Appendix

Appendix 2

Appendix 2

GESR Present Station Base

Small Zone	Station Name	Governarate (Large Zone)
1	Jubrin	Aleppo
2	Tel Blat	Aleppo
3	Sheikh Ahmad	Aleppo
4	Fodda	Aleppo
5	Hassan	Aleppo
6	Qadissiya	Aleppo
7	Abu Asi	Raqqa
8	Al-Grin	Raqqa
9	Al-Sadaqa	Raqqa
10	Hneida	Raqqa
11	Kdeiran	Raqqa
12	Salhabiya	Raqqa
13	Raqqa	Raqqa
14	Al-Karama	Raqqa
15	Judaida	Raqqa
16	Milaj	Deir el-Zor
17	Zalabiya	Deir el-Zor
18	Al-Kasra	Deir el-Zor
19	Muheimida	Deir el-Zor
20	Deir el-Zor	Deir el-Zor
21	Al-Jazira	Deir el-Zor
22	Bir Juwaief	Deir el-Zor
23	Abu Fas	Hassaka
24	Rumeilan	Hassaka
25	Sabah al-Kheir	Hassaka
26	Hassaka	Hassaka
27	Siha	Hassaka
28	Kabaka	Hassaka
29	Sbate	Hassaka
30	Old Qamishli	Hassaka
31	Qahtaniyya	Hassaka
32	Tel Alo	Hassaka
33	Al-Yaroubiye	Hassaka
34	Aleppo	Aleppo
35	Wudehi	Aleppo
36	Kafar Halab	Aleppo
37	Maarret Ikhwan	Idlib
38	Bishmaroun	Idlib
39	Mhambel	Idlib
40	Frika	Idlib
41	Jisr Elshogour	Hama
42	Budama	Lattakia
43	Bibar	Lattakia
44	Sheikhana	Lattakia
45	As-Safkoun	Lattakia
46	Al-Kabir	Lattakia
47	Lattakia	Lattakia
48	Hamidia	Aleppo
49	Abu Dhour	Aleppo
50	Sinjar	Idlib
51	Hamdania	Hama
52	Qoumhana	Hama
53	Hama	Hama
54	Kafar Buhom	Hama
55	Har Bnafsi	Hama
56	Sneisel	Homs
57	Kharbettin	Homs
58	Al-Khansa	Homs
59	Umm Jaamah	Homs
60	Tel Kalakh	Tartous
61	Akkari	Tartous
62	Samariyan	Tartous
63	Tartous	Tartous
64	Homs1 (Passenger)	Homs
65	Qattineh	Homs
66	Arqusair	Homs
67	Lebanies Border	Homs
68	Shinshar	Homs
69	Khnefis	Homs
70	Noamia	Homs
71	Mhine	Homs
72	Al-Rumeila	Homs

GESR Present Station Base (continue)

Small Zone	Station Name	Governarate (Large Zone)
73	Al-Qariyatein	Homs
74	Al-Barida	Homs
75	Al-Bsayra	Homs
76	Al-Fajwa	Homs
77	Al-Hamra	Homs
78	Al-Sharqia	Homs
79	Abtar	Homs
80	Saqqar	Homs
81	Tadmor	Homs
82	Khanat	Damascus
83	Dmeir	Damascus
84	Baharia	Damascus
85	Turkmania	Damascus
86	South Damascus	Damascus
87	Tel Rifaat	Aleppo
88	Qatma	Aleppo
89	Afrin	Aleppo
90	Rajo	Aleppo
91	Midan Ekbas	Aleppo
92	Muslimia	Aleppo
93	Akhtarin	Aleppo
94	Arrai	Aleppo
95	Roueisa	Tartous
96	Marqia	Tartous
97	Baniyas	Lattakia
98	El-Sin	Lattakia
99	Jabla	Lattakia
100	Sharbit	Lattakia
101	New Port	Tartous
102	Ansari	Aleppo
103	Lattakia (Freight)	Lattakia
104	Lattakia Seaport	Lattakia
105	Homs 2 (Freight)	Homs
106	Konaifes Manajem	Homs
107	Sharkieh Manajem	Homs
108	Damascus (Freight)	Damascus
109	Bir Ghadir	Homs
110	Ard Azzour	Damascus
111	Sad Alfurat	Raqqa
112	Deir el-Zor (Frieght)	Deir el-Zor
113	New Qamishli	Hassaka
114	Mohardeh	Hama
115	Turkish Border	Hassaka
116	Qadban	Hama
117	Lebanese Border	Tartous
118	Iraqi Border	Hassaka
119	Adra	Damascus
120	Rodwania	Aleppo
121	Shahbaa	Aleppo
122	Arabia	Aleppo
123	Zaizoun	Idlib
124	Eskan	Aleppo
125	Tishreen	Damascus
126	Abo Dena	Raqqa
127	Bouka	Lattakia
128	Shahbaa (Cement	Aleppo
129	Kafr Jona	Aleppo

GEHR Present Station Base

Small Zone	Station Name	Governarate (Large Zone)
130	Alkanawat	Damascus
131	Dommar	Damascus
132	Hamma	Damascus
133	Aljdaida	Damascus
134	Ein Alfiga	Damascus
135	Deir Kanoun	Damascus
136	Wadi Barda	Damascus
137	Tokia	Damascus
138	Zabadani	Damascus
139	Sorghaya	Damascus
140	Alkadam	Damascus
141	Alkesweh	Damascus

GEHR Present Station Base

Small Zone	Station Name	Governarate (Large Zone)
142	Deir Ali	Damascus
143	Masmia	Daraa
144	Gebab	Daraa
145	Khabab	Daraa
146	Mohjjeh	Daraa
147	Ezraa	Qunaytra
148	Ghazala	Daraa
149	Dara	Daraa
150	Alsenaeia	Damascus
151	Daraya	Damascus
152	Moadameia	Damascus
153	Artooz	Damascus
154	Saf Aldobat	Damascus
155	Qatana	Damascus
156	Moaskarat	Damascus
157	Mzerieb	Daraa
158	Mzerib Bohaira	Daraa
159	Tal Shhab	Daraa
160	Zaizoon	Daraa
161	Mokaren	Daraa
162	Komam Gharz	Daraa
163	Alteba	Daraa
164	Alkasem	Daraa
165	Bosra	As'sweida
166	Alkalaa	As'sweida
167	Nasib	Daraa

GESR Station for Future

Small Zone	Station Name	Governarate (Large Zone)
168	Alkesweh	Damascus
169	Ghbagheb	Daraa
170	Sanamein	Daraa
171	Mahaje	Daraa
172	Sheikh Meskin	Daraa
173	Dael	Daraa
174	Daraa	Daraa
175	Jordan Border	Daraa
176	Al-Tabiye	Deir el-Zor
177	Al-Mayadin	Deir el-Zor
178	Ghranij	Deir el-Zor
179	Al-Bahra	Deir el-Zor
180	Al-Maslakha	Deir el-Zor
181	Al-Bukamal	Deir el-Zor
182	Iraqi Border	Deir el-Zor
183	Douma	Damascus
184	Harasta	Damascus
185	Kaboun	Damascus
186	Idrib	Idlib
187	As Sweida	As'sweida
188	Industrial Area	Aleppo
189	Industrial Area	Homs
190	Cement Factory	Damascus
191	Industrial Area	Damascus
192	Arak	Homs
193	As-Sukhne	Homs
194	Judban	Deir el-Zor
195	Kabajeb	Deir el-Zor
196	Al Goula	Deir el-Zor
197	West Deir el-Zor	Deir el-Zor

GEHR Station for Future

Small Zone	Station Name	Governarate (Large Zone)
198	International Airport	Damascus

Outside of Syria

Small Zone	Area Name
199	Turkey
200	Jordan
201	Lebanon
202	Iraq
203	Seaport

Appendix 5

Appendix 5

Table 5.2.1 Repairing equipment

Shop	Usage	Machine name	Q'ty	Principal function
Final adjustment shop	DL	Overall circuit testing apparatus	1	Air・electric circuit test
		Wheel-load measuring equipment	1	Single shaft measurement
		Water rheostat	2	For performance test
		Sand feeding device	1	
		Height-working scaffold	1	For roof-top works
	Common	Withstand voltage testing machine	1	
		Voltage display device/safety device etc	1	For withstand voltage test
		High-pressure compressor	1	For air circuit test
		Refueling equipment	1	
		Feed water equipment	1	
		Fuel draw out equipment	1	
		Cooling water draw out equipment	1	
		Exhauster	1	
		Iron and sand dust filter for oil	1	
	DC	Overall circuit testing apparatus	1	Air・electric circuit test
		Wheel-load measuring equipment	1	Single shaft measurement
		Height-working scaffold	1	For roof-top works
	Subtotal		18	
Dismounting/mounting shop	DL	Overhead traveling crane	1	30t/5t
		Overhead traveling crane	2	25t/5t
		Car-body lifting hook	2	Portal・25t
		Car-body lifting hook fixture	1	
		Lifting-type scaffolding car	2	1t
		Height-working scaffold	2	For roof-top works
		Engine lifting hook	1	
		Bogie lifting hook	1	
		Under-floor equipment attaching/detaching device	1	
		Engine attaching/detaching device	1	
		Parts carrier	1	1t
	Common	Engine transport equipment	1	30t Battery type
		Bogie transport equipment	1	Battery type
	DC	Overhead traveling crane	1	30t/5t
		Overhead traveling crane	2	25t/5t
		Car-body lifting hook	2	Portal・25t
		Car-body lifting hook fixture	1	
		Lifting-type scaffolding car	2	1t
		Height-working scaffold	2	For roof-top works
		Engine lifting hook	1	
		Bogie lifting hook	1	
		Under-floor equipment attaching/detaching device	1	
		Engine attaching/detaching device	1	
		Parts carrier	1	1t
	Subtotal		32	
Car-body washing/air blow shop	Common	Car-body washing/air blow equipment	2	
		Traverser	1	120t
		Temporary bogie	4	
		Car-body transporter truck	1	
		Air compressor	1	For air blast
	Subtotal		9	

Shop	Usage	Machine name	Q'ty	Principal function
Car-body maintenance shop	DL	Overhead travelling crane	1	10t/3t
		Body supporting stand	40	Removal type H＝1,600 1,400
		Lifting-type scaffolding car	4	1t
		Height-working scaffold	6	For roof-top works
	DC	Overhead travelling crane	1	10t/3t
		Body supporting stand	32	Removal type H＝1,600 1,400
		Lifting-type scaffolding car	4	1t
		Height-working scaffold	6	For roof-top works
	Subtotal		94	
Bogie maintenance shop	DL	Bogie disassembling work bench	4	
		Bogie assembling equipment	2	
	Common	Overhead travelling crane	1	25t/3t
		Overhead travelling crane	2	5 t
		Bogie lifting hook	1	
		Bogie-frame washing equipment	1	Jet type
		Oscillating washing machine	1	
		Magnetic-particle test equipment	1	
		Bogie transport equipment	1	Battery type
		Bogie-frame painting booth	1	
		Airless painting apparatus	2	
		Brake testing equipment	1	Leakage test
		Bogie work bench	26	
		Shot blasting machine	1	Parts cleaning
		Welding booth	1	
	DC	Bogie disassembling work bench	2	
		Bogie assembling equipment	2	
		Reversing gear disassembling/assembling work bench	4	
		Reversing gear testing equipment	2	
	Subtotal		56	
Wheel-set maintenance shop	DL	Axle-box detaching device	2	
		Axle-box setter	2	
		Axle-box disassembling work bench	2	
		Axle-box assembling equipment	2	
		Wheel-set disassembling work bench	2	
		Wheel-set assembling work bench	4	
		Wheel-set rotating test machinery	3	
		Induction heating equipment for inner-race	1	
	Common	Overhead travelling crane	1	10t/3t
		Overhead travelling crane	2	3t Pull-up type
		Wheel-set turn-table	2	
		Wheel-set washing equipment	1	Jet type
		Wheel-set rotating equipment	2	
		Magnetic-particle test equipment	1	For wheel-set
		Magnetic-particle test equipment	1	For gear wheel
		Ultrasonic flaw detector	1	Straight beam
		Ultrasonic flaw detector	1	Angle beam
		Car wheel lathe	2	
		Chip carry out equipment	2	
		Wheel-set painting booth	1	
		Airless painting apparatus	2	
		Wheel-set press	1	600t
		Vertical lathe	2	
		Wheel axle lathe	1	
		Journal lathe	1	

Shop	Usage	Machine name	Q'ty	Principal function
Wheel-set maintenance shop	Common	Wheel axle grinding machine	1	
		Tyre induction heater	1	
		Tyre tightening machine	1	
		Suspension metal correct machine	1	
		Roller bearing washing machine	1	
		Roller bearing disassembling/assembling equipment	2	
		Oscillating washing machine	1	
		Grease filler	1	
	DC	Axle-box detaching device	2	
		Axle-box setter	2	
		Axle-box disassembling work bench	2	
		Axle-box assembling equipment	2	
		Wheel-set disassembling work bench	2	
		Wheel-set assembling work bench	2	
		Induction heating equipment for inner-race	1	
	Subtotal		64	
Engine maintenance shop	DL	Engine rotary disassembly equipment	2	
		Engine rotary assembly equipment	2	
		Engine work bench	7	
		Cylinder boring machine	1	
		Fuel injection pump work bench	5	
		Fuel injection pump testing machine	1	
		Nozzle testing machine	1	
		Speed governor testing machine	1	
		Double spindle boring machine	1	For connecting rod
		Piston/connecting rod work bench	2	
		Balancing machine	1	
		Hydrostatic device testing equipment	1	
		Air compressor repairing work bench	1	
		Air compressor assembling stand	1	
		Air compressor testing equipment	1	
		Blower testing machine	1	
		Crank-shaft bearing gauge	1	
		Radiator washing equipment	1	
		Radiator leakage testing machine	1	
		Ventilator	1	
	Common	Overhead travelling crane	1	30t/5t
		Overhead travelling crane	2	5t
		Engine lifting hook	1	
		Engine transport equipment	1	
		Soft blasting equipment	1	
		Jet washing equipment	1	
		Magnetic-particle test equipment	1	For engine parts
		Magnetic-particle test equipment	1	For crank-shaft
		Oscillating washing machine	1	
		Crank-shaft bearing line boring machine	1	
		Crank-shaft grinding machine	1	
		Cam-shaft line boring machine	1	
		Cam-shaft grinding machine	1	
		Hydraulic press	1	25t
		Sylinder honing machine	1	
		Water jacket pickling device	1	
		Valve guide remove/press fit equipment	1	20t
		Plane valve seat inspection equipment	1	
		Valve seat grinding machine	1	
		Valve grinding machine	1	

