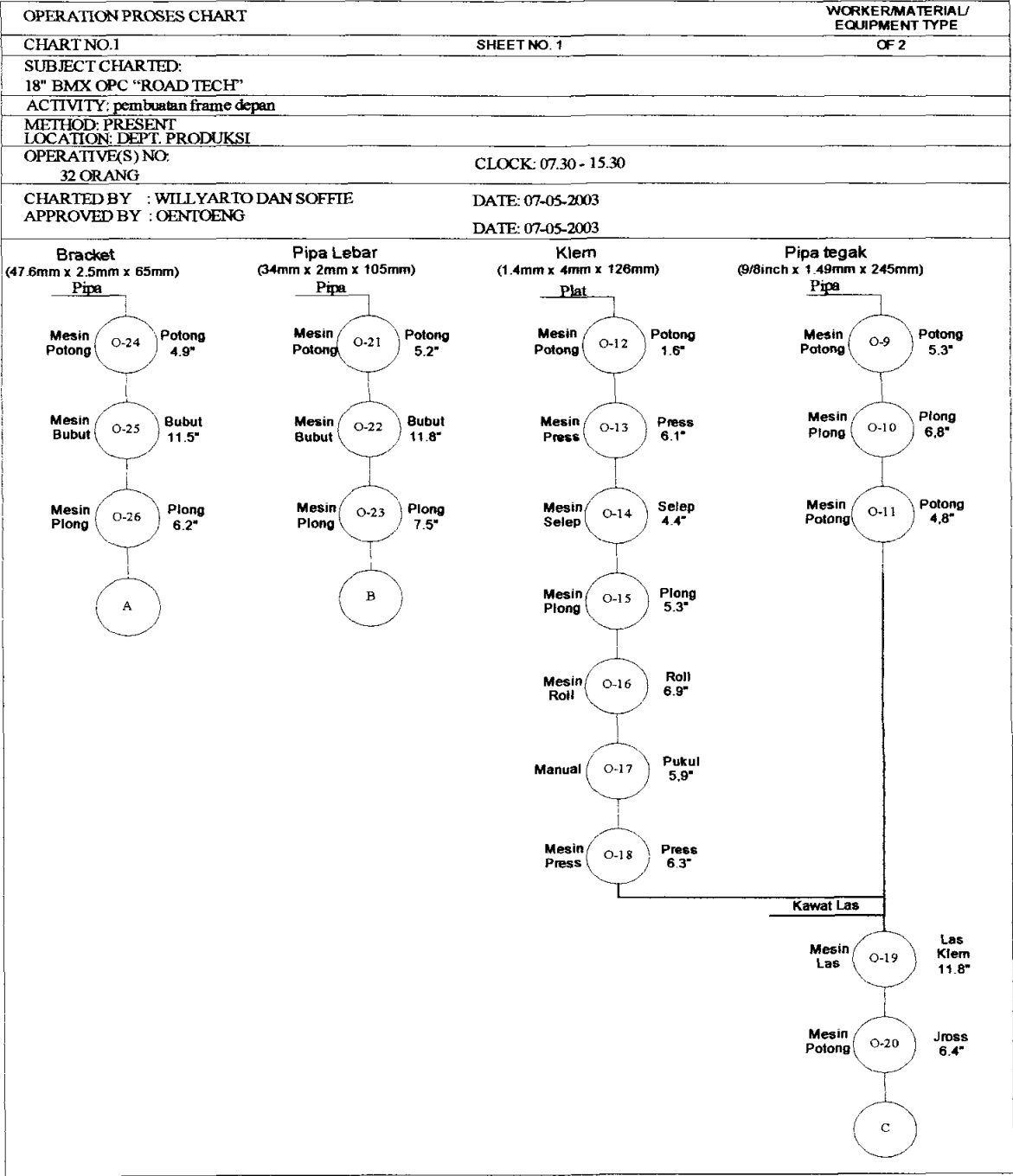
OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.5	SHEET NO. 1	OF 1
SUBJECT CHARTED: 16" BMX OPC "ROAD TECH"		
ACTIVITY: pembuatan chain wheel		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 5 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003
Plat <pre>graph TD; Plat --> O1((O-1)); O1 --> O2((O-2)); O2 --> O3((O-3)); O3 --> O4((O-4)); O4 --> O5((O-5)); O5 --> End[];</pre> The flowchart illustrates the five-step process for manufacturing a chain wheel. It begins with a 'Plat' (plate) input, leading to operation O-1 (Mesin Potong / Potong 2,6"). This is followed by O-2 (Mesin Plong / Plong Tengah 15,6), O-3 (Mesin Plong / Plong Gigi 18,2"), O-4 (Mesin Plong / Plong Bintang 17,5), and finally O-5 (Mesin Press / Press Gigi 8,6"). The process concludes with a downward-pointing triangle symbol.		
Jumlah operasi : 5		

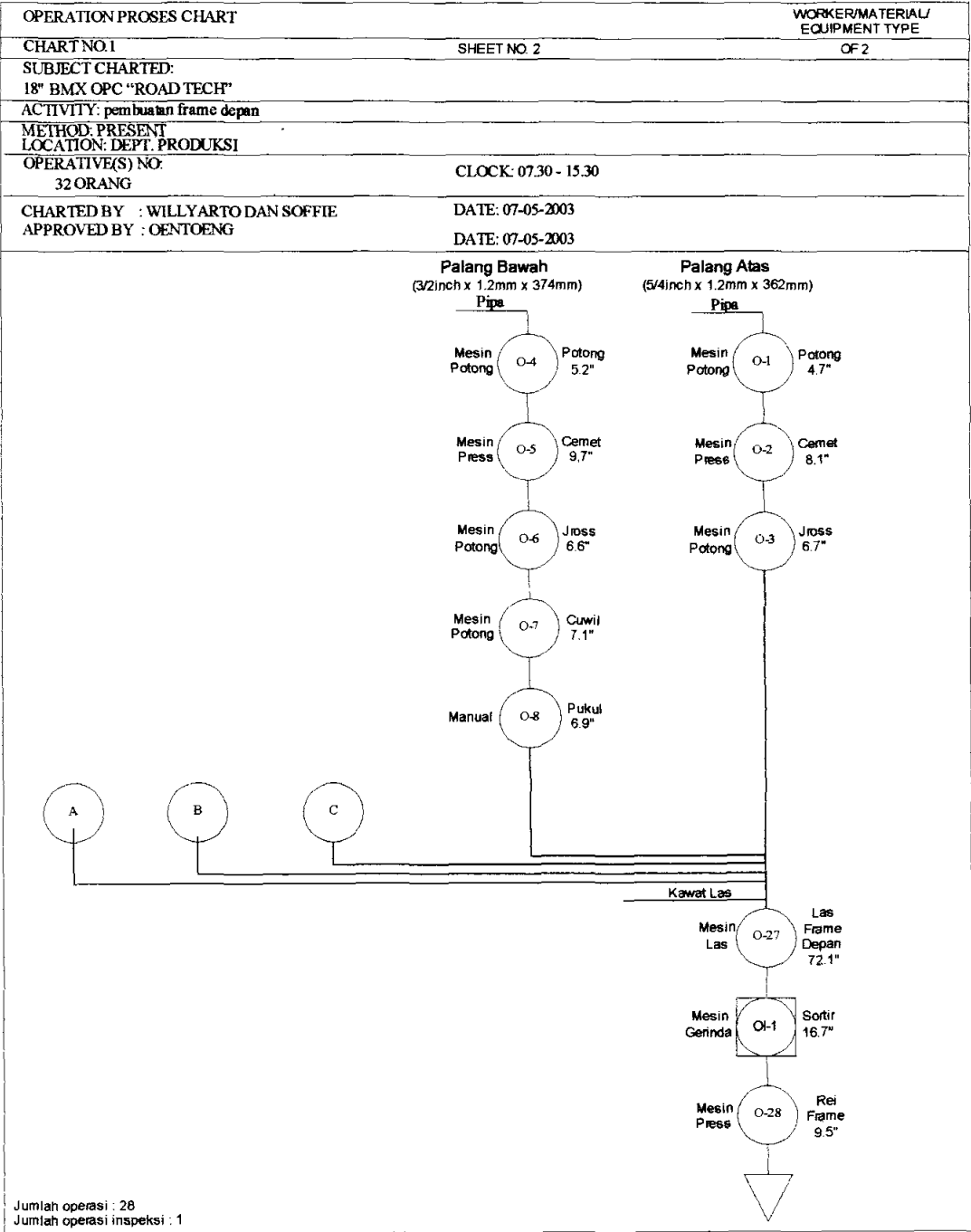


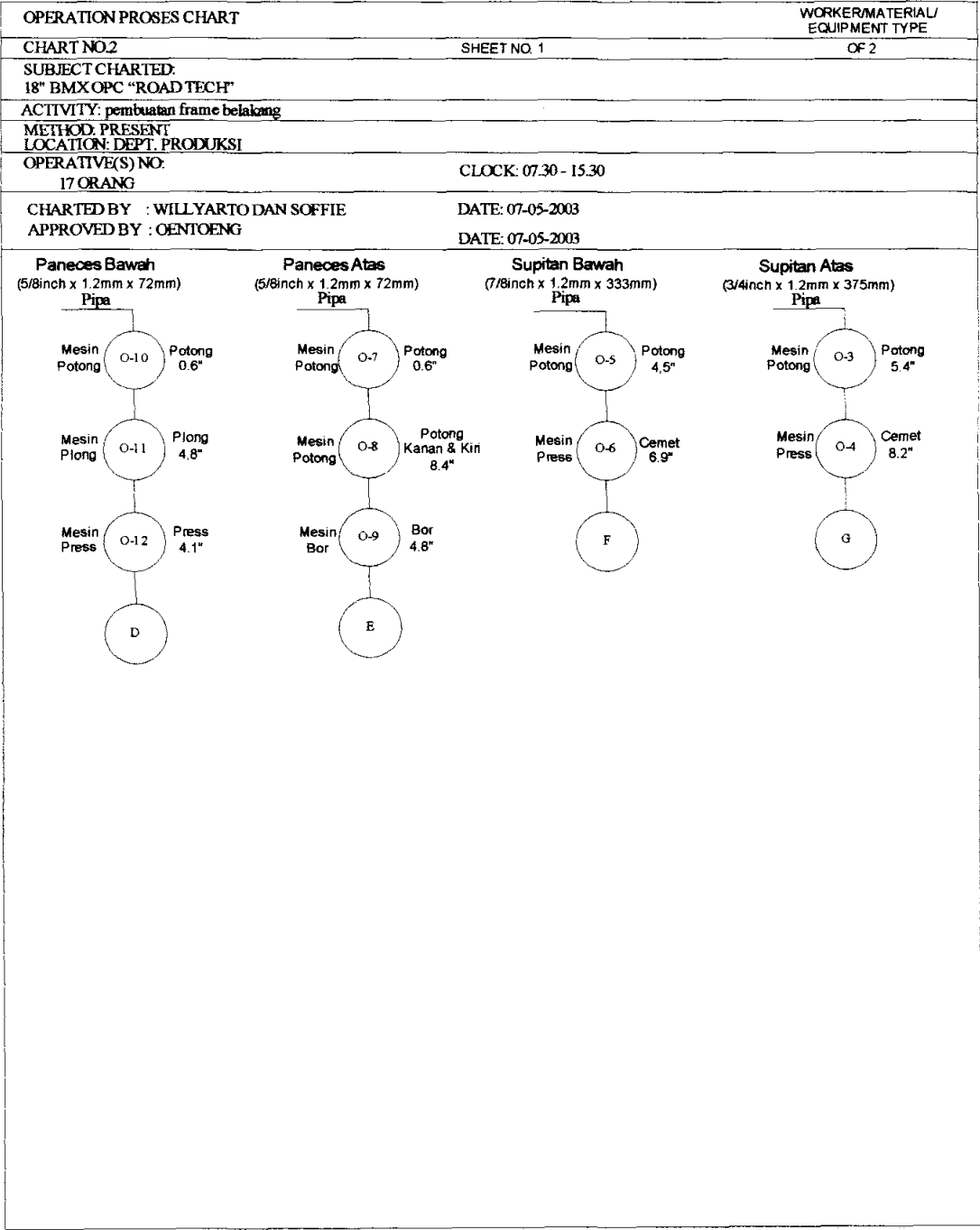
OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.7	SHEET NO. 1	OF 1
SUBJECT CHARTED: 16" BMX OPC "ROAD TECH"		
ACTIVITY: pembuatan seat post		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 7 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003

Jumlah operasi : 4

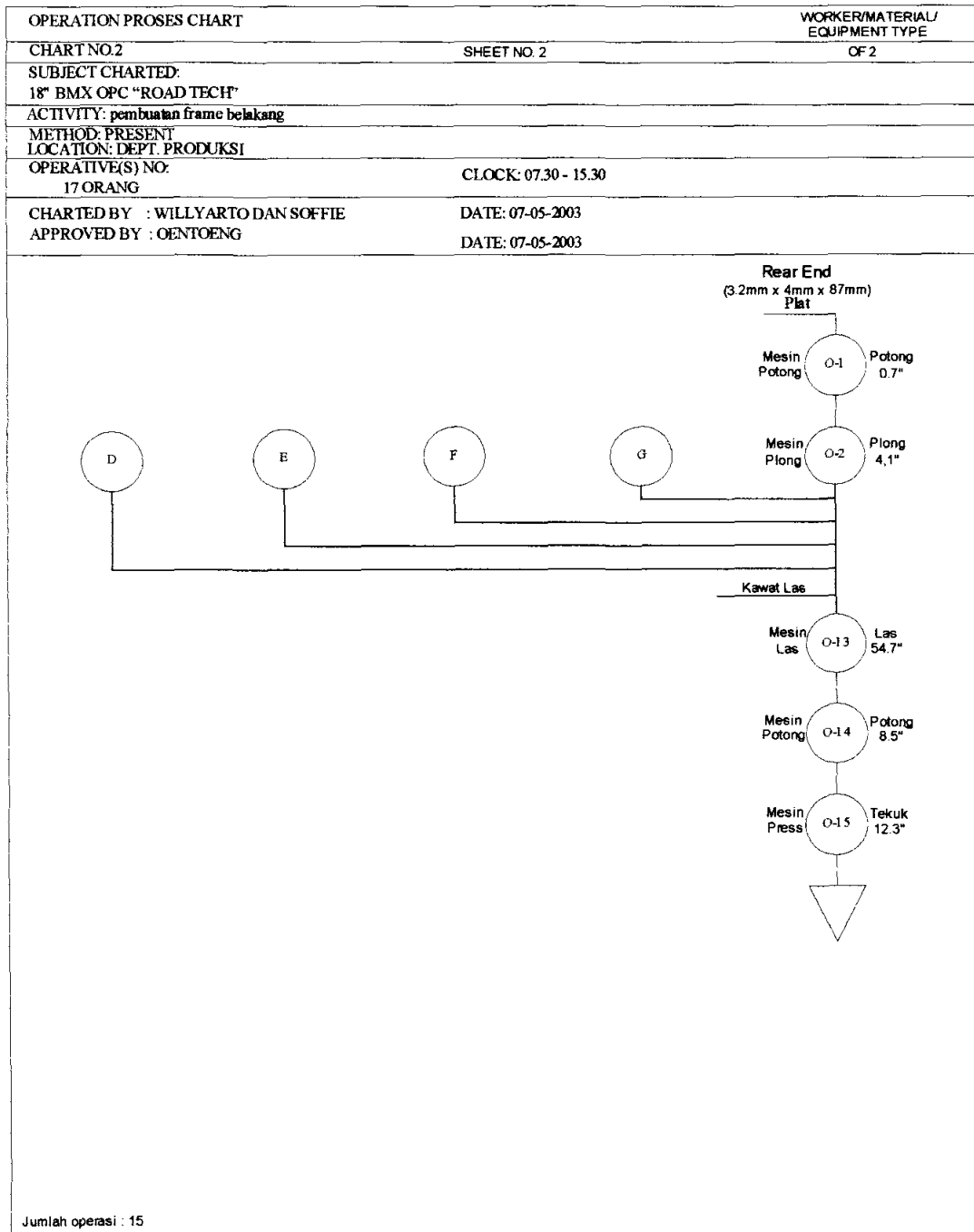


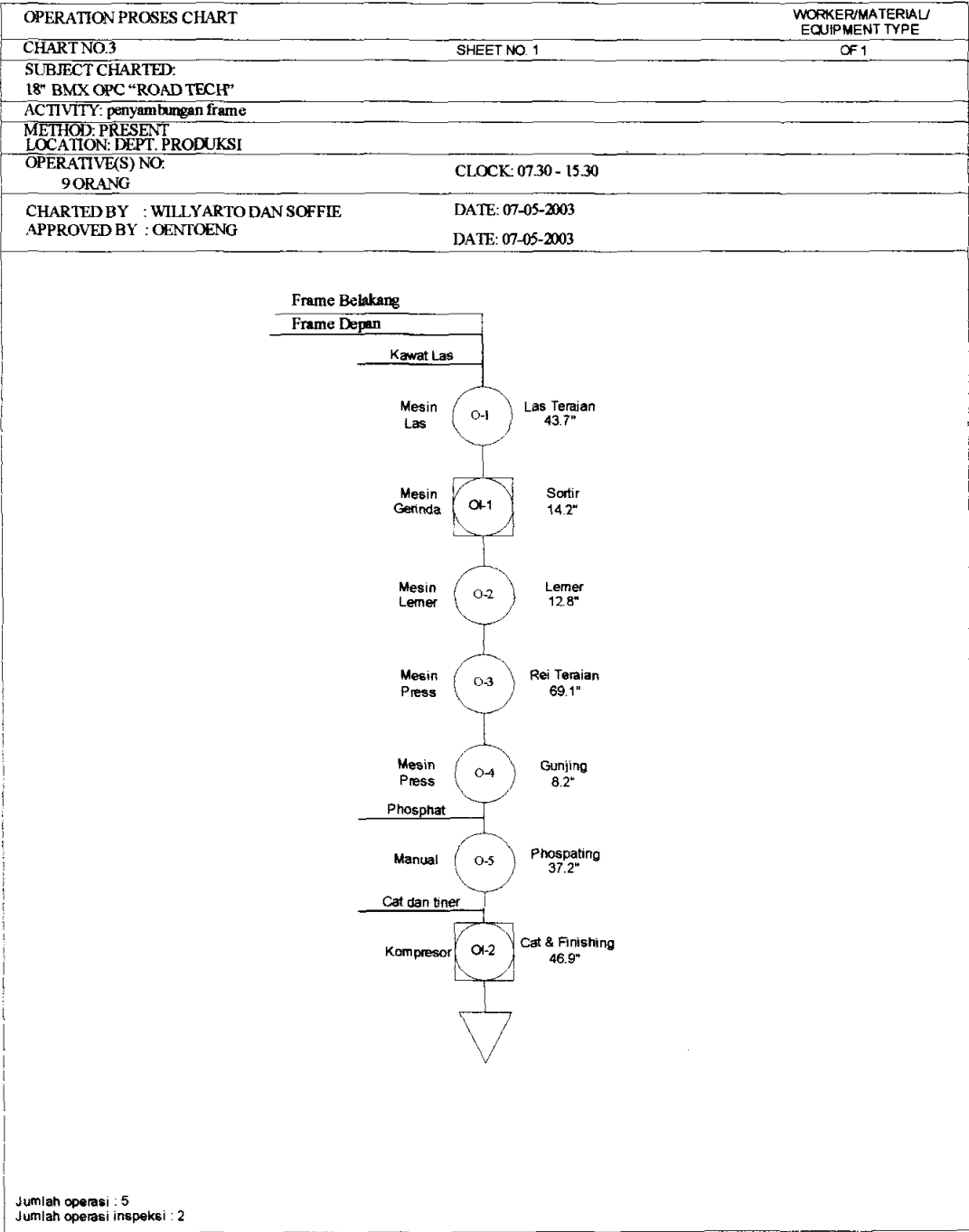


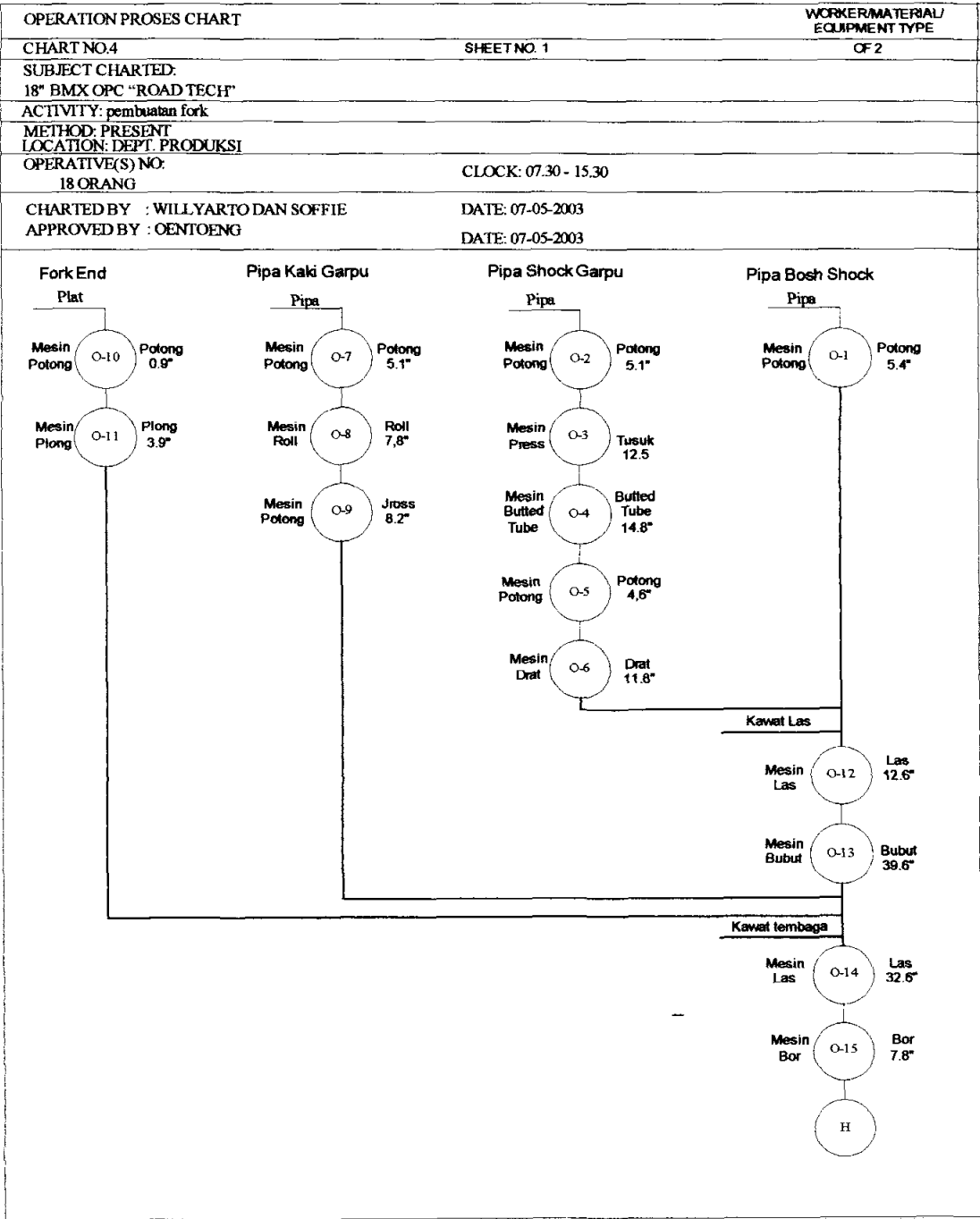




PEXPERDIKSIAN
KELOMPOK KIRI DAN KIRI KIRI
BUKALAYA

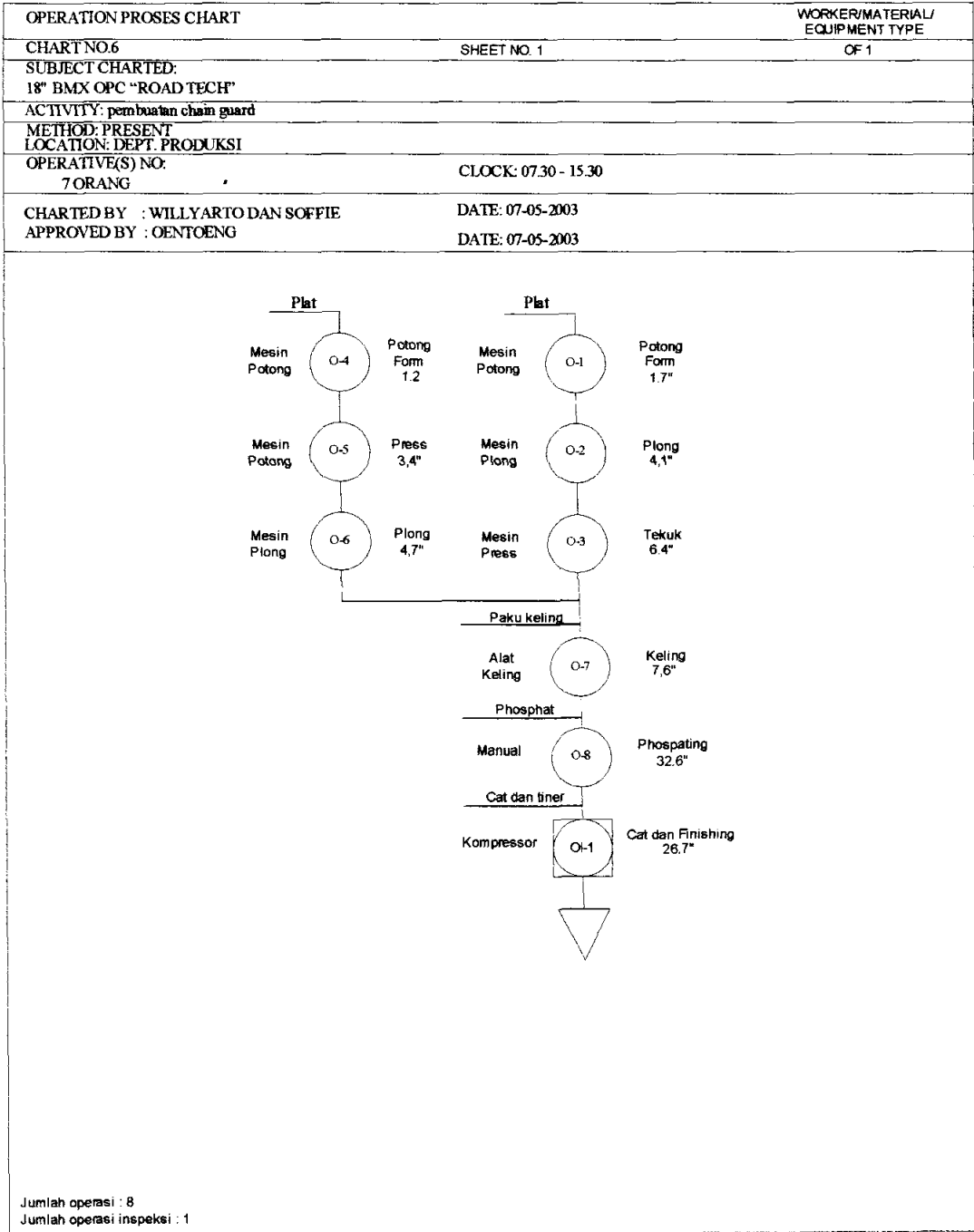






OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.4	SHEET NO. 2	OF 2
SUBJECT CHARTED: 18" BMX OPC "ROAD TECH"		
ACTIVITY: pembuatan fork		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 18 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003
<pre>graph TD; H((H)) --> OI1[OI-1 Mesin Gerinda / Sortir 22.6"]; OI1 --> O16((O-16 Manual / Phosphating 37.1")); O16 --> OI2[OI-2 Kompresor / Cat dan Finishing 38.1"]; OI2 --> End([End]);</pre>		
Jumlah operasi : 16 Jumlah operasi inspeksi : 2		

OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE																								
CHART NO.5	SHEET NO. 1	OF 1																								
SUBJECT CHARTED: 18" BMX OPC "ROAD TECH"																										
ACTIVITY: pembuatan chain wheel																										
METHOD: PRESENT																										
LOCATION: DEPT. PRODUKSI																										
OPERATIVE(S) NO: 5 ORANG		CLOCK: 07.30 - 15.30																								
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003																								
APPROVED BY : OENTOENG		DATE: 07-05-2003																								
Plat <pre>graph TD; Plat --> O1((O-1)); O1 --> O2((O-2)); O2 --> O3((O-3)); O3 --> O4((O-4)); O4 --> O5((O-5)); O5 --> End[▽];</pre><table><tr><th>Operation</th><th>Machine</th><th>Process</th><th>Size</th></tr><tr><td>1</td><td>Mesin Potong</td><td>Potong</td><td>2.6"</td></tr><tr><td>2</td><td>Mesin Plong</td><td>Plong Tengah</td><td>15,6</td></tr><tr><td>3</td><td>Mesin Plong</td><td>Plong Gigi</td><td>18,2"</td></tr><tr><td>4</td><td>Mesin Plong</td><td>Plong Bintang</td><td>17,5</td></tr><tr><td>5</td><td>Mesin Press</td><td>Press Gigi</td><td>8,6"</td></tr></table>			Operation	Machine	Process	Size	1	Mesin Potong	Potong	2.6"	2	Mesin Plong	Plong Tengah	15,6	3	Mesin Plong	Plong Gigi	18,2"	4	Mesin Plong	Plong Bintang	17,5	5	Mesin Press	Press Gigi	8,6"
Operation	Machine	Process	Size																							
1	Mesin Potong	Potong	2.6"																							
2	Mesin Plong	Plong Tengah	15,6																							
3	Mesin Plong	Plong Gigi	18,2"																							
4	Mesin Plong	Plong Bintang	17,5																							
5	Mesin Press	Press Gigi	8,6"																							
Jumlah operasi : 5																										



OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.7	SHEET NO. 1	OF 1
SUBJECT CHARTED: 18" BMX OPC "ROAD TECH"		
ACTIVITY: pembuatan seat post		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 7 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003

Pipa

Mesin Potong O-1 Potong 4.3"

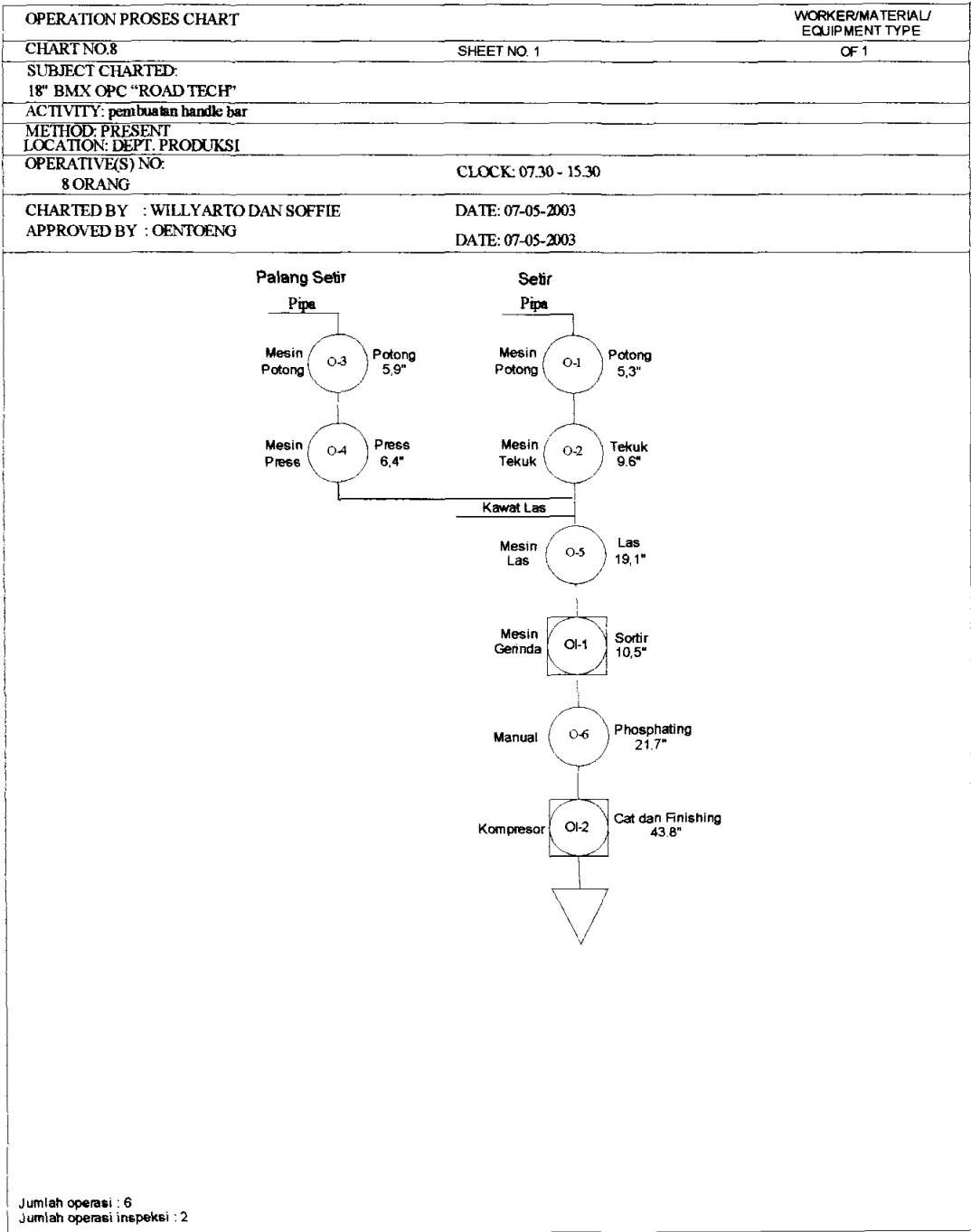
Mesin Hidrolis O-2 Hidrolis 8.3"

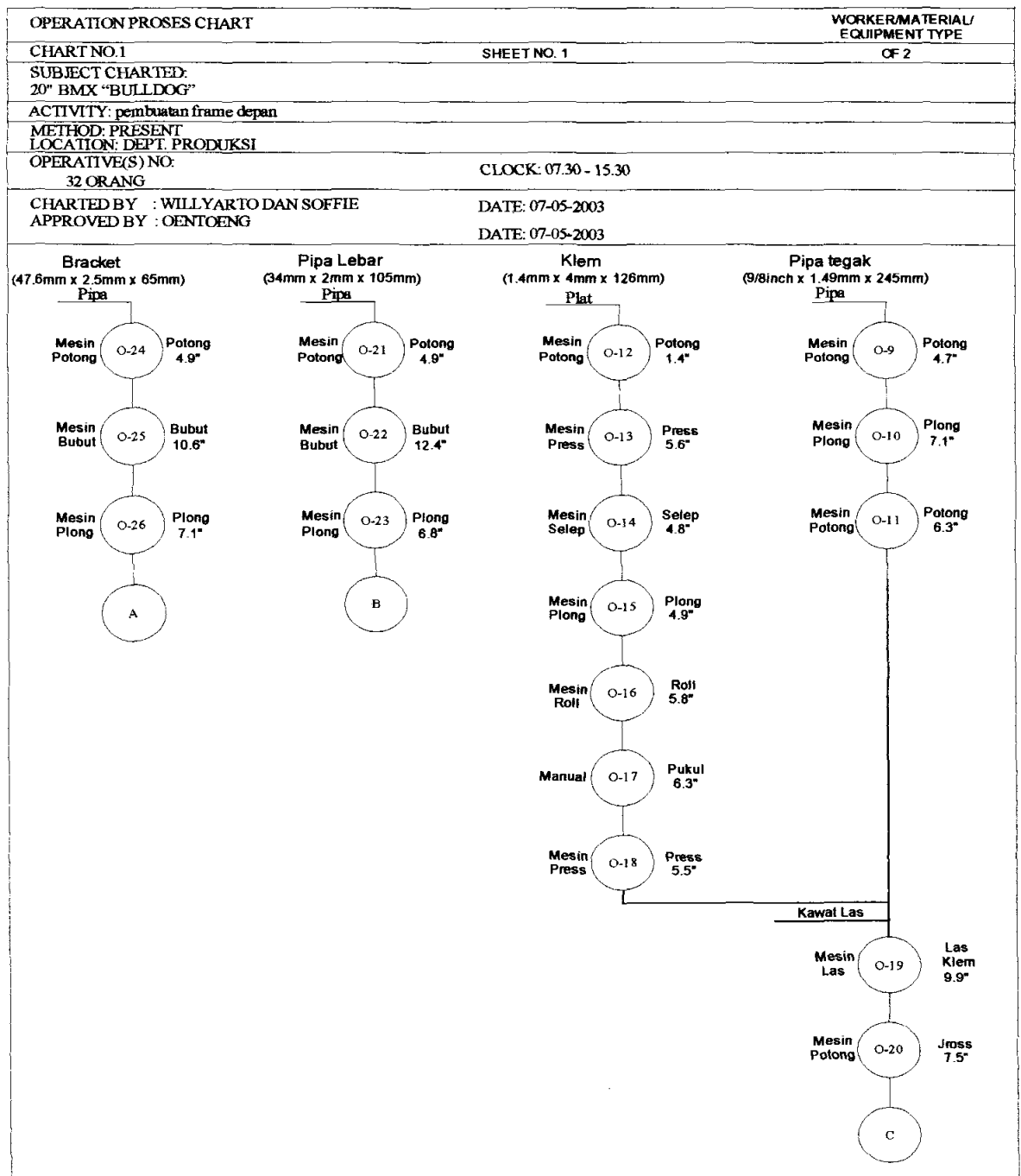
Mesin Serut O-3 Serut 10.7"

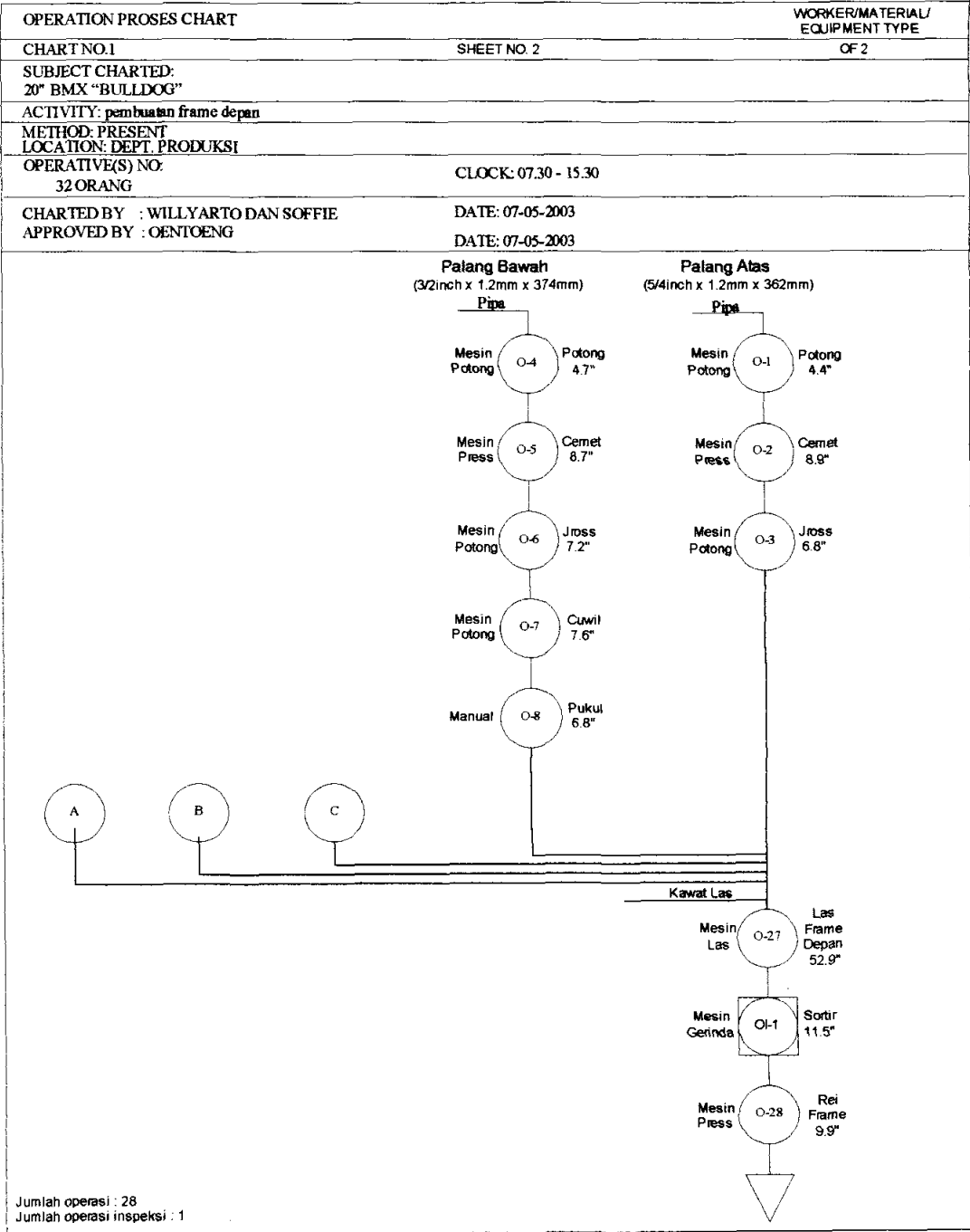
Manual O-4 Merk 8.6"

```
graph TD; A[Pipa] --> B((O-1)); B --> C((O-2)); C --> D((O-3)); D --> E((O-4)); E --> F[▽];
```

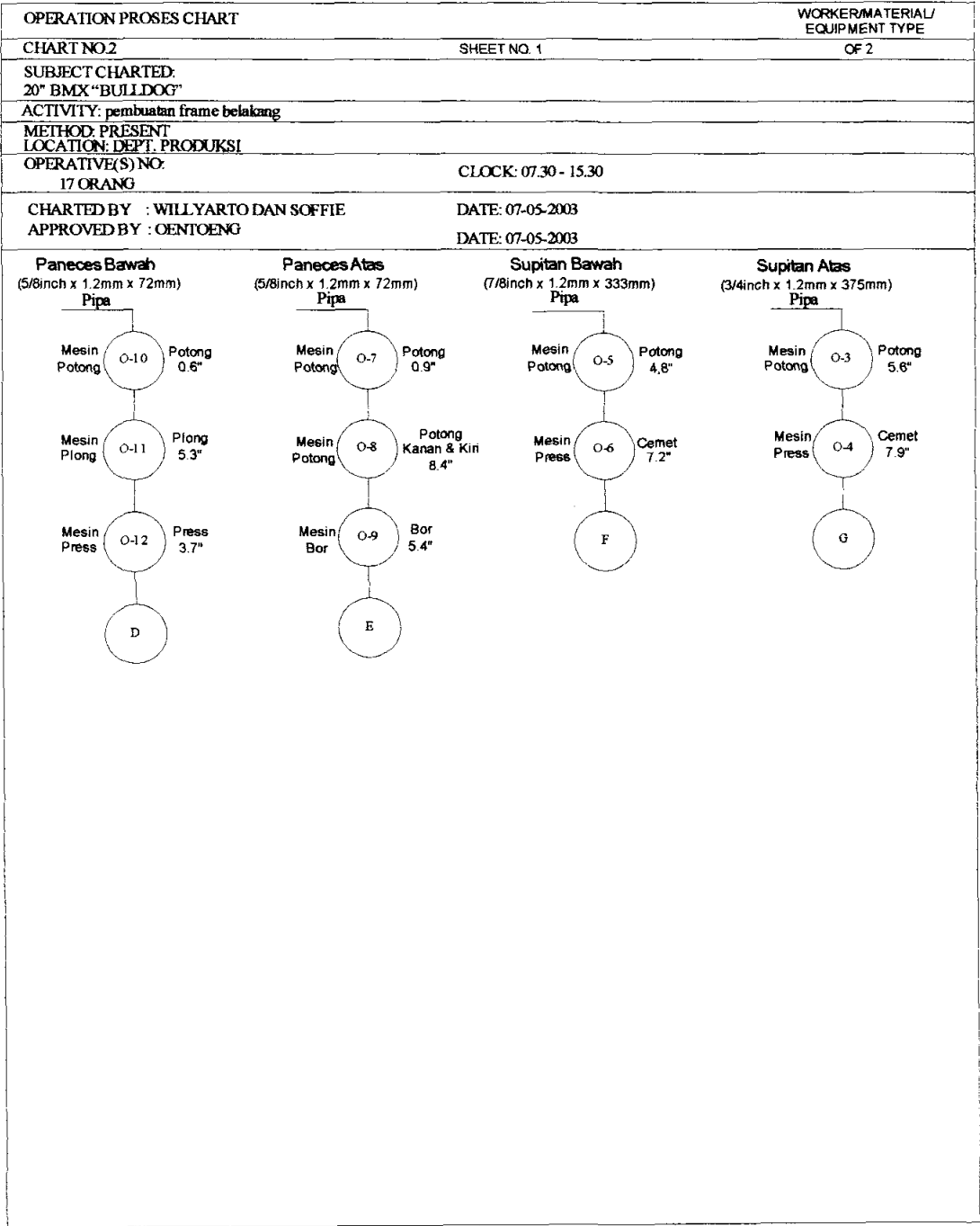
Jumlah operasi : 4

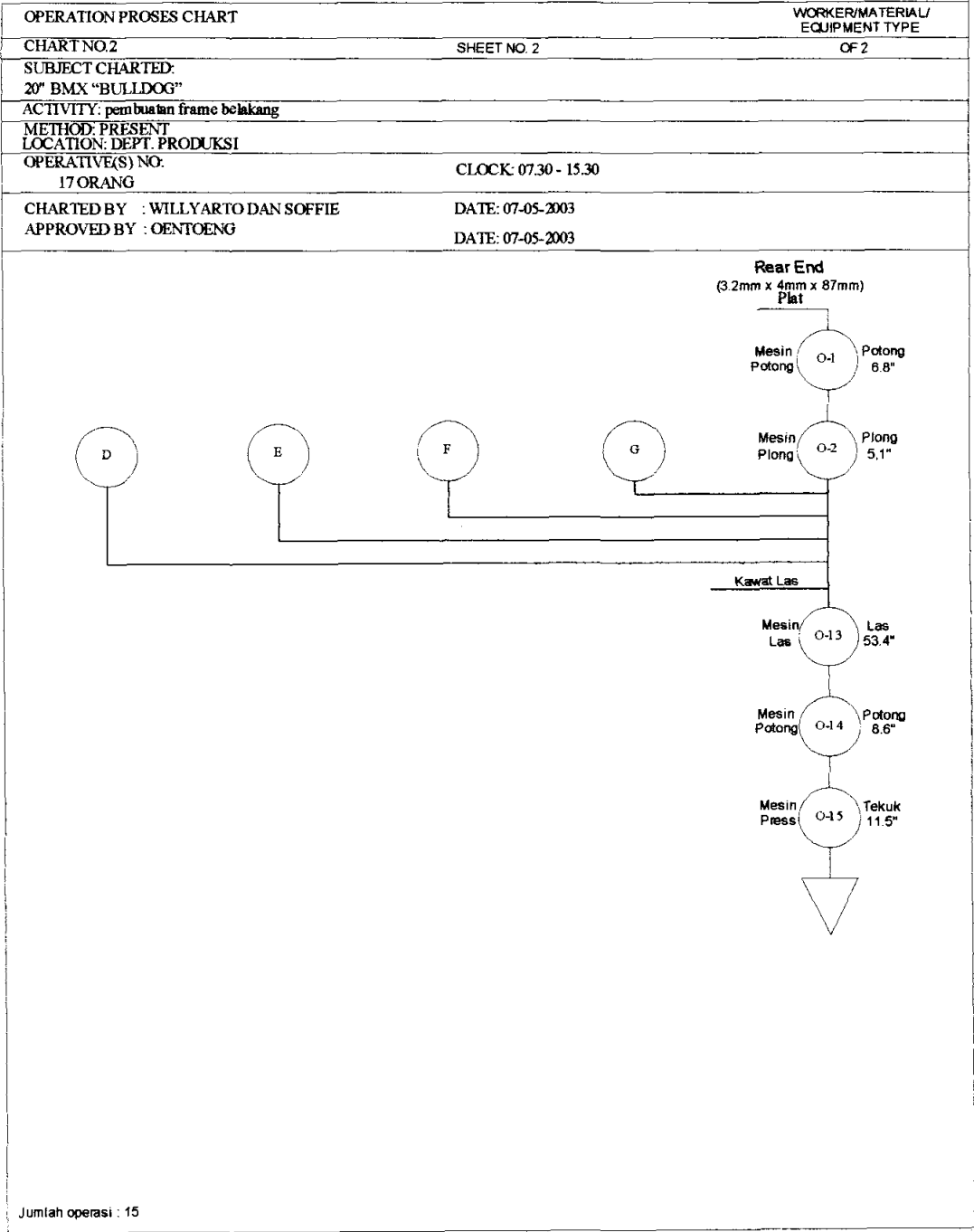


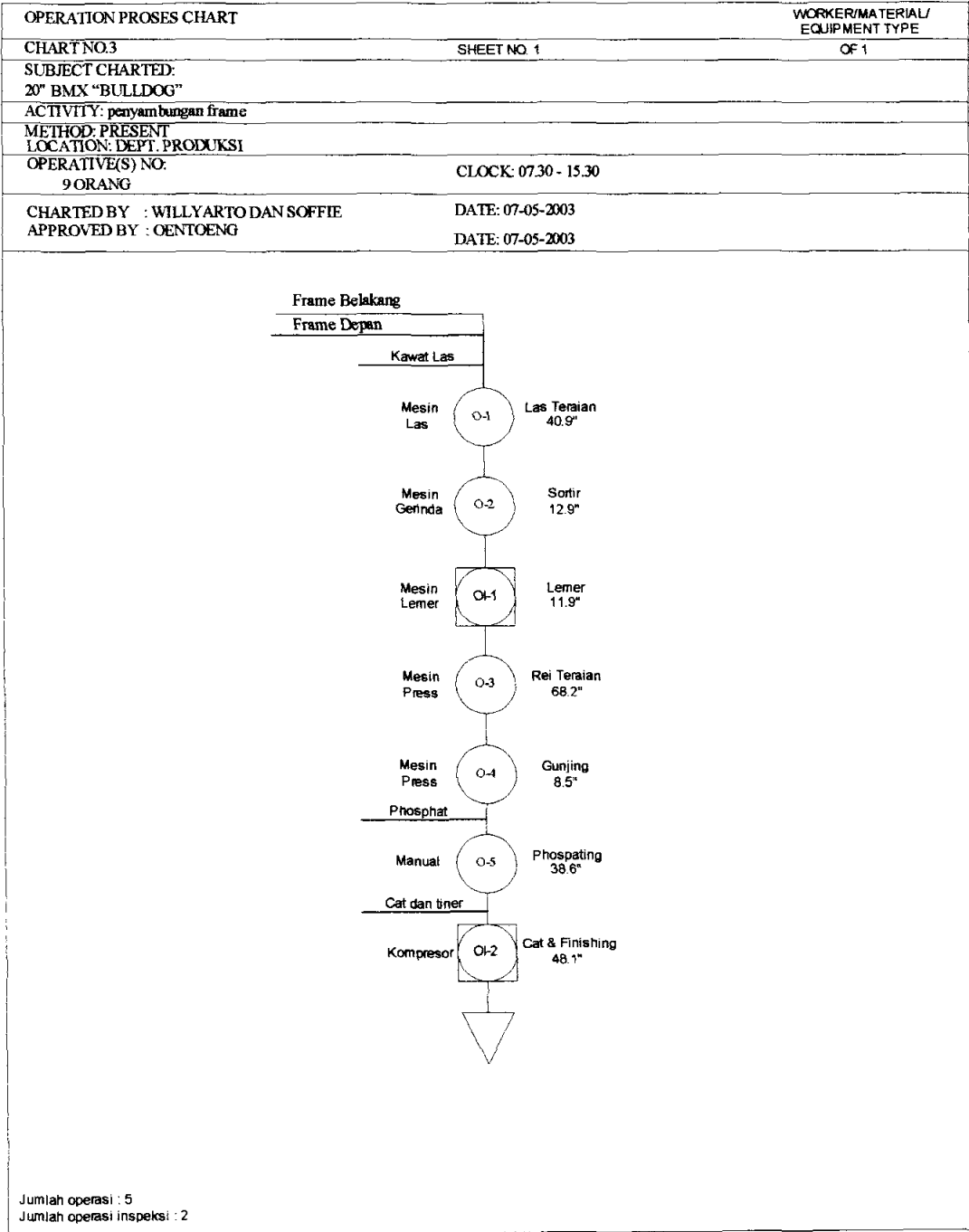


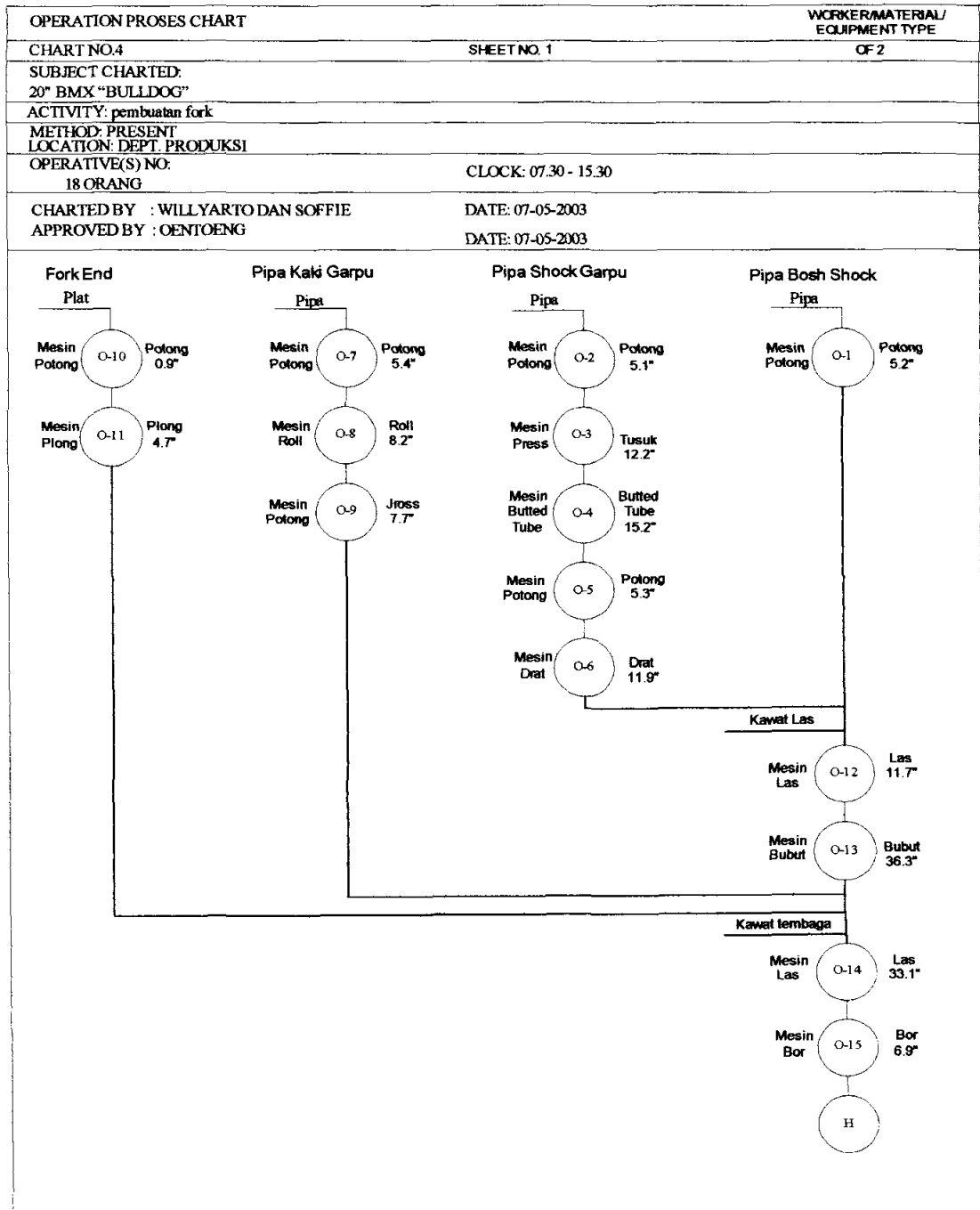


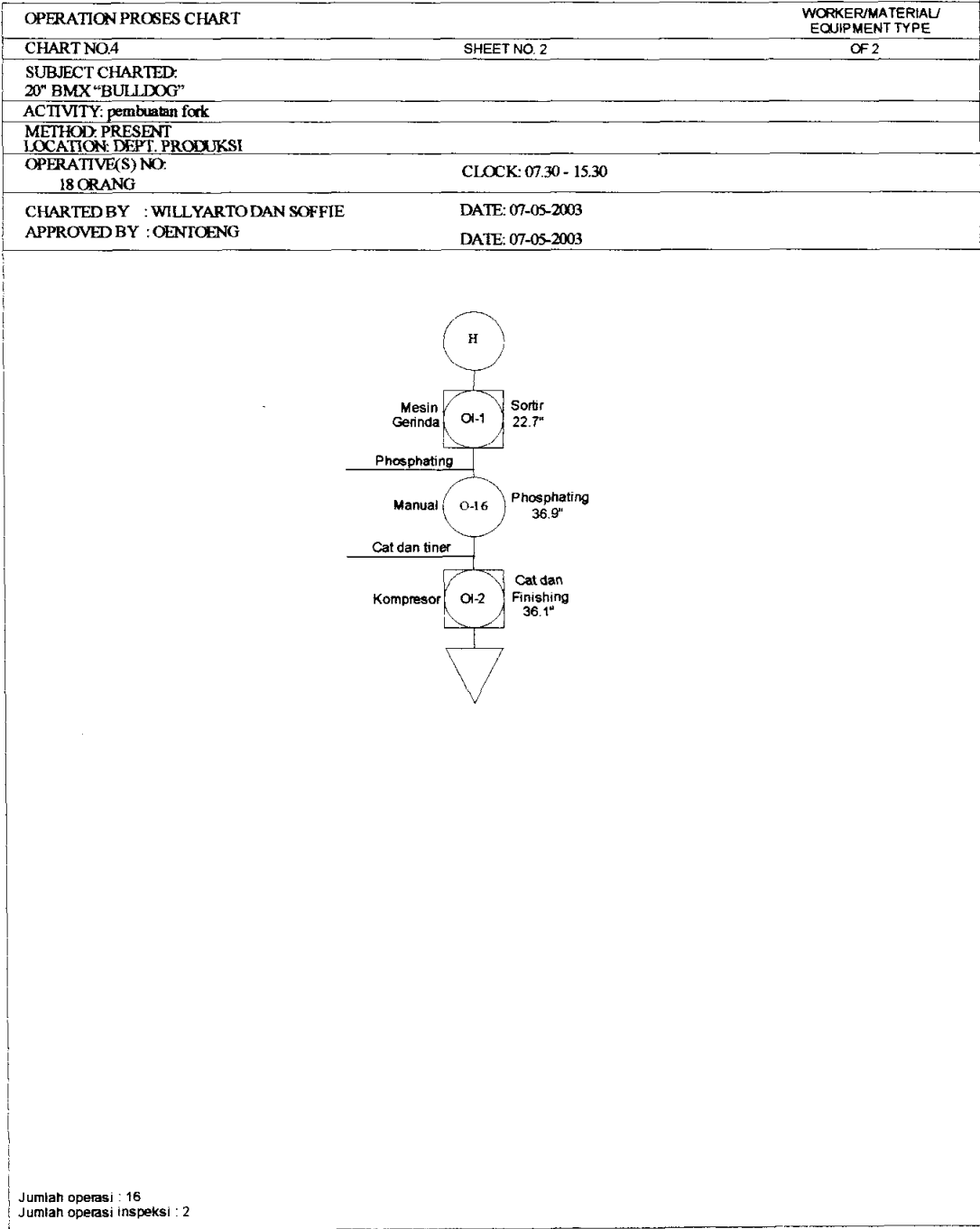
Jumlah operasi : 28
Jumlah operasi inspeksi : 1