Shop	Usage	Machine name	Q'ty	Principal function
Engine maintenance shop	Common	Valve spring testing machine	1	
		Planing machine	1	
		Painting booth	1	
		Airless painting apparatus	2	
	DC	Engine rotary disassembly equipment	2	
		Engine rotary assembly equipment	2	
		Fuel injection pump testing machine	1	
		Nozzle testing machine	1	
		Fuel injection pump work bench	5	
		Change gear rotary disassembling/assembling equipment	3	
		Magnetic-particle test equipment	1	
		Change gear oscillating washing machine	1	
		Double spindle boring machine	1	For connecting rod
		Piston/connecting rod work bench	2	
		Cylinder boring machine	1	
		Crank-shaft bearing gauge	1	
		Engine preheating device testing machine	1	
		Heat exchanger testing machine	1	
		Rotary converter	1	
	Subtotal		83	
Engine performance test room	DL	Engine performance testing device	2	
		Water rheostat	2	For engine performance test
	Common	Overhead travelling crane	1	30t/5t
		Engine lifting hook	1	
		Lubricating device	1	
		Water softening plant	1	
		Fuel supply equipment	1	
		Smoke removing facilities	1	
		Painting booth	1	
		Airless painting apparatus	2	
	DC	Engine performance testing device	2	
	Subtotal		15	
Rotating machine maintenance shop	DL	Overhead travelling crane	1	10t/3t
		Overhead travelling crane	1	5t
		Rotaiting machine air-blast equipment	1	
		Magnetic-frame washing equipment	1	
		Magnetic-frame tester	1	Electric characteristic test
		Armature tester	1	
		Armature shaft ultrasonic flaw detector	1	
		Armature lathe	1	
		Commutator grooving machine	1	Automatic type
		End-cover washing equipment	1	
		Roller bearing washing equipment	1	
		No-load testing device	2	
		Load testing device	1	
		Pinion heater	1	

Shop	Usage	Machine name	Q'ty	Principal function
Rotating machine maintenance shop	DL	Pinion magnetic-particle test equipment	1	
		Tig welding machine	1	
		Armature binding machine	1	
		Tape winding machine	1	
		Slot of armature coil correct machine	1	
		Ultrasonic washer	1	
		Vacuum impregnation equipment	1	
		Drying furnace	1	
		Coil winding machine	1	
		Coil forming machine	1	
		Balancing machine	1	
		Generator rotary disassembling/assembling stand	4	
		Generator testing machine	2	
		Generator work bench	7	
		Auxiliary generator rotary disassembling/assembling stand	4	
		Auxiliary generator testing machine	2	
		Auxiliary generator work bench	7	
		Traction motor rotary disassembling/assembling stand	6	
		Traction motor work bench	10	
		Withstand voltage testing machine	1	
		Motor for feed pump testing machine	1	
		Air-blow/dust collecting equipment	1	
		Painting booth	1	
		Airless painting apparatus	2	
		Terminal heat run testing equipment	1	
		Brush holder spring testing machine	1	
		Hydraulic press	1	400t
	Subtotal		77	
Electric parts maintenance shop	DL	Large current relay testing machine	1	
		Non-contact relay testing machine	1	
		No-fuse breaker testing machine	1	
		High-speed circuit breaker testing machine	1	
		Dynamo for slip detection tester	1	
		Speed ratio rotating detector testing machine	1	
		Semiconductor testing machine	1	
	Common	Overhead travelling crane	1	5t
		Overhead travelling crane	1	3t Pull-up type
		Air-blow/dust collecting equipment	1	
		Small-sized relay testing machine	1	
		Electro-magnetic valve tester	1	
		Jumper coupler tester	1	
		Speedometer tester	1	
		Electric-meter calibrating apparatus	1	
		ATS testing machine	1	
		Storage battery testing device	1	For electric charge/discharge test
		Storage battery charging equipment	1	

Shop	Usage	Machine name	Q'ty	Principal function
Electric parts maintenance shop	Common	Withstand voltage testing machine	1	
		Water temperature relay testing machine	1	
		Charging generator testing machine	1	
		Oil hydraulic relay testing machine	1	
		Starter testing machine	1	
		Electro-pneumatic change valve testing machine	1	
		Electric parts painting booth	1	
		Airless painting apparatus	2	
	DC	Silicone rectifier testing machine	1	
		Wiring breaker tester	1	
	Subtotal		29	
Air-brake parts maintenance shop	Common	Overhead travelling crane	2	3t Pull-up type
		Shot blasting machine	1	
		Ultrasonic washer	1	
		Oscillating washing machine	1	
		Air-brake valve testing machine	1	
		Transfer valve testing machine	1	
		Distributing valve testing machine	1	
		Safety valve testing machine	1	
		Cock lapping machine	1	
		Cock testing machine	1	
		Pressure regulating valve testing machine	1	
		Pressure gauge tester	1	
		A control valve testing machine	1	
		Whistle valve tester	1	
		High-pressure air compressor	1	
		Air-blast equipment	1	
		Painting booth	1	
		Airless painting apparatus	2	
	Subtotal		20	
Iron-work/coil-spring maintenance shop	Common	Overhead travelling crane	2	2t Pull-up type
		Upright drilling machine	1	
		Metal sawing machine	1	
		Shearing machine	1	
		Bending machine	1	
		Bending roll	1	
		Pipe cutting machine	1	
		Pipe threading machine	1	
		Bolt screw cutting machine	1	
		Band sawing machine	1	
		Pipe bending machine	1	
		General purpose grinder	1	
		Induction hardening equipment	1	
		Hydraulic press	1	50t
		Heating furnace	1	
		Fuel tank	1	

Shop	Usage	Machine name	Q'ty	Principal function
Iron-work/coil-spring Maintenance shop	Common	Welding machine	2	
		Tig welding machine	1	
		Welding booth	1	
		Coil-spring disassembly equipment	1	
		Shot blasting machine	1	
		Magnetic-particle test equipment	1	
		Coil-spring assembly equipment	1	
		Coil-spring testing machine	1	
		Coil-spring painting equipment	1	
		Oil damper washing machine	1	
		Oil damper testing device	1	
		Electro-plating equipment	1	
	Subtotal		30	
Machining shop	Common	Overhead travelling crane	3	2t Pull-up type
		Upright drilling machine	2	
		Radial drilling machine	1	
		Shaping machine	1	
		Slotter	1	
		Planer	1	
		Parallel lathe	3	
		Turret lathe	1	
		Vertical lathe	1	
		Horizontal boring machine	1	
		Vertical boring machine	1	
		Gear cutting machine	1	
		Gear hobbing machine	2	
		Horizontal milling machine	1	
		Vertical milling machine	1	
		Universal tool & cutter grinding machine	1	
		Surface grinding machine	1	
		Round nosed tool grinding machine	1	
		Bolt screw cutting machine	1	
		Metal sawing machine	1	
		Pipe cutting machine	1	
		Pipe threading machine	1	
		Pipe bending machine	1	
		General purpose grinder	1	
	Subtotal		30	
Wood-work・seat cushion work-place	Common	Overhead travelling crane	1	2t Pull-up type
		Band sawing machine	1	
		Single side planer	1	
		Universal circular sawing machine	1	
		Tenoning machine	1	
		Dust collecting equipment	1	
	DC	Seat-cushion washing equipment	1	
		Vacuum cleaner	1	
		Industrial sewing machine	2	
	Subtotal		10	

Shop	Usage	Machine name	Q'ty	Principal function
Car-body painting shop	Common	Car-body painting booth	2	
		Airless painting apparatus	8	
		Washing booth	2	
		Side panel lifting-type scaffold	8	
		End panel lifting-type scaffold	8	
		Car-body transporter truck	1	On rail & road
		Temporary bogie	8	
	Subtotal		37	
Machine repair shop	Common	Overhead travelling crane	2	2t Pull-up type
		Upright drilling machine	1	
		Metal sawing machine	1	
		Shearing machine	1	
		Bending machine	1	
		Bending roll	1	
		Pipe cutting machine	1	
		Pipe bending machine	1	
		Pipe threading machine	1	
		Universal machine tool	1	
		Welding machine	2	
		General purpose grinder	1	
		Withstand voltage testing machine	1	
		Hydraulic press	1	10t
		Working car	2	1t
		Height-working car	2	
	Subtotal		20	
Foundry shop	Common	Overhead travelling crane	1	5t Wireless control
		Overhead travelling crane	1	3t Pull-up type With lifting magnet
		Overhead travelling crane	1	1t Pull-up type
		High frequency induction furnace	2	2t For cast iron
		Electric furnace body	1	2t For cast iron
		High frequency induction furnace	1	200kg For alloy copper
		Pouring machine	1	2t For cast iron
		Platform weighing machine	1	3t
		Sand treatment equipment	1	
		Sand cooler	1	
		Sand bin	1	
		Mixer	1	
		Molding machine	2	
		Molding-box transfer conveyor	1	
		Hopper	2	
		Bucket conveyor	2	
		Shot blasting machine	1	
		Core oven	1	
		Emission spectro chemical analysis	1	
		Molding box	150	Top flask 1,000 ㎜×1,000 ㎜×200 ㎜
		Molding box	150	Bottom flask 1,000 ㎜×1,000 ㎜×200 ㎜
		Metal mold	10	
		Deck for works	1	108 ㎡
		Ventilator	1	
		General purpose grinder	1	
	Subtotal		336	

Shop	Usage	Machine name	Q'ty	Principal function
Forge shop	Common	Overhead travelling crane	2	2t Pull-up type
		Air hammer	1	1/2t
		Heating furnace	2	
		Fuel tank	1	
		Suspension metal built-up device	1	
		Ventilator	1	
		Cementation furnace	1	
		Induction hardening equipment	1	
		Metal sawing machine	1	
	Subtotal		11	
Boiler room	Common	Boiler	3	5t
		Boiler water purifier	1	
		Fuel supply equipment	1	
		Air compressor	7	$8m^3$/min 45kW
	Subtotal		12	
Material testing room	Common	Universal material testing machine	1	
		Impact tester	1	
		Hardness tester	2	
		Thickness tester	1	For paint film measuring
		Electronic balance	1	
		Emission spectro analyzer for fuel and oil	1	
	Subtotal		7	
Transporting equipment	Common	Passenger automobile	1	
		Micro bus	1	
		Truck	1	3t
		Truck	1	2t
		Fork-lift truck	1	3t
		Fork-lift truck	1	2t
		Fork-lift truck	2	1t
		Parts carrier	2	2t
		Parts carrier	2	1t
		Shunting engine	1	20t
		Fire-engine	1	
	Subtotal		14	
Material warehouse	Common	Gantry crane	2	5t
		Overhead travelling crane	1	5t
	Subtotal		3	
Storehouse of dangerous articles	Common	Ventilator	1	
	Subtotal		1	
Piping facilities・etc	Common	Steam pipe	1	
		Air pipe	1	
		Air reservoir	4	
		Gas pipe	1	
		Acetylene gas generator	1	
	Subtotal		8	

Shop	Usage	Machine name	Q'ty	Principal function
Shed for effluent treatment plant	Common	Effluent treatment plant	1	30t/h
		Sludge incinerator	1	
		Fuel supply equipment	1	
	Subtotal		3	
Shed for incineration equipment	Common	Waste incinerator	1	
		Fuel tank	1	
	Subtotal		2	
Total			1,021	

Appendix 5.3 Maintenance Structure of Locomotive, Diesel Railcar Maintenance Equipment

5.3.1 Maintenance structure of maintenance equipment

Breakdown of machines for car inspection/repair or deterioration/worn-out of function will give a great influence on schedule of car inspection/repair and securing the quality.
Therefore, it is very important to keep machines in normal condition and also to make good use of valuable property with limited expense.

(1) Maintenance of machine

There are many kind of machines and usage of machines varies depend on cases, therefore, unified maintenance is not practical and uneconomical. It is more realistic to take suitable method for each machines.

(2) Maintenance method of machine

Maintenance method of machine can be broadly divided into Preventive Maintenance, ex post fact maintenance and Improvement Maintenance. To decide which method should be , it is needed to decide from the viewpoint of function securing and economy. Those machines which will give great importance to the quality of car inspection/repair work or to secure the schedule can be classified as “Important Machine” and also those machines related to the labor disaster and environmental pollution can be classified as “Special Control Machine” and apply the preventive maintenance method and those less influential machines can be itemized as “ex post facto maintenance” by providing daily maintenance for more economical purpose.

(3) Maintenance department of machine

For machines in car workshop, specific department of machine control should be installed in workshop for arrangement of machine property, recording the repair past history, preparing all kind of statistics, work planning, out-sourcing control and training.

5.3.2 System of Maintenance Control of Facilities

(1) Organization

Control of machine facilities and maintenance are very complex and also continuous arrangement for accumulate knowledge and technology are needed, therefore, the work should preferably organized. An example of car workshop is shown in “Fig.5.3.1 An example of facilities control organization”.