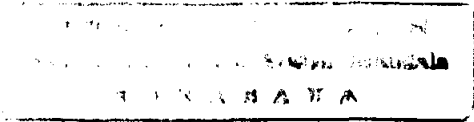












OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.5	SHEET NO. 1	OF 1
SUBJECT CHARTED: 20" BMX "BULLDOG"		
ACTIVITY: pembuatan chain wheel		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 5 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003
Plat Mesin Potong 0-1 Potong 2.2" Mesin Plong 0-2 Plong Tengah 15.4" Mesin Plong 0-3 Plong Gigi 18.2" Mesin Plong 0-4 Plong Bintang 17.9" Mesin Press 0-5 Press Gigi 8.3" ▼		
Jumlah operasi : 5		

OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.7	SHEET NO. 1	OF 1
SUBJECT CHARTED: 20" BMX "BULLDOG"		
ACTIVITY: pembuatan seat post		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 7 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003

Pipa

Mesin Potong O-1 Potong 5.1"

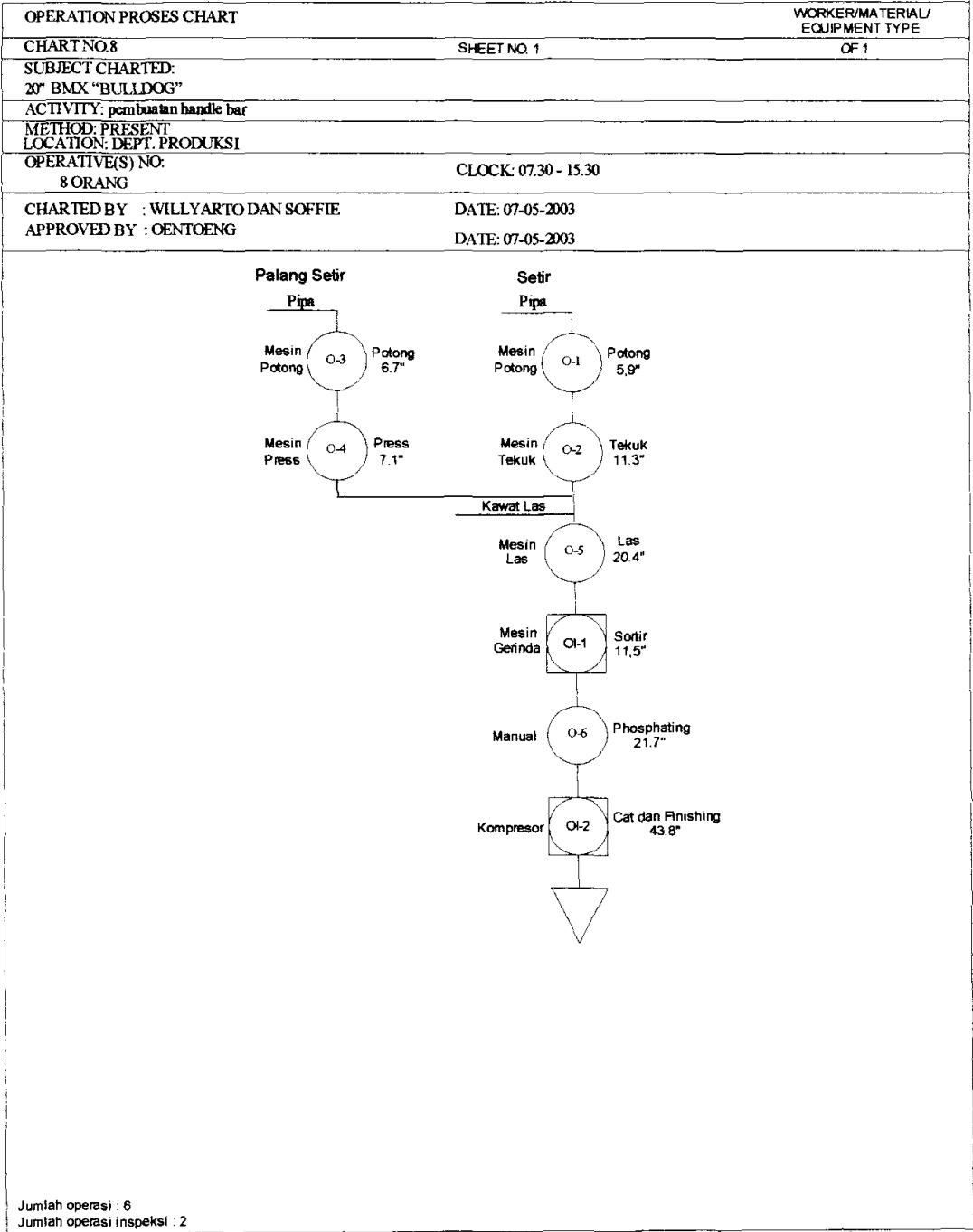
Mesin Hidrolis O-2 Hidrolis 9.6"

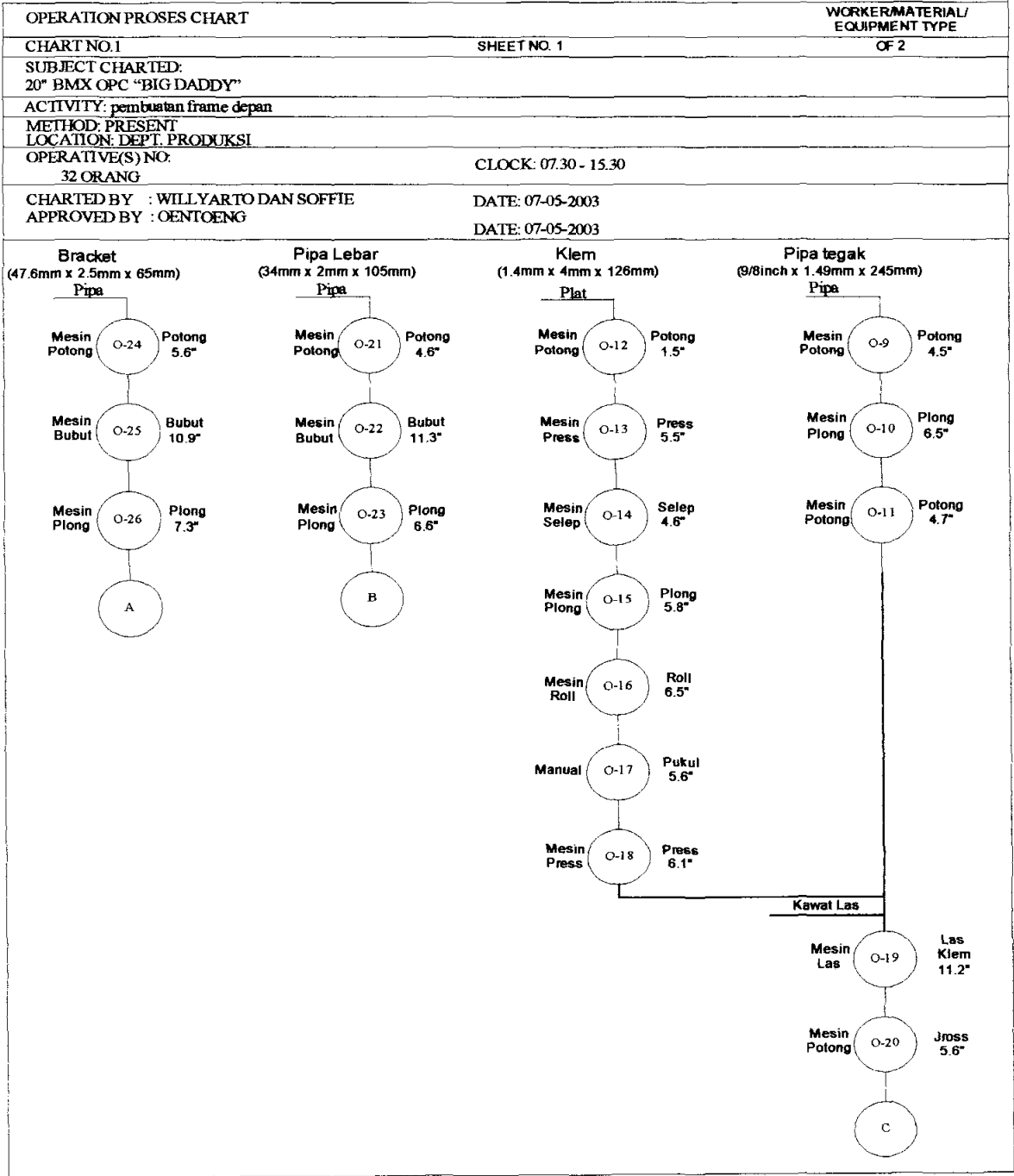
Mesin Serut O-3 Serut 12.1"

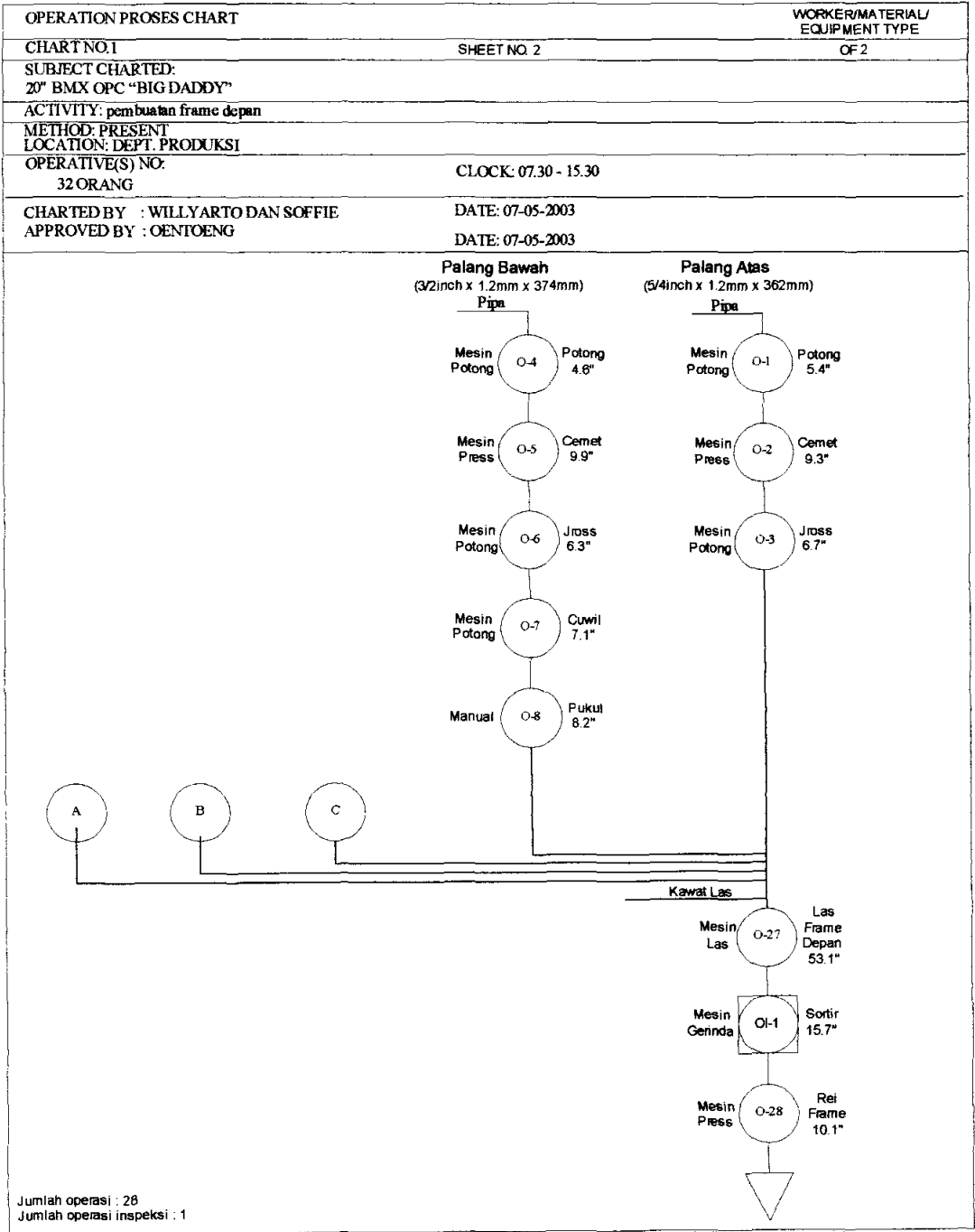
Manual O-4 Merk 9.9"

```
graph TD; A[Pipa] --> B((O-1)); B --> C((O-2)); C --> D((O-3)); D --> E((O-4)); E --> F[▽];
```

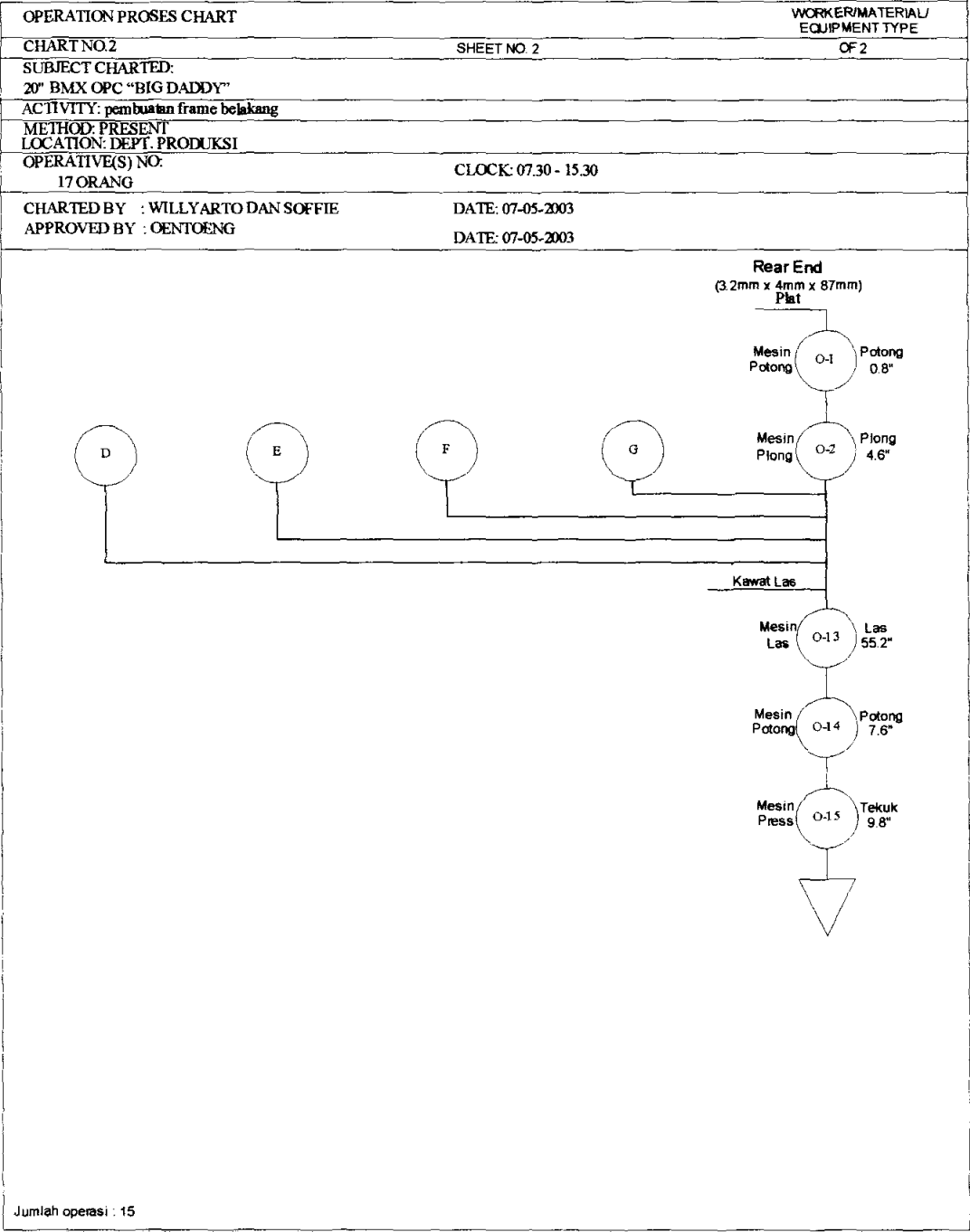
Jumlah operasi : 4

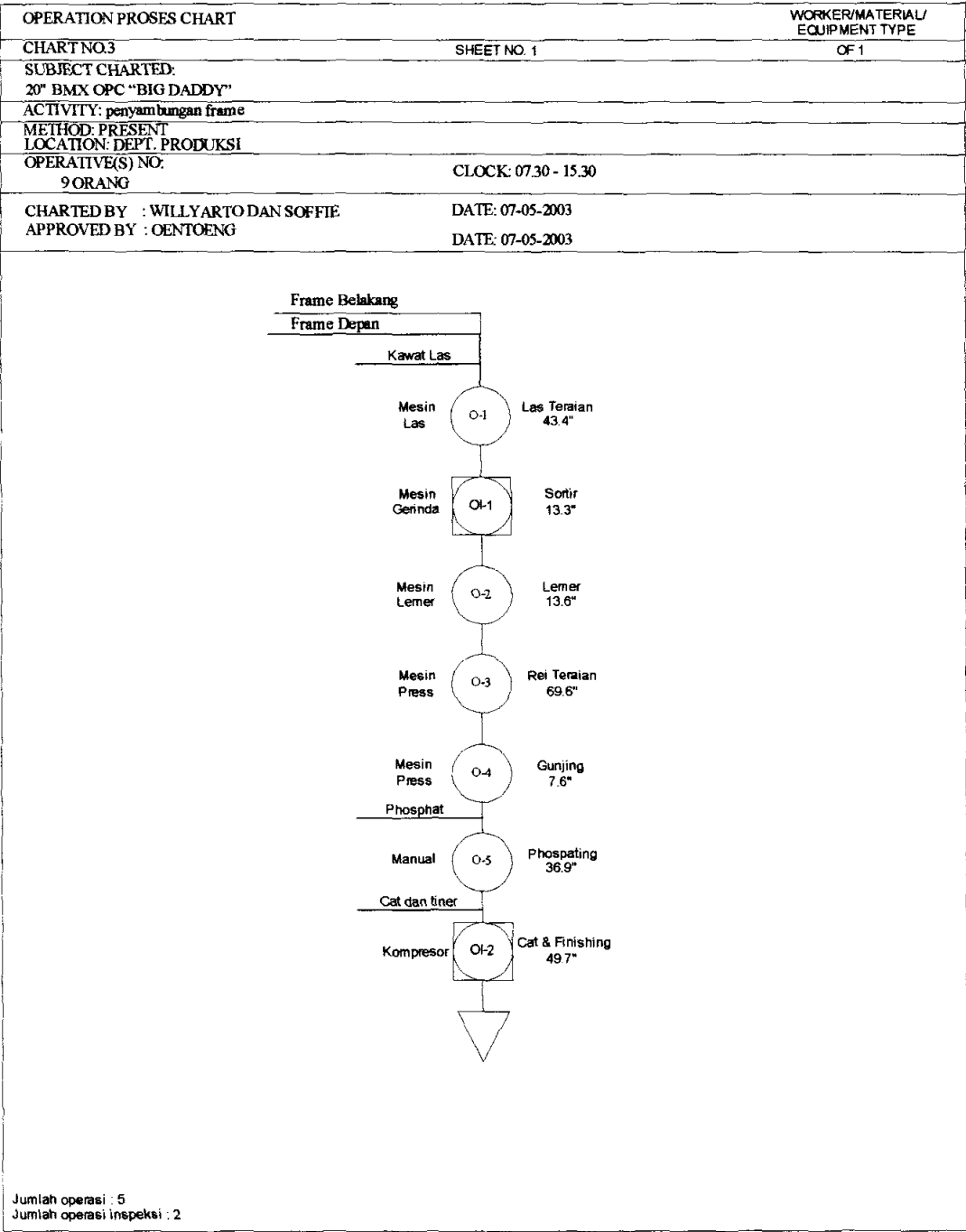


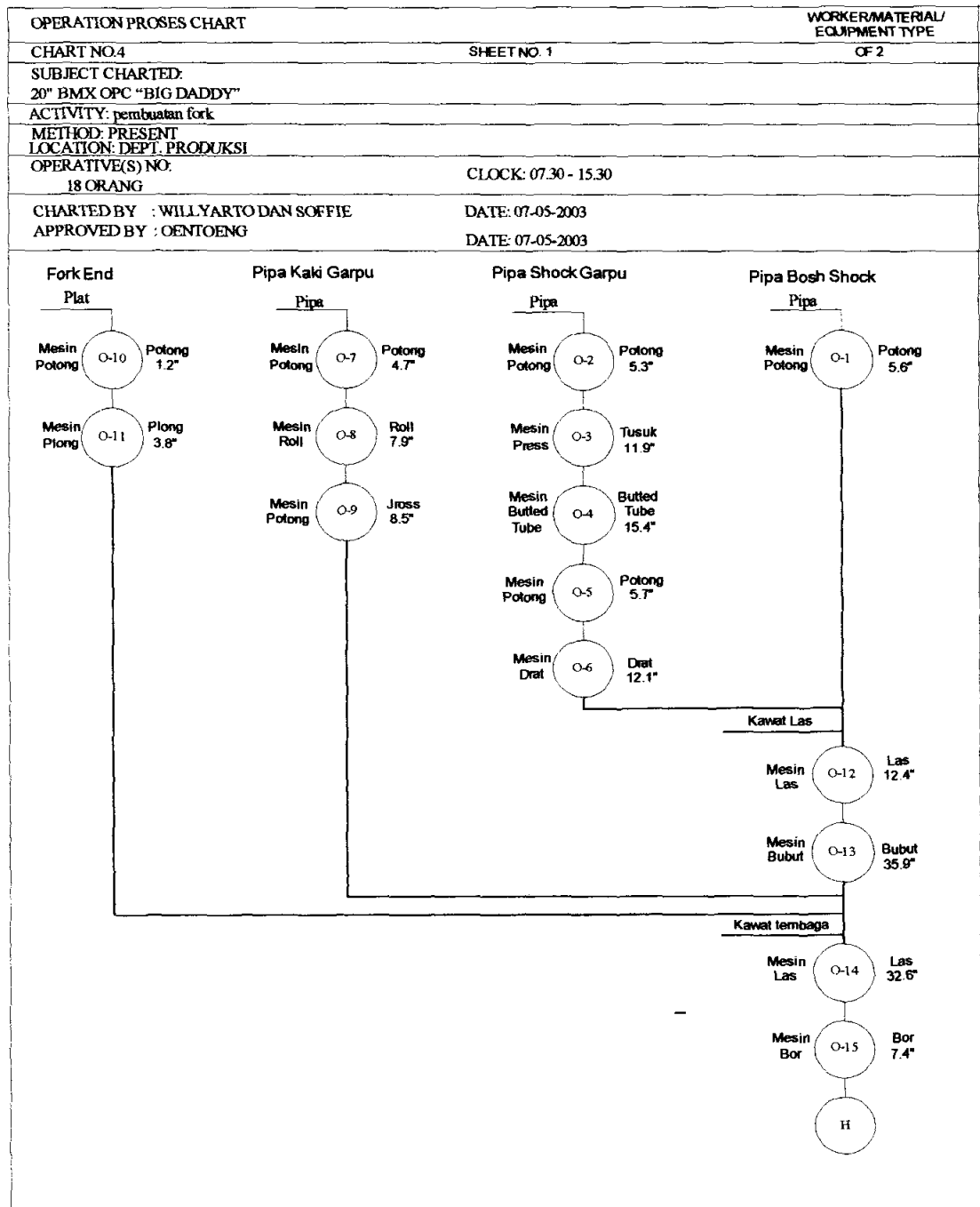




OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE	
CHART NO.2		SHEET NO 1	
SUBJECT CHARTED: 20" BMX OPC "BIG DADDY"		OF 2	
ACTIVITY: pembuatan frame belakang			
METHOD: PRESENT			
LOCATION: DEPT. PRODUKSI			
OPERATIVE(S) NO: 17 ORANG		CLOCK: 07.30 - 15.30	
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003	
APPROVED BY : OENTOENG		DATE: 07-05-2003	
Paneces Bawah (5/8inch x 1.2mm x 72mm) Pipa Mesin Potong O-10 Potong 0.8" Mesin Plong O-11 Plong 5.3" Mesin Press O-12 Press 4.3" D Paneces Atas (5/8inch x 1.2mm x 72mm) Pipa Mesin Potong O-7 Potong 0.8" Mesin Potong O-8 Potong Kanan & Kiri 10.2" Mesin Bor O-9 Bor 4.7" E Supitan Bawah (7/8inch x 1.2mm x 333mm) Pipa Mesin Potong O-5 Potong 4.9" Mesin Press O-6 Cemet 8.8" F Supitan Atas (3/4inch x 1.2mm x 375mm) Pipa Mesin Potong O-3 Potong 4.4" Mesin Press O-4 Cemet 7.5" G			







OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.4	SHEET NO. 2	OF 2
SUBJECT CHARTED: 20" BMX OPC "BIG DADDY"		
ACTIVITY: pembuatan fork		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 18 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003
Jumlah operasi : 16 Jumlah operasi inspeksi : 2		

PERPUSKANTORAN
Kantor Wilayah Mandala
BUKARAYA

OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.5	SHEET NO. 1	OF 1
SUBJECT CHARTED: 20" BMX OPC "BIG DADDY"		
ACTIVITY: pembuatan chain wheel		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 5 ORANG	CLOCK: 07.30 - 15.30	
CHARTED BY : WILLYARTO DAN SOFFIE	DATE: 07-05-2003	
APPROVED BY : OENTOENG	DATE: 07-05-2003	
<pre> graph TD Plat --> O1((O-1)) O1 --> O2((O-2)) O2 --> O3((O-3)) O3 --> O4((O-4)) O4 --> O5((O-5)) O5 --> End[] style End fill:none,stroke:none </pre>		
Jumlah operasi : 5		

OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.7	SHEET NO. 1	OF 1
SUBJECT CHARTED: 20" BMX OPC "BIG DADDY"		
ACTIVITY: pembuatan seat post		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 7 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003

Pipa

Mesin Potong

O-1

Potong 5.1"

Mesin Hidrolis

O-2

Hidrolis 9.6"

Mesin Serut

O-3

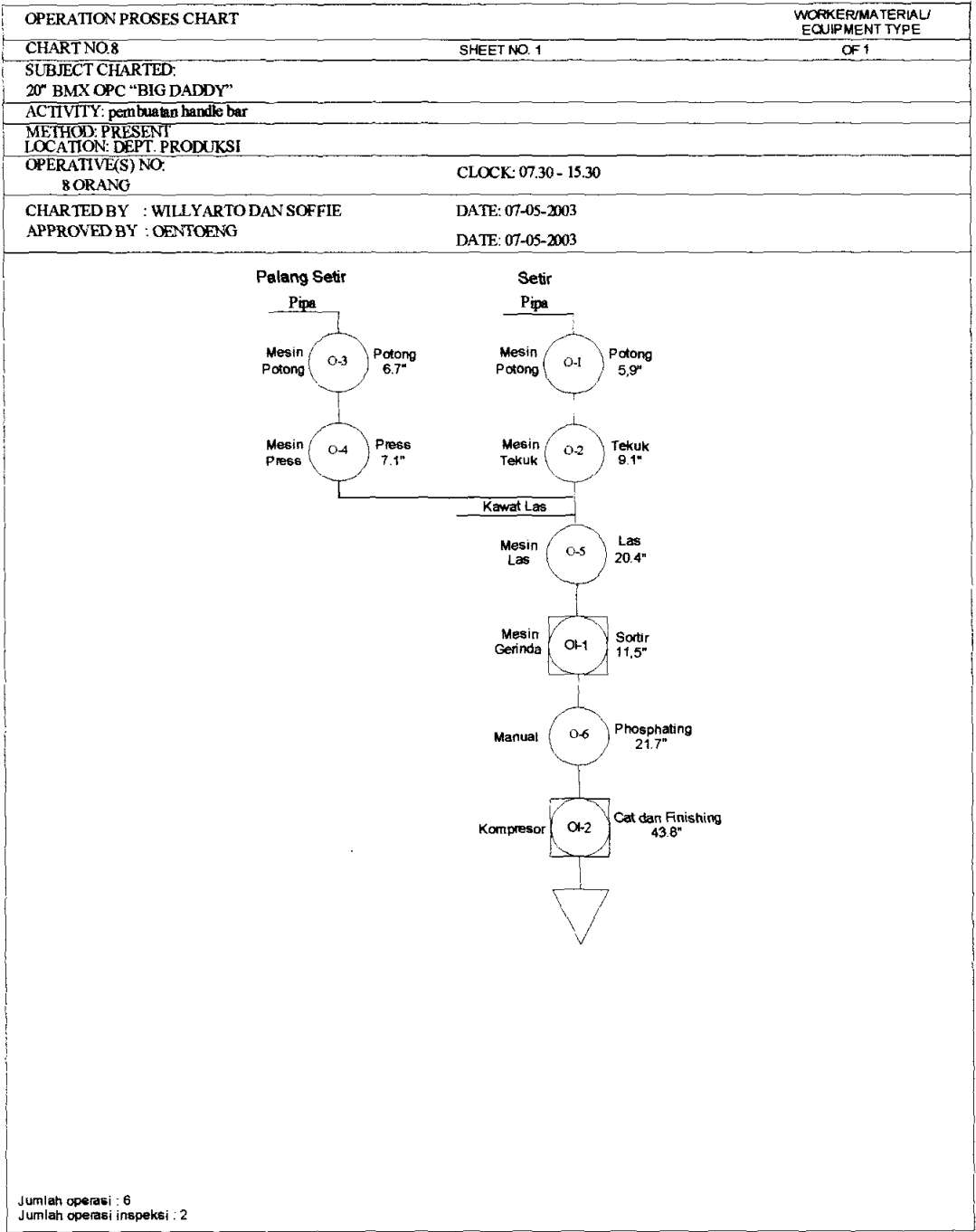
Serut 12.1"

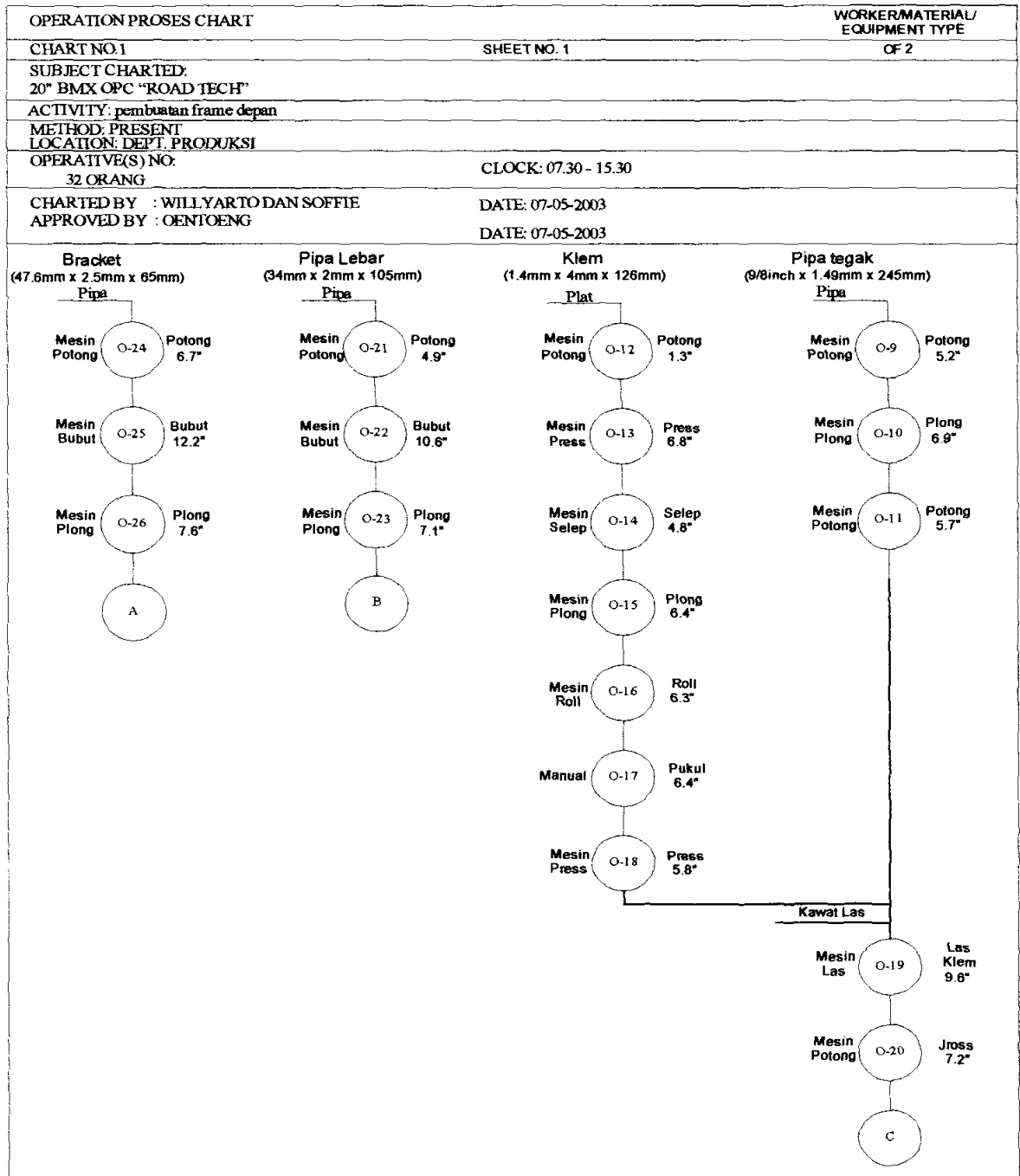
Manual

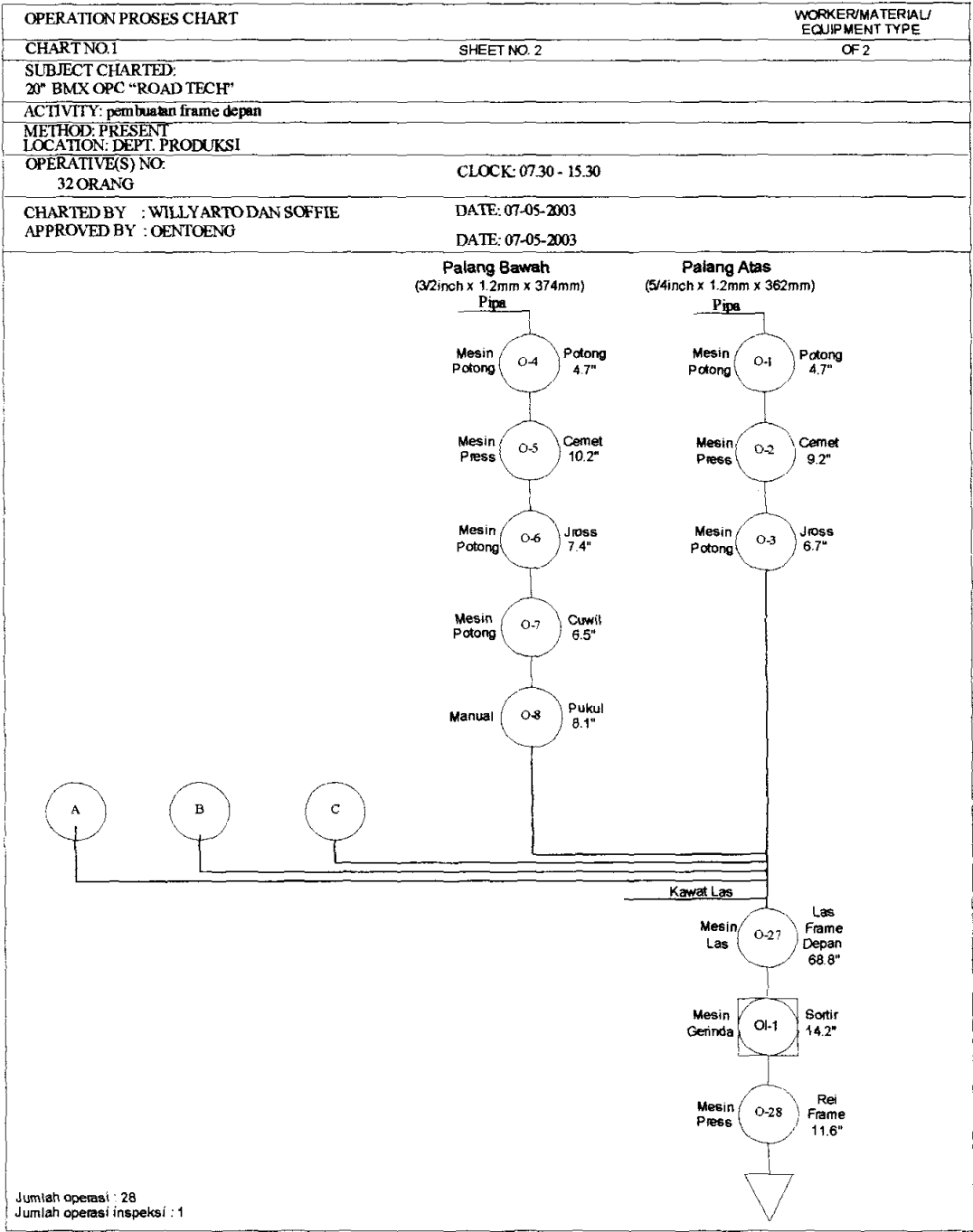
O-4

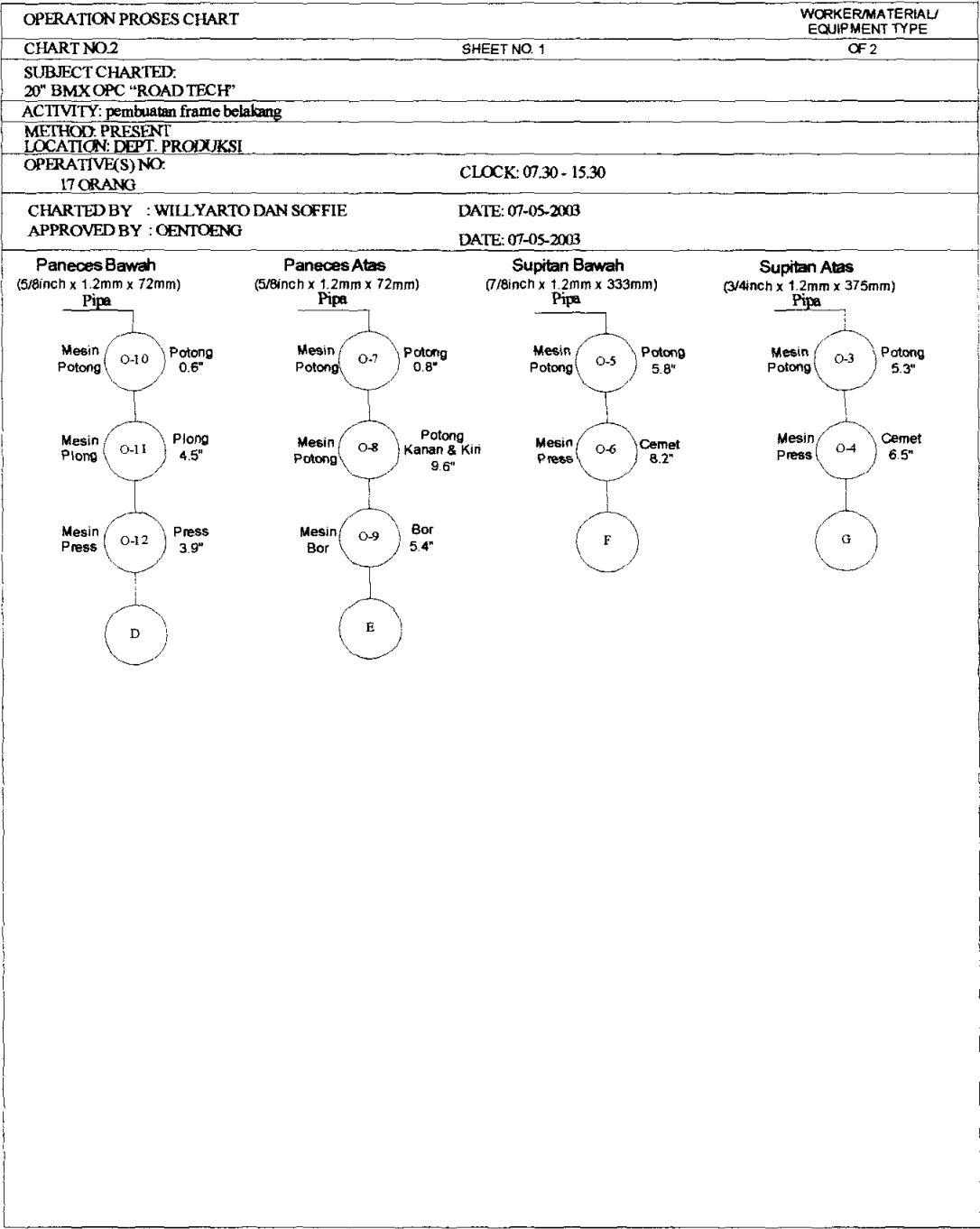
Merk 9.9"

Jumlah operasi : 4





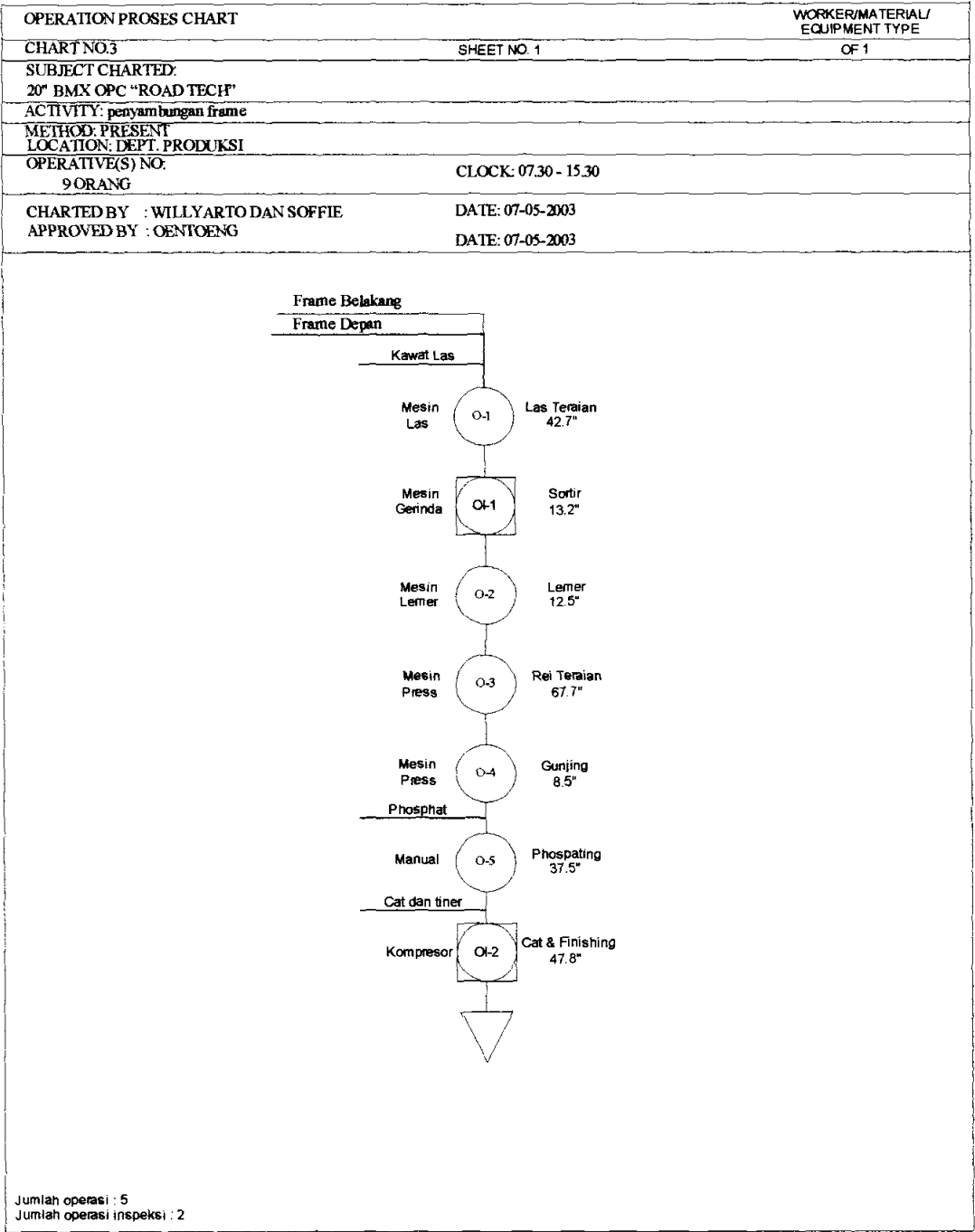


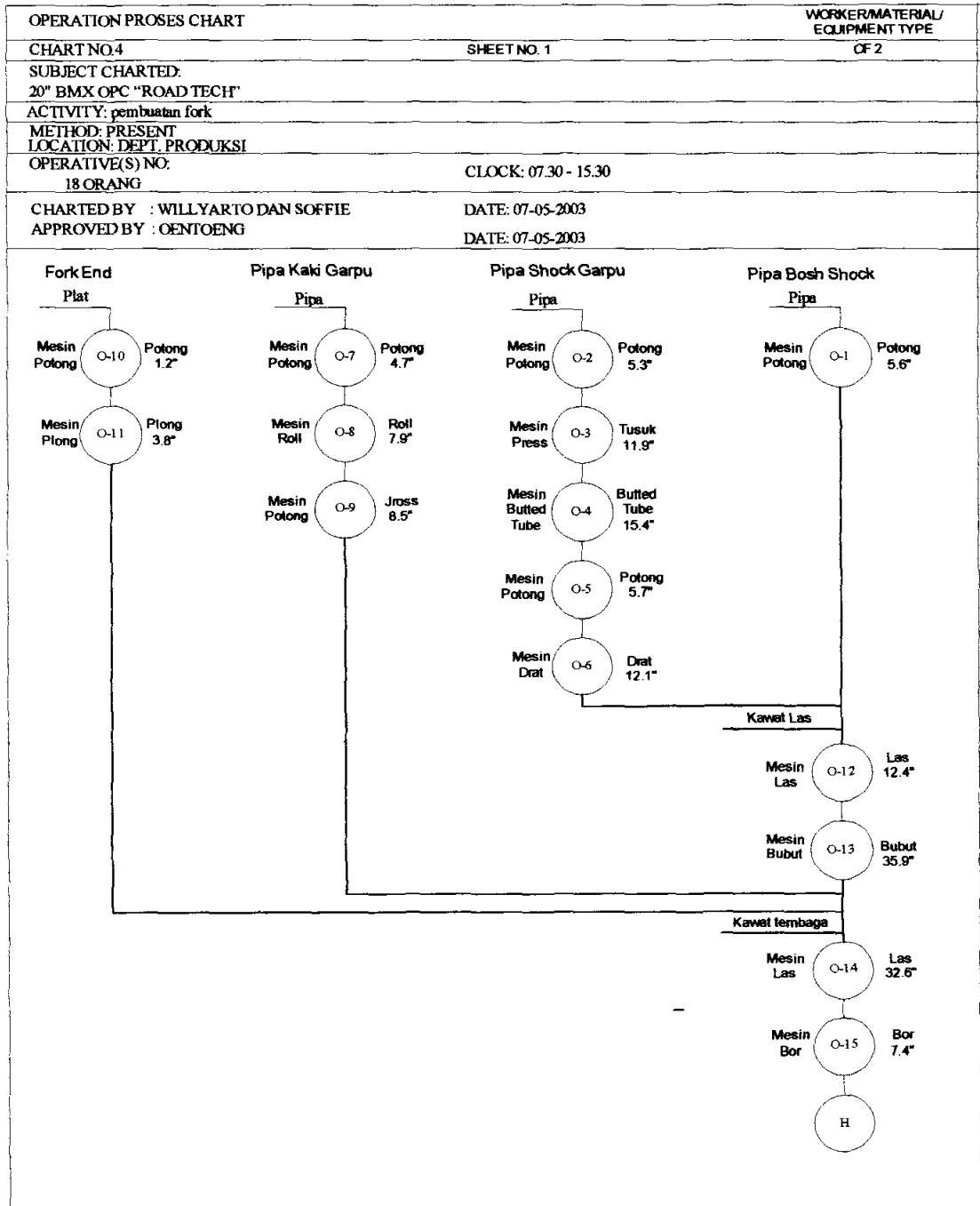


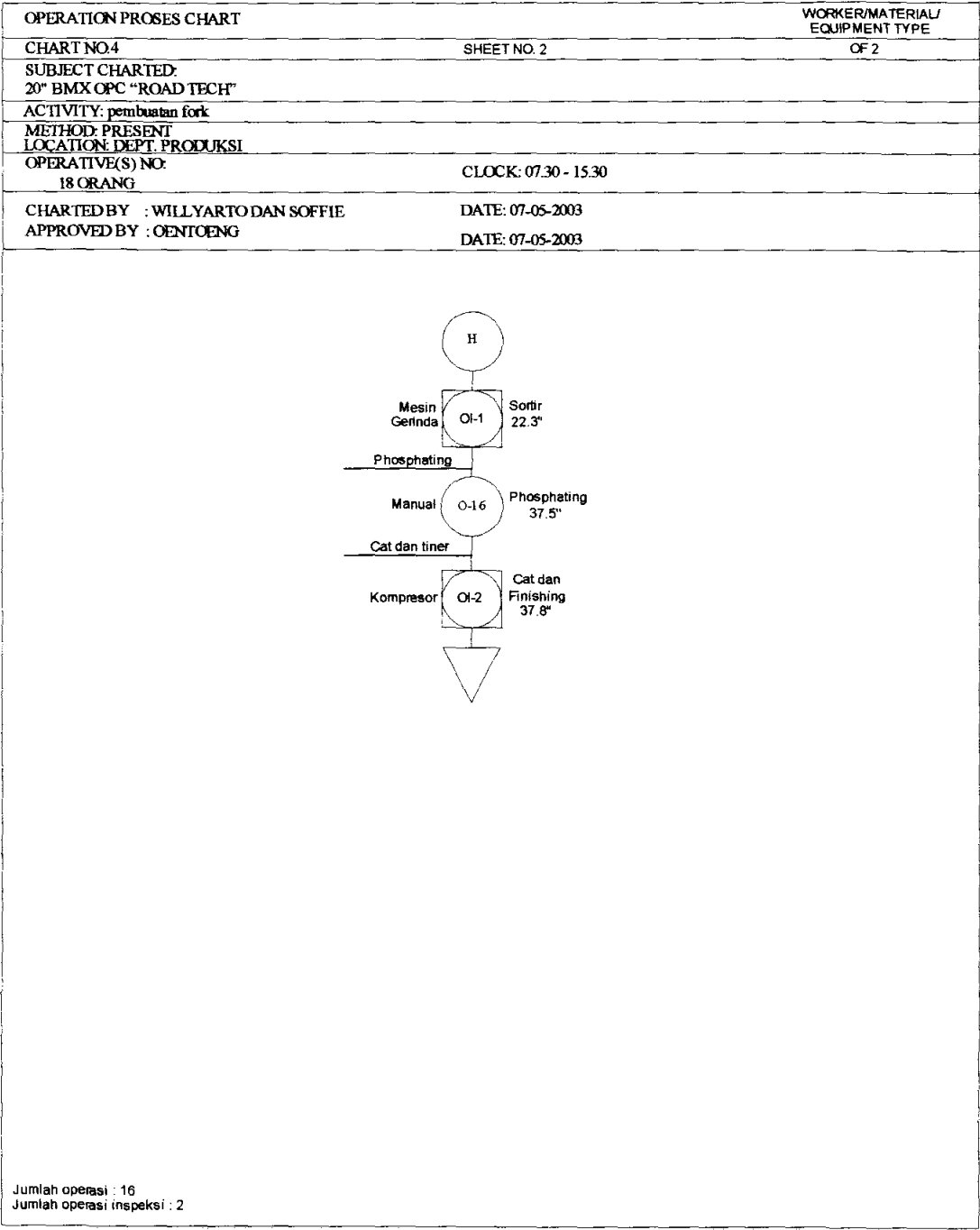
```

graph TD
    Start([Rear End  
(3.2mm x 4mm x 87mm)  
Plat]) --> O1((O-1  
Mesin Potong  
Potong 1,3"))
    O1 --> O2((O-2  
Mesin Plong  
Plong 5,8"))
    O2 --> D((D))
    O2 --> E((E))
    O2 --> F((F))
    O2 --> G((G))
    D --> O13((O-13  
Mesin Las  
Las 52,8"))
    E --> O13
    F --> O13
    G --> O13
    O13 --> O14((O-14  
Mesin Potong  
Potong 8,2"))
    O14 --> O15((O-15  
Mesin Press  
Tekuk 11,6"))
    O15 --> End([ ])
  