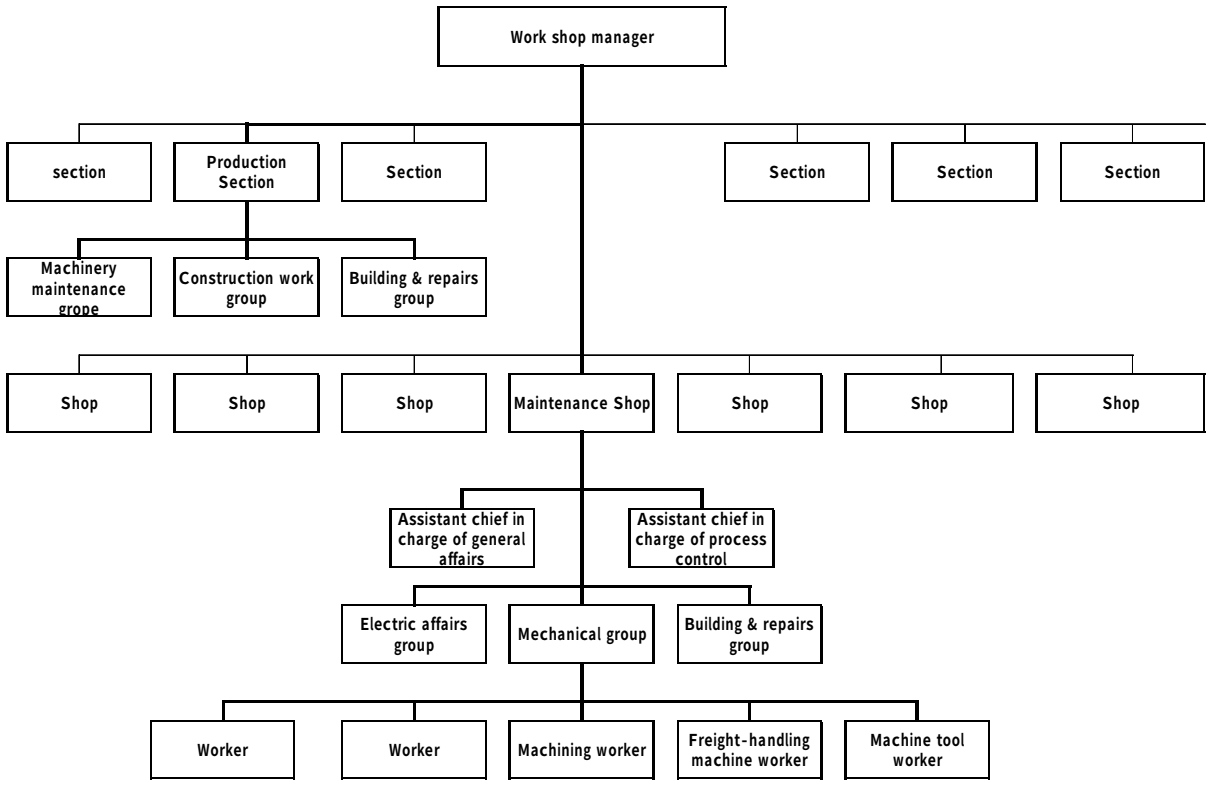


Fig5.3.1 An example of facilities control organization

Thick line indicate the department in charge of facilities maintenance.

Production section will assist the workshop manager in the integrity of workshop facilities and responsible for installment of facilities and maintenance and its work is as stated in “Table 5.3.1 work of production section” and “ Table 5.3.2 work in maintenance shop”.

Table 5.3.1 Work of production Section

Chief Facility Section; Planning & Guidance of Workshop establishment, improvement and maintenance		
Planning	1	Long term plan of workshop facility
	2	Yearly plan of establishment & improvement (budget, settlement)
	3	Yearly plan of facility maintenance
	4	Preparation of various regulation on machine control
	5	Introduction of technical development
	6	Education plan for maintenance stuff
	7	Prevention of pollution & improvement of environment
	8	Measures for maintenance related regulation
	9	Control of fixed property
Daily work	1	Monthly various work plan (establishment, improvement, maintenance)
	2	Design of various work, drafting, supervising, completion test
	3	Preparation of various statistics & report
	4	Preparation plan of material and settlement
	5	Preparation of work equipment & tool, settlement
	6	Adjustment of work progress with related work-site

Table 5.3.2 Work of maintenance shop

Maintenance shop manager; Actual work for inspection, maintenance and work of machine facility		
planning	1	Drafting the plan of round of inspection, periodical inspection
	2	Recording & reporting of break down & repair
	3	Investigation & improvement of inspection item, cycle and limit
	4	Preparation of work standard
	5	Technical guiding, work improvement, safety measure
Daily work	1	Implementation of various inspection & repair based on plan
	2	Disposition against for break down temporally
	3	Site guidance & control for out source work

(2) Kind of inspection and responsible person for implementation

1) Daily inspection

Functioning test, prior and after using machines and whenever necessary, oiling and cleaning are implemented . Person in charge will be designate for handling the machine .

2) Patrol of inspection

Inspection done for machines as they are and in operational condition and periodically once for 1 month upon designating the person in charge by maintenance shop manager.

The purpose of this inspection is to prevent the occurrence of accident and to keep the

normal operation of machines and also to make reference data for the coming next inspection.

3) Periodic inspection

Periodical inspection takes place every certain term by dismantling main part of machine for inspection and depend on occasion, replace necessary parts and make repair. Maintenance shop manager will take action based on inspection plan and will constitute the base of preventive integration.

4) Temporary inspection

When the machine breaks down or when some inferiority place found by patrol inspection and held over for immediate repair, temporary inspection will be scheduled by maintenance shop manager.

5) Special inspection

To replace main part of machine and when improvement or move machine, anew inspection is done. Maintenance shop manager will take initiative for inspection.

5.3.3 Cycle of Inspection

There are every kind of machines and at each place, frequency of using the machines, condition of burden, environmental condition, expecting value of function and demand for safety are all different, thus, the degree of urgency is quite different depending on each individual machines. Therefore, it is very difficult to decide the cycle of inspection and even does not meet with actual circumstance. Also, machines are not always break down uniformly but defect will appear first without any fail ; As an example,

(1) Machines using oil circuit, oil-ring and oil-seal are needed to replace in approximately 1 year.
(2) High speed bearing is better to be replaced in 3 year.
(3) In the case of crane.
    1) Lifting hook needs to be checked every month and replaced in 1/2-1 year.
    2) Wheel flange wear and axle seizure are happened due to shortage of oil injection.

Keep these items in mind, and with reference to those maintenance manuals submitted when machines are purchased, it is most ideal to decide the cycle in conformity with

the actual circumstances. The next shows the actual example of cycle.

(a) Special Control Machines. (Table 5.3.3)

For the purpose of preventing environmental pollution and labor disaster, inspection cycle & report obligation are stipulated by law, those machines should be maintained with priority and particular attention

Table 5.3.3 Example of inspection cycle of special control machine

Machine name	Round inspection	Periodic inspection
Boiler	Within 1 month	Within 1 year
Crane etc.	Within 1 month	Within 1 year
Simple lift	Within 1 month	Within 1 year
Fork lift	Within 1 month	Within 1 year
Power drive press and share	1 month	Within 1 year
Power drive centrifugal machine	1 month	Within 1 year
Drying facility and accessory facility	1 month	Within 1 year
Driving car by rail	Within 1 month	Within 1 year Within 3 year (function)
Conveyance machine rolling stock system	1 month	Within 1 year
Local exhaust device		
Dust abolishing device		
Waste fluid device		

(b) Important Machines (Table 5.3.4)

Since the break down of machines are in danger to affect other schedule of work, preventive integrity should be strictly enforced

Table 5.3.4 Example of inspection cycle for important machine

Name of machine	Round inspection	Periodic inspection
Pump	1 month	1 year
Wheel lathe	1 month	1 year
Electric motor disassembling & assembling device	1 month	1 year
Conveyance device for parts	1 month	1 year
Air compressor	1 month	1 year
Rolling stock function taster	1 month	1 year
Air conditioning device	1 month	1 year
Safety device for falling from elevated work site	1 month	1 year
Rolling stock parts washing device	1 month	1 year
Drainage disposition device	1 month	1 year
Incinerator	1 month	1 year
Rolling stock traverser	1 month	1 year

5.3.4 Inspection Plan

Inspection plan will be planned with close and compact adjustment between the group use the machines under stipulated inspection standard on type of inspection and cycle and the maintenance group. For those machines which need disassembling, facilities of different operation ratio depend on season like Air Conditioning and machines which give fatal influence over to other works using machines, the decision of inspection timing is very important. Chief production section will prepare inspection plan (yearly, monthly) and maintenance shop manager will execute the plan.

5.3.5 Recording and Reporting of Inspection

When the inspection carried out, the person who executed inspection will make recording on type of inspection and contents etc. according to the specified form and report to Maintenance shop manager. Based on this report, necessary measures will be made at places concerned.

That is to say, either immediate repair work to be done or to decide the repair timing for preparation of material and budgetary plan.

Therefore, for the effective usage, recording and safekeeping of report is to be made.

5.3.6 Limit of Repair and Limit of Usage

As a important ground for machine control, there are guidance, handling explanation and drawing offered by machine maker. These must be preserved well and make practical use as guidance of actual work. Repair limit which shows the limit of repair and usage limit which shows the limit of replacement must be defined as important part of machine.

Although the same type of machine there may be, the deterioration and abrasion are different according the usage condition & environment of machines, therefore, each limitation must be decided considering the usage frequencies and inspection cycle.

As for the limit numerical value, it is generally take performance value as reference.

Every day inspection record, measured value must be arranged and kept preserved.

5.3.7 Handling of Machine

It should not be neglected that the influence of machine operator's mental attitude like in the case of oil injection and adjustment. Especially, for important machines, full education/guidance must be exerted for machine handling staff on operation/ manipulation of machines, outline of structure and function, adjustment of each part of machines, the way of oil injection, detail of inspection & method, safety work, prevention of disaster and related laws and certain qualification should be given and further, provision must be made for operators are required to have such qualification for handling machines. Table 5.3.5 is an example to acquire the operating license.

Table 5.3.5 Machines requiring license of handling (example)

Name of machine	Remarks
Rolling stock shunting machine	
Crane	
Power type conveyance car	
Boiler	
Air compressor	more than 75kw
Ultrasonic flaw detector	
Magnetic flaw detector	
Main motor test device	
Main generator test machine	
Traverser	Car body traverser
High voltage equipment	
Extra high voltage equipment	

5.3.8 Preparation of past history book

By each machine, to make record of main inspection contents and remodeling items is very effective to decide the investment plan and replacement timing.

Generally, past history book is prepared by production section chief and kept preserved by maintenance shop manager and recording must be made without omission in case of occurrence of fatal obstacle or inspection and remodeling.

Appendix 5.5 : Architectural Drawings

Drawing List

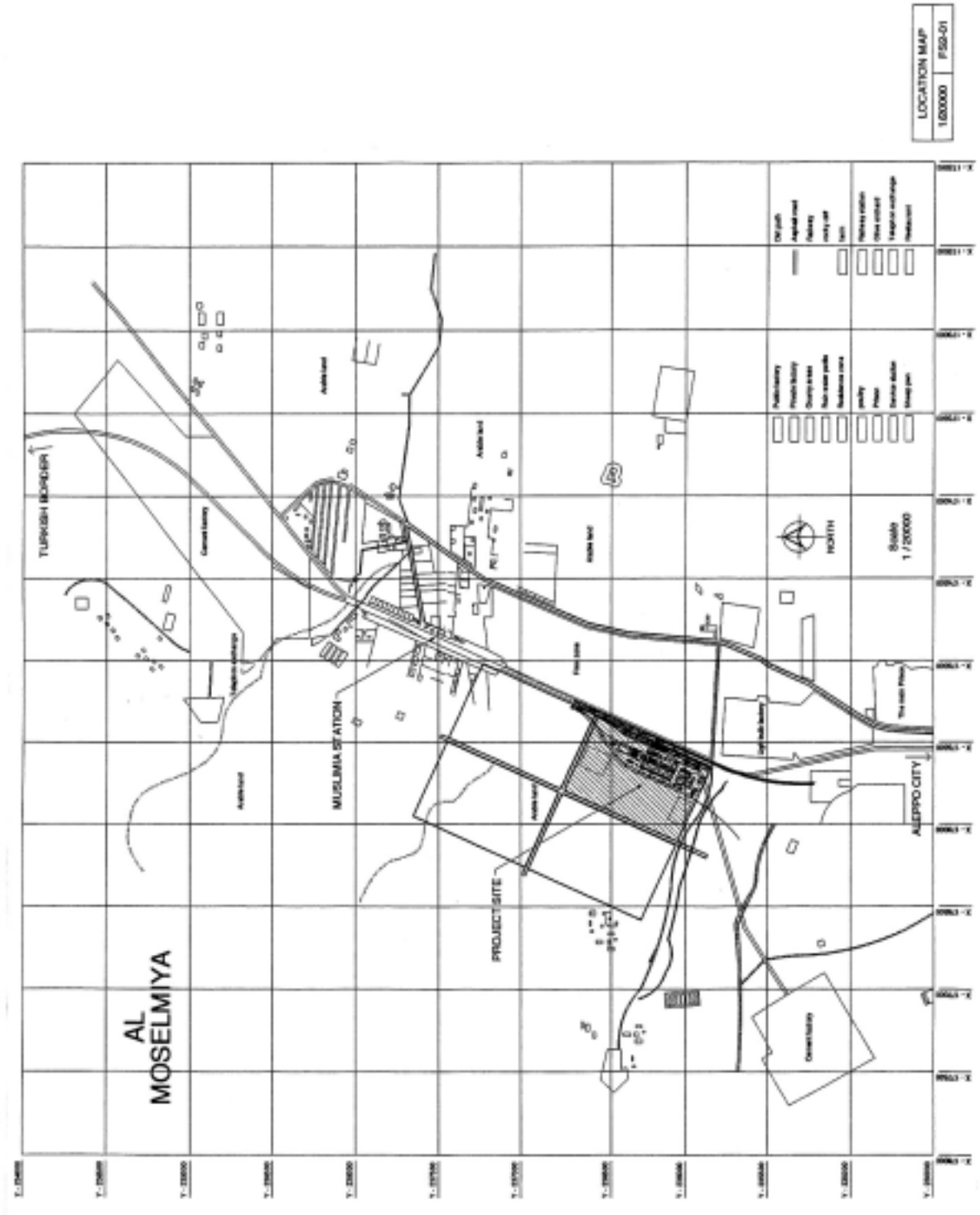
Drawing No.	Title
FS2-00	Drawing List
FS2-01	Location Map
FS2-02	General Layout for Locomotive Workshop Facility
FS2-03	Final Adjustment Shop
FS2-04	Main Workshop (1/2)
FS2-05	Main Workshop (2/2)
FS2-06	Car-body Washing & Air-blow Shop (1/2)
	Car-body Painting Shop (1/2)
FS2-07	Car-body Washing & Air-blow Shop (2/2)
	Car-body Painting Shop (2/2)
FS2-08	Engine Performance Test Room
	Boiler Room
FS2-09	Iron-work, Spring Inspection & Repair Shop
	Machine Repair Shop
	Forge Shop
FS2-10	Foundry Shop
FS2-11	Storehouse of Dangerous Articles
	Garage
FS2-12	Storehouse-1 & 2
FS2-13	Substation-1, 2 & 3
FS2-14	Administration Building (1/2)
FS2-15	Administration Building (2/2)
FS2-16	Canteen-1 (1/3)
FS2-17	Canteen-1 (2/3)
FS2-18	Canteen-1 (3/3)
FS2-19	Canteen-2

FS2-00 Drawing List

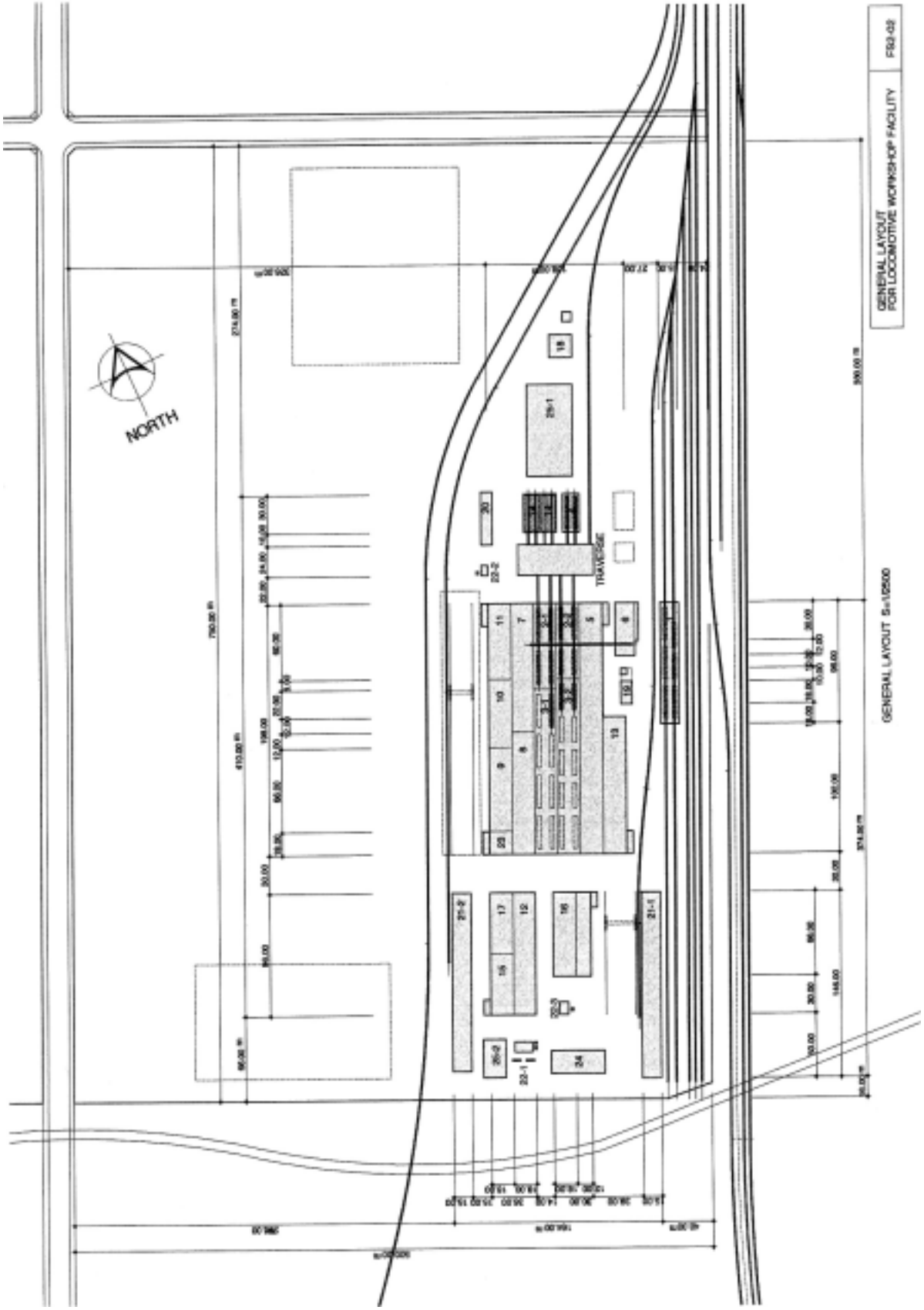
Dwg No.	No.	Shop Name	Floor Area	Scale
FS2-01		LOCATION MAP		1/20000
FS2-02		GENERAL LAYOUT FOR LOCOMOTIVE WORKSHOP FACILITY		1/2500
FS2-03	1	FINAL ADJUSTMENT SHOP	1,440 m2	1/400
FS2-04		MAIN WORKSHOP 1/2	20,124 m2	1/800
FS2-05		MAIN WORKSHOP 2/2		1/800
FS2-06	4	CAR-BODY WASHING & AIR-BLOW SHOP 1/2	360 m2	1/400
	14	CAR-BODY PAINTING SHOP 1/2	780 m2	1/400
FS2-07	4	CAR-BODY WASHING & AIR-BLOW SHOP 2/2		1/400
	14	CAR-BODY PAINTING SHOP 2/2		1/400
FS2-08	6	ENGINE PERFORMANCE TEST ROOM	720 m2	1/400
	19	BOILER ROOM	182 m2	1/400
FS2-09	12	IRON-WORK,SPRING INSPECTION & REPAIR SHOP	3,518 m2	1/400
	15	MACHINE REPAIR SHOP		1/400
	17	FORGE SHOP		1/400
FS2-10	16	FOUNDRY SHOP	2,220 m2	1/400
FS2-11	18	STOREHOUSE OF DANGEROUS ARTICLES	144 m2	1/200
	20	GARAGE	378 m2	1/200
FS2-12	21-1	STOREHOUSE	2,190 m2	1/400
	21-2	STOREHOUSE	2,100 m2	1/400
FS2-13	22-1	SUBSTATION-1 (RECEIVING)	112 m2	1/200
	22-2	SUBSTATION-2 (MAIN WORKSHOP)	40 m2	1/200
	22-3	SUBSTATION-3 (FOUNDRY SHOP)	70 m2	1/200
FS2-14	24	ADMINISTORATION BLDG. 1/2	1,512 m2	1/200
FS2-15	24	ADMINISTORATION BLDG. 2/2		1/200
FS2-16	25-1	CANTEEN-1 (MAIN WORKSHOP) 1/3	5,184 m2	1/200
FS2-17		CANTEEN-1 (MAIN WORKSHOP) 2/3		1/200
FS2-18		CANTEEN-1 (MAIN WORKSHOP) 3/3		1/200
FS2-19	25-2	CANTEEN-2 (MACHINE REPAIR SHOP)	1,080 m2	1/200
		WASTE WATER TREATMENT ROOM		
		INCINERATOR ROOM		
			42,172 m2	

DRAWING LIST FS2-00

FS2-01 Location Map

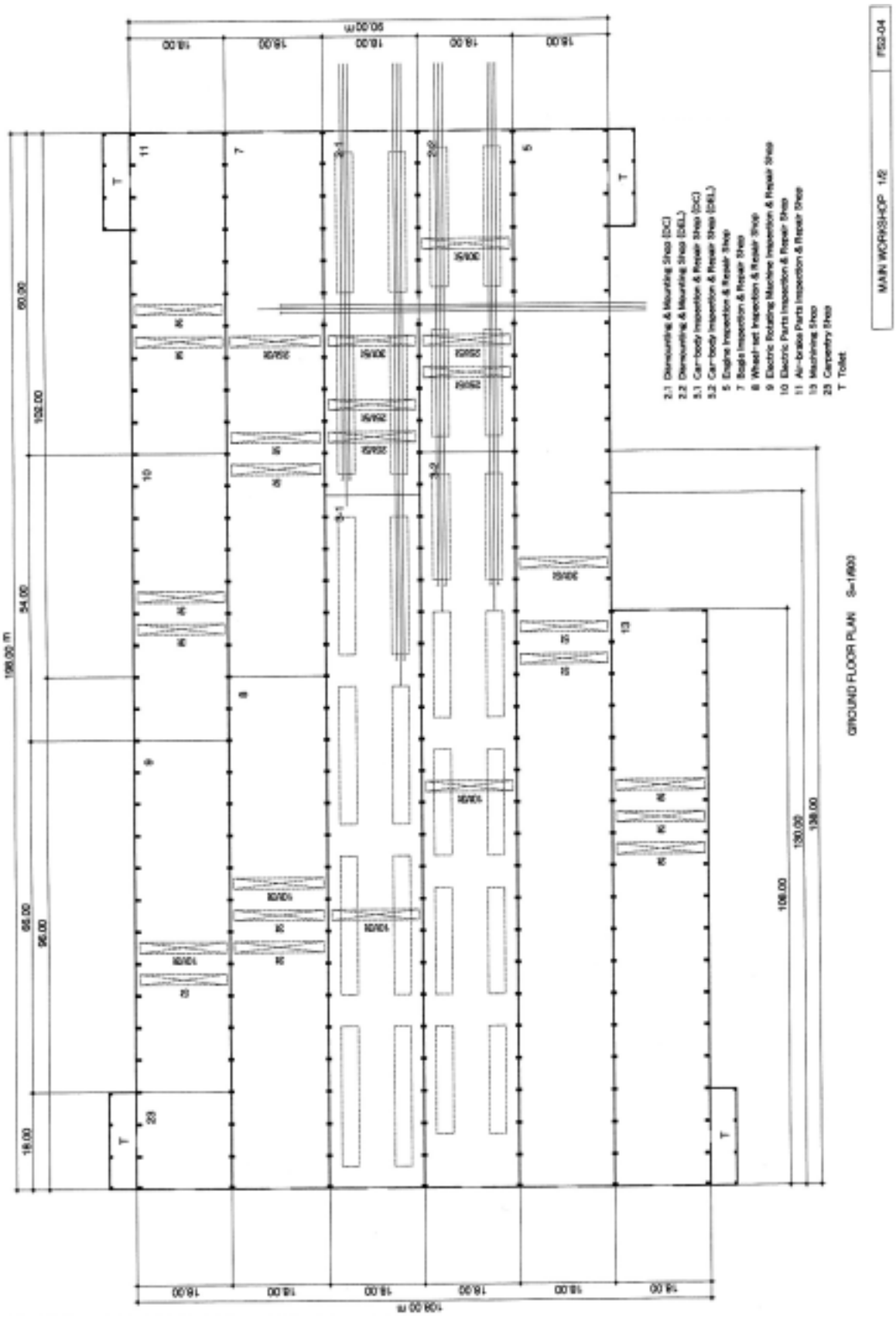


FS2-02 General Layout for Locomotive Workshop Facility



FS2-03 Final Adjustment Shop

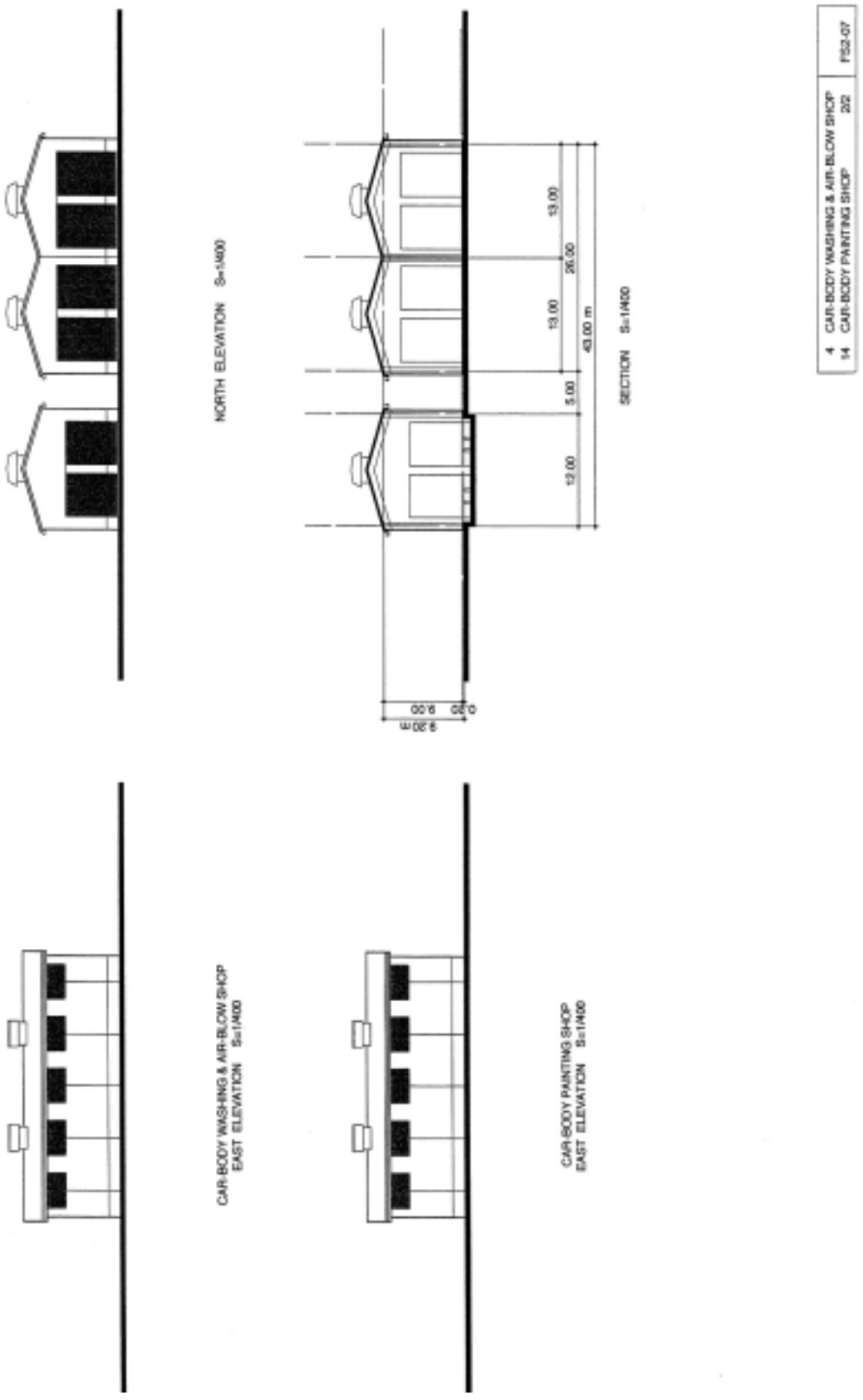
FS2-04 Main Workshop (1/2)