```

Jumlah operasi : 15

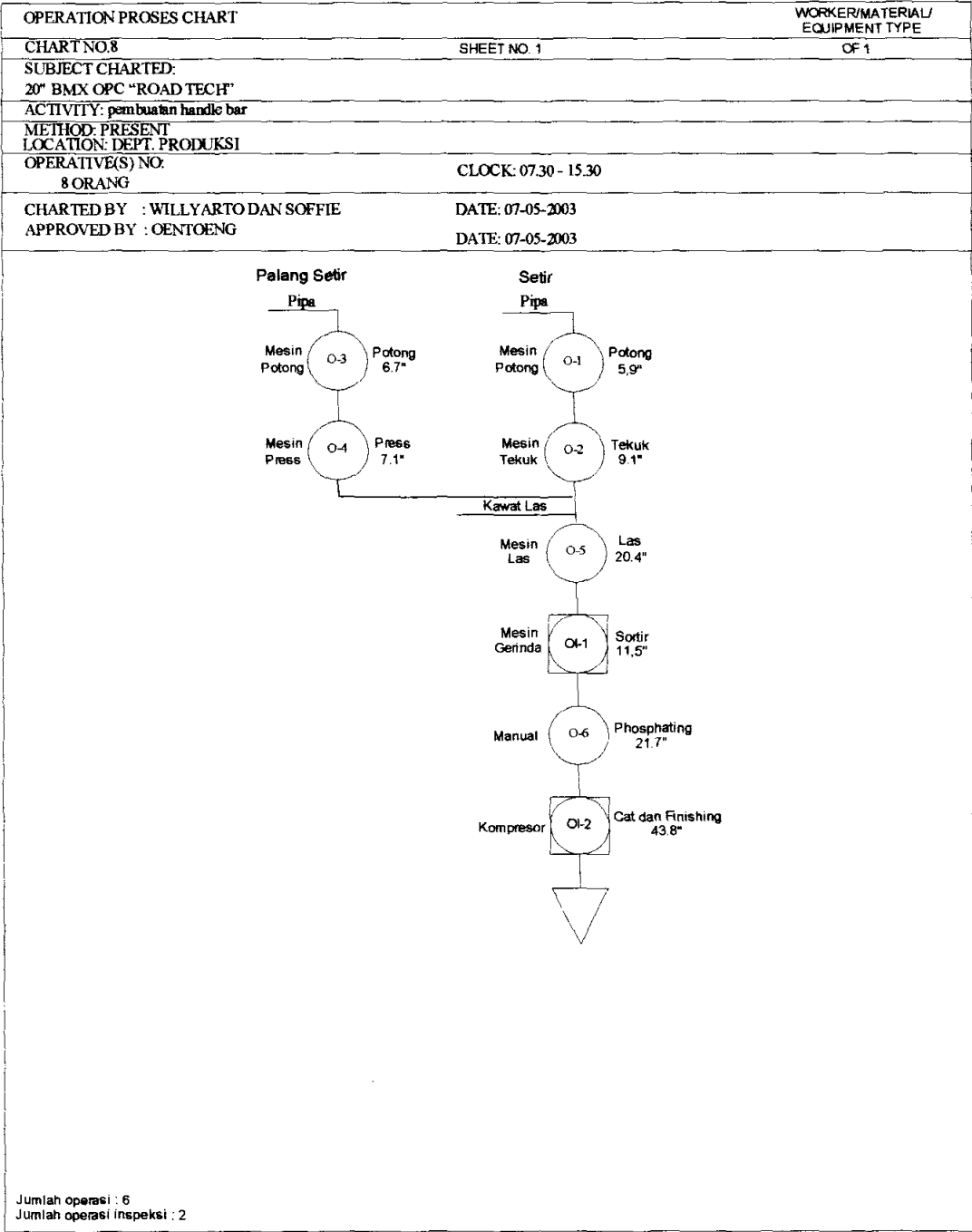


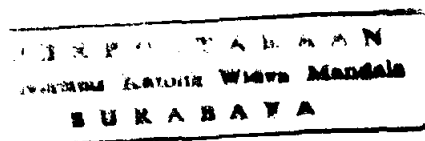




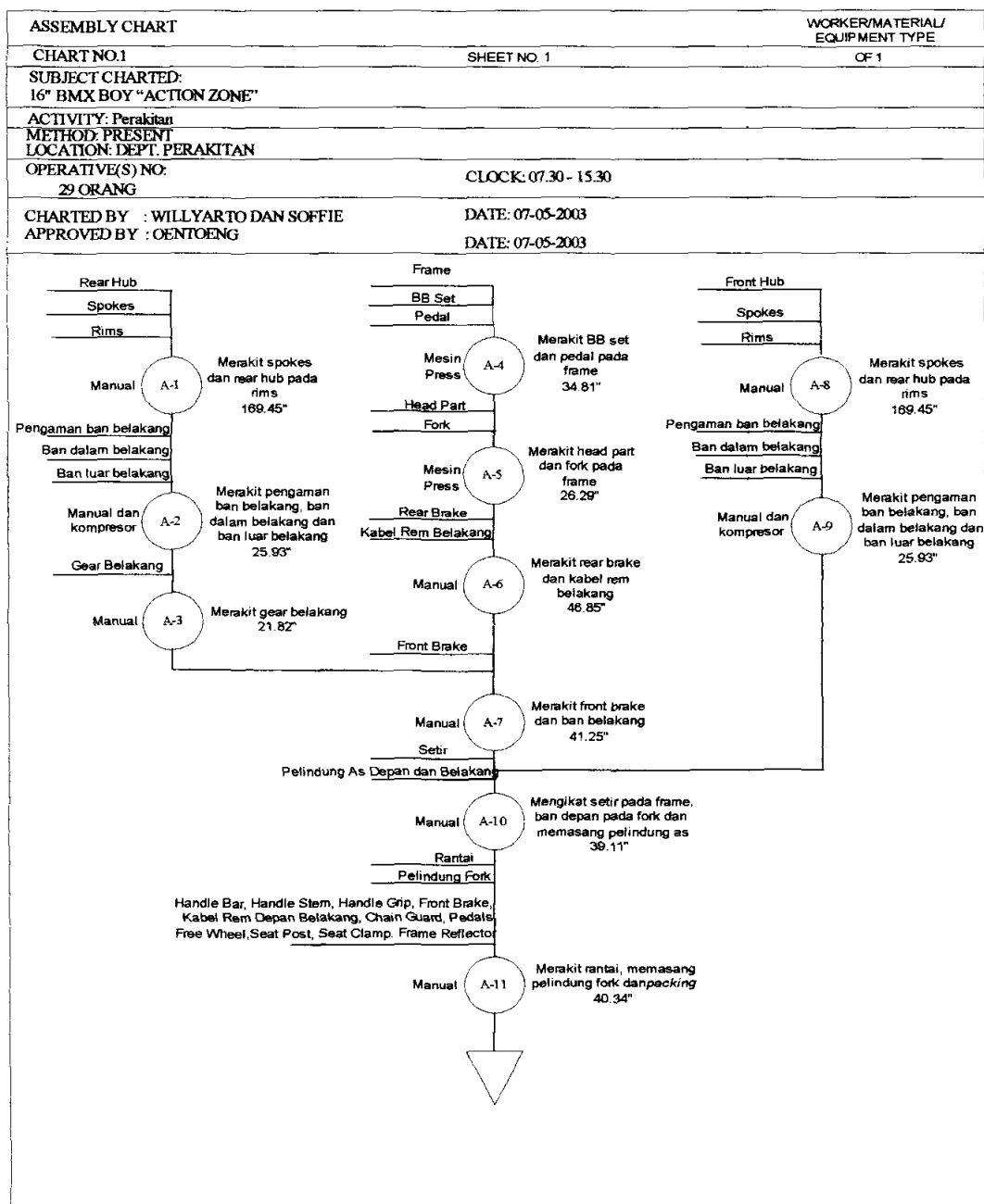
OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.5	SHEET NO. 1	OF 1
SUBJECT CHARTED: 20" BMX OPC "ROAD TECH"		
ACTIVITY: pembuatan chain wheel		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 5 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003
Plat <pre>graph TD; Plat --> O1((O-1)); O1 --> O2((O-2)); O2 --> O3((O-3)); O3 --> O4((O-4)); O4 --> O5((O-5)); O5 --> End[];</pre>		
Jumlah operasi : 5		

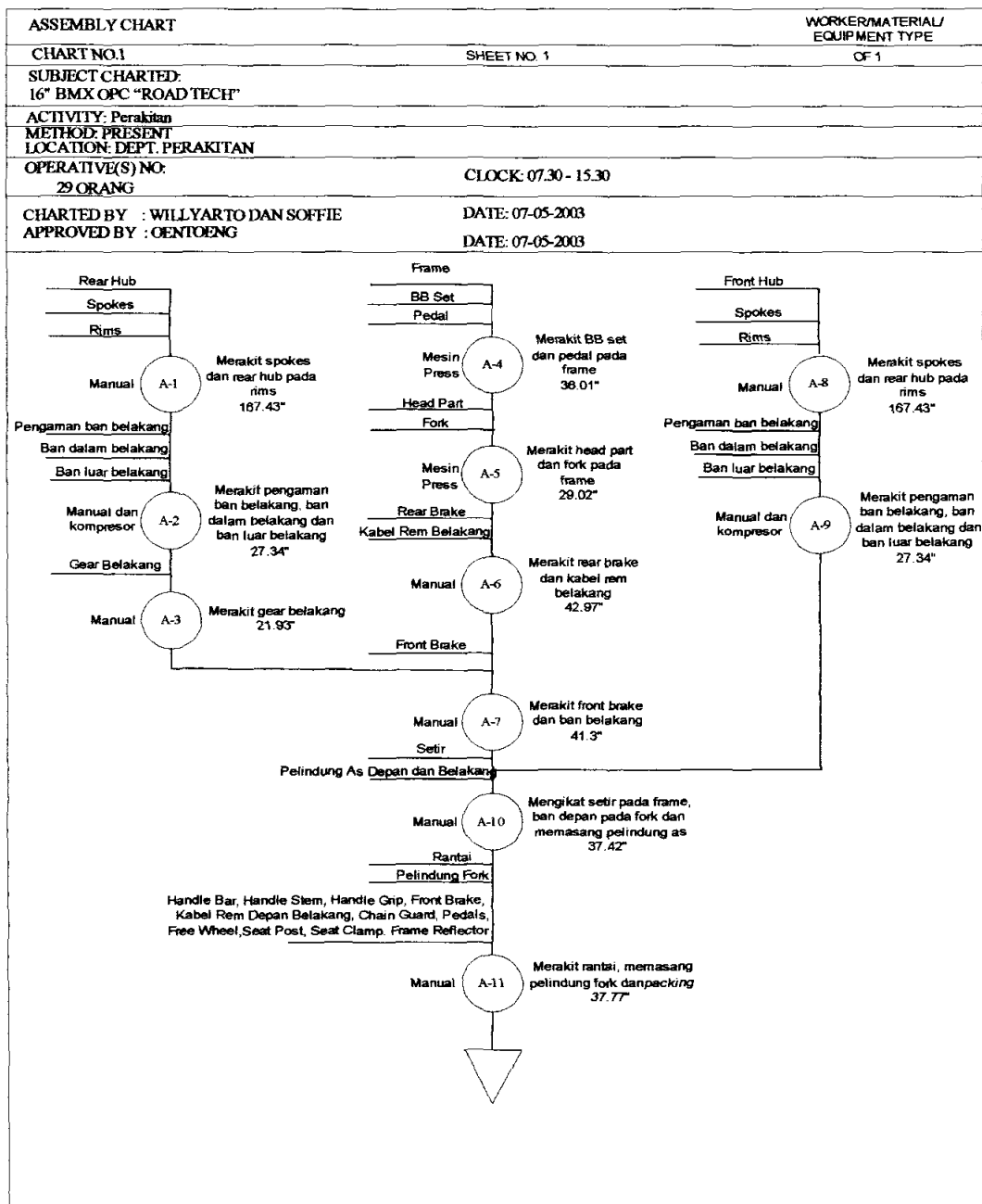
OPERATION PROSES CHART		WORKER/MATERIAL/ EQUIPMENT TYPE
CHART NO.7	SHEET NO. 1	OF 1
SUBJECT CHARTED: 20" BMX OPC "ROAD TECH"		
ACTIVITY: <u>pembuatan seal post</u>		
METHOD: PRESENT		
LOCATION: DEPT. PRODUKSI		
OPERATIVE(S) NO: 7 ORANG		CLOCK: 07.30 - 15.30
CHARTED BY : WILLYARTO DAN SOFFIE		DATE: 07-05-2003
APPROVED BY : OENTOENG		DATE: 07-05-2003
Pipa <pre>graph TD; A[Pipa] --> B((O-1)); B --> C((O-2)); C --> D((O-3)); D --> E((O-4)); E --> F[▽];</pre>		
Jumlah operasi : 4		

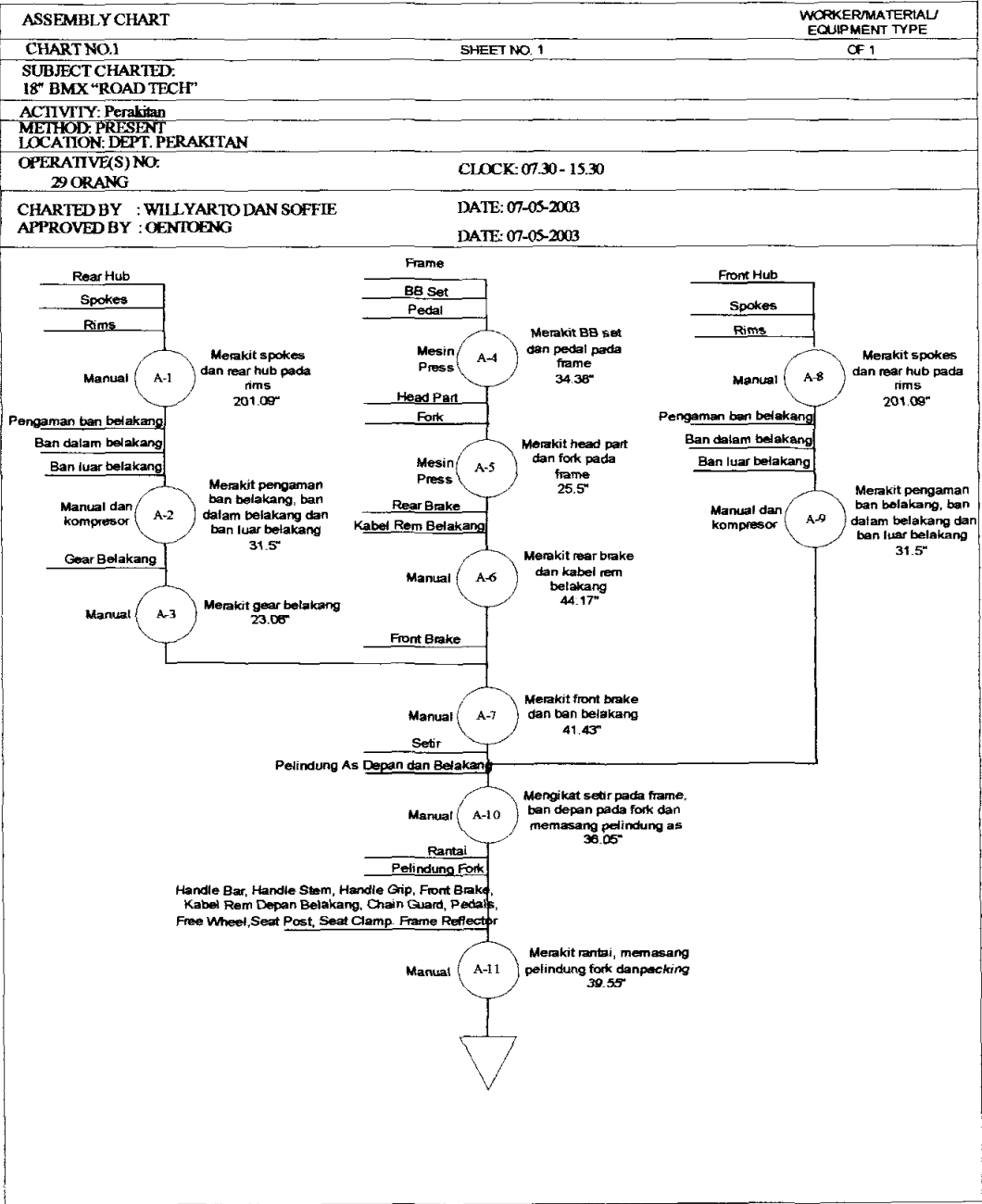


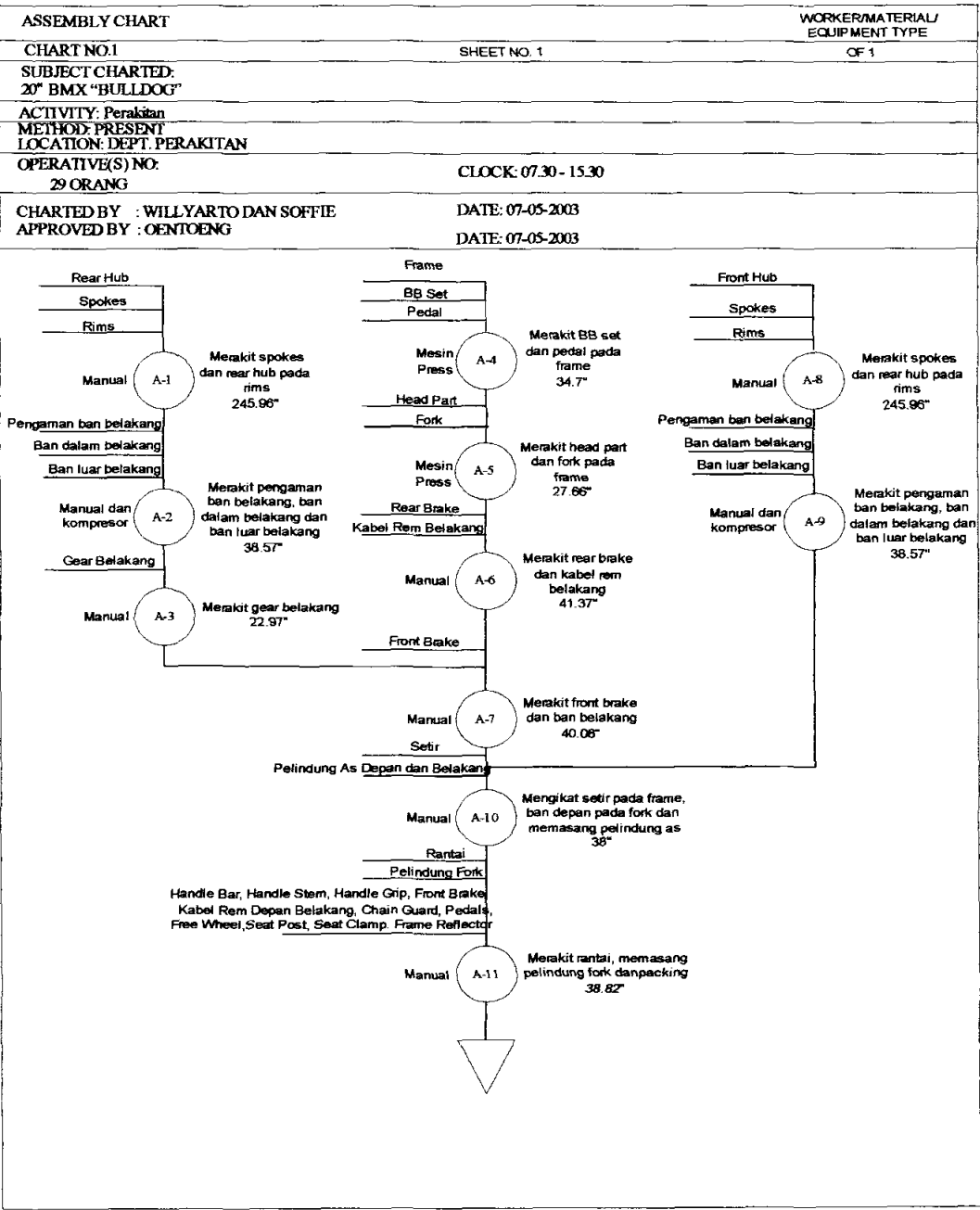


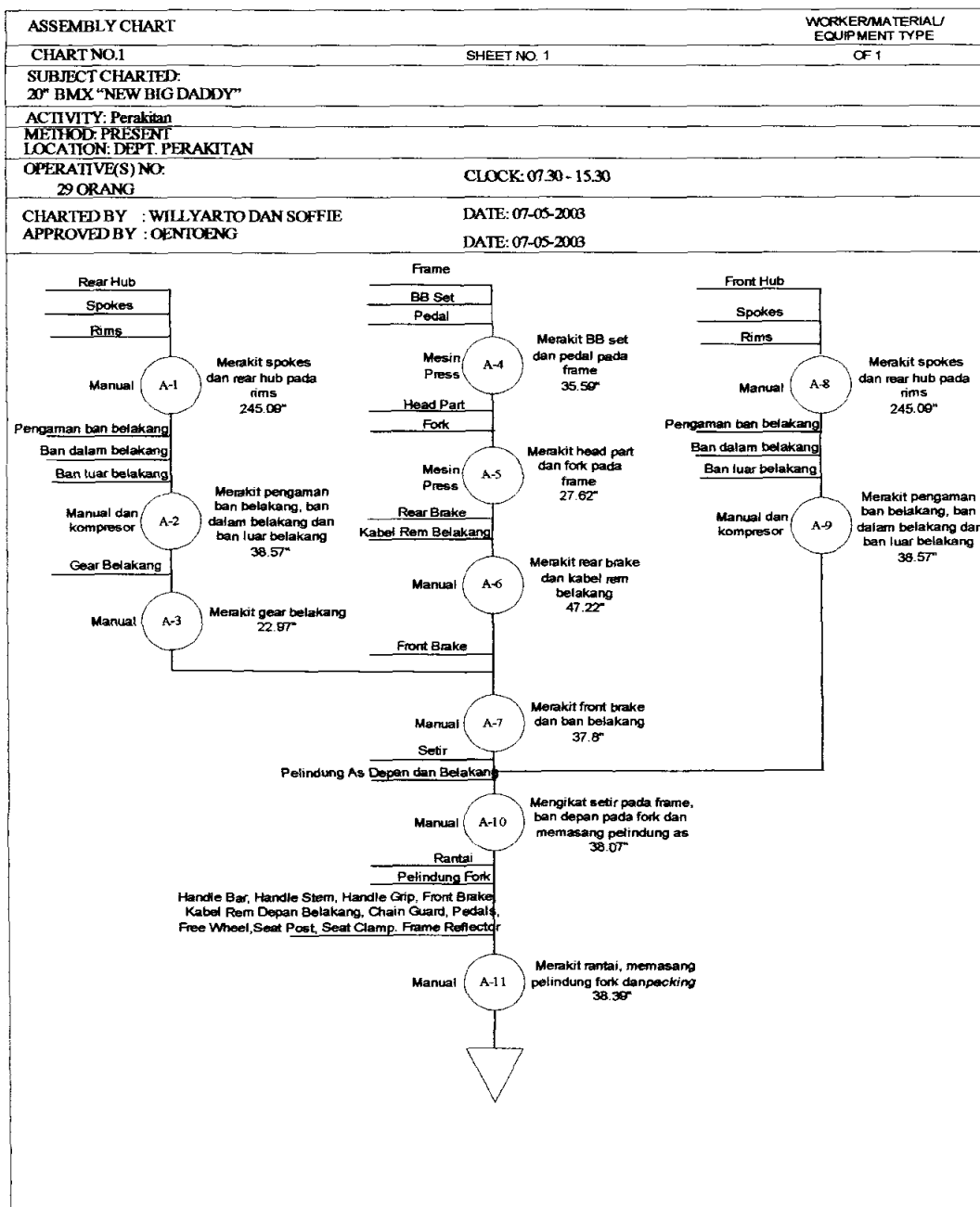
LAMPIRAN C

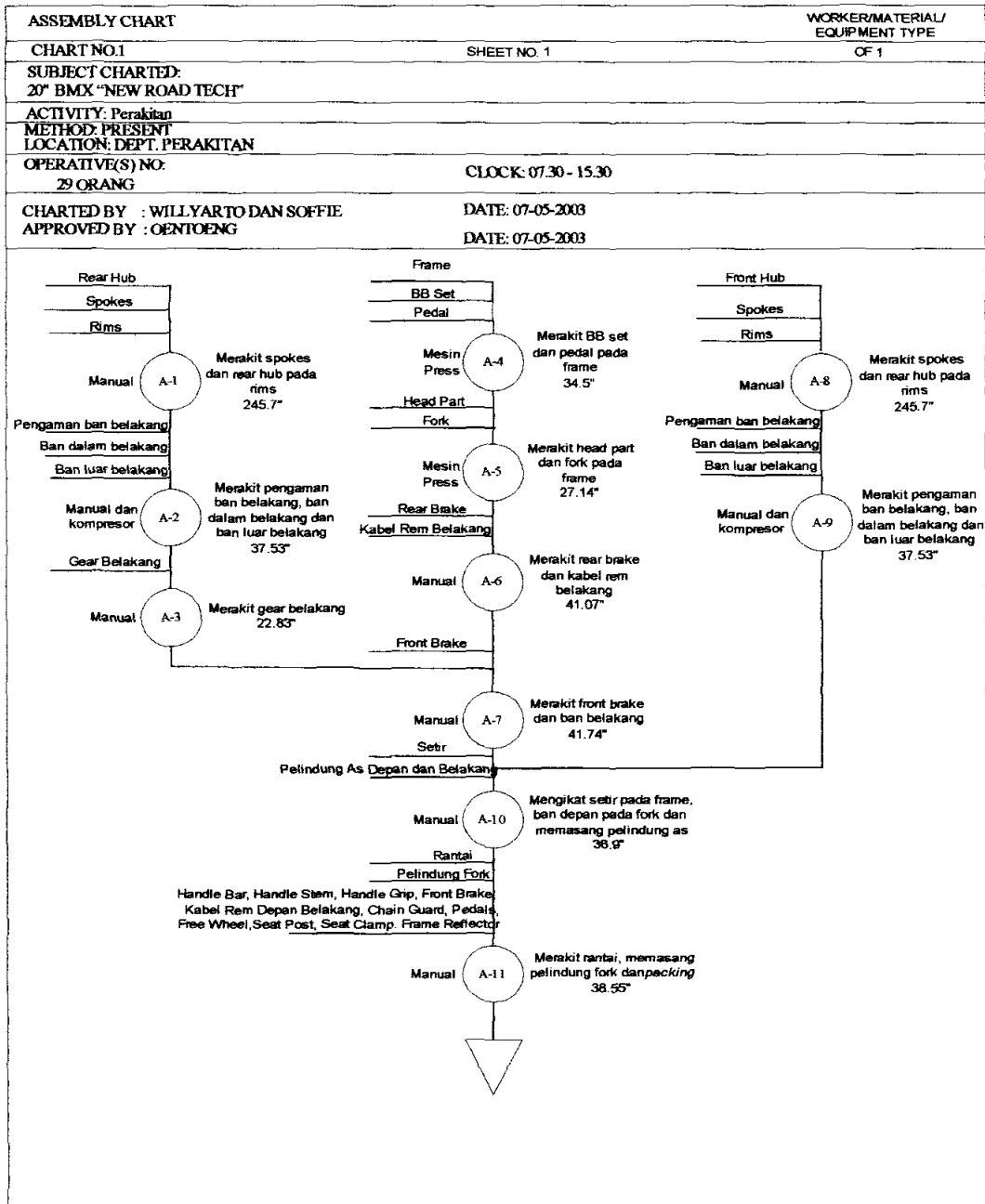












Lampiran D

Tabel D-I Pengamatan Waktu Elemen Kerja 16"
BMX "ACTION ZONE"

Elemen	Pengamatan ke-n									
	1	2	3	4	5	6	7	8	9	10
1	42.23	45.86	46.24	50.72	46.51	45.97	41.93	46.32	47.15	50.89
2	42.23	45.86	46.24	50.72	46.51	45.97	41.93	46.32	47.15	50.89
3	70.03	76.61	75.96	73.19	78.11	76.83	82.89	76.55	80.39	76.28
4	70.03	76.61	75.96	73.19	78.11	76.83	82.89	76.55	80.39	76.28
5	9.56	10.45	10.12	9.53	8.59	9.58	8.81	10.52	10.67	8.86
6	9.56	10.45	10.12	9.53	8.59	9.58	8.81	10.52	10.67	8.86
7	15.85	16.22	17.58	18.53	15.37	15.31	14.28	15.53	17.61	16.31
8	15.85	16.22	17.58	18.53	15.37	15.31	14.28	15.53	17.61	16.31
9	22.96	18.79	20.94	22.48	19.73	22.89	22.97	20.89	23.11	23.45
10	15.82	17.64	16.49	15.37	18.25	14.84	17.93	14.97	16.87	16.53
11	9.34	10.35	8.56	9.91	8.87	9.66	9.41	9.64	8.63	8.19
12	20.79	17.84	19.37	18.57	19.11	17.46	17.22	17.28	17.31	18.46
13	15.16	18.19	16.81	17.28	18.29	16.64	18.41	15.62	16.71	17.15
14	23.83	27.11	26.94	26.55	25.53	23.67	25.64	25.19	23.47	27.41
15	25.97	19.54	24.51	23.92	23.76	22.29	24.72	22.86	20.83	24.86
16	18.14	22.61	21.36	18.65	21.59	22.95	22.56	21.19	20.45	23.71
17	15.27	17.58	18.26	15.68	17.61	16.72	15.32	15.59	15.23	15.12
18	10.88	10.52	13.35	11.24	12.16	12.51	13.11	11.84	10.84	10.52
19	17.23	19.67	18.78	18.19	18.13	16.72	18.37	15.69	18.78	17.67
20	9.78	8.06	9.39	9.53	8.45	9.14	8.96	10.14	9.57	8.31
21	11.07	10.07	10.53	12.43	12.27	12.26	11.14	12.28	10.97	10.14
22	7.16	7.38	7.64	7.12	8.24	7.43	8.41	8.19	8.72	7.22
23	30.34	32.22	32.49	32.61	33.27	32.71	28.31	29.55	30.16	30.46