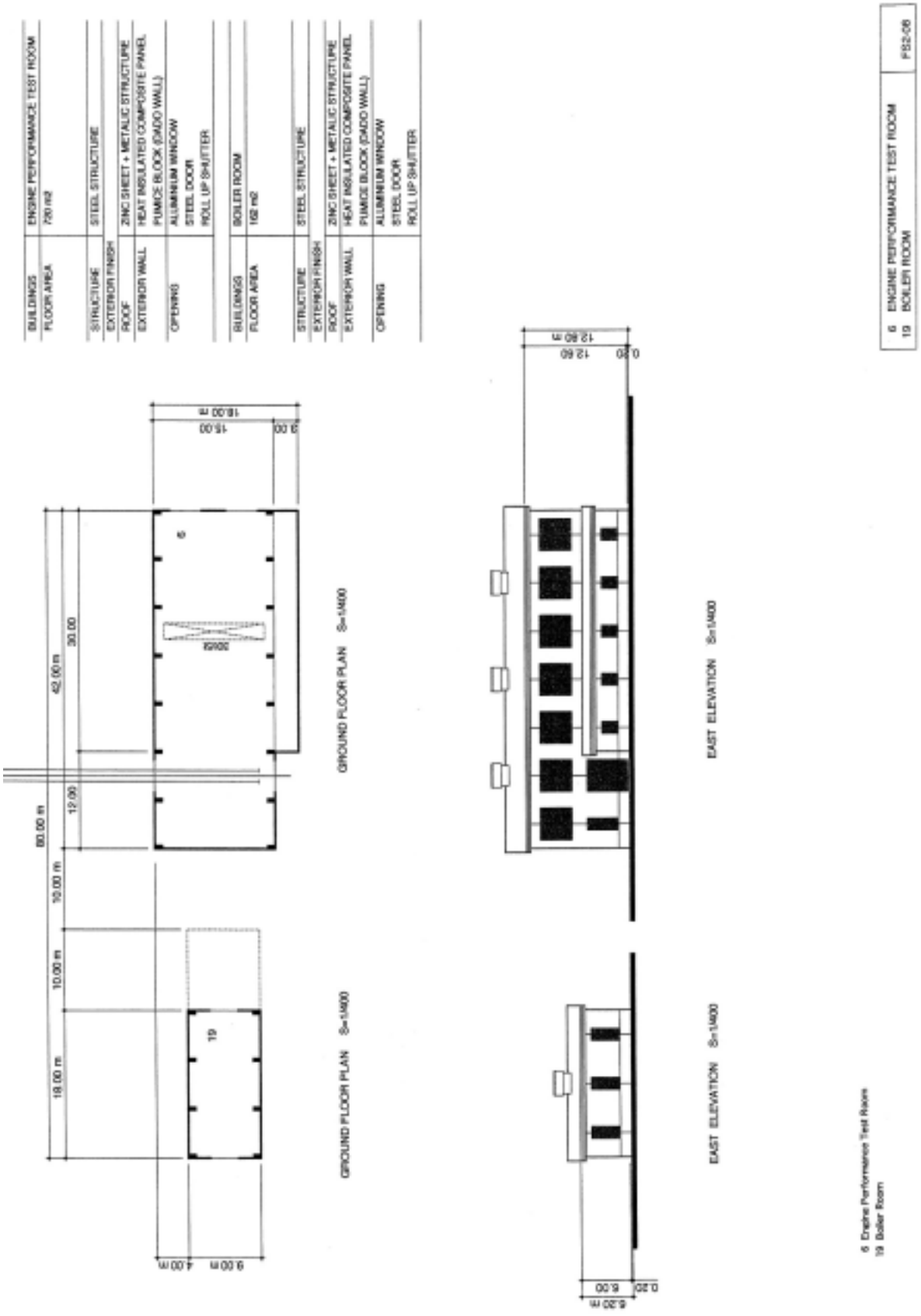


FS2-05 Main Workshop (2/2)

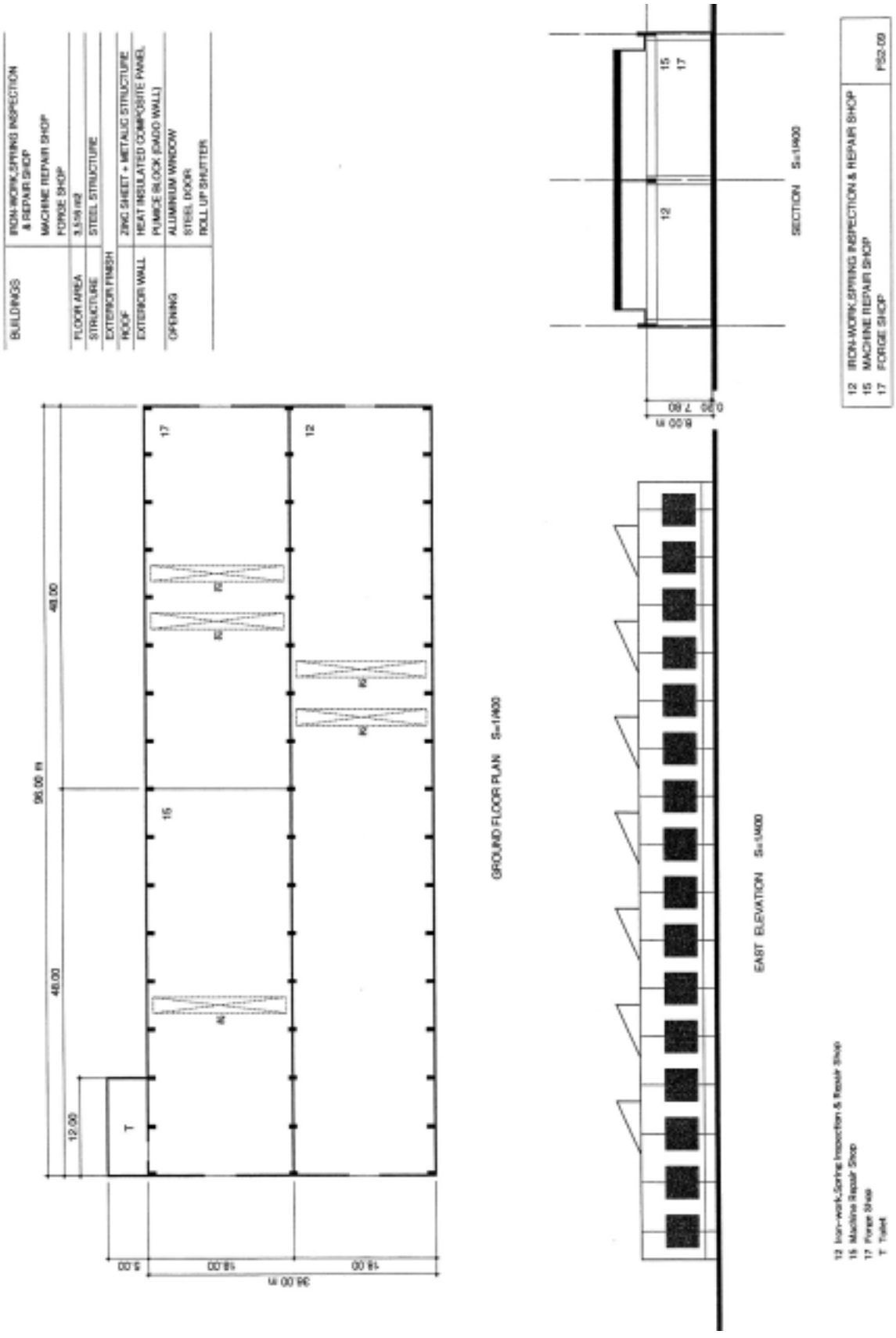
BUILDINGS
CAR-BODY WASHING & AIR-BLOW SHOP
FLOOR AREA
360 m2
STRUCTURE
STEEL STRUCTURE
EXTERIOR FINISH
ROOF
ZINC SHEET + METALIC STRUCTURE
EXTERIOR WALL
HEAT INSULATED COMPOSITE PANEL
PUMICE BLOCK (SASO WALL)
OPENING
ALUMINIUM WINDOW
STEEL DOOR
ROLL UP SHUTTER
BUILDINGS
CAR-BODY PAINTING SHOP
FLOOR AREA
780 m2
STRUCTURE
STEEL STRUCTURE
EXTERIOR FINISH
ROOF
ZINC SHEET + METALIC STRUCTURE
EXTERIOR WALL
HEAT INSULATED COMPOSITE PANEL
PUMICE BLOCK (SASO WALL)
OPENING
ALUMINIUM WINDOW
STEEL DOOR
ROLL UP SHUTTER
4 CAR-BODY WASHING & AIR-BLOW SHOP
14 CAR-BODY PAINTING SHOP
1/2
FS2-06
43.00 m
13.00
13.00
5.00
12.00
64.00 m
30.00 m
10.00 m
24.00 m
TRAVERSE
60.00 m
GROUND FLOOR PLAN S=1/400
4 Car-body Washing & Air-blow Shop
14 Car-body Painting Shop

FS2-07 Car-body Washing & Air-blow Shop (2/2), Car-body Painting Shop (2/2)




BUILDINGS
ENGINE PERFORMANCE TEST ROOM
FLOOR AREA
720 m2
STRUCTURE
STEEL STRUCTURE
EXTERIOR FINISH
ROOF
ZINC SHEET + METALIC STRUCTURE
EXTERIOR WALL
HEAT INSULATED COMPOSITE PANEL
PUMICE BLOCK (DADO WALL)
OPENING
ALUMINIUM WINDOW
STEEL DOOR
ROLL UP SHUTTER
BUILDINGS
BOILER ROOM
FLOOR AREA
162 m2
STRUCTURE
STEEL STRUCTURE
EXTERIOR FINISH
ROOF
ZINC SHEET + METALIC STRUCTURE
EXTERIOR WALL
HEAT INSULATED COMPOSITE PANEL
PUMICE BLOCK (DADO WALL)
OPENING
ALUMINIUM WINDOW
STEEL DOOR
ROLL UP SHUTTER
6 ENGINE PERFORMANCE TEST ROOM
19 BOILER ROOM
FS2-08
GROUND FLOOR PLAN S=1/400
GROUND FLOOR PLAN S=1/400
EAST ELEVATION S=1/400
EAST ELEVATION S=1/400
6 Engine Performance Test Room
19 Boiler Room

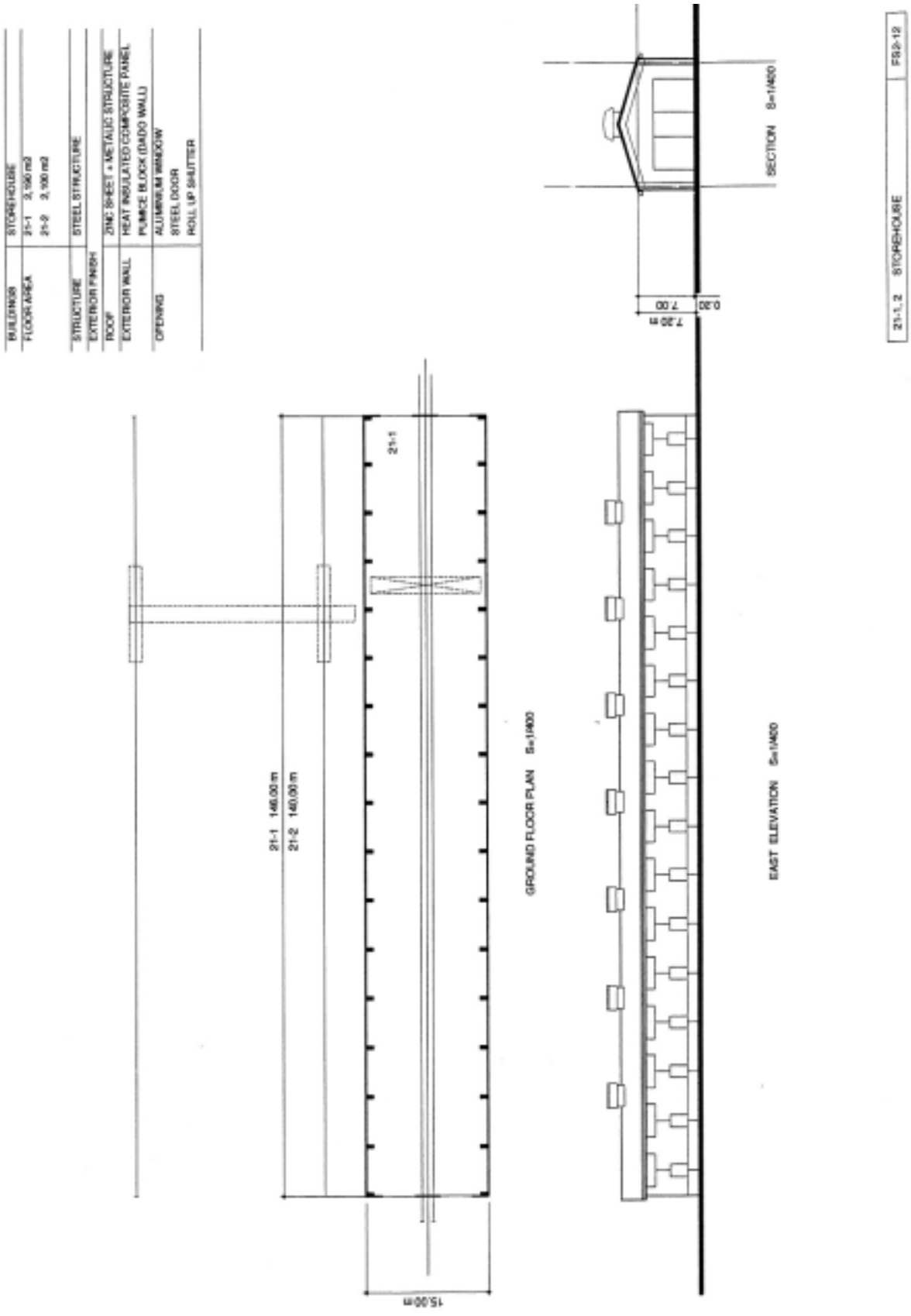
FS2-09 Iron-work, Spring Inspection & Repair Shop, Machine Repair Shop, Forge Shop



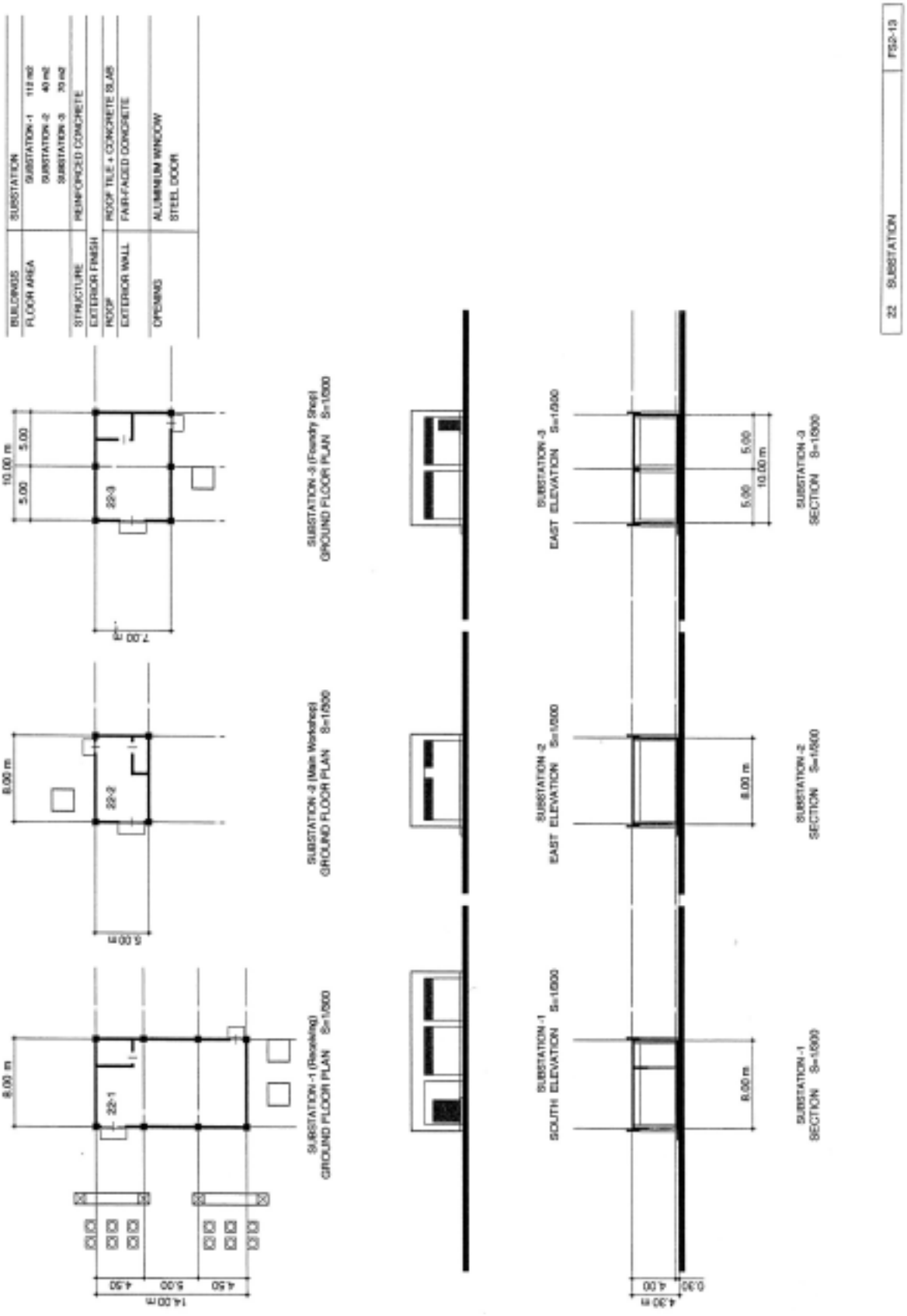
FS2-10 Foundry Shop

FS2-11 Storehouse of Dangerous Articles, Garage

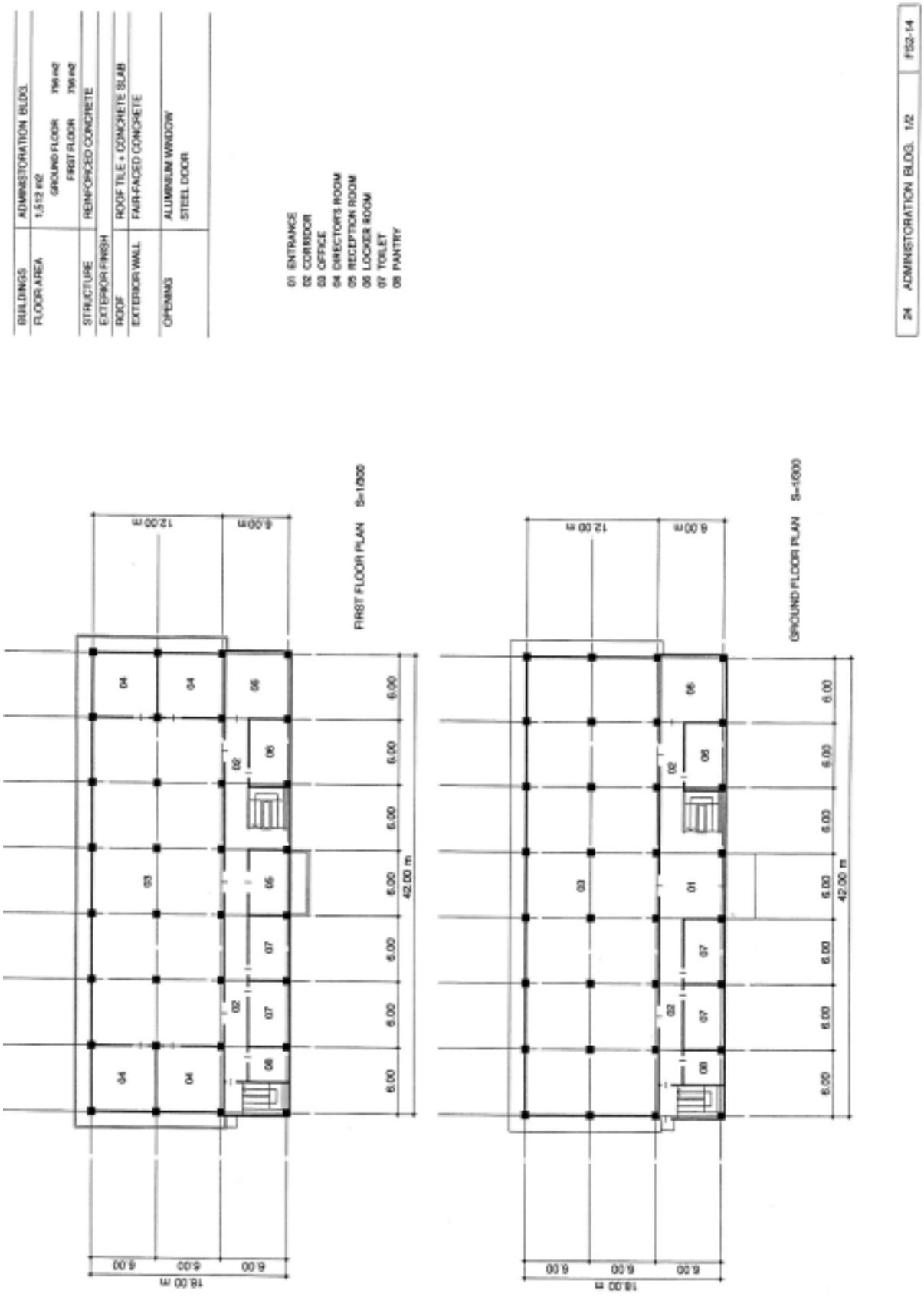
FS2-12 Storehouse-1 & 2



FS2-13 Substation-1, 2 & 3

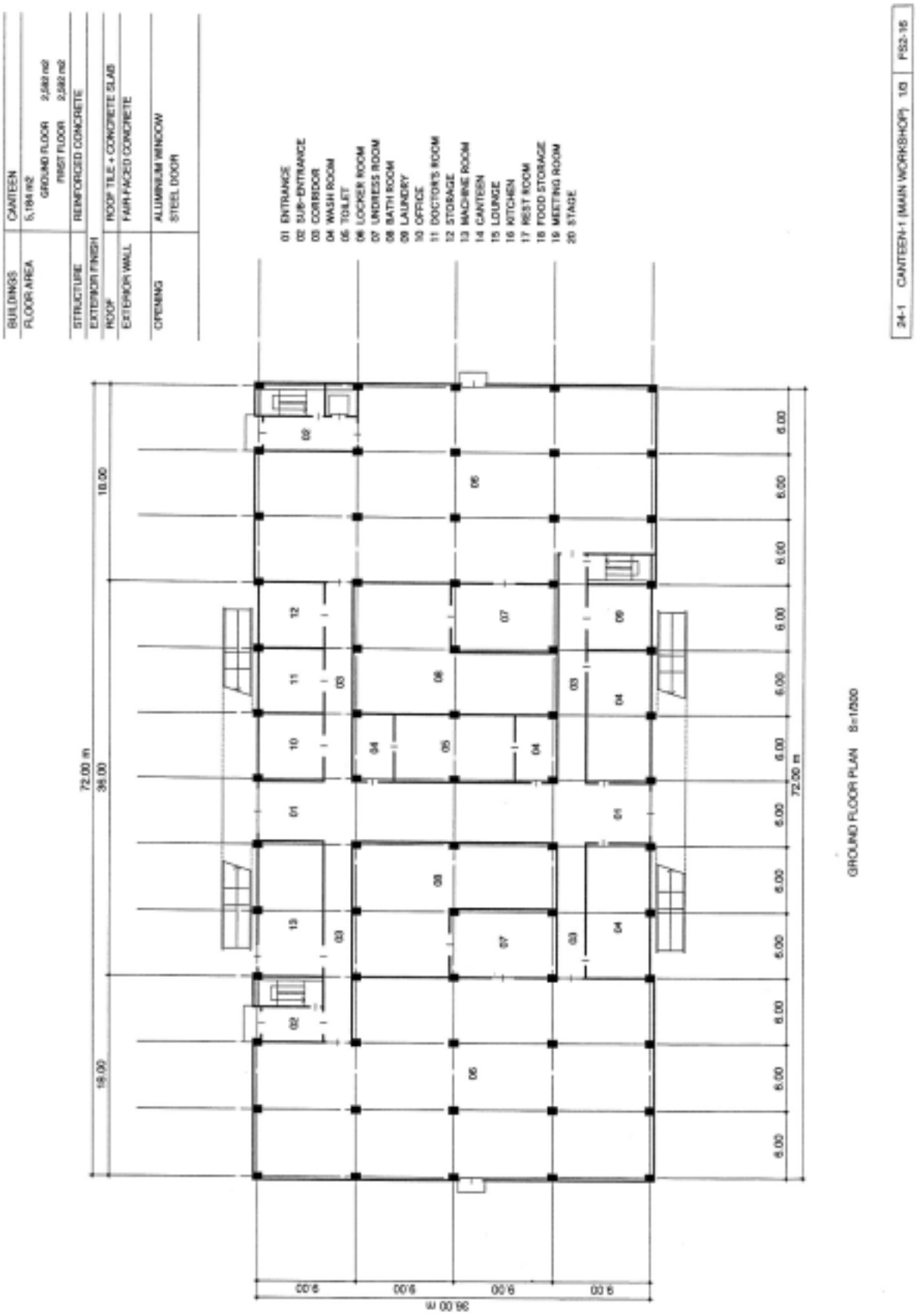


FS2-14 Administration Building (1/2)