Tabel D-II Pengamatan Waktu Elemen Kerja 16”
BMX ”ROADTECH”

Elemen	Pengamatan ke-n									
	1	2	3	4	5	6	7	8	9	10
1	46.11	46.27	43.47	49.12	46.59	47.61	46.43	47.69	50.54	48.34
2	46.11	46.27	43.47	49.12	46.59	47.61	46.43	47.69	50.54	48.34
3	72.76	73.64	70.79	75.54	74.24	67.93	71.74	77.06	74.53	71.85
4	72.76	73.64	70.79	75.54	74.24	67.93	71.74	77.06	74.53	71.85
5	9.55	10.17	9.54	10.75	10.53	9.76	10.44	11.81	10.04	9.67
6	9.55	10.17	9.54	10.75	10.53	9.76	10.44	11.81	10.04	9.67
7	16.64	17.04	17.87	16.15	17.44	18.02	17.87	16.88	17.11	16.07
8	16.64	17.04	17.87	16.15	17.44	18.02	17.87	16.88	17.11	16.07
9	20.37	21.06	23.31	20.83	22.71	23.36	21.88	20.62	23.07	22.12
10	16.55	16.13	16.34	13.66	16.05	16.57	13.86	15.53	13.88	13.66
11	11.53	9.63	10.55	11.49	11.31	10.37	9.46	10.25	10.42	10.25
12	22.81	18.23	19.42	21.63	21.99	21.54	19.78	21.75	19.28	20.75
13	19.91	16.67	17.72	19.58	20.95	19.35	19.65	18.24	16.29	16.52
14	24.16	23.04	23.89	24.18	22.19	21.17	23.49	23.97	23.49	24.19
15	19.85	22.97	23.93	24.46	23.93	22.78	22.34	24.75	24.58	22.14
16	17.92	18.42	19.46	21.35	17.89	21.19	20.02	21.79	19.94	17.96
17	16.75	16.79	15.92	15.94	15.64	16.84	16.62	16.53	15.72	17.02
18	11.45	9.57	9.84	10.76	10.23	10.94	10.48	11.12	10.77	8.41
19	16.34	18.65	19.18	17.27	16.98	19.52	17.78	16.04	17.16	21.88
20	8.29	9.09	9.34	8.92	8.97	9.76	8.17	9.97	8.87	9.16
21	10.75	10.18	10.48	10.81	11.47	10.41	11.54	11.41	9.87	9.92
22	7.24	7.16	6.97	9.44	6.91	7.29	7.32	8.26	7.49	7.42
23	29.18	30.84	28.61	32.72	29.7	30.75	31.22	29.95	30.98	29.13

Tabel D-III Pengamatan Waktu Elemen Kerja 18”
BMX ”ROADTECH”

Elemen	Pengamatan ke-n									
	1	2	3	4	5	6	7	8	9	10
1	51.17	55.84	49.52	53.66	52.87	55.71	58.37	53.98	54.99	56.55
2	51.17	55.84	49.52	53.66	52.87	55.71	58.37	53.98	54.99	56.55
3	86.34	94.22	95.05	89.14	91.86	97.28	100.3	91.57	92.47	87.84
4	86.34	94.22	95.05	89.14	91.86	97.28	100.3	91.57	92.47	87.84
5	9.68	12.78	10.15	11.31	9.75	11.64	11.92	11.07	10.75	11.97
6	9.68	12.78	10.15	11.31	9.75	11.64	11.92	11.07	10.75	11.97
7	22.13	19.37	20.67	20.69	19.65	19.14	18.97	21.77	19.93	20.29
8	22.13	19.37	20.67	20.69	19.65	19.14	18.97	21.77	19.93	20.29
9	21.32	24.46	22.27	21.54	25.71	24.51	25.45	21.74	21.76	21.82
10	17.44	15.57	18.68	16.23	17.36	15.06	16.73	16.71	15.07	17.05
11	9.77	9.96	8.85	7.84	9.88	8.91	9.61	9.05	8.29	9.02
12	18.46	18.86	17.81	18.34	17.04	17.68	18.44	16.18	17.54	17.56
13	17.69	17.57	16.83	18.71	17.43	17.09	16.84	17.23	16.72	17.66
14	25.77	23.93	23.2	27.43	25.15	26.88	24.39	26.93	24.26	26.23
15	24.89	25.74	22.29	24.26	23.58	24.61	22.88	23.15	21.46	23.06
16	20.43	18.08	21.12	19.48	17.86	17.52	17.26	20.34	17.36	18.09
17	13.45	17.79	17.18	14.31	17.19	13.89	15.14	16.16	16.06	13.46
18	10.75	10.46	10.12	9.03	10.41	10.96	10.66	10.25	9.87	11.25
19	18.92	17.04	18.12	16.38	18.47	19.89	16.23	19.48	16.58	17.33
20	7.73	10.5	9.01	9.04	7.88	9.56	8.14	9.12	9.47	8.69
21	9.31	9.65	11.64	11.14	10.03	10.36	11.08	9.62	9.94	9.34
22	8.52	7.33	8.17	7.29	8.92	8.58	7.88	8.41	7.12	7.68
23	31.98	29.93	32.97	29.41	30.32	33.17	34.36	31.83	30.41	31.21

Tabel D-IV Pengamatan Waktu Elemen Kerja 20”
BMX ”BULLDOG”

Elemen	Pengamatan ke-n									
	1	2	3	4	5	6	7	8	9	10
1	68.57	67.08	67.67	66.31	65.62	68.22	67.26	68.73	66.92	69.29
2	68.57	67.08	67.67	66.31	65.62	68.22	67.26	68.73	66.92	69.29
3	114.68	109.66	110.37	108.37	112.37	110.84	110.41	109.02	109.72	112.73
4	114.68	109.66	110.37	108.37	112.37	110.84	110.41	109.02	109.72	112.73
5	13.61	11.89	13.14	13.43	10.76	13.36	11.82	11.83	13.21	13.05
6	13.61	11.89	13.14	13.43	10.76	13.36	11.82	11.83	13.21	13.05
7	23.86	24.68	24.21	24.91	23.64	26.35	24.77	23.05	23.73	26.01
8	23.86	24.68	24.21	24.91	23.64	26.35	24.77	23.05	23.73	26.01
9	22.78	23.61	20.49	22.03	21.47	23.77	22.07	22.68	22.41	22.58
10	17.29	19.02	18.61	18.58	17.25	15.68	18.23	15.23	16.24	17.31
11	8.23	9.87	10.36	10.61	10.54	7.65	9.25	8.49	8.69	9.67
12	18.61	18.99	16.97	17.65	18.17	16.17	18.03	15.23	17.48	16.26
13	18.61	17.99	19.97	17.65	18.17	17.17	18.03	18.23	19.14	18.26
14	25.55	22.07	23.93	21.76	21.18	25.18	23.26	23.13	22.09	22.32
15	23.61	23.91	21.09	18.09	23.38	23.62	23.84	24.56	19.69	22.88
16	18.62	17.47	17.38	19.83	18.78	17.82	20.18	16.09	18.71	18.29
17	16.43	15.05	15.67	18.88	16.25	16.91	16.61	15.23	15.86	15.82
18	10.85	10.89	10.02	12.27	10.31	12.27	11.95	11.04	10.25	10.78
19	20.42	19.31	17.62	15.56	17.21	17.08	17.46	16.03	15.04	16.01
20	9.73	8.62	8.06	8.12	9.27	8.97	7.29	9.33	9.04	9.84
21	10.09	12.77	10.41	11.27	9.89	10.31	10.21	10.67	9.31	11.54
22	8.18	6.33	8.82	8.38	7.11	8.55	6.78	7.37	7.45	7.32
23	31.25	30.14	32.45	30.55	30.09	30.91	31.66	31.63	30.79	31.95

Tabel D-V Pengamatan Waktu Elemen Kerja 20"**BMX "NEW BIG DADDY"**

Elemen	Pengamatan ke-n									
	1	2	3	4	5	6	7	8	9	10
1	55.03	68.64	58.68	60.08	71.14	62.11	69.79	66.19	69.45	66.13
2	55.03	68.64	58.68	60.08	71.14	62.11	69.79	66.19	69.45	66.13
3	116.92	105.83	125.06	112.55	119.24	103.75	113.83	104.31	129.42	123.55
4	116.92	105.83	125.06	112.55	119.24	103.75	113.83	104.31	129.42	123.55
5	15.73	14.31	15.42	14.75	17.02	15.67	14.03	15.42	14.95	15.33
6	15.73	14.31	15.42	14.75	17.02	15.67	14.03	15.42	14.95	15.33
7	20.88	21.77	20.37	24.11	24.1	21.58	25.92	23.29	26.64	24.08
8	20.88	21.77	20.37	24.11	24.1	21.58	25.92	23.29	26.64	24.08
9	22.88	24.26	25.03	23.82	21.46	23.28	19.99	22.23	22.07	24.66
10	16.87	16.33	17.69	15.31	19.68	18.08	21.32	17.42	19.92	17.31
11	10.01	9.19	10.52	9.55	11.35	9.37	10.51	9.64	11.43	9.21
12	17.04	17.55	17.65	17.62	18.9	14.63	17.97	19.32	17.44	17.32
13	16.7	16.62	14.32	15.84	18.97	19.18	17.94	18.48	15.59	16.25
14	21.83	24.19	23.61	25.81	24.37	24.84	25.61	26.33	24.45	27.02
15	19.32	21.69	19.87	20.63	22.24	19.65	19.22	18.85	22.61	19.01
16	24.12	23.83	22.73	24.57	23.88	20.35	20.57	20.09	21.37	22.58
17	15.01	19.12	16.32	18.72	15.71	16.57	14.22	17.74	15.33	16.97
18	11.22	9.91	10.63	12.82	11.95	10.63	12.23	11.57	11.75	9.56
19	17.13	17.36	17.34	19.02	15.28	18.27	17.15	16.76	19.43	19.15
20	9.89	9.89	10.41	7.71	8.25	9.03	8.87	8.23	9.22	9.03
21	10.06	10.38	9.79	9.32	10.65	9.53	10.56	9.33	10.33	11.82
22	7.62	9.87	8.11	8.05	7.21	6.73	8.09	7.83	8.16	9.37
23	30.48	35.29	33.41	27.98	33.45	26.12	29.35	30.39	26.18	29.27

**Tabel D-VI Pengamatan Waktu Elemen Kerja 20”
BMX ”NEW ROADTECH”**

Elemen	Pengamatan ke-n									
	1	2	3	4	5	6	7	8	9	10
1	61.73	66.04	62.38	68.83	68.89	63.84	65.47	69.77	61.26	72.57
2	61.73	66.04	62.38	68.83	68.89	63.84	65.47	69.77	61.26	72.57
3	100.93	110.38	128.34	109.34	101.68	124.36	112.21	113.62	118.41	116.15
4	100.93	110.38	128.34	109.34	101.68	124.36	112.21	113.62	118.41	116.15
5	14.22	16.72	15.43	12.67	14.81	13.33	16.98	13.88	13.66	13.72
6	14.22	16.72	15.43	12.67	14.81	13.33	16.98	13.88	13.66	13.72
7	23.11	24.58	20.48	22.85	24.85	20.65	23.26	23.07	22.33	22.19
8	23.11	24.58	20.48	22.85	24.85	20.65	23.26	23.07	22.33	22.19
9	22.44	24.21	20.45	23.49	23.98	24.88	19.16	24.28	22.98	22.43
10	18.45	14.84	17.69	15.29	16.22	15.27	15.55	16.52	17.67	15.27
11	8.77	8.12	8.52	7.91	7.02	9.02	10.18	7.73	9.12	8.3
12	18.77	18.65	17.72	15.36	19.77	15.68	18.23	16.08	16.23	20.17
13	16.34	19.34	19.18	20.38	18.36	18.67	17.37	18.57	18.24	18.67
14	26.34	23.46	21.43	22.28	22.78	23.17	22.27	18.78	24.96	22.76
15	24.37	22.35	22.37	25.79	24.71	20.31	25.24	22.89	23.64	24.16
16	19.08	17.49	19.95	17.36	16.83	17.81	14.13	20.05	20.75	16.61
17	16.73	17.04	17.09	16.27	15.26	15.27	16.68	15.52	14.99	17.96
18	9.72	9.93	11.42	10.47	9.25	11.67	10.83	10.28	10.88	10.67
19	18.03	19.51	18.11	15.27	16.48	18.69	19.73	18.05	19.89	17.85
20	9.05	10.07	9.73	10.21	10.04	9.04	9.52	10.56	9.28	9.17
21	9.67	11.45	10.38	10.33	11.27	9.34	10.78	9.98	9.88	8.03
22	8.13	7.48	6.87	6.53	8.95	6.93	7.73	7.22	8.48	8.06
23	30.43	30.05	27.97	28.92	33.71	28.01	32.7	36.01	30.68	26.33

LAMPIRAN E

KEPUTUSAN PRESIDEN REPUBLIK INDONESIA

NOMOR : 89/2002

TANGGAL : 31 Desember 2002

TARIF DASAR LISTRIK UNTUK KEPERLUAN INDUSTRI

NO.	GOL. TARIF	BATAS DAYA	BIAYA BEBAN (Rp./kVA/bulan)		BIAYA PEMAKAIAN (Rp./kWh)	
			TRW. I 2003	TRW. II 2003	TRW. I 2003	TRW. II 2003
1.	I-1/TR	s.d. 450 VA	24.000	25.000	Blok I: 0 s.d. 30 kWh : 158 Blok II: di atas 30 kWh : 325	Blok I: 0 s.d. 30 kWh : 159 Blok II: di atas 30 kWh : 360
2.	I-1/TR	900 VA	27.000	29.500	Blok I: 0 s.d. 72 kWh : 250 Blok II: di atas 72 kWh : 330	Blok I: 0 s.d. 72 kWh : 280 Blok II: di atas 72 kWh : 365
3.	I-1/TR	1.300 VA	28.000	30.000	Blok I: 0 s.d. 104 kWh : 390 Blok II: di atas 104 kWh : 400	Blok I: 0 s.d. 104 kWh : 420 Blok II: di atas 104 kWh : 430
4.	I-1/TR	2.200 VA	28.500	30.200	Blok I: 0 s.d. 196 kWh : 395 Blok II: di atas 196 kWh : 405	Blok I: 0 s.d. 196 kWh : 425 Blok II: di atas 196 kWh : 435
5.	I-1/TR	di atas 2.200 VA s.d. 14 kVA	28.700	30.400	Blok I: 0 s.d. 80 jam nyala : 400 Blok II: di atas 80 jam nyala : 410	Blok I: 0 s.d. 80 jam nyala : 425 Blok II: di atas 80 jam nyala : 435
6.	I-2/TR	di atas 14 kVA s.d. 200 kVA	29.000	31.000	Blok WBP = $K \times 395$ Blok LWBP = 395	Blok WBP = $K \times 410$ Blok LWBP = 410
7.	I-3/TM	di atas 200 kVA	26.100	27.800	0 s.d. 350 jam nyala, Blok WBP = $K \times 387$ di atas 350 jam nyala, Blok WBP = 387 Blok LWBP = 387	0 s.d. 350 jam nyala, Blok WBP = $K \times 412$ di atas 350 jam nyala, Blok WBP = 412 Blok LWBP = 412
8.	I-4/TT	30.000 kVA ke atas	24.000	25.500	387	410

Catatan :

K : Faktor perbandingan antara harga WBP dan LWBP sesuai dengan karakteristik beban sistem kelistrikan setempat (1,4 £ K £ 2), yang ditetapkan oleh Direksi Perusahaan Perseroan (PERSERO) PT Perusahaan Listrik Negara.

WBP : Waktu Beban Puncak

LWBP : Luar Waktu Beban Puncak

Jam nyala : adalah kWh per bulan dibagi dengan kVA tersambung

LAMPIRAN F

Model Optimasi Untuk Perancangan Lintasan Perakitan di P.T. WIMCYCLE

Contoh notasi kombinasi elemen untuk stasiun-10 sampai dengan stasiun-23:

D1011 : kombinasi elemen-10 dan elemen-11 pada stasiun-11.

C...P = Stasiun-10...stasiun-23

Persamaan (4.7)

$$\text{MIN } B1+B2+B3+B4+B5+B6+B7+B8+B9+B10+B11+B12+B13+B14+B15+B16+B17+B18+B19+B20+B21+B22+B23+2023.3086C-750000X$$

ST

Persamaan (4.1)

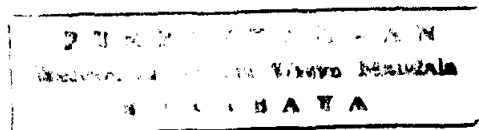
$$\begin{aligned}
 &X101-B101 \geq 0 \\
 &X201-B201 \geq 0 \\
 &X101+X201-2B1201 \geq 0 \\
 &X101+X301-2B1301 \geq 0 \\
 &X101+X301+X501-3B13501 \geq 0 \\
 &X201+X401+X601-3B24601 \geq 0 \\
 &X102-B102 \geq 0 \\
 &X202-B202 \geq 0 \\
 &X302-B302 \geq 0 \\
 &X402-B402 \geq 0 \\
 &X502-B502 \geq 0 \\
 &X602-B602 \geq 0 \\
 &X702-B702 \geq 0 \\
 &X802-B802 \geq 0 \\
 &X902-B902 \geq 0 \\
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 &X102+X302-2B1302 \geq 0 \\
 &X102+X402-2B1402 \geq 0 \\
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 &X102+X802-2B1802 \geq 0 \\
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 &X702+X802-2B7802 \geq 0 \\
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 &X102+X302+X602-3B13602 \geq 0 \\
 &X102+X402+X502-3B14502 \geq 0 \\
 &X102+X402+X602-3B14602 \geq 0
 \end{aligned}$$

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 $X21018+X23018-2K2123 \geq 0$
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 $X21021-N21 \geq 0$
 $X22021-N22 \geq 0$
 $X23021-N23 \geq 0$
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 $X17021+X21021+X22021-3N172122 \geq 0$
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 $X22022-O22 \geq 0$
 $X23022-O23 \geq 0$
 $X21022+X22022-2O2122 \geq 0$
 $X21022+X23022-2O2123 \geq 0$
 $X22022+X23022-2O2223 \geq 0$
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Persamaan (4.2)

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 F1418+F1518+F1618+F1718+F1819+F1820+F1821+F121820+F121821+F141820+F151820+F151821+
 F161820+F161821+F171820+F171821+F181920+F181921+F182021+G18+G1018+G1218+G1418+
 G1518+G1618+G1718+G1819+G1820+G1821+G1822+G121820+G121821+G141820+G151820+
 G151821+G151822+G161820+G161821+G171820+G171821+G171822+G181920+G181921+G182021+G182
 022+G182122+H18+H1218+H1418+H1518+H1618+H1718+H1819+H1820+H1821+H1822+
 H121820+H121821+H141820+H151820+H151821+H151822+H161820+H161821+H171820+H171821+H171
 822+H181920+H181921+H182021+H182022+H182122+H18+H1218+H1418+H1518+H1618+H1718+
 I1819+I1820+I1821+I1822+I121820+I121821+I141820+I151820+I151821+I151822+I161820+I161821+
 I171820+I171821+I171822+I181920+I181921+I182021+I182022+I182122+J18+J1218+J1418+J1518+
 J1618+J1718+J1819+J1820+J1821+J1822+J121820+J121821+J141820+J151820+J151821+J151822+
 J161820+J161821+J171820+J171821+J171822+J181920+J181921+J182021+J182022+J182122+K18+
 K1218+K1418+K1518+K1618+K1718+K1819+K1820+K1821+K1822+K121820+K121821+K141820+
 K151820+K151821+K151822+K161820+K161821+K171820+K171821+K171822+K181920+K181921+K182
 021+K182022+K182122+L18+L1418+L1518+L1618+L1718+L1819+L1820+L1821+L1822+
 L141820+L151820+L151821+L151822+L161820+L161821+L171820+L171821+L171822+L181920+
 L181921+L182021+L182022+L182122+M18+M1618+M1718+M1820+M1821+M1822+M161820+
 M161821+M171820+M171821+M171822+M182021+M182022+M182122=I
 C19+C1019+C1119+C1219+C101119+D19+D1019+D1119+D1219+D1319+D1419+D1519+D1619+
 D1920+D101119+D111920+D181920+E19+E1019+E1119+E1219+E1319+E1419+E1519+E1619+
 E1819+E1920+E1921+E101119+E111920+E181920+E181921+E192021+F19+F1019+F1219+F1319+
 F1419+F1519+F1619+F1719+F1819+F1920+F1921+F181920+F181921+F192021+G19+G1019+G1219+G131
 9+G1419+G1519+G1619+G1719+G1819+G1920+G1921+G171920+G181920+G181921+
 G192021+G192022+H19+H1219+H1319+H1419+H1519+H1619+H1719+H1819+H1920+H1921+
 H171920+H181920+H181921+H192021+H192022+I19+I1219+I1319+I1419+I1519+I1619+I1719+
 I1819+I1920+I1921+I171920+I181920+I181921+I192021+I192022+J19+J1219+J1319+J1419+J1519+
 J1619+J1719+J1819+J1920+J1921+J171920+J181920+J181921+J192021+J192022+K19+K1219+
 K1319+K1419+K1519+K1619+K1719+K1819+K1920+K1921+K171920+K181920+K181921+
 K192021+K192022+L19+L1319+L1419+L1519+L1619+L1719+L1819+L1920+L1921+L171920+
 L181920+L181921+L192021+L192022=I
 D20+D1220+D1320+D1420+D1520+D1620+D1820+D1920+D111920+D121820+D141820+D151820+
 D161820+D181920+E20+E1220+E1420+E1520+E1620+E1820+E1920+E2021+E111920+E121820+
 E141820+E142021+E151820+E161820+E181920+E182021+E192021+F20+F1220+F1320+F1420+
 F1520+F1620+F1720+F1820+F1920+F2021+F121720+F121820+F131720+F141820+F142021+
 F151820+F161820+F171820+F171920+F172021+F172022+F181920+F182021+F192021+G20+G1220+G132
 0+G1420+G1520+G1620+G1720+G1820+G1920+G2022+G121720+G121820+G122022+
 G131720+G141820+G142021+G151820+G161820+G171820+G171920+G172021+G172022+G181920+G182
 021+G182022+G192021+G192022+G202122+H20+H1220+H1320+H1420+H1520+H1620+
 H1720+H1820+H1920+H2021+H2022+H121720+H121820+H122022+H131720+H141820+H142021+
 H151820+H161820+H171820+H171920+H172021+H172022+H181920+H182021+H182022+H192021+H192
 022+H202122+I20+I1220+I1320+I1420+I1520+I1620+I1720+I1820+I1920+I2021+I2022+
 I121720+I121820+I122022+I131720+I141820+I142021+I151820+I161820+I171820+I171920+I172021+
 I172022+I181920+I182021+I182022+I192021+I192022+I202122+J20+J1220+J1320+J1420+J1520+
 J1620+J1720+J1820+J1920+J2021+J2022+J121720+J121820+J122022+J131720+J141820+J142021+
 J151820+J161820+J171820+J171920+J172021+J172022+J181920+J182021+J182022+J192021+
 J192022+J202122+K20+K1220+K1320+K1420+K1520+K1620+K1720+K1820+K1920+K2021+
 K2022+K121720+K121820+K122022+K131720+K141820+K142021+K151820+K161820+K171820+
 K171920+K172021+K172022+K181920+K182021+K182022+K192021+K192022+K202122+L20+
 L1320+L1420+L1520+L1620+L1720+L1820+L1920+L2021+L2022+L131720+L141820+L142021+
 L151820+L161820+L171820+L171920+L172021+L172022+L181920+L182021+L182022+L192021+

$$\begin{aligned}
& L192022+L202122+M20+M1620+M1720+M1820+M2021+M2022+M161820+M171820+M172021+ \\
& M172022+M182021+M182022+M202122+N20+N1720+N2021+N2022+N172021+N172022+ \\
& N202122=1 \\
& G172122+H172122+I172122+J172122+K172122+L172122+M172122+N172122+E21+E1421+E1621+ \\
& E1821+E1921+E2021+E121821+E142021+E151821+E161821+E181921+E182021+E192021+F21+ \\
& F1421+F1621+F1721+F1821+F1921+F2021+F121821+F142021+F151821+F161821+F171821+ \\
& F172021+F181921+F182021+F192021+G21+G1421+G1621+G1721+G1821+G1921+G2021+G2122+ \\
& G121821+G142021+G151821+G161821+G171821+G172021+G181921+G182021+G182122+G192021+G202 \\
& 122+H21+H1421+H1621+H1721+H1821+H1921+H2021+H2122+H2123+H121821+H142021+ \\
& H151821+H161821+H171821+H172021+H181921+H182021+H182122+H192021+H202122+I21+ \\
& I1421+I1621+I1721+I1821+I1921+I2021+I2122+I2123+I121821+I142021+I151821+I161821+I171821+ \\
& I172021+I181921+I182021+I182122+I192021+I202122+J21+J1421+J1621+J1721+J1821+J1921+J2021+J212 \\
& 2+J2123+J121821+J142021+J151821+J161821+J171821+J172021+J181921+J182021+J182122+ \\
& J192021+J202122+K21+K1421+K1621+K1721+K1821+K1921+K2021+K2122+K2123+K121821 \\
& K142021+K151821+K161821+K171821+K172021+K181921+K182021+K182122+K192021+K202122+L21+ \\
& L1421+L1621+L1721+L1821+L1921+L2021+L2122+L2123+L142021+L151821+L161821+ \\
& L171821+L172021+L181921+L182021+L182122+L192021+L202122+M21+M1621+M1721+M1821+ \\
& M2021+M2122+M2123+M161821+M171821+M172021+M182021+M182122+M202122+N21+N1721+N202 \\
& 1+N2122+N2123+N172021+N202122+O21+O2122+O2123=1 \\
& G172122+H172122+I172122+J172122+K172122+L172122+M172122+N172122+ \\
& G22+G1822+G2022+G2122+G122022+G151822+G161722+G171822+G172022+G182022+G182122+ \\
& G192022+G202122+H22+H1822+H2022+H2122+H2223+H122022+H151822+H161722+H171822+ \\
& H172022+H182022+H182122+H192022+H202122+I22+I1822+I2022+I2122+I2223+I122022+I151822+ \\
& I161722+I171822+I172022+I182022+I182122+I192022+I202122+J22+J1822+J2022+J2122+J2223+ \\
& J122022+J151822+J161722+J171822+J172022+J182022+J182122+J192022+J202122+K22+K1822+ \\
& K2022+K2122+K2223+K122022+K151822+K161722+K171822+K172022+K182022+K182122+ \\
& K192022+K202122+L22+L1822+L2022+L2122+L2223+L151822+L161722+L171822+L172022+ \\
& L182022+L182122+L192022+L202122+M22+M1822+M2022+M2122+M2223+M161722+M171822+ \\
& M172022+M182022+M182122+M202122+N22+N2022+N2122+N2223+N172022+N202122+O22+ \\
& O2122+O2223=1 \\
& H23+H2123+H2223+I23+I2123+I2223+J23+J2123+J2223+K23+K2123+K2223+L23+L2123+L2223+ \\
& M23+M2123+M2223+N23+N2123+N2223+O23+O2123+O2223+P23=1
\end{aligned}$$

Persamaan (4.3)

$$\begin{aligned}
& B101+B201+B1201+B1301+B13501+B24601-X1=0 \\
& B102+B202+B302+B402+B502+B602+B702+B802+B902+B1202+B1302+B1402+B1602+B1802+ \\
& B2302+B2402+B2502+B2702+B2902+B3402+B3502+B3602+B3802+B4502+B4602+B4702+B4902+ \\
& B5602+B5702+B5802+B6702+B6802+B6902+B7802+B7902+B8902+B13502+B13602+B14502+ \\
& B14602+B23502+B24502+B24602+B35602+B45602-X2=0 \\
& B103+B203+B303+B403+B503+B603+B703+B803+B903+B1203+B1303+B1403+B1603+B1803+ \\
& B2303+B2403+B2503+B2703+B2903+B3403+B3503+B3603+B3803+B4503+B4603+B4703+B4903+ \\
& B5603+B5703+B5803+B6703+B6803+B6903+B7803+B7903+B8903+B13503+B13603+B14503+ \\
& B14603+B23503+B24503+B24603+B35603+B45603-X3=0 \\
& B104+B204+B304+B404+B504+B604+B704+B804+B904+B1204+B1304+B1404+B1604+B1804+ \\
& B2304+B2404+B2504+B2704+B2904+B3404+B3504+B3604+B3804+B4504+B4604+B4704+B4904+ \\
& B5604+B5704+B5804+B6704+B6804+B6904+B7804+B7904+B8904+B13504+B13604+B14504+ \\
& B14604+B23504+B24504+B24604+B35604+B45604-X4=0 \\
& B105+B205+B305+B405+B505+B605+B705+B805+B905+B1205+B1305+B1405+B1605+B1805+ \\
& B2305+B2405+B2505+B2705+B2905+B3405+B3505+B3605+B3805+B4505+B4605+B4705+B4905+ \\
& B5605+B5705+B5805+B6705+B6805+B6905+B7805+B7905+B8905+B13505+B13605+B14505+ \\
& B14605+B23505+B24505+B24605+B35605+B45605-X5=0 \\
& B206+B306+B406+B506+B606+B706+B806+B906+B2306+B2406+B2506+B2706+B2906+B3406+ \\
& B3506+B3606+B3806+B4506+B4606+B4706+B4906+B5606+B5706+B5806+B6706+B6806+B6906+ \\
& B7806+B7906+B8906+B23506+B24506+B24606+B35606+B45606-X6=0 \\
& B407+B507+B607+B707+B807+B907+B4507+B4607+B4707+B4907+B5607+B5707+B5807+B6707+ \\
& B6807+B6907+B7807+B7907+B8907+B45607-X7=0 \\
& B608+B708+B808+B908+B6708+B6808+B6908+B7808+B7908+B8908-X8=0 \\
& B809+B909+B8909-X9=0 \\
& C10+C11+C12+C13+C19+C1011+C1012+C1013+C1019+C1112+C1113+C1119+C1213+C1219+ \\
& C101113+C101119-X10=0
\end{aligned}$$

M172122+M1617+M1718+M201+M22+M23+M1617+M1618+M1620+M1621+M1718+M1720+M1721+M1820+M1821+M1822+M2021+M2022+M2122+M2123+M2223+M161722+M161820+M161821+M171820+M171821+M171822+M172021+M172022+M182021+M182022+M182122+

M202122-X20=0

N172122+N17+N20+N21+N22+N23+N1720+N1721+N2021+N2022+N2122+N2123+N2223+N172021+N172022+N202122-X21=0

O21+O22+O23+O2122+O2123+O2223-X22=0

P23-X23=0

Persamaan (4.4)

2584.214B101+2584.214B201+2548.214B1201+ 6460.535B1301+7106.5885B13501+7106.5885B24601-B1=0
 2584.214B102+2584.214B202+3876.321B302+3876.321B402+646.0535B502+646.0535B602+
 677.178B702+677.178B802+646.0535B902+2548.214B1202+6460.535B1302+6460.535B1402+
 3230.2675B1602+3631.392B1802+6460.535B2302+6460.535B2402+3230.2675B2502+3631.392B2702+3230.
 2675B2902+3876.321B3402+4522.3745B3502+4522.3745B3602+4533.499B3802+
 4532.3745B4502+4532.3745B4602+4553.499B4702+4532.3745B4902+646.0535B5602+
 677.178B5702+677.178B5802+677.178B6702+677.178B6802+646.0535B6902+677.178B7802+
 677.178B7902+677.178B8902+7106.5885B13502+7106.5885B13602+7106.5885B14502+
 7106.5885B14602+7106.5885B23502+7106.5885B24502+7106.5885B24602+4522.3745B35602+
 4522.3745B45602-B2=0

2584.214B103+2584.214B203+3876.321B303+3876.321B403+646.0535B503+646.0535B603+
 677.178B703+677.178B803+646.0535B903+2548.214B1203+6460.535B1303+6460.535B1403+
 3230.2675B1603+3231.17926B1803+6460.535B2303+6460.535B2403+3230.2675B2503+
 3631.392B2703+3230.2675B2903+3876.321B3403+4522.3745B3503+4522.3745B3603+
 4533.499B3803+4532.3745B4503+4532.3745B4603+4553.499B4703+4532.3745B4903+
 646.0535B5603+677.178B5703+677.178B5803+677.178B6703+677.178B6803+646.0535B6903+
 647.87703B7803+677.178B7903+677.178B8903+7106.5885B13503+7106.5885B13603+
 7106.5885B14503+7106.5885B14603+7106.5885B23503+7106.5885B24503+7106.5885B24603+
 4522.3745B35603+4522.3745B45603-B3=0

2584.214B104+2584.214B204+3876.321B304+3876.321B404+646.0535B504+646.0535B604+
 677.178B704+677.178B804+646.0535B904+2548.214B1204+6460.535B1304+6460.535B1404+
 3230.2675B1604+3231.17926B1804+6460.535B2304+6460.535B2404+3230.2675B2504+
 3631.392B2704+3230.2675B2904+3876.321B3404+4522.3745B3504+4522.3745B3604+
 4533.499B3804+4532.3745B4504+4532.3745B4604+4553.499B4704+4532.3745B4904+
 646.0535B5604+677.178B5704+677.178B5804+677.178B6704+677.178B6804+646.0535B6904+
 647.87704B7804+677.178B7904+677.178B8904+7106.5885B13504+7106.5885B13604+
 7106.5885B14504+7106.5885B14604+7106.5885B23504+7106.5885B24504+7106.5885B24604+
 4522.3745B35604+4522.3745B45604-B4=0

2584.214B105+2584.214B205+3876.321B305+3876.321B405+646.0535B505+646.0535B605+
 677.178B705+677.178B805+646.0535B905+2548.214B1205+6460.535B1305+6460.535B1405+
 3230.2675B1605+3231.17926B1805+6460.535B2305+6460.535B2405+3230.2675B2505+
 3631.392B2705+3230.2675B2905+3876.321B3405+4522.3745B3505+4522.3745B3605+
 4533.499B3805+4532.3745B4505+4532.3745B4605+4553.499B4705+4532.3745B4905+
 646.0535B5605+677.178B5705+677.178B5805+677.178B6705+677.178B6805+646.0535B6905+
 647.87705B7805+677.178B7905+677.178B8905+7106.5885B13505+7106.5885B13605+
 7106.5885B14505+7106.5885B14605+7106.5885B23505+7106.5885B24505+7106.5885B24605+
 4522.3745B35605+4522.3745B45605-B5=0

2584.214B206+3876.321B306+3876.321B406+646.0535B506+646.0535B606+677.178B706+
 677.178B806+646.0535B906+6460.535B2306+6460.535B2406+3230.2675B2506+3631.392B2706+
 3230.2675B2906+3876.321B3406+4522.3745B3506+4522.3745B3606+4533.499B3806+
 4532.3745B4506+4532.3745B4606+4553.499B4706+4532.3745B4906+646.0535B5606+
 677.178B5706+677.178B5806+677.178B6706+677.178B6806+646.0535B6906+677.178B7806+
 677.178B7906+677.178B8906+7106.5885B23506+7106.5885B24506+7106.5885B24606+
 4522.3745B35606+4522.3745B45606-B6=0

3876.321B407+646.0535B507+646.0535B607+677.178B707+677.178B807+646.0535B907+
 4532.3745B4507+4532.3745B4607+4553.499B4707+4532.3745B4907+646.0535B5607+677.178B5707+
 677.178B5807+677.178B6707+677.178B6807+646.0535B6907+677.178B7807+677.178B7907+
 677.178B8907+4522.3745B45607-B7=0

646.0535B608+677.178B708+677.178B808+646.0535B908+677.178B6708+677.178B6808+
 646.0535B6908+677.178B7808+677.178B7908+677.178B8908-B8=0

677.178B809+646.0535B909+677.178B8909-B9=0

671.1185C10+660.0821C11+646.0535C12+646.0535C13+672.8176C19+685.1471C1011+

671.1185C1012 + 671.1185C1013 + 660.90734C1019 + 660.0821C1112 + 660.0821C1113 + 686.8462C1119 +
 646.0535C1213+672.8176C1219 + 685.1471C101113 + 711.9112C101119-B10 = 0

671.1185D10 + 660.0821D11 + 646.0535D12 + 646.0535D13 + 682.4105D14 + 680.3356D15 +

646.0535D16 + 646.0535D18 + 672.8176D19 + 646.0535D20 + 685.1471D1011 + 671.1185D1012 +
 671.1185D1013 + 663.65654D1014 + 663.06192D1015 + 671.1185D1018 + 660.90734D1019 +
 660.0821D1112 + 660.0821D1113 + 696.4392D1114 + 686.8462D1119 + 646.0535D1213 + 682.4105D1214 +
 680.3356D1215 + 646.0535D1216 + 646.0535D1218 + 672.8176D1219 +
 646.0535D1220 + 682.4105D1314 + 680.3356D1315 + 646.0535D1316 + 672.8176D1319 + 646.0535D1320 +
 682.4105D1416 + 682.4105D1418 + **709.1746D1419** + 682.4105D1420 + 680.3356D1516 + 680.3356D1518
 + 707.0997D1519 + 680.3356D1520 + 646.0535D1618 +
 672.8176D1619 + 646.0535D1620 + 672.8176D1819 + 646.0535D1820 + 672.8176D1920 + 685.1471D101113
 + 711.9112D101119 + 686.8462D111920 + 646.0535D121820 + 682.4105D141820 +
 680.3356D151820 + 646.0535D161820 + 671.1185D181920 - B11 = 0
 671.1185E10 + 660.0821E11 + 646.0535E12 + 646.0535E13 + 682.4105E14 + 680.3356E15 + 646.0535E16 +
 646.0535E18 + 672.8176E19 + 646.0535E20 + 646.0535E21 + 685.1471E1011 + 671.1185E1012 +
 671.1185E1013 + 663.65654E1014 + 663.06192E1015 + 671.1185E1018 + 660.90734E1019 + 660.0821E1112 + 660.0
 821E1113 + 696.4392E1114 + 686.8462E1119 + 646.0535E1213 + 682.4105E1214 + 680.3356E1215 +
 646.0535E1216 + 646.0535E1218 + 672.8176E1219 + 646.0535E1220 + 682.4105E1314 + 680.3356E1315 +
 646.0535E1316 + 672.8176E1319 + 646.0535E1320 + 682.4105E1416 + 682.4105E1418 + 709.1746E1419 +
 682.4105E1420 + 682.4105E1421 + 680.3356E1516 + 680.3356E1518 + 707.0997E1519 + 680.3356E1520 +
 646.0535E1618 + 672.8176E1619 + 646.0535E1620 + 646.0535E1621 + 672.8176E1819 + 646.0535E1820 +
 646.0535E1821 + 672.8176E1920 + 672.8176E1921 + 646.0535E2021 + 685.1471E101113 +
 711.9112E101119 + 686.8462E111920 + 646.0535E121820 + 646.0535E121821 + 682.4105E141820 +
 682.4105E142021 + 680.3356E151820 + 680.3356E151821 + 646.0535E161820 + 646.0535E161821 +
 672.8176E181920 + 672.8176E181921 + 646.0535E182021 + 672.8176E192021 - B12 = 0
 671.1185F10 + 646.0535F12 + 646.0535F13 + 682.4105F14 + 680.3356F15 + 646.0535F16 + 646.0535F17 +
 646.0535F18 + 672.8176F19 + 646.0535F20 + 646.0535F21 + 671.1185F1012 + 671.1185F1013 +
 663.65654F1014 + 663.06192F1015 + 671.1185F1018 + 660.90734F1019 + 646.0535F1213 + 682.4105F1214 + 680.3
 356F1215 + 646.0535F1216 + 646.0535F1217 + 646.0535F1218 + 672.8176F1219 + 646.0535F1220 +
 682.4105F1314 + 680.3356F1315 + 646.0535F1316 + 646.0535F1317 + 672.8176F1319 + 646.0535F1320 +
 682.4105F1416 + 682.4105F1418 + 709.1746F1419 + 682.4105F1420 + 682.4105F1421 + 680.3356F1516 +
 680.3356F1517 + 680.3356F1518 + 707.0997F1519 + 680.3356F1520 + 646.0535F1617 + 646.0535F1618 +
 672.8176F1619 + 646.0535F1620 + 646.0535F1621 + 646.0535F1718 + 672.8176F1719 + 646.0535F1720 +
 646.0535F1721 + 672.8176F1819 + 646.0535F1820 + 646.0535F1821 + 672.8176F1920 + 672.8176F1921 +
 646.0535F2021 + 646.0535F121720 + 646.0535F121820 + 646.0535F121821 + 646.0535F131720 +
 672.4105F141820 + 672.4105F142021 + 680.3356F151820 + 680.3356F151821 + 646.0535F161820 +
 646.0535F161821 + 646.0535F171820 + 646.0535F171821 + 672.8176F171920 + 646.0535F172021 +
 672.8176F181920 + 672.8176F181921 + 646.0535F182021 + 672.8176F192021 - B13 = 0
 646.0535G172122 + **671.1185G10** + 646.0535G12 + 646.0535G13 + **672.4105G14** + 680.3356G15 +
 646.0535G16 + 646.0535G17 + 646.0535G18 + 672.8176G19 + 646.0535G20 + 646.0535G21 + 646.0535G22 +
 671.1185G1012 + 671.1185G1013 + **663.65654G1014** + 663.06192G1015 + 671.1185G1018 +
 660.90734G1019 + 646.0535G1213 + 672.4105G1214 + 680.3356G1215 + 646.0535G1216 + 646.0535G1217 + 646.0
 535G1218 + 672.8176G1219 + 646.0535G1220 + 672.4105G1314 + 680.3356G1315 + 646.0535G1316 +
 646.0535G1317 + 672.8176G1319 + 646.0535G1320 + 672.4105G1416 + 672.4105G1418 + **709.1746G1419** +
 672.4105G1420 + 672.4105G1421 + 680.3356G1516 + 680.3356G1517 + 680.3356G1518 + 707.0997G1519 +
 680.3356G1520 + 646.0535G1617 + 646.0535G1618 + 672.8176G1619 + 646.0535G1620 + 646.0535G1621 +
 646.0535G1718 + 672.8176G1719 + 646.0535G1720 + 646.0535G1721 + 672.8176G1819 + 646.0535G1820 +
 646.0535G1821 + 646.0535G1822 + 672.8176G1920 + 672.8176G1921 + 646.0535G2021 + 646.0535G2022 +
 646.0535G2122 + 646.0535G121720 + 646.0535G121820 + 646.0535G121821 + 646.0535G122022 +
 646.0535G131720 + 672.4105G141820 + 672.4105G142021 + 680.3356G151820 + 680.3356G151821 +
 680.3356G151822 + 646.0535G161722 + 646.0535G161820 + 646.0535G161821 + 646.0535G171820 +
 646.0535G171821 + 646.0535G171822 + 672.8176G171920 + 646.0535G172021 + 646.0535G172022 +
 672.8176G181920 + 672.8176G181921 + 646.0535G182021 + 646.0535G182022 + 646.0535G182122 +
 672.8176G192021 + 672.8176G192022 + 646.0535G202122 - B14 = 0
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 646.0535H17 + 646.0535H18 + 672.8176H19 + 646.0535H20 + 646.0535H21 + 646.0535H22 + 646.0535H23 +
 646.0535H1213 + 672.4105H1214 + 680.3356H1215 + 646.0535H1216 + 646.0535H1217 + 646.0535H1218 +
 672.8176H1219 + 646.0535H1220 + 672.4105H1314 + 680.3356H1315 + 646.0535H1316 + 646.0535H1317 +
 672.8176H1319 + 646.0535H1320 + 672.4105H1416 + 672.4105H1418 + **709.1746H1419** + 672.4105H1420 +
 672.4105H1421 + 680.3356H1516 + 680.3356H1517 + 680.3356H1518 + 707.0997H1519 + 680.3356H1520 +
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 646.0535H1822 + 672.8176H1920 + 672.8176H1921 + 646.0535H2021 + 646.0535H2022 + 646.0535H2122 +
 646.0535H2123 + 646.0535H2223 + 646.0535H121720 + 646.0535H121820 + 646.0535H121821 +
 646.0535H122022 + 646.0535H131720 + 672.4105H141820 + 672.4105H142021 + 680.3356H151820 +
 680.3356H151821 + 680.3356H151822 + 646.0535H161722 + 646.0535H161820 + 646.0535H161821 +

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 646.0535I1220+672.4105I1314+680.3356I1315+646.0535I1316+646.0535I1317+672.8176I1319+
 646.0535I1320+672.4105I1416+672.4105I1418+**709.1746I1419**+672.4105I1420+672.4105I1421+
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Persamaan (4.5)

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 G1516+G1517+G1518+G1519+G1520+G1619+G1719+G1819+G1920+G1921+G141820+G142021+
 G151820+G151821+G151822+G171920+G181920+G181921+G192021+G192022+H14+H15+H19+
 H1214+H1215+H1219+H1314+H1315+H1319+H1416+H1418+H1419+H1420+H1421+H1516+H1517+H151
 8+H1519+H1520+H1619+H1719+H1819+H1920+H1921+H141820+H142021+H151820+
 H151821+H151822+H171920+H181920+H181921+H192021+H192022+I14+I15+I19+I1214+I1215+
 I1219+I1314+I1315+I1319+I1416+I1418+I1419+I1420+I1421+I1516+I1517+I1518+I1519+I1520+
 I1619+I1719+I1819+I1920+I1921+I141820+I142021+I151820+I151821+I151822+I171920+I181920+
 I181921+I192021+I192022+J14+J15+J19+J1214+J1215+J1219+J1314+J1315+J1319+J1416+J1418+
 J1419+J1420+J1421+J1516+J1517+J1518+J1519+J1520+J1619+J1719+J1819+J1920+J1921+J141820+
 J142021+J151820+J151821+J151822+J171920+J181920+J181921+J192021+J192022+K14+K15+K19+
 K1214+K1215+K1219+K1314+K1315+K1319+K1416+K1418+K1419+K1420+K1421+K1516+K1517+K151
 8+K1519+K1619+K1719+K1819+K1920+K1921+K141820+K142021+K151820+K151821+
 K151822+K171920+K181920+K181921+K192021+K192022+L14+L15+L19+L1314+L1315+L1416+
 L1418+L1419+L1420+L1421+L1516+L1517+L1518+L1519+L1520+L1619+L1719+L1819+L1920+
 L1921+L141820+L142021+L151820+L151821+L151822+L171920+L181920+L181921+L192022-SD=0

4B101+4B201+4B1201+ 10B1301+11B13501+11B24601+4B102+4B202+6B302+6B402+
 B502+B602+B702+B802+B902+4B1202+10B1302+10B1402+5B1602+5B1802+10B2302+10B2402+
 5B2502+5B2702+5B2902+6B3402+7B3502+7B3602+7B3802+7B4502+7B4602+7B4702+7B4902+
 B5602+B5702+B5802+B6702+B6802+B6902+B7802+B7902+B8902+11B13502+11B13602+
 11B14502+11B14602+11B23502+11B24502+11B24602+7B35602+7B45602+4B103+4B203+6B303+
 6B403+B503+B603+B703+B803+B903+4B1203+10B1303+10B1403+5B1603+5B1803+10B2303+
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 11B14503+11B14603+11B23503+11B24503+11B24603+7B35603+7B45603+4B104+4B204+6B304+
 6B404+B504+B604+B704+B804+B904+4B1204+10B1304+10B1404+5B1604+5B1804+10B2304+
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 11B14504+11B14604+11B23504+11B24504+11B24604+7B35604+7B45604+4B105+4B205+6B305+
 6B405+B505+B605+B705+B805+B905+4B1205+10B1305+10B1405+5B1605+5B1805+10B2305+
 10B2405+5B2505+5B2705+5B2905+6B3405+7B3505+7B3605+7B3805+7B4505+7B4605+7B4705+
 7B4905+B5605+B5705+B5805+B6705+B6805+B6905+B7805+B7905+B8905+11B13505+11B13605+
 11B14505+11B14605+11B23505+11B24505+11B24605+7B35605+7B45605+4B206+6B306+6B406+
 B506+B606+B706+B806+B906+10B2306+10B2406+5B2506+5B2706+5B2906+6B3406+7B3506+
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 C19+C1011+C1012+C1013+C1019+C1112+C1113+C1119+C1213+C1219+C101113+C101119+D10+
 D11+D12+D13+D14+D15+D16+D18+D19+D20+D1011+D1012+D1013+D1014+D1015+D1018+
 D1019+D1112+D1113+D1114+D1119+D1213+D1214+D1215+D1216+D1218+D1219+D1220+D1314+D131
 5+D1316+D1319+D1320+D1416+D1418+D1419+D1420+D1516+D1518+D1519+D1520+D1618+
 D1619+D1620+D1819+D1820+D1920+D101113+D101119+D111920+D121820+D141820+D151820+
 D161820+D181920+E10+E11+E12+E13+E14+E15+E16+E18+E19+E20+E21+E1011+E1012+E1013+
 E1014+E1015+E1018+E1019+E1112+E1113+E1114+E1119+E1213+E1214+E1215+E1216+E1218+
 E1219+E1220+E1314+E1315+E1316+E1319+E1320+E1416+E1418+E1419+E1420+E1421+E1516+
 E1518+E1519+E1520+E1618+E1619+E1620+E1621+E1819+E1820+E1821+E1920+E1921+E2021+
 E101113+E101119+E111920+E121820+E121821+E141820+E142021+E151820+E151821+E161820+
 E161821+E181920+E181921+E182021+E192021+F10+F12+F13+F14+F15+F16+F17+F18+F19+
 F20+ F21+F1012+F1013+F1014+F1015+F1018+F1019+F1213+F1214+F1215+F1216+F1217+F1218+
 F1219+F1220+F1314+F1315+F1316+F1317+F1319+F1320+F1416+F1418+F1419+F1420+F1421+
 F1516+F1517+F1518+F1519+F1520+F1617+F1618+F1619+F1620+F1621+F1718+F1719+F1720+
 F1721+F1819+F1820+F1821+ F1920+F1921+F2021+F121720+F121820+F121821+F131720+F141820+
 F142021+F151820+F151821+F161820+F161821+F171820+F171821+F171920+F172021+F172022+
 F181920+F181921+F182021+F192021+G10+G12+G13+G14+G15+G16+G17+G18+G19+G20+G21+
 G22+G1012+G1013+G1014+G1015+G1018+G1019+G1213+G1214+G1215+G1216+G1217+G1218+
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 G1719+G1720+G1721+G1819+G1820+G1821+G1822+G1920+G1921+G2021+G2022+G2122+
 G121720+G121820+G121821+G122022+G131720+G141820+G142021+G151820+G151821+
 G151822+G161722+G161820+G161821+G171820+G171821+G171822+G171920+G172021+
 G172022+G181920+G181921+G182021+G182022+G182122+G192021+G192022+G202122+
 H12+H13+H14+H15+H16+H17+H18+H19+H20+ H21+H22+H23+H1213+H1214+H1215+
 H1216+H1217+H1218+H1219+H1220+H1314+H1315+H1316+H1317+H1319+H1320+H1416+
 H1418+H1419+H1420+H1421+H1516+H1517+H1518+H1519+H1520+H1617+H1618+H1619+
 H1620+H1621+H1718+H1719+H1720+H1721+H1819+H1820+H1821+H1822+H1920+H1921+
 H2021+H2022+H2122+H2123+H2223+H121720+H121820+H121821+H122022+H131720+H141820+
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 I182022+I182122+I192021+I192022+I202122+J12+J13+J14+J15+J16+J17+J18+J19+J20+J21+J22+J23+J1213
 +J1214+J1215+J1216+J1217+J1218+J1219+J1220+J1314+J1315+J1316+J1317+J1319+J1320+

J1416+J1418+J1419+J1420+J1421+J1516+J1517+J1518+J1519+J1520+J1617+J1618+J1619+J1620+
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 K12+K13+K14+K15+K16+K17+K18+K19+K20+ K21+K22+K23+K1213+K1214+K1215+
 K1216+K1217+K1218+K1219+K1220+K1314+K1315+K1316+K1317+K1319+K1320+K1416+
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 K192021+K192022+K202122+L13+L14+L15+L16+L17+L18+L19+ L20+ L21+L22+L23+
 L1314+L1315+L1316+L1317+L1319+L1320+L1416+L1418+L1419+L1420+L1421+L1516+L1517+
 L1518+L1519+L1520+L1617+L1618+L1619+L1620+L1621+L1718+L1719+L1720+L1721+
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 L171821+L171822+L171920+L172021+L172022+L181920+L181921+L182021+L182022+L182122+
 L192021+L192022+L202122+M16+M17+M18+M20+M21+M22+M23+M1617+M1618+M1620+
 M1621+M1718+M1720+M1721+M1820+M1821+ M1822+M2021+M2022+M2122+M2123+M2223+
 M161722+M161820+M161821+M171820+M171821+M171822+M172021+M172022+M182021+
 M182022+M182122+M202122+N17+N20+N21+N22+N23+N1720+N1721+N2021+N2022+N2122+N2123+N
 2223+N172021+N172022+N202122+O21+O22+O23+O2122+O2123+O2223+P23-OPRRAKIT=0

Persamaan (4.6)

MSP≤12

MK≤2

OPRBAN≤23

MP≤2

SD≤2

OPRRAKIT≤6

Persamaan (4.8)