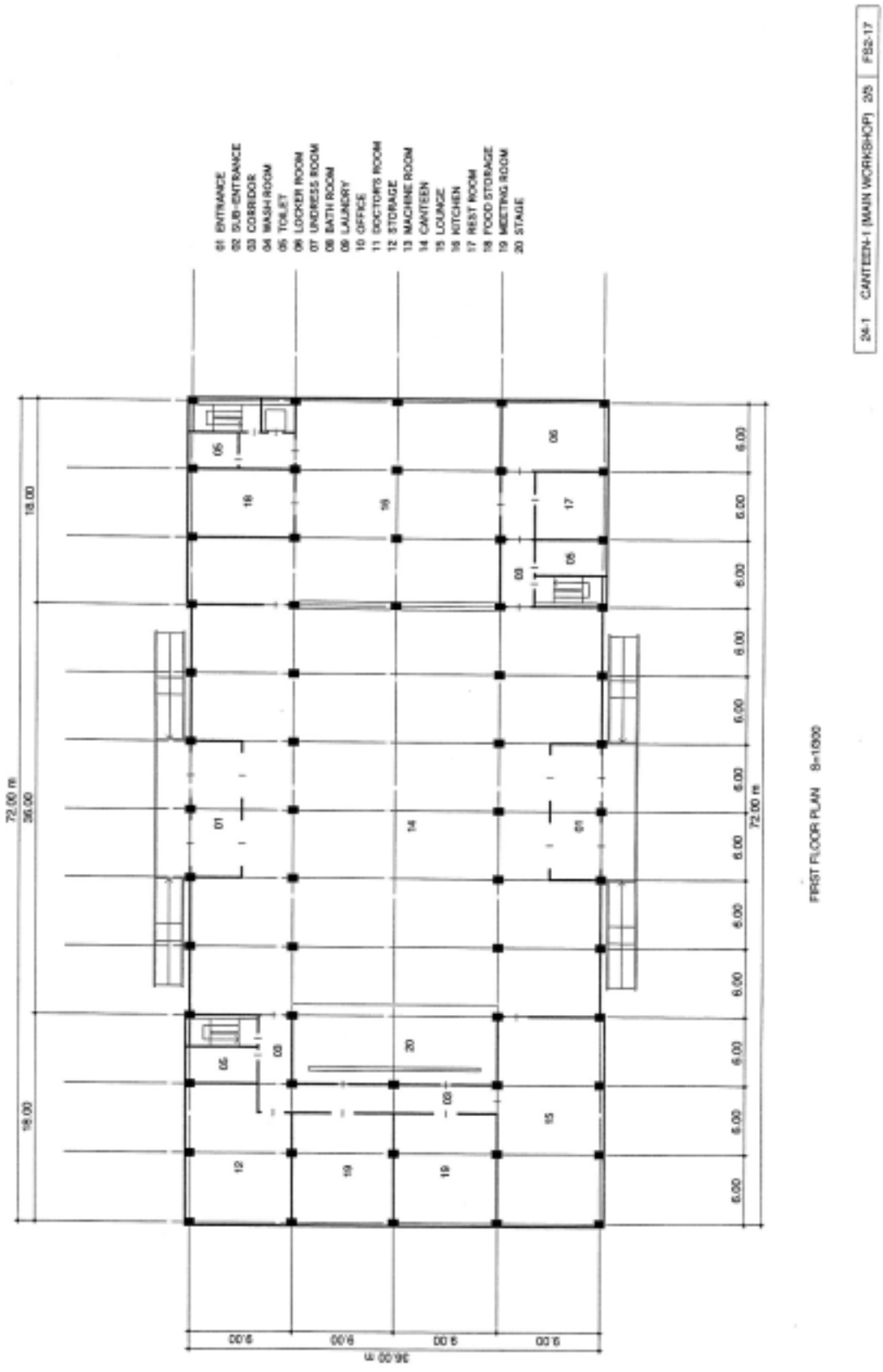


FS2-15 Administration Building (2/2)

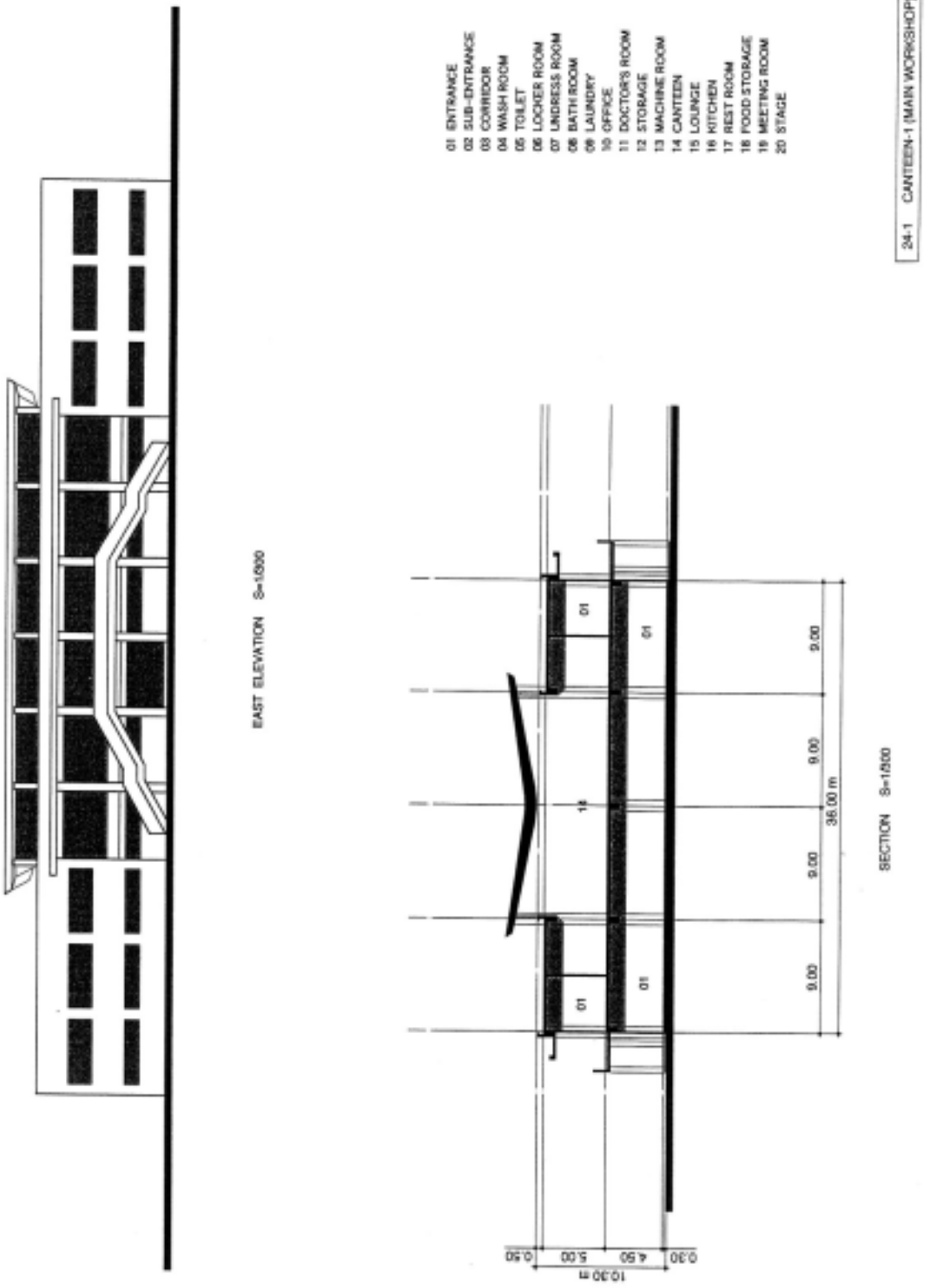
FS2-16 Canteen-1 (1/3)



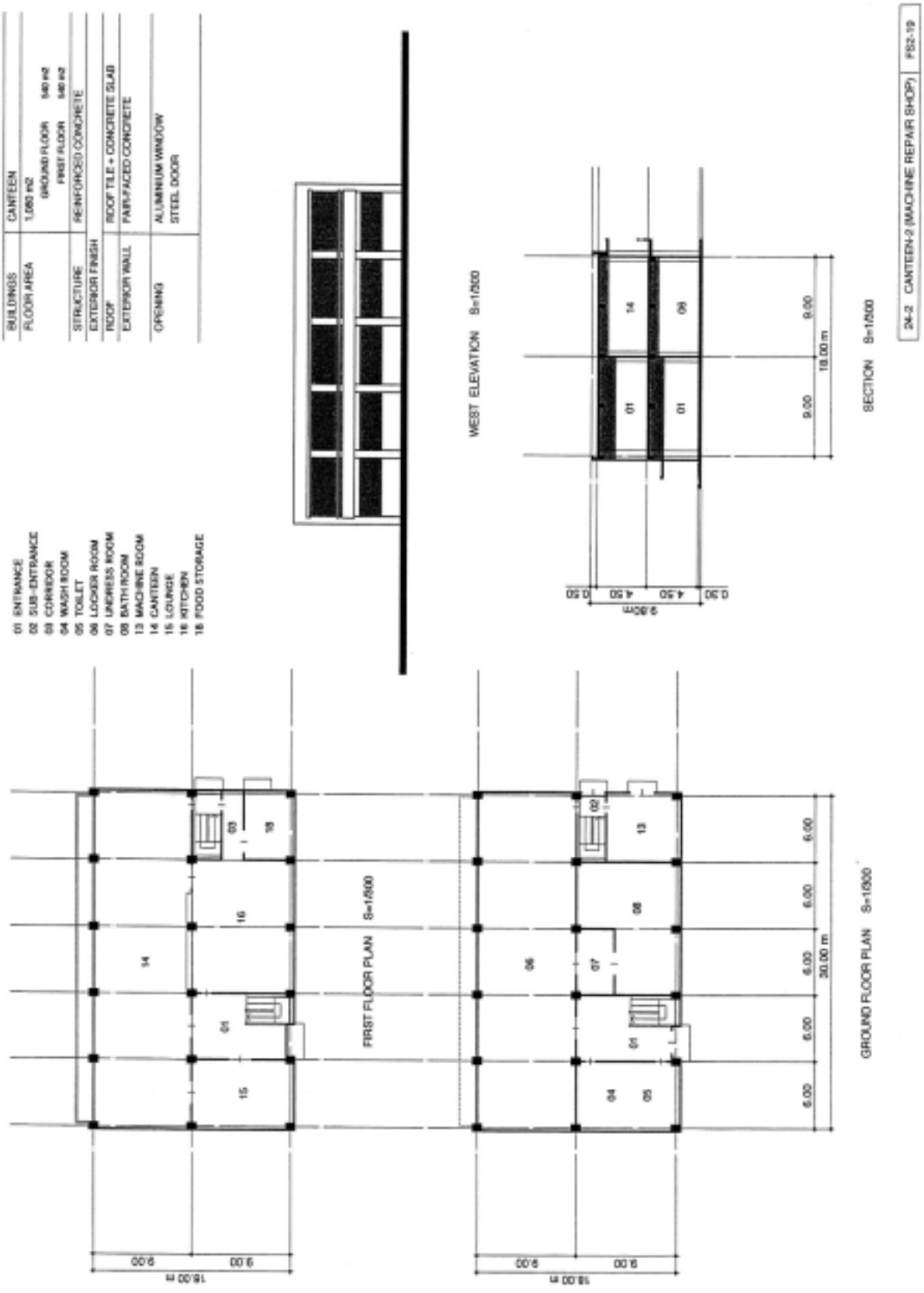
FS2-17 Canteen-1 (2/3)



FS2-18 Canteen-1 (3/3)



FS2-19 Canteen-2



Appendix 8

Appendix 8.2.1 (1)　　Feasibility Study on the Locomotive Workshop Modernization Financial Analysis

Sensitivity Analysis　Savings　0% down　Workshop Construction Cost　0% up

(Unit: Million Syrian Pounds)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Savings of Expenses																
Savings of Overhaul Cost	0	0	0	0	0	20	20	20	20	44	44	44	44	44	68	68
Savings of Temporary Repair Cost	0	0	0	0	0	2	2	2	2	3	3	3	3	3	4	4
Savings of Wheel Shaving Cost	0	0	0	0	0	22	22	22	22	34	34	34	34	34	58	58
Savings of Wheel Replacement Cost	0	0	0	0	0	28	28	28	28	45	45	45	45	45	75	75
Total	0	0	0	0	0	72	72	72	72	126	126	126	126	126	206	206
Investment																
Construction Cost of New Workshop																
Land	0	0	39	0	0	0	0	0	0	0	0	0	0	0	0	0
Building	0	0	415	415	415	34	34	34	0	0	0	0	0	0	0	0
Facilities & Equipment	0	0	216	216	216	0	0	0	0	0	0	0	0	0	0	0
Roadbed	0	240	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail	0	39	156	0	0	0	0	0	0	0	0	0	0	0	0	0
Machinery	0	0	0	1,779	1,973	0	863	961	0	6	0	0	0	0	17	0
Sub-Total	0	279	826	2,410	2,604	34	897	995	0	6	0	0	0	0	17	0
Consultant Fee	25	48	56	53	53	41	65	65	0	0	0	0	0	0	0	0
Total	25	326	882	2,463	2,657	75	961	1,059	0	6	0	0	0	0	17	0
Salvage Value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maintenance Facilities of Diesel Cars																
Building	0	0	0	0	0	-34	-34	-34	0	0	0	0	0	0	0	0
Facilities & Equipment	0	0	0	0	0	0	-863	-961	0	-2	0	0	0	0	-4	0
Consultant Fee	0	0	0	0	0	-29	-35	-35	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	-63	-932	-1,030	0	-2	0	0	0	0	-4	0
Salvage Value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rolling Stock	0	0	0	0	0	-3,183	0	0	0	-736	0	0	0	0	-644	0
Salvage Value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cashflow for FIRR																
Savings of Expenses	0	0	0	0	0	72	72	72	72	126	126	126	126	126	206	206
Investment(-)	25	326	882	2,463	2,657	-3,171	29	29	0	-731	0	0	0	0	-631	0
Salvage Value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	-25	-326	-882	-2,463	-2,657	3,243	42	42	72	857	126	126	126	126	837	206
FIRR	5.4%															

Appendix 8.2.1 (2) Feasibility Study on the Locomotive Workshop Modernization Financial Analysis

Sensitivity Analysis Savings 0% down Workshop Construction Cost 0% up

(Unit: Million Syrian Pounds)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Savings of Expenses															
Savings of Overhaul Cost	68	68	68	159	159	159	159	159	159	159	159	159	159	159	2,392
Savings of Temporary Repair Cost	4	4	4	6	6	6	6	6	6	6	6	6	6	6	102
Savings of Wheel Shaving Cost	58	58	58	93	93	93	93	93	93	93	93	93	93	93	1,566
Savings of Wheel Replacement Cost	75	75	75	121	121	121	121	121	121	121	121	121	121	121	2,039
Total	206	206	206	378	378	378	378	378	378	378	378	378	378	378	6,099
Investment															
Construction Cost of New Workshop															
Land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,347
Facilities & Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	648
Roadbed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	240
Rail	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195
Machinery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,599
Sub-Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,067
Consultant Fee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	405
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,472
Salvage Value	0	0	0	0	0	0	0	0	0	0	0	0	0	328	328
Maintenance Facilities of Diesel Cars															
Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-102
Facilities & Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1,829
Consultant Fee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-100
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-2,031
Salvage Value	0	0	0	0	0	0	0	0	0	0	0	0	0	-54	-54
Rolling Stock	0	0	0	-1,435	0	0	0	0	0	0	0	0	0	0	-5,998
Salvage Value	0	0	0	0	0	0	0	0	0	0	0	0	0	-421	-421
Cashflow for FIRR															
Savings of Expenses	206	206	206	378	378	378	378	378	378	378	378	378	378	378	6,099
Investment(-)	0	0	0	-1,435	0	0	0	0	0	0	0	0	0	0	442
Salvage Value	0	0	0	0	0	0	0	0	0	0	0	0	0	-147	-147
Total	206	206	206	1,813	378	378	378	378	378	378	378	378	378	230	5,509
FIRR															

Appendix 9

APPENDIX 9

Appendix 9.1 Water Quality Analysis Survey

The Muslimiya area residents, as well as the Muslimiya station, rely on well water for their drinking and irrigation. Three samples were obtained from the Muslimiya area. In addition three samples were obtained from Jubrin area where the existing workshop is located. Results of the sample analysis are shown in the following table. All samples are not fit for drinking according to the draft Syrian standards (shaded figures in table).

Water Quality Chemical Analysis

	M 1	M 2	M 3	J 1	J 2	J 3
Location	Siffat village	Ahdath District	Muslimia Station	North of station	Jubrin Station	East of Station
Well depth	77m	130m	150m	50m	100-120m	30m
Positive ions (mg/l)						
Ca	68	62	76	80	50	128
Mg	22	17	13.4	22	18.3	22
Na	7	4	5	4	5	8
K	0.7	0.5	0.4	0.5	0.4	0.95
Nh4	**0.09**	0.05	**0.09**	0.04	0.04	**0.26**
Fe	0.05	0.015	0.01	0.10	0.19	0.05
Cu	0.18	0.04	0.06	0.16	0.10	0.22
Negative ions (mg/l)						
HCO3	202	208	213	268	165	329
Cl	31.9	22	26	29	20	49
SO4	39.84	26	9	15	48	38
NO3	17.3	9	25.5	13.6	1.2	29
NO2	0.02	**0.07**	**0.14**	**0.08**	0.02	0.027
PO4	0.2	0.16	0.12	0.26	0.08	0.19
CO3	0.0	0	0	0	0	0
pH	7.65	7.45	7.35	7.15	7.5	7.2
EC (micro seimens/cm)	725	470	560	620	430	1,015
TDS (mg/lit)	520	365	400	435	330	740
SS	80	47	40	80	30	110
COD (mg/lit)	6	8	8	4	4	12
BOD (mg/lit)	0	0	0	0	0	0
THT (mg/lit of CaCO3)	165	170	175	220	135	270
THP (mg/lit of CaCO3)	95	55	70	70	65	140
Total Chrome (mg/lit)	0.05	0.07	0.08	0.04	0.04	0.05
TAC (mg/lit of CaCO3)	165	170	175	220	135	270
Total bacterial number (/100 m.lit)	**>5000**	**>5000**	**>10000**	**>2000**	**>2000**	**>10000**
E.C.	**(+)**	**(+)**	**(-)**	**(-)**	**(-)**	**(+)**
Algae	(+5)	(-)	(-)	(-)	(-)	(+3)

Appendix 9.2 Results of Interview Surveys

Results of the interview survey for 49 households in the project area are shown in the following table.

Residents Interview Survey Results

Item / Area	1	2	3	4	5	6	7	8	Total
1) Number of households	18	3	3	3	11	6	4	1	49
2) Residence status									
2.1) Informal	18	3	3	3	4	2	4	0	37
2.2) Formal	0	0	0	0	7	4	0	1	12
3) Ave. years family in this area	14.3	38.3	25	5.3	68.5	69.7	9.8	3	34.2
4) Ave. household size	14.6	8.7	20.3	6.7	14.4	12.2	13.3	6.0	13.4
5) Ave. workers/household	2.1	2.0	4.0	2.7	2.6	2.8	2.5	1.0	2.5
6) Work location									
6.1) Muslimiya area	79%	100%	100%	75%	93%	88%	90%	0%	87%
6.2) Outside project area	21%	0%	0%	25%	7%	12%	10%	100%	13%
7) Work sector									
7.1) Agriculture	8%	33%	75%	50%	48%	31%	0%	0%	31%
7.2) Industry	68%	33%	25%	25%	34%	63%	80%	0%	50%
7.3) Others	24%	34%	0%	25%	17%	6%	20%	100%	19%
8) Services availability									
8.1) Sanitary drainage									
- Sewage system	44%	0%	0%	0%	0%	33%	0%	0%	20%
- Septic tank	56%	100%	100%	100%	100%	77%	100%	100%	80%
8.2) Potable water									
- Water system	0%	0%	0%	0%	0%	67%	0%	0%	8%
- Well	89%	67%	100%	100%	100%	33%	100%	100%	86%
(Well depth in meters)	50-150	50-100	70-150	60-100	40-110	60-75	75-140	100-150	40-150
- Water purchase	11%	33%	0%	0%	0%	0%	0%	0%	6%
8.3) Electric power									
- Main network	100%	100%	100%	100%	100%	100%	100%	100%	100%
- Power supply unreliable	56%	67%	0%	0%	0%	0%	0%	0%	0%
8.4) Solid waste									
- Open dumping/burning	89%	100%	33%	67%	100%	83%	100%	100%	88%
- Container	11%	0%	0%	0%	0%	17%	0%	0%	6%
- Farm use	0%	0%	67%	33%	0%	0%	0%	0%	6%
9) Problems with surrounding facilities									
9.1) Railways	11%	0%	0%	0%	0%	0%	0%	100%	17%
9.2) Cement plant	100%	100%	100%	100%	100%	100%	100%	100%	100%
9.3) Poultry farm	0%	0%	0%	33%	45%	0%	0%	0%	12%
9.4) Sheep herding	11%	0%	33%	67%	27%	0%	0%	0%	12%
9.5) Free zone area	0%	0%	0%	0%	0%	33%	0%	0%	4%
10) Other problems									
10.1) Transportation problem	11%	67%	100%	100%	100%	0%	0%	0%	43%
10.2) Roads poor	22%	67%	100%	100%	64%	33%	75%	0%	49%
10.3) Health care insufficient	94%	100%	100%	100%	100%	100%	100%	100%	98%
10.4) No telephone	83%	100%	100%	67%	100%	100%	100%	0%	90%
11) Opposition to new W/S	0%	0%	0%	0%	0%	0%	0%	0%	0%

Thirteen factories and the Station were interviewed and the results of six are shown in the following table.

Facilities Interview Survey Results

Item / Facility	Muslimiya Cement plant	Cereals Mills	Glass Factory	Tax Free Zone	Batteries Plant	Station
1) Production	Cement 605 t/yr Clinker 680 t/yr	Wheat Milled 50 t/d	Flat tiles 140,000t/yr Bottles 10,000 t/yr	153 store-houses and plants	Car Batteries	Train Op-eration Sheep Pens
2) Years of activity	40	30	23	40	10	90
3) Workers employed	1,300	10	1,500	1,500	8	25
4) Environmental issues						
4.1) Industrial solid waste	Collected and trans-ported	Sold as fodder	Broken glass recy-cled	Collected and trans-ported	Collected and trans-ported	Open dump
4.2) Industrial wastewater	Drained in open drain	Drained to cement plant drain	Drained to main drain	Drained to main drain	Drained to main drain	Septic tank
4.3) Odor	No problem	No problem	Bad inside and outside the plant	Bad odor from tan-neries	Bad inside the plant	No problem
4.4) Air emissions	Textile fil-ters and electric strainers	Dust from the milling operations	Combustion gasses	Some emis-sions	No problem	Locomotives smoke
4.5) Noise	Inside the plant	Inside the plant	Inside the plant	Inside the zone	No problem	When train passes
5) Impact of surrounding facilities						
5.1) Railway operation	None	None	None	None	None	When train passes
5.2) Cement plant	Serious, es-pecially during blasting	Serious, es-pecially during blasting	Serious, es-pecially during blasting	Serious, es-pecially during blasting	Serious, es-pecially during blasting	Serious, es-pecially during blasting
6) Infrastructure problems						
6.1) Transportation	Company transport	Company transport	Good	Good	Poor	Good
6.2) Roads	Fair	Good	Good	Good	Good	Fair
6.3) Health centers	Available in plant	None	Available in plant	None	None	None
6.4) Telephones	Available	Available but service poor	Available	Available	None	Available but limited
7) Other comments	Workers health poor Railway passing in plant causes accidents		Plant ex-pansion plan under study Request to transport raw materi-als by rail	Expansion plan within zone Request for second railway line to serve zone		About 20 families liv-ing inside the station (GESR staff)
8) Comment on new workshop	Rail devel-opment welcome	No opinion	Rail devel-opment welcome	Rail devel-opment welcome	No opinion	No opinion

Ten farms were interviewed. The results of six are shown in the following table.

Farms Interview Survey Results

Item / Farm	Muslimiya	Maarata village	Siffat village	Siffat village (Public sector poultry farm)	Agriculture research center	West of the Station
1) Production						
1.1) Cultivation	Cereals, vegetables, cotton, olives	Cereals, olives	Cereals, flowers, trees	None	Cereals, trees, vegetables	Cereals, trees
1.2) Livestock	Sheep, cows, chicken, pigeons	Sheep	Sheep, pigeons	Chicken	Sheep, cows	
2) Years of activity	50	30	15	20	40	5
3) People living on the farm	35	8	7	30	4	8
4) Workers employed	15	4	3	45	23	3
5) Farm support facilites						
5.1) Irrigation water	Well (150m), summer low flow	Rain irrigated cultivation	Well (100m), poor quality	Well (100m), good quality	Well (100m), good quality	Well (90m), good quality, summer low flow
5.2) Soil conditions	Red cultivable soil, 2 seasons	Red cultivable soil	Red cultivable soil	Egg production	Red cultivable soil	Red cultivable soil
5.3) Fertilizers	Organic and chemical	Organic and chemical	Organic and chemical	None	Organic and chemical	Organic
5.4) Solid waste	Open dump and fodder	Open dump and fodder	Open dump, fodder and compost	None	Open dump and fodder	Burnt and fodder
6) Impact of surrounding facilities						
6.1) Railway operation	None	None	None	None	None	Sheep odor
6.2) Cement plant	Serious, especially during blasting	Some, especially during blasting	Some, but harmful to farm	None	Serious, especially during blasting	Serious, especially during blasting
7) Infrastructure problems						
7.1) Transportation	Fair	Good	Good	Good	Good	Poor
7.2) Roads	Unpaved branch roads	Fair	Fair	Good	Good	Poor
7.3) Health centers	None	None	None	Good	None	None
7.4) Telephones	None	None	None	Available	Available	None
8) Other comments	Cultivated land is 6 ha.		Pigeons raised as hobby and not for sale		Industrial wastewater drains into Kwik river and than flows back into center	Electricity not available for agriculture activity
9) Comment on new workshop	No opinion	No opinion	No opinion	No opinion	No opinion	No opinion

Appendix 9.3 Countermeasures to Mitigate Environmental Impacts

9.3.1 Solid Waste Management System

1) Determination of waste types and amounts to be generated at the workshop

- Hazardous wastes (such as spent solvents/degreasers, used oil mixed with chlorinated solvents, shop floor cleaning solutions, metal brightening solutions, oil-water separator sludge, pain and paint thinners, etc.)
- Special wastes to be handled as hazardous wastes despite a non-hazardous designation such as sludge or soil contaminated with oil and used oil.
- General wastes from the canteen and office work

2) Separation and storage of the waste at the source

3) Treatment of certain waste at the facility

4) Transport of the waste from the workshop to the treatment plant

5) System for waste recycling and reduction

9.3.2 Wastewater Management System

(1) Sources of wastewater

- Sanitary wastes from rest rooms of canteens
- Industrial wastes (such as maintenance area floor washing, tank bottom water, parts cleaning, painting, turntables, fueling area sub drains, etc.)
- Equipment wash waters (such as from manual washing of vehicle, rail car and locomotive exteriors, wash bay operations, and cleaning of tank cars and box car interiors)
- Other waste streams (such as from underground storage tank removal and cleanup, storm water collected in secondary containment structures, and storm water runoff)

(2) Treatment of wastewater on site

Facilities have been incorporated in the preliminary design concerning the treatment of wastewater. These are considered sufficient for mitigating anticipated environmental problems.