173.16X101+173.16X201+194.04X301+194.04X401+147.6X501+147.6X601-C≤0
 173.16X102+173.16X202+194.04X302+194.04X402+147.6X502+147.6X602+248.4X702+248.4X802+
 270X902-C≤0
 173.16X103+173.16X203+194.04X303+194.04X403+147.6X503+147.6X603+248.4X703+248.4X803+
 270X903-C≤0
 173.16X104+173.16X204+194.04X304+194.04X404+147.6X504+147.6X604+248.4X704+248.4X804+
 270X904-C≤0
 173.16X105+173.16X205+194.04X305+194.04X405+147.6X505+147.6X605+248.4X705+248.4X805+
 270X905-C≤0
 173.16X206+194.04X306+194.04X406+147.6X506+147.6X606+248.4X706+248.4X806+270X906-C≤0
 194.04X407+147.6X507+147.6X607+248.4X707+248.4X807+270X907-C≤0
 147.6X608+248.4X708+248.4X808+270X908-C≤0
 248.4X809+270X909-C≤0
 200.04X10010+111.96X11010+219.96X12010+214.2X13010+213.6X19010-C≤0
 200.04X10011+111.96X11011+219.96X12011+214.2X13011+290.16X14011+273.6X15011+
 236.88X16011+130.2X18011+213.6X19011+109.44X20011-C≤0
 200.04X10012+111.96X11012+219.96X12012+214.2X13012+290.16X14012+273.6X15012+
 236.88X16012+130.2X18012+213.6X19012+109.44X20012+126.36X21012-C≤0
 200.04X10013+219.96X12013+214.2X13013+290.16X14013+273.6X15013+236.88X16013+
 194.52X17013+130.2X18013+213.6X19013+109.44X20013+126.36X21013-C≤0
 200.04X10014+219.96X12014+214.2X13014+290.16X14014+273.6X15014+236.88X16014+
 194.52X17014+130.2X18014+213.6X19014+109.44X20014+126.36X21014+93.36X22014-C≤0
 219.96X12015+214.2X13015+290.16X14015+273.6X15015+236.88X16015+194.52X17015+
 130.2X18015+213.6X19015+109.44X20015+126.36X21015+93.36X22015+370.68X23015-C≤0
 219.96X12016+214.2X13016+290.16X14016+273.6X15016+236.88X16016+194.52X17016+
 130.2X18016+213.6X19016+109.44X20016+126.36X21016+93.36X22016+370.68X23016-C≤0
 219.96X12017+214.2X13017+290.16X14017+273.6X15017+236.88X16017+194.52X17017+
 130.2X18017+213.6X19017+109.44X20017+126.36X21017+93.36X22017+370.68X23017-C≤0
 219.96X12018+214.2X13018+290.16X14018+273.6X15018+236.88X16018+194.52X17018+

$$\begin{aligned}
&130.2X18018+213.6X19018+109.44X20018+126.36X21018+93.36X22018+370.68X23018-C\leq 0 \\
&214.2X13019+290.16X14019+273.6X15019+236.88X16019+194.52X17019+130.2X18019+ \\
&213.6X19019+109.44X20019+126.36X21019+93.36X22019+370.68X23019-C\leq 0 \\
&236.88X16020+194.52X17020+130.2X18020+109.44X20020+126.36X21020+93.36X22020+ \\
&370.68X23020-C\leq 0 \\
&194.52X17021+109.44X20021+126.36X21021+93.36X22021+370.68X23021-C\leq 0 \\
&126.36X21022+93.36X22022+370.68X23022-C\leq 0 \\
&370.68X23023-C\leq 0
\end{aligned}$$

persamaan (4.9)

$$\begin{aligned}
&X101+X102+X103+X104+X105=1 \\
&X201+X202+X203+X204+X205+X206=1 \\
&X301+X302+X303+X304+X305+X306=1 \\
&X401+X402+X403+X404+X405+X406+X407=1 \\
&X501+X502+X503+X504+X505+X506+X507=1 \\
&X601+X602+X603+X604+X605+X606+X607+X608=1 \\
&X702+X703+X704+X705+X706+X707+X708=1 \\
&X802+X803+X804+X805+X806+X807+X808+X809=1 \\
&X902+X903+X904+X905+X906+X907+X908+X909=1 \\
&X10010+X10011+X10012+X10013+X10014=1 \\
&X11010+X11011+X11012=1 \\
&X12010+X12011+X12012+X12013+X12014+X12015+X12016+X12017+X12018=1 \\
&X13010+X13011+X13012+X13013+X13014+X13015+X13016+X13017+X13018+X13019=1 \\
&X14011+X14012+X14013+X14014+X14015+X14016+X14017+X14018+X14019=1 \\
&X15011+X15012+X15013+X15014+X15015+X15016+X15017+X15018+X15019=1 \\
&X16011+X16012+X16013+X16014+X16015+X16016+X16017+X16018+X16019+X16020=1 \\
&X17013+X17014+X17015+X17016+X17017+X17018+X17019+X17020+X17021=1 \\
&X18011+X18012+X18013+X18014+X18015+X18016+X18017+X18018+X18019+X18020=1 \\
&X19010+X19011+X19012+X19013+X19014+X19015+X19016+X19017+X19018+X19019=1 \\
&X20011+X20012+X20013+X20014+X20015+X20016+X20017+X20018+X20019+X20020+X20021=1 \\
&X21012+X21013+X21014+X21015+X21016+X21017+X21018+X21019+X21020+X21021+X21022=1 \\
&X22014+X22015+X22016+X22017+X22018+X22019+X22020+X22021+X22022=1 \\
&X23015+X23016+X23017+X23018+X23019+X23020+X23021+X23022+X23023=1
\end{aligned}$$

Persamaan (4.10)

elemen kerja-1 mendahului elemen kerja-3

$$\begin{aligned}
&-X101+X301\leq 0 \\
&-X101-X102+X302\leq 0 \\
&-X101-X102-X103+X303\leq 0 \\
&-X101-X102-X103-X104+X304\leq 0 \\
&-X101-X102-X103-X104-X105+X305\leq 0 \\
&-X101-X102-X103-X104-X105+X306\leq 0
\end{aligned}$$

elemen kerja-2 mendahului elemen kerja-4

$$\begin{aligned}
&-X201+X401\leq 0 \\
&-X201-X202+X402\leq 0 \\
&-X201-X202-X203+X403\leq 0 \\
&-X201-X202-X203-X204+X404\leq 0 \\
&-X201-X202-X203-X204-X205+X405\leq 0 \\
&-X201-X202-X203-X204-X205-X206+X406\leq 0 \\
&-X201-X202-X203-X204-X205-X206+X407\leq 0
\end{aligned}$$

elemen kerja-3 mendahului elemen kerja-5

$$\begin{aligned}
&-X301+X501\leq 0 \\
&-X301-X302+X502\leq 0 \\
&-X301-X302-X303+X503\leq 0 \\
&-X301-X302-X303-X304+X504\leq 0 \\
&-X301-X302-X303-X304-X305+X505\leq 0 \\
&-X301-X302-X303-X304-X305-X306+X506\leq 0 \\
&-X301-X302-X303-X304-X305-X306+X507\leq 0
\end{aligned}$$

elemen kerja-4 mendahului elemen kerja-6

- X401+X601 $\leq$ 0
- X401-X402+X602 $\leq$ 0
- X401-X402-X403+X603 $\leq$ 0
- X401-X402-X403-X404+X604 $\leq$ 0
- X401-X402-X403-X404-X405+X605 $\leq$ 0
- X401-X402-X403-X404-X405-X406+X606 $\leq$ 0
- X401-X402-X403-X404-X405-X406-X407+X607 $\leq$ 0
- X401-X402-X403-X404-X405-X406-X407+X608 $\leq$ 0

elemen kerja-5 mendahului elemen kerja-7

- X501-X502+X702 $\leq$ 0
- X501-X502-X503+X703 $\leq$ 0
- X501-X502-X503-X504+X704 $\leq$ 0
- X501-X502-X503-X504-X505+X705 $\leq$ 0
- X501-X502-X503-X504-X505-X506+X706 $\leq$ 0
- X501-X502-X503-X504-X505-X506-X507+X707 $\leq$ 0

elemen kerja-6 mendahului elemen kerja-8

- X601-X602+X802 $\leq$ 0
- X601-X602-X603+X803 $\leq$ 0
- X601-X602-X603-X604+X804 $\leq$ 0
- X601-X602-X603-X604-X605+X805 $\leq$ 0
- X601-X602-X603-X604-X605-X606+X806 $\leq$ 0
- X601-X602-X603-X604-X605-X606-X607+X807 $\leq$ 0
- X601-X602-X603-X604-X605-X606-X607-X608+X808 $\leq$ 0
- X601-X602-X603-X604-X605-X606-X607-X608+X809 $\leq$ 0

elemen kerja-7 mendahului elemen kerja-9

- X702+X902 $\leq$ 0
- X702-X703+X903 $\leq$ 0
- X702-X703-X704+X904 $\leq$ 0
- X702-X703-X704-X705+X905 $\leq$ 0
- X702-X703-X704-X705-X706+X906 $\leq$ 0
- X702-X703-X704-X705-X706-X707+X907 $\leq$ 0
- X702-X703-X704-X705-X706-X707-X708+X908 $\leq$ 0
- X702-X703-X704-X705-X706-X707-X708+X909 $\leq$ 0

elemen kerja-10 mendahului elemen kerja-12

- X10010+X12010 $\leq$ 0
- X10010-X10011+X12011 $\leq$ 0
- X10010-X10011-X10012+X12012 $\leq$ 0
- X10010-X10011-X10012-X10013+X12013 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X12014 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X12015 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X12016 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X12017 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X12018 $\leq$ 0

elemen kerja-10 mendahului elemen kerja-14

- X10010-X10011+X14011 $\leq$ 0
- X10010-X10011-X10012+X14012 $\leq$ 0
- X10010-X10011-X10012-X10013+X14013 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X14014 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X14015 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X14016 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X14017 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X14018 $\leq$ 0
- X10010-X10011-X10012-X10013-X10014+X14019 $\leq$ 0

elemen kerja-10 mendahului elemen kerja-19

- X10010+X19010 $\leq$ 0

$-X10010-X10011+X19011 \leq 0$
 $-X10010-X10011-X10012+X19012 \leq 0$
 $-X10010-X10011-X10012-X10013+X19013 \leq 0$
 $-X10010-X10011-X10012-X10013-X10014+X19014 \leq 0$
 $-X10010-X10011-X10012-X10013-X10014+X19015 \leq 0$
 $-X10010-X10011-X10012-X10013-X10014+X19016 \leq 0$
 $-X10010-X10011-X10012-X10013-X10014+X19017 \leq 0$
 $-X10010-X10011-X10012-X10013-X10014+X19018 \leq 0$
 $-X10010-X10011-X10012-X10013-X10014+X19019 \leq 0$

elemen kerja-11 mendahului elemen kerja-13

$-X11010+X13010 \leq 0$
 $-X11010-X11011+X13011 \leq 0$
 $-X11010-X11011-X11012+X13012 \leq 0$
 $-X11010-X11011-X11012+X13013 \leq 0$
 $-X11010-X11011-X11012+X13014 \leq 0$
 $-X11010-X11011-X11012+X13015 \leq 0$
 $-X11010-X11011-X11012+X13016 \leq 0$
 $-X11010-X11011-X11012+X13017 \leq 0$
 $-X11010-X11011-X11012+X13018 \leq 0$
 $-X11010-X11011-X11012+X13019 \leq 0$

elemen kerja-11 mendahului elemen kerja-14

$-X11010-X11011+X14011 \leq 0$
 $-X11010-X11011-X11012+X14012 \leq 0$
 $-X11010-X11011-X11012+X14013 \leq 0$
 $-X11010-X11011-X11012+X14014 \leq 0$
 $-X11010-X11011-X11012+X14015 \leq 0$
 $-X11010-X11011-X11012+X14016 \leq 0$
 $-X11010-X11011-X11012+X14017 \leq 0$
 $-X11010-X11011-X11012+X14018 \leq 0$
 $-X11010-X11011-X11012+X14019 \leq 0$

elemen kerja-11 mendahului elemen kerja-19

$-X11010+X19010 \leq 0$
 $-X11010-X11011+X19011 \leq 0$
 $-X11010-X11011-X11012+X19012 \leq 0$
 $-X11010-X11011-X11012+X19013 \leq 0$
 $-X11010-X11011-X11012+X19014 \leq 0$
 $-X11010-X11011-X11012+X19015 \leq 0$
 $-X11010-X11011-X11012+X19016 \leq 0$
 $-X11010-X11011-X11012+X19017 \leq 0$
 $-X11010-X11011-X11012+X19018 \leq 0$
 $-X11010-X11011-X11012+X19019 \leq 0$

elemen kerja-12 mendahului elemen kerja-20

$-X12010-X12011+X20011 \leq 0$
 $-X12010-X12011-X12012+X20012 \leq 0$
 $-X12010-X12011-X12012-X12013+X20013 \leq 0$
 $-X12010-X12011-X12012-X12013-X12014+X20014 \leq 0$
 $-X12010-X12011-X12012-X12013-X12014+X20015 \leq 0$
 $-X12010-X12011-X12012-X12013-X12014-X12015+X20016 \leq 0$
 $-X12010-X12011-X12012-X12013-X12014-X12015-X12016+X20017 \leq 0$
 $-X12010-X12011-X12012-X12013-X12014-X12015-X12016-X12017+X20018 \leq 0$
 $-X12010-X12011-X12012-X12013-X12014-X12015-X12016-X12017+X20019 \leq 0$
 $-X12010-X12011-X12012-X12013-X12014-X12015-X12016-X12017-X12018+X20020 \leq 0$
 $-X12010-X12011-X12012-X12013-X12014-X12015-X12016-X12017-X12018+X20021 \leq 0$

elemen kerja-13 mendahului elemen kerja-15

$-X13010-X13011+X15011 \leq 0$
 $-X13010-X13011-X13012+X15012 \leq 0$
 $-X13010-X13011-X13012-X13013+X15013 \leq 0$
 $-X13010-X13011-X13012-X13013-X13014+X15014 \leq 0$

$-X13010-X13011-X13012-X13013-X13014-X13015+X15015 \leq 0$
 $-X13010-X13011-X13012-X13013-X13014-X13015-X13016+X15016 \leq 0$
 $-X13010-X13011-X13012-X13013-X13014-X13015-X13016-X13017+X15017 \leq 0$
 $-X13010-X13011-X13012-X13013-X13014-X13015-X13016-X13017-X13018+X15018 \leq 0$
 $-X13010-X13011-X13012-X13013-X13014-X13015-X13016-X13017-X13018-X13019+X15019 \leq 0$

elemen kerja-14 mendahului elemen kerja-16

$-X14011+X16011 \leq 0$
 $-X14011-X14012+X16012 \leq 0$
 $-X14011-X14012-X14013+X16013 \leq 0$
 $-X14011-X14012-X14013-X14014+X16014 \leq 0$
 $-X14011-X14012-X14013-X14014-X14015+X16015 \leq 0$
 $-X14011-X14012-X14013-X14014-X14015-X14016+X16016 \leq 0$
 $-X14011-X14012-X14013-X14014-X14015-X14016-X14017+X16017 \leq 0$
 $-X14011-X14012-X14013-X14014-X14015-X14016-X14017-X14018+X16018 \leq 0$
 $-X14011-X14012-X14013-X14014-X14015-X14016-X14017-X14018-X14019+X16019 \leq 0$
 $-X14011-X14012-X14013-X14014-X14015-X14016-X14017-X14018-X14019+X16020 \leq 0$

elemen kerja-15 mendahului elemen kerja-18

$-X15011+X18011 \leq 0$
 $-X15011-X15012+X18012 \leq 0$
 $-X15011-X15012-X15013+X18013 \leq 0$
 $-X15011-X15012-X15013-X15014+X18014 \leq 0$
 $-X15011-X15012-X15013-X15014-X15015+X18015 \leq 0$
 $-X15011-X15012-X15013-X15014-X15015-X15016+X18016 \leq 0$
 $-X15011-X15012-X15013-X15014-X15015-X15016-X15017+X18017 \leq 0$
 $-X15011-X15012-X15013-X15014-X15015-X15016-X15017-X15018+X18018 \leq 0$
 $-X15011-X15012-X15013-X15014-X15015-X15016-X15017-X15018-X15019+X18019 \leq 0$
 $-X15011-X15012-X15013-X15014-X15015-X15016-X15017-X15018-X15019+X18020 \leq 0$

elemen kerja-16 mendahului elemen kerja-17

$-X16011-X16012-X16013+X17013 \leq 0$
 $-X16011-X16012-X16013-X16014+X17014 \leq 0$
 $-X16011-X16012-X16013-X16014-X16015+X17015 \leq 0$
 $-X16011-X16012-X16013-X16014-X16015-X16016+X17016 \leq 0$
 $-X16011-X16012-X16013-X16014-X16015-X16016-X16017+X17017 \leq 0$
 $-X16011-X16012-X16013-X16014-X16015-X16016-X16017-X16018+X17018 \leq 0$
 $-X16011-X16012-X16013-X16014-X16015-X16016-X16017-X16018-X16019+X17019 \leq 0$
 $-X16011-X16012-X16013-X16014-X16015-X16016-X16017-X16018-X16019-X16020+X17020 \leq 0$
 $-X16011-X16012-X16013-X16014-X16015-X16016-X16017-X16018-X16019-X16020+X17021 \leq 0$

elemen kerja-17 mendahului elemen kerja-22

$-X17013-X17014+X22014 \leq 0$
 $-X17013-X17014-X17015+X22015 \leq 0$
 $-X17013-X17014-X17015-X17016+X22016 \leq 0$
 $-X17013-X17014-X17015-X17016-X17017+X22017 \leq 0$
 $-X17013-X17014-X17015-X17016-X17017-X17018+X22018 \leq 0$
 $-X17013-X17014-X17015-X17016-X17017-X17018-X17019+X22019 \leq 0$
 $-X17013-X17014-X17015-X17016-X17017-X17018-X17019-X17020+X22020 \leq 0$
 $-X17013-X17014-X17015-X17016-X17017-X17018-X17019-X17020-X17021+X22021 \leq 0$
 $-X17013-X17014-X17015-X17016-X17017-X17018-X17019-X17020-X17021+X22022 \leq 0$

elemen kerja-18 mendahului elemen kerja-21

$-X18011-X18012+X21012 \leq 0$
 $-X18011-X18012-X18013+X21013 \leq 0$
 $-X18011-X18012-X18013-X18014+X21014 \leq 0$
 $-X18011-X18012-X18013-X18014-X18015+X21015 \leq 0$
 $-X18011-X18012-X18013-X18014-X18015-X18016+X21016 \leq 0$
 $-X18011-X18012-X18013-X18014-X18015-X18016-X18017+X21017 \leq 0$
 $-X18011-X18012-X18013-X18014-X18015-X18016-X18017-X18018+X21018 \leq 0$
 $-X18011-X18012-X18013-X18014-X18015-X18016-X18017-X18018-X18019+X21019 \leq 0$
 $-X18011-X18012-X18013-X18014-X18015-X18016-X18017-X18018-X18019-X18020+X21020 \leq 0$

-X18011-X18012-X18013-X18014-X18015-X18016-X18017-X18018-X18019-X18020+X21021<=0
 -X18011-X18012-X18013-X18014-X18015-X18016-X18017-X18018-X18019-X18020+X21022<=0

elemen kerja-18 mendahului elemen kerja-22

-X18011-X18012-X18013-X18014+X22014<=0
 -X18011-X18012-X18013-X18014-X18015+X22015<=0
 -X18011-X18012-X18013-X18014-X18015-X18016+X22016<=0
 -X18011-X18012-X18013-X18014-X18015-X18016-X18017+X22017<=0
 -X18011-X18012-X18013-X18014-X18015-X18016-X18017-X18018+X22018<=0
 -X18011-X18012-X18013-X18014-X18015-X18016-X18017-X18018-X18019+X22019<=0
 -X18011-X18012-X18013-X18014-X18015-X18016-X18017-X18018-X18019-X18020+X22020<=0
 -X18011-X18012-X18013-X18014-X18015-X18016-X18017-X18018-X18019-X18020+X22021<=0
 -X18011-X18012-X18013-X18014-X18015-X18016-X18017-X18018-X18019-X18020+X22022<=0

elemen kerja-19 mendahului elemen kerja-20

-X19010-X19011+X20011<=0
 -X19010-X19011-X19012+X20012<=0
 -X19010-X19011-X19012-X19013+X20013<=0
 -X19010-X19011-X19012-X19013-X19014+X20014<=0
 -X19010-X19011-X19012-X19013-X19014-X19015+X20015<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016+X20016<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017+X20017<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017-X19018+X20018<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017-X19018-X19019+X20019<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017-X19018-X19019+X20020<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017-X19018-X19019+X20021<=0

elemen kerja-19 mendahului elemen kerja-21

-X19010-X19011-X19012+X21012<=0
 -X19010-X19011-X19012-X19013+X21013<=0
 -X19010-X19011-X19012-X19013-X19014+X21014<=0
 -X19010-X19011-X19012-X19013-X19014-X19015+X21015<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016+X21016<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017+X21017<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017-X19018+X21018<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017-X19018-X19019+X21019<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017-X19018-X19019+X21020<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017-X19018-X19019+X21021<=0
 -X19010-X19011-X19012-X19013-X19014-X19015-X19016-X19017-X19018-X19019+X21022<=0

elemen kerja-20 mendahului elemen kerja-22

-X20011-X20012-X20013-X20014+X22014<=0
 -X20011-X20012-X20013-X20014-X20015+X22015<=0
 -X20011-X20012-X20013-X20014-X20015-X20016+X22016<=0
 -X20011-X20012-X20013-X20014-X20015-X20016-X20017+X22017<=0
 -X20011-X20012-X20013-X20014-X20015-X20016-X20017-X20018+X22018<=0
 -X20011-X20012-X20013-X20014-X20015-X20016-X20017-X20018-X20019+X22019<=0
 -X20011-X20012-X20013-X20014-X20015-X20016-X20017-X20018-X20019-X20020+X22020<=0
 -X20011-X20012-X20013-X20014-X20015-X20016-X20017-X20018-X20019-X20020-
 X20021+X22021<=0
 -X20011-X20012-X20013-X20014-X20015-X20016-X20017-X20018-X20019-X20020-
 X20021+X22022<=0

elemen kerja elemen kerja-21 mendahului elemen kerja-23

-X21012-X21013-X21014-X21015+X23015<=0
 -X21012-X21013-X21014-X21015-X21016+X23016<=0
 -X21012-X21013-X21014-X21015-X21016-X21017+X23017<=0
 -X21012-X21013-X21014-X21015-X21016-X21017-X21018+X23018<=0
 -X21012-X21013-X21014-X21015-X21016-X21017-X21018-X21019+X23019<=0
 -X21012-X21013-X21014-X21015-X21016-X21017-X21018-X21019-X21020+X23020<=0
 -X21012-X21013-X21014-X21015-X21016-X21017-X21018-X21019-X21020-X21021+X23021<=0
 -X21012-X21013-X21014-X21015-X21016-X21017-X21018-X21019-X21020-X21021-
 X21022+X23022<=0

$-X_{21012}-X_{21013}-X_{21014}-X_{21015}-X_{21016}-X_{21017}-X_{21018}-X_{21019}-X_{21020}-X_{21021}-$
 $X_{21022}+X_{23023}\leq 0$
 elemen kerja-22 mendahului elemen kerja-23
 $-X_{22014}-X_{22015}+X_{23015}\leq 0$
 $-X_{22014}-X_{22015}-X_{22016}+X_{23016}\leq 0$
 $-X_{22014}-X_{22015}-X_{22016}-X_{22017}+X_{23017}\leq 0$
 $-X_{22014}-X_{22015}-X_{22016}-X_{22017}-X_{22018}+X_{23018}\leq 0$
 $-X_{22014}-X_{22015}-X_{22016}-X_{22017}-X_{22018}-X_{22019}+X_{23019}\leq 0$
 $-X_{22014}-X_{22015}-X_{22016}-X_{22017}-X_{22018}-X_{22019}-X_{22020}+X_{23020}\leq 0$
 $-X_{22014}-X_{22015}-X_{22016}-X_{22017}-X_{22018}-X_{22019}-X_{22020}-X_{22021}+X_{23021}\leq 0$
 $-X_{22014}-X_{22015}-X_{22016}-X_{22017}-X_{22018}-X_{22019}-X_{22020}-X_{22021}-X_{22022}+X_{23022}\leq 0$
 $-X_{22014}-X_{22015}-X_{22016}-X_{22017}-X_{22018}-X_{22019}-X_{22020}-X_{22021}-X_{22022}+X_{23023}\leq 0$

Persamaan (4.11)

$X_{101}+X_{201}+X_{301}+X_{401}+X_{501}+X_{601}-6X_1\leq 0$
 $X_{102}+X_{202}+X_{302}+X_{402}+X_{502}+X_{602}+X_{702}+X_{802}+X_{902}-9X_2\leq 0$
 $X_{103}+X_{203}+X_{303}+X_{403}+X_{503}+X_{603}+X_{703}+X_{803}+X_{903}-9X_3\leq 0$
 $X_{104}+X_{204}+X_{304}+X_{404}+X_{504}+X_{604}+X_{704}+X_{804}+X_{904}-9X_4\leq 0$
 $X_{105}+X_{205}+X_{305}+X_{405}+X_{505}+X_{605}+X_{705}+X_{805}+X_{905}-9X_5\leq 0$
 $X_{206}+X_{306}+X_{406}+X_{506}+X_{606}+X_{706}+X_{806}+X_{906}-8X_6\leq 0$
 $X_{407}+X_{507}+X_{607}+X_{707}+X_{807}+X_{907}-6X_7\leq 0$
 $X_{608}+X_{708}+X_{808}+X_{908}-4X_8\leq 0$
 $X_{809}+X_{909}-2X_9\leq 0$
 $X_{10010}+X_{11010}+X_{12010}+X_{13010}+X_{19010}-5X_{10}\leq 0$
 $X_{10011}+X_{11011}+X_{12011}+X_{13011}+X_{14011}+X_{15011}+X_{16011}+X_{18011}+X_{19011}+X_{20011}-10X_{11}\leq 0$
 $X_{10012}+X_{11012}+X_{12012}+X_{13012}+X_{14012}+X_{15012}+X_{16012}+X_{18012}+X_{19012}+X_{20012}+X_{21012}-$
 $11X_{12}\leq 0$
 $X_{10013}+X_{12013}+X_{13013}+X_{14013}+X_{15013}+X_{16013}+X_{17013}+X_{18013}+X_{19013}+X_{20013}+X_{21013}-$
 $11X_{13}\leq 0$
 $X_{10014}+X_{12014}+X_{13014}+X_{14014}+X_{15014}+X_{16014}+X_{17014}+X_{18014}+X_{19014}+X_{20014}+X_{21014}+$
 $X_{22014}-12X_{14}\leq 0$
 $X_{12015}+X_{13015}+X_{14015}+X_{15015}+X_{16015}+X_{17015}+X_{18015}+X_{19015}+X_{20015}+X_{21015}+X_{22015}+$
 $X_{23015}-12X_{15}\leq 0$
 $X_{12016}+X_{13016}+X_{14016}+X_{15016}+X_{16016}+X_{17016}+X_{18016}+X_{19016}+X_{20016}+X_{21016}+X_{22016}+$
 $X_{23016}-12X_{16}\leq 0$
 $X_{12017}+X_{13017}+X_{14017}+X_{15017}+X_{16017}+X_{17017}+X_{18017}+X_{19017}+X_{20017}+X_{21017}+X_{22017}+$
 $X_{23017}-12X_{17}\leq 0$
 $X_{12018}+X_{13018}+X_{14018}+X_{15018}+X_{16018}+X_{17018}+X_{18018}+X_{19018}+X_{20018}+X_{21018}+X_{22018}+$
 $X_{23018}-12X_{18}\leq 0$
 $X_{13019}+X_{14019}+X_{15019}+X_{16019}+X_{17019}+X_{18019}+X_{19019}+X_{20019}+X_{21019}+X_{22019}+$
 $X_{23019}-11X_{19}\leq 0$
 $X_{16020}+X_{17020}+X_{18020}+X_{20020}+X_{21020}+X_{22020}+X_{23020}-7X_{20}\leq 0$
 $X_{17021}+X_{20021}+X_{21021}+X_{22021}+X_{23021}-5X_{21}\leq 0$
 $X_{21022}+X_{22022}+X_{23022}-3X_{22}\leq 0$
 $X_{23023}-X_{23}\leq 0$

Persamaan (4.13)

$C\leq 531.6$
 $C\geq 370.68$

LAMPIRAN G
OUTPUT LINDO

OBJECTIVE FUNCTION VALUE

1) 317173.1218

VARIABLE	VALUE	REDUCED COST
MSP	12.000000	0.000000
MK	2.000000	0.000000
OPRBAN	23.000000	0.000000
MP	2.000000	0.000000
SD	2.000000	0.000000
OPRRAKIT	6.000000	0.000000
X2	1.000000	0.000000
X6	1.000000	0.000000
X7	1.000000	0.000000
X8	1.000000	0.000000
X9	1.000000	0.000000
X102	1.000000	0.000000
X202	1.000000	0.000000
X306	1.000000	0.000000
X406	1.000000	0.000000
X507	1.000000	0.000000
X607	1.000000	0.000000
X708	1.000000	0.000000
X808	1.000000	0.000000
X909	1.000000	-1.000000
B1202	1.000000	5096.428222
B3406	1.000000	7752.64209
B5607	1.000000	646.053528
B7808	1.000000	1352.355958
B909	1.000000	647.053528
X10	1.000000	0.000000
X13	1.000000	0.000000
X15	1.000000	0.000000
X16	1.000000	0.000000
X18	1.000000	0.000000
X22	1.000000	0.000000
X10010	1.000000	0.000000
X11010	1.000000	0.000000
X14013	1.000000	0.000000
X19013	1.000000	0.000000

X12015	1.000000	0.000000
X16015	1.000000	0.000000
X13016	1.000000	433392.687500
X17016	1.000000	393574.000000
X20016	1.000000	221430.890625
X15018	1.000000	0.000000
X18018	1.000000	0.000000
X22018	1.000000	0.000000
X21022	1.000000	0.000000
X23022	1.000000	0.000000
C1011	1.000000	1370.2959
F1419	1.000000	709.174622
H1216	1.000000	646.053528
I131720	1.000000	646.053528
K151822	1.000000	680.335571
O2123	1.000000	646.053528
B2	5096.428222	0.000000
B6	7752.64209	0.000000
B7	646.053528	0.000000
B8	1352.355958	0.000000
B9	646.053528	0.000000
B10	1370.2959	0.000000
B13	709.174622	0.000000
B15	646.053528	0.000000
B16	646.053528	0.000000
B18	680.335571	0.000000
B22	646.053528	0.000000
C	518.160034	0.000000
X	1.000000	-750000.000000

NO. ITERATIONS=80439909
BRANCHES= 8700 DETERM.= 1.000E 0